

Digital Temperature Controllers

E5EN

This Best-selling General-purpose Temperature Controller Is Now Even Better. Setup Tool Cable and Support Software Are Also Available.

- Controllers now available with analog inputs.
- Faster sampling at 250 ms.
- Transfer output provided for easy output to recorders.
- Voltage outputs (to drive SSRs) for both heating and cooling control.
- Models available with three-phase heater burnout detection and SSR failure detection.
- Manual output provided.
- Controller available with long-life relay output.
- Models available with external power supply for ES1B Infrared Thermosensor.
- Easy setting with 11-segment displays.
- Connect to either a thermocouple or platinum resistance thermometer with the same model.
- Easily see the status from a distance with PV display with three-color switching function.

Note: 1. Refer to *Safety Precautions for All E5□N Models*.
2. Refer to *New E5CN/E5CN-U/E5EN/E5AN Operation*.



48(W) x 96(H) x 78(D) mm



Features

Improved Functions for a Wider Range of Application

Control Analog Values, such as Pressures, Flowrates, and Levels

The E5EN Series now also includes models that accept analog inputs, enabling control applications other than for temperature, including pressure, flowrate, level, humidity, and weight control.

Faster Sampling at 250 ms

The previous sampling time of 500 ms has been reduced by half to 250 ms. This enables the E5EN to handle application requiring even greater response speed and accuracy.

Easy Connector to a Recorder

A transfer output now makes it easy to connect to a recorder or PLC Analog I/O Unit.

Voltage Outputs (to Drive SSRs) for Both Heating and Cooling Control.

Voltage outputs can be used for both heating and cooling for Models with Two Control Outputs.

Three-phase Heater Burnout Detection

With Models with Three-phase Heater Burnout and SSR Failure Detection, two current transformers can be connected to detect both heater burnout and SSR failure at the same time, reducing costs because a separate heater burnout alarm device is not required. SSR failure detection can be used even with Models with Single-phase Heater Burnout Alarms.

E58-CIFQ1 USB-Serial Conversion Cable for Computer Connection

A personal computer connection is possible for models without communications.

The CX-Thermo Support Software (sold separately) can be used to set parameters, monitor operation, and parameter masks.

Specifications: page 8, Dimensions: page 11



Related Product	<ul style="list-style-type: none">• EST2-2C-MV3 CX-Thermo Support Software• ES1B Infrared Thermosensor
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Model Number Structure

Model Number Legend

E5EN-□□□M□-500
1 2 3 4 5

1. Output 1 type

R: Relay
Q: Voltage for driving SSR
C: Current

2. Number of alarms

3: 3 alarms

3. Heater burnout/SSR failure

Output 2/External power supply for ES1B

H: Heater burnout/SSR failure detection (1 CT)
HH: Heater burnout/SSR failure detection (2 CT)
Q: Voltage for driving SSR
Y: Long-life Relay (with a triac)
P: External Power supply for ES1B

Blank: Not available

4. Option Unit

5. Input type

T: Thermocouple/platinum resistance thermometer (multi-input)
L: Analog input

Ordering Information

Temperature Input (Multi Input) Standard Models

Size	Power supply voltage	Number of alarm points	Control output	Heater alarm	Model
1/8 DIN 48 × 96 × 78 (W × H × D)	100 to 240 VAC	3	Relay	No	E5EN-R3MT-500
				Yes (1 CT)	E5EN-R3HMT-500
				Yes (2 CT)	E5EN-R3HHMT-500
			Voltage (for driving SSR)	No	E5EN-Q3MT-500
				Yes (1 CT)	E5EN-Q3HMT-500
				Yes (2 CT)	E5EN-Q3HHMT-500
	24 VAC/VDC	3	Relay	No	E5EN-R3MT-500
				Yes (1 CT)	E5EN-R3HMT-500
				Yes (2 CT)	E5EN-R3HHMT-500
			Voltage (for driving SSR)	No	E5EN-Q3MT-500
				Yes (1 CT)	E5EN-Q3HMT-500
				Yes (2 CT)	E5EN-Q3HHMT-500
24 VAC/VDC	3	Current	No	E5EN-C3MT-500	
			Yes (1 CT)	E5EN-C3HMT-500	
			Yes (2 CT)	E5EN-C3HHMT-500	
		Voltage (for driving SSR)	No	E5EN-Q3MT-500	
			Yes (1 CT)	E5EN-Q3HMT-500	
			Yes (2 CT)	E5EN-Q3HHMT-500	

Temperature Input (Multi Input) 2 Outputs Models

Size	Power supply voltage	Number of alarm points	Control output 1	Control output 2	Power supply for ES1B	Model	
1/8 DIN 48 × 96 × 78 (W × H × D)	100 to 240 VAC	3	Relay	Voltage (for driving SSR)	No	E5EN-R3QMT-500	
				Voltage (for driving SSR)		Voltage (for driving SSR)	E5EN-Q3QMT-500
						Long-life Relay (with a triac) (See note.)	E5EN-Q3YMT-500
			Current	Voltage (for driving SSR)		E5EN-C3QMT-500	
				Long-life Relay (with a triac) (See note.)		E5EN-C3YMT-500	
			Relay	No		Yes	Voltage (for driving SSR)
					E5EN-Q3PMT-500		
					E5EN-C3PMT-500		

Note: Switching for the long-life relay output is performed using a triac to open and close the circuit. The output will not turn OFF if the long-life relay output is connected to a DC load. Always use the long-life relay output connected to an AC load. For details, check the conditions in *Ratings/Characteristics*.

Note: Be sure to read the precautions for correct use and other precautions in the following user's manual before using the Digital Controller.

E5CN/E5CN-U/E5EN/E5AN Digital Temperature Controller User's Manual (Cat. No. H134)

E5CN/E5EN/E5AN Digital Temperature Controller Communications Functions User's Manual (Cat. No. H135)

■ Analog Input Models

Size	Power supply voltage	Number of alarm points	Control output 1	Heater alarm	Control output 2	Model
1/8 DIN 48 × 96 × 78 (W × H × D)	100 to 240 VAC	3	Relay	No	No	E5EN-R3ML-500
			Voltage (for driving SSR)	No		E5EN-Q3ML-500
			Current	No		E5EN-C3ML-500
			Relay	Yes (1 CT)		E5EN-R3HML-500
			Voltage (for driving SSR)	Yes (1 CT)		E5EN-Q3HML-500
			Voltage (for driving SSR)	No	Long-life Relay (with a triac)	E5EN-Q3YML-500

■ Option Units

Name	Function	Model
Communication Unit	RS-232C Communication	E53-EN01
	RS-485 Communication	E53-EN03
Event Input Unit	Event Input	E53-AKB

Specifications

■ Ratings

Item	Power supply voltage	100 to 240 VAC, 50/60 Hz (See note.)	24 VAC, 50/60 Hz or 24 VDC
Operating voltage range		85% to 110% of rated supply voltage	
Power consumption		Approx. 10 VA	Approx. 5.5 VA at 24 VAC, Approx. 4 W at 24 VDC
Sensor input		Models with temperature inputs Thermocouple: K, J, T, E, L, U, N, R, S, or B Platinum resistance thermometer: Pt100 or JPt100 Infrared temperature sensor: 10 to 70°C, 60 to 120°C, 115 to 165°C, or 140 to 260°C Voltage input: 0 to 50 mV	
		Models with analog inputs Current input: 4 to 20 mA or 0 to 20 mA Voltage input: 1 to 5 V, 0 to 5 V, or 0 to 10 V	
Input impedance		Current input: 150 Ω, Voltage input: 1 MΩ (Use a 1:1 connection when connecting the ES2-HB.)	
Control output	Relay output	SPST-NO, 250 VAC, 5 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA	
	Voltage output	Output voltage: 12 VDC $\pm 15\%$ $\pm 15\%$ (PNP), max. load current: 40 mA, with short-circuit protection circuit (max. load current of control output 2: 21 mA)	
	Current output	4 to 20 mA DC/0 to 20 mA DC, load: 600 Ω max., resolution: approx. 2,700	
	Long-life relay output	SPST-NO, 250 VAC, 3 A (resistive load), electrical life: 1,000,000 operations, load power supply voltage: 75 to 250 VAC (DC loads cannot be connected.), minimum applicable load: 5 V, 10 mA, leakage current: 5 mA max. (250 VAC, 60 Hz)	
Alarm output		SPST-NO, 250 VAC, 1 A (resistive load), electrical life: 100,000 operations, minimum applicable load: 5 V, 10 mA	
Event input	Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.	
	Non-contact input	ON: Residual voltage: 1.5 V max., OFF: Leakage current: 0.1 mA max.	
		Outflow current: Approx. 7 mA per point	
External power supply for ES1B		12 VDC $\pm 10\%$, 20 mA, Short-circuit protection provided.	
Control method		ON/OFF control or 2-PID control (with auto-tuning)	
Setting method		Digital setting using front panel keys	
Indication method		11-segment digital display and individual indicators (7-segment displays also possible) Character height: PV: 14 mm, SV: 9.5 mm	
Other functions		Manual output, heating/cooling control, transfer output (on some models), loop break alarm, multi SP, SP ramp, MV limiter, input digital filter, self-tuning, temperature input shift, run/stop, protection functions, etc.	
Ambient operating temperature		-10 to 55°C (with no icing or condensation), for 3-year warranty: -10 to 50°C	
Ambient operating humidity		25% to 85%	
Storage temperature		-25 to 65°C (with no icing or condensation)	

Note: Do not use the output from an inverter as the power supply. (Refer to *Safety Precautions for All E5EN Models*.)

Input Range

Thermocouples/Platinum Resistance Thermometers (Multi-inputs)

Input Type	Platinum resistance thermometer		Thermocouple												Infrared temperature sensor				Analog input					
	Pt100		JPt100		K	J	T	E	L	U	N	R	S	B	10 to 70°C	60 to 120°C	115 to 165°C	140 to 260°C						
Temperature range (°C)	850	500.	100.	500.	100.	1300	500.	850	400.	400.	400.	600	850	400.	400.	1300	1700	1700	1800	90	120	165	260	Usable in the following ranges by scaling: -1999 to 9999 or -199.9 to 999.9
Setting number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

The applicable standards for the input types are as follows:

K, J, T, E, N, R, S, B: IEC 584-1

L: Fe-CuNi, DIN 43710-1985

U: Cu-CuNi, DIN 43710-1985

Pt100: IEC 751

Shaded settings are the default settings.


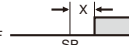
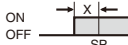
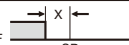





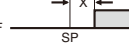



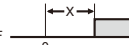

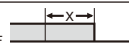

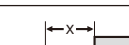

Models with Analog Inputs

Input Type	Current		Voltage		
Input specification	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Setting range	Usable in the following ranges by scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99 or -1.999 to 9.999				
Setting number	0	1	2	3	4

Shaded settings are the default settings.

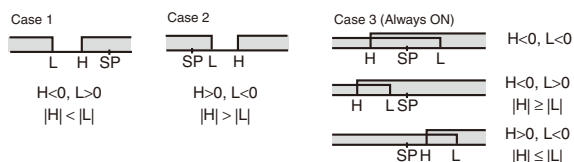
Alarm Types

Select alarm types out of the 12 alarm types listed in the following table.

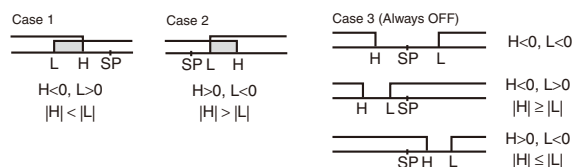
Set value	Alarm type	Alarm output operation	
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 (See note 1.)	Upper- and lower-limit	ON OFF 	(See note 2.)
2	Upper limit	ON OFF 	ON OFF 
3	Lower limit	ON OFF 	ON OFF 
4 (See note 1.)	Upper- and lower-limit range	ON OFF 	(See note 3.)
5 (See note 1.)	Upper- and lower-limit with standby sequence	ON OFF  (See note 5.)	(See note 4.)
6	Upper-limit with standby sequence	ON OFF 	ON OFF 
7	Lower-limit with standby sequence	ON OFF 	ON OFF 
8	Absolute-value upper-limit	ON OFF 	ON OFF 
9	Absolute-value lower-limit	ON OFF 	ON OFF 
10	Absolute-value upper-limit with standby sequence	ON OFF 	ON OFF 
11	Absolute-value lower-limit with standby sequence	ON OFF 	ON OFF 
12 (See note 6.)	LBA (for alarm 1 only)	---	

Note: 1. With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."

2. Set value: 1, Upper- and lower-limit alarm



3. Set value: 4, Upper- and lower-limit range



4. Set value: 5, Upper- and lower-limit with standby sequence

For Upper- and Lower-Limit Alarm Described Above

- Case 1 and 2
Always OFF when the upper-limit and lower-limit hysteresis overlaps.

- Case 3: Always OFF

5. Set value: 5, Upper- and lower-limit with standby sequence

Always OFF when the upper-limit and lower-limit hysteresis overlaps.

6. Set value: 12, LBA can be set only for alarm 1.

Set the alarm types for alarms 1 to 3 independently in the initial setting level. The default setting is 2 (upper limit).

■ Characteristics

Indication accuracy	Thermocouple: ($\pm 0.5\%$ of indicated value or $\pm 1^\circ\text{C}$, whichever is greater) ± 1 digit max. (See note 1.) Platinum resistance thermometer: ($\pm 0.5\%$ of indicated value or $\pm 1^\circ\text{C}$, whichever is greater) ± 1 digit max. Analog input: $\pm 0.5\%$ FS ± 1 digit max. CT input: $\pm 5\%$ FS ± 1 digit max.	
Influence of temperature (See note 2.)	Thermocouple input (R, S, B): ($\pm 1\%$ of PV or $\pm 10^\circ\text{C}$, whichever is greater) ± 1 digit max. Other thermocouple input: ($\pm 1\%$ of PV or $\pm 4^\circ\text{C}$, whichever is greater) ± 1 digit max. *K thermocouple at -100°C max.: $\pm 10^\circ\text{C}$ max.	
Influence of voltage (See note 2.)	Platinum resistance thermometer: ($\pm 1\%$ of PV or $\pm 2^\circ\text{C}$, whichever is greater) ± 1 digit max. Analog input: ($\pm 1\%$ FS) ± 1 digit max.	
Hysteresis	Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.01 to 99.99% FS (in units of 0.01% FS)	
Proportional band (P)	Models with thermocouple/platinum resistance thermometer (multi-input) input: 0.1 to 999.9 EU (in units of 0.1 EU) (See note 3.) Models with analog input: 0.1 to 999.9% FS (in units of 0.1% FS)	
Integral time (I)	0 to 3999 s (in units of 1 s)	
Derivative time (D)	0 to 3999 s (in units of 1 s) (See note 4.)	
Control period	0.5, 1 to 99 s (in units of 1 s)	
Manual reset value	0.0 to 100.0% (in units of 0.1%)	
Alarm setting range	-1999 to 9999 (decimal point position depends on input type)	
Sampling period	250 ms	
Affect of signal source resistance	Thermocouple: $0.1^\circ\text{C}/\Omega$ max. (100 Ω max.) (See note 5.) Platinum resistance thermometer: $0.4^\circ\text{C}/\Omega$ max. (10 Ω max.)	
Insulation resistance	20 M Ω min. (at 500 VDC)	
Dielectric strength	2,000 VAC, 50 or 60 Hz for 1 min (between terminals with different charge)	
Vibration resistance	Malfunction	10 to 55 Hz, 20 m/s ² for 10 min each in X, Y, and Z directions
	Destruction	10 to 55 Hz, 0.75-mm single amplitude for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction	100 m/s ² min., 3 times each in X, Y, and Z directions
	Destruction	300 m/s ² min., 3 times each in X, Y, and Z directions
Weight	Controller: Approx. 260 g, Mounting Bracket: Approx. 100 g	
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IP20, Terminal section: IP00	
Memory protection	Non-volatile memory (number of writes: 1,000,000 operations)	
EMC	ESD Immunity: EN61000-4-2: 4 kV contact discharge 8 kV air discharge Electromagnetic Immunity: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz, 1.4 GHz to 2 GHz) Burst Noise Immunity: EN61000-4-4: 2 kV power line 1 kV measurement line, I/O signal line Surge Immunity: EN61000-4-5: 1 kV normal mode (power line, output line (relay output)) 2 kV common mode (power line, output line (relay output)) Conducted Disturbance Immunity: EN61000-4-6: 3 V (0.15 to 80 MHz) Voltage Dip/Interrupting Immunity: EN61000-4-11: 0.5 cycle, 100% (rated voltage) Radiated Interference Electromagnetic Field Strength: EN61326 Class A Noise Terminal Voltage: EN61326 Class A	
Approved standards	UL 61010C-1 (listing) CSA C22.2 No.1010.1 (evaluated by UL)	
Conformed standards	EN61010-1: 2001 IEC61010-1: 2001	

- Note:**
- The indication of K thermocouples in the -200 to 1300°C range, T and N thermocouples at a temperature of -100°C max., and U and L thermocouples at any temperature is $\pm 2^\circ\text{C} \pm 1$ digit maximum. The indication accuracy of the B thermocouple at a temperature of 400°C max. is not specified. The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is $\pm 3^\circ\text{C} \pm 1$ digit max.
 - Conditions
Ambient temperature: -10°C to 23°C to 55°C , Voltage range: -15% to $+10\%$ of rated voltage
 - "EU" stands for Engineering Unit and is used as the unit after scaling. For a temperature sensor, the EU is $^\circ\text{C}$ or $^\circ\text{F}$.
 - When robust tuning (RT) is ON, the differential time is 0.0 to 999.9 (in units of 0.1 s).
 - B, R, and S sensors: $0.2^\circ\text{C}/\Omega$ max. (100 Ω max.)

■ USB-Serial Conversion Cable

Applicable OS	Windows 2000/XP
Applicable software	Thermo Mini, CX-Thermo
Applicable models	E5CN/E5CN-U/E5AN/E5EN
USB interface standard	Conforms to USB Specification 1.1.
DTE speed	38400 bps
Connector specifications	Computer: USB (type A plug) Temperature Controller: Serial
Power supply	Bus power (Supplied from USB host controller.)
Power supply voltage	5 VDC
Current consumption	70 mA
Ambient operating temperature	0 to 55°C (with no condensation or icing)
Ambient operating humidity	10% to 80%
Storage temperature	-20 to -60°C (with no condensation or icing)
Storage humidity	10% to 80%
Altitude	2,000 m max.
Weight	Approx. 100 g

Note: A driver must be installed in the personal computer. Refer to installation information in the *operation manual* for the Conversion Cable.

■ Communications Specifications

Transmission line connection method	RS-485: multipoint RS-232C: point-to-point
Communications	RS-485 (two-wire, half duplex)/RS-232C
Synchronization method	Start-stop synchronization
Baud rate	1200, 2400, 4800, 9600, 19200, or 38400 bps
Transmission code	ASCII
Data bit length (See note.)	7 or 8 bits
Stop bit length (See note.)	1 or 2 bits
Error detection	Vertical parity (none, even, odd) Frame check sequence (FCS) with SYSWAY Block check character (BCC) with CompoWay/F or CRC-16 Modbus
Flow control	None
Interface	RS-485
Retry function	None
Communications buffer	40 bytes
Communications response wait time	0 to 99 ms Default: 20 ms

Note: The baud rate, data bit length, stop bit length, and vertical parity can be individually set using the Communications Setting Level.

■ Current Transformer (Sold Separately)

Dielectric strength	1,000 VAC for 1 min
Vibration resistance	50 Hz, 98 m/s ²
Weight	E54-CT1: Approx. 11.5 g, E54-CT3: Approx. 50 g
Accessories (E54-CT3 only)	Armatures (2) Plugs (2)

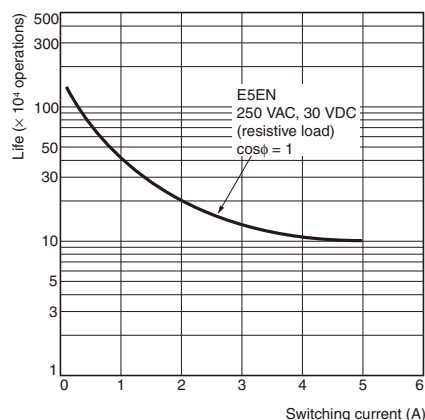
■ Heater Burnout Alarms and SSR Failure Detection Alarms

Maximum heater current	50 A AC
Input current indication accuracy	±5% FS ±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned OFF. 50.0 A: Heater burnout/SSR failure alarm output turned ON. Minimum detection ON time: 190 ms (See note 1.)
SSR failure detection alarm setting range	0.1 to 49.9 A (in units of 0.1 A) 0.0 A: Heater burnout/SSR failure alarm output turned ON. 50.0 A: Heater burnout/SSR failure alarm output turned OFF. Minimum detection OFF time: 190 ms (See note 2.)

Note: 1. If the ON time of control output 1 is less than 190 ms, heater burnout detection and the heater current will not be measured.

2. If the OFF time of control output 1 is less than 190 ms, SSR failure detection and the leakage current will not be measured.

■ Electrical Life Expectancy Curve for Relays (Reference Values)



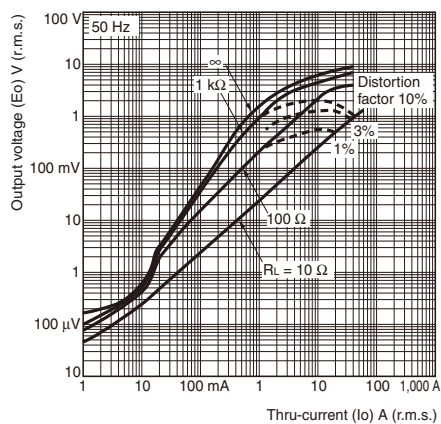
Note: Do not connect a DC load to a Controller with a Long-life Relay Output.

E54-CT1**Thru-current (I_o) vs. Output Voltage (E_o) (Reference Values)**

Maximum continuous heater current: 50 A (50/60 Hz)

Number of windings: 400 ± 2

Winding resistance: $18 \pm 2 \Omega$

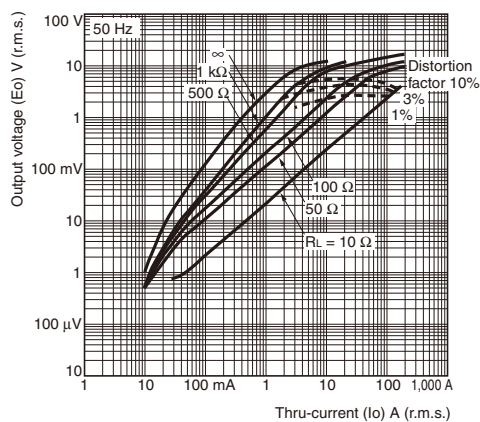
**E54-CT3****Thru-current (I_o) vs. Output Voltage (E_o) (Reference Values)**

Maximum continuous heater current: 120 A (50/60 Hz)

(Maximum continuous heater current for an OMRON Temperature Controller is 50 A.)

Number of windings: 400 ± 2

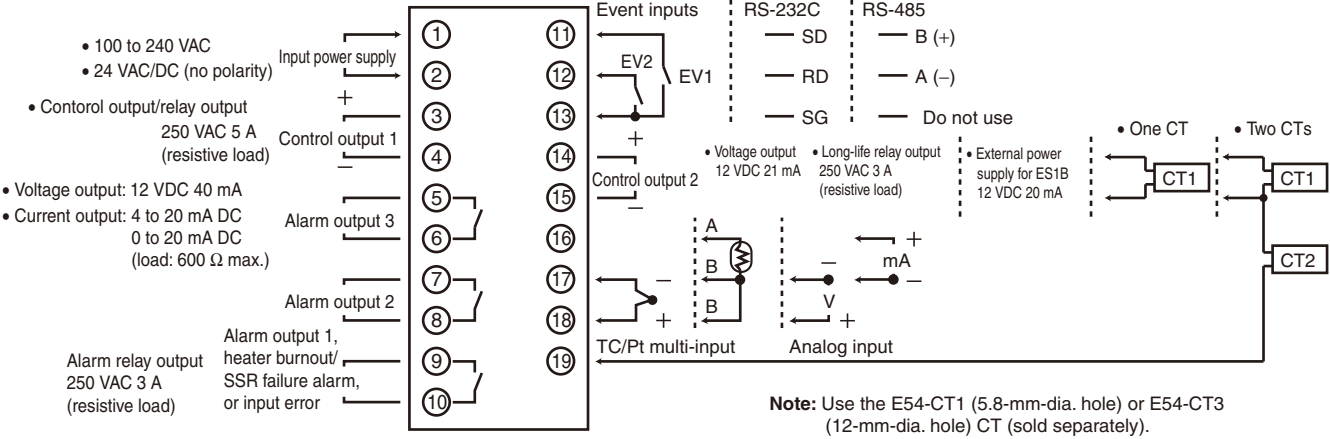
Winding resistance: $8 \pm 0.8 \Omega$



External Connections

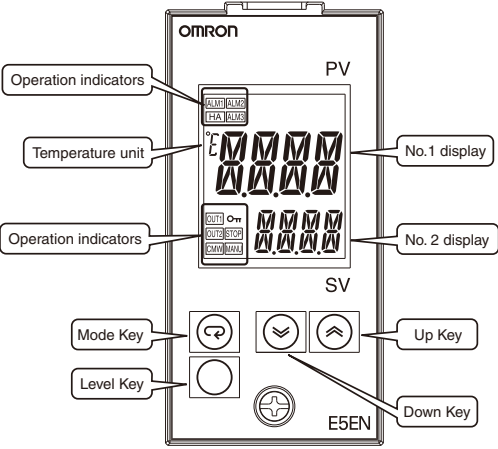
- The voltage output (control output 1) is not electrically insulated from the internal circuits. When using a grounding thermocouple, do not connect any of the control output terminals to ground. If the control output terminals are connected to ground, errors will occur in the measured temperature values as a result of leakage current.
- The voltage output (control output 2) is electrically isolated from internal circuits with basic insulation.
- An "R" suffix on the lot number indicates reinforced insulation between input power supply, relay output, and other terminals.
- Consult with your OMRON representative before using the external power supply for the ES1B for any other purpose.

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Nomenclature

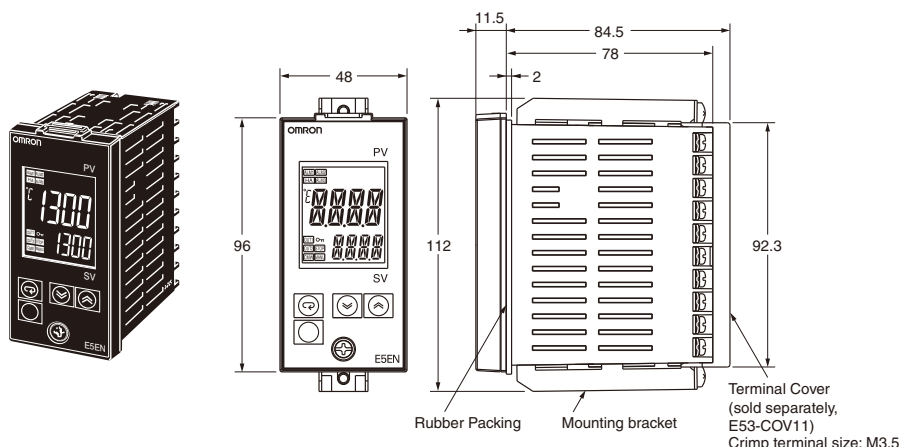
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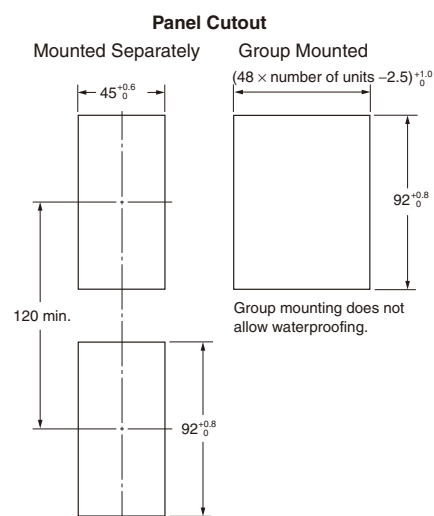
Dimensions

Note: All units are in millimeters unless otherwise indicated.

E5EN



Note: To remove the Controller from the case, loosen the screw at the bottom of the front panel with a screwdriver while pressing down on the hook at the top of the front panel.

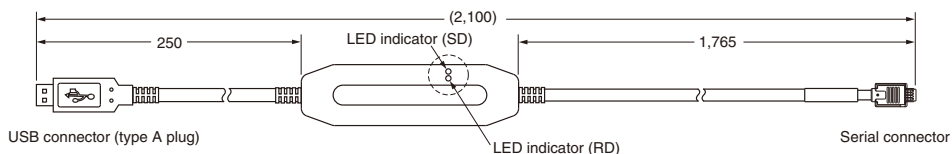
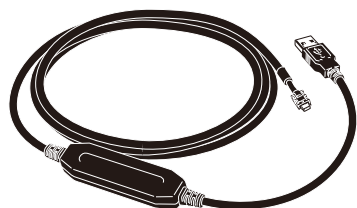


- Recommended panel thickness is 1 to 8 mm.
- Group mounting is not possible in the vertical direction. (Maintain the specified mounting space between Controllers.)
- To mount the Controller so that it is waterproof, insert the waterproof packing onto the Controller.
- When two or more Controllers are mounted, make sure that the surrounding temperature does not exceed the allowable operating temperature specified in the specifications.

Accessories

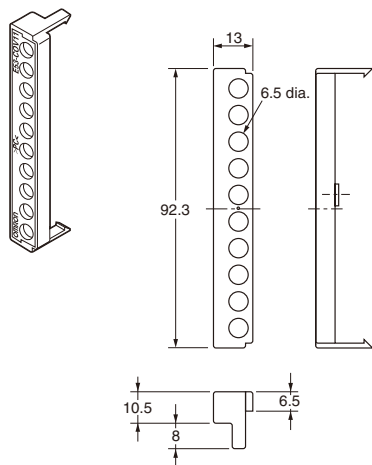
USB-Serial Conversion Cable (Sold Separately)

E58-CIFQ1



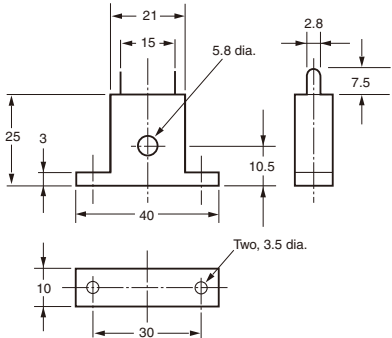
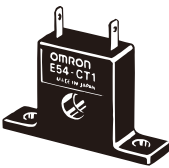
Terminal Covers

E53-COV11 (Two Covers Included)

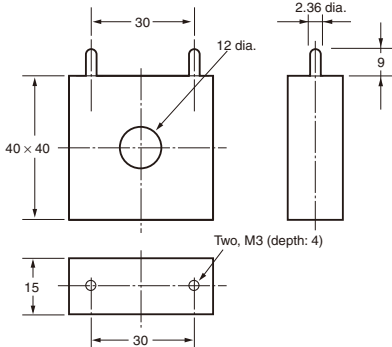


Current Transformers (Sold Separately)

E54-CT1

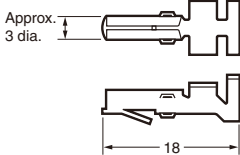


E54-CT3

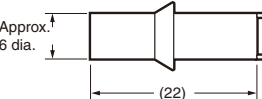


E54-CT3 Accessory

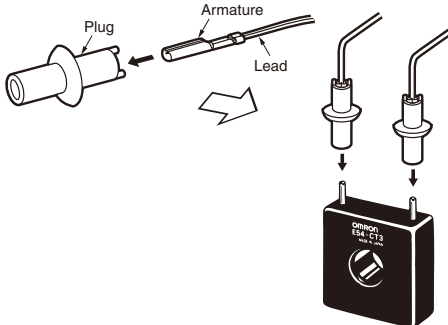
• Armature



• Plug



Connection Example



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

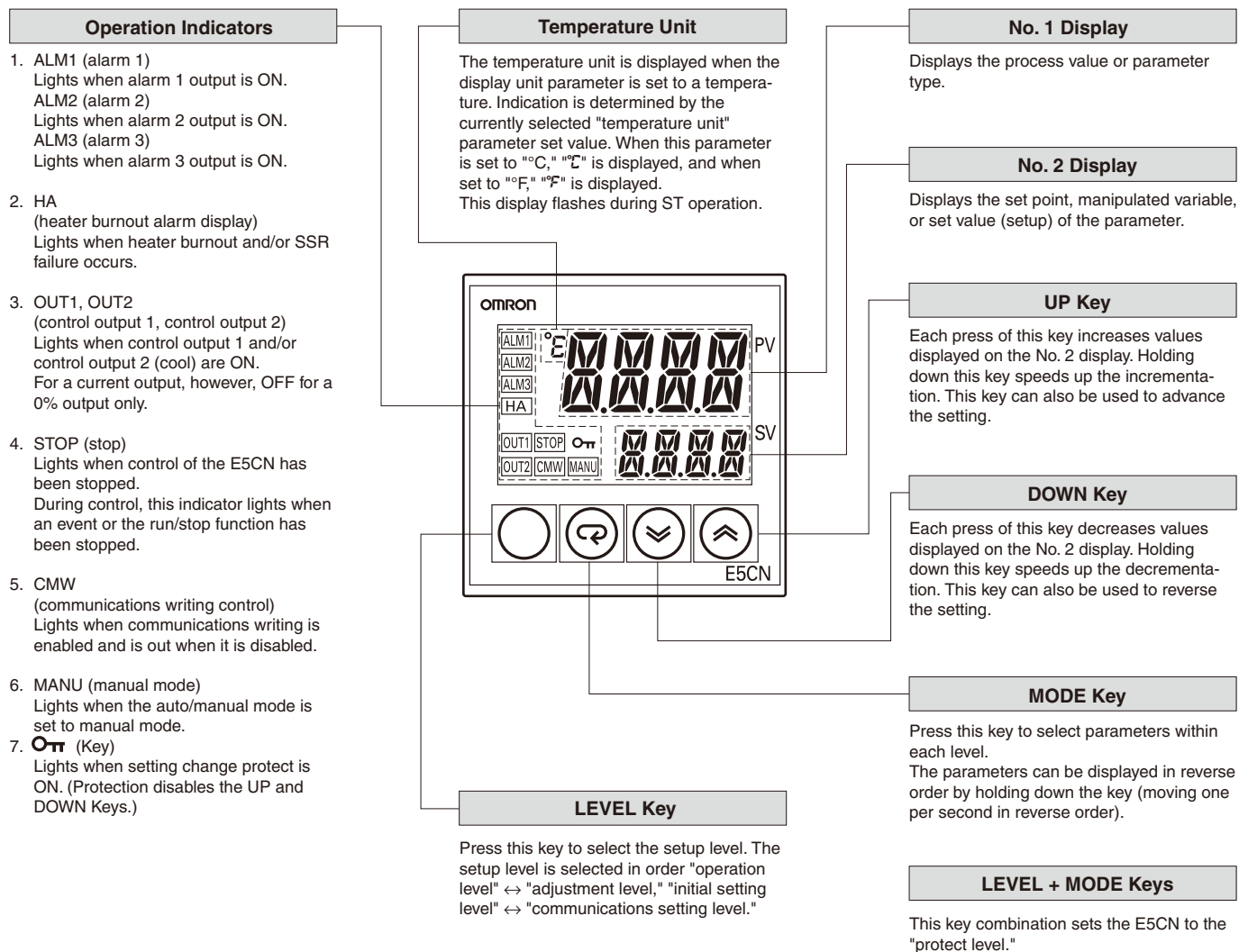
In the interest of product improvement, specifications are subject to change without notice.

New E5CN/E5CN-U/E5EN/E5AN Operation

Nomenclature

Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

E5CN

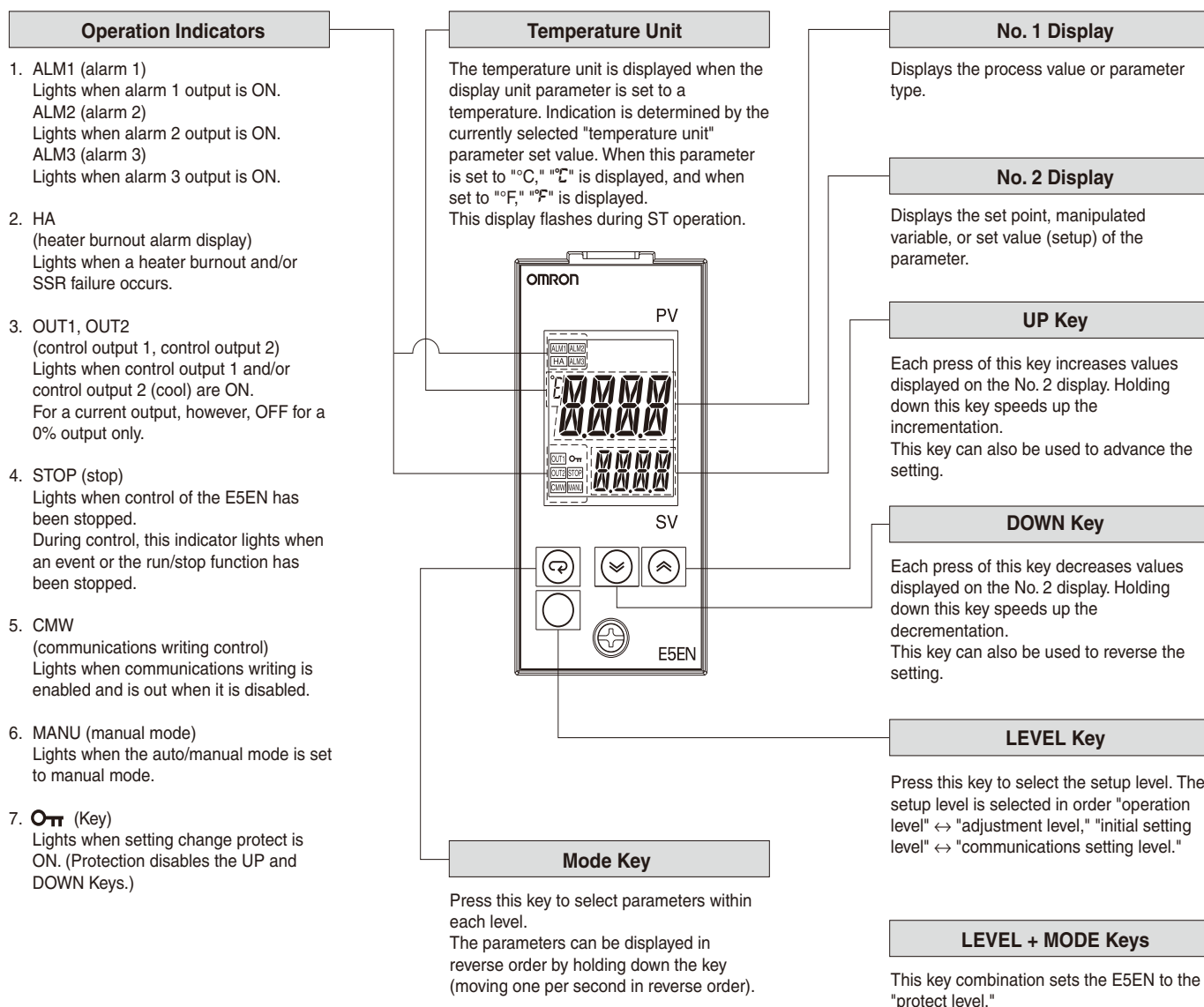


Note: Be sure to read the precautions for correct use and other precautions in the following user's manual before using the Digital Controller.

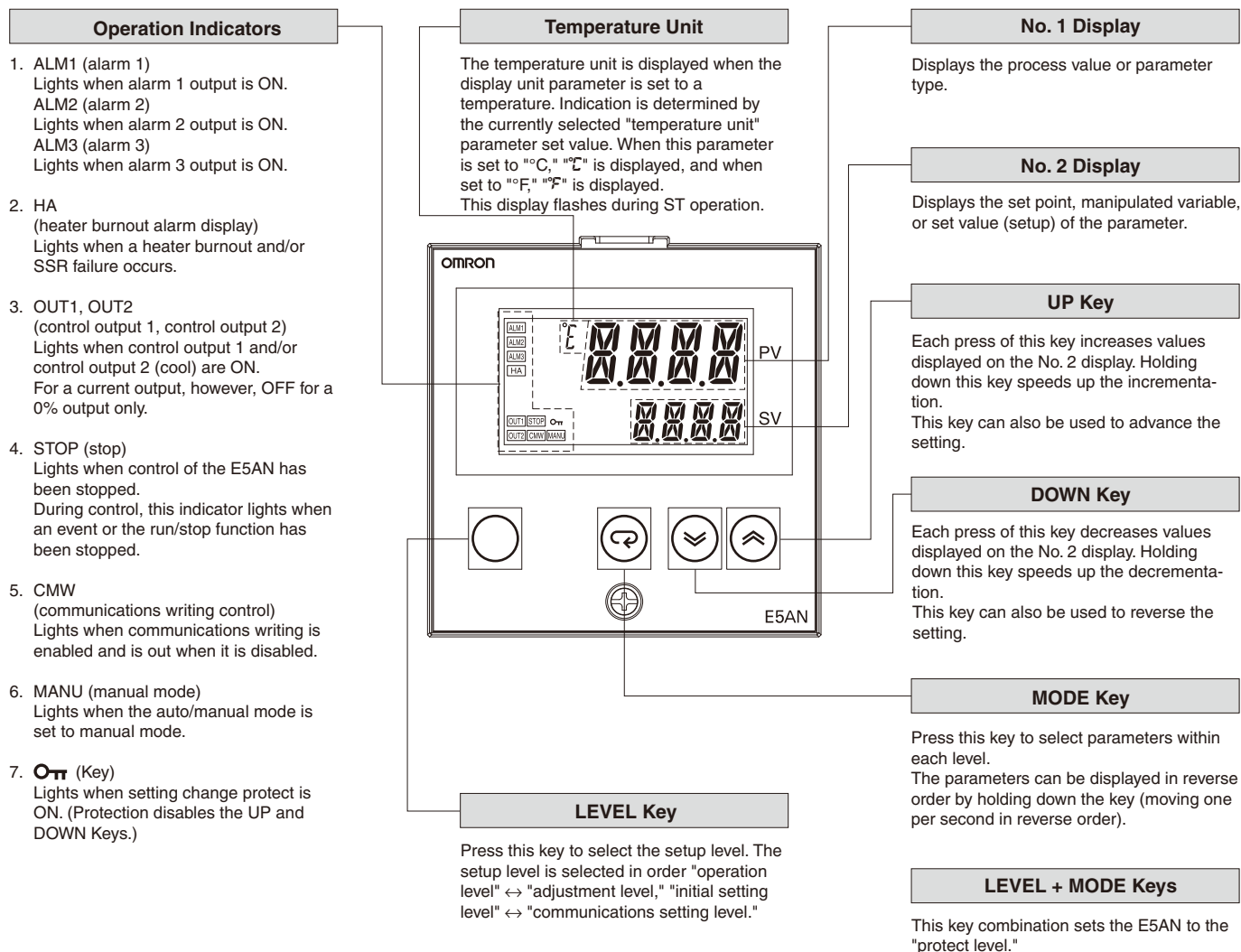
E5CN/E5CN-U/E5EN/E5AN Digital Temperature Controller User's Manual (Cat. No. H134)

E5CN/E5EN/E5AN Digital Temperature Controller Communications Functions User's Manual (Cat. No. H135)

E5EN



E5AN



Note: Be sure to read the precautions for correct use and other precautions in the following user's manual before using the Digital Controller.

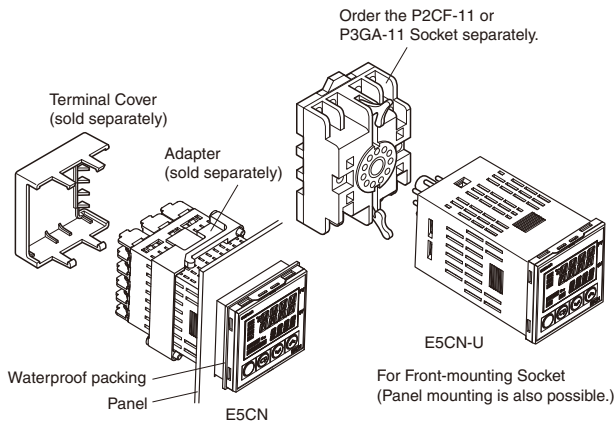
E5CN/E5CN-U/E5EN/E5AN Digital Temperature Controller User's Manual (Cat. No. H134)

E5CN/E5EN/E5AN Digital Temperature Controller Communications Functions User's Manual (Cat. No. H135)

Mounting

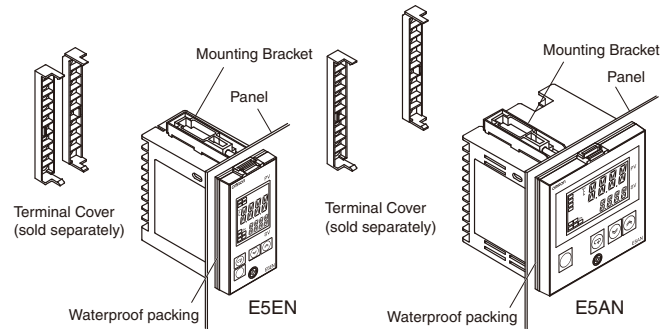
Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

E5CN



1. The Panel Mounting Adapter is also included with the E5CN-U. There is no waterproof packing included with the E5CN-U.
2. Insert the E5CN/E5CN-U into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CN/E5CN-U.
4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N.m.

E5EN/E5AN



1. Insert the E5EN/E5AN into the square mounting hole in the panel (thickness: 1 to 8 mm). Attach the Mounting Brackets provided with the product to the mounting grooves on the top and bottom surfaces of the rear case.
2. Use a ratchet to alternately tighten the screws on the top and bottom Mounting Brackets little by little to maintain balance, until the ratchet turns freely.

Mounting the Terminal Cover

For the E5CN, make sure the "UP" characters on the Cover are in the correct position and insert the Cover into the holes at the top and bottom.

For the E5EN or E5AN, fit the E53-COV11 Terminal Cover over the upper hook. Mount it in the direction shown in the above diagram. If the Terminal Cover is mounted in the opposite direction, proper mounting of the fixtures may not be possible.

Removing the Temperature Controller from the Case

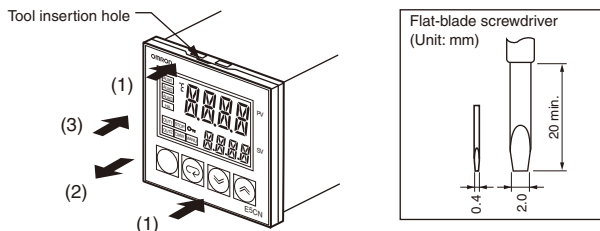
The Temperature Controller must be removed from the case to set specifications.

Refer to *Specification Setting after Turning ON Power* on page 21 for information on setting specifications.

Remove the Temperature Controller from the case when it requires maintenance.

E5CN

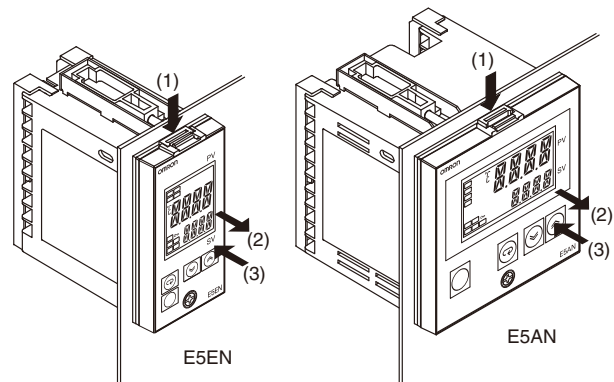
The Temperature Controller can be removed from the case to perform maintenance without removing the terminal leads. This is possible for only the E5CN, and not for the E5CN-U.



1. Insert the tool into the two tool insertion holes (one on the top and one on the bottom) and release the hooks.
2. Insert the tool in the gap between the front panel and rear case, and pull out the front panel slightly. Hold the top and bottom of the front panel and carefully pull it out toward you, without applying unnecessary force.
3. When inserting the E5CN, check to make sure that the sealing rubber is in place and push the E5CN toward the rear case until it snaps into position. While pushing the E5CN into place, push down on the hooks on the top and bottom surfaces of the rear case so that the hooks are securely locked in place. Be sure that electronic components do not come into contact with the case.

E5EN/E5AN

Prepare a Phillips screwdriver suitable for the screw on the front panel to remove the Temperature Controller.



1. Push on the hooks on the top of the front panel, and at the same time, turn the Phillips screwdriver to the left to loosen the screw on the bottom of the front panel.
2. Pull out the front panel gripping both sides.
3. When inserting the E5EN/E5AN Temperature Controller, check to make sure that the sealing rubber is in place. Then, while pushing the front panel into place, turn the Phillips screwdriver to the right in the opposite direction used when removing the panel to tighten the screws on the top and bottom surfaces (tightening torque: 0.3 to 0.5 N.m). Make sure that electronic components do not come into contact with the case.

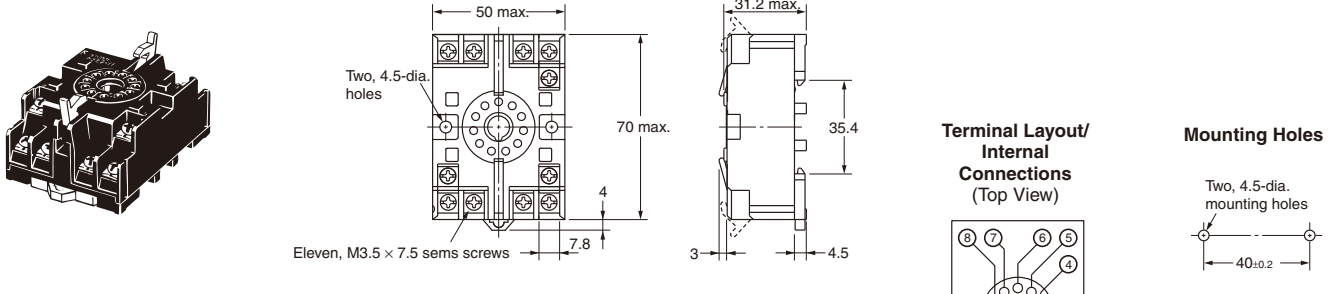
E5CN-U Wiring Socket

Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

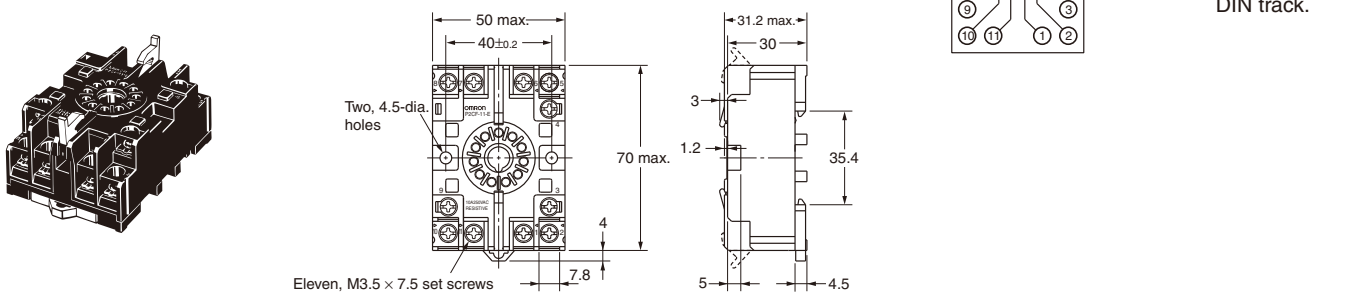
Note: Do not use any other sockets. Otherwise, accuracy may be adversely affected.

■ Front-connecting Socket

P2CF-11 (Standard Model)



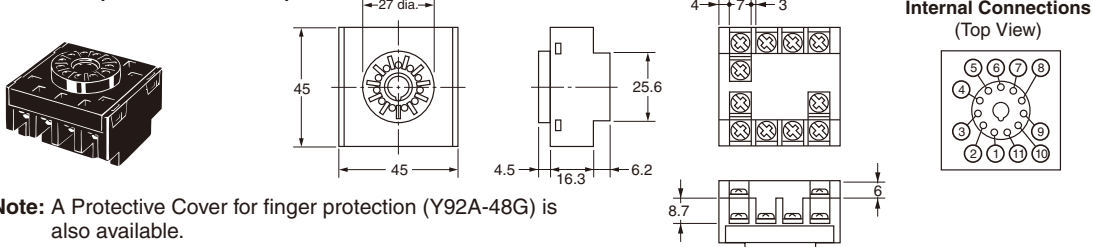
P2CF-11-E (Model with Finger Protection)



Note: This socket uses a structure with finger protection. Round crimp terminals cannot be used. Use forked crimp terminals.

■ Back-connecting Socket

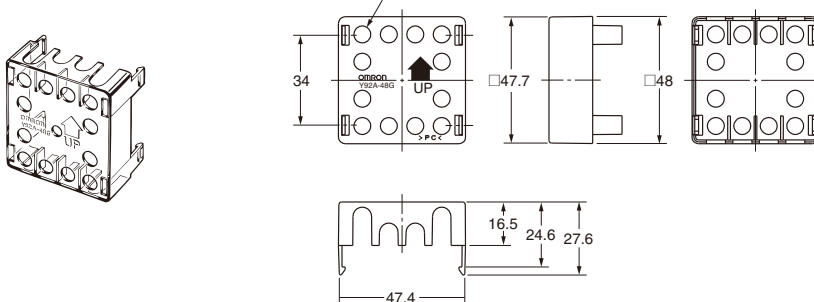
P3GA-11 (Standard Model)



Note: A Protective Cover for finger protection (Y92A-48G) is also available.

■ Terminal Cover

Y92A-48G



Wiring Precautions

Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

- Separate input leads and power lines to protect the E5AN/E5EN/E5CN/E5CN-U and its lines from external noise.
- We recommend using solderless terminals when wiring the E5AN/E5EN/E5CN/E5CN-U.
- Tighten the terminal screws using a torque between 1.13 and 1.36 N·m.
- Use the following type of solderless terminals for M3.5 screws.



Setup Guide

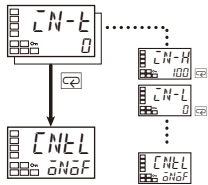
Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

On previous Controllers, sensor input type, alarm type and control period were set on DIP switches. These hardware settings are now set in parameters in setup menus. The **LEVEL** and **MODE** Keys are used to switch between setup menus, and the amount of time that you hold the keys down for determines which setup menu you move to. This section describes two typical examples.

1. ON/OFF Control

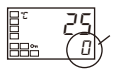
Typical Application Examples

① Changing Parameters



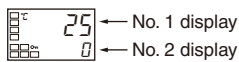
indicates that there is a parameter. Keep on pressing the mode key until the desired parameter is selected.

② Changing Set Values



Use the or keys to change the set value displayed in the setup menu.

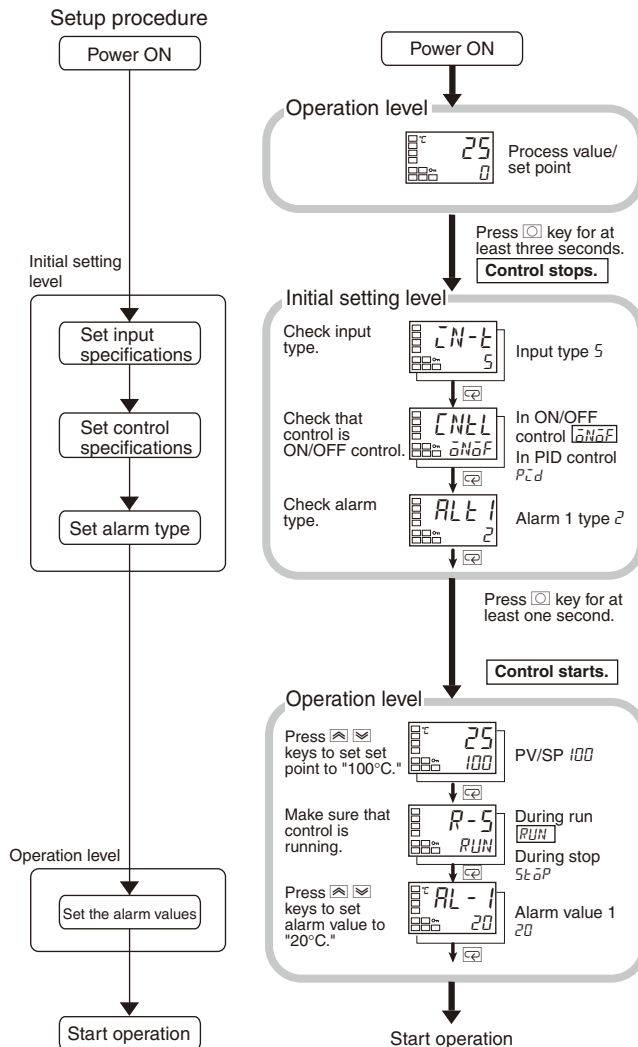
③ Display



Typical Example

Input type: 5 K thermocouple -200 to 1300°C
 Control method: ON/OFF control
 Alarm type: 2 upper limit
 Alarm value 1: 20°C (For setting deviation)
 Set point: 100°C

(Change only the alarm value 1 and set point. The rest must be left as default settings.)



Note: Be sure to read the precautions for correct use and other precautions in the following user's manual before using the Digital Controller.

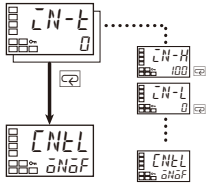
E5CN/E5CN-U/E5EN/E5AN Digital Temperature Controller User's Manual (Cat. No. H134)

E5CN/E5EN/E5AN Digital Temperature Controller Communications Functions User's Manual (Cat. No. H135)

2. PID Control Using Autotuning

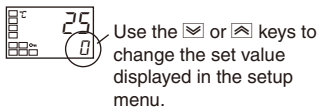
Typical Application Examples

1 Changing Parameters

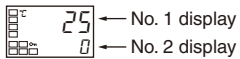


□ indicates that there is a parameter. Keep on pressing the mode key until the desired parameter is selected.

2 Changing Set Values

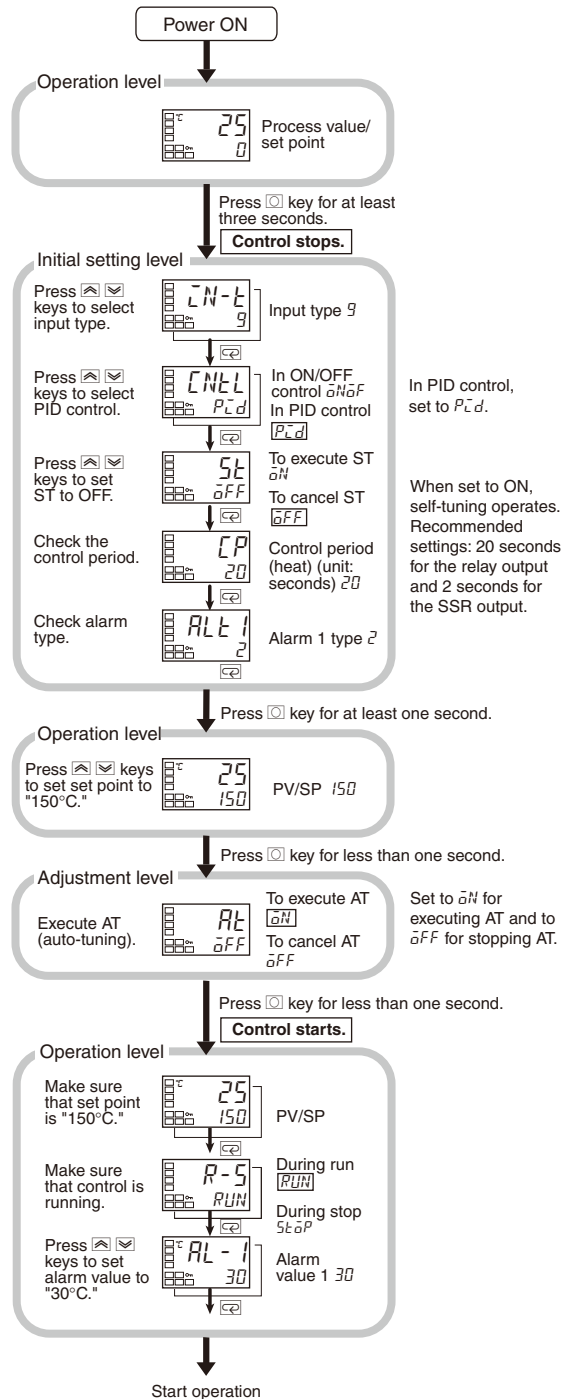
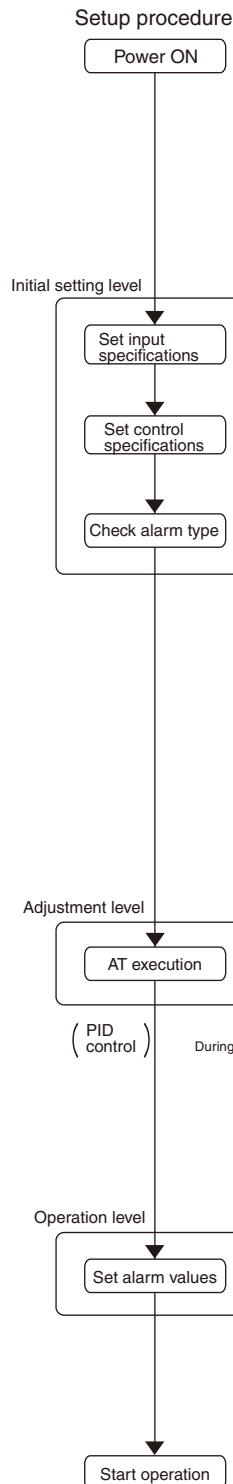


3 Display

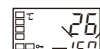


Typical Example

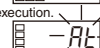
Input type: 9 T thermocouple -200 to 400°C
 Control method: PID control
 Calculate PID constants by AT (auto-tuning).
 Alarm type: 2 upper limit
 Alarm value 1: 30°C (For setting deviation)
 Set point: 150°C



PV/SP After AT execution.



While AT is being executed, SP will flash. After AT execution.



During AT execution.

In PID control, set to P.C.d.

When set to ON, self-tuning operates. Recommended settings: 20 seconds for the relay output and 2 seconds for the SSR output.

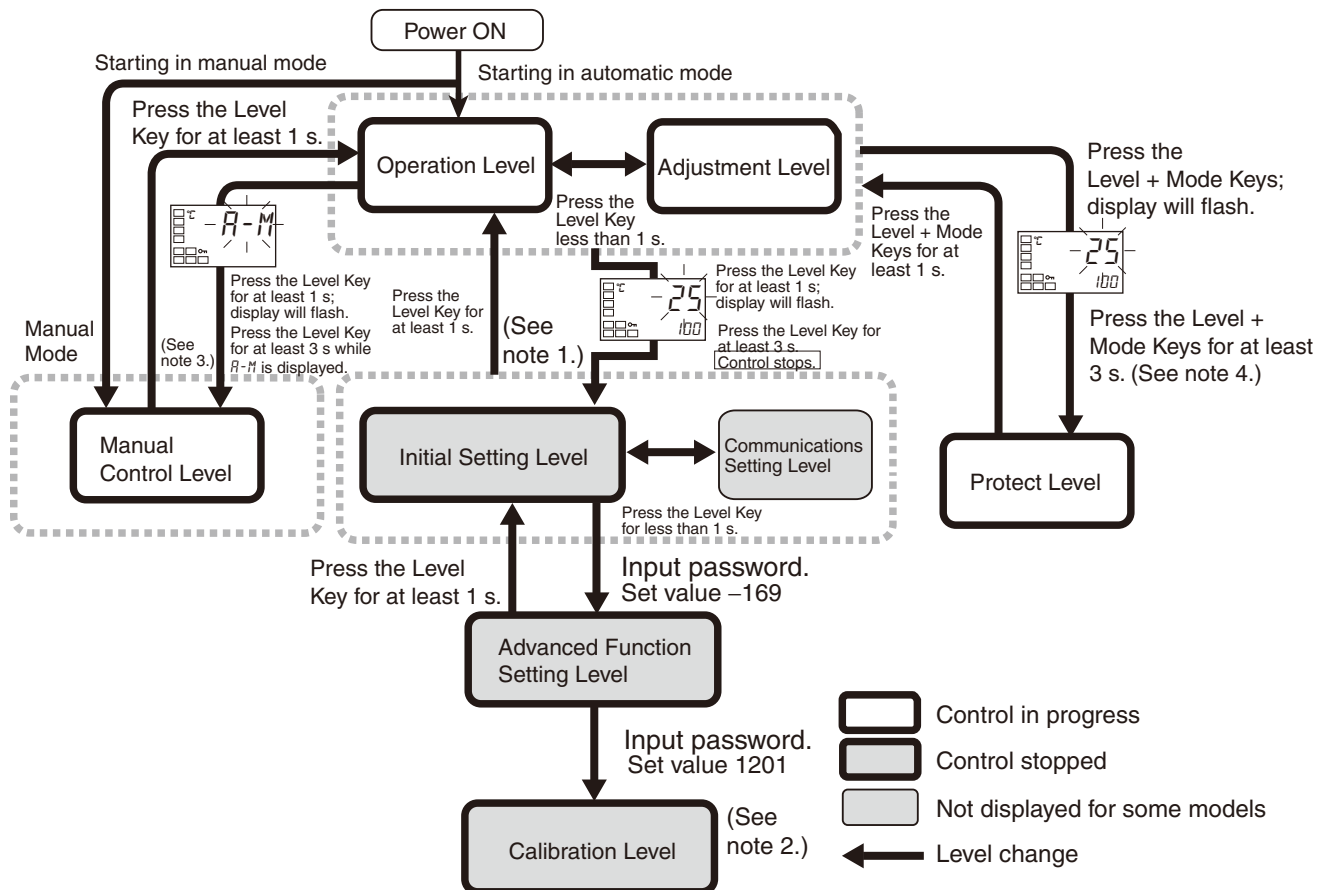
Specification Setting after Turning ON Power

Refer to *E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.*

Outline of Operation Procedures

Key Operation

The following diagram illustrates the entire setting level. A password is required to enter the advance function setting level and the calibration level. Some parameters may not be displayed depending on the protection settings and operation conditions. The control operation will stop when switching from operation level to initial setting level.



- Note:**
- Operation level entered for software reset.
 - You cannot move to other levels by operating the keys on the front panel from the calibration level. You must turn OFF the power supply.
 - You can move only to the operation level by operating the keys on the front panel from the manual control level.

Level	Control in progress	Control stopped
Protect level	Can be set.	---
Operation level	Can be set.	---
Adjustment level	Can be set.	---
Manual control level	Can be set.	---
Initial setting level	---	Can be set.
Advanced function setting level	---	Can be set.
Calibration level	---	Can be set.
Communications setting level	---	Can be set.

Of these levels, the initial setting level, communications setting level, advanced function setting level and calibration level can be used only when control has stopped. Note that control is stopped when these four levels are selected. When switched back to the operation level from one of these levels, control will start.

- The time taken to move to the protect level can be adjusted by changing the "Move to protect level time" setting.

■ Description of Each Level

Operation Level

- This level is displayed when you turn the power ON. You can move to the protect level, initial setting level and adjustment level from this level.
- Normally, select this level during operation. During operation, the process value, set point and manipulated variable can be monitored, and the alarm value and upper- and lower-limit alarms can be monitored and modified.

Adjustment Level

- To select this level, press the **LEVEL** Key once for less than one second.
- This level is used to enter set values and offset values for control. This level contains parameters for setting the set values, AT (auto-tuning), communications writing enable/disable, hysteresis, multi-SP, input shift values, heater burnout alarm (HBA), and PID constants. You can move to the top parameter of the operation level, protect level, or initial setting level from here.

Manual Control Level

- When the **LEVEL** Key is pressed for at least three seconds in the operation level's auto/manual switching display, the manual control level will be displayed. (The MANU operation indicator will light.)
- The manipulated variable can be changed manually in the manual control level.
- To return to the operation level, press the **LEVEL** Key for at least one second.

Initial Setting Level

- To select this level, press the **LEVEL** Key for at least three seconds in the operation level. This level is for specifying the input type, selecting the control method, control period, setting direct/reverse action and alarm type. You can move to the advanced function setting level or communications setting level from this initial setting level. To return to the operation level, press the **LEVEL** Key for at least one second. To move to the communications setting level, press the **LEVEL** Key once for less than one second.

Protect Level

- To select this level, simultaneously press the **LEVEL** and **MODE** Keys for at least 3 seconds. This level is to prevent unwanted or accidental modification of parameters. Protected levels will not be displayed, and so the parameters in that level cannot be modified.

Communications Setting Level

- To select this level, press the **LEVEL** Key once for less than one second in the initial setting level. When the communications function is used, set the communications conditions in this level. Communicating with a personal computer (host computer) allows set points to be read and written, and manipulated variables to be monitored.

Advanced Function Setting Level

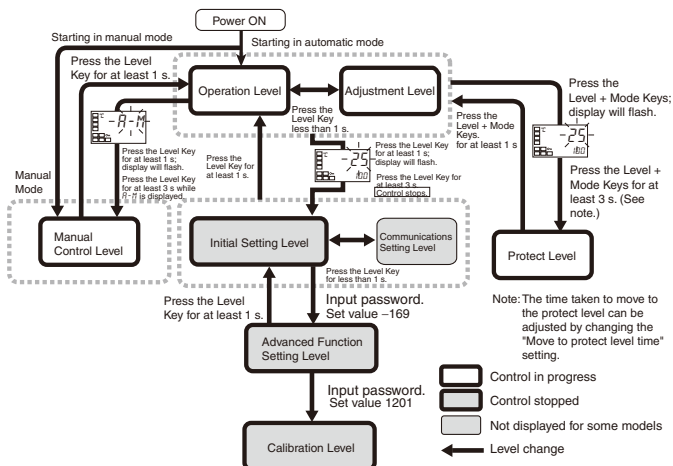
- To select this level, first set the initial setting/communications protection in the protect level to 0, then enter the password ("169") in the initial setting level.
- You can move to the calibration level or initial setting level from this level.
- This level is for setting the automatic return of display mode, MV limiter, event input assignment, standby sequence, alarm hysteresis, ST (self-tune) and to move to the user calibration level.

Calibration Level

- To select this level, you must enter the password ("1201") in the advanced function setting level. This level is for offsetting deviation in the input circuit.
- You cannot move to other levels by operating the keys on the front panel from the calibration level. To cancel this level, turn the power OFF then back ON again.

Initial Setting Level

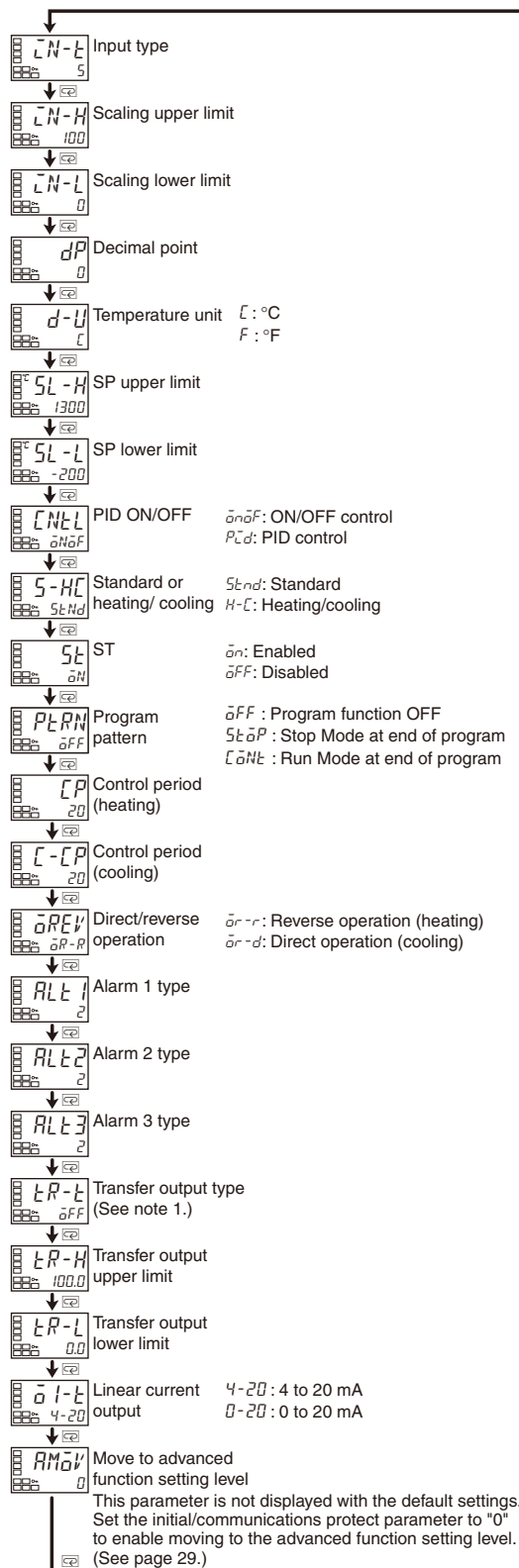
This level is used for setting basic specifications of the Temperature Controller. Using this level, set the input type for selecting the input to be connected such as the thermocouple or platinum resistance thermometer and set the range of set point and the alarm mode.



The move from the operation level to the initial setting level, press key for three seconds or more.

- The initial setting level is not displayed when "initial/communications protection" is set to "2." This initial setting level can be used when "initial setting/communications protection" is set to "0" or "1."
- The "scaling upper limit," "scaling lower limit," and "decimal point" parameters are displayed when a voltage input is selected as the input type.

Initial Setting Level



To return to the operation level, press the \square key for longer than one second.

Note 1.

Transfer type	Setting
OFF	OFF
Set point	SP
Ramp set point	SP-M
Present value	PV
Manipulated variable (heating)	MV
Manipulated variable (cooling)	C-MV

Input Type

	Input type	Specifications	Set value	Input temperature range
Thermocouple/ resistance thermometer multi- input type	Resistance thermometer	Pt100	0	-200 to 850 (°C)/-300 to 1500 (°F)
			1	-199.9 to 500.0 (°C)/-199.9 to 900.0 (°F)
		2	0.0 to 100.0 (°C)/0.0 to 210.0 (°F)	
		JPt100	3	-199.9 to 500.0 (°C)/-199.9 to 900.0 (°F)
	4		0.0 to 100.0 (°C)/0.0 to 210.0 (°F)	
	Thermocouple	K	5	-200 to 1300 (°C)/-300 to 2300
			6	-20.0 to 500.0 (°C)/0.0 to 900.0 (°F)
		J	7	-100 to 850 (°C)/-100 to 1500 (°F)
			8	-20.0 to 400.0 (°C)/0.0 to 750.0 (°F)
		T	9	-200 to 400 (°C)/-300 to 700 (°F)
			10	-199.9 to 400.0 (°C)/-199.9 to 700.0 (°F)
		E	11	0 to 600 (°C)/0 to 1100 (°F)
		L	12	-100 to 850 (°C)/-100 to 1500 (°F)
		U	13	-200 to 400 (°C)/-300 to 700 (°F)
			14	-199.9 to 400.0 (°C)/-199.9 to 700.0 (°F)
		N	15	-200 to 1300 (°C)/-300 to 2300 (°F)
		R	16	0 to 1700 (°C)/0 to 3000 (°F)
		S	17	0 to 1700 (°C)/0 to 3000 (°F)
		B	18	100 to 1800 (°C)/30 to 3200 (°F)
	ES1B Infrared Temperature Sensor	10 to 70°C	19	0 to 90 (°C)/0 to 190 (°F)
		60 to 120°C	20	0 to 120 (°C)/0 to 240 (°F)
		115 to 165°C	21	0 to 165 (°C)/0 to 320 (°F)
		160 to 260°C	22	0 to 260 (°C)/0 to 500 (°F)
Analog input	0 to 50 mV	23	One of following ranges depending on the results of scaling: -1999 to 9999, -199.9 to 999.9	

Note: Initial setting: 5 (type K thermocouple)

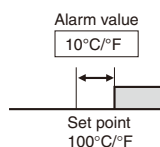
	Input type	Specifications	Set value	Input temperature range
Analog input type	Analog input	4 to 20 mA	0	One of the following ranges depending on the results of scaling: -1999 to 9999 -199.9 to 999.9 -19.99 to 99.99 -1.999 to 9.999
		0 to 20 mA	1	
		1 to 5 V	2	
		0 to 5 V	3	
		0 to 10 V	4	

Note: Initial setting: 0 (Current input of 4 to 20 mA)

Example: When the alarm is set ON at 110°C/°F or higher.

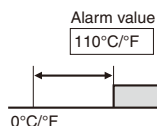
When an alarm type other than the absolute-value alarm is selected

(For alarm types 1 to 7) The alarm value is set as a deviation from the set point.



When the absolute-value alarm is selected

(For alarm types 8 to 11) The alarm value is set as an absolute value from the alarm value of 0°C/°F.



Alarm Type

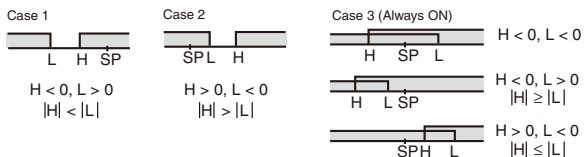
For alarm 1 to alarm 3, select the alarm types out of the 12 alarm types listed in the following table.

Set value	Alarm type	Alarm output operation	
		When X is positive	When X is negative
0	Alarm function OFF	Output OFF	
1 ^{*1}	Upper- and lower-limit		*2
2	Upper-limit		
3	Lower-limit		
4 ^{*1}	Upper- and lower-limit range		*3
5 ^{*1}	Upper- and lower-limit with standby sequence		*4
6	Upper-limit with standby sequence		
7	Lower-limit with standby sequence		
8	Absolute-value upper-limit		
9	Absolute-value lower-limit		
10	Absolute-value upper-limit with standby sequence		
11	Absolute-value lower-limit with standby sequence		
12	LBA (alarm 1 only)	---	

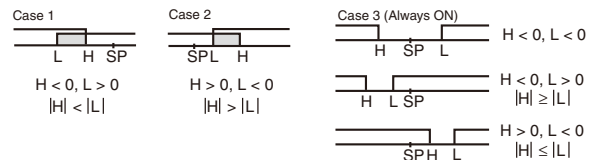
Note: If the alarm type is set to a value from 1 to 7, set the alarm value as the deviation from the SP.

*1: With set values 1, 4 and 5, the upper and lower limit values can be set independently for each alarm type, and are expressed as "L" and "H."

*2: Set value: 1, Upper- and lower-limit alarm



*3: Set value: 4, Upper- and lower-limit range



*4: Set value: 5, Upper- and lower-limit with standby sequence

Note: Conditions for upper and lower limit alarm cases in the above diagram:

- The hysteresis is always OFF for cases 1 and 2 when the upper-limit and lower-limit hysteresis overlaps.
- The hysteresis is always OFF for case 3.

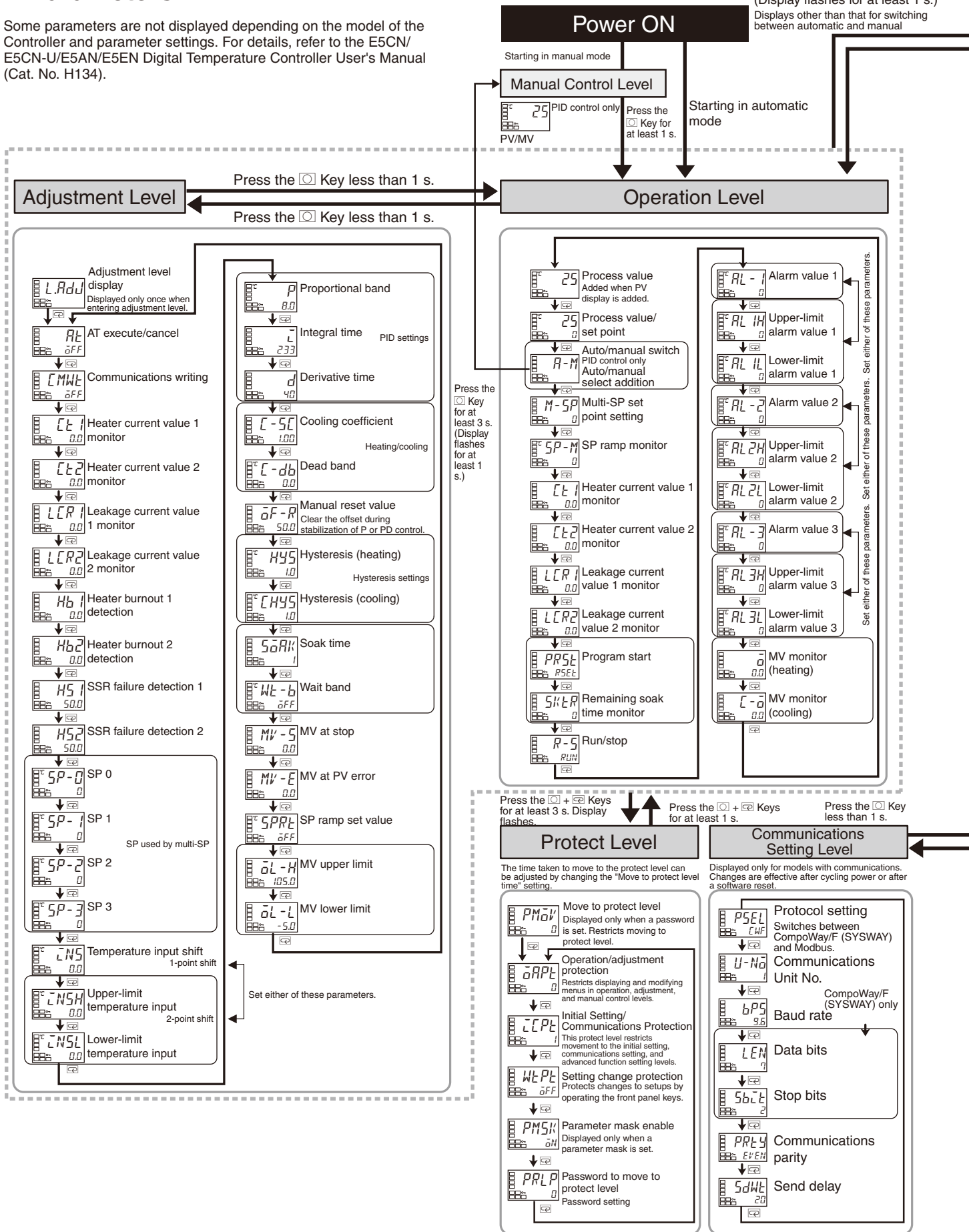
*5: Set value: 5, Upper- and lower-limit with standby sequence alarm. Always OFF when the upper-limit and lower-limit hysteresis overlaps.

Set the alarm types for alarm 1 to alarm 3 independently in the initial setting level. The default setting is 2 (upper limit).

Parameters

Some parameters are not displayed depending on the model of the Controller and parameter settings. For details, refer to the E5CN/E5CN-U/E5AN/E5EN Digital Temperature Controller User's Manual (Cat. No. H134).

Press the Key for at least 3 s. (Display flashes for at least 1 s.)
Displays other than that for switching between automatic and manual



Press the Key for at least 1 s.

Initial Setting Level

Advanced Function Setting Level

Press the Key less than 1 s.

Initial Setting Level menu items:

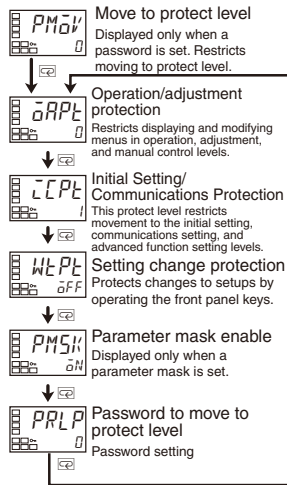
- LN-L** Input type (5)
- LN-H** Scaling upper limit (100)
- LN-L** Scaling lower limit (0)
- dP** Decimal point (0) For input type of analog
- d-U** Temperature unit (C) For input type of temperature
- SL-H** SP upper limit (1300) Limit the set point.
- SL-L** SP lower limit (-200)
- CNEL** PID ON/OFF (oN oF)
- S-HL** Standard or heating/cooling (StNd)
- ST** ST (oN) For input type of temperature, standard, or PID
- PLRN** Program pattern (oFF) When assigning PID or control output to pulse output
- CP** Control period (heating) (20) Set the pulse output cycle.
- C-CP** Control period (cooling) (20)
- oREV** Direct/reverse operation (oR-R)
- ALt1** Alarm 1 type (2)
- ALt2** Alarm 2 type (2)
- ALt3** Alarm 3 type (2)
- LR-L** Transfer output type (oFF) Linear output
- LR-H** Transfer output upper limit (100.0)
- LR-L** Transfer output lower limit (0.0)
- oI-L** Linear current output (4-20) Linear output
- AMoV** Move to advanced function setting level (0) Displayed when initial setting/communications protection is set to 0

Advanced Function Setting Level menu items:

- LN-L** Parameter initialization (oFF)
- EV-M** Number of multi-SP uses (Two SPs: 1, Four SPs: 2)
- EV-1** Event input assignment 1 (HdNE)
- EV-2** Event input assignment 2 (St oP)
- MSPU** Multi-SP uses (oFF)
- SPRU** SP ramp time unit (M)
- RESL** Standby sequence reset method (R)
- ALIN** Alarm 1 open in alarm (N-o)
- ALH1** Alarm 1 hysteresis (0.2)
- AL2N** Alarm 2 open in alarm (N-o)
- ALH2** Alarm 2 hysteresis (0.2)
- AL3N** Alarm 3 open in alarm (N-o)
- ALH3** Alarm 3 hysteresis (0.2)
- HbU** Heater burnout detection (oN)
- HbL** Heater burnout latch (oFF)
- HbH** Heater burnout hysteresis (0.1)
- SL-b** ST stable range (15.0)
- ALFA** α (0.65)
- INF** Input digital filter (0.0)
- PVAd** Additional PV display (oFF)
- o-dP** MV display (oFF)
- REL** Automatic return of display mode (oFF)
- AL1L** Alarm 1 latch (oFF)
- AL2L** Alarm 2 latch (oFF)
- AL3L** Alarm 3 latch (oFF)
- PARL** Move to protect level time (3)
- SEPo** Input error output (oFF)
- CUC** Cold junction compensating method (oN)
- RLRV** MB command logic switching (oFF)
- COLP** PV display color (REd)
- PV-b** PV stable range (5.0)
- AL1oN** Alarm 1 ON delay (0)
- AL2oN** Alarm 2 ON delay (0)
- AL3oN** Alarm 3 ON delay (0)
- AL1oF** Alarm 1 OFF delay (0)
- AL2oF** Alarm 2 OFF delay (0)
- AL3oF** Alarm 3 OFF delay (0)
- CSLP** Input shift type (CHS 1)
- MVSE** Additional MV for stop/error (oFF)
- AMAd** Auto/manual switching function addition (oFF)
- RL** RT (oFF)
- HSD** SSR failure detection (oN)
- HSL** SSR failure latch (oFF)
- HSH** SSR failure hysteresis (0.1)
- LbA** LBA detection time (0)
- LbAL** LBA detection threshold (8.0)
- LbAb** LBA detection width (3.0)
- oUL1** Control output 1 assignment (o)
- oUL2** Control output 2 assignment (N oNE)
- ALM1** Alarm output 1 assignment (ALM 1)
- ALM2** Alarm output 2 assignment (ALM 2)
- ALM3** Alarm output 3 assignment (ALM 3)
- CSEL** Display text switch (oN)
- t-U** Soak time unit (M)
- ALSP** Alarm SP selection (SP-H)
- CMoV** Move to calibration level (0)

Move by setting password (-169).

Protect Level



Parameter Mask Enable


Use this parameter to turn the parameter mask function ON and OFF. Setup Support Software is required to use the parameter mask function.

Setup Support Software: EST2

Password to Move to Protect Level (Default: 0)

Use this parameter to set the password for moving to protect level. Set the value by simultaneously pressing the **UP** Key and **LEVEL** Key or the **DOWN** Key and the **LEVEL** Key.

The protect level cannot be entered if the password has been forgotten. Contact OMRON if the password has been forgotten.

To set the password, enter the password in the screen indicating moving to protect level (), and then press the **MODE** Key. Operation/adjustment protection will be displayed.

Operation/Adjustment Protection

The following table shows the relationship between set values and the range of protection.

Level		Set value			
		0	1	2	3
Operation level	PV	○	○	○	○
	PV/SP	⊙	⊙	⊙	○
	Other	⊙	⊙	×	×
Adjustment level		⊙	×	×	×

- When this parameter is set to "0," parameters are not protected.
- Default setting: 0
- ⊙ : Can be displayed and changed
- : Can be displayed
- × : Cannot be displayed and move to other levels not possible

Initial Setting/Communications Protection

This protect level restricts movement to the initial setting level, communications setting level and advanced function setting level.

Set value	Initial setting level	Communications setting level	Advanced function setting level
0	○	○	○
1	○	○	×
2	×	×	×

- Default setting: 1
- : Move to other levels possible
- × : Move to other levels not possible

Setting Change Protection

This protect level protects setup from being changed by operating the keys on the front panel.

Set value	Description
OFF	Setup can be changed by key operation.
ON	Setup cannot be changed by key operation. (The protect level, can be changed.)

- Default setting: OFF. The Key indicator will light when ON is set.

Communications Setting Level

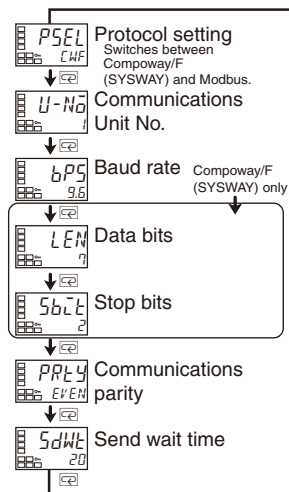
Set the E5CN/E5CN-U/E5EN/E5AN communications specifications in the communications setting level. For setting communications parameters, use the E5CN/E5CN-U/E5EN/E5AN panel.

The communications parameters and their settings are listed in the following table.

Parameter	Displayed characters	Set (monitor) value	Set value	Default
Protocol setting	<i>PSEL</i>	<i>CMF/Mod</i>	CompoWay/F (Sysway)/Modbus	<i>CMF</i>
Communications unit No.	<i>U-Nō</i>	0 to 99	0 to 99	1
Baud rate	<i>bPS</i>	1.2/2.4/4.8/9.6/19.2/38.4	1.2/2.4/4.8/9.6/19.2/38.4 (kbits/s)	9.6
Data bits	<i>LEN</i>	7/8	7/8 (bit)	7
Stop bits	<i>SbLt</i>	1/2	1/2	2
Parity	<i>PRLY</i>	NONE/EVEN/Odd	None, even, odd	<i>EVEN</i>
Send data wait time	<i>SDWT</i>	0 to 99	0 to 99 (ms)	20

Before executing communications with the E5CN/E5CN-U/E5EN/E5AN, set the communications unit No., baud rate, etc., through key operations as described below. As for other operations, refer to relevant Operation Manual.

1. Press the **LEVEL** Key for at least three seconds in the "operation level." The level moves to the "initial setting level."
2. Press the **LEVEL** Key for less than one second. The "initial setting level" moves to the "communications setting level."
3. Pressing the **MODE** Key advances the parameters as shown in the following figure.
4. Press the **UP** or **DOWN** Keys to change the parameter setups.



Set the parameters so that they match the host computer.

Protocol Setting (*PSEL*)

Use this parameter to select the communications protocol. Select from either CompoWay/F (SYSWAY) or Modbus.

Communications Unit No. (*U-Nō*)

When communicating with the host computer, the unit number must be set in each Temperature Controller so that the host computer can identify each Temperature Controller. The number can be set in a range from 0 to 99 in increments of 1. The default setting is 1. When using more than one Unit, be careful not to use the same number twice. Duplicate settings will cause malfunction. This value becomes valid when the power is turned OFF and ON again.

Baud Rate (*bPS*)

Use this parameter to set the speed of communications with the host computer. It can be set to one of the following values; 1.2 (1200 bps), 2.4 (2400 bps), 4.8 (4800 bps), 9.6 (9600 bps), 19.2 (19200 bps), and 38.4 (38400 bps)

This setting becomes valid when the power is turned OFF and ON again.

Data Bits (*LEN*)

Use this parameter to change the communications data bit length to 7 bits or 8 bits.

Stop Bits (*SbLt*)

Use this parameter to change the communications stop bit to 1 or 2.

Parity (*PRLY*)

Use this parameter to set the communications parity to None, Even, or Odd.

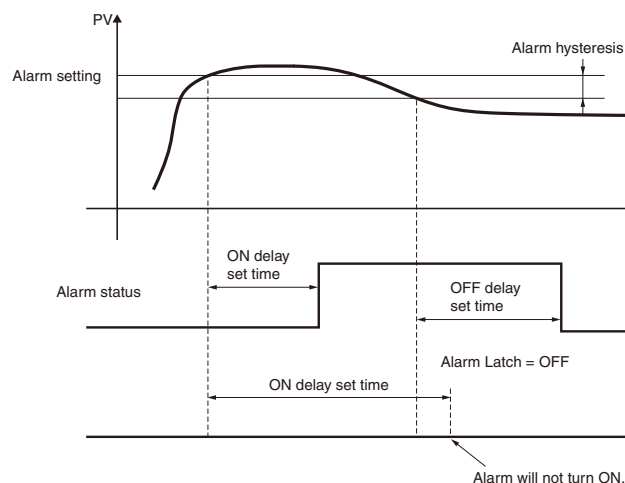
Send Data Wait Time (*SDWT*)

Use this parameter to set the send data wait time in increments of 1 ms from 0 to 99 ms. The default setting is 20 ms.

Alarm Delays

Delays can be set for the alarm outputs. ON and OFF delays can be set separately for alarms 1, 2, and 3. The ON and OFF delays for alarm 1 function only for the alarm function. If the alarm output 1 is set to be output as an OR with other alarm functions (i.e., the heater burnout alarm, HS alarm, or input error output alarm), the delays will not function for the other alarms. The ON and OFF delays for alarms 1, 2, and 3 also apply to the individual ALM1, ALM2, and ALM3 indicators and to communications status. The alarm ON delays will also function when power is turned ON or when moving from initial setting level to operation level (i.e., to software resets). All outputs will turn OFF and the OFF delays will not function when moving to the initial setting level or when an alarm is output for a heater burnout error.

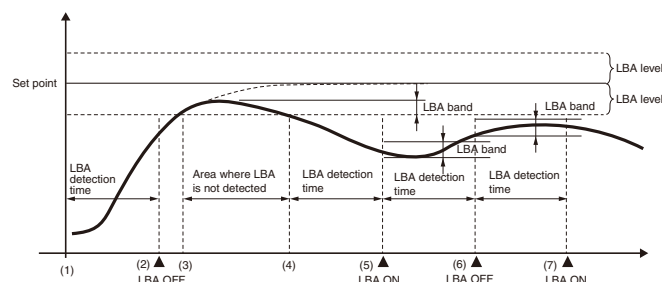
Operation of Alarm ON and OFF Delays (for an Upper-limit Alarm)



- The alarm will not turn ON if the time that the alarm is ON is equal to or less than the ON delay set time. Also, the alarm will not turn OFF if the time that the alarm is OFF is equal to or less than the OFF delay set time.
- If an alarm turns OFF and then back ON during the ON delay time, the time will be remeasured from the last time the alarm turns ON. Also, if an alarm turns ON and then back OFF during the OFF delay time, the time will be remeasured from the last time the alarm turns OFF.

Loop Break Alarm (LBA)

- With a loop break alarm, there is assumed to be an error in the control loop if the control deviation ($SP - PV$) is greater than the threshold set in the "LBA level" parameter and if the control deviation is not reduced by at least the value set in the "LBA detection band" parameter within the LBA detection time.
- Loop break alarms are detected at the following times.



If the control deviation is reduced in the area between 1 and 2 (i.e., the set point is approached) and the amount the control deviation is reduced is at least equal to the LBA band, the loop break alarm will remain OFF.

The process value is within the LBA level between 3 and 4, and thus loop break alarms will not be detected. (The loop break alarm will remain OFF.)

If the process value is outside the LBA level between 4 and 5 and the control deviation is not reduced by at least the LBA band within the LBA detection time, the loop break alarm will turn ON.

If the control deviation is reduced in the area between 5 and 6 (i.e., the set point is approached) and the amount the control deviation is reduced is at least equal to the LBA band, the loop break alarm will turn OFF.

If the control deviation is reduced in the area between 6 and 7 (i.e., the set point is approached) and the amount the control deviation is reduced is less than the LBA band, the loop break alarm will turn ON.

- If the LBA detection time, LBA level, LBA detection band, and PID settings are not appropriate, alarms may be detected inappropriately or alarms may not be output when necessary.
- Loop break alarms may be detected if unexpectedly large disturbances occur continuously and a large deviation does not decrease.
- If a loop break occurs when the set point is near the ambient temperature, the temperature deviation in a steady state may be less than the LBA level, preventing detection of the loop break.
- If the set point is so high or low that it cannot be reached even with a saturated manipulated variable, a temperature deviation may remain even in a steady state and a loop break may be detected.
- Detection is not possible if a fault occurs that causes an increase in temperature while control is being applied to increase the temperature (e.g., an SSR short-circuit fault).
- Detection is not possible if a fault occurs that causes a decrease in temperature while control is being applied to decrease the temperature (e.g., a heater burnout fault).

Parameters Related to Loop Break

Alarms

Parameter name	Symbol	Setting range		Remarks
LBA detection time	LbR	0 to 9999 (s)		Setting 0 disables the LBA function.
LBA level	$LbRL$	Controllers with Thermocouple/Resistance Thermometer Multi-inputs	0.1 to 999.9 (°C/°F) (See note.)	Default: 8.0 (°C/°F)
		Controllers with Analog Inputs	0.01 to 99.99 (%FS)	Default: 10.00% FS
LBA band	$LbRb$	Controllers with Thermocouple/Resistance Thermometer Multi-inputs	0.0 to 999.9 (°C/°F) (See note.)	Default: 3.0 (°C/°F)
		Controllers with Analog Inputs	0.00 to 99.99 (%FS)	Default: 0.20% FS

Note: Set “none” as the unit for analog inputs.

- A loop break alarm can be output by setting the alarm 1 type to 12 (LBA).
- The ALM1 indicator will light when a loop break is detected.
- Loop breaks are not detected during SP ramp operation.
- Loop breaks are not detected during auto-tuning, manual operation, or while stopped.
- If the alarm 1 latch is set to ON, the latch will be effective for the loop break alarm.

Automatically Setting the LBA

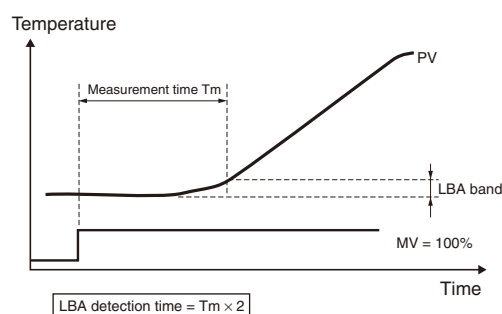
Detection Time

- The LBA detection time is automatically set by auto-tuning. (It is not set automatically, however, for heating/cooling control.)
- If the optimum LBA detection time is not obtained by auto-tuning, set the “LBA detection time” parameter (advance function setting level).

Determining the LBA Detection Time

To manually set the LBA detection time, set the “LBA detection time” parameter to twice the LBA reference time given below.

1. Set the output to the maximum value.
2. Measure the time required for the width of change in the input to reach the LBA band.



3. Set the “LBA detection time” parameter to two times the measured time.

LBA Level

- Set the control deviation when the control loop is working properly.
- The default is 8.0 (°C/°F) for Controllers with Thermocouple/Resistance Thermometer Multi-Inputs and 10.00% FS for Controllers with Analog Inputs.

LBA Band

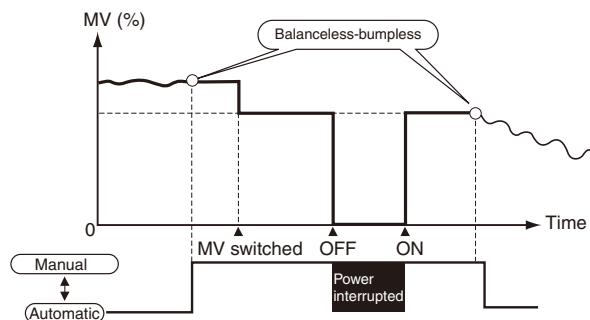
- There is assumed to be an error in the control loop if the control deviation is greater than the threshold set in the “LBA level” parameter and if the control deviation does not change by at least the value set in the “LBA band” parameter.
- The default is 3.0 (°C/°F) for Controllers with Thermocouple/Resistance Thermometer Multi-Inputs and 0.20% FS for Controllers with Analog Inputs.

Manual Operation Control Function

- The manipulated variable can be set in manual mode if the “PV/MV” parameter is displayed in the manual control level. The final MV used in automatic mode will be used as the initial manual MV when moving from automatic mode to manual mode. In manual mode, the change value will be fixed immediately and reflected in the actual MV.
- The automatic display return function will not operate in manual mode.
- Balanceless-bumpless operation will be performed for the MV when switching from manual operation to automatic operation. (See note.)
- If a power interruption occurs during manual operation, manual operation will be restarted when power is restored using the same MV as when power was interrupted.
- Switching between automatic and manual operation is possible for a maximum of one million times.
- Manual operation can be used only for PID control.

Note: In balanceless-bumpless operation, the MV before switching is used initially after the switch and then gradually changed to achieve the proper value after switch to prevent radical changes in the MV after switching operation.

The overall manual operation is illustrated in the following figure.

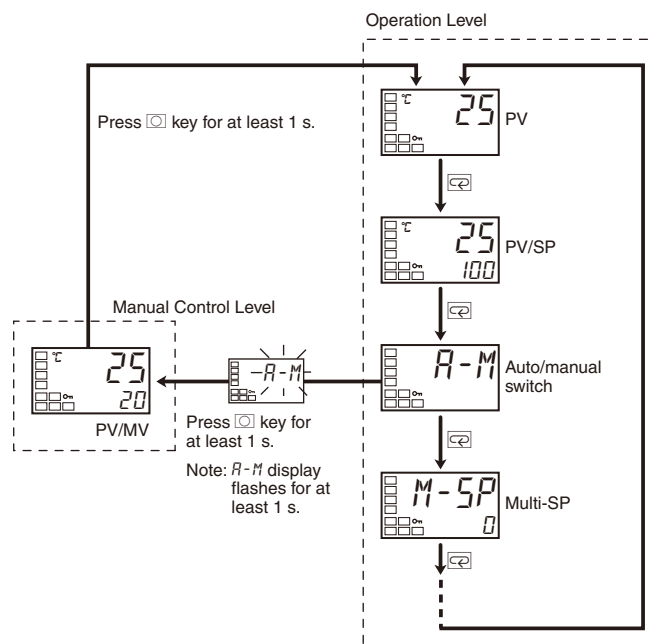


Related Displays and Parameters

Parameter name	Symbol	Level	Remarks
PV/MV (manual MV)	---	Manual Control Level	-5.0 to 105.0 (heating/cooling control: -105.0 to 105.0)
Auto/manual switch	R-M	Operation Level	Switches between automatic and manual modes.
Auto/manual select addition	RMrd	Advanced Function Setting Level	Enables switching between automatic and manual modes.

Moving to the Manual Control Level

- When the **LEVEL** Key is pressed for at least 3 seconds in the operation level's auto/manual switching display, the manual mode will be entered and the manual control level will be displayed. It is not possible to move to any displays except for the “PV/MV” parameter during manual operation. Press the **LEVEL** Key for at least one section from the “PV/MV” display in manual control level to return to automatic mode and display the top parameter in the operation level.



- If an event input is set to “MANU” (auto/manual), the “auto/manual switch” parameter will not be displayed. Use the event input to switch between automatic and manual modes.

Auto/Manual Select Addition

The “auto/manual select addition” parameter must be set to ON in the advance function setting level before it is possible to move to manual mode. The default is OFF.

Note: 1. Priority of Manual MV and Other Functions

Even when operation is stopped, the manual MV is given priority. Auto-tuning and self-tuning will stop when manual mode is entered.

Note: 2. Manual MV and SP Ramp

If operating, the SP ramp function will continue even when manual mode is entered.

Transfer Output Function

If a control output is a linear current output it can be used as a transfer output. To use the transfer output, set the “transfer output type” parameter to any setting other than OFF.

(When the “transfer output type” parameter is set to any setting other than OFF, the “transfer output upper limit” and “transfer output lower limit” parameters will be enabled.)

Transfer Output Type

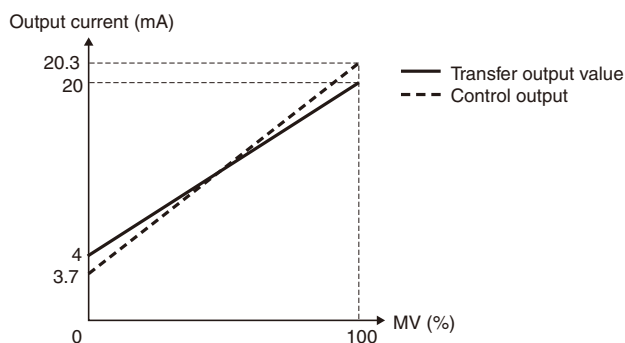
Transfer output type	Symbol	Setting range
OFF (See note 1.)	\overline{OFF}	---
Set point	SP	SP lower limit to SP upper limit
Set point during SP ramp	$SP-M$	SP lower limit to SP upper limit
PV	PV	Sensor setting range lower limit to Sensor setting range upper limit or Scaling lower limit to Scaling upper limit
MV monitor (heating)	MV	-5.0 to 105.0 (heating/cooling control: 0.0 to 105.0) (See note 2.)
MV monitor (cooling)	\overline{MV}	0.0 to 105.0 (See note 2.)

Note: 1. The default is OFF. If the transfer type is set to OFF, the item assigned in the “control output 1 assignment” parameter will be output on control output 1.

2. The difference between the transfer output value and the linear current output value is illustrated in the following figure.

If the linear output is used as the transfer output when the linear current output type is set to 4 to 20 mA, 4.0 mA will be output for 0% and 20.0 mA will be output for 100%.

When a linear output is used for the control output, 3.7 mA is output for 0% and 20.3 mA is output for 100% when the control output for heating is selected to ensure that the control object is controlled at 0% and 100%.



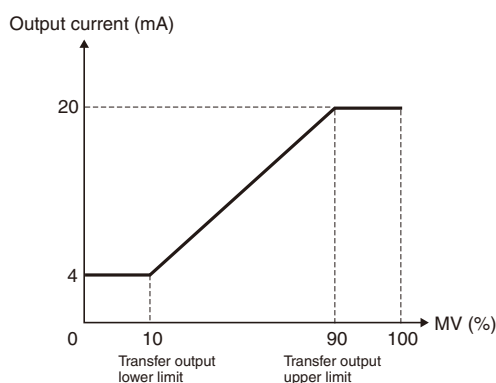
(The above graph is for when the linear current output type is set to 4 to 20 mA.)

Transfer Scaling

- Reverse scaling is possible by setting the “transfer output lower limit” parameter larger than the “transfer output upper limit” parameter. If the “transfer output lower limit” and “transfer output upper limit” parameters are set to the same value when 4 to 20 mA is set, the transfer output will be output continuously at 0% (4 mA).
- If the SP, SP during SP ramp, or PV is selected, the “transfer output lower limit” and “transfer output upper limit” parameters will be forcibly initialized to the respective upper and lower setting limits for changes in the upper and lower limits of the SP limiter and the temperature unit.

If the MV for heating or MV for cooling is selected, the “transfer output lower limit” and “transfer output upper limit” parameters will be initialized to 100.0 and 0.0, respectively, when a switch is made between standard control and heating/cooling control using the “standard or heating/cooling” parameter.

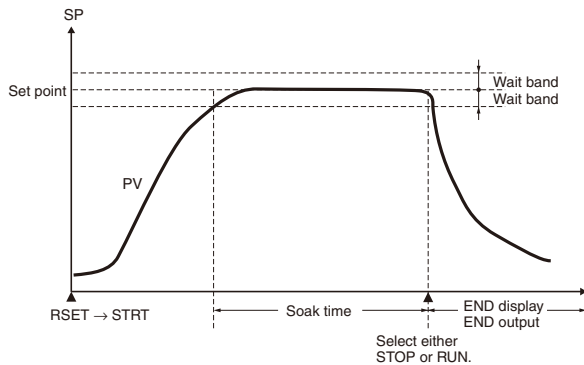
- The output current when the linear current type is set to 4 to 20 mA, the transfer output upper limit is set to 90.0, and the transfer output lower limit is set to 10.0 is shown in the following graph.
- For scaling from 0.0% to 100.0%, the output for -5.0 to 0.0 will be the same value as for 0.0%, and the output for 100.0 to 105.0 will be the same value as for 100.0%



(The above graph is for when the linear current output type is set to 4 to 20 mA.)

Simple Program Function

- The simple program function can be used for the following type of control.



- The program will start when the “program start” parameter is changed from RSET to STRT. END will be displayed on the No. 2 display and the output assigned as the program end output will turn ON after the time set in the “soak time” parameter has expired in the wait band. The “program pattern” parameter can be used to select moving to STOP mode or continuing operation in RUN mode after the program ends.

Parameters Related to the Simple Program Function

Parameter name	Symbol	Set (monitor) values	Unit	Display level
Program pattern	<i>PLRN</i>	OFF, STOP, CONT	---	Initial setting level
Program start	<i>PRST</i>	RSET, STRT	---	Operation level
Soak time	<i>SOAK</i>	1 to 9999	min or h	Adjustment level
Soak time unit	<i>t-U</i>	m (minutes)/h (hours)	---	Advanced function setting level
Wait band	<i>Wt-b</i>	OFF or 0.1 to 999.9 (See note 2.)	°C or °F (See notes 1 and 2.)	Adjustment level
Soak time remain monitor	<i>SKLR</i>	0 to 9999	min or h	Operation level

- Note:** 1. Set for Controllers with Thermocouple/Resistance Thermometer Multi-inputs. Set “none” as the unit for Controllers with Analog Inputs.
 2. The setting unit of the “wait band” parameter is %FS for Controllers with Analog Inputs and the setting range is OFF or 0.01 to 99.99.

Error Displays (Troubleshooting) Refer to E5CN/E5CN-U/E5EN/E5AN/E5GN Operation for previous models of the E5CN/E5CN-U/E5EN/E5AN.

When an error occurs, an error code will be displayed on the No. 1 display. Check the contents of an error and take appropriate countermeasures.

No.1 display	Contents	Countermeasure	Output status	
			Control output	Alarm output
S.ERR (S.ERR)	Input error (See note 2.)	Check that the input wiring is correct, that there is no disconnection or short-circuit, and that the input type is correct. (Thermocouple input short-circuits cannot be detected.)	OFF (See note 3.)	Treated as an abnormal temperature
E111 (E111)	Memory error	Reset the power. If the display does not change, replacement is necessary. If the error is removed, it is possible that the original error was caused by noise. Check that there are no possible sources of noise.	OFF	OFF
H.ERR (H.ERR)	HB error (See note 2.)		OFF (See note 3.)	OFF

Note 1. If the input is within the range for which control is possible but outside the displayable range (–1999 (–199.9) to 9999 (999.9)), $\square\square\square\square$ will be displayed if the value is less than –1999 (–199.9), and $\square\square\square\square$ will be displayed if it is greater than 9999 (999.9). Control output and alarm output will operate normally for either of these displays. Refer to the *E5CN/E5CN-U/E5AN/E5EN Digital Temperature Controller User's Manual* (Cat. No. H134) for details on the ranges for which control is possible.

2. These errors are displayed only when the Controller is set to display the present value or the present value and the set value. They are not displayed in other statuses.
3. If a manual MV, MV at stop, or MV at error is set, output will be performed according to the setting.

Troubleshooting

Check the points in the following table if the temperature does not rise, outputs do not turn ON, or there are large discrepancies in the temperature.

Problem	Items to check and probable cause	Countermeasure
The temperature does not rise. Outputs do not turn ON.	1. Has control stopped? If the STOP indicator is lit, control has stopped.	Set $RUN/SETOP$ to RUN in the operation level. The STOP indicator will turn OFF.
	2. Is control set to forward operation? Control must be set to reverse operation for heating control.	Set control operation $OPREV$ to reverse operation $OPREV$ in the initial setting level.
	3. Are the OUT indicators for control output lit or flashing? If the control output is not current output, the OUT indicators turn ON in synchronization with the output.	If the OUT indicators do not light at all, check items 1 and 2. If the OUT indicators are continuously lit, check connections to sensors, heaters, and other peripheral devices.
	4. If PID control is used, it is possible that the PID constants are unsuitable.	If possible, obtain the PID constants using auto-tuning. (Autotuning uses 100% output with respect to the load, and so overshooting may occur.)
There are large discrepancies in the temperature.	1. Is the correct type of sensor used?	After checking the sensor type, check the setting for input type (ENT) in the initial setting level.
	2. Are input offset values used?	Check the settings for input offset ($EN5$) in the adjustment level. To display the temperature as measured by the sensor, set the input offset to 0.0.
	3. Is a compensating conductor used to extend the thermocouple connection?	Be sure to use a compensating conductor that is suitable for the sensor used.
	4. Is the sensor separated by a long distance? Is the insertion length short?	Check the installation location of the sensor with respect to the measured object. The sensor's insertion length must be at least 20 times the diameter of the protective tubing.
	Checking Temperature Controller input:	
<ul style="list-style-type: none"> • Thermocouple: Short the input terminals to display the room temperature. • Platinum Resistance Thermometer: Connect a resistance to the input terminals and check the display. Connect 100 Ω to A-B and short B-B: 0°C Connect 140 Ω to A-B and short B-B: Approx. 100°C 		

Returning Internal Parameters to Their Defaults

Perform this procedure to return all settings to their initial states

For details, refer to *Parameters* on page 26.

Initialize the settings in the advanced function setting level. To enter the advanced function setting level, initial setting/communications protection must be released in the protect level.

1. Releasing Protection

Enter the protect level. Set the Initial Setting Communications Protection parameter to 0.

2. Entering the Advanced Function Setting Level

Enter the advanced function setting level (top display: $\bar{N}\bar{L}\bar{L}$). Set the bottom display to $FR\bar{L}\bar{L}$. After a few seconds initialization will be completed and it will return to OFF automatically.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

Safety Precautions for All E5□N Models

⚠ CAUTION

Do not touch the terminals while power is being supplied. Doing so may occasionally result in minor injury due to electric shock.



Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.



Do not use the product where subject to flammable or explosive gas. Otherwise, minor injury from explosion may occasionally occur.



Do not leave the conversion cable connected to the product. Malfunction may occur due to noise in the cable.



Do not use the Temperature Controller or Conversion Cable if it is damaged. Doing so may occasionally result in minor electric shock or fire.



Never disassemble, modify, or repair the product or touch any of the internal parts. Minor electric shock, fire, or malfunction may occasionally occur.



CAUTION - Risk of Fire and Electric Shock

- This product is UL listed as Open Type Process Control Equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
- More than one disconnect switch may be required to de-energize the equipment before servicing the product.
- Signal inputs are SELV, limited energy. (See note 1.)
- Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits. (See note 2.)



If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.



Tighten the terminal screws of the E5CN, E5EN, or E5AN to between 1.13 and 1.36 N·m. Loose screws may occasionally result in fire. (See note 3.)



For the E5GN, tighten the screws to the following torque:
Terminals 1 to 6: 0.23 to 0.25 N·m
Terminals 7 to 9: 0.12 to 0.14 N·m



Set the parameters of the product so that they are suitable for the system being controlled. If they are not suitable, unexpected operation may occasionally result in property damage or accidents.



A malfunction in the product may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the product, take appropriate safety measures, such as installing a monitoring device on a separate line.

A semiconductor is used in the output section of long-life relays. If excessive noise or surge is impressed on the output terminals, a short-circuit failure is likely to occur. If the output remains shorted, fire will occur due to overheating of the heater or other cause. Take measures in the overall system to prevent excessive temperature increase and to prevent fire from spreading.



Do not allow pieces of metal or wire cuttings to get inside connectors. Failure to do so may occasionally result in minor electric shock, fire, or damage to equipment.



Do not allow dust and dirt to collect between the pins in the connector on the Conversion Cable. Failure to do so may occasionally result in fire.



- Note:**
- An SELV circuit is one separated from the power supply with double insulation or reinforced insulation, that does not exceed 30 V r.m.s. and 42.4 V peak or 60 VDC.
 - A class 2 power supply is one tested and certified by UL as have the current and voltage of the secondary output restricted to specific levels.
 - The tightening torque for E5CN-U is 0.5 N·m.

Precautions for Safe Use

Be sure to observe the following precautions to prevent malfunction or adverse effects on the performance or functionality of the product. Not doing so may occasionally result in faulty operation.

- This product is specifically designed for indoor use only. Do not use this product in the following places:
 - Places directly subject to heat radiated from heating equipment.
 - Places subject to splashing liquid or oil atmosphere.
 - Places subject to direct sunlight.
 - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
 - Places subject to intense temperature change.
 - Places subject to icing and condensation.
 - Places subject to vibration and large shocks.
- Use and store the product within the rated ambient temperature and humidity. Gang-mounting two or more Temperature Controllers, or mounting Temperature Controllers above each other may cause heat to build up inside the Temperature Controllers, which will shorten their service life. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers.
- To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
- Be sure to wire properly with correct polarity of terminals.
- Use the specified size (M3.5, width 7.2 mm or less) crimped terminals for wiring the E5CN, E5EN, or E5AN. To connect bare wires to the terminal block, use stranded or solid copper wires with a gage of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm²). (The stripping length is 5 to 6 mm.) Up to two wires or two crimp terminals can be connected to a single terminal.
- To wire the E5GN, use wires with a gage of AWG24 to AWG14 (equal to a cross-sectional area of 0.205 to 2.081 mm²) for terminals 1 to 6, and wires with a gage of AWG28 to AWG22 (equal to a cross-sectional area of 0.081 to 0.326 mm²) for terminals 7 to 9. (The stripping length is 5 to 6 mm.)
- Do not wire the terminals that are not used.
- To avoid inductive noise, keep the wiring for the product's terminal block away from power cables carry high voltages or large currents. Also, do not wire power lines together with or parallel to product wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular, motors, transformers, solenoids, magnetic coils, or other equipment that have an inductance component).
When a noise filter is used at the power supply, first check the

voltage or current, and attach the noise filter as close as possible to the product.

Allow as much space as possible between the product and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.

9. Use this product within the rated load and power supply.
10. Make sure that the rated voltage is attained within two seconds of turning ON the power using a switch or relay contact. If the voltage is applied gradually, the power may not be reset or output malfunctions may occur.
11. Make sure that the Temperature Controller has 30 minutes or more to warm up after turning ON the power before starting actual control operations to ensure the correct temperature display.
12. When executing self-tuning, turn ON power to the load (e.g., heater) at the same time as or before supplying power to the product. If power is turned ON to the product before turning ON power to the load, self-tuning will not be performed properly and optimum control will not be achieved.
13. A switch or circuit breaker must be provided close to the product. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
14. Always turn OFF the power supply before pulling out the interior of the product, and never touch nor apply shock to the terminals or electronic components. When inserting the interior of the product, do not allow the electronic components to touch the case.
15. Never touch or apply shock to the electronic parts inside the E5GN when the terminal block of the E5GN is removed.
16. Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
17. Design the system (e.g., control panel) considering the 2 seconds of delay that the product's output will be set after power ON.
18. The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
19. The EEPROM has a limited write life. When overwriting data frequently, e.g., via communications, use RAM Mode.
20. Check the orientation of the connectors on the Conversion Cable before connecting the Conversion Cable. Do not force a connector if it does not connect smoothly. Using excessive force may damage the connector.
21. Do not place heavy object on the Conversion Cable, bend the cable past its natural bending radius, or pull on the cable with undue force.
22. Do not connect or disconnect the Conversion Cable while communications are in progress. Product faults or malfunction may occur.
23. Make sure that the Conversion Cable's metal components are not touching the external power terminals.
24. Do not touch the connectors on the Conversion Cable with wet hands. Electrical shock may result.
25. Some inverters are labeled as having an output frequency of 50/60 Hz. Smoke or burning, however, may occur due to increased temperature in the Temperature Controller. Do not use an inverter output to supply power to the Temperature Controller.

Precautions for Correct Use

Service Life

1. Use the product within the following temperature and humidity ranges:
Temperature: -10 to 55°C (with no icing or condensation)
Humidity: 25% to 85%
If the product is installed inside a control board, the ambient temperature must be kept to under 55°C, including the temperature around the product.
2. The service life of electronic devices like Temperature Controllers is determined not only by the number of times the relay is switched but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature, the shorter the service life and, the lower the temperature, the longer the service life. Therefore, the service life can be extended by lowering the temperature of the Temperature Controller.
3. When two or more Temperature Controllers are mounted horizontally close to each other or vertically next to one another, the internal temperature will increase due to heat radiated by the Temperature Controllers and the service life will decrease. In such a case, use forced cooling by fans or other means of air ventilation to cool down the Temperature Controllers. When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

Measurement Accuracy

1. When extending or connecting the thermocouple lead wire, be sure to use compensating wires that match the thermocouple types.
2. When extending or connecting the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance and keep the resistance of the three lead wires the same.
3. Mount the product so that it is horizontally level.
4. If the measurement accuracy is low, check to see if input shift has been set correctly.

Waterproofing

The degree of protection is as shown below. Sections without any specification on their degree of protection or those with IP□0 are not waterproof.

Front panel: NEMA4X for indoor use (equivalent to IP66)
Rear case: IP20, Terminal section: IP00
(E5CN-U: Front panel: Equivalent to IP50, rear case: IP20, terminals: IP00)

Operating Precautions

1. It takes approximately two seconds for the outputs to turn ON from after the power supply is turned ON. Due consideration must be given to this time when incorporating Temperature Controllers in a sequence circuit.
2. When using self-tuning, turn ON power for the load (e.g., heater) at the same time as or before supplying power to the Temperature Controller. If power is turned ON for the Temperature Controller before turning ON power for the load, self-tuning will not be performed properly and optimum control will not be achieved.
3. When starting operation after the Temperature Controller has warmed up, turn OFF the power and then turn it ON again at the same time as turning ON power for the load. (Instead of turning the Temperature Controller OFF and ON again, switching from STOP mode to RUN mode can also be used.)
4. Avoid using the Controller in places near a radio, television set, or wireless installing. These devices can cause radio disturbances which adversely affect the performance of the Controller.

USB-Serial Conversion Cable

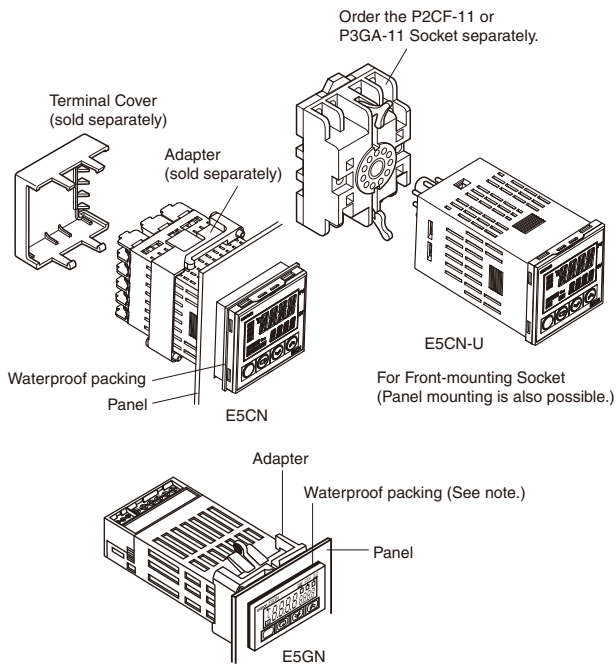
1. The disk that is included with the Conversion Cable is designed for a computer CD-ROM driver. Never attempt to play the disk in a general-purpose audio player.
2. Do not connect or disconnect the Conversion Cable connector repeatedly over a short period of time. The computer may malfunction.
3. After connecting the Conversion Cable to the computer, check the COM port number before starting communications. The computer requires time to recognize the cable connection. This delay does not indicate failure.
4. Do not connect the Conversion Cable through a USB hub. Doing so may damage the Conversion Cable.
5. Do not use an extension cable to extend the Conversion Cable length when connecting to the computer. Doing so may damage the Conversion Cable.
6. For models with communications, the same port is used by the Setting Tool port and for communications via the communications terminals. Do not use communications via the communications terminals when using the Setting Tool port.

Mounting

Mounting to a Panel

For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.

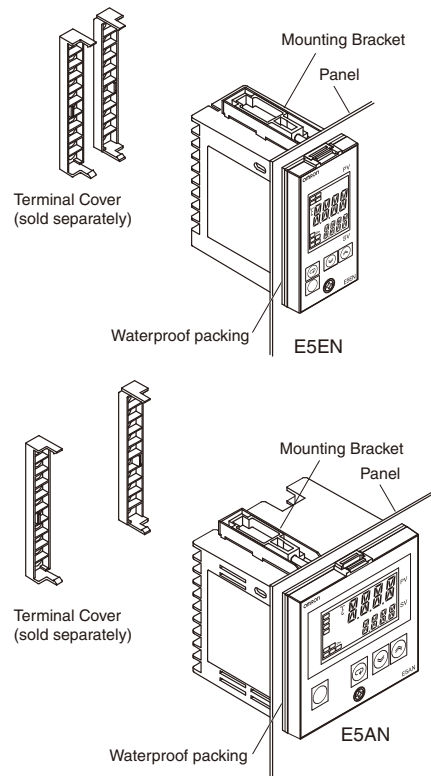
E5CN/E5GN



Note: Install the Rubber Packing if a waterproof structure is required for the front surface.

1. The Panel Mounting Adapter is also included with the E5CN-U. There is no waterproof packing included with the E5CN-U.
2. Insert the E5CN/E5CN-U/E5GN into the mounting hole in the panel.
3. Push the adapter from the terminals up to the panel, and temporarily fasten the E5CN/E5CN-U/E5GN.
4. Tighten the two fastening screws on the adapter. Alternately tighten the two screws little by little to maintain a balance. Tighten the screws to a torque of 0.29 to 0.39 N·m.

E5EN/E5AN



1. Insert the E5AN/E5EN into the square mounting hole in the panel (thickness: 1 to 8 mm). Attach the Mounting Brackets provided with the product to the mounting grooves on the top and bottom surfaces of the rear case.
2. Use a ratchet to alternately tighten the screws on the top and bottom Mounting Brackets little by little to maintain balance, until the ratchet turns freely.

Mounting the Terminal Cover

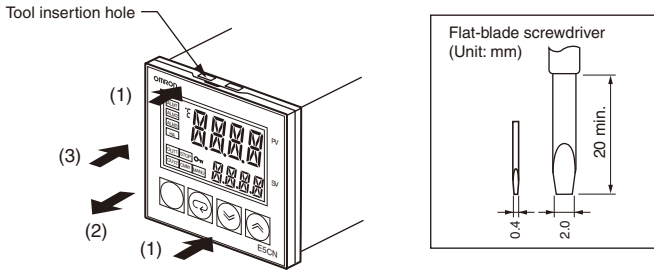
For the E5CN, make sure the "UP" characters on the Cover are in the correct position and insert the Cover into the holes at the top and bottom.

For the E5EN or E5AN, fit the E53-COV11 Terminal Cover over the upper hook. Mount it in the direction shown in the above diagram. If the Terminal Cover is mounted in the opposite direction, proper mounting of the fixtures may not be possible.

Removing the Temperature Controller from the Case

E5CN

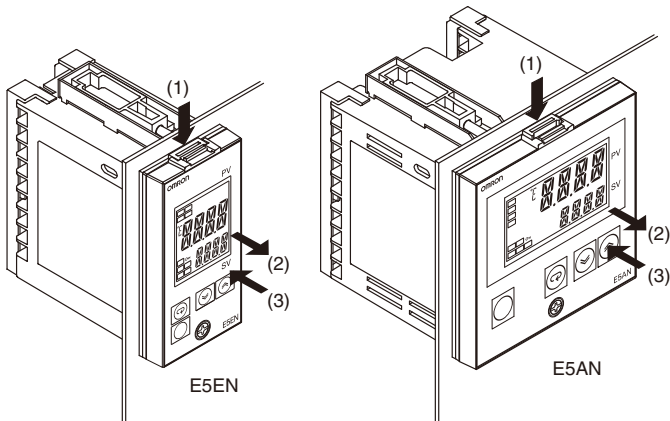
The Temperature Controller can be removed from the case to perform maintenance without removing the terminal leads. This is possible for only the E5CN, and not for the E5CN-U.



1. Insert the tool into the two tool insertion holes (one on the top and one on the bottom) and release the hooks.
2. Insert the tool in the gap between the front panel and rear case, and pull out the front panel slightly. Hold the top and bottom of the front panel and carefully pull it out toward you, without applying unnecessary force.
3. When inserting the E5CN, check to make sure that the sealing rubber is in place and push the E5CN toward the rear case until it snaps into position. While pushing the E5CN into place, push down on the hooks on the top and bottom surfaces of the rear case so that the hooks are securely locked in place. Be sure that electronic components do not come into contact with the case.

E5EN/E5AN

Prepare a Phillips screwdriver suitable for the screw on the front panel to remove the Temperature Controller.

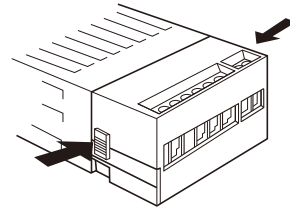


1. Push on the hooks on the top of the front panel, and at the same time, turn the Phillips screwdriver to the left to loosen the screw on the bottom of the front panel.
2. Pull out the front panel gripping both sides.
3. When inserting the E5AN/E5EN Temperature Controller, check to make sure that the sealing rubber is in place. Then, while pushing the front panel into place, turn the Phillips screwdriver to the right in the opposite direction used when removing the panel to tighten the screws on the top and bottom surfaces (tightening torque: 0.3 to 0.5 N·m). Make sure that electronic components do not come into contact with the case.

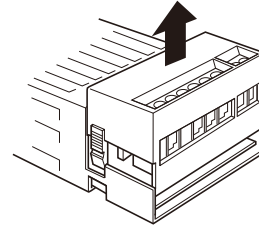
Removing and Attaching the E5GN Terminal Plate

The E5GN can be replaced by removing the terminal plate.

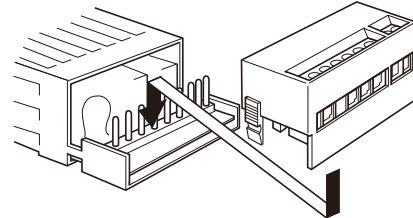
1. Press down hard on the fasteners on both sides of the terminals to unlock the terminal plate and pull upwards.



2. Draw out the terminal plate as it is.



3. Before you insert the terminal plate again, make sure that the pins match the positions of the holes in the terminal plate.



Precautions when Wiring

E5CN, E5CN-U, E5EN, and E5AN

- Separate input leads and power lines in order to prevent external noise.
- Use wires with a gage of AWG24 (cross-sectional area: 0.205 mm²) to AWG14 (cross-sectional area: 2.081 mm²) twisted-pair cable (stripping length: 5 to 6 mm).
- Use crimp terminals when wiring the terminals.
- Tighten the terminal screws to a torque of 1.13 to 1.36 N·m.
- Use the following types of crimp terminals for M3.5 screws.



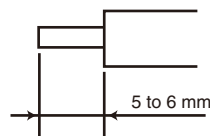
- Do not remove the terminal block. Doing so will result in malfunction or failure.

E5GN

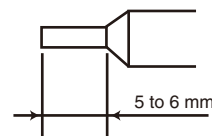
- Connect the terminals as specified below.

Terminal No.	Cables	Pin terminals
1 to 6	AWG24 to AWG14	2.1 mm dia. max.
7 to 9	AWG28 to AWG22	1.3 mm dia. max.

- The exposed current-carrying part to be inserted into terminals must be 5 to 6 mm.



Cable



Pin terminal

- Tighten the terminal screws to the torque specified below.

Terminal No.	Screw	Maximum tightening torque
1 to 6	M2.6	0.23 to 0.25 N·m
7 to 9	M2	0.12 to 0.14 N·m

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In the interest of product improvement, specifications are subject to change without notice.

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