

FOR

MICROCOMPUTER BASED

PROGRAMMABLE CONTROLLER

PC-900



Thank you for your purchase of our Microcomputer based Programmable Controller PC-900.

This manual contains instructions for the mounting, functions, operations and notes when operating the **PC-900**.

For your confirmation of the model and specifications of the controller, please peruse and make sure you understand this instruction manual before starting operation.

To prevent accidents arising from the use of this controller, please ensure the operator who uses it receives this manual.



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******* Notes to users *******

Before operating this controller, please understand about following matters.

🚹 Warning

Turn the power supplied to the instrument OFF before wiring or checking. If working or touching the terminal with the power switched to ON, there is a possibility of Electric Shock, which can cause severe injury or death.

Moreover, the instrument must be grounded before the power supplied to the instrument is turned on.

🗥 Caution

Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.

Λ Notices

- Set-up of the Rotary switch and the DIP switch inside the controller is required before the power is turned on. The product is factory adjusted as [Sensor input: K, Control action: PID (with Auto-tuning function), Heating action, Alarm (A1): Pattern end output, Alarm (A3): High limit alarm output, Alarm (A4): Low limit alarm output, Unit:℃]. Refer to page 9, "Set-up".
- It is recommended that the PID auto-tuning is performed on the trial run.
- It is advisable to utilize protective devices against such environmental conditions which may cause damage to the device or the deterioration of its parts.
- In case of the PC-955 model, set the Open and Closed output time to meet the specification of the control valve.

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1. Model names

1.1 Explanation of the model names

Alphanumeric character to represent the function or type is applied to the . [Example]



Standard model names

PC-9 🗌 5	-□ /M,		Series name: PC-900 [96x96x100mm (WxHxD)]
Control 3			PID auto-tuning
action 5			ON/OFF servo output PID
Alarm action 5			Alarm 3: High limit, Alarm 4: Low limit (*1)
	R		Relay contact output: 1a 1b (PC-935) or 1a x 2 (PC-955) (*2)
Control output	S		Non-contact voltage output (for SSR drive): 12 ^{+ 2} ₀ Vdc
	А		Current output: 4 to 20mAdc
Input	М		Multi-range input (*3)
		A2	Alarm 2 (including Pattern end output 2) (*4, *5)
		LA	Loop break alarm (*5, *7)
		DR	Relay contact: 1a Control output
		DS	Non-contact voltage (SSR drive): 12^{+2}_{0} Vdc (OUT2) (*4, *6)
		DA	Current: 4 to 20mAdc
		TA	Current (4 to 20 mAdc)
Option		TV	Voltage (0 to 1 Vdc)
		C5	Based on EIA RS-485 Serial communication
		С	Based on EIA RS-232C
		SVTC	Setting value digital transmission
		TS	Time signal output
		BK	Color: Black
		IP	Dust-proof, Drip-proof
		TC	Electrical shock protecting terminal cover
	Designa	ated	Input range
	specific	ation	Alarm action
	(Shippe	ed as	Cooling action, applicable to option DR, DS or DA
	design	lated)	Transmission

(See page 109 for the contents of the options in detail.)

- (*1): 12 types of alarm action, no alarm action or pattern end output are selectable by internal rotary switch and DIP switch.
- (*2): The control output of the type PC-955 is available to the relay contact output only.
- (*3): 16 types of input, Thermocouple, RTD, Current and Voltage are selectable by internal rotary switch and DIP switch.
- (*4): This option is not available to the type PC-955.
- (*5): When option A2 and LA are applied together, the output terminal are common.
- (*6): This option is not available with a combination of the option A2 or LA.
- (*7): In case of PC-955 type, the LA lamp lights when abnormal status, but there is no output.

1.2 How to indicate the model nameplate

🗥 Warning

Do not take the inner assembly out nor touch the terminal with the power supply on. If touching the terminal with the power on status, there is a possibility of Electric Shock which can cause severe injury or death.

Model nameplates are put on the case and the left side of the inner assembly.

Model nameplate (Example)



(1): Model name

(2): Option codes

(3): Instrument number (Indicated only on internal assembly)

2. Name and Function of the sections



[Fig. 2-1]

1 PV display

It indicates the Process variable (PV) with red display.

② SV/MV/TIME display

It indicates the Setting value (SV), Manipulating value (MV) or Time (TIME) with green display. (The display can be changed by the **bind** key.)

③ Pattern number display

It indicates the Pattern number with yellow display.

④ Program monitor indicator

During program control, green (\sim) is lit when the PV is rising.

During program control, green (-) is lit when the PV is constant.

During program control, green (\searrow) is lit when the PV is falling.

(5) Step number display

It indicates the Step number with green display.

6 SV indicator [SV]

Green indicator is lit when the Setting value (SV) is being displayed on the SV/MV/TIME display.

⑦ PC-935, Control output (OUT1) indicator [OUT1]

Green indicator is lit when the Control output (OUT1) is ON.

(With the current output type, it blinks corresponding to the manipulating value at 0.125 seconds of period.)

PC-955, Control motor Open output indicator [OUT1]

Green indicator is lit when the Control motor Open output (OUT1) is ON.

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8	PC-935, Control output (OUT2) indicator [OUT2]
	Yellow indicator is lit when the Control output (OUT2) is ON.
	(With the current output type, it blinks corresponding to the manipulating value at 0.125
	seconds of period.)
	PC-955, Control motor Closed output indicator [OUT2]
	Yellow indicator is lit when the Control motor Closed output (OUT2) is ON.
9	Program control performance indicator [RUN]
	During program control, red indicator is lit.
10	Alarm 1 output action (including Pattern end 1 output) indicator
	or Sensor burnout indicator [A1/SB]
	Red indicator is lit when the Alarm 1 (A1) output or Pattern end 1 output is ON.
	Red indicator is lit when the Sensor burnout.
	Alarm 2 output action (including Pattern end 2 output) indicator
	or Loop break alarm output indicator [A2/LA]
	Red indicator is lit when the Alarm 2 (A2) output or Pattern end 2 output is ON.
	Red indicator is lit when the Loop break alarm output is ON.
(12)	Alarm 3 output action (including Pattern end 3 output) indicator [A3]
	Red indicator is lit when the Alarm 3 (A3) output or Pattern end 3 output is ON.
13	Alarm 4 output action (including Pattern end 4 output) indicator [A4]
	Red indicator is lit when the Alarm 4 (A4) output or Pattern end 4 output is ON.
14	Manual control indicator [MAN]
	Red indicator is lit in Manual control.
(15)	Auto-tuning action indicator [AT]
	Decimal point (end of the right) on SV/MV/TIME display blinks during auto-tuning.
16	MV indicator [MV]
	Red indicator is lit when the Manipulating value (MV) of the control output (OUT1)
	is being displayed on the SV/MV/TIME display.
	Red indicator blinks when the Manipulating value (MV) of the control output (OUT2)
	is being displayed on the SV/MV/TIME display.
1	Time indicator [TIME]
_	Yellow indicator is lit when the Time (TIME) is being displayed on the SV/MV/TIME display.
(18)	Fixed value control mode indicator [FIX]
_	Red indicator is lit in Fixed value control.
(19)	Program control hold indicator [HOLD]
	Red indicator blinks when holding program control.



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3. Set-up

Taking the internal assembly out

Before the power supplied to this instrument is on, take the internal assembly out from the case by pushing the hook (bottom of the instrument) to arrow direction and holding the notches.





Using small slotted screwdriver and tweezers, designate the Sensor input, Alarm 1 action, Alarm 2 action, Control action, Heating (reverse)/Cooling (direct) action, Alarm 1 and 2 standby functions, Unit "C or "F and Program starting form (Automatic/Manual) change by rotary switch and DIP switch by following procedure.

If the option A2 is not applied, the rotary switch A2 (SW301) is not equipped



[Fig. 3-2]

The following items can be designated by the DIP switch (SW304). Factory adjusted as all switches OFF.

[Table 3-7	1]
------------	----

Item	Sw. No.	Designation	Switch Status
Control action	1	PID (with Auto-tuning function)	OFF
Control action 1		Fuzzy overshoot suppressing PID	ON
Heating/Cooling	з	Heating (reverse) action	OFF
Action	5	Cooling (direct) action	ON
Alarm 1		No standby action	OFF
standby 4 action		Standby action	ON
Alarm 2 standby	5	No standby action	OFF
action *1	5	Standby action	ON
ium pirm	6	°C	OFF
0/T 0	0	ፑ	ON
Sensor input *2	7	K, J, R, B, N, PL-II, Pt100, JPt100 (with decimal point)	OFF
Sensor input 2		S, E, T, C, 4 to 20mA, 0 to 20mA, 0 to 1V, Pt100 (no decimal point)	ON
Program start	0	Manual start	OFF
Auto/Man	0	Automatic start	ON

• Make the switch No. 2 of the DIP switch always OFF.

- *1: The standby function does not work if the option A2 is not applied.
- *2: The sensor input can be designated by the combination of this item and the rotary switch sensor input (SW303).

When starting Program in Program control mode

- Manual start : In case power supplied to the PC-900 is on, it goes to standby mode.
 Then press the key to start the program.
- Automatic start : In case power supplied to the PC-900 is on, the program is automatically started from the step 0 directly.

The sensor type selection

Select the sensor by the rotary switch (SW303) and the DIP switch (SW304, No. 7). and \degree or \degree by the DIP switch (SW304, No. 6). Factory adjusted as [K, -200 to 1370 \degree].

[Table 3-2]

SW303	SW304	Type of	Scale r	ange
No.	No.7	sensor	SW 304 (No. 6 OFF)	SW 304 (N0. 6 ON)
	OFF	к	-200 to 1370℃	-320 to 2500℉
1	OFF	J	-200 to 1000℃	-320 to 1800F
2 1,0,0,0	OFF	R	0 to 1760℃	0 to 3200 F
3	OFF	В	0 to 1820℃	0 to 3300°F
	OFF	PL-II	0 to 1390℃	0 to 2500 F
5	OFF	Ν	0 to 1300℃	0 to 2300 F
6 •	OFF	Pt100	-199.9 to 850.0℃	-199.9 to 999.9℉
7	OFF	JPt100	-199.9 to 500.0℃	-199.9 to 900.0℉
0	ON	S	0 to 1760℃	0 to 3200 F
	ON	E	0 to 1000℃	0 to 1800 F
2 1	ON	Т	-199.9 to 400.0℃	-199.9 to 750.0℉
3	ON	C(W/Re5-26)	0 to 2315℃	0 to 4200°F
4	ON	DC 4 to 20mA	-1999	to 9999
5	ON	DC 0 to 20mA	-1999	to 9999
6	ON	DC 0 to 1V	-1999	to 9999
7	ON	Pt100	-200 to 850℃	-320 to 1560°F

The type of alarm action or the pattern end output for program control can be designated by the rotary switch SW302 (A1) and SW301 (A2)
 If the option A2 is not applied, the rotary switch SW301 (A2) is not equipped.
 Rotary switch SW302 (A1): Alarm 1 (A1) action or Pattern end 1 output.
 Rotary switch SW301 (A2): Alarm 2 (A2) action or Pattern end 2 output.
 Factory adjusted as Alarm 1: Pattern end 1 output

Alarm 2: No alarm action

|--|

Alarm 1 action	Rotary Sw. (SW302) No.	Alarm 2 action	Rotary Sw. (SW301) No.
No alarm action		No alarm action	
High limit alarm	1	High limit alarm	1 1
Low limit alarm	2 •••••••	Low limit alarm	2
High/Low limits alarm	3 2	High/Low limits alarm	3
Hi/Lo limit range alarm	4	Hi/Lo limit range alarm	4
Process high alarm	5	Process high alarm	5
Process low alarm	6 •	Process low alarm	6
Pattern end output	7	Pattern end output	7

When the set-up is completed, insert the internal assembly into the case.

Surely insert the assembly until it is locked by the hook on the bottom of the instrument. (sounds click) **Do not make a mistake about the top and bottom of the internal assembly. If inserting the assembly into the case by force mistaking the direction, the printed circuit board may be damaged.**

4. Mounting to control panel

4.1 Site selection

Mount the controller in a place with:

- (1) A minimum of dust, and an absence of corrosive gases.
- (2) No mechanical vibrations or shocks.
- (3) No exposure to direct sunlight, an ambient temperature is 0 to 50°C (32 to 122°F) and it does not change suddenly.
- (4) An ambient humidity is 85%RH or less, and non-condensing.
- (5) The controller should be away from the electromagnetic switch of large capacity or cables through which large current flows.
- (6) No water, oil nor chemicals and their vapor directly splash.

4.2 External dimension drawing, Panel cutout drawing



[Fig. 4.2-1]

Lateral close mounting n: Number of units mounted [Fig. 4.2-2]

4.3 Mounting

Mounting panel thickness is 1 to 15mm.

Insert the PC-900 from the front of the panel. Catch the mounting bracket to the holes top and bottom of the case, and screw to fix.

(Do not screw with excessive force, or the case may be bent, because it is made of resin. Torque to screw is approximately 0.12N•m.)



[Fig. 4.3-1]

5. Wiring connection

Warning

Turn the power supplied to the instrument OFF before wiring or checking. If working or touching the terminal on the power ON status, there is a possibility of Electric Shock which can cause severe injury or death. Moreover, the instrument must be grounded before the power supplied to the Instrument is turned on.

5.1 Terminal arrangements



[Fig. 5.1-1]

PC-900

PC-955 type



- The terminal block of this instrument is designed to wire from the left side.
- Lead wire must be inserted from the left side of the terminal, and fasten by the terminal screw.
- Dotted line shows the option, no terminal is equipped if it is not specified.

A1 to A4	: Alarm 1 output to Alarm 4 output (A2: PC-935 type only)
	: Heating/Cooling control output (Bolov contact, Non contact voltage, Current)
DR, DS, DA	. Heating/Cooling control output(Relay contact, Non-contact voltage, Current)
TA, TV	: Transmission output
LA	: Loop break alarm output (PC-935 type only)
P. SELECT	: Pattern No. external selection
P. END	: Pattern end output
T.SIG	: Time signal output
STOP, HOLD,	ADV, RUN, COM : External operation terminal

• Recommended terminal

Use a solderless terminal with insulation sleeve to fit to M3 screw as shown below.



[Fig. 5.1-3]

Solderless terminal	Manufacturer	Model name	Tightening torque
Vituno	Nichifu Terminal Industries CO.,LTD.	1.25-Y3	
Туре	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	0.6 Nem May 1.0 Nem
Dound type	Nichifu Terminal Industries CO.,LTD.	1.25-3	0.0 Mm, Max 1.0 Mm
Round type	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	

5.2 Wiring connection examples

1 Notice

Select 3A of fuse from European qualified products, and mount it with the holder in the external circuit within 3m of distance from the controller.

🗥 Notice

- Use a thermocouple and compensating lead wire applicable to the input specifications of this controller.
- Use a 3-wire system of RTD applicable to the input specifications of this controller.
- This controller has no built-in power switch nor fuse. Therefore, the circuit breaker (conforming to IEC standard, 100Vac 5A, 220Vac 5A) should be provided in the circuit near the external controller, besides should be indicated as the switch used to cut the circuit.
- In case of 24Vdc, do not make a mistake on the polarity.
- With the relay contact output type, use an auxiliary electromagnetic switch externally to protect the built-in relay contact.
- In case of PC-955 type, provide the electromagnetic switch between PC-955 and control motor.
- When wiring, keep input wire (Thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.

Use a thick wire (1.25 to 2.0mm²) for the earth ground.





* To prevent from a bad influence to the instrument owing to the unexpected level noise, it is recommended that the surge absorber be provided between the coil of the external relay.

Example for PC-955 type



[Fig. 5.2-2]

• External operation input terminal Open collector input





Pattern number external selection



[Fig. 5.2-5]



Contact (pulse) input

[Fig. 5.2-4]

Time signal output terminal (Option: TS) Open collector output: 8 circuits Capacity: 24Vdc 50mA maximum



[Fig. 5.2-6]

6. Operation

6.1 Operation flow chart



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- Pressing the 🜌 key at any point in the setting mode returns the PC-900 to the status (*1), (*2) or (*3). Dotted line: Option



6.2 Key operation when setting

- Press the with or with key to change the setting value or the selection. When the with and with key or the with and with key pressed simultaneously, makes the numerical value change faster when setting.
- To register the setting vallue or selected item, use the the key.
- To return the mode from each setting mode to Program control running mode, Standby mode or Fixed value control running mode, press the key.

6.3 Program pattern setting

If the mode is in Fixed value control running mode, press the key to select Standby mode.

Fixed value control running mode



Fixed value control mode indicator (FIX) is lit.

[Fig. 6.3-1]

Fixed value control mode indicator (FIX) is unlit.

Stanby mode

[Indications of each display and indicator depend on from the status of the instrument.]

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.

Standby	mode or
Program	n control running mode
PTN	PV
0	25
STEP	SV/MV/TIME
Program	n pattern setting mode
PTN	PV
	PLA .
STEP	SV/MV/TIME
	HOLD

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Data setting for Step number 0 is completed. The indication on Step display will be changed to \ddagger [1], and the item is turned to **Step temperature setting for Step number 1**.

Repeat the operation the same way as **Step temperature setting for Step number 0** to **Output Block number selection to be used for Step number 0** as many steps as necessary. If the key is pressed at the item **Output block number selection to be used for Step number 9**, it returns to **Step temperature setting for Step number 0**.

When the setting is completed, press the **Example** key. The mode is returned to **Standby or Program Control running mode**.



6.4 How to clear the setting value

Data on and after any step number in the program pattern can be cleared, besides all setting values can be cleared.

Be careful, if cleared by mistake, the pattern data must be set again.

• How to clear the program pattern.

At any item in the program pattern setting mode, press the **with** key for 3 seconds, and the program pattern data on and after the step number being displayed on the step number display will be cleared and the data returns to factory adjusted values.

«Example»

When clearing the program pattern on and after the step number 3 in pattern number 0.

At any setting item in Step number 3, if the **use** key is pressed for 3 seconds, the data on and after the Step number 3 to Step number 9 are cleared.

Data of the Step number 0 to Step number 2 in Pattern number 0 and Data of Pattern number 1 to Pattern number 9 are not cleared.

How to clear all setting values.

When the clearing is finished, the display [c L -] goes out and the mode returns to Standby.



(Refer to [Fig. 6.3-1])

6.5 Block data setting

Block setting mode have [PID block], [Time signal block], [Wait block], [Alarm block] and [Output block]. When each block is set, be sure that the mode is Standby mode or Program control running mode. If the mode is in Fixed value control running mode, press the key to select Standby mode.

PID block data setting

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.



- Set the Control output (OUT1) Proportional band for Block number 0.
- Setting the value to 0.0 % causes the PC-935 to act as an ON/OFF controller.
- Setting range: 0.0 to 999.9 % (For PC-935 type) 0.1 to 999.9 % (For PC-955 type)
- Factory adjusted as 2.5 %



- Set the Integral time for Block number 0. Setting the value to 0 sec disables the function.
- Setting range: 0 to 3600 sec (For PC-935 type) 1 to 3600 sec (For PC-955 type)
- Factory adjusted as 200 sec
- Set the Derivative time for Block number 0. Setting the value to 0 sec disables the function.
- Setting range: 0 to 1800 sec
- Factory adjusted as 50 sec
- Set the ARW value for Block number 0. Setting the value to 0 % disables the function.
- Setting range: 0 to 100 %
- Factory adjusted as 50 %
- Set the Control output (OUT2) Proportional band for Block number 0.

Multiplying factor setting to Control output (OUT1) Proportional band. The equation is as follows.

Setting the value to 0.0 causes the PC-900 to act as an ON/OFF controller. If the Proportional band of Control output (OUT1) is 0.0%, it acts as an ON/OFF controller as well.

- Setting range: 0.0 to 10.0 (Multiplying factor)
- Factory adjusted as 1.0
- This setting item is available only when the option Control output (OUT2) [code: DR, DS or DA] is added.
- With the type PC-955, this setting item is not available.

Control output (OUT2) Proportional band

= Control output (OUT1) Proportional band imes Multiplying factor

PID block data setting for Block number 0 is completed. The indication on PV display will be changed to $[P_{i}] = P_{i}$, and the item is turned to **Control output (OUT1) Proportional band setting for Block number 1.**

Repeat the operation the same way as **Control output (OUT1) Proportional band setting for Block number 0** to **Control output (OUT2) Proportional band setting for block number 0** as many blocks as necessary.

If the key is pressed at the item Control output (OUT2) Proportional band setting for block number 9, it returns to Control output (OUT1) Proportional band setting for Block number 0.

When the setting is completed, press the **Example** key. The mode is returned to **Standby or Program Control running mode**.



Time signal block data setting

When the option Time signal output [TS] is added, the character Time signal block [$f_{...}$, $\Omega \Omega$] is indicated on the PV display.

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.



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The function of Time signal

Time signal is a function to provide Time signal outputs for each step during program control by setting the output OFF time and ON time.

- Maximum 8 Time signal outputs can be set for each step number.
- Time signal output works in order Output OFF time and Output ON time. The signal automatically turns OFF when ON time expires within a step.
- Combination of Output OFF time and Output ON time as one block, up to 16 blocks can be set.
- When the ON time is set the same as the Step time, the Time signal output turns a momentary OFF condition at the turning point of the step. When a Time signal ON time is meant to continue to the next step, set the ON time so that it can extend into the next step.
- When moved to the next step, the Time signal output acts OFF/ON following the step setting no relation to the previous step.

Wait block data setting

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.



Press the two key several times until the Wait block character $[\overline{a}, \Omega\overline{\Omega}]$ is Indicated on PV display. If passed, use the two key.





Wait function

A function during program control, it does not proceed to the next step at the end of the step until the PV (process variable) reaches within the Waiting zone [SV (setting value) to SV \pm Wait value]. The progress of the step time is suspended at that time.

The step number display blinks during the Wait action.

The Wait function works when

«SV – Wait value \leq PV \leq SV + Wait value»

 In case the program pattern is rising «SV – Wait value ≤ PV»



[Fig. 6.5-2]

 In case the program pattern is falling «SV + Wait value ≥ PV»



Wait function cancellation

Wait function can be canceled by pressing the area or key.

[ADV] or [STOP] input of the External operation function can be canceled the Wait function as well.

Alarm block data setting

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.




- Set the Alarm 1 (A1) action point for Block number 0.
- This item is not available when Pattern end output 1 is selected (initial status), and if no alarm action is selected by rotary switch (SW302).
- When using the Alarm 1 (A1) as alarm action, select Alarm 1 action by rotary switch SW302 (A1).
- Setting range: See the table on the next page.
- Factory adjusted as Pattern end output 1
- Set the Alarm 2 (A2) action point for Block number 0.
- This item is not available to following cases. (1) Option A2 is not applied.
 - (2) No alarm action or Pattern end output 2 is selected by rotary switch (SW301).(3) For the type PC-955.
- Setting range: See the table on the next page.
- Factory adjusted as 0[℃]
- Set the Alarm 3 (A3) action point for Block number 0.
- This item is not available when No alarm action or Pattern end output 3 is selected by key operation in Alarm 3 (A3) action form selection.
- Setting range: See the table on the next page.
- Factory adjusted as 0°C
- Set the Alarm 4 (A4) action point for Block number 0.
- This item is not available when No alarm action or Pattern end output 4 is selected by key operation in Alarm 4 (A4) action form selection.
- Setting range: See the table on the next page.
- Factory adjusted as 0°C

Alarm block data setting for Block number 0 is completed. The indication on PV display will be changed to $[\exists l_{-} l]$, and the item is turned to **Alarm 1 (A1) action point setting for Block number 1.**

Repeat the operation the same way as Alarm 1 (A1) action point setting for Block number 0 to Alarm 4 (A4) action point setting for Block number 0 as many blocks as necessary.

If the key is pressed at the item Alarm 4 (A4) action point setting for Block number 9, it returns to Alarm 1 (A1) action point setting for Block number 0.

When the setting is completed, press the **East** key. The mode is returned to **Standby or Program Control running mode**.

Alarm 1 to Alarm 4 setting range (The same range is applicable when Standby function is applied.)

[Table 6.5-1]

Type of alarm	Setting range	Setting range (with decimal point)
High limit alarm (*)	-Input range span	-199.9 to
	to Input range span	Input range span
Low limit alarm (*)	-Input range span	-199.9 to
	to Input range span	Input range span
High/Low limits alarm (*)	0 to Input range span	0.0 to Input range span
High/Low limit range alarm (*)	0 to Input range span	0.0 to Input range span
Process high alarm	Input range minimum value	-199.9 to Input range
	to Input range maximum value	maximum value
Dracaca law clarm	Input range minimum value	-199.9 to Input range
FIDCESS IOW alaliti	to Input range maximum value	maximum value

(*): Deviation setting

• When the input type is DC, for [Input range span] read [Input range scaling span], the minimum value of minus side is -1999. (The decimal point place follows the selection.)

• In case the input type is RTD with decimal point or T type of thermocouple, the minimum value of minus side is -199.9.

Output block data setting

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.



Press the weight key several times until the Output block character $[\alpha _ \square \square \square]$ is indicated on PV display. If passed, use the weight key.

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6.6 Number of Repeat of the Pattern and Pattern link setting

If the mode is in Fixed value control running mode, press the key to select Standby mode.



[Indications of each display and indicator depend on the status of the instrument.]

Referring to page 126 (Program pattern graphing example), the setting procedure is shown as follows.



Press the key several times until the character [c,H',n] is indicated on PV display. If passed, use the key.



6.7 Attached function setting

Set each parameter for Alarm, Output, Main setting value limit, Transmission output, Input, Communication, and Other functions to meet the need of operations.

Alarm parameter setting

The alarm parameter setting items of **Program control running mode** are the same as those of **Fixed** value control running mode.

This section describes how to set the alarm parameters in the Program control running mode.







OPERATIONS (Alarm parameter setting)



- Select the Alarm 4 (A4) action form.
- Selecting item: The same as the Alarm 3 (A3) action form selection.
- · Factory adjusted as Low limit alarm.
- Set the Alarm 1 (A1) hysteresis.
- Setting range: 0.1 to 100.0°C(°F)
- Factory adjusted as 1.0°C.
- This item is not available when Pattern end output 1 is selected (initial status), and if no alarm action is selected by rotary switch SW302.
- Set the Alarm 2 (A2) hysteresis.
- Setting range: 0.1 to 100.0°C(F)
- Factory adjusted as 1.0℃
- This item is not available to following cases. (1) Option A2 is not applied.
 - (2) No alarm action or Pattern end output 2 is selected by rotary switch (SW301).
 - (3) For the type PC-955.
- Set the Alarm 3 (A3) hysteresis.
- Setting range: 0.1 to 100.0°C(F)
- Factory adjusted as 1.0[℃]
- This item is not available when No alarm action or Pattern end output 3 is selected by key operation in Alarm 3 (A3) action form selection (See page 44).
- Set the Alarm 4 (A4) hysteresis.
- Setting range: 0.1 to 100.0℃(°F)
- Factory adjusted as 1.0[℃]
- This item is not available when No alarm action or Pattern end output 4 is selected by key operation in Alarm 4 (A4) action form selection.

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- Set the Alarm 1 (A1) delayed timer. Alarm output turns ON when passed the setting time after the input value (PV) enters the Alarm output range.
- Setting range: 0 to 9999 seconds
- · Factory adjusted as 0 seconds
- This item is not available when Pattern end output 1 is selected (initial status), and if No alarm action is selected by rotary switch (SW302).
- Set the Alarm 2 (A2) delayed timer. Alarm output turns ON when passed the setting time after the input value (PV) enters the Alarm output range.
- Setting range: 0 to 9999 seconds
- Factory adjusted as 0 seconds
- This item is not available to following cases. (1) Option A2 is not applied.
 - (2) No alarm action or Pattern end output 2 is selected by rotary switch (SW301).(3)For the type PC-955.
- Set the Alarm 3 (A3) delayed timer. Alarm output turns ON when passed the setting time after the input value (PV) enters the Alarm output range.
- Setting range: 0 to 9999 seconds
- Factory adjusted as 0 seconds
- This item is not available when No alarm action or Pattern end output 3 is selected by key operation in Alarm 3 (A3) action form selection (See page 44).
- Set the Alarm 4 (A4) delayed timer. Alarm output turns ON when passed the setting time after the input value (PV) enters the Alarm output range.
- Setting range: 0 to 9999 seconds
- Factory adjusted as 0 seconds
- This item is not available when No alarm action or Pattern end output 4 is selected by key operation in Alarm 4 (A4) action form selection.



- Loop break alarm
- The alarm output turns ON when the process variable (PV) does not rise [fall *] as much value as the span or greater within the time to judge for loop break alarm after the manipulating value reaches to 100% or output high limit value.
- The alarm output also turns ON when the process variable (PV) does not fall [rise *] as much value as the span or greater within the time to judge for loop break alarm after the manipulating value reaches to 0% or output low limit value.
- In case the control output is Direct mode (Cooling), the condition is changed to [*].



Output parameter setting

The output parameter setting items of **Program control running mode** are the same as those of **Fixed value control running mode**. However, [Control output (OUT1) high limit setting], [Control output (OUT1) low limit setting], [Control output (OUT1) changing rate limit setting], [Control output (OUT2) high limit setting] and [Control output (OUT2) low limit setting] used in Fixed value control are not indicated when Program control mode.

This section describes how to set the output parameter in the Program control running mode.







- Set the Control output (OUT1) proportional cycle.
- · Setting range: 1 to 120 seconds
- 30 seconds for the type Relay contact output 3 seconds for the type Non-contact voltage output
- In case of PC-955, this setting item is for the manipulating value operating cycle, and it controls by operating the manipulating value every fixed time.
- This setting item is not available to the type DC
- Set the Control output (OUT1) high limit.
- Setting range: Control output (OUT1) low limit setting value to 105% Setting more than 100% is effective only to DC current output type.
- Factory adjusted as 100%.
- This setting item is available only to Fixed value control parameter setting mode.
- Set the Control output (OUT1) low limit.
- Setting range: -5% to Control output (OUT1) high limit setting value Setting less than 0% is effective only to DC current output type.
- This setting item is available only to Fixed value control parameter setting mode.

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OPERATIONS (Output parameter setting)





- Set the Control output (OUT2) high limit.
- Setting range: Control output (OUT2) low limit setting value to 105% Setting more than 100% is effective only to
- DC current output type. • Factory adjusted as 100%.
- This setting item is available only when the option [DR, DS or DA] is added.
- With the type PC-955, this setting item is not available.
- This setting item is available only to Fixed value control parameter setting mode.
- · Set the Control output (OUT2) low limit.
- Setting range: -5% to Control output (OUT2) high limit setting value
 Setting less than 0% is effective only to DC current output type.
- Factory adjusted as 0%.
- This setting item is available only when the option [DR, DS or DA] is added.
- With the type PC-955, this setting item is not available.
- This setting item is available only to Fixed value control parameter setting mode.
- · Set the Control output (OUT2) ON/OFF hysteresis.
- Setting range: 0.1 to 100.0℃ (F)
- Factory adjusted as 1.0℃
- This setting item is available only when the option [DR, DS or DA] is added.
- This setting item is not available to the type PC-955.
- Set the Overlap band/Dead band between Control output (OUT1) and Control output (OUT2).
- Dead band: + setting, Overlap band: setting
- Setting range: ±Control output (OUT1) Proportional band value converted
- Factory adjusted as 0.0℃
- This setting item is available only when the option [DR, DS or DA] is added.
- This setting item is not available to the type PC-955.







• Control output (OUT1) changing rate limit

In case of heating control, and when the process variable is lower than the setting value, the control Output (OUT1) manipulating value generally changes from OFF to ON as shown Fig. 6.7-1, however, if the control output (OUT1) changing rate limit is applied, the changing rate of the control output (OUT1) manipulating value is changeable according to the rate setting as shown Fig. 6.7-2. For example, it is utilized to heat the object gradually with high temperature heater (used at approximately 1500 to 1800°C) broken when conducted the current suddenly.



How to measure the Open output time and Closed output time automatically.

Simultaneously press the and keys after checking the valve position is full closed or full open.

Then the mode turns Open output time or Closed output time automatic measurement, it starts count from 0.0 seconds, besides the control motor open output or closed output turns ON, the motor moves to open or closed direction.

Press the **the verse** key when the valve reaches full open or closed. Then the count stops, it registers the Open output or Closed output time, besides the Control motor open or closed output turns OFF.

Main setting value limit setting

The main setting value limit setting items of **Program control running mode** are the same as those of **Fixed value control running mode**.

This section describes how to set in the Program control running mode.





Transmission output parameter setting

The Transmission output parameter setting items of **Program control running mode** are the same as those of **Fixed value control running mode**.

This section describes how to set the output parameter in the **Program control running mode**.









Control running mode.

When the type of Transmission is selected by Transmission output selection, the Transmission output high limit value and low limit value are changed as follows.

[Table 6.7-1]

Type of Transmission output	High limit value	Low limit value
[PV] Process variable	Input range	Input range
[SV] Main setting value	high limit value*	low limit value*
[MV] Control output (OUT1) manipulating value	100.0	0.0

* In case of Thermocouple K type of input, the High limit value: 1370°C, the low limit value: - 200°C.

During Standby mode, the Transmission output value is as follows.

[Table 6.7-2]

Type of Transmission output	Transmission output value	
[PV] Process variable	The output value is the PV according to	
	the high limit value and low limit value.	
[SV] Main setting value	In case of option TA: 4mA	
[MV] Control output (OUT1) manipulating value	TV: 0V	



Input parameter setting

The input parameter setting items of **Program control running mode** are the same as those of **Fixed** value control running mode.

This section describes how to set the input parameter in the **Program control running mode**.









OPERATIONS (Input parameter setting)



What is the sensor correction function?

When a sensor cannot be set at a location where control is desired, the sensor measuring value may deviate from the value in the controlled location, and when controlling with plural PC-900s, the accuracy of sensors or the difference of load capacities have influence on the control. Therefore, sometimes measuring value does not accord with the same setting value. In such a case, the control can be accorded with desired value by shifting the input value of sensors.

What is the PV filter time constant?

It suppresses the unsteady input (influence by input noise) with the filter function on software having the same effect as CR filter by first-order lag operating the input value (PV).

When the input value changed in step type as shown Fig. 6.7-3, it changes slowly as shown Fig. 6.7-4. T (PV filter time constant) means the time to reach to 63% of the change.



[Fig. 6.7-3]



Communication parameter setting

The Communication parameter setting items of **Program control running mode** are the same as those of **Fixed value control running mode**.

In case the option Serial communication [code: C, C5] is added, the character communication parameter [code] is indicated.

This section describes how to set the communication parameter in the Program control running mode.





- · Select the transfer rate to meet the rate of the Host
- Selecting item: Indicated on SV/MV/TIME display as shown below.

	24	2400bps
PTN		ADV
	48	4800bps
PTN		ADV
	96	9600bps
PTN		ADV
	192	19200bps

- · Factory adjusted as 9600bps
- · Set the Individual instrument number to this PC-900 when connecting plural PC-900s for communication. Do not set the same number as other PC-900.
- Setting range: 0 to 95
- Factory adjusted as 0







Other function setting

The other function setting items of **Program control running mode** are the same as those of **Fixed** value control running mode.

Only two items [Setting value lock] and [Output selection when the Input burnout] are applied in the Fixed value control running mode.

This section describes how to set the Other function in the Program control running mode.



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• PV start [PV]

When started the Program control, it starts the control by quickly changing the Setting Value and the corresponding time to the Process variable (PV).

PVr start [PVr]

Basically, the same as PV start, however, it also starts the control by PV start when Repeating the pattern.

SV start [SV]

It starts the control from the SV set at " Step temperature setting value (SV) [when program control start] setting ".














OPERATIONS (Other function setting)



Overshoot suppression factor selection

Performs the Auto-tuning by selecting the action to multi-mode. For the Overshoot suppression function, it is one of the condition that the values P, I, D and ARW are the optimum value by the Auto-tuning.

If the overshoot or undershoot occurs at the step changing point, select the optimum value from the range 0.5 to 10.0 of Overshoot suppression factor.



In case Overshoot is caused as shown⁽¹⁾, make the factor larger.

In case too much time is necessary to be stable as shown 2, make the factor smaller.

6.8 Fixed value control parameter setting



Main setting value (SV) setting



PID parameter setting



- Set the Proportional band of control output (OUT1). Setting the value to 0.0% causes the PC-935 to act as an ON/OFF controller.
- Setting range: 0.0 to 999.9% (For PC-935 type) 0.1 to 999.9% (For PC-955 type)
- Factory adjusted as 2.5%
- Set the Integral time. Setting the value to 0 disables the function.
- Setting range: 0 to 3600 seconds (For PC-935 type) 1 to 3600 seconds (For PC-955 type)
- Factory adjusted as 200 seconds







PTN

STEP

ΡV

SV/MV/TIME

81

Ο

HOLD

Alarm action point setting



- Setting range: See the table on the next page.
- Factory adjusted as Pattern end output 1
- This item is not available when Pattern end output 1 is selected (initial status), and if no alarm action is selected by rotary switch (SW302, See page 12).



OPERATIONS (Fixed value control parameter setting)



Data setting for Alarm action point is completed. Press the key, the mode is returned to **Fixed value control running mode**.

Alarm 1 to Alarm 4 setting range (The same range is applicable to Standby function) [Table 6.8-1]

Type of alarm	Setting range	Setting range (with decimal point)
High limit alarm (*)	-Input range span to	-199.9 to
	Input range span	Input range span
Low limit clorm (*)	-Input range span to	-199.9 to
	Input range span	Input range span
High/Low limits alarm (*)	0 to Input range span	0.0 to Input range span
High/Low limit range alarm (*)	0 to Input range span	0.0 to Input range span
Brocoss high alarm	Input range minimum value to	-199.9 to Input range
	Input range maximum value	maximum value
Dragona low clarm	Input range minimum value to	-199.9 to Input range
	Input range maximum value	maximum value

(*): Deviation setting

When the input type is DC, for [Input range span] read [Input range scaling span].



Attached function setting mode

It includes the undermentioned parameters and setting items. How to set and setting item are the same as [each parameter of Program control running mode],

[Alarm parameter]

- Alarm 3 (A3) action form selection
- Alarm 4 (A4) action form selection
- Alarm 1 (A1) hysteresis setting
- Alarm 2 (A2) hysteresis setting *1
- Alarm 3 (A3) hysteresis setting
- Alarm 4 (A4) hysteresis setting
- Alarm 1 (A1) delayed timer setting
- Alarm 2 (A2) delayed timer setting *1
- Alarm 3 (A3) delayed timer setting
- Alarm 4 (A4) delayed timer setting
- Loop break alarm time setting *2
- Loop break alarm span setting *2
 - *1 This setting item is available when Option A2 is applied.
 - *2 This setting item is available when Option LA is applied.

[Output parameter]

- Control output (OUT1) proportional cycle setting
- Control output (OUT1) high limit setting
- Control output (OUT1) low limit setting
- Control output (OUT1) ON/OFF hysteresis setting
- Control output (OUT1) changing rate limit setting
- Control output (OUT2) proportional cycle setting *3
- Control output (OUT2) action selection *3
- Control output (OUT2) high limit setting *3
- Control output (OUT2) low limit setting *3
- Control output (OUT2) ON/OFF hysteresis setting *3
- Overlap band/Dead band setting *3
- Open/Closed output dead band setting *4
- Open output time setting *4
- Closed output time setting *4
 - *3 This setting item is available when Option [DR, DS or DA] is added.
 - *4 This setting item is available only to the type PC-955.



[Main setting value limit]

- Main setting value (SV) high limit setting
- Main setting value (SV) low limit setting

[Transmission output parameter]

- Transmission output selection *5
- Transmission output high limit setting *5
- Transmission output low limit setting *5
 - *5 In case Option [TA or TV] is added, this setting item is indicated.

[Input parameter]

- Scaling high limit setting
- Scaling low limit setting
- Decimal point place selection
- Sensor correction setting
- PV filter time constant setting

[Communication parameter]

- Communication transfer rate selection *6
- Instrument number setting *6
- Communication mode selection *6
 - *6 In case Option [C or C5] is added, this setting item is indicated.

[Other function]

- Setting value lock selection
- · Output selection when the input burnout

7 Running

7.1 Program setting

Before starting the Program control, check following matters.

[Before the power is turned on]

- Mounting to control panel (See page 9)
- Wiring connection (See page 14)
- Set-up (See page 6)

[After the power is turned on]

• When the mode is in Fixed value control (Indicator [FIX] lights), press the key.

- (1) Program pattern setting (See page 21)
- (2) Block data setting (See page 26)
- (3) Number of repeat of the pattern and Pattern link setting (See page 41)
- (4) Attached function setting (See page 43)
 - In case of PC-955 type, the Open/Closed output time setting, etc. to meet to control valve motor.
- (5) Auto/Manual control changing (See page 86)
- (6) Pattern number selection

[Pattern number selection by External operation]

The Pattern number 1 to 7 can be selected by external terminal connection.

(The Pattern number selected by Pattern number External operation takes priority over the key operation on front panel.)

Referring to [Table 7.1-1], select the Pattern number by connecting between 3, 4 and/or 5 and 6 (common).

[Table 7.1-1]

Instrument terminal			Pat	tern	nun	nber		
		1	2	3	4	5	6	7
13 b0		0		0		0		0
(④ b1			0	0			$^{\circ}$	0
15 b2					0	0	0	0

For example, when selecting the Pattern number 7, connect 13 and 16, 14 and 16, and 15 and 16. To cancel the number, open the terminal between 13 and 16, 14 and 16, and 15 and 16.

7.2 Program control running

[Starting System]

• Automatic start: Turn the power supplied to the PC-900 on, and the program is automatically started from the step 0 after warm-up status.

When making the program start automatically, slide the No. 8 switch of the DIP switch (SW304) to ON side before the power supplied to the PC-900 is on.

Manual start : After the power is turned on and warm-up is completed, the program is started from the step 0 by pressing the key in case of Standby mode.
 When Fixed value control running mode, press the key. The mode is returned to Standby mode.

When making the program start manually, slide the No. 8 switch of the DIP switch (SW304) to OFF side before the power supplied to the PC-900 is on.

[Status when the Program control is started]

- SV start : It starts the control from the SV set " Step temperature setting value (SV) [when program control start] setting".
- PV start : It starts the control from the PV by quickly changing the Setting value and the corresponding time to the Process variable (PV).
- PVr start : The same as PV start, however, it also starts the control by PV start when repeating the pattern.

[Program control running by External operation]

Program control is started by closing the terminal between 0 – 0 with the contact or Open collector.

• RUN input : It is processed at the ON rising edge.



[Program control halt (HOLD)]

Press the key to halt the time progress, and it performs the Fixed value control by the setting value at that time. At this time, the HOLD indicator (Red) lights.

To perform the program control again, press the key.



[Step progressing (ADV)]

Each time the key is pressed, the step is progressed to the next. Even if the Wait function is working, if the key is pressed, it is progressed to the next.

[Step backing (Back advance)]

Each time the key is pressed while the key is being pressed, it ends the step on the process, and the step goes back to the previous and performs the control.

[Step time fast progress (FAST)]

While the the key is pressed and held, the time progress becomes 60 times as fast as usual. If the Wait action is applied, the Wait function takes priority over this function.

[Program control end on the process (STOP)]

Press the **week** key, and the Program control will be stopped on the process.

[Program control end (P. END)]

When the Program control is finished, the mode turns to Standby, and the A1/SB indicator lights and the character $PE \neg d$ blinks on SV/MV/TIME display. Besides, the Pattern end output turns on. If the weight key is pressed for 1 second or greater, the Pattern end output turns off.

[Step setting value change during running]

During running, to change the setting value, press the key to turn the mode to Programming mode. After setting, press the key again to turn the mode to running.

If the step temperature or step time is changed, the control is changed as follows.

[When the step temperature is changed from SV1 to SV2.]



[When the step time is changed from T1 to T2.]



7.3 Fixed value control running

Before starting the Fixed value control, check following matters.

[Before the power is turned on]

- Mounting to control panel (See page 9)
- Wiring connection (See page 14)
- Set-up (See page 6)

[After the power is turned on]

• When the mode is in Program control (PTN display lights), press the key while the key is being pressed to make the mode to Fixed value control.

Then press the key to change the mode to setting.

- (1) Fixed value parameter setting (See page 75)
- (2) Attached function setting (See page 43)
- (3) Auto/Manual control changing (See page 86)

When the setting is completed, press the key. The control action is started so as to maintain the controlling object at the main setting value.

[Key operations during Fixed value control]

key: Changes the indication on SV/MV/TIME display SV or MV.

key: Ends the Fixed value control and turns the mode to Program control (Standby).



7.4 Manual control performance

Output manipulating value is set by manual.

Auto/Manual control change

Control change method is common to [Fixed value control running mode] and [Program control running mode]. Therefore, about the Program control is described in this section.





[Key operation in Manual control]

During Manual control, use the **manual**, **and manual** keys to increase or decrease the output manipulating value.

Setting range: Fixed value control output (OUT1) low limit to high limit value Maximum range, 0.0 to 100.0% (R/M, S/M), -5.0 to 105.0% (A/M)

[When the option Heating and Cooling control output (code: DR, DS or DA) is add.]

Setting range: – Fixed value control output (OUT2) high limit to Fixed value control output (OUT1) high limit Maximum range, -100.0 to 100.0% (R/M, S/M), -105.0 to 105.0% (A/M)

[In case of PC-955 type, the value status is as follows]

Control output manipulating value 0.0% ⇒ Full closed

Control output manipulating value 100.0% □ Full open

When control output manipulating value is 0.1% to 99.9%, the Open output ON time and Closed output ON time are decided by the control output manipulating value at the time and the setting values (Open/Closed output dead band, Manipulating value operating cycle, Open output time, Closed output time, etc.), thus the valve flow rate is adjusted.

[With Manual control, refer to following parameters for Fixed value control.]

- Control output (OUT1) high limit setting value
- · Control output (OUT1) low limit setting value
- · Control output (OUT1) changing rate limit setting value
- Control output (OUT2) high limit setting value (Option DR, DS or DA is applied to PC-935)
- Control output (OUT2) low limit setting value (Option DR, DS or DA is applied to PC-935)
- Open output time setting value (only to PC-955)
- Closed output time setting value (only to PC-955)

[Balanceless-bumpless function]

The function not to suddenly change the output manipulating value when the control mode is changed from automatic to manual and vice versa.

- In case the mode is changed from automatic to manual, it makes the output manipulating value before change to the initial value for manual control.
- In case the mode is changed from manual to automatic, it makes the output manipulating value before change to the initial value for automatic control.

7.5 SV/MV/TIME display change

Each time the **struct** key is pressed, the indication on SV/MV/TIME changes as follows.

• Program control



7.6 Notes when PID auto-tuning is performing

- If [Loccc] is designated in Setting value lock selection, Fuzzy overshoot suppressing PID auto-tuning or PID auto-tuning cannot be worked.
- During PID auto-tuning, all parameter cannot set.

[In program control running mode]

When the PID auto-tuning is performed, it starts the tuning at the point, and the program time is not progressed until the tuning is completed. The remaining time is performed after the tuning is terminated.



In case of Multi mode , when setting the PID auto-tuning at the point the program control is stared, the PID auto-tuning is automatically performed at the elapsed point (A) of 90% of progress time on each step. In case the same PID block is set in 1 pattern (e.g. step 1 and 3), the tuning is performed only the first step (e.g. step 1), and the later step (e.g. step 3) is ignored. After the PID auto-tuning is terminated for each step, the values Control output (OUT1) proportional band, Integral time, Derivative time, ARW and Control output (OUT2) proportional band are automatically set to the PID block number selected at each step.



[Fig. 7.6-2]

When performing the Multi mode PID auto-tuning, AT indicator lights, and when it is performing the auto-tuning after the PV reached at A point, AT indicator blinks.

7.7 PID auto-tuning performance/cancellation

This section describes how to set in the Program control running mode.







8. Explanation of Control action and Alarm action

8.1 Fuzzy overshoot suppression PID action

It always watches the changing rate of the control output manipulating value and the deviation from the program control starting point, and suppresses the control output manipulating value before the step is changed, thus the overshoot is suppressed.

- PID auto-tuning should be performed to each step in advance.
- Fuzzy overshoot suppression PID auto-tuning will not work when the Integral time (I) is set to 0.
- When Wait or Hold function works, Fuzzy overshoot suppression PID auto-tuning is cancelled.

8.2 Explanation of PID and ARW

Proportional band (P)

Proportional action is the action of which the control output varies in proportion to the deviation between setting value and processing value.

If the proportional band is narrowed, the output changes according to even by a slight variation of the processing value, and better control result can be obtained as the offset decreases.

However, if when the proportional band is extremely far too narrowed, it may cause variation in the processing value even by slight disturbance, and turns into control such as ON/OFF action of the so called hunting phenomenon.

Therefore, when the processing value comes to the balanced position near the setting value and a constant value is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

Integral time (I)

Integral action is to eliminate offset. When the integral time is shortened, the returning speed to the setting point is quickened. However, the cycle of oscillation is also quickened and stability becomes unfavorable.

Derivative time (D)

Derivative action is to restore the change of processing value according to the changing rate. It reduces the amplitude of overshoot and undershoot width.

If the derivative time is shortened, restoring value comes small, and if the derivative time is adjusted longer, a phenomenon of returning too much may occur and the control system may be oscillated.

Anti-reset windup (ARW)

ARW prevents overshoot (undershoot) caused owing to the integral action. In case of Fixed value control, the less ARW value is, the less excess integral action becomes at the point the PV reaches to the setting value. However, it needs time till stabilized.

For Program control, ARW is used with the overshoot suppression coefficient, it suppresses the overshoot (undershoot) at the point the gradient of each step is changed.

(When setting Wait value, this function does not work to the step.)

How to get the duty factor for ARW by manual setting

In case of Relay contact output or Non-contact voltage output

Duty factor (%) = $\frac{\text{ON action time}}{\text{Proportional cycle}}$ x 100(%)

In case of Current output

Duty factor (%) = $\frac{\text{Output current value (mA)} - 4}{16} \times 100(\%)$

• Set to 50% (the same as factory adjusted) for trial run, if duty factor is unknown.

8.3 PID auto-tuning of this controller

In order to decide each value of P, I, D and ARW automatically, this system gives the fluctuation to the controlling object by force.

[In case the difference between setting value and processing temperature is large when the the temperature rises.]

Fluctuation is given at the temperature 1.5% of scaling span less than the setting value.



[Fig. 8.3-1]

[In case of the stable situation during control or when control temperature is within \pm 1.5% of scaling span.]

Fluctuation is given at the setting value.



[In case control temperature is 1.5% or greater of scaling span higher than the setting value.] Fluctuation is given at the temperature 1.5% of scaling span higher than the setting value.



[Fig. 8.3-3]

Shinho

8.4 Standard action drawings

Action	Heating (reverse) action		Cooling (direct) action		tion	
		Proportional bar	nd	Proportional band		
Control action	ON	2 Set	∆ ting	Z Se	A tting	ON
PC-935		1	1		1	1
Relay contact output	н @ С (5 L (6	H 4	H @q C 5 L 6	H @ C ⑤ L ⑥ O	H @ C ⑤ L ⑥ (*1)	H @ C (5 L (6)
Non-contact voltage output	5	5 + 12/0Vdc 6 (*1)	5	(5)	(5) + 0/12Vdc (6) - (*1)	5
Current output	5 + 20mAdc 6	5 + 20 to 4mAdc 6 (*2)	5 — + 4mAdc 6 — –	5 + 4mAdc 6	5 + 4 to 20mAdc 6 (*2)	5 — + 20mAdc 6 — –
Indicator [OUT1] Green	Lit		Unlit	Unlit		Lit
Open output Terminal(5)—(6) Closed output Terminal (5)—(7)		(*1)	© © Ø		(*1)	
Indicator [OUT1] Green	Lit		Unlit	Unlit		Lit
Indicator [OUT2] Yellow	Unlit		Lit	Lit		Unlit

(*1) Cycle action is performed according to deviation.(*2) Changes continuously according to deviation.

PC-900

PC-900

8.5 ON/OFF action drawings

Action	Heatin	g (reverse) action	Cooling (direct) action		
Control action	ON	Hysteresis	\ / Main s	Hysteresis	ON
PC-935					
Relay contact output	н @ © С © L ©	H ④ C ⑤ L ⑥	H ④ C ⑤ L ⑥		H @ C ⑤ L ⑥
Non-contact voltage output	5 + 12Vdc 6	(5)	5		(5)
Current output	5 + 20mAdc 6	(5)	5 + 4mAdc 6		(5)──── + 20mAdc (6)─── -
Indicator [OUT1] Green	Lit	Unlit	Unlit		Lit
PC-955					
Open output Terminal (5) — (6) Closed output Terminal (5) — (7)					
Indicator [OUT1] Green	Lit	Unlit	Unlit		Lit
Indicator [OUT2] Yellow	Unlit	Lit	Lit		Unlit

Part: Acts ON or OFF.

Shinho

8.6 Heating/Cooling action drawings [Option DR, DS or DA] (only for PC-935 type)

Control output (OUT1): Heating (Reverse) action, Control output (OUT2): Cooling (Direct) action

		Control output OUT1, P-band	Control output OUT2, P-band	
Control action	ON			
	0FF	Z Set) tting	
Control output (OUT1, line ———	—)		
Relay contact output	H (4) ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	H 4 C 5 C 5 C (*1)	Н @ С 5 L 6	
Non-contact voltage output	5 + 12Vdc 6	(*1)	(5)	
Current output	5 + 20mAdc 6	5 + 20 to 4mAdc 6 (*2)	⑤ + 4mAdc ⑥	
Indicator				
[OUT1] Green	Lit			Unlit
Control output	(OUT2, line)		
Relay contact output		ه_ وا	⑦ 8 (*1)	© 8
Non-contact voltage output		⑦+ oVdc ⑧	⑦+ 0/12Vdc ⑧ (*1)	⑦+ 12Vdc ⑧
Current output		7 + 4mAdc 8	7 + 4 to 20mAdc 8 (*2)	⑦ + 20mAdc ⑧
Indicator [OUT2] Yellow	Unlit			Lit

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Control output (OUT1): Cooling (Direct) action, Control output (OUT2): Heating (Reverse) action

		Control output OUT2, P-band	Control output OUT1, P-band	
Control action	ON			
	OFF	Z Se	L tting	
Control outpu	t (OUT1, line –)		
Relay contact output		H @ C ⑤ L ⑥ 이	H 4 C 5 L 6 (*1)	H @ C ⑤ L ⑥
Non-contact voltage output		5 + 0Vdc 6	5 + 0/12Vdc 6 (*1)	5 + 12Vdc 6
Current output		5	5 + 4 to 20mAdc 6 (*2)	⑤ + 20mAdc ⑥ –
Indicator				
[OUT1] Green	Unlit			Lit
Control outpu	it (OUT2, line)		
Relay contact output	⊘ 8	⑦ ⑧ (*1)	رکسی ا ۱	
Non-contact voltage output	⑦+ 12Vdc ⑧	7 + 12/0Vdc 8 - (*1)	⑦ + oVdc ⑧	
Current output	⑦ + 20mAdc ⑧	7 + 20 to 4 mAdc 8 (*2)	⑦ + 4mAdc ⑧	
Indicator				
[OUT2] Yellow	Lit			Unlit

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

Shinko

When setting Dead band

Action	Control output (OUT1)			Cont	rol output (C	OUT2)
Control action	ON OFF	Proportional band	Dead b	and >	Proportional band	ON OFF
Relay contact output	H 4 C 5 L 6	H 4 C 5 L 6 (*1)	H 4 C 5 L 6	@] 	⑦ ⑧ (*1)	⊘ ⊛
Non-cotact voltage output	5	(5)	(5)	7	7 + 0/12Vdc 8 (*1)	7 + 12Vdc 8
Current output	5 + 20mAdc 6	5 + 20 to 4 mAdc 6 (*2)	5 + 4mAdc 6	7 + 4mAdc 8	7 + 4 to 20mAdc 8 (*2)	7 + 20mAdc 8 – –
Indicator						
[OUT1] Green	Lit					Unlit
Indicator						
[OUT2] Yellow	Unlit					Lit

part: Acts ON or OFF.

(*1) Cycle action is performed according to deviation.

(*2) Changes continuously according to deviation.

When setting the Overlap band with Relay contact output

	Control out	out (OUT1) proportior	nal band	
		Control output (C	UT2) proportional band	
Control action	ON	Overlap band		ON
	OFF			OFF
		Setting		
Relay contact	H4 I	Н4)—а	Н4)—	
output			c5	
(OUT1)]		LG		
		(*1)		
Indicator				
[OUT1] Green	Lit			Unlit
Relay contact			⑦—	
output			8	
[Control output (OUT2)]		(*1)	, C	
Indicator				
[OUT2] Yellow	Unlit			Lit

Part: Acts ON or OFF. (*1) Cycle action is performed according to deviation.

Shinho

8.7 Action drawing when setting Open/Closed output dead band (only for PC-955)



8.8 Pattern end action drawing



Pattern end output is turned ON when the Program control is finished.

Pattern end output is not cancelled until the MODE

key is pressed.



8.9 Alarm 1 to 4 action drawings

• Standby function works at [] part.

• A and h shows the action point of the alarm output.

• Output terminals for Alarm 2: 7 – 8 (only for PC-935) Alarm 3: 9 – 30, Alarm 4: 8 – 30

Shinho



• Standby function works at [] part.

• A and shows the action point of the alarm output.

• Output terminals for Alarm 2: 7 – 8 (only for PC-935) Alarm 3: 9 – 30, Alarm 4: 8 – 30

9. Other functions

Burnout alarm

When the thermocouple or RTD is burnt out or the input value reaches [Rated scale maximum value +1% of rated scale span] or greater, PV display blinks [---] and it makes the control output off. With the input RTD Pt100 (F) or DC, the rated scale maximum value is 999.9 or 9999, if the input value is greater than the maximum value, PV display blinks [---], however, the control is performed to rated scale maximum value +1% of rated scale span.

When the input value falls [Rated scale minimum value -1% of rated scale span] or less, PV display blinks [____] and it makes the control output off.

With the input Thermocouple T, RTD or DC, the rated scale minimum value is -199.9 or -1999, if the input value is less than the minimum value, PV display blinks [____], however, the control is performed to rated scale minimum value -1% of rated scale span.

Self-diagnostic

It watches the CPU by watchdog timer, and when abnormal status on the CPU has been found, it makes the controller warm-up status.

Automatic cold junction temperature compensation (Thermocouple input type)

It detects the temperature at the connecting terminal between thermocouple and instrument, and always makes it the same status at which the reference junction is located at 0° [32F].

Warm-up indication

For approximately 2s after the power supplied to the instrument is turned on, the type of input and the unit are indicated on the PV display, and the maximum input rated value (in case of DC input, scaling high limit value) on the SV/MV/TIME display.

10. Specifications 10.1 Standard specifications	
Name	: Digital Programmable Controller (PC-935 type) ON/OFF servo Digital Programmable Controller (PC-955 type)
Mounting method	: Flush
Setting	: Input system using membrane sheet key
Display	
PV display	: Red LED display 4 digits, size 14.3(H) x 8(W)mm
SV/MV/TIME display	: Green LED display 4 digits, size 10(H) x 5.5(W)mm
Pattern No. display	: Yellow LED display 1 digit, size 8(H) x 4(W)mm
Step No. display	: Green LED display 1 digit, size 8(H) x 4(W)mm
Input	
Thermocouple	: K, J, R, S, B, E, T [JIS, IEC], C (W/Re5-26) [ASTM], N (IEC) and PL-II (NBS) External resistance, 100 ^o or less
	When input burnout, Upscale
RTD	: Pt100 (JIS, IEC), JPt100 3-wire system
	Allowable input lead wire resistance, 10Ω or less per wire
	When input burnout, Upscale
Current	: 0 to 20mAdc, 4 to 20mAdc
	Input impedance, 50 Ω
	When input burnout, 0 to 20mA, the same as 0mA 4 to 20mA, Downscale
Voltage	: 0 to 1Vdc
	Input impedance, $1M\Omega$ or greater
	Allowable input voltage, 5V or less
	Allowable signal source resistance, 2k [®] or less
	When input burnout, Upscale
Input sampling period	: 0.125 seconds
Indicating or Setting acc	uracy
I hermocouple input	: Within $\pm 0.2\%$ of input range full scale ± 1 digit, however, for R or S input, range 0 to 200°C (400°F), within $\pm 4°C$ (8°F). When B input, range 0 to 300°C (600°F), without the range of accuracy guarantee.
	In case of K, J or T input, for less than 0°C (32°F),
	within \pm 0.4% of input range full scale \pm 1digit
	(Cold junction compensating accuracy, $\pm 1^{\circ}$, at 0 to 50°C)
RTD input	: Within $\pm 0.2\%$ of input range full scale ± 1 digit
Current input	: Within $\pm 0.2\%$ of input range full scale ± 1 digit
	: Within $\pm 0.2\%$ of input range full scale ± 1 digit
Time indicating accuracy	: Within $\pm 0.1\%$ of setting time
	$+1a1b$ (for DC 055 type 1a $\times 2$)
Relay contact	Control capacity, 250Vac 3A (resistive load) 250Vac 1A (inductive load cosØ=0.4)
Non-contact voltage	: for SSR drive
	12 ⁺² ₀ Vdc Maximum 40mAdc (short circuit protected)
Current	: 4 to 20mAdc (Isolated type) Load resistance, maximum 550 Ω

Alarm 1 (A1), 3 (A3) and 4 (A4) output

Deviation setting by \pm to main setting (excepting Process value alarm), and when the input exceeds the range the output turns ON or OFF (in case of High/Low range alarm).

Alarm action can be selected by internal switch or key operation.

• No alarm:

 High limit alarm (Deviation setting) 	: \pm input range span* (Off when set to 0)
 Low limit alarm (Deviation setting) 	: \pm input range span* (Off when set to 0)
 High/Low limits alarm (Deviation setting) 	: 0 to input range span* (Off when set to 0)
• High/Low limit range alarm (Deviation setting): 0 to input range span* (Off when set to 0)
 Process high alarm 	: input range minimum to input range maximum
 Process low alarm 	: input range minimum to input range maximum

*: For DC input, input range scaling span.

Standby function: Selectable

Setting accuracy : Within $\pm 0.2\%$ of input range full scale ± 1 digit

: ON/OFF action Action

Hysteresis setting range:

When thermocouple or RTD input, 0.1 to 100.0°C (F)

When DC input, 1 to 1000 (Decimal point place follows the selection.)

Output

: Relay contact 1a (In case of [A3] or [A4], 1a x 2) Control capacity 250Vac 3A (resistive load) 250Vac 1A (inductive load $\cos \phi = 0.4$) (However, A3 and A4 common terminal, Maximum 3A)

Controlling action

One of the actions Fuzzy overshoot suppressing PID action (with auto-tuning function) or PID action (with auto-tuning function) is selectable by DIP switch.

Fuzzy overshoot suppressing PID action or PID action (with auto-tuning function)

Proportional band (P)	: 0.0 to 999.9% (Setting the value to 0.0 causes the instrument to act as
	an ON/OFF controller.)
Integral time (I)	: 0 to 3600 sec (Setting the value to 0 disables the function.)
Derivative time (D)	: 0 to 1800 sec (Setting the value to 0 disables the function.)
Proportional cycle	: 1 to 120 sec (Unavailable for the Current output type,)
Anti-reset windup (ARW)	: 0 to 100%
Output limiter	: 0 to 100% (In case of Current output, -5 to 105%)
Open output time setting	: 0.1 to 999.9s (For PC-955 type)
Closed output time setting	g: 0.1 to 999.9s (For PC-955 type)
Hysteresis setting range	: When thermocouple or RTD input, 0.1 to 100.0°C (下)
	When DC input, 1 to 1000 (Decimal point place follows the selection.)
Supply voltage	:100 to 240Vac, 50/60Hz, 24Vac/dc, 50/60Hz (Specified)
Anowable voltage internation	In case of 24Vac/dc 20 to 28Vac/dc
Ambient temperature	: 0 to 50°C(32 to 122°F)
Ambient humidity	: 35 to 85%RH (non-condensing)
Power consumption	: Approx. 15VA

Circuit insulation configuration

[PC-935]



- (*1) In case both Control output (OUT1) and Control output (OUT2) are Current output type or Non-contact voltage output type, between A-B is non-isolated.
- (*2) In case Control output (OUT1) is Current output type or Non-contact voltage output type, between A-C, A-D, A-E are non-isolated.

In case Control output (OUT2) is Current output type or Non-contact voltage output type, between B-C, B-D, B-E are non-isolated.

Insulation resistance

10M^Q or greater at 500Vdc

Insulation test **must not** be carried out,

between A-B in case of Circuit insulation configuration (*1),

between A-C, A-D, A-E, B-C, B-D, B-E, in case of (*2),

C-D-E and F-G because they are non-isolated.


Circuit insulation configuration

[PC-955]



Insulation resistance

10M^Ω or greater at 500Vdc

Insulation test must not be carried out,

A-B-C and D-E because they are non-isolated.

Dielectric strength

Between input terminal and ground terminal, 1.5kVac for 1 minute Between input terminal and power terminal, 1.5kVac for 1 minute Between power terminal and ground terminal, 1.5kVac for 1 minute Between output terminal and ground terminal, 1.5kVac for 1 minute Between output terminal and power terminal, 1.5kVac for 1 minute

Weight	: Approx. 500g		
External dimension	: 96 x 96 x 110mm (W x	(H x D)	
Material	: Base and Case, Flame resisting resin		
Color	: Base and Case, Light gray		
Attached functions	s : Setting value lock, Setting value limit, Sensor correction,		
	Multi-range, Multi-fund	ction, Alarm action delayed timer, Warm-up display,	
	Wait, Hold, Advance,	Back advance, Repeat, Link, Time fast progressing,	
	Data clear, Pattern number external selection, External operation,		
	Power failure compensation, Fixed value control, Self-diagnosis,		
	Automatic cold junctic	on temperature compensation, Sensor burnout	
	function [upscale, downscale] and PV start.		
Accessories	: Mounting bracket	1 set	
	Instruction manual	1 сору	
	Unit nameplate	1 sheet	
	Terminal cover	2 pieces [When option [TC] is applied.]	
	Gasket	1 piece [When option [IP] is applied.]	



10.2 Optional specifications

Alarm output [A2] (only PC-935 type)

Deviation setting by \pm to main setting (excepting Process value alarm), and when the input exceeds the range the output turns ON or OFF (in case of High/Low range alarm).

Alarm action can be selected by internal switch.

When the option Alarm 2 output (A2) and Loop break alarm output (LA) are applied together, the output terminal is common.

Alarm 2 output (option code: A2) is not available with a combination of Heating/Cooling control output (option code: DR, DS or DA).

No alarm action

 High limit alarm (Deviation setting) 	: \pm input range span* (Off when set to 0)
 Low limit alarm (Deviation setting) 	: \pm input range span* (Off when set to 0)
 High/Low limits alarm (Deviation setting) 	: 0 to input range span* (Off when set to 0)
• High/Low limit range alarm (Deviation setting): 0 to input range span* (Off when set to 0)
 Process high alarm 	: input range minimum to input range maximum
 Process low alarm 	: input range minimum to input range maximum

*: For DC input, input range scaling span.

Standby function: Selectable

Setting accuracy: Within \pm 0.2% of input range full scale \pm 1digit

Action : ON/OFF action

Hysteresis setting range:

When thermocouple or RTD input, 0.1 to 100.0°C (F)

When DC input, 1 to 1000 (Decimal point place follows the selection.)

Output

: Relay contact 1a Control capacity 250Vac 3A (resistive load)

250Vac 1A (inductive load cos∅=0.4)

Loop break alarm output [LA]

It detects the breaking status on the loop such as heater burnout, sensor burnout or the operation end trouble.

When Loop break alarm output (LA) and Alarm 2 output (A2) are applied together, the output terminal is common.

Loop break alarm output (LA) is not available with a combination of Heating/Cooling control output (DR, DS or DA).

In case of PC-955 type, relay contact output is not available. (However, the LA indicator lights.) Setting range: Loop break alarm time setting, 0 to 200 minutes

Loop break alarm span setting, When TC (excepting T) or RTD input, 0 to 100℃(下) 0.0 to 100.0℃(下) (with decimal point)

When DC input, 1 to 1000 (Decimal point) place follows the setting.)

Output : Relay contact 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load, $\cos \emptyset = 0.4$)



Heating/Cooling control output [DR, DS or DA] (only PC-935 type)

Heating/Coo alarm output	oling contro t.	I output is not available with a combination of Alarm 2 output or Loop break
The specific	ations of h	eating side are the same as Main control.
Cooling side	proportion	al band : Multiplying factor to the control output (OUT1) proportional band is
U		0.0 to 10.0.
		(ON/OFF action when set to 0.0)
Cooling side	e integral tir	ne : Integral time of control output (OUT1)
Cooling side	derivative	time : Derivative time of control output (OUT1)
Cooling side	proportion	al cycle: 1 to 120sec. (Unavailable to the DC current output type.)
Overlap ban	d/Dead ba	nd setting range:
• •		\pm Heating proportional band value converted
Action : ON/OFF action		
Hysteresis : When thermocouple or RTD input, 0.1 to 100.0°C(F)		
When DC input, 1 to 1000 (Decimal point place follows the selection.)		
Cooling action	on mode se	election function:
		Air cooling Linear characteristic
		Oil cooling1.5th power of linear characteristic
		Water cooling2nd power of linear characteristic
Output [I	DR] Rela	y contact 1a
	-	Control capacity 250Vac 3A (resistive load)
		250Vac 1A (inductive load cosø=0.4)
[[[DS] Non-contact voltage (for SSR drive)	
		12 ⁺² ₀ Vdc Maximum 40mAdc (short circuit protected)
[[DA] Curre	ent
		4 to 20mAdc (Isolation type)
		Load resistance, Maximum 55012

Transmission output [TA or TV]

Any one of transmissions, Process variable, Main setting value or Main output manipulating value, is output in current or voltage, converting the value to analog signal every 0.125 seconds.

Transmitting parameter: PV, SV, MV (Selectable by key)

Resolution	: 1/10000		
Current (TA)	: 4 to 20mAdc	(load resistance,	maximum 500 Ω)
Voltage (TV)	: 0 to 1Vdc	(load resistance,	minimum 100k ₂)
Output accuracy	: Within $\pm 0.3\%$	of full scale	



Serial communication [C or C5]

Following operations can be executed from the external computer.

- Reading and setting of the Main setting value, PID value and various setting values.
- Reading of the input value and the action status.
- Change of the functions.

Data format

Communication circuit : Based on EIA RS-485 [Option code: C5] or

Based on EIA RS-232C [Option code: C]

The number of units to be connected: RS-232C-----I unit (Unable to connect in parallel) RS-485----- maximum 31 units (for PC-900) Communication method : Half-duplex communication start-stop synchronous Data transfer rate : 2400, 4800, 9600 and 19200bps (selectable by key operation)

> Start bit: 1 Data bit : 7 Parity : Even parity Stop bit: 1

Setting value digital transmission [SVTC]

If this option is designated adding the option C5 (RS-485), the main setting value can be transmitted in digital when combined with FCD or FCR applied the option C5.



Maximum 31 FCD (FCR)

[Fig. 10.2-1]



Time signal output [TS]

Time signal block number (Block number that the OFF time and ON time of the signal were set) can be set to each step.

Maximum 8 channels per step can be output.

The time signal output is changeable to status output as shown below.

Time signal output TS1 🔿 RUN

Time signal output TS2

Time signal output TS3

Time signal output TS4 📑 FAST

Time signal output TS5

Number of circuit : 8 Output : Open collector, Capacity 24Vdc maximum 50mA

Color black [BK]

Front panel	: Dark gray
Case	: Black

Terminal cover [TC]

Electrical shock protecting terminal cover

Dust-proof • Drip-proof [IP]

Drip-proof and Dust-proof specification (IP54)

- Effective to only panel surface, case part is excluded. It is recommended to use Front cover (soft type, sold separately) to strengthen the Dust-proof and Drip-proof function.
- To protect the controller from water leak between control panel and controller, make notes of the following items.
 - ① The panel cutout dimension should be proper and no burrs.
 - ② The control panel surface to be mounted should be vertical.



Specified specifications

[Fig. 10.2-2]

- Input range : Shipped as specified range.
- Alarm action : Shipped as specified alarm action. (e.g. A1, A2, A3, A4)
- Cooling action mode: Shipped as specified action mode. (e.g. for the option DR, DS or DA)
- Transmission output: Shipped as specified output. (e.g. for the option TA or TV)

11. When troubled

When troubled, refer to the following items after checking the power and the wiring.

/ Warning

Turn the power supplied to the instrument OFF before wiring or checking. If working or touching the terminal with the power ON status, there is a possibility of Electric Shock which can cause severe injury or death.

Moreover, the instrument must be grounded before the power supplied to the instrument is turned on.

[Indication]

• Phenomenon: PV display blinks [= = =].

Presumed cause	Action
Thermocouple or RTD burnout	• Exchange the Thermocouple or RTD.
	[In case of Thermocouple]
	If the input terminal of the instrument is shorted,
	and if nearby room temperature is indicated, the
	instrument should be normal and sensor may be
	broken.
	[In case of RTD]
	If approx. 100^{Ω} of resistance is connected to the
	Input terminal between A-B of the instrument and
	between B-B is shorted, and if nearby 0°C(°F) is
	indicated, the instrument should be normal,
	and sensor may be broken.
 Lead wire of thermocouple or RTD is not 	 Surely connect the lead wire.
surely mounted.	

• Phenomenon: PV display blinks [____].

Presumed cause	Action
Codes (A, B, B) of RTD does not agree with	Connect the wire properly.
the instrument terminal.	
 Polarity of thermocouple or compensation lead 	 Connect the wire properly.
wire is reverse.	

• Phenomenon: Indication on PV display is abnormal or unstable.

Presumed cause	Action
Designation of the Sensor input is improper.	 Set the Sensor input properly by Rotary switch
	and DIP switch. (page 11)
 The temperature unit ([*] or [*]F) is mistaken. 	 Set the unit properly by DIP switch. (page 10)
 Sensor correcting value is unsuitable. 	 Set the value suitably. (page 61)



Presumed cause	Action
Specification of Thermocouple or RTD is improper	Make the specification properly, the sensor to the instrument or the instrument to the sensor
AC leaks into thermocouple or RTD circuit.	Use isolated type of thermocouple.
There is an apparatus to send out inductive	• Keep the instrument away from the apparatus
interference or noise near the controller.	which sends out inductive interference or noise.

[Key operation]

• Phenomenon: Main setting value, PID values, Proportional cycle value and Alarm 1 to 4 cannot be set. (Values cannot be changed by the read or read key.)

Presumed cause	Action
 Setting value lock is designated. 	 Release the lock designation. (page 67)
 During PID auto-tuning. 	 Cancel the tuning if necessary. (page 89)

• Phenomenon: Even if the or key is pressed, the setting indication does not change over or under in the rated scale range, therefore the settings are impossible.

Presumed cause	Action
 Main setting value high limit or low limit may be 	 Set the limit value again to appropriate value.
set at the point the value cannot be changed.	(page 55)

• Phenomenon: Program does not start even if the **East** key is pressed in Program mode.

Presumed cause	Action
• External operation STOP is working.	• Open the terminal between $@$ and $@$. (page 83)

• Phenomenon: Program is finished in a moment.

Presumed cause	Action
Step time is not set.	Set the step time. (page 22)

• Phenomenon: Step does not move.

Presumed cause	Action	
Status is in HOLD.	 Press the way to perform the program 	
WAIT action is working.	 control again. (page 83) Press the or water water and the second sec	
	function. (page 34, 84)	



[Control]

• Phenomenon: Process variable (PV) does not rise.

Presumed cause	Action
 Thermocouple or RTD burnout 	 Exchange the Thermocouple or RTD.
 Thermocouple or RTD is not surely mounted 	 Surely mount (insert) the Thermocouple or RTD
(inserted) to the control object.	to the control object.

• Phenomenon: Process variable (PV) rises too much.

Presumed cause	Action	
Specification of the Thermocouple or RTD is	Make the specification properly, the sensor to the	
improper.	instrument or the instrument to the sensor.	

• Phenomenon: Fixed value control is not performed.

Presumed cause	Action	
Program mode is selected.	Change the mode to Fixed value control.	
	(page 85)	

• Phenomenon: Output is kept its ON status.

Presumed cause	Action
Control output (OUT1) low limit value or Control	 Set the value appropriately. (page 49, 51)
output (OUT2) low limit value is set to 100% or	
greater in the Block setting mode (Output block).	

• Phenomenon: Output is kept its OFF status.

Presumed cause	Action
 Control output (OUT1) high limit value or Control output (OUT2) high limit value is set to 0% or 	 Set the value appropriately. (page 49, 51)
less in the Block setting mode (Output block).	

If happened unclear phenomenon other than above mentioned, make inquiries about the matters at our agency or your shop where purchased.

12. Initial values

[program control]

• Pattern setting mode [P[.n .]

PV	Setting item	Initial value	Memo
display		(SV, MV, TIME display)	Monto
PEn	Pattern number selection	0	
EEAP.	Step temperature setting	0°C	
F1 68	Step time setting	00.00 min	
_PLd	PID block number setting	0	
_FS1	Time signal 1 block number	0	
_652	Time signal 2 block number	0	
_653	Time signal 3 block number	0	
_F54	Time signal 4 block number	0	
_645	Time signal 5 block number	0	
_545	Time signal 6 block number	0	
_657	Time signal 7 block number	0	
_558	Time signal 8 block number	0	
_ JAC	Wait block number	0	
_ BL ō	Alarm block number	0	
_ oUF	Output block number	0	

• Block setting mode [PRc.と.]

PO_P	Proportional band (OUT1)	2.5%	
P0_1	Integral time	200sec	
P0_0	Derivative time	50sec	
P0_0	Anti-reset windup	50%	
РОРЬ	Proportional band (OUT2)	1.0 (Multiplying factor)	

* Time signal block [f.... $\Omega\Omega$] (In case of the Time signal block number 0)

			·
00_F	Time signal output OFF time	00.00 min	
00_0	Time signal output ON time	00.00 min	

<i>30</i> -	Wait value setting	0°C	

* Alarm block [\square _. \square \square] (In case of the Alarm block number 0)

80_ I	Alarm 1 (A1) action point	0°C	
80_2	Alarm 2 (A2) action point	0°C	
80_3	Alarm 3 (A3) action point	0°C	
80_4	Alarm 4 (A4) action point	0°C	

* Output block [a...aa] (In case of the Output block number 0)

PV display	Setting item	Initial value (SV, MV, TIME display)	Memo
o0_H	Control output (OUT1) high limit	100%	
o0_L	Control output (OUT1) low limit	0%	
о ОНЬ	Control output (OUT2) high limit	100%	
оOLЬ	Control output (OUT2) low limit	0%	
oOcL	Changing rate limit (OUT1)	0%	

• Number of repeat, Pattern link designation mode [$\sub H^{\prime}$. \sub]

r EPF	Number of repeat (Pattern No. 0)	0	
c HL o	Pattern link (Pattern No. 0 and 1)	= = = =: No link	

• PID auto-tuning performing mode [Rf. . .]

8C S	Auto-tuning action	مەمةد: Normal mode	
RГ	Auto-tuning Performance/Cancellation	: Cancellation	

• Attached function setting mode [⊂.ɑ∩d]

* Alarm parameter setting mode [AL.A .]

RL 3F	Alarm 3 (A3) action form	H: High limit alarm	
RL YE	Alarm 4 (A4) action form	L: Low limit alarm	
R IHY	Alarm 1 (A1) hysteresis	1.0°C	
R5H7	Alarm 2 (A2) hysteresis	1.0°C	
<i>ВЭНУ</i>	Alarm 3 (A3) hysteresis	1.0°C	
ЯЧНУ	Alarm 4 (A4) hysteresis	1.0°C	
R 189	Alarm 1 (A1) delayed timer	0 sec	
R59A	Alarm 2 (A2) delayed timer	0 sec	
R339	Alarm 3 (A3) delayed timer	0 sec	
ЯЧЈУ	Alarm 4 (A4) delayed timer	0 sec	
LP_F	Loop break alarm time	0 min	
LP_H	Loop break alarm span	0°C	

PV display	Setting item (SV, MV, TIME displa		Memo
C	Proportional cycle (OUT1)	R/M: 30 sec, S/M: 3 sec	
НУЧ	ON/OFF action hysteresis (OUT1)	1.0°C	
c_b	Proportional cycle (OUT2)	DR: 30 sec, DS: 3 sec	
cRcL	Cooling action selection (OUT2)	🕮 🖃 Air cooling	
H955	ON/OFF action hysteresis (OUT2)	1.0°C	
dЪ	Overlap band/Dead band setting	0.0%	
P_db	Open/Closed output dead band	3.0%	
Pof	Open output time setting	30 sec	
PcF	Closed output time setting	30 sec	

* Main setting value limit setting mode [LI.r]

5H	Main setting value high limit	1370°C	
56	Main setting value low limit	-200°C	

* Transmission output parameter setting mode [f.r.a .]

Froh	Transmission output	PH: PV	
$\int r = L H$	Transmission output high limit	1370°C	
[-LL	Transmission output low limit	-200°C	

* Input parameter setting mode [f. .]

SELH	Scaling high limit	9999	
SELL	Scaling low limit	-1999	
dΡ	Decimal point place	. : No decimal point	
50	Sensor correction	0.0℃	
FILE	PV filter time constant	0.0 sec	

* Communication parameter setting mode [c.a.a.a]

cāhP	Communication transfer rate	95: 9600bps	
cñno	Instrument number	0	
cāh	Communication mode	oooL: Serial	
		communication	

PV		Initial value	N 4
display	Setting item	(SV, MV, TIME display)	Memo
Lock	Setting value lock selection	: Lock cancelled	
5_58	Step temperature setting value when program	0.0°C	
	control start		
5-56	Program control starting system	PB: PV start	
PrEL	Status after power failure restored selection	conf: Continuation	
ō_5	Step time unit selection	من م: Minute	
5_£ā	Step time indicating method	ー「: Remaining time	
5_68	Step temperature indication	∀alue	
		corresponds to time progress	
PELā	Pattern end output time setting	0 sec	
PEH	Step temperature setting value holding function when	רם₽: Stop	
	Program completed		
FS 15	Time signal 1 output or Status output (RUN) selection	「与: Time signal 1	
1424	Time signal 2 output or Status output (HOLD) selection	「 与: Time signal 2	
F 5 3 5	Time signal 3 output or Status output (WAIT) selection	「 与: Time signal 3	
1545	Time signal 4 output or Status output (FAST) selection	「ㄣ: Time signal 4	
1454	Time signal 5 output or Status output (STOP) selection	└ ५: Time signal 5	
oSF	Overshoot suppression factor	1.0	
EoUF	Output selection when the input burnout	oFF: Makes the control	
		output OFF	

* Other function setting mode [α [β .E.-.]

• Automatic/Manual control changing mode [売吊っ比]

ō8nU	Automatic/Manual control change	RUF o: Automatic	

[Fixed value control]

• Fixed value control parameter setting mode [F.I. 🗄 .]

 * Main setting value (SV) setting mode [□ . . .]

 □
 Main setting value (SV) setting

 0°C

* PID parameter setting mode [PI.d .]

ρ	Proportional band (OUT1)	2.5%	
1	Integral time	200 sec	
9	Derivative time	50 sec	
Π	Anti-reset windup	50%	
РЬ	Proportional band (OUT2)	1.0 (multiplying factor)	

* Alarm action point setting mode [eal . . .]

81	Alarm 1 action point setting	0°C	
<i>82</i>	Alarm 2 action point setting	0°C	
83	Alarm 3 action point setting	0°C	
ЯЧ	Alarm 4 action point setting	0°C	

• PID auto-tuning performing mode [Rf. . .]

PV display	Setting item	Initial value (SV, MV, TIME display)	Memo
865	Auto-tuning action	مەمةد: Normal mode	
Яſ	Auto-tuning performance/cancellation	= = = =: Cancellation	

• Attached function setting mode [c.and]

* Alarm parameter setting mode [서도고 .]		
RL 3F	Alarm 3 (A3) action form	∺: High limit alarm
RL YF	Alarm 4 (A4) action form	L : Low limit alarm
R IHY	Alarm 1 (A1) hysteresis	1.0°C
RSHA	Alarm 2 (A2) hysteresis	1.0°C
ЯЗНУ	Alarm 3 (A3) hysteresis	1.0°C
ЯЧНУ	Alarm 4 (A4) hysteresis	1.0°C
R 189	Alarm 1 (A1) delayed timer	0 sec
8297	Alarm 2 (A2) delayed timer	0 sec
8338	Alarm 3 (A3) delayed timer	0 sec
8439	Alarm 4 (A4) delayed timer	0 sec
LP_F	Loop break alarm time	0 min
LP_H	Loop break alarm span	0°C

* Output parameter setting mode [aLIF. .]

C	Proportional cycle (OUT1)	R/M: 30 sec, S/M: 3 sec
oLH	Control output (OUT1) high limit	100%
oll	Control output (OUT1) low limit	0%
H95	ON/OFF action hysteresis (OUT1)	1.0°C
orBC	Changing rate limit (OUT1)	0%
c_b	Proportional cycle (OUT2)	DR: 30 sec, DS: 3 sec
cRcf	Cooling action selection (OUT2)	위 ㄷ: Air cooling
оLНЬ	Control output (OUT2) high limit	100%
ollb	Control output (OUT2) low limit	0%
НУЧЬ	ON/OFF action hysteresis (OUT2)	1.0°C
db	Overlap band/Dead band setting	0.0%
P_db	Open/Closed output dead band	3.0%
Pof	Open output time setting	30 sec
Pcf	Closed output time setting	30 sec

* Main setting value limit setting mode [-1 , -7]

58	Main setting value high limit	1370°C	
56	Main setting value low limit	-200°C	

Shinho

* Transmission output parameter setting mode [f.r.a .]

PV display	Setting item	Initial value (SV, MV, TIME display)	Memo
Froh	Transmission output	<i>РН</i> : PV	
$\Gamma = LH$	Transmission output high limit	1370°C	
FrLL	Transmission output low limit	-200°C	

* Input parameter setting mode [1.っP. .]

SELH	Scaling high limit	9999	
SELL	Scaling low limit	-1999	
dP	Decimal point place	. : No decimal point	
50	Sensor correction	0.0°C	
FILE	PV filter time constant	0.0 sec	

* Communication parameter setting mode [c.aāā]

cāhP	Communication transfer rate	95: 9600bps	
cino	Instrument	0	
د م م	Communication mode	noāl : Serial	
		communication	

* Other function setting mode [af.E.c.]

Lock	Setting value lock selection	= = = =: Lock cancelled	
EoUF	Output selection when the input burnout	FF: Makes the control	
		output OFF	

• Automatic/Manual control changing mode [売得っ比]

Index 1 (Program control)

[Program setting mode]

Pattern number setting 22	 Time signal block number selection22
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Step time setting 22	Alarm block number selection 23
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 Control output (OUT1) 	Alarm 1 (A1) action point setting36
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 Integral time setting27 	Alarm 3 (A3) action point setting 36
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Control output (OUT2)	Output block data setting
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[Number of repeat, Pattern link setting mode]

 Number of repeat of pattern setting 42 	
Pattern link setting 42	

[PID auto-tuning performing mode]

PID auto-tuning action selection	- 90
PID auto-tuning performance/cancellation	- 91

	• • • •
Alarm parameter setting	Input parameter setting
Alarm 3 (A3) action form selection 44	 Scaling high limit value setting60
• Alarm 4 (A4) action form selection 45	 Scaling low limit value setting60
• Alarm 1 to 4 (A1 to A4) hysteresis setting 45	Decimal point place selection61
• Alarm 1 to 4 (A1 to A4) delayed timer setting -46	Sensor correction setting61
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[Auto/Manual control changing mode]

 Auto/Manual control cha 	nging 8	6
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Index 2 (Fixed value control)

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PID parameter setting	 Alarm 3 (A3) action point setting79
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Integral time setting 76	
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Anti-reset windup setting77	
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proportional band 77	

[PID auto-tuning performing mode]

 PID auto-tuning action 	selection90
--	-------------

• PID auto-tuning performance/cancellation --- 91

[Attached function setting mode]

Alarm parameter setting	Main setting value limit setting
• Alarm 3 (A3) action form selection 44	Main setting value
Alarm 4 (A4) action form selection 45	high limit setting 55
• Alarm 1 to 4 (A1 to A4) hysteresis setting45	Main setting value
• Alarm 1 to 4 (A1 to A4) delayed timer setting 46	low limit setting55
Loop break alarm time setting47	
Loop break alarm span setting47	Transmission output parameter setting
	Transmission output selection 57
Output parameter setting	 Transmission output high limit setting57
Control output (OUT1)	 Transmission output low limit setting58
• proportional cycle setting 49	
• high limit setting 49	Input parameter setting
• low limit setting 49	Scaling high limit value setting60
ON/OFF hysteresis setting 50	 Scaling low limit value setting 60
• changing rate limit setting 50	 Decimal point place selection61
Control output (OUT2)	Sensor correction setting61
• proportional cycle setting 50	PV filter time constant setting61
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	• Output selection when the input burnout73

[Auto/Manual control changing mode]

Auto/Manual control changing ------ 86

Program pattern graphing

Graph the Program pattern and make the Data sheet before setting the Program. (Refer to page 126) Copy the Program pattern sheet (Page 131) and graph the pattern by following procedure.

- Enter the temperature on vertical axis including the highest and lowest temperature to be used.
- Enter the step temperature, step time, and each block number of PID, Time signal 1 to 8, Wait, Alarm Output to be used respectively in order from step number 0.

(Enter the block number to each step even if the same number is used.)

• Plot the step temperature on the Program pattern sheet.

Explanation of Program pattern sheet

Vertical axis : Temperature (°C or °F)

Horizontal axis: Step time (Hours: Minutes or Minutes: Seconds)

- Setting value to the step temperature is the step end temperature.
- Setting value to the step time is the process time.

The relation of the Step temperature and Step time is as shown the example on the next page.

- [Step 0]: It controls the temperature so as to be 500°C by 30 minutes (0:30)
 - If SV start is selected by Program control starting system (page 67), it controls from the SV, and if PV or PVR start is selected, it controls so as to be 500°C quickly changing the SV to PV.
- [Step 1]: It controls the temperature at the fixed value 500°C for 1 hour (1:00).

(PID block)

Consists of Control output (OUT1) proportional band, Integral time, Derivative time and Control output (OUT2) proportional band (*), (10 types of block number 0 to 9 can be set)

(Time signal block)

Consists of Time signal output OFF time and Time signal output ON time setting value.

16 types of Time signal block (Block number 0 to 15) can be set to Time signal 1 to 8 (TS1 to TS8) respectively. With the Time signal 1 to 5 (TS1 to TS5), it can be set only when [Time signal output] is selected by [Time signal output/Status output section (page 70 to 72)].

(Wait block)

10 types of Wait block (Block number 0 to 9) can be set.

$\langle Alarm \ block \rangle$

Consists of Alarm 1 action point, Alarm 2 action point (only when the option A2 is added), Alarm 3 action point and Alarm 4 action point.

$\langle \text{Output block} \rangle$

Consists of Control output (OUT1) high limit, Control output (OUT1) low limit, Control output (OUT2) high limit (*), Control output (OUT2) low limit (*) and Control output (OUT1) changing rate limit. 10 types of Output block (Block number 0 to 9) can be set.

(*): Only when the option DR, DS or DA is applied.

Program pattern graphing example

Program pattern (Pattern number 0)						
Step number	`	0	1	2	3	4
	1000					
	1000					
Cotting volue						
	500					
	500					
	°C					
	0					N N
Step temperature (°	C)	500	500	1000	1000	0
Step time (h: min)		0:30	1:00	0:40	1:00	2:00
PID block number		1	1	2	2	1
		0	1	0	1	0
TS 1 block number	ON		V///////			ļ
	OFF					
		2	2	2	2	2
TS 2 block number	ON					
	OFF					
		1	2	1	2	0
TS 3 block number	ON					
	OFF					
		1	1	1	1	0
TS 4 block number	ON			V///////		
	OFF	<i>V////</i>				
		0	0	0	0	1
TS 5 block number	ON					
	OFF					
		1	0	1	0	1
TS 6 block number	ON					<i>V////</i>
	OFF					
		2	0	2	0	2
TS 7 block number	ON			<i></i>		
	OFF					
		0	0	0	0	2
TS 8 block number	ON					
	OFF					
Wait block number		1	0	1	0	0
Alarm block number	-	1	2	1	2	1
Output block numbe	er	0	1	0	1	0

Even though the step intervals are shown to be equal length on the sheet, the actual length depends on the amount of time in a step.

Data Sheet making

Copy the Data sheet (Page 129) and make the Data sheet by following procedure.

- Enter only necessary items of block data for PID, Time signal 1 to 8, Wait, Alarm and Output.
- Enter other setting items if necessary.

Data sheet making example

[PID block]

No.	Control output (OUT1) Proportional band	Integral time	Derivative time	(ARW)	Control output (OUT2) Proportional band
0	2.5%	200sec.	50sec.	50%	2.5%
1	2.0%	180sec.	30sec.	40%	2.0%
2	1.8%	80sec.	20sec.	60%	1.8%

[Time signal block (option: TS)]

$\overline{\ }$	Output OFF time	Output ON time	
No.	(hours: minutes)	(hours: minutes)	
0	0: 00	0: 00	
1	0: 20	0: 30	
2	0: 00	0: 30	

[Wait block]

No.	Wait value
0	0 (OFF)
1	10°C
2	5°C

[Alarm block]

No.	Alarm 1 (A1) action point (Pattern end output)	Alarm 2 (A2) action point (Process value alarm)	Alarm 3 (A3) action point (High limit alarm)	Alarm 4 (A4) action Point (Low limit alarm)
0		1370°C	0 (OFF)	0 (OFF)
1		1370°C	10°C	10°C
2		1370°C	5°C	5°C

[Output block]

No	Control output (OUT1) High limit	Control output (OUT1)	Control output (OUT2) High limit	Control output (OUT2)	Control output (OUT1) Changing rate limit
0	100%	0%	100%	0%	0%/sec
1	100%	10%	100%	10%	10%/sec
2	80%	0%	80%	0%	0%/sec

• Proportional cycle

- : <u>15 seconds</u>
- Number of repeat : <u>1</u>
- Pattern link
- : <u>No link</u> sfer rate : 9600bp
- Communication Transfer rate : <u>9600bps</u>
- Communication Instrument number: 1
- Overshoot suppression factor : <u>1.0</u>

[Fixed value control parameter]

- Main setting value
- Control output (OUT1) proportional band [₽
- Integral time
- Derivative time
- Anti-reset windup
- Control output (OUT2) proportional band [₽^b
- [B]• Temperature alarm (A1) setting value
- Temperature alarm (A2) setting value
- [83] • Temperature alarm (A3) setting value
- Temperature alarm (A4) setting value

]: <u>1000°C</u>

[5

[/

[d]

[[]]

-]: <u>2.0%</u>
-]: <u>180 seconds</u>
-]: 30 seconds
-]: <u>50%</u>
-]: <u>2.0%</u> (When multiplying factor 1.0)
-]: Pattern end output
- <u>[82</u>]]: 1370°C (Process value alarm)
-]: <u>10°C</u> (High limit alarm) [84]
 -]: <u>10°C</u> (Low limit alarm)

• Data sheet and Program pattern sheet

[PID block]

	Control output (OUT1)	Integral time	Dorivativo timo		Control output (OUT2)
No.	Proportional band	integral time	Derivative time	ARW	Proportional band
0	%	sec	sec	%	%
1	%	sec	sec	%	%
2	%	sec	sec	%	%
3	%	sec	sec	%	%
4	%	sec	sec	%	%
5	%	sec	sec	%	%
6	%	sec	sec	%	%
7	%	sec	sec	%	%
8	%	sec	sec	%	%
9	%	sec	sec	%	%

[Time signal block (option: TS)]

\setminus	Output OFF time	Output ON time
No.	(:)	(:)
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

[Wait block]

L	
No.	Wait value
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

[Alarm block]

\setminus	Alarm 1 (A1) action point	Alarm 2 (A2) action point	Alarm 3 (A3) action point	Alarm 4 (A4) action point
No.	()	()	()	()
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				

[Output block]

\setminus	Control output				
\backslash	(OUT1)	(OUT1)	(OUT2)	(OUT2)	(OUT1)
No.	High limit	Low limit	High limit	Low limit	Changing rate limit
0	%	%	%	%	%/sec
1	%	%	%	%	%/sec
2	%	%	%	%	%/sec
3	%	%	%	%	%/sec
4	%	%	%	%	%/sec
5	%	%	%	%	%/sec
6	%	%	%	%	%/sec
7	%	%	%	%	%/sec
8	%	%	%	%	%/sec
9	%	%	%	%	%/sec

- Proportional cycle
- Number of repeat
- Pattern link
- Communication Transfer rate
- Communication Instrument number:
- Overshoot suppression factor

[Fixed value control parameter]

- Main setting value
- Control output (OUT1) proportional band [
 □
- Integral time
- Derivative time

:____

- Anti-reset windup
- Control output (OUT2) proportional band [Pb <u>[8] I</u>
- Temperature alarm (A1) setting value
- Temperature alarm (A2) setting value
- Temperature alarm (A3) setting value
- [*R*]]: <u>[84</u> 1:

]:

]:

1:

]:

]: _

%

sec

sec

]: <u>%</u>

]: __%

]: _____

[Ъ

[/

[d]

ſΩ

[82]

• Temperature alarm (A4) setting value

Program pattern (Pattern number)					
Step number	0	1	2	3	4
Sotting value (S)()					
					I
Step temperature (°C)					
Step time (:)					
PID block number					
TS 1 block number					
ON					
OFF					
TS 2 block number ON					
OFF					
TS 3 block number ON					
OFF					
TS 4 block number ON					
OFF					
TS 5 block number					
OFF					
011					
TS 6 block number ON					
OFF					
IS / block number ON					
OFF					
TS 8 block number ON					!
OFF					
Wait block number					
Alarm block number					
Output block number					

Program pattern ((Pattern number)		
5	6	7	8	9	Step number
					Setting value (SV)
					Step temperature (°C)
					Step time (:)
					PID block number
					ON TS 1 block number OFF
					ON TS 2 block number OFF
					ON TS 3 block number OFF
					ON TS 4 block number OFF
					ON TS 5 block number OFF
					ON TS 6 block number OFF
					ON TS 7 block number OFF
					ON TS 8 block number OFF
					Wait block number
					Alarm block number Output block number



MEMO



MEMO

**** Inquiry ****

For any inquiry of this controller, after checking the following as to the controller, please contact your shop where purchased, or our agency.

- Model ----- PC-935-R/M
- Type of input ----- K
- Option ----- A2, TS
- Instrument number ----- No. x x x x x x x

In addition to the above, let us know the details of malfunction, if any, and the operating conditions specifically on job site.

For inquiry about the specification change of this products, please contact us or out agency.



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No.PC91E1 2000. 09