FUJI ELECTRIC **Instruction Manual**

Micro-controller X
Model: PXR4

INP-TN1PXRa-E

Fuji Electric Co., Ltd.
Head Office
11-2, Osaki 1-chome, Shinagawa-ku, Tokyo, 141-0032 Japan
http://www.fujielectric.co.jp

Fuji Electric Instruments Co., Ltd.
Sales Div. International Sales Dept.
No.1, Fuji-machi, Hino-city, Tokyo, 191-8502 Japan
Phone : +81-42-585-6201,6202
Fax : +81-42-585-6187
http://www.fic-net.co.jp

Thank you for your purchasing "Fuji Digital Temperature Controller."Please check that the product is exactly the one you ordered and use it according to the following instructions. (Please refer to a separate operation manual for details.) Dealers are cordially requested to ensure the delivery of this Instruction Manual to hands of the end-users.

NOTICE The contents of this document may be changed in the future without prior notice.
We paid the utmost care for the accuracy of the contents. However, we are not liable for direct and indirect damages resulting from incorrect descriptions, omission of information, and use of information in this document.

CONTENTS

Check of specifications and accessories

Before using the controller, check if the type and specifications are as ordered. (A Table of Model code configuration is given in Page 4).

Check that all of the following accessories are included in the package box.

- Temperature controller -------- 1 unit
- Instruction manual ---------- 1 copy
- Mounting bracket ---------- 1 pce.
- I/V unit (250Ω resistor) -------- 1 pce. (4-20mA DC input type only)
- Terminal cover ---------- 1 pce. (optional item seperately ordered.)

The related documents

For details, refer to the following documents.

Contents	Name	Name
Specifications	Catalogue	ECNO : 1136
Operation method	MICRO-CONTROLLER X (Model : PXR) OPERATION MANUAL	ECNO : 406
Communication functions	COMMUNICATION FUNCTIONS (MODBUS) INSTRUCTION MANUAL	INP-TN512642-E

Read before using Safety Precautions

Before using this product, the user is requested to read the following precautions carefully to ensure the safety. Safety precautions must be taken by every user to prevent accidents.
The safety requirements are classified into "warning" and "caution" according to the following interpretations :

⚠ **Warning**	Suggesting that the user's mishandling can result in personal death or serious injury.
⚠ **Caution**	Suggesting that the user's mishandling can result in personal injury or damage to the property.

⚠ WARNING Over-temperature Protection

Any control system should be designed with prior consideration that any part of the system has potential to fail.
In case of temperature controlling, a continuance of heating on should be regarded as the most dangerous state.
The followings are the most probable causes of inducing continuance of heating on:
1) The failure of the controller with heating output constantly on
2) The disengagement of the temperature sensor out from the system
3) The short circuit in the thermocouple wiring
4) Valve or switch contact point outside the system is locked to keep heating on
In any application in which it is apprehended that physical injury or destruction of equipment might occur, please install an independent safeguard equipment to prevent over-temperature which shut down the heating circuit, and for additional safety, we recommend this equipment to have its own temperature sensor.
The alarm output signal of the controller is not designed to work as protective measures when the controller is in failure condition.

1. ⚠ Warning

1.1 Installation and wiring

- This controller designed to be installed at the following conditions.

Operating temperature	-10 to +50 [°C]	
Operating humidity	90%RH or less (Non condensation)	
Installation category	II	Conforming to IEC1010-1
Pollution degree	2	

- The controller must be installed such that with the exception of the connection to the mains, creepage and clearance distances shown in the table below are maintained between the temperature probe and any other assemblies which use or generate a voltage shown in the table below.
  Failure to maintain these minimum distances would invalidate the EN 61010 safety approval.

Voltage used or generated by any assemblies	Clearance (mm)	Creepage (mm)
Up to 50Vrms or V DC	0.2	1.2
Up to 100Vrms or V DC	0.2	1.4
Up to 150Vrms or V DC	0.5	1.6
Up to 300Vrms or V DC	1.5	3.0
Above 300Vrms or V DC	Contact with our sales office.	

- If the voltage shown above exceeds 60V DC (i.e. hazardous voltage), the basic insulation is required between all terminals of this controller and the ground, and supplementary insulation is required for the alarm output.
  Isolation class of this controller is as shown below. Be sure to check that the isola-tion class of the controller satisfies your requirements before installan.

——— : Basic insulation, ------ : Non-insulation, ——— : Functional insulation

Mains (Power source)	Measured value input, CT input
Control output1 (relay output)	Internal circuit
Control output2 (relay output)	Control output1 (SSR drive output / Current output)
Alarm outout (AL1)	
Alarm outout (AL2)	Communication (RS-485) circuit
Heater burnout alarm output (HB)	Digital input (DI).

- If there is a danger of a serious accident resulting from a failure or a defect in this unit, provide the unit with an appropriate external protective circuit to prevent an accident.
- The unit is normally supplied without a power switch and fuses.
  Make wiring so that the fuse is placed between the main power supply switch and this controller. (Main power supply: 2 pole breaker, fuse rating: 250V, 1A)
- When wiring the power supply terminal, use vinyl insulated 600 volt cable or equivalent.
- To avoid the damage and failure of controller, supply the power voltage fitting to the rating.
- To avoid an electric shock and controller failure, do not turn ON the power before all wiring is completed.
- Be sure to check that the distance is kept to avoid electric shock or firing before turning the power ON.
- Keep away from terminals while the circuit is energized in order to avoid an electric shock and a malfunction.
- Never attempt to disassemble, fabricate, modify, or repair this unit because tampering with the unit may result in a malfunction, electric shock, or a fire.

1.2 Maintenance precautions

- Be sure to turn off the power before this controller is installed or removed in order to avoid an electric shock, malfunction, and fault.
- Regular maintenance is recommended a longer service life of this controller. Some parts of this controller have a limited life span, or they will be deteriorated with the lapse of time.
- One-year warranty is guaranteed for this unit including accessories, provided that the controller is properly used.

2. ⚠ Warning

2.1 Cautions on installation

Avoid the following places for installation.

- a place where the ambient temperature may reach beyond the range of from 0 to 50°C while in operation.
- a place where the ambient humidity may reach beyond the range of from 45 to 85% RH while in operation.
- a place where a change in the ambient temperature is so rapid as to cause condensation.
- a place where corrosive gases (sulfide gas and ammonia gas, in particular) or combustible gases are emitted.
- a place where the unit is subject directly to vibration or shock.
- a place exposed to water oil, chemicals,steam and vapor.
  (if immersed with water, take the inspection by sales office to avoid an electrical leakage and firing)
- a place where the unit is exposed to dust, salt air, or air containing iron particles.
- a place where the unit is subject to intereference with static electricity, magnetism, and noise.
- a place where the unit is exposed to direct sunlight.
- a place where the heat may be accumulated due to the radiation of heat.

2.2 Caution on installation on panel

- Insert the mounting bracket (accessory) from the rear side until the main unit is securely fit into the panel. If there should be a play, tighten two screws lightly until the play is eliminated. (Do not tighten the screws excessively because the mounting bracket can be removed from the stopper by the force.)
- The front side of this controller conforms to NEMA 4X(equivalent with IP66). To ensure the waterproofness between the instrument and the panel, use packings that are provided as accessories in the following manner: (The improper fitting of packings will ruin the waterproofness.)
  ① As shown in Figure 1, fit a packing to the case of the unit and then insert it in the panel.
  ② Tighten screws on the fixing frame or fixtures so that no gaps are given between the front of controller and packing and between panels. Check that there are no deviation and deformation of packing as shown in Fig.3.

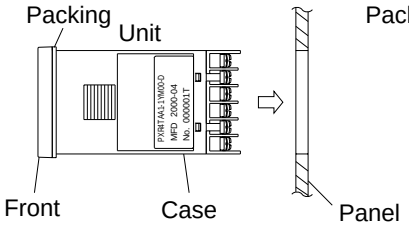


Figure 1

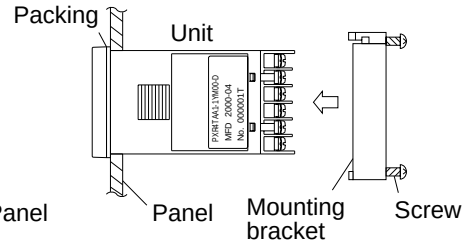


Figure 2

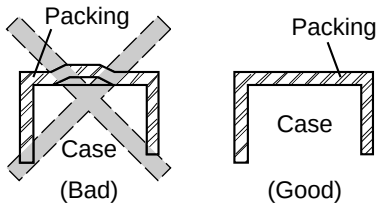
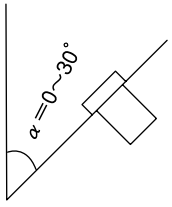


Figure 3

Standard : Vertical mounting, flush on the panel. (The controller is horizontal.)
When mounting the controller on tilted surface, the maximum tilt angle is 30° (degree) from virtical.



(Caution)

- Don't block the openings around the controller, or radiation effect will be reduced.
- Don't block the ventilation openings at the top of the terminal block.

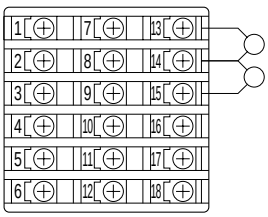
2.3 Precautions in wiring connection

- For the thermocouple sensor type, use thermocouple compensation wires for wiring.
  For the RTD type, use a wiring material with a small lead wire resistance and no resistance differentials among three wires.
- Keep input lines away from power line and load line to avoid the influence from noise induced.
- For the input and output signal lines, be sure to use shielded wires and keep them away from each other.
- If a noise level is excessive in the power supply, the additional installation of an insulating transformer and the use of a noise filter are recommended. (example: ZMB22R5-11 Noise Filter manufactured by TDK)
  Make sure that the noise filter is installed to a place such as a panel that is properly grounded. The wiring between the noise filter output terminal and the instrument power supply terminal should be made as short as possible. None of fuses or switches should be installed to the wiring on the noise filter output side because the filter effect will be degraded by such a installation.
- A better anti-noise effect can be expected by using stranded power supply cable for the instrument. (The shorter the stranding pitch is, the better the anti-noise effect can be expected.)
- For the unit with an alarm against a failure (burn-out) in the heater, use the same power line for connection of the power supplies for the heater and the controller.
- A setup time is required for the contact output when the power is turned on. If the contact output is used as a signal for an external interlock circuit, use a delay relay at the same time.
- Use the auxiliary relay since the life is shortened if full capacity load is connected to the output relay. SSR/SSC drive output type is preferred if the output operations occur frequently.
  [Proportional interval] relay output: 30 seconds or more, SSR/SSC: one second or more]
- If inductive load such as magnetic switches connected as a relay output load, it is recommended to use Z-Trap manufactured by Fuji Electric to protect a contact from switching serge and keep a longer life.

  Model : ENC241D-05A (power supply voltage: 100 V)
  ENC471D-05A (power supply voltage: 200 V)

  Where to install : Connect it between contacts of the relay control output.

  Example)



Z-Trap connection

- The SSR/SSC-driven output, an output of 4 to 20 mA DC, are not electrically insulate from internal circuits.
  Use a non-grounded sensor for resistance bulb or thermocouple.

2.4 Requirement for key operation/operation in abnormalities

- Prior to the operation, be sure to check alarm functions, since a failure in the proper setting will result in a failure in the proper output of an alarm in case of an abnormality.
- A display of UUUU or LLLL will appear in case of a break in the input. Be sure to turn off the power when a sensor is replaced.

2.5 Others

- Do not use organic solvents such as alcohol and benzine to wipe this controller. Use a neutral detergent for wiping the controller.

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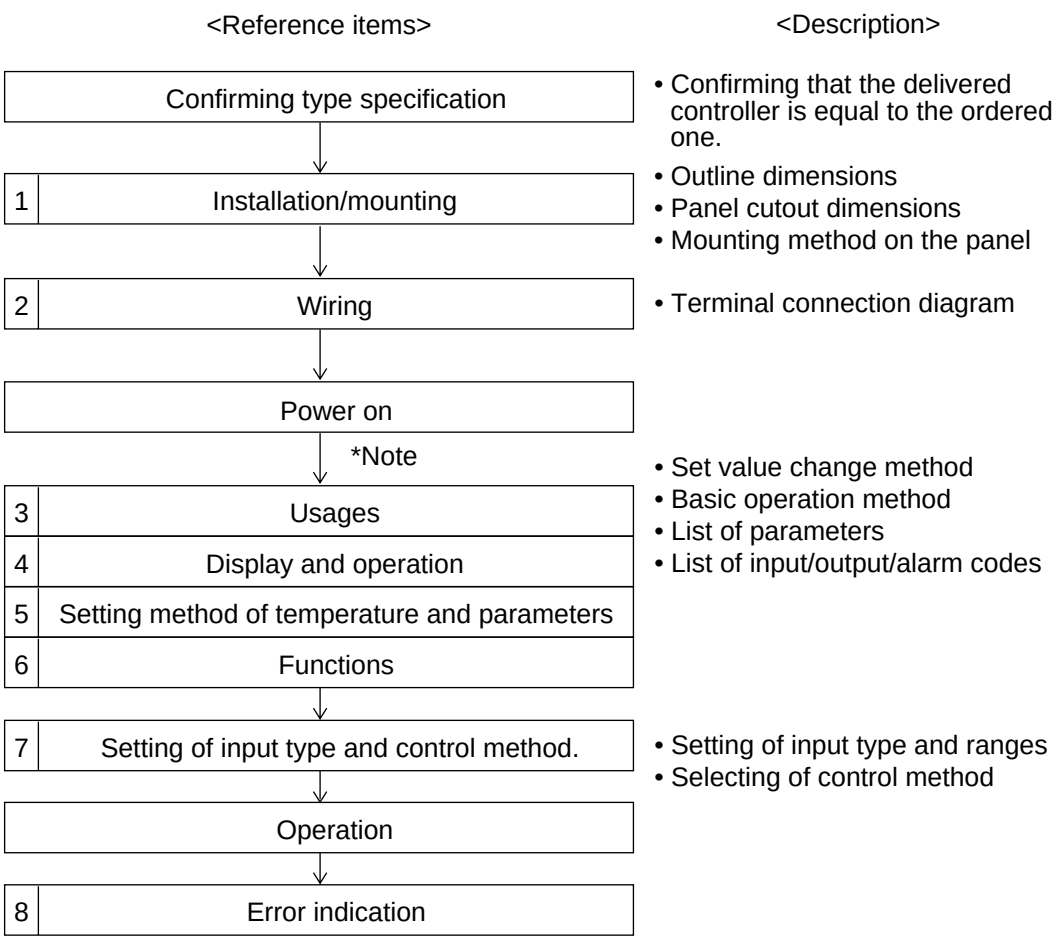


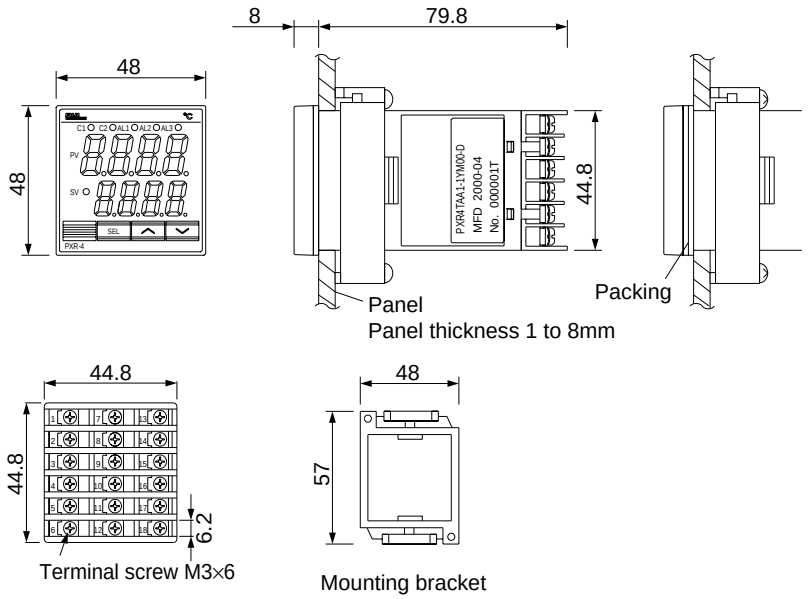
(Note) *To start the operation, wait for about 30 minutes after the power-on for warm up.

1 Installation/mounting

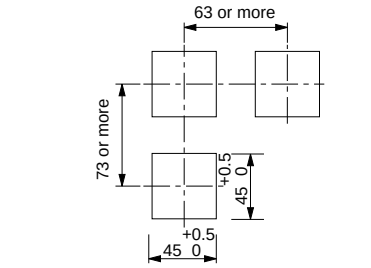
Outline and Panel Cutout Dimensions (Standard type/ Waterproof type)

(Unit : mm)

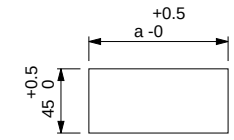
Outline dimensions



Panel cutout dimensions



For side by side installation
Note) See the Note1.



Number of units	2	3	4	5	6
a	93	141	189	237	285

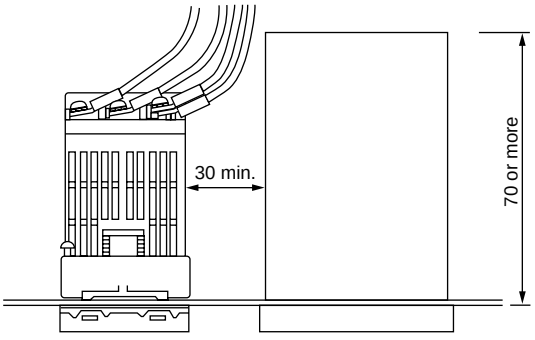
Cautions on wiring

- Wiring should be started from the left side terminal (No. 1 to No. 6).
- Use crimped terminals matched to the screw size. Tightening torque should be 0.8 Nm (Since the case is made of plastic, do not tighten excessively).
- Do not connect anything to terminals not used.

Note 1

Caution on side by side installation

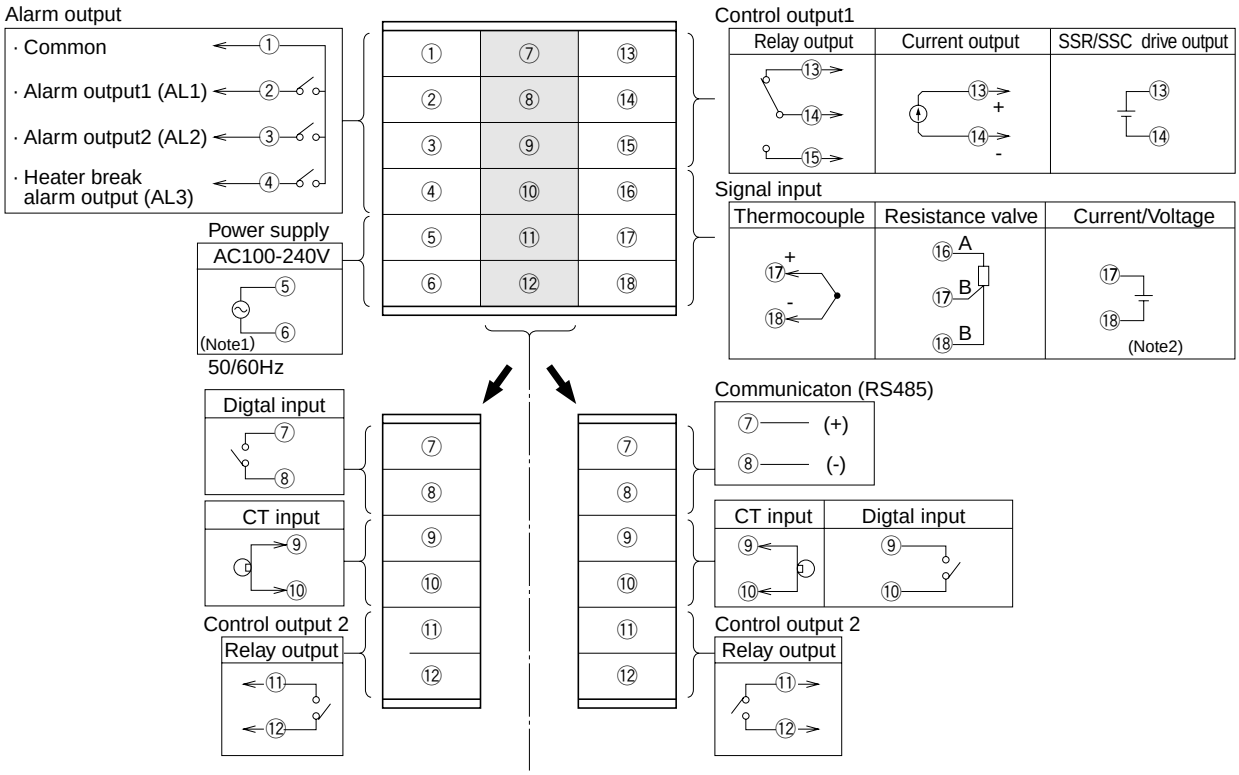
- With the power supply of 200 V AC or more, a maximum ambient temperature is 45°C. (It is recommended to use a fan for cooling.)



When there is another instrument (larger than 70mm) or a wall on the right side of this controller, be sure to install the controller keeping a space of more than 30mm.

2 Wiring

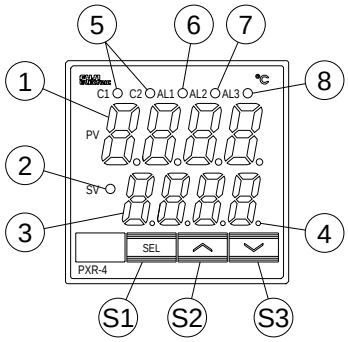
Terminal Connection Diagram (100 to 240 V AC)



Note1 : Check the power supply voltage before installation.
Note2 : Connect the I/V unit (250Ω resistor) (accesory) between the terminal ⑰ and ⑱ in case of currert input.

3 Usage (Read before using)

Name of Functional Parts and Functions



Model : PXR4

Setting keys

	Name	Function
Ⓢ1	Select key	The key shifting to the 1st, the 2nd or the 3rd block parameter, switching the display between parameter and the data at the 1st, the 2nd and the 3rd block.
Ⓢ2	Up key	· The numerical value is increased by pressing the key once. The numerical value keeps on increasing by pressing the key continuously. · For searching parameters within the 1st, the 2nd and the 3rd block.
Ⓢ3	Down key	· The numerical value is decreased by pressing the key once. The numerical value keeps on decreasing by pressing the key continuously. · For searching parameters within the 1st, tne 2nd and the 3rd block.

Display/Indication

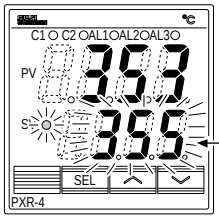
	Name	Function
①	Process value (PV)/parameter name display	1) Displays a process value (PV). 2) Displays the parameter symbols at parameter setting mode. 3) Displays various error indications (refer to the 8, Error indications).
②	Set value (SV) indication lamp	The lamp is lit while a set value (SV) is displayed.
③	Set value (SV)/parameter setting display	1) Displays a set value (SV). 2) Display the parameter settings at parameter setting mode. 3) Flickers at Standby mode. 4) Displays the set value (SV) and “SV-1” alternately when the SV switching function is used.
④	Auto-tuning/self-tuning indicator	The lamp flickers while the PID auto-tuning or the self-tuning is being performed.
⑤	Control output indication lamp	C1 : The lamp is lit while the control output 1 is ON. C2 : The lamp is lit while the control output 2 is ON.
⑥	Alarm output 1 (AL1) indication lamp (Note 1)	The lamp is lit when the alarm output 1 is activated. It flickers during ON delay operation.
⑦	Alarm output 2 (AL2) indication lamp (Note 1)	The lamp is lit when the alarm output 2 is activated. It flickers during ON delay operation.
⑧	Heater break alarm output (AL3) indication lamp (Note 1)	The lamp is lit while the heater break alarm output is ON.

Note 1) Control output 2 and alarm function are optional.

4 Display and operation

Standby mode

· To perform standby operation, set "STby" as ON in the 1st block parameter.



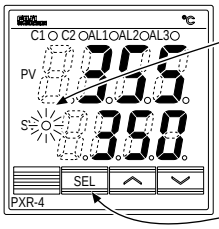
· Standby mode:
(Output) Control outputs (1 and 2) and alarm outputs (all) are not provided. However, depending on setting of "P-n1", control action, control outputs are provided at the abnormal input.
No alarm output is provided at standby mode, even in (Fault-condition).

Caution Be careful since the equipment does not provide output of the alarm of the main unit abnormality during the standby operation.
(Control) Control is not performed.
(Display) SV display flickers.

Caution The SV display does not flicker while the 1st, 2nd and 3rd block parameters are displayed.
(Setting) SV and parameter settings are able to perform.

Switching by 1st block STby settings

Operation mode



1 Change of set value (SV)

When the SV lamp is lit, the set value (SV) is displayed at the lower line.
The set value (SV) can be changed.

Caution After the data setting, the data are registered automatically in 3 seconds.

2 Shift to the 1st, 2nd and 3rd block parameter

To shift to the other blocks, press the SEL key.

Caution Depending on the pressing time of SEL key, you can select the block to shift.

SEL pressing time	Shifting block
About 1 sec pressing	1st block
About 3 sec pressing	2nd block
About 5 sec pressing	3rd block

Switching by the SEL key

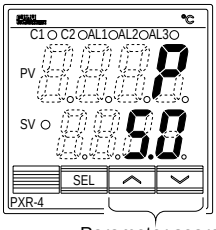
Parameter setting mode

Press the SEL for 2 sec.

3 Shift to operating condition

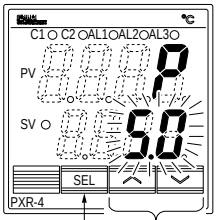
Operation mode

1 Parameter selection



Press the SEL once.

2 Parameter settings



Parameter search.

Press the ^ . Press the v .

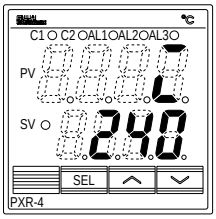
Parameter change.

^ Increases parameter set value

v Decreases parameter set value

SEL

Registers parameter set value, returning to the parameter shift mode **1**.



^

By repeating the same procedure, the parameters can be displayed according to the parameter list shown in 5, Setting methods of temperature and parameters.

Parameter setting procedure

1 Select a parameter you want to set by pressing the ^ or v key.

2-1 Press the SEL key to allow the parameter to change.
(Under the changing condition, the parameter set value flickers).

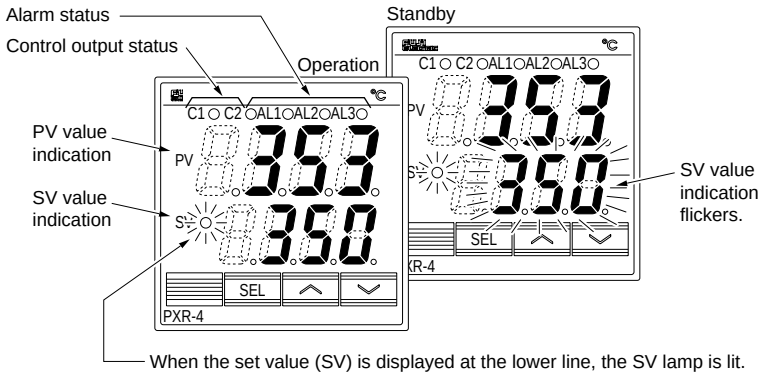
2-2 Pressing the ^ or v key, to change the parameter set value.

2-3 After the parameter has been changed, press the SEL key for registration.

3 To shift to Operation/Standby mode, press the SEL key for 2 sec.

5 Setting methods of temperature and paramenters

Operation/Standby mode



Press for about 1 sec. SEL SEL Press for about 2 sec.

1st block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
StbY	STbY	Standby settings	Switches RUN or Standby of the control. ON: Control standby (output: OFF, alarm: OFF) OFF: Control RUN	OFF	
ProG	ProG	Ramp/soak control	OFF: stop, rUn: Start, HLd: status hold	OFF	
LACH	LACH	Alarm latch cancel	Releases alarm latch. 1: Alarm latch release	0	
AT	AT	Auto-tuning	0: Stop, 1: Standard AT start, 2: Low PV type AT start	0	
TM-1	TM-1	Timer 1 display	Time displays remining time at the timer mode.	10	
TM-2	TM-2	Timer 2 display		10	
AL1	AL1	Alarm 1 set value	(appears only with alarm action type 1 to 10). Setting range: Note 1	10	Table 3 (Page 4)
A1-L	A1-L	Alarm 1 low limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Page 4)
A1-H	A1-H	Alarm 1 high limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Page 4)
AL2	AL2	Alarm 2 set value	(appears only with alarm action type 1 to 10). Setting range: Note 1	10	Table 3 (Page 4)
A2-L	A2-L	Alarm 2 low limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Page 4)
A2-H	A2-H	Alarm 2 high limit set value	(appears only with alarm action type 16 to 31). Setting range: Note 1	10	Table 3 (Page 4)
LoC	LoC	Key lock	Setting of key lock status.	0	

	All parameters		SV	
	Front key	Comm-unication	Front key	Comm-unication
0	○	○	○	○
1	×	○	×	○
2	×	○	○	○
3	○	×	○	×
4	×	×	×	×
5	×	×	○	×

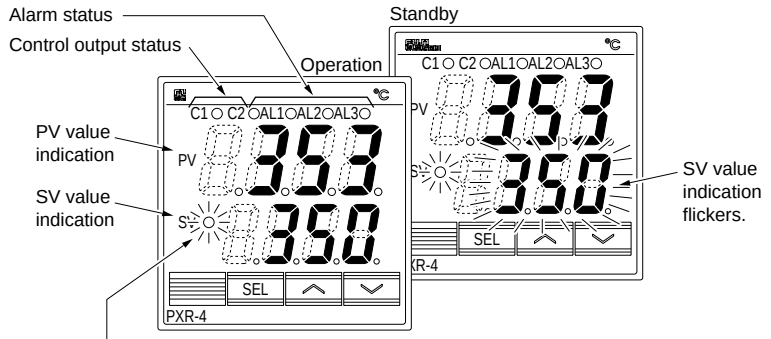
○: Setting enable, ×: Setting disable

Note 1) Setting range : 0 to 100%FS (in case of absolute value alarm)
100 to 100%FS (in case of deviation alarm)

Note 2) Never set "TC" / "TC2" = 0

· Some parameters may not be displayed on the screen, depending upon the types.

Operation/Standby mode

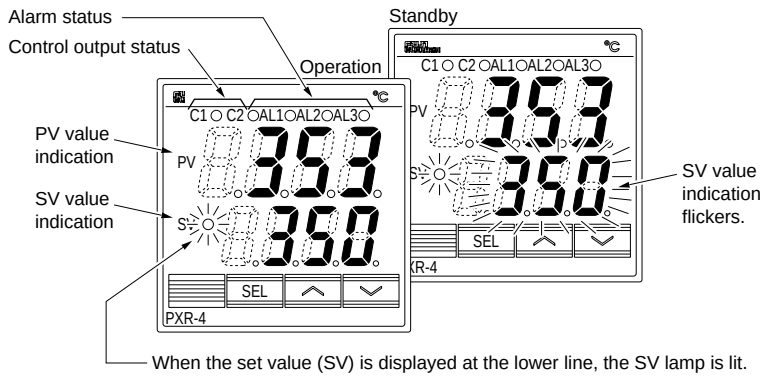


Press for about 3 sec. SEL SEL Press for about 2 sec.

2nd block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
P	P	Proportional band	Setting range: 0.0 to 999.9% ON/OFF control when "P" = 0	5.0	
I	I	Integral time (reset)	Setting range: 0 to 3200 sec. No integral action when "I" = 0	240	
d	D	Derivative action time	Setting range: 0.0 to 999.9 sec. No derivative action when "d" = 0	60.0	
HYS	HYS	Hysteresis for ON/OFF contorol	Setting range: 0 to 50% FS	1	
CooL	CooL	Proportional band coefficient on cooling side	Sets the proportional band coefficient on the cooling side. (Setting range : 0.0 to 100.0) ON/OFF control when "Cool" = 0	1.0	
db	db	Deadband/overlap	Shifts the output value on the cooling side. (Setting range: -50.0 to 50.0%)	0.0	
CTrL	CTrL	Control algorithm	Type of control algorithm. (Setting range: PID, FUZZY, SELF)	PID	
TC	TC	Cycle time (control output 1)	Sets cycle time of control output 1. (Setting range: 1 to 150 sec)	30/2	Note 2
TC2	TC2	Cycle time (control output 2)	Sets cycle time of control output 2. (Setting range: 1 to 150 sec)	30	Note 2
P-n2	P-n2	Input type code	Type of input	As ordered	Table 1 (Page 4)
P-SL	P-SL	Lower limit of input range	Lower limit of input range (Setting range: -1999 to 9999)	As ordered	Table 2 (Page 4)
P-SU	P-SU	Upper limit of input range	Upper limit of input range (Setting range: -1999 to 9999)	As ordered	Table 2 (Page 4)
P-dP	P-dP	Setting of decimal point position	Select a decimal point position of display. (Setting range: 0 to 2) 0 : No decimal point "1" "2"	As ordered	Table 2 (Page 4)
PVOF	PVOF	PV offset	Shift the display of process value (PV). (Setting range: -10 to 10%FS)	0	
P-dF	P-dF	Time constant of input filter	Time constant (Setting range: 0.0 to 900.0 sec.)	5.0	
ALM1	ALM1	Type of alarm 1	Setting types of alarm action (Setting range: 0 to 34)	0/5	Table 3 (Page 4)
ALM2	ALM2	Type of alarm 2		0/9	Table 3 (Page 4)
STAT	STAT	Ramp/soak status	Displays the current Ramp/Soak status. No setting can be made.	-	
PTn	PTn	Ramp/soak execute type	Selects the ramp/soak execute type. 1: Executes 1st to 4th segment. 2. Executes 5th to 8th segment. 3. Executes 1st to 8th segment.	1	
SV-1 ⋮ SV-8	SV-1 to SV-8	Ramp target SV-1 to SV-8	Sets the target SV for each ramp segment. (Setting range: 0 to 100%FS)	0%FS	
TM1r ⋮ TM8r	TM1r to TM8r	1st ramp segment time to 8th ramp segment time	Sets the time for each ramp segment. (Setting range: 0 to 99 hours and 59 minutes)	0.00	
TM1S ⋮ TM8S	TM1S to TM8S	1st soak segment time to 8th soak segmentl time	Sets the time for each soak segment. (Setting range: 0 to 99 hours and 59 minutes)	0.00	

Operation/Standby mode



Press for about 5 sec. SEL

SEL Press for about 2 sec.

3rd block parameter

Parameter display symbol		Parameter	Description of contents	Default setting	Remarks
P-n1	P-n1	Control action	Selects the control action.	0	Table 4 (Page 4)
SU-L	SV-L	Lower limit of SV	Lower limit of SV (Setting range: 0 to 100%FS)	0%FS	
SU-H	SV-H	Upper limit of SV	Upper limit of SV (Setting range: 0 to 100%FS)	100%FS	
dLY1	dLY1	ON delay time of alarm 1	ON delay time setting for alarm output (Setting range: 0 to 9999 sec)	0	
dLY2	dLY2	ON delay time of alarm 2		0	
CT	CT	CT input value	CT (Current Transformer) input value	-	
Hb	Hb	HB alarm set value	Sets current value to detect the heater disconnection (Setting range: 1.0 to 50.0A, 0: OFF)	0.0	
A1hY	A1hY	Hysteresis for alarm 1	Sets ON-OFF hysteresis for alarm output. (Setting range: 0 to 50%FS)	1	
A2hY	A2hY	Hysteresis for alarm 2		1	
A1oP	A1oP	Additional function of alarm 1	Additional function of alarm output (Setting range: 000 to 111) Alarm latch (1:use, 0:not use) Alarm of error status (1:use 0:not use) De-energized (1:use 0:not use), Note 3.	000	
A2oP	A2oP	Additional function of alarm 2		000	
dI-1	dI-1	DI1 function	Selects digital input 1 (DI1) function (Setting range: 0 to 12)	0(OFF)	6-7 (Page 3)
STno	STno	Station No.	Communication station No. (Setting range: 0 to 255)	1	
CoM	CoM	Parity setting	Parity setting. Baud rate is fixed at 9600 bps. (Setting range: 0 to 2)	0	6-6 (Page 3)
PYP	PYP	Code for PYP input type	Input type code used when communicating with PYP. See the OPERATION MANUAL (Initial value: K: 0 to 400 °C)	34	
dSP1 ⋮ dP13	dSP1 to dSP13	Parameter mask	Specifying parameter mask		

Note 3) De-energized: Contact opens when the alarm "ON".

6 Functions

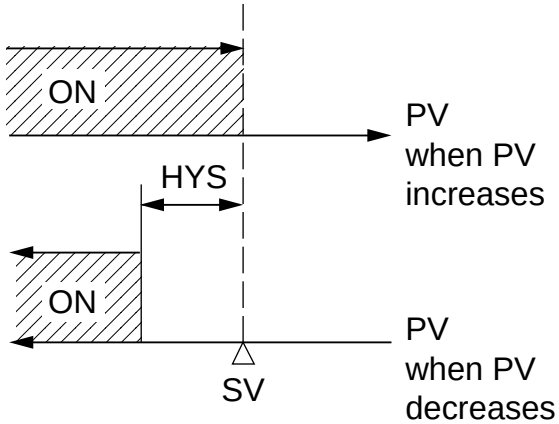
6-1 ON/OFF control

- At ON/OFF control mode,output signal is as shown below.
  Set parameter “P” = 0 for selecting the ON/OFF control mode.
  Set the hysteresis to avoid chattering.
  (Default setting: Hys = 1)

- Parameter setting and operation example

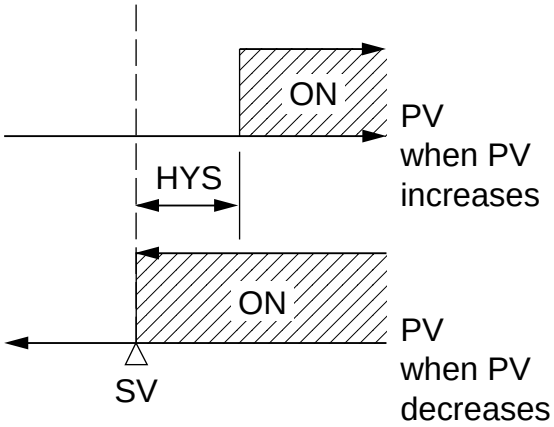
Example 1 : Reverse operation

Parameter	Setting value
P	0.0
P-n1	0 (or 1)
HYS	Any value



Example 2 : Direct operation

Parameter	Setting value
P	0.0
P-n1	2 (or 3)
HYS	Any value



6-2 Auto-tuning (AT)

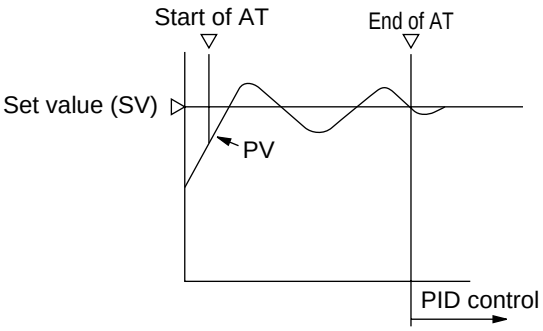
Autotuning is the automatic calculation and entering of the control parameters (P,I and D) into memory. Prior to the auto-tuning, complete the setting of input range
(P-SL,P-SU, P-dP), a set value (SV), alarm setting (AL1, AL2), and cycle time (TC).

How to start the auto-tuning

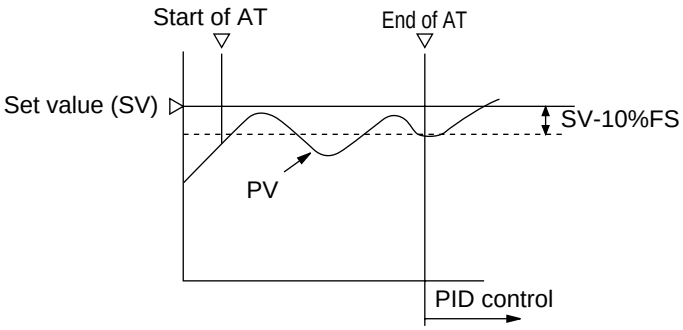
Set the parameter AT as either “1” or “2” by using ⌒ or ⌒ key, and press the SET key to start the auto-turning. Then the point indicator at the lower right starts blinking. At the completion of Auto-tuning, the point indicator stops blinking, then parameter AT is automatically set to 0.

	When auto-tuning is cancelled or not performed.	Standard type (auto-tuning at SV)	Low PV type (auto-tuning at 10%FS below SV.)
Setting code (AT)	0	1	2

① Standard type (AT=1)



② Low PV type (AT=2) : Overshoot decreased at tuning.



(a) The P.I.D. parameter calculated by auto-tuning remains even if the power is turned off. If the power is turned off before the auto-tuning is completed, you must restart the auto-tuning.

(b) The PV may be changed greatly depending on the process, because the con trol output is ON/OFF action (two position operation) in the auto-tuning. So, do not use the auto-turning if the process does not allow a significant variation of PV.
In addition, the auto-tuning should not be used in any process such as pressure control and flow control, where a quick-response is required.

(c) If the auto-tuning isn’t completed in four hours, the auto-tuning is suspected to fail. In this case, check the wiring and parameters such as the control action,
input type, etc.

(d) Carry out the auto-tuning again, if there is any change in SV, input range (P-SL, P-SV or P-dP) or process condition. Perform the auto-tuning if fuzzy control is selected as the control algorithm.

(e) When resetting the AT parameter, set the parameter to “0” once, then reset it.

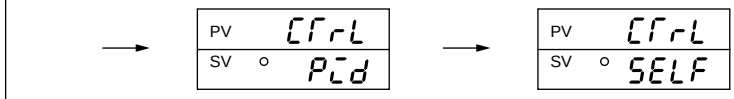
6-3 Self-tuning

1) At power on, changing a set value or the external disturbance, tuning is made automatically so that the PID parameters are re-optimized.
   It is useful where modification of PID parameters is required repeatably due to frequent change in process condition.
   If high controllability is important, select the PID or fuzzy control algorithm and use auto-tuning.

2) Setting for self-tuning
   ① Turn on the power and set the SV.
   ② Select SELF at “CTrL” (control algorithm) parameter.
   ③ Turn off the power once.
   ④ Turn on the power of the whole system. The controller should be turned on at the same time with the other equipments or even later. Otherwise, the selftuning might not be performed successfully.
   ⑤ Self-tuning starts. Then the point indicator at the lower right corner starts blinking until the PID parameters are re-optimized.

   Note) Whenever it is necessary to re-try the self-tuning, please set “CTrL” = PID once, and then start the above setting procedure from the beginning.

2nd block parameter



· Set "CTrL" (control algorithm) as SELF.

PID	PID control
FUZY	Fuzzy control
SELF	Self-tuning control

3) Self-tuning indication

The point indicator at the lower right corner starts blinking until the PID parameters are re-optimized.

4) Self-tuning is executed by any of the following conditions.
   ① During temperature rise at power ON.
   ② During temperature rise at SV changing if necessary.
   ③ When control is out of stable condition and is judged as being out of stable condition continuously.

5) Self-tuning is not executed under the following conditions:
   ① During standby mode
   ② During ON/OFF control
   ③ During auto-tuning
   ④ During ramp/soak operation
   ⑤ During input error
   ⑥ With dual output (“P-n1” ≥ 4)
   ⑦ When P, I, D or Ar is manually set

   Under the following coditions, self-tuning is canceled.
   ① When SV is changed.
   ② When Self-Tuning can not be completed in about 9 hours after the start.

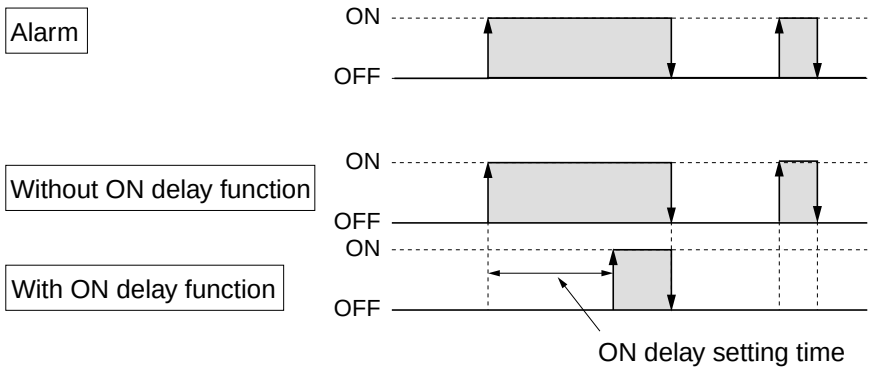
6) Cautions
   · Turn on the power of the whole system. The controller should be turned on at the same time with the other equipments or even later. Otherwise, the self tuning might not be performed successfully.
   · Don’t change the SV while the self-tuning is executing.
   · Once PID parameters are optimized, the self-tuning is not excuted at the next power on unless SV is changed.
   · After the execution of self-tuning, if the controlability is not your expected level, please select PID or FUZZY at “CTrL” parameter, and then, start the auto-tuning.

6-4 Alarm function [option]

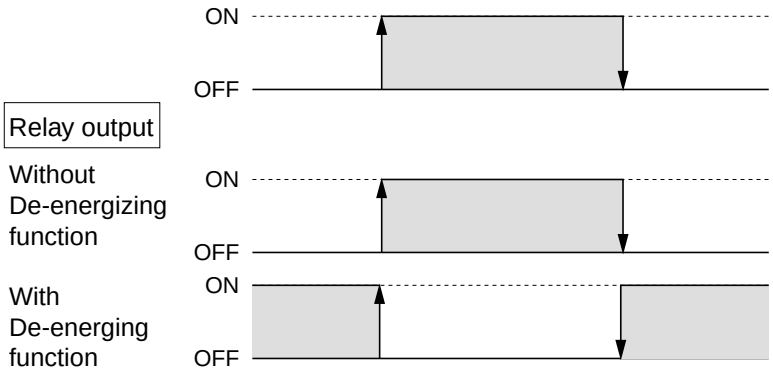
1) Kinds of alarm

- Absolute value alarm, deviation alarm, combination alarm, and zone alarm are available.
  (For details, see Table 4, Alarm action type codes on page 4.)

ON delay function



Energizing/de-energizing function



2) Alarm function

No.	Function	Description	Parameters to set
①	Hysteresis	Set the hysterisis to avoid chattering.	Alarm 1 : A1hy Alarm 2 : A2hy
②	ON delay	The alarm is turned on with delay of a certain seconds as previously set after PV goes in the alarm band.	Alarm 1 : dLy1 Alarm 2 : dLy2
③	Alarm latch	Keeps the alarm ON status once an alarm is turend ON. To cancel the alarm latch, please take one of the following procedure.	
		i) Turn ON the controller again.	
		ii) Turn the alarm latch settings to OFF once.	Alarm 1 : A1oP Alarm 2 : A2oP
		iii) Use alarm lacth cancel parameter.	LACH
		iv) Cancel by Digtal input (DI1).	dC-1
		v) Cancel by communication function.	
④	Error status alarm	Alarm is turned on when error indications are displayed.	Alarm 1 : A1oP Alarm 2 : A2oP
⑤	De-energizing	Alarm output can be de-energized.	Alarm 1 : A1oP Alarm 2 : A2oP

Combination of alarm functions

Please see the table as shown below.
O: Possible combination
X: Impossible combination

	Without HOLD/Timer	With HOLD	With Timer
Alarm latch	O	O	X
De-energizing	O	O	O
ON delay	O	Note 1	X
Alarm in error status	O	O	X

Note 1) The alarm is not turned on the first time the measured value is in the alarm band. Instead it turns on only when the measured value goes out of the band and enters it again.

Cautions on alarms

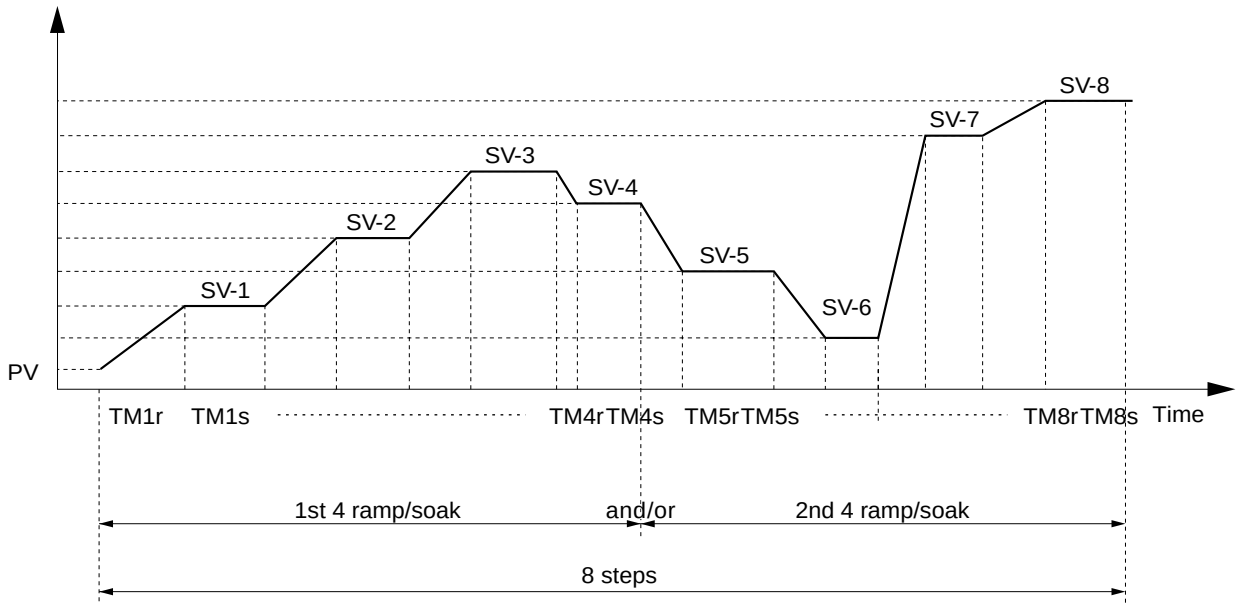
No.	Cautions	Items/Classification
1	Note that the ON delay function is effective for alarm in error status.	Alarm in error status
2	Even during "Err" display, alarms in error status work.	Alarm at error indication
3	Even when “LLLL” or “UUUU” is displayed, an alarm function works normally.	
4	Alarm action type codes in No.12 to 15 are also included in No.24 to 27. It is, therefore, recommended to use No.24 to 27. In addition, please note when selecting No.12 to 15, setting in ALM2, dLY2, and A2hy are effective.	Alarm action type code
5	With the HB alarm, ON delay function, de-energizing function and latch function cannot be used.	HB alarm
6	The minimum alarm set value is –199.9.	Alarm set value
7	As the alarm action type changed, the alarm set value may also be changed accordingly.	
8	Note that all of alarm outputs are not provided at the standby condition.	Alarm at standby mode.
9	Error status alarm is not provided at the standby mode.	
10	The HOLD function is effective even if the PV value is in the hysteresis area when the power is turned ON.	

6-5 Ramp/soak function [option]

1. Function

   Changes the set value (SV) as the time elapses according to a predetermined program pattern, as shown below.

   Either 4 ramp/soak x 2 patterns or 8 ramp/soak x 1 pattern can be programmed. The first ramp starts from the process value (PV) just before the programming is executed.



PTn	Pattern	Ramp/Soak
1	1	4
2	2	4
3	1 + 2	8

2. Setting

   · Select the program pattern (PTn) and set the rUn at "ProG" parameter.

   · Ramp/soak pattern can not be changed while ramp/soak program is running.

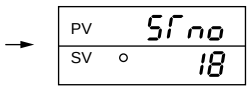
Note:

· The ramp/soak program is canceled if the controller becomes to standby mode. Then, if the controller becames to opration mode, the program doesn't run again.

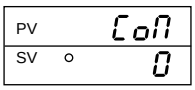
6-6 Communication function [option]

1) Function
   · Data can be written/read through the MODBUS® protocol.
2) Before using this function, please set related parameters as shown below.

3rd block parameter



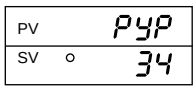
Set the station No. at "STno" (station No. setting paramter).
[Sample: station No. = 18]



Set the parity at "COM".

CoM	
0	Odd
1	Even
2	No parity

[Sample: Odd parity]



Please do not change "PYP" unless used with PYP, Color Touch-Operation Unit.

3) Caution
   · Station No. can be set in the range of 0 to 255. (No communication is allowed with 0).
   · After changing the setting of parity at “COM”, please power off and re-start the controller.
   · Baud rate is fixed to 9600 bps.

6-7 Digital input (DI function) [option]

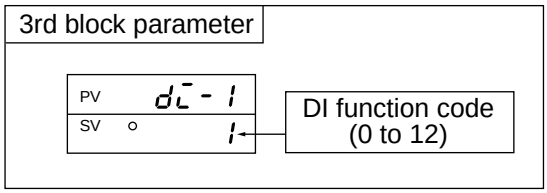
1) Function

· With Digital input, the follwing functions are available.

① SV switching
② Control mode; RUN/STANDBY selection
③ Ramp/soak RUN/RESET selection
④ Auto-tuning start/stop
⑤ Alarm latch cancel
⑥ Timer start/reset

2) To use DI function;

· Select the function refering to the Table shown below.



3) Table of DI function

DI function code	Function	Description
1	Set value (SV) switcing	Switching between local SV and "SV-1" (remote SV)
2	Control mode, RUN/STANDBY	At standby mode, control is not provided and SV flickers.
3	Auto-tuning (standard) start	Start/Stop can be switched at the time of DI raising up or dropping down.
4	Auto-tuning (low PV) start	
5	All alarm latch cancel	When this function is not used, DI is not effective.
6	Alarm 1 latch cancel	
7	Alarm 2 latch cancel	
9	ALM1 timer	ON/OFF delay timer operation is available. The remaining time of the timer can be checked with timer-1 and -2 display parameters (first block).
10	ALM2 timer	
12	Ramp/soak RUN/RESET	RUN/RESET of ramp/soak can be performed at the time of DI raising up or dropping down.

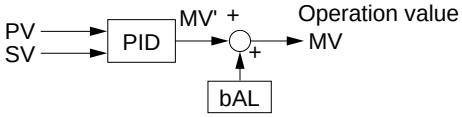
6-8 Other functions

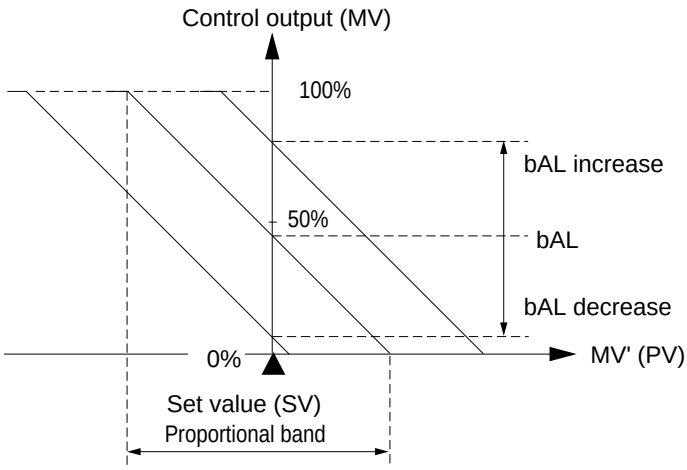
The parameters “bAL” and “Ar” are masked at defaut setting.
If necessary to appear these parameters, please refer to the following procedure.

1) Function
   - “bAL” and “Ar” are functions to suppress overshoot.
     (Usually it is not necessary to change the setting.)
2) If they aren't optimum value, sometime you don't get the good control. Usually it is not necessary to set them.
3) "Ar"(Anti-reset wind-up) is automatically set by "Auto tuning".

1 bAL

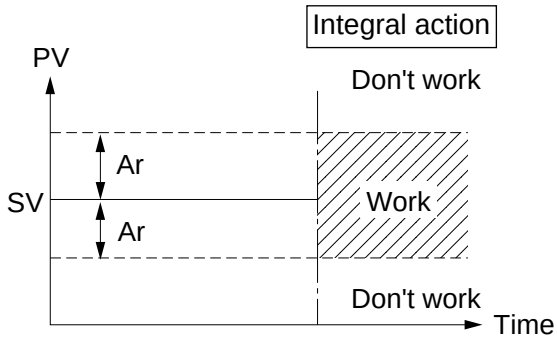
MV is calculated by adding the offset (bAL) to MV’ ,the result of PID calculation, from PV and SV.





2 Ar

The integral range is SV±Ar.
Integral action don't work when PV is out of the range.



Mask/Unmask bAL and Ar

1 To unmask

① Display the "dSP3" in the third block parameter and then subtract 128 from current value.
② Display the "dSP4" in the third block parameter and then subtract 1 from current value.

2 To mask

① Display the "dSP3" in the third block parameter and then add 128 to current value.
② Display the "dSP4" in the third block parameter and then add 1 to current value.

7 Setting of input type and control algorithm

1 Setting of the input type

* Skip this procedure if the input type is specified when you order.

① Please check if the input type set at “P-n2” is same as what you use.

Choose the sensor type you use from Table 1 shown below, and set the code at “P-n2”.
(Example) For T thermo-couple, set “P-n2”=7.

(Note) Please refer to the following table for the modification of the input type.

TC ⟷ RTD (within Group I)*	Can be modified by changing “P-n2”.
TC/RTD (Group I)* ⟷ 1 to 5V DC / 4 to 20mA DC (Group II)*	Modification not possible

TC : Thermocouple RTD : Resistance bulb (*Please refer to table 1)

⇩

② Is setting of input temperature range suitable for the sensor you use?

Standard range to each sensor is shown in Table 2. Select the temperature range suitable for the equipments you use, set lower/ upper limit values to “P-SL” / “P-SU” respectively.

(Example) For temperature range 0 to 800 [°C] : Set “P-SL” and “P-SU” to 0 and 800 respectively.

(Note) If the span of setting ranges is smaller than the one of minimum standard range, the accuracy (% full scale) is influenced.

(Note) No standard range is given in case of 1 to 5V DC (4 to 20mA DC) input. Please set the range within the following limitation.
- Maximum span : 9999
- Lower limit : -1999
- Upper limit : 9999

Note:
Please set “P-n2”: Input sensor type and “P-SL/P-SU/P-dP”: input range setting prior to any other parameter settings. When “P-n2” and/or “P-SL/P-SU/P-dP” is changed, some other parameters may also be in fluenced. Please check all parameters before starting control.

2 Setting of the algorithm

* Read if the control doesn't work as you expect.

① Select the type of control output action.

	Control output action	Description	Setting procedure
Heating	Reverse	As PV increases, MV decreases. As PV decreases, MV increases.	Set parameter "P-n1" = 0 or 1. (Refer to Table 2)
Cooling	Direct	As PV increases, MV also increases. As PV decreases, MV also decreases.	Set parameter "P-n1" = 2 or 3. (Refer to Table 2)

② Control algorithm (ON/OFF, PID or fuzzy)

Type of control	Description	Setting
ON/OFF control	Output is either ON (100%) or OFF (0%). (Suitable when frequent output switching is inconvenient.)	Set "P" =0.0. Refer to "6-1 ON/OFF control"
PID control	The output signal changes within the range at 0 to 100% according to PID calculation which determine the proportional of ON to OFF in each TC (cycle time).	Select PID at "CTrL". Execute auto-tuning so that optimum P.I.D can be calculated automatically. (PID parameters can be set spontaneously). *Refer to "6-2 Auto-tuning".
Fuzzy control	Fuzzy operation is added to PID providing control with less overshoot.	Select FUZy at "CTrL". Then execute the auto-tuning so that FUZZY control starts.
PID control with self-tuning.	At power on, changing a set value or the external disturbance, tuning is made automatically so that the PID parameters are re-optimized. It is useful where modification of PID parameters is required repeatably due to frequent change in process condition.	Select SELF at "CTrL". Refer to "6-3 Self-tuning".

8 Error indications

This controller has a display function to indicate several types of error code shown below.
If any of the error codes is displayed, please eliminate the cause of error immediately.
After the cause is eliminated, turn off the power once, and then re-start the controller.

Error code	Possible cause	Control output	Group
UUUU	① Thermocouple burnt out. ② RTD (A) leg burnt out. ③ PV value exceeds P-SU by 5% FS.	① when the burn-out control output is set as the lower limit (standard): OFF or 4 mA or less ② when the burn-out control output is set as the upper limit: ON or 20 mA or larger	I
LLLL	① The RTD leg (B or C) burnt out. ② The RTD leg (between A and B or A and C) short. ③ PV value is below P-SL by 5%FS. ④ 1 to 5 V DC or 4 to 20mA DC wiring open or short.		
LLLL	① PV value < -1999. Note) In case of RTD input, "LLLL" is not displayed even if the temperature becomes below -150 ˚C.	Control is continued until the value reaches -5% FS or less, after which burn-out condition will occur.	II
Err (SV indication flickers)	Incorrect range setting (P-SL/P-SU).	OFF or 4mA or less	
FALF	Fault in the controll.	Undefined (Stop using this controller immediately.) Contact with Fuji Electric Co.,Ltd. or the nearest repesentatives.	

Table 1

Input type code

Parameter : P-n2

Group	Input type	Code
I	RTD	
	· Pt100 (IEC)	1
	Thermocouple	
	· J	2
	· K	3
	· R	4
	· B	5
	· S	6
	· T	7
	· E	8
	· N	12
	· PL-II	13

Group	Input type	Code
II	1 to 5V DC, 4 to 20mA DC	16

· In case of 4 to 20mA DC input, mount a 250Ω resistor enclosed in the package box.

TC ⟷ RTD (within Group I)*	Can be modified by changing "P-n2"
TC/RTD ⟷ 1 to 5 V DC / 4 to 20 mA DC (Group I)* (Group II)*	Modification not possible

Table 2

Control output action code

Parameter : P-n1

Code	Output	Control output action		Output at Burn-out*	
		Output 1	Output 2	Output 1	Output 2
0	Single (Control output 1)	Reverse action	---	Lower limit	---
1				Upper limit	
2		Direct action		Lower limit	
3				Upper limit	
4	Dual [Control output 1 and 2. Heating/Cooling]	Reverse action	Direct action	Lower limit	Lower limit
5				Upper limit	
6				Lower limit	Upper limit
7				Upper limit	
8		Direct action		Lower limit	Lower limit
9				Upper limit	
10				Lower limit	Upper limit
11				Upper limit	
12		Reverse action	Reverse action	Lower limit	Lower limit
13				Upper limit	
14				Lower limit	Upper limit
15				Upper limit	
16		Direct action		Lower limit	Lower limit
17				Upper limit	
18				Lower limit	Upper limit
19				Upper limit	

(*) Outputs when Error Indication Group I.
Please refer to 8 (Error indications).
This is effective even in Standby mode.

Lower limit: OFF or 4mA or less
Upper limit: ON or 20mA or more

[Caution for dual output] (option)

(1) Parameter “I” and “D” can not be set separately.
(2) In case “P”=0 (ON/OFF control) for heating side, cooling side becomes ON/OFF control automatically.
(3) In case “Cool” =0.0, cooling side becomes ON/OFF control. And hysteresis is fixed at 0.5%FS.

Table 3

Input range (Standard range)

Parameter : P-SL, P-SU, P-dP

Input signal type		Range (°C)	Range (°F)
RTD (IEC)	Pt100Ω	0 to 150	32 to 302
	Pt100Ω	0 to 300	32 to 572
	Pt100Ω	0 to 500	32 to 932
	Pt100Ω	0 to 600	32 to 1112
	Pt100Ω	-50 to 100	-58 to 212
	Pt100Ω	-100 to 200	-148 to 392
	Pt100Ω	-150 to 600	-238 to 1112
	Pt100Ω	-150 to 850	-238 to 1562
Thermo-couple	J	0 to 400	32 to 752
	J	0 to 800	32 to 1472
	K	0 to 400	32 to 752
	K	0 to 800	32 to 1472
	K	0 to 1200	32 to 2192

Input signal type		Range (°C)	Range (°F)
Thermo-couple	R	0 to 1600	32 to 2912
	B	0 to 1800	32 to 3272
	S	0 to 1600	32 to 2912
	T	-199 to 200	-328 to 392
	T	-150 to 400	-238 to 752
	E	0 to 800	32 to 1472
	E	-199 to 800	-328 to 1472
	N	0 to 1300	32 to 2372
	PL-II	0 to 1300	32 to 2372
DC voltage	1 to 5VDC	-1999 to 9999 (Scaling is possible) • Maximum span : 9999 • Lower limit : -1999 • Upper limit : 9999	

Note 1) Except for the following, the input accuracy is ±0.5% FS ±1 digit ±1 °C (Input accuracy does not be guaranteed for the ranges of measurement other than in the table above.)
R thermocouple 0 to 400 °C
B thermocouple 0 to 500 °C
: in these ranges, this controller may display an incorrect process value due to the characteristic of the sensor.

Note 2) In case a measuring range of -150 to 600 °C or -150 to 850 °C is used for resistance bulb input, temperatures below -150 °C does not be indicated correctly. Therefore, "LLLL" does not appear despite a continuous fall below -150 °C.

Note 3) If the resistance bulb or thermocouple is used at a temperature below the lowest value in the measurement range, the input accuracy cannot be guaranteed.

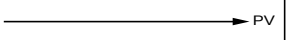
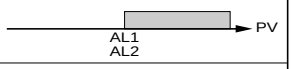
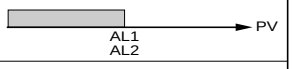
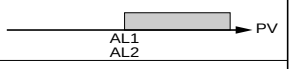
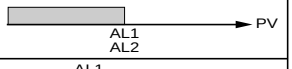
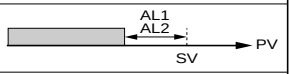
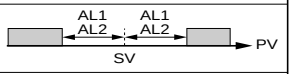
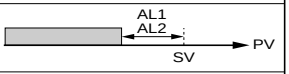
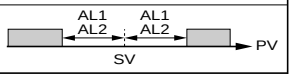
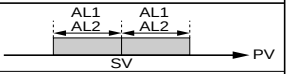
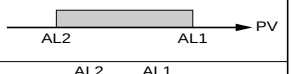
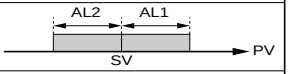
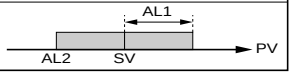
Note 4) Addition of decimal point is impossible if the input range or span is larger than 999.9 at the RTD/thermocouple input.

Table 4

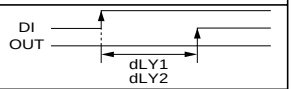
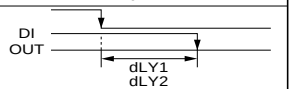
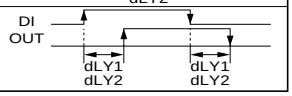
Alarm action type code

Parameter : P-AH, P-AL

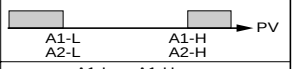
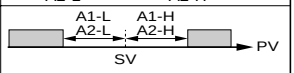
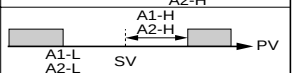
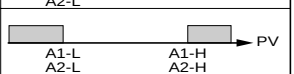
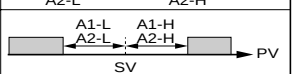
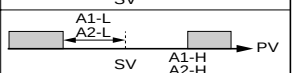
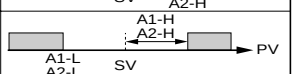
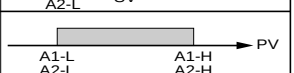
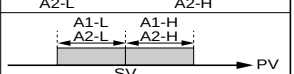
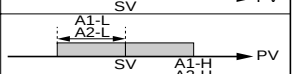
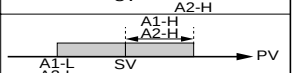
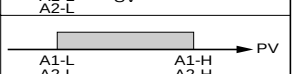
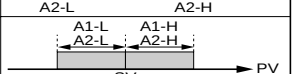
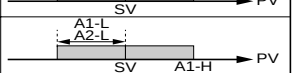
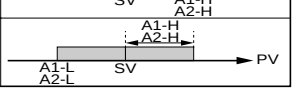
· Standard alarm code

	ALM1	ALM2	Alarm type	Action diagram
	0	0	No alarm	
Absolute value alarm	1	1	High alarm	
	2	2	Low alarm	
	3	3	High alarm (with hold)	
	4	4	Low alarm (with hold)	
Deviation alarm	5	5	High alarm	
	6	6	Low alarm	
	7	7	High/Low alarm	
	8	8	High alarm (with hold)	
	9	9	Low alarm (with hold)	
	10	10	High/Low alarm (with hold)	
Zone alarm	11	11	High/Low deviation alarm (ALM1/2 independent action)	
	-	12	High/Low absolute alarm	
	-	13	High/Low deviation alarm	
	-	14	High absolute /Low deviation alarm	
	-	15	High deviation /Low absolute alarm	

· Timer code

	ALM1	ALM2	Alarm type	Action diagram
Timer	32	32	ON delay timer	
	33	33	OFF delay timer	
	34	34	ON/OFF delay timer	

· Alarm code with dual set value

	ALM1	ALM2	Alarm type	Action diagram
High /Low limit alarm	16	16	High/Low absolute alarm	
	17	17	High/Low deviation alarm	
	18	18	High absolute /Low deviation alarm	
	19	19	High deviation /Low absolute alarm	
	20	20	High/Low absolute alarm (with hold)	
	21	21	High/Low deviation alarm (with hold)	
	22	22	High absolute /Low deviation alarm (with hold)	
	23	23	High deviation /Low absolute alarm (with hold)	
Zone alarm	24	24	High/Low absolute alarm	
	25	25	High/Low deviation alarm	
	26	26	High absolute /Low deviation alarm	
	27	27	High deviation /Low absolute alarm	
	28	28	High/Low absolute alarm (with hold)	
	29	29	High/Low deviation alarm (with hold)	
	30	30	High absolute /Low deviation alarm (with hold)	
	31	31	High deviation /Low absolute alarm (with hold)	

Note) · When alarm action type code is changed, alarm set value may also become different from previous settings.
Please check these parameters, turn off the power once, and then re-start the controller, before s tarting control.

· When selecting No.12 to 15, setting in ALM2, dLY2, and A2hy are effective, and output to the AL2 relay.

PXR Model Code Configuration

PXR 4 □ □ □ 1 – □ □ □ □ □ – □

Digit	Specification		Note
4	<Size of front H X W>		
	48 X 48mm Screw terminal type	4	
5	<Input signal>		
	Thermocouple °C	T	
	Thermocouple °F	R	
	RTD Pt100 3-wire type °C	N	
	RTD Pt100 3-wire type °F	S	
	4 to 20mA DC	B	
	1 to 5V DC	A	
6	<Control output 1>		
	Relay contact output	A	
	SSR / SSC drive output	C	
	DC4 to 20mA output	E	
7	<Control output 2>		
	None	Y	
	Relay contact output	A	Note 1
8	<Revision code>	1	
9	<Optional specification 1>		Note 2
	None	0	
	One alarm	1	
	Heater break alarm	2	
	One alarm + heater break alarm	3	
	8 ramps / soaks	4	
	One alarm + 8 ramps / soaks	5	
	Heater break alarm + 8 ramps / soaks	6	
	One alarm + Heater break alarm + 8 ramps / soaks	7	
	Two alarms	F	
	Two alarms + 8 ramps / soaks	G	
10	<Instruction manual> <Power supply voltage>		
	None 100 to 240V AC	N	
	Japanese 100 to 240V AC	Y	
	English 100 to 240V AC	V	
11	<Optional specification 2>		
12	None	0 0 0	
13	RS485 transmission	M 0 0	
	Dgital input 1 point	S 0 0	
	RS485 transmission + Digital input 1 point	V 0 0	Note 3
14	<Non-standard specification>		
	Non-standard parameter setting	F	

Note 1) In case of 7th digit code "A", the codes "3", "7", "F" and "G" in 9th digit are not available.

Note 2) In case of 9th digit code "3", "7", "F" or "G", the code "A" in 7th digit is not available.
In case of 9th digit code "2", "3", "6" or "7", the code "E" in 6th digit is not available, and the code "V00" in 11th to 13th digit is not available.

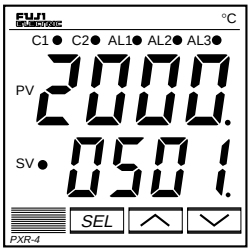
Note 3) In case of 11th to 13th code "V00", the code "2", "3", "6" and "7" in 9th digit is not available.

Specification

Power voltage:	100 (- 15%) to 240V AC (+10%), 50/60Hz
Power consumption:	15V AC or less/240V AC
Relay contact output:	Control output 1: SPDT contact, 220V AC / 30V DC 3A (resistive load)
	Control output 2: SPST contact, 220V AC / 30V DC 3A (resistive load)
SSR/SSC driving output:	ON: 24V DC (17 to 25V DC)
(voltage pulse output)	OFF: 0.5V DC or less
	Maximum current ; 20mA or less
	Resistive load 850Ω or more
4-20mA DC output:	Allowable load resistor 600Ω or less
Alarm output (up to 2 outputs):	Relay contact (SPST contact) 220V AC / 30V DC 1A (resistive load)
Heater disconnection alarm output:	Relay contact (SPST contact) 220V AC / 30V DC 1A (resistive load)
Communication function :	RS-485 Modbus interface
	Transmission system ; Half-dueplex bit serial start-stop synchronization
	Transmission rate ; 9600bps
	Transmission protocol ; In conformity to Modbus RTU
	Transmission distance ; Up to 500m (total length)
	Connectable units ; Up to 31units
Digital input :	Number of input;1 input
	Input contact capacity ; 5V, 2mA DC
Ambient temperature:	-10 to 50°C
	-10 to 45°C (when side by side mounting)
Operating ambient humidity:	90%RH or less (no condensation)
Preservation temperature:	-20 to 60°C

Modbus RTU : A trademark of Modicon Corp.,USA

FUJI ELECTRIC



Micro-controller X

Model: PXR

Operation Manual

ECNO:406a

Table of Contents

Model Specifications

PXR 4 5 6 7 8 – 9 10 11 12 13

digit	Specification	Note	Code
4	**<Front dimensions (H x W)>**		
	48 × 48 mm Screw-terminal type		**4**
5	**<Input signal>**		
	Thermocouple °C		**T**
	Thermocouple °F		**R**
	Resistance bulb Pt100 3-wire type °C		**N**
	Resistance bulb Pt100 3-wire type °F		**S**
	4-20mA DC		**B**
	1-5V DC		**A**
6	**<Control output 1>**		
	Relay contact output		**A**
	Voltage pulse output		**C**
	4-20mA DC output	Note 1	**E**
7	**<Control output 2>**		
	-		**Y**
	Relay contact output	Note 2	**A**
8	**<Revision code>**		**1**
9	**<Optional specifications 1>**		
	-		**0**
	Alarm (1 pc.)		**1**
	Alarm for heater break		**2**
	Alarm (1 pc.) + Alarm for heater break	Note 3	**3**
	Ramp-soak	Note 3	**4**
	Alarm (1 pc.) + Ramp-soak		**5**
	Alarm for heater break + ramp-soak	Note 3	**6**
	Alarm (1 pc.) + Alarm for heater break + Ramp-soak	Note 3	**7**
	Alarm (2 pcs.)		**F**
	Alarm (2 pcs.) + Ramp-soak		**G**
10	**<Instruction Manual for> <Power>**		
	None 100-240V AC		**N**
	Japanese 100-240V AC		**Y**
	English 100-240V AC		**V**
11	**<Optional specifications 2>**		
12	-		**0**
13	RS 485 (Modbus)		**M**
	Digital input (1 pc.)		**S**
	RS 485 (Modbus) + Digital input (1 pc.)		**V**

Note 1 Cannot be specified with the alarm for heater break. ("2, 3, 6, or 7" cannot be specified for ninth digit.)
Note 2 Cannot be specified with the Alarm (1 pc.) + Alarm for heater break or Alarm (2 pcs.). ("3, 7, F, or G" cannot be specified for ninth digit.)
Note 3 Cannot be specified with the RS 485 + Digital input (1 pc.). ("V00" cannot be specified for 11th, 12th, or 13th digit.)

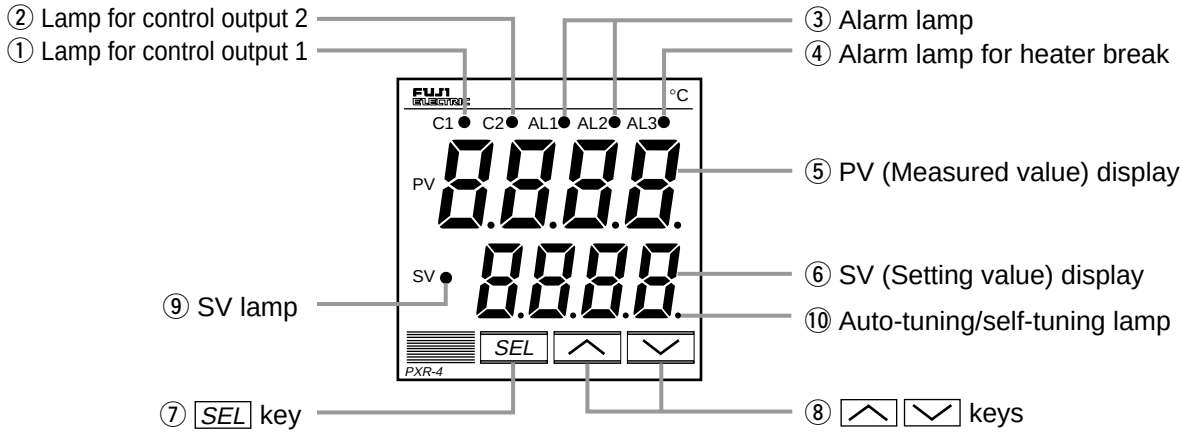
The default settings of input signals, measured ranges, and setting values are shown below.

Thermocouple specified : Thermocouple K, Measured range: 0 to 400°C, Setting value: 0°C
Resistance bulb specified : Pt, Measured range: 0 to 150°C, Setting value: 0°C
Voltage, Current specified : Scaling: 0 to 100%, Setting value: 0%
In any case other than the description above, specify input signals and measured range.
The input signals for the thermocouple and the resistance bulb can be switched with the front panel keys.

The default settings of control action is reverse for output 1 and direct for output 2.
The reverse and direct actions can be switched with keys on the face panel.

1 Part Names and Functions

This chapter explains the part names and functions on the face panel. The face panel has the PV and SV displays, the status indicating lamp, and the setting keys, etc. Those functions are explained below. Please read and understand them before using the PXR. For details about the setting of parameters, see Chapter 2.



① Lamp for control output 1
Lights up while control output 1 stays ON.

② Lamp for control output 2
Lights up while control output 2 stays ON.

③ Alarm lamp
Lights up when an error occurs. While the lamp lights up, the alarm output stays ON.

④ Alarm lamp for heater break
Lights up when the heater is broken. While the lamp lights up, the alarm output for heater break stays ON.

⑤ PV (Measured value) display
Displays the PV. When setting a parameter, its name appears.

⑥ SV (Setting value) display
Displays the SV. When setting a parameter, its value appears.

⑦ SEL key
Used to select a parameter block and a parameter, and register a set value.

⑧ ∧ ∨ keys
Used to change the SV, call parameters, and change parameter values.

⑨ SV lamp
Lights up while the SV is displayed in the SV display. When parameters and data are displayed, the SV lamp goes out.

⑩ Auto-tuning/self-tuning lamp
Flashes under an auto-tuning or self-tuning operation.

2 Operations

This chapter explains how to set the SV (Setting value) and the parameters for the PXR.

2-1 Parameter list

Parameters for the PXR are classified under three blocks according to the frequency of use. The parameters of the second and third blocks are used at initialization or when they are of absolute necessity.

Parameters of the first block

Parameter display symbol	Parameter name	Description		Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
SrbY	Standby setting	Switches between RUN and Standby for control.		oN: Control standby (Output: OFF, Alarm: OFF) oFF: Control RUN*		dSP1-1	11
ProG	Ramp-soak control	Switches between Start, Stop, and Hold for ramp-soak control		oFF: Stop* rUn: Start HLd: Hold		dSP1-2	12
LACH	Alarm latch cancel	Cancels the alarm latch.		0: Keeps the alarm latch.* 1: Opens up the alarm latch.		dSP1-4	13
AT	Auto-tuning	Used for setting the constants for P, I, and d by auto-tuning.		0: OFF (Resets the auto-tuning or does not use it.)* 1: ON (Performs the auto-tuning in the SV standard type.) 2: ON (Performs the auto-tuning in low PV type (SV value-10%FS).)		dSP1-8	14
TM-1	Timer 1 display	Displays the remaining time of timer 1.		- (Unit: seconds)		dSP1-16	15
TM-2	Timer 2 display	Displays the remaining time of timer 2.		- (Unit: seconds)		dSP1-32	15
AL1	Set value of alarm 1	Sets the value at which alarm 1 is detected.	AL1 is displayed when alarm type 1 is 0 to 15, or 32 to 34, and A1-H or A1-L is displayed when alarm type 1 is 16 to 31.	When the alarm type is absolute value: 0 to 100%FS (*:10) When the alarm type is deviation: -100 to 100%FS (*:10)		dSP1-128	16 *
A1-L	Lower limit value of alarm 1	Sets the lower limit value at which alarm 1 is detected.				dSP2-1	16 *
A1-H	Upper limit value of alarm 1	Sets the upper limit value at which alarm 1 is detected.				dSP2-2	16 *
AL2	Set value of alarm 2	Sets the value during which alarm 2 is detected.	AL2 is displayed when alarm type 2 is 0 to 15 or 32 to 34, and A2-H or A2-L is displayed when alarm type 2 is 16 to 31.	When the alarm type is absolute value: 0 to 100%FS (*:10) When the alarm type is deviation: -100 to 100%FS (*:10)		dSP2-4	16 *
A2-L	Lower limit value of alarm 2	Sets the lower limit value at which alarm 2 is detected.				dSP2-8	16 *
A2-H	Upper limit value of alarm 2	Sets the upper limit value at which alarm 2 is detected.				dSP2-16	16 *
LoC	Key lock	Specifies whether or not to allow the change of parameters.		0: All settings are changeable both from the face panel and via communication.* 1: All settings are unchangeable from the face panel, but changeable via communication. 2: Only the SV is changeable from the face panel, and all settings are changeable via communication. 3: All settings are changeable from the face panel, but unchangeable via communication. 4: All settings are unchangeable from the face panel or via communication. 5: Only the SV is changeable from the face panel, but all settings are unchangeable via communication.		dSP3-1	17

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of "4" on page 68.

Parameters of the second block

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of “4” on page 68.

Parameter display symbol	Parameter name	Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
P	Proportional band	Set P to 0.0 to select the ON/OFF control (Two-position control).	0.0 to 999.9% (*: 5.0)		dSP3-2	18
I	Integral time		0 to 3200 seconds (*: 240)		dSP3-4	19
d	Derivative time		0.0 to 999.9 seconds (*: 60.0)		dSP3-8	20
HYS	Hysteresis range for ON/OFF control	Sets the hysteresis for ON/OFF control.	0 to 50%FS (*: equivalent of 1.0°C)		dSP3-16	21 *
CooL	Cooling-side proportional band coefficient		0.0 to 100.0 (*: 1.0)		dSP3-32	22
db	Cooling-side proportional band shift		-50.0 to +50.0 (*: 0.0)		dSP3-64	23
bAL	Output convergence value		-100 to 100% (*: single 0.0, dual 50.0)		dSP3-128	24
Ar	Anti-reset windup		0 to 100%FS (*: 100%FS)		dSP4-1	24 *
CTrL	Control algorithm	Selects the control algorithm.	PID: Runs normal PID control.* FUZY: Runs PID control with fuzzy logic. SELF: Runs PID control with self-running.		dSP4-2	25
SLFb	PV (Measured value) stable range	Sets the PV stable range for the self-tuning operation.	0 to 100%FS (*: 2%FS)		dSP4-4	29 *
onoF	Setting HYS (Hysteresis) mode	Selects the hysteresis operation at ON/OFF control.	oFF: Starts the two-position control at the values of SV+HYS/2 and SV-HYS/2. on: Starts the two-position control at the values of SV and SV+HYS, or SV and SV-HYS.		dSP4-8	30
rC	Cycle time of control output 1	Not shown at 4-20mA DC output	RLY, SSR: 1 to 150 seconds (*: Contact output = 30, SSR/SSC-driven output = 2)		dSP4-16	31
rC2	Cycle time of control output 2 (cooling-side)		1 to 150 seconds (*: 30)		dSP4-32	32
P-n2	Input signal code	Set this parameter when changing the types of temperature sensors.	1 to 16 (*: specified by customer while ordering) Note 1		dSP4-64	33
P-SL	Lower limit of measuring range		-1999 to 9999 (*: specified by customer while ordering) Note 1		dSP4-128	34
P-SU	Upper limit of measuring range		-1999 to 9999 (*: specified by customer while ordering) Note 1		dSP5-1	34
P-dP	Setting the decimal point position		0 to 2 (*: specified by customer while ordering) Note 1		dSP5-2	36
P-F	°C / °F selection		°C / °F		dSP5-4	34
PVOF	PV (Measured value) offset		-10 to 10%FS (*: 0)		dSP5-8	37 *
SVOF	SV (Setting value) offset		-50 to 50%FS (*: 0)		dSP5-16	38 *
P-dF	Time constant of input filter		0.0 to 900.0 seconds (*: 5.0)		dSP5-32	39
AL1	Alarm type 1	Sets the types of alarm operations.	0 to 34 (*: 0/5)		dSP5-64	40
AL2	Alarm type 2	Sets the types of alarm operations.	0 to 34 (*: 0/9)		dSP5-128	40
SrAr	Status display of ramp-soak		- (*: OFF)		dSP6-2	44
Prn	Selecting ramp-soak execute type	Selects ramp-soak patterns.	1: Performs 1st to 4th segments.* 2: Performs 5th to 8th segments. 3: Performs 1st to 8th segments.		dSP6-4	43
Su-1	1st target value /Switching-SV value	Sets the 1st target SV of ramp-soak operation. / Selected at switching-SV function for DI1	Within the SV limit. (*: 0%FS)		dSP6-8	44 *
rM1r	First ramp segment time	Sets the first ramp segment time.	0 to 99h59m (*: 0.00)		dSP6-16	44

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of “4” on page 68.

Parameter display symbol	Parameter name	Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
rn15	1st soak segment time	Sets the 1st soak segment time.	0 to 99h59m (*: 0.00)		dSP6-32	44
Su-2	2nd target SV	Sets the 2nd target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP6-64	44*
rn2r	2nd ramp segment time	Sets the 2nd ramp segment time.	0 to 99h59m (*: 0.00)		dSP6-128	44
rn25	2nd soak segment time	Sets the 2nd soak segment time.	0 to 99h59m (*: 0.00)		dSP7-1	44
Su-3	3rd target SV	Sets the 3rd target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-2	44*
rn3r	3rd ramp segment time	Sets the 3rd ramp segment time.	0 to 99h59m (*: 0.00)		dSP7-4	44
rn35	3rd soak segment time	Sets the 3rd soak segment time.	0 to 99h59m (*: 0.00)		dSP7-8	44
Su-4	4th target SV	Sets the 4th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-16	44*
rn4r	4th ramp segment time	Sets the 4th ramp segment time.	0 to 99h59m (*: 0.00)		dSP7-32	44
rn45	4th soak segment time	Sets the 4th soak segment time.	0 to 99h59m (*: 0.00)		dSP7-64	44
Su-5	5th target SV	Sets the 5th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP7-128	44*
rn5r	5th ramp segment time	Sets the 5th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-1	44
rn55	5th soak segment time	Sets the 5th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-2	44
Su-6	6th target SV	Sets the 6th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP8-4	44*
rn6r	6th ramp segment time	Sets the 6th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-8	44
rn65	6th soak segment time	Sets the 6th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-16	44
Su-7	7th target SV	Sets the 7th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP8-32	44*
rn7r	7th ramp segment time	Sets the 7th ramp segment time.	0 to 99h59m (*: 0.00)		dSP8-64	44
rn75	7th soak segment time	Sets the 7th soak segment time.	0 to 99h59m (*: 0.00)		dSP8-128	44
Su-8	8th target SV	Sets the 8th target SV of ramp-soak operation.	Within the SV limit. (*: 0%FS)		dSP9-1	44*
rn8r	8th ramp segment time	Sets the 8th ramp segment time.	0 to 99h59m (*: 0.00)		dSP9-2	44
rn85	8th soak segment time	Sets the 8th soak segment time.	0 to 99h59m (*: 0.00)		dSP9-4	44
Mod	Ramp-soak mode	Selects the power-on start, repeat, and standby functions for ramp-soak operations.	0 to 15 (*: 0)		dSP9-8	44

Note 1: When a customer does not specify the settings while ordering, the following settings are selected as factory defaults.

Thermocouple input: Thermocouple K Measured range: 0 to 400°C

Resistance bulb input: Measured range: 0 to 150°C

Voltage/Current input: Scaling: 0 to 100%

Parameters of the third block

Note: The parameters for which * is marked with the page number in Reference page are related to Remedies of "4" on page 68.

Parameter display symbol	Parameter name	Description	Setting range and factory default setting (*)	User's set value	Parameter mask DSP	Reference page
P-n 1	Control action	Specifies control action and output at the input burn-out.	0 to 19 (*: specified by customer while ordering) Note 2		dSP9-16	47
SU-L	SV (Setting value) lower limiter	Sets the lower limit of the SV.	0 to 100%FS (*: 0%FS)		dSP9-32	48*
SU-H	SV (Setting value) upper limiter	Sets the upper limit of the SV.	0 to 100%FS (*: 100%FS)		dSP9-64	48*
dLY1	Delay time 1	Delay time or timer value for alarm 1 relay.	0 to 9999 seconds (*: 0)		dSP9-128	49
dLY2	Delay time 2	Delay time or timer value for alarm 2 relay.	0 to 9999 seconds (*: 0)		dSP10-1	49
CT	Current transe display	Displays the current detector input value for HB alarm.	-		dSP10-4	51
Hb	HB (Set value of heater break alarm) setting	Sets the operation value that detects the heater break.	0 to 50.0A (Setting to 0.0A turns off the HB alarm.) (*: 0.0)		dSP10-8	51
A1hY	Alarm 1 hysteresis	Sets the hysteresis range of ON and OFF of alarm 1.	0 to 50%FS (*: 1)		dSP10-16	53*
A2hY	Alarm 2 hysteresis	Sets the hysteresis range of ON and OFF of alarm 2.	0 to 50%FS (*: 1)		dSP10-32	53*
A1oP	Alarm 1 options	Sets the optional functions of alarms 1 and 2. 8888 Alarm latch (1: use, 0: not use) Alarm of error status (1: use, 0: not use) De-energized output (1: use, 0: not use)	000 to 111 (*: 000)		dSP10-128	54
A2oP	Alarm 2 options		000 to 111 (*: 000)		dSP11-1	54
PLC1	Lower limit for output 1	Sets the lower limit for output 1.	-3.0 to 103.0% (*: -3.0)		dSP11-4	56
PHC1	Upper limit for output 1	Sets the upper limit for output 1.	-3.0 to 103.0% (*: 103.0)		dSP11-8	56
PLC2	Lower limit for output 2	Sets the lower limit for output 2.	-3.0 to 103.0% (*: -3.0)		dSP11-16	56
PHC2	Upper limit for output 2	Sets the upper limit for output 2.	-3.0 to 103.0% (*: 103.0)		dSP11-32	56
PCUT	Output limit types	Sets the limit types of outputs 1 and 2 (breaking the limit, or maintained within the limit).	0 to 15 (*: 0)		dSP11-64	57
oUT1	Output value (MV) display	Displays the value of output 1.	-		dSP11-128	58
oUT2	Output value (MV) display	Displays the value of output 2.	-		dSP12-1	58
rCJ	RCJ (Cold junction compensation) setting	Sets the cold junction compensation function to ON/OFF.	ON: Performs the RCJ (Cold junction compensation).* OFF: Does not perform the RCJ (Cold junction compensation).		dSP12-2	59
GAIn	PV gradient		0.001 to 2.000 (*: 1.000)		dSP12-4	
AdJ0	User-definable zero adjustment	Shifts the zero point of input value.	-50 to 50%FS (*: 0)		dSP12-8	60*
AdJS	User-definable span adjustment	Shifts the span of input value.	-50 to 50%FS (*: 0)		dSP12-16	60*
dI-1	DI1 (Digital input 1) operation	Sets the DI1 operations.	0 to 12 (*: 0=OFF)		dSP12-32	61
STno	Station No.	Sets the station No. for communication.	0 to 255 (Setting to 0 does not start the communications function.) (*: 1)		dSP12-128	64
CoM	Parity setting	Sets the parity for communication. (The baud rate is fixed at 9600bps.	0: Odd parity* 1: Even parity 2: No parity		dSP13-1	65
PyP	Input type for PYP (Color Touch-Operation Unit)	Sets the input type for communicating with PYP.	0 to 255 (*: 34)		dSP13-2	66
dSP1 to dSP9 dP10 to dP13	Parameter mask	Sets whether or not to display each parameter.	0 to 255 (*: specified by customer while ordering)		-	67

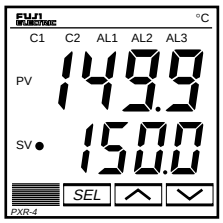
Note 2: The following settings are selected as factory defaults depending on the model you order.

Seventh digit = Y model: 0 Seventh digit = A model: 4

2-2 Basic operations

Just after power-on:

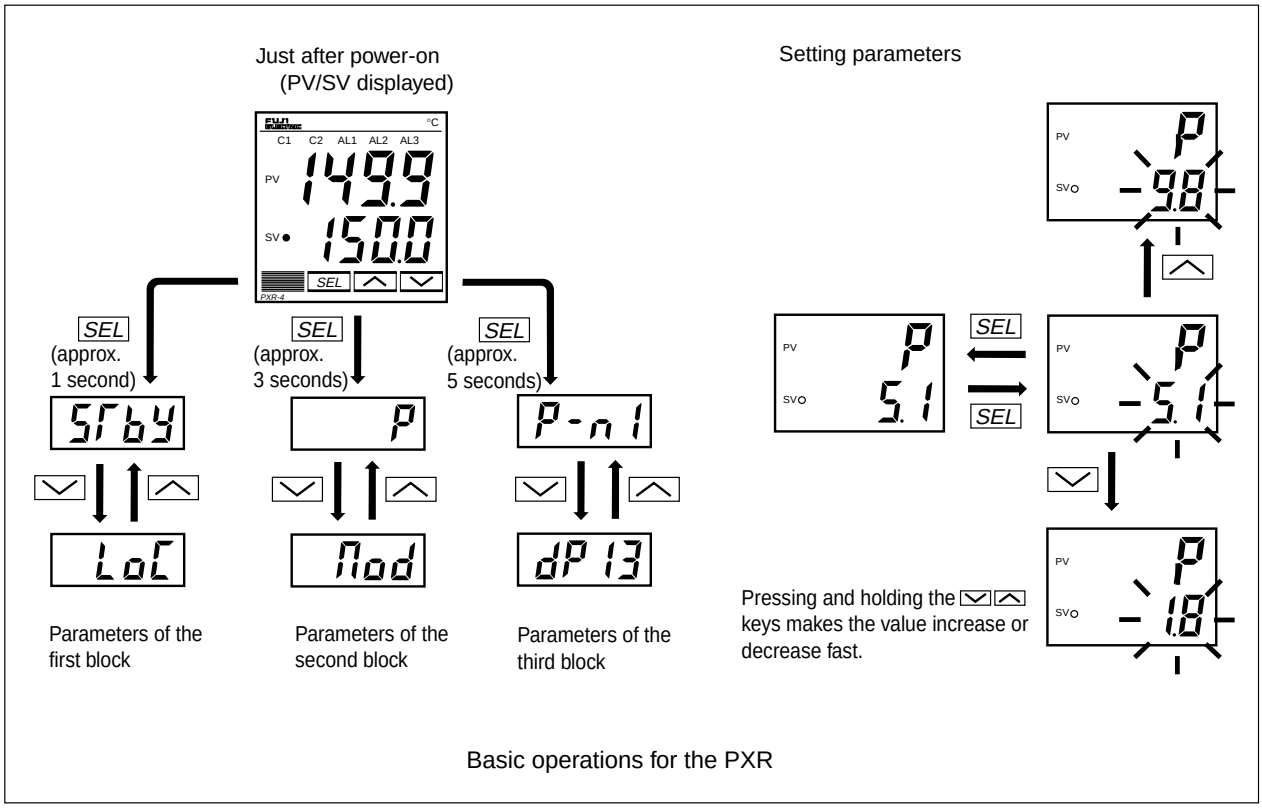
The display below appears just after power-on.



How to switch parameters:

The figure below shows the basic operations for the PXR.

If it has not been used for 30 seconds, the display returns to the one just after power-on (PV/SV displayed).



Basic operations for the PXR

How to set values:

key: One press increases the value by 1.

Press and hold this key to increase the value fast.

key: One press decreases the value by 1.

Press and hold this key to decrease the value fast.

How to register the set data:

By pressing the SEL key, the displayed values are registered.

Note that the SV (SV0) will be registered in 3 seconds without any operation.

2-3 Parameter functions and method of settings

Method of setting the SV (Setting value)

[Description]

- The SV is a target value for control.
- Any SV that is outside of the range set in the parameters of SV-L (lower limit) and SV-H (upper limit) of the third block cannot be set. (See page 48.)

Related parameters: SV-L (page 48)
SV-H (page 48)

[Setting example] Changing the SV from 250°C to 1195°C

Display	Operating procedure
 	1. Press the ∧ or ∨ keys to display 1195. 2. 1195 will be registered in the SV (SV0) in three seconds. After that, the controller will operate with the SV being 1195.

SrbY Standby setting (Settings: oFF/on)

[Description]

- This parameter switches the control between RUN and Standby.
- During standby, the control output and the alarm output stay OFF, like the standby for ramp-soak operation.
- While the alarm with a hold is selected, the hold function takes effect after changing the Standby setting from ON to OFF.
- SrbY is displayed during the standby for ramp-soak operations or the controller changes to the standby state in case of the occurrence of errors.
- The other operations are the same as those of the ramp-soak standby.
- The setting of ON/OFF for standby is saved after power-off.
- When the standby is set to ON during the auto-tuning, self-tuning, and ramp-soak operations, those operations will stop. (The PID constant will not be renewed.) Even through it is set to OFF later, the auto-tuning, self-tuning, and ramp-soak operations will not be re-started.
- During standby, the ON-delay timer is reset. When returning to RUN from the standby state, the timer will start from the beginning.

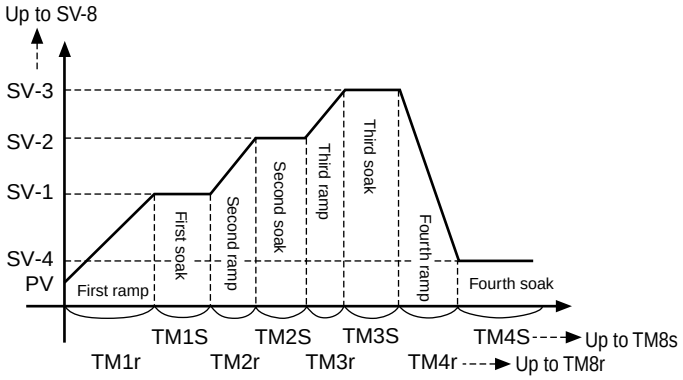
[Setting example] Starting the control

Display	Operating procedure
 	1. Press and hold the SEL key for one second. SrbY will be displayed.
	2. Press the SEL key once. The current setting (oFF) flashes on the SV display.
	3. Press the ∧ or ∨ keys to display on.
	4. Press the SEL key once. The standby state for control is selected. (control output and all the alarm outputs: OFF)
	5. If you want to display the operation status, press and hold the SEL key for two seconds. The value on the SV display will flash, indicating the standby status.

PrOG Ramp-soak control (Settings: oFF/rUn/hLd) (Option)

[Description]

- This function automatically changes the SV (Setting value) according to the program pattern set in advance as shown in the right line graph. Up to eight pairs of ramp-soak operation can be programmed.
- The first ramp starts at the PV (Measured value) that is the one just before running the program.
- The program can also automatically run at power-on (Power-on starting function). Refer to the parameter of Mod (page 44).



Ramp: the section in which the SV changes toward the target value.
Soak: the section in which the SV is the target value, and remains unchanged.

Related parameters: SRAT (page 44)
SU-1 to SU-8 (page 44)
rM1r to rM8r (page 44)
rM1S to rM8S (page 44)
Mod (page 44)
PRn (page 43)

[Setting example] Starting the ramp-soak operation

Display	Operating procedure
1499 1500 SRbY oFF	1. Press and hold the SEL key for one second. SRbY will be displayed on the PV display.
PrOG oFF	2. Press the ∨ key to display PrOG
PrOG oFF	3. Press the SEL key once. The current setting (oFF) flashes on the SV display.
PrOG rUn	4. Press the ∧ or ∨ keys to display rUn.
PrOG rUn	5. Press the SEL key once. Then, the program will start according to the ramp-soak pattern that is set in advance.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

LACH Canceling the alarm latch (Setting range: 0/1) (Option)

[Description]

- This parameter cancels the alarm latch when it is latching.

Related parameters:
A1oP to A2oP (page 54)

[Setting example] Opening up the alarm latch

Display	Operating procedure
 	1. Press and hold the SEL key for one second. SrbY will be displayed on the PV display.
	2. Press the ∨ key to display LACH.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 1.
	5. Press the SEL key once. 1 will stop flashing and will change to 0 in a few seconds.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

AT Auto-tuning function (Settings: 0/1/2)

[Description]

[Note]

If the controller is powered off during auto-tuning, this makes the auto-tuning ineffective with each parameter of P, I, and d unchanged. To start the auto-tuning operation, set AT to "1" or "2" again.

- To suspend the auto-tuning, set AT to "0". This makes the auto-tuning cancel with each parameter of P, I, and d unchanged.
- Once the parameters of P, I, and d are set automatically by the auto-tuning, those parameters are stored in the controller even after it is powered off. Therefore, it is not necessary to execute the auto-tuning again.
- By setting AT to "1" or "2" , the auto-tuning operation starts, and at the end of the tuning, 0 will be displayed automatically to AT.
- After the auto-tuning operation, the controller starts to operate at the automatically set values of P, I, and d.
- A decimal point at the right end of the SV display flashes during auto-tuning.
- There are two codes for AT:
  Setting code [1]: SV standard type
  Performs the auto-tuning based on the SV.
  Setting code [2]: Low PV type
  Performs the auto-tuning based on the SV-10%FS.

[Note]

Since ON/OFF control is performed during auto-tuning, overshoot against the SV may occur. To reduce the overshoot, execute the auto-tuning operation with the setting code [2] (Low PV) selected.

- The auto-tuning can be executed both just after power-on and in a control or stable status.

Related parameters:

P (page 18)
I (page 19)
d (page 20)
Ar (page 24)
CooL (page 22)

[Setting example] Setting the auto-tuning operation to 1

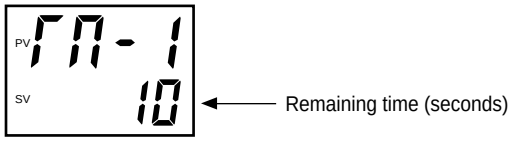
Display	Operating procedure
	1. Press and hold the SEL key for one second. STBY will be displayed on the PV display.
	
	2. Press the ∨ key to display AT.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 1.
	5. Press the SEL key once. 1 will stop flashing and the auto-tuning will start. During auto-tuning, a decimal point at the right end of the SV display flashes.
	6. When the auto-tuning finishes properly, a decimal point stops flashing, and the set values of P, I, and d parameters change. When the auto-tuning finishes abnormally, a decimal point stops flashing, but the set values of P, I, and d parameters remain unchanged.
	7. If you want to display the operation status, press and hold the SEL key for two seconds.

FN-1, FN-2 Displaying ON-delay alarm or the remaining time of timers (unit: seconds) (Option)

[Description]

- These parameters display the remaining time of Timers 1 and 2.
- The remaining time of the ON/OFF-delay timer is counted down. When the counter shows 0, the alarm relay is closed.
- During count-down, if the PV changes to the value of the temperature at which the alarm is set to OFF, or if "DI" for the timer is set to OFF, the counter is reset, and the alarm relay is opened.

- FN-1 display parameter



[Setting example] Displaying ON-delay alarm or the remaining time of timers

Display	Operating procedure
1499 1500 SEL oFF	1. Press and hold the SEL key for one second. SEL will be displayed.
FN-1 10	2. Press the ∨ key to display FN-1. The remaining time of timer 1 will be displayed.
FN-2 8	3. Press the ∧ or ∨ keys to display the remaining timer of FN-1 and FN-2.
1499 1500	4. If you want to display the operation status, press and hold the SEL key for two seconds.

AL 1	AL2	Setting alarm 1 and 2
A1-H	A2-H	Upper limit of alarm 1 and 2
A1-L	A2-L	Lower limit of alarm 1 and 2

(Setting range:
Absolute value alarm: 0 to 100%FS
Deviation value alarm: -100 to 100%FS)
(Option)

[Description]

- These parameters are used to for settings of alarm 1 and 2.
- When the alarm type (ALM1 or ALM2) is set to 0 to 15, alarms 1 and 2 (AL 1 and AL2) can be set.
- When the alarm type (ALM1 or ALM2) is set to any value other than 0 to 15, the upper and lower limits of alarm 1 and 2 (A1-H, A2-H, A1-L, A2-L) can be set.

[Note]
Setting codes (12 to 15) cannot be selected in alarm type 1 (ALM1).

Related parameters: ALM1, ALM2 (page 40)
A1hY, A2hY (page 53)
dLY1, dLY2 (page 49)
A1oP, A2oP (page 54)

[Setting example] Setting the operation value of alarm 2 to -10°C

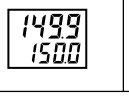
Display	Operating procedure
1499 1500	1. Press and hold the SEL key for one second.
SrbY oFF	SrbY will be displayed on the PV display.
AL2 10	2. Press the ∨ key to display AL2.
AL2 -10	3. Press the SEL key once. The current setting (10) flashes on the SV display.
AL2 -10	4. Press the ∧ or ∨ keys to display -10.
AL2 -10	5. Press the SEL key once. -10 will stop flashing and will be registered for AL2. After that, the controller will operate with the operation value of alarm 2 being -10°C.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

LoC Key lock (Setting range: 0–5)

[Description]

- This parameter makes the set values of parameters unchangeable. However, the parameter name and the set values can be displayed.
- To reset the key lock, change to 0 .
- Even when the key lock is set, control and alarm functions can operate properly.
- There are six levels of the key lock:
  - 0 : Unlocked (reset)
  - 1 : All settings are unchangeable from the controller, but changeable via communication.
  - 2 : Only the SV is changeable from the controller, and all settings are changeable via communication.
  - 3 : All settings are changeable from the controller, but unchangeable via communication.
  - 4 : All settings are unchangeable from the controller or via communication.
  - 5 : Only the SV is changeable from the controller, but all settings are unchangeable via communication.

[Setting example] Setting the key lock to “2”

Display	Operating procedure
 	1. Press and hold the SEL key for one second. SrbY will be displayed on the PV display.
	2. Press the ∨ key to display LoC.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 2.
	5. Press the SEL key once. 2 will stop flashing and will be registered for LoC . After that, any setting other than the SV cannot be changed from the front panel.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

P Proportional band (Setting range: 0.0 to 999.9% of the measured range)

[Description]

- To select the ON/OFF control (two-position control), set P to 0.0. It is not necessary to set I and d.
- P can be automatically set by the auto-tuning operation.
- When P is too small, control will be unstable, and when P is too large, the response will be delayed.
- Set the hysteresis of the ON/OFF control (two-position control) in the parameter HYS.
- If auto-tuning is run after the ON/OFF control is selected, the ON/OFF control changes to the PID control. To keep the ON/OFF control selected, do not execute the auto-tuning.

[Setting example] Changing the proportional band from 5.0% to 15.0%

Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	
	2. Press the SEL key once. The current setting (5.0) flashes on the SV display.
	3. Press the ∧ or ∨ keys to display 15.0.
	4. Press the SEL key once. 15.0 will stop flashing and will be registered for P. After that, the controller will operate with P being 15.0%.
	5. If you want to display the operation status, press and hold the SEL key for two seconds.

Integral time (Setting range: 0 to 3200 seconds)

[Description]

- $\overline{I}$ can be set automatically by the auto-tuning operation.
- $\overline{I}$ can also be set manually.
- When $\overline{I}$ is set to 0, the integral operation does not start.
- When P is set to 0.0, this makes the setting of $\overline{I}$ ineffective.

[Setting example] Changing the integral time from 240 seconds to 600 seconds

Display	Operating procedure
	1. Press and hold the SEL key for three seconds.
	P will be displayed on the PV display.
	2. Press the ∨ key to display $\overline{I}$.
	3. Press the SEL key once.
	The current setting (240) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 600.
	5. Press the SEL key once. 600 will stop flashing and will be registered for $\overline{I}$. After that, the controller will operate with $\overline{I}$ being 600 seconds.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

d Derivative time (Setting range: 0.0 to 999.9 seconds)

[Description]

- d can be set automatically by the auto-tuning operation.
- d can also be set manually.
- When d is set to 0, the differential operation does not start.
- When P is set to 0.0, this makes the setting of d ineffective.

[Setting example] Changing the differential time from 60.0 seconds to 50.0 seconds

Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	
	2. Press the ∨ key to display d.
	3. Press the SEL key once. The current setting (60.0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 50.0.
	5. Press the SEL key once. 50.0 will stop flashing and will be registered for d. After that, the controller will operate with d being 50.0 seconds.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

HYS Hysteresis range for ON/OFF control (Setting range: 0 to 50%FS)

[Description]

- To select the ON/OFF control (two-position control), set P to 0.0. It is not necessary to set I and d.
- When the hysteresis range (Range of ON/OFF control) is too small, the output may switch the ON/OFF frequently. (This may affect the life of the device to be controlled, especially when contact output is selected.)
- The unit of the set value of this parameter is ºC or ºF (engineering unit). The setting range varies according to the measured range of input.

[Ex] Input Thermocouple K : At measured range of 0 to 400 ºC, the setting range is 0 to 200 ºC.

Resistance bulb : At measured range of 0 to 150 ºC, the setting range is 0 to 75 ºC.

Related parameters: P (page 18)
onoF (page 30)

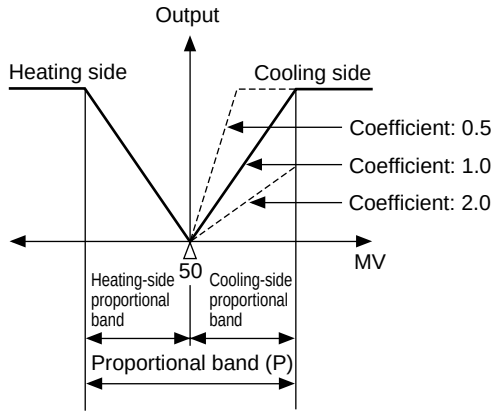
[Setting example] Changing the hysteresis range from 1˚C to 35˚C

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
HYS 1	2. Press the ∨ key to display HYS.
HYS 1	3. Press the SEL key once. The current setting (1) flashes on the SV display.
HYS 35	4. Press the ∧ or ∨ keys to display 35 .
HYS 35	5. Press the SEL key once. 35 will stop flashing and will be registered for HYS . After that, the controller will operate with the hysteresis range being 35˚C.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

CoolCooling-side proportional band coefficient (Option: Available for DUAL output only) (Setting range: 0.0 to 100.0)

[Description]

- This parameter is used for setting the cooling-side proportional band. (See the figure below.)



- Before setting the cooling-side proportional band, set the heating-side proportional band to an optimum value. To select the two-position control for the cooling side, set Cool to 0.0.

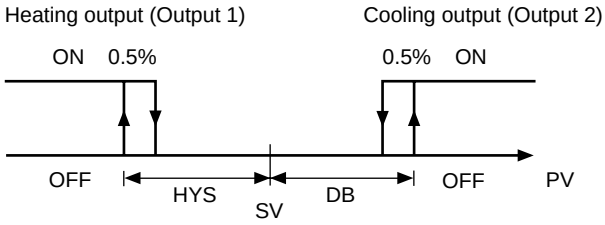
$$\text{Cooling-side proportional band} = \frac{\text{Proportional band (P)}}{2} \times \text{Coefficient}$$

Ex) When making the proportional band of 10% of the full scale with the proportional band (P) being 50%:

$$10\% = \frac{50\%}{2} \times \text{Coefficient}$$

Consequently, the coefficient is 0.4.

- When P is set to 0.0 and Cool is set to 0.0 in the dual output type, the cooling output is as shown in the figure below. The hysteresis is fixed at 0.5%FS.



Related parameters: HYS (page 21)
P (page 18)
db (page 23)

[Setting example] Changing the cooling-side proportional band coefficient from 1.0 to 2.5

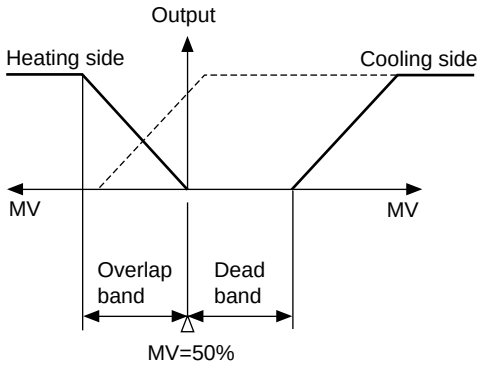
Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
Cool 10	2. Press the ∨ key to display Cool .
Cool 10	3. Press the SEL key once. The current setting (10) flashes on the SV display.
Cool 25	4. Press the ∧ or ∨ keys to display 25 .
Cool 25	5. Press the SEL key once. 25 will stop flashing and will be registered for Cool . After that, the controller will operate with the cooling-side proportional band coefficient being 2.5.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

db Cooling-side proportional band shift (Dead band/Overlap band)

(Option: Available for DUAL output only) (Setting range: -50.0 to +50.0)

[Description]

- This parameter is used for shifting the cooling-side proportional band from the set value. (See the figure below.)



- When db is a positive value, it is called the "Dead band", and when it is a negative value, the "Overlap band".
- Since the unit of db is same one used for MV [%], if you want to set db in the unit of deviation [%], db must be converted using the equation below.

$$\text{DB [\%]} = \text{Deviation} \times \frac{100}{\text{P}} \text{ [\%]}$$

Ex) When making a dead band with a deviation of 1.0 [%] from the SV while the proportional band (P) is 5.0%:

$$\text{DB [\%]} = 1.0 \times \frac{100}{5.0} = 20 \text{ [\%]}$$

Consequently, set the parameter db to 20 [%].

- Related parameters: P (page 20)

[Setting example] Shifting the cooling-side proportional band by 2.0

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds.
P 5.0	P will be displayed on the PV display.
db 0.0	2. Press the ∨ key to display db .
db 0.0	3. Press the SEL key once. The current setting (0.0) flashes on the SV display.
db 2.0	4. Press the ∧ or ∨ keys to display 2.0 .
db 2.0	5. Press the SEL key once. 2.0 will stop flashing and will be registered for db. After that, the controller will operate with db being 2.0 %.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

bAL Output offset value (Setting range: -100.0 to 100.0 %)

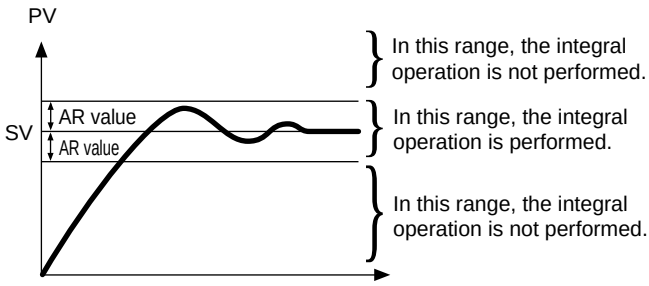
Ar Anti-reset windup (Setting range: 0 to 100%FS)

[Description]

- The anti-reset windup (Ar) is automatically set to an optimum value by the auto-tuning operation.
  By setting bAL, the amount of overshoot can be adjusted.

[Note]

By making use of a fuzzy control system equipped to PXR, the amount of overshoot can be minimized without setting bAL and Ar.



[Setting example] Changing the anti-reset windup from 60˚C to 80˚C.

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
Ar 60	2. Press the ﹀ key to display Ar .
Ar 60	3. Press the SEL key once. The current setting (60) flashes on the SV display.
Ar 80	4. Press the ﹀ or ﹀ keys to display 80 .
Ar 80	5. Press the SEL key once. 80 will stop flashing and will be registered for Ar . After that, the controller will operate with the anti-reset windup being 80˚C.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

CTrL Control algorithm (Settings: PID/FUZY/SELF)

[Description]

- This parameter is used for selecting PID control, FUZZY-PID control, or PID control with self-tuning.
- To select the PID control or FUZZY-PID control, it is necessary to set the parameters of P, I, d, and Ar manually or by the auto-tuning in advance.
- For the ON/OFF control (Two-position control), select the PID control and then set P to 0.0. For detailed information, refer to P (page 20).
- Refer to the next page for the PID control with self-tuning.

[Setting example] Changing the control system from PID to FUZZY

Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	
	2. Press the ∨ key to display CTrL.
	3. Press the SEL key once. The current setting (PID) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display FUZY.
	5. Press the SEL key once. FUZY will stop flashing and will be registered for CTrL. After that, the controller will operate with the FUZZY control system activated.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

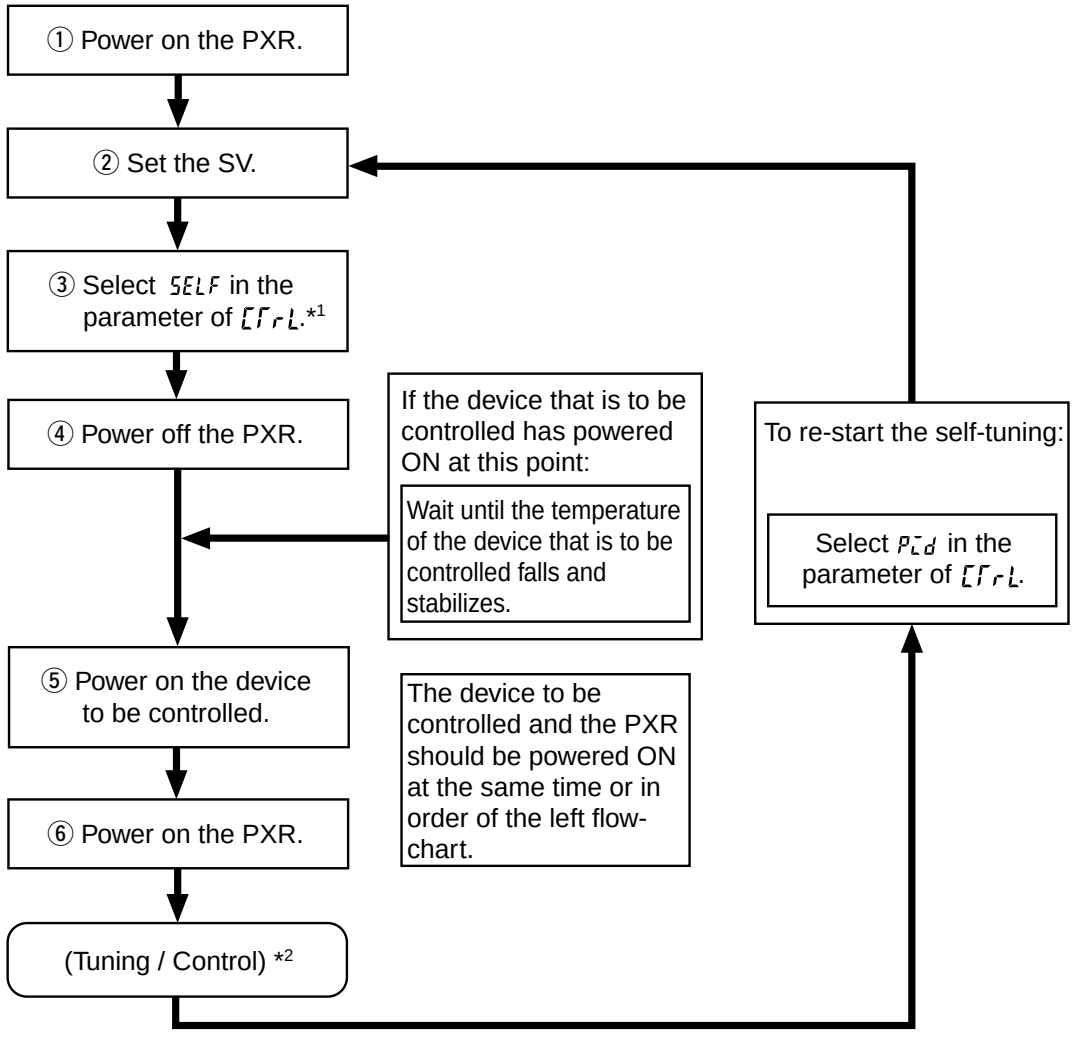
[Self-tuning]

1 Function:

With the self-tuning function, PID parameters are automatically re-optimised depending on the actual condition of device to be controlled and the setting temperature (SV).

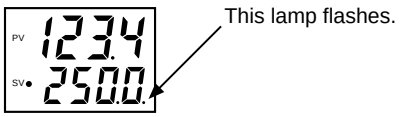
2 How to execute:

Follow the procedure shown below to set and execute the self-tuning. The self-tuning starts to run at the appropriate conditions. (See page 27)



*1: How to set the parameter of CTrL:

*2: Display during self-tuning is shown below:



3 Conditions under which the self-tuning runs:

① At power-on:

The self-tuning runs when all of the following conditions are met.

- The SV that appears at power-on is not the same one when the P , I , d , and Ar were set previously. (When the P , I , d , and Ar are set by the self-tuning, auto-tuning, manual setting, and writing by communications tools at previous time)
- The (SV-PV) at power-on is larger than (the value of P × input range) or (the set value of SLFb).

② When the SV is changed:

The self-tuning runs when all the conditions below are met.

- The changed SV is larger than the SV that was set when the P , I , d , and Ar were selected previously.
- The changed amount of the SV is larger than 0.
- The changed amount of the SV is larger than (the set value of P × input range) or (the set value of SLFb).

③ When output becomes unstable:

The self-tuning runs when control becomes unstable and the hunting of the operating output (MV) occurs. (The self-tuning runs only once as long as the SV is not changed.)

④ When the control standby mode is cancelled:

The self-tuning runs by the same reason as "① At power-on" are met.

* Only when the PXR is set to standby mode at power-on.

4 Conditions under which the self-tuning does not run:

① During control standby mode
② During two-position control (Parameter of P = 0)
③ During auto-tuning operation
④ During ramp-soak operation
⑤ Error display (LLLL or UUUU is displayed.)
⑥ During dual output (The set value of the parameter of P-n1 is larger than 4.)
⑦ When setting the parameters of P , I , d , and Ar manually (including the setting written by communications tools)

5 Conditions under which the self-tuning is suspended:

① At the condition described in 4 shown above
② When the SV is changed during self-tuning operation
③ When the self-tuning operation can not be completed within approx. 9 hours

6 Caution

① Once the PID constant is set, the self-tuning does not operate at next power-on as long as the SV is not changed.
② For an accurate tuning, be sure to power on the device to be controlled before or at the same time as the PXR is powered on. If the PXR has to be powered on first for reasons of the system configuration, perform the auto-tuning with the PID or FUZZY control.
③ If the device to be controlled is powered on under temperature change (especially when it rises), accurate tunings can not be performed. Be sure to power on the PYX when the temperature of device to be controlled is stabilized.
④ The self-tuning does not run for cooling system control under Direct Action output (Parameter P-n1 = 2 or 3).
⑤ In case the control is not stable after performing the self-tuning, change the algorithm to the PID or FUZZY control and perform the auto-tuning.

7 Reference [About the self-tuning method]

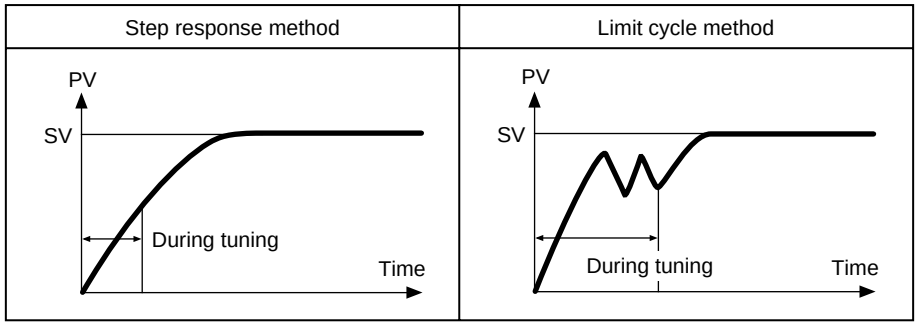
The PID constant is calculated in one of the following two methods.

The method is selected automatically depending on the characteristics of the device to be controlled.

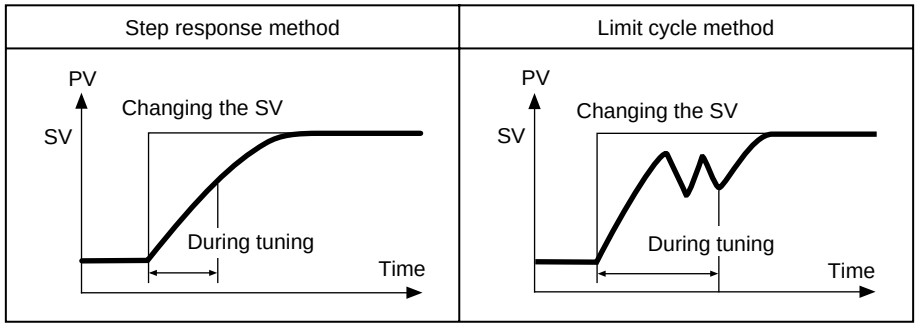
- Step response method
- Limit cycle method

The following figures show the operations at power-on and changing the SV, and under unstable control.

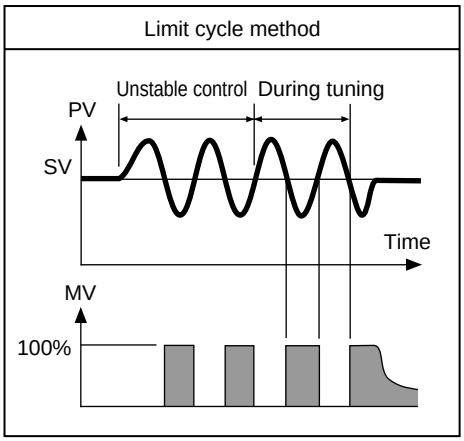
① Operations at power-on



② Operations at changing the SV



③ Operation under unstable control



SLFb PV (Measured value) stable range (Setting range: 0 to 100%FS)

[Description]

- Self-tuning logic recognizes that control is stable if PV is staying within the SV ± SLFb .
- It is not necessary to set this parameter under normal conditions.

[Setting example] Changing the PV stable range from 2 to 3

Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	
	2. Press the ﹀ key to display SLFb .
	3. Press the SEL key once. The current setting (2) flashes on the SV display.
	4. Press the ﹀ or ﹀ keys to display 3 .
	5. Press the SEL key once. 3 will stop flashing and will be registered for SLFb. After that, the controller will operate with the PV range being 3.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

onoF HYS (Hysteresis) mode at ON/OFF control (Settings: oFF/on)

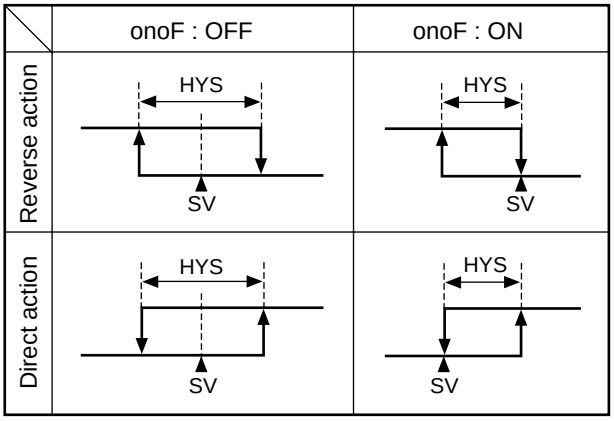
[Description]

- This parameter is use for selecting the hysteresis operation mode at ON/OFF control.

  oFF : Starts the ON/OFF control at the values of SV+ $\frac{\text{HYS}}{2}$ and SV- $\frac{\text{HYS}}{2}$.

  on : Starts the ON/OFF control at the values of SV and SV+HYS, or SV and SV-HYS.

- Default setting: ON



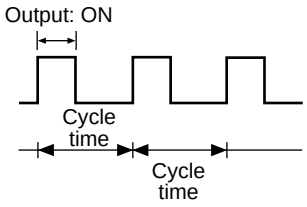
[Setting example] Setting the hysteresis mode to ON

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
onoF oFF	2. Press the ∨ key to display onoF .
onoF oFF	3. Press the SEL key once. The current setting (oFF) flashes on the SV display.
onoF on	4. Press the ∨ key to display on .
onoF on	5. Press the SEL key once. on will stop flashing and will be registered for onoF. After that, the controller will operate with the hysteresis being as shown in the figure of ON above.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

CC Cycle time of control output 1 (Setting range: 1 to 150 seconds)

[Description]

- This parameter is applicable for to the contact output and SSR-driving output.
- While input is within the proportional band, output changes between ON and OFF in cycles. These cycles are called cycle time.



- Do not set this parameter to "0".

For contact output:

The higher the frequency of output is, the more precise the control becomes. However a high frequency of output may shorten the life of the contacts and the device to be controlled. Be sure to adjust the proportional cycles considering controllability and the life of the device and the contacts.

Typical: 30 seconds

For SSR-driving output:

Use in short cycles if there is no problem with the device to be controlled.

Typical: 1 to 2 seconds

[Setting example] Setting the cycle time from 30 seconds to 20 seconds

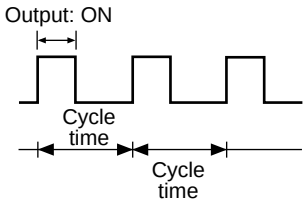
Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
CC 30	2. Press the ∨ key to display CC.
CC 30	3. Press the SEL key once. The current setting (30) flashes on the SV display.
CC 20	4. Press the ∧ or ∨ key to display 20.
CC 20	5. Press the SEL key once. 20 will stop flashing and will be registered for CC. After that, the controller will operate with the cycle time being 20 seconds.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

rC2 Cycle time of control output 2 (Cooling-side)

(Setting range: 1 to 150 seconds) (Option: Available for DUAL output only)

[Description]

- By this parameter is set, the cycle time of control output 2.
- While input is within the proportional band, output changes between ON and OFF in cycles. These cycles are called cycle time.



For contact output:

The higher the frequency of output is, the more precise the control becomes. However a high frequency of output may shorten the life of the contacts and the device to be controlled. Be sure to adjust the proportional cycles considering controllability and the life of the device and the contacts.

Typical: 30 seconds

- Do not set this parameter to "0".

[Setting example] Setting the cooling-side cycle time from 30 seconds to 20 seconds

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
rC2 30	2. Press the ∨ key to display rC2.
rC2 30	3. Press the SEL key once. The current setting (30) flashes on the SV display.
rC2 20	4. Press the ∧ or ∨ key to display 20.
rC2 20	5. Press the SEL key once. 20 will stop flashing and will be registered for rC2. After that, the controller will operate with the cooling-side cycle time being 20 seconds.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

P-n2 Input signal code (Setting range: 0 to 16)

[Description]

- This parameter is used for selecting input signals. Input signal varies depending on the sensors (2 types below). Set a code that corresponds to the sensor you use.
  - Type I : Thermocouples (9 kinds of signals)
    Resistance bulbs (1 kind of signal)
  - Type II : Voltage, current
- Input signals can be selected within the same type. It is impossible to select input signals of a different type.
- For type II, when changing from the current input to the current input, connect the supplied resistance of 250 Ω between terminals ⑰ and ⑱ as well as changing the code. When changing from the current input to the voltage input, remove the resistance of 250 Ω as well as changing the code.

[Note]

After changing the codes, power off the PXR, and then power it on again.

- Input signals and codes

① Input signals code table

Type	Input signal	Code P-n2
I	Resistance bulb (RTD)	
	• Pt 100	1
	Thermocouple	
	• J	2
	• K	3
	• R	4
	• B	5
	• S	6
	• T	7
	• E	8
	• N	12
	• PL-II	13
II	1 to 5 V, 4 to 20mA DC	16

[Setting example] Changing from thermocouple K to thermocouple T in Type I

Display	Operating procedure
 	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	2. Press the ∨ key to display P-n2.
	3. Press the SEL key once. The current setting (3) flashes on the SV display.
	4. Press the ∧ or ∨ key to display 7.
	5. Press the SEL key once. 7 will stop flashing and will be registered for P-n2. After that, the controller will operate with the kind of input signals being thermocouple T.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

P-SL Setting the the measuring range (Input range) (Setting range: -1999 to 9999)

P-SU

P-F Selection °C / °F (Settins: °C / °F)

[Description]

- These parameters is used for setting the lower and upper limits of the measured range and unit of temperature.
- A decimal point position can be set in the parameter of P-dP.
- For the current and voltage inputs, 0, 1 and 2 can be set for P-dP, and for other inputs, 0 and 1 can be set for P-dP.
- See the right table for input range.

② Input range table (Standard range)

Input type		Range (°C)	With / without a decimal point (°C)*	Range (°F)	With / without a decimal point (°F)*
Resistance bulb JIS (IEC)	Pt100Ω	0 to 150	O	32 to 302	O
		0 to 300	O	32 to 572	O
		0 to 500	O	32 to 932	O
		0 to 600	O	32 to 1112	X
		-50 to 100	O	-58 to 212	O
		-100 to 200	O	-148 to 392	O
		-150 to 600	O	-238 to 1112	X
		-150 to 850	X	-238 to 1562	X
Thermocouple	J	0 to 400	O	32 to 752	O
	J	0 to 800	O	32 to 1472	X
	K	0 to 400	O	32 to 752	O
	K	0 to 800	O	32 to 1472	X
	K	0 to 1200	X	32 to 2192	X
	R	0 to 1600	X	32 to 2912	X
	B	0 to 1800	X	32 to 3272	X
	S	0 to 1600	X	32 to 2912	X
	T	-150 to 200	O	-238 to 392	X
	T	-150 to 400	O	-238 to 752	X
	E	0 to 800	O	32 to 1472	X
	E	-150 to 800	O	-238 to 1472	X
	N	0 to 1300	X	32 to 2372	X
	PL-II	0 to 1300	X	32 to 2372	X
Direct-current voltage	1 to 5 V DC	-1999 to 9999 (Scaling is possible)			

* O: with
X: without

* For 4 to 20 mA DC input, connect a resistance of 250Ω between terminals ⑰ and ⑱ to change the input to the 1 to 5 V DC input.

[Note]

The input accuracy is ±0.5%FS±1 digit except the cases shown below.

Thermistor: ±1% FS ± 1 digit

Thermocouple R at 0 to 400 °C:
Thermocouple B at 0 to 500 °C:
} In this range, this controller may display a wrong process value because of the characteristecs of the sensor.

Other kinds of thermocouples: ±0.5% FS ± 1 digit ± 1 °C

[Setting example] Changing the measuring range from 0°C to 150°C to -100°C to 200°C (Pt100)

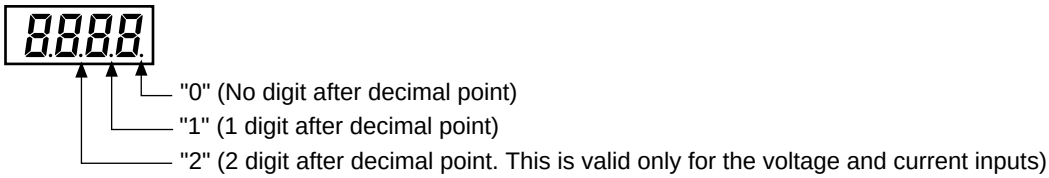
Display	Operating procedure
	1. Press and hold the SEL key for three seconds.
	P will be displayed on the PV display.
	2. Press the ﹀ key to display P-SL.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ﹀ or ﹀ key to display - 100.
	5. Press the SEL key once. - 100 will stop flashing and will be registered for P-SL.
	6. Press the ﹀ key to display P-SU on the PV display.
	7. Press the SEL key once. The current setting (150) flashes on the SV display.
	8. Press the ﹀ or ﹀ key to display 200.
	9. Press the SEL key once. 200 will be registered for P-SU. After that, the controller will operate with the measured range being -100°C to 200°C.
	10. If you want to display the operation status, press and hold the SEL key for two seconds.

P-dP Decimal point position (Settings: 0 / 1 / 2)

[Description]

- This parameter is used for selecting the number of decimal point position for the PV (Measured value).

Related parameters: P-SL (page 34)
P-SU (page 34)



[Setting example] Changing the decimal point position setting from 0 to 1

Display	Operating procedure
150 150	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
P-dP 0	2. Press the ∨ key to display P-dP.
P-dP -0	3. Press the SEL key once. The current setting (0) flashes on the SV display.
P-dP -1	4. Press the ∧ key to display 1.
P-dP 1	5. Press the SEL key once. 1 will stop flashing and will be registered for P-dP. After that, the controller will operate with one decimal point position displayed.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

PUOF PV (Measured value) offset (Setting range: -10 to 10%FS)

[Description]

- With this function, predetermined value is added to the input reading. This parameter is used for adjusting PXR's indication so that it becomes same as the one of the other instruments like recorder.
- The PXR operates at the displayed PV (the value to which the PV offset value is added).

[Setting example] Adding the PV offset value of 5°C to the input value of 1200 °C

Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	
	2. Press the ∨ key to display PUOF.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ key to display 5.
	5. Press the SEL key once. 5 will stop flashing and will be registered for PUOF. After that, the controller will operate so that the value to which the offset value of 5°C is added can be brought close to the set value.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

SUOF SV (Setting value) offset (Setting range: -50 to 50%FS)

[Description]

- With this function, predetermined value is added to the original SV. This parameter is used to eliminate the offset that occurs in performing P control.
- The PXR operates based on the SV to which the SV offset value is added.
- Alarm judgment is made by the displayed SV to which the SV offset value is not added.

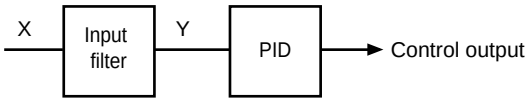
[Setting example] Adding the SV offset value of 9°C to the currently set value

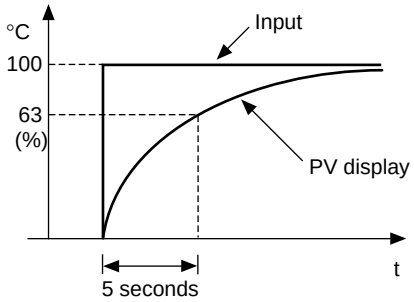
Display	Operating procedure
	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
	2. Press the ∨ key to display SUOF.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ key to display 9.
	5. Press the SEL key once. 9 will stop flashing and will be registered for SUOF . (The displayed SV remains unchanged.) After that, the controller will operate at the SV value to which the SV offset value of 9°C is added.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

P-dF Time constant of input filter (Setting range: 0.0 to 900.0 seconds)

[Description]

- This parameter is used for reducing the fluctuation of input signal (filter function).
  For example, when the input filter constant is set to 5 seconds, the PV changes as shown in right figure while input changes from 0 to 100% suddenly. It takes 5 seconds for the PV to change from 0 to 63.2%.





[Note]

The factory default setting is 5.0 (5 seconds). Do not change this parameter as long as changing is not of absolute necessity.

[Setting example] Changing the filter constant from 5.0 (5 seconds) to 10.0 (10 seconds)

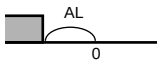
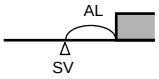
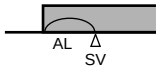
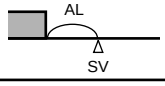
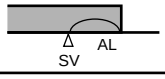
Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 5.0	
P-dF 5.0	2. Press the ∨ key to display P-dF.
P-dF 5.0	3. Press the SEL key once. The current setting (5.0) flashes on the SV display.
P-dF 10.0	4. Press the ∧ or ∨ key to display 10.0.
P-dF 10.0	5. Press the SEL key once. 10.0 will stop flashing and will be registered for P-dF. After that, the controller will operate with the filter constant being 10.0.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

ALM1 , ALM2 Alarm types (Setting range: 0 to 34) (Option)

[Description]

- These parameters is used for selecting the operation types of Alarms 1 and 2.
- Alarm1 is activated in the same way as Alarm2 except for codes 12 to 15. (Codes 12 to 15 cannot be selected for Alarm1 .)
- When any code of 12 to 15 is selected for Alarm 2, Alarm 2 is activated and Alarm 1 is cancelled. "Alarm hysteresis", "Delay time", and "Alarm latch" can be selected in Alarm 2 settings.
- The display of the parameter in which the alarm value is set varies depending on the alarm operation types.

[Note] Alarm set value and alarm operations

		Alarm set value (AL)	
		Plus setting	Minus setting
Absolute value	Upper limit		Disabled
	Lower limit		Disabled
Deviation value	Upper limit		
	Lower limit		

[Note]

- Since the alarm set value may change after changing the alarm operation types, be sure to set the alarm set value again.
- After changing the alarm operation types, power the PXR off, and then on.
- Setting code 0 indicates "No alarm".

Related parameters: A1HY , A2HY (page 53)
A1oP , A2oP (page 54)
AL1 , AL2 (page 16)
dLY1 , dLY2 (page 49)

[Setting example] Changing the alarm type of Alarm 2 from upper-limit deviation to the upper-limit deviation with hold

Display	Operating procedure
	1. Press and hold the SEL key for three seconds.
	P will be displayed on the PV display.
	2. Press the ∨ key to display ALM2.
	3. Press the SEL key once. The current setting (5) flashes on the SV display.
	4. Press the ∧ key to display 8.
	5. Press the SEL key once. 8 will stop flashing and will be registered for ALM2 . After that, the controller will operate with Alarm 2 of upper limit deviation with hold.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

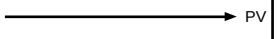
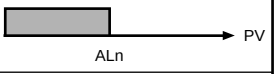
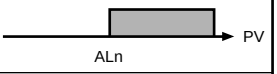
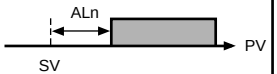
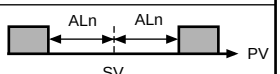
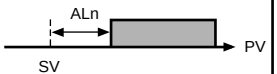
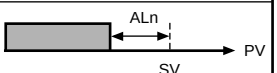
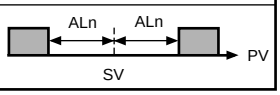
[Alarm type list]

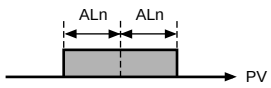
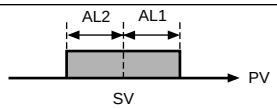
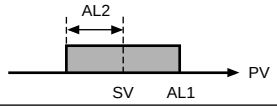
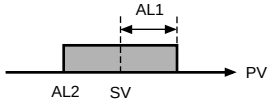
The table below shows the meaning of symbols in the following operation figures.

Alarm type	Alarm 1		Alarm 2	
	Display symbol	Screen name	Display symbol	Screen name
0~15	AL1	Set value of Alarm 1	AL2	Set value of Alarm 2
16~31	A1-L	Lower-limit of set value of Alarm 1	A2-L	Lower-limit of set value of Alarm 2
	A1-H	Upper-limit of set value of Alarm 1	A2-H	Upper-limit of set value of Alarm 2

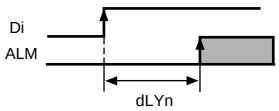
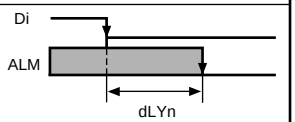
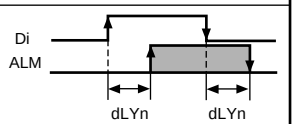
- Alarm 1 is activated in the same way as Alarm 2 except codes 12 to 15. (Codes 12 to 15 cannot be selected for Alarm 1. If any of them is set, it is recognized as code 0, which indicates "No alarm".)
- When any code of 12 to 15 is selected for Alarm 2, Alarm 2 is activated and Alarm 1 is not raised. "Alarm hysteresis", "Delay time", and "Alarm latch" can be selected in Alarm 2 settings.
- The display of the parameter in which the alarm value is set varies depending on the alarm operation types.
- Since the alarm set value may change after changing the alarm operation types, confirm the alarm set value. (Note that this is not abnormal.)

• Alarm codes for standard types

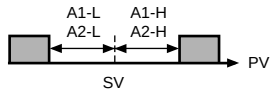
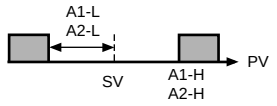
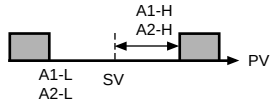
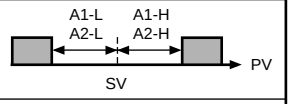
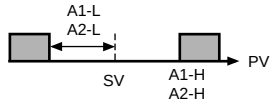
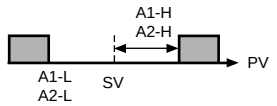
	ALM1	ALM2	Alarm type	Operation figure
	0	0	No alarm	
Absolute value alarm	1	1	Upper-limit absolute value	
	2	2	Lower-limit absolute value	
	3	3	Upper-limit absolute value (with hold)	
	4	4	Lower-limit absolute value (with hold)	
Deviation value alarm	5	5	Upper-limit deviation	
	6	6	Lower-limit deviation	
	7	7	Upper and lower limits deviation	
	8	8	Upper-limit deviation (with hold)	
	9	9	Lower-limit deviation (with hold)	
	10	10	Upper and lower limits deviation (with hold)	

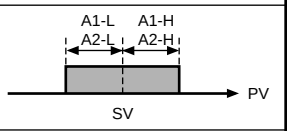
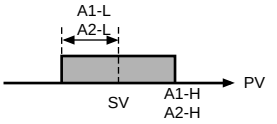
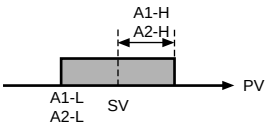
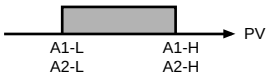
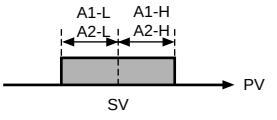
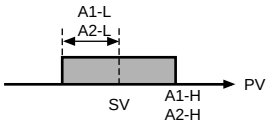
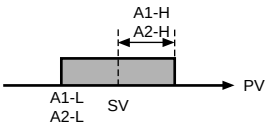
	ALM1	ALM2	Alarm type	Operation figure
Range alarm	11	11	Range upper and lower limits deviation (ALM1/2 independent operation)	
	-	12	Range upper and lower limits absolute value	
	-	13	Range upper and lower limits deviation	
	-	14	Range upper limit absolute value and lower limit deviation	
	-	15	Range upper limit deviation and lower limit absolute value	

• Timer codes

	ALM1	ALM2	Alarm type	Operation figure
Timer	32	32	ON-delay timer	
	33	33	OFF-delay timer	
	34	34	ON/OFF-delay timer	

• Alarm codes with dual set values

	ALM1	ALM2	Alarm type	Operation figure
Upper and lower limits alarm	16	16	Upper and lower limits absolute value	
	17	17	Upper and lower limits deviation	
	18	18	Upper limit absolute value and lower limit deviation	
	19	19	Upper limit deviation and lower limit absolute value	
	20	20	Upper and lower limits absolute value (with hold)	
	21	21	Upper and lower limit deviation (with hold)	
	22	22	Upper limit absolute value and lower limit deviation (with hold)	
	23	23	Upper limit deviation and lower limit absolute value (with hold)	

	ALM1	ALM2	Alarm type	Operation figure
Range alarm	24	24	Range upper and lower limits absolute value	
	25	25	Range upper and lower limits deviation	
	26	26	Range upper limit absolute value and lower limit deviation	
	27	27	Range upper limit deviation and lower limit absolute value	
	28	28	Range upper and lower limits absolute value (with hold)	
	29	29	Range upper and lower limits deviation (with hold)	
	30	30	Range upper limit absolute value and lower limit deviation (with hold)	
	31	31	Range upper limit deviation and lower limit absolute value (with hold)	

dLYn: The delay time of Alarms 1 and 2 or timers 1 and 2

ALn: The set value of Alarms 1 and 2

AL1: The set value of Alarm 1

AL2: The set value of Alarm 2

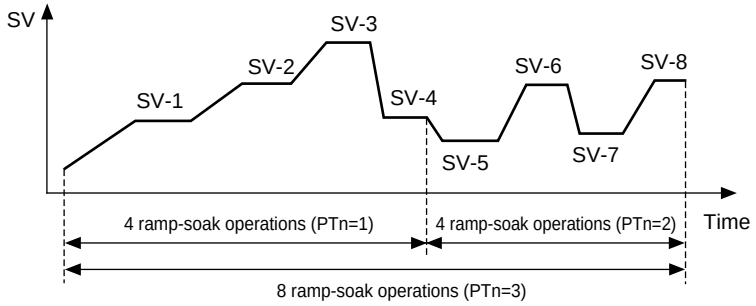
PTn Selecting ramp-soak execute type (Settings: 1 / 2 / 3) (Option)

[Description]

- The ramp-soak execute tyoe become effective when the ramp-soak operation is changed from oFF to run .
- Setting range
  - 1 : Performs 1st to 4th segments.
  - 2 : Performs 5th to 8th segments.
  - 3 : Performs 1st to 8th segments.

[Note]

- The change of the ramp-soak execute type are not effective if they are changed during RUN or HOLD.
- Types 1 and 2 cannot run one after another.
- Once SU-1 to SU-8 are set, when the SV limiter is set the set values of SU-1 to SU-8 are not changed, but the SV displayed during ramp-soak operation is affected by the SV limiter.



[Setting example] Changing the ramp-soak execute type from 1 to 3

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds.
P 50	P will be displayed on the PV display.
PTn 1	2. Press the ∨ key to display PTn.
PTn -1-	3. Press the SEL key once.
	The current setting (1) flashes on the SV display.
PTn -3-	4. Press the ∧ key to display 3.
PTn 3	5. Press the SEL key once. 3 will stop flashing and will be registered for PTn . After that, the controller will operate in ramp-soak type 3
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

SrAr Ramp-soak status display (Display only)

Su-1 to Su-8 1st to 8th target SV (Setting range: Su-L to Su-H) (Option)

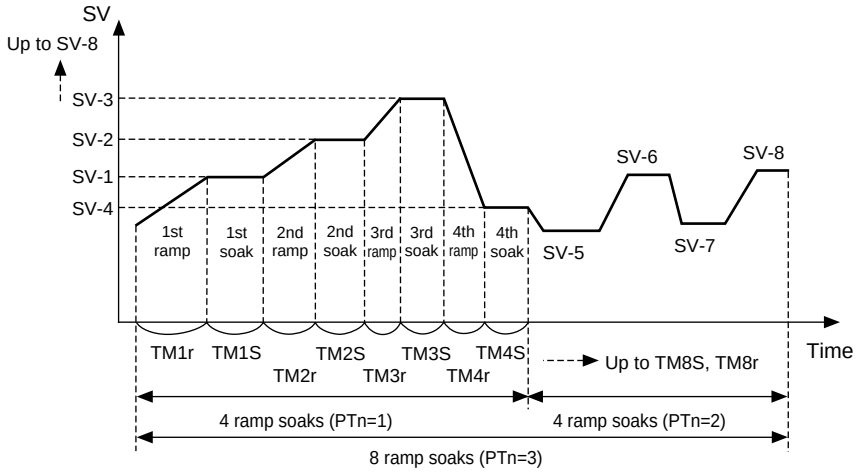
rM1r to rM8r 1st to 8th ramp segment time (Setting range: 0 to 99h 59min) (Option)

rM1S to rM8S 1st to 8th soak segment time (Setting range: 0 to 99h 59min) (Option)

Mod Ramp-soak modes (Setting range: 0 to 15) (Option)

[Description]

- By these parameters, the SV (Set value) are automatically changed over time according to the patterns set in advance as shown in the figure below. A maximum of 8 ramp-soak segments can be set in PXR.
- The first ramp starts from the PV (Measured value) just before performing the program.
- The program can also be started at power-on automatically (Power-on start function).
- A maximum of eight ramp-soak segments can be set. It is also possible to set 4 ramp-soak segments twice instead.
- When the following parameters are changed under ramp-soak operation, operation will change the patterns of the ramp-soak pattern is changed to the new setting.
  - Su-1 to Su-8
  - rM1r to rM8r
  - rM1S to rM8S
  - Mod



[Parameters]

In order to execute these functions, it is necessary to set the programs in advance. To set the programs, set the SV (Setting value) and time desired for the parameters shown in the table on next page.

Related parameters: PTn (page 43)
ProG (page 12)
Su-L (page 48)
Su-H (page 48)

Parameter display symbol	Name		Description	Factory default settings	Remark
STAT	STAT	Current program status	Displays the Ramp-soak current status. This parameter is only for display, and cannot set anything. oFF: OFF 1-rP to 8-rP: Under the 1st to 8th ramp operation 1-St to 8-St: Under the 1st to 8th soak operation End: Ends the program	–	No symbol appears when the ramp-soak model is not selected.
SU-1 to SU-8	SV-1 to SV-8	1st to 8th target SV	Sets the target value (SV) of each ramp segment (Setting range: SU-L to SU-H)	0%FS	
TM1r to TM8r	TM1r to TM8r	1st to 8th ramp segment time	Sets the ramp time for each segment (Setting range: 0 to 99h 59min)	0.00	
TM1S to TM8S	TM1s to TM8s	1st to 8th soak segment time	Sets the soak time for each segment (Setting range: 0 to 99h 59min)	0.00	
Mod	Mod	Ramp-soak mode	Selects the modes of ramp-soak function. Set to "0" under normal conditions	0	

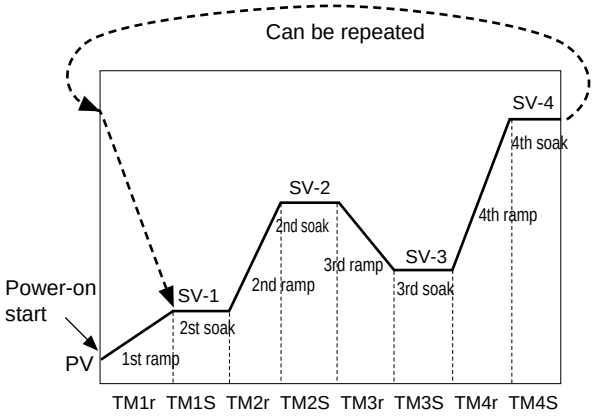
[MODE code list]

MOD	Power-on start	Output at the END	Output at OFF	Repeat operation
0	OFF	Continuous control	Continuous control	OFF
1	OFF	Continuous control	Continuous control	ON
2	OFF	Continuous control	Standby mode	OFF
3	OFF	Continuous control	Standby mode	ON
4	OFF	Standby mode	Continuous control	OFF
5	OFF	Standby mode	Continuous control	ON
6	OFF	Standby mode	Standby mode	OFF
7	OFF	Standby mode	Standby mode	ON
8	ON	Continuous control	Continuous control	OFF
9	ON	Continuous control	Continuous control	ON
10	ON	Continuous control	Standby mode	OFF
11	ON	Continuous control	Standby mode	ON
12	ON	Standby mode	Continuous control	OFF
13	ON	Standby mode	Continuous control	ON
14	ON	Standby mode	Standby mode	OFF
15	ON	Standby mode	Standby mode	ON

[Description of functions]

1. Power-on start: The ramp-soak operation starts to run from the current PV value.
2. Output at END: The output status at the END of the ramp-soak operation.
3. Output at OFF: The output status while the ramp-soak operation is set to OFF.
4. Repeat operation: This function makes the ramp-soak operation to continue after one cycle of ramp-soak operation is completed. At the event of Repeat operation: OFF, the SV that is set in the final cycle is kept.

* Standby mode: Output: control output OFF or -3%
Alarm: OFF
Control: OFF



[Ramp]

The segment in which the set value changes toward the target value.

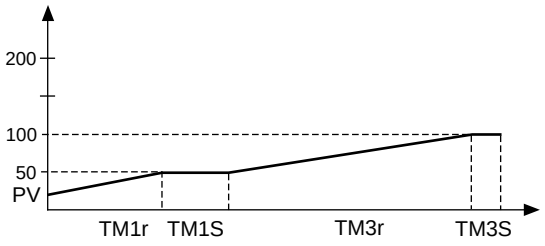
[Soak]

The segment in which the set value is always the target value and remains unchanged.

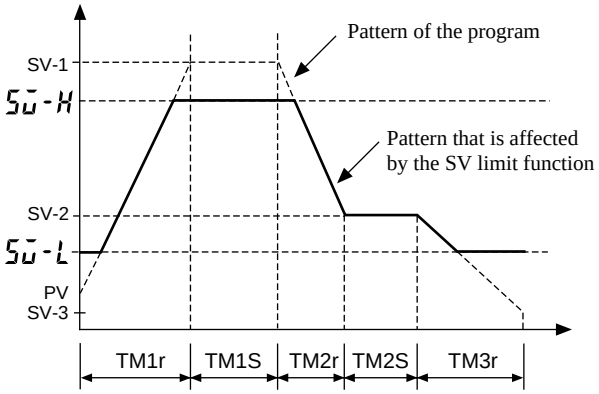
- The segment in which both the ramp time and soak time are set to "0" is skipped.

  [Ex]

SV-1: 50	SV-2:200	SV-3:100
TM1r:0.10	TM2r:0.00	TM3r:1.00
TM1S:0.05	TM2S:0.00	TM3S:0.75



- The SV limit function is valid even while the ramp-soak operation is running.
  Although the set value (SV-n) remains unchanged, the SV under ramp-soak operation is affected by the limit function. Therefore, the pattern is as shown in the figure on right, and it may not change according to the original set time.



[Setting example] Setting the 1st target SV to 400°C

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for three seconds. P will be displayed on the PV display.
P 50	
SV-1 0	2. Press the ∨ key to display SV-1.
SV-1 0	3. Press the SEL key once. The current setting (0) flashes on the SV display.
SV-1 400	4. Press the ∧ key to display 400.
SV-1 400	5. Press the SEL key once. 400 will stop flashing and will be registered for SV-1.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

P-n1 Specifying control action, and output direction at input burn-out (Setting range: 0 to 19)

[Description]

- This parameter specifies action (Single/Dual and Heating/Cooling), and output direction at input burn-out.
- The standard model (single output) or the heating/cooling control output (dual output) are available.
- There is defference of hardware between the standard model and the heating/cooling control output model. Set the code that is applicable to your controller.
- In general, reverse action is applyed for the heating process and direct action is applyed for the cooling process.

* "burn-out output" means the output direction at input burn-out.

* The lower limit of a burn-out output indicates that output is set to OFF, or 4mA or less. The upper limit indicates that output is set to ON, or 20mA or more.

• Control operation code table

Code (P-n1)	Model	Control action		Burn-out output*	
		Output 1	Output 2	Output 1	Output 2
0	Standard (single)	Reverse	...	Lower limit	...
1				Upper limit	
2		Direct		Lower limit	
3				Upper limit	
4	Heating /Cooling (dual)	Reverse	Direct	Lower limit	Lower limit
5				Upper limit	
6				Lower limit	Upper limit
7				Upper limit	
8		Direct		Lower limit	Lower limit
9				Upper limit	
10				Lower limit	Upper limit
11				Upper limit	
12		Reverse	Reverse	Lower limit	Lower limit
13				Upper limit	
14				Lower limit	Upper limit
15				Upper limit	
16		Direct		Lower limit	Lower limit
17				Upper limit	
18				Lower limit	Upper limit
19				Upper limit	

[Setting example] Changing the "Reverse/Lower limit for burn-out output" to the "Direct/Upper limit for burn-out output"

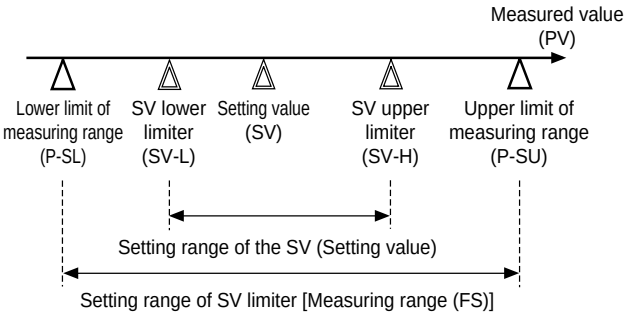
Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the SEL key once. The current setting (0) flashes on the SV display.
	3. Press the ∧ or ∨ keys to display 3 .
	4. Press the SEL key once. 3 will stop flashing and will be registered for P-n1 . After that, the controller will operate with the "Direct/Upper limit for burn-out output" selected.
	5. If you want to display the operation status, press and hold the SEL key for two seconds.

SV (Setting value) lower limiter (Setting range: 0 to 100%FS)

SV (Setting value) upper limiter (Setting range: 0 to 100%FS)

[Description]

- These parameters set the setting range of the SV (Setting value).
- Both the SV under ramp-soak operation and the SV switched by the DI1 function are affected by the SV limiter.
- The SV upper and lower limiters (,) can be set within the range of the measuring values (,).



[Note]

- Before setting the parameters of and , be sure to set the following parameters.
  - Setting the lower limit of the measured range ( )
  - Setting the upper limit of the measured range ( )
  - Setting the of decimal places point position ( )
- After changing the parameters of , , and , power off the PXR, and then on. Then, set the parameters of and again.
- Before setting the SV, set the parameters of and .
- Be sure to set the values of and so that is larger than or is the same as .
- Although the displayed SV is affected by the limiter immediately after setting and , the set values of to are not affected.
- When the SV limiter is set during ramp-soak operation or switching the SV with the DI1 function, the SV (SV0) that is set manually and the displayed SV are affected by the SV limiter. So, after setting the ramp-soak operation to OFF, or returning the switched SV to the original SV, the PXR operates with the SV0 affected by the SV limiter.

[Setting example] Setting the upper limiter to 100°C

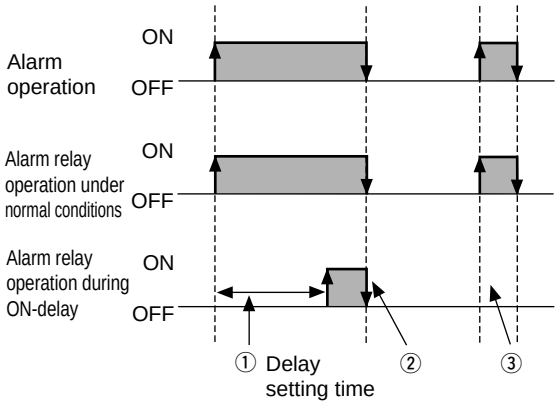
Display	Operating procedure
150 150	1. Press and hold the SEL key for five seconds. will be displayed on the PV display.
P-n1 0	
400	2. Press the key to display .
400	3. Press the SEL key once. The current setting (400) flashes on the SV display.
100	4. Press the or keys to display 100.
100	5. Press the SEL key once. 100 will stop flashing and will be registered for . After that, the upper limit of the SV will be 100°C.
150 100	6. If you want to display the operation status, press and hold the SEL key for two seconds.

dLY1 , dLY2 The time of ON-delay alarm or timer function (Setting range: 0 to 9999 seconds)

[Description]

ON-delay alarm

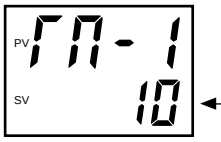
- With this function, the alarm relay is closed after the predetermined delay time. (See operation ① shown in the figure below.)
- In case the cause of the alarm is solved within the delay time, the alarm relay is not closed. (See operation ③ shown in the figure below.)
- The alarm relay is opened regardless of this parameter. (See operation ② shown in the figure below.)



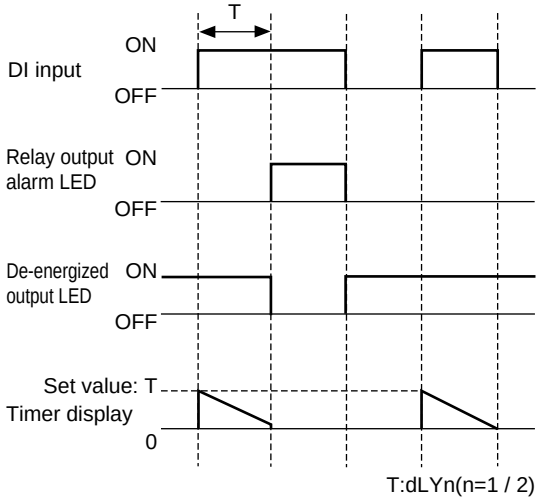
- In case the alarm is set to OFF during standby, the ON-delay operation performs again when returning to RUN.
- When the delay time is changed during ON-delay operation, the alarm is activated in the changed delay time.

Timer function

- When the ON-delay timer is selected (ALMn = 32), the relay is closed in the set time after DI input is set to ON. While the DI input stays OFF, the timer cannot be activated.
- When the OFF-delay timer is selected (ALMn = 33), the timer cannot be activated while the DI input is set to ON. The relay is closed in the set time after DI input is set to OFF.
- When the ON/OFF-delay timer is selected (ALMn = 34), the timer is activated while the DI input stays either ON or OFF.
- The timer display function shows the remaining time of timers 1 and 2.
- The set time is counted down while the ON or OFF timer is activated.
- While the ON timer is activated, the alarm relay is closed when the remaining time is 0. While the OFF timer is activated, the alarm relay is opened when the remaining time is 0.

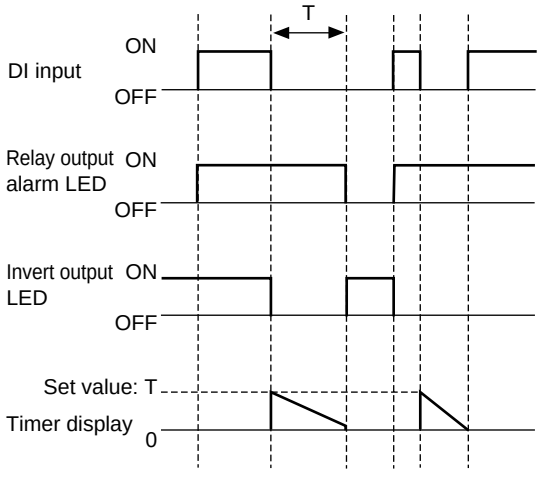


• ON-delay timer operation



T:dLYn(n=1 / 2)

• OFF-delay timer operation



T:dLYn(n=1 / 2)

[Setting example] Setting the delay time for ON-delay alarm to 30 seconds

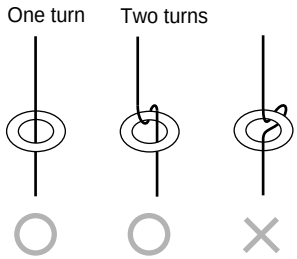
Display	Operating procedure
	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
	
	2. Press the ∨ key to display dLY1.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 30.
	5. Press the SEL key once. 30 will stop flashing and will be registered for dLY1. After that, the controller will operate with the ON-delay alarm being 30 seconds.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

CT Displaying current detector input (Display only) (Option)

Hb Hb (Set value of heater break alarm) (Setting range: 0.0 to 50.0 A) (Option)

[Description]

- When Hb is set to 0.0, the HB alarm is turned OFF.
- The point at which the alarm is activated can be set in the parameter of Hb.
- There are two types of the current transformers (CT) available: CTL-6-SF type for 1 A to 30 A and CTL-12-S36-8F type for 20 A to 50 A. Select the suitable type to the current value of the heater you use.
- How to set the point at which the alarm is actevated:
  - Set the output of the PXR to ON continuously to provide the current to the heater.
  - You can monitor the current value of the heater in the parameter of CT. Set the value that is 70 to 80 % of the monitored current value as the final set value.
  - When the number of heaters is "n" (more than two), set the middle value between the current of "n" heaters and the current of ("n"-1) heaters.
- When the thyristor (SCR) phase control system is used to control the heater, the parameters of CT and Hb cannot be used.
- In case detection of an error becomes difficult due to insufficient heater capacity, pass the wire through the CT twice to double the apparent current. This will improve the sensitivity of the CT. (In this case, set the value that is twice as much as the original value.)
- When winding the wire around the CT several times, be sure to wind in the same direction.

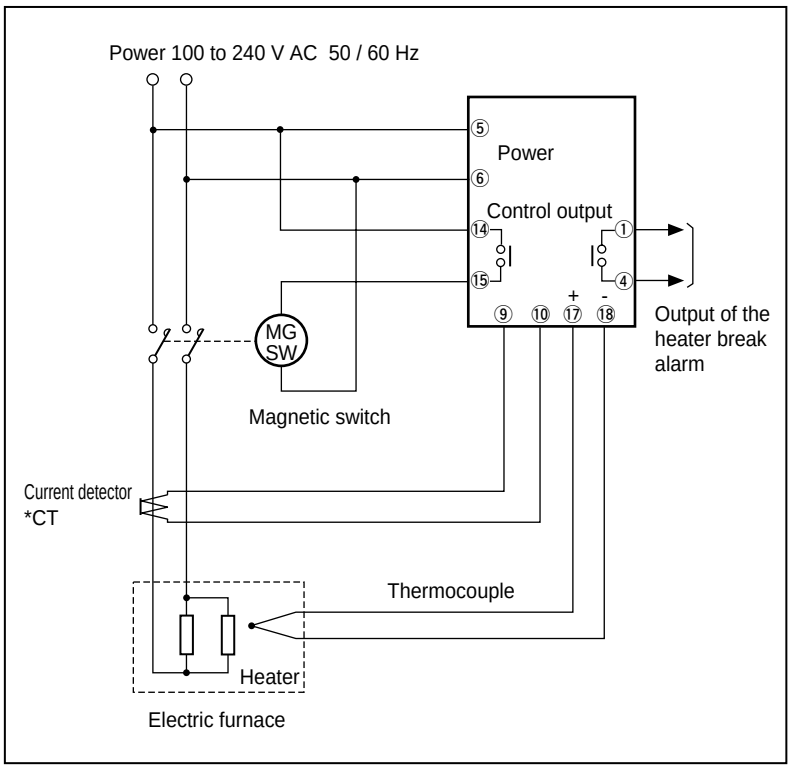


[Note]

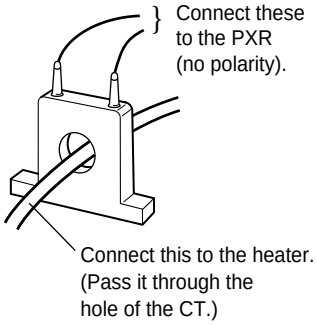
For the alarm for heater break, set the proportional cycle (rC) to 20 seconds or more.

Related parameter: rC (page 31)

• Connection example for the alarm for heater break (PXR model)



• How to connect the current transformer (CT) for heater break:



[Setting example] Changing the detecting current of heater break from 8.0 A to 9.0A

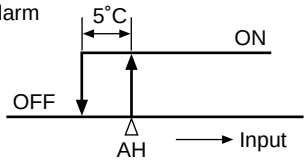
Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the ∨ key to display Hb.
	3. Press the SEL key once. The current setting (80) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 90.
	5. Press the SEL key once. 90 will stop flashing and will be registered for Hb. After that, the controller will operate with detecting current of heater break being 9.0A
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

A1hy , A2hy Hysteresis of alarm 1 and 2 (Setting range: 0 to 50% FS) (Option)

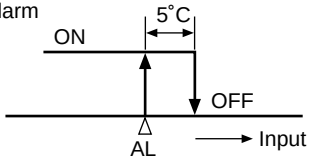
[Description]

- The alarm is detected in the two-position operation (ON/OFF). The hysteresis means the difference between the input at ON and the input at OFF. For example, the hysteresis of 5°C means that the range between ON and OFF is 5°C.
- As to the decimal point position, the setting at P-dP is respected.

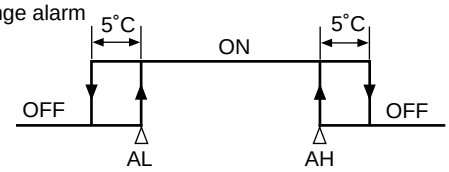
• Upper limit alarm



• Lower limit alarm

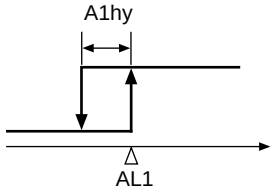


• Range alarm

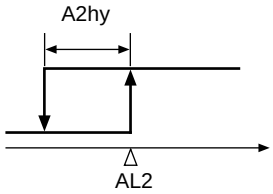


- Hysteresis can be set for each alarm.

• ALM1



• ALM2



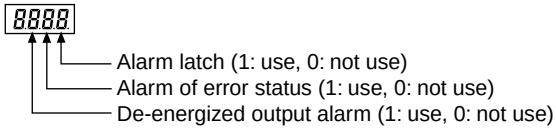
[Setting example] Changing the hysteresis of alarm 2 from 1°C to 3°C

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
P-n1 0	
A2hy 1	2. Press the ∨ key to display A2hy.
A2hy -1-	3. Press the SEL key once. The current setting (1) flashes on the SV.
A2hy -3-	4. Press the ∧ or ∨ keys to display 3.
A2hy 3	5. Press the SEL key once. 3 will stop flashing and will be registered for A2hy . After that, the controller will operate with the hysteresis of alarm 2 being 3°C.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

A1oP , A2oP Options of alarm 1 and 2 (Setting range: 000 to 111) (Option)

[Description]

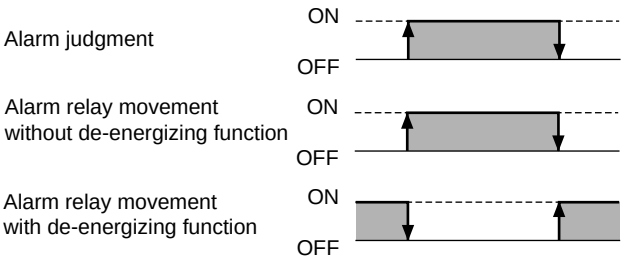
- These parameters are used for switch ON/OFF of the alarm latch, the error satus alarm, and the de-energized output alarm functions for each of Alarm 1 and 2.
- Each function is set to ON by setting the following digit to "1":



- The alarm latch is the function to keep the alarm ON, once the alarm judgment shows the alarm ON status. To cancel the alarm latch, follow the instructions below.
  - Power off the PXR, and then on.
  - Set the alarm latch to OFF.
  - Cancel the alarm latch at the alarm latch canseling parameter.
  - Cancel the alarm latch by DI input.
  - Cancel the alarm latch via communication.
- The alarm of error status is activated, when the problems in the table below occur. When using this error status alarm function, set the alarm types (ALM1 or 2) to "0".

Display	Causes
UUUU	• A break in the thermocouple sensor • A break in the resistance bulb sensor (RTD) (A) • The PV reading value exceeds the P-SU by 5%FS or more.
LLLL	• A break in the resistance bulb sensor (B) or (C) • The resistance bulb sensor (A-B) or (A-C) is short-circuited. • The PV reading value is below the P-SL by 5%FS or more. • A break or a short-circuit in the voltage input line.
FALF	• Breakdown in the PXR

- The de-energized output alarm function is used for energizing or de-energizing the alarm relay to be closed. While this function is set to ON, when the alarm judgment shows the ON status, the relay is opened, and when the alarm judgment shows the OFF status, the relay is closed.



[Note]

- The ON-delay, the alarm latch, and the de-energized output functions can be activated for the error status alarm.
- The alarm lamps (AL1, AL2) goes on and off according to the alarm judgment regardless of the de-energized output settings.

[Setting example] Setting the error status alarm function for Alarm 2 to ON

Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the ∨ key to display A2oP.
	3. Press the SEL key once. The current setting (000) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 010.
	5. Press the SEL key once. 010 will stop flashing and will be registered for A2oP. After that, the controller will operate with the error status alarm function for Alarm 2 being ON.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

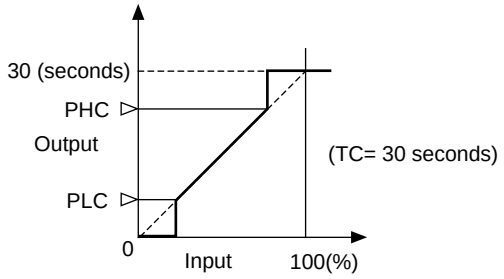
PLC1 , PHC1 Upper and lower limits for control output 1 (Setting range: -3.0 to 103.0%)

PLC2 , PHC2 Upper and lower limits for control output 2 (Setting range: -3.0 to 103.0%) (Option)

[Description]

- These parameters set the limit value of output.

	Upper limit	Lower limit
OUT1	PHC1	PLC1
OUT2	PHC2	PLC2



- How the output is limited (maintained within the limit or breaks the limit) is set in the parameter of PCUR .
- When flammability is controlled by turning the gas on and off, this function can avoid flashing.

(Minimum ON pulse width [seconds]) = $PLC1 \times \frac{100}{TC}$

(Minimum OFF pulse width [seconds]) = $(100 - PHC1) \times \frac{100}{TC}$

CC : Cycle time

Related parameters: CC (page 33)
PCUR (page 57)

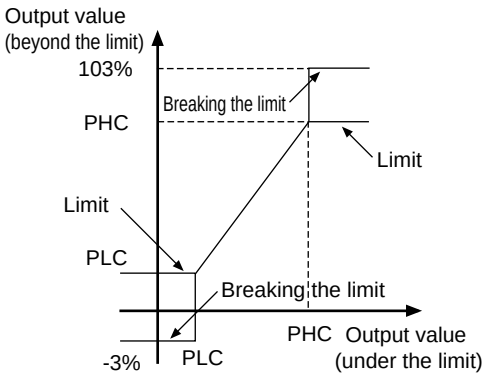
[Setting example] Changing the lower pulse width limit from 20.0% to 10.0%

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for five seconds.
P-n1 0	P-n1 will be displayed on the PV display.
PLC1 200	2. Press the ∨ key to display PLC1.
PLC1 200	3. Press the SEL key once. The current setting (200) flashes on the SV display.
PLC1 100	4. Press the ∧ or ∨ keys to display 100 .
PLC1 100	5. Press the SEL key once. 100 will stop flashing and will be registered for PLC1. After that, the controller will operate with the output lower limit being 10%.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

PCUT Output limit types (Setting range: 0 to 15)

[Description]

- This parameter sets whether or not to maintain the value within the limit when the output value increases up to the limit set value.



PCUT	Output 1		Output 2	
	Upper limit	Lower limit	Upper limit	Lower limit
0	103%	-3%	103%	-3%
1	103%	Limit	103%	-3%
2	Limit	-3%	103%	-3%
3	Limit	Limit	103%	-3%
4	103%	-3%	103%	Limit
5	103%	Limit	103%	Limit
6	Limit	-3%	103%	Limit
7	Limit	Limit	103%	Limit
8	103%	-3%	Limit	-3%
9	103%	Limit	Limit	-3%
10	Limit	-3%	Limit	-3%
11	Limit	Limit	Limit	-3%
12	103%	-3%	Limit	Limit
13	103%	Limit	Limit	Limit
14	Limit	-3%	Limit	Limit
15	Limit	Limit	Limit	Limit

[Setting example] Selecting the operation that outputs 1 and 2 are maintained within the upper and lower limits

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
P-n1 0	
PCUT 0	2. Press the ∨ key to display PCUT .
PCUT 0	3. Press the SEL key once. The current setting (0) flashes on the SV display.
PCUT 15	4. Press the ∧ or ∨ keys to display 15 .
PCUT 15	5. Press the SEL key once. 15 will stop flashing and will be registered for PCUT . After that, the controller will operate with outputs 1 and 2 maintained within the upper and lower limits.
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

oUT 1 , oUT2 Output value display (Display only: -3.0 to 103.0%)

[Description]

- These parameters display the output values of outputs 1 and 2 in the unit of %. (Since the values are calculated with the software, they may have some error comparing to the actual output.)

[Setting example] Confirming the output value (the calculated value) of control output 1

Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the ∨ key to display oUT 1.
	The output value will appear in the SV display.
	3. If you want to display the operation status, press and hold the SEL key for two seconds.

rCJ RCJ (Cold junction compensation) (Setting range: ON/OFF)

[Description]

- This parameter sets whether or not to perform the RCJ (Cold junction compensation) for the thermocouple input. Use the factory default setting (ON: performs the RCJ) under normal conditions.
  ON: Performs the RCJ (Cold junction compensation).
  OFF: Does not perform the RCJ (Cold junction compensation).
- Set this parameter to OFF under the conditions that the RCJ is not needed, such as when the RCJ is performed outside of the PXR or when the temperature deviations are recorded.

[Setting example] Changing the RCJ (Cold junction compensation) from ON to OFF

Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the ∨ key to display rCJ.
	3. Press the SEL key once. The current setting (on) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display oFF.
	5. Press the SEL key once. oFF will stop flashing and will be registered for rCJ. After that, the controller will operate with the RCJ (Cold junction compensation) being oFF.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

AdJ0 Adjusting the PV (Measured value) display (0%) (Setting range: -50 to 50% FS)

AdJ5 Adjusting the PV (Measured value) display (100%) (Setting range: -50 to 50% FS)

[Description]

- The user-definable functions are independent of the adjustment values of the PXR. Setting the parameters of **AdJ0** and **AdJ5** to **0** can return to the factory default settings.

1. Prepare the following devices before adjustment by using these parameters.
   - DC voltage standard generator
     1 to 5V (for voltage input)
     0 to 100 mV (for thermocouple input)
   - Decade resistance box
     100.0 to 400.0 Ω (for resistance bulb input)
2. Set the parameter of **rCJ** to OFF.
3. Apply a voltage that is equivalent of 0%.
   If there is an error large enough to impair its accuracy, set the parameter of **AdJ0**. (See the right example to set **AdJ0**.)
4. Apply a voltage that is equivalent of 100%.
   If there is an error large enough to impair its accuracy, set the parameter of **AdJ5**. (See the right example to set **AdJ5**.)
5. Return the parameter of **rCJ** to ON.

[Operating example for input range of 0°C to 400°C]

{ Reading at input of 0°C: -1°C
{ Reading at input of 400°C: 402°C

Set the parameter of **AdJ0** to "1".
Set the parameter of **AdJ5** to "-2"

Therefore;

{ Reading at input of 0°C: 0°C
{ Reading at input of 400°C: 400°C

[Adjustment example for input range of 0 to 400°C]

Before adjustment	Adjustment value	After adjustment
Display at input of 0°C: -1°C	**AdJ0** : 1	Display at input of 0°C: 0°C
Display at input of 400°C: 402°C	**AdJ5** : -2	Display at input of 400°C: 400°C

Setting the parameters of **AdJ0** and **AdJ5** to "0" returns to the factory default settings.

[Setting example] Setting the zero adjustment to "+1°C"

Display	Operating procedure
1499 / 1500	1. Press and hold the SEL key for five seconds. **P-n1** will be displayed on the PV display.
P-n1 / 0	
AdJ0 / 0	2. Press the ∨ key to display **AdJ0**.
AdJ0 / -0	3. Press the SEL key once. The current setting (**0**) flashes on the SV display.
AdJ0 / -1	4. Press the ∧ or ∨ keys to display **1**.
AdJ0 / 1	5. Press the SEL key once. **1** will stop flashing and will be registered for **AdJ0**. After that, the controller will operate with the zero adjustment being +1°C.
1499 / 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

dI-1 DI1 (Digital input 1) operation (Setting range: 0 to 12)

[Description]

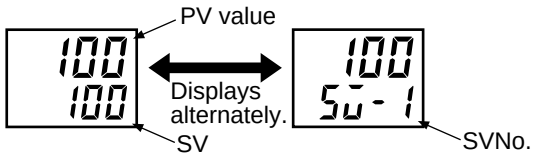
- This parameter (DI1 setting parameter) selects DI functions. Set the DI1 to ON to activate the functions.
  Setting range: 0 to 12
  - 0 = No function
  - 1 = Switches the SV.
  - 2 = Control RUN/Standby
  - 3 = Starts the auto tuning (standard).
  - 4 = Starts the auto tuning (low PV).
  - 5 = Cancels latching for all alarms.
  - 6 = Cancels latching for alarm 1.
  - 7 = Cancels latching for alarm 2.
  - 9 = Activates ALM 1 relay timer.
  - 10 = Activates ALM 2 relay timer.
  - 12 = Ramp-soak operation RUN/RESET

Switching the SV (DI function 1)

- This function switches the SV.

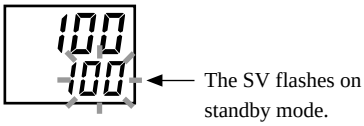
DI1 function	DI1 OFF	DI1 ON
Switching the SV	SV set by front operation (SV 0)	SV 1

- Su-1 of the ramp-soak target SV is used to set the SV 1.
- The SV cannot be changed on the SV display screen while Su-1 is selected.
- While switching the SV, the SV and the SV No. appear alternately. (SV: 2 seconds, SV No.: 1 second) However, the SV No. is not displayed during the ramp-soak operation.



Switching control RUN/Standby (DI function 2)

- RUN and Standby mode is switched by DI1
  DI ON : Standby
  DI OFF: RUN
- The SV flashes on standby mode.

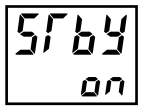


- The control can also be switched between RUN/Standby manually.
  Select ON or OFF in the parameter for SrbY (Setting standby).

SrbY setting screen (the first block)

Display during OFF: RUN mode

Display during ON: Standby mode



- The table below shows the relationship between the RUN and Standby mode switched with a manual operation, DI 1, and ramp-soak operation.

DI 1	Standby status of ramp-soak operation			
	OFF		ON	
	Manual setting			
	OFF	ON	OFF	ON
DI OFF	RUN	Standby	Standby	Standby
DI ON	Standby	Standby	Standby	Standby

Starting the auto-tuning (DI functions 3, 4)

- These functions set the start/stop of the auto-tuning.

DI function	DI ON edge	DI OFF edge
AT (Standard)	AT start	AT cancel
AT (Low PV)		

Cancel the alarm latch (DI functions 5 to 7)

- These functions can cancel the alarm latch while alarms are latched by setting the alarm latch function to ON.

Set value of dI - 1	DI1 ON	DI1 OFF
5	Cancels the latching for alarms 1 and 2	Keeps the alarm latching
6	Cancels the latching for alarm 1	
7	Cancels the latching for alarm 2	

Timer operation (DI functions 9, 10)

- The DI can set the ON/OFF of timer while codes 32 to 34 are set in "Setting alarm types" (page 40). For the operation, see page 40.

Ramp-soak operation RUN/RESET (DI function 12)

- The ramp-soak operation is switched between RUN/RESET by DI1.
  DI ON edge ⇑: RUN
  DI OFF edge ⇓: RESET

[Note]

RUN and RESET are switched by ON and OFF edge of DI.

- The ramp-soak operation can be also switched between RUN/RESET manually.
- The ramp-soak execute types that are set in the parameter of PTn operate.
- The table below shows the operations when the DI changes during ramp-soak operation.

Ramp-soak operation status	DI	
	ON edge	OFF edge
RUN	No change	RESET
RESET	RUN	No change
HOLD	RUN	RESET
END	No change	RESET

- When the settings are set manually, via communication, and DI, the settings that are set later are valid.

[Setting example] Changing the SV (SV0) to SV1

Display	Operating procedure
	1. Press and hold the SEL key for five seconds.
	P-n1 will be displayed on the PV display.
	2. Press the ▽ key to display dL-1.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the △ or ▽ keys to display 1.
	5. Press the SEL key once. 1 will stop flashing and will be registered for dL-1.
	6. Short-circuit the Di1 terminals. The SV will be changed from SV0 to SV1.
	7. If you want to display the operation status, press and hold the SEL key for two seconds. The SV value and SV No. will appear alternately.

SLno Station No. for communication (Setting range: 0 to 255)

[Description]

- Do not set the same number as the set one in other Micro-controllers.
- See Communication function instruction manual for details.

[Setting example] Setting the station No. to "123"

Display	Operating procedure
	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
	
	2. Press the ∨ key to display SLno.
	3. Press the SEL key once. The current setting (1) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 123.
	5. Press the SEL key once. 123 will stop flashing and will be registered for SLno. After that, the controller will operate with the station number being 123.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

CoM Parity for communication (Setting range: 0 to 2)

[Description]

- This parameter sets the parity for communications.
  The baud rate is fixed at 9600bps.
  - 0 : Odd parity
  - 1 : Even parity
  - 2 : No parity

[Setting example] Setting the even parity

Display	Operating procedure
 	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
	2. Press the ∨ key to display CoM.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 1.
	5. Press the SEL key once. 1 will stop flashing and will be registered for CoM. However, it does not switch to the even parity at this point.
	6. Power off the PXR, and then on. The even parity is set now.

PYP Input type for PYP (Color Touch-Operation Unit) (Setting range: 0 to 7, 32 to 47)

[Description]

- When the Color Touch-Operation Unit (Model: PYP) made by Fuji Electric is connected to the PXR, this parameter makes the PYP recognize the measured range.
- When setting the same temperature range that is set in the input range, P-SL, and P-SU of the PXR, the readings between the PXR and PYP are met.

Set value	Input type		Temperature range(°C)
00	Resistance bulb	Pt100	0 to 150°C
01	JIS		0 to 300°C
02	IEC		0 to 500°C
03			0 to 600°C
04			-50 to 100°C
05			-100 to 200°C
06			-150 to 600°C
07			-150 to 850°C
32	Thermocouple	J	0 to 400°C
33		J	0 to 800°C
34		K	0 to 400°C
35		K	0 to 800°C
36		K	0 to 1200°C
37		R	0 to 1600°C
38		B	0 to 1800°C
39		T	-199.9 to 200°C
40		T	-150 to 400°C
41		E	0 to 800°C
42		E	-199.9 to 800°C
43		S	0 to 1600°C
44		N	0 to 1300°C
45		U	-199.9 to 400°C
46		WRe5 · 26	0 to 2300°C
47		PLII	0 to 1300°C

[Setting example] Setting the input range of the PXR to thermocouple B

Display	Operating procedure
1499 1500	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
P-n1 0	
PYP 34	2. Press the ∨ key to display PYP.
PYP 34	3. Press the SEL key once. The current setting (34) flashes on the SV display.
PYP 38	4. Press the ∧ or ∨ keys to display 38.
PYP 38	5. Press the SEL key once. 38 (Thermocouple B) will stop flashing and will be registered for PYP. After that, PYP will recognize the input range of the PXR as thermocouple B (0 to 1800˚C).
1499 1500	6. If you want to display the operation status, press and hold the SEL key for two seconds.

dSP1 to dSP9

dP10 to dP13 Parameter display mask (Setting range: 0 to 255)

[Description]

- This parameter skips the parameter display by items.
- This parameter is used not to display the items that are not used, or not to change the settings mistakenly.
- "Parameter mask DSP" in "2-1 Parameter list" (pages 5 to 7) shows which parameter is skipped by setting dSP1 to dSP9 and dP10 to dP13.
- Set the total value of the item codes that you want to skip.

[Setting example] Skipping "I" and "d"

Setting "4+8=12" according to the code table of dSP3

Display	Operating procedure
	1. Press and hold the SEL key for five seconds. P-n1 will be displayed on the PV display.
	
	2. Press the ∨ key to display dSP3.
	3. Press the SEL key once. The current setting (0) flashes on the SV display.
	4. Press the ∧ or ∨ keys to display 12.
	5. Press the SEL key once. 12 will stop flashing and will be registered for dSP3. After that, the parameters of I and d will be skipped, and will not be displayed.
	6. If you want to display the operation status, press and hold the SEL key for two seconds.

3 Troubleshooting

This section explains the judgments and remedies for problems.

Symptoms	Possible causes	Remedies	Reference pages
1. The display has shown UUUU or LLLL.	① The setting of P-n2 is not correct for the input signals of sensors or others.	Set the parameter of P-n2 correctly.	Page 33
	② The polarity of the sensor does not match that of the PXR.	Correct the polarity of the sensor and the PXR.	Page 51
	③ Input terminals are short-circuited in thermocouple B or R. (P-n2 = 4, 5)	Set the parameter of P-n2 to 3, and check if the temperature around an ordinary temperature is displayed. (Thermocouples B and R have a large error around ordinary temperatures. However, this is not a fault.)	Page 33
	④ The input signals of sensors or others do not match those of the controller you use.	Ask to make adaptations on your model. Or replace your model with a new one.	-
	⑤ The connecting cables for the sensor are loose.	Tighten the connecting cables.	-
	⑥ A break or short-circuit occurred in the sensor.	Replace the sensor with a new one. Or remove the short-circuit.	-
	⑦ The sensor or other input devices that are connected to the PXR have problems.	Replace the sensor or other input devices with new ones.	-
	⑧ The set value of the parameter of P-SL is larger than the value of P-SU.	Set the parameters again so that the value of P-SL is smaller than the value of P-SU.	Page 34
	⑨ The measured value is too large or too small.	Set the parameters again so that the difference of the set values of P-SL and P-SU is made larger.	Page 34
2. Err has been displayed.	① The value of P-SU is set to 3277°C or more for thermocouple and resistance bulb input.	Set the parameters of P-SL and P-SU again according to the input range table.	Page 34
	② The measured range (P-SU to P-SL) is set to 10000 or more for voltage and current input.	Set the parameters of P-SL and P-SU again so that the measured range is 9999 or less.	Page 34
3. A decimal point has not been displayed.	"0" is set in the parameter of P-dP.	Set the parameter of P-dP to "1" or "2".	Page 36
4. The SV or the set values of some parameters have been changed without any operation.	① The parameter of P-SL, P-SU, or P-dP was changed.	Set all the parameters again. (When the set values of the parameters of P-SL, P-SU, and P-dP are changed, the set value of each parameter for which "*" is marked with the page 5 to 8 of the Parameter list, are changed.)	Page 34 Page 5 to 8
	② When the set value of P-SU is larger than 1000, "1" is registered for P-dP.	Set P-dP to "0", and return P-SU to an original value.	Page 34
5. ON/OFF control (Two-position control) has not started.	0.0 is not set in the parameter of P.	Set the parameter of P to 0.0.	Page 18
6. ON/OFF control has not function properly.	① The set value of parameter HYS is not correct.	Adjust the set value of parameter HYS to be suitable for the device to be controlled.	Page 21
	② The setting of parameter onoF is not correct.	Set the parameter onoF correctly.	Page 30
7. The Micro-controller has not controlled properly.	① The set values of the parameters P, I, and d are not correct.	Perform the auto-tuning.	Page 14
	② The cycle times are too long.	Decrease the set value of the parameters rC and rC2 gradually.	Page 31
	③ Output is limited.	Set the parameters of PLC1, PHC1, PLC2, and PHC2 again to be suitable for the process.	Page 56
	④ Output is not limited correctly.	Set the parameters of PCUr again to be suitable for the process.	Page 57

Symptoms	Possible causes	Remedies	Reference pages
8. Response is too slow. (The measured value changes slowly.)	Input filter constant is too large.	Decrease the set value of the parameter of P-dF.	Page 39
9. Output changes between ON and OFF, but the reading does not change.	① Some input terminals are short-circuited.	Remove the short-circuited terminals.	-
	② The connecting cable for the device to be controlled are not connected properly.	Connect it properly.	-
	③ The device to be controlled has powered off.	Power it on.	-
	④ The output signals of the Micro-controller do not match the input signals of the device to be controlled.	Prepare the Micro-controller to be suitable for the device to be controlled. Or select the device to be controlled to be suitable for the Micro-controller.	-
10. The keys do not operate. The set value of the parameters cannot be changed.	"1", "2", "4", or "5" is set in the parameter of LoC.	Set the parameter of LoC to "0" or "3".	Page 17
11. The SV cannot be changed.	① "1", or "4" is set in the parameter of LoC.	Set the parameter of LoC to "0", "2", "3" or "5".	Page 17
	② You have tried to set the value that is outside of the SV limitter (Parameters of SU-L to SU-H).	Widen the range of SU-L to SU-H. (However, it should be within the set range in the input range table.)	Page 48
	③ You have tried to change the SV during ramp-soak operation (rUn, HLd, or End is selected.)	Set the parameter of ProG to oFF.	Page 12
12. The parameters you want to confirm or change are not displayed.	The concerned parameters are set to skip in the parameters of dSP1 to dP13.	Change the set value of the concerned dSP.	Page 67
13. Auto-tuning does not work properly.	① After starting the auto-tuning operation, the display has showed UUUU or LLLL.	Set the parameters again so that the difference of the set values of P-SL and P-SU is made larger, and perform the auto-tuning again.	Page 34
	② You have changed the SV after starting the auto-tuning operation.	Set the desirable SV, and perform the auto-tuning again.	-
	③ The response of the controlled device was too fast.	Use a controller whose control cycle is fast, such as PYH.	-
	④ You have tried to perform the auto-tuning during ramp-soak operation.	Set the parameter of ProG to oFF, and perform the auto-tuning again.	Page 12
	⑤ Peripheral devices have problems. Or they are not connected properly.	Connect them properly.	Page 51
	⑥ Direct/reverse actions are not suitable for the operations of the device to be controlled.	Set the parameter of P-n1 properly.	Page 47
	⑦ The response of the controlled device was too slow, and the auto-tuning did not finish in 9 hours.	Perform the tuning manually. (Set the parameter of P to "0" to try the ON/OFF control in a hurry.)	Page 18
14. An excessive overshoot has occurred during auto-tuning operation.	-	(1) Perform the auto-tuning with the parameter of AT being "2" (Low PV type).	Page 14
	-	(2) Perform the tuning manually.	Page 18
15. The self-tuning does not work properly.	See the section of the parameter of CTrL.		Page 25

FUJI ELECTRIC

Instruction Manual

MICRO CONTROLLER X COMMUNICATION FUNCTIONS (RS-485 MODBUS)

TYPE: PXR

Fuji Electric Co.,Ltd.

INP-TN512642a-E

NOTICE

1. Exemption items from responsibility
   The contents of this document may be changed in the future without prior notice.
   We paid the utmost care for the accuracy of the contents. However, we are not liable for direct and indirect damages resulting from incorrect descriptions, omission of information, and use of information in this document.

CONTENTS

1. COMMUNICATION FUNCTIONS

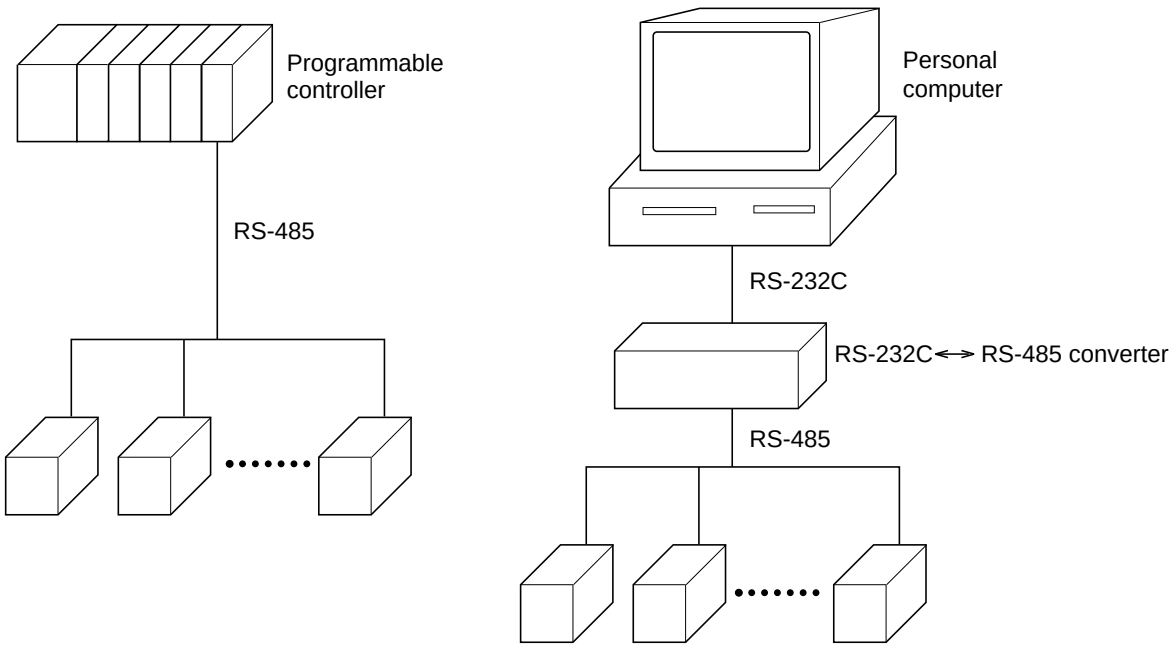
1.1 General

- PXR provides a communication function by RS-485 interface, by which it can transmit and receive data to and from host computer, programmable controller, graphic display panel, etc.

- The communication system consists of master station and slave stations. Up to 31 slave stations (PXR) can be connected per master station.
  Note that, because the master station can communicate with only one slave station at a time, a party to communicate with must be specified by the "Station No." set at each slave station.

- In order that the master station and slave station can communicate, the format of the transmit/receive data must coincide. For the PXR, the format of the communication data is determined by the MODBUS protocol.

- Please use an RS-232C↔RS-485 converter in case of designating a personal computer or other devices which have an RS-232C interface as a master station.
  [RS-232C↔RS-485 converter] (recommended article)
  Type: KS-485 (non-isolated type)/SYSTEM SACOM Corp.
  Type: SI-30A (isolated type)/SEKISUI ELECTRONICS Co., Ltd.



[Note] MODBUS® is the registered trade mark of Gould Modicon.

2. SPECIFICATIONS

2.1 Communication Specifications

Item	Specification	
Electrical specification	Based on EIA RS-485	
Transmission system	2-wire, semi-duplicate	
Synchronizing system	Start-stop synchronous system	
Connection format	1 : N	
Number connectable units	Up to 31 units	
Transmission distance	500m max. (total extension distance)	
Transmission speed	9600bps	
Data format	Data length	8 bits
	Stop bit	1 bit
	Parity	none, even, odd (selectable)
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16	
Isolation	Functional isolation between transmission circuit and others (withstand voltage : 500V AC)	

3. CONNECTION

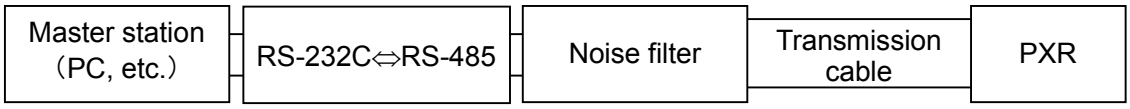
> ⚠ WARNING
>
> For avoiding electric shock and malfunctions, do not turn on the power supply untill all wiring have been completed.

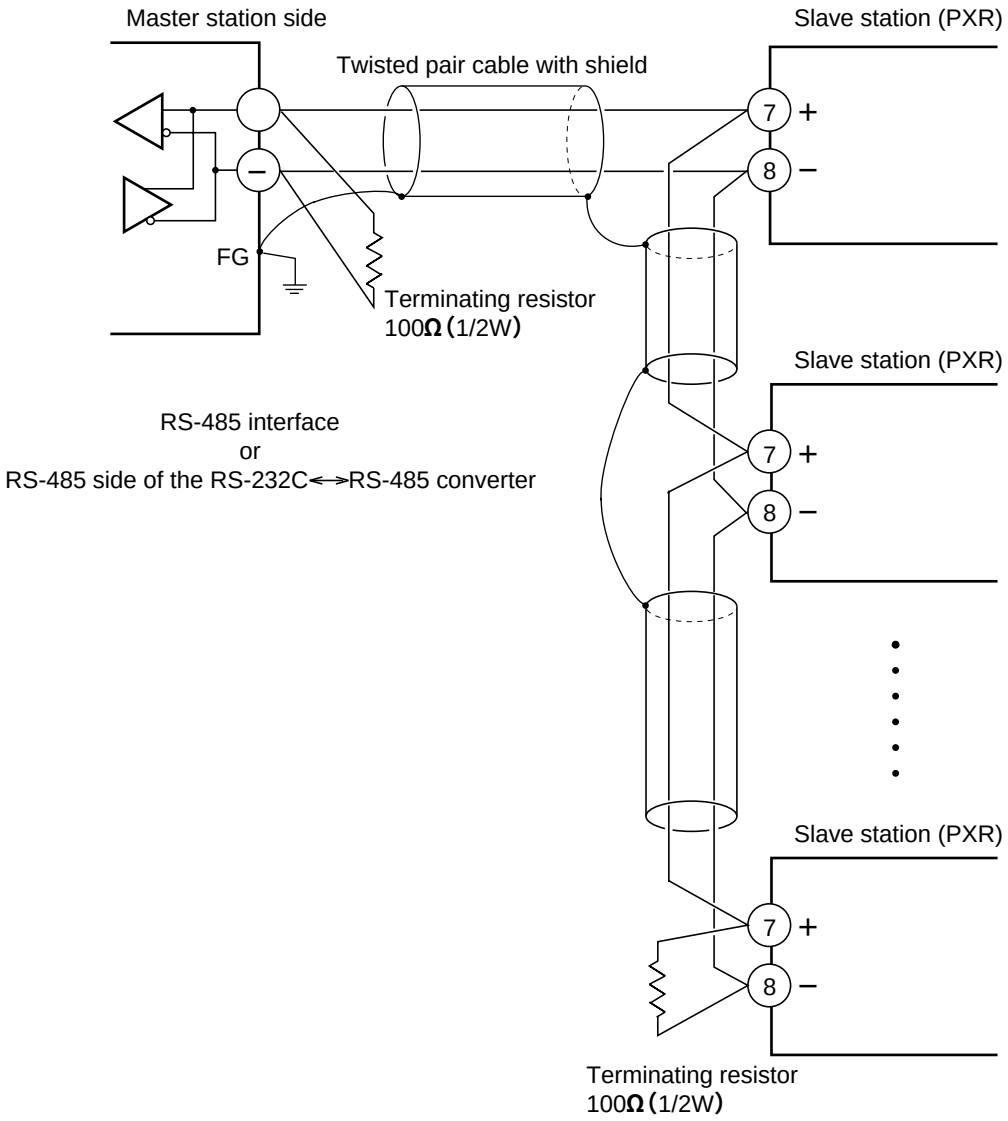
3.1 Terminal Allocation

Terminal number	Signal name
7	+
8	-

3.2 Wiring

- Use twisted pair cables with shield.
  Recommended cable: UL2464, UL2448, etc.
- The total extension length of the cable is up to 500 m. A master station and up to 31 units of the PXR can be connected per line.
- Both ends of the cable should be terminate with terminating resistors 100Ω 1/2W.
- The shield wire of the cable should be grounded at one place on the master station unit side.
- If the PXR is to be installed where the level of noise applied to the PXR may exceed 1000 V, it is recommended to install a noise filter in the master station side as below.
  Recommended noise filter: ZRAC2203-11/TDK





4. SETTING OF COMMUNICATION CONDITION

In order that the master station and instrument (PXR) can correctly communicate, following settings are required.

- All communication condition settings of the master station are the same as those of instruments (PXR).
- All instruments (PXR) connected on a line are set to "Station Nos. (STno)" which are different from each other. (Any "Station No." is not shared by more than one instrument.)

4.1 Set Items

The parameters to be set are shown in the following table. Set them by operating the front panel keys.

Parameter symbol	Item	Value at delivery	Setting range	Remarks
————	Transmission speed	9600bps	Fixed (can not be changed)	Set the same communication condition to the master station and all slave stations.
————	Data length	8 bits	Fixed (can not be changed)	
————	Stop bit	1 bit	Fixed (can not be changed)	
CoM	Parity setting	0	0: odd parity 1: even parity 2: none parity	
STno	Station No.	1	0 to 255 (0:communication function stop)	Set a different value to each station.

4.2 Setting Operation Method

The following example shows how to set the communication conditions.

Example: Selecting an even parity and “STno=18” on a station.

Key operation	Indication	Description
	200 200	Running state (PV/SV indication)
SEL (6 seconds)	P-n1 0	Press the SEL key for approximately 6 seconds. P-n1 appears and No. 3 block parameter is selected.
∨	STno 0	Operate the ∨ key repeatedly until STno parameter appears. (If past over, operate the ∧ key to return.)
SEL	STno 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	STno 18	Operate the ∧ or ∨ key to change the numeric value to 18.
SEL	STno 18	Press the SEL key again. The numeric value stops blinking and the setting is registered.
∨	CoM 0	Press the ∨ key to display the CoM parameter.
SEL	CoM 0	Press the SEL key. The numeric value on the lower indicator blinks and the setting mode is selected.
∧∨	CoM 1	Operate the ∧ or ∨ key until the numeric value changes to 1 (even parity).
SEL	CoM 1	Press the SEL key again. The numeric value stops blinking and the setting is registered.
SEL (3 seconds)	200 200	Press the SEL key for 3 seconds to resume the running indication (PV/SV indication).

5. MODBUS COMMUNICATION PROTOCOL

5.1 General

The communication system by the MODBUS protocol is that the communication is always started from the master station and a slave station responds to the received message.

Transmission procedures is as shown below.

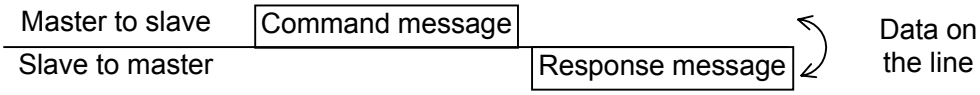
1） The master station sends a command message to a slave station.

2） The slave station checks that the station No. in the received message matches with the own station No. or not.

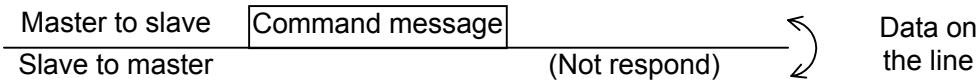
3） If matched, the slave station executes the command and sends back the response message.

4) If mismatched, the slave station leaves the command message and wait for the next command message.

a) In case when the station No. in the received command message matches with the own slave station No.



b) In case when the station No. in the received command message mismatches with the own slave station No.



The master station can individually communicate with any one of slave stations connected on the same line upon setting the station No. in the command message.

5.2 Composition of Message

Command message and response message consist of 4 fields ; Station No., Function code, Data and Error check code. And these are send in this order.

Station No. (1 byte)
Function code (1 byte)
Data (2 to 125 bytes)
Error check code (CRC-16) (2 bytes)

Fig. 5-1 Composition of message

In the following, each field is explained.

(1) Station No.

Station No. is the number specifiing a slave station. The command message is received and operated only by the slave station whose station No. matches with the No. set in the parameter "STno".
For details of setting the parameter "STno", refer to chapter 4.

(2) Function code

This is a code to designate the function executed at a slave station.
For details, refer to section 5.4.

(3) Data

Data are the data required for executing function codes. The composition of data varies with function codes.
For details, refer to chapter 6.
A coil number or a register number is assigned to each data in the temperature controller. For reading/writing the data by communication, designate the coil number or register number.
Note that the coil number or register number transmitted on message is expressed as its relative address.
The relative address is calculated by the following expression.

$$\boxed{\text{Relative address}} = \left(\text{The lower 4 digits of the } \boxed{\text{Coil number or register number}} \right) - 1$$

For example, when the resister number designated by a function code is 40003,

Relative address = (lower 4 digits of 40003) – 1
= 0002

is used on the message.

(4) Error check code

This is the code to detect message errors (change in bit) in the signal transmission.
On the MODUBUS protocol (RTU mode), CRC-16 (Cycric Redundancy Check) is applied.
For CRC calculation method, refer to section 5.5.

5.3 Response of Slave Station

(1) Response for normal command

To a relevant message, the slave station creates and sends back a response message which corresponds to the command message. The composition of message in this case is the same as in section 5.2.
Contents of the data field depend on the function code. For details, refer to Chapter 6.

(2) Response for abnormal command

If contents of a command message have an abnormality (for example, non-actual function code is designated) other than transmission error, the slave station does not execute that command but creates and sends back a response message at error detection.
The composition of response message at error detection is as shown in Fig. 5-2 The value used for function code field is function code of command message plus 80_H.
Table 5-1 gives error codes.

Station No.
Function code + 80_H
Error code
Error check（CRC-16）

Fig. 5-2 Response message at error detection

Table 5-1 Error code

Error code	Contents	Description
01H	Illegal function	Non-actual function code is designated. Check for the function code.
02H	Illegal data address	A relative address of a coil number or resister number to which the designated function code can not be used.
03H	Illegal data value	Because the designation of number is too much, the area where coil numbers or resister numbers do not exist is designated.

(3) No response

Under any of the following items, the slave station takes no action of the command message and sends back no response.

- A station number transmitted in the command message differs from the station number specified to the slave station.
- A error check code is not matched, or a transmission error (parity error, etc.) is detected.
- The time interval between the composition data of the message becomes longer than the time corresponding to 24 bits. (Refer to section 5.6 Transmission Control Procedure)
- While the data is being written in non-volatile memory after write via communication, the next write is attempted.

5.4 Function Code

According to MODBUS protocol, coil numbers and register numbers are assigned by function codes.
Each function code acts on specific coil number and register number.
This correspondence is shown in Table 5-2, and the message length by function is shown in Table 5-3.

Table 5-2 Correspondence between function codes and objective address

Function code			⟷	Coil No. and resister No.		
No.	Function	Object		No.	Contents	
01_H	Read-out (continuously)	Coil		0xxxx	Read-out/write-in	bit data
02_H	Read-out (continuously)	Input relay		1xxxx	Read-out	bit data
03_H	Read-out (continuously)	Holding register		4xxxx	Read-out/write-in	word data
04_H	Read-out (continuously)	Input register		3xxxx	Read-out	word data
05_H	Write-in	Coil		0xxxx	Read-out/write-in	bit data
06_H	Write-in	Holding register		4xxxx	Read-out/write-in	word data
10_H	Write-in (continuously)	Holding register		4xxxx	Read-out/write-in	word data

Table 5-3 Function code and message length

[Unit:byte]

Function code	Contents	Number of designatable data	Command message		Response message	
			Minimum	Maximum	Minimum	Maximum
01_H	Read-out of bit data	1bit*1	8	8	6	6
02_H	Read-out of bit data (read-out only)	8 bits*1	8	8	6	6
03_H	Read-out of word data	60 words*1	8	8	7	125
04_H	Read-out of word data (read-out only)	15 words*1	8	8	7	35
05_H	Write-in of bit data	1 bit	8	8	8	8
06_H	Write-in of word data	1 word	8	8	8	8
10_H	Write-in of continuous word data	60 words *1	11	129	8	8

*1) The "Number of designatable data" given above is the limit due to the number of data which the instrument assigns to coil number and register number (except function codes 05_H, 06_H).

5.5 Calculation of Error Check Code (CRC-16)

CRC-16 is the 2-byte (16-bits) error check code. From the top of the message (station No.) to the end of the data field are calculated.

The slave station calculates the CRC of the received message, and does not respond if the calculated CRC is different from the contents of the received CRC code.

Fig. 5-3 shows the flow of the CRC-16 calculation system.

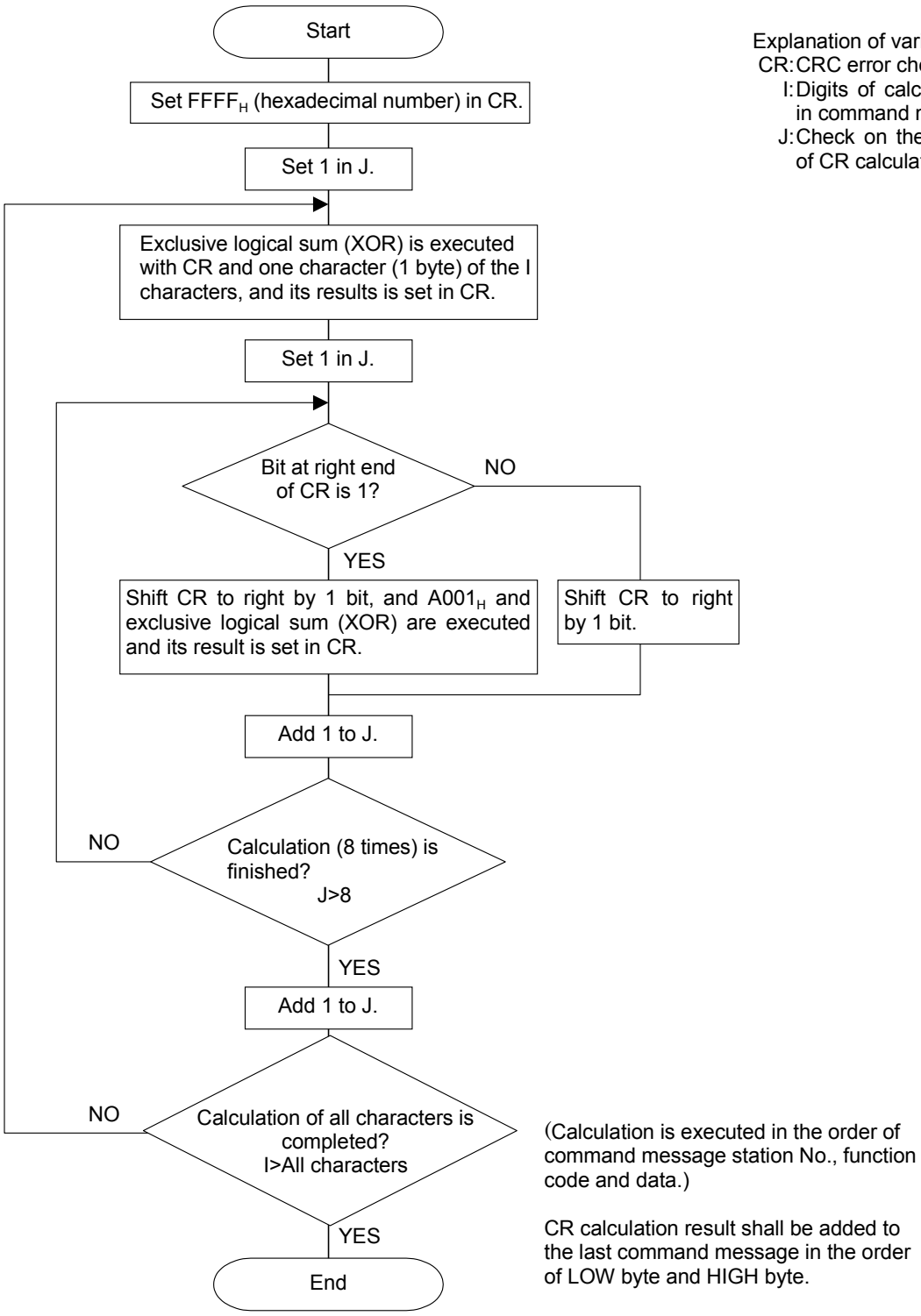


Fig. 5-3 Flow of CRC-16 calculation

5.6 Transmission Control Procedure

(1) Transmission procedure of master station

The master station must proceed to a communication upon conforming to the following items.

(1-1) Before sending a command message, provide 48 bits time or more vacant status.

(1-2) For sending, the interval between bytes of a command message is below 24 bits time.

(1-3) Within 24 bits time after sending a command message, the receiving status is posted.

(1-4) Provide 48 bits time or more vacant status between the end of response message reception and beginning of next command message sending [same as in (1-1)].

(1-5) For ensuring the safety, make a confirmation of the response message and make an arrangement so as to provide 3 or more retries in case of no response, error occurrence, etc.

Note) The above definition is for most unfavorable value. For ensuring the safety, it's recommended the program of the master to work with safety factors of 2 to 3. Concretely, it is advised to arrange the program for 9600 bps with 10 ms or more for vacant status (1-1), and within 1 ms for byte interval (1-2) and changeover from sending to receiving (1-3).

(2) Description

1) Detection of the message frame

Since the communication system uses the 2-wire RS-485 interface, there may be 2 statuses on a line below.

(a) Vacant status (no data on line)

(b) Communication status (data is existing)

Instruments connected on the line are initially at a receiving status and monitoring the line. When 24 bits time or more vacant status has appeared on the line, the end of preceding frame is assumed and, within following 24 bits time, a receiving status is posted. When data appears on the line, instruments receive it while 24 bits time or more vacant status is detected again, and the end of that frame is assumed. I.e., data which appeared on the line from the first 24 bits time or more vacant status to the next 24 bits time or more vacant status is fetched as one frame.

Therefore, one frame (command message) must be sent upon confirming the following.

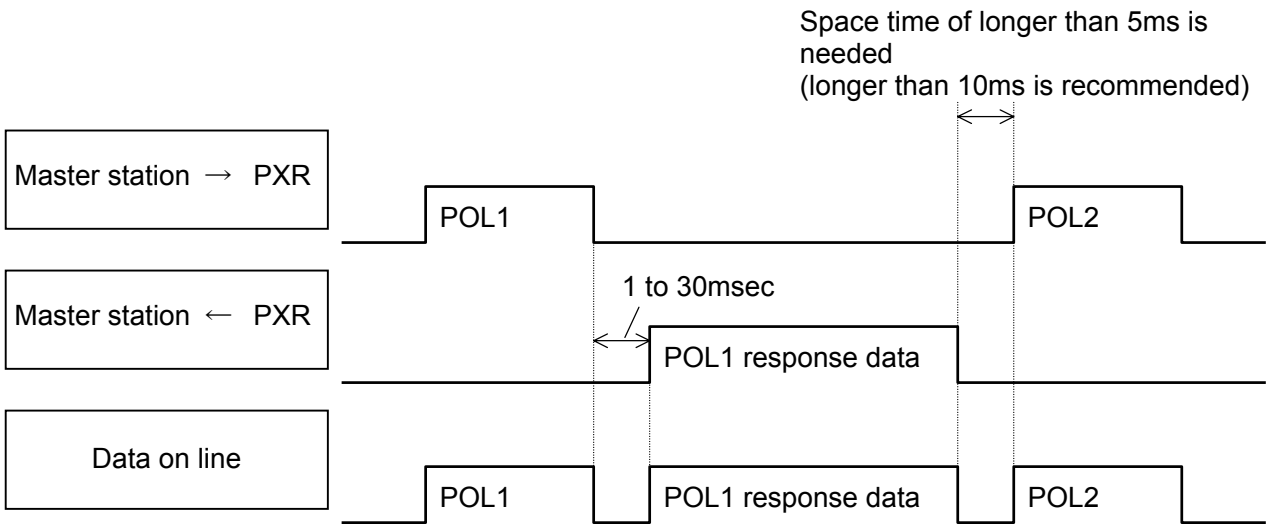
(1-1) 48 bits time or more vacant status precedes the command message sending.

(1-2) Interval between bytes of 1 command message is smaller than 24 bits time.

2) Response of this instrument (PXR)

After a frame detection (24 bits time or more vacant status), this instrument carries out processing with that frame as a command message. If the command message is destined to the own station, a response message is returned. Its processing time is 1 to 30 ms (depends on contents of command message). After sending a command message, therefore, the master station must observe the following.

(1-3) Receiving status is posted within 24 bits time after sending a command message.


Space time of longer than 5ms is needed
(longer than 10ms is recommended)
Master station → PXR
POL1
POL2
1 to 30msec
Master station ← PXR
POL1 response data
Data on line
POL1
POL1 response data
POL2

5.7 FIX Processing (Cautions at write-in of data)

The instrument is provided inside with a non-volatile memory (EEPROM) for holding the setting parameters. Data written in the non-volatile memory is not lost even if turning off the power. When setting parameter is written via communication, the data is stored in the internal memory (RAM) and then written in the non-volatile memory.

FIX execution writes the parameters stored in the internal memory into the non-volatile memory, but this function is not required any more because the data is written in non-volatile memory when it is written in the parameter.

Fig. 5-4 shows the FIX procedure.

Cautions:

- Write in the non-volatile memory takes approximately 5 seconds at the longest approximately 5 seconds.
- While writing, do not turn off the power of the PXR. Otherwise, the data in the non-volatile memory will be destroyed, whereby the PXR could not be used any longer.
- The non-volatile memory (EEPROM) is a device where the number of write-in times is limited. The guaranteed number of write-in times of the non-volatile memory used on the instrument is 10,000 minimum. Therefore, limit the times of change of parameter setting to absolute minimum. Refrain from carrying out the FIX processing periodically for example or while such is not absolutely required.

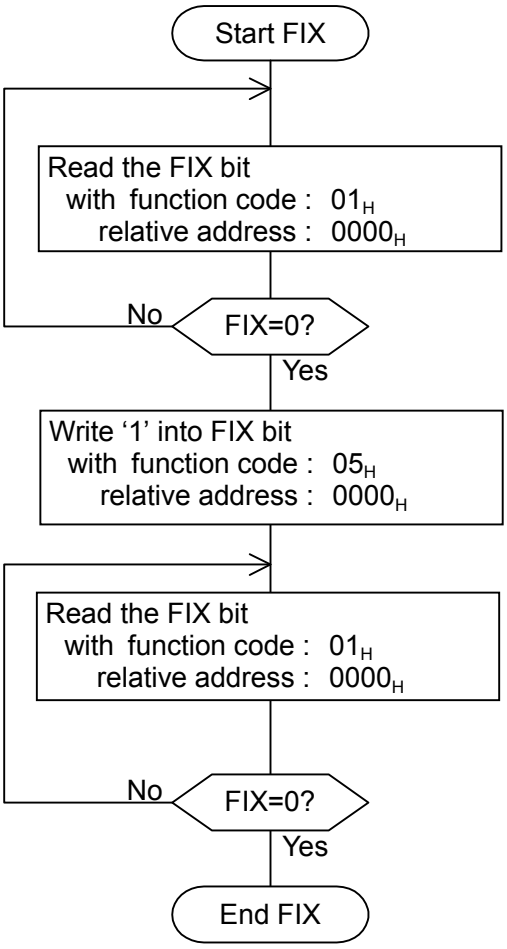


Fig. 5-4 FIX procedure

6. DETAILS OF MESSAGE

6.1 Read-out of Bit Data [Function code:01_H]

Function code	Max. bit number read-out in one message	Relative data address	Coil number
01_H	1 bit	0000_H	00001

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	00_H
	00_H
Read-out bit number	00_H
	01_H
CRC data	Upper
	Lower

Response message composition (byte)

Station No.	
Function code	
01_H	
State of the first 8 bits	
CRC data	Upper
	Lower

* Arrangement of read-out bit data

MSB							LSB
0	0	0	0	0	0	0	

State of read-out bit

(2) Function explanations

The state of the bit of the coil No. 00001 is read-out.

(3) Message transmission (example)

The following shows an example of reading-out the FIX execution request data from No. 1 slave station.
FIX execution request bit Relative address : 0000_H Number of data : 01_H

Command message composition (byte)

Station No..		01_H
Function code		01_H
Read-out start No. (relative address)	Upper	00_H
	Lower	00_H
Read-out bit number	Upper	00_H
	Lower	01_H
CRC data	Upper	FD_H
	Lower	CA_H

Response message composition (byte)

Station No.		01_H
Function code		01_H
Read-out byte number		01_H
State of the first 8 bits		00_H
CRC data	Upper	51_H
	Lower	88_H

* Meaning of read data

State of FIX execution request 00_H=

MSB							LSB
0	0	0	0	0	0	0	0

↑
No execution of FIX

6.2 Read-out of Read-out Only Bit Data [Function code:02_H]

Function code	Max. bit number read-out in one message	Relative data address	Coil number
02_H	8 bits	0000_H－$000F_H$	10001－10016

(1) Message composition

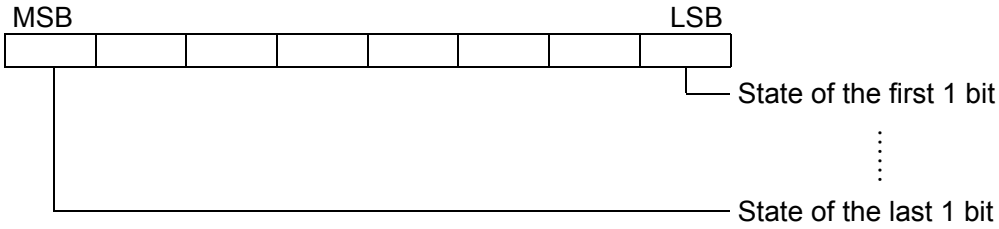
Command message composition (byte)

Station No.		
Function code		
Read-out start No. (relative address)	Upper	
	Lower	
Read-out bit number	00_H	
	Lower	01_H to 08_H
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.	
Function code	
01_H	
State of the read-out bit	
CRC data	Upper
	Lower

* Arrangement of read-out bit data



(2) Function explanations

Bit information data of continuous read-out bit number from the read-out start number.
Read-out bit data are arranged in 8-bit unit and transmitted from the slave station.
When read-out bit data number is not multiple of 8, all the bits (MSB side) not related with the state of the last 8 bits will become "0".

(3) Message transmission (example)

The following shows an example of reading-out the state of the alarm 1 and alarm 2 transmitted from No.31 slave station.

Alarm 1 detect data bit Relative address : $000C_H$ Data number : 02_H

Alarm 2 detect data bit Relative address : $000D_H$

Command message composition (byte)

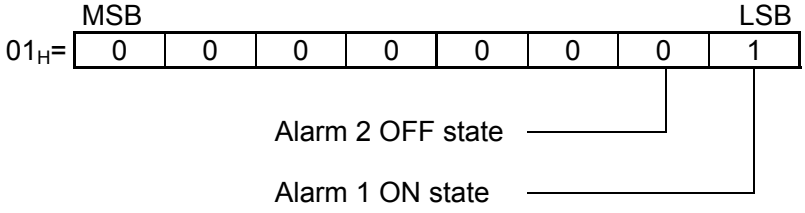
Station No.		$1F_H$
Function code		02_H
Read-out start No. (relative address)	Upper	00_H
	Lower	$0C_H$
Read-out bit number	Upper	00_H
	Lower	02_H
CRC data	Upper	$3A_H$
	Lower	76_H

Response message composition (byte)

Station No.		$1F_H$
Function code		02_H
Read-out byte number		01_H
State of the first 8 bits		01_H
CRC data	Upper	66_H
	Lower	60_H

* Meaning of read-out data

State of alarm detection of alarms 1 and 2 (State of the first 2 bits)



6.3 Read-out of Word Data [Function code:03_H]

Function code	Max. word number read-out in one message	Relative data address	Resister No.	Kind of data
03_H	60 words	0000_H－0070_H	40001－40113	Internal calculation value
		$03E8_H$－0458_H	41001－41113	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.	
Function code	
Read-out start No. (relative address)	Upper
	Lower
Read-out word number	Upper
	Lower
CRC data	Upper
	Lower

} 1 to 60

Response message composition (byte)

Station No.	
Function code	
Read-out byte number	
Contents of the first word data	Upper
	Lower
Contents of the next word data	Upper
	Lower
Contents of the last word data	Upper
	Lower
CRC data	Upper
	Lower

Read-out word number×2

* Arrangement of read-out word data

MSB LSB
Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
～ ～
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read. Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission

(a) In case of data of internal calculation value

The following shows an example of reading the low and high limits of set value from No. 2 slave station.
Relative address of low limit of set value : $001E_H$ Data number : 02_H

Command message composition (byte)

Station No.		02_H
Function code		03_H
Read-out start No. (relative address)	Upper	00_H
	Lower	$1E_H$
Read-out word number	Upper	00_H
	Lower	02_H
CRC data	Upper	$A4_H$
	Lower	$3E_H$

Response message composition (byte)

Station No.		02_H
Function code		03_H
Read-out byte number		04_H
Contents of the first word data	Upper	00_H
	Lower	00_H
Contents of the next word data	Upper	27_H
	Lower	10_H
CRC data	Upper	$D3_H$
	Lower	$0F_H$

* Meaning of read-out data

Low limit of set value 00 00_H = 0 (= 0.00%FS)
(contents of first word data)

High limit of set value 27 10_H = 10000 (=100.00%FS)
(contents of next word data)

When input range is 0 to 400℃

Low limit of set value = 0℃ (= 0.00%FS)

High limit of set value =400℃ (=100.00%FS)

Point For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

(b) In case of data of engineering unit

The following shows an example of reading the low and high limits of set value from No. 2 slave station.
Relative address of low limit set value : 0406_H Data number : 02_H

Command message composition (byte)

Station No.		02_H
Function code		03_H
Read-out start No. (relative address)	Upper	04_H
	Lower	06_H
Read-out word number	Upper	00_H
	Lower	02_H
CRC data	Upper	25_H
	Lower	09_H

Response message composition (byte)

Station No.		02_H
Function code		03_H
Read-out byte number		04_H
Contents of the first word data	Upper	0_H
	Lower	0_H
Contents of the next word data	Upper	01_H
	Lower	90_H
CRC data	Upper	$C8_H$
	Lower	CF_H

* Meaning of read-out data

Low limit of set value 00 00_H = 0
(contents of first word data)

High limit of set value 01 90_H = 400
(contents of next word data)

When the position of decimal point is 0 (Parameter P-dP=0),

Low limit of set value = 0℃

High limit of set value =400℃

〉Point〈 For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

6.4 Read-out of Read-out Only Word Data [Function code:04_H]

Function code	Max. word number read-out in one message	Relative data address	Resister No.	Kind of data
04_H	15 words	0000_H－$000E_H$	30001－30015	Internal calculation value
		$03E8_H$－$03F6_H$	31001－31015	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Read-out start No. (relative address)	Upper	
	Lower	
Read-out word number	Upper	} 1 to 15
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Read-out byte number		Read-out word number×2
Contents of the first word data	Upper	
	Lower	
Contents of the next word data	Upper	
	Lower	
～	～	
Contents of the last word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

* Arrangement of read-out word data

MSB LSB
Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
～
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanations

Word data of continuous word numbers from the read-out start No. can be read. Read-out word data are transmitted from the slave station in the order of upper and lower bytes.

(3) Message transmission

(a) In case of data of internal calculation value

The following shows an example of reading-out the PV from No. 1 slave station.

Relative address of PV : 0000_H Data number : 01_H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read-out start No. (relative address)	Upper	00_H
	Lower	00_H
Read-out word number	Upper	00_H
	Lower	01_H
CRC data	Upper	31_H
	Lower	CA_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read-out byte number		02_H
Contents of the first word data	Upper	03_H
	Lower	46_H
CRC data	Upper	38_H
	Lower	32_H

* Meaning of read-out data

Contents of the first word data 03 46_H = 838 (=8.38%FS)

When input range is 0-400℃,

PV=33.5℃ (=8.38%FS×400)

Input range

(b) In case of data of engineering unit

The following shows an example of reading-out the PV value from No. 1 slave station.

Relative address of PV value : $03E8_H$ Data number : 01_H

Command message composition (byte)

Station No.		01_H
Function code		04_H
Read-out start No. (relative address)	Upper	03_H
	Lower	$E8_H$
Read-out word number	Upper	00_H
	Lower	01_H
CRC data	Upper	$B1_H$
	Lower	BA_H

Response message composition (byte)

Station No.		01_H
Function code		04_H
Read-out byte number		02_H
Contents of the first word data	Upper	01_H
	Lower	$4F_H$
CRC data	Upper	38_H
	Lower	32_H

* Meaning of read-out data

Contents of the first word data 01 $4F_H$ = 335

When the position of decimal point is 1 (Parameter P-dP=1),

PV=33.5℃ (=33.5)

Point For handling of the internal calculation value, engineering unit and decimal point, refer to section 7.1.

6.5 Write-in of Bit Data (1 bit) [Function code:05_H]

Function code	Max. bit number written-in one message	Relative data address	Coil No.
05_H	1 bit	0000_H	00001

This function has become unnecessary. (The customer can continue using the controller without changing the program.)

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	00_H	
	00_H	
State of write-in designation	Upper	0000_H=0 / $FF00_H$=1
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	00_H	
	00_H	
State of write-in designation	Upper	0000_H=0 / $FF00_H$=1
	Lower	
CRC data	Upper	
	Lower	

(2) Function explanations

Data of "0" or "1" is written in a bit of write-in designation No. bit. When "0" is written-in data of 0000_H is transmitted, and when "1" is written-in, data of $FF00_H$ is transmitted.

(3) Message transmission (example:This is the method of FIX execution)

The following shows an example of FIX execution request to No. 1 slave station.
FIX execution request bit Relative address：0000_H

Command message composition (byte)

Station No.		01_H
Function code		05_H
Write-in designate No. (relative address)	Upper	00_H
	Lower	00_H
State of write-in designation	Upper	FF_H
	Lower	00_H
CRC data	Upper	$8C_H$
	Lower	$3A_H$

Response message composition (byte)

Station No.		01_H
Function code		05_H
Write-in designate No. (relative address)	Upper	00_H
	Lower	00_H
State of write-in designation	Upper	FF_H
	Lower	00_H
CRC data	Upper	$8C_H$
	Lower	$3A_H$

After receiving above command, it takes approximately 100ms to 5s seconds that PXR saves memory data from RAM to EEPROM.

Caution

If you turn off the PXR during above saving (approximately 100ms to 5s), memory data are broken and can not be used.

Point For details of FIX processing, refer to section 5.7.

6.6 Write-in of Word Data (1 word) [Function code:06_H]

Function code	Max. word number write-in in one message	Relative data address	Resister No.	Kind of data
06_H	1 words	0000_H－0070_H	40001－40113	Internal calculation value
		$03E8_H$－0458_H	41001－41113	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	Upper	
	Lower	
Write-in word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.		
Function code		
Write-in designate No. (relative address)	Upper	
	Lower	
Write-in word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

(2) Function explanation

Designated word data is written in write-in designate No. Write-in data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of setting 100.0 (10000=$C3E8_H$) to the parameter "P" of No.1 slave station.

Parameter "P" Relative address: 0005_H (table of internal calculation unit)

(or $03ED_H$ (table of engineering value))

* Parameter "P" is not in the engineering unit setting, the same value is written in both tables.

Command message composition (byte)

Station No.		01_H	
Function code		06_H	
Write-in designate No. (relative address)	Upper	00_H	In case of interval calculation value
	Lower	05_H	
State of write-in designation	Upper	03_H	
	Lower	$E8_H$	
CRC data	Upper	99_H	
	Lower	75_H	

Response message composition (byte)

Station No.		01_H
Function code		06_H
Write-in designate No. (relative address)	Upper	00_H
	Lower	05_H
State of write-in designation	Upper	03_H
	Lower	$E8_H$
CRC data	Upper	99_H
	Lower	75_H

Point For handling of internal calculation value, engineering unit and decimal point, refer to section 7.1.

Note!
1)While setting is being locked, response is returned normally, but the command is not executed.
2)While the data is written in non-volatile memory, response is not returned.

6.7 Write-in of Continuous Word Data [Function code:10_H]

Function code	Max. word number write-in in one message	Relative data address	Resister No.	Kind of data
10_H	60 words	0000_H－0070_H	40001－40113	Internal calculation value
		$03E8_H$－0458_H	41001－41113	Engineering unit

(1) Message composition

Command message composition (byte)

Station No.		
Function code		
Write-in start No. (relative address)	Upper	
	Lower	
Write-in word number	Upper	} 1 to 60
	Lower	
Write-in byte number		} Write-in word number×2
First write-in word data	Upper	
	Lower	
Next write-in word data	Upper	
	Lower	
～		～
Last write-in word data	Upper	
	Lower	
CRC data	Upper	
	Lower	

Response message composition (byte)

Station No.	
Function code	
Write-in start No. (relative address)	Upper
	Lower
Write-in word number	Upper
	Lower
CRC data	Upper
	Lower

* Arrangement of write-in word data

MSB LSB
Upper byte of contents of the first word data
Lower byte of contents of the first word data
Upper byte of contents of the next word data
Lower byte of contents of the next word data
～
Upper byte of contents of the last word data
Lower byte of contents of the last word data

(2) Function explanation

Word data of continuous word number is written from write-in start address. Write-in word data are transmitted from master station in the order of upper and lower bytes.

(3) Message transmission (example)

The following shows an example of writing-in P=100.0, I=10, and D=5.0 to No. 1 slave station.

$P=03E8_H$ ($=1000_D$)

$I=0064_H$ ($=100_D$)

$D=0032_H$ ($=50_D$)

Parameter "P" Relative address:0005_H Data number:03_H

Command message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	05_H
Write-in word number	Upper	00_H
	Lower	03_H
Write-in byte number		06_H
First write-in word data	Upper	03_H
	Lower	$E8_H$
Next write-in word data	Upper	00_H
	Lower	64_H
Last write-in word data	Upper	00_H
	Lower	32_H
CRC data	Upper	56_H
	Lower	BE_H

Response message composition (byte)

Station No.		01_H
Function code		10_H
Write-in start No.	Upper	00_H
	Lower	05_H
Write-in word number	Upper	00_H
	Lower	03_H
CRC data	Upper	90_H
	Lower	09_H

Point Since the transmission data can not include a decimal point, data of 100.0 is transmitted as "1000".

For transmission format of each data, refer to the address map (Chapter 7).

7. ADDRESS MAP AND DATA FORMAT

7.1 Data Format

7.1.1 Transmission data format

The MODBUS protocol used in this instrument (PXR) is RTU (Remote Terminal Unit) mode.
Transmitted data is "numeric value" and not "ASCII code".

7.1.2 Internal calculation value and engineering unit

This instrument can handle 2 kinds of set value data or other data which are affected by input range as follows.

1) Internal calculation value : In % with respect to input range (0.00 to 100.00, without decimal point)
2) Engineering unit : Subjected to scaling to actual value according to input range

"Engineering unit" data can be handled with "Internal calculation value" address (register No.) plus 1,000

[Example] The value of "PV = 150" (input range: 0 to 400°C)

	Register No.	Data (HEX)		Data (decimal)
Internal calculation value	30001	0EA6H	➡	3750（37.50%）
Engineering unit	31001	0096H		150

In case of "Internal calculation value" here,

37.50 (%) × 400 (full scale) = 150 (°C) is obtained.

Note that the same data is handled at both addresses if it is not affected by input range.
This handling does not apply to bit data. (Address increased by 1,000 is invalid.)
For data affected by input range, refer to address maps in Sections 7.2 and 7.3.

Note : After changing the input range by communication write-in, pay attention to the decimal point position. After changing the decimal point position by communication write-in, simultaneously change the lower limit and upper limit of input range.

Example: Input range 0 to 400 changed into 0.0 to 400.0

a) Face panel operation: P-dP=0→1 suffices

b) Communication write-in: P-dP=0→1
P-SL=0→0
P-SU=400→4000
} must be performed.

7.1.3 Handling of decimal point

Some internally stored data have more digits below decimal point than displayed on the face panel. No decimal point is added to transmission data.
For data given in the following table, carry out an alignment of decimal point.

(a) Internal calculation value data (address map shown in Section 7.2)

Digits below point	Kind	Resister No.
Designate by parameter [P-dP] (0 to 2)	Parameter [P-SL]	40018
	Parameter [P-SU]	40019
1 digit below point	Parameter [P]	40006
	Parameter [i]	40007
	Parameter [d]	40008
	Parameter [CooL]	40010
	Parameter [P-dF]	40022
	Parameter [HB]	40039
	Parameter [CT]	30010
2 digits below point	Data affected by input range	See address map (Section 7.2)
	Parameter [dB]	40011
	Parameter [bAL]	40013
	Parameter [PLC1]	40025
	Parameter [PHC1]	40026
	Parameter [PLC2]	40027
	Parameter [PHC2]	40028
	Parameter [OUT1]	30004
	Parameter [OUT2]	30005

(b) Engineering unit (address map shown in Section 7.3)

Digits below point	Kind	Resister No.
Designate by parameter [P-dP] (0 to 2)	Parameter [P-SL]	41018
	Parameter [P-SU]	41019
	Data affected by input range	See address map (Section 7.3)
1 digit below point	Parameter [P]	41006
	Parameter [i]	41007
	Parameter [d]	41008
	Parameter [CooL]	41010
	Parameter [P-dF]	41022
	Parameter [HB]	41039
	Parameter [CT]	31010
2 digits below point	Parameter [dB]	41011
	Parameter [bAL]	41013
	Parameter [PLC1]	41025
	Parameter [PHC1]	41026
	Parameter [PLC2]	41027
	Parameter [PHC2]	41028
	Parameter [OUT1]	31004
	Parameter [OUT2]	31005

7.1.4 Data when input is abnormal

When "UUUU" or "LLLL" is displayed on the face panel on account of over-range, under-range or input open-circuit for example, PV read-out value is 105% or -5% of input range.

Presence of any input abnormality via communication can be detected by:

"Register No. 30008 (or 31008): Input/main unit abnormal status"

7.2 Address Map of Internal Calculation Value Data

Data affected by input range is handled in terms of internal value (0.00 to 100.00% value) before scaling.

For detailed contents about individual parameter function or setting range, refer to the operation manual (ECNO: 406).

Bit data [read-out/write-in] : Function code [01_H, 05_H]

Relative address	Coil No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000_H	00001	Bit	Write in non-volatile memory (FIX execution)	0:Not writing-in 1:Writing in memory	0:No request 1:Request to write in		(the same function as 40001)

Bit data [read-out only] : Function code [02_H]

Relative address	Coil No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000_H	10001	Bit	Alarm 1 ON/OFF	0:Alarm 1 OFF, 1: Alarm 1 ON		
0001_H	10002		(Reserve)			
0002_H	10003		(Reserve)			
0003_H	10004		(Reserve)			
0004_H	10005	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		
0005_H	10006		(Reserve)			
0006_H	10007		(Reserve)			
0007_H	10008		(Reserve)			
0008_H	10009	Bit	Alarm 1 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 1 OFF 1: Relay output of alarm 1 ON		
0009_H	10010	Bit	Alarm 2 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 2 OFF 1: Relay output of alarm 2 ON		
$000A_H$	10011		(Reserve)			
$000B_H$	10012	Bit	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON		
$000C_H$	10013	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		(Same as 10001)
$000D_H$	10014	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		(Same as 10002)
$000E_H$	10015		(Reserve)			
$000F_H$	10016	Bit	HB alarm relay output	0:HB alarm output OFF 1:HB alarm output ON		(Same as 10012)

Word data [read-out/write-in] : Function code [03_H, 06_H, 10_H]

Relative address	Resister No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000_H	40001	Word	Non-volatile memory write-in	0: Not writing-in 1: Writing in memory	0:No request 1:Request to write in		(Same function as 00001)
0001_H	40002	Word	PID/FUZZY/SELF selection	0:PID control 1:FUZZYcontrol 2:SELF tuning control			CTrL * Inhibit change while controlling
0002_H	40003	Word	SV value set on face panel	0 to 10000 (within 0.00 to 100.00% FS within set value limits)		*	
0003_H	40004	Word	Control RUN/standby	0: Invalidate standby (RUN) 1:Validate standby			STby
0004_H	40005	Word	Auto tuning command	0: Auto tuning disabled 1: While executing standard type AT executed 2: While executing low PV type AT executed	0: Disable auto tuning 1: Request execution of standard type 2: Request execution of low PV type AT		AT
0005_H	40006	Word	P	0 to 9999（0.0 to 999.9%）			P
0006_H	40007	Word	I	0 to 32000（0 to 3200.0 sec）			i
0007_H	40008	Word	D	0 to 9999（0.0 to 999.9 sec）			D
0008_H	40009	Word	Hysteresis range at two-position control	0 to 5000（0.00 to 50.00%FS）		*	HyS
0009_H	40010	Word	COOL	0 to 1000（0.0 to 100.0）			CooL
$000A_H$	40011	Word	Dead band	-5000 to 5000（-50.00 to +50.00）			db
$000B_H$	40012	Word	Anti-reset windup	0 to 10000（0.00 to 100.00%）		*	Ar
$000C_H$	40013	Word	Output convergence value	-10000 to 10000 （-100.00 to 100.00%）			bAL
$000D_H$	40014	Word	PV shift	-1000 to 1000（-10.00 to 10.00%FS）		*	PVOF
$000E_H$	40015	Word	SV offset	-5000 to 5000（-50.00 to 50.00%FS）		*	SVOF
$000F_H$	40016	Word	Input type code	0 to 16			P-n2
0010_H	40017	Word	Temperature unit	0:℃ 1:°F			P-F
0011_H	40018	Word	Input scale lower limit	-1999 to 9999			P-SL
0012_H	40019	Word	Input scale upper limit	-1999 to 9999			P-SU
0013_H	40020	Word	Decimal point place	0 to 2			P-dP
0014_H	40021		(Do not use)				
0015_H	40022	Word	Input filter time constant	0 to 9000（0.0 to 900.0 sec）			P-dF
0016_H	40023	Word	RCJ yes/no	0: Disable RCJ compensation (do not perform reference cold junction compensation) 1: Enable RCJ compensation (perform reference cold junction compensation)			rCJ
0017_H	40024	Word	MV limit kind	0 to 15			PCUT
0018_H	40025	Word	Output 1 lower limit	-300 to 10300（-3.00 to 103.00%）			PLC1
0019_H	40026	Word	Output 1 upper limit	-300 to 10300（-3.00 to 103.00%）			PHC1
$001A_H$	40027	Word	Output 2 lower limit	-300 to 10300（-3.00 to 103.00%）			PLC2
$001B_H$	40028	Word	Output 2 upper limit	-300 to 10300（-3.00 to 103.00%）			PHC2
$001C_H$	40029		(Do not use)				
$001D_H$	40030		(Do not use)				
$001E_H$	40031	Word	Set value (SV) lower limit	0 to 10000（0.00 to 100.00%FS）		*	SV-L
$001F_H$	40032	Word	Set value (SV) upper limit	0 to 10000（0.00 to 100.00%FS）		*	SV-H
0020_H	40033		(Do not use)				
0021_H	40034		(Do not use)				
0022_H	40035		(Do not use)				
0023_H	40036		(Do not use)				
0024_H	40037		(Do not use)				
0025_H	40038		(Do not use)				
0026_H	40039	Word	Heater burnout alarm set value	0 to 500（0.0 to 50.0A）			Hb
0027_H	40040	Word	Setting lock	0 to 5			LoC

Relative address	Resister No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0028_H	40041	Word	Alarm 1 type	0 to 34			ALM1
0029_H	40042	Word	Alarm 2 type	0 to 34			ALM2
$002A_H$	40043		(Do not use)				
$002B_H$	40044	Word	Alarm 1 set value or alarm 1 lower limit set value	For absolute value alarm 0 to 10000 (0.00 to 100.00%FS) For deviation alarm -10000 to 10000 (-100.00 to 100.00%FS)		*	AL1 or A1-L
$002C_H$	40045	Word	Alarm 2 set value or alarm 2 lower limit set value			*	AL2 or A2-L
$002D_H$	40046		(Do not use)				
$002E_H$	40047	Word	Alarm 1 upper limit set value	For absolute value alarm 0 to 10000 (0.00 to 100.00%FS) For deviation alarm -10000 to 10000 (-100.00 to 100.00%FS)		*	A1-H
$002F_H$	40048	Word	Alarm 2 upper limit set value			*	A2-H
0030_H	40049		(Do not use)				
0031_H	40050	Word	Alarm 1 hysteresis	0 to 5000 (0.00 to 50.00%FS)		*	A1hy
0032_H	40051	Word	Alarm 2 hysteresis	0 to 5000 (0.00 to 50.00%FS)		*	A2hy
0033_H	40052		(Do not use)				
0034_H	40053	Word	Alarm 1 ON-delay set value	0 to 9999 (0 to 9999 sec)			dLy1
0035_H	40054	Word	Alarm 2 ON-delay set value	0 to 9999 (0 to 9999 sec)			dLy2
0036_H	40055		(Do not use)				
0037_H	40056		(Do not use)				
0038_H	40057	Word	Ramp/soak No. 1 target value	0 to 10000 (0.00 to 100.00%FS, within set value limit)		*	Sv-1
0039_H	40058	Word	Ramp/soak No. 2 target value			*	Sv-2
$003A_H$	40059	Word	Ramp/soak No. 3 target value			*	Sv-3
$003B_H$	40060	Word	Ramp/soak No. 4 target value			*	Sv-4
$003C_H$	40061	Word	Ramp/soak No. 5 target value			*	Sv-5
$003D_H$	40062	Word	Ramp/soak No. 6 target value			*	Sv-6
$003E_H$	40063	Word	Ramp/soak No. 7 target value			*	Sv-7
$003F_H$	40064	Word	Ramp/soak No. 8 target value			*	Sv-8
0040_H	40065	Word	Ramp/soak No. 1 ramp time	0 to 5999 (0 to 5999 min) * With main unit parameter, Hour | Minute is displayed and set. Therefore, correspondence occurs as: 3601:Data via communication ‖ 6001:Display/setting on main unit			TM1r
0041_H	40066	Word	Ramp/soak No. 1 soak time				TM1S
0042_H	40067	Word	Ramp/soak No. 2 ramp time				TM2r
0043_H	40068	Word	Ramp/soak No. 2 soak time				TM2S
0044_H	40069	Word	Ramp/soak No. 3 ramp time				TM3r
0045_H	40070	Word	Ramp/soak No. 3 soak time				TM3S
0046_H	40071	Word	Ramp/soak No. 4 ramp time				TM4r
0047_H	40072	Word	Ramp/soak No. 4 soak time				TM4S
0048_H	40073	Word	Ramp/soak No. 5 ramp time				TM5r
0049_H	40074	Word	Ramp/soak No. 5 soak time				TM5S
$004A_H$	40075	Word	Ramp/soak No. 6 ramp time				TM6r
$004B_H$	40076	Word	Ramp/soak No. 6 soak time				TM6S
$004C_H$	40077	Word	Ramp/soak No. 7 ramp time				TM7r
$004D_H$	40078	Word	Ramp/soak No. 7 soak time				TM7S
$004E_H$	40079	Word	Ramp/soak No. 8 ramp time				TM8r
$004F_H$	40080	Word	Ramp/soak No. 8 soak time				TM8S
0050_H	40081	Word	Ramp/soak mode	0 to 15			MOD
0051_H	40082	Word	Ramp/soak command	0: oFF Ramp/soak stopped 1: rUn Ramp/soak operated 2: HLd Ramp/soak halted 3: End Ramp/soak ended	0:oFF Stop ramp/soak 1:rUn Start ramp/soak 2:HLd Halt ramp/soak		ProG

Relative address	Resister No.	Type	Memory contents	Read-out data / Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0052_H	40083	Word	Ramp/soak pattern selection	0: Execute No. 1 to 4 ramp/soak (PTn=1) 1: Execute No. 5 to 8 ramp/soak (PTn=2) 2: Execute No. 1 to 8 ramp/soak (PTn=3)		PTn
0053_H	40084		(Do not use)			
0054_H	40085	Word	PV stable range	0 to 10000 (0.00 to 100.00%FS)	*	SLFb
0055_H	40086		(Do not use)			
0056_H	40087	Word	Communication DI action request	*② (refer to section 7.4.)		
0057_H	40088	Word	Control action type code	0 to 19		P-n1
0058_H	40089	Word	Output proportional cycle (output 1)	0: Current output type 1 to 150 (1 to 150 sec) : Relay, SSR drive output type		TC
0059_H	40090	Word	Output proportional cycle (output 2)	1 to 150 (1 to 150 sec)		TC2
$005A_H$	40091		(Do not use)			
$005B_H$	40092	Word	Alarm 1 option function	0 to 7 (binary data 000_B to 111_B)		A1op
$005C_H$	40093	Word	Alarm 2 option function	0 to 7 (binary data 000_B to 111_B)		A2op
$005D_H$	40094		(Do not use)			
$005E_H$	40095	Word	DI1 action setting	0 to 12		di-1
$005F_H$	40096		(Do not use)			
0060_H	40097	Word	Hysteresis mode setting	0: off (main unit parameter setting) 1: on (main unit parameter setting)		ONOF
0061_H	40098	Word	(Do not use)			
0062_H	40099	Word	User zero adjustment	-5000 to 5000 (-50.00 to 50.00%FS)	*	ADJ0
0063_H	40100	Word	User span adjustment	-5000 to 5000 (-50.00 to 50.00%FS)	*	ADJS
0064_H	40101	Word	DSP1 (parameter mask designation)	0 to 255		dSP1
0065_H	40102	Word	DSP2 (parameter mask designation)	0 to 255		dSP2
0066_H	40103	Word	DSP3 (parameter mask designation)	0 to 255		dSP3
0067_H	40104	Word	DSP4 (parameter mask designation)	0 to 255		dSP4
0068_H	40105	Word	DSP5 (parameter mask designation)	0 to 255		dSP5
0069_H	40106	Word	DSP6 (parameter mask designation)	0 to 255		dSP6
$006A_H$	40107	Word	DSP7 (parameter mask designation)	0 to 255		dSP7
$006B_H$	40108	Word	DSP8 (parameter mask designation)	0 to 255		dSP8
$006C_H$	40109	Word	DSP9 (parameter mask designation)	0 to 255		dSP9
$006D_H$	40110	Word	DSP10 (parameter mask designation)	0 to 255		dSP10
$006E_H$	40111	Word	DSP11 (parameter mask designation)	0 to 255		dSP11
$006F_H$	40112	Word	DSP12 (parameter mask designation)	0 to 255		dSP12
0070_H	40113	Word	DSP13 (parameter mask designation)	0 to 255		dSP13

Note

Note) Read-out/write-in data from Resister No. 40083 (ramp/soak pattern selection) correspond to parameter "PTn" to be displayed as shown below:

Read-out/write-in data	Parameter PTn	Contents
0	1	1 to 4 ramp/soak executed
1	2	5 to 8 ramp/soak executed
2	3	1 to 8 ramp/soak executed

Word data (read-out only) : Function code [04_H]

Relative address	Resister No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000_H	30001	Word	Process value (PV)	0 to 10000（0.00 to 100.00%FS）	*	(Displayed PV value)
0001_H	30002	Word	Currently used set value (SV)	0 to 10000（0.00 to 100.00%FS）	*	(Displayed SV value)
0002_H	30003	Word	Currently used deviation (DV)	-10000 to 10000 （-100.00 to 100.00%FS）	*	
0003_H	30004	Word	MV (output 1)	-300 to 10300（-3.00 to 103.00%）		OUT1
0004_H	30005	Word	MV (output 2)	-300 to 10300（-3.00 to 103.00%）		OUT2
0005_H	30006	Word	Station No.	0 to 255		STno
0006_H	30007	Word	Alarm status	*③ (refer to Section 7.4.)		
0007_H	30008	Word	Input/main unit abnormal status	*④ (refer to Section 7.4.)		
0008_H	30009	Word	Ramp/soak current running position	0 to 17 *⑥ (refer to Section 7.4.)		STAT
0009_H	30010	Word	Heater current	0 to 500（0.0 to 50.0A）		CT
$000A_H$	30011	Word	Timer 1 current count	0 to 9999（0 to 9999 sec）		TM-1
$000B_H$	30012	Word	Timer 2 current count	0 to 9999（0 to 9999 sec）		TM-2
$000C_H$	30013		(Reserve)			
$000D_H$	30014		(Reserve)			
$000E_H$	30015	Word	DI action status	*⑤ (refer to Section 7.4.)		

Notes)

- For details of * ② to * ⑥ in the table, refer to Section 7.4.
- The area marked (Do not use) is a reserve area. Do not write in there.
- Register numbers 30002 (currently used SV) and 40003 (face panel set SV) do not become the same value while switching-SV is active or ramp/soak is under way. (Example: While SV-1 is selected, the value of SV-1 is read out of register number 30002.) For reading out SV for monitoring, use SV in register number 30002.

7.3 Address Map of Engineering Unit Data

Data affected by input range is handled in terms of a value (engineering unit) after scaling.

For detailed contents about individual parameter function or setting range, refer to the operation manual (ECNO: 406).

Bit data [read-out/write-in] : Function code [01_H, 05_H]

Relative address	Coil No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
0000_H	00001	Bit	Write in non-volatile memory (FIX execution)	0:Not Writing-in 1:Writing in memory	0:No request 1:Write-in request		(the same function as 40001)

Bit data [read-out only] : Function code [02_H]

Relative address	Coil No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
0000_H	10001	Bit	Alarm 1 ON/OFF	0:Alarm 1 OFF, 1: Alarm 1 ON		
0001_H	10002		(Reserve)			
0002_H	10003		(Reserve)			
0003_H	10004		(Reserve)			
0004_H	10005	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		
0005_H	10006		(Reserve)			
0006_H	10007		(Reserve)			
0007_H	10008		(Reserve)			
0008_H	10009	Bit	Alarm 1 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 1 OFF 1: Relay output of alarm 1 ON		
0009_H	10010	Bit	Alarm 2 output (Calculation result of non-exciting alarm)	0: Relay output of alarm 2 OFF 1: Relay output of alarm 2 ON		
$000A_H$	10011		(Reserve)			
$000B_H$	10012	Bit	HB alarm relay output	0: HB alarm output OFF 1: HB alarm output ON		
$000C_H$	10013	Bit	Alarm 1 ON/OFF	0: Alarm 1 OFF, 1: Alarm 1 ON		(Same as 10001)
$000D_H$	10014	Bit	Alarm 2 ON/OFF	0: Alarm 2 OFF, 1: Alarm 2 ON		(Same as 10002)
$000E_H$	10015		(Reserve)			
$000F_H$	10016	Bit	HB alarm relay output	0:HB alarm output OFF 1:HB alarm output ON		(Same as 10012)

Word data [read-out/write-in]: Function code [03_H, 06_H, 10_H]

Relative address	Resister No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
$03E8_H$	41001	Word	Non-volatile memory write-in (FIX execution)	0: Not writing in 1: Write in memory	0:No request 1:Request to write in		(Same function as 00001)
$03E9_H$	41002	Word	PID/FUZZY/SELF selection	0:PID control 1:FUZZYcontrol 2:SELF tuning control			CTrL * Inhibit change while controlling
$03EA_H$	41003	Word	SV value controlled on face panel	-1999 to 9999 (within set value limits)		*	
$03EB_H$	41004	Word	Control RUN/standby	0: Invalidate standby (RUN) 1:Validate standby			STby
$03EC_H$	41005	Word	Auto tuning command	0: Auto tuning disabled 1: While executing standard type AT executed 2: While executing low PV type AT executed	0: Disable auto tuning 1: Request execution of standard type 2: Request execution of low PV type AT		AT
$03ED_H$	41006	Word	P	0 to 9999（0.0 to 999.9%）			P
$03EE_H$	41007	Word	I	0 to 32000（0 to 3200.0 sec）			i
$03EF_H$	41008	Word	D	0 to 9999（0.0 to 999.9 sec）			D
$03F0_H$	41009	Word	Hysteresis range at two-position control	0 to 9999 (0 to 50% value of input scale）		*	HyS
$03F1_H$	41010	Word	COOL	0 to 1000（0.0 to 100.0）			CooL
$03F2_H$	41011	Word	Dead band	-5000 to 5000 (-50.00 to +50.00%）			db
$03F3_H$	41012	Word	Anti-reset windup	-1999 to 9999 (0 to 100% value of input scale）		*	Ar
$03F4_H$	41013	Word	Output convergence value	-10000 to 10000 （-100.00 to 100.00%）			bAL
$03F5_H$	41014	Word	PV shift	-1999 to 9999 (-10 to 10% value of input scale）		*	PVOF
$03F6_H$	41015	Word	SV offset	-1999 to 9999 (-50 to 50% value of input scale）		*	SVOF
$03F7_H$	41016	Word	Input type code	0 to 16			P-n2
$03F8_H$	41017	Word	Temperature unit	0:℃ 1:°F			P-F
$03F9_H$	41018	Word	Input scale lower limit	-1999 to 9999			P-SL
$03FA_H$	41019	Word	Input scale upper limit	-1999 to 9999			P-SU
$03FB_H$	41020	Word	Decimal point place	0 to 2			P-dP
$03FC_H$	41021		(Do not use)				
$03FD_H$	41022	Word	Input filter time constant	0 to 9000（0.0 to 900.0 sec）			P-dF
$03FE_H$	41023	Word	RCJ yes/no	0: Disable RCJ compensation (do not perform reference cold junction compensation) 1: Enable RCJ compensation (perform reference cold junction compensation)			rCJ
$03FF_H$	41024	Word	MV limit kind	0 to 15			PCUT
0400_H	41025	Word	Output 1 lower limit	-300 to 10300（-3.00 to 103.00%）			PLC1
0401_H	41026	Word	Output 1 upper limit	-300 to 10300（-3.00 to 103.00%）			PHC1
0402_H	41027	Word	Output 2 lower limit	-300 to 10300（-3.00 to 103.00%）			PLC2
0403_H	41028	Word	Output 2 upper limit	-300 to 10300（-3.00 to 103.00%）			PHC2
0404_H	41029		(Do not use)				
0405_H	41030		(Do not use)				
0406_H	41031	Word	Set value (SV) lower limit	-1999 to 9999（within input scale）		*	SV-L
0407_H	41032	Word	Set value (SV) upper limit	-1999 to 9999（within input scale）		*	SV-H
0408_H	41033		(Do not use)				
0409_H	41034		(Do not use)				
$040A_H$	41035		(Do not use)				
$040B_H$	41036		(Do not use)				
$040C_H$	41037		(Do not use)				
$040D_H$	41038		(Do not use)				
$040E_H$	41039	Word	Heater burnout alarm set value	0 to 500（0.0 to 50.0A）			Hb

Relative address	Resister No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
$040F_H$	41040	Word	Setting lock	0 to 5			LoC
0410_H	41041	Word	Alarm 1 type	0 to 34			ALM1
0411_H	41042	Word	Alarm 2 type	0 to 34			ALM2
0412_H	41043		(Do not use)				
0413_H	41044	Word	Alarm 1 set value or alarm 1 lower limit set value	-1999 to 9999 For absolute value alarm: 0 to 100% value of input scale For deviation alarm: –100 to 100% value of input scale		*	AL1 or A1-L
0414_H	41045	Word	Alarm 2 set value or alarm 2 lower limit set value			*	AL2 or A2-L
0415_H	41046		(Do not use)				
0416_H	41047	Word	Alarm 1 upper limit set value	-1999 to 9999 For absolute value alarm: 0 to 100% value of input scale For deviation alarm: –100 to 100% value of input scale		*	A1-H
0417_H	41048	Word	Alarm 2 upper limit set value			*	A2-H
0418_H	41049		(Do not use)				
0419_H	41050	Word	Alarm 1 hysteresis	0 to 9999 (0 to 50% value of input scale)		*	A1hy
$041A_H$	41051	Word	Alarm 2 hysteresis	0 to 9999 (0 to 50% value of input scale)		*	A2hy
$041B_H$	41052		(Do not use)				
$041C_H$	41053	Word	Alarm 1 ON-delay set value	0 to 9999（0 to 9999 sec）			dLy1
$041D_H$	41054	Word	Alarm 2 ON-delay set value	0 to 9999（0 to 9999 sec）			dLy2
$041E_H$	41055		(Do not use)				
$041F_H$	41056		(Do not use)				
0420_H	41057	Word	Ramp/soak No. 1 target value	-1999 to 9999 (within set value limit)		*	Sv-1
0421_H	41058	Word	Ramp/soak No. 2 target value			*	Sv-2
0422_H	41059	Word	Ramp/soak No. 3 target value			*	Sv-3
0423_H	41060	Word	Ramp/soak No. 4 target value			*	Sv-4
0424_H	41061	Word	Ramp/soak No. 5 target value			*	Sv-5
0425_H	41062	Word	Ramp/soak No. 6 target value			*	Sv-6
0426_H	41063	Word	Ramp/soak No. 7 target value			*	Sv-7
0427_H	41064	Word	Ramp/soak No. 8 target value			*	Sv-8
0428_H	41065	Word	Ramp/soak No. 1 ramp time	0 to 5999（0 to 5999 min） * With main unit parameter, Hour | Minute is displayed and set. Therefore, correspondence occurs as: 3601:Data via communication ‖ 6001:Display/setting on main unit			TM1r
0429_H	41066	Word	Ramp/soak No. 1 soak time				TM1S
$042A_H$	41067	Word	Ramp/soak No. 2 ramp time				TM2r
$042B_H$	41068	Word	Ramp/soak No. 2 soak time				TM2S
$042C_H$	41069	Word	Ramp/soak No. 3 ramp time				TM3r
$042D_H$	41070	Word	Ramp/soak No. 3 soak time				TM3S
$042E_H$	41071	Word	Ramp/soak No. 4 ramp time				TM4r
$042F_H$	41072	Word	Ramp/soak No. 4 soak time				TM4S
0430_H	41073	Word	Ramp/soak No. 5 ramp time				TM5r
0431_H	41074	Word	Ramp/soak No. 5 soak time				TM5S
0432_H	41075	Word	Ramp/soak No. 6 ramp time				TM6r
0433_H	41076	Word	Ramp/soak No. 6 soak time				TM6S
0434_H	41077	Word	Ramp/soak No. 7 ramp time				TM7r
0435_H	41078	Word	Ramp/soak No. 7 soak time				TM7S
0436_H	41079	Word	Ramp/soak No. 8 ramp time				TM8r
0437_H	41080	Word	Ramp/soak No. 8 soak time				TM8S
0438_H	41081	Word	Ramp/soak mode	0 to 15			MOD
0439_H	41082	Word	Ramp/soak command	0: oFF Ramp/soak stopped 1: rUn Ramp/soak operated 2: HLd Ramp/soak halted 3: End Ramp/soak ended	0:oFF Stop ramp/soak 1:rUn Start ramp/soak 2:HLd Halt ramp/soak		ProG

Note

Relative address	Resister No.	Type	Memory contents	Read-out data	Write-in data setting range	Affected by input range	Remarks or corresponding parameter
$043A_H$	41083	Word	Ramp/soak pattern selection	0: Execute No. 1 to 4 ramp/soak 1: Execute No. 5 to 8 ramp/soak 2: Execute No. 1 to 8 ramp/soak			PTn
$043B_H$	41084		(Do not use)				
$043C_H$	41085	Word	PV stable range	-1999 to 9999 (Within input scale)		*	SLFb
$043D_H$	41086		(Do not use)				
$043E_H$	41087	Word	Communication DI action request	*② (refer to section 7.4.)			
$043F_H$	41088	Word	Control action type code	0 to 19			P-n1
0440_H	41089	Word	Output proportional cycle (output 1)	0: Current output type 1 to 150（1 to 150 sec）: Relay, SSR drive output type			TC
0441_H	41090	Word	Output proportional cycle (output 2)	1 to 150（1 to 150 sec）			TC2
0442_H	41091		(Do not use)				
0443_H	41092	Word	Alarm 1 option function	0 to 7（binary data 000_B to 111_B）			A1op
0444_H	41093	Word	Alarm 2 option function	0 to 7（binary data 000_B to 111_B）			A2op
0445_H	41094		(Do not use)				
0446_H	41095	Word	DI1 action setting	0 to 12			di-1
0447_H	41096		(Do not use)				
0448_H	41097	Word	Hysteresis mode setting	0: off (main unit parameter setting) 1: on (main unit parameter setting)			ONOF
0449_H	41098	Word	(Do not use)				
$044A_H$	41099	Word	User zero adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJ0
$044B_H$	41100	Word	User span adjustment	-1999 to 9999 （-50 to 50% value of input scale）		*	ADJS
$044C_H$	41101	Word	DSP1 (parameter mask designation)	0 to 255			dSP1
$044D_H$	41102	Word	DSP2 (parameter mask designation)	0 to 255			dSP2
$044E_H$	41103	Word	DSP3 (parameter mask designation)	0 to 255			dSP3
$044F_H$	41104	Word	DSP4 (parameter mask designation)	0 to 255			dSP4
0450_H	41105	Word	DSP5 (parameter mask designation)	0 to 255			dSP5
0451_H	41106	Word	DSP6 (parameter mask designation)	0 to 255			dSP6
0452_H	41107	Word	DSP7 (parameter mask designation)	0 to 255			dSP7
0453_H	41108	Word	DSP8 (parameter mask designation)	0 to 255			dSP8
0454_H	41109	Word	DSP9 (parameter mask designation)	0 to 255			dSP9
0455_H	41110	Word	DSP10 (parameter mask designation)	0 to 255			dSP10
0456_H	41111	Word	DSP11 (parameter mask designation)	0 to 255			dSP11
0457_H	41112	Word	DSP12 (parameter mask designation)	0 to 255			dSP12
0458_H	41113	Word	DSP13 (parameter mask designation)	0 to 255			dSP13

Note） Read-out/write-in data from Resister No. 41083 (ramp/soak pattern selection) correspond to parameter “PTn” to be displayed as shown below:

Read-out/write-in data	Parameter PTn	Contents
0	1	1 to 4 ramp/soak executed
1	2	5 to 8 ramp/soak executed
2	3	1 to 8 ramp/soak executed

Word data (read-out only) : Function code [04_H]

Relative address	Resister No.	Type	Memory contents	Read-out data	Affected by input range	Remarks or corresponding parameter
$03E8_H$	31001	Word	Process value (PV)	-1999 to 9999 (within input scale)	*	(Displayed PV value)
$03E9_H$	31002	Word	Currently used set value (SV)	-1999 to 9999 (within set value limit)	*	(Dsiplayed SV value)
$03EA_H$	31003	Word	Currently used deviation (DV)	-1999 to 9999 (-100 to 100% value of input scale)	*	
$03EB_H$	31004	Word	MV (output 1)	-300 to 10300 (-3.00 to 103.00%)		OUT1
$03EC_H$	31005	Word	MV (output 2)	-300 to 10300 (-3.00 to 103.00%)		OUT2
$03ED_H$	31006	Word	Station No.	0 to 255		STno
$03EE_H$	31007	Word	Alarm status	*③ (refer to Section 7.4.)		
$03EF_H$	31008	Word	Input/main unit abnormal status	*④ (refer to Section 7.4.)		
$03F0_H$	31009	Word	Ramp/soak current running position	0 to 17 *⑥ (refer to Section 7.4.)		STAT
$03F1_H$	31010	Word	Heater current	0 to 500 (0.0 to 50.0A)		CT
$03F2_H$	31011	Word	Timer 1 current count	0 to 9999 (0 to 9999 sec)		TM-1
$03F3_H$	31012	Word	Timer 2 current count	0 to 9999 (0 to 9999 sec)		TM-2
$03F4_H$	31013		(Reserve)			
$03F5_H$	31014		(Reserve)			
$03F6_H$	31015	Word	DI action status	*⑤ (refer to Section 7.4.)		

Notes)

- For details of * ② to * ⑥ in the table, refer to Section 7.4.
- The area marked (Do not use) is a reserve area. Do not write in there.
- Register numbers 31002 (currently used SV) and 41003 (face panel set SV) do not become the same value while switching-SV is active or ramp/soak is under way. (Example: While SV-1 is selected, the value of SV-1 is read out of register number 31002.) For reading out SV for monitoring, use SV in register number 31002.

7.4 Additional Explanation of Address Map

*② Register number 40087, 41087 (read-out/write-in area)

Contents of the communication DI action

Used for requesting a DI action via communication. Once written in, the contents remain held unless the power is turned off or another value is written in. Pay attention to this point particularly when canceling the alarm latching.

Read-out data is the data which was written in via communication and is different from hardware DI action request data (see * ⑤). Do not doubly request the action of the same function as hardware DI.

Bit	Contents	Read-out		Write-in	
0 1	Switching-SV selection	Bit 1 0 0 0 0 1	 While selecting face panel set SV While selecting SV-1	Bit 1 0 0 0 0 1	 While selecting face panel set SV While selecting SV-1
2	(Reserve)				
3	(Reserve)				
4	(Reserve)				
5	Canceling the alarm 1 latching	0:Not requested to cancel the latching 1:Requested to cancel the latching		0:Not request to cancel the latching 1:Request to cancel the latching	
6	Canceling the alarm 2 latching	0:Not requested to cancel the latching 1:Requested to cancel the latching		0:Not request to cancel the latching 1:Request to cancel the latching	
7	(Reserve)				
8	ALM1 relay timer action	0:Timer action not requested 1:Timer action requested		0:Request to reset timer 1:Request to start timer	
9	ALM2 relay timer action	0:Timer action not requested 1:Timer action requested		0:Request to reset timer 1:Request to start timer	
10	(Reserve)				
11	(Reserve)				
12	(Reserve)				
13	(Reserve)				
14	(Reserve)				
15	(Reserve)				

*③ Register numbers 30007, 31007 (read-out only area)

Alarm status contents (bit data, Coil numbers 10009 to 10016 grouped in 1 byte.)

Bit	Contents	Read-out
0	Alarm 1 output (calculation result of de-energizing alarm)	0:Alarm 1 relay output OFF 1:Alarm 1 relay output ON
1	Alarm 2 output (calculation result of de-energizing alarm)	0:Alarm 2 relay output OFF 1:Alarm 2 relay output ON
2	(Reserve)	
3	HB alarm relay output	0:HB alarm output OFF 1:HB alarm output ON
4	Alarm 1 ON/OFF	0:Alarm 1 OFF, 1:Alarm 1 ON
5	Alarm 2 ON/OFF	0:Alarm 2 OFF, 1:Alarm 2 ON
6	(Reserve)	
7	HB alarm relay output	0:HB alarm output OFF 1:HB alarm output ON

*④ Register numbers 30008, 31008 (read-out only area)

Input/main unit abnormal status

Bit	Contents	Read-out
0	Input Lower open-circuit	0:Lower open-circuit absent 1:Lower open -circuit present
1	Input Upper open-circuit	0:Upper open-circuit absent 1:Upper open-circuit present
2	Input under-range	0:Under-range absent 1:Under-range present
3	Input over-range	0:Over-range absent 1:Over-range present
4	(Reserve)	
5	(Reserve)	
6	Setting range error	0:Setting range normal 1:Setting range abnormal
7	EEPROM error	0:EEPROM normal 1:EEPROM abnormal

*⑤ Register numbers 30015, 31015 (read-out only area)

Contents of DI action status

Hardware DI (DI input terminal) action request information

Bit	Contents	Read-out	
0 1	Switching-SV selection	Bit 1 0	
		0 0	Face panel set SV selected
		0 1	SV-1 selected
2	Control RUN/standby	0:Control RUN requested 1:Control standby requested	
3	Auto tuning (standard)	0:AT not requested 1:AT (standard) action requested	
4	Auto tuning (low PV type)	0:AT not requested 1:AT (low PV type) action requested	
5	Canceling the alarm 1 latching	0:Not requested to cancel the latching 1:Requested to cancel the latching	
6	Canceling the alarm 2 latching	0:Not requested to cancel the latching 1:Requested to cancel the latching	
7	(Reserve)		
8	ALM1 relay timer action	0:Timer action not requested (timer reset) 1:Timer action requested	
9	ALM2 relay timer action	0:Timer action not requested (timer reset) 1:Timer action requested	
10	(Reserve)		
11	RUN/RESET selection of ramp/soak	0:Not requested RUN (RESET) 1:Requested RUN	
12	(Reserve)		
13	(Reserve)		
14	(Reserve)		
15	(Reserve)		

*⑥ Register numbers 30009, 31009 (read-out only area)

Ramp/soak current running position

Read-out data	Indication of parameter "STAT"	Running position (status)
0	oFF	Stop status of ramp/soak
1	1-rP	No. 1 ramp time
2	1-Sk	No. 1 soak time
3	2-rP	No. 2 ramp time
4	2-Sk	No. 2 soak time
5	3-rP	No. 3 ramp time
6	3-Sk	No. 3 soak time
7	4-rP	No. 4 ramp time
8	4-Sk	No. 4 soak time
9	5-rP	No. 5 ramp time
10	5-Sk	No. 5 soak time
11	6-rP	No. 6 ramp time
12	6-Sk	No. 6 soak time
13	7-rP	No. 7 ramp time
14	7-Sk	No. 7 soak time
15	8-rP	No. 8 ramp time
16	8-Sk	No. 8 soak time
17	End	End status of ramp/soak

8. SAMPLE PROGRAM

This section concerns data read-out/write-in sample program by GW-BASIC*[1] which operated on Windows 95*[1] MS-DOS*[1] PROMPT.

Note that the program shown here is for reference for you to create a program and not for guaranteeing all actions.

Before executing the program, make sure of the communication conditions in the following procedure.

- Communication speed (baud rate), data length, stop bits and parity bit

  Set in this program. Match the conditions with this instrument.

  Note) Cautions on using SEKISUI's RS232C and RS485 converter unit (SI-30A)
  In SI-30A, send data are received, added to start of the answer data from the slave station. After cleared data corresponding to the number of sending bytes, treat the remaining data as the answer data in the data receiving process.

*1: GW-BASIC, Windows 95 and MS-DOS are registered trademarks of Microsoft Corporation.

(a) Example of data read-out

Operation:Read-out PV, SV (currently used), DV and MV (control output 1) at a time.
(Continuous word read-out from read-out only area)

Used function code : 04H

Read-out start register No. : 31001 (Engineering unit data)

Read-out word number : 4

```
1000 '-----------------------------------------------------
1010 '   WRITE CONTINUOUS WORDS   SAMPLE PROGRAM
1020 '-----------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1070 DIM CC(255)
1080 '
1100 '-------------- Send data setting -----------------------
1110 CC(1)=&H01        'Station No.   = 1
1120 CC(2)=&H06        'Function code = 06H
1130 CC(3)=&H04        'Upper byte of relative address(0439H) of resister No.41082
1140 CC(4)=&H39        'Lower byte of relative address(0439H) of resister No.41082
1150 CC(5)=&H00        'Upper byte of write-in word data(0001H)
1160 CC(6)=&H01        'Lower byte of write-in word data(0001H)
1170 COUNT=6
1200 '
1210 '------------- CRC code calculation of send data --------------
1220 GOSUB 3020                          'GOSUB  CRC.CALC
1230 CC(7)=CRC.L       'Lower byte of CRC calculation result -> Upper byte in message
1240 CC(8)=CRC.H       'Upper byte of CRC calculation result -> Lower byte in message
1250 COUNT=COUNT+2
1300 '
1310 '------------- Send data -----------------------------
1320 PRINT "Sending data > ";
1330 OPEN "COM1:9600,o,8,1" AS #1   '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 FOR I=1 TO COUNT
1350   PRINT #1,CHR$(CC(I));                'Writing in transmission port
1360   PRINT RIGHT$("0"+HEX$(CC(I)),2);" ";  'Displaying on screen
1370 NEXT I
1380 '
1390 FOR I=O TO 30000 :NEXT I               'Interval time
1500 '
1510 '------------- Data receive  ----------------------------
1520 PRINT
1530 LENGTH=LOC(1)                          'Number of data in receiving buffer
1540 IF LENGTH=0 THEN PRINT "No answer" :END
1550 PRINT "Receiving data < ";
1560 FOR I=1 TO LENGTH
1570   X$=INPUT$(1,#1)                      'Taking data from receiving buffer
1580   CC(I)=ASC(X$)                        'Digitizing and storing
1590   PRINT RIGHT$("0"+HEX$(CC(I)),2);" ";  'Displaying on screen
1600 NEXT I
1610 CLOSE #1
1620 COUNT=LENGTH-2
1630 GOSUB 3020                             'GOSUB  CRC.CALC
1700 '
1710 '------------- Transmission error check  ----------------------
1720 PRINT
```

```
1730 CRC.L$=RIGHT$("0"+HEX$(CRC.L),2)
1740 CRC.H$=RIGHT$("0"+HEX$(CRC.H),2)
1750 PRINT "CRC calculation = ";CRC.L$;" ";CRC.H$
1760 IF CC(LENGTH-1)<>CRC.L THEN GOTO 1790  'GOTO  ER.MESSAGE
1770 IF CC(LENGTH)<>CRC.H THEN GOTO 1790    'GOTO  ER.MESSAGE
1780 GOTO 1920                              'GOTO  PRT.RESULT
1790 'ER.MESSAGE
1800  PRINT "Communication error"
1810 END
1900 '
1910 '------------- Display of result ---------------------------
1920 'PRT.RESULT
1930  PRINT
1940  PRINT "Completion of ramp/soak start-up"
1950 END
3000 '
3010 '------------ CRC calculation  ------------------------------
3020 'CRC.CALC            'For contents, refer to  CRC calculation flow chart
3030  CR=&HFFFF
3040  FOR I=1 TO COUNT
3050   CR=CR XOR CC(I)
3060   FOR J=1 TO 8
3070    CT=CR AND &H1
3080    IF CR<0 THEN CH=1 ELSE CH=0:GOTO 3100     'GOTO  CRC.CALC.10
3090     CR=CR AND &H7FFF
3100    'CRC.CALC.10
3110     CR=INT(CR/2)
3120     IF CH=1 THEN CR=CR OR &H4000
3130     IF CT=1 THEN CR=CR XOR &HA001
3140   NEXT J
3150  NEXT I
3160  CRC.L=CR AND &HFF                          'Lower byte of CRC calculation
3170  CRC.H=((CR AND &HFF00)/256 AND &HFF)       'Upper byte of CRC calculation
3180 RETURN
```

(b) Data write-in example

Operation : Start ramp/soak of No. 1 station via communication
(Single word write-in)

Used function code : 06H

Write-in register No. : 41082 (Table of engineering unit data)

Write-in data : 1 (Ramp/soak start)

```
1000 '-------------------------------------------------------
1010 '   READ CONTINUOUS WORDS    SAMPLE PROGRAM
1020 '-------------------------------------------------------
1030 '
1040 '
1050 '
1060 CLS
1070 DIM CC(255)
1080 '
1100 '-------------- Send data setting -----------------------
1110 CC(1)=&H01        'Station No.   = 1
1120 CC(2)=&H04        'Function code = 04H
1130 CC(3)=&H03        'Upper byte of relative address(03E8H) of resister No.31001
1140 CC(4)=&HE8        'Lower byte of relative address(03E8H) of resister No.31001
1150 CC(5)=&H00        'Upper byte of read-out word number(0004H)
1160 CC(6)=&H04        'Lower byte of read-out word number(0004H)
1170 COUNT=6
1200 '
1210 '------------- CRC code calculation of send data --------------
1220 GOSUB 3020                          'GOSUB  CRC.CALC
1230 CC(7)=CRC.L       'Lower byte of CRC calculation result -> Upper byte in message
1240 CC(8)=CRC.H       'Upper byte of CRC calculation result -> Lower byte in message
1250 COUNT=COUNT+2
1300 '
1310 '------------- Send data --------------------------------
1320 PRINT "Sending data > ";
1330 OPEN "COM1:9600,o,8,1" AS #1   '9600bps, Odd Parity, Data Length=8, Stop bit=1
1340 FOR I=1 TO COUNT
1350   PRINT #1,CHR$(CC(I));                'Writing in transmission port
1360   PRINT RIGHT$("0"+HEX$(CC(I)),2);" ";  'Displaying on screen
1370 NEXT I
1380 '
1390 FOR I=0 TO 30000 :NEXT I               'Interval time
1500 '
1510 '------------- Data receive -----------------------------
1520 PRINT
1530 LENGTH=LOC(1)                          'Number of data in receiving buffer
1540 IF LENGTH=0 THEN PRINT "No answer" :END
1550 PRINT "Receiving data < ";
1560 FOR I=1 TO LENGTH
1570   X$=INPUT$(1,#1)                      'Taking data from receiving buffer
1580   CC(I)=ASC(X$)                        'Digitizing and storing
1590   PRINT RIGHT$("0"+HEX$(CC(I)),2);" ";  'Displaying on screen
1600 NEXT I
1610 CLOSE #1
1620 COUNT=LENGTH-2
1630 GOSUB 3020                             'GOSUB  CRC.CALC
1700 '
1710 '------------- Transmission error check  ----------------------
1720 PRINT
```

```
1730 CRC.L$=RIGHT$("0"+HEX$(CRC.L),2)
1740 CRC.H$=RIGHT$("0"+HEX$(CRC.H),2)
1750 PRINT "CRC calculation = ";CRC.L$;" ";CRC.H$
1760 IF CC(LENGTH-1)<>CRC.L THEN GOTO 1790   'GOTO  ER.MESSAGE
1770 IF CC(LENGTH)<>CRC.H THEN GOTO 1790    'GOTO  ER.MESSAGE
1780 GOTO 1920                              'GOTO  PRT.RESULT
1790 'ER.MESSAGE
1800  PRINT "Communication error"
1810 END
1900 '
1910 '------------- Display of result  ---------------------------
1920 'PRT.RESULT
1930  ' In case of decimal point position(P-dP)=1
1940  PRINT
1950  PV$=HEX$(CC(4))+RIGHT$("0"+HEX$(CC(5)),2)     '2 bytes -> 1 word
1960  SV$=HEX$(CC(6))+RIGHT$("0"+HEX$(CC(7)),2)     '2 bytes -> 1 word
1970  DV$=HEX$(CC(8))+RIGHT$("0"+HEX$(CC(9)),2)     '2 bytes -> 1 word
1980  MV$=HEX$(CC(10))+RIGHT$("0"+HEX$(CC(11)),2)   '2 bytes -> 1 word
1990  PRINT "PV =";VAL("&H"+PV$)/10;"degree C"      '1 place of decimal
2000  PRINT "SV =";VAL("&H"+SV$)/10;"degree C"      '1 place of decimal
2010  PRINT "DV =";VAL("&H"+DV$)/10;"degree C"      '1 place of decimal
2020  PRINT "MV1=";VAL("&H"+MV$)/100;"%"            'MV is data of 2 places of decimal
2030 END
3000 '
3010 '------------ CRC calculation  -----------------------------
3020 'CRC.CALC            'For contents, refer to  CRC calculation flow chart
3030  CR=&HFFFF
3040  FOR I=1 TO COUNT
3050   CR=CR XOR CC(I)
3060   FOR J=1 TO 8
3070    CT=CR AND &H1
3080    IF CR<0 THEN CH=1 ELSE CH=0:GOTO 3100     'GOTO  CRC.CALC.10
3090     CR=CR AND &H7FFF
3100    'CRC.CALC.10
3110     CR=INT(CR/2)
3120     IF CH=1 THEN CR=CR OR &H4000
3130     IF CT=1 THEN CR=CR XOR &HA001
3140   NEXT J
3150  NEXT I
3160  CRC.L=CR AND &HFF                          'Lower byte of CRC calculation
3170  CRC.H=((CR AND &HFF00)/256 AND &HFF)       'Upper byte of CRC calculation
3180 RETURN
```

9. TROUBLESHOOTING

If the communication is unavailable, check the following items.

☐ Whether all devices related to communication are turned on.

☐ Whether connections are correct.

☐ Whether the number of connected instruments and connection distance are as specified

☐ Whether communication conditions coincide between the master station (host computer) and slave stations (PXR)

- ☐ Transmission speed : 9600bps
- ☐ Data length : 8 bits
- ☐ Stop bit : 1 bit
- ☐ Parity : ☐odd
  ☐even
  ☐none

☐ Whether send/receive signal timing conforms to Section 5.4 in this manual.

☐ Whether the station No. designated as send destination by the master station coincides with the station No. of the connected PXR

☐ Whether more than one instrument connected on the same transmission line shares the same station No.

☐ Whether the station No. of instruments is set at other than 0.
If it's 0, the communication function does not work.

☐ Whether the 11th digit of type cord of this controller is M or V?.

(PXR4□□□□−□□$\begin{matrix}\mathrm{M}\\\mathrm{V}\end{matrix}$□□−□)