Programmable Temperature Controller

REX-P48/96 SERIES

OPERATION MANUAL

RKC RKC INSTRUMENT INC.

IM48P01-E1

INTRODUCTION

Thank you very much purchasing our "REX-P48, P96 series".
This manual describes how to use "REX-P48, P96 series" instruments. Please read this manual carefully before using the instruments.
Also keep this manual with much care for future reference.

USERS OF THIS MANUAL

This manual is prepared for all personnel who use "REX-P48, P96 series".
This manual is also written especially for readers who have a fundamental knowledge of electrical engineering, control engineering or communication.

CAUTIONS

- The contents of this manual may 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-P48, P96 series" 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 damages 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 damages

★For safe operation of "REX-P48, P96 series"

1. "REX-P48, P96 series'' must be used under the following conditions.
   "REX-P48. P96 series" is a component type and is used after mounting on an instrument panel. It is thus manufactured as a component destined for the final product, so its high-voltage blocks such as the power terminals are uncovered. Therefore, after it is installed on the final product, the final product supplier must take the necessary measures for the user to prevent touching directly the high-voltage blocks.
2. For correct and safe operation of "REX-P48, P96 series", always observe the safety precautions described in this manual when performing operations, maintenance and repair work. RKC neither assures responsibility nor provides warranty for problems or accidents occurring if these precautions are not observed.

- For safe operation of "REX-P48, P96 series", 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

● Wiring precautions

- If 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 the power line and the input/output lines from high currents by using fuses with appropriate ratings.

● Power supply

- In order to prevent instrument damage or failure, supply power of the specified rating.
- In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.

● Never use the instrument near inflammable gases.

- In order to prevent fire, explosion or instrument damage, never use this instrument at a location where inflam mable or explosive gases or exist.

● Never touch the inside of the instrument.

- In order to prevent electric shock or burns, never touch the inside of the instrument. Only RKC service engineers can touch the inside of the instrument to check the circuit or to replace parts. High voltage and high temperature sections inside the instrument are extremely dangerous.

● Never modify the instrument.

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

● Maintenance

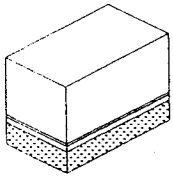
- In order to prevent electric shock, burns or instrument failure, only RKC service engineers may replace parts.
- In order to use this instrument continuously and safely, conduct periodic maintenance. Some parts used in this instrument have a limited service life and may deteriorate over time.

CONTENTS

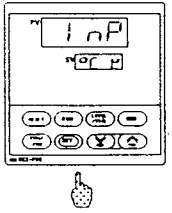
1. PREPARATION

1.1 Handling procedure

Conduct necessary work according to the following procedures.



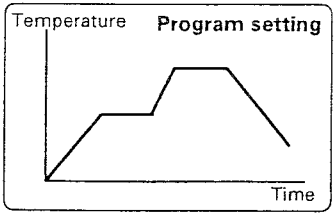
Person who performs the work from unpacking, mounting and wiring.
Please read the operation manual from "Checking the actual product".



Person who operates the instrument.
Please read the operation manual from "Name of parts".

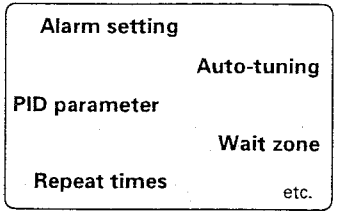
Person who has already mounted the instrument on the equipment and also finished wiring.

※For the convenience of explanation, pictures and diagrams for the REX-P98 are used in this operation manual, but there is no difference in operation.

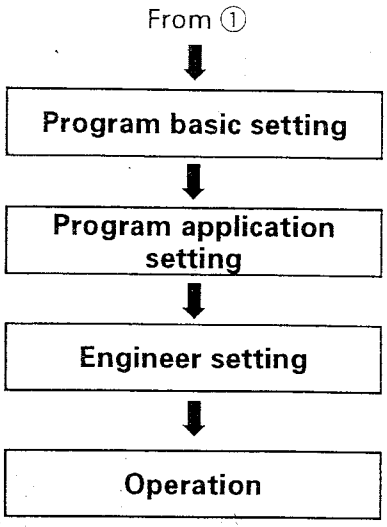


Person who conducts program settings. Please read the operation manual from "Program basic setting".

*Prior to factory shipment, no program is set. Therefore, when operating the instrument for the first time, always set the program.



Person who conducts each parameter settings. Please read the operation manual from "Engineer setting".



CAUTIONS

Connect the input signal wiring, and the turn ON the power. If the input signal wiring opens, the controller judges than input disconnected to cause the upscale or downscale of measured-value (PV) display.
Upscale ..... For TC or RTD input
Downscale ..... For TC (To be specified when ordering), voltage or current input.

1.2 Check of product delivered

Check than the following items are delivered without damage.

- Mainframe (1 unit)
- Mounting bracket (2 pieces)
- REX-P48/P96 series OPERATION MANUAL (1 copy)

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

REX-P48/P96 model code

P48
P96 □□□-□□*□□-□□-□

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Control action
- F : PID action (reverse)
- D : PID action (direct)
- L : Level PID action (reverse)
- M : Level PID action (direct)
- W : Heating/cooling PID action
- V : Level Heating/cooling PID action

② Input type
See input range table "Model code" on page 4.

③ Input range
See input range table "Model code" on page 4.

④ First control output [OUT1]
- M : Relay contact
- V : Voltage pulse
- 7 : Current 0 to 20mA DC
- 8 : Current 4 to 20mA DC

⑤ Second control output [OUT2]
- No symbol : When control action is F, D, L, M
- M : Relay contact
- V : Voltage pulse
- 7 : Current 0 to 20mA DC
- 8 : Current 4 to 20mA DC

⑥ First alarm, ⑦ Second alarm
- N : No alarm
- A : Deviation high alarm
- B : Deviation low alarm
- C : Deviation high/low alarm
- D : Band alarm
- E : Deviation high alarm with hold action
- F : Deviation low alarm with hold action
- G : Deviation high/low alarm with hold action
- H : Process high alarm
- J : Process low alarm
- K : Process high alarm with hold action
- L : Process low alarm with hold action
- Q : Deviation high alarm with re-hold action
- R : Deviation low alarm with re-hold action
- T : Deviation high/low alarm with re-hold action
- V : Set-value high alarm
- W : Set-value low alarm

⑧ External contact input
- N : No external contact input
- Y : With external contact input

⑨ External contact output
- N : No external contact output
- 1 : Pattern end output function
- 2 : Time signal output function

⑩ Analog output
- N : No analog output
- 1 : Voltage 0 to 10mV DC
- 2 : Voltage 0 to 100mV DC
- 3 : Voltage 0 to 1V DC
- 4 : Voltage 0 to 5V DC
- 5 : Voltage 0 to 10V DC
- 6 : Voltage 1 to 5V DC
- 7 : Current 0 to 20mA DC
- 8 : Current 4 to 20mA DC

Input range table

Input type	Model code ②	Model code ③	Ranges (°C)	Model code ②	Model code ③	Ranges (°F)
K	K	22	−199.9 to 999.9°C	K	B2	−199.9 to 999.9°F
	K	16	−200 to 1372°C	K	B3	−330 to 2500°F
J	J	14	−199.9 to 999.9°C	J	A9	−199.9 to 999.9°F
	J	15	−200 to 1200°C	J	B1	−330 to 2192°F
T	T	01	−199.9 to 400.0°C	T	A1	−199.9 to 752.0°F
R	R	02	0 to 1769°C	R	A2	0 to 3216°F
S	S	02	0 to 1769°C	S	A2	0 to 3216°F
B	B	02	0 to 1820°C	B	A2	0 to 3308°F
E	E	06	−200 to 1000°C	E	A5	−330 to 1832°F
N	N	02	0 to 1300°C	N	A2	0 to 2372°F
PL II	A	02	0 to 1390°C	A	A2	0 to 2534°F
W5Re/W26Re	W	02	0 to 2320°C	W	A4	0 to 4208°F
U	U	08	0 to 600°C	U	A4	0 to 1100°F
L	L	05	0 to 900°C	L	A2	0 to 1600°F
JPt100	P	20	−199.9 to 510.0°C	P	B6	−199.9 to 950.0°F
Pt100	D	20	−199.9 to 660.0°C	D	A1	−199.9 to 999.9°F

Input type B: Accuracy in the range of 0 to 400°C (0 to 752°F) → Not guaranteed.
Input type N, PL II, W5Re/W26Re: Accuracy in the range of 0 to 32°F → Not guaranteed.

PRECAUTIONS

For this instrument, the initialized settings such as the input and alarm types, etc. can be changed. Therefore, they might be changed before your receipt of this instrument.

2. MOUNTING

⚠ WARNING

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

2.1 Cautions for mounting ⚠

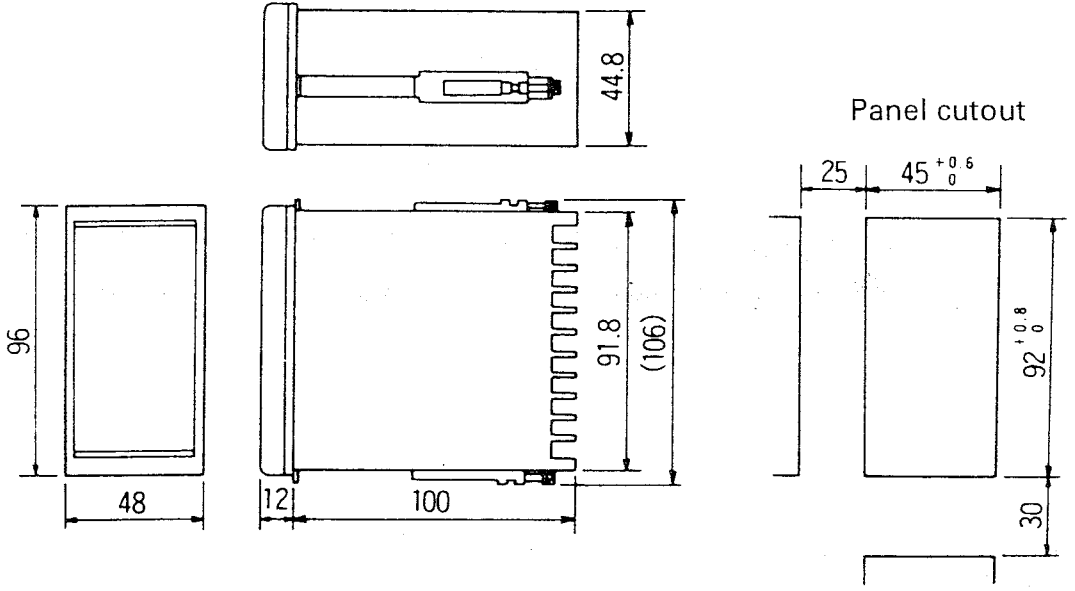
Avoid the following when selecting the mounting location.

- Ambient temperature of less than 5°C or more than 40°C.
- 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

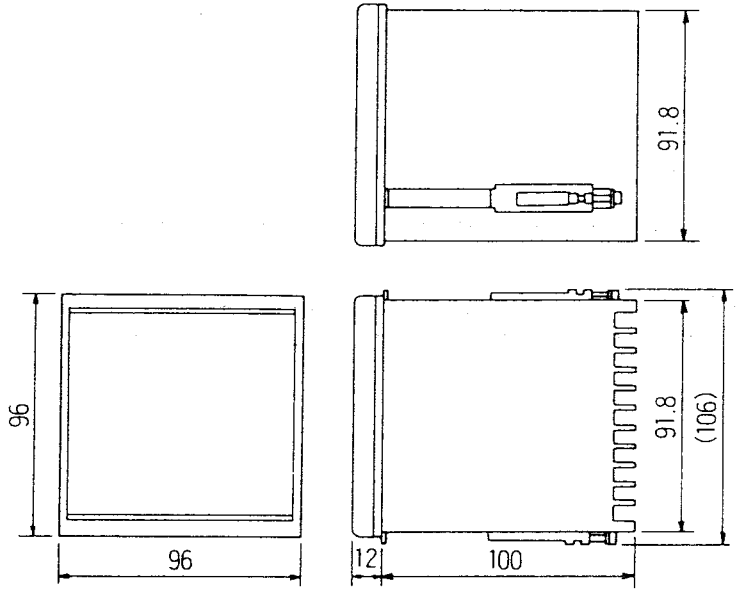
■ REX-P48

Unit : mm

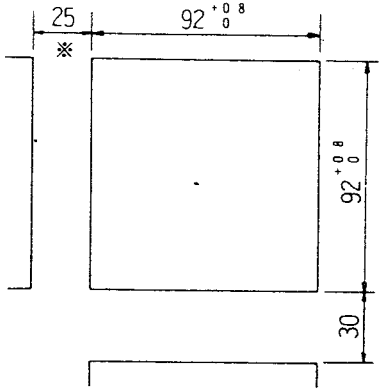


■ REX-P96

Unit : mm



Panel cutout



2.3 Mounting procedures

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 (Fig. 2). Do not overtighten the bracket setscrew.
⑤ Install a mounting bracket also at the bottom of the case in the same way as ③ and ④ above.

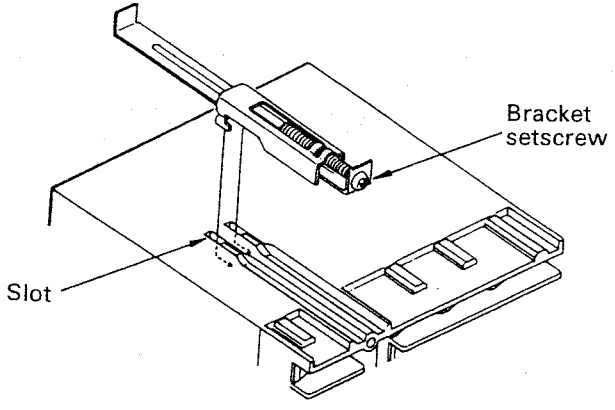


Fig. 1

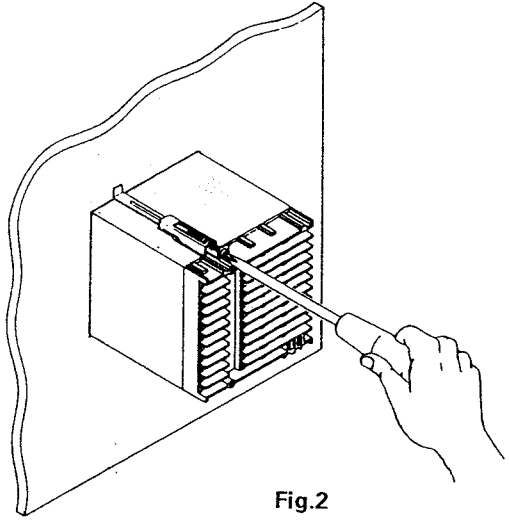


Fig.2

3. WIRING

⚠ WARNING

- **In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.**
- **If 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 the power line and the input/output lines from high currents by using fuses with appropriate ratings.**

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.

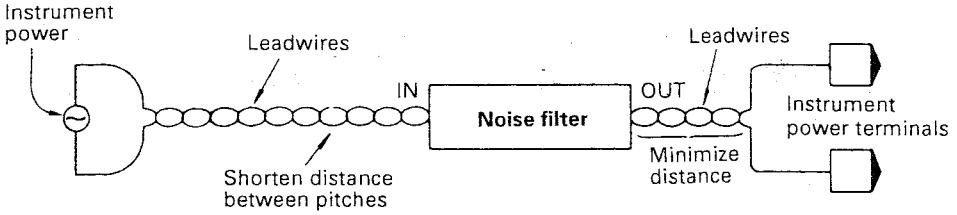
(4) Conduct instrument power wiring so as not to be influenced by noise from the electric equipment power. If it is assumed that a noise generation source is located near the controller and the controller is influenced by noise, use a noise filter.

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.



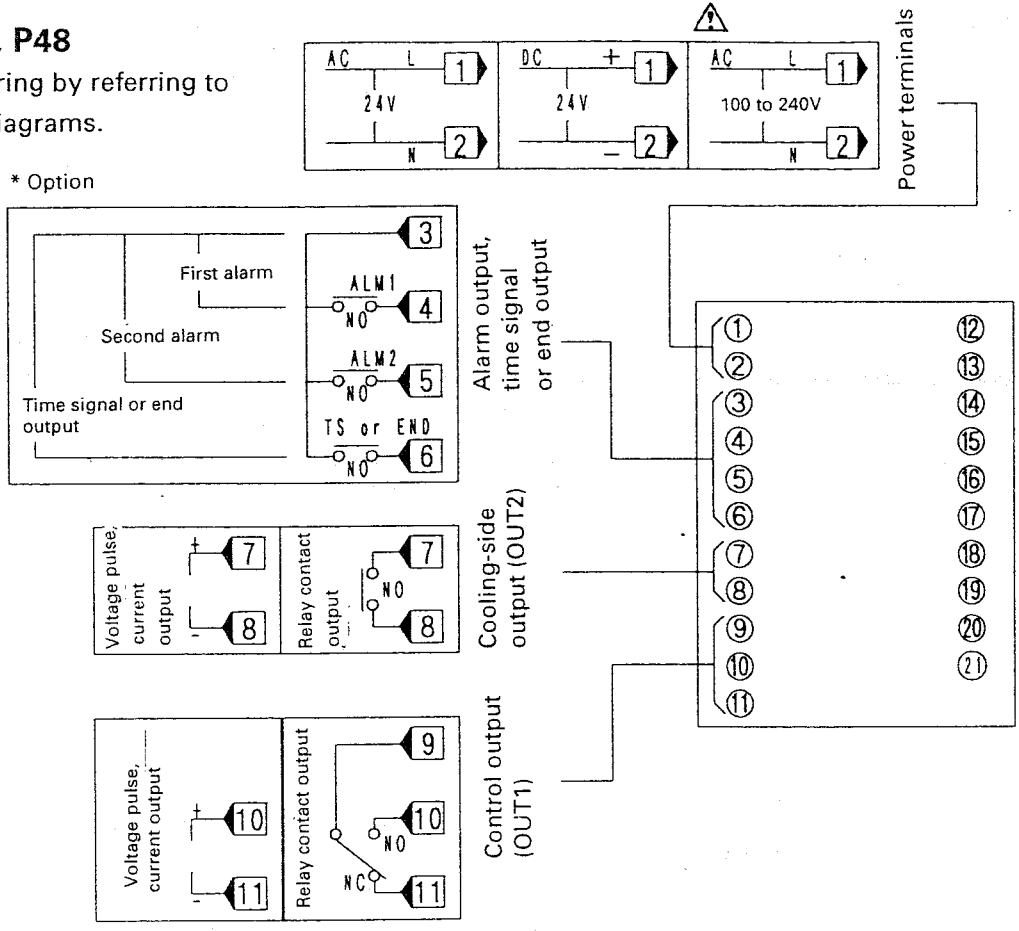
(5) For wiring, use electric wires conforming to the domestic standard of each country.

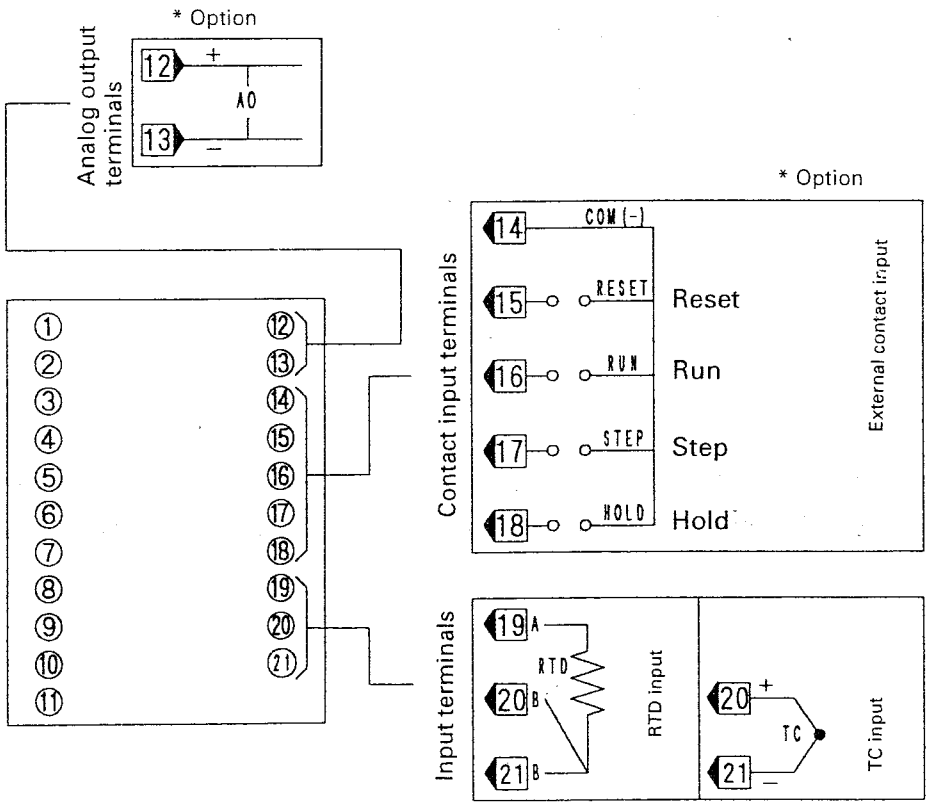
(6) About 2 sec. are required as the preparation time of contact output during power-ON. Use a delay relay when the output line, is used for an external interlock circuit.

3.2 Rear terminals

■ REX-P96, P48

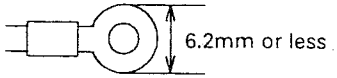
Conduct wiring by referring to following diagrams.





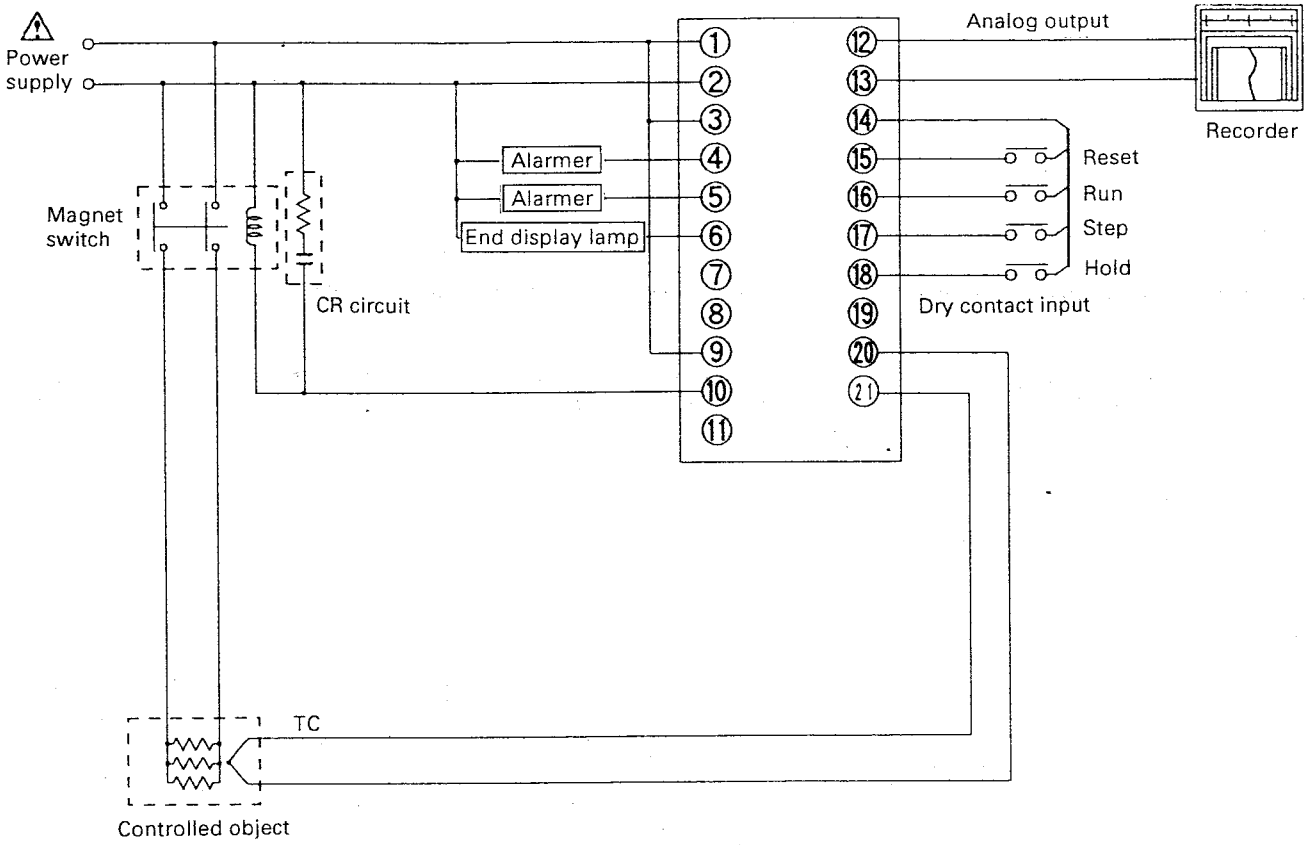
CAUTIONS

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 6.2mm wider or less.

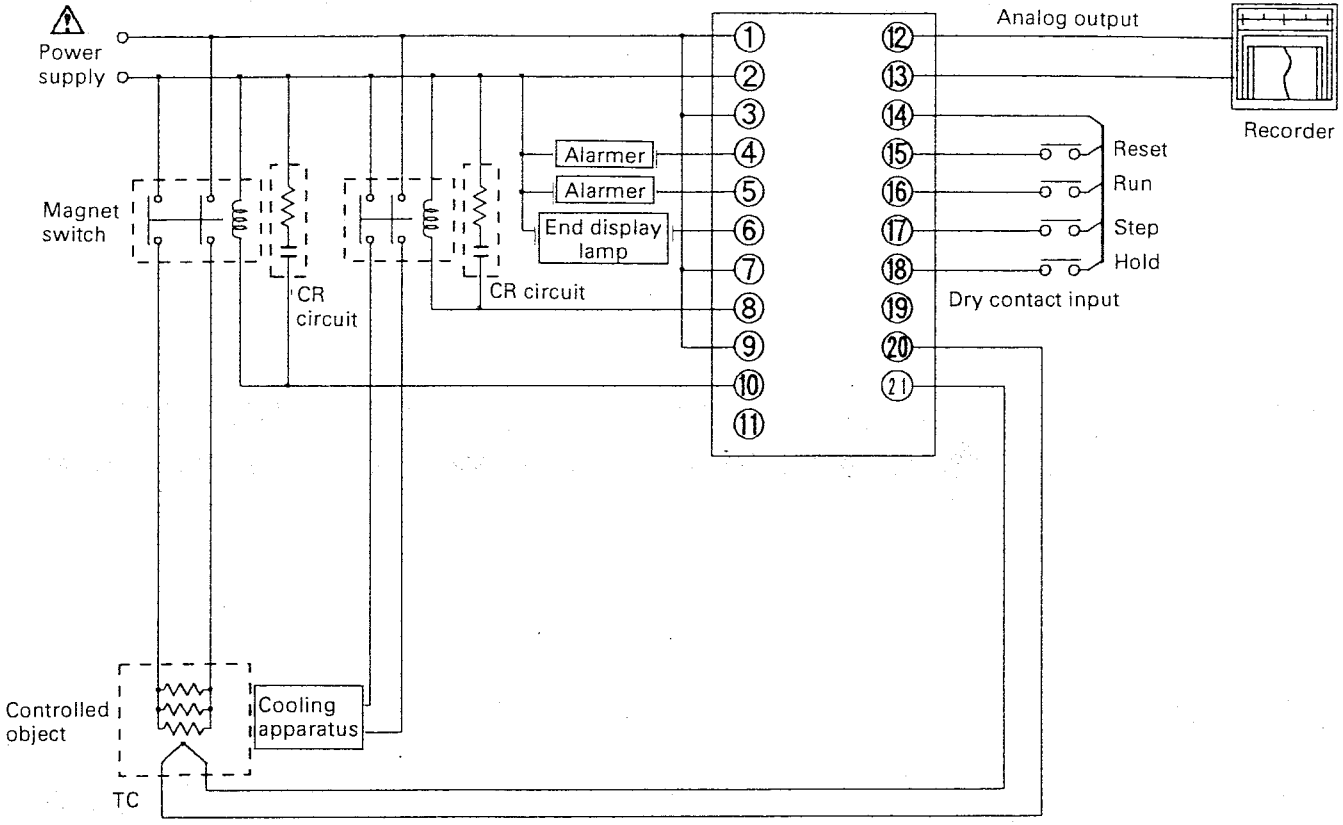


3.3 Wiring example

Heating type: REX-P48L ☐☐ - M ✻☐☐ - Y 1☐

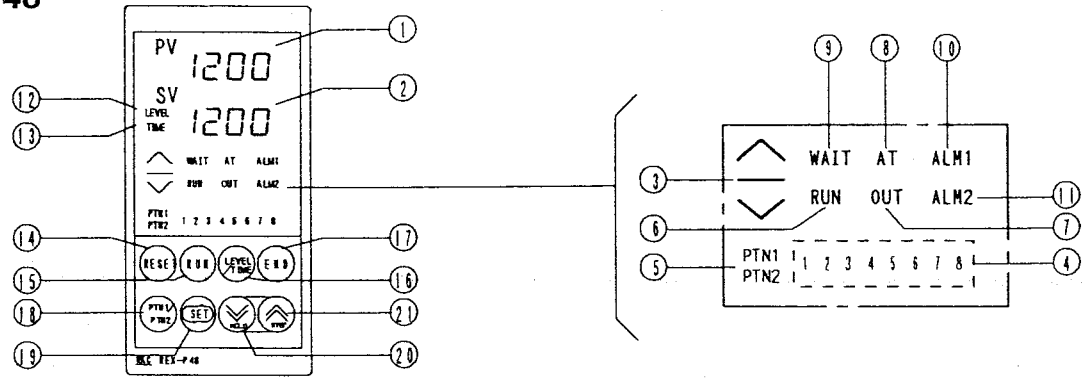


Heating/cooling type: REX-P48V □□ - M M *□□ - Y 1□

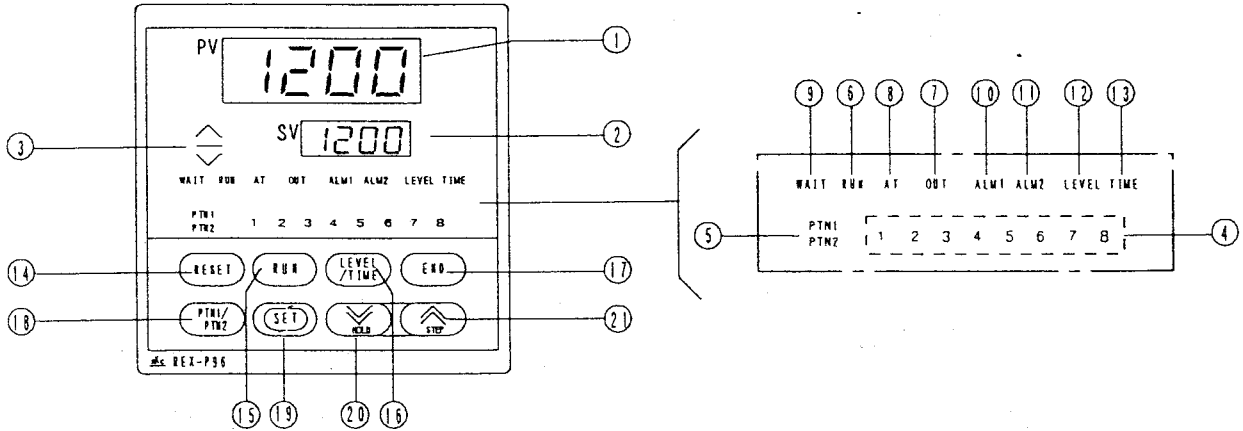


4. NAME OF PARTS

■ REX-P48



■ REX-P96



Name	Details
①**Measured-value (PV) display unit [Green]**	• Displays measured-value (PV). • Displays various characters depending on the instrument status.
②**Set-value (SV) display unit [Orange]**	• Displays set-value (SV). • Displays each parameter set-value. • Displays various characters depending on the instrument status.
③**Segment progress display lamp [Orange]**	• The ascending LED lights while the set value is increasing, the descending LED lights while the set value is decreasing, and the horizontal LED lights during soaking. • The alarm setting (option) alarm type is set by the combination of LEDs. For details, see Page 62.
④**Segment-in-progress display lamp [Orange]**	• The segment No. now under execution or programming lights.
⑤**Pattern display lamp[Green]**	• Displays the execution or setting pattern.
⑥**Run display lamp [Green]**	• Lights during operation.
⑦**Control output lamp [Red]**	• Lights when control output is turned ON. • Lights on green when cooling output is turned ON.
⑧**Auto-tuning (AT) lamp [Green]**	• Flashes during auto-tuning execution.
⑨**Wait lamp [Orange]**	• Lights during wait action.
⑩**ALM 1 lamp [Red]**	• Lights with the first alarm turned ON.
⑪**ALM 2 lamp [Red]**	• Lights with the second alarm turned ON.
⑫**Temperature display lamp [Green]**	• When lit, the setting temperature is displayed on the SV display unit.

Name	Details
⑬**Time display lamp [Green]**	• When lit, the segment remaining time is displayed on the SV display unit.
⑭**Reset key**	• Press to stop operation (reset).
⑮**Run key**	• Press to execute operation (run).
⑯**Level/time key**	• Press to change the display of the setting temperature and remaining time on the SV display unit.
⑰**End key**	• Press to set the program, or end registration or erase.
⑱**Pattern1/Pattern 2 change key**	• Press to change pattern 1 and pattern 2.
⑲**Set key**	• Used to set the program or parameter.
⑳**Set-value increment key/ Hold key**	• Used to set the program or parameter. Pressing this key for more than 1 sec. during operation holds the program. Press the key again when releasing the hold.
㉑**Set-value decrement key/ Step key**	• Press to increase the set value. Pressing this key for more than 1 sec. steps the segment.

OPERATION

● Introduction

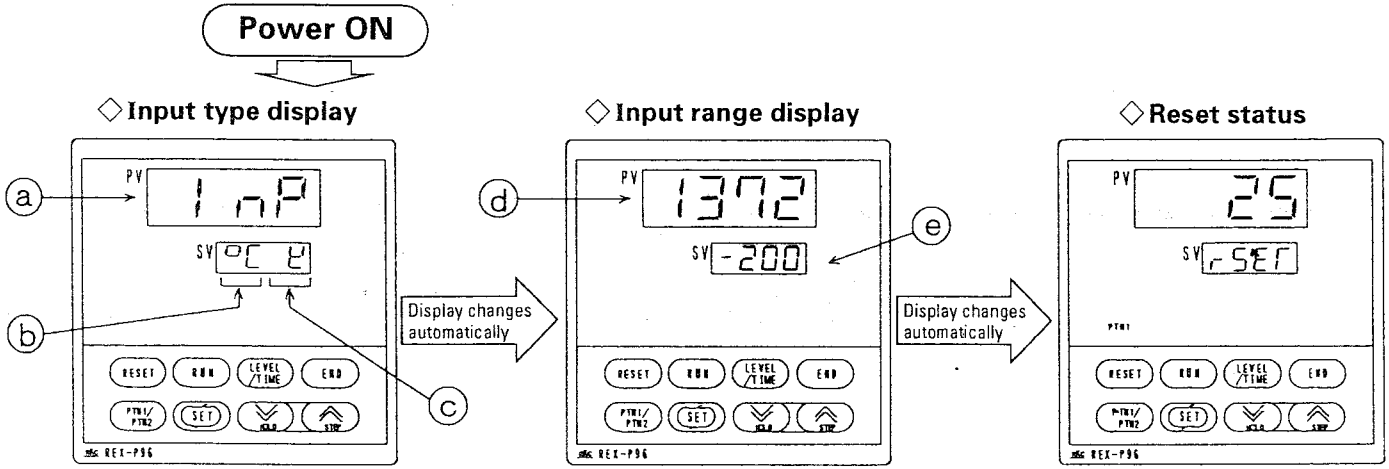
- In this manual, diagrams for the REX-P96 are used for explanation, but there is no difference in operation between the REX-P96 and REX-P48.
  In addition, for details on the position of each lamp, see "NAME OF PARTS".

● Composition

5. OPERATION

5.1 Program basic setting

a) Input type and range display



ⓐ Input display character (InP)

ⓑ Unit

Display	Character
°C	°C
°F	°F

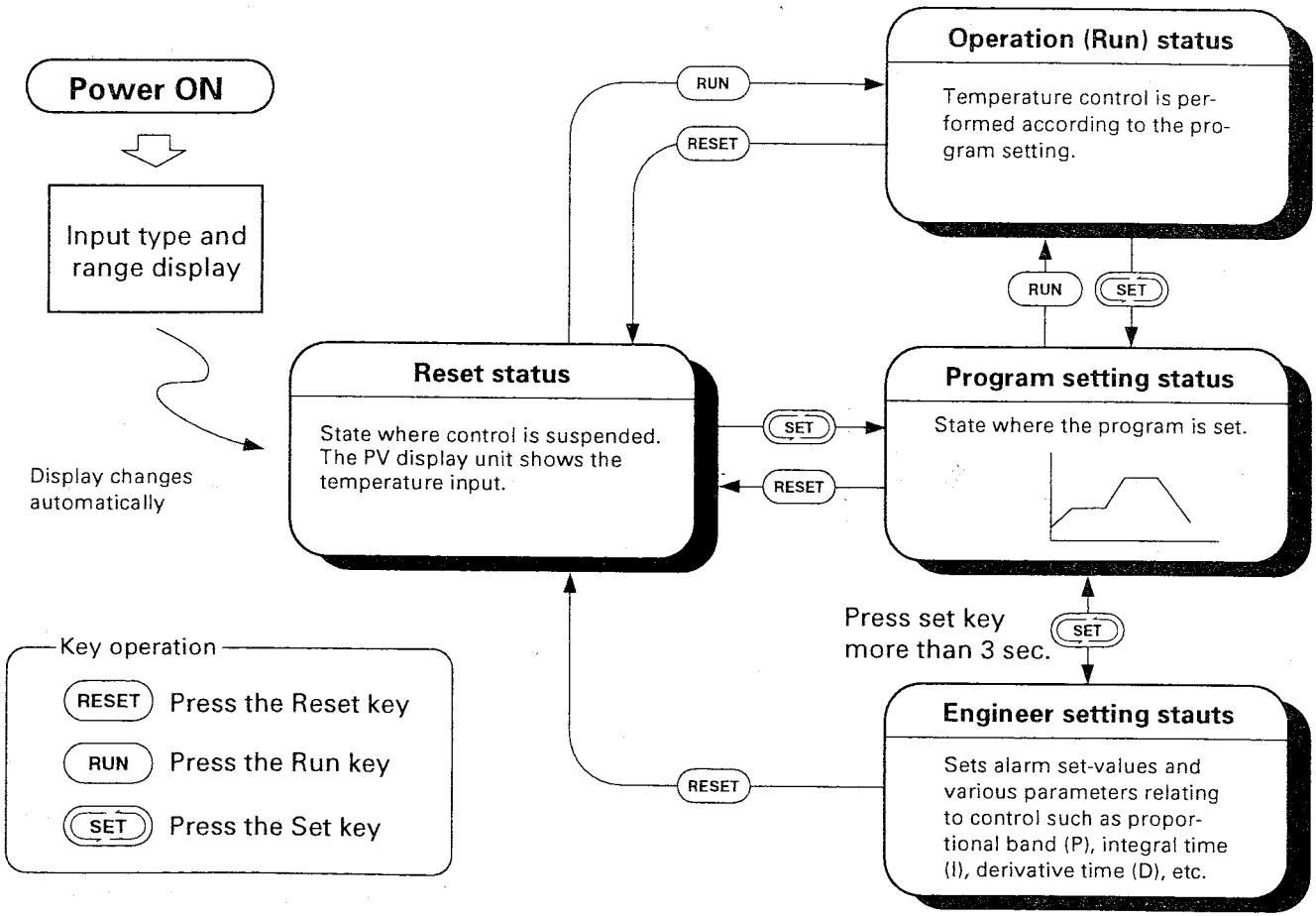
ⓒ Input type

Display														
Input type	Thermocouple												RTD	
	K	J	R	S	B	E	T	N	PL II	W5Re W26Re	U	L	JPt 100	Pt 100

ⓓ High input range limit value

ⓔ Low input range limit value

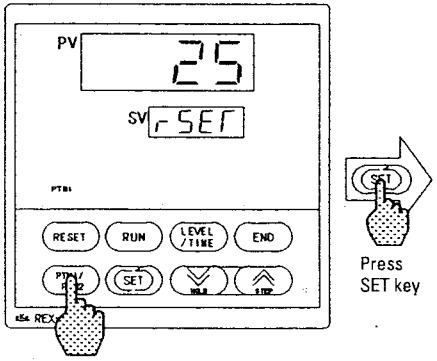
b) Operation status transition



c) Program basic setting

The procedure for making settings, from selection of the pattern to be set to pattern end registration, is described in the following.

① Setting pattern selection

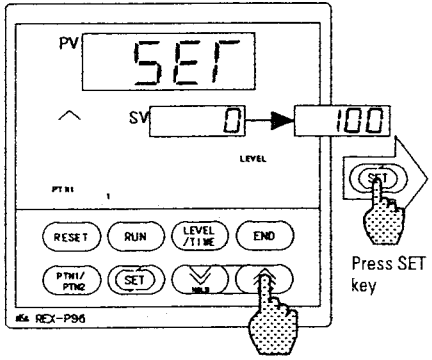


Press the (PTN1/PTN2) key to select the pattern to be set.

Pattern 1 : PTN1
Pattern 2 : PTN2

Press SET key

② Temperature setting

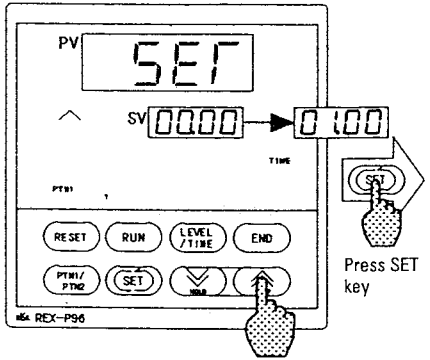


Press the (▲) key to set the desired temperature.

Setting example:
100
(100°C)

Press SET key

③ Segment time setting



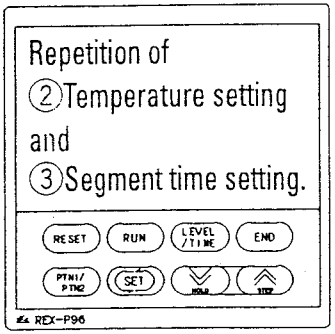
Press the (▲) key to set the segment time.

Setting example:
0 1.00
(1 hour)

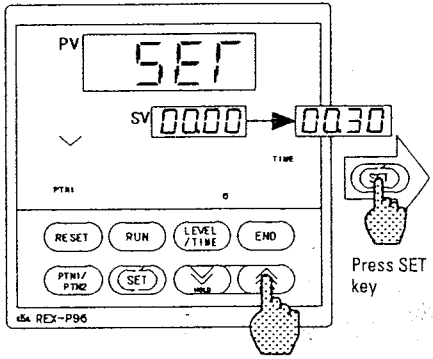
⚠ Precautions for key operation

- For this instrument, the displayed value changed by the (▼) or (▲) key is not registered. The displayed value thus set and changed is registered for the first time when the (SET) key is pressed.

④ **Repetition of temperature and time settings**



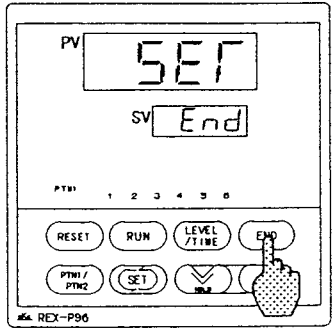
⑤ **Set the desired final segment time**



Press SET key

Press the ⟨STEP⟩ key to set the segment time.

⑥ **Pattern end registration**



Press the ⟨END⟩ key to set pattern end registration.

Setting example:

00.30

(30 min)

*** Pattern end release**

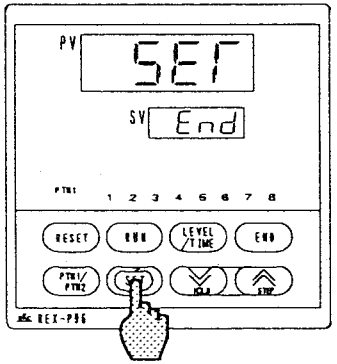
- To release the pattern end, press the ⟨END⟩ key again at the segment which is pattern-end-registered (SV display unit: "End")

5.2 Program application setting

a) Pattern link

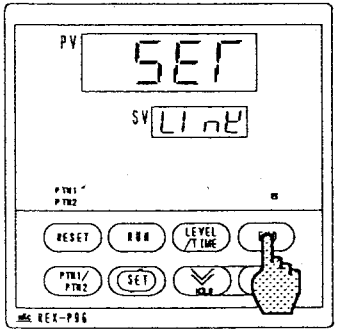
If the REX-P96/48 exceeds 8 segments per program, it can be used as 16 segments/pattern by linking two patterns.

① Confirmation of program end in pattern 1



Press the (SET) key several times to set the instrument to the final segment end registered state of pattern 1.

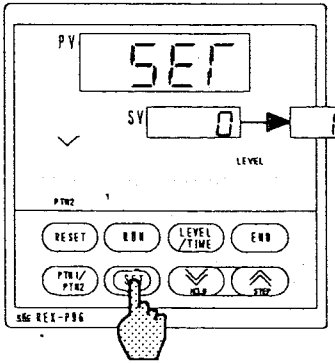
② Pattern link



Press SET key

Press the (END) key to release the pattern end registered state now registered.

③ Link segment temperature setting



Press SET key

Press the (STEP) key set a link segment temperature.

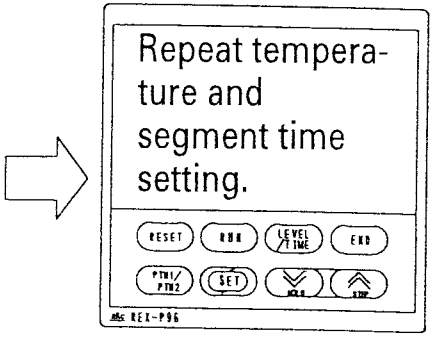
Setting example: 100

(100°C)

⚠ Precautions for setting operation

- When the pattern link function is used, the time signal function (option) set for each pattern and the pattern end output (option) setting become invalid, and must be re-set after the link pattern end is registered.

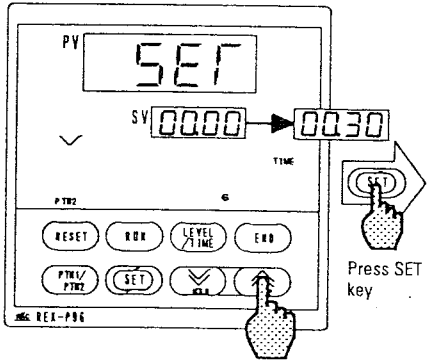
④ **Link pattern setting**



Set to temperture and segment time.

Pattern display:
PTN 1
PTN 2

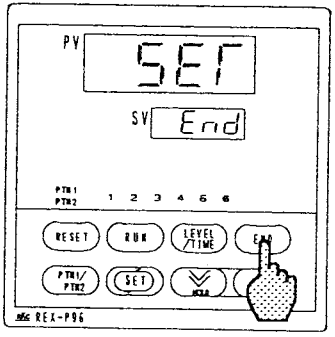
⑤ **The desired final segment time setting**



Press the ⟨STEP⟩ key to set the segment time.

Setting example:
00.30
(30 min)

⑥ **Link pattern end registration**



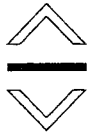
Press the ⟨END⟩ key to set pattern end registration.

b) Infinite time setting

The REX-P96/48 can set an infinite time to the segment to keep the temperature constant. Control continues at the temperature of the segment to which the infinite time is set until the program is reset or is stepped.

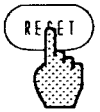
* Main point for setting infinite time

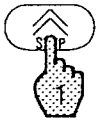
- The segment for which the infinite time can be set is that at which the temperature is kept constant.
  This means that the time during program setting can be set when the horizontal LED for displaying the segment progress state lights.



* Conditions for suspending infinite time operation

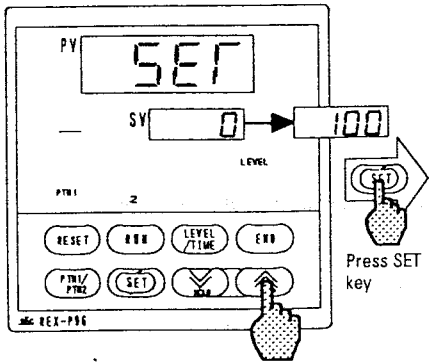
- Pressing the reset key during infinite time operation resets the program and suspends control.
  Similarly, control is suspended by resetting the external contact (option).
- Pressing the step key for more than 1 sec. during infinite time operation steps the program to the next segment and suspends infinite time operation.
  Similarly, control is suspended by stepping the segment by the external contact.





(For more than 1 sec.)

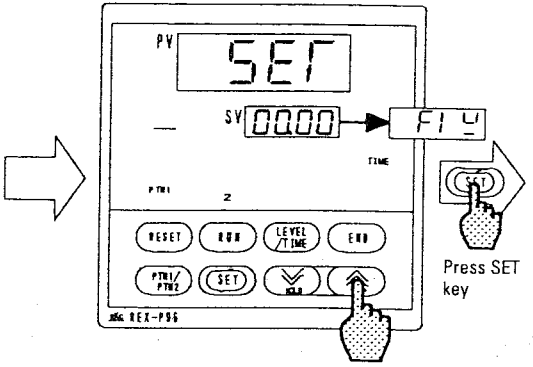
① Segment temperature setting



Press SET key

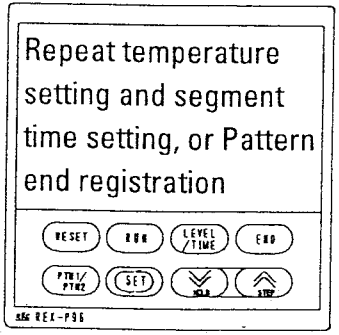
Sets the temperature which is to be kept constant.
Set to the same segment temperature as that of one segment ahead.

② Infinite time setting

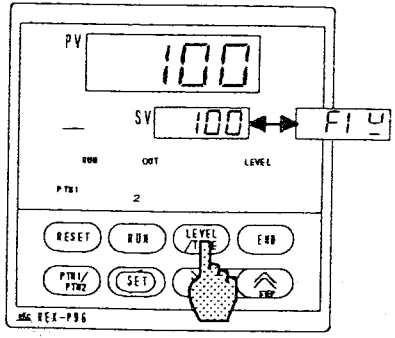


Keep pressing the ⟨∧⟩ key, and if the time exceeds 99 hours and 59 minutes, the infinite time symbol is displayed.
"F1 ∪"

③ Pattern setting



④ Example of infinite time operation (Run) display



Pressing the ⟨LEVEL /TIME⟩ key during infinite time operation displays "F1 ∪".
Pressing the ⟨LEVEL /TIME⟩ key again returns the above display to the set value.

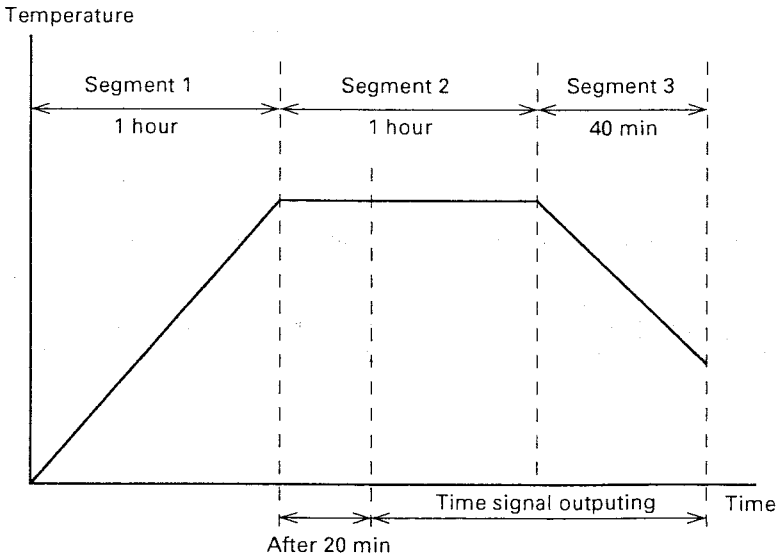
⚠ Precautions for setting infinite time

- Infinite time can be set only at the segment where the temperature is kept constant.
  Infinite time can not be set at a segment where the temperature is increased or decreased.
  Therefore, the setting can be made from segment 2 (inclusive).

c) Time signal setting

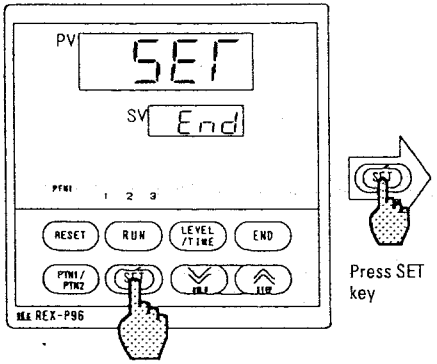
The time signal (TS) outputs the contact for a certain fixed time during program operation.

* Time signal setting example



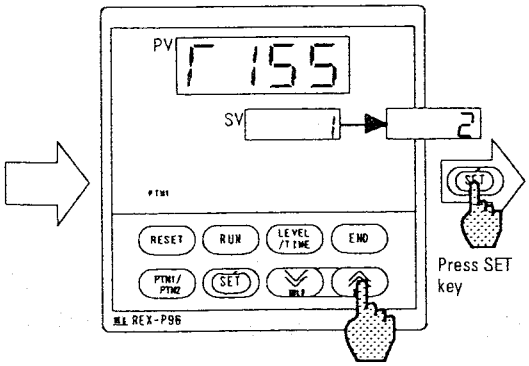
* When "No external contact output function" or "Pattern end output" is selected, no time signal settings are displayed.
* In this example, various setting of time signal 2 are omitted, but the setting procedures are the same as the various settings of time signal 1 from ② to ⑤.

① Confirmation of pattern end



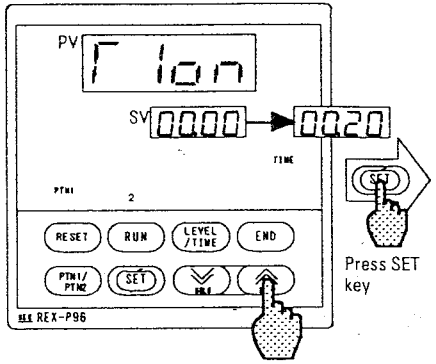
Press the (SET) key several times to display the segment which is pattern-end-registered.

② **Time signal 1**
Start segment setting



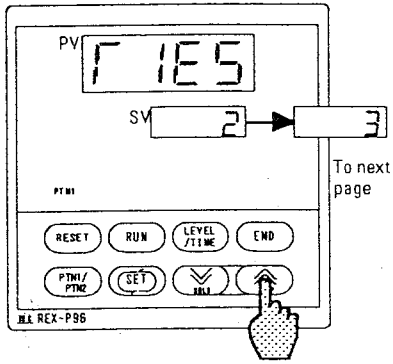
Press the ⟨STEP⟩ key to set the start segment of time signal 1 to "2".

③ **Time signal 1**
ON time setting



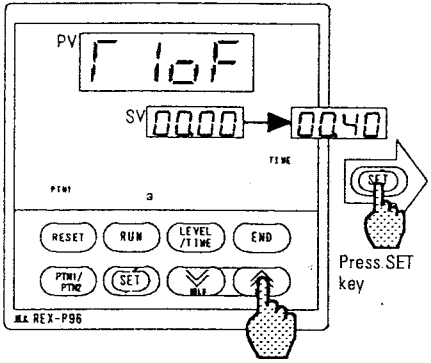
Press the ⟨STEP⟩ key to set the ON time of time signal 1 to 20 min. after segment 2.

④ **Time signal 1**
End segment setting



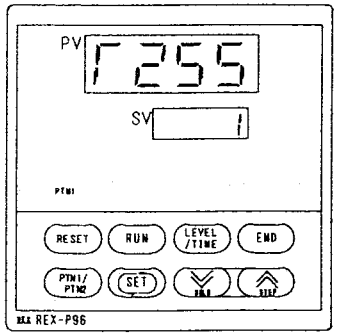
Press the ⟨STEP⟩ key to set the end segment of time signal 1 to "3".

⑤ **Time signal 1**
OFF time setting



Press the (SET) key to set the instrument to the OFF time state of time signal 1, then press the (STEP) key to set 40min. after segment 3.

⑥ **Time signal 2**
Start segment setting

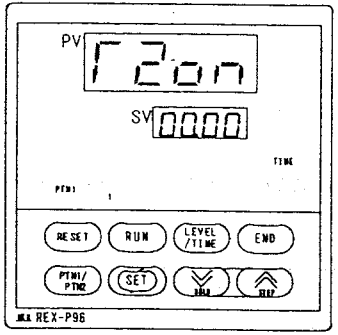


Press SET key

In this example, no setting is made.

For this setting, set the same setting as the start segment setting of ② time signal 1.

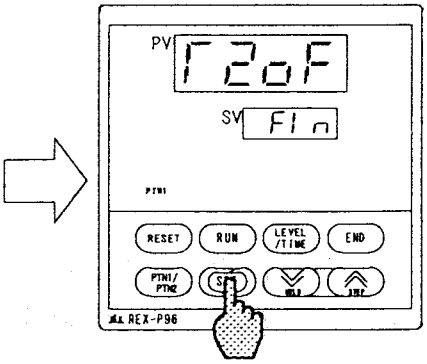
⑦ **Time signal 2**
ON time setting



In this example, no setting is mode.

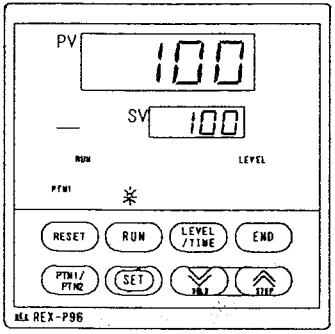
For this setting, set the same setting as the ON time setting of ③ time signal 1.

⑧ Time signal setting end



Press the (SET) key several times to display the time signal setting symbol "F1 n".

☆ Time signal display during operating (Running)

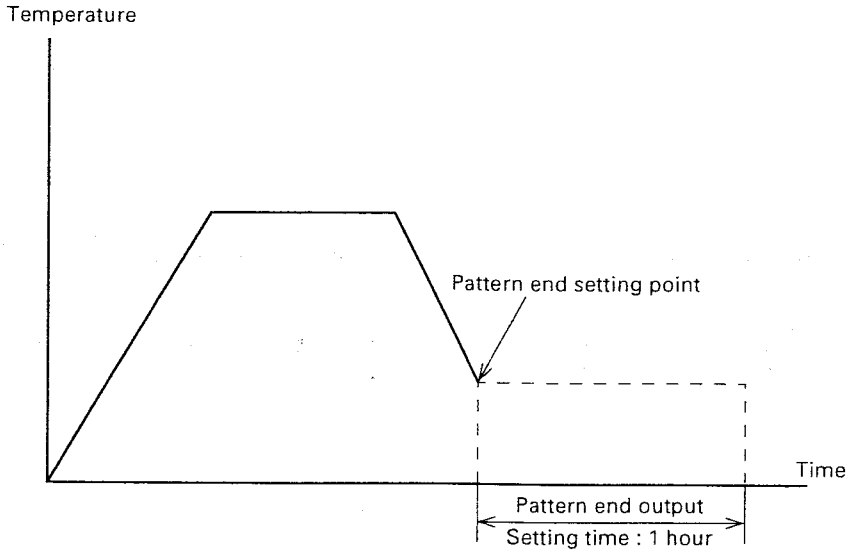


The LED which informs the operator of segment progress flashes while the time signal is displayed.

d) Pattern end output setting

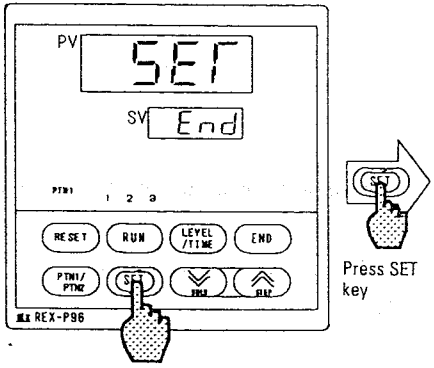
After the end of program pattern, the pattern end output outputs the contact output during the preset time.

* Pattern end output setting example



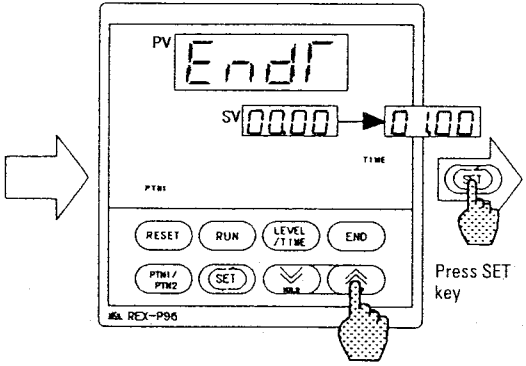
* When pattern "No external contact output function" or "Pattern end output" is selected, no pattern end setting are displayed.

① Confirmation of pattern end



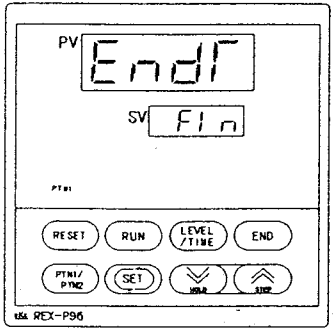
Press the (SET) key several times to display the segment which is pattern-end-registered.

② Pattern end output time setting



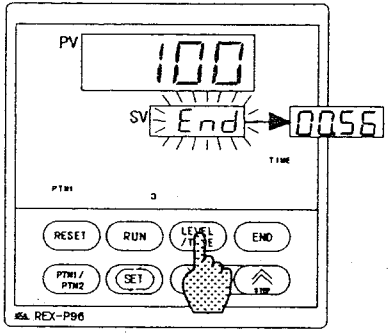
Press the (STEP) key set the time of pattern end output up for an hour.

③ Pattern end output time setting end



Display the pattern end output time symbol "Fin".

☆ Display during pattern end outputing

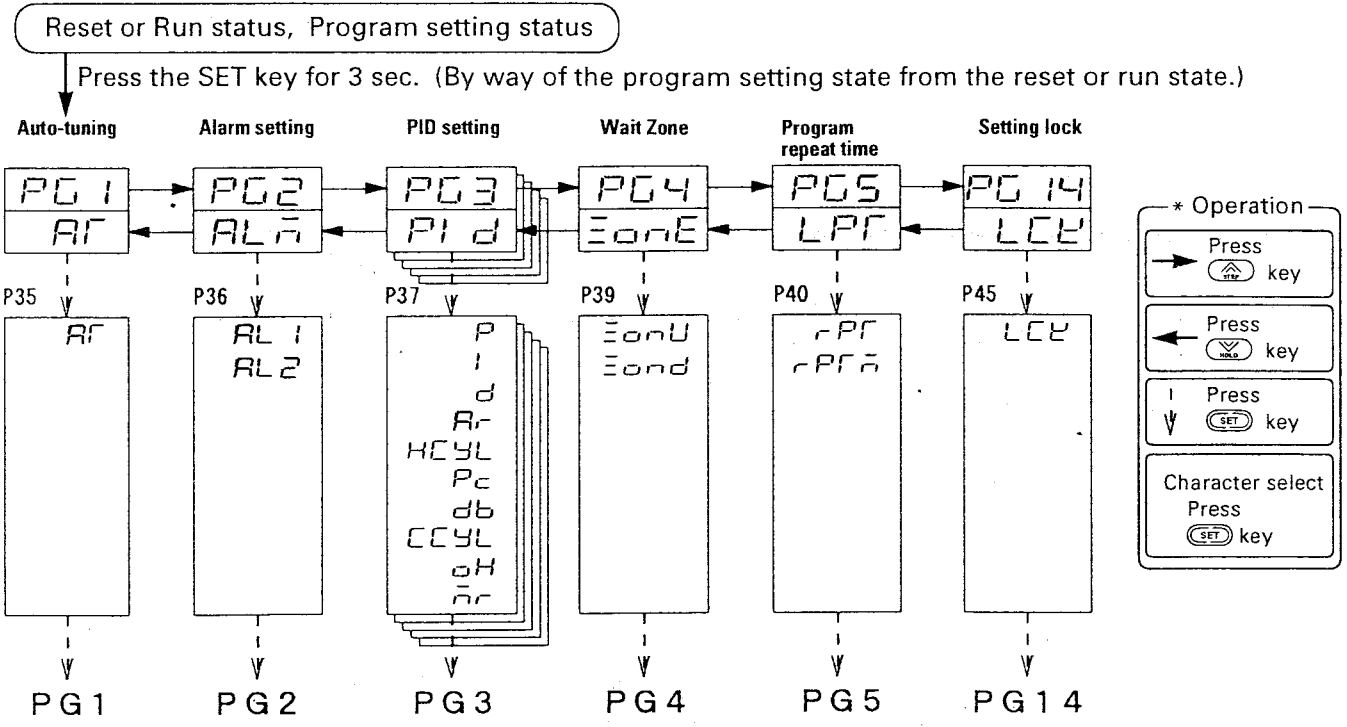


The "End" display flashes during pattern end display.

In addition, pressing the (LEVEL /TIME) key displays the remaining time of the pattern end output.

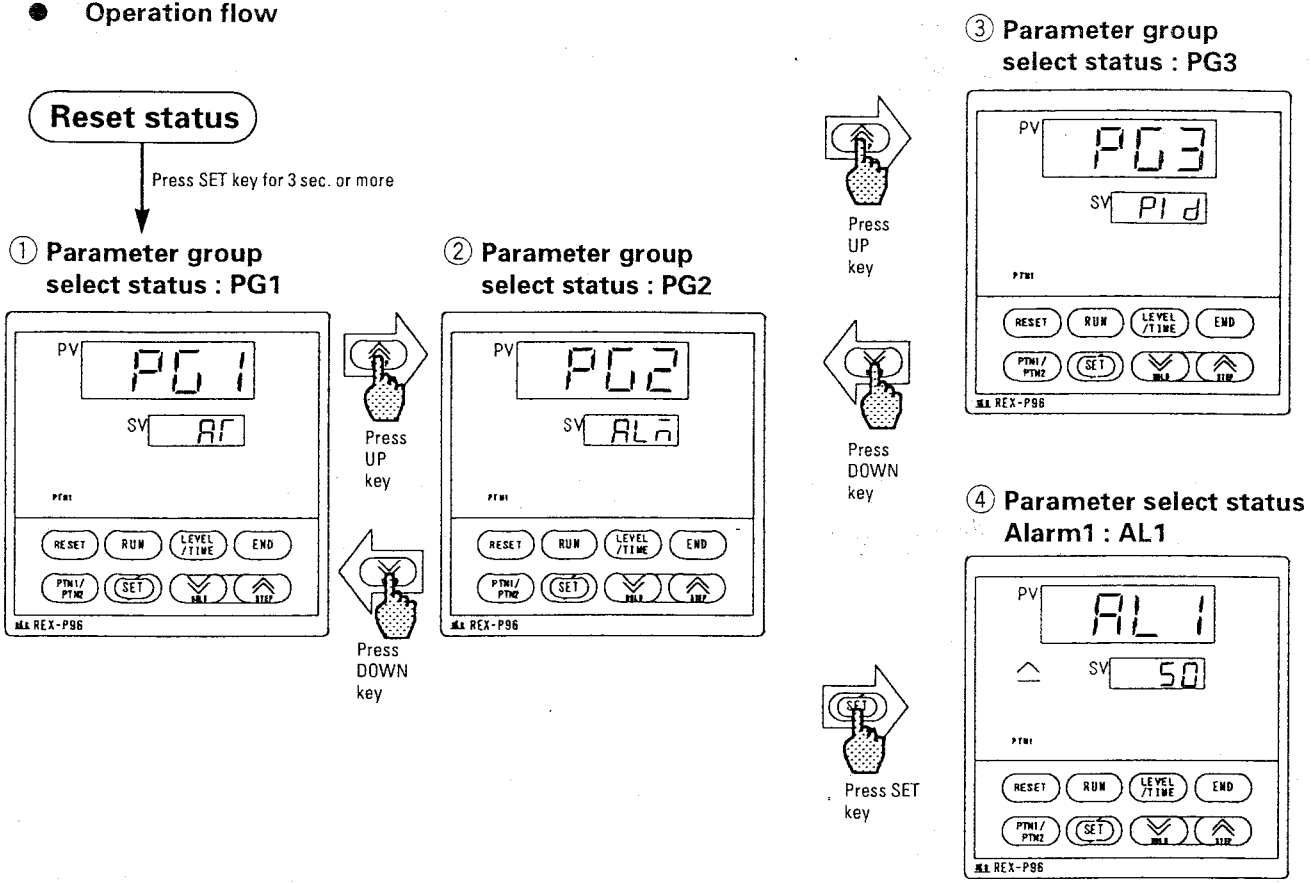
5.3 Engineer setting Level 1: Basic parameter setting

Engineer setting: Level 1 mode is used to set auto-tuning, alarm, various control constants, wait zone or the number of repeat times.
The parameter group (PG) list for level 1 is shown in the following.



CAUTION Not display by specifications.

● **Operation flow**



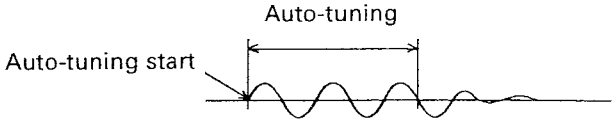
a) Parameter explanation

Parameter group (PG1): Auto-tuning section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG 1 PG1	Parameter group 1		The first characters of parameter group (PG1). They are also displayed first when the instrument is set to engineer set mode.	
AT AT	Auto-tuning	0 : Auto-tuning end or stop 1 : Auto-tuning start	Turns the auto-tuning ON/OFF	0

- **Auto-tuning**

Auto-tuning (AT) is function of automatically measuring, computing and setting the optimum PID constants.
Auto-tuning execution is valid only during program operation (RUN).
In addition, during auto-tuning execution the program stops and temperature hunting occurs as shown in the following diagram.
This means the instrument performs measurement and calculation, and is not abnormal.



* The auto-tuning time varies depending on the control system.

- **Auto-tuning (AT) suspension condition**

  - When the program is reset.
  - When the program is stepped.
  - When an engineer setting item is changed.
  - When a power failure occurs.

Parameter group (PG2): Alarm setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG2 PG2	Parameter group 2		The first characters of parameter group (PG2).	
AL 1 AL1	First alarm	• Deviation alarm High alarm, low alarm : –span to +span High and low alarm : –span to +span Band alarm : –span to +span • Process alarm : same as input range • Set-value alarm : same as input range	Sets the first alarm set-value.	50
AL2 AL2	Second alarm		Sets the second alarm set-value.	50

Displays for alarm setting

For alarm setting, the alarm type can be easily determined from the segment progress lamps [Orange] (see 4. Functional description on pages 15 and 16), which light or flash according to the alarm type.

Alarm type	Deviation high alarm	Deviation low alarm	Deviation high/low alarm	Band alarm	Process high alarm	Process low alarm	Set-value high alarm	Set-value low alarm
Segment status lamp (When alarm setting)								

*When the instrument is provided with the alarm wait action, the LED flashes.
However, no alarm wait action is provided for a set-value alarm.

Parameter group (PG3): PID setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG3 PG3	Parameter group 3		The first characters of parameter group (PG3).	
P P	Proportional band (Heating-side)	0 to span	Set when PI or PID control is performed. For heating/cooling PID action: Proportional band setting on the heating-side.	30 (30.0)
I I	Integral time	0 to 3600 sec.	Eliminates offset occurring in proportional control.	240
d d	Derivative time	0 to 3600 sec.	Prevents ripples by predicting output change, thereby improving control stability.	60
Ar Ar	Anti-reset wind-up (ARW)	0 to 100%	Prevents overshoot and/or undershoot caused by integral action effect.	100
** HCYL HCYL	Proportioning cycle (Heating side)	1 to 100 sec. ("0" cannot be set.)	Sets control output cycle when relay contact or voltage pulse output type.	20 : Relay contact 2 : Voltage pulse

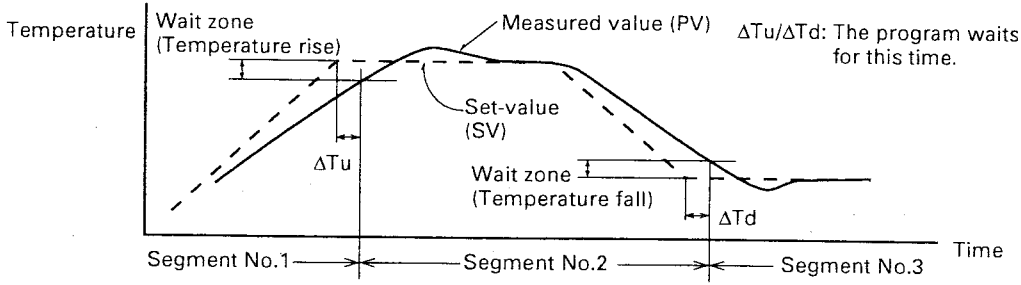
Parameter group (PG3): PID setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
* Pc PC	Cooling-side proportional band	1 to 1000% heating-side proportional band	Sets cooling-side proportional band when heating/cooling PID action is performed.	100
* db db	Deadband/ overlap	–10.0 to +10.0% of span	Sets control deadband between heating-side and cooling-side proportional bands. Minus (–) setting results in overlap.	0.0
* ** CCYL CCYL	Proportioning cycle (Cooling-side)	1 to 100 sec. ("0" cannot be set.)	Sets control output cycle when relay contact or voltage pulse output type.	20 : Relay contact 2 : Voltage pulse
oH oH	ON/OFF action differential gap	0 to 100°C [°F] or 0.0 to 100.0°C [°F]	Sets the differential gap during ON/OFF action.	2 (2.0)
*** Mr Mr	Manual reset	–50.0 to 50.0%	Corrects the manipulated variable (MV) to eliminate the offset occurring in proportional control.	0.0

* Display only during heating/cooling PID action.
** Display if the control output is relay contact or voltage pulse output.
*** No display during heating/cooling PID action.

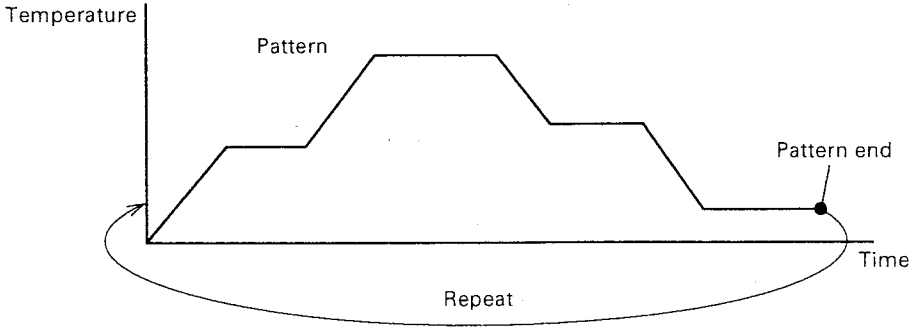
Parameter group (PG4): Wait zone section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG4 PG4	Parameter group 4		The first characters of parameter group (PG4).	
ZonU ZonU	Wait zone (Temperature rise)	0 to 99°C [°F] or 0.0 to 9.9°C [°F] ("0" setting: Function OFF)	If the temperature cannot follow the program progress during temperature rise, this function is used to make the program wait in the present segment but not to move to the next segment. The value thus set is the deviation value from the set value on the low temperature side.	0
Zond Zond	Wait zone (Temperature fall)	0 to 99°C [°F] or 0.0 to 9.9°C [°F] ("0" setting: Function OFF)	If the temperature cannot follow the program progress during temperature fall, this function is used to make the program wait in the present segment but not to move to the next segment. The value thus set is the deviation value from the set value on the high temperature side.	0



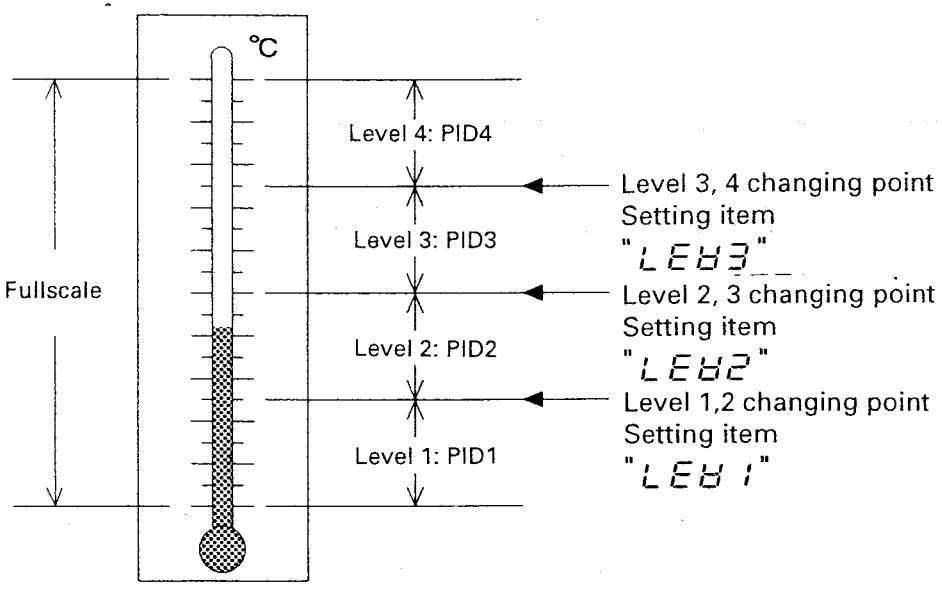
Parameter group (PG5): Program repeat section

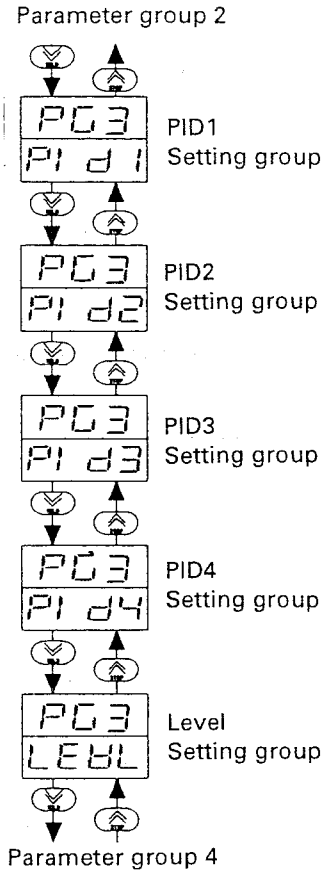
Symbol	Name	Setting range	Description	Initial value prior to shipment
PG5 PG5	Parameter group 5		The first characters of parameter group (PG5).	
rPT rPT	Program execution times setting	1 to 999 times * More than 1000 times executes the program indefinitely.	Sets the number of program execution times. If set to 1000 times or more, the program is executed indefinitely.	1
rPTM rPTM	Repeat times monitor	———	Displays the remaining number of program repeat times during program execution (RUN). Not displayed in the reset state.	—



b) Level PID (Option)

The level PID function is used to set PID control constants individually by dividing the fullscale into 4 regions (levels) in order to achieve finer temperature control.
This function is effective especially for a controlled object whose load characteristics differ depending on the temperature region.





Parameter group (PG3): Level PID setting section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG3 PG3	Parameter group 3		The first characters of parameter group (PG3).	
P 1 P 1	Proportional band (Heating-side)	0 to input span	Set when PI or PID control is performed. For heating/cooling PID action: Proportional band setting on the heating-side.	30 (30.0)
I 1 I 1	Integral time	0 to 3600 sec.	Eliminates offset occurring in proportional control.	240
d 1 d 1	Derivative time	0 to 3600 sec.	Prevents ripples by predicting output change, thereby improving control stability.	60
Ar 1 Ar 1	Anti-reset wind-up (ARW)	0 to 100%	Prevents overshoot and/or undershoot caused by integral action effect.	100
* Pc 1 Pc 1	Cooling-side proportional band	1 to 1000% heating-side proportional band	Sets cooling-side proportional band when heating/cooling PID action is performed.	100

* Displayed only during heating/cooling action.

※For level PID, parameter group 3 (PG3) has PID 1 to 4 and level setting.

Parameter group (PG3): Setting of the level ①

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG3 PG3	Parameter group 3		The first characters of parameter group (PG3).	
LEV1 LEV1	Level 1	The setting limiter low-limit to the setting limiter high-limit. However, if set to the setting limiter low-limit, level 1 becomes invalid.	Sets the boundary controlled by PID1 and PID2 groups.	
LEV2 LEV2	Level 2	The set-value of Level 1 to the setting limiter high-limit. However, if set to the set-value of Level 1, Level 2 becomes invalid.	Sets the boundary controlled by PID2 and PID3 groups.	
LEV3 LEV3	Level 3	The set-value of Level 2 to the setting limiter high-limit. However, if set to the set-value of Level 2, Level 3 becomes invalid.	Sets the boundary controlled by PID3 and PID4 groups.	
** HCYL HCYL	Proportioning cycle (Heating side)	1 to 100 sec. ("0" cannot be set.)	Sets control output cycle when relay contact or voltage pulse output type.	20:Relay cutout 2:Voltage pulse

** Displayed if the control output is relay contact or voltage pulse output.
※When the instrument is used in the set before shipment, it is operated using the PID1 constants.

Parameter grpup (PG3): Setting of the level ②

Symbol	Name	Setting range	Description	Initial value prior to shipment
* db	Deadband/ overlap	−10.0 to +10.0% of span	Sets control deadband between heating-side and cooling-side proportional bands. Minus (−) setting results in overlap.	0.0
* ** CCYL	Proportioning cycle (Cooling-side)	1 to 100 sec. ("0" cannot be set.)	Sets control output cycle when relay contact or voltage pulse output type.	20: Relay contact 2: Voltage pulse
oH	ON/OFF action differential gap	0 to 100°C [°F] or 0.0 to 100.0°C [°F]	Sets the differential gap during ON/OFF action.	2 (2.0)
*** Mr	Manual reset	−50.0 to 50.0%	Corrects the manipulated variable (MV) to eliminate the offset occurring in proportional control.	0.0

* Display only during heating/cooling PID action.
** Display if the control output is relay contact output or voltage pulse out.
*** No display during heating/cooling PID action.

c) Set data locking

Parameter group (PG14): Setting data lock section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG 14 PG14	Parameter group 14		The first characters of parameter group (PG14).	
LCK LCK	Set data lock level	See to setting contents	Set level which enables set data lock.	0 0 0 0

• Setting contents

Setting	PG1	PG2	PG3	PG4	PG5	PG6	PG7	PG8	PG9	PG10	PG11	PG12	PG13	PG14
0000	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	◎
0001	▲	▲	▲	▲	▲	—	—	—	—	—	—	—	—	◎
0010	◎	◎	◎	◎	◎	○	○	○	○	○	—	—	—	◎
0011	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	—	—	—	◎
0100	◎	◎	◎	◎	◎	○	○	○	○	○	○	○	○	◎
0101	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	◎

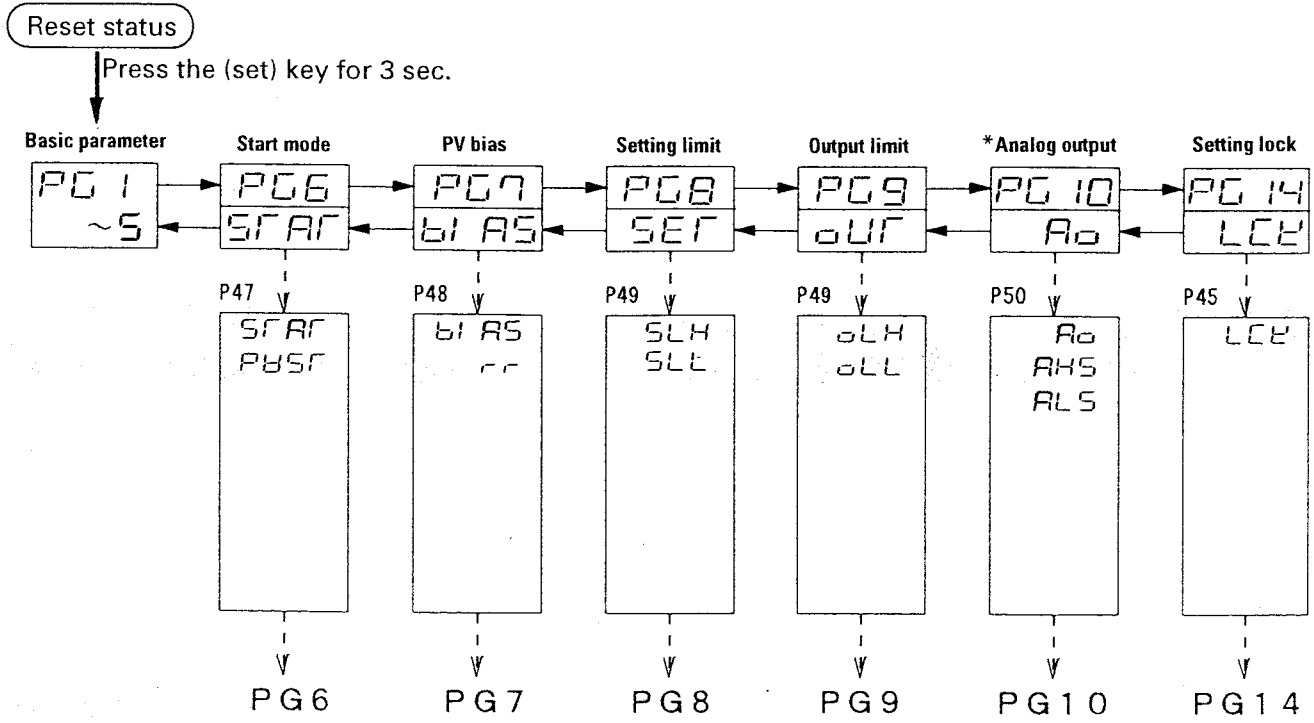
◎ : Enable setting
○ : Enable setting
* Only monitoring during running.
▲ : Only monitoring
— : No display (No monitoring)

⚠ Operating precautions

• If the contents of parameter groups 11 to 13 are changed, all of the settings return to the default values.
Prior to changing the setting, take a note of the program and various constants, and after the setting is changed re-set these constants.

5.4 Engineer setting: Level 2; Application parameter setting

Engineer setting level 2 is used to set start mode, PV bias, setting limit, output limit, analog output.
This parameter can be set when the date set to "0010" by the setting lock (PG14) is released.
The parameter group (PG) list for level 2 is shown in the following.



Items marked with * are displayed only when the option is selected.

a) Parameter explanation

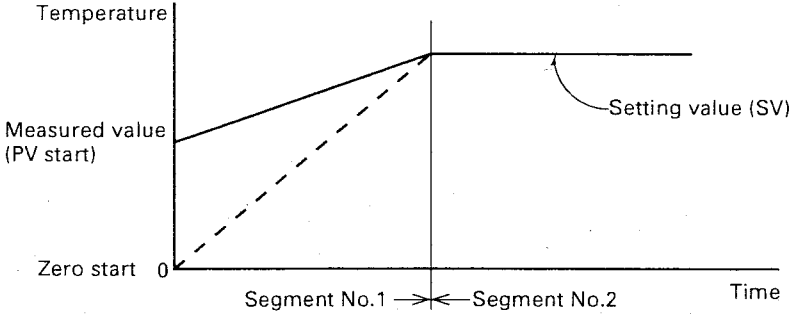
Parameter group (PG6): Start mode section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG6 PG6	Parameter group 6		The first characters of parameter group (PG6).	
STAT STAT	Start mode selection	0: Cold start from reset state 1: Power-ON start Enforced start from the 1st segment of pattern 1 2: Hot start	Selects action at power-ON or power recovery.	0
PVST PVST	Start point selection	0: Zero start 1: PV start	Selects the start point on the time axis at which the program is started.	0

*** Start mode**

This instrument follows the start mode set at power-ON or for a power failure exceeding 4 sec.

*** Start point**

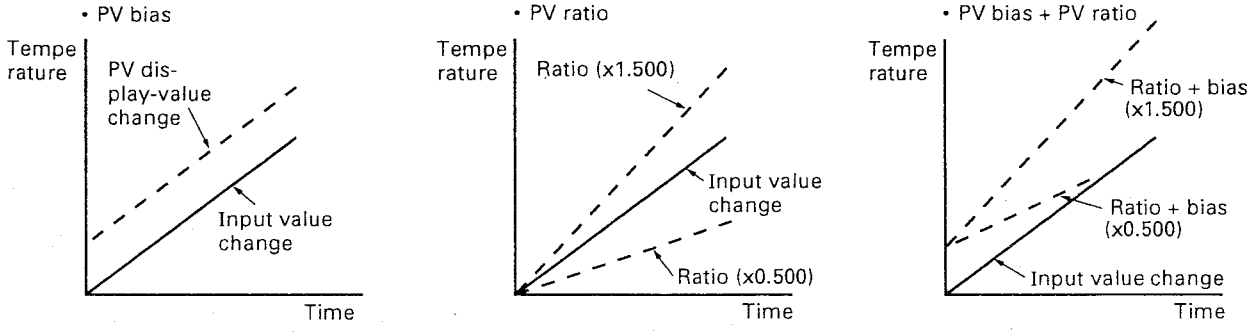


Parameter group (PG7): PV bias section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG7	Parameter group 7		The first characters of parameter group (PG7).	
bIAS	PV bias	–1999 to 9999°C [°F] or –199.9 to 999.9°C [°F]	Sensor correction is made by adding bias value to measured-value (PV).	0 (0.0)
rr	PV ratio	0.001 to 9.999	Sensor correction is made by multiplying ratio value to measured-value (PV).	1.000

*** PV bias and PV ratio**

PV displayed value = **Input value** × **PV ratio** + **PV bias**



Parameter group (PG8): Setting limit section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG8 PG8	Parameter group 8		The first characters of parameter group (PG8).	
SLH SLH	Setting limit (high limit)	Within input range *Setting high limit > Setting low limit	Sets high limit of setting range.	High input limit
SLL SLL	Setting limit (low limit)	Within input range *Setting high limit > Setting low limit	Sets Low limit of setting range.	Low input limit

Parameter group (PG9): Output limit section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG9 PG9	Parameter group 9		The first characters of parameter group (PG9).	
oLH oLH	Output limit (high limit)	–5.0 to 105.0% of manipulated output value	High limit of manipulated output value (MV). For heating/cooling PID action: Output limit (high limit) on the heating-side output	105.0
oLL oLL	Output limit (low limit)		Low limit of manipulated output value (MV). For heating/cooling PID action: Output limit (low limit) on the cooling-side output	–5.0 For heating/cooling PID action: 105.0

Parameter group (PG10): Analog output section (Option)

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG 10 PG10	Parameter group 10		The first characters of parameter group (PG10)	
Ao Ao	Analog output specification selection	0: Measured-value (PV) output 1: Set-value (SV) output 2: Manipulated output value (MV)	Selects analog output type.	0
AHS AHS	High limit analog output range	Specification selection 0, 1: Within input range 2 : 100.0 (Fixed)	Sets high limit of analog output range.	High input limit
ALS ALS	Low limit analog output range	Specification selection 0, 1: Within input range 2 : 0.0 (Fixed)	Sets low limit of analog output range.	Low input limit

PRECAUTIONS The output resolution is more than 10 bits (differs depending on the input type). If the output range is set to more than 10 bits (1024 counts), display skipping may occur when connected to a digital display unit.

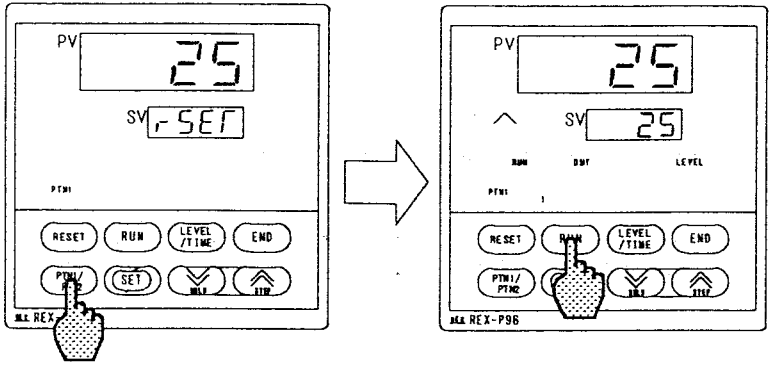
Output range = High limit setting – low limit setting

5.5 Operation

a) Execute the program

After completing the program setting and all parameter settings, check that the wiring is correct, then start operation.

① **Execute the program**

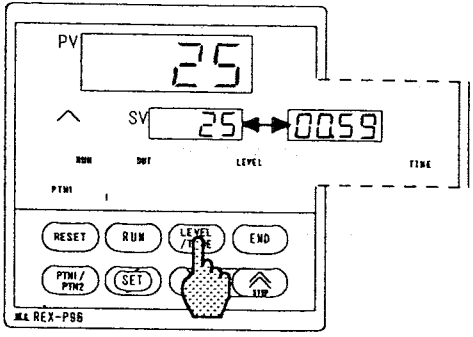


Press the (PTN1/PTN2) key to select the pattern to be operated.

Pattern 1 : PTN1
Pattern 2 : PTN2

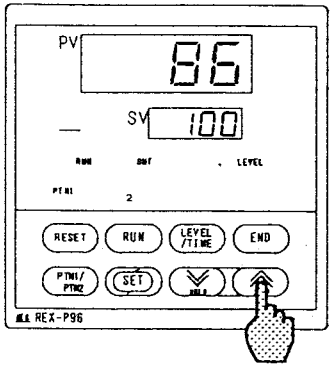
Press the (RUN) key to execute the program.

② **Make sure of the rest of segment time**



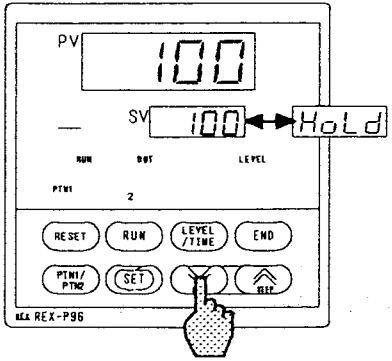
Pressing the the (LEVEL/TIME) key during operation displays the remaining time of the segment being executed. Pressing the (LEVEL/TIME) key again returns to the setting temperature display.

③ Execute the step



Pressing the (STEP) key for more than 1 sec. during operation advances the program segment by 1.

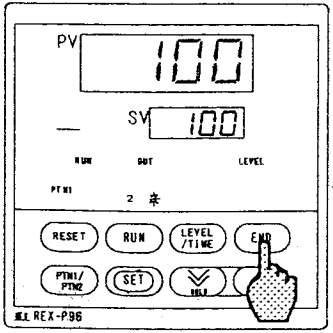
④ Execute the hold



Pressing the (HOLD) key for more than 1 sec. during operation holds the temperature set-value at that time, and "Hold" and the set value are displayed alternately.

*Press the (HOLD) key to release the hold.

⑤ Make sure of the final segment

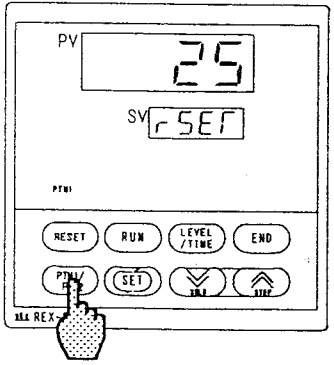


To next page

Pressing the (END) key during operation flashes the pattern-end-registered segment while the key is pressed.

b) Setting procedure of auto-tuning (AT)

① Rest status

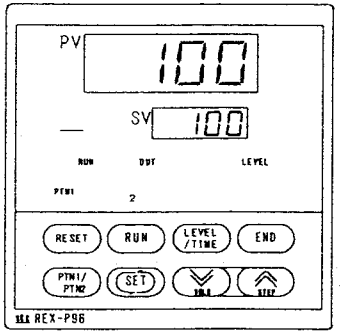


Press the PTN1/PTN2 key to select the pattern to be operated.

Pattern 1 : PTN1
Pattern 2 : PTN2

Press the (RUN) key

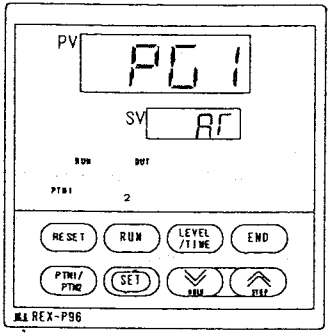
② Program execution status



Confirm that the instrument is set to the temperature setting required for auto-tuning when the program executes.
Use the step function if necessary.

Press the (SET) key for more 3 sec.

③ Engineer setting status Parameter group 1



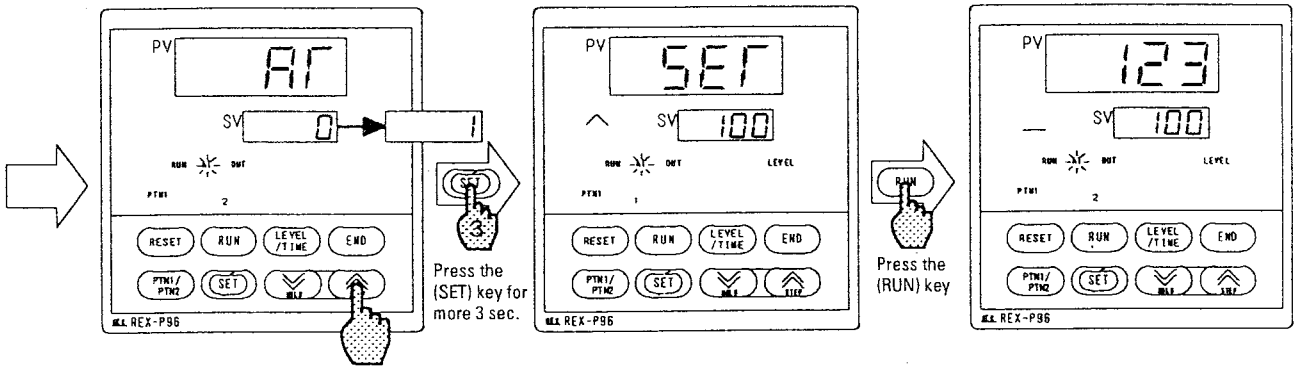
Call up the auto-tuning item of parameter group1.

Press the (SET) key

④ Set to auto-tuning execution

⑤ Program setting status

⑥ Program operation (RUN) status
Executing auto-tuning



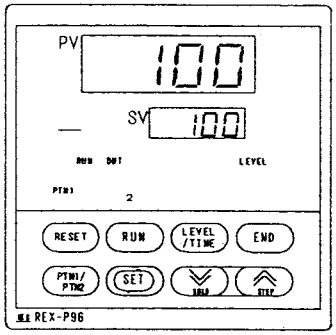
Press the ⏫ key to execute the auto-tuning.

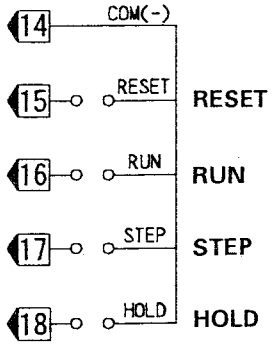
*** Auto-tuning setting precautions**

- Program stops during auto-tuning. In addition, temperature hunting occurs by the ON/OFF action.

5.6 External contact input (Option)

After completing the program setting and all parameter settings, check that the wiring is correct, then start operation.





① **Reset function (RESET)**
If rear terminal Nos. 14 and 15 are closed, the reset function is activated.

② **Run function (RUN)**
If rear terminal Nos. 14 and 16 are closed, the run function is activated.

③ **Step function (STEP)**
If rear terminal Nos. 14 and 17 are closed, the step function is activated, but only during program control.

④ **Hold function (Hold)**
If rear terminal Nos. 14 and 18 are closed, the hold function is activated, but only during program control.

* Reset, run or step is activated by one pulse (more than 0.5 sec.)
Hold is activated only when the contacts are closed.
However, there is a time lag of approx. 1 sec for step-key capture.
The priority order is reset, run, hold and step.

*** Input rated**

a) Input type : Dry contact input
① 500KΩ or more : Open
② 10Ω or less : Close
b) Contact current
: Approx 3.5mA
c) Contact open voltage
: Approx 18VDC or less
d) Wiring distance
: 10m or less

■ Initial value prior to shipment list (PG1 to 10)

PG1	AT	0	PG5	rPT	1
PG2	AL1	50		rPTM	–
	AL2	50	PG6	STAT	0
PG3	P	30 (30.0)		PVST	0
	I	240	PG7	bIAS	0 (0.0)
	d	60		rr	1.000
	Ar	100	PG8	SLH	High input range
	HCYL	Relay contact : 20 Voltage pulse: 2		SLL	Low input range
	Pc	100	PG9	oLH	105.0
	db	0.0		oLL	Heating :-5.0 Heating/cooling action : 105.0
	CCYL	Relay contact : 20 Voltage pulse: 2	PG10	Ao	0 (Measured value)
	oH	2 (2.0)		AHS	High input range
	Mr	0.0		ALS	Low input range
PG4	ZonH	0 (0.0)			
	ZonL	0 (0.0)			

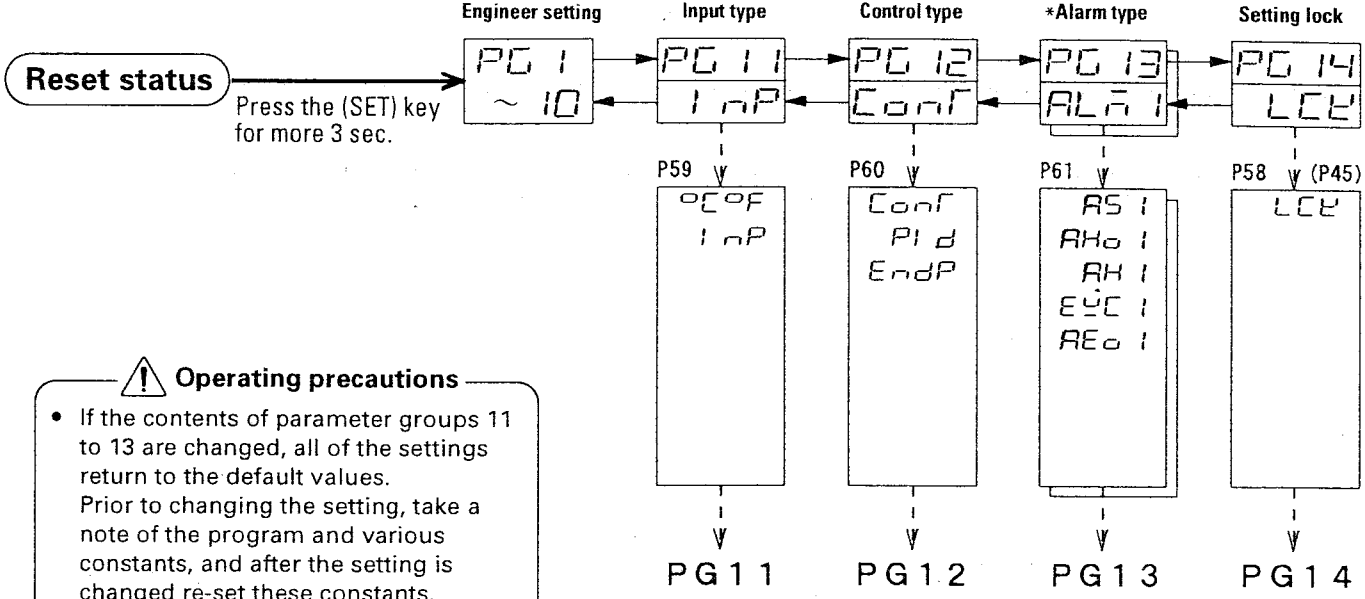
● For level PID
Mark □ : Common level 1 to 4.

PG3	P□	30 (30.0)
	I□	240
	d□	60
	Ar□	100
	Pc□	100
	LEV 1	High input range
	LEV 2	
	LEV 3	
	HCYL	Relay contact : 20 Voltage pulse: 2
	db	0.0
	CCYL	Relay contact : 20 Voltage pulse: 2
	oH	2 (2.0)
	Mr	0.0

PRECAUTIONS Note that there are some items which are not displayed depending on the specification.

6.1 Initial setting: Parameter setting

The initialize setting is for changing the input, control and alarm types specified when the controller was purchased.
Therefore, change this setting carefully on your own responsibility.
The parameter group (PG) list for the initialize setting is described in the following.



⚠ Operating precautions

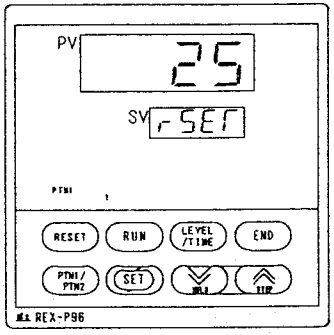
- If the contents of parameter groups 11 to 13 are changed, all of the settings return to the default values.
  Prior to changing the setting, take a note of the program and various constants, and after the setting is changed re-set these constants.

Mark *: Does not display when no alarm is provided.

6.2 Release procedures of setting lock

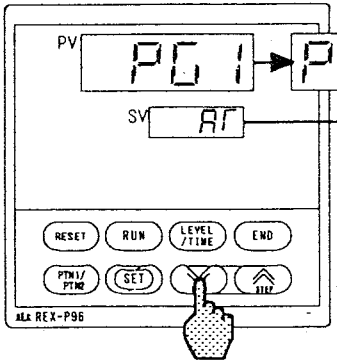
To perform the initialize setting, release the setting lock as follows.

① **Reset status**



Press the (SET) key for more 3 sec.

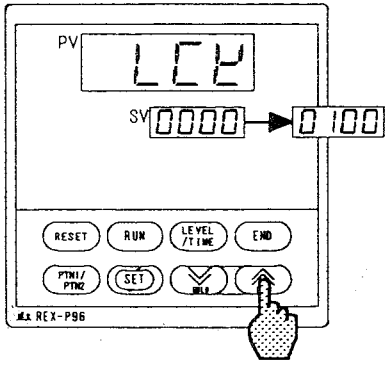
② **Engineer setting status**



Press the key ⟨HOLD⟩ to set the instrument to setting lock parameter group 14.

Press (SET) key

③ **Release the setting lock**



Press the ⟨STEP⟩ key to release the lock at the initialize setting level.

"0100"

*** Setting lock setting precautions**

- After releasing the setting lock and completing the necessary settings, return the display to "0000" by the same procedure as described above.

6.3 Parameter explanation

Parameter group (PG11): Input type section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG11	Parameter group 11		The first characters of parameter group (PG11).	
°C°F	°C/°F selection	°C: °C unit °F: °F unit	Selects temperature unit	°C
InP	Input type selection	Following under the table	Selects input type	To be specified when ordering

Input type

Input type	Model code		Select	Ranges (°C)	Model code		Select	Ranges (°F)
K	K	22	0	−199.9 to 999.9°C	K	B2	50	−199.9 to 999.9°F
	K	16	1	−200 to 1372°C	K	B3	51	−330 to 2500°F
J	J	14	2	−199.9 to 999.9°C	J	A9	52	−199.9 to 999.9°F
	J	15	3	−200 to 1200°C	J	B1	53	−330 to 2192°F
T	T	01	4	−199.9 to 400.0°C	T	A1	54	−199.9 to 752.0°F
R	R	02	5	0 to 1769°C	R	A2	55	0 to 3216°F
S	S	02	6	0 to 1769°C	S	A2	56	0 to 3216°F
B	B	02	7	0 to 1820°C	B	A2	57	0 to 3308°F
E	E	06	8	−200 to 1000°C	E	A5	58	−330 to 1832°F
N	N	02	9	0 to 1300°C	N	A2	59	0 to 2372°F
PL II	A	02	10	0 to 1390°C	A	A2	60	0 to 2534°F
W5Re/W26Re	W	02	11	0 to 2320°C	W	A4	61	0 to 4208°F
U	U	08	12	0 to 600°C	U	A4	62	0 to 1100°F
L	L	05	13	0 to 900°C	L	A2	63	0 to 1600°F
JPt100	P	20	14	−199.9 to 510.0°C	P	B6	64	−199.9 to 950.0°F
Pt100	D	20	15	−199.9 to 660.0°C	D	A1	65	−199.9 to 999.9°F

Input type B: Accuracy in the range of 0 to 400°C (0 to 752°F) → Not guaranteed.
Input type N, PLII, W5Re/W26Re: Accuracy in the range or 0 to 32°F → Not guaranteed.

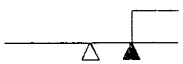
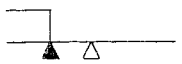
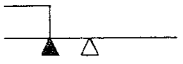
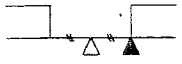
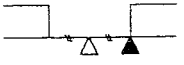
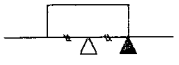
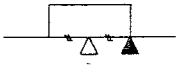
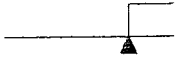
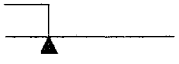
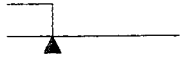
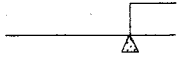
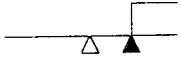
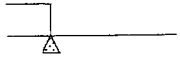
Parameter group (PG12): Control section

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG 12 PG12	Parameter group 12		The first characters of parameter group (PG12).	
ConF ConT	Direct/ Reverse action selection	0 : Reverse action 1 : Direct action	Selects direct or reverse control action.	To be specified when ordering
PId PId	PID/Level PID selection	0 : PID control 1 : Level PID control	Selects PID control or level PID control.	To be specified when ordering
EndP EndP	Selects control when program ended	0 : Continuous control 1 : Stop control	Select continuous control/stop control when program ended.	0

Parameter grpup (PG13): Alarm type (Option) * Same to alarm 2

Symbol	Name	Setting range	Description	Initial value prior to shipment
PG 13 PG13	Parameter group 13		The first characters of parameter group (PG13).	
AS 1 AS1	First alarm action selection	Refer to alarm action type explanation	Selects first alarm action	To be specified when ordering
AHo 1 AHo1	First alarm hold action selection	0 : No hold action 1 : Hold action1: Hold action is valid when the instrument is power-ON or transferred operation mode from STOP to execution (RUN). 2 : Hold action 2: Hold action is valid when the instrument is power-ON or transferred operation mode from STOP to execution (RUN) or changed the set-value.	Selects the first alarm hold action	To be specified when ordering
AH 1 AH1	First alarm differential gap	0 to 10°C [°F] or 0.0 to 10.0°C [°F]	Sets first alarm differential gap	2 (2.0)
EXC 1 EXC1	First alarm energized/ de-energized selection	0 : Energized alarm 1 : De-energized alarm	Selects whether first alarm is set to energized alarm or de-energized alarm.	0
AEo 1 AEo1	First alarm action selection at input abnormality	0 : Alarm ON when measured value is alarm action range. 1 : Compulsory alarm ON 2 : Compulsory alarm OFF	Selects first alarm action when measured-value (PV) exceeds input abnormality determination point.	0

Alarm action type explanation

Code	Alarm action type explanation		Display	Code	Alarm action type		Display
1	**Deviation high alarm**			②	**Deviation low alarm with hold action**		 LED blinks
2	**Deviation low alarm**			③	**Deviation high/low alarm with hold action**		 LED blinks
3	**Deviation high/low alarm**			④	**Deviation band alarm with hold action**		 LED blinks
4	**Deviation band alarm**			⑤	**Process high alarm with hold action**		 LED blinks
5	**Process high alarm**			⑥	**Process low alarm with hold action**		 LED blinks
6	**Process low alarm**			7	**Set-value high alarm**		 Upper LED blinks
①	**Deviation high alarm with hold action**		 LED blinks	8	**Set-value low alarm**		 Lower LED blinks

△ : Main setting ▲ : Alarm setting

* The high/low-limit deviation alarm and within-range deviation alarm become absolute value deviations.
* The code corresponds to the "AS□ " No. for selecting the alarm action type of parameter group 13 (PG13). Also, each figure enclosed with ○ in the above table shows the action when the alarm wait action is selected.
* Each display in the above table shows the relevant alarm type when parameter group 2 (PG2) or 13 (PG13) is set. Therefore, it differs from the operation status display that shows the state of program progress.

7. DISPLAY AT ABNORMALITY ⚠

• For input abnormality

Display	Details	Action (Output)	Measures
Measured-value (PV) Flashing	Input abnormality Measured-value (PV) exceeds the high input abnormality determination limit or less than the low input abnormality determination limit.	• Action at input abnormality If overscale or downscale occurs in the controller, control output is off, alarm outputs by alarm action selection at input abnormality. Shipping : Alarm ON when measured value is alarm action range.	⚠ WARNING **In order to prevent electric shock, prior to replacing the sensor, always turn OFF the power.**
▭▭▭▭ Flashing	Overscale Measured-value (PV) is beyond the effective input range.		Check input type, range, sensor and sensor connection.
▭▭▭▭ Flashing	Underscale Measured-value (PV) is below the effective input range.		

8. OUTPUT RATED TABLE

Output rated table

Control output	Relay contact	250V AC, 3A (Resistive load)
	Voltage pulse	0/12V DC (Load resistance: 600Ω or more)
	Current	0 to 20mA DC, 4 to 20mA DC (Load resistance: 600Ω or less)
Alarm output	Relay contact	250V AC, 1A (Resistive load)
Time signal output	Relay contact	250V AC, 1A (Resistive load)
Pattern end output	Relay contact	250V AC, 1A (Resistive load)
Analog output	Voltage	0 to 10mV DC, 0 to 100mV DC (Load resistance: 20kΩ or more) 0 to 1V DC, 0 to 5V DC, 0 to 10V DC, 1 to 5V DC (Load resistance: 1kΩ or more)
	Current	0 to 20mA DC, 4 to 20mA DC (Load resistance: 600Ω or less)

MEMO

MEMO

RKC RKC INSTRUMENT INC.

IM48P01-E1

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