E5EC

OMRON

Digital Controller

EN INSTRUCTION MANUAL

Thank you for purchasing the OMRON E5EC Digital Controller.
This manual describes the functions, performance, and application methods needed for optimum use of the product.
Please observe the following items when using the product.

- This product is designed for use by qualified personnel with a knowledge of electrical systems.
- Before using the product, thoroughly read and understand this manual to ensure correct use.
- Keep this manual in a safe location so that it is available for reference whenever required.

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Refer to the *E5CC/E5EC Digital Controllers User's Manual* (Cat. No. H174) for detailed application procedures.

Safety Precautions

●Key to Warning Symbols

⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, is likely to result in minor or moderate injury or property damage. Read this manual carefully before using the product.

1654642-3

●Warning Symbols

⚠ 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.	⊘
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 recognized 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. c) Signal inputs are SELV, limited energy. d) Caution: To reduce the risk of fire or electric shock, do not interconnect the outputs of different Class 2 circuits.	⚠
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.	⚠
Loose screws may occasionally result in fire. Tighten the terminal screws to the specified torque of 0.43 to 0.58 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 Temperature Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.	❗
Do not allow dirt or foreign objects to enter the jacks on the Digital Controller or cable connector pins. Otherwise, fire may occasionally occur.	❗

Suitability for Use

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product.
Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.
Know and observe all prohibitions of use applicable to this product.
NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.See also Product catalog for Warranty and Limitation of Liability.

Precautions for Safe Use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Use the product within specifications.

(1) The product is designed for indoor use only. Do not use the product outdoors. Do not use or store the product in any of the following locations.
- 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/store within the rated temperature and humidity ranges.
Provide forced-cooling if required.
(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 of crimped terminals (M3, width 5.8 mm or less) for wiring. To connect bare wires to the terminal block, use copper braided or solid wires with a gage of AWG24 to AWG18 (equal to a cross-sectional area of 0.205 to 0.8231 mm²). (The stripping length is 6 to 8 mm.). Up to two wires of same size and type, or two crimped terminals can be inserted into a single terminal.
(6) Do not wire the terminals which are not used.
(7) Allow as much space as possible between the controller and devices that generate a powerful high-frequency or surge.
Separate the high-voltage or large-current power lines from other lines, and avoid parallel or common wiring with the power lines when you are wiring to the terminals.
(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 Digital 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 the load and the unit ON simultaneously, or turn the load ON before you turn the controller ON.
(12) A switch or circuit breaker should be provided close to this unit.
The switch or circuit breaker should be within easy reach of the operator, and must be marked as a disconnecting means for this unit.
(13) Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol.
(14) Design system (control panel, etc) considering the 2 second of delay that the controller's output to be set after power ON.
(15) The output may turn OFF when shifting to certain levels. Take this into consideration when performing control.
(16) The number of non-volatile memory write operations is limited. Therefore, use RAM write mode when frequently overwriting data during communications or other operations.
(17) When disassembling the Temperature Controller for disposal, use suitable tools.
(18) Do not connect USB-Serial Conversion Cables to both the front-panel Setup Tool port and the serial connector. The Digital Controller may be damaged or may malfunction.
(19) Do not exceed the communications distance that is given in the specifications and use the specified communications cable. Refer to the *E5CC/E5EC Digital Controllers User's Manual* (Cat. No. H174) for the communications distance and cable specifications.

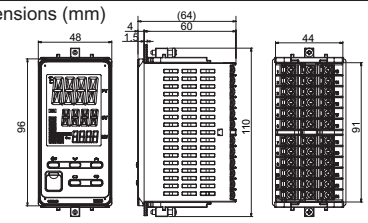
●Specifications

Power supply voltage	100 to 240 VAC, 50/60 Hz or 24 VAC, 50/60 Hz / 24VDC
Operating voltage range	85 to 110% of the rated voltage
Power consumption	Option 000: Approx. 4.1 VA (100 to 240 VAC) Approx. 3.0 VA (24 VAC)/approx. 1.7 W (24 VDC) All other specifications: Approx. 5.1 VA (100 to 240 VAC) Approx. 3.9 VA (24 VAC)/approx. 2.3 W (24 VDC)
Indication accuracy (Ambient temperature: 23°C)	Thermocouple: (±0.3 % of indication value or ±1°C, whichever is greater) ±1 digit max. Platinum resistance thermometer: (±0.2 % of indication value or ±0.8°C, whichever is greater) ±1 digit max. Analog input: ±0.2 % FS ±1 digit max.
Event input Contact input No-contact input	Output current: approx. 7 mA per contact. ON:1 kΩ max., OFF:100 kΩ min. ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
Remote SP input	4 to 20 mA DC or 0 to 20 mA DC 0 to 5 V DC or 0 to 10 V DC
Control output 1	Relay output: SPST-NO, 250 VAC, 5 A (resistive load) Electrical life of relay: 100,000 operations Voltage output (for driving SSR): 12 VDC ±20%, 40 mA for one control output, 21 mA if there are two control outputs Current output: 4 to 20 mA DC, 0 to 20 mA DC Load: 500Ω max.
Control output 2	Relay output: SPST-NO, 250 VAC, 5 A (resistive load) Electrical life of relay: 100,000 operations Voltage output (for driving SSR): 12 VDC, 21 mA Current output: 4 to 20 mA DC or 0 to 20 mA DC with load of 500 Ω max.
Control method	ON/OFF or 2-PID control
Auxiliary outputs	Relay outputs: 250 VAC, two outputs: 3 A (resistive load), four outputs: 2 A (resistive load) Electrical life of relay: 100,000 operations
Ambient temperature	–10 to 55°C (Avoid freezing or condensation)
Ambient humidity	RH25 to 85%
Storage temperature	–25 to 65°C (Avoid freezing or condensation)
Altitude	Max. 2,000 m
Recommended fuse	T2A, 250 VAC, time-lag, low-breaking capacity
Weight	Approx. 210 g (Digital Controller only)
Degree of protection	Front panel: IP66 Rear case: IP20, Terminal section: IP00
Installation environment	Installation category II, pollution degree 2 (as per IEC61010-1)
Memory protection	Non-volatile memory (Number of write operations: 1,000,000)
Transfer output	4 to 20 mA DC with load of 500 Ω max. 1 to 5 VDC with load of 1 kΩ min.

■Wiring

●Dimensions

Dimensions (mm)



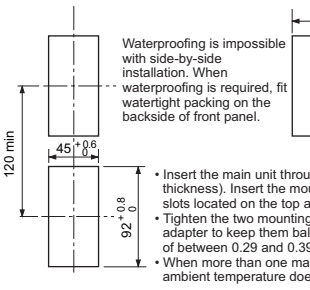
In the pack:
- Main unit
- Watertight packing
- Two mounting brackets
- Instruction manual
- Terminal cover
(Provided only for models with "-500" suffix.)

Solderless terminal size: M3
Terminal cover:
(Model: E53-COV24)
USB-Serial Conversion Cable
(Sold Separately)
(E58-CIFQ2)

* Do not remove the terminal block. Doing so may result in failure or malfunction.
* A Setup Tool port is provided on the bottom of the product. Use this port to connect a personal computer to the product when using the Setup Tool. The E58-CIFQ2 USB-Serial Conversion Cable is required to connect to the port shown in the above figure. The E58-CIFQ2-E USB-Serial Conversion Cable is required to connect to the port on the front panel. (Do not use the product with the USB-Serial Conversion Cable left permanently connected.)
Refer to the instruction manual provided with the USB-Serial Conversion Cable for details on connection methods.

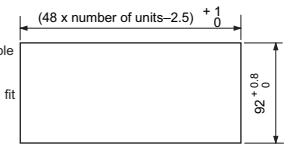
●Installation

Individual mounting (mm)



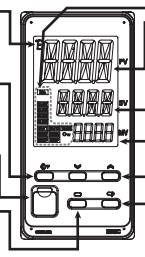
Waterproofing is impossible with side-by-side installation. When waterproofing is required, fit watertight packing on the backside of front panel.

Side-by-side mounting (mm)



- Insert the main unit through the mounting hole in the panel (1-8 mm thickness). Insert the mounting brackets (supplied) into the fixing slots located on the top and bottom of the rear case.
- Tighten the two mounting screws on the top and bottom of the adapter to keep them balanced, and finally tighten them to a torque of between 0.29 and 0.39 N·m.
- When more than one machine is installed, make sure that the ambient temperature does not exceed the specified limit.

●Names of Parts on Front Panel

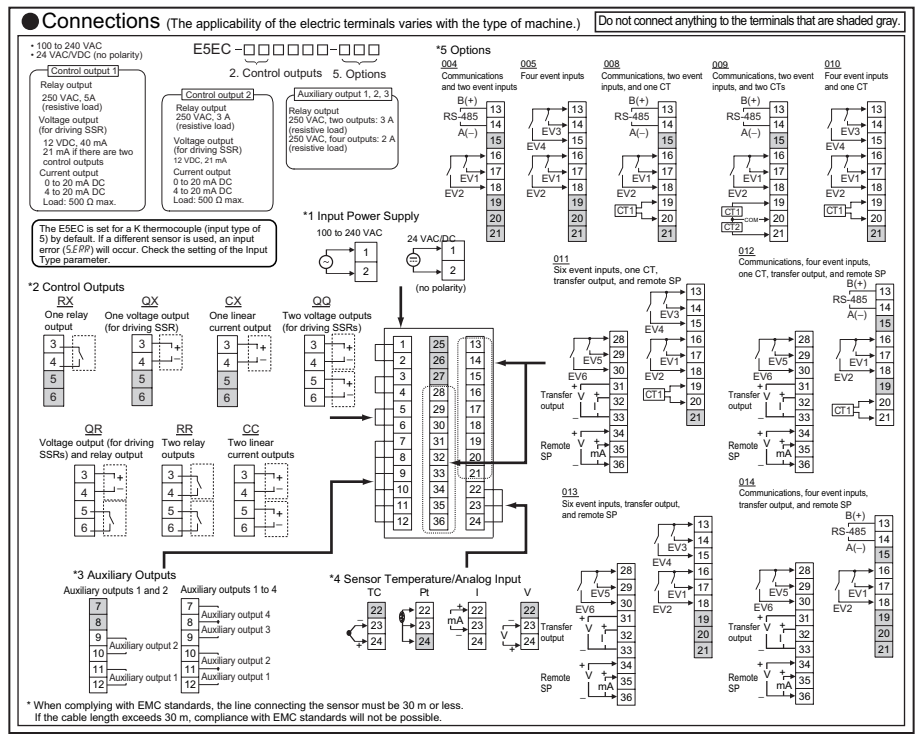


- °C / °F : temperature unit
The temperature unit is displayed when the displayed value is a temperature.
Either "℃" or "℉" is displayed according to the set value of the temperature unit.
- Shift key (PF key)
The default PF Setting parameter is for shifting the digit. This is a function key. When it is pressed, the function set for the PF Setting parameter will operate.
- Front-panel Setup Tool port
This port is used to connect the Controller to a computer to use the Setup Tool.
- Level key
Use this key to change levels:
- No.1 display
Process value or set data type
- No.2 display
Set point, set data read-out value or changed input value
- No. 3 display
MV, Soak Time Remain, and Multi-SP.
- Up and Down keys
Each press of ∧ key increments or advances the values displayed on the No.2 display.
Each press of ∨ key decrements or returns the values displayed on the No.2 display.
- Mode key
Press this key to change the contents of the display.
Press this button for 1 s or longer for reverse scroll.
- Press the ▭ key and the ◁▷ key together for at least 3 seconds to switch to protect level.

Operation indicators
- SUB1: Auxiliary output 1 indicator
- SUB2: Auxiliary output 2 indicator
- SUB3: Auxiliary output 3 indicator
- OUT1: Control output 1 indicator
For a current output, lit except for a 0% output.
- OUT2: Control output 2 indicator
- RSP: Remote SP indicator
Lit when the assigned function is ON.
- TUNE:
Flashing during self-tuning.
Lit during auto-tuning.
- STOP: control stop indicator
Lit when event input or "Run/Stop" is stopped during operation.
During control stop, functions other than control output are valid.
- CMW: communications writing enable/ disable indicator
Lit when communications writing is "enabled" and is out when it is "disabled".
- Oᴘᴛ: Protection indicator
Lit when Setting Change Protect is ON (disables the Up and Down Keys).
- MANU: Manual output indicator
Lit when the Auto/Manual Mode is set to Manual Mode.

●Connections (The applicability of the electric terminals varies with the type of machine.)

Do not connect anything to the terminals that are shaded gray.



* When complying with EMC standards, the line connecting the sensor must be 30 m or less. If the cable length exceeds 30 m, compliance with EMC standards will not be possible.

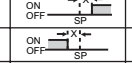
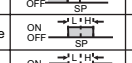
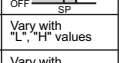
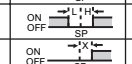
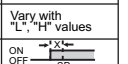
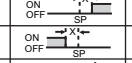
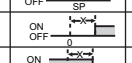
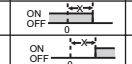
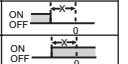
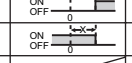
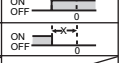
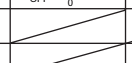
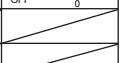
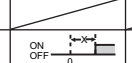
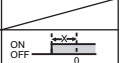
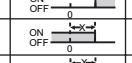
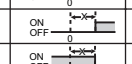
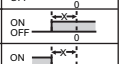
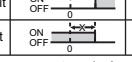
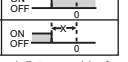
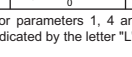
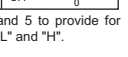
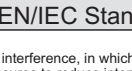
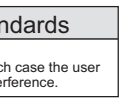
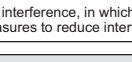
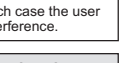
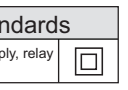
■Operation Menu

●Input Type

	Input type	Input	Setting	Setting range	
Temperature inputs	Platinum 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 (°F)
			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	-200 to 600 (°C)	-300 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)	0 to 3200 (°F)
		W	19	0 to 2300 (°C)	0 to 2300 (°F)
		PL II	20	0 to 1300 (°C)	0 to 3200 (°F)
	Infrared Thermosensor ES1B		21	0 to 90 (°C)	0 to 190 (°F)
			22	0 to 120 (°C)	0 to 240 (°F)
			23	0 to 165 (°C)	0 to 320 (°F)
			24	0 to 260 (°C)	0 to 500 (°F)
Analog input type	Current input	4 to 20mA	25	Use the following ranges for scaling: -1999 to 9999, -199.9 to 999.9, -19.99 to 99.99, -1.999 to 9.999	
		0 to 20mA	26		
	Voltage input	1 to 5V	27		
		0 to 5V	28		
		0 to 10V	29		

*The default is"5".
*S.ERR will be displayed when a platinum resistance thermometer is mistakenly connected while input type is not set for it. To clear the S.ERR display, correct the wiring and cycle the power supply.

●Alarms

Setting	Alarm type	Alarm output function	
		Positive alarm value (X)	Negative alarm value (X)
0	No alarm function	Output off	
*1 1	Deviation upper/lower limit		Vary with "L", "H" values
2	Deviation upper limit		
3	Deviation lower limit		
*1 4	Deviation upper/lower range		Vary with "L", "H" values
*1 5	Deviation upper/lower limit standby sequence ON		Vary with "L", "H" values
6	Deviation upper limit standby sequence ON		
7	Deviation lower limit standby sequence ON		
8	Absolute value upper limit		
9	Absolute value lower limit		
10	Absolute value upper limit standby sequence ON		
11	Absolute value lower limit standby sequence ON		
12	LBA (only for alarm 1)		
13	PV Change Rate Alarm		
14	SP absolute value upper limit		
15	SP absolute value lower limit		
16	MV absolute value upper limit		
17	MV absolute value lower limit		
18	RSP absolute value upper limit		
19	RSP absolute value lower limit		

*1: Upper and lower limits can be set for parameters 1, 4 and 5 to provide for different types of alarm. These are indicated by the letter "L" and "H".
• The default alarm type is "2"

⚠ Conformance to EN/IEC Standards

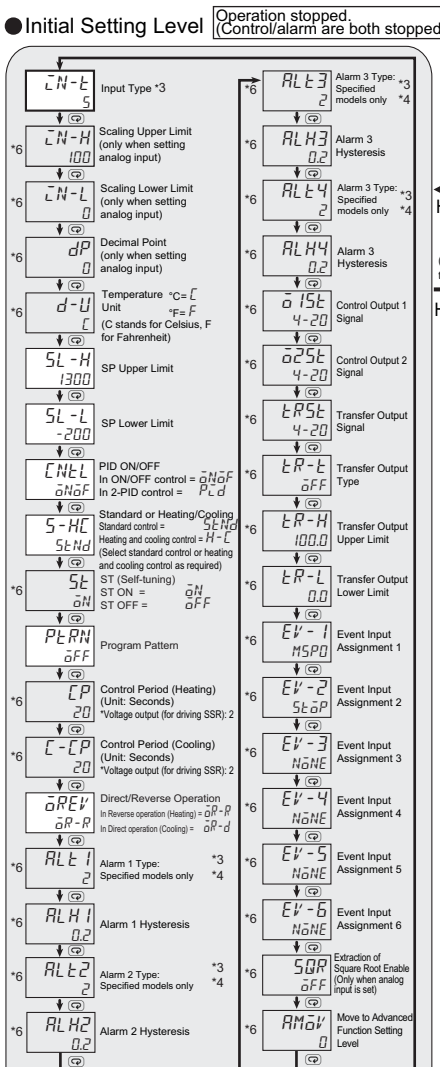
This is a class A product.
In residential areas it may cause radio interference, in which case the user may be required to take adequate measures to reduce interference.

⚠ Conformance to Safety Standards

Reinforced insulation is provided between input power supply, relay outputs, and between other terminals. ⧈

●Initial Setting Level

Operation stopped. (Control/alarm are both stopped.) *5



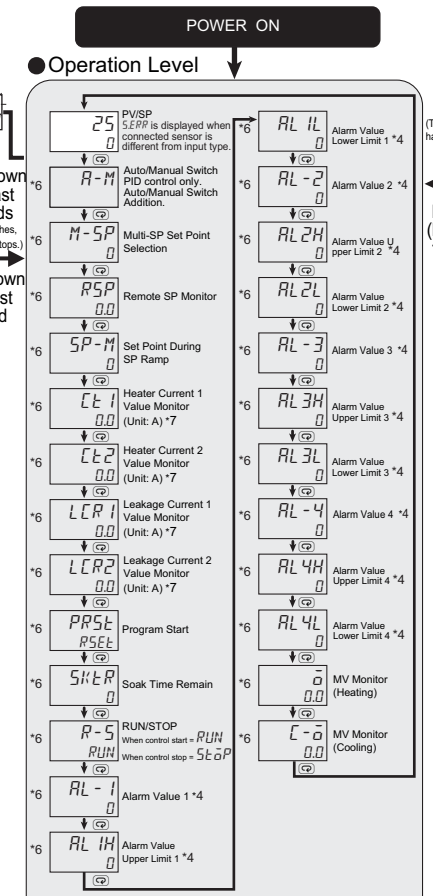
Initial setting level enables users to specify their preferred operating conditions (input type, alarm type, control method, etc.)

*3: Refer to the adjoining tables for details of input types and alarm types.
*4: Applicable only to models with alarm functions.
*5: Operation is stopped when moved to the initial setting level. (control/alarm are both stopped.)
*6: The grayed-out setting items may not be displayed according to the models and setting.
*7: Applicable only to models with heater burnout functions.
*8: The four numeric digits of the product code are displayed in the No. 2 display. The setting cannot be changed and there is nothing that you need to set.

Check the wiring before turning ON the power supply.

POWER ON

●Operation Level



Operation level should normally be used during operations.

Hold ▭ down for at least 3 seconds (No.1 display flashes, then the control stops.)

Hold ▭ down for at least 1 second

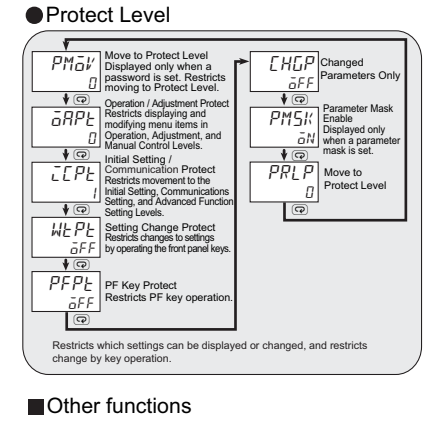
(The No.3 display has been omitted.)

Press ▭ (less than 1 second)

Hold ▭ and ◁▷ keys down for at least 1 second

Hold ▭ and ◁▷ keys down for at least 3 seconds

●Protect Level



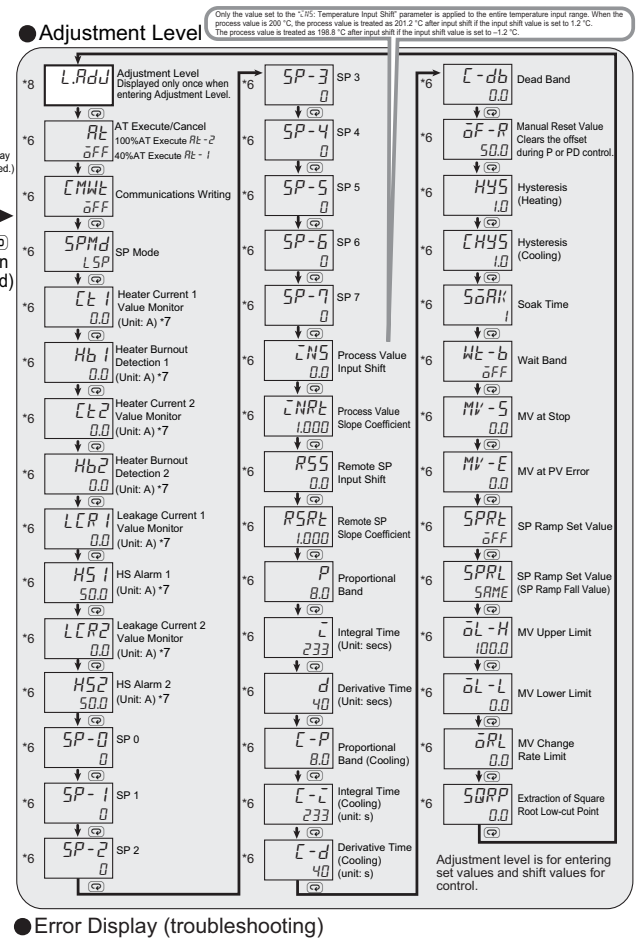
Restricts which settings can be displayed or changed, and restricts change by key operation.

■Other functions

Refer to the *E5CC/E5EC Digital Controllers User's Manual* (Cat. No. H174) for information on the Advanced Function Setting Level, Monitor/Setting Item Level, Manual Control Level, and other functions.
Refer to the *E5CC/E5EC Digital Controllers Communications Manual* (Cat. No. H175) for information on communications.

●Adjustment Level

Only the value set to the "△IN5: Temperature Input Shift" parameter is applied to the entire temperature input range. When the process value is 200 °C, the process value is treated as 201.2 °C after input shift if the input shift value is set to 1.2 °C. The process value is treated as 198.8 °C after input shift if the input shift value is set to –1.2 °C.



Adjustment level is for entering set values and shift values for control.

●Error Display (troubleshooting)

When an error has occurred, the No.1 display shows the error code. Take necessary measure according to the error code, referring the table below.

No.1 display	Meaning	Action	Status at error	
			Control output	Alarm
S.ERR (S. Err)	Input error *2	Check the setting of the Input Type parameter, check the input wiring, and check for broken or shorts in the temperature sensor.	OFF	Operates as above the upper limit.
E333 (E333)	A/D converter error *2	After the correction of A/D converter error, turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	OFF	OFF
E111 (E111)	Memory error	Turn the power OFF then back ON again. If the display remains the same, the controller must be repaired. If the display is restored to normal, then a probable cause can be external noise affecting the control system. Check for external noise.	OFF	OFF

If the input value exceeds the display limit (-1999 to 9999), though it is within the control range, cccc will be displayed under -1999 and ɔɔɔɔ above 9999. Under these conditions, control output and alarm output will operate normally. Refer to the *E5CC/E5EC Digital Controllers User's Manual* (Cat. No. H174) for the controllable ranges.

*2: Error shown only for "Process value / Set point". Not shown for other status.

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