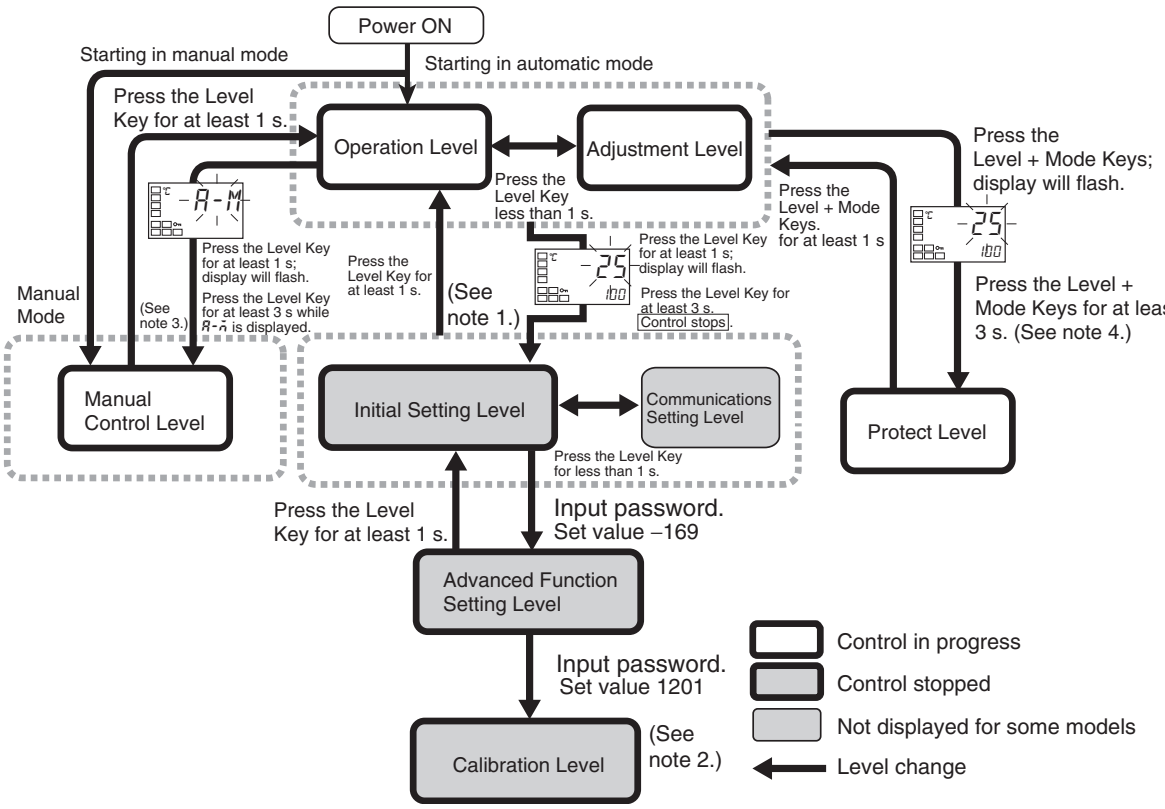
Common to all E5□N

Operation

■ Outline of Operation Procedures

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: 1. Operation level entered for software reset.
2. 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.
3. You can move only to the operation level by operating the keys on the front panel from the manual control level.
4. The time taken to move to the protect level can be adjusted by changing the “Move to protect level time” setting.

Troubleshooting

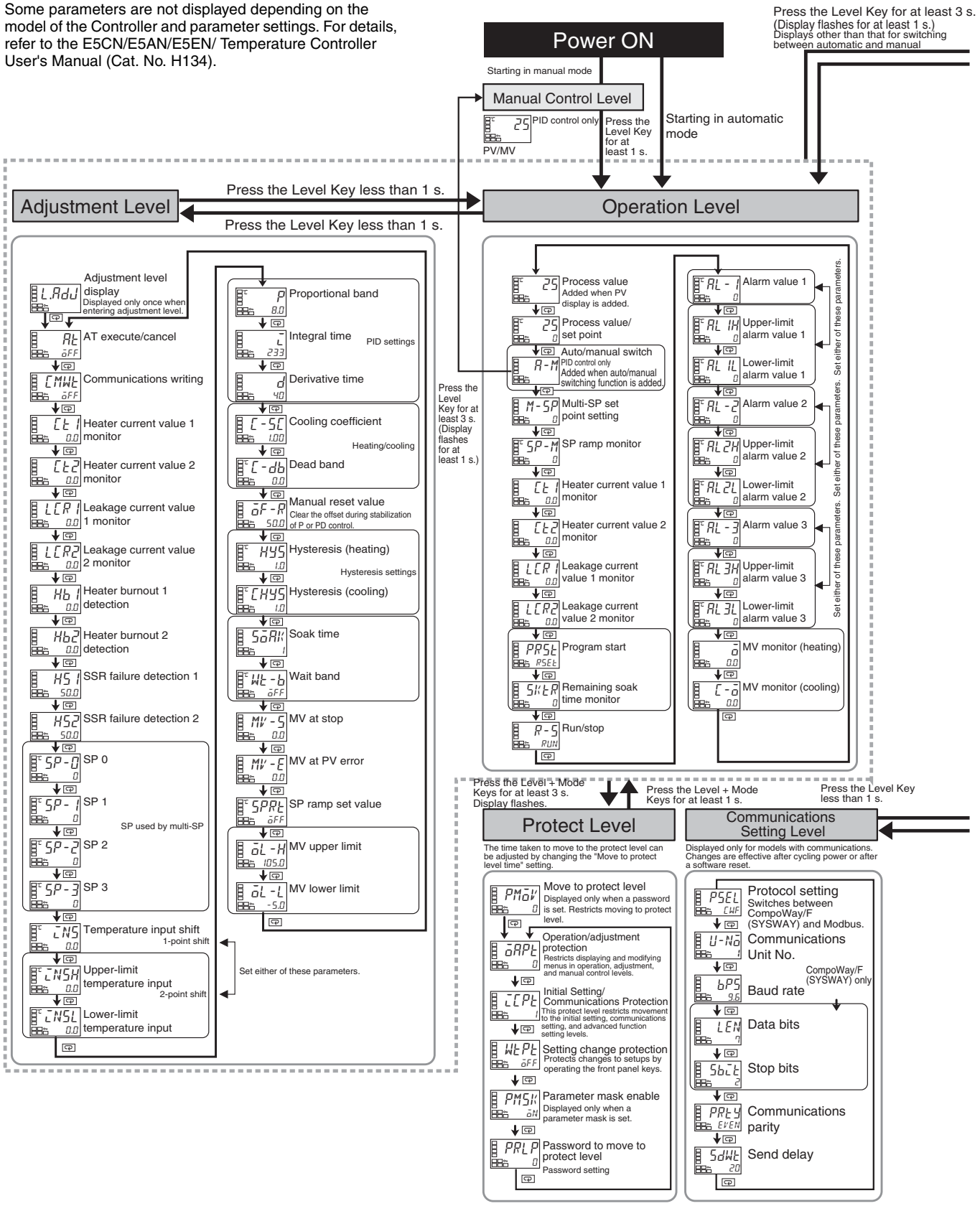
If an error occurs, an error message will be displayed on the No. 1 display. Use the error message to check the type of error and correct the error accordingly.

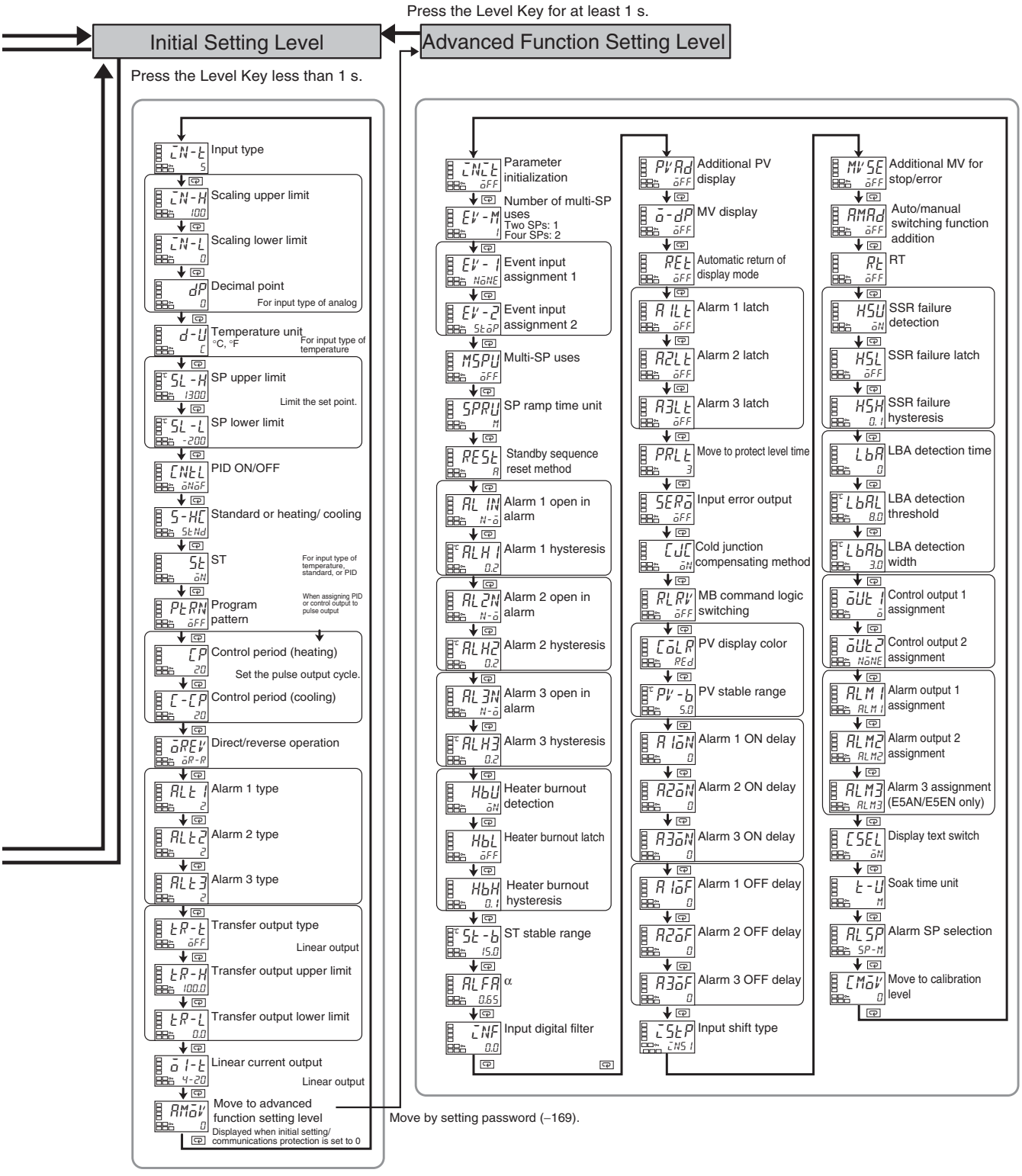
No. 1 display	Error	Correction	Output status at error	
			Control outputs	Alarm outputs
S.ERR (S. Err)	Input error (See note 2.)	Check for input wiring errors, broken wires, short-circuits, and input type error.	OFF	Handled as abnormally high temperature
	A/D converter error (See note 2.)	Check for an input error and then cycle the power supply. If the same error is still displayed, repairs will be necessary. If the Temperature Controller is normal after cycling the power supply, the error may have been caused by noise. Check for noise being generated nearby.	OFF	OFF
E111 (E111)	Memory error	Cycle the power supply. If the same error is still displayed, repairs will be necessary. If the Temperature Controller is normal after cycling the power supply, the error may have been caused by noise. Check for noise being generated nearby.	OFF	OFF
H.ERR (H. Err)	Internal circuit error (See note 2.)		OFF	OFF

Note: 1. If the input exceeds is within the controllable range but exceeds the display range (-1999 to 9999), CCCC will be displayed if the temperature is less than -1999 and DDDD will be displayed if the temperature is more than 9999. The control and alarm outputs will function normally during these displays. Refer to the E5CN/E5CN-U/E5AN/E5EN Temperature Controller User's Manual (Cat. No. H134) for information on the controllable range.
2. These errors are displayed only when the PV/SP is displayed. Errors are not displayed in other display modes.

■ Parameters

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




Press the Level Key for at least 1 s.
Initial Setting Level
Advanced Function Setting Level
Press the Level Key less than 1 s.
Input type
Scaling upper limit
Scaling lower limit
Decimal point
For input type of analog
Temperature unit
°C, °F
For input type of temperature
SP upper limit
Limit the set point.
SP lower limit
PID ON/OFF
Standard or heating/ cooling
ST
For input type of temperature, standard, or PID
Program pattern
When assigning PID or control output to pulse output
Control period (heating)
Set the pulse output cycle.
Control period (cooling)
Direct/reverse operation
Alarm 1 type
Alarm 2 type
Alarm 3 type
Transfer output type
Linear output
Transfer output upper limit
Transfer output lower limit
Linear current output
Linear output
Move to advanced function setting level
Displayed when initial setting/ communications protection is set to 0
Parameter initialization
Number of multi-SP uses
Two SPs: 1
Four SPs: 2
Event input assignment 1
Event input assignment 2
Multi-SP uses
SP ramp time unit
Standby sequence reset method
Alarm 1 open in alarm
Alarm 1 hysteresis
Alarm 2 open in alarm
Alarm 2 hysteresis
Alarm 3 open in alarm
Alarm 3 hysteresis
Heater burnout detection
Heater burnout latch
Heater burnout hysteresis
ST stable range
α
Input digital filter
Additional PV display
MV display
Automatic return of display mode
Alarm 1 latch
Alarm 2 latch
Alarm 3 latch
Move to protect level time
Input error output
Cold junction compensating method
MB command logic switching
PV display color
PV stable range
Alarm 1 ON delay
Alarm 2 ON delay
Alarm 3 ON delay
Alarm 1 OFF delay
Alarm 2 OFF delay
Alarm 3 OFF delay
Input shift type
Additional MV for stop/error
Auto/manual switching function addition
RT
SSR failure detection
SSR failure latch
SSR failure hysteresis
LBA detection time
LBA detection threshold
LBA detection width
Control output 1 assignment
Control output 2 assignment
Alarm output 1 assignment
Alarm output 2 assignment
Alarm 3 assignment (E5AN/E5EN only)
Display text switch
Soak time unit
Alarm SP selection
Move to calibration level
Move by setting password (−169).

Improvements to E5□N Functionality

■ Changes

Model numbers have been changed to allow for multi-input specifications.

Before Change

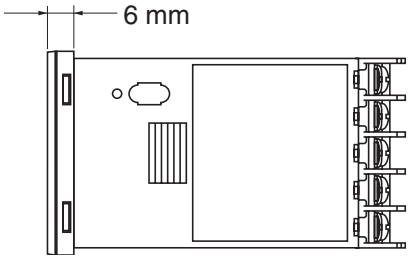
E5□N-□□□TC (models for thermocouples)
E5□N-□□□P (models for platinum resistance thermometers)

After Change

E5□N-□□□T
(Models that support both thermocouples and platinum resistance thermometers)

Precautions in Replacing Previous Controllers

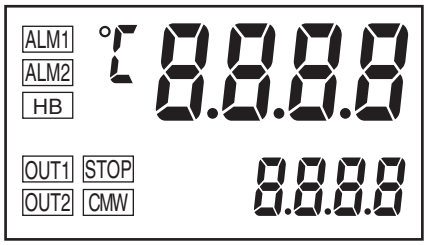
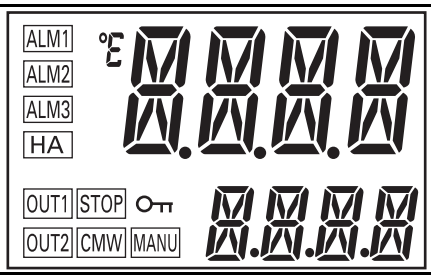
- The input type setting numbers have changed to allow for multi-input specifications. (The default setting is for a K sensor between -200 and 1,300°C.)
- Previous E5□N Controllers cannot be removed from the case for replacement with new models. Replace the case at the same time.
- The previous ThermoTools cannot be used with the new Controller models. Use CX-Thermo Support Software.
- The height of the front panel that extends when the Controller is mounted to a panel has been reduced from 9 to 6 mm for only the E5CN.



The following items have not changed in comparison to the previous E5□N models: Panel cutout, Internal panel dimensions for panel mounting, wiring screw sizes, wiring terminal arrangement, and parameter setting methods.

■ Improved Functions

The previous and new models can be easily differentiated by looking at the front panel. The OMRON logo is in a different position.

Item	Previous models (OMRON logo: lower left)	Improved models (OMRON logo: upper left)
Front panel (E5CN)		

Basically, the Controllers are upwardly compatible. The terminal arrangement, terminal sizes, and depth for panel mounting have not been changed. Changes are listed in the following tables. For details, refer to the E5CN/E5CN-U/E5AN/E5EN Temperature Controller User's Manual (Cat. No. H134).

■ Specifications (Main Changes)

Ratings

Item		Previous models	Improved models
Sensor input		E5□N-□□TC Thermocouple: K, J, T, E, L, U, N, R, S, or B Infrared temperature sensor: 10 to 70°C, 60 to 120°C or 115 to 165°C (160 to 260°C) Voltage input: 0 to 50 mV	E5□N-□□T (Multi-input models) Thermocouple: K, J, T, E, L, U, N, R, S, or B Infrared temperature sensor: 10 to 70°C, 60 to 120°C or 115 to 165°C (160 to 260°C) Voltage input: 0 to 50 mV Platinum resistance thermometer: Pt100 or JPt100
		E5□N-□□P Platinum resistance thermometer: Pt100 or JPt100	
		(No models with analog inputs)	E5□N-□□L (Models with analog inputs added.) 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
Control output	**Relay**	E5CN SPST-NO, 250 VAC, 3 A (resistive load) Electrical life: 100,000 operations min. E5EN/E5AN SPST-NO, 250 VAC, 5 A (resistive load) Electrical life: 100,000 operations min.	E5CN SPST-NO, 250 VAC, 3 A (resistive load) Electrical life: 100,000 operations min. E5EN/E5AN SPST-NO, 250 VAC, 5 A (resistive load) Electrical life: 100,000 operations min.
	Long-life relay	---	E5□N-Y□□ (Added models with long-life relay outputs.) SPST-NO, 250 VAC, 3 A (resistive load) Electrical life: 1,000,000 operations min. DC loads cannot be connected.
	Voltage	E5CN 12 VDC ±15% (PNP) Max. load current: 21 mA With short-circuit protection E5EN/E5AN 12 VDC ±15%/-20% (PNP) Max. load current: 40 mA With short-circuit protection	E5CN 12 VDC ±15% (PNP) Max. load current: 21 mA With short-circuit protection E5EN/E5AN 12 VDC ±15%/-20% (PNP) Max. load current: 40 mA With short-circuit protection
	Current	E5□N-C□□ 4 to 20 mA DC Load: 600 Ω max. Resolution: Approx. 2,600	E5□N-C□□ 4 to 20 mA DC or 0 to 20 mA DC Load: 600 Ω max. Resolution: Approx. 2,700
Control output 2	**Voltage**	(No models with two control outputs)	E5CN-□Q□ 12 VDC ±15% (PNP) Max. load current: 21 mA With short-circuit protection E5EN/E5AN 12 VDC ±15%/-20% (PNP) Max. load current: 21 mA With short-circuit protection
Display method		7-segment digital display and single-LED indicators	11-segment digital display and single-LED indicator (Improved visibility) (A 7-segment digital display also possible.)
Transfer output		(No models with transfer outputs)	Allocated to current output 4 to 20 mA DC or 0 to 20 mA DC Load: 600 Ω max. Resolution: Approx. 2,700
External power supply for ES1B		---	E5CN/E5EN 12 VDC ±10%, 20 mA, With short-circuit protection

Other Functions

Item	Previous models	Improved models
Display	---	Parameter mask function (provided with CX-Thermo Support Software)
	PV display switch between 2 colors (red/green)	PV display switch between 3 colors (red/amber/green)
	---	Display character switch (7-segment/11-segment)
Input	Temperature input shift (1-point shift for temperature input, 2-point shift for no-contact sensor input)	Temperature input shift (2-point shift also possible for temperature input)
Output	---	Manual outputs
	---	MV at stop
	---	MV at PV error
	---	Loop break alarm
Control	Control period: 1 to 99 s	Control period: 0.5 or 1 to 99 s
	---	Robust tuning
Alarm	---	Alarm delays
	---	Alarm SP selection (selection of alarm operation during SP ramp)
Other	---	Simple programming function
	---	Password to move to protect level
	---	Communications port for Support Software

Characteristics

Item	Previous models	Improved models
Sampling period	500 ms	250 ms

Communications Specifications

Item	Previous models	Improved models
Communications protocols	CompoWay/F (SYSWAY)	CompoWay/F (SYSWAY), Modbus
Baud rate	1200, 2400, 4800, 9600, 19200 bps	1200, 2400, 4800, 9600, 19200, 38400 bps

Heater Burnout/SSR Failure Detection Characteristics

Item	Previous models	Improved models
Maximum heater current	Option Units Single-phase 50 A VAC	Option Units Single-phase 50 A AC
	---	Option Units (two CT inputs) Three-phase 50 A AC
SSR failure detection	---	SSR failure detection

Precautions

⚠ 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

a) 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.

b) More than one disconnect switch may be required to de-energize the equipment before servicing the product.

c) Signal inputs are SELV, limited energy. (See note 1.)

d) 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 to between 1.13 and 1.36 N·m. Loose screws may occasionally result in fire. (See note 3.)

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: 1. 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.

2. 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.

3. 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 affects on the performance or functionality of the product. Not doing so may occasionally result in faulty operation.

1. 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.
2. 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.
3. To allow heat to escape, do not block the area around the product. Do not block the ventilation holes on the product.
4. Be sure to wire properly with correct polarity of terminals.
5. Use the specified size (M3.5, width 7.2 mm or less) crimped terminals for wiring. 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 mm^2). (The stripping length is 5 to 6 mm.) Up to two wires or two crimp terminals can be inserted into a single terminal.
6. Do not wire the terminals that are not used.
7. 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.
8. Use this product within the rated load and power supply.
9. 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.
10. 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.
11. 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.
12. 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.
13. 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.
14. Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
15. Design the system (e.g., control panel) considering the 2 seconds of delay that the product's output to be set after power ON.
16. The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
17. The EEPROM has a limited write life. When overwriting data frequently, e.g., via communications, use RAM Mode.
18. 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.
19. 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.
20. Do not connect or disconnect the Conversion Cable while communications are in progress. Product faults or malfunction may occur.
21. Make sure that the Conversion Cable's metal components are not touching the external power terminals.
22. Do not touch the connectors on the Conversion Cable with wet hands. Electrical shock may result.

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

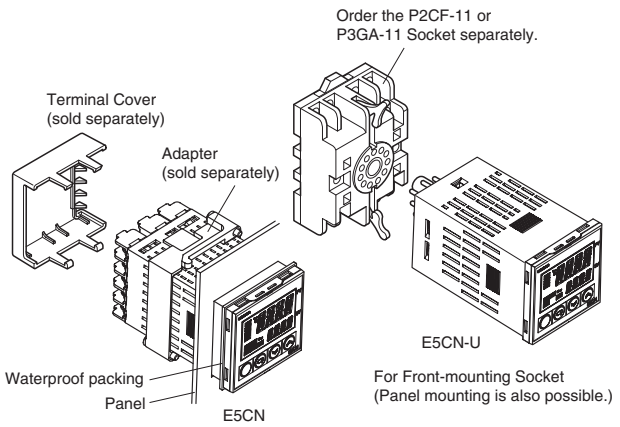
1. The disk that is included with the Conversion Cable is designed for a computer CD-ROM driver. Never attempt to play the disk in a general-purpose audio player.
2. Do not connect or disconnect the Conversion Cable connector repeatedly over a short period of time. The computer may malfunction.
3. After 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

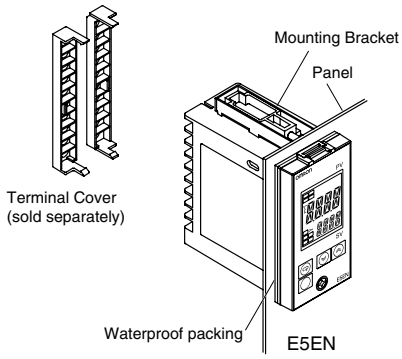
For waterproof mounting, waterproof packing must be installed on the Controller. Waterproofing is not possible when group mounting several Controllers. Waterproof packing is not necessary when there is no need for the waterproofing function.

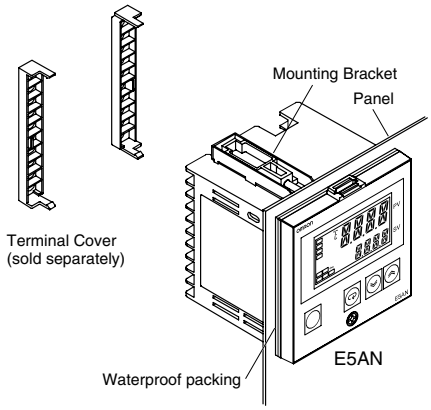
E5CN



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 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

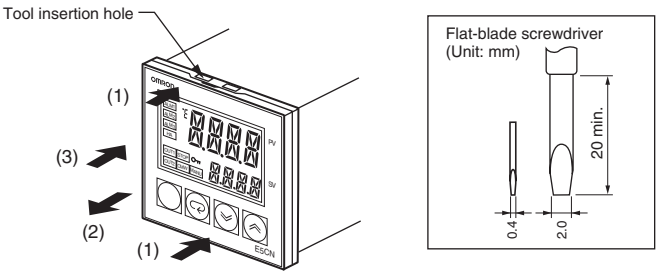
For the E5CN, make sure the “UP” characters on the Cover are in the correct position and insert the Cover into the holes at the top and bottom.

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

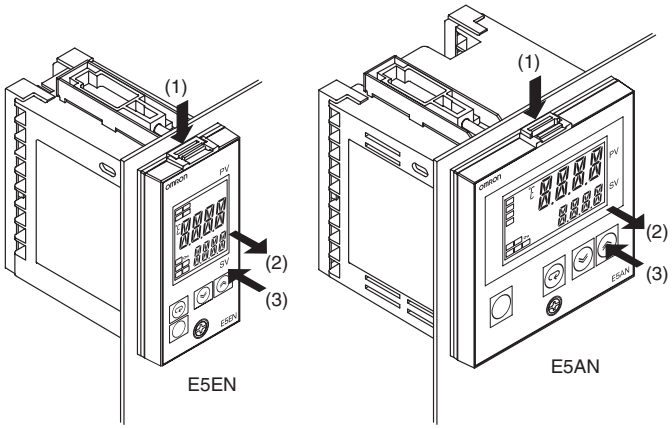
The Temperature Controller can be removed from the case to perform maintenance without removing the terminal leads. This is possible for only the E5CN, and not for the E5CN-U.



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

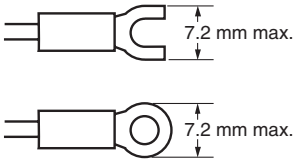
Prepare a Phillips screwdriver suitable for the screw on the front panel to remove the Temperature Controller.



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.

Precautions when Wiring

- Separate input leads and power lines in order to prevent external noise.
- Use wires with a gage of AWG24 (cross-sectional area: 0.205 mm^2) to AWG14 (cross-sectional area: 2.081 mm^2) 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.

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

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