** Inquiry **

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

[Example]

Model PC-635-A/E
Temperature specification ..... 0 to 400°C
Kinds of input .... K
Power source voltage .... AC 110/220V

Please let us know the details of malfunction of the instrument, if any, and the operating conditions specifically on job site.
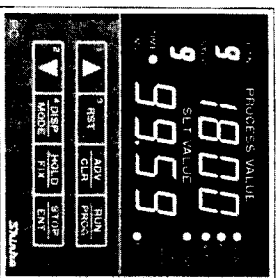
INSTRUCTION MANUAL
FOR
MICROCOMPUTER BASED PROGRAMMABLE TEMPERATURE CONTROLLER
PC-600 SERIES

Thank you for purchasing our Programmable Temperature Controller, PC-600 series. This instrument is delivered after its production and inspection on the basis of exact quality control in our factory. Further to confirmation of the model name and specifications of the instrument, peruse this instruction manual before operation. For your information, the model of this instrument is manifested on the lower side of the inner equipment.

——— Note: ———
Make sure to hand over this instruction manual to the hand of the operator who uses the instrument at site.

SHINKO TECHNOS CO., LTD.   OSAKA,   JAPAN

• • • Notes to users • • •

Before operating this controller, you should understand about following matters.

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.

< Notices >

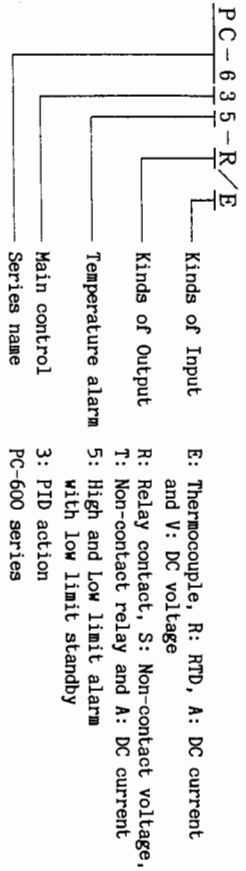• The instrument must be grounded.
• Do not operate the keys during warm-up status (for approx. 6 seconds after the power on), and do not turn the power on while the key is pressing, or the specification contents of the instrument will have possibles to change.
• Do not apply the voltage between the terminals ⑦ and ⑧ (See page 6), or there is a possibility that the transformer can be burning.

- CONTENTS -

1. EXPLANATION OF MODEL NAMES

1.1 Standard model names

P C - 6 3 5 - R / E

- Kinds of Input: E: Thermocouple, R: RTD, A: DC current and V: DC voltage
- Kinds of Output: R: Relay contact, S: Non-contact voltage, T: Non-contact relay and A: DC current
- Temperature alarm: 5: High and Low limit alarm with low limit standby
- Main control: 3: PID action
- Series name: PC-600 series

1.2 Optional specifications

Optional name	Code	Description
Step temperature setting value display	SS	Displays the Step temperature programed.
Cooling control action	CM	OFF in the range in which the input value is lower than the setting value, ON in the range higher than that.
Process value alarm setting	AA	Acts the temperature alarm set by process value.
Low limit standby not applied	LN	Low limit standby of temperature alarm not applied.
High limit standby applied	HW	High limit standby of temperature alarm is applied.
External control function	EC	Operatable various functions closing the contact (or by open collector).
Time signal output	TS	7 circuits, open collector, capacity DC 24V max. 50mA
Process variable transmitting output	PVT	Process variable (actual temperature) transmitting output DC 0 to 1V or DC 4 to 20mA.
Setting value transmitting output	SVT	Setting value transmitting output DC 4 to 20mA or DC 0 to 1V.
Serial communication interface	C	Transmits the data by EIA RS-232C.
Serial communication interface	C5	Transmits the data by EIA RS-485.
Automatic starting form	AST	After the power turned ON, starts the program at once.
PV starting form	PST	Begins the start of program at PV value.
Stop function after restored from power failure	PS	Turns to standby status after the power restored.
Hold function after restored from power failure	PRH	After restored, executes the program at the time of power failure and turns to hold status.

[Optional code indication]
Specify the optional codes mentioned above following the model names.
When two or more functions specified, delimit with comma.

Note: Following optional specifications can not be applied with each other. (i.e. Only one function in each item can respectively be applied.)
1. Process variable transmitting output (PVT) and Setting value transmitting output (SVT).
2. Automatic starting form (AST), Stop function after restored from power failure (PS) and Hold function after restored from power failure (PRH).
3. Serial communication (C) and (C5).

---

2. BEFORE USE

2.1 Unpacking
Unpack with great care not to shock the instrument.

2.2 Checking instrument and accessories
Check whether the appearance has any trouble (damage) or not.
Confirm following accessories: Mounting bracket, 1 set. Instruction manual, 1 o...

2.3 Confirmation of specifications
The model name of this instrument is manifested on the lower side of the inner equi
and the rated range is shown on the front face of the instrument. Operation flow chart 3 copies

3. MOUNTING TO CONTROL PANEL

3.1 Selection of location
Mount the controller in a location with:
(1) A minimum of dust and an absence of corrosive gases.
(2) An ambient humidity is not high.
(3) An ambient temperature is within 0°C to 55°C.
(4) No exposure to direct sunlight.
(5) Neither mechanical vibration nor shock.
(6) The controller is away from the electromagnetic switch of large capacity or wir
through which large current flows.

3.2 Panel cutout

130
130
90 +0.8 0
90 +0.8 ±1
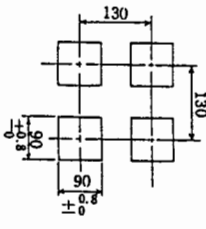
3.3 Dimensional outline drawing

96
96
6 1200
1200
14
89
137
115
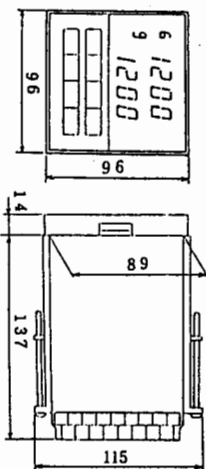
4. WIRING CONNECTION

4.1 Terminal arrangements

DC-A,-V: − / B / B / A / + | TC − + | RTD

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

PATTERN END OUTPUT ⑤ ④
AC SOURCE 220V 110V ⑧ ⑦ ⑥
GROUND ⑨

T.SIG 1 ⑩ | T.SIG 2 ⑪ | T.SIG 3 ⑫ | T.SIG 4 ⑬ | T.SIG 5 ⑭ | T.SIG 6 ⑮ | T.SIG 7 ⑯ | COM ⑰

TIME SIGNAL OUTPUT T.SIG 1~7 COM

RS-232C RS-485
⑱ TX YB
⑲ RX YA
⑳ COM COM

㉑ STOP
㉒ HOLD
㉓ ADV EXT.CONT
㉔ RUN
㉕ COM

㉟ + TRANSMIS OUTPUT
㉝ −
㉜ H HIGH ALA OUTPUT
㉛ LOW ALA OUTPUT
㉘ C MAIN OUT
㉗ L

−R/□
−S,T,A/□
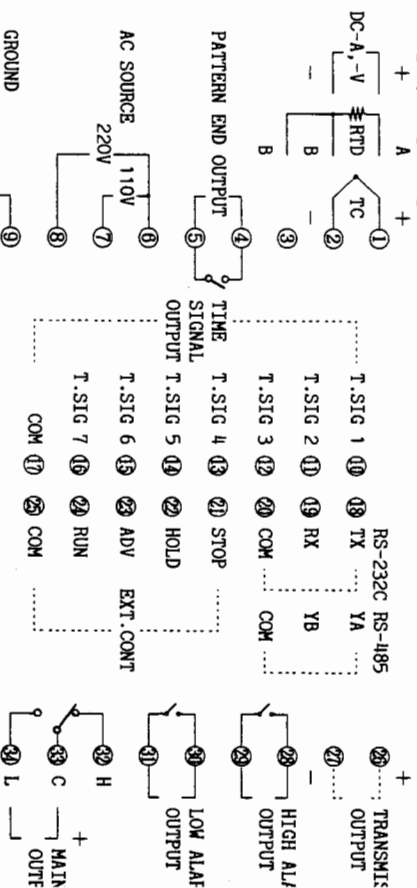
(Terminals indicated within dot line are arranged at the optional specifications, no terminals are applied if the option is not applied.)

Fig. 4.1 Terminal arrangements

4.2 Example of wiring
(1) Control output terminal

-R/[] (Relay contact)	-S/[] (Non-contact voltage)	-T/[] (Non-contact relay)	-A/[] (Current)
Relay contact to AC 220V 3A (resistive load) AC 220V 1A (inductive load cosφ=0.4)	DC 15 ±3V at load resistance 1.5kΩ. Use our SA-100 series for SSR.	Exciting current of AC electromagnetic relay should be: 20mA< Exciting <1A	DC 4 to 20mA at load resistance max.600Ω. Use our PA-200 series as trigger unit.

Fig. 4.2   Examples of wiring for control output terminals

(2) Power source for instrument and Ground terminal

Fig. 4.3   Wiring examples of power source for instrument and Ground terminal

Notes:

1. Power switch is not provided for this instrument. Therefore, both power switch and fuse (220V 2A) should be provided on the external circuit near this instrument.
2. Ground without fail, and use the wire as thick as possible.
3. With relay contact type of controller, auxiliary relay should be provided on the external of this instrument to protect the built-in relay.
4. To prevent the instrument from a bad influence owing to the unexpected level noise, it is recommended that the surge absorber be provided between the coil of the external relay.
5. For the improvement of the withstand noise, a noise filter is set between the power source circuit and ground terminal. (Leak current at AC 200V 1mA)
6. Voltage must not be applied to the terminals between ⑦ and ⑧.

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(3) Input terminal

-[]/E (Thermocouple input)	-[]/R (RTD input)
Use Thermocouple and compensating lead wire applicable to this controller. (K, J, etc.)	Use 3-wire system of RTD applicable (Pt100) to this controller.

-[]/A (DC current input)	-[]/V (DC voltage input)
Current transmitter	Voltage transmitter

Note: To avoid the influence of noise, keep input signal wire of thermocouple, RTD, DC current or DC voltage away from power source line for the instrument and the load current.

Fig. 4.4 Example wiring for input terminal
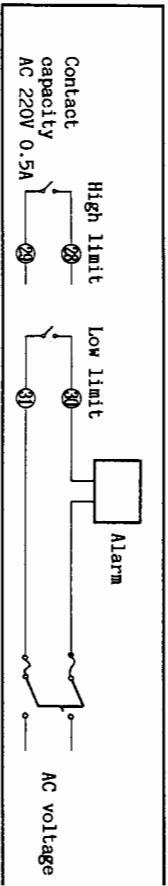
(4) Alarm output terminal

Fig. 4.5 Alarm output terminals

(5) Pattern end output terminal

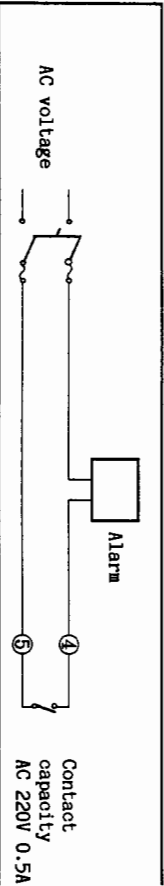Pattern end outputs when the final step of program terminated. To cancel the output, press [ ] key.

Fig. 4.6 Pattern end output terminals
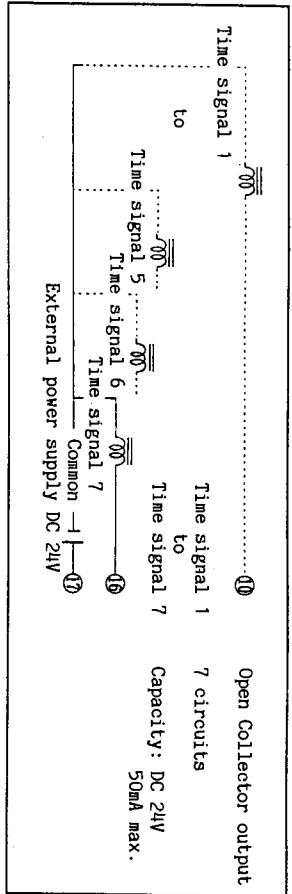
(6) Time signal output terminals (Option code: TS)

Time signal 1
to
Time signal 5
Time signal 6
Time signal 7
Common
External power supply DC 24V

Open Collector output
Time signal 1 to Time signal 7
7 circuits
Capacity: DC 24V 50mA max.

Fig. 4.7 Pattern end output terminals

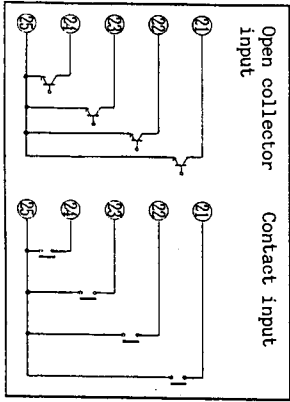(7) External operating input (Option code: EC)

Open collector input   Contact input

Fig. 4.8 External operating input

(8) External transmission output (Option code: PVT, SVT)

(9) Serial communication (Option code: C, C5)

External transmission output
Serial communication   RS-485, RS-232C

+   Receiving instrument
-
YA—TX— Personal
YB—RX— computer
COM
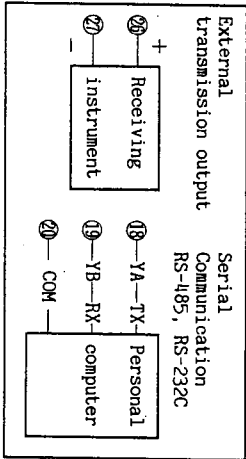
Fig. 4.9 External transmission output and Serial Communication

5. OPERATING PRINCIPLE

Input section   Output

External operation
RUN
HOLD
STOP
ADV
Isolation

Time signal, Temperature alarm
Isolation

Input
TC
RTD
DC4 to 20mA
DC to 1V
Amplifier

A/D conversion Isolation

Program pattern 10 kinds

Linear-isation

PV

PID operation

PID block 4 kinds
P.I.D.ARW
PID block 4 kinds

SV

MV

Pulse output or Current output
Conversion
Isolation

Prop. cycle variable
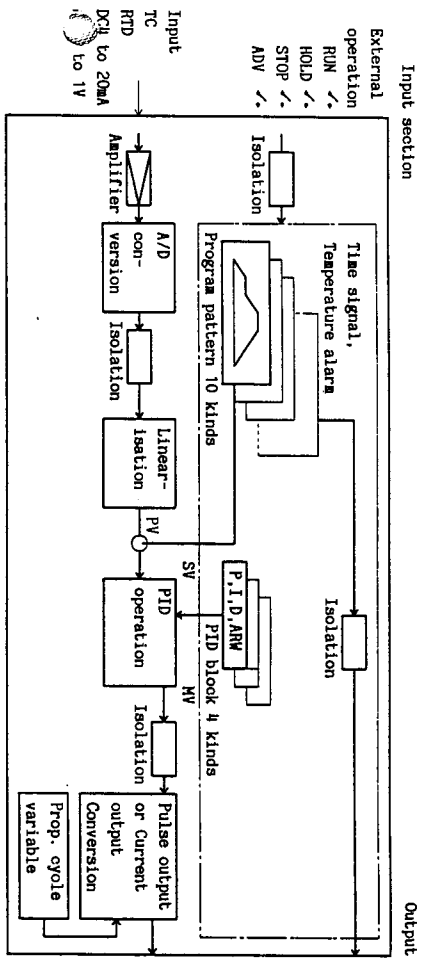
Fig. 5.1 Block diagram

Block diagram of this instrument is shown on Fig 5.1. This instrument is a digital programmable controller based on a microcomputer. This instrument can store 10 kinds of program patterns and 10 steps per pattern (total 100 steps), and it has many functions such as External operation input and Fixed value control, besides its original controlling functions. The action is: Program, such as Pattern setting or PID setting, which has been set by key operation becomes RUN situation by key operation or External operation input. Then, SV value of the specified pattern No. (operated at any time by the specified temperature and time) operated by PID together with A/D conversion and PV value linearised. The manipulating value (MV) operated by PID is converted into the switching signal or the current signal and is operated by pulse conversion circuit.

Explanation of words

Pattern   : Program composed of several steps.
Step   : Smallest unit which sets time and temperature.
PID block   : Aggregate of four parameters: P (Proportional band), I (Integral time), D (Derivative time) and ARW (Anti-reset windup).

Processing time: The rest of time on control execution.
Processing temperature   : Temperature of process performed. (Input temperature).
Wait   : The function which waits for the next step until the deviation between processing temperature and the final setting value at the end of a gradient step has been within Wait setting value. At that time, the progress of programming time is suspended.
Hold   : The function which stops processing time during execution of control.
ADV (Advance)   : It skips per step unit and carries forward a program of control.
Repeat   : It repeats the execution per pattern unit. (After the termination of all linked patterns when linked.)
Time signal   : The function which can set an optional time (OFF time and ON time) within a total time range of set pattern and can output time signal.
Temperature alarm   : It can be set to each (individual) step. Individual set for both high and low limit. The function which outputs signal when processing temperature exceeds the setting range.

6. EXPLANATION OF FUNCTION

③ Display for Process time, Manipulating value, Setting time and Setting temperature

④ Display for Process temperature and Setting mode

⑤ Run indicator
⑥ Hold indicator
⑦ PID auto-tuning indicator
⑧ Control output indicator
⑨ Alarm indicator
⑩ Fix indicator
⑪ Program indicator
⑤ Clear key [Clear key]
⑦ Program key [Run key]
⑤ Fix key [Hold key]
⑧ Entry key [Stop key]

① Pattern No. display
② Step No. display
⑫ Time indicator
⑬ Manipulating value indicator
③ Reset key
① Increase key
② Decrease key
④ Mode key [Display key]

Fig. 6.1 Explanation of Front function

Notes : (1) [ ] key is used when operation mode.
(2) The content of display is changed on the setting mode. As for the details, refer to each item.

6.1 Explanation of display function

Display	Name	Explanation of function
① 5 Red LED lights	Pattern number	Shows pattern number on Pattern number display (No.0 to 9)
② 8 Green LED lights	Step number	Shows step number on Step number display (No.0 to 9)
② 8 Green LED blinks	Wait indication	Indicates that the program control is being waiting. (Indicates on Step number display.)

Display	Name	Explanation of function
③ 8888 Green LED lights	Process time display	《In control mode, when ⑫ TIME (Red LED) lights.》 Shows the remaining time per step. (hour: minut...) (0 to 99:59)
③ 8888 Green LED lights	Manipulating value display	《In control mode, when ⑬ MV (Red LED) lights.》 Shows the value (%) of control output. 0 to 100... however, -10 to 110% for -A/D (4 to 20mA corre- spond to 0 to 100%). Shows duty factor in case of -R, S and T/D, output current in case of -A/D.
③ 8888 Green LED lights	Setting time display	《In setting mode, when setting the time.》 Shows the time setting value per step (hour: m... or proportional cycle, integral time, derivati... time. 0 to 99:59 or 0 to 3600 seconds)
③ 8888 Green LED lights	Setting temperature display	《In setting mode, when setting the temperature.》 Shows the temperature setting value per step. (On control mode, it shows the setting temperature according to each time.)
④ 8888 Red LED lights	Processing temperature display	《In control mode》 Shows the processing temperature.
④ - - - - Red LED lights	Burnout display	《In control mode》 Lights when thermocouple or RTD burnout. (Light... also when input exceeds 112.5% of rated value.)
④ 8888 Red LED blinks	Setting mode display	《In setting mode》 Shows each mode by the characters on setting mo...
⑤ RUN Red LED lights	Run indicator	Shows that the program is running.
⑥ HOLD Red LED blinks	Hold indicator	Shows that the program time is suspended.
⑦ AT Yellow LED blinks	PID auto-tuning indicator	Shows the execution of PID auto-tuning. When terminated, it turns to unlit.
⑧ CONT Green LED lights	Control output indicator	Lights when the control action (control output... ON. (However, with -A/D type, it blinks accord... to the output.)
⑨ ALM Red LED lights	Alarm indicator	Lights when Temperature alarm output ON.

Display	Name	Explanation of function
⑩ ○ FIX Red LED lights	Fix indicator	Shows the fixed value control status.
⑪ ○ PROG Red LED lights	Program indicator	Shows the program value control status.
⑫ ○ TIME Red LED lights	Time indicator	Shows that the step time remaining is being displayed.
⑬ ○ MV Red LED lights	Manipulation indicator	Shows the manipulating value status on SV value.

6.2 Explanation of key function
(1) Keys used when setting (Program keys)
It turns to setting mode by pressing keys in the order of [▲], [▼], [RST], [MODE].

	Key	Name	Explanation of function
1	[▲]	Increase key	Increases the numeric value.
2	[▼]	Decrease key	Decreases the numeric value.
3	[RST]	Reset key	Returns the setting mode to the standby mode. (Simultaneously, it registers the numeric value.)
4	[MODE]	Mode key	Switches the setting mode. (Simultaneously, it registers the numeric value.)
5	[CLR]	Clear key	Clears the program. Note: This key should be pressed 3sec. or more.
6	[FIX]	Fix key	Changes the mode to the fixed value control. (Simultaneously, it registers the numeric value.)
7	[PROG]	Program key	Changes the mode to the program control. (Simultaneously, it registers the numeric value.)
8	[ENT]	Entry key	Registers the numeric value.

---

(2) Keys used when operation

	Key	Name	Explanation of function
4	[MODE]	Display key	Switches SV display into the Setting temperature value → the Remaining step time → the Manipulating value → the Setting temperature value
5	[ADV]	Advance key	Interrupts the program step being executed and moves to the next step.
6	[FIX]	Hold key	Interrupts the program time being executed. As for control, fixed value control is executed with the value at that time.
7	[PROG]	Run key	Starts the Program or cancels the Hold.
8	[STOP]	Stop key	Stops the program being executed. Otherwise, cancels the pattern end output signal at the termination of final step of the program. This key should be pressed for 1sec. or more.

Note: Press [PROG] key to run the program, however, it starts from the beginning of the program pattern. To start the program from the middle of the pattern, or to o... the pattern end signal, press [ADV] key to advance the step.

7. FLOW OF BASIC OPERATION

[Program control]

Instrument power ON

Control execution ⇄ Standby

[Correction mode]
· Program pattern
· PID, Wait
· Prop. cycle
· Others

[Setting mode]
· Program pattern
· PID, Wait
· Prop. cycle
· Others

[Fixed value control]

Control execution ⇄ Display mode

[Setting mode]
· Main setting
· PID
· Alarm
· Others

Selection of the "Program control" and the "Fixed value control".

(1) Change the situation into setting mode by pressing key according to the order of "▲, ▼, RST, PROG.

(2)-1 The program control (when PROG lamp lighted) can be changed into the fixed value control by further pressing FIX key.

(2)-2 The fixed value control (when FIX lamp lighted) can be changed into the program control by further pressing FIX key.

When the setting lock is not designated, program can be corrected even if the control is executing. (However, the number of Repeat during control cannot be changed, although the setting value for the number of Repeat can be changed.)

---

8. HOW TO SET PROGRAM

8.1 Before key operations

Make the data before starting the setting. Arrange the data on data table to enter pattern programing on the graph table.

(1) For the graph table, put the temperature [°C] on vertical line and the time [hour: minute] on horizontal line.
(2) Plot in order from the data of step 0, and connect the plot.
(3) Enter each block No. of PID, Wait and Alarm.
(4) Enter the block No. at the position of necessary channel No. in the time signal [0 block, 16 time signal blocks and 7 circuits for channel. However, the following data abridged to make the example simply.
(Applicable to only in case the option is designated.)

* It is possible to set up to 10 steps per pattern, each 10 blocks for PID, Wait and Al

8.2 Data example
(1) Program pattern   (Example: Pattern No. 0)

Setting temperature [°C]: 150, 100, 50, 0

Step number: 0   1   2   3   4

→ Time [hour: minute]   1:00   2:00   2:30   3:00   3:30   4:00   4:40 5:00
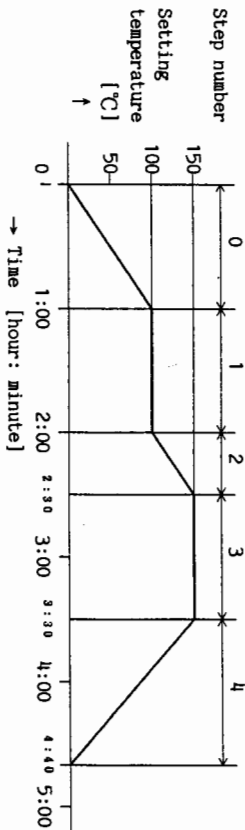
* Numeral shows block number.

Block number	0	1	2	3	4
PID	1	2	1	3	1
Wait	1	0	2	0	0
Alarm	1	2	1	3	1

Block number		0	1	2	3	4
Signal CH1	Number	20/80	0/75	0/60	30/30	0/60
Signal CH2	Number	0/0	0/60	0/0	20/20	0/75
Signal CH3	Number	0	2	0	4	3
Time signal						
∫						
Signal CH7	Number					

(2) Data table

Pattern No. 0 Step No.	Main program		Block number			Time signal						
	Step temperature	Step time [Hour:Min]	PID	Wait	Alarm	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6	CH 7
0	100 [°C]	1:00	1	2	1	5	2					
1	100	1:00	2	2	2	3	2					
2	150	0:30	1	1	2	2	0					
3	150	1:00	3	3	1	4						
4	0	1:10	1	0	1	2	3					
5												
6	When desired to reach the setting temperature(e.g. 180°C) in minimum time.											
7	180	0:00	Set the step time to 0 hour 0 minutes as 180°C, 0:00.									
8												
9												

In this example, up to step No.4 are used, and with time signal (Option) only CH1, CH2 are used.

◎ PID block setting

No.	P[%]	I[s]	D[s]	A[%]
*10	0	0	0	0
1	4.0	380	95	50
2	3.0	350	90	40
3	2.5	320	85	30

◎ Wait block setting

No.	Wait value [°C]
*20	0
1	±10
2	±5
3	0

◎ Alarm block setting

No.	H[°C]	L[°C]
*30	+max.	−min.
1	+max.	−5
2	+5	−min.
3	+2	−2

Each block PID, Wait and Alarm has 10 blocks, however, example is described with 4 blocks.

◎ Time signal block setting (Settable only when option designated.)   [min.]

No.	OFF	ON	No.	OFF	ON	No.	OFF	ON	No.	OFF	ON
*10	0	0	4	20	20	8			12		
1	30	30	5	20	60	9			13		
2	60	60	6			10			14		
3	0	75	7			11			15		

Notes: *1, In case of ON-OFF action, make all of PID block, Wait block and Alarm block to "0".

*2, When Wait is not used, it is easy if 0°C is set to No.0 block.
[i.e. If 0°C is set to Wait block No.0, others also become to 0°C (no wait).]

*3, When Alarm is not used, set the block setting of No.0 as high limit (H) maximum value and low limit (L) minimum value.
[i.e. If set the Alarm block as above, others also become to no alarm the same as Alarm block No.0.]
· No.0 block setting value is factory adjusted as high limit (H) to maximum value and low limit (L) to minimum value considering in case the alarm is not used.

*4, When Time signal is not used, set both ON and OFF in No.0 block to "0", others also become to "0" (no Time signal).]
[i.e. If set the Time signal block No.0 to "0", others also become to "0" (no Time signal).]

8.3 Programming
Program setting is composed of Pattern setting mode, Block setting mode, Auto-tuning setting mode, and Auxiliary function setting mode, and the Pattern setting mode can be selected pressing keys in the order of [▲], [▼], [FAST], [PROG]. Every pressing the [PROG] key, changes the mode to Block setting mode, Auto-tuning setting mode and Aux. function setting mode. Press [PROG] key at the mode to be set.

* Flow of setting mode

PV display [PROG] Pattern setting mode   P.r.n.
[PROG]
Block setting mode   P.R.c.t.
[PROG]
Auto-tuning setting mode   A.r...
[PROG]
Aux. function setting mode   c.o.n.d.
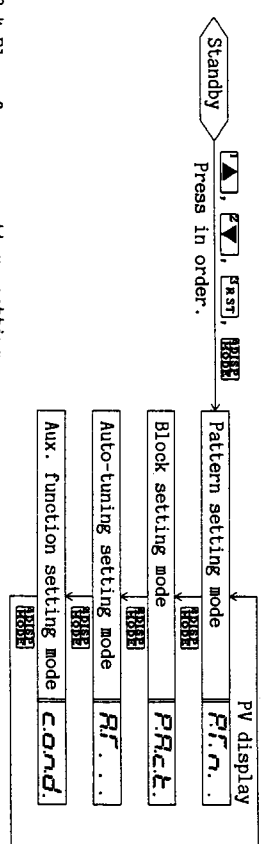
8.4 Flow of program pattern setting

Standby → Press in order [▲], [▼], [FAST], [PROG] → Pattern setting mode → Pattern No. setting → Repeat number setting → Pattern link designation → Pattern link designation [Not designated / Designated]

Step No.0 → Step temperature setting → Step time setting → PID block No. setting → Alarm block No. setting → Wait block No. setting → Time signal CH1 to 7 setting [Option]

Step No.1 → Step temperature setting → Step time setting → PID block No. setting → Alarm block No. setting → Wait block No. setting → Time signal CH1 to 7 setting [Option]

Step No.9 → Step temperature setting

[The next pattern number]
Step No.0 → Step temperature setting

8.5 Setting of Program pattern

Press [SEL] key when [Pro.] is displayed.

No.	Key operation	Display	Description
1	[▲] or [▼], [SEL]	Pr.o	Shows the Pattern number. If the number is correct, press [SEL] key. When it should be changed, select by [▲], [▼] keys and press [SEL] key.
2	[▲] or [▼], [SEL]	rEPt o	Shows the number of Repeat. Press [SEL] key if the number is correct. When it should be changed, use [▲], [▼] keys and press [SEL] key. (0: no repeat)
3	[▲] or [▼], [SEL]	rtEnP o	Shows the Step number on Step number display. Input the Step temperature by [▲], [▼] keys, and then press [SEL] key.
4	[▲], [▼]	tinE 00:00	Input the Step time by [▲], [▼] keys, and then press [SEL] key.
5	[▲], [▼]	-Pid o	Input the PID block number by [▲], [▼] keys, and then press [SEL] key.
6	[▲], [▼]	-UAt o	Input the Wait block number by [▲], [▼] keys, and then press [SEL] key.
7	[▲], [▼]	-ALo o	Input the Alarm block number by [▲], [▼] keys, and then press [SEL] key.

(*) Advance to procedure 15, in case the specification is standard.
(*) In case Time signal [Option code: TS] is applied, perform the next operations.

No.	Key operation	Display	Description
8 (*)	[▲], [▼], [SEL]	-t41 o	Input the Time signal block number to the time signal output CH1 by [▲], [▼] keys, and then press [SEL] key.
9 (*)	[▲], [▼], [SEL]	-t42 o	Input the Time signal block number to the time signal output CH2 by [▲], [▼] keys, and then press [SEL] key.
10 (*)	[▲], [▼], [SEL]	-t43 o	Input the Time signal block number to the time signal output CH3 by [▲], [▼] keys, and then press [SEL] key.

No.	Key operation	Display	Description
11 (*)	[▲], [▼], [SEL]	-t44 o	Input the Time signal block number to the time signal output CH4 by [▲], [▼] keys, and then press [SEL] key.
12 (*)	[▲], [▼], [SEL]	-t45 o	Input the Time signal block number to the time signal output CH5 by [▲], [▼] keys, and then press [SEL] key.
13 (*)	[▲], [▼], [SEL]	-t46 o	Input the Time signal block number to the time signal output CH6 by [▲], [▼] keys, and then press [SEL] key.
14 (*)	[▲], [▼], [SEL]	-t47 o	Input the Time signal block number to the time signal output CH7 by [▲], [▼] keys, and then press [SEL] key.
15 (*)	[▲], [▼], [SEL]	rtEnP o	Step number turns to 1. Input the Step temperature by [▲], [▼] keys, and then press [SEL] key.

Perform the same setting continuously, and up to No.9 of steps can be set. If step numbers to be used are less than 10, it is unnecessary for remaining steps to input the values 0. When correcting the patterns already set, only necessary parts are required to correct. When reducing the step number, display the unnecessary step number, and then press [SEL] key for 3 seconds, and setting value on and after the step number will turn to initial value.

· To return standby mode, press [R/ST] key.
· To return the beginning of pattern setting mode, press [RST] key.

8.6 Link of patterns

In case the number of steps are more than 10 in a pattern, the number of steps can be increased by linking the pattern with the next pattern and then the new pattern can be used. (maximum 100 steps)
After all settings of step No.9 have been finished, decide whether the patterns should be linked or not.

No.	Key operation	Display	Description
1	[▲], [▼], [SEL]	chAi o	Display asks whether the pattern should be linked or not. If linked, press [▲] (displays 1) and if not, press [▼] (displays 0), and then press [SEL] key.
2	[▲], [SEL]	rtEnP o	Pattern number increases by 1, and displays Step No.0.

· To return standby mode, press [R/ST] key.
· To return the beginning of pattern setting mode, press [RST] key.

8.7 Program clear

When [ENT] key is pressed for 3 seconds in setting mode, setting value on and after the Step number within displaying pattern turns to initial value.
Pattern link is also cancelled.

8.8 Setting of the blocks (PID, Wait, Alarm, Time signal)

```
Standby
   │  Press in order.
   │  ["▲"], ["▼"], [RST], [MODE]
   ▼
Pattern setting mode    PV display
   │  [MODE]
   ▼
Block setting mode      PRct.
   │  [MODE]
   ▼
PID block setting mode        P.00
   │  [MODE]
   ▼
Wait block setting mode       U.00
   │  [MODE]
   ▼
Alarm block setting mode      A.00
   │  [MODE]
   ▼
Time signal block setting mode   r.00
```
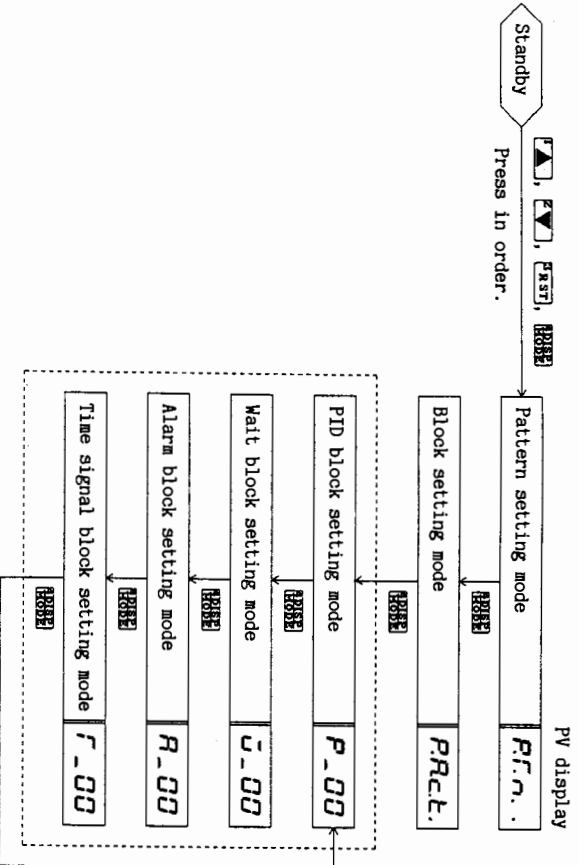
Note: Initial values of each block and setting values are adjusted as "0". Therefore, if a setting value is input to the block No.0, the setting value also becomes the input for the block not yet used.
It is useful that each block should be used from block No.1, and block No.0 should be used so that each block can not be operated.
(In this manual, it is explained with block No.0 for convenience sake.)
For example: PID block No.0 for ON-OFF action (P,I,D and ARW values "0")
Wait block No.0 for Wait function not designated.

(1) Setting of PID block

Press [ENT] key when [P.00] is displayed.
(Block No. will be changed if ["▲"] or ["▼"] key is pressed.)

No.	Key operation	Display	Description
1	["▲"], ["▼"], [ENT] — PID block / Block Number / item	-P0-P / P.00	Input Proportional band value of PID block No.0 by ["▲"], ["▼"] keys, and then press [ENT] key.
2	["▲"], ["▼"], [ENT]	P0-i / P0-1	Input Integral time value of PID block No.0 by ["▲"], ["▼"] keys, and then press [ENT] key.

No.	Key operation	Display	Description
3	["▲"], ["▼"], [ENT]	P0-d / P0-d	Input Derivative time value of PID block No.0 by ["▲"], ["▼"] keys, and then press [ENT] key.
4	["▲"], ["▼"], [ENT]	P0-A / P0-R	Input Anti-reset windup value of PID block No.0 by ["▲"], ["▼"] keys, and then press [ENT] key.
5	["▲"], ["▼"], [ENT]	P1-P / P1.P 00	Input Proportional band value of PID block No.1 by ["▲"], ["▼"] keys, and then press [ENT] key.

Perform the same setting continuously, and up to No.9 of blocks can be set.
It is not required to set all of the blocks, set necessary blocks only.

· To return standby mode, press [RST] key.
· To return the beginning of pattern setting mode, press [MODE] key.

(2) Setting of Wait block

Press [ENT] key when [U.00] is displayed.
(Block No. will be changed if ["▲"] or ["▼"] key is pressed.)

No.	Key operation	Display	Description
1	["▲"], ["▼"], [ENT] — Wait block / Block Number	-U0- / U0-	Input Wait value of Wait block No.0 by ["▲"], ["▼"] keys, and then press [ENT] key.
2	["▲"], ["▼"], [ENT]	U1- / U1-0	Input Wait value of Wait block No.1 by ["▲"], ["▼"] keys, and then press [ENT] key.

Perform the same setting continuously, and up to No.9 of Wait blocks can be set.
It is not required to set all of the blocks, set necessary blocks only.

· To return standby mode, press [RST] key.
· To return the beginning of pattern setting mode, press [MODE] key.

(3) Setting of Alarm block

Press [SHF] key when `A_00` is displayed.
(Block No. will be changed if [▲] or [▼] key is pressed.)

No.	Key operation	Display	Description
1	[▲], [▼], [SHF] Block Number / High limit	`A0.h` Alarm block / High limit	Input Alarm H (high limit alarm) value of Alarm block No.0 by [▲], [▼] keys, and then press [SHF] key.
2	[▲], [▼], [SHF]	`A0.L` Low limit	Input Alarm L (low limit alarm) value of Alarm block No.0 by [▲], [▼] keys, and then press [SHF] key.

Perform the same setting continuously, and up to No.9 of Alarm blocks can be set.
It is not required to set all of the blocks, set necessary blocks only.

· To return standby mode, press [RST] key.
· To return the beginning of pattern setting mode, press [PRG] key.

Notes: 1. No.0 block setting value is factory adjusted as high limit (H) to maximum value and low limit (L) to minimum value considering in case the alarm is not used.

2. In the case of alarm L (low limit alarm) "`A0_L`", it displays the value normally "`-199.9`" up to −199.9, however, when it becomes −200.0, it displays "`2000`".

● "`2.00.0`"
  —— It indicates the decimal point.
  —— It means minus (−).

(4) Setting of Time signal block [Option: TS]

The parts related with Program pattern and Time signal in "8.2 Data example" are shown below.

Program pattern	Step No.	0	1	2	3	4
	Step time	1:00	1:00	0:30	1:00	1:10
Time signal	Signal CH1	20/80 (*2)	0/75 (*2)	0/80 (*2) 0/30 (*3)	0/30 (*3)	0/80 (*3)
	No.	5	3	2	1	2
	Signal CH2	0/0	0/80	0/0	20/20 (*3)	0/75 (*1)
	No.	0	2	0	4	3

Notes: 1. When Time signal is set with longer time than the step time, it obeys the next step setting. (*1)
2. When setting ON signal continued to the next step, set the ON time to exceed to the next step. (*2)
 If time setting is set the same as the step time, time signal momentarily turns once OFF at a change of step.
3. Time signal automatically turns OFF signal after ON time passed. (*3)

Press [SHF] key when `r_00` is displayed.
(Block No. will be changed if [▲] or [▼] key is pressed.)

No.	Key operation	Display	Description
	[SHF]	`r_00`	Time signal block setting mode.
1	[▲], [▼], [SHF] Time signal block No.	`00.F` ON/OFF	Input OFF time of Time signal block No.0 by [▲], [▼] keys, and then press [SHF] key.
2	[▲], [▼], [SHF]	`00.n`	Input ON time of Time signal block No.0 by [▲], [▼] keys, and then press [SHF] key.
3	[▲], [▼], [SHF]	`01.F`	Input OFF time of Time signal block No.1 by [▲], [▼] keys, and then press [SHF] key.
4	[▲], [▼], [SHF]	`01.n`	Input ON time of Time signal block No.1 by [▲], [▼] keys, and then press [SHF] key.

Perform the same setting continuously.
It is not required to set all of the blocks, set necessary blocks only.

· To return standby mode, press [RST] key.
· To return the beginning of pattern setting mode, press [PRG] key.

(5) Setting of PID auto-tuning (AT)

Constant setting by PID auto-tuning (AT) is effective only during control.
Press [SHF] key in the correcting mode during control when `AT AUTO` is displayed.

Auto-tuning is started at the setting value (temperature setting) when AT has been started (operation), and the setting value in PID block is rewritten.
It has the influence with the other patterns which designates the block No.
(Program time is suspended during auto-tuning.)

The 1st AT point "a"
Auto-tuning start
Auto-tuning performing
The 2nd AT point "b"
Auto-tuning performing
Auto-tuning start

Step No.   0   1   2   3   4
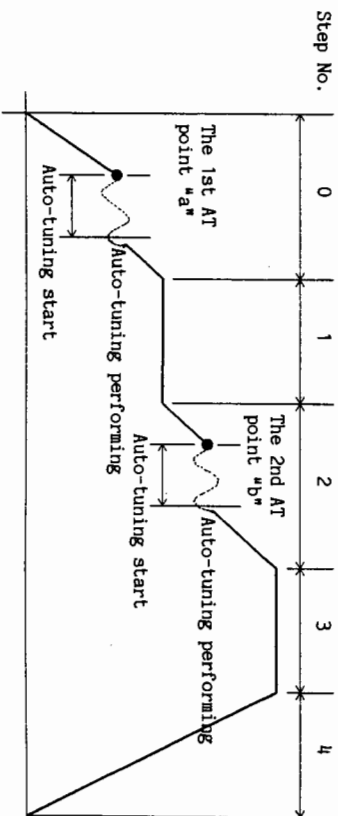
For example: In the preceding figure, the first AT is performed at "a" point. This point is in Step No.0, and PID block No.0 is selected, and the value in the brock is as follows. After Auto-tuning the contents of block No.0 is replaced with the value found by Auto-tuning.

		Before AT	After AT
The 1st AT point "a"	PID block No.0 P	0 %	3 %
	I	0 sec	200 sec
	D	0 sec	50 sec
	ARW	0 %	40 %
The 2nd AT point "b"	PID block No.0 P	3 %	2.4 %
	I	200 sec	80 sec
	D	50 sec	20 sec
	ARW	40 %	50 %

When executing Auto-tuning during RUN, program time is interrupted (execute AT on HOLD status) and after AT is terminated, performs the program time remaining.
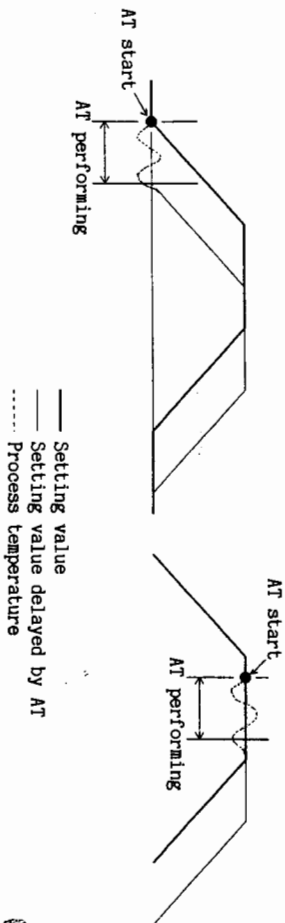
AT start

AT performing

AT start

AT performing

―― Setting value
――― Setting value delayed by AT
······· Process temperature

No.	Key operation	Display	Description
1	[▲], [▼], [RST]	Af...	PID auto-tuning setting mode.
	[LRY]	Af --	Press [LRY] to select PID auto-tuning setting mode.
2	[▲]	Af Auto	Press [▲] key to set Auto-tuning.
3	[RST]		Press [LRY] key to enter Auto-tuning. Press [RST] key at the termination.

(6) Cancellation of PID auto-tuning.
Press [LRY] key in the correcting mode when [Af....] is displayed.
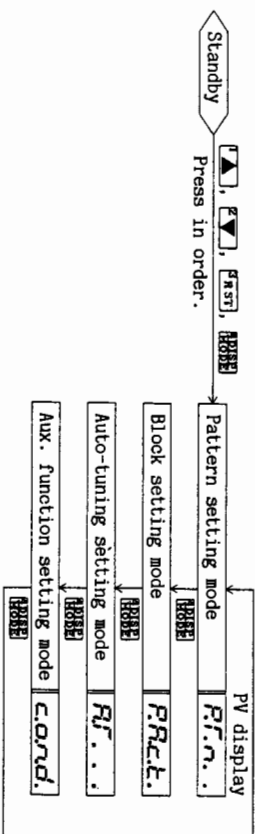It is set during PID auto-tuning.

No.	Key operation	Display	Description
1	[▲], [▼], [RST]	Af...	PID auto-tuning setting mode.
	[LRY]	Af Auto	Press [LRY] to select PID auto-tuning setting
2	[▼]	Af --	Press [▼] key to cancel PID auto-tuning.

• To cancel the PID auto-tuning, press [RST] key. Then, the control will be continued
• To return the beginning of pattern setting mode, press [PRG] key.

8.9 Correction and confirmation of program during execution of control

Program can be corrected and called (confirmation) during control as well as the setting mode. Auto-tuning should be carried out during control.

Flow of setting mode

Standby

[▲], [▼], [RST], [PRG]
Press in order.

PV display

Pattern setting mode — PT.n..

Block setting mode — P.R.c.t.

Auto-tuning setting mode — Af...

Aux. function setting mode — c.ond

The operation is the same as the setting mode (8.3 to 8.5).

Note: (1) As for correction of the number of repeat, the setting value can be corrected, however, the number of repeat during control can not be corrected.

(2) As for time division ON-OFF output, (-R/□, -S/□, -T/□) if the step is terminated at the status control output is ON, the output is continued until the ON period terminates.

Pattern

Pattern end

ON

OFF
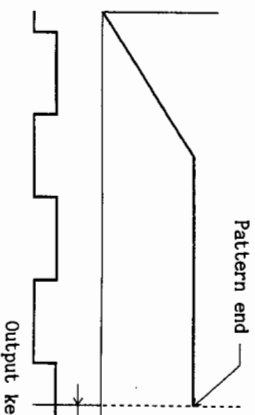
Output ke

9. AUXILIARY FUNCTION SETTING

9.1 Setting

Proportional cycle, Output high limit limiter, Output low limit limiter, Main setting high limit limiter, Main setting low limit limiter, Serial communication instrument number setting and Setting lock are settable in this Auxiliary function setting mode.

Press [INP] key when [c.and] is displayed (Auxiliary function setting mode).

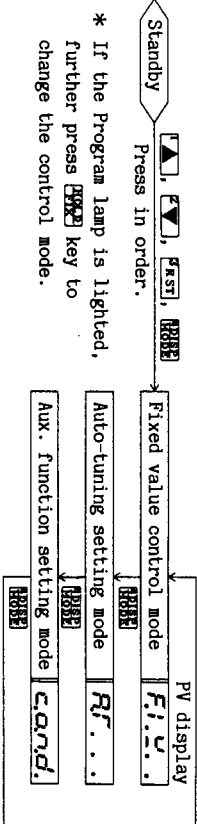| No.	Key operation	Display	Description
1	[INP]	cyc	Input the Proportional cycle by [▲], [▼] keys and then press [INP] key. (Initial value:In case of -R/□ 30S, -S/□ 3S.) This item is not available for the type -A/□.
2	[▲], [INP]	oft.h 100	To change the High limit limiter of the output, input with [▲], [▼] keys, and then press [INP] key. (Initial value: 100)
3	[▲], [INP]	oft.L 0	To change the Low limit limiter of the output, input with [▲], [▼] keys, and then press [INP] key. (Initial value: 0)
4	[INP], [INP]	sft.h 1200	To change the High limit limiter of the Main setting, input with [▲], [▼] keys, and then press [INP] key. (Initial value: Maximum of the range)
5	[▼], [INP]	sft.L 0	To change the Low limit limiter of the Main setting, input with [▲], [▼] keys, and then press [INP] key. (Initial value: Minimum of the range)
6	[INP], [INP]	d8n. 0	Set the Instrument number for serial communication. Apply the number with [▲], [▼] keys, and then press [INP] key. (Initial value: 0)
7	[INP], [INP]	Loc --	Specify whether all setting values (excepting pattern number) are locked or not. If locked, press [▲] key, and if not, press [▼] key. SV display indicates [Lock] when locked, and [--] when not lock.]

Notes: Press [INP] key at the items the setting is not required, and the item will move to the next. Proportional band will not be changed even if high limit limiter or low limit limiter of main setting is changed.
· To return standby mode, press [RST] key.
· To return the beginning of pattern setting mode, press [RUN] key.

9.2 Setting of control output High and Low limit limiter

The high and Low limit of control output can be set from 0 to 100% (-10 to 110% for -A/□type). Set the most suitable value according to the heater capacity or the processing condition.
(Initial value: 100% for high limit and 0% for low limit)

---

10. FIXED VALUE CONTROL

10.1 Flow of setting

Standby → Press in order.

| PV display |
| Fixed value control mode [F.i.v..] [Rf...] |
| Auto-tuning setting mode |
| Aux. function setting mode [c.and] |

* If the Program lamp is lighted, further press [RUN] key to change the control mode.

Note: During control (RUN lamp lights), operate the setting after pressing the [INP] key to select the standby status.

10.2 Setting

Press [INP] key when [F.i.v.] is displayed.
Set the values in order of Main setting, High limit alarm, Low limit alarm, Proportional band, Integral time, Derivative time and ARW.

No.	Key operation	Display	Description
1	[INP]	S 0	Input Main setting value by [▲], [▼] keys, then press [INP] key.
2	[▲], [INP]	Rh 0	Input High limit alarm setting value by [▲], [▼] keys, and then press [INP] key.
3	[▲], [INP]	RL 0	Input Low limit alarm setting value by [▲], [▼] keys, and then press [INP] key.
4	[▲], [INP]	P 00	Input Proportional band setting value by [▲], [▼] keys, and then press [INP] key.
5	[▲], [INP]	i 0	Input Integral time setting value by [▲], [▼] keys, and then press [INP] key.
6	[▲], [INP]	d 0	Input Derivative time setting value by [▲], [▼] keys, and then press [INP] key.
7	[▲], [INP]	Arw 0	Input ARW setting value by [▲], [▼] keys, and then press [INP] key.
8	[▲], [INP]	r 0	Press [RST] key at the termination.

10.3 Setting of PID auto-tuning (AT)

* Operate the setting during fixed value control.

No.	Key operation	Display	Description
	[▲], [▼], [RST]	AT...	PID auto-tuning mode.
1	Press [SET] key.	AT --	
2	Press [▲] key to set the PID auto-tuning.	AT AUTo	
3	Press [RST] key at the termination.		PID auto-tuning starts. (AT indicator blinks.)

10.4 Cancellation of PID auto-tuning (AT)

* Operate the setting during fixed value control.

No.	Key operation	Display	Description
	[▲], [▼], [RST]	AT...	PID auto-tuning mode.
1	Press [SET] key.	AT --	
2	Press [▼] key to cancel the PID auto-tuning.	AT AUTo	
3	Press [RST] key at the termination.		PID auto-tuning is cancelled. (AT indicator goes off.)

10.5 Setting of Auxiliary function

Auxiliary function setting of Fixed control is the same as Program control.
Settable: Proportional cycle, Output high limit limiter, Output low limit limiter,
Main control high limit limiter, Main control low limit limiter and Setting lock.

11. OPERATION

After setting, start the operation with following procedure.

① Turn the power supply ON
Turn the power supply to this instrument and to controlling circuit ON.
Do not turn the power supply on while key is pressing, or instrument specificati(on)
may be changed.

② Instrument is in warming up status.

```
PC-
 600
```

is displayed for approximately 6 seconds.

If a key is operated during this time, the instrument specifications may be chang(ed).
Therefore, key operations must not be performed during this time.

③ Pattern number setting
· Press the keys in order of [▲], [▼], [RST], [MODE] and then press [SET] key.
· Input the Program pattern number to be operated with [▲], [▼] keys and then
set the number with [SET] key.
· The setting is completed if [RST] key is pressed.
(The instrument turns to standby situation.)

④ Control performance
Press [RUN] key, and the instrument starts control.
(On the displays, the setting value, process variable, etc. will be displayed.)

⑤ Control termination
When the execution of program has been finished, the status of instrument becomes
termination and the pattern end output turns ON.
Pattern end output will not be generated if [SET] or [ADV] key is pressed before
program termination.
Note:
If instantaneous power failure (approx. 30ms. or less) occurred and restored,
this instrument will perform the continuation of the program.
If interrupted approximately 30ms or more, this instrument will continue the
control after the power failure is restored, passing the warmup status [②].
(However, if the option "stops after power failure restored" or "Holds after
power failure restored" is designated, it complys with the function designated.)

12. EXPLANATION OF CONTROLLING OPERATION

12.1 Explanation of PID

(1) Proportional band (P)

Proportional action is the action of which the control output varies in proportion to the deviation between setting value and processing temperature. If the proportional band is narrowed, the output changes according to even by a slight variation of the processing temperature, 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 temperature even by slight disturbance, and turns into control such as ON/OFF action of the so called hunting phenomenon.

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

(2) 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.

(3) Derivative time (D)

Derivative action is to restore the change of processing temperature 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.

12.2 PID auto-tuning of this instrument

In order to decide each value of P, I, D and ARW automatically, this system gives the fluctuation to the control object by force. Three kinds of undermentioned systems are automatically selected by an instrument.

(1) In case the difference between setting value and the processing temperature is large when the temperature rises.
Fluctuation is given at the temperature 2.5% of scaling span lower than the setting value.

Setting value ▽
Temperature ⇑
Time ⇨
2.5% of scaling span
→ Controlling action is performed with the values set by PID auto-tuning.
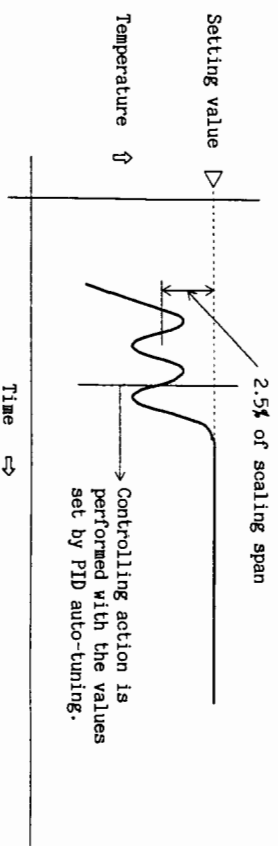
(2) In case of the stable situation during control or the control temperature is wit ±5% of scaling span: The fluctuation is given at the setting value.

Setting value ▽
Temperature ⇑
Time ⇨
→ Starting point of auto-tuning
→ Controlling action is performed with the values set by PID auto-tuning
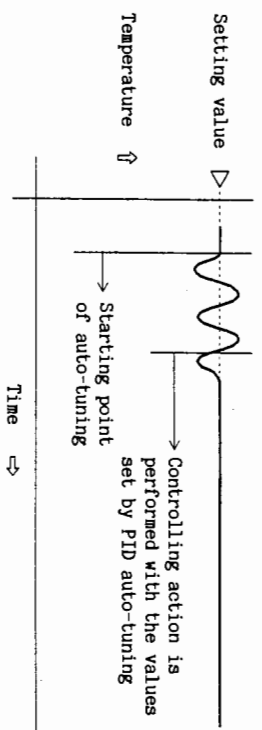
(3) When the control temperature is 5% of scaling span higher than the setting value The fluctuation is given at the temperature 2.5% of scaling span higher than the setting value.

Setting value ▽
Temperature ⇑
Time ⇨
2.5% of scaling span
→ Controlling action is performed with the values set by PID auto-tuning.
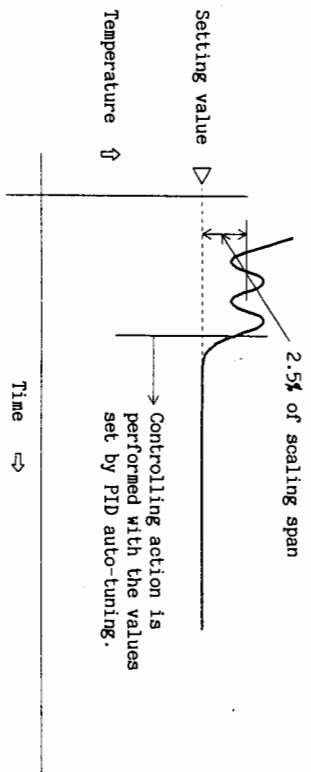
12.3 Explanation of ARW (Anti-reset windup)

ARW prevents overshoot caused when responding the step. It is set automatically using PID auto-tuning. If operating by manual, duty factor of load for the setting is of standard value, to fix controlling aim.

Duty factor is get as follows.

In case of SSR output and SSR driving output:

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

In case of Current output:

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

Set 50%, if duty factor is unknown.

3. MAINTENANCE AND CHECKING

The external factors when the controller acts malfunction are shown below:

Phenomenon	Status of instrument		Presumed trouble
	Digital display	Indicator	
Temperature does not rise.	Displays far above the setting value	CONT unlit	Burnout of thermocouple, compensating lead wire or RTD. Improper connection of input terminal.
	Displays the room temperature	CONT lit	Burnout or improper connection of heater. Troubles of electromagnetic switch or control device such as trigger.
Temperature rises too much	Displays (−) or around 0.	CONT lit	Short circuit of thermocouple or RTD. Wrong installation (insertion) of thermocouple or RTD. Reverse polarity of thermocouple or compensating lead wire. Wrong (low) specification of RTD.
—	Unstable display	Unstable	Influence of inductive fault or noise. AC leaks into thermometer detector. Wrong connection of terminals.

---

14. SPECIFICATIONS

14.1 Standard specifications

< Indicating section >

Temperature indicating
accuracy : Within ±0.3% of full scale ±1digit.

Time indicating
accuracy : Within ±0.1% of setting time.

Display : Digital display with LED.

PV value : (Actual temperature and Characters)
Red, Figure size 14.3mm × 8mm
(Setting temperature, Setting time, Remaining time or Manipulating value)

SV value Green, Figure size 14.3mm × 8mm

Pattern No. Red, Figure size 8mm × 4mm

Step No. Green, Figure size 8mm × 4mm

Action display : At [CONT] ON Green LED lights.

Control actions (−A/□type, blinks correspond to output)

At [ALM] ON Red LED lights.

At [PROG, FIX, RUN, TIME or MV]

Statuses At [HOLD] Red LED blinks.

At [AT] Yellow LED blinks

< Program control section >

Setting : By function keys
* Program pattern No. * Number of Repeat * Step No.
* Time * Temperature * PID block
* Wait
* Auxiliary functions
Proportional cycle
Output high limit limiter
Output low limit limiter
Main setting high limit limiter
Main setting low limit limiter
Setting value lock

* Optional functions

Operation system : By front face function keys
[▲] (Increase) [▼] (Decrease)
[MODE] (Mode/Display) [A/M] (Clear/Advance) [RST] (Reset)
[PROG] (Program/Run) [ENT] (Entry/Stop) [HK] (Fix/Hold)

Number of Patterns : 10 (Linkable)
Number of Steps : 10 steps/ pattern (Total 100 steps)
Number of Repeat : 9999 times
Program time range : 0 to 99 hours 59 minutes/step
Time setting accuracy : Within ±0.1% of setting time
Setting resolution : Temperature ... Refer to the [Rated scale table]
Time ... 1 minute

< Controlling section >

Temperature setting accuracy : Within ±0.3% of full scale ±1digit

Main control action : PID action (with Auto-tuning function)
Proportional band, Integral time, Derivative time and ARW are automatically tuned.
Proportional band: 0.1 to 200.0% variable
(ON-OFF action when set to 0.0)
Integral time, 1 to 3600sec. variable (off when set to 0)
Derivative time, 1 to 1800sec. variable (off when set to 0)
Proportional cycle, 1 to 120sec. variable

Anti-reset windup, 0 to 100% (ARW)

Wait temperature, ±(1 to 100)°C
Output limiter, 0 to 100%
(Sets the high limit and low limit of control output)
(However, -10 to +110% for -A/Ⅱ type, and 4 to 20mA of the value correspond to 0 to 100%)
(Not available for current output)

Control output :
-R/Ⅱ Relay contact 1c AC 220V 3A (resistive load)
AC 220V 1A (inductive load cosφ=4)
-S/Ⅱ Non-contact voltage (for SSR drive) Isolated
DC 15 ±3V Load resistance max. 600Ω
-T/Ⅱ Non-contact relay (SSR output) Isolated
AC 220V 1A
(20mA < Exciting current of AC electromagnet relay < 1A)
-A/Ⅱ Current DC 4 to 20mA (in proportional band)
Isolated, Load resistance max. 600Ω

Temperature alarm : Deviation setting against main setting. Set by selection from 10 blocks (No.0 to 9)
Setting range, High limit alarm, from (+) Maximum scale
to (+) Maximum scale width
Low limit alarm, from (-) Maximum scale
to (+) Maximum scale width

Action, ON-OFF action Dead band (hysteresis) 2°C
The low limit side is prevented until the input temperature comes higher than the alarm setting temperature.
Output, Relay contact, 1a ×2
Control capacity, AC 220V 0.5A (resistive load)
AC 220V 0.2A (inductive load cosφ=0.4)

Pattern end output : Outputs when the program is terminated.
Output, relay contact 1a
Control capacity, AC 220V 0.5A (resistive load)

< General specification >

Mounting : Flush
Rated scale : Refer to [Rated scale table].
(Multi-range system only for -Ⅱ/E)

Input :
-Ⅱ/E Thermocouple K, J, R, B and S (specified) below 100Ω
(Resistance per wire less than 4Ω)
-Ⅱ/R RTD Pt100 3-wire system
-Ⅱ/V DC voltage DC 0 to 1V
-Ⅱ/A DC current DC 4 to 20mA

Power supply : AC 110/220V, 50/60Hz
Voltage fluctuation : Allowable ±10% of rated voltage
Power failure : With power failure protecting function.
Ambient temperature : 0 to 55°C
Ambient humidity : 35 to 80%RH (non-condensing)
Power Consumption : Approx. 5W
Weight : Approx. 800g
Materials : Front frame: Resin, Case: Resin
Color : Front frame: Light gray, Case: Light gray

Insulation resistance: 10MΩ or more at DC 500V (However, the voltage must not be ap
to the terminals between input and

Dielectric strength : Between Input terminal and Ground terminal, AC 500V for 1 min
Between Power terminal and Ground terminal, AC 1.5kV for 1 min

Auxiliary function : Power failure countermeasure (Data memories are backed up with lithium battery for 5 years or m
Automatic cold junction temperature compensator -Ⅱ/E
(up-scale)
Burnout

Note: With B type of thermocouple input, the accuracy guarantee range is 300 to 1800

14.2 Optional specifications ([ ]: Optional code)

Setting value display : [SS] Step temperature setting value display.
Displays the Step temperature (temperature setting programmed on SV display.

Control action : [CM] Cooling control action.
OFF in the range in which the input value is lower
the setting value, ON in the range in which it is
than that.

Alarm setting : [AA] Process value alarm setting.
Alarm action : [LN] Low limit alarm without low limit standby function
[HW] High limit alarm with high limit standby function.

[Rated Scale Table]

Scale range	Resolution	Input	Scale range	Resolution	Input
0 to 400°C	1°C	T/C K, J	0 to 1800°C	1°C	T/C B
0 to 800°C	1°C	T/C K, J	-100.0 to 400.0°C	0.1°C	RTD Pt100
0 to 1200°C	1°C	T/C K	0 to 100.0	0.1	DC 0 to 1V
0 to 1600°C	1°C	T/C R, S	0 to 100.0	0.1	DC 4 to 20

External operating function: [EC] Following functions can be operated by closing contact or open collector.
(RUN) Starts the control of program or cancels the Hold.
(STOP) Terminates the program performing.
(HOLD) Suspends the progress of program time performing.
(ADV) Interrupts the program step performing and shifts it to the next.

Time signal output : [TS] The time signal block (OFF time and ON time of the signal) is set per step.
The same number can be designated many time by selecting any number from 16 kinds of time signal blocks which have already been set in advance. Maximum 7 channels can be used per step.
Number of circuit: 7, Output: Open collector,
Capacity: DC 24V, max. 50mA.

Transmitting output :
[PVT] Process variable (actual temperature) transmitting output. DC 0 to 1V or DC 4 to 20mA
[SVT] Setting value transmitting output DC 4 to 20mA (max. load resistance 600Ω) or DC 0 to 1V

Serial communication : [C,C5] The following operations can be carried out from the external computer.
1. Registration and correction of program
2. Reading of program
3. Operation of RUN, STOP, HOLD, ADVANCE, etc.
4. Reading of action status
Communication line, EIA RS-232C [C] or RS-485 [C5]
Communication system, Half-duplex synchronous start-stop system
Baud rate, 2400bps (changeable to 1200, 4800 and 9600bps)
Data configuration, Start bit : 1 bit
     Data bit : 7 bits
     Parity bit : Even number
     Stop bit : 1 bit

Automatic start : [AST] After the power turned ON, the program automatically starts at once. (Input with PROG key is not required.)

PV start : [PST] Begins the program start at process variable.

Power failure restoring :
[PS] Turns to standby status after the power failure restored.
[PRH] Performs the program at the time of power failure, after restored the power failure and turns to Hold status.

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15. CHARACTER TABLE

Character	Description	Character	Description
PC-600	Warming up status	Ar.	PID auto-tuning setting
[Program control]		Ar...	PID auto-tuning setting
P.n..	Pattern setting mode	-- *	No auto-tuning set designa...
PPn	Pattern number	AUto *	Auto-tuning setting desig...
rEPt	Number of repeat	c.ord.	Auxiliary function
tEmP	Step temperature	cyc	Proportional cycle
timE	Step time	ofth	Output high limit limiter
_Pid	PID block number setting	oftl	Output low limit limiter
_UAt	Wait block number setting	5fth	Main setting high limit li...
_Atn	Alarm block number setting	5ftl	Main setting low limit li...
_ts.l	Time signal CH No. setting(No.1)	toct	Serial communication instr... number setting
chAt	Pattern link setting	ddn	**[fixed value control]**
O *	No pattern link specified	toct *	Setting value lock designa...
/ *	Pattern link specified	-- *	No setting value lock desi...
PRct.	Block setting mode	toct	Setting value lock (excepting pattern number)
P_00	PID block setting mode		**[fixed value control]**
PO_d	Derivative time (PID block No.0)	Fi.u..	Setting mode
PO_i	Integral time (PID block No.0)	At	Low limit alarm
PO_P	Prop. band (PID block No.0)	Ah	High limit alarm
PO_A	ARW (PID block No.0)	t,	Main setting
u_00	Wait block setting mode	i	Integral time
uO_	Wait value setting (block No.0)	P	Proportional band
A_00	Alarm block setting mode	d	Derivative time
AO_h	High limit alarm (block No.0)	Aru	Anti-reset windup (ARW)
AO_t	Low limit alarm (block No.0)		
r_00	Time signal block setting mode		Characters such as Ar , --
OO_f	OFF time(Time signal block No.0)		AUto,c.ord,cyc,ofth,
OO_n	ON time (Time signal block No.0)		oftl,5fth,5ftl,toct
			are the same meaning as Program control.

Marked by *, these characters are displayed on the SV display (Green LED), and others
on the PV display (Red LED). Numbers underlined indicate the block Nos. or channel No...

16. MULTI-RANGE FUNCTION

8 kinds of range are applicable for Thermocouple type of controller (U/E) with this function. (Range No.0 to 7)

	PV display	SV display
Standby ▲, FAST, HOLD, STEP	Multi-range mode	rRnC
	0 to 400°C K	rRnC 0
	0 to 400°C J	rRnC 1
	0 to 800°C K	rRnC 2
	0 to 800°C J	rRnC 3
	0 to 1200°C K	rRnC 4
	0 to 1600°C R	rRnC 5
	0 to 1600°C S	rRnC 6
	0 to 1800°C B	rRnC 7
Control performing (Standby status)	......	......

Note: When switching the multi-range, the multi-range number should not be more than 8.
With B type of thermocouple input, the accuracy guarantee range is 300 to 1800°C.

17. ATTACHED TABLE
(1) Program pattern (Pattern No.   )

Step number						
Setting temperature [°C]						

→   Time [hour : minute]

(2) Data table

			Block number					
signal CH1 No.								
signal CH2 No.								
signal CH3 No.								
Time signal CH4 No.								
signal CH5 No.								
signal CH6 No.								
signal CH7 No.								

Main program

Pattern No.	Step temperature	Step time [Hour:Min]	PID	Wait	Alarm	Time signal
						CH 1	CH 2	CH 3	CH 4	CH 5	CH
Start						
1		:				
2		:				
3		:				
4						
5						
6						
7						
8						
9						

◎ PID block setting

No.	P[%]	I[s]	D[s]	A[%]
0				
1				
2				
3				

◎ Wait block setting

No.	Wait value [°C]
0	
1	
2	
3	

◎ Alarm block setti

No.	H[°C]	L[°C
12		
13		
14		
15		

◎ Time signal block setting (Settable only when option designated.)

No.	OFF	ON	No.	OFF	ON
0			4		
1			5		
2			6		
3			7		

No.	OFF	ON	No.	OFF	ON
0			8		
1			9		
2			10		
3			11		

Block No.	PID	Wait	Alarm
0			
1			
2			
3			