OMRON ®

Ramp/Soak Process Controller | E5AK-T/E5EK-T

Advanced Ramp/Soak Process Controllers Ideal for Worldwide Use

- E5AK-T offers up to eight patterns of simple programming control (4 patterns for E5EK-T), with 16 steps per pattern

- Modular structure, one-stock type

- High-accuracy: 100 ms sampling (for analog input)

- Conforms to international EMC and safety standards.

- IP66/NEMA4 (indoor use) front face

- Serial communications (RS-232C, RS-422 and RS-485) and transfer output (4 to 20 mA)

- Position-proportional control model is offered

- Heat/Cool control

- 24 V AC/DC types also available

Ordering Information

When ordering, order control output boards and option boards separately. Example: for a relay control output, order the E53-R output board in addition to the standard Process Controller (E5AK-T/E5EK-T). Also specify the current transformer.

■ PROCESS CONTROLLERS

Item	Description	Part number
Base unit	Standard model with terminal cover	E5AK-TAA2-500 AC100-240
		E5AK-TAA2-500 AC/DC24
	Position-proportional model with terminal cover	E5AK-TPRR2-500 AC100-240
		E5AK-TPRR2-500 AC/DC24
	Standard model with terminal cover	E5EK-TAA2-500 AC100-240
		E5EK-TAA2-500 AC/DC24
	Position-proportional model with terminal cover	E5EK-TPRR2-500 AC100-240
		E5EK-TPRR2-500 AC/DC24

Note: 1. When using the heater burnout alarm function with a standard model, the linear output board cannot be used for the control outputs (heat).

　　　2. The Process Controller provides transfer outputs at 4 to 20 mA for the PV and other values and control outputs at 4 to 20 mA for the current outputs.

■ OUTPUT BOARDS

Item	Description	Part number
Output board	Relay	**E53-R**
	SSR	**E53-S**
	Pulse (NPN) 12 VDC	**E53-Q**
	Pulse (NPN) 24 VDC	**E53-Q3**
	Pulse (PNP) 24 VDC	**E53-Q4**
	Linear (4 to 20 mA)	**E53-C3**
	Linear (0 to 20 mA)	**E53-C3D**
	Linear (0 to 10 V)	**E53-V34**
	Linear (0 to 5 V)	**E53-V35**

Note: The Controller uses a dedicated, high-resolution output board. The E53-C current output board for the E5□X cannot be used with the E5AK-T/E5EK-T Controller.

■ OPTION BOARD

Item	Description	Part number
Option board	Event input	**E53-AKB**
	Communication (RS-232C)	**E53-AK01**
	Communication (RS-422)	**E53-AK02**
	Communication (RS-485)	**E53-AK03**
	Transfer output	**E53-AKF**

Note: 1. The option board can be used either by the E5AK or E5EK.

2. The E5AK-T allows a maximum of three option boards to be mounted. Refer to the *Operations* Section for mounting combinations. The E5EK-T allows only one option board to be mounted.

■ ACCESSORIES (ORDER SEPARATELY)

Current Transformer

Item	Hole diameter	Part number
Current transformer (See Note.)	5.8 mm	**E54-CT1**
	12.0 mm	**E54-CT3**

Note: No CT is required unless the heater burnout alarm function is used.

Terminal Cover

Item	Connectable models	Part number
Terminal cover	E5AK	**E53-COV0809**
	E5EK	**E53-COV08**

Unit Label

Item	Part number
Unit label	**Y92S-L1**

■ TEMPERATURE RANGES

Platinum Resistance Thermometer

Input (See Note.)		JPt100	Pt100
Range	°C	−199.9° to 650.0°	−199.9° to 650.0°
	°F	−199.9° to 999.9°	−199.9° to 999.9°
Setting (°C/°F) (main setting and alarm)		0	1

Note: Switch selectable.

Thermocouple

Input (see note)		K1	K2	J1	J2	T	E	L1	L2	U	N	R	S	B	W	PLⅡ
Range	°C	−200 to 1,300	0.0 to 500.0	−100 to 850	0.0 to 400.0	−199.9 to 400.0	0 to 600	−100 to 850	0.0 to 400.0	−199.9 to 400.0	−200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 2,300	0 to 1,300
	°F	−300 to 2,300	0.0 to 900.0	−100 to 1,500	0.0 to 750.0	−199.9 to 700.0	0 to 1,100	−100 to 1,500	0.0 to 750.0	−199.9 to 700.0	−300 to 2,300	0 to 3,000	0 to 3,000	300 to 3,200	0 to 4,100	0 to 2,300
Resolution (°C/°F) (main setting and alarm)		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Note: Switch selectable: Setting number is factory-set to 2 (K1).
        Thermocouple W is W/Re5-26 (tungsten rhenium 5, tungsten rhenium 26).

Current/Voltage

Input (See Note.)	Current input		Voltage input		
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Range	One of following ranges depending on results of scaling −1999 to 9999 −199.9 to 999.9 −19.99 to 99.99 −1.999 to 9.999				
Setting	17	18	19	20	21

Note: Switch selectable.

Specifications ────────────────────

■ **RATINGS**

Model		E5EK/AK-T (Standard)	E5EK/AK-T (24 V Type)
Supply voltage		100 to 240 VAC, 50/60 Hz	24 VAC/VDC, 50/60 Hz
Power consumption	E5AK-T	16 VA	12 VA, 8 W
	E5EK-T	15 VA	
Operating voltage range		85% to 110% of rated supply voltage	
Input	Thermocouple	K, J, T, E, L, U, N, R, S, B, W, PLɪɪ	
	Platinum resistance thermometer	JPt100, Pt100	
	Current input	4 to 20 mA, 0 to 20 mA (Input impedance: 150 Ω)	
	Voltage input	1 to 5 V, 0 to 5 V, 0 to 10 V (Input impedance: 1 MΩ)	
Control output	Standard model	According to Output Unit (see *Output Board Ratings and Characteristics*)	
	Position-proportional model (See Note.)	2 Relay outputs: SPST-NO, 1 A at 250 VAC (including inrush current)	
Auxiliary output		SPST-NO, 3 A at 250 VAC (resistive load)	
Control method		ON/OFF or advanced PID control (with auto-tuning)	
Setting method		Digital setting using front panel keys or communications features	
Indication method		7-segment digital display and LEDs	
Potentiometer		100 Ω to 2.5 kΩ	
Event input	Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.	
	No-contact input	ON: residual voltage: 1.5 V max., OFF: leakage current: 0.1 mA max.	
Transmission output		4 to 20 mA, permissible load impedance: 600 Ω max., resolution: approx. 2,600 steps	
Current transformer input		Connect only Omron Current Transformer (E54-CT1 or E54-CT3)	
Additional functions	Standard	Manual output, heating/cooling control, SP limiter, loop burnout alarm, MV limiter, MV change rate limiter, input digital filter, input shift, run/reset, protect functions, scaling function	
Approved standards		UL 1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection), when the separately-ordered terminal cover is mounted.	

Note: All control outputs are insulated from the input circuit.

■ CHARACTERISTICS

Indication accuracy (See Note 1.)	Thermocouple	(±0.3% of indication value or ±1°C, whichever greater) ±1 digit max.
	Platinum resistance thermometer	(±0.2% of indication value or ±0.8°C, whichever greater) ±1 digit max.
	Analog input	±0.2% (of indication value) ±1 digit max.
Hysteresis		0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		0.1% to 999.9% FS (in units of 0.1% FS)
Integral (reset) time (I)		0 to 3,999 s (in units of 1 s)
Derivative (rate) time (D)		0 to 3,999 s (in units of 1 s)
Control period		1 to 99 s (in units of 1 s)
Manual reset value		0.0% to 100.0% (in units of 0.1%)
Alarm setting range		−1,999 to 9,999 or −199.9 or 999.9 (decimal point position dependent on input type or result of scaling)
Set time		0 to 99 hrs 59 min or 0 to 99 min 59 s
Program capacity		8 patterns (E5AK-T) or 4 patterns (E5EK-T), 16 steps
Programming method		Time or ramp setting method
Time accuracy		±0.2% (±500 ms) of the set value
Sampling period (See Note 2.)	Temperature input	250 ms
	Analog input	100 ms
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		2,000 VAC, 50/60 Hz for 1 min between terminals of different polarities
Vibration resistance		Malfunction: 10 to 55 Hz, 10 m/s^2 (approx. 1G) for 10 min each in X, Y, and Z directions
		Destruction: 10 to 55 Hz, 20 m/s^2 (approx. 2G) for 2 hrs each in X, Y, and Z directions
Shock resistance		Malfunction: 200 m/s^2 min. (approx. 20G), 3 times each in 6 directions (100 m/s^2 (approx. 10G) applied to the relay)
		Destruction: 300 m/s^2 min. (approx. 30G), 3 times each in 6 directions
Ambient temperature	Operating	−10°C to 55°C (14°F to 131°F) with no icing and 3-year warranty period: −10°C to 50°C (14°F 122°F)
	Storage	−25°C to 65°C (−13°F to 149°F) with no icing
Ambient humidity	Operating	35% to 85%
Enclosure ratings	Front panel	NEMA4 for indoor use (equivalent to IP66)
	Rear case	IEC standard IP20
	Terminals	IEC standard IP00
Memory protection		Non-volatile memory (number of writings: 100,000 operations)
Weight	E5AK-T	approx. 450 g
	E5EK-T	approx. 320 g
	Mounting bracket	approx. 65 g

(This table continues on the next page.)

Note: 1. The indication accuracy of the K1, T, and N thermocouples at a temperature of -100°C max. is ±2°C ±1 digit maximum. The indication accuracy of the U and L thermocouples at any temperature is ±2°C ±1 digit maximum.
The indication accuracy of the B thermocouple at a temperature of 400°C max. is unrestricted.
The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit maximum.
The indication accuracy of the W thermocouple at any temperature is (±0.3% of the indicated value or ±3°C, whichever is greater) ±1 digit maximum.
The indication accuracy of the PLII thermocouple at any temperature is (±0.3% of the indicated value or ±2°C, whichever is greater) ±1 digit maximum.
2. The sampling period of the standard model with CT and remote SP inputs is 250 ms.

Characteristics Table – continued from previous page

EMC	Emission Enclosure:	EN55011 Group 1 class A
	Emission AC Mains:	EN55011 Group 1 class A
	Immunity ESD:	EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3)
	Immunity RF-interference:	ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz)
	Immunity Conducted Disturbance:	ENV50141:10 V (0.15 to 80 MHz) (level 3)
	Immunity Burst:	EN61000-4-4: 2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
Approved standards	UL1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection), when the separately-ordered terminal cover is mounted.	

■ OPTION BOARD RATINGS AND CHARACTERISTICS

Model	Description		Specifications
E53-AKB	Event input		Contact input: ON: 1 kΩ max., OFF: 100 kΩ min. No-contact input: ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
E53-AK01	Communications	RS-232C	Transmission method: Half-duplex Synchronization method: Start-stop synchronization (asynchronous method) Baud rate: 1.2/2.4/4.8/9.6/19.2 kbps
E53-AK02		RS-422	
E53-AK03		RS-485	
E53-AKF	Transfer output		4 to 20 mA: Permissible load impedance: 600 Ω max.; Resolution: approx. 2,600 steps

Note: Event input is used for switching the target value, run or stop command, or automatic and manual mode with an external signal input.

■ CURRENT TRANSFORMER RATINGS

Maximum continuous heater current		50 amps
Dielectric strength		1,000 VAC (for 1 min)
Vibration resistance		50 Hz, 98 m/s^2 (10G)
Weight	E54-CT1	approx. 11.5 g
	E54-CT3	approx. 50 g
Accessories (E54-CT3 only)	Armature	2
	Plug	2

■ HEATER BURNOUT ALARM

Max. heater current	Single-phase 50 A VAC (See Note 1.)
Heater current value display accuracy	±5% FS±1 digit max.
Heater burnout alarm setting range	0.1 to 49.9 A (in units of 0.1 A) (See Note 2.)
Min. detection ON time	190 ms (See Note 3.)

Note: 1. Use the K2CU-F□□A-□GS (with gate input terminals) for the detection of three-phase heater burnout.

2. The heater burnout alarm is always OFF if the alarm is set to 0.0 A and always ON if the alarm is set to 50.0 A.

3. No heater burnout detection or heater current value measurement is possible if the control output (heat) is ON for less than 190 ms.

Nomenclature

■ E5AK-T

Pattern Number

Indicates the pattern number.

Program Status Indicators

The top indicator indicates the rising step, the middle indicator indicates the constant step, and the bottom indicator indicates the falling step.

Bar Graph

Indicates the rate of pattern elapsing time at the rate of 20% (5 levels) per one segment.

Operation Indicators

- OUT1
  Lit when the pulse output function assigned to control output 1 turns ON.

- OUT2
  Lit when the pulse output function assigned to control output 2 turns ON.

- SUB1
  Lit when the output function assigned to auxiliary output 1 turns ON.

- SUB2
  Lit when the output function assigned to auxiliary output 2 turns ON.

- MANU
  Lit when the manual operation mode.

- RST
  Lit when the operation is reset.

- RMT
  Lit during remote operation.

- AT
  Flashes during auto-tuning.

- HOLD
  Lit when the program is on hold.

- WAIT
  Lit when the program is waiting.
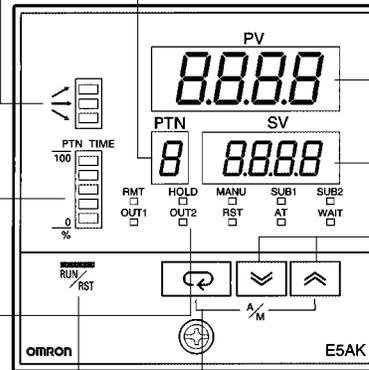
Display 1

Displays the process value or parameter code.

Display 2

Displays the present SP, manipulated variable, or parameter settings.

Up Key/Down Key

Press to increase or decrease the value on the No.2 display.

Display Key

Press to shift the display to the next parameter.

RUN/RST Key

Switches between RUN and RESET mode.

■ E5EK-T
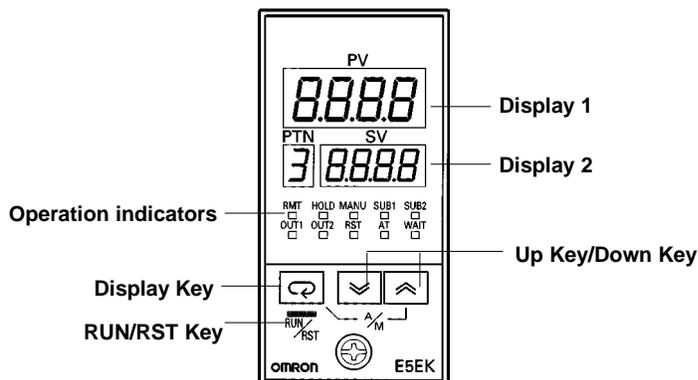
Display 1

Display 2

Operation indicators

Up Key/Down Key

Display Key

RUN/RST Key

Operation ————————————————————————

Note: Before changing any switch settings, always turn OFF the power supply to the Process Controller
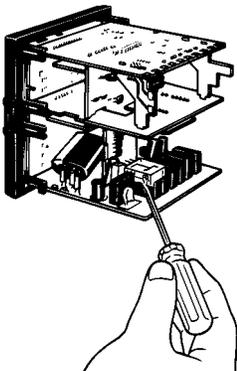
■ SETTINGS

1. On a standard model, set up the output boards for control outputs 1 and 2 before mounting the Controller.
2. On a position-proportional model, the relay output board is already set, so this setup operation is unnecessary. (Do not replace with other output boards.)
3. When setting up the output boards, remove the internal mechanism from the housing and insert the output boards into the sockets for control outputs 1 and 2.

Setting Up the Output Board
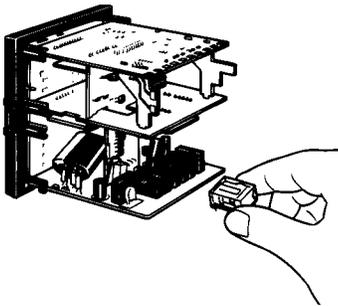
Removing the Output Board

To replace the output board, use a flat-blade screwdriver to push up the output board.
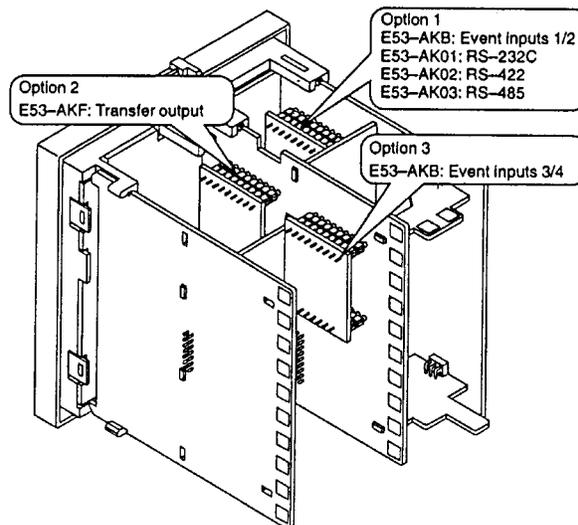

Setting Up the Option Board

E5AK-T

1. Remove the power board and option boards in the order shown in the following diagram.
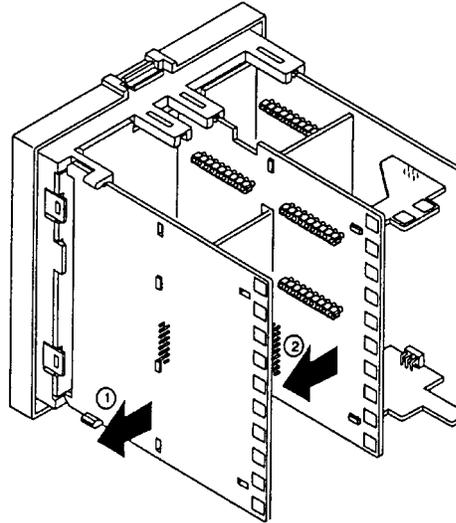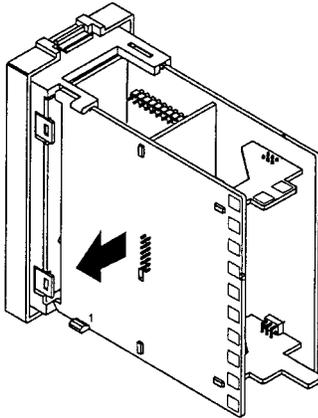

2. Insert the option boards into the sockets for options 1 to 3. The following diagram shows the relationship between the option boards and mounting positions.
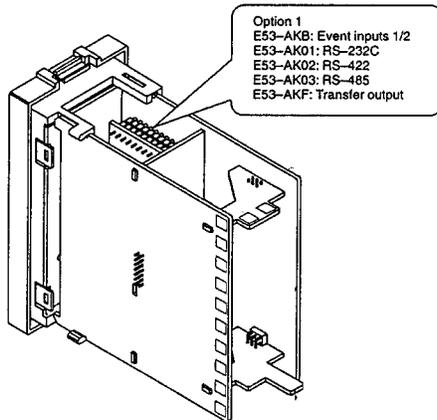

Option 1
E53–AKB: Event inputs 1/2
E53–AK01: RS–232C
E53–AK02: RS–422
E53–AK03: RS–485

Option 2
E53–AKF: Transfer output

Option 3
E53–AKB: Event inputs 3/4

3. Mount the option boards and the power board in the order shown.

E5EK-T

1. Remove the power board and option boards in the order shown in the following diagram.

2. Insert the option board into the socket for option 1. The following diagram shows the relationship between the option board and mounting position.


Option 1
E53–AKB: Event inputs 1/2
E53–AK01: RS–232C
E53–AK02: RS–422
E53–AK03: RS–485
E53–AKF: Transfer output

3. Mount the option board and the power board in the order shown.

Removing the Internal Mechanism

To remove the internal mechanism from the housing, use a Phillips screwdriver matching the screw on the lower part of the front panel.

1. Turn the screw counterclockwise while pressing the hook on the upper part of the front panel.

Hook
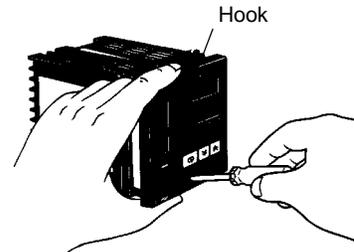
2. Carefully pull out the internal mechanism while holding the left and right sides of the front panel.

Mounting

1. Insert the E5AK-T Controller into the panel's mounting hole at the position shown in the figure below.
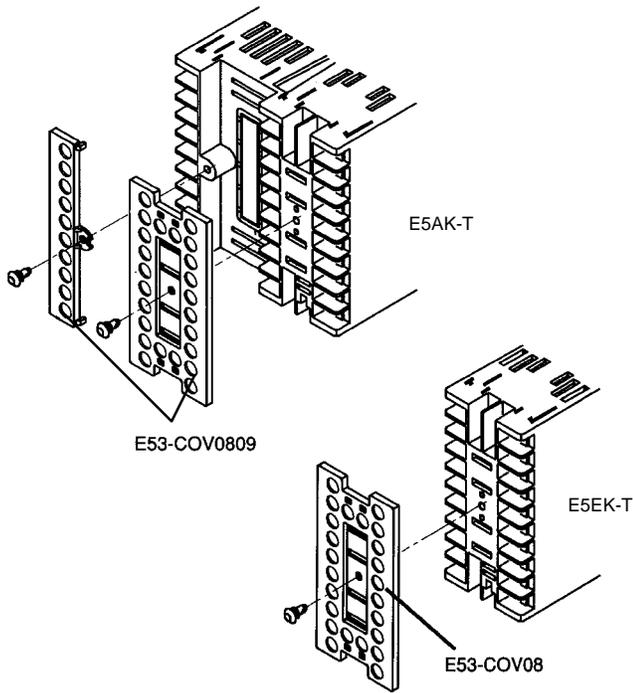2. Fit the mounting bracket (accessory) into the fixing slots on the top and bottom of the rear case.
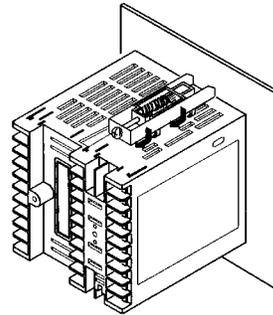
3. Tighten the mounting bracket screws on the upper and lower parts of the E5AK-T in small increments alternately and equally until the ratchet starts to slide.
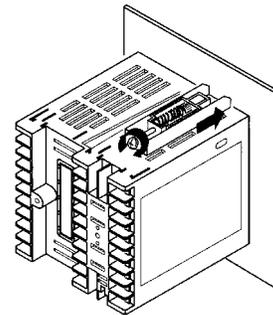
E53-COV0809, E53-COV08 Terminal Cover (Order Separately)

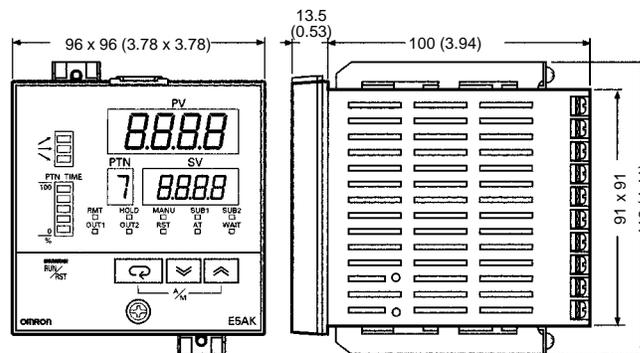Fasten the terminals covers as follows by using the snap pins.

Note: Snap pins are provided with the terminal covers.

E5AK-T

E53-COV0809

E5EK-T

E53-COV08

Dimensions

Unit: mm (inch)

■ **E5AK-T**
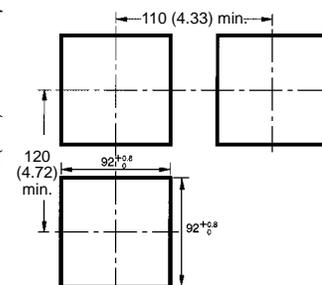
96 x 96 (3.78 x 3.78)

13.5 (0.53)

100 (3.94)

PV

PTN TIME

100

SV

PTN

7

RMT   HOLD   MANU   SUB1   SUB2

OUT1   OUT2   RST   AT   WAIT

%

RUN/
RST

OMRON

E5AK

91 x 91

112 (4.41)

Panel Cutouts

110 (4.33) min.

120 (4.72) min.

$92^{+0.8}_{0}$

$92^{+0.8}_{0}$

Note: 1. Recommended panel thickness is 1 to 8 mm.
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must not be closely mounted (vertically or horizontally).

■ E5EK-T

Panel Cutouts

48
(1.89)

100 (3.94)

PV

PTN   SV

RMT HOLD MANU SUB1 SUB2
OUT1 OUT2 RST AT WAIT

RUN/RST   A/M

omron   E5EK

96
(3.78)

91

112 (4.41)
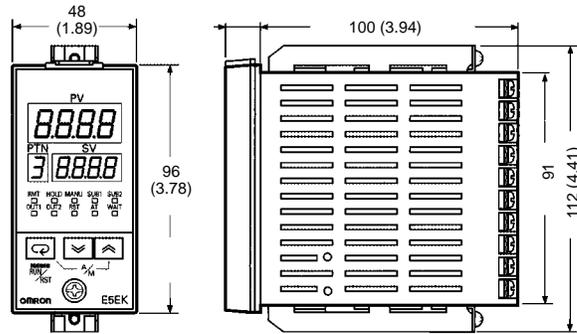
60
(2.36)
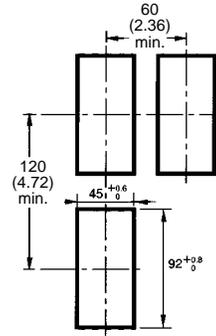min.

120
(4.72)
min.

45 $^{+0.6}_{0}$

92 $^{+0.8}_{0}$

Note: 1. Recommended panel thickness is 1 to 8 mm.
2. Maintain the specified vertical and horizontal mounting space between each Unit. Units must
not be closely mounted vertically or horizontally.

■ ACCESSORIES (ORDER SEPARATELY)

Terminal Cover

E53-COV0809

E53-COV08

43.2
(1.70)

89 (3.50)

3
(0.12)

1.5
(0.06)

22.05
(0.87)

89 (3.50)

3
(0.12)

3
(0.12)

43.2
(1.70)

89 (3.50)

3
(0.12)

1.5
(0.06)

Current Transformer

E54-CT1

21 (0.83)

15

5.8 (0.23)
dia.

2.8 (0.11)dia.

7.5 (0.30)

25 (0.98)

10.5 (0.41)

40 (1.57)

10 (0.39)

30 (1.18)
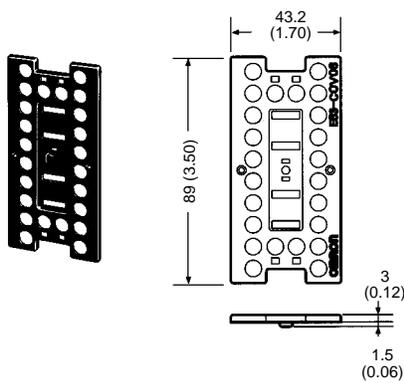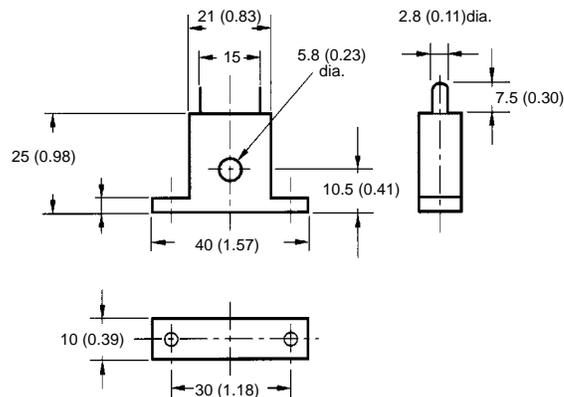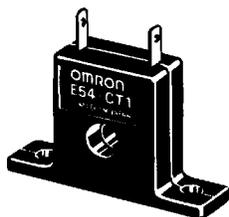
Unit: mm (inch)

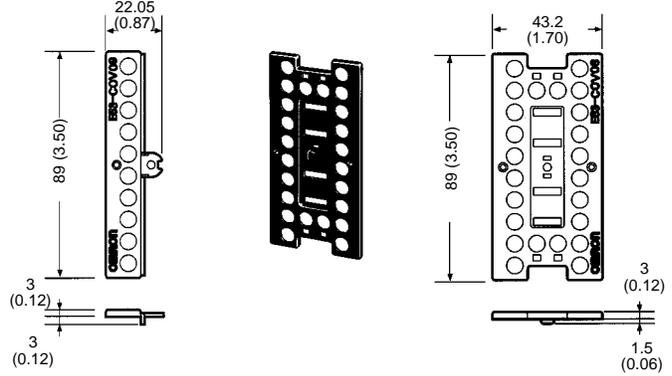**E54-CT3**
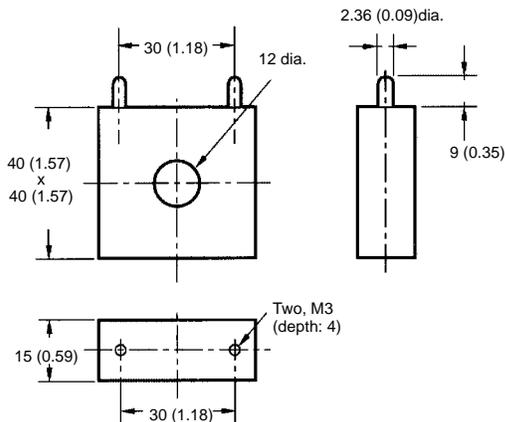
Installation

■ INSTALLATION

Main Parts
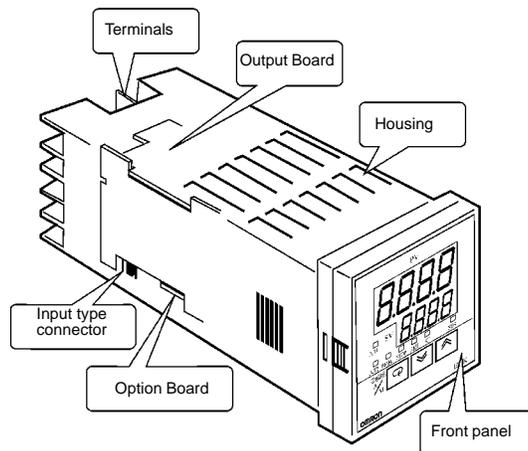
Removing Internal Mechanism

While pressing the hooks on the left and right sides of the front panel, carefully pull the internal mechanism from the housing. (Refer to the drawing below.)
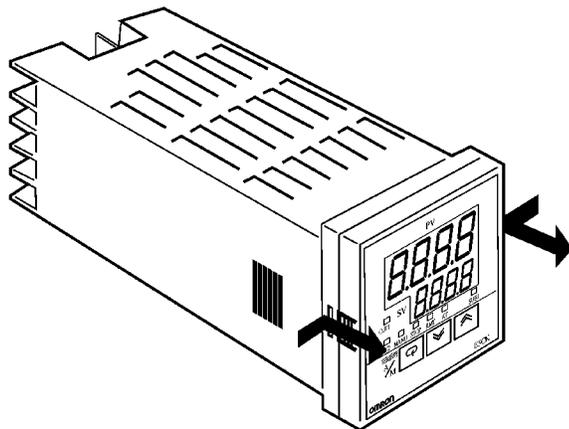
■ SETTING UP THE OUTPUT BOARD

1. Two rectangular holes are provided on the power board (right side of Controller). Fit the two protrusions of the output board into these two holes.
2. With the output board fitted into the power board, fit the output board into the connector on the control board (left side of Controller).
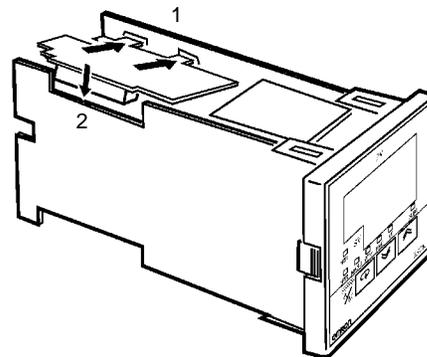
■ SETTING UP THE OPTION BOARD

1. Place the Controller bottom up, and fit the option board horizontally into the connector on the power board (right side of Controller).
2. With the power board connected, fit the board vertically into the connector on the control board (left side of controller).
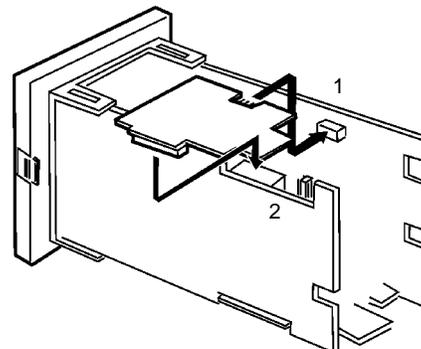
■ MOUNTING THE CONTROLLER

1. Insert the Controller into the panel's mounting hole at the position shown in the figure below.
2. Push the adapter along the Controller body from the terminals up to the panel, and fasten temporarily.
3. Tighten the two fixing screws on the adapter. When tightening screws, tighten the two screws alternately keeping the torque to approximately 0.29 to 0.39 N • m, or 3 to 4 kgf • cm.
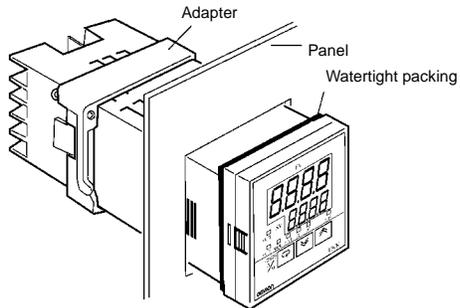
Input Jumper Setting

Note: The jumper is factory-set to TC • PT (temperature input).

Set the jumper to temperature, voltage, or current input according to the sensor connected to the input terminal.
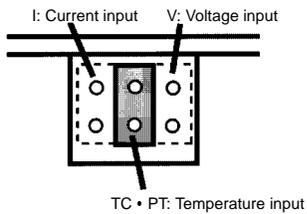
Note: Do not touch the pins of the jumper connector when setting the input type.

After setting the jumper, put on the housing, pressing the housing until the hooks of the front panel snap on.
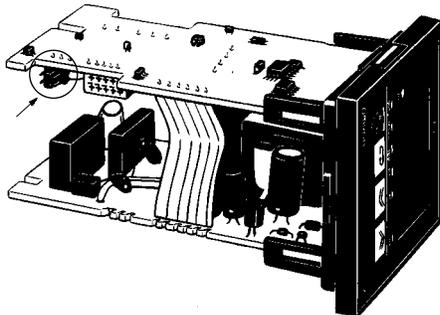
■ WIRING TERMINALS

Terminal Arrangement

E5AK-T

AC100–240V 50/60 Hz
(AC/DC24V)

SOURCE

OUT1		TRSF	30 31 32 20	EV1/2 RS232C RS422 RS485

```
        10          30 31 32  20    EV1/2
         9    TRSF   29         19   RS232C
                                     RS422
OUT1     8          28         18   RS485
         7          27         17
                    26         16   CT
OUT2     6                          PTMR
         5    EV3/4 25         15
SUB1     4          24         14   TC
         3          23         13   Pt
         2          22         12   I
SUB2     1          21 33      11   V
```
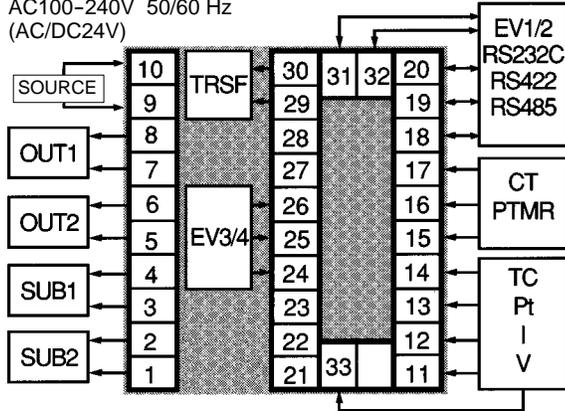
TRSF: Transfer output
EV1 to 4: Event input
PTMR: Potentiometer

E5EK-T

AC100–240V 50/60 Hz
(AC/DC24V)

SOURCE

```
        10  21 22  20    EV1/2
         9           19   TRSF
                          RS232C
OUT1     8           18   RS422
         7           17   RS485
OUT2     6           16   CT
         5           15   PTMR
SUB1     4           14   TC
         3           13   Pt
         2           12   I
SUB2     1  23       11   V
```
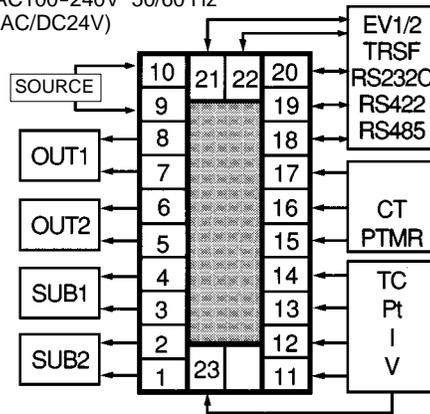
TRSF: Transfer output
EV1/2:   Event input
PTMR: Potentiometer

■ WIRING PRECAUTIONS

- Use ducts to separate input leads and power lines in order to protect the Controller and its lines from external noise.
- Solderless terminals are recommended when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. Be careful not to tighten the terminal screws too tightly.

Power Blocks for E5AK-T/EK-T

The E5AK/E5EK has independent power supplies for each of the terminal blocks shown below.

E5AK-T

E5EK-T

■ E5AK-T WIRING

In the following wiring diagrams, the left side of the terminal numbers indicate the inside of the Controller.

Power Supply

Input 100 to 240 VAC or AC/DC 24 V to terminal numbers 9 and 10 according to the specifications.

Sensor Input

Connect the sensor input to terminal numbers 11 to 14 and 33 as follows according to the input type.

Thermocouple   Platinum resistance thermometer   Voltage input   Current input

Control Output

Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available output boards and their internal equalizing circuits.

Relay	SSR	NPN	PNP
E53-R	E53-S	E53-Q / E53-Q3	E53-Q4

4 to 20mA/0 to 20mA	0 to 10V/0 to 5V
E53-C3 / E53-C3D	E53-V34 / E53-V35

With E53-V□□ output boards, approx. 2 V is output for one second after the power is interrupted.

Specifications for Each Output Board

Model	Output type	Specifications
E53-R	Relay	5 A at 250 VAC
E53-S	SSR	1 A at 75 to 250 VAC
E53-Q E53-Q3 E53-Q4	Voltage (NPN) Voltage (NPN) Voltage (PNP)	NPN: 40 mA at 12 VDC (with short-circuit protection) NPN: 20 mA at 24 VDC (with short-circuit protection) PNP: 20 mA at 24 VDC (with short-circuit protection)
E53-C3 E53-C3D	4 to 20 mA 0 to 20 mA	4 to 20 mA; permissible load impedance: 600 Ω max.; resolution: approx. 2600 0 to 20 mA; permissible load impedance: 600 Ω max.; resolution: approx. 2600
E53-V34 E53-V35	0 to 10 V 0 to 5 V	0 to 10 VDC; permissible load impedance: 1 kΩ min.; resolution: approx. 2600 0 to 5 VDC; permissible load impedance: 1 kΩ min.; resolution: approx. 2600

With E5AK-PRR2 Controllers, the relay output (1 A at 250 VAC) is fixed.

When replacing the output board, use the E53-R. The following diagrams show the relationship between terminals and open/close relay settings.

Open   Close

Auxiliary Output

Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:

Auxiliary output 1   Auxiliary output 2

Output specifications are as follows: SPST-NO, 3 A at 250 VAC

CT Input/Potentiometer

When using the HBA function on the E5AK-TAA2 Controller, connect CT input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5AK-TPRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:

CT input   Potentiometer

For details on CT inputs, refer to *Appendix, About Current Transformer* in the *E5AK-T/E5EK-T User's Manual (H83/H85)*.

For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100 Ω to 2.5 kΩ.

Remote SP Input

Connect the input (RSP) to be used as the remote SP to terminal numbers 21 and 22. Only 4 to 20 mA inputs can be connected. Connect the input as follows:
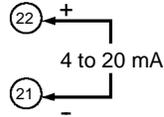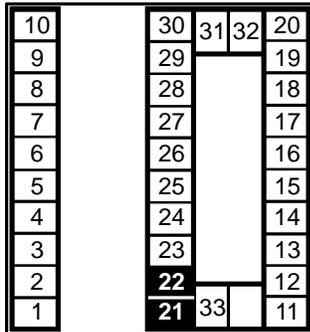
Event Input

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20, and events 3 and 4 (EV3/4) to terminal numbers 24 to 26. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:

Event input 1 and 2   Event input 3 and 4
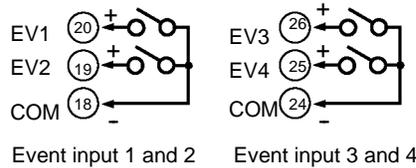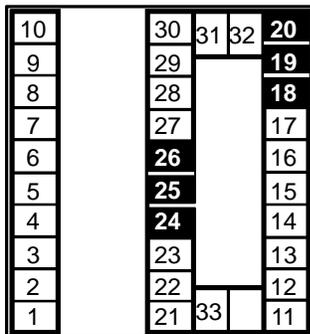
Terminals 18 and 24 (COM) are connected internally.

Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max. OFF: 100 kΩ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

Polarities during no-contact input are as follows:

Event input 1 and 2   Event input 3 and 4
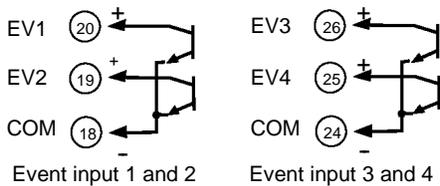
Transfer Output

Connect transfer output (TRSF) to terminal numbers 29 and 30. The internal equalizing circuit for transfer output is as follows:
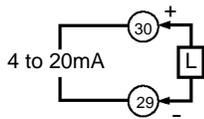
4 to 20mA

Transfer output specifications are as follows: 4 to 20 mA
Permissible load impedance: 600 Ω max.
Resolution: approx. 2600

Communications

Terminal numbers 18 to 20, 31 and 32 can be used only on Controllers with communications boards (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in the *E5AK-T/E5EK-T User Manuals (H83 and H85)*.

■ **E5EK-T WIRING**

In the following wiring diagrams, the left side of the terminal numbers indicate the inside of the Controller.

Power Supply

Input 100 to 240 VAC or AC/DC 24 V to terminal numbers 9 and 10 according to the specifications.

Sensor Input

Connect the sensor input to terminal numbers 11 to 14 and 33 as follows according to the input type.

Thermocouple   Platinum resistance thermometer   Voltage input   Current input
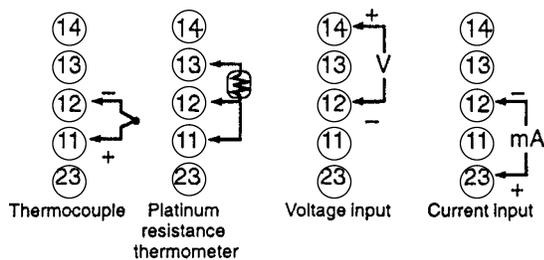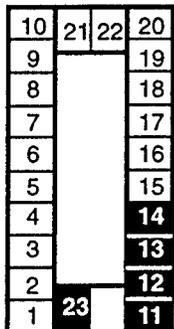
Control Output

Terminal numbers 7 and 8 are for control output 1 (OUT1), and terminal numbers 5 and 6 are for control output 2 (OUT2). The following diagrams show the available output boards and their internal equalizing circuits.

With E53-V☐☐ output boards, approx. 2 V is output for one second after the power is interrupted.

Specifications for Each Output Board

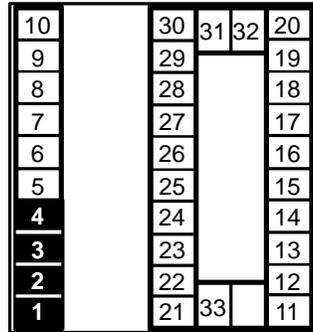| Model	Output type	Specifications
E53-R	Relay	5 A at 250 VAC
E53-S	SSR	1 A at 75 to 250 VAC
E53-Q E53-Q3 E53-Q4	Voltage (NPN) Voltage (NPN) Voltage (PNP)	NPN: 40 mA at 12 VDC (with short-circuit protection) NPN: 20 mA at 24 VDC (with short-circuit protection) PNP: 20 mA at 24 VDC (with short-circuit protection)
E53-C3 E53-C3D	4 to 20 mA 0 to 20 mA	4 to 20 mA, permissible load impedance: 600 Ω max., resolution: approx. 2600 0 to 20 mA, permissible load impedance: 600 Ω max., resolution: approx. 2600
E53-V34 E53-V35	0 to 10 V 0 to 5 V	0 to 10 VDC, permissible load impedance:1 kΩ min., resolution: approx. 2600 0 to 5 VDC, permissible load impedance: 1 kΩ min., resolution: approx. 2600

With E5EK-TPRR2 Controllers, the relay output (1 A at 250 VAC) is fixed.

When replacing the output board, use the E53-R. The following diagrams show the relationship between terminals and open/close relay settings.
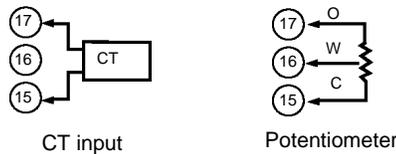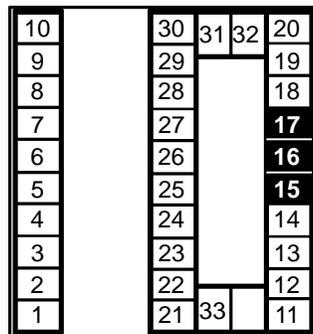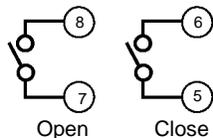

Auxiliary Output

Terminal numbers 3 and 4 are for auxiliary output 1 (SUB1) and terminal numbers 1 and 2 are for auxiliary output 2 (SUB2). The following diagrams show the internal equalizing circuits for the auxiliary outputs:
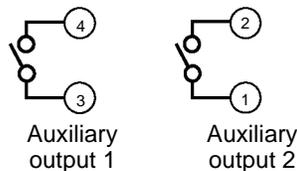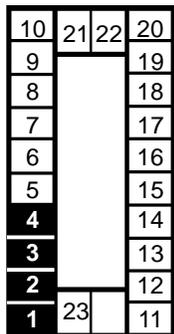
Output specifications are as follows: SPST-NO, 3A at 250 VAC

CT Input/Potentiometer

When using the HBA function on the E5EK-TAA2 Controller, connect CT input (CT) to terminal numbers 15 to 17. When monitoring the valve opening on the E5EK-TPRR2 Controller, connect the potentiometer (PTMR) to terminal numbers 15 to 17. Connect each of these inputs as follows:


CT input   Potentiometer

For details on CT inputs, refer to *Appendix, About Current Transformer* in the *E5AK-T/E5EK-T User's Manual (H83/H85)*.

For details on the potentiometer, refer to the *Instruction Manual* for the valve connected to the Controller. The variable resistance range is 100 Ω to 2.5 kΩ.

Remote SP Input
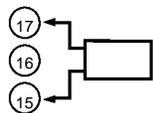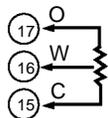
Connect the input (RSP) to be used as the remote SP to terminal numbers 15 and 16. However, note that the remote SP cannot be used on the E5EK-TPRR2 Controller. Only 4 to 20 mA inputs can be connected. Connect the input as follows:

4 to 20 mA
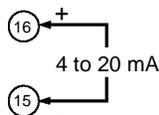
Event Input

Connect event inputs 1 and 2 (EV1/2) to terminal numbers 18 to 20. However, note that terminal numbers 18 to 20 cannot be used on Controllers with a communications function. Connect the event inputs as follows:
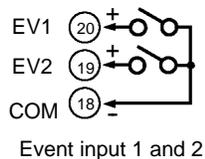

Event input 1 and 2

Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact input	ON: Residual voltage 1.5 V max., OFF: Leakage current 0.1 mA max.

Polarities during no-contact input are as follows:

EV1 ⑳ +
EV2 ⑲ +
COM ⑱ −
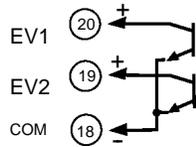
Event input 1 and 2

Transfer Output

Connect transfer output (TRSF) to terminal numbers 21 and 22. The internal equalizing circuit for transfer output is as follows:
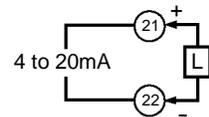
4 to 20mA ㉑ + L
           ㉒ −

Transfer output specifications are as follows:4 to 20 mA,
Permissible load impedance: 600 Ω max.,
Resolution: Approx. 2600

Communications
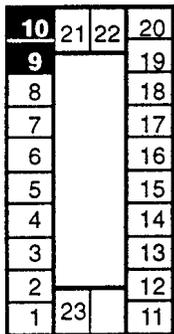
Terminal numbers 18 to 22 can be used only on controllers with communications boards (E53-AK01/02/03). For details on wiring, refer to *Chapter 6, Using the Communications Function* in the *E5AK-T/E5EK-T User Manuals (H088-E3-1 and H089-E3-1)*.

■ AFTER TURNING POWER ON

Determine the I/O specifications of the Process Controller in setup mode.

```
┌──────────┐
│ Power ON │
└──────────┘
      │
┌──────────────┐
│ Process value│
│            0 │
└──────────────┘
      │ 🔄 1 s min.
┌──────────────┐
│ ñEnU         │
│         Lu-0 │
└──────────────┘
      │ ⬆
┌──────────────┐
│ ñEnU         │
│         PrGn │
└──────────────┘
      │ ⬆
┌──────────────┐
│ ñEnU         │
│         Lu-I │
└──────────────┘
      │ ⬆
┌──────────────┐
│ ñEnU         │
│         Lu-2 │
└──────────────┘
      │ ⬆
┌──────────────┐
│ ñEnU         │
│          SEt │
└──────────────┘
      │ 🔄 1 s min.
┌──────────────┐
│ in-t         │  Input type
│            2 │
└──────────────┘
Temperature input  🔄  Current/Voltage input
```

Temperature input	Current/Voltage input
d-U `C` — °C/°F selection	**in-H** `100` — Scaling upper limit → 🔄 **in-L** `0` — Scaling lower limit → 🔄 **dP** `0` — Decimal point

```
      │ 🔄
┌──────────────┐
│ init         │  Parameter initialize
│           no │
└──────────────┘
      │
```

From next page   To next page
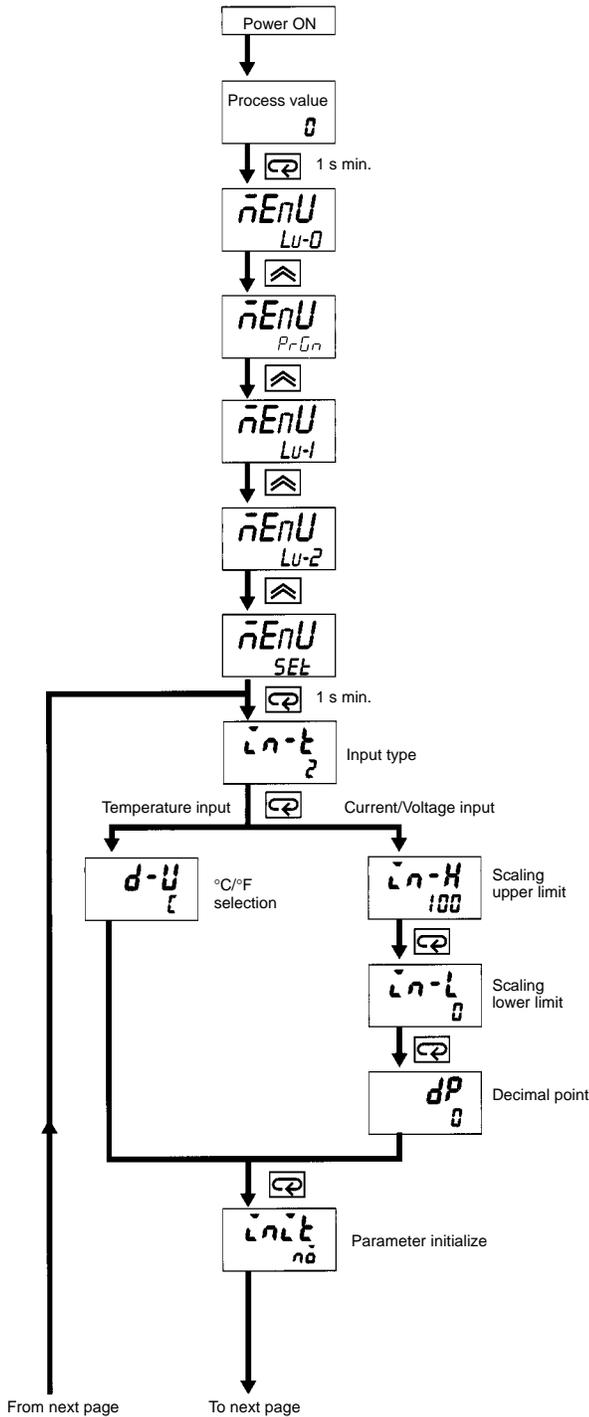
■ INPUT TYPE

Set the code according to the following table. Default is "2: K1 thermocouple."

Platinum Resistance Thermometer

Set value	Input type		
0	JPt100	−199.9 to 650.0 (°C) /−199.9 to 999.9 (°F)	Platinum resistance thermometer
1	Pt100	−199.9 to 650.0 (°C) /−199.9 to 999.9 (°F)	
2	K1	−200 to 1,300 (°C) /−300 to 2,300 (°F)	Thermocouple
3	K2	0.0 to 500.0 (°C) /0.0 to 900.0 (°F)	
4	J1	−100 to 850 (°C) /−100 to 1,500 (°F)	
5	J2	0.0 to 400.0 (°C) /0.0 to 750.0 (°F)	
6	T	−199.9 to 400.0 (°C) /−199.9 to 700.0 (°F)	
7	E	0 to 600 (°C) /0 to 1,100 (°F)	
8	L1	−100 to 850 (°C) /−100 to 1,500 (°F)	
9	L2	0.0 to 400.0 (°C) /0.0 to 750.0 (°F)	
10	U	−199.9 to 400.0 (°C) /−199.9 to 700.0 (°F)	
11	N	−200 to 1,300 (°C) /−300 to 2,300 (°F)	
12	R	0 to 1,700 (°C) /0 to 3,000 (°F)	
13	S	0 to 1,700 (°C) /0 to 3,000 (°F)	
14	B	100 to 1,800 (°C) /300 to 3,200 (°F)	
15	W	0 to 2,300 (°C) /0 to 4,100 (°F)	
16	PLII	0 to 1,300 (°C) /0 to 2,300 (°F)	
17	4 to 20 mA		Current input
18	0 to 20 mA		
19	1 to 5 V		Voltage input
20	0 to 5 V		
21	0 to 10 V		

■ PARAMETER INITIALIZE

Parameter initialization sets all parameters to default values except for the input type, scaling upper limit, scaling lower limit, decimal point, and °C/°F selection parameters.

To previous page   From previous page
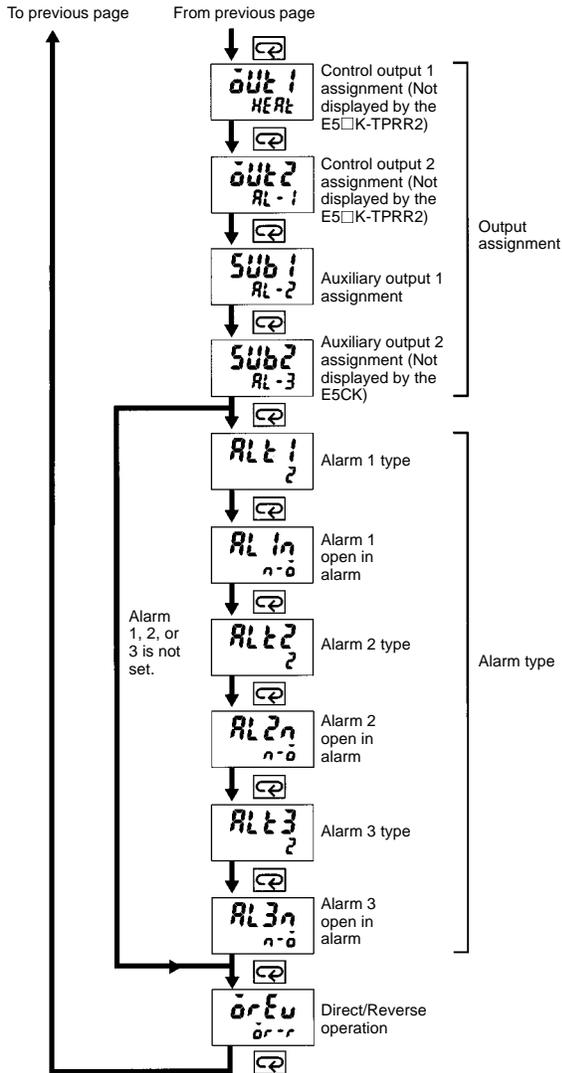
■ OUTPUT ASSIGNMENTS

Signals available as allocated outputs are the control output (heat), control output (cool), alarm 1, alarm 2, alarm 3, LBA, and HBA. The auxiliary outputs of the Process Controller cannot be used as control outputs.

Control output (heat), control output (cool), alarm 1, alarm 2, alarm 3, LBA, error 1 (input error), and error 2 (A/D converter error) output functions are available. These functions are assigned to control outputs 1 and 2 and auxiliary outputs 1 and 2.

The assignment destination of each output function is restricted. Refer to the tables provided under the headings, *Standard Models and Position-Proportionate Models.*

■ STANDARD MODELS

Output function	Control output 1	Control output 2	Auxiliary output 1	Auxiliary output 2
Control output (heat)	Yes	Yes	---	---
Control output (cool)	Yes	Yes	---	---
Alarm 1	Yes	Yes	Yes	Yes
Alarm 2	Yes	Yes	Yes	Yes
Alarm 3	Yes	Yes	Yes	Yes
HBA	Yes	Yes	Yes	Yes
LBA	Yes	Yes	Yes	Yes
Error 1: Input error	---	---	Yes	Yes
Error 2: A/D converter error	---	---	Yes	Yes

> With control output (cool), the conditions for switching from standard control to heating and cooling control are reached when the output function is assigned at the cooling side during heating and cooling control.

In other words, heating and cooling control is carried out when control output (cool) is assigned, and standard control is carried out when output is not assigned.

■ POSITION-PROPORTIONAL MODELS

Output function	Control output 1	Control output 2	Auxiliary output 1	Auxiliary output 2
Alarm 1	---	---	Yes	Yes
Alarm 2	---	---	Yes	Yes
Alarm 3	---	---	Yes	Yes
Error 1: Input error	---	---	Yes	Yes
Error 2: A/D converter error	---	---	Yes	Yes
Error 3: RSP input error	---	---	Yes	Yes

LBA

The LBA (loop break alarm) function is available when it is assigned as an output. The LBA function is not available when a memory or A/D converter error results.

LBA is a function for determining that an error has occurred somewhere on the control loop and outputting an alarm when the process value does not change with the manipulated variable at a maximum or minimum state. Accordingly, the LBA function can be used as a means for detecting a malfunctioning control loop.

■ ALARM MODE SELECTORS

Alarm outputs are available if they are allocated as outputs. Factory setting is "2: Upper-limit alarm (deviation)."

Switch setting	Alarm operation	Alarm output	
		When X is positive	When X is negative
1	Upper- and lower-limit alarm (deviation)	ON/OFF, ←X→←X→, SP	Always ON
2	Upper-limit alarm (deviation)	ON/OFF, ←X→, SP	ON/OFF, ←X→, SP
3	Lower-limit alarm (deviation)	ON/OFF, ←X→, SP	ON/OFF, ←X→, SP
4	Upper- and lower-limit range alarm (deviation)	ON/OFF, ←X→←X→, SP	Always OFF
5	Upper- and lower-limit alarm with standby sequence (deviation)	ON/OFF, ←X→←X→, SP	Always OFF
6	Upper-limit alarm with standby sequence (deviation)	ON/OFF, ←X→, SP	ON/OFF, ←X→, SP
7	Lower-limit alarm with standby sequence (deviation)	ON/OFF, ←X→, SP	ON/OFF, ←X→, SP
8	Absolute-value upper-limit alarm	ON/OFF, ←X→, 0	ON/OFF, ←X→, 0
9	Absolute-value lower-limit alarm	ON/OFF, ←X→, 0	ON/OFF, ←X→, 0
10	Absolute-value upper-limit alarm with standby sequence	ON/OFF, ←X→, 0	ON/OFF, ←X→, 0
11	Absolute-value lower-limit alarm with standby sequence	ON/OFF, ←X→, 0	ON/OFF, ←X→, 0

Deviation Alarm

If the alarm mode selector is set to a number between 1 and 7, alarm values are set to the width deviated from the set point as shown in the following illustration.

Alarm value
10°C/°F
110°C/°F
Set point (SP)
100°C/°F
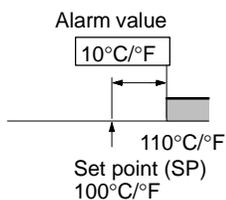
Absolute Alarm

If the alarm mode selector is set to 8 or 9, alarm values are set to the absolute value based on 0°C/°F as shown in the following illustration.

Alarm value
110°C/°F
0°C/°F   110°C/°F

■ CLOSE IN ALARM/OPEN IN ALARM

When the Controller is set to "close in alarm," the status of the alarm output function is output as it is. When set to "open in alarm," the status of the alarm output function is output inverted.

Condition	Alarm	Output	Output LED
Close in alarm	ON	ON	Lit
	OFF	OFF	Not lit
Open in alarm	ON	OFF	Lit
	OFF	ON	Not lit

Alarm type and close in alarm (normally open)/open in alarm (normally close) can be set independently from each alarm.

Close in alarm/Open in alarm is set in the "alarm 1 to 3 open in alarm" parameters (setup mode).
Factory setting is "close in alarm" [n-$\bar{o}$].

■ PARAMETER OPERATION LIST

Switching to modes other than manual or protect mode is carried out using the mode selection in the menu display.

The figure below shows all parameters in the order that they are displayed. Some parameters are not displayed depending on the protect mode setting and conditions of use.

■ PARAMETERS AND MENUS

For more details on the functions of each part and display contents, refer to the *E5AK-T/E5EK-T User Manuals.* All functions selected with the Controller in setup or expansion mode or all optional functions of the Process Controller may not be displayed.

Protect Mode

The protect function is for preventing unwanted modification of parameters and switching between run and reset operation or auto and manual operation.

Manual Mode

In this mode, the Controller can be switched to manual operation. The manipulated variable can be manipulated manually only in this mode.

Level 0 Mode

Set the Controller to this mode during normal operation. In this mode, you can change the set point and pattern during operation, and execute step operation (e.g. advance). You can only monitor (not change) the process value, step No., standby time, pattern elapsing time, pattern execution count, and manipulated variable.

Program Mode

This is the programming mode. In this mode, you can set the number of steps used in each pattern, pattern execution count, alarm values, set points for each step, step time, and time signals for two steps.

Level 1 Mode

This is the main mode for adjusting control. In this mode, you can execute AT (auto-tuning), set up the control period, PID parameters, heater burnout alarm (HDA) conditions, and set alarm values.

Level 2 Mode

This is the auxiliary mode for adjusting control. In this mode, you can set the parameters for limiting the manipulated variable, switch between the remote and local modes, and set the loop break alarm (LBA), alarm hysteresis, and the digital filter value of inputs.

Setup Mode

This is the mode for setting the basic specifications. In this mode, you can set parameters that must be checked or set before an operation such as the input type, scaling, output assignments, and direct/reverse operation.

Expansion Mode

This is the mode for setting expanded functions. In this mode, you can set SP setting limiter, switching between advanced PID control or ON/OFF control, program time unit, selection of step time/rate of rise, time unit of ramp rise rate, and the time for automatic return to the monitoring display.

Option Mode

This is the mode for setting optional functions. You can select this mode only when an option board is mounted in the Controller. In this mode, you can set the communications conditions, transfer output and event input parameters to match the type of option board mounted in the Controller. Heater burnout alarm function and position-proportional travel time are also found in this mode.

Calibration Mode

This mode is provided so that the user can calibrate inputs and output. When calibrating input, the selected input type is calibrated. Whereas, transfer output can be calibrated only when the communications board (E53-AKF) is set in the Controller.

■ **PARAMETER OPERATION**

Refer to the *E5AK-T and E5EK-T User Manuals (H83 and H85)* for each parameter and the calibration mode in detail.

Also refer to "Settings" in the *Operation Section*.

Level 0 Mode

Display	Description
Measured value **0**	Process Value Set Point
Ptrn 0	Pattern Number (With E5CK-T, this display appears when more than two patterns are used.)Pattern number
StEP 0	Step Number
Hold oFF	Hold
Rdu oFF	Advance
Stbn Time	Standby Time (displays remaining time)
tinE Time	Pattern Elapsing Time
rPtn Number of times	Pattern Execution Count
o Operation Value	Operation Value (heating)
C-o Operation Value	Operation Value (Cooling)
u-n Valve Opening	Valve Opening

(Control Valve Control)

(Heating/Cooling Control)

PV/SP

The process value is displayed on the No.1 display and the set point is displayed on the No.2 display.

When the multi-SP function is in use, the value of whichever is set, set point 0 or 1, is linked.

Remote SP Monitor

Monitors remote SP in the local SP mode.

Set Point During SP Ramp

Monitors the set point when the SP ramp function is used.

■ **PROTECT MODE**

RUN/RST + [key]

Press twice for 1 s min.

SECr 1 Security

KEYP 0 Key protect

To level 0   RUN/RST + [key]   Press twice for 1 s min.
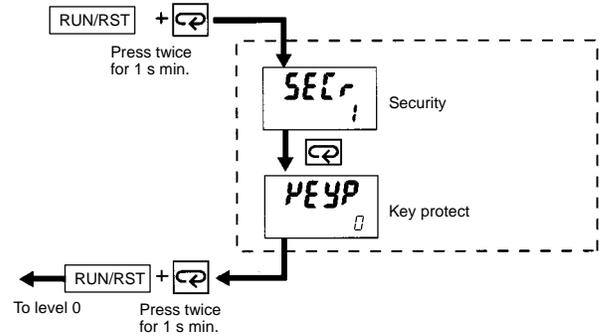
Security

Any mode marked with "X" in the following table is not displayed on the menu when this parameter is set to "0" to "3."

Mode	Set value				
	0	1	2	3	4
Calibration	---	x	x	x	x
Option	---	---	x	x	x
Expansion	---	---	x	x	x
Setup	---	---	x	x	x
Level 2	---	---	---	x	x
Level 1, 0	---	---	---	---	x

The Unit will be in only level 0 mode and the menu will not be available when this parameter is set to "4" to "6."

Only the "PV/SP" parameter in the level 0 mode can be used when this parameter is set to "5."

Only the "PV/SP" parameter in the level 0 mode can be used when this parameter is set to "6."

Key Protect

Invalidate the automatic, manual, run, and reset functions.

■ **MANUAL MODE**

[key] + [▲]

Press twice for 1 s min.

38.8 — Process value
16.0 — Manipulated variable/Valve opening
— MANU indicator

[key] + [▲]

Press twice for 1 s min.

Note: Only for E5AK-T

■ LEVEL 1 MODE

```
At
oFF
```
AT Execute/Cancel

```
P
100
```
Proportional Band
Available if the Controller is in advanced PID control.

```
L
233
```
Integral Time
Available if the Controller is in advanced PID control.

```
d
40
```
Derivative Time
Available if the Controller is in advanced PID control.

For E5□K-TPRR2

For heating/cooling control

```
C-SC
1.00
```
Cooling Coefficient
Used with the Controller is in heating and cooling control.

```
db
2.0
```
Position-proportional dead band

```
C-db
0.00
```
Dead Band
Used with the Controller is in heating and cooling control.

```
oF-r
500
```
Manual Reset Value
Available when the integral time parameter of the Controller in standard control is "0."

```
HYS
0.10
```
Hysteresis (Heat)
Available when the Controller is in ON/OFF control.

For heating/cooling control

```
CHYS
0.10
```
Hysteresis (Cool)
Available when the Controller is in ON/OFF control

```
CP
20
```
Control Period (Heat)
Available when the Controller has a relay or voltage output, or is in advanced PID control.

For heating/cooling control

```
C-CP
20
```
Control Period (Cool)
Available when the Controller has a relay or voltage output, or is in advanced PID control.

```
Ct
Current value
```
Heater Current Monitor
Available when the heater burnout alarm is assigned.

```
Hb
00
```
Heater Burnout Detection
Available when the heater burnout alarm is assigned.

■ LEVEL 2 MODE

Display	Description
r-L / LCL	Remote/Local Used for the communications function.
5Eb / 0	Standby time
LbR / 0	LBA Detection Time Available when the LBA (loop break alarm) is assigned as an output. Unavailable to the E5☐K-TPRR2.
ṁu-r / 0.0	MV at Reset
ṁu-E / 0.0	MV at PV Error
ōL-H / 105.0	MV Upper Limit Unavailable to the E5☐K-TPRR2.
ōL-L / -5.0	MV Lower Limit Unavailable to the E5☐K-TPRR2.
ōrL / 0.0	MV Change Rate Limit
ＬnF / 0	Input Digital Filter

For E5☐K-TPRR2

| **ōC-H** / 0.8 | Open/Close hysteresis |

RLH1 / 0.02	Alarm 1 Hysteresis Available only when the alarm output 1 is assigned.
RLH2 / 0.02	Alarm 2 Hysteresis Available only when the alarm output 2 is assigned.
RLH3 / 0.02	Alarm 3 Hysteresis Available only when the alarm output 3 is assigned.
Ｌn5H / 0.0	Input Shift Upper Limit Available if the input type is a thermocouple or platinum resistance thermometer.
Ｌn5L / 0.0	Input Shift Lower Limit Available if the input type is a thermocouple or platinum resistance thermometer.

(See *Input Shift*)

Input Shift

When temperature input is selected, scaling is not required. This is because input is treated as the "temperature" as it is matched to the input type. However, note that the upper- and lower-limit values of the sensor can be shifted. For example, if both the upper- and lower-limit values are shifted by 1.2°C, the process value (before shift) is regarded as 201.2°C after shift when input is 200°C before shift.

To set the input shift, set shift values in the "input shift upper limit" and "input shift lower limit" parameters (level 2 mode).

■ **EXPANSION MODE**

5L-H **1300**	Target Value Upper Limit
5L-L **-200**	Target Value Lower Limit
LntL **Pid**	PID/ON/OFF (not displayed for control valve control)
P-on **Lon**	At Power ON
E5Et **rSt**	At Operation End
P-no **1**	Number of Patterns (displayed for E5CK-T)
t-U **HHmm**	Program Time Unit
t-Pr **time**	Time setting/Inclination Setting
PrU **m**	Inclination Setting Time Unit (used for setting inclination)
PuSt **SP**	PV Start (used for setting time)
ut-b **0**	Weight Width (available for E5AK-T or E5EK-T)
rPAL **on**	Alarm Valid During Ramping
rUnA **oFF**	Run-all Valid (with E5CK-T, this display appears when more than two patterns are used.)
ALFA **065**	α Available if the Controller is in advanced PID control.
At-G **1.0**	AT Calculated Gain Available if the Controller is in advanced PID control.
rEt **0**	Automatic Display Reset Time
At-H **0.2**	AT Hysteresis Available if the Controller is in advanced PID control with the ST set to OFF.
LbAb **0.2**	LBA Detection Width Available only when the LBA (loop break alarm) function is assigned. Unavailable to the E5□K-TPRR2.

■ **OPTION MODE**

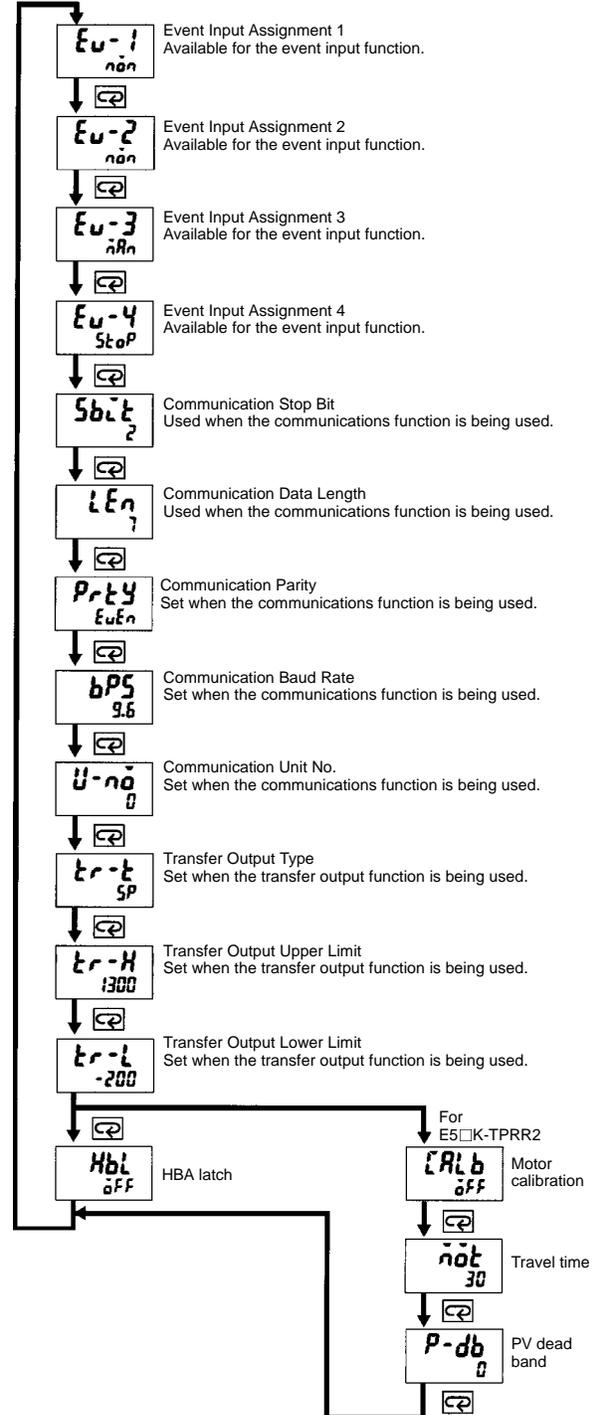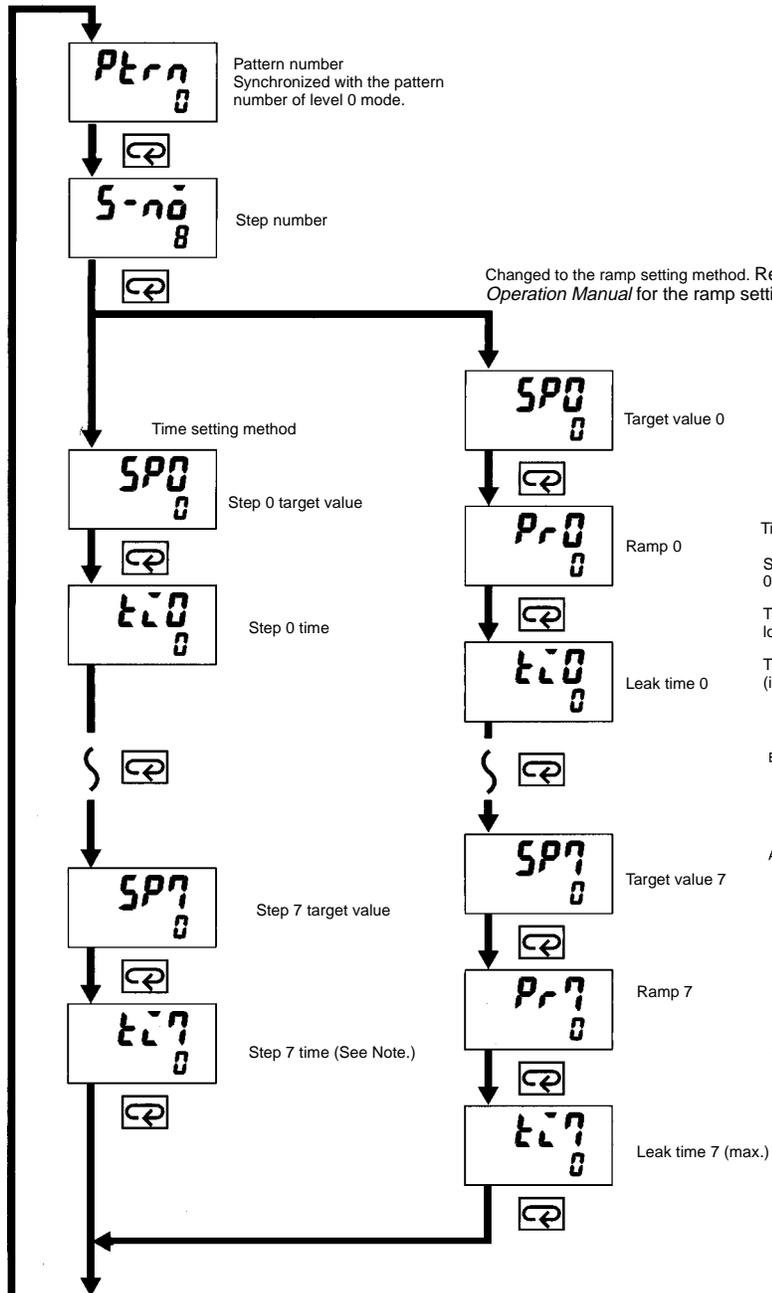|	
Eu-1 **non**	Event Input Assignment 1 Available for the event input function.
Eu-2 **non**	Event Input Assignment 2 Available for the event input function.
Eu-3 **mAn**	Event Input Assignment 3 Available for the event input function.
Eu-4 **StoP**	Event Input Assignment 4 Available for the event input function.
Sbit **2**	Communication Stop Bit Used when the communications function is being used.
LEn **7**	Communication Data Length Used when the communications function is being used.
PrtY **EuEn**	Communication Parity Set when the communications function is being used.
bPS **9.6**	Communication Baud Rate Set when the communications function is being used.
U-no **0**	Communication Unit No. Set when the communications function is being used.
tr-t **SP**	Transfer Output Type Set when the transfer output function is being used.
tr-H **1300**	Transfer Output Upper Limit Set when the transfer output function is being used.
tr-L **-200**	Transfer Output Lower Limit Set when the transfer output function is being used.

		For E5□K-TPRR2	
HbL **oFF**	HBA latch	**CALb** **oFF**	Motor calibration
		mot **30**	Travel time
		P-db **0**	PV dead band

■ PROGRAM MODE

Ptrn 0
Pattern number
Synchronized with the pattern
number of level 0 mode.

5-no 8
Step number

Changed to the ramp setting method. Refer to the
Operation Manual for the ramp setting method.

SP0 0
Target value 0

Pr0 0
Ramp 0

ti0 0
Leak time 0

Time setting method

SP0 0
Step 0 target value

ti0 0
Step 0 time

SP7 0
Step 7 target value

ti7 0
Step 7 time (See Note.)

SP7 0
Target value 7

Pr7 0
Ramp 7
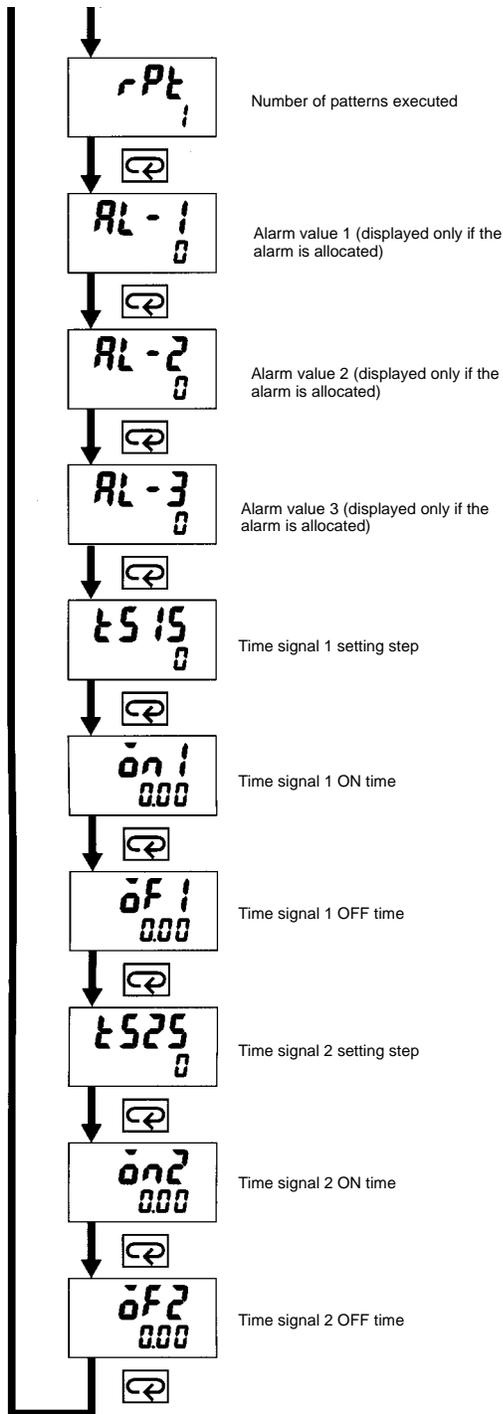
ti7 0
Leak time 7 (max.)

Time Setting Method

Set the number of steps to be used beginning with step 0 (e.g., step
0 target value, step 0 time, step 1 target value, and step 1 time).

The step target value can be set within a range between the
lower and upper target value limits. The default value is zero.

The step time can be set within a range between 0.00 and 99.59
(in hr and min or min and s). The default value is 0.00.

SP

| Step 0 | Step 1 | Step 2 | Step 3 |

B

A

| Step 0 time | Step 1 time | Step 2 time | Step 3 time |

Time
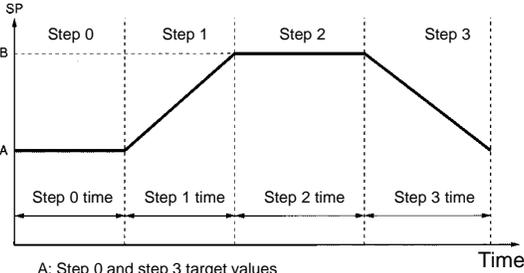
A: Step 0 and step 3 target values
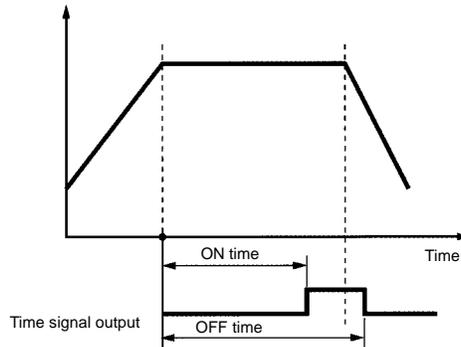B: Step 1 and step 2 target values

Step 0 is flat as shown in the above graph. Set step 0 to 0.00 so that
step 1 will be the actual first step when writing ramp-start programs.

Note: Up to step 15 (i.e., a total of 16 steps)
can be set in the time setting method.

rPt
1

Number of patterns executed

AL - 1
0

Alarm value 1 (displayed only if the alarm is allocated)

AL - 2
0

Alarm value 2 (displayed only if the alarm is allocated)

AL - 3
0

Alarm value 3 (displayed only if the alarm is allocated)

tS1S
0

Time signal 1 setting step

on 1
0.00

Time signal 1 ON time

oF 1
0.00

Time signal 1 OFF time

tS2S
0

Time signal 2 setting step

on2
0.00

Time signal 2 ON time

oF2
0.00

Time signal 2 OFF time

Time Signal

Two types of time signal patterns can be set in each pattern.

Two types of time signal timers are available (i.e., ON-time and OFF-time use), each of which starts with the edge of the step.

The output is ON from the moment the ON time elapses until the OFF time elapses.

Set the step so that the time signal is triggered by the time signal 1/2 setting step parameters. The default is step 0.

Set the ON/OFF timing with the timing signal 1/2 ON-time and time signal 1/2 OFF-time parameters in Program mode.

ON Conditions

If the ON time is shorter than the OFF time, the signal will be reset or ON after the ON time elapses until the next pattern starts.

The signal is not ON if there is no difference in period between the ON time and OFF time.

If ADVANCE is executed while the time signal setting step is executed, the time equivalent to the setting step will be deemed to have elapsed. In the above graph, for example, the signal is ON from the edge of the next step until the OFF time elapses.

■ HOW TO USE THE ERROR DISPLAY

When an error has occurred, the No.1 display alternately indicates error codes together with the current display item.
This section describes how to check error codes on the display, and the actions that must be taken to remedy the problem.

$5.Err$	**Input Error**

Meaning	Input is in error.
Action	Check the wiring of inputs, disconnections, and shorts, and check the input type and the input type jumper connector.
Operation at Error	For control output functions, output the manipulated variable matched to the setting of the "MV at PV error" parameter (level 2 mode). Alarm output functions are activated when the upper limit is exceeded.
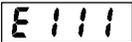
$E111$	**Memory Error**

Meaning	Internal memory operation is in error
Action	First, turn the power OFF then back ON again. If the display remains the same, the E5□K-T Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.
Operation at Error	Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

$E333$	**A/D Converter Error**

Meaning	Internal circuits are in error.
Action	First, turn the power OFF then back ON again. If the display remains the same, the E5□K-T Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.
Operation at Error	Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

$A.Err$	**Calibration Data Error**

This error is output only during temperature input and is displayed for two seconds when the power is turned ON.

Meaning	Calibration data is in error.
Action	Must repair.
Operation at Error	Both control output functions and alarm output functions are active. However, note that the readout accuracy is not assured.

| `cccc` |
| `ɔɔɔɔ` |

Display Range Over

Meaning Though not an error, this is displayed when the process value exceeds the display range when the control range (setting range ±10%) is larger than the display range (-1999 to 9999).

- When less than "-1999" `cccc`
- When greater than "9999" `ɔɔɔɔ`

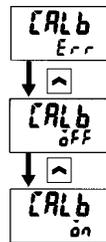**Operation** Control continues, allowing normal operation.

| `Err` |

Motor Calibration Error (Displayed on the No. 2 Display)

Meaning Motor calibration has ended with an error.

Action First, correctly connect the wiring for the potentiometer, open output, and close output.
Execute the motor calibration again.

Operation Procedure

```
CALb
Err
  ↓ [⌃]
CALb
off
  ↓ [⌃]
CALb
on
```

Operation at Error When motor calibration is executed, open output will operate and then close output will operate. However, as the value is incorrect, the result turns out to be an error.

Precautions

■ OPERATING ENVIRONMENT

• Operate the Controller within the rated ambient operating temperature, ambient operating humidity, and storage temperature ranges.

• Use the Controller according to the vibration resistance, shock resistance, and enclosure ratings.

• Do not install the Controller in places with corrosive gas or excessive dust.

• Do not install the Controller near machines generating high-frequency noise.

■ MOUNTING

• The dimensions of the Controller conform to DIN 43700.

• Recommended panel thickness is 1 to 8 mm.

• Mount the Unit horizontally.

■ CONNECTION

• To reduce inductive noise influence, the lead wires connecting the input type to the Controller must be separated from the power lines and load lines.

• Use the specified compensating conductors for thermocouples. Use lead wires having a small resistance for platinum resistance thermometers.

■ CONNECTION EXAMPLE

• Wire the terminals of the Unit using solderless terminals.

• The tightening torque applied to the terminal screws of the Unit must be approximately 0.78 N • m or 8 kgf • cm.

• Use the following type of solderless terminals for M3.5 screws.
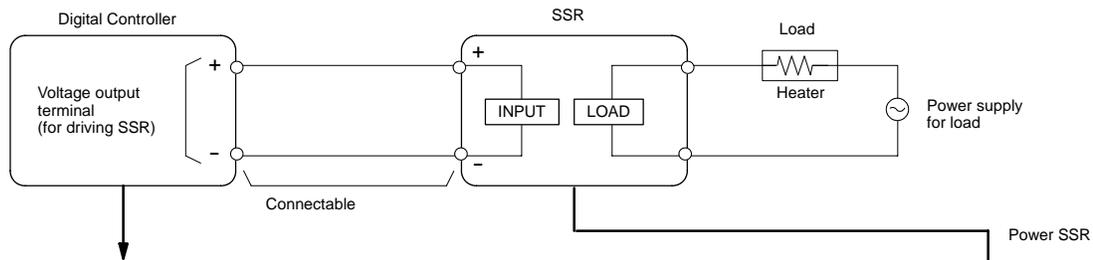

7.2 mm max.

7.2 mm max.

■ OPERATION

• The alarm outputs of a model with an alarm function may not turn ON correctly when the model malfunctions. The use of alarm equipment with the Controller is recommended.

• The parameters and internal switch are set before shipping so that the Unit will function normally. Change the settings of the parameters and internal switch according to the application if necessary.

• After power has been supplied to the Controller, several seconds are required until the relay is turned ON. Consider this time delay when designing sequenced circuits which incorporate a Controller.

• Do not use excessive force when removing the internal mechanism from the housing. Protect the internal connector or electronic parts of the Unit from shock.

• Protect against static discharge when changing the settings of the internal switch. Changing the settings on a grounded conductive mat is recommended.

• When connecting the control output board to the Temperature Controller or Process Controller, make sure that the control output board is the appropriate type, or the system may malfunction.

• The heater burnout alarm will not be available if the linear output board is used.

■ SSR

Connection Example of Process Controller and SSR

Digital Controller

Voltage output terminal (for driving SSR)

SSR

INPUT   LOAD

Load

Heater

Power supply for load

Connectable

Power SSR

E5☐K-T
Process Controller with Voltage Output (12 VDC, 40 mA max.)

E5CK-T
Controller with Voltage Output (12 VDC, 20 mA max.)

See the following table.

Model	G3PA	G3NH	G3NA	G3NE	G3B
Appear-ance					
SSRs connected in parallel	E5AK-/E5EK-T: 8 pcs. E5CK-T: 4 pcs.	E5AK-/E5EK-T: 8 pcs. E5CK-T: 4 pcs.	E5AK-/E5EK-T: 5 pcs. E5CK-T: 2 pcs.	E5AK-/E5EK-T: 2 pcs. E5CK-T: 1 piece	E5AK-/E5EK-T: 5 pcs. E5CK-T: 2 pcs.
Rated input voltage	5 to 24 VDC	5 to 24 VDC	5 to 24 VDC	12 VDC	5 to 24 VDC
Features	Thin, monoblock construction with heat sink	For high-power heater control	Standard model with screw terminals	Compact, low-cost model with tab terminals	Socket, model with 5-A switching capacity

OMRON ®