

Common to all E5□R

E5AR/E5ER Common Information

■ Features/Performance

High-speed Sampling at 50 ms for Stable Control of Targets Requiring High-speed Response

The E5□R-DRT offers high-speed sampling at 50 ms for 4 loops (two to fivefold improvement on previous OMRON products). This is optimal for control operations such as high-speed response control by ceramic heaters, flowrate control, and pressure control.

Precision Control through High-resolution Temperature/Analog Inputs. Extraction of Square Root for Flowrate Control.

The high resolution and precision of inputs (Pt100, 0.01°C resolution), and high resolution and external overshooting adjustment function of outputs allow precision control/transfer.

The analog inputs have a high resolution (5-digit display at 0.01% resolution for Pt), and high precision of $\pm 0.1\%$ FS (two to three times better than previous OMRON products). The transfer and control outputs also have a high resolution of 1/43,000 (for 4 to 20 mA, a twentyfold improvement on previous OMRON products). In addition to PID autotuning, external interference gain parameters are provided to improve resistance to external interference. This allows high resolution when measuring, detecting changes, or logging internal temperature and humidity of devices, such as environmental testing equipment.

Simultaneous 5-digit Digital Display of PVs and SPs

Process values (PVs), set points (SPs), and manipulated variables (MVs)/Bank No. data is displayed simultaneously in a 3-row digital display. This simplifies PID tuning and monitoring of device status. The negative LCD display with backlight and simultaneous display of a bar graph (E5AR only) provides high visual clarity.

Multipoint, Cascade, and Proportional Control Using a Single Unit with 2 Temperature/Analog Inputs, and Standard Control of 4 Loops from a Single Unit with 4 Inputs (See Note). And Position-proportional Control.

The series includes models with 1, 2, and 4 temperature/analog inputs (see note). Various control modes can be selected in the software settings, including standard control, heating and cooling control, cascade control, proportional control, and remote SP control. This enables a single Unit to perform multipoint control (up to 4 inputs for the E5AR only), cascade control, and proportional control.

Particularly with multipoint control, a single Unit can be used to simultaneously control up to 4 points, such as temperature, humidity, and pressure, thereby contributing to reduced costs per loop and smaller panels.

Models that perform position-proportional control can be used to control proportional motors.

Note: The size of models with 4 analog inputs is 96 x 96 mm (E5AR only).

Easily Coordinate Control of PLCs Using Multiple I/O

Up to 6 event inputs are provided (depending on the model). These can be used to externally control memory bank switching, RUN/STOP, auto/manual, SP mode, and remote/local operations. A single transfer output (depends on the model) is also provided. This allows external output of PVs, SPs, MVs, and SP ramp values for each loop. Up to 4 auxiliary outputs are also provided. This allows external output of 11 alarm modes and input errors.

Using RS-485 communications (CompoWay/F), data can be easily shared with CS/CJ-series or other OMRON PLCs through a CJ1W-CIF21 Simple Communications Unit. MODBUS protocol is also supported.

Conforms to DeviceNet Multivendor Network

A DeviceNet connection enables high-speed data transfer by allocating settings and parameters to be monitored in PLC I/O areas. This greatly reduces the program development requirements for communications.

Using the DeviceNet Configurator, all parameters can be uploaded or downloaded in a single operation. Set parameters can also be saved, loaded, and printed, dramatically reducing maintenance time.

Various Calculation Functions

Calculation functions are provided as a standard feature, such as SP ramp, extraction of square root, and straight-line and broken-line approximation.

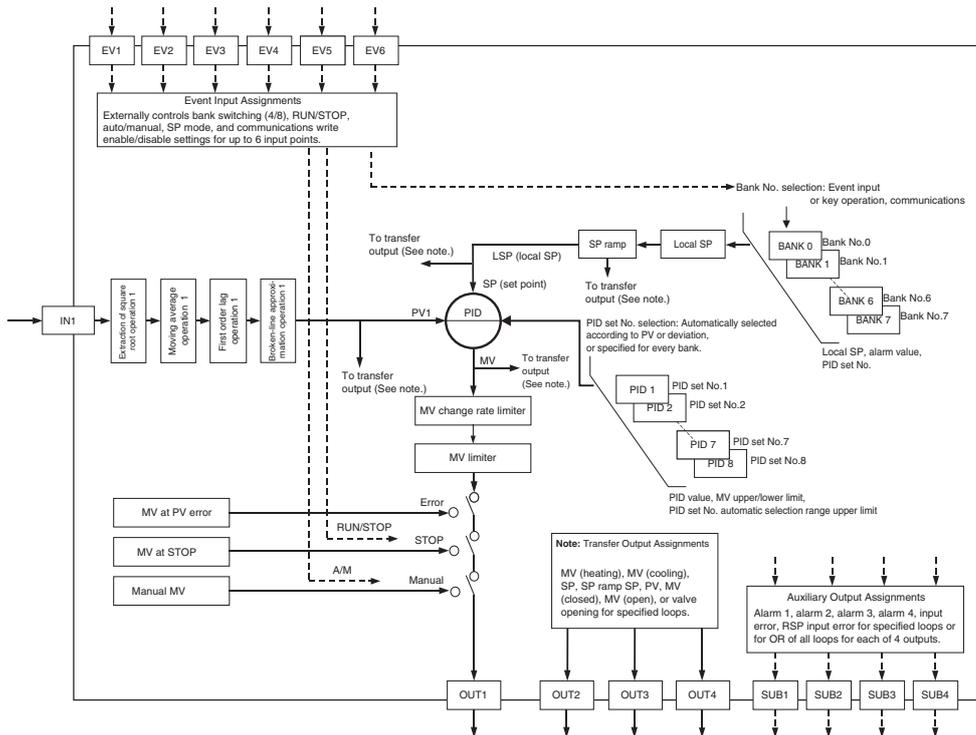
Download Initial Settings, and Mask, Print, Save in CSV Format, or Tune Display Settings Interactively from a Personal Computer. (CompoWay/F-compatible Models with Communications Functions Only)

Thermo Tools (Support Software sold separately) can be used to simply set initial settings from a personal computer. (Downloading initial settings reduces the time required for setting.)

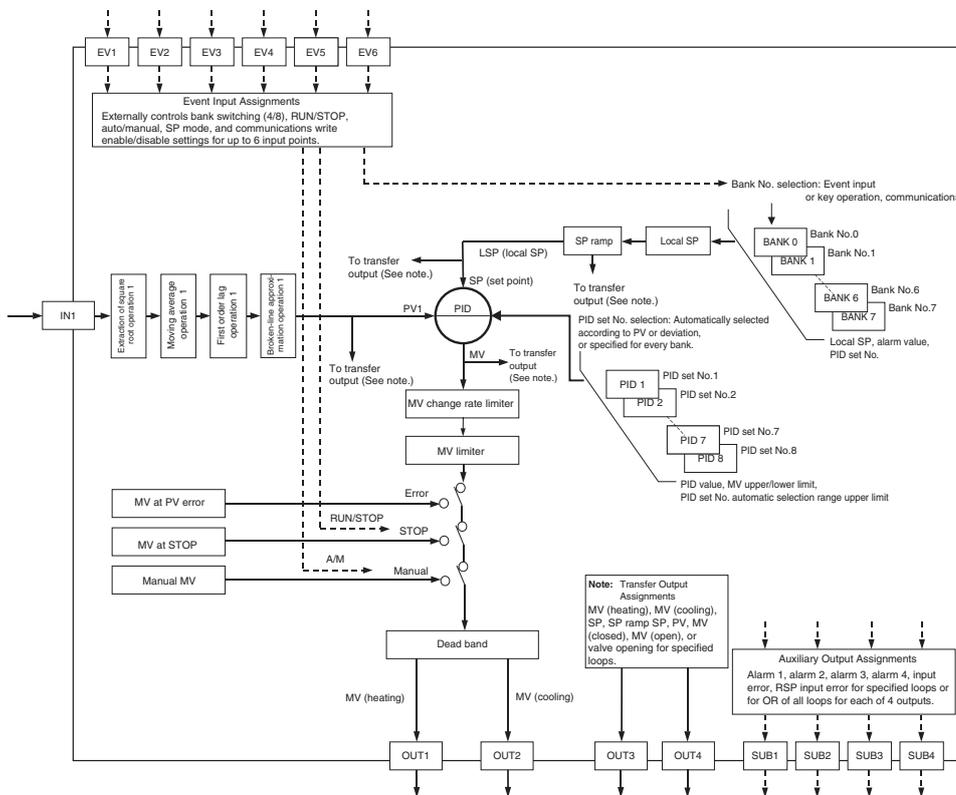
Required setting data alone can also be displayed and set. Setting data can be saved as a document. PID tuning can also be performed while monitoring PV trends (fine tuning is also possible).

I/O Block Diagram

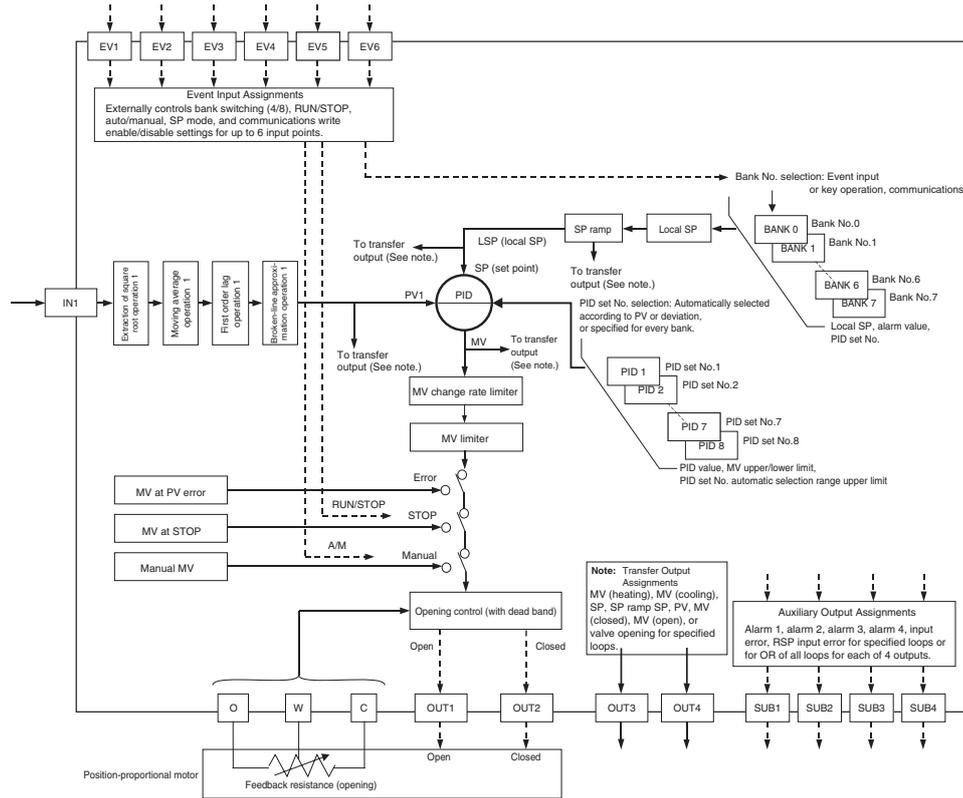
Standard Control Mode



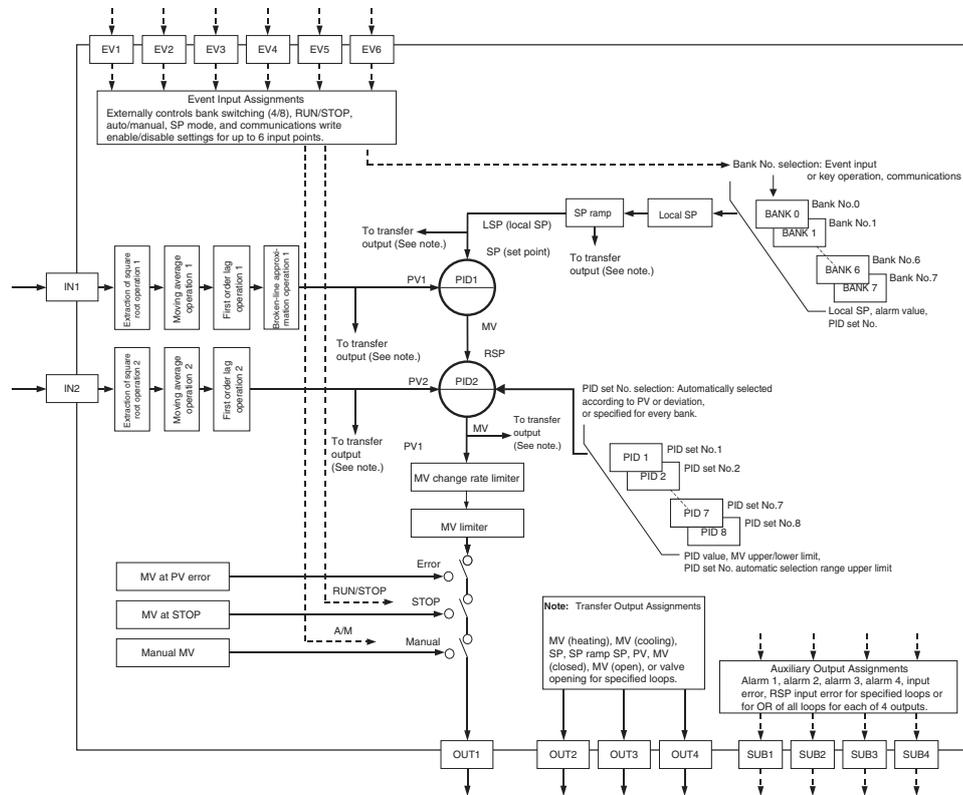
Heating and Cooling Control Mode



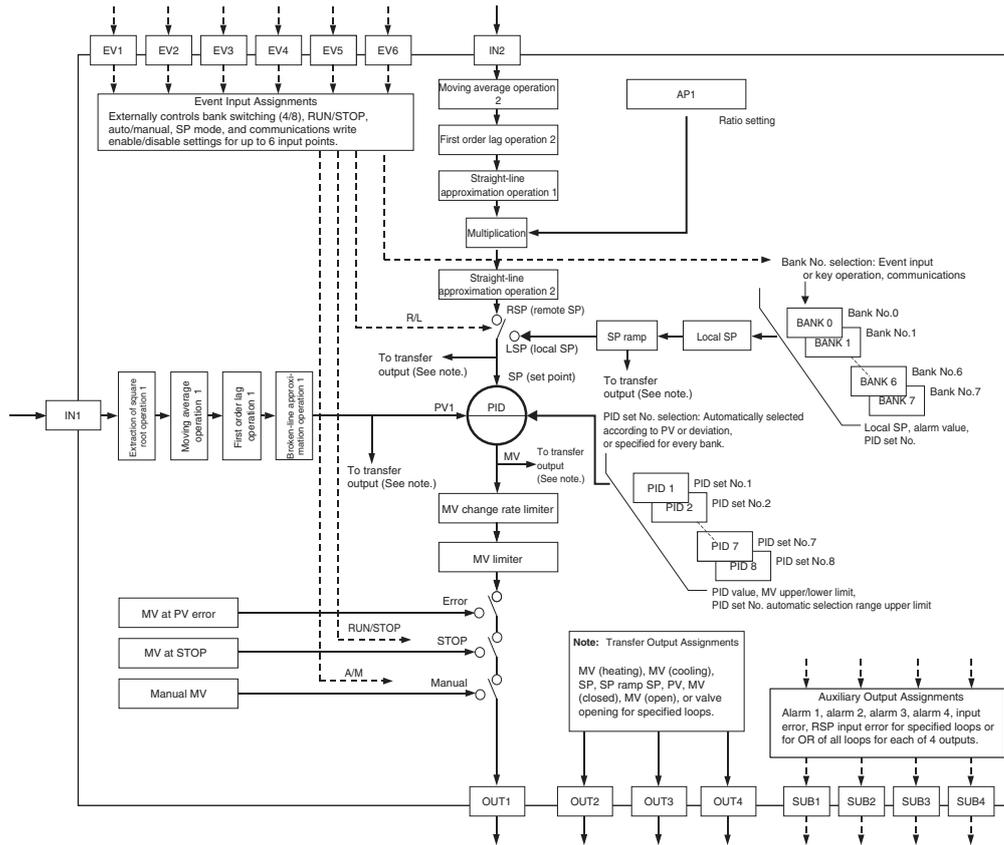
Single-loop Position-Proportional Control Mode



Single-loop Cascade Control Mode (2-Loop Controller)



Single-loop Proportional Control Mode (2-Loop Controller)

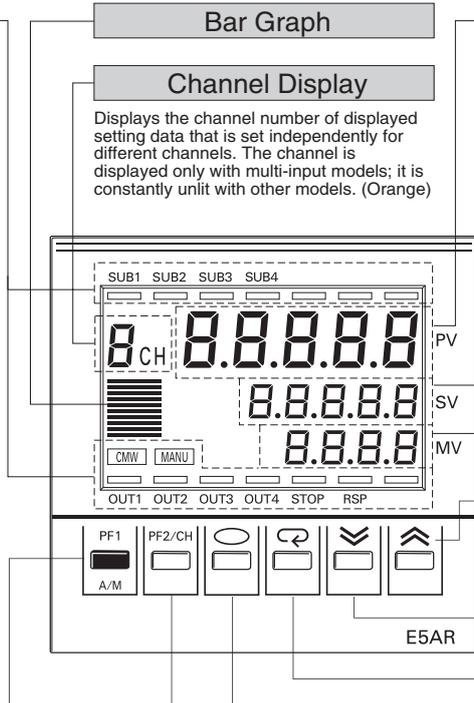


Nomenclature

E5AR

Operation Indicators

- SUB1
Lit when the function allocated to auxiliary output 1 is ON and unlit when it is OFF.
- SUB2
Lit when the function allocated to auxiliary output 2 is ON and unlit when it is OFF.
- SUB3
Lit when the function allocated to auxiliary output 3 is ON and unlit when it is OFF.
- SUB4
Lit when the function allocated to auxiliary output 4 is ON and unlit when it is OFF.
- CMW
Lit when communications writing is enabled and unlit when it is disabled.
- MANU
Lit during operation in manual mode. Unlit otherwise.
- OUT1
Lit when control output 1 is ON. Unlit when it is OFF.
- OUT2
Lit when control output 2 is ON. Unlit when it is OFF.
- OUT3
Lit when control output 3 is ON. Unlit when it is OFF.
- OUT4
Lit when control output 4 is ON. Unlit when it is OFF.
- STOP
Lit when operation is stopped. Unlit otherwise. Lights when operation is stopped by event or run/stop input.
- RSP
Lit when the SP mode is remote. Unlit otherwise.



Function Key 2/Channel Key

With multi-input models, this key operates as a channel key. With single-input models, it operates as a function key and activates the function set with the PF2 setting when pressed.

Function Key 1

This key operates as a function key and activates the function set with the PF1 setting when pressed.

No. 1 Display

Displays the PVs, setting names, and errors. (Red)

No. 2 Display

Displays SPs, setting values, and heater current monitor values. (Green)

No. 3 Display

Displays MVs, bank numbers, and level names. (Orange)

Up Key

Press this key to increase the value in the No. 2 display. Hold the key down to increase the value more quickly. It can also be used to proceed through the setting items.

Down Key

Press this key to decrease the value in the No. 2 display. Hold the key down to decrease the value more quickly. It can also be used to go back through the setting items.

Mode Key

Press this key to switch between different setting data within a setting level.

Level Key

Press this key to switch between different levels.

Level and Mode Keys

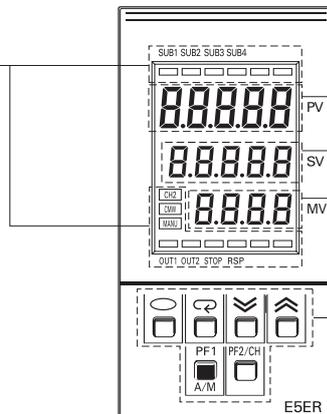
Use this key combination to switch to the protect level.

E5ER

Items without explanations are explained in the diagram for the E5AR.

Operation Indicators

- CH2
Lit when values for channel 2 are displayed. Unlit otherwise.



No. 1 Display

No. 2 Display

No. 3 Display

Operation Keys

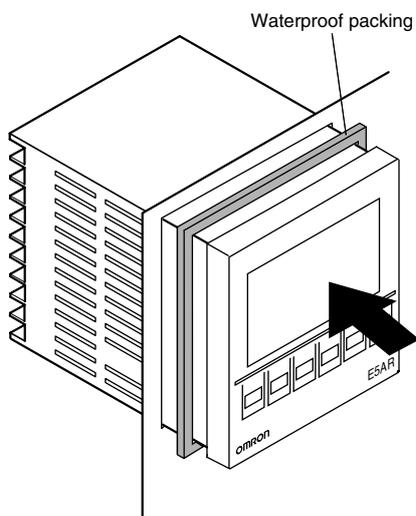
Level and Mode Keys

Use this key combination to switch to the protect level.

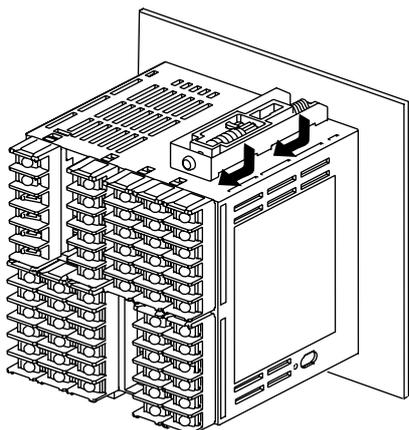
Installation

E5AR

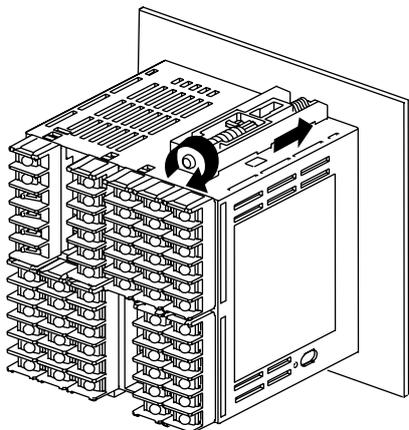
1. Ensure waterproofing by mounting with waterproof packing.
2. Insert the E5AR into the mounting hole panel.



3. Insert the mounting brackets into the grooves on the top and bottom of the rear case.

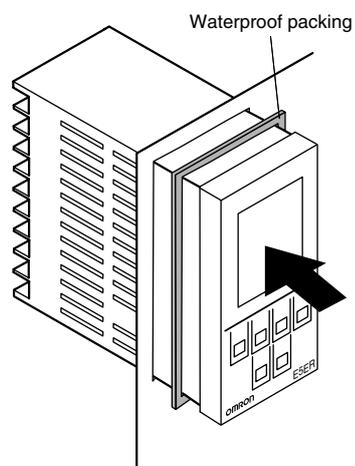


4. Tighten the screws on the mounting brackets alternately, keeping an even balance, until the ratchet stops tightening.

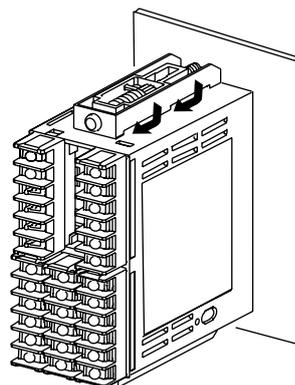


E5ER

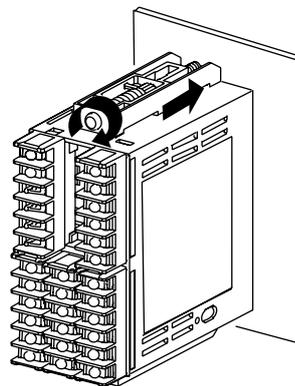
1. Ensure waterproofing by mounting with waterproof packing.
2. Insert the E5ER into the mounting hole panel.



3. Insert the mounting brackets into the grooves on the top and bottom of the rear case.



4. Tighten the screws on the mounting brackets alternately, keeping an even balance, until the ratchet stops tightening.



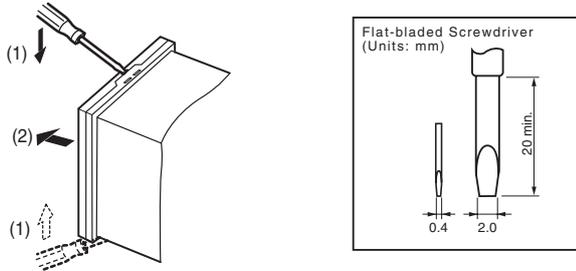
Drawing Out

Although the Unit does not have to be drawn out for standard operation, it can be drawn out for maintenance if necessary.

Removing the Front Panel

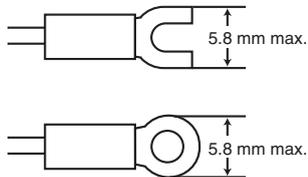
A flat-bladed screwdriver (shown below) is required to remove the front panel.

1. Insert the screwdriver in the holes (2) at the top and bottom of the front panel and unfasten the hooks.
2. Insert the screwdriver in the gap between the front panel and the rear case and pull out the front panel a little. Then, hold the top and bottom of the front panel and pull in the direction of the arrow (below) to remove.



Wiring Precautions

- Prevent the influence of noise by separating input lines and power lines.
- Use crimp terminals.
- Tighten the terminal screws using a torque between 0.40 and 0.56 N·m.
- Use M3 crimp terminals with the following dimensions.

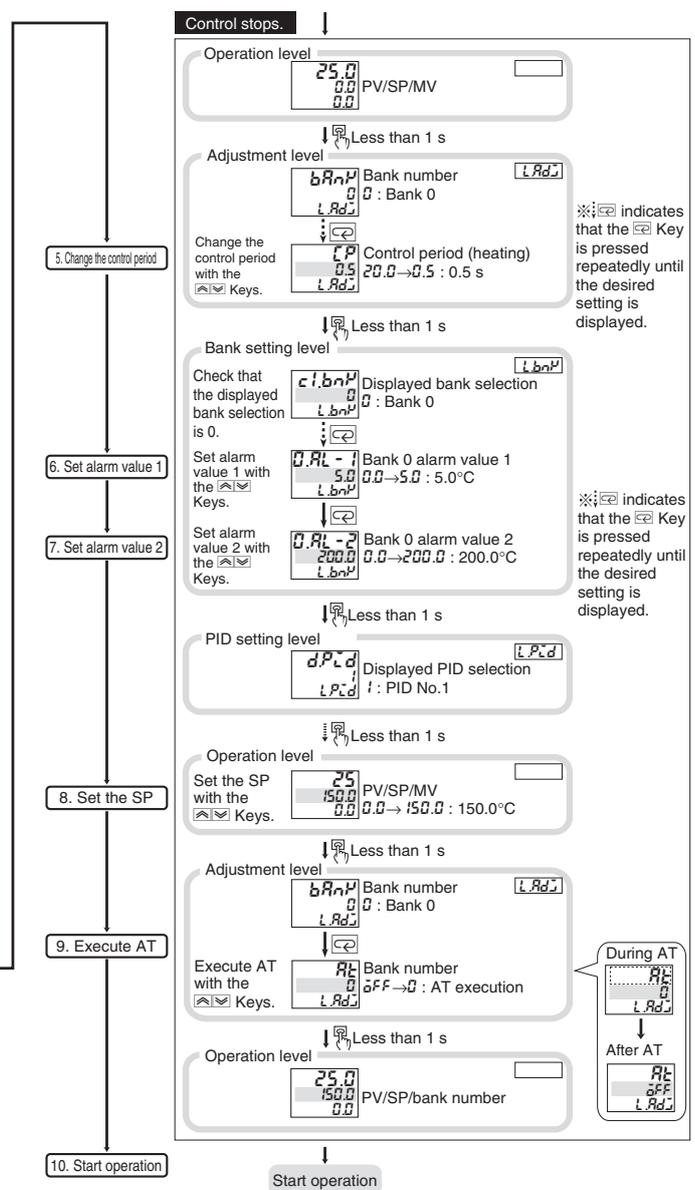
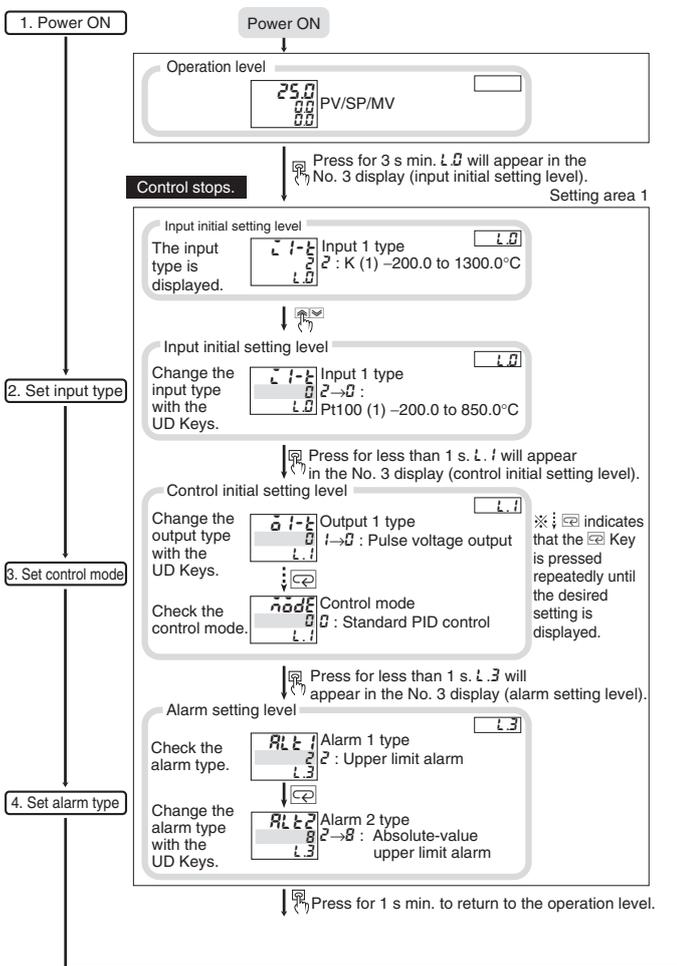
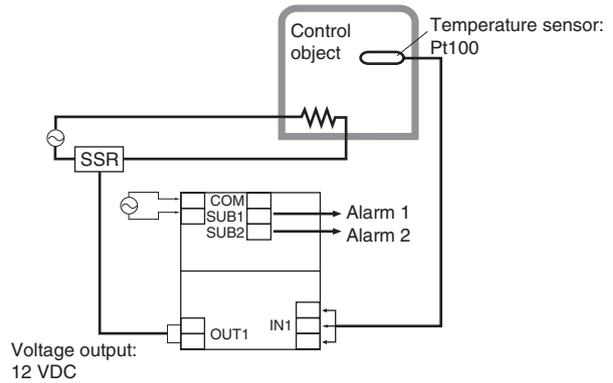


Initial Setup

Typical Example

This example shows how to perform initial setup for the E5AR-Q4B (100 to 240 VAC) and is based on the following conditions.

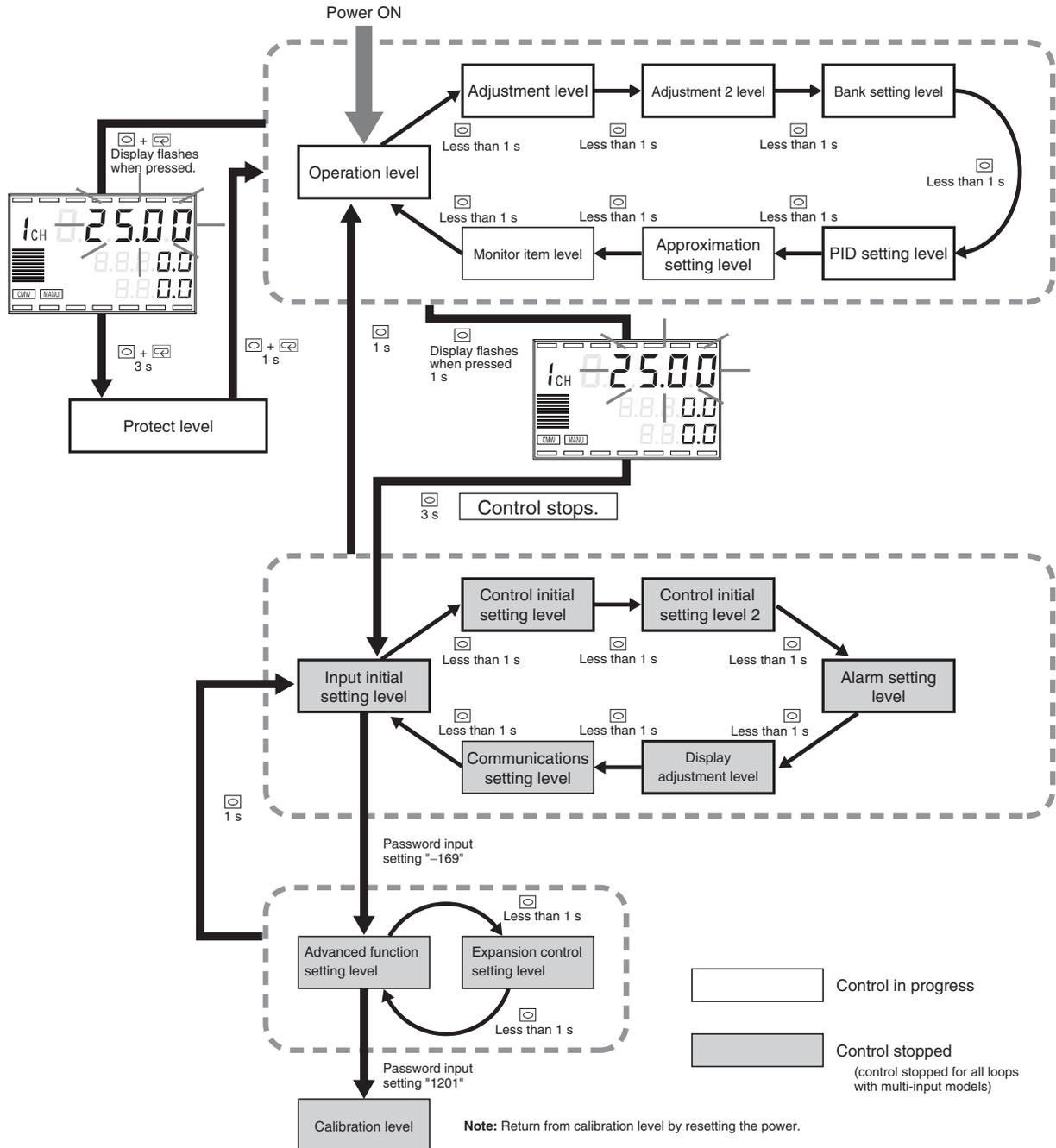
- Input type: Pt100 (-200.0 to 850.0° C)
- Control method: PID control
- Output: Pulse voltage output
- Control period: 0.5 s
- Alarm 1: Upper limit alarm at 5.0° C
- Alarm 2: Absolute-value upper limit alarm at 200.0° C
- PID: Obtained by auto-tuning (AT)
- SP: 150.0° C



Specification Setting after Turning ON Power

Setting Level Configuration and Key Operations

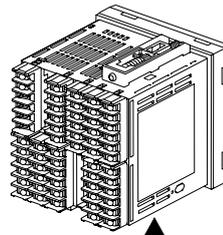
Setting items are divided into “levels” and the settings are as “parameters.” With the E5AR/E5ER, setting items are classified into the 17 types shown below. When power is turned ON, all the indicators light for approx. 1 min before the Unit enters the operation level.



Note: Depending on the model or settings, some levels may not be displayed.

Input Allocation List

Set value	Input type name	Input range		Input type switch	
		(°C)	(°F)		
0	Pt100 (1)	-200.0 to 850.0	-300.0 to 1500.0	Set to TC.PT 	
1		-150.00 to 150.00	-199.99 to 300.00		
2	K	-200.0 to 1300.0	-300.0 to 2300.0		
3		-20.0 to 500.0	0.0 to 900.0		
4	J	-100.0 to 850.0	-100.0 to 1500.0		
5		-20.0 to 400.0	0.0 to 750.0		
6	T	-200.0 to 400.0	-300.0 to 700.0		
7	E	0.0 to 600.0	0.0 to 1100.0		
8	L	-100.0 to 850.0	-100.0 to 1500.0		
9	U	-200.0 to 400.0	-300.0 to 700.0		
10	N	-200.0 to 1300.0	-300.0 to 2300.0		
11	R	0.0 to 1700.0	0.0 to 3000.0		
12	S	0.0 to 1700.0	0.0 to 3000.0		
13	B	100.0 to 1800.0	300.0 to 3200.0		
14	W	0.0 to 2300.0	0.0 to 4100.0		
15	4 to 20 mA	One of the following ranges is displayed by scaling.		Set to ANA-LOG 	
16	0 to 20 mA				-19999 - 99999
17	1 to 5 V				-1999.9 - 9999.9 -199.99 - 999.99
18	0 to 5 V				-19.999 - 99.999
19	0 to 10 V				-1.9999 - 9.9999

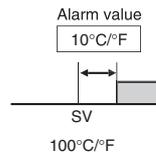


Input type switch (bottom)

The following example shows the settings required for the alarm to turn ON when the temperature exceeds 110°C/F.

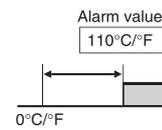
Alarms Other Than Absolute-value Alarms (Alarm Types 1 to 7)

Set the alarm value as a deviation from the SP.



Absolute-value Alarms (Alarm Types 8 to 11)

Set the alarm value as an absolute value with respect to 0°C/F.



- The initial set value is 2 and the factory setting for the input type switch is TC.PT.

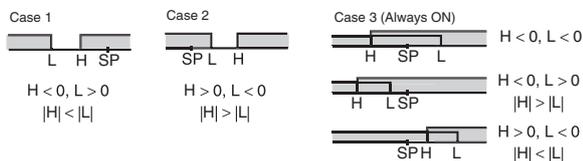
Alarm Type List

Alarm values are indicated by "X" in the following table. In cases where upper and lower limits are set independently, the upper limit is indicated by "H" and the lower limit is indicated by "L." If upper/lower limit, upper/lower limit range, or upper/lower limit with standby sequence is selected as the alarm type, set both the alarm upper limit and alarm lower limit values. For any other selection, set the (single) alarm value.

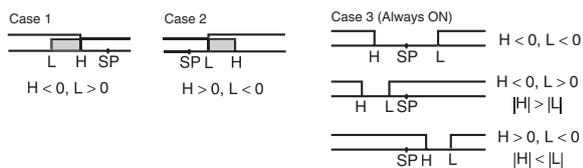
Set value	Alarm type	Alarm output function	
		Positive alarm value (X)	Negative alarm value (X)
0	No alarm function	Output OFF	
1 (See note 1.)	Upper/lower limit	ON OFF	(See note 2.)
2	Upper limit	ON OFF	ON OFF
3	Lower limit	ON OFF	ON OFF
4 (See note 1.)	Upper/lower limit range	ON OFF	(See note 3.)
5 (See notes 1 and 6.)	Upper/lower limit with standby sequence	ON OFF	(See note 4.)
6 (See note 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 (See note 6.)	Absolute-value upper-limit with standby sequence	ON OFF	ON OFF
11 (See note 6.)	Absolute-value lower-limit with standby sequence	ON OFF	ON OFF

Note 1: With set values 1, 4, and 5, upper and lower limit values can be set independently. They are indicated by "H" and "L" respectively.

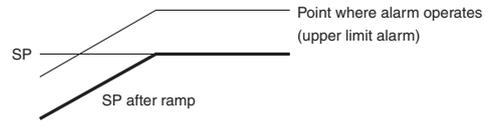
2: Set value 1: Upper/lower limit alarm



3: Set value 4: Upper/lower limit range

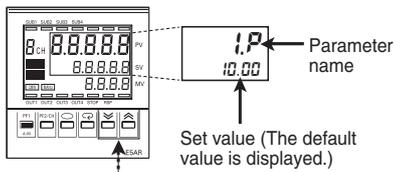


- 4: Set value 5: Upper/lower limit with standby sequence
Based on the above explanation for the upper/lower limit alarm, in cases 1 and 2, if the upper and lower limits effectively overlap because of hysteresis, operation will be always OFF; in case 3, operation will be always OFF.
- 5: Set value 5: Upper/lower limit with standby sequence
If the upper and lower limits effectively overlap because of hysteresis, operation will be always OFF.
- 6: For more details on the standby sequence, refer to the *User's Manual* (Z182).
- 7: If SP ramp is used, the alarm function will operate with respect to the SP after ramp during operation, and will operate with respect to the SP while operation is stopped.



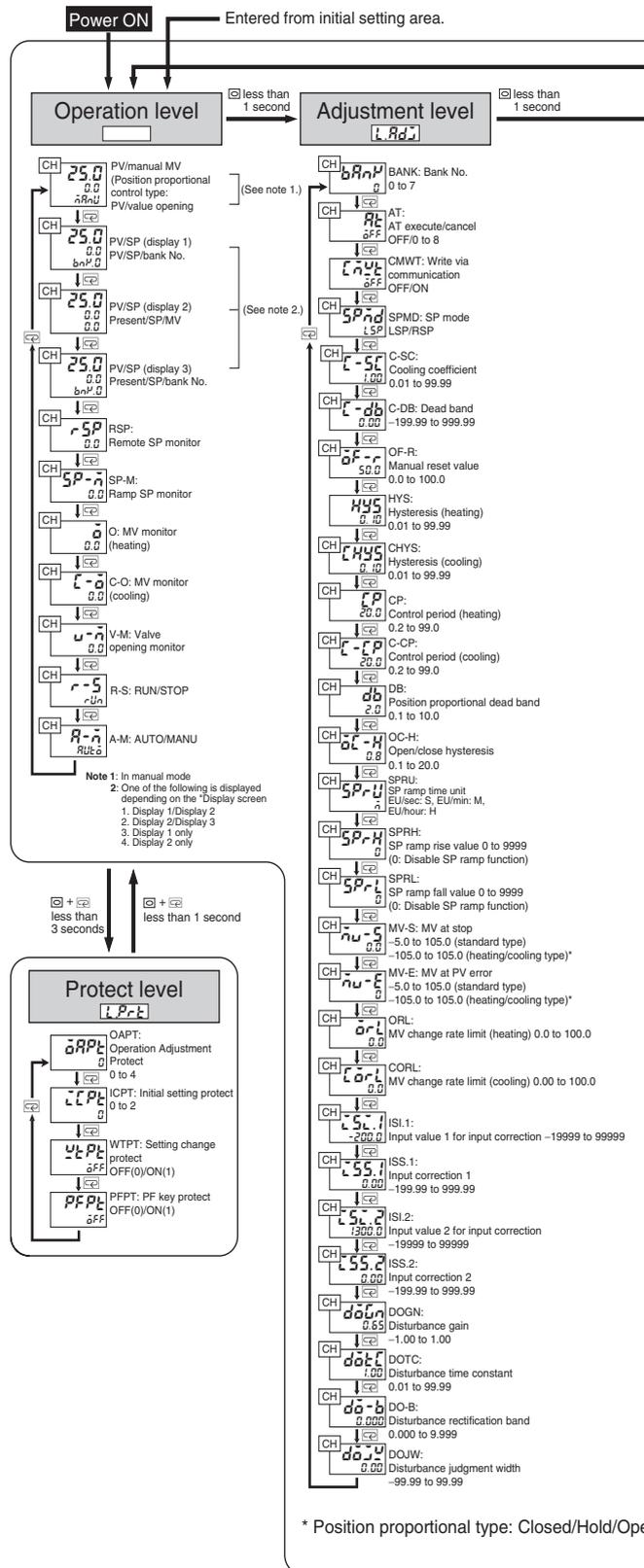
Parameter Lists

Display of Parameter Names and Set Values

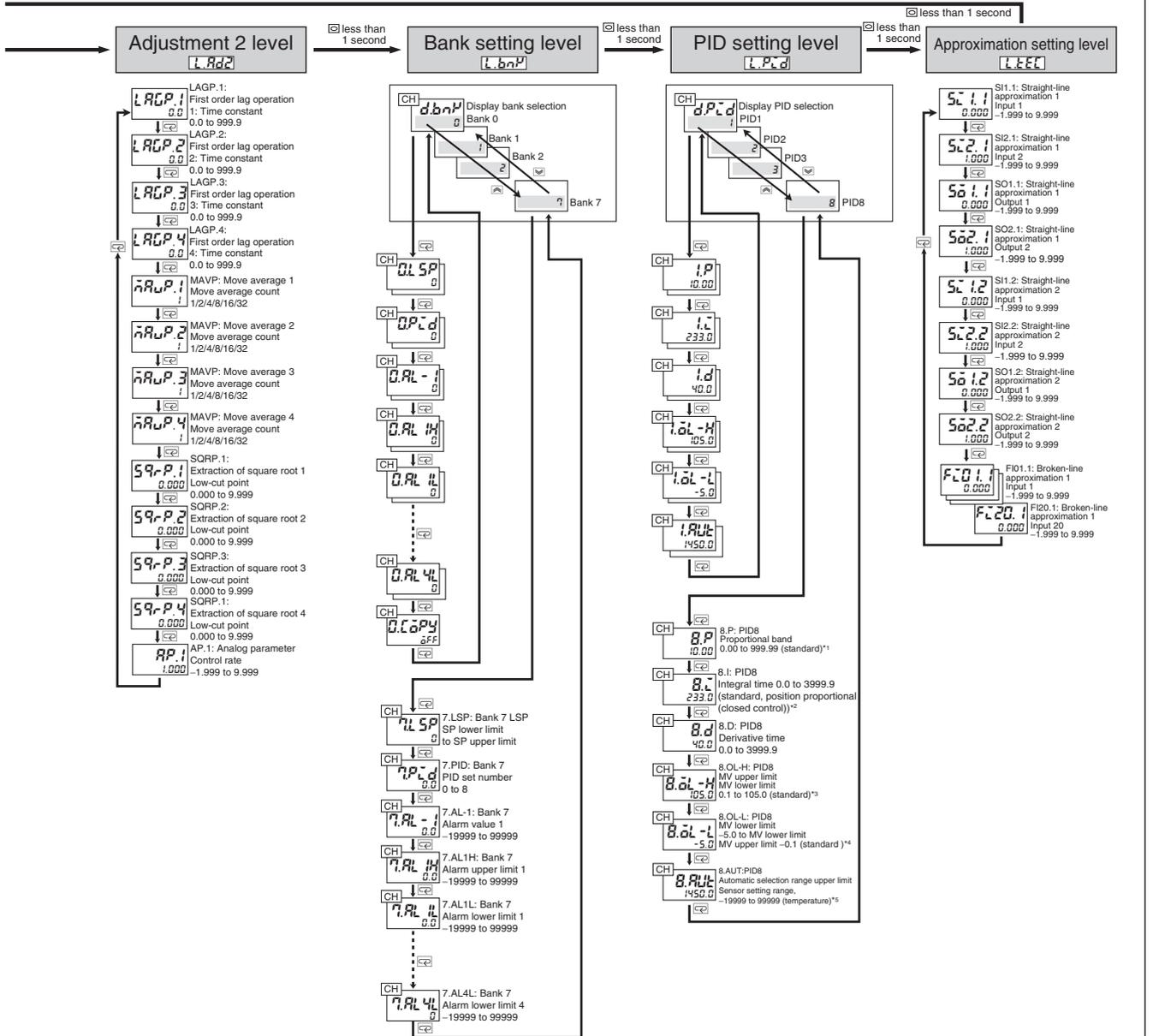


Change with keys

Note: Although all the parameters are listed here, the parameters that are actually displayed may vary with the model and/or functions used.



Operation adjustment area

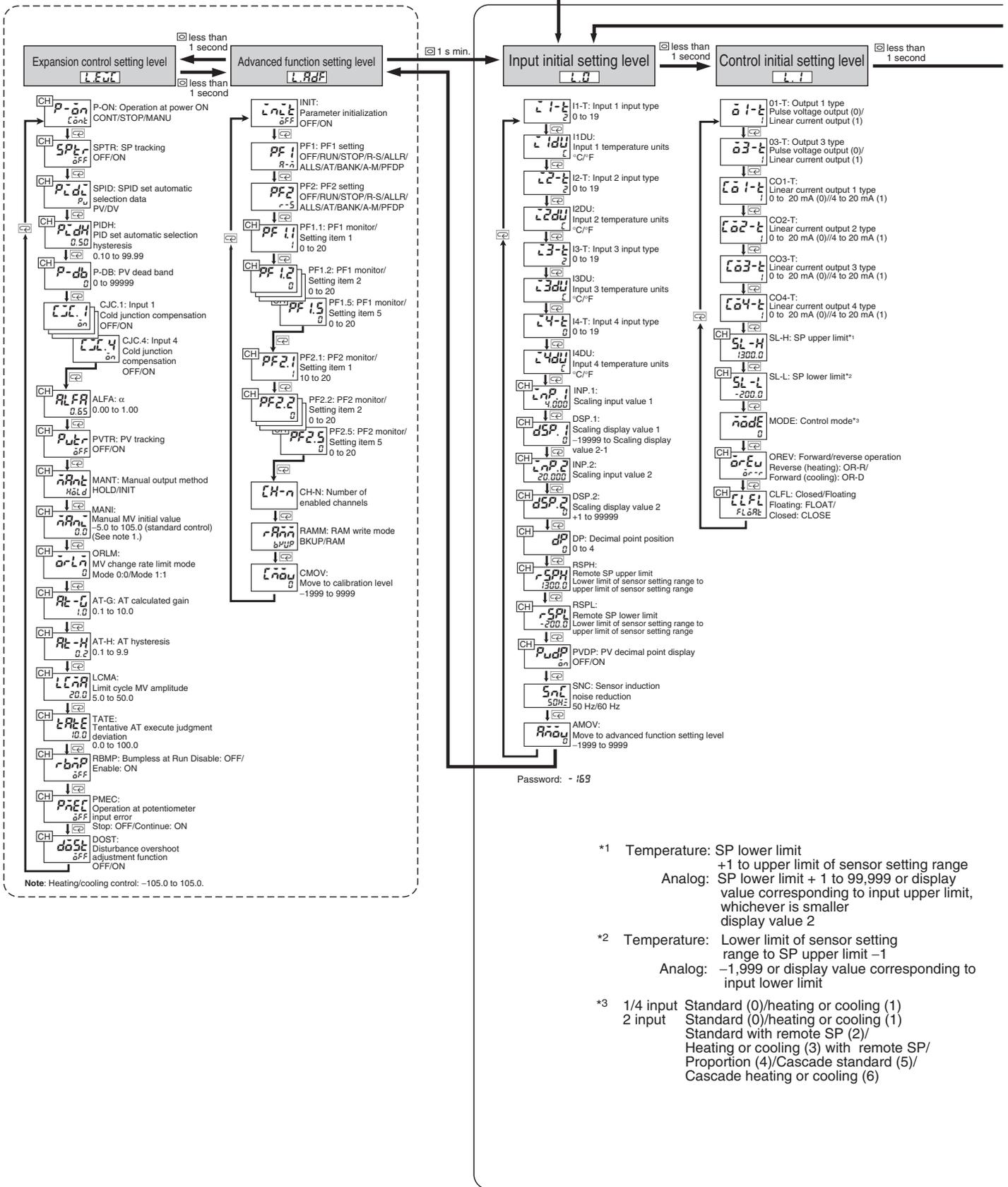


- *1 Position proportional type: 0.01 to 999.99.
- *2 Position proportional (floating control) type: 0.1 to 3999.9.
- *3 Heating and cooling control: 0.0 to 105.0.
- *4 Heating and cooling control: -105.0 to 0.0.
- *5 Analog type: -10% to 110% of scaling display range, with a maximum of -19999 to 99999.

Press the key for 3 seconds to move to the input initial setting level (page 28).

Control stops.

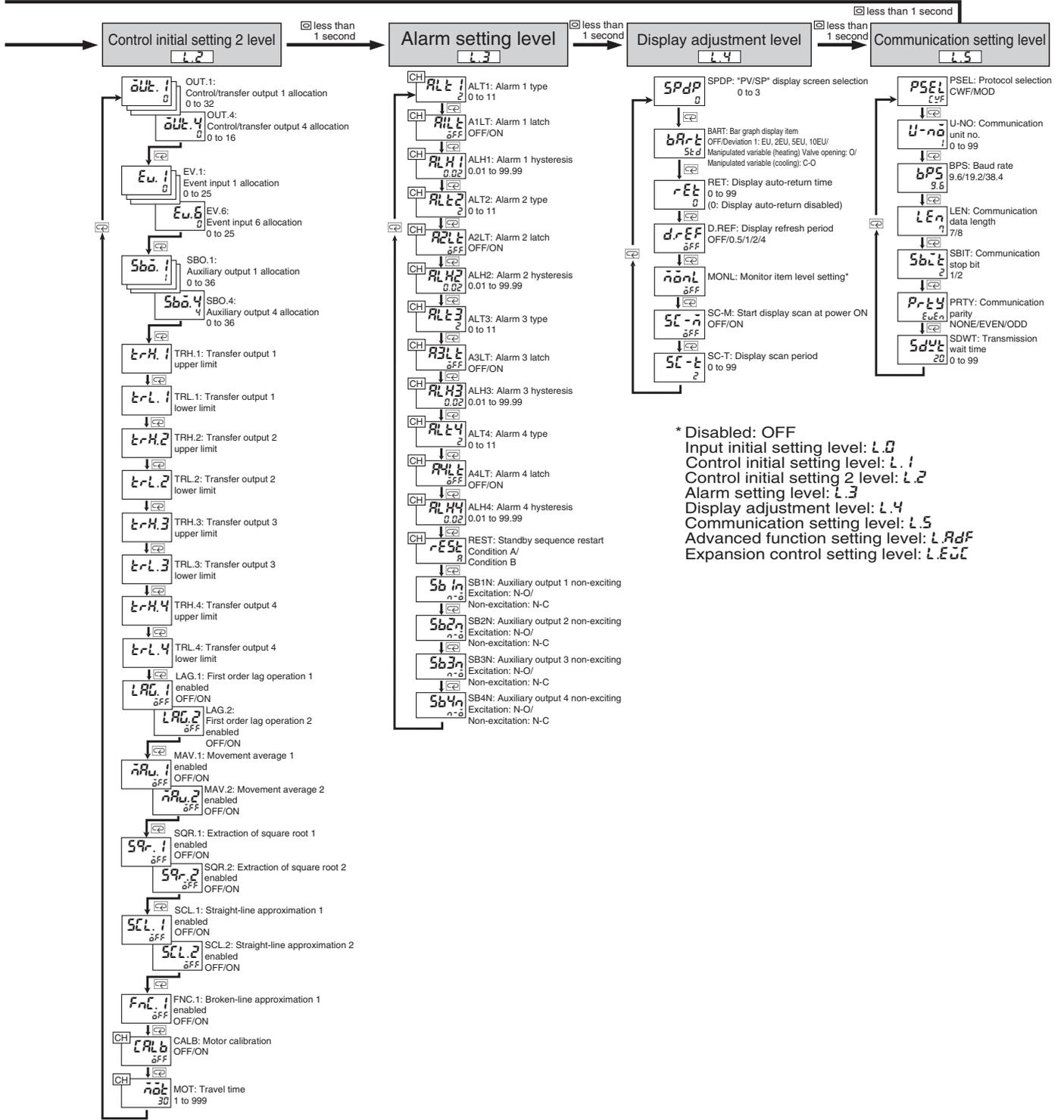
Entered from operation adjustment area.



Note: Heating/cooling control: -105.0 to 105.0.

- *1 Temperature: SP lower limit +1 to upper limit of sensor setting range
 Analog: SP lower limit + 1 to 99,999 or display value corresponding to input upper limit, whichever is smaller
 display value 2
- *2 Temperature: Lower limit of sensor setting range to SP upper limit -1
 Analog: -1,999 or display value corresponding to input lower limit
- *3 1/4 input Standard (0)/heating or cooling (1)
 2 input Standard (0)/heating or cooling (1)
 Standard with remote SP (2)/
 Heating or cooling (3) with remote SP/
 Proportion (4)/Cascade standard (5)/
 Cascade heating or cooling (6)

Initial setting area



* Disabled: OFF
 Input initial setting level: L.0
 Control initial setting level: L.1
 Control initial setting 2 level: L.2
 Alarm setting level: L.3
 Display adjustment level: L.4
 Communication setting level: L.5
 Advanced function setting level: L.RdF
 Expansion control setting level: L.EJL

Press the key for 1 s min. to move to the operation level (page 26).

Protect Level

The protect function can be used to restrict the setting items that can be changed and thereby prevent unintentional setting changes. The protection functions that can be used include operation adjustment protection, initial setting level protection, setting change protection, and PF key protection.

Operation/Adjustment Protection

Key operations in the operation level, adjustment level 2, bank setting level, PID setting level, approximation setting level, and monitor item level can be restricted using the settings shown below.

Set value	Operation		Adjustment, adjustment 2	Bank setting, PID setting, approximation setting, monitor item
	PV/SP	Other		
0	☆	☆	☆	☆
1	☆	☆	☆	▲
2	☆	☆	▲	▲
3	☆	▲	▲	▲
4	○	▲	▲	▲

☆: Can be displayed and changed

○: Can be displayed

▲: Cannot be displayed and moving levels is not possible.

Default set value: 0

Initial Setting Level Protection

Movement to the input initial setting level, control initial setting level, control initial setting level 2, alarm setting level, display adjustment level, and communications setting level can be restricted using the settings shown below.

Set value	Movement to the input initial setting level	Movement to control initial setting level, control initial setting level 2, alarm setting level, display adjustment level, and communications setting level
0	Permitted: Move to advanced function setting levels" displayed.	Permitted
1	Permitted: Move to advanced function setting levels" not displayed.	Permitted
2	Prohibited	Prohibited

Communications Setting Level

Set the communications specifications in the communications setting level using panel operations. The communications parameters and their settings are listed in the following table.

Parameter	Displayed characters	Set values	Displayed set values
Protocol selection	PSEL	CompoWay/F, Modbus	FW / n̄od
Communications unit number	U-n̄ō	0 to 99	0, 1 to 99
Baud rate	bPS	9.6/19.2/38.4 (kbps)	9.6 / 19.2 / 38.4
Data length	LEn	7/8 (bits)	8 (bit)
Stop bits	Sb̄ct	1/2 (bits)	1 / 2
Parity	Pr̄ty	None/even/odd	n̄n̄E / Ev̄En / ādd
Response send waiting time	Sd̄yt	0 to 9,999 s	0 to 20 to 9999

Note: The highlighted values indicate default settings.

Before executing communications, set the communications unit number, baud rate, and other communications parameters using key operations in the way described below. Refer to the *User's Manual (Z182)* for details on other operations.

- If the set value for initial setting level protection is set to 2, nothing will happen when an attempt is made to enter the input initial setting level from the operation level, adjustment level, adjustment level 2, bank setting level, PID setting level, approximation setting level, or monitor item level by pressing the Level Key for 1 s min. (Also, the display will not flash as it usually does when changing level.)
- The default set value for initial setting level protection is 0.

Setting Change Protection

Settings can be protected from changes using the Up and Down Keys using the settings shown below.

Set value	Description
OFF	Settings can be changed with key operations.
ON	Settings (except those in the protect level) cannot be changed with key operations.

- Default set value: OFF

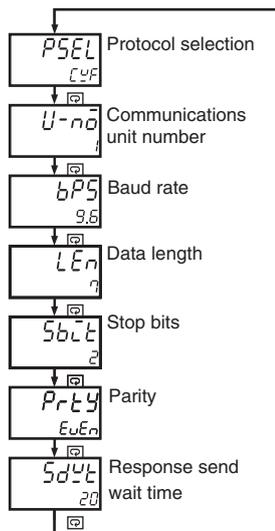
PF Key Protection

The PF1 and PF2 Keys can be enabled/disabled using the settings shown below.

Set value	Description
OFF	PF1 and PF2 Keys enabled.
ON	PF1 and PF2 Keys disabled. (Operations as function keys or loop keys are prohibited.)

- The default set value for PF key protection is OFF.

3. Press the Mode Key to move around the parameters in the way shown below.
4. Change the parameter settings as required using the Up and Down Keys.



Set the communications parameters to match those of the computer to be communicated with.

Protocol Selection (*PSEL*)

Select either CompoWay/F or Modbus as the communications protocol. CompoWay/F is a general-purpose communications-based unified communications protocol developed by OMRON. Modbus is a communications protocol that conforms to the RTU Mode of the Modicon Inc.'s Modbus Protocol (specifications: PI-MBUS-300 Rev. J).

Communications Unit Number (*U-nb*)

When communicating with the host computer, the unit number must be set in each Controller so that the host computer can identify each one. The number can be set to any integral value in the range 0 to 99. The default setting is 1. When using more than one Controller, be careful not to use the same number twice. Duplicate settings will cause malfunction. The set 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; 9.6 (9,600 bps), 19.2 (19,200 bps), or 38.4 (38,400 bps). The setting becomes valid when the power is turned OFF and ON again.

Data Length (*LEN*)

The length of communications data can be set to either 7 or 8 bits.

Stop Bits (*SbLt*)

The number of communications stops bits can be set to either 1 or 2.

Parity (*Prty*)

The communications parity can be set to none, even, or odd.

Response Send Wait Time (*Sdwt*)

Changes to the response send wait time are enabled either after software reset or when the power is turned OFF and ON again.

Error Display (Troubleshooting)

When an error occurs, error codes will be displayed in the No.1 and/or No. 2 displays. Check the error contents and take the appropriate counter-measures.

Display 1	Display 2	Error description	Remedies	Output state at error	
				Control output	Alarm output
Unit	Err	Unit error	First, reset the power. If the display does not change, repair 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
Unit	CHG	Unit change			
dSP	Err	Display unit error			
595	Err	Main unit error	First, reset the power. If the display does not change, repair 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
EEP	Err	EEPROM error	First, reset the power. If the display does not change, repair 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
5Err	Normal display	Sensor input error	Check that the input wiring is correct, that the input type switch is set correctly, that there is no disconnection or short-circuit, and that the input type is correct. If there are no irregularities with the above items, reset the power. If the display does not change, repair 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.	MV is output according to the "MV at PV error" setting.	Same operation as when upper limit is exceeded.
cccc cccc	Normal display	Outside display range (below) Outside display range (above)	This is not an error, however, the present value is outside of the display range (-19999 to 99999).	Normal operation	Normal operation
Normal display	The RSP run indicator is blinking	RSP input error	Check and see if the wire to the RSP input is broken or shorted.	MV is output according to the "MV at PV error" setting.	OFF
Normal display	-----	Potentiometer input error	Check the potentiometer wire.	Normal operation	Normal operation
ERLb	Err	Motor calibration error	Check the wiring to the potentiometer and the valve drive motor, and then repeat motor calibration.	OFF	OFF
1-t 2-t 3-t 4-t	A set value flashes	Input type switch error	Make sure the input type switch and the displayed "Input type" setting accord with the input type you will use.	OFF	OFF

Note: If the Controller does not operate as expected after making the settings, check the wiring and the settings. If the Controller still does not operate as expected, it is possible that parameters have been set incorrectly. It is recommended that the Controller is initialized and the settings performed again. (Initializing the Controller will return all settings to their default values. Make a note of the settings before performing initialization.)

Troubleshooting

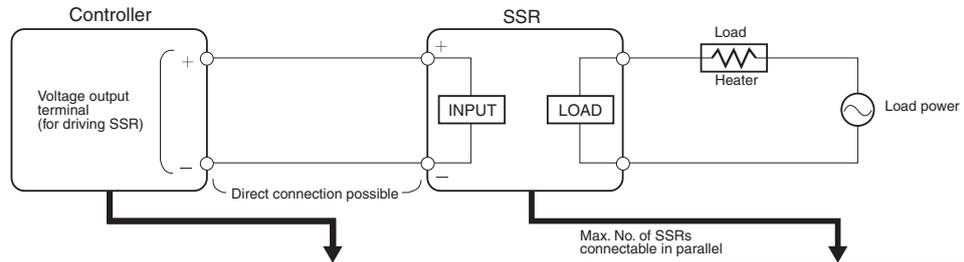
If the temperature does not increase, outputs do not turn ON, or large discrepancies in the temperature occur, perform the checks listed in the following table.

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 r_{UN}/St_{OP} to r_{UN} 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 $\bar{a}r_{Eu}$ to $\bar{a}r_{-r}$ 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. (Auto-tuning 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 ($\bar{c}*_{-t}$) in the initial setting level. (*: 1 to 4)
	2. Are input correction values set?	Check the settings for input correction ($\bar{c}5\bar{c}*$, $\bar{c}55*$) in the adjustment level. ($\bar{c}5\bar{c}$, *: 1 to 4) To display the temperature as measured by the sensor, set 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: <u>Thermocouple</u> Short the input terminals to display the room temperature. <u>Platinum Resistance Thermometer</u> 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	

Peripheral Devices

Temperature Sensor and SSR

Connection Example with SSR



E5□R

E5AR

Analog values representing temperature, flowrate, or concentration

Converter, digital panel meter, flowrate meter, non-contact temperature sensor, displacement sensor, etc.

E52

E5ER

Calculating the Maximum Number of SSRs Connectable in Parallel

A: Max. load current of Digital Controller's voltage output driving the SSRs is 40 mA for the E5AR (E5AR-QQ□WW-□ = 21 mA).

B: SSR's input impedance is 7 mA for G3NA

In this case, the maximum number of SSRs connectable in parallel would be as follows:

A/B = 5

The maximum load current in the connection example is 40 mA.

Max. No. of SSRs connectable in parallel

5 Units (E5AR/ E5ER)

5 Units (E5AR/ E5ER)

4 Units (E5AR/ E5ER)

5 Units (E5AR/ E5ER)

5 Units (E5AR/ E5ER)

2 Units (E5AR/ E5ER)

8 Units (E5AR/ E5ER)

G3PC (SSR with failure detection)	
240 VAC (20 A)	
Rated input voltage: 12 to 24 VDC	
Compact and slim models with a built-in heat sink	
G3PB (Single-phase)	
240 VAC (15 A, 25 A, 35 A, 45 A)	
Rated input voltage: 12 to 24 VDC	
Compact and slim models with a built-in heat sink	
G3PB (Three-phase)	
240 VAC/400 VAC (15 A, 25 A, 35 A, 45 A)	
Rated input voltage: 12 to 24 VDC	
Simultaneous three-phase control with a built-in heat sink	
G3PA	
240 VAC (10 A, 20 A, 40 A, 60 A) 400 VAC (20 A, 30 A, 50 A)	
Rated input voltage: 5 to 24 VDC	
Compact and slim models with a built-in heat sink	
G3NA	
240 VAC (5 A, 10 A, 20 A, 40 A) 480 VAC (10 A, 20 A, 40 A)	
Rated input voltage: 5 to 24 VDC	
Standard models with screw terminals	
G3NE	
240 VAC (5 A, 10 A, 35 A, 20 A)	
Rated input voltage: 12 VDC	
Compact and low-cost models with tab terminals	
G3NH	
440 VAC (75 A, 150 A)	
Rated input voltage: 5 to 24 VDC	
For controlling high-power heaters	

Precautions

⚠ WARNING

Always provide protective circuits in the network. Without protective circuits, malfunctions may possibly result in accidents that cause serious injury or significant property damage. Provide double or triple safety measures in external control circuits, such as emergency stop circuits, interlock circuits, or limit circuits, to ensure safety in the system if an abnormality occurs due to malfunction of the product or another external factor affecting the product's operation.



⚠ CAUTION

Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor injury due to electric shock.



Do not touch the terminals, or electronic components or patterns on the PCB within 1 minute after turning OFF the power. 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 in locations where flammable or explosive gases are present. Doing so may occasionally result in minor or moderate explosion, causing minor or moderate injury, or property damage.



Tighten the screws on the terminal block and the connector locking screws securely using a tightening torque within the following ranges. Loose screws may occasionally cause fire, resulting in minor or moderate injury, or damage to the equipment.



Terminal block screws: 0.40 to 0.56 N·m

Connector locking screws: 0.25 to 0.30 N·m

Perform correct setting of the product according to the application. Failure to do so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.



Ensure safety in the event of product failure by taking safety measures, such as installing a separate overheating prevention alarm system. Product failure may occasionally prevent control, or operation of alarm outputs, resulting in damage to the connected facilities and equipment.



Do not use the equipment for measurements within Measurement Categories II, III, or IV (according to IEC61010-1). Doing so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment. Use the equipment for measurements only within the Measurement Category for which the product is designed.



The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may occasionally result in contact welding or burning.



Make sure that the product will not be adversely affected if the DeviceNet cycle time is lengthened as a result of changing the program with online editing. Extending the cycle time may cause unexpected operation, occasionally resulting in minor or moderate injury, or damage to the equipment.



Before transferring programs to other nodes or changing I/O memory of other nodes, check the nodes to confirm safety. Changing the program or I/O memory of other nodes may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment.



Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor or moderate injury due to electric shock.



■ Precautions for Safe Use

- Use and store the product within the specified ambient temperature and humidity ranges. If several products are mounted side-by-side or arranged in a vertical line, the heat dissipation will cause the internal temperature of the products to rise, shortening the service life. If necessary, cool the products using a fan or other cooling method.
- Provide sufficient space around the product for heat dissipation. Do not block the vents on the product.
- Use the product within the noted supply voltage and rated load.
- Be sure to confirm the name and polarity for each terminal before wiring the terminal block and connectors.
- Do not connect anything to unused terminals.
- Use the specified size of crimp terminals (M3, width: 5.8 mm max.) for wiring the terminal block.
- To connect bare wires to the terminal block, use AWG22 to AWG14 (cross-sectional area: 0.326 to 2.081 mm²) to wire the power supply terminals and AWG28 to AWG16 (cross-sectional area: 0.081 to 1.309 mm²) for other terminals. (Length of exposed wire: 6 to 8 mm)
- Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON.
- Turn OFF the power first before drawing out the product. Never touch the terminals or the electronic components, or subject them to physical shock. When inserting the product, do not allow the electronic components to contact the case.
- Do not remove the inner circuit board.
- Output turns OFF when shifting to the initial setting level in certain modes. Take this into consideration when setting up the control system.
- Allow the product to warm up for at least 30 minutes after the power is turned ON.
- Install surge absorbers or noise filters in devices near the product that generate noise (in particular, devices with an inductance component, such as motors, transformers, solenoids, and magnetic coils). If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close as possible to the product. Separate the product as far as possible from devices generating strong high-frequency noise (e.g., high-frequency welders and high-frequency sewing machines) or surges.
Do not tie noise filter input/output wires together.
- Keep the wiring for the product's terminal block and connector separate from high-voltage, high-current power lines to prevent inductive noise. Do not run the wiring parallel to or in the same cable as power lines. The influence of noise can also be reduced by using separate wiring ducts or shield lines.
- Install an external switch or circuit breaker and label them clearly so that the operator can quickly turn OFF the power.
- Do not use the product in the following locations.
 - Locations where dust or corrosive gases (in particular, sulfuric or ammonia gas) are present.
 - Locations where icing or condensation may occur.
 - Locations exposed to direct sunlight.
 - Locations subject to excessive shock or vibration.

- Locations where the product may come into contact with water or oil.
 - Locations subject to direct radiant heat from heating equipment.
 - Locations subject to extreme temperature changes.
17. Cleaning: Do not use thinners. Use commercially available alcohol.
 18. Use the specified cables for the communications lines and stay within the specified DeviceNet communications distances. Refer to the *DeviceNet Manual (W267)* for details on communications distance specifications and cables.
 19. Do not pull the DeviceNet communications cables with excessive force or bend them past their natural bending radius.
 20. Do not connect or remove connectors while the DeviceNet power is being supplied. Doing so will cause product failure or malfunction.

■ Precautions for Correct Use

Service Life

Use the product within the following temperature and humidity ranges:

Temperature: -10 to 55°C (with no icing or condensation)

Humidity: 25% to 85%

When the product is installed inside a control panel, make sure that the temperature around the product, not the temperature around the control panel, does not exceed 55°C.

The service life of this product and similar electronic devices is determined not only by the number of switching operations of relays but also by the service life of internal electronic components. Component service life is affected by the ambient temperature: the higher the temperature becomes, the shorter the service life becomes and, the lower the temperature becomes, the longer the service life becomes. Therefore, the service life can be extended by lowering the temperature of the product.

Be sure to install the product according to the specified conditions. Otherwise, the heat generated by the product will cause the internal temperature to rise, shortening the service life. If necessary, cool the product using fans or other means of air ventilation.

When providing forced cooling, however, be careful not to cool down the terminals sections alone to avoid measurement errors.

Noise Countermeasures

To prevent inductive noise, separate the wiring for the product's terminal block and connector from high-voltage, high-current power lines. Do not run the wiring parallel to or in the same cable as power lines. The influence of noise can also be reduced by using separate wiring ducts or shield lines.

Install surge absorbers or noise filters in devices near the product that generate noise (in particular, devices with an inductance component, such as motors, transformers, solenoids, and magnetic coils).

If a noise filter is used for the power supply, check the voltage and current, and install the noise filter as close as possible to the product.

Separate the product as far as possible from devices generating strong high-frequency noise (e.g., high-frequency welders and high-frequency sewing machines) or surges.

Measurement Accuracy

When extending the thermocouple lead wire, be sure to use a compensating wire that matches the thermocouple type.

When extending the lead wire of the platinum resistance thermometer, be sure to use wires that have low resistance, and make sure that the resistances of the three lead wires are the same.

If the measurement accuracy is low, check whether the input shift is set correctly.

Waterproofing

The degree of protection is as shown below.

Front panel	NEMA 4X indoor use (equivalent to IP66)
Rear case	IP20
Terminals	IP00

Warranty and Limitations of Liability

■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

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 PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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