Digital Program Controller

# REX-P300

# INSTRUCTION MANUAL

## INTRODUCTION

Thank you for purchasing the "REX–P300". This manual describes how to use the "REX–P300". Prior to using the instruments, please carefully read this manual and fully understand the contents.
Keep this manual safely for future reference as required.

## USERS OF
## THIS MANUAL

This manual is prepared for all personnel who use "REX–P300".
This manual is also written especially for readers who have a fundamental knowledge of electrical engineering or control engineering.

## CAUTIONS

- This manual is subject to change without prior notice.
- Examples of figures, diagrams and numeric values used in this manual are for a better understanding of the text, but not for assuring the resultant operation.
- The contents of this manual are copy righted; all rights are reserved by RKC INSTRUMENT INC. It is prohibited to reprint or reproduce the whole or a part of this manual without the prior of RKC INSTRUMENT INC.
- "REX–P300" and this manual are manufactured and prepared under strict quality control before delivery.
  However, if any problems arise, please contact us directly or your nearest our sales agent.
- RKC assumes no responsibility for any of the following damage which the user or third party may suffer.
  ① Damage incurred as a result of using this product.
  ② Damage caused by product failure which cannot be predicted by RKC.
  ③ Other indirect damage.

# ★ INSTRUMENT SAFETY CAUTIONS

1. This instrument is designed to be mounted on instrumentation panels. It is therefore manufactured as part of the final product to facilitate wiring. This means that unauthorized personnel can easily access the high−voltage sections in this instrument such as power terminals, etc. Therefore, when this instrument is installed on the final product, the user should take the necessary measures for the final product to ensure that unauthorized personnel cannot access the high−voltage sections, etc.

2. In order to use this instrument correctly and safely, always observe the cautions described in this manual when performing operations and maintenance. RKC assumes no responsibility for any injury or accident resulting from not following these cautions.

● **For safe operation of "REX−P300", the following "Signal Words" and "Symbol Marks" are used in this manual.**

**<Signal Words>**

**WARNING** : Where there are possible dangers such as electric shock, fire (burns), etc. Which could cause loss of life or injury, precautions to avoid such dangers are described.

**CAUTION** : These describe precautions to be taken if unit damage may result if operating procedures are not strictly followed.

**NOTE** : Extra notes or precautions are added to operating procedures and explanations.

**<Symbol Marks>**

⚠ : This mark is used when great care is needed especially for safety.

✳ : This mark is used to add extra notes, precautions or supplementary explanations to table and figures.

## ⚠ **WARNING**

● **Never modify the instrument.**

· In order to prevent accident or instrument failure, never modify the instrument.

● **Maintenance**

· In order to prevent electric shock, burns or instrument failure, only RKC service engineers may replace parts.

· In order to use this instrument continuously and safely, conduct periodic maintenance. Some parts used in this instrument have a limited service life and may deteriorate over time.

# ★ OPERATION PRECAUTIONS

- Before cleaning the instrument, check that the power is turned off.

- Remove stains on the display unit using a soft cloth or tissue paper.

- As the display unit is easily scratched, do not scrub or touch it with a hard object.

- Do not operate the front key with a pointed object such as a ball point pen or screwdriver, as this may scratch or damage the key.

# CONTENTS

# PREPARATION

This chapter describes how to prepare the hardware before using this instrument.

| Checks |

● When necessary to check the entire procedure before operation. (Pages 3 to 5)

● When necessary to check the contents of the package. (Page 2)

| Mounting |

● When necessary to check restrictions on mounting. (Page 6)

● When necessary to check dimensions. (Page 7)

● When necessary to check the mounting procedure. (Page 8)

| Wiring |

● When necessary to check restrictions on wiring. (Pages 9 to 10)

● When necessary to check terminal configuration. (Pages 11 to 12)

# 1. PREPARATION

## 1.1 Handling procedure

Conduct necessary work according to the following procedures:

● Person who performs the work from mounting and wiring. Please read the operation manual from "**Check of product delivered**".

● Person who operates the instrument. Please read the operation manual from "**NAME OF PARTS**".

\*Person who has already mounted the instrument on the equipment and also finished wiring.

| | |
|---|---|
| **Check of product delivered** | (Page 3) |
| ⇩ | |
| **Check of model codes** | (Pages 4, 31) |
| ⇩ | |
| **Mounting** | (Page 6) |
| ⇩ | |
| **Wiring** | (Page 9) |
| ⇩ | |
| **Name of parts** | (Page 14) |
| ⇩ | |
| To ① | |
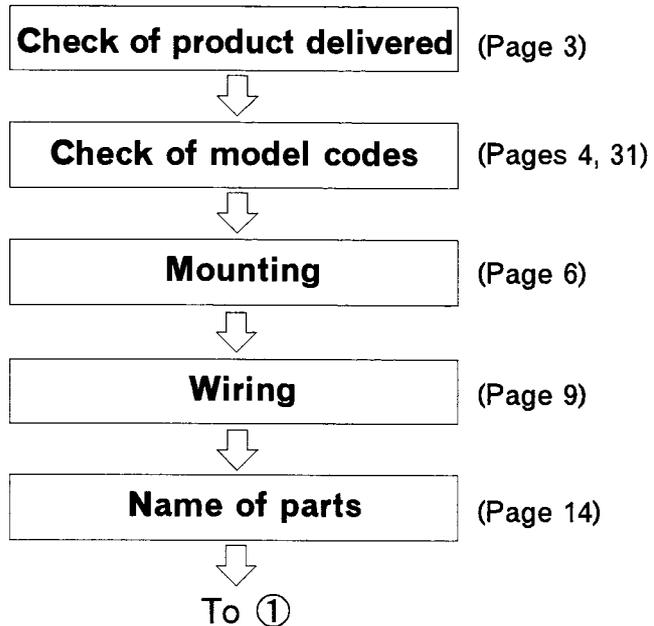
● Person who conducts program
  settings.
  Please read the operation manual
  from "**PROGRAM SETTING**".


● Person who conducts each
  parameter settings.
  Please read the operation manual
  from "**ENGINEER SETTING**".

From ①

⇩

| Check of input range | (Pages 21, 25) |

⇩

| Program setting | (Page 33) |

⇩

| Engineer setting | (Page 55) |

⇩

| Operation | (Page 75) |

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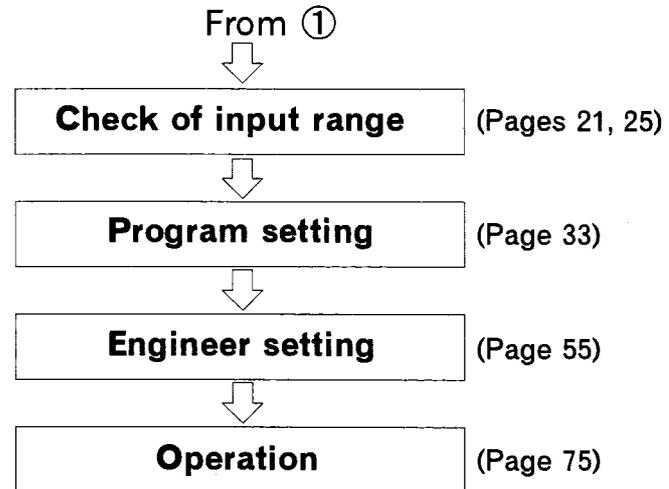
| **CAUTION** |

**Connect the input signal wiring,and then turn ON the power.If the input signal wiring opens, the P300 judges the input is disconnected. (Page 99)**


## 1.2 Check of product delivered

Check than the following items are delivered without damage.

● Mainframe (1 unit)              ● REX–P300 INSTRUCTION MANUAL [IM300P01–E1](1 copy)
● Mounting bracket (2 pieces)  ● REX–P300 PARAMETERS QUICK REFERENCE SHEET [IM300P03–E1]
                                                                                        (1 sheet)

## 1.3 Check of model codes

Check the model code from the following list to determine if the product delivered is as desired.

## ■ Model code

R E X — P 3 0 0 F □ □ □ — □ N — □ * D — □ □ □ □ — □
     ①② ③    ④⑤   ⑥  ⑦  ⑧⑨⑩⑪  ⑫

### ① Control action

  F : PID action with auto—tuning

### ② Input type

  See input range table on page 31.

### ③ Input range

  See input range table on page 31.

### ④ Control output [OUT1]

  M : Relay contact
  V : Voltage pulse
  4 : Continuous voltage 0 to 5 V DC
  5 : Continuous voltage 0 to 10 V DC

  6 : Continuous voltage 1 to 5 V DC
  7 : Current 0 to 20 mA DC
  8 : Current 4 to 20 mA DC

### ⑤ Control output [OUT2]

  N : No control output (Fixed)

### ⑥ Power supply voltage

  3 : 24 V AC/DC
  4 : 100 to 240 V AC

### ⑦ Alarm function

  D : With alarm function 2—point

## ⑧ Pattern setting contact input 〔 **Option** 〕

N : Not provided

1 : Provided

## ⑨ No. of time signal output points

4 : 4 points

8 : 8 points (Option)

## ⑩ Auxiliary output 〔 **Option** 〕

N : No auxiliary output

S : Auxiliary output provided
(OUT2 to OUT4) *1

## ⑪ Analog output 〔 **Option** 〕

N : No analog output

1 : Voltage 0 to 10 mV DC

2 : Voltage 0 to 100 mV DC

3 : Voltage 0 to 1 V DC

4 : Voltage 0 to 5 V DC

5 : Voltage 0 to 10 V DC

6 : Voltage 1 to 5 V DC

7 : Current 0 to 20 mA DC

8 : Current 4 to 20 mA DC

## ⑫ Communication function 〔 **Option** 〕

N : No communication function

1 : RS-232C

4 : RS-422A

5 : RS-485

*1 When analog output is selected, the number
of auxiliary outputs becomes 2 (OUT2,OUT3).

# 2. MOUNTING

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## ⚠ WARNING

⚡ In order to prevent electric shock and instrument failure, do not turn on the power supply until all of the wiring is completed.

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## 2.1 Cautions for mounting

### ■ Mounting environment

Avoid the following when selecting the mounting location.

- Ambient temperature of less than 5 °C (41 ° F ) or more than 40 °C (104 ° F ).
- Ambient humidity of less than 20 % or more than 80 % RH.
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Should be used indoors where the system is not exposed to direct sunlight.
- Heat to be accumulated radiation heat.

## 2.2 Dimensions

Unit : mm(inch)

91.8(3.61)

**Panel cutout**

25(0.98)　92 $^{+0.8}_{0}$　(3.62 $^{+0.031}_{0}$ )

\*

92 $^{+0.8}_{0}$(3.62 $^{+0.031}_{0}$ )

\* Minimum

30
(1.18)

98(3.86)
96(3.78)

96 (3.78)
98 (3.86)

14(0.55)

91.8(3.61)
106(4.17)

2 (0.08) **

12
1 0 0 (3.94)
(0.47)

**Thickness of rubber packing

Dimensions in inches are shown for reference.

## 2.3 Mounting procedure

① Mount the panel cutout corresponding to the number of units on the panel by referring to panel cutout dimensions.

② Insert the instrument into the panel from the front side.

③ Engage each mounting bracket with the bracket insertion slots (Fig.1).

④ Then tighten the mounting bracket setscrew from the rear with a Phillips screwdriver.
  Do not overtighten the bracket setscrew.
  [Recommended tighten torque : 0.3 N·m or less (3 kgf·cm or less)]

⑤ Set the other mounting bracket in the same way as in ③ and ④.

*This instrument is provided with a waterproof and dustproof rubber packing. For details of replacing the packing due to deterioration, see " **5. REPLACING THE RUBBER PACKING** ".(Page 101)

**Bracket setscrew**

**Mounting bracket**

**Slot**

**Fig.1**
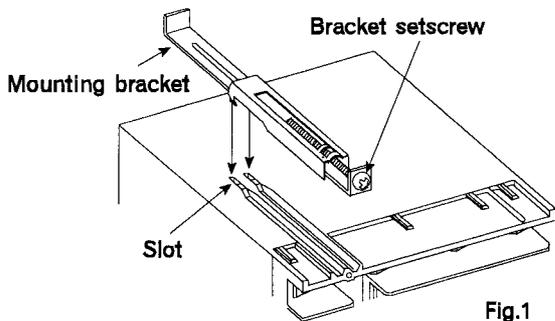
NOTE
● The front of this instrument conforms to IP54 with the instrument mounted on a control panel.

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# 3. WIRING

<div style="border:2px solid black;">

## ⚠ WARNING

⚡ ● In order to prevent electric shock and instrument failure, do not turn on the power supply until all of the wiring is completed.
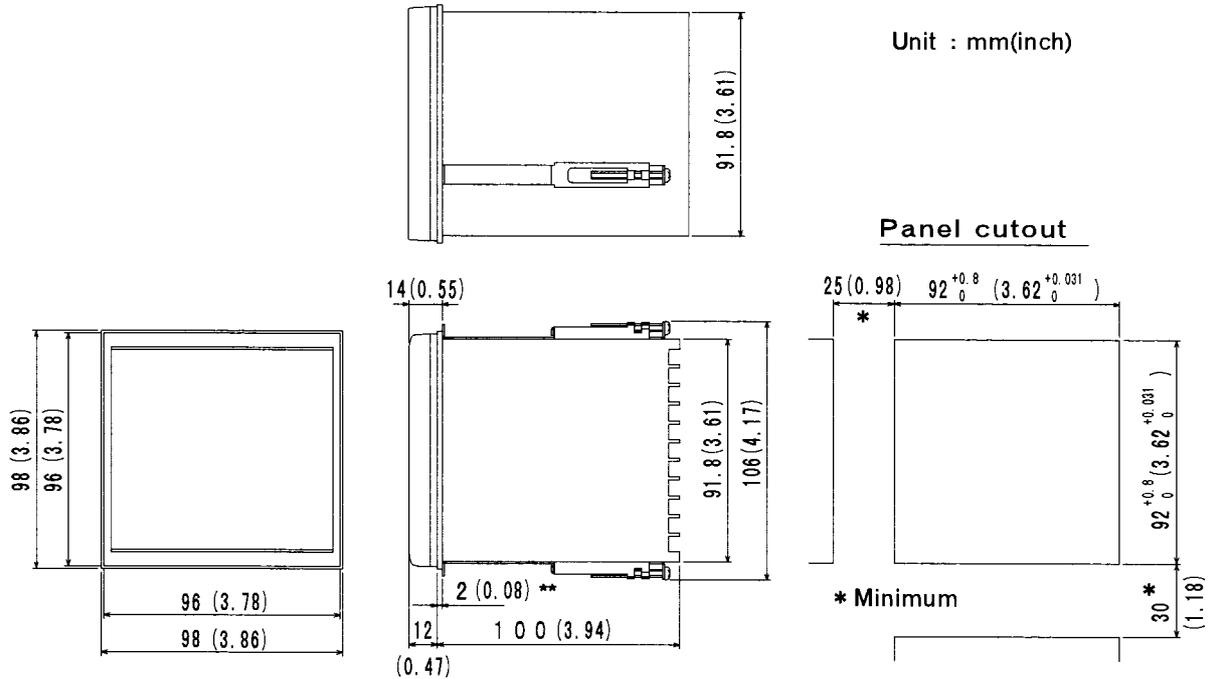
● In failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.

● In order to prevent instrument damage or failure, protect power line and input/output lines from high currents by using fuses with appropriate ratings.

</div>

## 3.1 Cautions for wiring

(1) For thermocouple input, use the specified compensation wire.

(2) For RTD input, use leads with low resistance and having no resistance differences between the 3 leads.

(3) Conduct input signal wiring away from instrument power, electric equipment power and load lines as such as possible to avoid noise induction.

(4) Conduct instrument power wiring so as not to be influenced by noise from the electric equipment power. If it is assumed that a noise generation source is located near the controller and the controller is influenced by noise, use a noise filter.

① To obtain a satisfactory noise filter effect, select the most suitable type after due consideration of instrument power supply voltage and filter frequency characteristics.

② For instrument power wiring, if it is assumed that noise exerts a bad influence upon the controller, shorten the distance between twisted power supply wire pitches. (The shorter the distance between the pitches, the more effective for noise reduction.)

③ Install the noise filter on the panel which is always grounded and minimize the wiring distance between the noise filter output side and the instrument power terminals.
Otherwise, the longer the distance wiring, the less effective for noise.

④ Do not install fuses and/or switches on the filter output signal since this may lessen filter effect.

Instrument power    Leadwires    IN | Noise filter | OUT    Leadwires    Instrument power terminals
Shorten distance between pitches    Minimize distance
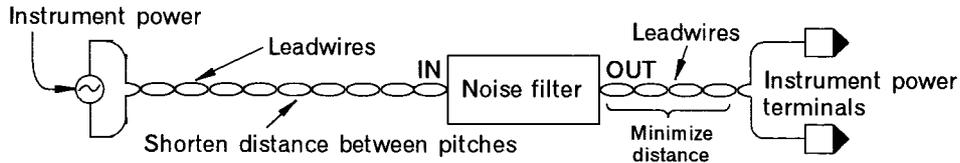
(5) For wiring, use wires conforming to the domestic standard of each country.
For power supply wires, use 600 V Polyvinyl chloride insulated wires (JIS C3307).

(6) About 2 sec. are required as the preparation time of contact output during power–ON.
Use a delay relay when the output line, is used for an external interlock circuit.

(7) This instrument has no power supply switch nor fuses. Therefore, install them separately close to the instrument, if required.
[Recommended fuse rating : Rated voltage ; 250 V   Rated current ; 1 A   Type ; Time–lag fuse]

(8) This instrument is intended to be used under the following environmental conditions. (IEC1010)
[OVERVOLTAGE CATEGORY II , POLLUTION DEGREE 2]

## 3.2 Terminal configuration

Conduct wiring by referring to following diagrams.

Power terminals:

| AC L | | DC + | | AC L | |
|---|---|---|---|---|---|
| 24V | 1 | 24V | 1 | 100 to 240V | 1 |
| N | 2 | − | 2 | N | 2 |

Control output terminals:

Continuous voltage / Continuous current / Voltage pulse output:

OUT1 + 4
OUT1 − 5

Relay contact output:

OUT1 3
NO 4
NC 5

Control output terminals (center block):

| 1 | 33 | 22 | 12 |
| 2 | 34 | 23 | 13 |
| 3 | 35 | 24 | 14 |
| 4 | 36 | 25 | 15 |
| 5 | 37 | 26 | 16 |
| 6 | 38 | 27 | 17 |
| 7 | 39 | 28 | 18 |
| 8 | 40 | 29 | 19 |
| 9 | 41 | 30 | 20 |
| 10 | 42 | 31 | 21 |
| 11 | 43 | 32 | A |

NO : Normally open
NC : Normally closed

Open collector output terminals:

Pattern end output / Time signal output:

COM (−) 6
TS1 7
TS2 8
TS3 9
TS4 10
END 11

Open collector output terminals:

Time signal output:

COM (−) 33
TS5 34
TS6 35
TS7 36
TS8 37

(Option)

Auxiliary output

Output terminals (Option) / Relay contact output:

OUT2 38
NO 39
OUT3 40
NO 41
OUT4 42
NO 43

Analog output

+ 42
AO
− 43

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Communication terminals (Option)

Alarm output terminals

**CAUTIONS**

RS-422A
- SG [22]
- T(A) [23]
- T(B) [24]
- R(A) [25]
- R(B) [26]

RS-485
- SG [22]
- T/R(A) [23]
- T/R(B) [24]

RS-232C
- SG [22]
- SD [23]
- RD [24]

First alarm — ALM1 NO [12] [13]
Second alarm — ALM2 NO [14]

1. Terminals which are not used according to the controller type are all removed.

2. Do not excessively tighten the terminal screws.

Recommended tighten torque:
0.4N·m(4kgf·cm)
Maximum allowance tighten torque:
1.0N·m(10kgf·cm)

3. Use the lug with 6.2 mm wider or less.

6.2mm(0.24inch) or less

| 1 | 33 | 22 | 12 |
| 2 | 34 | 23 | 13 |
| 3 | 35 | 24 | 14 |
| 4 | 36 | 25 | 15 |
| 5 | 37 | 26 | 16 |
| 6 | 38 | 27 | 17 |
| 7 | 39 | 28 | 18 |
| 8 | 40 | 29 | 19 |
| 9 | 41 | 30 | 20 |
| 10 | 42 | 31 | 21 |
| 11 | 43 | 32 | A |

External contact input terminals

COM(−) [15]
RESET
RUN
STEP function
HOLD function

RESET [16]
RUN [17]
STEP [18]
HOLD [19]

Pattern No. setting
COM(−) [27]
PTN. 1 [28]
PTN. 2 [29]
PTN. 4 [30]
PTN. 8 [31]
P. SET [32]

External contact input terminals
(Option)

[20] A
RTD
[21] B
[A] B
RTD input

[21] +
TC
[A] −
TC input

[21] +
IN
[A] −
Voltage(Low) input
Voltage(High) input
Current input

Input terminals

# *SETTING*

This chapter describes the name of each section and how to set the various parameters.

**Operation**
- When necessary to check the operation key function. (pages 14 to 23)
- When necessary to check the setting modeselection method. (pages 20 to 22)

**Settings**
- When necessary to make program control settings. (pages 33 to 54)
- When necessary to set SV in fixed set−point control. (pages 55, 93)
- When necessary to set manipulated output value (MV) in manual mode. (page 94)
- When necessary to set alarm, PID or input/output values. (pages 55 to 73)
- When necessary to check the present input type and range. (pages 21, 24)
- When necessary to change the scale high/low limit value. (pages 24 to 25)
- When necessary to change the program start method. (page 26)
- When necessary to change the power frequency. (page 28)

# 1. NAME OF PARTS

## ■ Display unit

| ① Measured−value (PV) display unit  [ Green ] | · Displays measured−value (PV).<br>· Displays various characters depending on the instrument condition. |
|---|---|
| ② Set−value (SV) display unit  [ Orange ] | · Displays set−value (SV).  (Auto mode)<br>· Displays manipulated output value (MV).  (Manual mode)<br>· Displays the remaining time of the segment and the number of repeat execution times. (page 78)<br>· Displays set value of each parameter.<br>· Displays various characters depending on the instrument condition. |

## ■ Indication lamps

| ③ Segment progress lamp  [ Orange ] | · Rise   : Lights during set−value rise.    *1,*2<br>· Soak  : Lights during soak.          *2<br>· Fall    : Lights during set−value fall.    *1,*2 |
|---|---|
| ④ RUN lamp    [ Green ] | · Lights in program control mode.         *2,*3 |
| ⑤ RESET lamp    [ Green ] | · Lights in reset mode.              *3 |
| ⑥ FIX lamp    [ Green ] | · Lights in fixed set−point control mode.    *3 |

| ⑦ SV lamp | [ Green ] | · Lights when SV is displayed on the set−value (SV) display unit. |
|---|---|---|
| ⑧ MV lamp | [ Green ] | · Lights when MV is displayed on the set−value (SV) display unit. |
| ⑨ TIME lamp | [ Green ] | · Lights when time is displayed on the set−value (SV) display unit. |
| ⑩ AT lamp | [ Green ] | · Flashes during auto−tuning execution. |
| ⑪ Output lamp (OUT1) | [ Green ] | · Lights when control output is turned on.　　　　*4 |
| ⑫ Output lamp (OUT2 to OUT4) | [ Green ] option | · Lights when auxiliary output is turned on. (OUT2 to OUT4) <br> · Lights when analog output is turned on. (OUT4)　*4 |
| ⑬ Alarm lamp (ALM1,ALM2) | [ Red ] | · Lights when alarm output is turned on. |

*1　Flashes in the wait state.
*2　Extinguished at the program end.
*3　Remains lit even when the instrument is changed to manual mode or AT from the reset state, program control or fixed set−point control.
*4　Lamp indication becomes as follows for continuous or analog output.
　　For an output of less than 0%: Extinguished　　　　For an output of more than 100%: Lit
　　For an output of more than 0% but less than 100%: Dimly lit

| ⑭ Pattern lamp　　[ Orange ] (PTN1 to 16) | · The pattern No. being executed is lights.<br>· Flashes during program setting and pattern No. selection.<br>· The selected pattern No. lights during segment (level/time) setting. |
|---|---|
| Time signal lamp (TS1 to 8) | · The output No. flashes with the time signal output turrned on. (Common to PTN1 to 8 lamps) |
| Pattern end lamp (PTN9) | · The PTN9 lamp flashes with the pattern end output turned on. |
| ⑮ Segment lamp　　[ Green ] (SEG1 to 16) | · The segment No. whose program is being executed lights.<br>· The set segment No. flashes during program setting.<br>· All of the set segment Nos. light when the program end is registered. |

# ■ Operation keys

| ⑯ Reset key (RESET)<br>(RESET) | · Used when control needs to be stopped to set to the reset state. |
|---|---|
| ⑰ Run/Hold key (RUN/HOLD)<br>(RUN ▷<br>HOLD ⅲ) | · Used when program control is performed.<br>· Used for hold function execution/release during program control execution. |

(Continued from the previous page.)

| ⑱ Step/Reverse set key (STEP/R.SET) $\overbrace{\text{STEP}\triangleright\triangleright}^{}$ $\overbrace{\text{R.SET}}^{}$ | · Used when the present set parameter needs to be returned to the immediately previous parameter. (R.SET) <br> · Pressing this key for more than 1 sec with the display set to the monitor state during program control execution proceeds to the next segment. (STEP) <br> · Pressing this key for more than 2 sec with the setting screen displayed changes to time signal setting mode. |
|---|---|
| ⑲ Pattern/End key (PTN/END) $\overbrace{\text{PTN}}^{}$ $\overbrace{\text{END}}^{}$ | · Pressing this key with the instrument set to the reset state changes to the execution pattern selection display. <br> · The end segment display lamp flashes while this key is being pressed during program control execution. <br> · Used for program end (PEnd) setting/release during program setting. |
| ⑳ Monitoring/Mode key (MONI/MODE) $\overbrace{\text{MONI}}^{}$ $\overbrace{\text{MODE}}^{}$ | · Used when the monitor state or operation mode is changed. <br> · Pressing this key for more than 2 sec changes to the operation mode selection display. <br> · Pressing this key together with the SET key during the reset state changes to SETUP setting mode. |

(Continued on the next page.)

| ㉑ Set key (SET) | · Used for parameter registration/calling up. |
| | · Pressing this key for more than 2 sec changes to engineer setting mode. |
| ㉒ UP/DOWN key ( ∧ ∨ ) | · Used to increment or decrement the value.<br>If this key is kept pressed, the variable acceleration of the numeric value gradually increases. (Acceleration function)<br><br>\*Pressing the SET key while this key is being pressed results in the following variable acceleration of the numeric value.<br><br>When the variable acceleration in slow:Becomes fast suddenly<br>When the variable acceleration in fast :Becomes slow suddenly<br><br>*When the UP and Down keys are simultaneously pressed:*<br>The immediately previous segment level and time set−values are called up during segment setting. The setting can be made easily by changing the value thus called up. |

# 2. BASIC OPERATION

## 2.1 Relationship between key operation and mode

**Power ON**

Input type/Input range display *1

**Reset state**
- Display of measured-value (PV)
- The RESET lamp lights.

RESET

(SET) + (MON/MODE)

**SETUP setting**

(SET)

(SET) *2

**Program setting**

**Engineer setting**

(SET) *3

RUN ▷ / HOLD Ⅲ      RESET

**Operation monitoring mode**
- PV/SV display (PV/MV display)
- AUTO/MAN transfer
- Remaining segment time
- No. of remaining pattern repeat times
- Manipulated-output monitor

(SET) *2

(STEP▷▷ / R.SET) *2

**Action mode transfer**
- PV/SV display
- Program/FIX transfer
- PID/AT transfer
- Setting key lock

**Time signal setting**

*1 : The display state differs depending on the start mode.
(See page 28.)

*2 : For more than 2sec.

*3 : Can only be checked.

(MON/MODE) *2

(SET)

(MON/MODE) *2

(SET)

(MON/MODE)

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# ■ Input type and input range display

This instrument immediately confirms input type and range following power–ON.



**Power ON**

*1 : Display changes automatically

**Input type display**　　　　**Input range display**　　　　**Reset status**
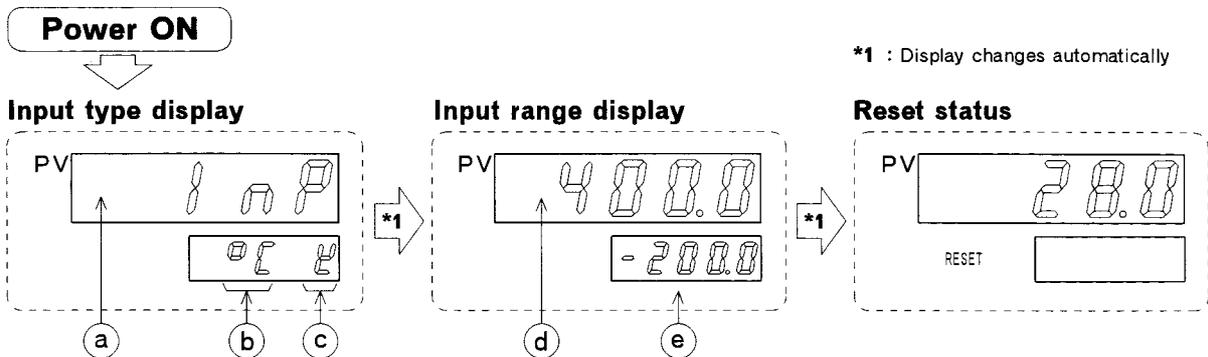
(a) : Input display character (InP)

(b) : Unit　　　(c) : Input type

| Display | Unit |
|---------|------|
| °C | ℃ |
| °F | ℉ |

| Display | ᵗ⁴ | ⅃ | ⌐ | 5 | ᵇ | E | ⌐ | ⌐ | P | ⊐ | ⊔ | L | P⌐ | ⅃P | P⌐ | ᵗ⁴ | ¦ |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|----|----|----|---|---|
| Input | Thermocouple (TC) | | | | | | | | | | | | | RTD | | Voltage | Current |
| type | K | J | R | S | B | E | T | N | PL Ⅱ | W5Re/ W26Re | U | L | PR 40–20 | 100 | Pt 100 | | |

(d) : High input range limit value　　　(e) : Low input range limit value

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## 2.2 Setting mode selection method



**Power ON**

Page 24
### SETUP setting
Input type and input range settings are changed.

**Input type/input range display**

Page 33
### Program setting
Program related settings are made.

Display changes automatically

- - - ►To time signal setting

### Reset state
Control stopped state.
Outputs the control output value during reset.

### Engineer setting
Various control related parameters such as alarm, PID, output, etc. are set.

Page 55

──────► Press the (RESET) key.

- - - -► Press the (SET) and (MON/MODE) keys simultaneously.

── - -► Press the (SET) key for more than 2 sec.

- - - -► Press the (SET) key.

── - -► Press the (STEP▷▷/R.SET) key for more than 2 sec.

### Time signal setting
Time signal related settings are made.

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## ⚠ Key operational cautions

● If no key is pressed for more than 1 minute in any of the following setting mode states, the instrument automatically returns to the monitor state (PV/SV display).

- · SETUP setting mode
- · Time signal setting mode
- · Program setting mode
- · Engineer setting mode

● If the instrument is changed to the monitor state during setting operation, the value during setting is not captured.

● For this instrument, the numeric value is not registered if it is only changed by the UP/DOWN keys. It is registered only when the SET key is pressed after being changed.

● If SV is changed on the PV/SV display during fixed set—point control, it is automatically registered about 2 sec after the setting is changed regardless of SET key operation.

● Parameter items which are not added to the specification are not displayed.

## ⚠ Setting key lock function

● This function is used to lock the SET or STEP/R.SET operation key. By locking the operation key, a change in the setting caused by misoperation is prevented. However in this case, as no setting mode (SETUP setting/program setting/time signal setting/engineer setting) is called up, the set—value cannot be checked.
For the method of setting the setting key lock function, see page 81.

# 3. SETUP SETTING MODE

In SETUP setting mode, the input type, power frequency or each function selection can be set.
Change the numeric value by pressing the UP/DOWN keys, and register it and call up the next item by pressing the SET key.

## 3.1 Display sequence

**Reset status**
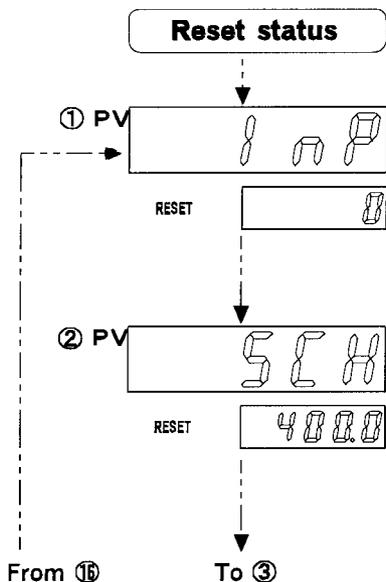
- - - - ▶ Press the SET and MONI/MODE keys simultaneously.
- - - ▶ Press the SET key.

① PV

RESET

**Input type selection**
The measured input (PV) type can be changed.
Input range : See page 31.
Initial value : According to model type.

*When changing the input type, always check also the selection pin insertion position.(See page 32.)

② PV

RESET

**Scale high - limit setting**
For temperature input, set the setting limiter high - limit within the input range. For voltage or current input, set the input display scale high - limit.

● Setting range :
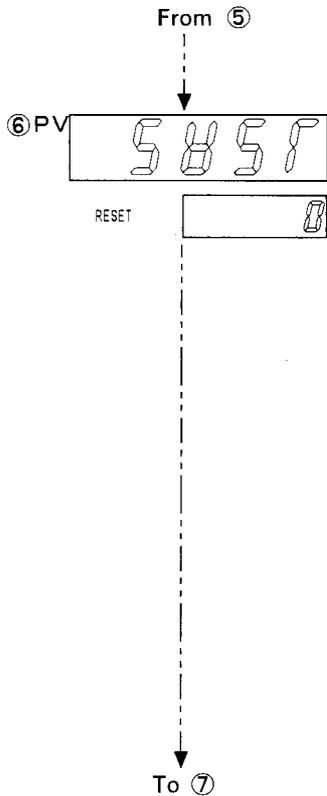Temperature input : Within input range
（Where, Setting limiter high - limit＞Setting limiter low - limit)
Voltage or current input : Within scale low - limit to 32000 digits

● Initial value : According to model type.

From ⑯        To ③

From ②

③ PV [ 5 C L ]

RESET [ -2 0 0.0 ]

④ PV [ P C d P ]

RESET [ 1 ]

⑤ PV [ A d d ]

RESET [ 0 ]

To ⑥

## Scale low-limit setting

For temperature input, set the setting limiter low-limit within the input range. For voltage or current input, set the input display scale low-limit.

● Setting range:

Temperature input : Within input range
(Where, Setting limiter high-limit > Setting limiter low-limit)

Voltage or current input : Within −19999 digits to scale high-limit

● Initial value　: According to model type.

## Decimal-point position setting [Displayed for voltage/current input]

Sets the decimal-point position on the input display scale.

● Setting range:

0 (No decimal-point)　　　　　3 (3 digits below decimal-point)
1 (1 digit below decimal-point)　4 (4 digits below decimal-point)
2 (2 digits below decimal-point)

● Initial value　: 1 (1 digit below decimal-point)

## Device address setting

[Displayed when the controller has the commumication function]

Sets the commumication device address of this controller.

● Setting range : 0 to 99

● Initial value　: 0

*If several sets are multidrop-connected, make the setting so that the device address is not duplicated.
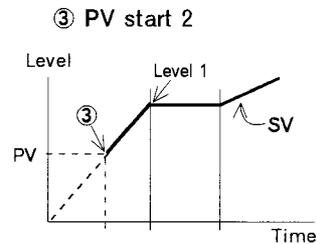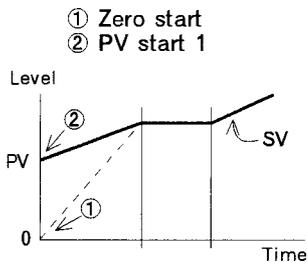
From ⑤

⑥PV



RESET

To ⑦

## SV selection at program start

Set from which level SV is started when program control is performed.

● Setting range : 0 (Zero start) *
   1 (PV start 1 〔Fixed time type〕)
   2 (PV start 2 〔Time shortening/constant slope type〕)
● Initial value  : 2

*Started from the input range low—limit for the voltage/current input specification.

① Zero start
② PV start 1



③ PV start 2



· At PV ≦ 0 ℃:
SV is started from 0 ℃.

· At PV ≧ Level 1:
SV is started from level 1.

From ⑥

⑦ PV `EndP`
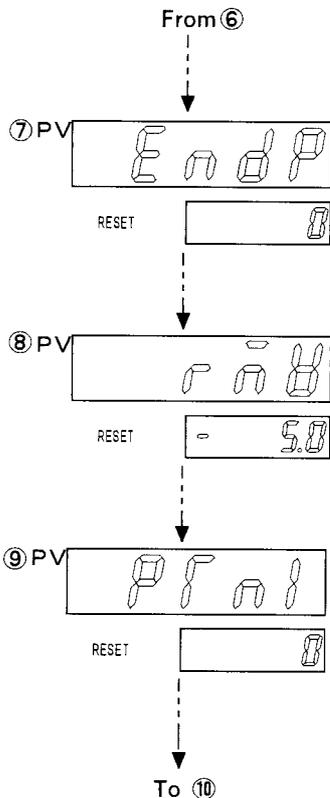
RESET `0`

## Control state selection at program end

Set whether control continues or stops at the program end.

- Setting range : 0 (Control continues)
  1 (Control stops [Control output OFF] )
- Initial value : 0

⑧ PV `rA0`

RESET `- 5.0`

## Control output value during reset

Set the control output value in the reset state.

- Setting range : −5.0 to +105.0 %
- Initial value : −5.0

*No output limiter function is activated.

⑨ PV `PTn1`

RESET `0`

## Contact input pattern entry method [Option]

Set the method of selecting the pattern No. by contact input.
(See pages 89 to 91.)

- Setting range : 0 (Setting by pattern set entry [Patterns 1 to 16] )
  1 (Setting by contact input change [Patterns 1 to 16] )
  2 (Setting by pattern set entry [Patterns 1 to 15] )
  3 (Setting by contact input change [Patterns 1 to 15] )
- Initial value : 0

To ⑩

From ⑨

⑩ PV [ Pd ]
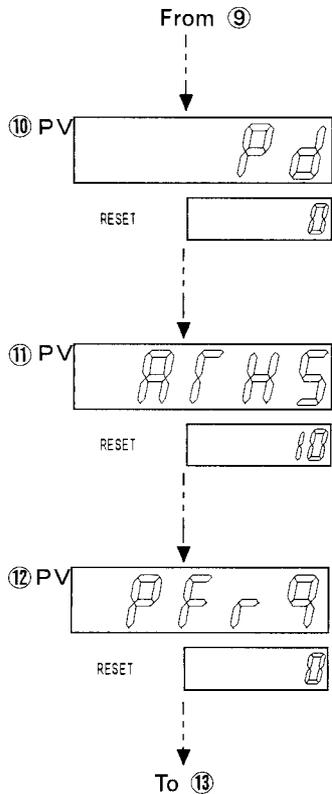
RESET [ 0 ]

**Start mode selection**

Set the start state when power is turned on or power failure is recoverd.

● Setting range :
  0 (HOT start 〔Start from the state before power is turned off〕 )
  1 (COLD start 〔Start from the reset state〕 )
● Initial value　: 0

⑪ PV [ AT HS ]

RESET [ 10 ]

**Auto-tuning differential gap**

Set the auto-tuning differential gap time.

● Setting range : 0 to 100 sec
● Initial value　: 10

⑫ PV [ PFrq ]

RESET [ 0 ]

To ⑬

**Power frequency**

Set the power frequency used.

Setting range : 0 (50 Hz)　　1 (60 Hz)
Initial value　: 0

*If the power frequency is changed, turn the power off once, then turn it on again.

From ⑫

⑬ PV

| | b o 5 |
|---|---|
| RESET | 1 |
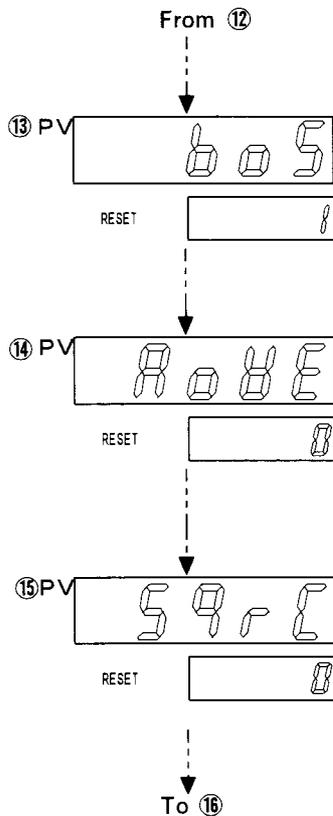
**Action selection at burnout occurrence**
[Displayed for thermocouple input]

Set the action when thermocouple burnout occurs.

● Setting range : 0 (Indefinite)
　　　　　　　　 1 (Upscale)
　　　　　　　　 2 (Downscale)

● Initial value　: 1

⑭ PV

| | A o U E |
|---|---|
| RESET | 0 |

**Action selection for abnormal PV input**

Set the output state for PV input overscale or downscale.

● Setting range : 0 (Nothing is done for control.)
　　　　　　　　 1 (Control output OFF)
　　　　　　　　 2 (Control output ON)
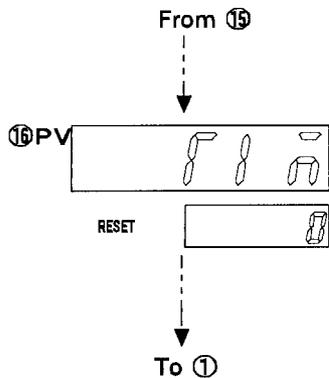
● Initial value　: 0

⑮ PV

| | 5 9 r C |
|---|---|
| RESET | 0 |

**Selection of Use/Non-use of square root extraction function**
[Displayed for voltage/current input]

Set the Use/Non-use of the square root extraction function for voltage or current input.

● Setting range : 0 (Use)　　1 (Non-use)

● Initial value　: 0

*Low-level cutoff is set in engineer setting mode. (See page 59.)

To ⑯

**From ⑮**

⑯PV

RESET

**To ①**

**Setting time unit selection**

Set the unit of segment time and time signal start/end time.

● Setting range : 0 (Hour/min.)    1 (Min./sec)
● Initial value   : 0

*To return to the reset state, press the MONI/MODE key.

- 30 -

# 3.2 Input range table

| Group | | Input type | Select | Code |
|---|---|---|---|---|
| Temperature input TC | K (ᴾ) | - 200.0 to 400.0 ℃ | 0 | K35 |
| | | 0.0 to 1300.0 ℃ | 1 | K23 |
| | | 0.0 to 800.0 ℉ | 2 | KA4 |
| | | 0.0 to 2400.0 ℉ | 3 | KB4 |
| | J (ᴶ) | - 200.0 to +400.0 ℃ | 4 | J27 |
| | | 0.0 to 1200.0 ℃ | 5 | J16 |
| | | 0.0 to 800.0 ℉ | 6 | JB6 |
| | | 0.0 to 2100.0 ℉ | 7 | JB5 |
| | R (ᵣ) | 0.0 to 1700.0 ℃ | 8 | R05 |
| | | 0.0 to 3200.0 ℉ | 9 | RA5 |
| | S (ᔆ) | 0.0 to 1700.0 ℃ | 10 | S04 |
| | | 0.0 to 3200.0 ℉ | 11 | SA5 |
| | B (ᵇ) *1 | 0.0 to 1800.0 ℃ | 12 | B04 |
| | | 0.0 to 3200.0 ℉ | 13 | BA9 |
| | E (ᴱ) | - 200.0 to + 200.0 ℃ | 14 | E17 |
| | | 0.0 to 1000.0 ℃ | 15 | E08 |
| | | 0.0 to 1800.0 ℉ | 16 | EA6 |
| | T (ᵀ) | - 200.0 to + 200.0 ℃ | 17 | T13 |
| | | - 200.0 to +400.0 ℃ | 18 | T19 |
| | | 0.0 to 400.0 ℃ | 19 | T06 |
| | | - 300.0 to +700.0 ℉ | 20 | TB7 |
| | | 0.0 to 700.0 ℉ | 21 | TA7 |
| | N (ᴺ) *1 | 0.0 to 1300.0 ℃ | 22 | N05 |
| | | 0.0 to 2300.0 ℉ | 23 | NA4 |
| | PLⅡ (ᴾ) *1 | 0.0 to 1300.0 ℃ | 24 | A05 |
| | | 0.0 to 2300.0 ℉ | 25 | AA5 |

| Group | | Input type | Select | Code |
|---|---|---|---|---|
| Temperature input TC | W5Re/W26Re (ᵤ) | 0.0 to 1200.0 ℃ | 26 | W06 |
| | | 0.0 to 2300.0 ℃ | 27 | W04 |
| | | 0.0 to 2200.0 ℉ | 28 | WA6 |
| | | 0.0 to 4200.0 ℉ | 29 | WA8 |
| | U (ᵤ) | 0.0 to 600.0 ℃ | 30 | U04 |
| | | 0.0 to 1100.0 ℉ | 31 | UB1 |
| | L (ᴸ) | 0.0 to 900.0 ℃ | 32 | L04 |
| | | 0.0 to 1600.0 ℉ | 33 | LA6 |
| | PN40 %Rh - PN20 %Rh (ᴾᵣ) *1 | 0.0 to 1800.0 ℃ | 34 | F01 |
| | | 0.0 to 3200.0 ℉ | 35 | FA1 |

*1 The following temperature ranges are out of the accuracy guarantee.

B and PN40%Rh - PN20%Rh types : 0.0 to 400.0℃, 0.0 to 752.0℉
N, PLⅡ, and W5Re/W26Re types : 0.0 to 32.0℉

- 31 -

| Group | | Input type | | Select | Code |
|---|---|---|---|---|---|
| Temp. input | RTD | Pt100 Ω | − 200.0 to    200.0 ℃ | 36 | D21 |
| | | | − 200.0 to    600.0 ℃ | 37 | D25 |
| | | | − 300.0 to   1200.0 ℉ | 38 | DB8 |
| | | JPt100 Ω  *1 | − 200.0 to    200.0 ℃ | 39 | P21 |
| | | | − 200.0 to + 600.0 ℃ | 40 | P26 |
| | | | − 300.0 to +1100.0 ℉ | 41 | PC3 |
| Voltage input | *2 | mV, V (H) | 0    to     10 mV DC | 42 | 101 |
| | Voltage (Low) | | 0    to    100 mV DC | 43 | 201 |
| | | | − 100   to + 100 mV DC | 44 | 901 |
| | | | 0    to      1 V DC | 45 | 301 |
| | | | − 1    to    +1 V DC | 46 | 902 |
| | | | 0    to      5 V DC | 47 | 401 |
| | | | − 5    to    +5 V DC | 48 | 903 |
| | | | 1    to      5 V DC | 49 | 601 |
| | Voltage (High)  *3 | V (H) | 0    to     10 V DC | 50 | 501 |
| | | | − 10   to    +10 V DC | 51 | 904 |
| | *2*3 Current input | mA (I ) | 0    to     20 mA DC | 52 | 701 |
| | | | 4    to     20 mA DC | 53 | 801 |

*1 500.0 to 600.0 °C/932.0 to 1100.0 ℉: Accuracy is not guaranteed.

*2 Scaling can be made between −19999 and +32000 digits.

*3 When voltage (high) or current input is used,
the selection pin insertion position in this instrument
must be changed.

## ●Selection pin position changing method ⚠

Always pull out the internal circuit board after turning off
the power. When changing the pin position, hold the pin
using tweezers.



TC, RTD, or Voltage (low)
inputs

Current input



Voltage (high) input
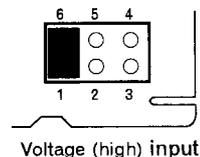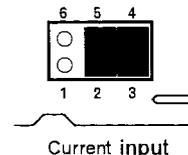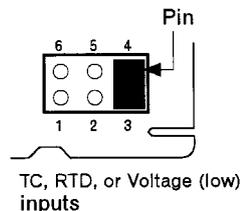
# 4. PROGRAM SETTING MODE

In program setting mode, the program pattern necessary for program operation is set.
Change the numeric value by pressing the UP/DOWN keys, and register it and call up the next item by pressing the SET key.

## 4.1 Display sequence



(Pattern 1)                    (Pattern 16)
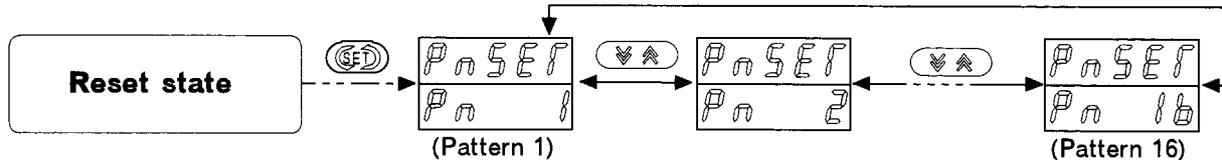
### Program pattern setting items

| |
|---|
| · Segment (level, time) |
| · Program end |
| · Number of repeat execution times |
| · Pattern linking |
| · Wait zone (For rise) |
| · Wait zone (For fall) |
| · Pattern end output time |

· Each program pattern consists of the setting items on the left and up to 16 patterns can be set.

· Up to 16 segments/program pattern can be set.

## 4.2 Fundamentals of program pattern setting

Setting items and procedures relating to program pattern setting are described in the following.
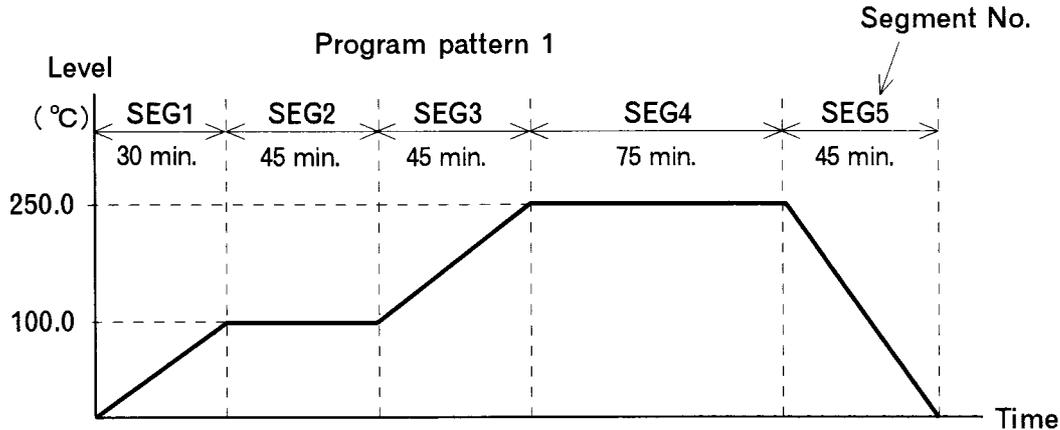
## ■ Setting items

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| $P \cap 5 E \Gamma$<br>PnSET | Pattern No. | Pn1 to Pn16 | Select the pattern No. to which the program pattern needs to be set. | |
| $L E H$ □<br>LEV □ | Segment level | Same as the input range | Set the desired segment value (level) and time.<br><br>*The relevant segment No. is displayed in □ . ( $I$ to $I6$ ) | 0.0 |
| $\Gamma I \bar{\cap}$ □<br>TIM □ | Segment time | 0 hour: 00 min. to<br>        99 hour: 59 min.<br>or<br>0 min.: 00 sec to<br>        99 min.: 59 sec | | 0.00 |
| $P E \cap d$<br>PEnd | Program end | 1 to 16 | The end program pattern segment is registered. | |

## ■ Setting procedure

The setting procedure from "Setting pattern selection" to "Program end registration" is described in the following.

### Setting example



Program pattern 1

Segment No.

Level
(°C)

| SEG1 | SEG2 | SEG3 | SEG4 | SEG5 |
| 30 min. | 45 min. | 45 min. | 75 min. | 45 min. |

250.0

100.0

Time

---

⚠ **Key operational cautions**

· Even if the displayed value is changed, it is not registered.  To register it, press the SET key.
· If the key is not operated for more than 60 sec, the present screen returns to the PV/SV display
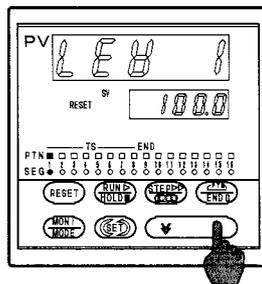  screen.

## ① Setting pattern selection
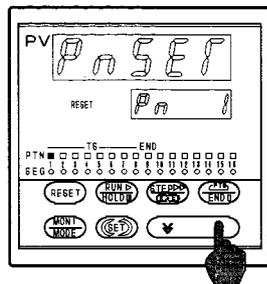


Press the UP/DOWN keys to
select the desired pattern.
The PTN lamp corresponding
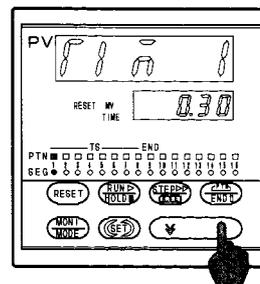to the selected pattern No.
flashes.

Setting example : $P_n$   1

## ② Level setting



Press the UP/DOWN keys to
set the desired level.
The SEG lamp corresponding
to the set level flashes.

Setting example :
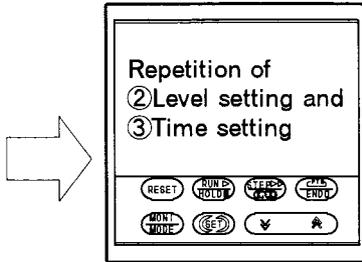  1 0 0.0 (100.0°C) [Segment 1]

## ③ Time setting



Press the UP/DOWN keys to
set the segment time.
The SEG lamp corresponding
to the set segment time flashes.

Setting example :
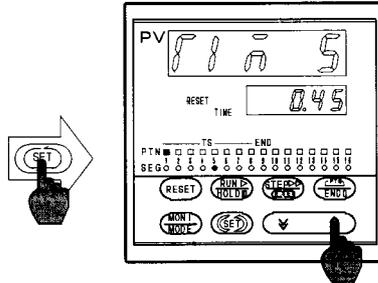  0.3 0 (30 min.) [Segment 1]

---

## NOTES

● For pattern No. selection, the pattern No. displayed first is the execution pattern No.

● The set level does not change even if the input range or setting limit is changed. However, if it is out
of the range, an error is displayed during operation.

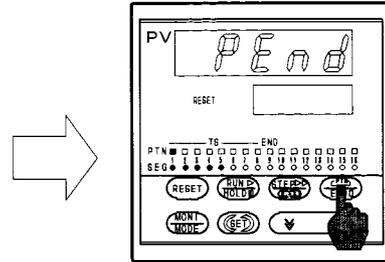● The unit of segment time can be changed in SETUP setting mode.

### ④ Setting repetition

Repetition of
②Level setting and
③Time setting

(RESET) (RUN/HOLD) (STEP/CYC) (CYC/END) (MONI/MODE) (SET) (∨) (∧)

### ⑤ Final segment time setting

PV ⌐¹ ⌐ 5

RESET
TIME    0.45

—————TS————END
PTN ■ □□□□□□□□□□□□□□□□
SEG ○ ○ ○ ○ ◇ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

(RESET) (RUN/HOLD) (STEP/CYC) (CYC/END) (MONI/MODE) (SET) (∨)

Press the UP/DOWN keys to
set the final segment time.
The SEG lamp corresponding
to the set segment time flashes.

Setting example :
0.45 (45 min.) [Segment 5]

### ⑥ Program end registration

PV ⌐PEnd

RESET

—————TS————END
PTN □ □□□□□□□□□□□□□□□
SEG ◆ ◆ ◆ ◆ ◆ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

(RESET) (RUN/HOLD) (STEP/CYC) (CYC/END) (MONI/MODE) (SET) (∨)

Press the END key to register
the program end, then all of
the SEG lamps corresponding
to the set segments light.

---

## NOTES

● If the program end is registered after the level is set, the previous segment immediately before the present segment is assumed to be the program end.

● For program end release, display "PEnd" , then press the END key.

● If up to 16 segments are set, no program end item is displayed.

● The program pattern ends at the 16th segment if program end registration or pattern link is not specified.

## 4.3 Program pattern repetition

When operation of the same program pattern needs to be repeated several times, the number of repeat times can be set.

## ■ Setting items

This setting item is displayed after the segment is set or the program end is registered.

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|--------------------------------|
| ┌ 𝖯 ┌ 5<br><br>rPTS | No. of repeat execution times | 1 to 1000 times<br><br>* | Set the number of repeat execution times. | 1 |

* For a setting of more than 1000 times: Program executes an infinite number of times.



Level | Start level during repeat | Program pattern

Pattern end
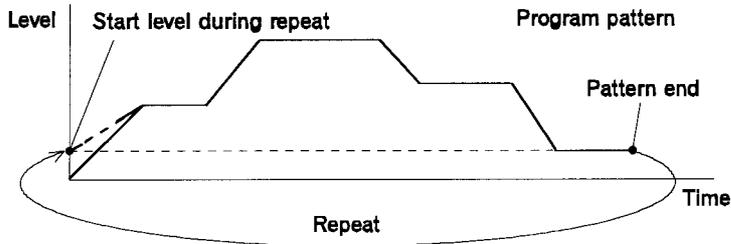
Time

Repeat

## NOTE

● When the pattern is repeated, the pattern end output signal is output for about 0.5 sec regardless of the pattern end output time setting. (See page 47.)
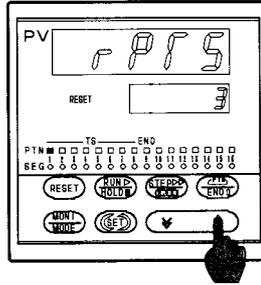
# ■ Setting procedure

Example: When the program pattern corresponding to pattern No. 1 needs to be repeated 3 times
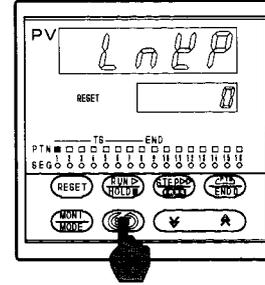
## ① Setting screen calling up
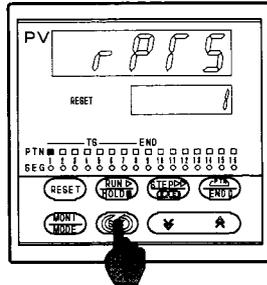


First, select pattern No.1, then press the SET key several times to show the number of repeat execution times display.

## ② Setting of No. of repeat execution times



Press the UP/DOWN keys to set the number of repeat execution times to "3".

## ③ Registration of the set contents



Press the SET key to register the value thus set. The contents of the display change to the next setting item.

---

## NOTE

● If program pattern linking is specified, this is treated as a program pattern including the program pattern which is the destination of linking designation. In addition, when the number of repeat execution times is set to the program pattern which is the destination of link designation, this setting is disabled.

## 4.4 Program pattern linking

One program pattern consists of up to 16 segments.
A program pattern consisting of more than 16 segments can be created by linking these program patterns.

## ■ Setting items

This setting item is displayed after the number of repeat execution times (rPTS).

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|---------------------------------|
| L n ʁ P  LnKP | Link pattern No. | 0 to 16  0 : No pattern linking | Sets the program pattern Nos. to be linked. | 0 |

Pattern 1 ... Pattern 2    If linked ➔    Pattern 1 ... Pattern 2

Program end          Program end
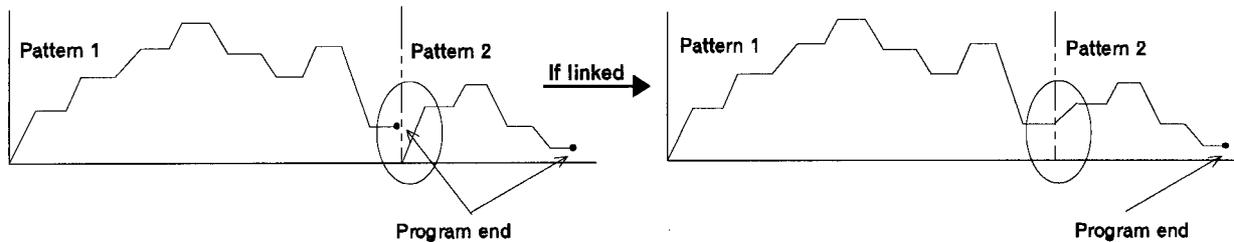
# ■ Setting procedure

Example: When pattern No.3 is specified as the linking destination of pattern No.1

### ① Setting screen calling up
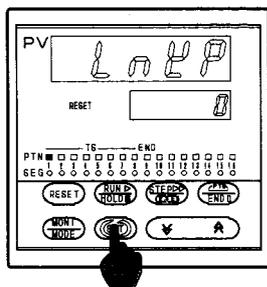


First, select pattern No.1, then press the SET key several times to show the link pattern No. display.

### ② Designation of linking destination
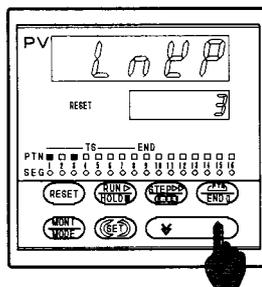


Press the UP/DOWN keys to set pattern No.3 to be linked. The PTN lamp corresponding to the set pattern No. flashes.

### ③ Registration of the set contents
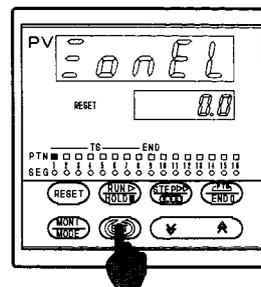


Press the SET key to register the value thus set. The contents of the display change to the next setting item.

---

## NOTE

● The same program patterns can also be linked. In this case, the program pattern becomes endless.

## 4.5 Wait zone setting (Wait function)

During program control, there may be a case where the measured–value (PV) cannot follow program execution. In this case, by setting a wait zone, the program stops executing every time the segment ends and waits to move to the next segment until the measured–value (PV) is within the wait zone range. During the wait state, the segment progress lamp flashes.

## ■ Setting items

This setting item is displayed after link pattern No. (LnKP).

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|----------------------------------|
| Ξσⁿ E L<br><br>WonEL | Wait zone<br>(For fall) | Temperature input:<br>0.0 to 10.0 ℃ [℉]<br><br>Voltage/current inputs:<br>0.0 to 10.0 % of span | Set the deviation value on the plus side for the level.<br><br>If the deviation value is set to 0.0, the wait zone (for fall) is turned off. | 0.0 |
| Ξσⁿ E H<br><br>WonEH | Wait zone<br>(For rise) | Temperature input:<br>− 10.0 to 0.0 ℃ [℉]<br><br>Voltage/current inputs:<br>− 10.0 to 0.0 % of span | Set the deviation value on the minus side for the level.<br><br>If the deviation value is set to 0.0, the wait zone (for rise) is turned off. | 0.0 |

* If "0.0" is set for both the fall and rise wait zones, the wait function is not activated.

## Outline of wait zone



Level

Measured−value (PV)

Wait zone (for rise)

△Tu or △Td:
Program execution waits for this time.

Level
(set−value)

△Tu

Wait zone
(for fall)

△Td

Time

Segment No. 1 ──────── Segment No. 2 ──────── Segment No. 3

## ■ Setting procedure

Example: When the wait zone (for fall) corresponding to pattern No.1 is set to "3.0 °C "

### ① Setting screen calling up



First, select pattern No.1, then press the SET key several times to show the wait zone display.

### ② Setting



Press the UP/DOWN keys to set the desired value "3.0".

### ③ Registration of the set contents



Press the SET key to register the value thus set. The contents of the display change to the next setting item.

## NOTES

● Pressing the STEP key in the wait state activates the step function.   Move the segment of the program that is waiting to the next segment.

● The value set for each program pattern is applied to the wait zone of the linked program patterns.

## 4.6 Pattern end output time setting

After the program ends, the pattern end output signal (open collector output) is output.  The ON time of this pattern end output signal can be set.
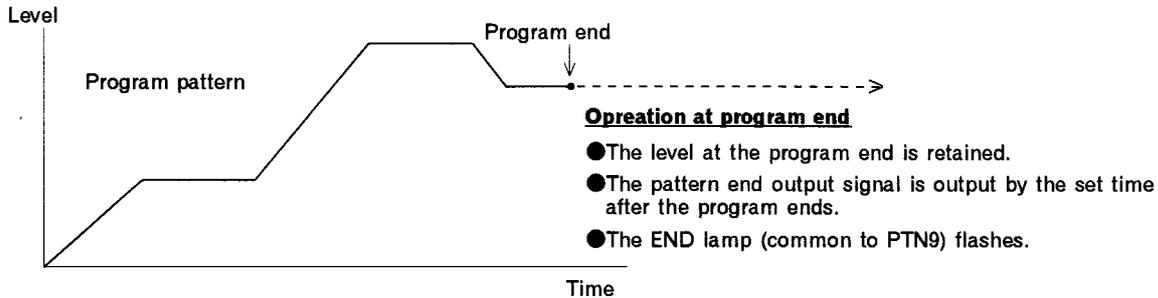
## ■ Setting items

This setting item is displayed after wait zone rise (WonEH).

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|---------------------------------|
| E Γ  ET | Pattern end output time | 0 min.: 00 sec to 99 min.: 59 sec (Time unit: Fixed) | Set the ON time of the pattern end output signal. | 0.00 |

* If the time is set to "0 min.: 00 sec", the pattern end output signal remains ON until the instrument is reset or the power is turned off.



Level

Program end

Program pattern

Time

**Opreation at program end**
- ●The level at the program end is retained.
- ●The pattern end output signal is output by the set time after the program ends.
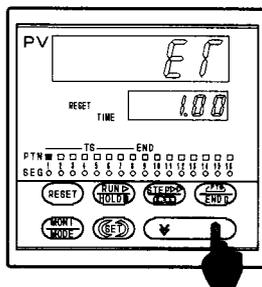- ●The END lamp (common to PTN9) flashes.

# ■ Setting procedure

Example: When the pattern end output time of pattern No.1 is set to "1 min."

## ① Setting screen calling up
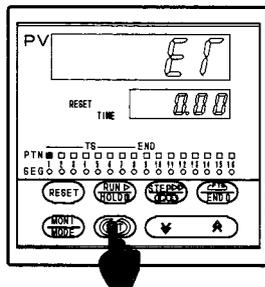


First, select pattern No.1, then press the SET key several times to show the pattern end output time display.

## ② Setting



Press the UP/DOWN keys to set the desired time to "1.00".

## ③ Registration of the set contents
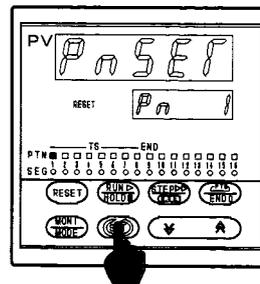


Press the SET key to register the set time. The display returns to the pattern No. display.

---

## NOTES

● Pressing the RESET key turns off the pattern end output signal.

● When pattern linking is specified, the pattern end output time setting of the execution pattern (first pattern) is output as the pattern end output signal.

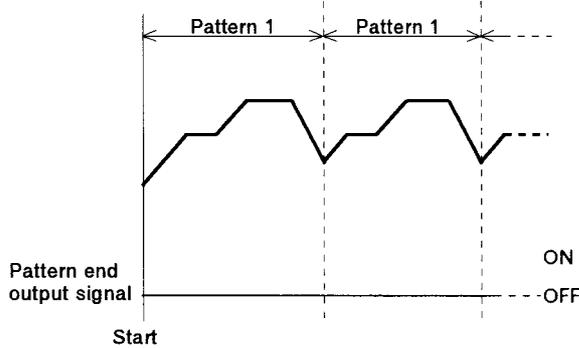(Continued from the previous page.)

● The pattern end output signal is output for about 0.5 sec during pattern repeat.   When the linking or repeat of the same program pattern is specified, the pattern end output signal becomes as follows.

**For linking designation**

Pattern 1    Pattern 1  - - -

Pattern end
output signal

ON

- - -OFF

Start
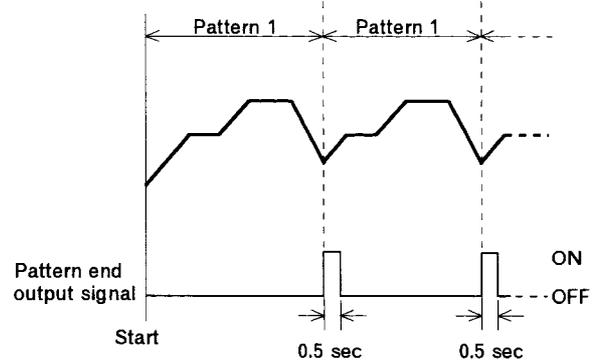
*When the linking of the same pattern is specified,
no pattern end output signal is output.

**For repeat designation**

Pattern 1    Pattern 1  - - -

Pattern end
output signal

ON

- - -OFF

Start

0.5 sec    0.5 sec

● No pattern end output signal is output in fixed set-point control or manual mode.

# 5. TIME SIGNAL SETTING MODE

The time signal which can be output as the program proceeds is set in time signal setting mode.
Change the numeric value by pressing the UP/DOWN keys, then register it and call up the next item by
pressing the SET key.

## 5.1 Display sequence



**Reset state**

\*\* For more than 2 sec.

SETUP setting mode
Program setting mode
Engineer setting mode

(Pattern 1)    (Pattern 16)
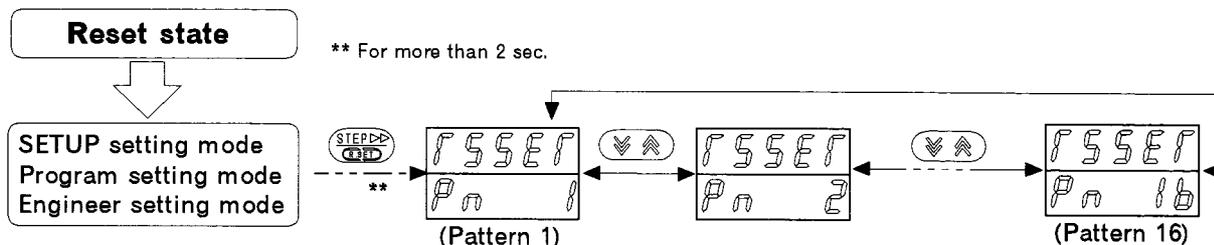
### Time signal setting items

- · Time signal output No.
- · Start segment
- · ON time
- · End segment
- · OFF time

· The setting items on the left correspond to those for
  one time signal output.
  Up to 16 time signals per program pattern can be set.

· The output type is the open collector output with 4 or
  8 output points. (8 points: Option)

## 5.2 Time signal setting

## ■ Setting items

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| ┌ 5 5 ℇ ┌ <br><br>TSSET | Pattern No. | Pn1 to Pn16 | Select any pattern No. to which the time signal needs to be set. | |
| □□-┌ 5<br><br>□□ –TS | Time signal output No. | 0 to 4 or 0 to 8 (Option) | Set the time signal output No.<br><br>(0: Time signal output OFF) | 0 |
| □□-ㄷ 5<br><br>□□ –cS | Start segment | 1 to 16 | Set the segment No. whose time signal is turned on. | 1 |
| □□-ㅁ ㄇ<br><br>□□ –on | Time signal ON time | 0:00 to 99:59 | Set the time until the time signal is turned on.<br><br>Time unit:<br>[*hour: **min.] or [**min.: **sec] | 0.00 |

* Sections □□ : Indicate time signal storage data No. ( ┃ to ┃ 6 )

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| □□ - ⅂ 5 <br><br> □□ −⅂ S | End segment | 1 to 16 | Set the segment No. whose time signal is turned off. | 1 |
| □□ - �□ F <br><br> □□ −oF | Time signal OFF time | 0:00 to 99:59 | Set the time until the time signal is turned off. <br><br> Time unit: <br> [*hour: **min.] or [**min.: **sec] | 0.00 |

* Sections □□ : Indicate time signal storage data No. ( *□ 1* to *1 6* )

---

## NOTES

● The time signal output state is held in the wait or hold state.  For example, if the instrument is set to the hold state with the time signal turned on, the time signal ON state is held.

● The time signal output is turned off in fixed set−point control or manual control.  If the instrument is returned to program control, the time signal returns to the ON state.

● The time signal output is turned off during auto−tuning execution.

● When the time signal is not used, set the time signal output No. to "0".

● Set the time signal segment and time as follows.

> **"Start segment · Time signal ON time" < "End segment · Time signal OFF time"**

If the "Start segment · Time signal ON time" setting exceeds the "End segment · Time signal OFF time" , the time signal output is not turned on.

● If the time signal ON time and the time signal OFF time are set larger than the segment time, the time signal ON time and the time signal OFF time become the same time as the segment time.
See the following diagram.



**Example**
Start segment : 1
Time signal ON time : 40 min.
End segment   : 2
Time signal OFF time : 50 min.
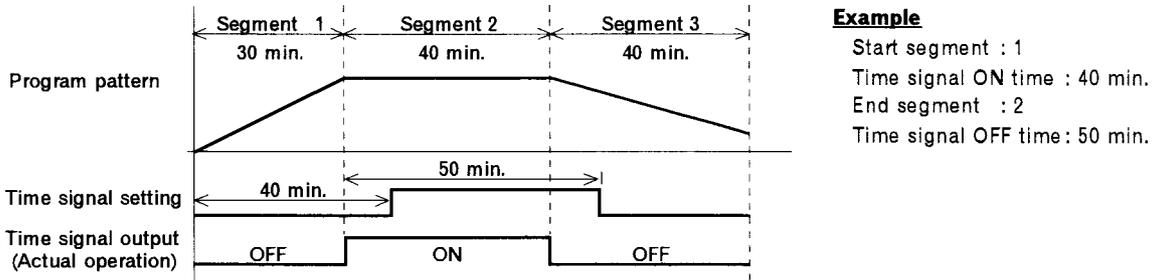
● The time signal output is not turned on at the start for about 0.5 sec during any of the following operations.
  · Program start
  · Program repeat
  · Pattern linking

# ■ Setting procedure

The time signal setting procedure is described using the following diagram as an example.

## Setting example



|  | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
|  | 30 min. | 40 min. | 40 min. |

Program pattern 2

Time signal 1 (TS1)

OFF | ON | OFF

20 min.

15 min.

## ① Setting pattern selection



Press the UP/DOWN keys to select the desired pattern. The PTN lamp corresponding to the selected pattern No. flashes.

Setting example : $P_n$　$2$

---
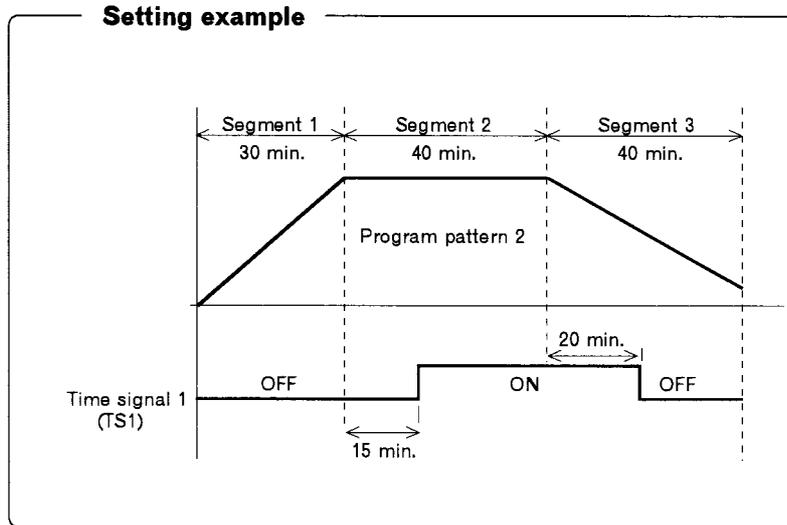
## NOTE

● The pattern No. displayed first during pattern No. selection corresponds to the pattern No. at which program control is performed.
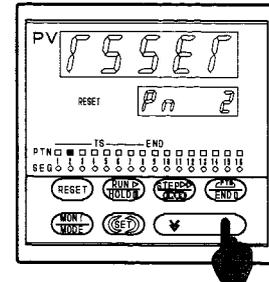
## ② Time signal output No. setting
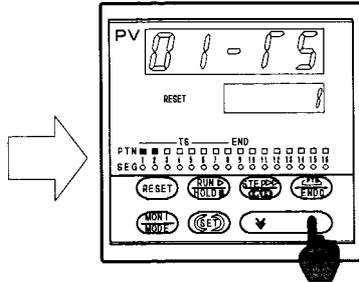


Press the UP/DOWN keys to set the desired time signal (TS) output No.
The TS lamp corresponding to the set output No. flashes.

Setting example : 𝟣 (TS No.1)

## ③ Start segment setting
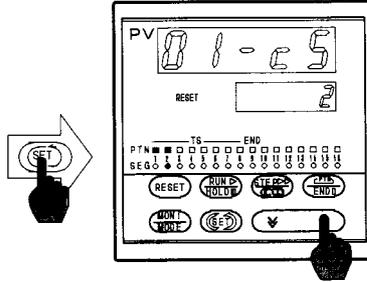


Press the UP/DOWN keys to set the desired time signal start segment.
The SEG lamp corresponding to the set start segment flashes.

Setting example :
𝟤 (Segment 2)

## ④ Time signal ON time setting
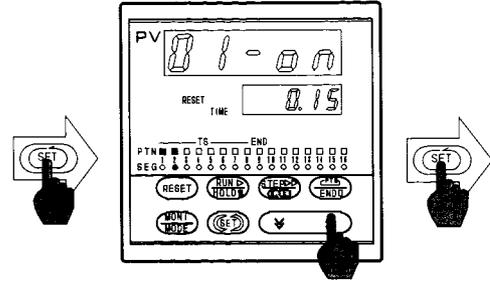


Press the UP/DOWN keys to set the desired start segment ON time.

Setting example :
𝟢. 𝟣𝟧 (15 min.)

**NOTE**

● The unit of time signal ON time and time signal OFF time can be changed in SETUP mode.

## ⑤ End segment setting
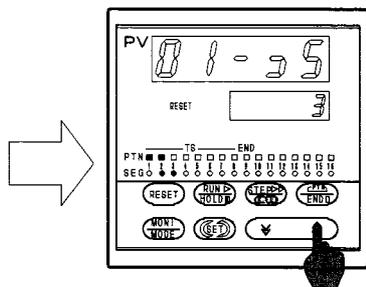


Press the UP/DOWN keys to
set the desired end segment.
The SEG lamp corresponding
to the set end segment flashes.

Setting example:
$\exists$ (Segment 3)

## ⑥ Time signal OFF time setting
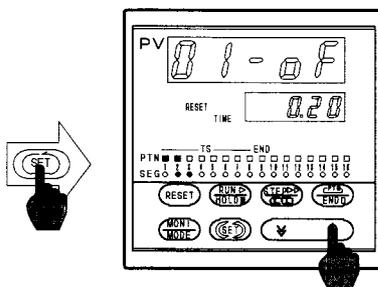


Press the UP/DOWN keys to
set the desired end segment
OFF time.

Setting example:
$0.20$ (20 min.)

## ⑦ Registration of the set contents
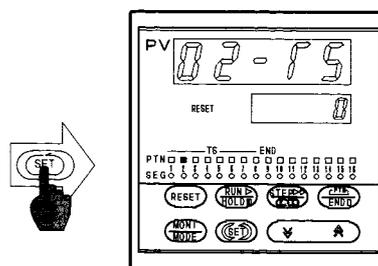


Press the SET key to register
the end segment OFF time.
The display changes to the
setting items corresponding
to time signal output No. 2.

---

**NOTE**

● Time signal output No. 16 ( $16 - \Gamma 5$ ) is displayed, then this display changes to the pattern selection
( $\Gamma 5 5 E \Gamma$ ) display.

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# 6. ENGINEER SETTING MODE

In engineer setting mode, control parameters, alarms and various optional functions can be set.

## 6.1 Display sequence

( Mode other than engineer setting mode )

Press the SET key for 2 sec or more.

To PG60

| SV | PV | ALM1 | ALM2 | PID1 | PID2 | PID3 |
|---|---|---|---|---|---|---|
| PG 10 | PG 20 | PG 30 | PG 31 | PG 40 | PG 41 | PG 42 |
| Sb | Pb | ALn1 | ALn2 | Pid 1 | Pid 2 | Pid 3 |

To PG43

| P.57 | P.57 | P.62 | P.64 | P.66 | P.66 | P.66 |
|---|---|---|---|---|---|---|
| F-Sb | Pb | AL1 | AL2 | P1 | P2 | P3 |
| | Pr | AS1 | AS2 | I1 | I2 | I3 |
| | Pidb1 | AH1 | AH2 | d1 | d2 | d3 |
| | Pidb2 | ALr1 | ALr2 | Ar1 | Ar2 | Ar3 |
| | Pidb3 | EnC1 | EnC2 | FUΞΞ1 | FUΞΞ2 | FUΞΞ3 |
| | dF1 | | | | | |
| | L-CUr | | | | | |

| To PG10 | To PG20 | To PG30 | To PG31 | To PG40 | To PG41 | To PG42 |

**NOTE** There are set items which are not displayed depending on the specification.

## Description of key operations

- Parameter group (PG) selection            :Press the UP/DOWN keys. ($\vee\wedge$)      [ ◄──────► ]
- Parameter setting item selection          :Press the SET key. ((SET))                    [ ─ ─ ─► ]
- Change of the set contents
  (Numeric−value increment or decrement) :Press the UP/DOWN keys. ($\vee\wedge$)
- Registration of the set contents          :Press the SET key. ((SET))

To PG10 ◄──────────────────────────────────────────────────────────────

To PG42 ◄──►

| PID4 | OUT1 | OUT2 | OUT3 | OUT4 | Communication function |
|---|---|---|---|---|---|
| PG 43 | PG 50 | PG 51 | PG 52 | PG 53 | PG 60 |
| PId 4 | oUr 1 | oUr 2 | oUr 3 | oUr 4 | SCI |

P.66 | P.68 | P.69 | P.69 | P.70 | P.73

| P 4 | CY 1 | o52 | o53 | o54 | bPS |
| 1 4 | oLH | SUb2 | SUb3 | SUb4 | bIr |
| d 4 | oLL | | | Ao | |
| Ar 4 | oS | | | AHS | |
| FUZZ4 | | | | ALS | |

To PG43 | To PG50 | To PG51 | To PG52 | To PG53 | To PG60
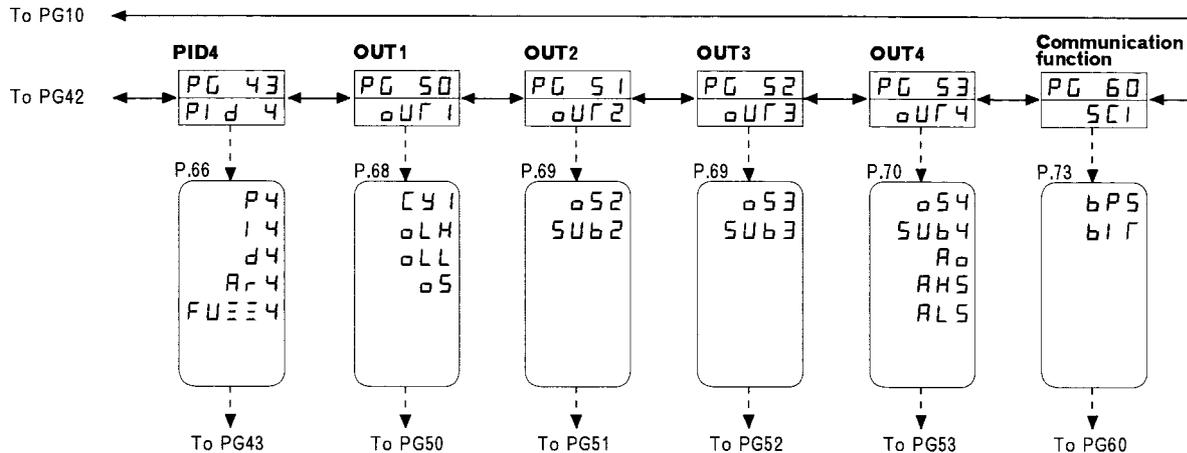
**NOTE**  PG51 to PG60: Optional function parameter group. If the optional function is installed, the set items can be displayed.

## 6.2 Description of parameter groups (PG10 to PG60)

### PG10 : SV setting section

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P G   I O<br><br>PG 10 | Parameter group 10 | | The first characters of parameter group (PG10).They are also displayed first when the instrument is set to engineer setting mode. | |
| F - 5 H<br>F−SV | SV in fixed set−point control   * | Scale low−limit (SCL)<br>to<br>Scale high−limit (SCH) | Set the set−value (SV) in fixed set−point control. | 0.0 |

*The set−value (SV) in fixed set−point control can be set even during fixed set−point control execution. (See page 93.)

### PG20 : PV setting section

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P G   2 O<br>PG 20 | Parameter group 20 | | The first characters of parameter group (PG20). | |

(Continued from the previous page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P b<br>Pb | PV bias | Temperature input:<br>−10.0 to +10.0 °C [°F]<br><br>Voltage/current inputs:<br>−10.0 to +10.0 % | Sensor correction is made by adding bias value to measured−value (PV).<br><br>See *2. | 0.0 |
| P r<br>Pr | PV ratio | 0.001 to 9.999 | Sensor correction is made by multiplying ratio value to measured−value (PV).<br><br>See *2. | 1.000 |
| PI dH I<br>PIDV1 | Level PID setting 1 | Input range low−limit to PID level−2 set−value | Set the level which becomes the boundary point of PID group 1 and PID group 2.<br><br>See *1. | Range high−limit |
| PI dH 2<br>PIDV2 | Level PID setting 2 | PID level−1 set−value to PID level−3 set−value | Set the level which becomes the boundary point of PID group 2 and PID group 3.<br><br>See *1. | Range high−limit |

(Continued on the next page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| $P I \ d H \ \exists$  PIDV3 | Level PID setting 3 | PID level-2 set-value to Input range high-limit | Set the level which becomes the boundary point of PID group 3 and PID group 4.  See *1. | Range high-limit |
| $d F \ I$  dF1 | Digital filter | 0 to 100 sec (0 sec : Digital filter OFF) | Set the time of the 1st-order lag filter which rejects any noise contained in the measured input. | 0 |
| $L - [ U \ \Gamma$  L-CUT | Low level cut-off point | 0.00 to 25.00 % of span | Set the low level cut-off point. Cut the small input value which varies widely as a result of square root extraction.  See *3. | 0.00 |

*1 Set the level PID boundary point as follows.

Level 1 $\leq$ Level 2 $\leq$ Level 3

(Continued from *1)

PID constants can be independently set to PID groups 1 to 4. (See page 66.)
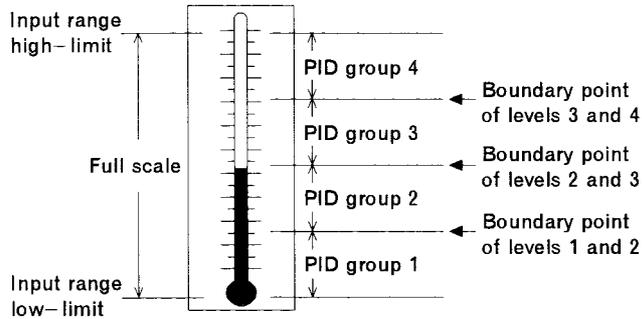


- If the same value is set to levels 1 and 2, PID group 2 cannot be used.
- If the same value is set to levels 2 and 3, PID group 3 cannot be used.
- If the same value is set to all levels 1 to 3, PID groups 2 and 3 cannot be used.

*2 PV bias and PV ratio

$$\boxed{\text{PV displayed value}} = \boxed{\text{Input value}} \times \boxed{\text{PV ratio}} + \boxed{\text{PV bias}}$$



PV bias

PV ratio

PV bias + PV ratio
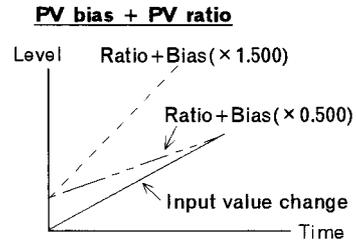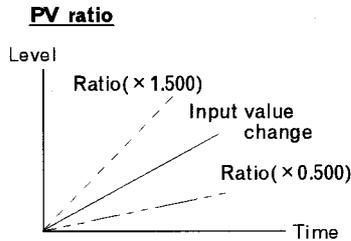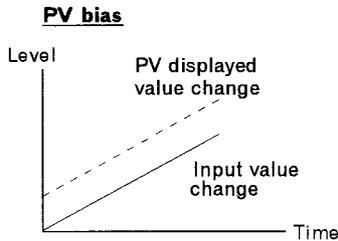
**\*3** Displayed when "Square root extraction function provided" (SETUP setting mode) is selected for the voltage/current input specification.
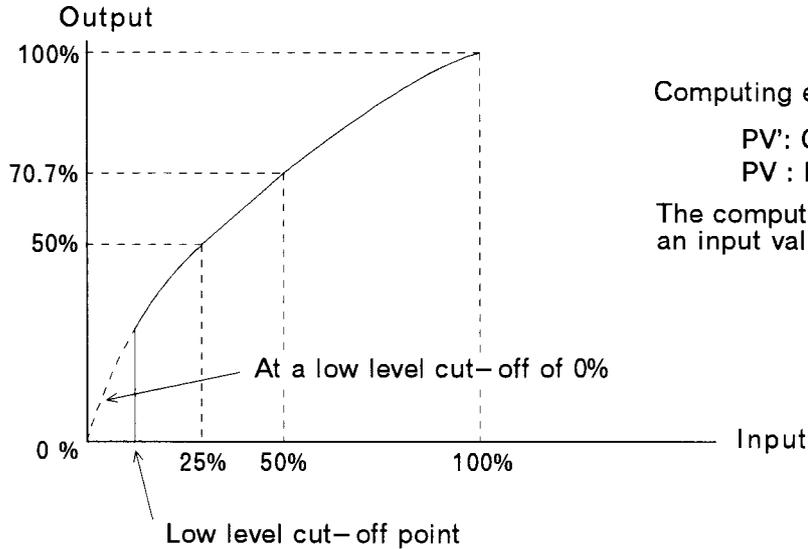


Computing equation   $PV' = \sqrt{PV}$ where,

    PV': Computation result
    PV : Input value

The computation result becomes 0 at an input value of less than 0%.

## PG30 : Alarm section 1 [ALM1]

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|---------------------------------|
| $PG\ 30$ <br> PG 30 | Parameter group 30 | | The first characters of parameter group (PG30). | |
| $AL\ 1$ <br> AL1 | First alarm set−value | **See \*A.** | Set the first alarm set−value. <br><br> **See \*1,\*2.** | 50.0 |
| $AS\ 1$ <br> AS1 | First alarm action selection | 0 to 14 <br><br> **See \*B.** | Set the first alarm action. <br><br> **See \*1,\*2.** | 5 |
| $AH\ 1$ <br> AH1 | First alarm differential gap | Temperature input: <br> 0.0 to 10.0 ℃ [℉ ] <br> Voltage/current inputs: <br> 0.0 to 10.0 % of span | Set the first alarm differential gap. <br><br> **See \*1,\*2.** | 2.0 |
| $ALT\ 1$ <br> ALT1 | First alarm timer | 0 to 600 sec <br> (0 sec : Timer OFF) | Set the time until the first alarm is turned on after the measured−value (PV) enters the first alarm area. <br> **See \*1 to \*3.** | 0 |

(Continued on the next page.)

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(Continued from the previous page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|--------------------------------|
| E ᵁ [ ¦ <br><br>EXC1 | First alarm energized/ de−energized | 0 : Energized alarm <br> 1 : De−energized alarm | Select whether the first alarm is set to an energized alarm or de− energized alarm. <br> **See \*1,\*2.** | 0 |

**\*1** Not displayed when there is no alarm.
**\*2** Not displayed when "14 (FAIL alarm)" is selected from "First alarm action selection."
**\*3** The alarm state can be released even when the timer is activated.

**\*A**    Process high alarm, process low alarm    : Within input range
       Set−value high alarm, set−value low alarm  : Within input range
       Deviation high alarm, deviation low alarm    : − span to +span or within − 19999 to +32000 digits
       Deviation high/low alarm, band alarm       : − span to +span (Absolute−value setting) or
                                                         within − 19999 to +32000 digits

**\*B**   0 : Alarm OFF                8 : Band alarm (Absolute−value setting)
      1 : Set−value high alarm      9 : Process high alarm with hold action
      2 : Set−value low alarm       10 : Process low alarm with hold action
      3 : Process high alarm         11 : Deviation high alarm with hold action
      4 : Process low alarm          12 : Deviation low alarm with hold action
      5 : Deviation high alarm      13 : Deviation high/low alarm with hold action(Absolute−value setting)
      6 : Deviation low alarm       14 : FAIL alarm
      7 : Deviation high/low alarm(Absolute−value setting)

## PG31 : Alarm section 2 [ALM2]

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P G  3 I <br><br> PG 31 | Parameter group 31 | | The first characters of parameter group (PG31). | |
| A L 2 <br><br> AL2 | Second alarm set–value | **See \*A.** | Set the second alarm set–value. <br><br> **See \*1,\*2.** | – 50.0 |
| A S 2 <br><br> AS2 | Second alarm action selection | 0 to 14 <br><br> **See \*B.** | Set the second alarm action. <br><br> **See \*1,\*2.** | 6 |
| A H 2 <br><br> AH2 | Second alarm differential gap | Temperature input: <br> 0.0 to 10.0 °C [ °F ] <br> Voltage/current inputs: <br> 0.0 to 10.0 % of span | Set the second alarm differential gap. <br><br> **See \*1,\*2.** | 2.0 |
| A L T 2 <br><br> ALT2 | Second alarm timer | 0 to 600 sec <br> (0 sec : Timer OFF) | Set the time until the second alarm is turned on after the measured–value (PV) enters the second alarm area. <br> **See \*1 to \*3.** | 0 |

(Continued from the previous page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| E Ч С � <br> EXC2 | Second alarm energized/ de–energized | 0 : Energized alarm <br> 1 : De–energized alarm | Select whether the second alarm is set to an energized alarm or de-energized alarm. <br> **See \*1,\*2.** | 0 |

\*1 Not displayed when there is no alarm.
\*2 Not displayed when "14 (FAIL alarm)" is selected from "Second alarm action selection."
\*3 The alarm state can be released even when the timer is activated.


\*A   Process high alarm, process low alarm        : Within input range
     Set–value high alarm, set–value low alarm   : Within input range
     Deviation high alarm, deviation low alarm    : − span to +span or within − 19999 to +32000 digits
     Deviation high/low alarm, band alarm         : − span to +span (Absolute–value setting) or
                                                     within − 19999 to +32000 digits


\*B   0 : Alarm OFF                            8 : Band alarm (Absolute–value setting)
     1 : Set–value high alarm                 9 : Process high alarm with hold action
     2 : Set–value low alarm                 10 : Process low alarm with hold action
     3 : Process high alarm                  11 : Deviation high alarm with hold action
     4 : Process low alarm                   12 : Deviation low alarm with hold action
     5 : Deviation high alarm                13 : Deviation high/low alarm with hold action(Absolute–value setting)
     6 : Deviation low alarm                 14 : FAIL alarm
     7 : Deviation high/low alarm(Absolute–value setting)

## PG40 to PG43 : PID setting section (PID groups 1 to 4)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|--------------------------------|
| $P\ \Box\quad 4\ \Box$<br>PG 40 | Parameter group 40 | | The first characters of parameter group (PG40). | |
| $P\quad I$<br>P1 | Proportional band 1 | Temperature input:<br>  0.0 to span °C [°F]<br><br>Voltage/current inputs:<br>  0.0 to 1000.0 % of span | Set when PI or PID control is performed.<br><br><br>See *1. | 30.0 |
| $I\quad I$<br>I1 | Integral time 1 | 0 to 3600 sec<br>(0 : Integral action OFF) | Set the time of integral action which eliminates the offset occurring in proportional control.<br>See *2. | 240 |
| $d\quad I$<br>d1 | Derivative time 1 | 0 to 3600 sec<br>(0 : Derivative action OFF) | Set the time of derivative action which prevents ripples by predicting output changes and thus improves control stability.<br>See *2. | 60 |

(Continued on the next page.)

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(Continued from the previous page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| $Ar1$<br><br>Ar1 | Anti–reset windup 1 | 1 to 100 % of proportional band | Overshooting and undershooting are restricted by the integral effect.<br><br>**See \*2,\*3.** | 100 |
| $FUZZ1$<br><br>FUZZ1 | Fuzzy function 1 ON/OFF | on: Fuzzy function ON<br>off: Fuzzy function OFF | Select fuzzy function ON/OFF.<br>Can restrict overshooting or undershooting.<br><br>**See \*2,\*4.** | on |

( This table describes the setting details of PG40.   PGs41 to 43 are the same as of PG40.   However, the numeric section of the symbol indicating PID group No. differs for each PG. )

**\*1** If the proportional band is set to "0.0", the instrument acts as ON/OFF action control.
Differential gap of ON/OFF action: $\pm$ 1 °C [ °F ] fixed

**\*2** Not displayed when the proportional band is set to "0.0".

**\*3** Effective when the fuzzy function is set to "off".

**\*4** The fuzzy function is effective only when the instrument is in fixed set–point control (FIX).

## PG50 : Output section [OUT1] <span style="float:right">(Control output setting)</span>

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P G  5 0 <br> PG 50 | Parameter group 50 | | The first characters of parameter group (PG50). | |
| [ 4 ! <br> CY1 | Proportio-ing cycle | 1 to 100 sec | Set the control output cycle. <br><br> **See \*1.** | **See \*2.** |
| o L H <br> oLH | Output limit (high limit) | −5.0 to +105.0 % <br><br> However, <br> Output limit (high−limit)> <br>     Output limit (low−limit) | Set the high limit of manipulated output value (MV). | 105.0 |
| o L L <br> oLL | Output limit (low limit) | | Set the low limit of manipulated output value (MV). | −5.0 |
| o 5 <br> oS | Direct/reverse action selection | 0 : Direct action <br> 1 : Reverse action | Selects direct or reverse control action. | 1 |

**\*1** Displayed only for relay contact output or voltage pulse output.
**\*2** Relay contact output : 20 sec    Voltage pulse output : 2 sec

## PG51 to PG53 : Output section [OUT2 to OUT4] (Optional specification)

(Auxiliary output setting)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|-------------------------------|
| P G 5 1 <br> PG 51 | Parameter group 51 | | The first characters of parameter group (PG51). | |
| o 5 2 <br> oS2 | OUT2 action selection | 0 to 7 <br><br> **See "*A" on page 72.** | Select the OUT2 output action. <br><br> **See *1.** | 2 |
| 5 U b 2 <br> SUb2 | OUT2 set–value | Within input range | Can be set when the high/low–limit SV or high/low–limit PV is selected in **OUT2** action selection. <br><br> **See *1.** | 0.0 |

**\*1** Displayed when there is the auxiliary output.

(Auxiliary output setting)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|--------|------|---------------|-------------|-------------------------------|
| P G 5 2 <br> PG 52 | Parameter group 52 | | The first characters of parameter group (PG52). | |

(Continued from the previous page.)

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| o 5 ∃ <br> oS3 | OUT3 action selection | 0 to 7 <br><br> **See "*A" on page 72.** | Select the OUT3 output action. <br><br> **See *1.** | 3 |
| 5 ∐ b ∃ <br><br> SUb3 | OUT3 set–value | Within input range | Can be set when the high/low–limit SV or high/low–limit PV is selected in OUT3 action selection. <br><br> **See *1.** | 0.0 |

**\*1** Displayed when there is the auxiliary output.

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P ⌂ 5 ∃ <br> PG 53 | Parameter group 53 | | The first characters of parameter group (PG53). | |
| o 5 Ч <br> oS4 | OUT4 action selection | 0 to 7 <br><br> **See "*A" on page 72.** | Select the OUT4 output action. <br><br> **See "*1" on page 71.** | 4 |

(Continued on the next page.)

(Continued from the previous page.)

**(Auxiliary output and analog output settings)**

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| 5 U b 4 <br><br> SUb4 | OUT4 set−value | Within input range | Can be set when the high/low−limit SV or high/low−limit PV is selected in OUT4 action selection. <br><br> **See *1.** | 0.0 |
| A o <br><br> Ao | Analog output selection | 0 to 4 <br><br> **See "*B" on page 72.** | Select the analog output type. <br><br> **See *2.** | 0 |
| A H 5 <br><br> AHS | Analog output scaling high−limit | **See "*B" on page 72.** | Set the analog output scaling high−limit. <br><br> **See *2.** | Range high−limit |
| A L 5 <br><br> ALS | Analog output scaling low−limit | **See "*B" on page 72.** | Set the analog output scaling low−limit. <br><br> **See *2.** | Range low−limit |

**\*1**  Displayed when there is no analog output, but there is the auxiliary output.

**\*2**  Displayed when there is the analog output.   (OUT4 is used for analog output.)

**\*A** Output action selection (OUT 2 to OUT4)

0 : High—limit set—value (SV) output **\*1**      4 : End signal output
1 : Low—limit set—value (SV) output **\*1**      5 : Soak state signal output
2 : High—limit measured—value (PV) output **\*1,\*2**   6 : Hold state signal output
3 : Low—limit measured—value (PV) output **\*1,\*2**   7 : Run state signal output

**\*1** The SV and PV outputs are turned off in the reset state, or manual mode in the reset state.
The SV and PV outputs also are output even in the program end state.
**\*2** Differential gap: 2.0 °C [°F] or 2.0% of span (Fixed)

**\*B** Analog output specification selection and setting range of analog output scaling high/low—limit

| Analog output type | | Setting range **\*\*** | Remarks |
|---|---|---|---|
| **Set value** | **Details** | | |
| 0 | Measured—value output (PV) | Within input range | Scaling is possible between −19999 and +32000 digits. |
| 1 | Deviation value output (DEV) | ± input span | |
| 2 | Set—value output (SV) | Within input range | |
| 3 | Manipulated output (MV) | 0.0 to 100.0 % | Scaling cannot be made. |
| 4 | Segment time percentage | ALS : 0.0 %<br>AHS : 100.0 % | |

**\*\*** Analog output scaling low—limit (ALS) < Analog output scaling high—limit (AHS)

## PG60 : Communication section (Optional specification)

**CAUTION** When the set contents are changed, turn the power off once then turn it on again.

| Symbol | Name | Setting range | Description | Initial value prior to shipment |
|---|---|---|---|---|
| P �6 �60 / PG 60 | Parameter group 60 | | The first characters of parameter group (PG60). | |
| � P 5 / bPS | Communi-cation speed | 0 : 2400 bps   3 : 19200 bps<br>1 : 4800 bps<br>2 : 9600 bps | Select communication speed.<br><br>See *1. | 3 |
| � I ᒋ / bIT | Communi-cation data bit config-uration | See *A. | Select data bit configuration during communication.<br><br>See *1. | 0 |

**\*1** Displayed when there is communication function.

**\*A**

| Setting | Data bit [bit] | Stop bit [bit] | Parity bit |
|---|---|---|---|
| 0 | 8 | 1 | None |
| 1 | 8 | 2 | None |
| 2 | 7 | 1 | Even |
| 3 | 7 | 2 | Even |
| 4 | 7 | 1 | Odd |
| 5 | 7 | 2 | Odd |

# MEMO

# OPERATION & MAINTENANCE

This chapter describes instrument operation, auto−tuning execution, display at error occurrence and rubber packing replacement.

**Operation**
- ● When necessary to perform program control operation. (pages 82, 87)
- ● When necessary to change to fixed set−point control operation. (page 92)
- ● When necessary to change to manual control operation. (page 94)
- ● When necessary to temporarily stop program control. (page 84)
- ● When necessary to proceed to the next segment. (page 86)
- ● When necessary to execute the auto−tuning function. (page 96)
- ● When necessary to select the setting key lock. (page 81)
- ● When necessary to operate the instrument by external contact input. (page 87)
- ● When necessary to select the pattern No. by external contact input. Option (page 89)

**Monitor**
- ● When necessary to monitor the remaining time of the segment. (page 78)
- ● When necessary to monitor the number of program repeat execution times. (page 79)
- ● When necessary to monitor the manipulated output (MV) in manual mode. (page 79)

**Error**
- ● Input error occurred. (page 99)
- ● The error No. was displayed. (page 100)

**Maintenance**
- ● When necessary to replace the rubber packing due to deterioration. (page 101)

# 1. BEFORE OPERATION

## 1.1 Checking before operation

Check the following items before operation to ensure safe operation of the instrument.

① Check that the instrument is not mounted in any environment described in "2.1 Cautions for mounting" of Chapter: PREPARATION. (page 6)

② Check that the power supply voltage meets the specification.

③ Check that there is no abnormality in the wiring section.
   - See "2.3 Mounting procedure" in Chapter: PREPARATION. (page 8)
   - See "3. WIRING" in Chapter: PREPARATION. (page 9)

④ Check items after power-ON.
   - Check that the program is already set.
     → See "4. PROGRAM SETTING MODE" in Chapter: SETTING. (page 33)
   - Check that each necessary parameter item is set.
     → See in Chapter: SETTING. (page 13)

## 1.2 Operation mode type and operation monitor

### ( 1 ) Operation mode selection

This instrument has the following four main operation modes:

#### ① Reset mode (Reset state)

- Outputs the control output in reset mode.
- The alarm output is turned off.
- The auxiliary output (option) is turned off.
- When set–value output, deviation value output, or segment time percentage is selected in analog output (option) selection, the analog output is set to its low–limit value in reset mode.

#### ② Program control mode (RUN state)

Program pattern control set in "4. PROGRAM SETTING MODE" is performed. (See page 33.)

#### ③ Fixed set–point control mode (FIX)

Fixed set–point control is performed. The set–value (SV) in fixed set–point control is set in "6. ENGINEER SETTING MODE". (See page 55.)

#### ④ Manual mode (MAN)

Control is manually performed. The manipulated output (MV) in manual mode can be operated on the PV/MV display. (See "2.3 Operation in manual mode" on page 94.)

## ( 2 ) Operation monitor display

The operation monitor display can be used to check the state of program control, fixed set-point control or manual mode operation. The types of monitored items are described in the following.
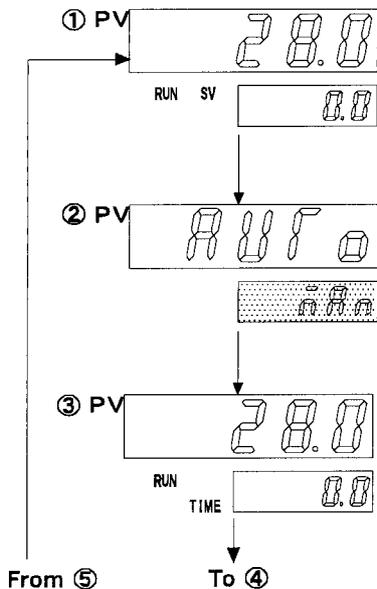
⟶ :Press the MONI/MODE key.

**PV/SV (PV/MV) display**

The measured-value (PV) and the set-value (SV) are displayed.
In addition, the set-value (SV) in fixed set-point control mode or the manipulated output (MV) in manual mode can be changed by pressing the UP/DOWN keys. (When the set-value (SV) is changed, the changed set-value is captured 2 sec later.)

**AUTO/MAN transfer**

Auto mode (AUTO) or manual mode (MAN) can be checked.
In addition, each mode is changed.   (See page 94.)

**Remaining segment time**

If the instrument is set to the RUN state, the set remaining segment time is displayed on the set-value (SV) display unit.
However, the remaining segment time is not displayed in fixed set-point control mode or manual mode.

▒▒▒:Dim lighting  ☐:Bright lighting

From ⑤          To ④

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To ①      From ③

④ PV 
```
┌─────────────┐
│   ┌ ┌┐ ┌ ┌┐ │
│   │ │┘ │ │  │
└─────────────┘
```
RUN
```
┌────┐
│   ┃│
└────┘
```

⑤ PV
```
┌─────────────┐
│       ┌┐ ┌┐ │
│       │  └┤  │
└─────────────┘
```
RUN   MV
```
┌──────────┐
│ ┌ ┌┐ ┌ . │
│ └┤ └┘ └┤  │
└──────────┘
```
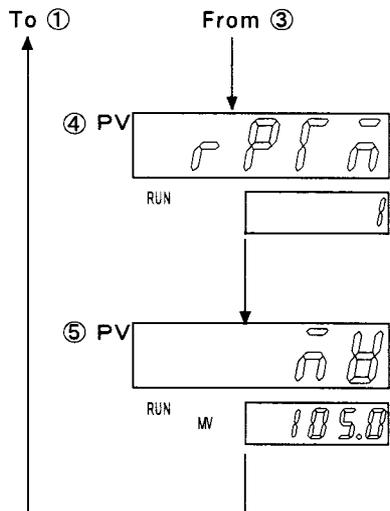
## Number of remaining pattern repeat times

The number of remaining program pattern times is displayed on the set−value (SV) display unit. However, the number is not displayed in fixed set−point control mode or manual mode.

## Manipulated output monitor

The manipulated output is displayed on the set−value (SV) display unit. However, the output is not displayed in manual mode.

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## 1.3 Action mode

Action mode is used to perform fixed set-point control, select PID/AT or set setting key lock.
The action mode items are described in the following.

## ■ Display sequence



**▶(PV/SV display)** ─────▶ :Press the MONI/MODE key.

│ To be pressed for 2 sec.

① PV ⌐ *P r o C*
    *F I X*

**Selection of program control/fixed set-point control (P.92)**
Program control mode (RUN state) or fixed set-point control
mode (FIX) is selected by pressing the UP/DOWN keys.
* The FIX lamp lights in fixed set-point control mode.

② PV *P I d*
    *A T U*

**PID/AT transfer (P.96)**
PID control or auto-tuning (AT) is selected by pressing the UP/
DOWN keys.
* If the auto-tuning function (AT) is executed, the AT lamp flashes.

③ PV *U n L C K*
    *L C K*

**Setting key lock (P.81)**
The SET and STEP/R. SET keys can be locked.   The selection is
made by pressing the UP/DOWN keys.

▨:Dim lighting ⬜:Bright lighting

# ■ Setting key lock function

The setting key lock function is used to lock the SET or STEP/R. SET keys. Accidental changes of the set contents can be prevented by locking these keys. However, as none of the following setting modes can be called up, the set-value cannot be checked.

- ● SETUP setting mode
- ● Program setting mode
- ● Engineer setting mode
- ● Time signal setting mode

## Setting procedure

① **Set to action mode**
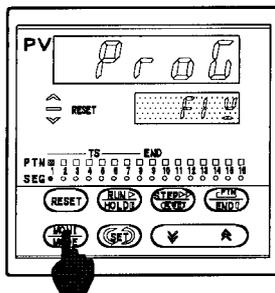


Press the MONI/MODE key for more than 2 sec to change to action mode display.

② **Set to setting key lock display**
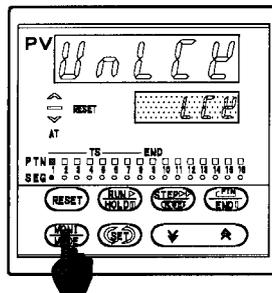


Press the MONI/MODE key to show the setting key lock display.

③ **Set to lock**
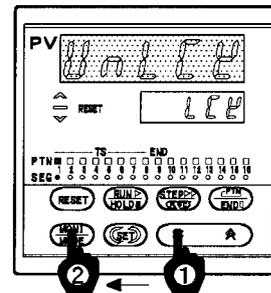


Press the DOWN key to set to lock ($L\,C\,H$). The action is established immediately when the change is made.

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# 2. OPERATION START

## 2.1 Operation in program control mode

## ■ Operation by keys

① Set to reset mode
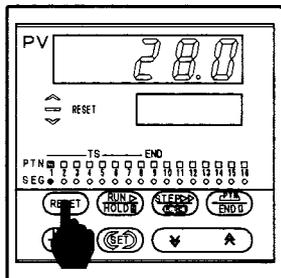


Press the RESET key to set the instrument to reset mode.

② Executing pattern setting display
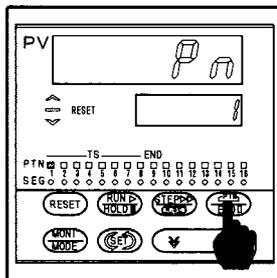


Press the PTN/END key to show the executing pattern display.

> *The pattern lamp corresponding to the executing pattern No. flashes during executing pattern No. setting.

③ Executing pattern setting
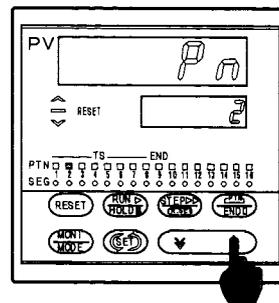


Press the UP/DOWN keys to select the pattern No. of the pattern to be executed. Pressing the SET or PTN/END key makes the setting effective.

## NOTE

● Executing patterns can not be changed in the program control mode state (RUN state).

④ **Program control start**
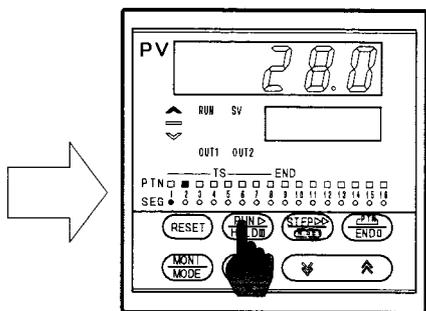


Pressing the RUN/HOLD key
starts program control (RUN).

**When program control does not start even if the RUN/HOLD key is pressed**

● Program control does not start when program control has been set to the end state. In this case, press the RESET key to set the instrument to reset mode, then start program control.

● When the reset or program control (RUN) contact is closed, program control does not start. In this case, open the contact.

---

**NOTES**

● When operation mode is changed during program control, program execution temporarily stops. The set-value at that time is maintained during program control.

● Pressing the RUN/HOLD key during program control temporarily stops program execution. The set-value at that time is maintained during program control.

● Pressing the STEP/R. SET key for more than 1 sec during program control moves the segment being executed to the next segment.

# ■ Hold (HOLD) function

When program execution needs to be temporarily stopped (hold state) during program control, press the RUN/HOLD key. In the hold state, the set−value (SV) display unit alternately displays the " H ㅁ L ㅁ " and the level (set−value) at the time of temporary stop.
Pressing the RUN/HOLD key again starts program control from the point of temporary stop.
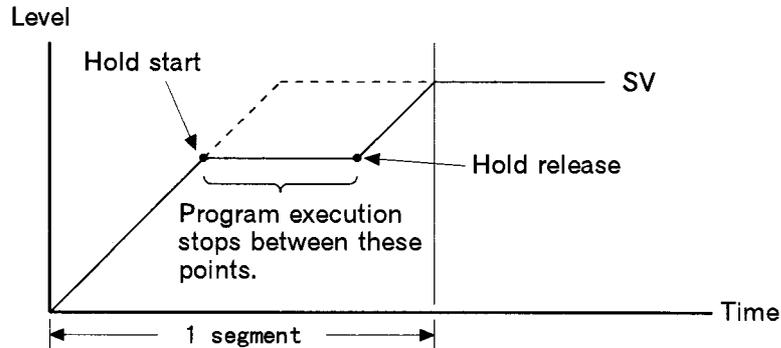


When the instrument is not set to the hold state even by pressing the RUN/HOLD key

● Not set to the hold state when program control has been set to the end state.
● Not set to the hold state when the instrument is reset or the program control (RUN) external contact input terminals are closed.

## NOTES

● The hold state is not released even if another operation mode (fixed set–point control mode or manual mode) is selected in the hold state.

● If the instrument is set to the hold state by external contact input, the hold state cannot be released by pressing the front key.   The external contact input has priority over entry by the front key.

● The hold function can be set only during program control.

# ■ Step (STEP) function

To jump to the next segment during program control, press the STEP/R. SET key for more than 1 sec. Every time the STEP/R. SET key is pressed, control advances one segment.



---
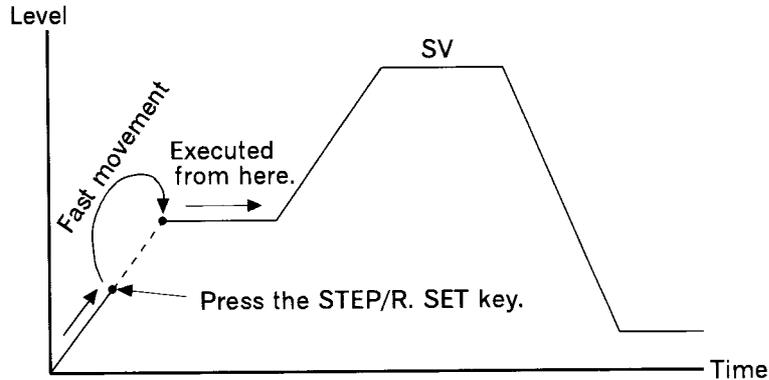
## NOTES

● The step function can be used on the PV/SV display during program control.

● The step function can not be used in the hold state.

● When the program control (RUN) external contact input terminals are closed, the STEP/R. SET key is disabled.

## ■ Operation by external contact input

Reset mode setting, program control mode setting, step function, hold function or pattern No. setting (option) can be operated not only by pressing the relevant front keys but also by contact input from the rear terminals.

## Selection of operation mode, step function or hold function

Operation and each function are selected according to the open or closed state of terminal Nos. 15 to 19.

### ( 1 ) External contact input type

#### ① Reset mode setting (RESET)

If terminal Nos. 15 and 16 (RESET) are closed, operation mode is set to reset mode (reset state). In addition, while the contact is closed, the instrument is fixed to the reset state.

#### ② Program control mode setting (RUN)

If terminal Nos. 15 and 17 (RUN) are closed, operation mode is set to program control mode (RUN state).

#### ③ Step function (STEP)

If terminal Nos. 15 and 18 (STEP) are closed, the step function is activated.  However, this function is enabled only in program control mode (RUN state).  If the step function needs to be activated again, open the contact then close it.  The step function is activated immediately when the contact is changed from open to close.

#### ④ Hold function (HOLD)

If terminal Nos. 15 and 19 (HOLD) are closed, the hold function is activated.   However, this function is enabled only in program control mode (RUN state).   In addition, if the contact is opened, program control starts from the stopped state.   If the instrument is set to the hold state by external contact input, the hold state cannot be released by pressing the front key.

### NOTES

● Reset mode and program control mode settings hold their states even if the terminals are opened after being closed once.

● In order to set the instrument to reset mode or program control mode by external contact input, if the respective terminals are closed, operation mode cannot be selected by pressing the front key.

● The hold function is activated only when the terminals are closed.

### ( 2 ) Priority order of external contact input

| Contact input | Priority order |
|---|---|
| Reset mode | Higher |
| Program control mode | |
| Hold function | |
| Step function | Lower |

## Pattern No. selection

Select the pattern No. according to the open or closed state of terminal Nos. 27 to 31.
If terminal Nos. 27 and 32 (P.SET) are closed, the selected data is captured. However, this applies only in reset mode. There are 4 setting types for pattern No. setting by contact input. (See page 27.)
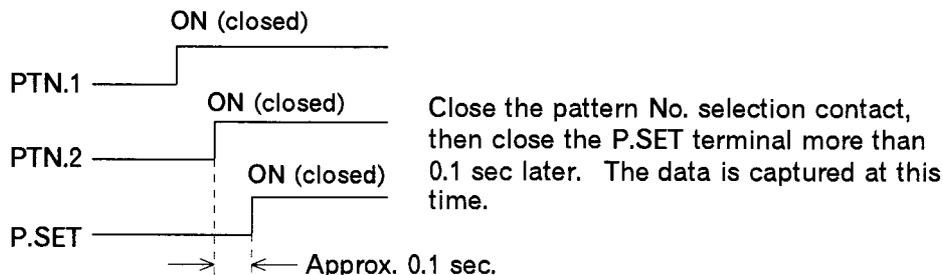
① **Type of capturing pattern No. by closing terminal No. 32 (P.SET)**
(Pattern No. setting from pattern No. 1 to pattern No. 16 is possible.)

| Pattern No. / Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No.27−28 (PTN.1) | × | O | × | O | × | O | × | O | × | O | × | O | × | O | × | O |
| No.27−29 (PTN.2) | × | × | O | O | × | × | O | O | × | × | O | O | × | × | O | O |
| No.27−30 (PTN.4) | × | × | × | × | O | O | O | O | × | × | × | × | O | O | O | O |
| No.27−31 (PTN.8) | × | × | × | × | × | × | × | × | O | O | O | O | O | O | O | O |

× : Open   O : Closed   (Terminal No.27: Common)

**Pattern No. capturing timing**   (Example: When set to pattern 4)

ON (closed)

PTN.1 ⎯⎯⎯

ON (closed)

PTN.2 ⎯⎯⎯

ON (closed)

P.SET ⎯⎯⎯

Approx. 0.1 sec.

Close the pattern No. selection contact, then close the P.SET terminal more than 0.1 sec later. The data is captured at this time.

## ② Type of capturing pattern No. by judging contact selection

(Pattern No. setting from pattern No. 1 to pattern No. 16 is possible.)

| Pattern No. Terminal No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No.27−28 (PTN.1) | × | O | × | O | × | O | × | O | × | O | × | O | × | O | × | O |
| No.27−29 (PTN.2) | × | × | O | O | × | × | O | O | × | × | O | O | × | × | O | O |
| No.27−30 (PTN.4) | × | × | × | × | O | O | O | O | × | × | × | × | O | O | O | O |
| No.27−31 (PTN.8) | × | × | × | × | × | × | × | × | O | O | O | O | O | O | O | O |

× : Open   O : Closed   (Terminal No.27: Common)

*It takes 2 sec for data to be captured after the pattern No. selection contact is closed.

## ③ Type of capturing pattern No. by closing terminal No. 32 (P.SET)

(Pattern No. setting from pattern No. 1 to pattern No. 15 is possible.)

For example, when a digital switch starting from "0" is used, select the pattern No. when the pattern No. must match the digital switch No. If this type is selected, pattern Nos. selected by contact input become 1 to 15.

| Pattern No. Terminal No. | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No.27−28 (PTN.1) | × | O | × | O | × | O | × | O | × | O | × | O | × | O | × | O |
| No.27−29 (PTN.2) | × | × | O | O | × | × | O | O | × | × | O | O | × | × | O | O |
| No.27−30 (PTN.4) | × | × | × | × | O | O | O | O | × | × | × | × | O | O | O | O |
| No.27−31 (PTN.8) | × | × | × | × | × | × | × | × | O | O | O | O | O | O | O | O |

× : Open   O : Closed   (Terminal No.27: Common)

\*When the contact is opened, pattern No. becomes "1" even if the digital switch indicates "0," because pattern Nos. of the instrument do not include "0".

④ **Type of capturing pattern No. by judging contact selection**
(Pattern No. setting from pattern No. 1 to pattern No. 15 is possible.)

For example, when a digital switch starting from "0" is used, select the pattern No. when the pattern No. must match the digital switch No. If this type is selected, pattern Nos. selected by contact input become 1 to 15.

| Pattern No. / Terminal No. | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No.27−28 (PTN.1) | × | ○ | × | ○ | × | ○ | × | ○ | × | ○ | × | ○ | × | ○ | × | ○ |
| No.27−29 (PTN.2) | × | × | ○ | ○ | × | × | ○ | ○ | × | × | ○ | ○ | × | × | ○ | ○ |
| No.27−30 (PTN.4) | × | × | × | × | ○ | ○ | ○ | ○ | × | × | × | × | ○ | ○ | ○ | ○ |
| No.27−31 (PTN.8) | × | × | × | × | × | × | × | × | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

× : Open    ○ : Closed   (Terminal No.27: Common)

\*When the contact is opened, pattern No. becomes "1" even if the digital switch indicates "0," because pattern Nos. of the instrument do not include "0".

## 2.2 Operation in fixed set–point control mode

Fixed set–point control is used to maintain the measured–value (PV) at the fixed value. SV during fixed set–point control can be set in engineer setting mode and on the PV/SV display.

### ( 1 ) Operation procedure

① **Set to action mode**
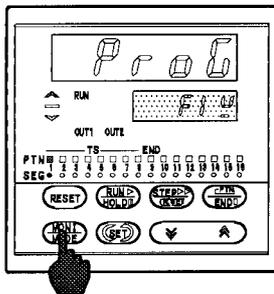


Press the MONI/MODE key for more than 2 sec to set the instrument to action mode. First, "Program control/Fixed set-point control selection" is displayed.

② **Set to fixed set–point control**
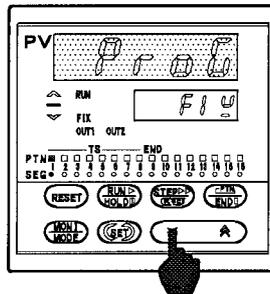


Press the DOWN key to select fixed set-point control mode. At this time, the FIX lamp lights.

③ **Establish the mode**
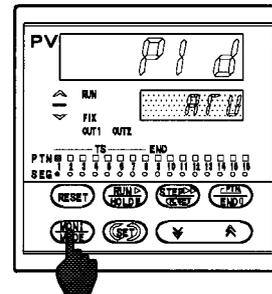


Press the MONI/MODE key to establish the mode.

---

**NOTES**

● Fixed set–point control mode can be selected from either reset mode or program control mode.

(Continued on the next page.)

● If fixed set−point control mode is selected from program control mode, program execution temporarily stops.  If program control mode is selected from fixed set−point control mode, program control re-starts from the level (set−value) at the point of temporary stop.

## ( 2 ) Set−value (SV) changing method in fixed set−point control mode

"SV during fixed set−point control," can be changed on the PV/SV display during fixed set−point control. SV is displayed on the "set−value (SV) display unit" and can be set by pressing he UP/DOWN keys.

### PV/SV display



Set−value (SV) display unit
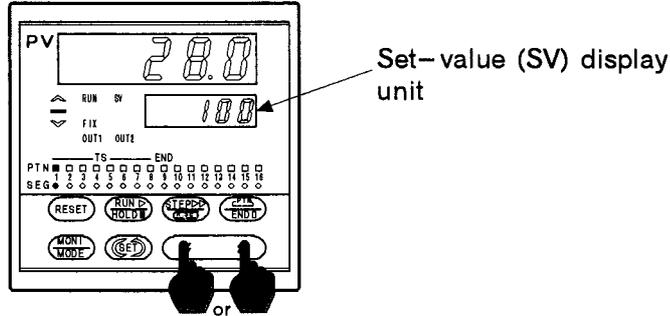
Change the set−value (SV) by pressing he UP/DOWN keys.
The set−value (SV) is captured 2 sec after it is changed.

## NOTE

● SV during fixed set−point control can also be changed in engineer setting mode.  For details, see "6. ENGINEER SETTING MODE (page 55)".

## 2.3 Operation in manual mode

This instrument can select manual operation (manual mode) during program control or fixed set–point control and can directly set the manipulated output (MV).   Use this manual mode in order to perform trial runs manually.

### ( 1 ) Transfer to manual mode

#### ① Set to operation monitor
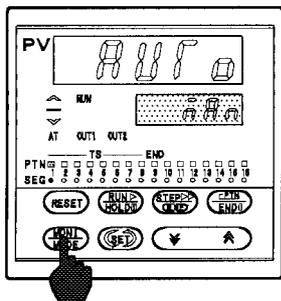
#### ② Set to manual mode

Press the MONI/MODE key to select operation monitor mode. First, "AUTO/MAN transfer" is displayed.
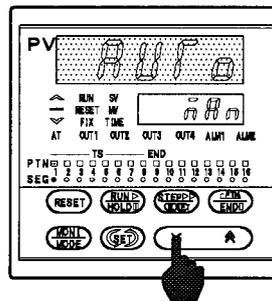
Press the DOWN key to select manual mode (ⱤⱤⱤ).

---

## NOTES

● When manual mode is selected from auto mode, the balanceless–bumpless function is activated to prevent rapid output changes.   The above also applies when auto mode is selected from manual mode.

(Continued on the next page.)

● When manual mode is selected from program control mode, program execution temporarily stops. When program control mode is selected from manual mode, program control re– starts from the level (set–value) at the point of temporary stop.

## ( 2 ) Manipulated output (MV) changing method

The manipulated output value (MV) can be changed on the PV/SV (PV/MV) display during manual operation.   The manipulated output value (MV) is displayed on the "set–value (SV) display unit" and can be set by pressing the UP/DOWN keys.

### PV/SV (PV/MV) display



Set-value (SV) display unit
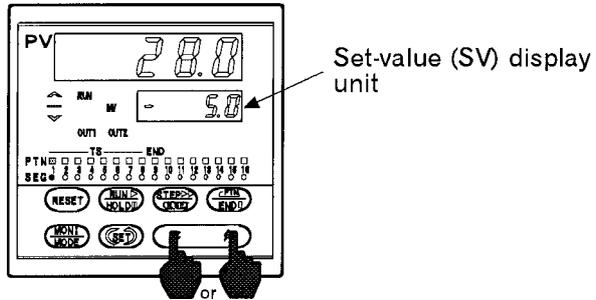
Change the manipulated output value (MV) by pressing the UP/DOWN keys.

## NOTE

● When the "PV/MV display" appears, the MV lamp lights.

# 3. AUTO-TUNING

The auto-tuning (AT) function is used to automatically measure, compute and set PID constants.
The conditions of activating the auto-tuning (AT) function and those of suspending the function are
described in the following.   This function is activated or stopped by "PID/AT transfer" (see page 80.) in
action mode.

## 3.1 Auto-tuning start

### ■ Conditions of activating the auto-tuning function

Start this function after all of the following conditions are satisfied.

- The instrument is in fixed set-point control or program control.
- There is no error in the input value.
- The RESET and RUN contacts are opened.
- The instrument is not is manual mode.
- The output limit (high-limit) is not less than 0.

## ■ Auto-tuning start procedure

(This example is when the instrument is in fixed set-point control.)
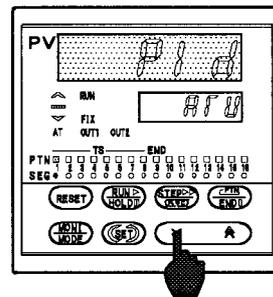
### ① Action mode selection
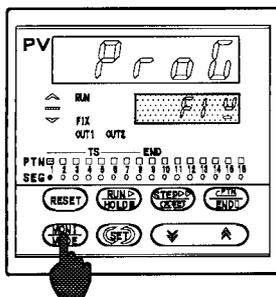


Press the MONI/MODE key for more than 2 sec during fixed set-point control to set the instrument to action mode.

### ② AT execution/stop selection
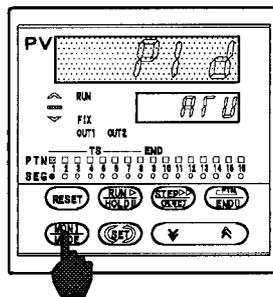


Press the MONI/MODE key to set the instrument to "PID/AT transfer".

### ③ AT execution/stop change



Press the DOWN key to set the instrument to auto-tuning ($R\Gamma U$) execution. (The AT lamp flashes.)

---

## NOTES

● The AT lamp flashes during auto-tuning (AT) execution.

● When the auto-tuning (AT) function is executed during program control, program execution is automatically set to the hold state. (No hold display shown.)

## 3.2 Auto-tuning suspension

### ■ Conditions in which the auto-tuning (AT) function are suspended

- ● When the set-value (SV) is changed.
- ● When high or low output limit value is changed.
- ● When PV bias, PV ratio or PV digital filter is changed.
- ● When the auto-tuning function does not end 3 hours and 40 min after it starts.
- ● When "AUTO/MAN mode" is switched to manual mode.
- ● When "PID/AT transfer" is switched to PID.
- ● When the instrument is set to the RESET state during program control or fixed set-point control.
- ● When the RESET or RUN contact is closed.
- ● When the input value becomes abnormal (when the input value exceeds the input error trigger point)
- ● When the power is turned off.
- ● When the instrument is in the FAIL state.
- ● When program execution jumps (stepped) during program control.

---

### ┌─────┐
### │ NOTE │
### └─────┘

- ● When the conditions of auto-tuning (AT) suspension are satisfied, the AT is immediately suspended and PID control starts.  The PID constants are the values before the AT was started.

# 4. DISPLAY AT ABNORMALITY ⚠

## 4.1 For input abnormality

| Display | Details | Action (output) | Measures |
|---|---|---|---|
| Measured–value (PV)<br><br>Flashing | **Input abnormality**<br><br>Measured–value (PV) rose above the high input range limit or fell below the low input range limit. | **Action at input abnormality**<br><br>If overscale or underscale occurs,the instrument performs the action set in the action selection when SETUP setting mode is abnormal. | ⚠ **WARNING**<br><br>**In order to prevent electric shock, prior to replacing the sensor, always turn OFF the power.**<br><br>Check input type,range, sensor and sensor connection. |
| ▢ ▢ ▢ ▢ ▢<br><br>Flashing | **Overscale**<br><br>Measured–value (PV) is beyond the effective input range. | | |
| ⊔ ⊔ ⊔ ⊔ ⊔<br><br>Flashing | **Underscale**<br><br>Measured–value (PV) is below the effective input range. | | |

## 4.2 By self–diagnostic function

If an error is found by the self–diagnostic function, the error and PV/SV are alternately displayed.
(" $E \, r \, r$ " is displayed on the PV display unit and the No. corresponding to the error is displayed on the SV display unit.)
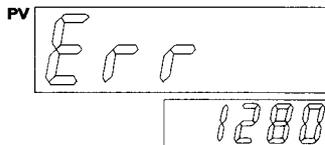
| PV/SV display | | Error display |
|---|---|---|
| PV | Alternately displayed. | $E \, r \, r$ |
| SV | ⟷ | Error No. |
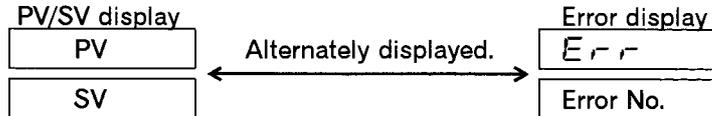
When the instrument is set to the hold or end state, the error and state are alternately displayed.
(" $H \, o \, L \, d$ " and " $E \, n \, d$ " are displayed on the SV display unit.)

If two or more errors occur simultaneously, the error No. obtained by adding each error No. corresponding to the error is displayed.

| Error No. | Details | Action (output) | Measures |
|---|---|---|---|
| 1 | EEPROM error | Error display only | Turn OFF the power once. |
| 2 | NOVRAM error | Error display only | If an error occurs after the power is |
| 4 | Set–value (SV) error | Operated at input range high–limit or low–limit | turned ON again,contact your nearest RKC sales office or agent from which |
| 256 | Input value error | Control output OFF | you bought the instrument. |
| 512 | Temp. compensation | Control output OFF | If Error No. 4 occurs, re–set the set– |
| 1024 | Adjusted data destruction | Error display only | value so that it is within the setting limit. |

**Example: When adjusted data destruction and input error occur simultaneously**

PV

$E \, r \, r$

$1280$

The PV display unit shows " $E \, r \, r$ ", and the SV display unit shows No. $1280$ obtained by adding $256$ (input error) to $1024$ (adjusted data destruction).

# 5. REPLACING THE RUBBER PACKING

<table>
<tr><td>⚠ **WARNING**</td></tr>
<tr><td>
⚡
- In order to prevent electric shock and instrument failure, always turn off the power supply befor replacing the rubber packing.

- In order to prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.

- In order to prevent injury or instrument failure, do not touch the internal printed circuit board.
</td></tr>
</table>

If the waterproof and dustproof rubber packing deteriorates,contact your nearest RKC sales office or agent from which you bought the instrument.

| Type | Parts code | Remarks |
|------|-----------|---------|
| REX–P300 | KD900N–32 | For the board |
|  | KD900–35 | For the case |

## ● Replacement of rubber packing

### CAUTION

**Prior to replacing the rubber packing, first confirm that no water remains, then turn on the power supply. If the water remains, shorting may result.**

**For the board**

① Pull the internal assembly out of the case, then remove the old rubber packing.
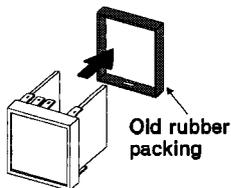


Old rubber packing

② Replace the old rubber packing with a new one, then put the internal chassis in the case.



New rubber packing

Insertion direction

R - side    Plane

Central longittidinal direction
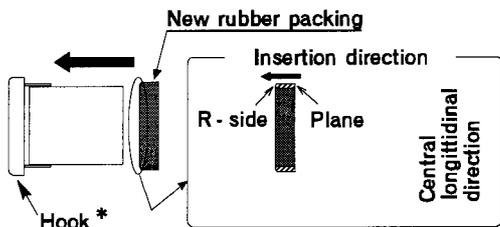
Hook *

\* Firmly push the rubber packing in the board until it also contacts the hook.

**For the case**

① Remove the mounting bracket and disconnect all of the lead wires from the rear terminal board of this instrument, then remove the instrument from the control panel. Next, remove the deteriorated rubber packing form this instrument.
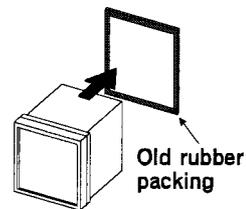


Old rubber packing

② Firmly push the new rubber packing into the instrument, then re–mount the instrument in the control panel.



New rubber packing
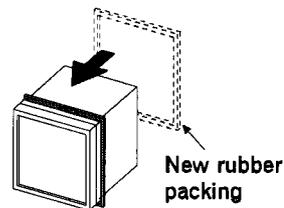
# SPECIFICATIONS

## ( 1 ) INPUT

| Input impedance | TC input | 1M Ω or more |
|---|---|---|
| | Voltage input | 1M Ω or more (Low type)    Approx. 1M Ω (High type) |
| | Current input | Approx. 250 Ω |
| Influence of external resistance | | Approx. 0.4 $\mu$ V/ Ω |
| Influence of input lead | | 10 Ω or less (per wire) |
| Allowable input voltage | | Within ± 7 V    *Voltage (high) input: Within ± 14 V |
| Sampling cycle | | 0.1 second |
| Contact input | Input type | Dry contact input (Shared common) |
| | | 500 k Ω or more ··· Open    10 Ω or less ··· Closed |
| | Contact current | 10 mA or less |
| | Contact open voltage | Approx. 5 V DC (Built-in power) |
| *1 | Wiring distance | 10 m or less |
| | | Varies with installation environment(noise,etc.) |

## ( 2 ) OUTPUT

| Control output | Relay contact output | 250 V AC,  3A (Resistive load)    1"c" contact |
|---|---|---|
| | | Electrical life : 300,000 times or more (Rated load) |
| | | Cycle : 1 to 100 second variable |
| | Voltage pulse output | 0/12 V DC (Load resistance 800 Ω or more) |
| | | Cycle : 1 to 100 second variable |

| Control output | Current output | 0 to 20 mA DC, 4 to 20 mA DC<br>(Load resistance 600 $\Omega$ or less)   * Specify when ordering<br>Resolution : 11 bits or more<br>Output impedance : 5M $\Omega$ or more |
| | Continuous voltage output | 0 to 5 V DC, 0 to 10 V DC, 1 to 5 V DC<br>(Load resistance 1 k $\Omega$ or more)   * Specify when ordering<br>Resolution : 11 bits or more<br>Output impedance : 0.1 $\Omega$ or less |
| Pattern end output *2 | Output method | Open collector output<br>Rating: 24 V DC, 50 mA max.   ON voltage: 2 V max. |
| | No. of output points | 1 point |
| Time signal output *2 | Output method | Open collector output<br>Rating: 24 V DC, 50 mA max.   ON voltage: 2 V max. |
| | No. of output points | 4 or 8 points ( 8 points: Option) |
| Alarm output | Output method | Relay contact output (Shared common)<br>250V AC, 0.5 A (Resistive load)    1"a" contact |
| | Electrical life | 50,000 times or more (Rated load) |
| | No. of output points | 2 points |

## ( 3 ) OPTION

| Auxiliary output | Output method | Relay contact output   250V AC, 0.5 A (Resistive load)<br>1"a" contact |
| | No. of output points | 3 points (OUT2 to OUT4)<br>* However, when "analog output" (option) is specified,<br>  the number of output points becomes 2. |
| Analog output | Output method | Continuous voltage/current output |
| | No. of output points | 1 point (OUT4 is used.) |

| Analog output | Output resolution | 11 bits or more |
|---|---|---|
| | Output accuracy | 0.1% of span |
| | Output signal | Voltage output A : 0 to 10 mV DC, 0 to 100 mV DC<br>Voltage output B : 0 to 1 V DC, 0 to 5 V DC,<br>            0 to 10V DC, 1 to 5 V DC<br>Current output    : 0 to 20 mA DC, 4 to 20 mA DC<br>\* For 0 to 20mA DC : Does not become less than 0 mA. |
| | Allowable<br>load resistance | Voltage output A : 20 kΩ or more<br>Voltage output B : 1 kΩ or more<br>Current output    : 600 Ω or less |
| | Output impedance | Voltage output A : Approx. 10 Ω<br>Voltage output B : 0.1 Ω or less<br>Current output    : 5 MΩ or more |
| Communication<br>function | Interface | Based on RS−232C, EIA standard<br>Based on RS−422A, EIA standard<br>Based on RS−485, EIA standard<br>            \* Specify when ordering |

## ( 4 ) GENERAL SPECIFICATIONS

| Power supply voltage | 90 to 264 V AC (50/60Hz common use) [ Including power supply voltage variation]<br>( Rating: 100 to 240 V AC ) | |
|---|---|---|
| | 21.6 to 26.4 V AC   ( Rating: 24 V AC ) | |
| | 21.6 to 26.4 V DC   ( Rating: 24 V DC ) | |
| Power consumption | 12 VA max. (at 100 V AC) | 12 VA max.   (at 24 V AC) |
| | 17 VA max. (at 240 V AC) | 360 mA max. (at 24 V DC) |
| Power failure effect | No influence is exerted upon the instrument for power failure of less than 50ms. | |

(Continued from the previous page.)

| Memory backup | Backed up by EEPROM and non-volatile RAM<br>No. of write times: Approx. 1 million times   Data storage period:Approx. 10 years | |
|---|---|---|
| Insulation resistance | Between measuring and grounding terminals | 20 M Ω or more at 500 V DC |
| | Between power and grounding terminals | 20 M Ω or more at 500 V DC |
| Dielectric strength | Between measuring and grounding terminals | For 1 min. at 1000 V AC |
| | Between power and grounding terminals | For 1 min. at 1500 V AC |
| Operating environment | Ambient temperature | 5 to 40 ℃ (41 to 104 ℉ ) |
| (Condition of normal operation) | Ambient humidity | 20 to 80 % (RH) |
| Weight | Approx. 500 g (With all options attached) | |
| Dimensions | 96 (W) × 96 (H) × 100 (D) mm | |
| Wiring example | | |

**\*1 External contact input**
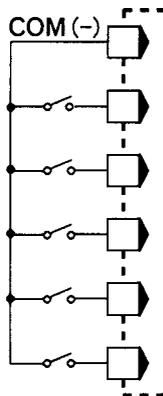
**\*2 Open collector output**



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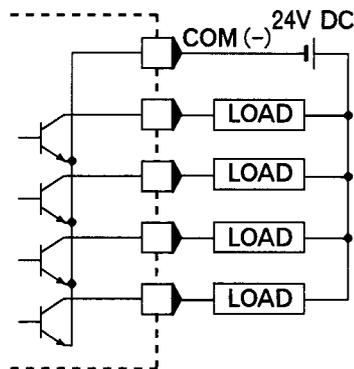
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IM300P01-E1

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