This user manual intended for use with NP200 VER: 010
or newer controllers. Please check your model number.

NP200

PROGRAMMABLE TEMPERATURE CONTROLLER

User Manual

HANYOUNG nux

TABLE OF CONTENTS

1. Safety Cautions

Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality.

⚠ Danger	Danger DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
⚠ Warning	Warning Warning indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.
⚠ Caution	Caution Caution used without the safety alert symbol indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury, property damage.

⚠ Danger

Do not touch or contact the input/output terminals, an electric shock may occur.

⚠ Warning

1. If there is a possibility of an accident caused by errors or malfunctions of this product, install external protection circuit to prevent the accident.
2. This product does not contain an electric switch or fuse, so the user needs to install a separate electric switch or fuse externally. (Fuse rating : 250 V 0.5A)
3. When setting, "Input type selection number" must be selected in the Group Input(G.In) and also "Output type selection number" must be selected in the Group Output(G.Out) before moving to other group. If not, data of other group will be changed to the initial stage.
4. To prevent defection or malfunction of this product, supply proper power voltage in accordance with the rating.
5. To prevent electric shock or devise malfunction of this product, do not supply the power until the wiring is completed.
6. Since this product is not designed with explosion–protective structure, do not use it at any place with flammable or explosive gas.
7. Do not disassemble, modify, revise or repair this product. This may cause malfunction, electric shock or fire.
8. Installation and removal of this product should be done while the power is off. Or it may cause malfunction or electric shock.
9. If the product is used in a manner not specified by the manufacturer, it may cause injuries or property damages.
10. To avoid an electric shock, the controller is intended to be mounted into an enclosed panel during its operation.

⚠ Caution

1. The information in this manual is subject to chage without prior notice.
2. Before using the product you have purchased, check to make sure that it is exactly what you ordered.
3. On receipt of goods, please check for any damage or abnormality that have occurred during shipping
4. Envirionmental Conditions : Operating Temperature Range: 0 to 50 ℃
   Operating and Storage Humidity: 35 to 85% max. RH non–condensing
5. Do not use this product in the presence of TOXIC, CORROSIVE, FLAMMABLE, and OXIDIZING gases.
6. Do not use this product at any place with direct vibration or impact.
7. Do not use this product in the presence of water, oil, medical substances, moisture, dust, salt or iron contents. (Use at the Pollution Degree 1∼2)
8. Do not use organic solvents such as alcohol or benzene for this prodcts.
   The bezel should only be cleaned with a soft cloth and neutral PH detergent.
9. Do not use this product at any place with excessive induction lesion, static electricity or magnetic noise.
10. Do not use this product at any place with possible thermal accumulation due to direct sunlight or heat radiation
11. Install this product at place no higher than 2,000m in altitude.
12. Attach the bractets(2pcs) on the holes of the panel and tighten with a screwdriver.
    Fixing torque is about 14.7 N·cm (1.5 kg·cm)

13. In case of water intrusion, the inspection is required to check the possiblity of electric leakage or fire.
14. Use a compensating cable for connecting thermocouples.
15. The lead wire resistance is small for RTD input use and please use the one which has no resistance difference to 3 wires.
16. To avoid inductive noise to input wires, seperate from the power and output wires.
17. Keep input wires away from output wires, otherwise using shielded wires recommended.
18. Use non–grounded sensor to R.T.D and thermocouple
19. If there is excessive noise from the power supply, using insulating transformer and noise filter is recommended. The noise filter must be attached to a panel grounded, and the wire between the filter output side and power supplyterminal must be as short as possible.
20. It is effective to use a twisted cable for power supply against noise
21. If alarm function is not set correctly, alarm output can not be operated at a trouble.
22. When replacing the sensor, please turn OFF the power supply.
23. Use an extra relay when the frequency of operation is rather high. In this case, SSR output type is recommended.
    • Electromagnetic switch : Proportional cycle time is Min. 20 sec
    • SSR : Proportional cycle time is Min. 1 sec
    • Contact output life : Mechanically Min.10 million times (no load)
      Eletrically Min. 100 thousand times (rated load)
    • SSR drive pulse voltage, 4 – 20 mA DC are not insulated with internal circuit
24. The instrument has IP65 protection grade. But to guarantee its grade and specification, make sure to use rubber seals when installing the instrument to panel.
25. Do not connect anything to the unused terminals.
26. After checking polarity of terminal, connect wires at the correct position.
27. When the product is installed to a panel, use a circuit breaker or switch in conformity with IEC847–1 or IEC947–3.
28. Switches and circuit breakers should be installed nearby the products for prompt and convenient operation.
29. In case of using swtiches and circuit breakers, please display instruction message on the panel e.g. "Power is disconnected by operating switches or circuit breaker."
30. For the continuous and safe use of this product, the periodical maintenance is recommended.
31. Some parts of this product have limited life span, and others are changed by their usage.
32. The warranty period is 1 year and limited to the product including parts properly and in normal manner used.
33. The heater power supply and the instrument power supply should be connected using the same power supply when using heater break alarm.
34. After the power is on, the preparation time for contact output is required. In case of use for signals of external interlock circuit, use with a delay relay.
35. After replacing into new products, make sure that all parameter settings are same as the previous products.

● NP200 Series Programmable Temperature Controller

Versatility is a key advantage of NP200 Programmable Temperature Controller. The following features are incorporated into NP200 to maximize user benefits. NP200 programs 30 patterns with 300 segments (each pattern can have maximum 99 segments). The high performance CPU allows great accuracy (+/−0.1%) and sampling time (100ms). Also, NP200 has multiple inputs (19 types), multiple outputs (3 types), auto−tuning (2 types), time signal (5), heat & cooling output, level PID calculation and control, and emergency output functions. Large back−light display clearly indicates unit monitored, program running, elapsed time, temperature, and operation mode.

● Key Features & Benefits

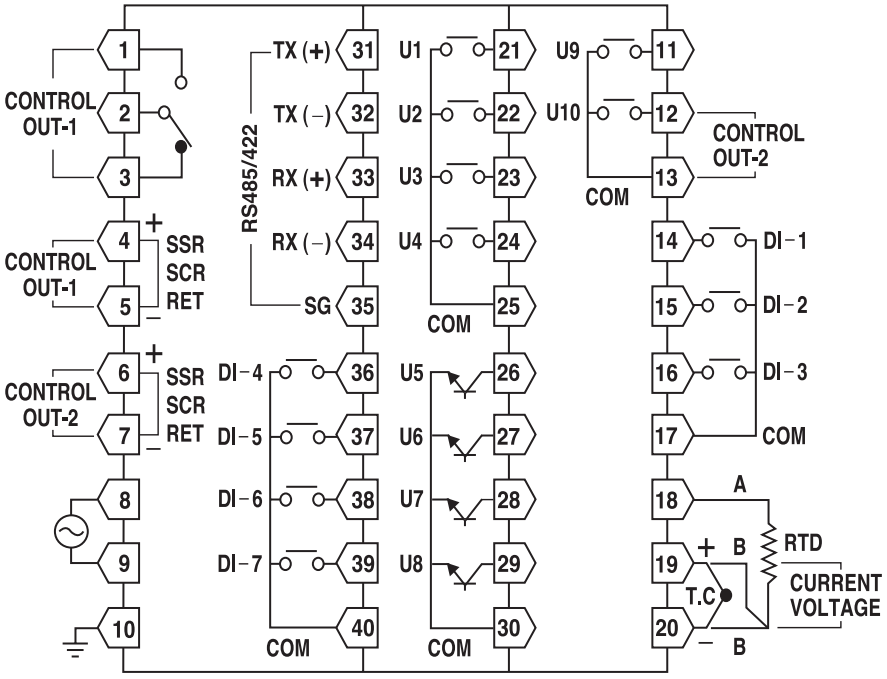
User Output	The User can set a parameter that activates the desired control output up to 10 (From U1 through U10). User Output includes: ① Alarm (ALARM 1~4) ② Time signal (TS1~TS5) ③ Inner signal (IS1~IS5) ④ Pattern end (PTEND) ⑤ Program run (RUN) ⑥ Fixed control mode (FIX) ⑦ Reset mode (RST) ⑧ Hold (HOLD) ⑨ Wait (WAIT) ⑩ Output during the manual control (MAN) ⑪ Output during the ascending segment ⑫ Output during the descending segment ⑬ Output during the soak segment (Be sure that U10 is assigned to Cooling Operation Output, if a controller is the Heating/Cooling model)
Heating/Cooling PID Control In program control	Heating/Cooling control outputs the PID operational result in two types of signal, that is, for heating and for cooling. You can choose either PID control or ON/OFF control for the output of heating side and cooling side. If you set the proportional value(P) of heating side as ″0〃 the ON/OFF control is selected for the heating side, while the fixing of the band(Pc) of cooling side ″0〃 chooses the ON/OFF control for cooling side. . Moreover, you can choose one method among heating side output, cooling side output, relay output, voltage pulse output and current output and apply the controling function with it.
Universal Input/Output	his controller has two types of auto−tuning as STD(standard type) and LOW (Low PV type is the value 10% lower than the set value)
2 Type of Auto Tuning Mode (Standard/Low PV)	This controller has two types of auto−tuning as STD(standard type) and LOW (Low PV type is the value 10% lower than the set value)
Level PID Operation	The input range is divided into four levels and differnt PID group is applied to each level. If you choose Level function, the PID group is automatically selected by Level irrespective of PID number or Set Value Number(SVNO). You can apply different PID data to different range to get an optimum PID value in wide temperatare range.

2. Model Code

Model	Number		Function
NP200–	□	□	Programmable Controller (96 X 96 mm)
Control Type	0		Universal Type
	1		Heating/Cooling Type
Option		0	None
		1	RS422 / 485 (Communication Function)
		2	DI 4 Points(External Signal Input)
		3	RS422 / 485(Communication Function), DI 4Points

※ DI 1~3 Standard, DI 4~7 Option

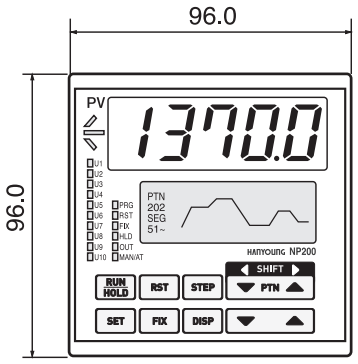
3. Wiring

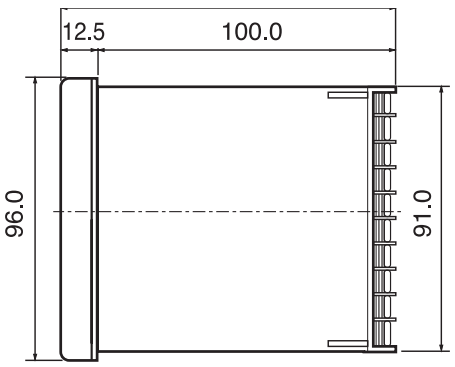


4. Dimensions

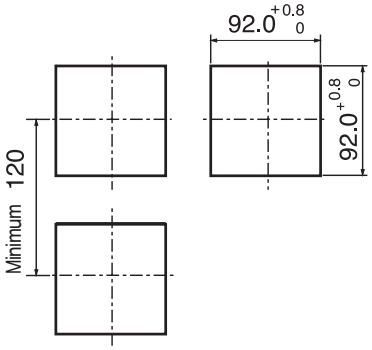
[Unit : mm]

● Dimension





● Panel Cutout



5. Input & Output

5-1. Input Signal and Measurement Range

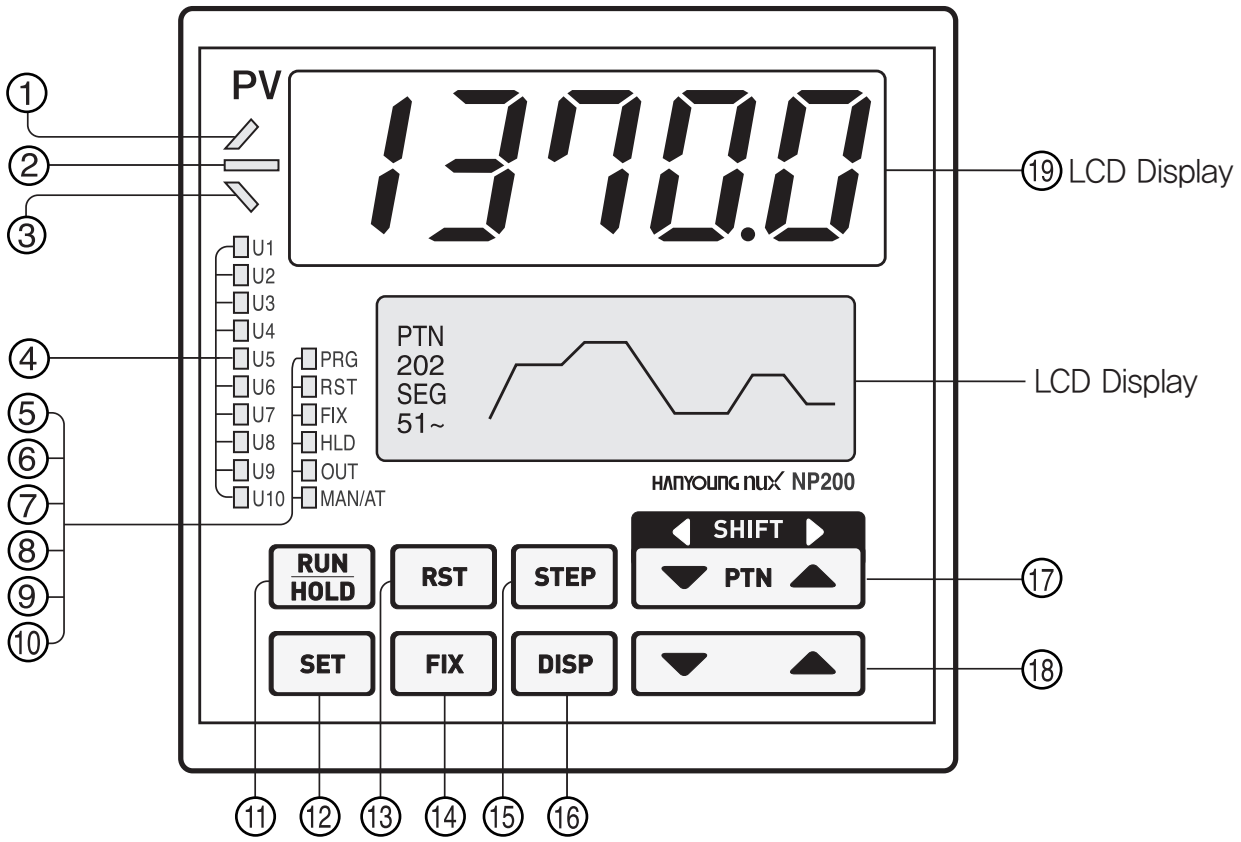
Input Signal		Input Code	Range (℃)	Accuracy
Thermocouple	K *1	K1	-200.0 ~ 1370.0	±0.10 % of FS ±1digit
	K *1	K2	-200.0 ~ 1000.0	
	J *1	J	-200.0 ~ 1200.0	
	E *1	E	-200.0 ~ 1000.0	
	T *1	T	-200.0 ~ 400.0	
	R	R	0 ~ 1700	±0.15 % of FS ±1digit
	B *2	B	0 ~ 1800	
	S	S	0 ~ 1700	
	L *1	L	-200.0 ~ 900.0	±0.1 % of FS ±1digit
	N	N	-200.0 ~ 1300.0	±0.2 % of FS ±1digit
	U *1	U	-200.0 ~ 400.0	±0.1 % of FS ±1digit
	W	W	0 ~ 2300	
	Platinel II	Platinel2	0.0 ~ 1300.0	
R.T.D	JPt100	JPT100	-200.0 ~ 500.0	
	Pt100	PT100	-200.0 ~ 640.0	
Direct Voltage (V)	1 – 5 V	1/5 V	Range of Scalling SL-L ~ SL-H = -2000 ~ 14000 *When using current input, use a resistor 250 Ω 0.1 % on input terminal (between No.19 and 20) to convert 4~20mV	
	0 – 10 V	0/10 V		
Direct Voltage (mV)	-10 – 20 mV	-10/20 mV		
	0 – 100 mV	0/100 mV		
Direct	4 – 20 mA d.c.	1/5 V**		

※ Display Range : -5 % ~ +105 % of Above Range *1 : 0 ℃bellow : ±0.2 % of FS ±1digit
*2 : 0 ~ 400 ℃의 range : ±5 % of FS ±2digit

5-2. Output Type

Classification	Output(OUT) (Heating/ Cooling side)	OUT1		OUT2	
		Relay Output	SSR/SCR(Current Output)	U10	SSR/SCR (Current Output)
Np200 - 0 (Universal)	RLY (Relay)	ON-OFF Control		(U 10)	(Retransmission)
	SSR		SSR OutPut		
	SCR		4 – 20 mA		
	RLY (Relay)	Relay Output			
NP200 - 1 (Heating/ Cooling)	SSR / SSR		SSR Output	(U 10)	SSR Output
	SCR / SSR		4 – 20 mA		
	Relay / SSR	Relay Output	(Retransmission)		
	SSR / SCR		SSR Output	(U 10)	4 – 20 mA
	SCR / SCR		4 – 20 mA		
	Relay / SCR	Relay Output	(Retransmission)		
	SSR / Relay		SSR Output	Relay Output	(Retransmission)
	SCR / Relay		4 – 20 mA		
	Relay / Relay	Relay Output			

6. Part Name and Functions



6-1. LED Displays

LED Indication	Description
① Lamp	This display lights during the ascending ramp segment (UP).
② Lamp	This display lights during the soak segment (SOAK).
③ Lamp	This display lights during the descending ramp segment (DOWN).
④ U1~U10 Lamp	This display lights when the User Output (U1~U10) is activated by the prescribed parameter.
⑤ PRG Lamp	This display lights during the temperature control program running (Program run).
⑥ RST Lamp	This display lights when the controller operation has been paused through RESET.
⑦ FIX Lamp	This display lights when the controller operation is controlled through FIX .
⑧ HOLD Lamp	This display lights when the program has been paused through HOLD.
⑨ OUT Lamp	This display lights when the Control Output (OUT-1) is activated. If output is variable, the display lights proportionally.
⑩ MAN/AT Lamp	This display lights during the manual control (MAN). If a controller is in AUTO control mode, this display lights when an auto-tuning (AT) is in-process.

6–2. Front Panel Key Functions

⚠ CAUTION

– Push the key until you feel pressure.
– Do not push sharp objects (such as pencil) on key. Otherwise, it may cause damage or malfunction.

Key	Descriptions
⑪ RUN/HOLD (RUN/HOLD)*	• Used to activate selected Pattern Number. • Pressing RUN/HOLD key for at least 1 second activates Segment Hold (pausing). • Pressing RUN/HOLD key for at least 1 second deactivates Segment Hold (pausing) and resume operation (RUN).
⑫ SET (SET)	• Used to input Parameter. • Used to input Control Mode. • Used to verify and bypass Parameter settings when in the parameter Group Display. • Pressing SET key for at least 3 seconds switches between the Operating Display and Menu Display.
⑬ RST (RESET)*	• Pressing REST key after a program runs will reset the controller to STOP mode and end all programs. • Pressing REST key after a program runs will reset the controller RESET mode and end all FIXs.
⑭ FIX (FIX)*	• Used to change Operation mode to FIX mode. • Pressing FIX key after a program runs/or in Stop will reset the controller to FIX mode.
⑮ STEP (STEP)*	• Pressing STEP key after a program runs will pause the running segment and activate next segment.
⑯ DISP (DISPLAY)	• Used to change the Operating Display (LCD: Liquid Crystal Display). • Used to switch menu display (PROG, OPER, FUNC and STUP). • Used to return back to the previous display.
⑰ SHIFT / PTN (PTN UP/DOWN)	• Pressing PTN key will change pattern number. • Pressing SHIFT key will change the digit(s) of Set Value.
⑱ ▼ ▲ (UP/DOWN)	• Used to change the value of digits when setting parameters. • Used to move between parameter groups. • Pressing UP/DOWN key activates Key Speed.
⑲ PV DISPLAY	• This display indicates the Process Value (PV) while a program is running. • Temperature display range (Below zero (–) comes in first place of five digit number.) -19999 ~ 99999

* You may push the key for one second or longer.

6-3. LCD Displays

● Operating Display

· Operating display consists of five sub-displays.

· Press [DISP] for display switching.

● Set Value (SV) Display

1) Program Run

① SV : This display indicates the set value that currently is being monitored and programmed.

② ℃ : This display indicates the temperature unit as below
Direct current (d.c. V) : temperature unit of U.UNIT.
Thermocouple or RTD : temperature unit of UNIT.

③ PT : This display indicates the pattern number.

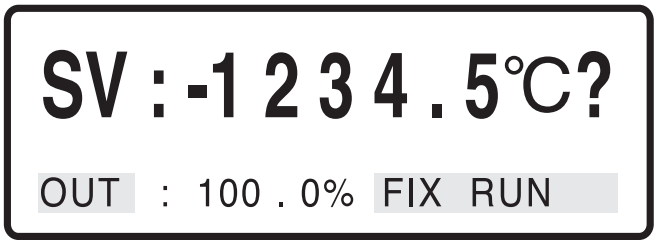
④ SEGNO : This display indicates the running segment (Now SEG) and total number of programmed segments (Total SEG).

⑤ TIME : This display indicates the remaining time of running segment (hr./Min.:**h** or Min./Sec.:**m**).

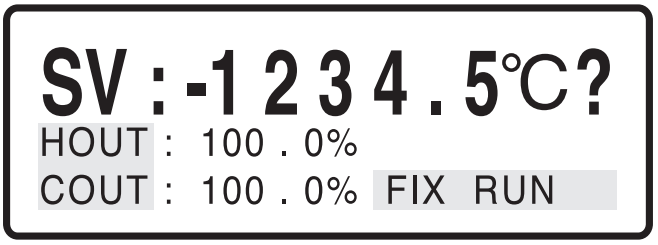
⑥ REPEAT : This display indicates the number(s) of repeated and total number of repeats (Now Repeat / Total Repeat).
If Total Repeat is Continue or Now Repeat exceeds 99, the display indicates [∞].

2) Fixed Control (FIX)

[Heating model: SV Display at Fix Mode]



[Heating/Cooling model, SV Display at Fix Mode]



① SV: This display indicates the set value that currently is being monitored and programmed.

② ℃: This display indicates the temperature unit as below:
Direct current (d.c. V): temperature unit of U.UNIT;
Thermocouple or RTD: temperature unit of UNIT.

③ ? : This display blink "?" when SV is changed by pressing [▼ ▲] key during the FIX mode.

3) Reset

① SV : This display indicates the minimum value of setting range.

② ℃ : This display indicates the current temperature unit.

③ PT : This display indicate the current Pattern (Use SHIFT PTN key to change the required pattern type)

④ SEGNO : This display indicate total number of programmed segments and END.SEG of the current pattern. (END.SEG / Total SEG)

※ Total SEG and END.SEG

• If the latest programmed SEG is larger than ENG.SEG, Total SEG displays END.SEG.

• If END.SEG is same to/or larger than the latest SEG, Total SEG displays the latest programmed SEG.

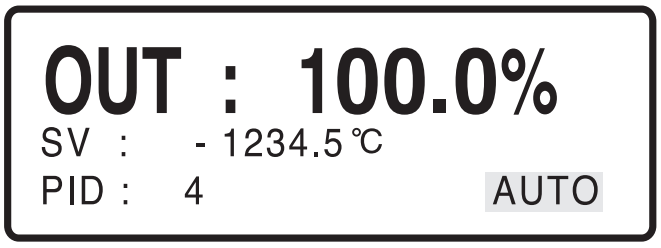
【Ex. 1】 If 10SEGs are programmed while END.SEG is 8SEG, then Total SEG is 8SEG.

【Ex. 2】 If 5SEGs are programmed while END.SEG is 7SEG, then Total SEG is 5SEG.

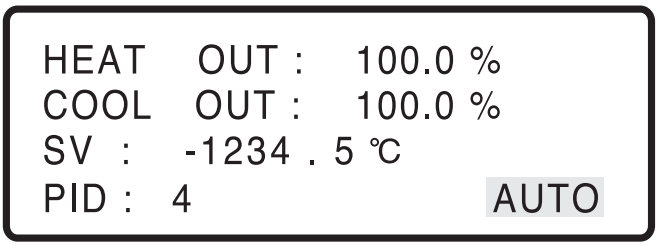
【Ex. 3】 If 5SEGs are programmed while END.SEG is OFF, Total SEG is 5SEG.

● Output (OUT) Display

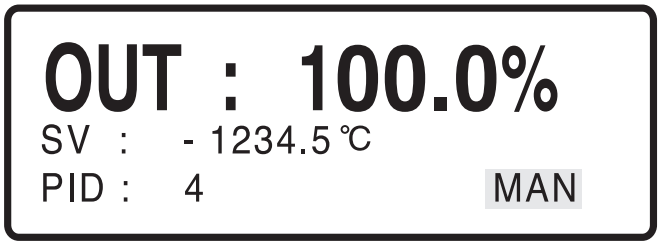
1) Auto Mode, Heating model



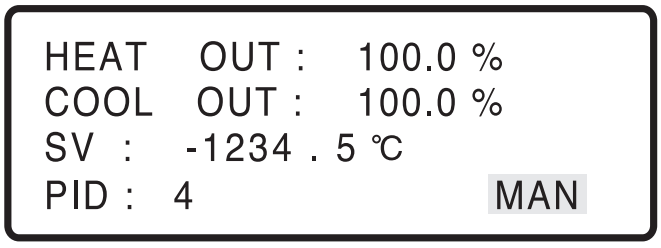
2) Auto Mode, Heating/Cooling model



3) Manual Mode, Heating model



4) Manual Mode, Heating/Cooling model



1) OUT : This display indicates the output value of Heating model.

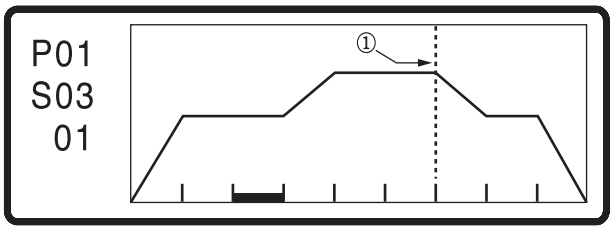
2) HEAT OUT : This display indicates the heating output value of Heating/Cooling model.
COOL OUT : This display indicates the cooling output value of Heating/Cooling model.

3) SV : This display indicates the set value that currently being monitored and programed during PROG or FIX Mode.
This display indicates the minimum value of setting range during RESET mode.

4) PID : This display indicates PID GROUP number that currently being controlled.

5) AUTO/MAN : This display indicates the output mode that currently being monitored. Use ▼ ▲ key to change the required output mode during manual (MAN) mode.

● Graph Display



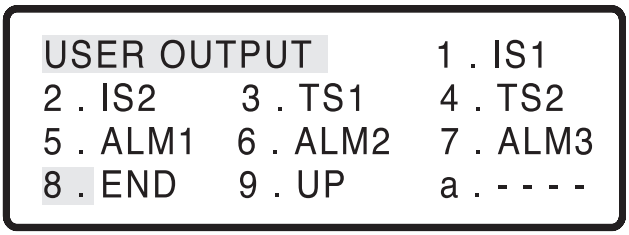
1) SV of selected pattern number (on Display–1: setup) is shown in the graphic image as below.
2) Maximum 9 segments are displayed.
The current segment is indicated in bold–black bar on x–axis. However, above bold–black bar disappears during the Fixed Control or Reset Mode.
3) Use [▼ ▲] key to change the required segment from 1 through 9.
4) P** indicates the pattern number that currently being selected (FIX, RESET) or operated (PROG).
5) S** indicates the segment number that currently being operated. However, S– – presents during the Fixed Control or Reset Mode.
6) 01 indicates the first segment number among others that currently being displayed.
7) ◀ ▶ indicates the graph that is not currently being displayed(▶ : right, ◀ : left, ◀ ▶ : both).
8) Vertical bar ① indicates END.SEG.

● User Output Display

1) User Output display indicates programmed parameters from 1 through 10.

【Display below means:】

- U1 is Inner Signal 1
- U2 is Inner Signal 2
- U3 is Time Signal 1
- U4 is Time Signal 2
- U5 is Alarm 1
- U6 is Alarm 2
- U7 is Alarm 3
- U8 is Pattern End Signal
- U9 is Pattern Up Signal
- U10 is inactive.



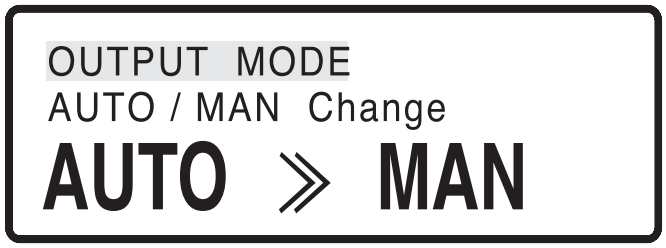
2) The current User Output Number is heightened.
For instance, above display shows Pattern End Signal is being generated and User Output 8 is being activated.

3) Programmable User Output Display parameters are as below:

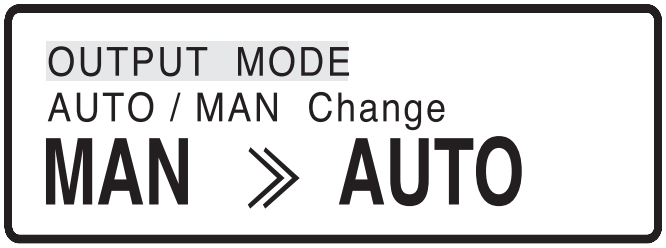
- OFF : " ———— "
- Alarm 1 ~ 4 : "ALM1" ~ "ALM4"
- Time Signal 1 ~ 5 : "TS1" ~ "TS5"
- Inner Signal 1 ~ 5 : "IS1" ~ "IS5"
- Pattern End Signal : "END"
- Pattern Up Signal : "UP"
- Pattern Down Signal : "DOWN"
- Pattern Soak Signal : "SOAK"
- Program Run : "PROG"
- Fix Run : "FIX"
- Reset : "RST"
- Hold : "HOLD"
- Wait : "WAIT"

● Auto & Manual Display

1) uto (AUTO) Output



2) Manual (MAN) Output



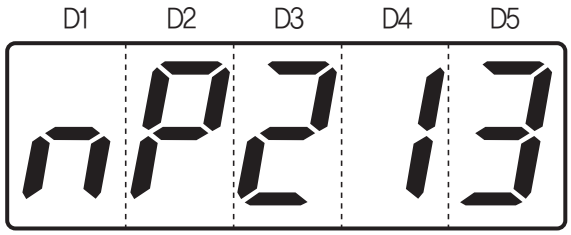
① AUTO ≫ MAN indicates that the current output mode is AUTO, MAN ≫ AUTO indicates that the current output mode is MANUAL.

② If AUTO/MAN is locked, this display is inactive .

※ For instance, if current output mode is AUTO and pressing [SET] key will change from output mode to MANUAL and MAN ≫ AUTO will be displayed.

●Power-On Display

1) PV Display



① Characters shown in D1 ~ D3 indicate NP200 model.

② Character show in D4 indicates temperature controller type (0: Heating; 1: Heating/Cooling)

③ Character show in D5 indicates additional information of temperature controller (0: none, 1: Communication,2 : Four Digital Inputs, 3: Communication/Four Digital Inputs)

2) SV Display

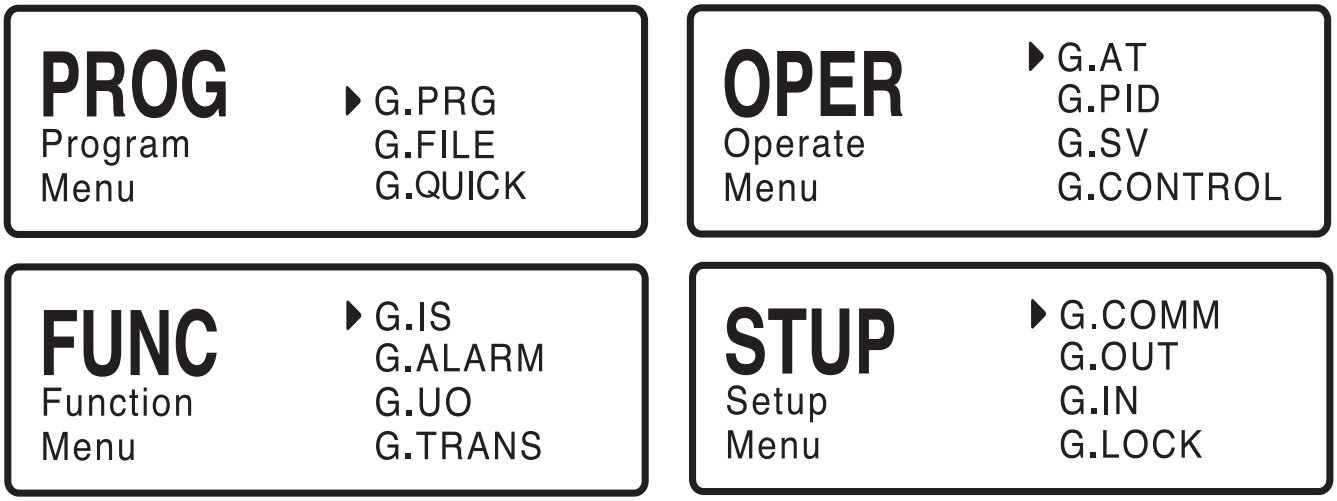
① Characters in top-left indicate NP200 model, controller type and additional information.

② Character in bottom indicates Version number.

● Menu Display

1) Menu displayed on LCD screen consists of groups and sub-groups as blow:

Menu	Group	Sub-group
PROG (Program)	G.PRG (Program Group) G.FILE (File Group) G.QUICK (Quick Menu Group)	INFORM (Pattern/Segment Information) PT.EDIT (Pattern Edit) SEG.EDIT (Segment Edit)
OPER (Operation)	G.AT (Auto-Tuning Group) G.PID (PID Group) G.SV (Set-up Group) G.CONTROL (Control Group)	-
FUNC (Function)	G.IS (Inner Signal) G.ALARM (Alarm Group) G.UO (User Output Group) G.TRANS (Transfer Group)	-
STUP (Set-up)	G.COMM (Communication group) G.OUT (Output group) G.IN (Input Group) G.LOCK (Locking group)	-



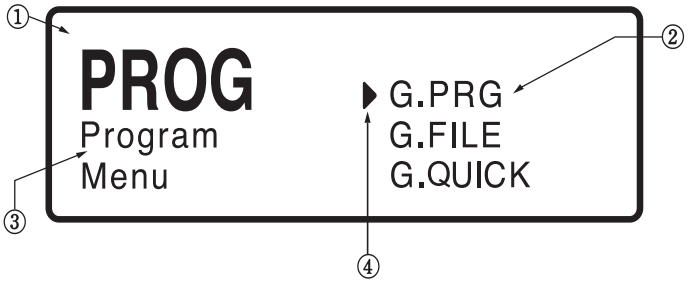
① Pressing [DISP] key will alter Menu displays.

② Sub-groups are displayed on left. Use [▼ ▲] key to change the required sub-group (▶ indicates the selected Sub-Group Menu). Pressing [SET] key will confirm the selected sub-group.

③ For returning back to Menu display, press [DISP] key.

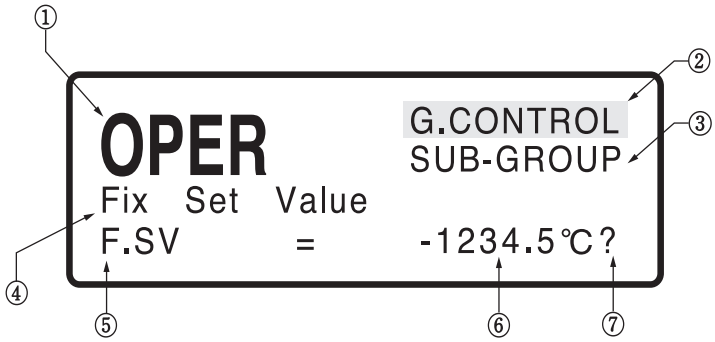
2) Menu Display Parameters

① This display indicates the Menu name.
② This display indicates the Group name.
③ This display indicates the full name of Menu.
④ Use [▼ ▲] key to change the required sub-group.

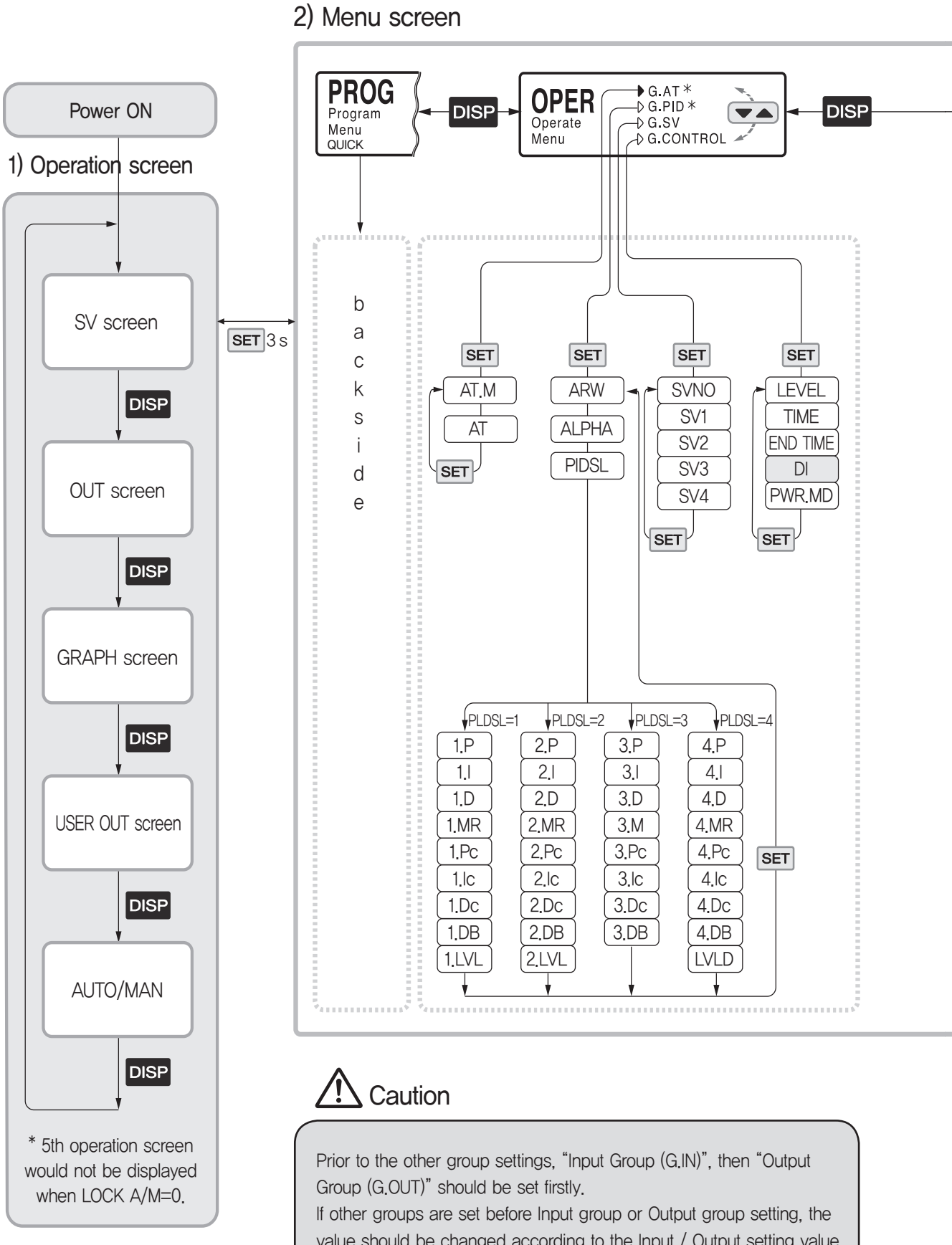


3) Group Display Parameters

① This display indicates the Menu name
② This display indicates the Group name.
③ This display indicates the Sub-Group .
④ This display indicates the full name of Parameter.
⑤ This display indicates the Parameter name.
⑥ This display indicates the Parameter value.
⑦ Use [▼ ▲] key to change the Parameter value.
?-display blinks when the Parameter value is changed.



7. Menu Display

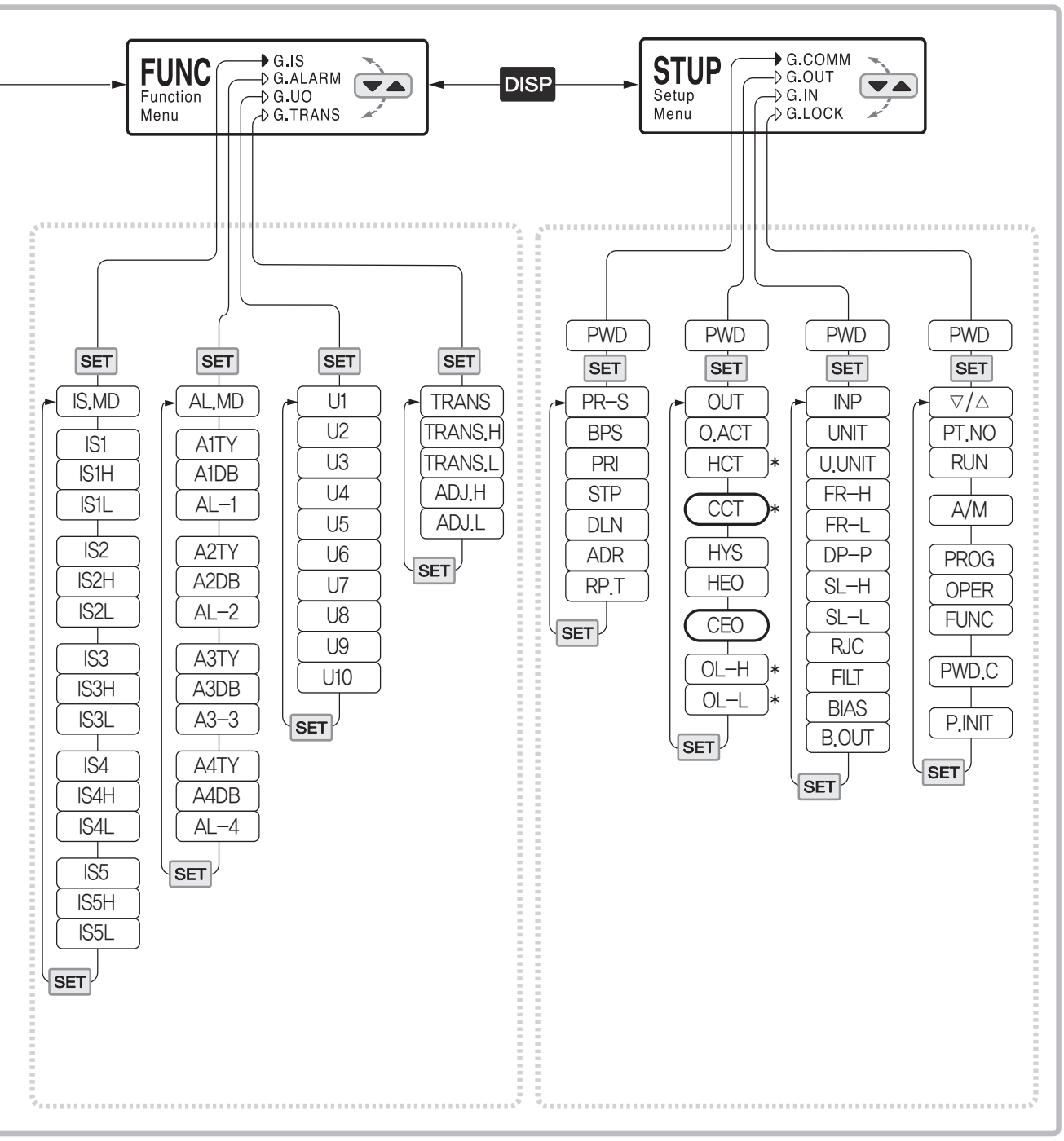


⚠ Caution

Prior to the other group settings, “Input Group (G.IN)”, then “Output Group (G.OUT)” should be set firstly.
If other groups are set before Input group or Output group setting, the value should be changed according to the Input / Output setting value.

CAUTIION

- Menu Setting Screen
- Menu setting is recommended after program operation is off.
- It is to prevent setting value changed according to a certain set-up parameter setting.
- Some parameter may not indicated due to its mode & additional specification of controller, control type selection etc.



● When power is ON

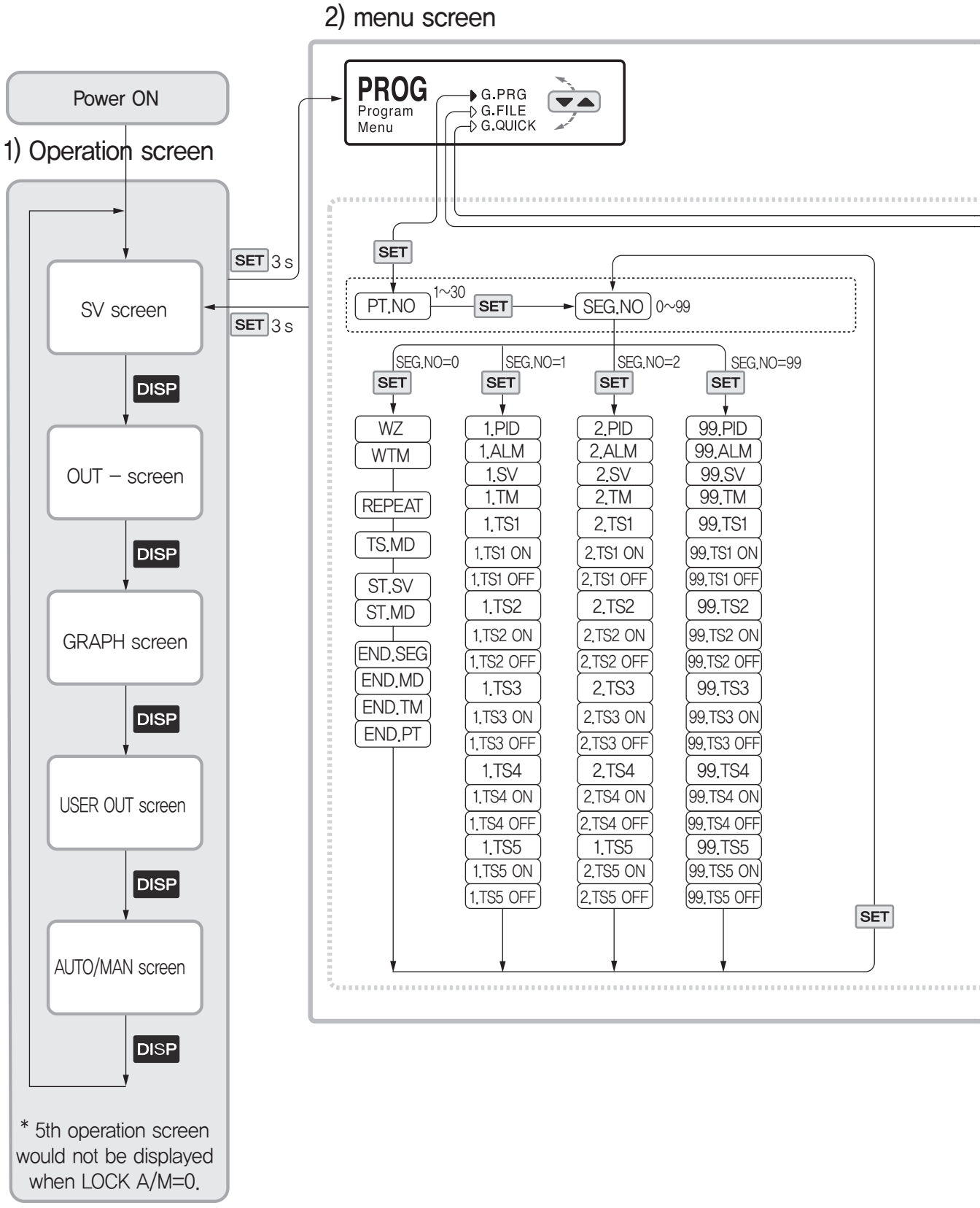
The controller starts from the same operating mode as when the device was OFF. But if the device was in program mode, will follow ST.MD

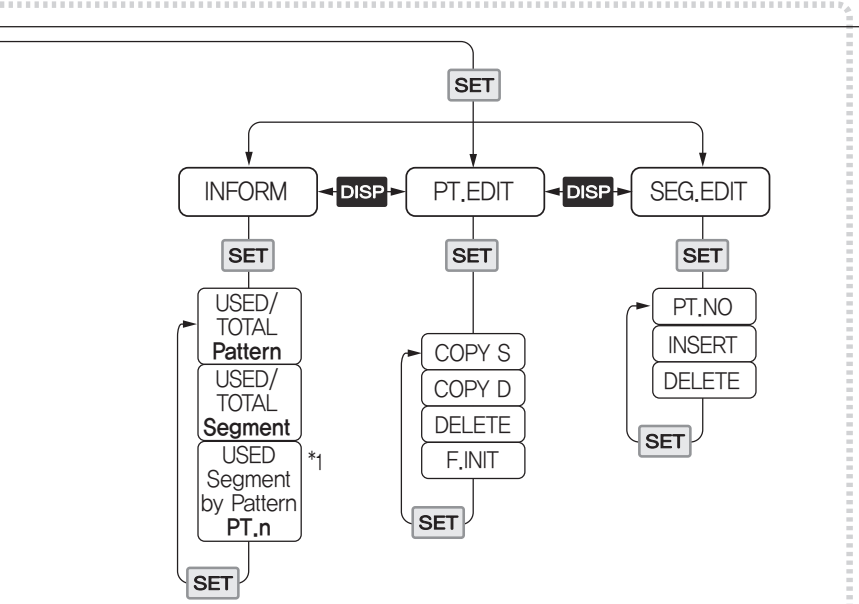
: OPTION

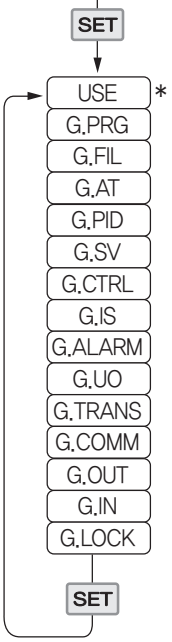
: H/C TYPE시

- AUTO operation MODE : Starts control from HEO set value
- MAN operation MODE : Starts control from HEO set value

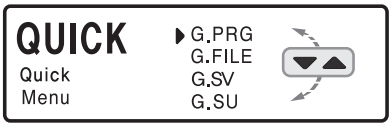
* : In ON/OFF (OUT=0) control SKIP
In MAN control, AT GROUP is


2) menu screen
Power ON
1) Operation screen
SV screen
SET 3 s
SET 3 s
DISP
OUT – screen
DISP
GRAPH screen
DISP
USER OUT screen
DISP
AUTO/MAN screen
DISP
* 5th operation screen would not be displayed when LOCK A/M=0.
PROG
Program
Menu
G.PRG
G.FILE
G.QUICK
SET
PT.NO
1~30
SET
SEG.NO
0~99
SEG.NO=0
SEG.NO=1
SEG.NO=2
SEG.NO=99
SET
WZ
WTM
REPEAT
TS.MD
ST.SV
ST.MD
END.SEG
END.MD
END.TM
END.PT
1.PID
1.ALM
1.SV
1.TM
1.TS1
1.TS1 ON
1.TS1 OFF
1.TS2
1.TS2 ON
1.TS2 OFF
1.TS3
1.TS3 ON
1.TS3 OFF
1.TS4
1.TS4 ON
1.TS4 OFF
1.TS5
1.TS5 ON
1.TS5 OFF
2.PID
2.ALM
2.SV
2.TM
2.TS1
2.TS1 ON
2.TS1 OFF
2.TS2
2.TS2 ON
2.TS2 OFF
2.TS3
2.TS3 ON
2.TS3 OFF
2.TS4
2.TS4 ON
2.TS4 OFF
2.TS5
2.TS5 ON
2.TS5 OFF
99.PID
99.ALM
99.SV
99.TM
99.TS1
99.TS1 ON
99.TS1 OFF
99.TS2
99.TS2 ON
99.TS2 OFF
99.TS3
99.TS3 ON
99.TS3 OFF
99.TS4
99.TS4 ON
99.TS4 OFF
99.TS5
99.TS5 ON
99.TS5 OFF
SET





*If you ON USE menu, display will be changed as below (Group will be display only ON menu).



● Operation when Power ON

Starts operation from operation mode before Power off. But in program mode, operation will be followed by ST.MD.

• AUTO operation MODE: Starts from HEO set value • MAN operation MODE: Starts from HEO set value	*1 ▼ ▲ PATTERN number selection (1~3) by Keys with DIRECT ENTRY

8. Setting Guidline

8-1. Program Menu(PROG)

> ⚠ CAUTION
> Prior to the other group settings, "Input Group (G.IN)",
> then "Output Group (G.OUT)" should be set firstly.
> If other groups are set before Input group or Output group setting, the value should be changed according to the Input / Output setting value.

● Program Group (G.PRG)

Classification	Signal	Parameter	Set-up range	Display Condition	Default
Entry	PT.NO	Pattern Number Selector	1 ~ 30	Always	1
	SEG.NO	Segment Number Selector	0 ~ 99		0
SEG. NO = 0	WZ	Wait Zone	OFF, 0 ~ 10 % (EUS)		OFF
	WTM	Wait Time	OFF, 0.01 ~ 99.59 (TIME)		OFF
	REPEAT	Repeat Set	CONTINUE / 1 ~ 99		1
	TS.MD	Time Signal Mode	NONE, ON/OFF1~5, TIME1~5		ON/OFF1
	ST.SV	Start Set Value	0 ~ 100 % (EU)		EU (0 %)
	ST.MD	Start Mode	SSV, PV1, PV2		SSV
	END.SEG	Pattern End Segment	OFF, 1 ~ 99		OFF
	END.MD	Pattern End Mode	RESET, HOLD, FIX, LINK		RESET
	END.TM	End Signal Time	OFF, 0.01 ~ 99.59 (TIME)		OFF
	LINK.PT	Link Pattern	1 ~ 30	END.MD = LINK	1
SEG. NO = 1	01. PID	01. PID NO. Select	1 ~ 4	Always	1
	01. ALM	01. ALM NO.Select	OFF, 1 ~ 15	Always	OFF
	01. SV	01. Set Value	0 ~100 % (EU)	Always	EU (0 %)
	01. TM	01. Segment Time	OFF, 0.00 ~ 99.59 (TIME)		OFF
	01. TS1	Time Signal 1	OFF, ON	Always	OFF
	TS1 ON	01. TS1 on Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 1.TS1 = ON	00.00
	TS1 OFF	01. TS1 OFF Time			
	01. TS2	Time Signal 2	OFF, ON	Always	OFF
	TS2 ON	01. TS2 on Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 1.TS2 = ON	00.00
	TS2 OFF	01. TS2 OFF Time			
	01. TS3	Time Signal 3	OFF, ON	Always	OFF
	TS3 ON	01. TS3 on Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 1.TS3 = ON	00.00
	TS3 OFF	01. TS3 OFF Time			
	01. TS4	Time Signal 4	OFF, ON	Always	OFF
	TS4 ON	01. TS4 on Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 1.TS4 = ON	00.00
	TS4 OFF	01. TS4 OFF Time			
	01. TS5	Time Signal 5	OFF, ON	Always	OFF
	TS5 ON	01. TS5 on Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 1.TS5 = ON	00.00
	TS5 OFF	01. TS5 OFF Time			

Classification	Signal	Parameter	Set-up range	Display Condition	Default
SEG. NO = 2~98					
SEG. NO = 99	99. PID	PID NO. Select	1 ~ 4	PID control level=OFF	1
	99.ALM	ALM NO.Select	OFF, 1~15	Always	OFF
	99. SV	Set Value 1	0 ~ 100 % (EU)	Always	EU (0 %)
	99. TM	Segment Time 1	OFF, 0.00 ~ 99.59 (TIME)	Always	OFF
	99. TS1	Time Signal 1	OFF, ON	Always	OFF
	TS1 ON	TS1 ON Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 99.TS1 = ON	00.00
	TS1 OFF	TS1 OFF Time			
	99. TS2	Time Signal 2	OFF, ON	Always	OFF
	TS2 ON	TS2 ON Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 99.TS2 = ON	00.00
	TS2 OFF	TS2 OFF Time			
	99. TS3	Time Signal 3	OFF, ON	Always	OFF
	TS3 ON	TS3 ON Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 99.TS3 = ON	00.00
	TS3 OFF	TS3 OFF Time			
	99. TS4	Time Signal 4	OFF, ON	Always	OFF
	TS4 ON	TS4 ON Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 99.TS4 = ON	00.00
	TS4 OFF	TS4 OFF Time			
	99. TS5	Time Signal 5	OFF, ON	Always	OFF
	TS5 ON	TS5 ON Time	00.00 ~ 99.59 (TIME)	TS.MD = Time 99.TS5 = ON	00.00
	TS5 OFF	TS5 OFF Time			

● File Group (G.FILE)

Classification	Signal	Parameter	Setting range	Display condition	Default
INFORM	Pattern	USED / TOTAL (30)	DISPLAY ONLY	Always	0 / 30
	Segment	USED / TOTAL (300)			0 / 300
	PT. n	Used Segment by Pattern			0 / 0
PT. EDIT	COPY. S	Copy Source	OFF / 1 ~ 30 Pattern	Always COPY. S ≠ OFF	OFF
	COPY. D	Copy Destination			
	RESULT	Result of File	-	COPY. S = 1 ~ 30	–
	DELETE	Delete Pattern Number	OFF / 1 ~ 30 Pattern	COPY. D = 1 ~ 30	OFF
	RESULT	Result of File CMD	-	COPY. S = 1 ~ 30 COPY. D = 1 ~ 30 DELETE = 1 ~ 30	–
	F.INIT	File All Initialize (Program initializing)	NO, YES	Always	OFF
	CONFIRM	Really File Init ?			ON
SEG. EDIT	PT. NO	Pattern Number Select	1 ~ 30 Pattern	Always	1
	INSERT	Insert Segment Number	OFF / 1 ~ 99 seg	PT.NO = 1 ~ 30	OFF
	RESULT	Result of File CMD	–	INSERT = 1 ~ 98	–
	DELETE	Delete Segment Number	OFF / 1 ~ 99 seg	Always	OFF
	RESULT	Result of File CMD	-	DELETE = 1 ~ 99	–

● Quick Menu Group (G.QUICK)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
G.QUICK	USE	Quick menu use or not	OFF / ON	Always	OFF
	G.PRG	PRG Group use or not			ON
	G.FILE	FILE Group use or not			
	G.AT	AT Group use or not			
	G.PID	PID Group use or not			
	G.SV	SV Group use or not			
	G.CTRL	CTRL Group use or not			
	G.IS	IS Group use or not			
	G.ALARM	ALARM Group use or not			
	G.UO	UO Group use or not			
	G.TRANS	TRANS Group use or not			
	G.COMM	COMM Group use or not			
	G.OUT	OUT Group use or not			
	G.IN	IN Group use or not			
	G.LOCK	LOCK Group use or not			

8-2. Operating Menu (OPER)

● Auto tuning Group (G.AT) : Only display when program operation status

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	AT. MD	Auto Tuning Mode Selection	STD, LOW *1	AUTO & PID	STD
	AT	Auto Tuning	OFF, ON, Auto (*2)	AUTO & PID제어시	OFF

*1 ; Low : Auto Tuning Starts as –10% of SV *2 Auto is displayed when LEVEL=ON in Control Group

⚠ Caution

● Using of Auto Tuning
– Please do not use Auto Tuning as following controls
– Quick response controller such as flow control and press control
– Controller output should not be ON /OFF even for a short time.
– Controller should not have big load to the control part
– Fluctuation of set value gives bad effect on product quality

● PID Group (G.PID)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	ARW	Anti – Reset Wind up	AUTO, 50.0 ~ 200.0 %	PID Control	50.0
	ALPHA	Alpha	0 ~ 100	PID Control	50
	PIDSL	PID Group Select	0 ~ 4 (Set 1 ~ 4 to move to next parameter)	PID Control	0
	n.P	Proportional band	0.1 (H/C Type : 0.0) ~ 999.9 %	PID Control	5.0 %
	n.I	Integral time	OFF / 1 ~ 6000 s (Sec.)	PID Control	240 s
	n.D	Derivative time			60 s
	n.MR	Manual reset	–0.5 ~ 105.0 % (%)	I = OFF	50.0%
	n.Pc	Proportional band of cooling side	0.0 (ON/OFF control) / 0.1 ~ 999.9 %	HC TYPE	5.0 %
	n.Ic	Integral time of cooling side	OFF / 1 ~ 6000 s		240 s
	n.Dc	Derivative time of cooling side	OFF / 1 ~ 6000 s		60 s
	n.DB	Dead band of Heating-Cooling side	–100.0 ~ 50.0 %		3.0 %
	n.LVL	PID Level n	EU (0) ≤ 1.LVL ≤ 2.LVL ≤ EU (100 %) (EU)	LEVEL = ON	EU (100%)
	LVLD	Reference DEV	OFF / EUS (0 ~ 100 %) (EU)	LEVEL = ON	EUS (0.5%)

● Set Value Group (G.SV)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
FIX SV	SVNO	Set Value NO, Select	1 ~ 4	Always	1
	SV1	Set Value 1	EU (0 ~ 100 %) (EU)	Always	EU (0 %)
	SV2	Set Value 2			
	SV3	Set Value 3			
	SV4	Set Value 4			

● Control Group (G.CONTROL)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	LEVEL	Level PID	OFF, ON	PID	OFF
	TIME	Time Unit	HH:MM, MM:SS	Always	HH.MM
	END.TM	Time Unit	HH:MM, MM:SS	Always	HH.MM
	DI	Digital Input Enable	OFF / ON	DI OPTION시	OFF
	PWR. MD	Power ON Mode	HOT, COOL	Always	COOL

8-3. Function Menu (FUNC)

● Inner Signal Group (G.IS)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	IS.MD	Inner Signal Mode	TSV, NSV, PV	Always	TSV
IS1	IS1	Inner Signal 1	OFF, ON		OFF
	IS1H	Inner Signal 1 High	IS1L + 1digit + EU (100 %)	IS1 = ON	EU (100 %)
	IS1L	Inner Signal 1 Low	EU (0 %) ~ IS1H – 1digit		EU (0 %)
IS2	IS2	Inner Signal 2	OFF, ON	Always	OFF
	IS2H	Inner Signal 2 High	IS2L + 1digit + EU (100 %)	IS2 = ON	EU (100 %)
	IS2L	Inner Signal 2 Low	EU (0 %) ~ IS2H – 1digit		EU (0 %)
IS3	IS3	Inner Signal 3	OFF, ON	Always	OFF
	IS3H	Inner Signal 3 High	IS3L + 1digit + EU (100 %)	IS3 = ON	EU (100 %)
	IS3L	Inner Signal 3 Low	EU (0 %)~ IS3H – 1digit		EU (0 %)
IS4	IS4	Inner Signal 4	OFF, ON	Always	OFF
	IS4H	Inner Signal 4 High	IS4L + 1digit + EU (100 %)	IS4 = ON	EU (100 %)
	IS4L	Inner Signal 4 Low	EU (0 %) ~ IS4H – 1digit		EU (0 %)
IS5	IS5	Inner Signal 5	OFF, ON	Always	OFF
	IS5H	Inner Signal 5 High	IS5L + 1digit + EU (100 %)	IS5 = ON	EU (100 %)
	IS5L	Inner Signal 5 Low	EU (0 %) ~ IS5H – 1digit		EUS (0 %)

● Alarm Group (G.ALARM)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
Alarm Mode	AL.MD	Alarm Mode	ALL, FIX & PROG, FIX, PROG	Always	ALL
Alarm Type	A1TY A2TY A3TY A4TY	Alarm 1 Type Alarm 2 Type Alarm 3 Type Alarm 4 Type	OFF, 1 ~ 20 ※ Please refer to Types of Alarm	Always	1 2 1 2
Alarm Dead band Setting	A1DB A2DB A3DB A4DB	Alarm 1 Dead Band Alarm 2 Dead Band Alarm 3 Dead Band Alarm 4 Dead Band	EUS (0 ~ 100 %)	AnTY ≠ OFF	EUS (0.5 %)
Alarm Set value Setting	AL–1 AL–2 AL–3 AL–4	Alarm 1 Point Alarm 2 Point Alarm 3 Point Alarm 4 Point	EU (0~100 %) EUS (0~100%)	AnTY ≠ OFF	EU (100 %) EU (0 %) EU (100 %) EU (0 %)

● User Output Group (G.UO)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	UO1	User Output 1	• OFF(-----) • SGAL • Alarm (ALM1~ALM4) • Time Signal (TS1~TS5) • Inner Signal (IS1~IS5) • PTEND / PROG / FIX / RST / HOLD / WAIT / MAN / UP / DOWN / SOAK	Always	0FF
	UO2	User Output 2			
	UO3	User Output 3			
	UO4	User Output 4			
	UO5	User Output 5			
	UO6	User Output 6			
	UO7	User Output 7			
	UO8	User Output 8			
	UO9	User Output 9			
	UO10	User Output 10			

● Retransmission Group (G.TRANS)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	TRANS	Select Retransmission	PV, SV, MV, SPS	Always	0FF
	TRANS.H	High Value of Retransmission	T/C,RTD : FR–H ~ FR–L mV, V : SL–H ~ SL–L only, RET.H > RET.L (EU)	RET = PV or SV	T/C,RTD : FR–H mV,V : SL–H
	TRANS.L	Low Value of Retransmission			T/C,RTD : FR–L mV,V : SL–L
	ADJ.H	Adjust High Value of Retransmission	95.0 ~ 105.0 %	Always	100.0
	ADJ.L	Adjust Low Value of Retransmission	–5.0 ~ 5.0 %		0.0

8-4. Setup Menu (STUP)

● Communication Group (G.COMM)

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	PWD	Password	0 ~ 9999	PWD.C	0
	PR-S	RS485, RS422 Protocol select	PC-LINK / PC-LK-S / MODBUS ASCII / MODBUS RTU	OPT	PC-LINK
	BPS	Baud Rate	600 - 38400		9600
	PRI	Parity	NONE / EVEN / ODD		NONE
	STP	Stop Bit	1, 2		1
	DLN	Data Length	7, 8 (Except PC-LIN : 8)		8
	ADR	Address	1 ~ 99		1
	RP.T	Response Time	0 ~ 10		0

● Output Group (G.OUT) ⚠ Caution After setting Input group, Output group, please setup other groups.

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	PWD	Password	0~9999	PWD.C	0
	OUT	Output Type	Please refer output type	Always	Universal : Relay Heating/Cooling : SSR/SSR
	O.ACT	Output Action	REVERSE DIRECT	Universal	REVERSE
	HCT	Heat cycle Time	1 ~ 1000 s	RLY or SSR Output (Except ON/OFF control)	RLY : 30 s SSR : 2 s
	CCT	Cool cycle Time	1 ~ 1000 s	Heating/Cooling RLY or SSR output	RLY : 30 s SSR : 2 S
	HYS	(Hysteresis (ON / OFF Control))	EUS (0 ~ 100 %)	ON/OFF control	EUS (0.5 %)
		Heating, Cooling, Normal	0.0 ~ 100.0 %	Heating/Cooling	0.5 %
	HEO	Heat Emergency output Preset Out 1, (Heat)	-5.0 ~ 105.0 % Heating/Cooling : 0.0 ~ 105.0 %	Always	0.0 %
	CEO	Preset Out 2 Cool Emergency output	0.0 ~ 105.0 %	Heating/Cooling	0.0 %
	OL-H	Output Limit High	OL-L + 1digit ~ 105. % Heating/Cooling: 0.0 ~ 105.0 %	PID	100.0 %
	OL-L	Output Limit Low	-0.5 % ~ OL-H - 1digit Heating/Cooling: 0.0 ~ 105.0 %	PID	0.0 % HC : 100.0 %

● Input Group (G.IN)

⚠ Caution After setting Input group, Output group, please setup other groups.

Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	PWD	Password	0 ~ 9999	PWD.C	0
	INP	Input Type	Please refer to input type and range	Always	K1
	UNIT	Input Unit	℃	T/C, RTD	℃
	U.UNIT	User Unit	℃, %, %RH, Pa, - (No unit)	mV, V	℃
	FR-H	Full Range High	Please refer to input type and range Notice, FR-H > FR-L	Always	1370.0
	FR-L	Full Range Low			-200.0℃
	DP-P	Dot Point Position	0 ~ 3	mV, V	1
	SL-H	Scale Limit High	-2000 ~ 14000 Notice, SL-H > SL-L Decimal point position sets by DP-P	mV, V	100.0
	SL-L	Scale Limit Low			0.0
	RJC	RJC ON / OFF	ON, OFF	Thermocouple input	ON
	FILT	PV Input Filter	OFF, 1 ~ 120	Always	OFF
	BIAS	PV Input Bias	EUS (-100 ~ 100 %)	Always	EUS (0 %)
	B.OUT	Burn-out Select	OFF, UP, DOWN	Always	UP

● Lock Group (G.LOCK)

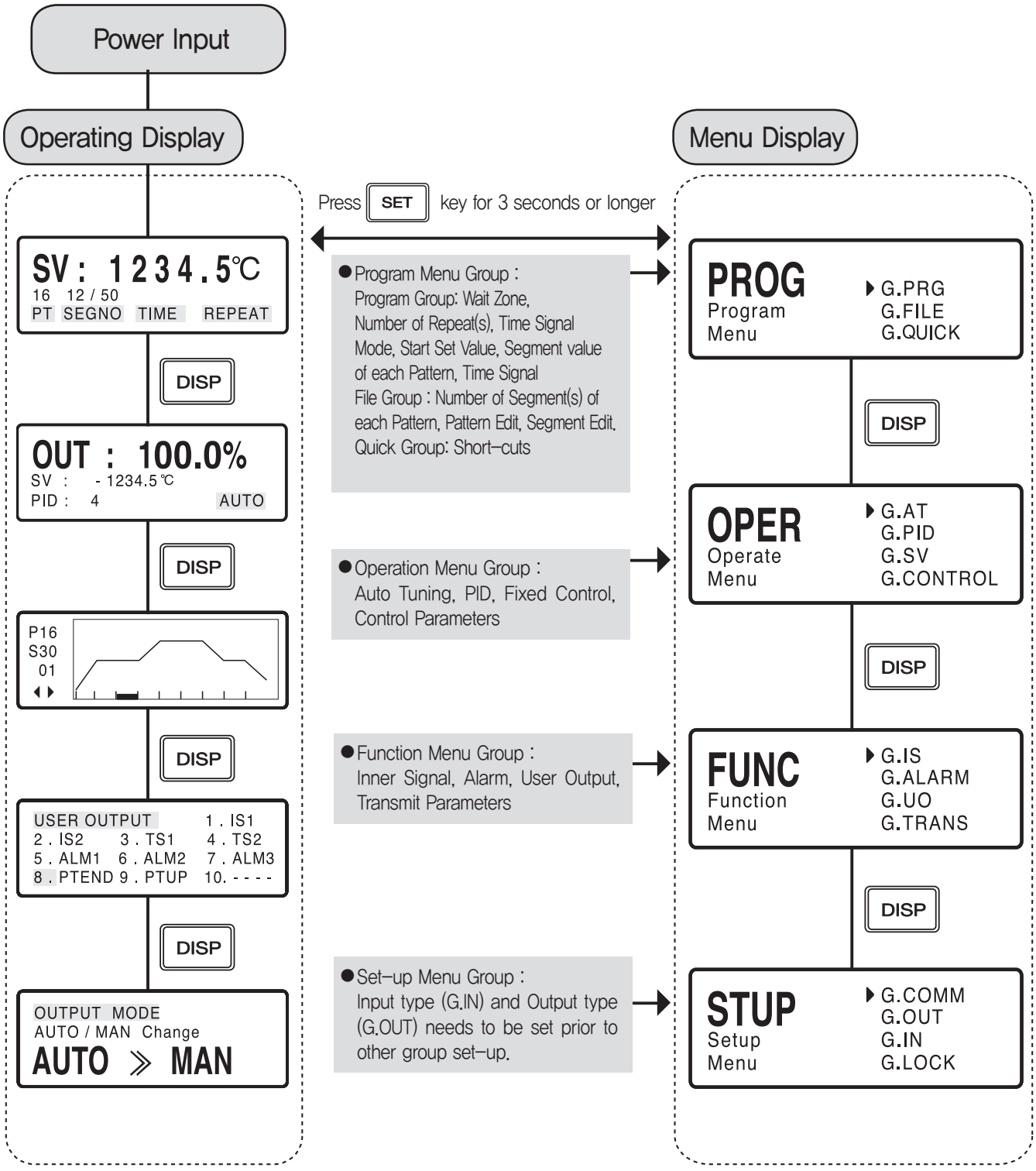
Menu	Code	Parameter	Setting Range	Display Condition	Default Value
	PWD	Password	0 ~ 9999	PWD.C	0
	▽ / △	Down Up Key Lock	OFF, ON	Always	OFF
	PT.NO	Pattern Number Lock			
	RUN	Run Key Lock			
	A / M	Auto / Man Lock			
	PROG	PROG Menu Lock			
	OPER	OPER Menu Lock			
	FUNC	FUNC Menu Lock			
	PWD.C	Password Chage	0 ~ 9999	Always	0
	P.INIT	Parameter Initialize	NO, YES	Always	NO

※ If you set password to PWD.C (Password Change), PWD parameter will be displayed.

9. Initial Setting Description

This instrument is made up of 5 kinds of operation display and 4 kinds menu display . Please refer to LCD display and Menu display during the set up process.

9-1. Menu Display



9-2. Setting Example

• Input sensor set up

1) K type thermocouple so range is -200.0 ~ 1370 C'.
2) Set-UP group: STUP (Setup menu), G.IN (Input group)
3) Same as default set value so no chagne.

After wiring, power on and operation screen will be display.
If press "Set" key 3 sec, Operating display - Menu display will be screen alternately.

Select sensor type	• Menu screen ➜ Push [DISP] key ➜ STUP ➜ Push ▼ ▲ key and go G.IN. ➜ Push [SET] key ➜ INP ➜ select K1 type by ▼▲ key.
	• If you want to change input type to PT100Ω, push ▲▼ key and select INP = PT100 and push SET key. (Each time you push SET key to move the next parameter)
Select input unit	• Input Unit select = ˚C
Setup Full Range High	• Full Range High FR-H = 1370.0 ˚C
Setup Full Range Low	• Full Range LOW FR-L = -200.0 ˚C
Select Cold Junction Compensation (RJC)	• RJC = ON
Setup PV Input Filter	• PV Input Filter = OFF
Setup PV Input Bias	• PV Input Bias = 0.0 ˚C
Select Burn Out	• Burn Out Select = UP

[Caution] Incorrect setting may cause of overheating or other problems.

• Select Output Type to SSR

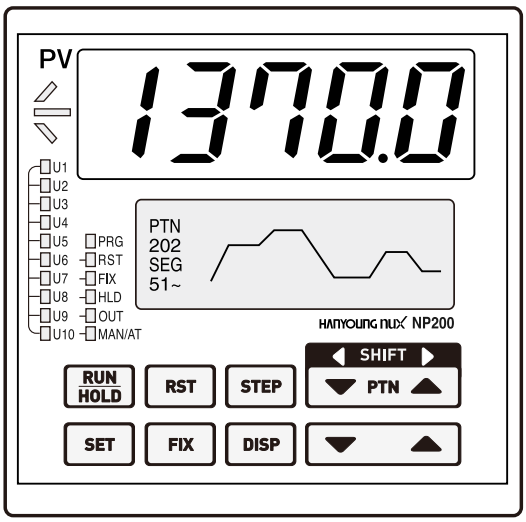
1) Use SSR output for heating control output.
2) Setting group: STUP ➜ G.OUT
3) Set as like below

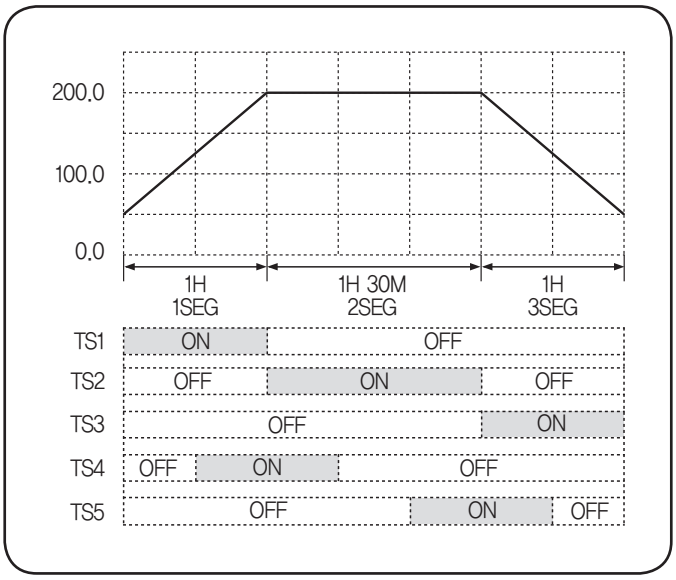
Control output type selection	• Menu screen ➜ Push [DISP] key ➜ STUP ➜ Push ▼ ▲ key and go G.OUT. ➜ Push [SET] key ➜ OUT ➜ select OUT=RLY by ▼ ▲ key
	• Push ▼ ▲ key and select SSR among RLY (PID), SCR(4-20mA), SSR and ON/OFF(Relay). Push [SET] key to select it.
Select Output Action	• Output Action O.ACT = REVERSE
Heat Cycle Time	• HEAT Cycle Time HCT = 2 Second
Heat Emergency Output	• Heat Emergency Output HEO = 0.0%
Output Limit High	• Output Limit High OL-H = 100.0%
Output Limit Low	• Output Limit Low OL-L = 0.0%

● Program

Push SET key at least 3 seconds from Operating Display.
Program from PROG menu ➜ G. PRG.

1) Programming is to the Figure below.
2) Wait Zone: 3.0 ℃, Wait Time: 30Mins.





Select Pattern number	• Menu Display ➜ Push [DISP] key : OPER➜FUCN➜STUP➜ PROG display sequentially
	• PROG ➜ Push ▲ ▼ key and go G.PRG ➜ Push SET key ➜ Select Pattern Number PT.NO = 1. Push SET key to select it.
Select Segment number	• Segment Number SEGNO = 0 display. It means 0 segment. Push [SET] key to select it
Set Wait Zone	• Wait Zone WZ = OFF display. Set WZ=3.0 ° C ? by ▲ ▼ key. Push [SET] key to select it
Set Wait Time	• Wait Time WTM =OFF display. Set WTM=00h 30m ? by ▲ ▼ and [▼ PTN ▲] key. Push [SET] key to select it
Set Repeat	• Repeat Set REPEAT= 1 display. Push [SET] key to select it
Set Time Signal Mode	• Time Signal Mode TS.MD=ON/OFF 1 display. Set TS.MD=TIME 5 ? by ▲ ▼ key. Push [SET] key to select it
Set Start Set Value	• Start Set Value ST.SV=–200.0'C display. Set ST.SV=50.0'C ? by ▲ ▼ and [▼ PTN ▲] key. Push [SET] key to select it
Set Start Mode	• Start Mode ST.MD=SSV display. Push [SET] key to select it
Set Pattern End Segment	• Pattern End Segment END.SEG=OFF display. Push [SET] key to select it
Set Pattern End Mode	• Pattern End Mode END .MD = RESET display. Set END.MD=HOLD ? by ▲ ▼ key. Push [SET] key to select it
Set End Signal Time	• End Signal Time END.TM = OFF display. Push [SET] key to select it * Segment Number Seg.NO=0 display. Setting finish and set segment parameter Seg.NO = 1~3

3) PT NO = 1 / SEG NO = 0

Code	Parameter	SV	Display condition
PT NO	Pattern No.	1	Always
SEG NO	Segment No.	0	
WZ	Wait Zone	3.0	
WTZ	Wait Time	00h 30m	
REPEAT	Repeat	1	
TS.MD	Time Signal Mode	TIME5	
ST.SV	Start Set Value	50.0	
ST.MD	Start Mode	SSV	
END.SEG	Pattern End Segment	OFF	
END.MD	Pattern End Mode	HOLD	
END.TM	End Signal Time	OFF	

4) SEG NO = 1 ~ 3

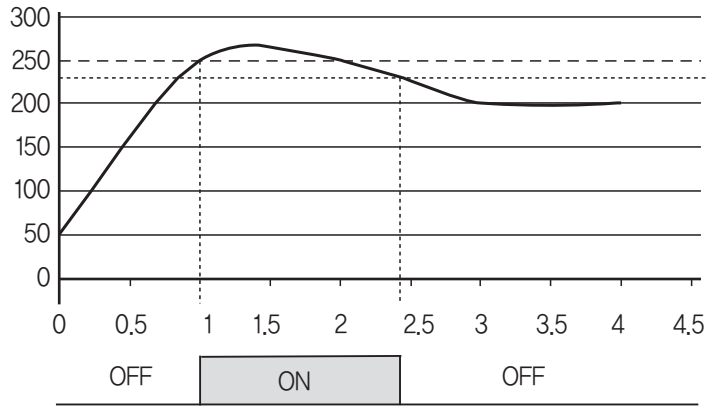
Code	Parameter	Segment 1 Set Value	Segment 2 Set Value	Segment 3 Set Value	Display Condition
PT NO	Pattern Number	1	1	1	Always
SEG NO	Segment Number	1	2	3	
01.PID	PID Group Number	1	1	1	PID control LEVEL = OFF
01.ALM	Alarm Number	01 : 0001	01 : 0001	01 : 0001	Always
01.SV	temperature setting value	200.0	200.0	50.0	
01.TM	Segment Time	01h 00m	01h 30m	01h 00m	
TS1	Time Signal–1	ON	OFF	OFF	Always
TS1.ON	Time Signal–1 ON–Time	00h 00m			TS.MD = Time 1.TS1 = ON
TS1.OFF	Time Signal–1 OFF–Time	01h 00m			
TS2	Time Signal–2	OFF	ON	OFF	Always
TS2.ON	Time Signal–2 ON–Time		00h 00m		TS.MD = Time
TS2.OFF	Time Signal–2 OFF–Time		01h 30m		
TS3	Time Signal–3	OFF	OFF	ON	Always
TS3 ON	Time Signal–3 ON–Time			00h 00m	TS.MD = Time 1.TS3 = ON
TS3 OFF	Time Signal–3 OFF–Time			01h 00m	
TS4	Time Signal–4	ON	ON	OFF	Always
TS4 ON	Time Signal–4 ON–Time	00h 30m	00h 00m		TS.MD = Time 1.TS4 = ON
TS4 OFF	Time Signal–4 OFF–Time	01h 00m	01h 30m		
TS5	Time Signal–5	OFF	ON	ON	Always
TS5 ON	Time Signal–5 ON–Time		01h 00m	00h 00m	TS.MD = Time 1.TS5 = ON
TS5 OFF	Time Signal–5 ON–Time		01h 30m	00h 30m	

● G.ALARM

■ ALARM 1 is set to the High Limit Alarm.

1) If PV is 250.0 ℃ or above, the Alarm is ON.

2) If PV is 230.0 ℃ or below, the Alarm is OFF.



■ There are four alarm outputs for alarm temperature settings. Set the alarm mode, alarm type, alarm deadband, temperature alarm settings.
Alarm operation is activated in ALL, FIX & PROG, FIX, PROG according to the parameter of AL.MD in G.ALARM.
Even if each parameter of G.ALARM is set in the program control, alarm selected by alarm parameter(xx.ALM) in each segment of each pattern is activated.
Ex) in case all alarm number 1, 2, 3, 4 set, the alarm number 1 is only activated if the alarm parameter(01.ALM) is set with 1 in the segment number 1 of pattern number 1.

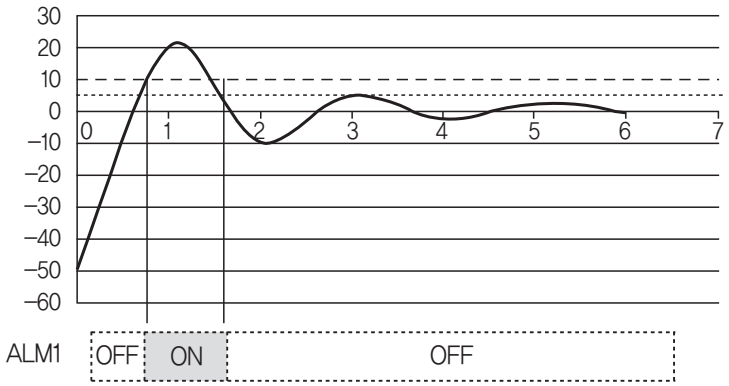
Alarm Model Setting	• Push [SET] Key at least 3 seconds from Operation display 〉 PROG 〉 Push [DISP] key 〉 FUNC 〉 Push ▲▼ key and go G.ALARM. 〉 Push [SET] key 〉 AL.MD=ALL.
	• Push ▲▼ key and select amount ALL, FIX&PROG, FIX or PROG. Push [SET] key to select it
Alarm 1 Type Setting	• Alarm 1 type A1TY= 1 display. Push [SET] key to select it
Alarm 1 Dead Band Setting	• Alarm 1 Dead Band A1DB = 7.9 ° C display. Push ▲▼ key and set IS2H=20.0'C ?. Push [SET] key to select it
Alarm 1 Temperature Setting	• Alarm 1 Dead Band A1DB = 7.9 ° C display. Push ▲▼ key and set IS2H=20.0 ° C ?. Push [SET] key to select it
Alarm 2 Type Setting	• Alarm 2 Type A2TY=2 display. Push ▲▼ key and set A2TY=3 ?. Push [SET] key to select it
Alarm 2 Dead Band Setting	• Alarm 2 Dead Band A2DB=7.9 ° C display. Push ▲▼ key and set A2DB=5.0 ° C ?. Push [SET] key to select it
Alarm 2 Temperature Setting	• Alarm 2 Point AL–2=–200.0'C display. Push ▲▼ key and set AL–2=10.0'C ?. Push [SET] key to select it
Alarm 3 Setting	• No setting
Alarm 4 Setting	• No setting

■ ALARM 2 is set to the High Limit Deviation Alarm.

1) If DEV (Deviation set value)is 10.0 ℃ or above, the Alarm is ON.

2) If DEV is 5.0 ℃ or below, the Alarm is OFF.

3) DEV = PV -SV



■ Setting Group : G.ALARM

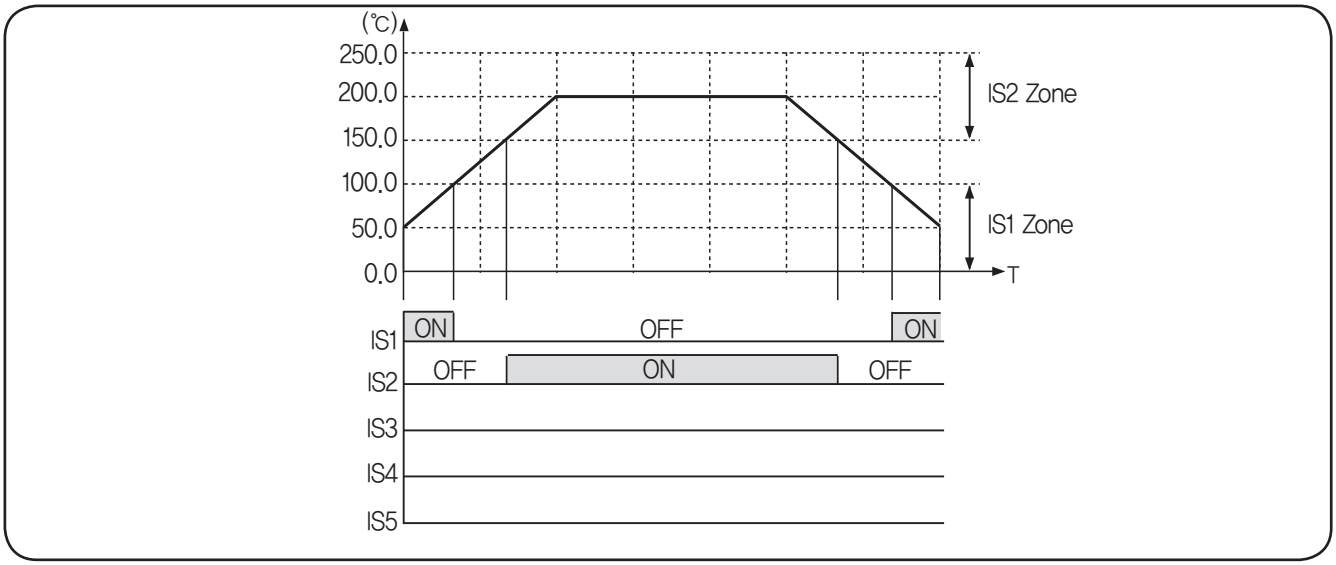
Setting is to the Table below.

Alarm	Code	Default Value	Setting Range	Default Value
Alarm Mode	AL.MD	ALL	ALL, FIX & PROG, FIX, PROG	ALL
ALM1	A1TY	1	OFF, 1 ~ 20	1
	A1DB	20.0 ℃	EUS 0 ~100 %	7.9
	AL–1	250.0 ℃	PV : EU (–100 ~ 100 %) PV : EUS (–100 ~ 100 %)	1370.0
ALM2	A2TY	3	OFF, 1 ~ 20	2
	A2DB	5.0 ℃	EUS 0 ~100 %	7.9
	AL–2	10.0 ℃	PV : EU (–100 ~ 100 %) PV : EUS (–100 ~ 100 %)	–200.0
ALM3	A3TY			1
	A3DB			7.9
	AL–3			1370.0
ALM4	A4TY			2
	A4DB			7.9
	AL–4			–200.0

• Inner Signal

IS (Inner Signal) setting is to the Figure below.

1) IS1 Zone is set to 0.0 ~ 100.0 ℃.
2) IS2 Zone is set to 150.0 ~ 250.0 ℃.
3) Inner Signal is active when NSV (current value of the SV) is inside of IS Zone.



Setting is to the Table below.

Inner Signal Mode Setting	• Push [DISP] key ➜ FUCN ➜ Push ▲▼ key and go G.IS ➜ Push [SET] key ➜ IS.MD=TSV
	• Push ▲▼ key and set IS.MD=NSV. Push [SET] key to select it
Inner Signal 1 Setting	• Inner Signal 1 IS1=OFF. Push ▲▼ key and set IS1=ON ?. Push [SET] key to select it
Inner Signal 1 High Limit Setting	• Inner Signal 1High IS1H=1370.0 ˚c display. Push ▲▼ key and set IS1H = 100.0 ˚C ?. Push [SET] key to select it
Inner Signal 1 Low Limit Setting	• Inner Signal 1 Low IS1L=–200.0 ˚C display. Push ▲▼ key and set IS1L = 000. ˚C ?. Push [SET] key to select it (0.0'C setting)
Inner Signal 2 Setting	• Inner Signal 2 IS2=OFF. Push ▲▼ key and [SET] IS2=ON ?. Push SET key to select it
Inner Signal 2 High Limit Setting	• Inner Signal 2High IS2H=1370.0 ˚c display. Push ▲▼ key and set IS2H = 250.0 ˚C ?. Push [SET] key to select it
Inner Signal 2 Low Limit Setting	• Inner Signal 2 Low IS2L=–200.0 ˚C display. Push ▲▼ key and set IS2L = 150.0 ˚C ?. Push [SET] key to select it (0.0'C setting)
Inner Signal 3	• Inner Signal 3 IS3=OFF display
Inner Signal 4	• Inner Signal 4 IS4=OFF display
Inner Signal 5	• Inner Signal 5 IS5=OFF display

• User Output

9 out of 10 User Outputs are to set as below :

1) UO1~UO5 = TS1~TS5
2) UO6~UO7 = ALM1~ALM2
3) UO8~UO9 = IS1~IS2
4) UO10 is inactive.

Operation display ➜ Push [SET] key at least 3 seconds ➜ PROG ➜ Push [DISP] key ➜ FUNC ➜ Push ▲▼ key and go G.UO ➜ Push [SET] key ➜ User Output 1 display U01 = –– (Default value). Push ▲▼ key and [SET] U01=TS1? Push SET key to select it. Set U02~U09 as same ways.

Set as below

Code	Parameter	Selection Output	Selectable output
UO 1	Use output–1	Time Signal Output–1 (TS1)	1) Alarm Output (1~4 contacts) 2) Time Signal Output (1~5 contacts) 3) Inner Signal Output (1~5 contacts) 4) Pattern End Output (PTEND) 5) Program Run Output (PROG) 6) Fixed Control Output (FIX) 7) Reset Output (RST) 8) Hold Output (HOLD) 9) Wait Output (WAIT) 10) Manual Output (MAN) 11) Pattern Up Output (UP) 12) Pattern Down Output (Down) 13) Pattern Soak Output (SOAK)
UO 2	Use output–2	Time Signal Output–2(TS2)	
UO 3	Use output–3	Time Signal Output–3(TS3)	
UO 4	Use output–4	Time Signal Output–4(TS4)	
UO 5	Use output–5	Time Signal Output–5(TS5)	
UO 6	Use output–6	Alarm Output–1 (ALM1)	
UO 7	Use output–7	Alarm Output–2(ALM2)	
UO 8	Use output–8	Inner Signal Output–1 (IS1)	
UO 9	Use output–9	Inner Signal Output–2(IS2)	
UO 10	Use output–10	No use	
Total 10 user output (U1~U10). When heating/ Cooling type and In case of cooling output is relay, U10 is not available. Regardless U10, cooling output will be applied. Use output cannot be repeated as same content. The SGAL Input is activated when one of the four alarms is turned ON, if U5 ~ U10 is set to output SGAL.			

• AT : Auto Tuning

For the best result, this Setting Example postulates PT NO=1 and SEG NO=2.

1) Activate the Operating Display.
   (Pressing SET key for three seconds will change from Menu Display to Operating Display).
2) Activate RESET and then use PTN key to select PT NO–1.
   (Pressing RST key for one second will activate RESET)
3) Pressing RUN/HOLD key for one second will initiate programming.
4) Press STEP key for one second to select SEG NO–2
5) Start AT (Auto–Tuning) process. There are two ways to turn ON AT.

Method–1	Push SET+UP keys together at least 3 seconds in the operating display. AT lame will be blinked and after Auto Tuning AT lamp will be off. NP200 operate with Auto Turning values.
Method–2	To turn off Auto Turning during Auto Turning, Push SET+UP keys together at least 3 seconds or off AT from G.AT.

10. Program Menu (PROG)

■ Program Group (G.PRG)

● Pattern Number Select

- NP200 can program 30 patterns and 300 segments.
- NP200 stores a maximum of 300 segments in 10 patterns (maximum 99 segments per pattern).
- Each pattern consists of 99 segments and 0 (SEG=0).

● Segment Number Select

1) Segment (SEG) =0
The pattern of Segment (SEG)=0 is to set:
Start condition (SSV, STC): SSV → Start set Value, STC → Start code
End condition (END.SEG, END.MOD, END.TM, and LINK.PT)
WAIT condition (WTM, WZ)
Time Signal Mode (TS.MD : TIME SIGNAL MODE)
Number of Repeat (REPEAT)

2) Segment (SEG) =1~99
The pattern of Segment (SEG)=1~99 is to set.
Operating PID Group Number (PIDNO), Set Value (SV), Time (TM), Time Signal (TS, TS.ON, and TS.OFF)

● Wait Zone (WZ) Setting

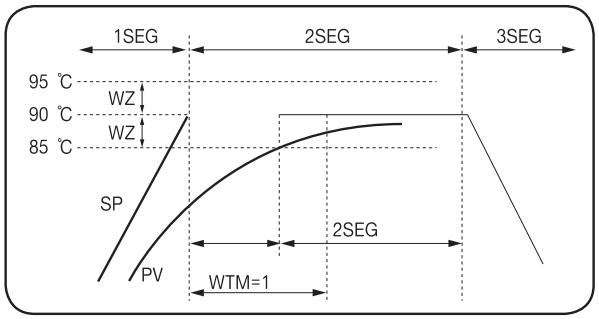
WZ (Wait Zone) : This sets the deviation range of the PV from the SV.

● Wait Zone Time Setting

If PV fails to enter into WZ, the Wait function will infinitely repeat. To avoid this problem, WTM (Wait Time) needs to be set. The wait function delays the start of the next program segment until the PV reaches within a specified deviation range from the SP, or until the Wait Time has expired.
It is not guaranteed that there is no deviation between SV and PV before starting the next program segment. The wait function will be enabled to prevent problems caused by large deviation.
The wait function can be applicable to all program segments.
WAIT ZONE (WZ) sets the deviation value used for the wait function (If WTM=OFF, Wait Time is infinite.)
When set, a running program will not move to the next segment until the PV enters into the WZ.
When OFF, the wait function will not be enabled -a running program will move to the next segment even the PV fails to enter into the WZ.

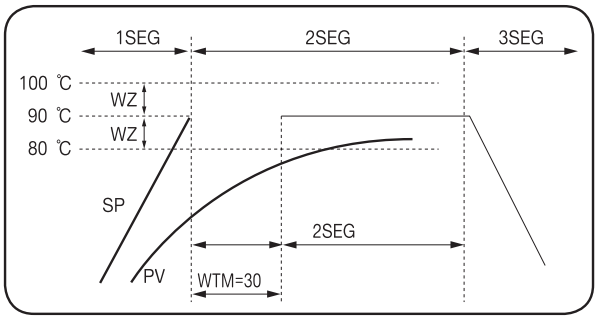
【Ex.1】 WZ=5 ℃, WTM=1Hr.

During the Soak Segment(2SEG), SV is 90 ℃. Thus, the deviation range is between 85 to 95 ℃. If PV reaches within a specified WZ (wait zone) earlier than WTM (1H), the Wait Function is disabled and the running program will move to the next segment.



【Ex.2】 WZ=10 ℃, WTM=30Min.

During the Soak Segment(2SEG), SV is 90 ℃. Thus, the deviation range is between 80 to 100 ℃. If PV reaches within a specified WZ (wait zone) later than WTM (30M), the Wait Function will delay 30 minutes before starting the next program segment.



【Ex.3】 WZ=OFF, WTM=1Hr.

When WZ is OFF, the Wait Function is disabled.

【Ex.4】 WZ = 10℃, WTM = OFF

When WTM is OFF, the Wait Time is infinite until the PV reaches within a specified WZ (Wait Zone).

- Repeat Set

• Repeat is to set the repeat parameter.
• Repeat set range is either1~99 or infinite (Repeat=1 means no repeat because it is single time operation).

- Time Signal Mode (TS.MD)

① Time Signal Mode is divided into two types. One is ON/FF setting mode (ON/OFF1, ON/OFF2, ON/OFF3, ON/OFF4, ON/OFF5) and another one is Time setting mode (Time1, Time2, Time3, Time4, Time5). Time signal output is max 5.
② ON/OFF setting mode: Setting ON or OFF time for Time Signal Output from corresponding segment
③ Time setting mode: Setting ON and OFF time separately for Time Signal Output from corresponding segment
④ Also, when segment number "0" (SEG.NO = 0 from G.PRG, if you set Time Signal Mode (TS.MD) "ON/OFF2" or "Time3", Time Signal number will be limited to 2 or 3.

3) Example: Time Signal Mode: ON/OFF

【Ex.】In the case Time Signal (TS) is established as below:

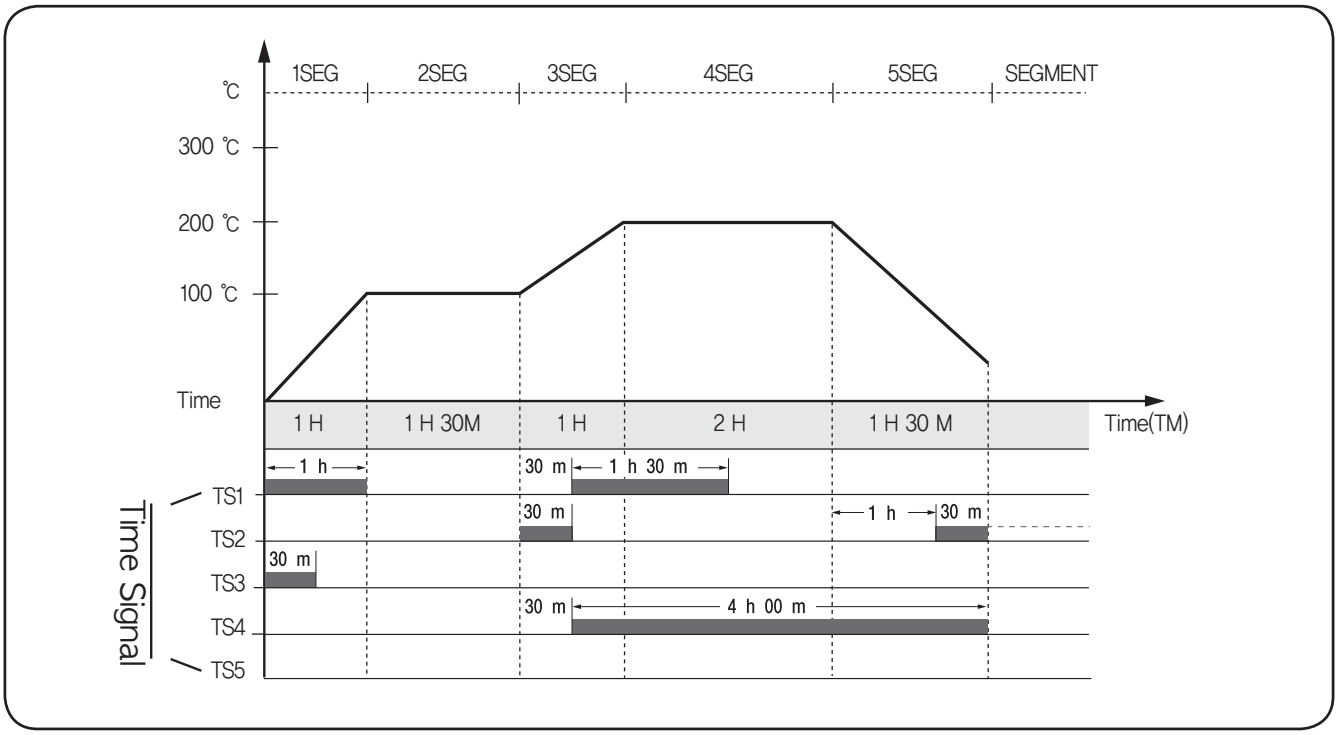
Segment	1	2	3	4	5
TS1	ON	OFF	OFF	OFF	OFF
TS2	OFF	OFF	OFF	ON	ON
TS3	ON	OFF	OFF	ON	OFF
TS4	ON	ON	ON	ON	ON
TS5	OFF	OFF	OFF	OFF	OFF

※

Time Signal 1 (TS1) : Time Signal is activated (ON) at the beginning of the Segment-1 and deactivated (OFF) at the end of Segment-1.
Time Signal 2 (TS2) : Time Signal is activated (ON) at the beginning of the Segment-4 and continued until the end of the Segment-5.
Time Signal 3 (TS3) : Time Signal is active (ON) during the Segment-1 and Segment-4.
Time Signal 4 (TS4) : Time Signal is active from 1 through 5.
Time Signal 5 (TS5) : Time Signal is inactive. TS is not used.

Operation example when Time Signal Mode is selected to Time.

【Ex.】In the case Time Signal (TS) is established as below :



※ As shown in figure above, ON TM of Time Signal-1 (TS1) is 0. Thus, TS is activated (ON) at the beginning of the Segment-1 and deactivated after 1 hour of OFF TM (which is same to Segment Time) at the end of the Segment-1.
Again, Time Signal is activated (ON) after 30 minutes and deactivated (OFF) after 1 hour 30 minutes. OFF TM is the actual output time.
The length of OFF TM is longer than 1 hour so that the output continues to the next segment.

※ Time Signal-2 (TS2) is activated (ON) at the beginning of the Segmen-3 and deactivated (OFF) after 30 minutes. Again, Time Signal is activated (ON) after 1 hour from the beginning of the Segment-5. Regardless of OFF TM length, TS will finish (OFF) when the program ends.

※ Time Signal–3 (TS3) is activated (ON) at the beginning of the Segmen–1 and deactivated (OFF) after 30 minutes. No more segments exist so that TS is inactive (OFF) thereafter.

※ Time Signal–4 (TS4) is activated (ON) after 30 minutes from the beginning of the Segment–3, and deactivated (OFF) after 4 hours. The length of OFF TM is longer than 1 hour so that the output continues to the next segment.

※ Time Signal 5 (TS5) is inactive (OFF). TS is not used.

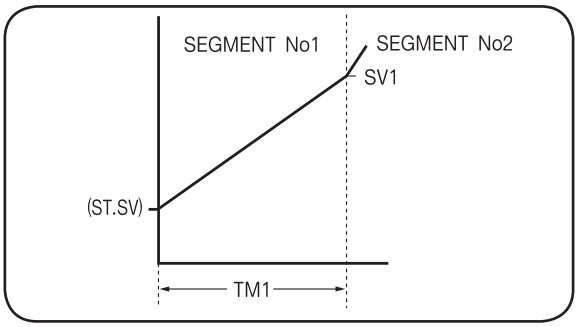
● Start Set Value

• The starting conditions of each program vary depending on Start Mode.

Start Mode	Program Start Behavior
SSV	Start from start setting value
PV1	Start from process value and pattern priority
PV2	Start from process value and time priority

1) Start Mode (ST.MD)=SSV: Start at SV

• In SSV mode, the program will begin with at a specified temperature (Start Set Value) regardless of PV.
• And the program will ramp to the SV1 over the time designated in Time Segment–1(TM1).

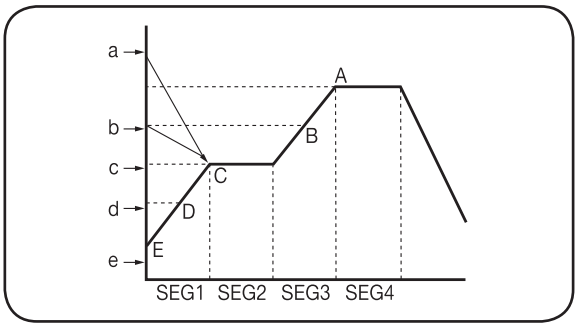


2) Start Mode (ST.MD)= PV1: Start at PV (Pattern)

• PV1 mode, the program will start at the PV but it is related to SSV, PV, Soak and n, TM. (Refer to the Figures below for additional information.)
• If PV is lower than SSV, the program will start at the SSV.
• Soak Segment is present in the program: If PV is higher than Soak SV, the program will start at the Soak Segment.
• Pattern is reversed during the program running: If PV is higher than SV, the program will start at corresponding segment.
• Program starts at the middle of pattern: Time designated in corresponding segment is ignored.

① First Soak at Segment–2:

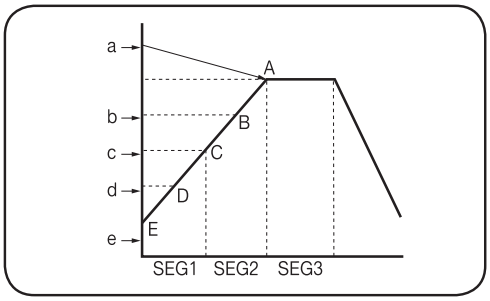
• If PV is in a ~ c : Segment–1 is ignored and the program will start at the beginning of the first soak (segment–2).
• If PV is in d : The program will start at the Segment–1 (D: PV=SV). In this case, the time designated from E to D in Segment–1 is ignored, and the program will run for the time designated from D to C.



Starting PV at Program Activation	Program Start Point
a	C
b	C
c	C
d	D
e	E (SSV)

② First Soak at Segment–3 :

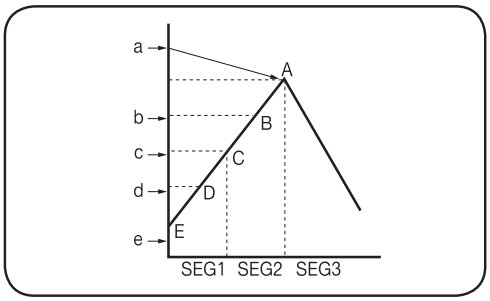
- If PV is in a : Segment–1 and 2 are ignored and the program will start at the beginning of the first soak.
- If PV is b ~ d : The program will start at the B, C, and D where PV is same to SV. In the case where PV is b, the time designated from E to B is ignored, and the program will run for the time designated from B to A.
  Starting PV at Program Activation Program Start Point
- If, PV is in c : The time designated from E to C is ignored, and the program will run for the time designated from C to A.
- If, PV is in c : The time designated from E to D is ignored, and the program will run for the time designated from D to A.
- If PV is in e (PV ≤ SSV) : The program will start at SSV.



Starting PV at Program Activation	Program Start Point
a	A
b	B
c	C
d	D
e	E (SSV)

③ No Soak Segment in the Program

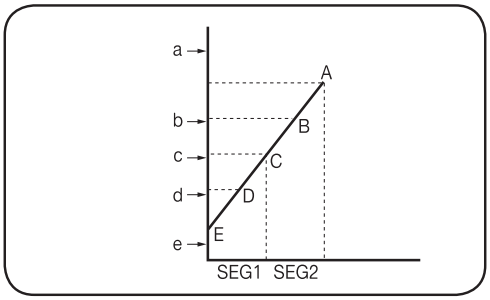
- If PV is in a : Segment–1 and 2 are ignored and the program will start at the beginning of the first reverse point (Segment–3).
- If PV is in b~d : The program will start at the B, C, and D where PV is same to SV. In the case where PV is b, the time designated from E to B is ignored, and the program will run for the time designated from B to A. Starting PV at Program Activation Program Start Point
- If PV is in c : The time designated from E to C is ignored, and the program will run for the time designated from C to A.
- If PV is in d : The time designated from E to D is ignored, and the program will run for the time designated from D to A.
- If PV is in e (PV ≤ SSV) : The program will start at SSV.



Starting PV at Program Activation	Program Start Point
a	A
b	B
c	C
d	D
e	E (SSV)

④ Only Ascending Ramp Segments

- If PV is in a : The program will not start.
- If PV is in b~d : The program will start at the B, C, and D where PV is same to SV. In the case where PV is b, the time designated from E to B is ignored, and the program will run for the time designated from B to A.
- If PV is in c : The time designated from E to C is ignored, and the program will run for the time designated from C to A.
- If PV is in d : The time designated from E to D is ignored, and the program will run for the time designated from D to A.
- If PV is in e (PV ≤ SSV) : The program will start at SSV.



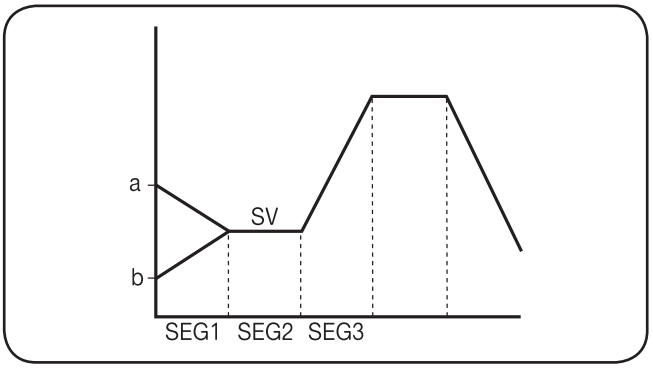
Starting PV at Program Activation	Program Start Point
a	Program will NOT start
b	B
c	C
d	D
e	E (SSV)

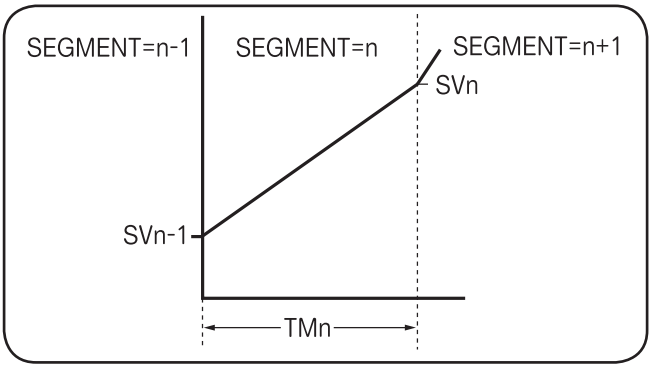
3) Start Mode (ST.MD) = PV2: Start at PV (Time)

The program will run from PV to SV in the Segment–1 during the time designate by the User.
Pattern is determined by the time designated in the Segment–1.

4) Pattern Graph

$$\frac{(SVn - SV_{n-1})}{TMn}$$ Set value (SV) will be changed





● Pattern End Segment (END.SEG)

- END.SEG is to set the parameter when the program has to end.
- END.SEG will end the program (segment that programmed to be perform later than END.SEG will be ignored)
- If END. SEG is inactive (OFF), the program will end when the last segment finishes.

【Ex.1】 If a pattern has 10 segments and END.SEG is 5, the pattern will end when the Segment–5 finishes.
【Ex.2】 If a pattern has 10 segments and END.SEG is inactive(OFF0, the pattern will end when the Segment–10 finishes.
【Ex.1】 If a pattern has 10 segments and END.SEG is 15, the pattern will end when the Segment–10 finishes.

● Pattern End Mode (END.MD)

Pattern End Mode (END.MD) consists of Reset (RST), Hold (HOLD), Fixed Control (FIX), and Link (LINK).
If LINK is selected, the pattern number will be displayed on LINK/PT.

1) If Reset is selected (END.MD=RESET);
- Shifting to Reset Mode when a pattern ends.
- Shifting to Reset Mode will activate Pattern End Signal Output (Output Time varies depending on END.TM)

2) If Hold is selected (END.MD=HOLD);
- Shifting to Hold Mode when a pattern ends.
- SV is not changed and the output is normal control.

3) If Fixed Control is selected (END.MD=FIX);
- Shifting to FIX Mode when a pattern ends.
- After shifting, select SV as per SVNO for normal control.

4) If Link is selected (END.MD=LINK);
- Shifting to the designated pattern when a pattern ends.
- Starting condition may vary depending on Start Mode (ST.MD) of respective pattern.

● Pattern End Signal Time (END.TM)

- Program ending will activate Pattern End Signal. The Parameter is to set the End Signal activation (END.TM). (Unit of time is determined by the Time Unit (TIME) of Control Group)

- If END.TM is inactive (OFF), the End Pattern Time Signal does not occur.

● Link Pattern Number (LINK.PT)

• When the program ends and if you want to link another pattern to that, LINK.PT is to set the parameter.
• Pattern number can be identical to itself. In this case, the pattern infinitely repeats (as same REPEAT=CONTINUE)

● Recording and Change of Program (Update Confirm)

• Program Change
Program can be changed when it is completed or it is running.
If the value is changed during the segment process, the original value will be maintained for the duration of the segment. After segment is complete, the controller will change to the new value.
If the value of next segment is changed, the controller will immediately change to the new value.
• Segment Number from 1 through 99 (SEG.NO=1~99) :
PID Group Number, Target, Run Time, and Time Signal (TS, TS.ON, and TS.OFF).

● PID Number Select (PID NO. Select)

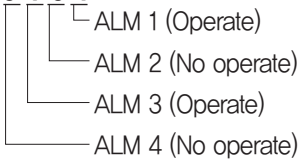
NP200 programs four PID groups. Default is PID GROUP–1. All PID control outputs are user programmable (and each segment can be controlled by corresponding PID)

• LEVEL PID of Control Group
LEVEL=OFF: Each segment is controlled by corresponding PID Group.
LEVEL=ON: All segments are controlled by LEVEL PID.

● Alarm Number Set (ALM NO. Select)

NP200 programs four Alarm Groups (See. G.ALARM).
As shown in Table below, multiple numbers of Alarm Groups can be selected.

Example) **05 : 0 1 0 1**



If you select ALM. NO 5, 0101 means ALM3 and ALM1 activate.

No	Display	ALM4	ALM3	ALM2	ALM1
0	OFF	X	X	X	X
1	01 : 0001	X	X	X	O
2	02 : 0010	X	X	O	X
3	03 : 0011	X	X	O	O
4	04 : 0100	X	O	X	X
5	05 : 0101	X	O	X	O
6	06 : 0110	X	O	O	X
7	07 : 0111	X	O	O	O
8	08 : 1000	O	X	X	X
9	09 : 1001	O	X	X	O
10	10 : 1010	O	X	O	X
11	11 : 1011	O	X	O	O
12	12 : 1100	O	O	X	X
13	13 : 1101	O	O	X	O
14	14 : 1110	O	O	O	X
15	15 : 1111	O	O	O	O

● Segment Temperature Set Value (Set Value)

This feature is to set the target temperature of each segment.

● Segment Time Set (Segment Time)

This feature is to set the time required to reach to the target temperature of each segment.

● Segment Time Signal–1 (Time Signal 1)

Turn ON Time Signal of each segment, and then set TSx ON and TSx OFF Time.
(Only if, TS.MD is TIMEx)
TS is to set for each pattern (From Segment1 through Segment 99)

● Power Failure during the Running

If the program running is interrupted by power failure, Power Mode (PWR.MD) of Control Group (G.CTL) is activated.

● Program Time Set

For time setting: Segment Time (n, TM) of Program Group
For time unit: Time Unit (TIME) of Control Group (G.CTL)

● Hold (HOLD)

1) Hold during the program running
- Pressing RUN/HOLD key for one second or turning ON Digital Input 2 (DI2) will pause the program process.
- Pressing RUN/HOLD key for one second or turning OFF Digital Input 2 (DI2) will resume the program process.
- Pressing STEP key for one second will turn off HOLD, and force the running program stop / move to the next segment.
- Pressing RESET key for one second will turn off HOLD, and the running program will end.
- While in HOLD, the current value of SV is not changed and the control is normal.

2) Hold after program ends
- End Mode (END.MD) is HOLD: The completed program will be in HOLD mode.

3) Reset after program ends
- Pressing RESET key for one second or turning OFF Digital Input 2 (DI2) will pause turn off HOLD, and the program process will end.

● Step (STEP)

- Pressing STEP key for one second or turning ON Digital Input (DI3) will force the running segment stop and move to the next segment.
- Pressing STEP key will turn OFF WAIT or HOLD, and will force the program to the next segment.
- If the running segment is the last, the pressing STEP key will enable END.MD.

■ File Group (G.FILE)

File Group consists of INFORM, PT. EDIT and SEG.EDIT.

● Number of Patterns and Segments Being Used (INFORM)

USED / TOTAL Pattern	Number of Patterns that currently being used (NP200 programs a maximum 30 Patterns)
USED TOTAL Segment	Number of Segment that currently being used (NP200 programs a maximum 300 Segments)
Used Segment by Pattern	Number of Segment that currently being used in each Pattern. Pressing ▼ ▲ key will change the Pattern Number.

● Pattern Edit (PT. EDIT)

Copy Source	• To input the pattern number to be copied (Source Pattern).
Copy Destination	• To input the pattern number to pasted (Destination Pattern).
Result of File	• To verify the result of copy & paste (For more information, See 1–2–4 Edit Error).
Delete Pattern Number	• To delete the pattern.
Result of File CMD	• To verify the result of pattern delete.
File all Initialize	• To initialize all segments (0~99).
Confirm Really File Init	• To confirm file initialization. Pressing YES will initialize all patterns.

● Segment Edit (SEG. EDIT)

Pattern Number Select	• To input the pattern number to be edited.
Insert Segment Number	• To input the segment number to be added. • Adding new segment will push back all subsequent segments automatically. Parameters of the newly added segment are default. • Insert segment parameter has default value.
Result of File CMD	• To verify the result of segment add.
Delete Segment Number	• To input the segment number to be deleted. • Deleting segment will pull up all subsequent segments automatically.
Result of File CMD	• To verify the result of segment delete.

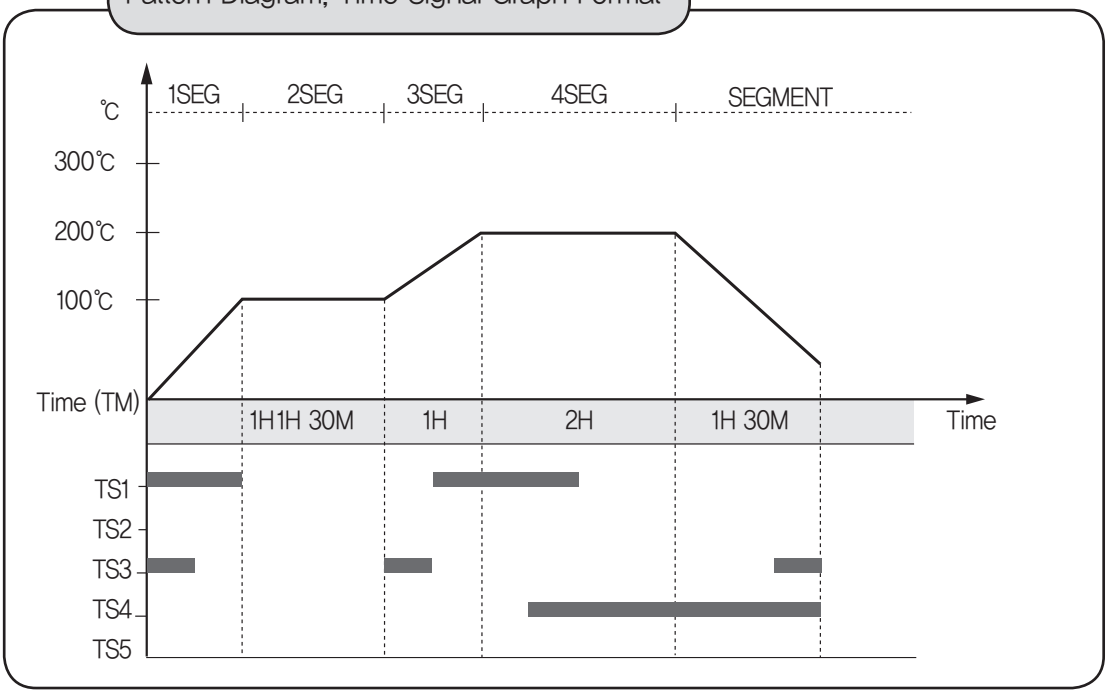
● Edit Error

NO PT	• Cannot delete because the pattern has no data. • Cannot copy because the pattern has no data.
NO SEG	• Cannot delete because has no data. the segment has no data. • Cannot add because the segment has no data.
PT USE	• Cannot paste because the Destination Pattern already has data.
PT RUN	• Cannot delete because the pattern/segment is running. • Cannot paste because the pattern/segment is running.

● Pattern Graph (PTN–1)

• As shown in graph below, the Patter is at the top while the Time Signal is at the bottom.
• Y–axis: Temperature, X–axis: Time

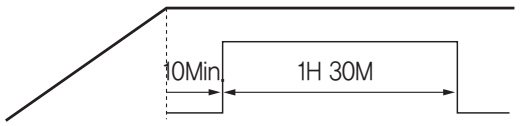
Pattern Diagram, Time Signal Graph Format



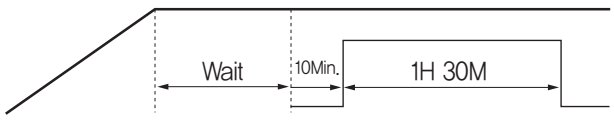
● Time Signal (TS), Wait, and Hold

Time Signal is being paused in WAIT or HOLD mode.
【Ex.1】 If WAIT is set to as shown in Fig. 1–1;
Time Signal (TS) is being paused during the WAIT as shown in Fig. 1–2 below.

【Fig. 1–1】



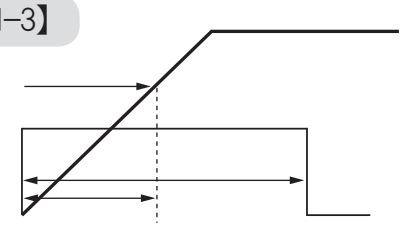
【Fig. 1–2】



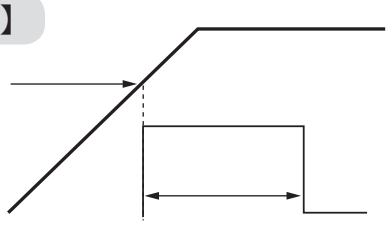
● Time Signal (TS) and Start Mode (ST.MD)

In PV START mode, Time Signal (TS) time is deemed passed as much as the program runs.
【Ex.2】 As shown in Fig. 1–3 below, if ST.MD is set to PV (PV START);
As shown in Fig.1–4, Time Signal (TS) time is deemed passed as much as the program runs.

【Fig. 1–3】

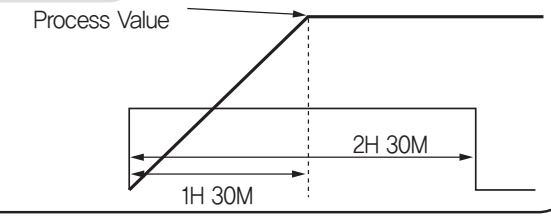


【Fig. 1–4】

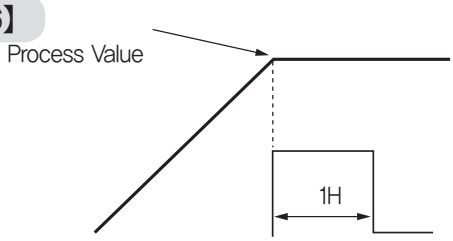


【Ex.3】 As shown in Fig 1–5 below, if ST.MD is set to PV (PV START);
As shown in Fig.1–6, Time Signal (TS) time is deemed passed as much as the program runs.

【Fig. 1–5】



【Fig. 1–6】

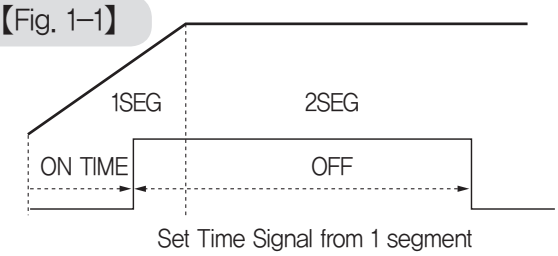


● Time Signal (TS) Graph

1) Normal Time Signal (TS)

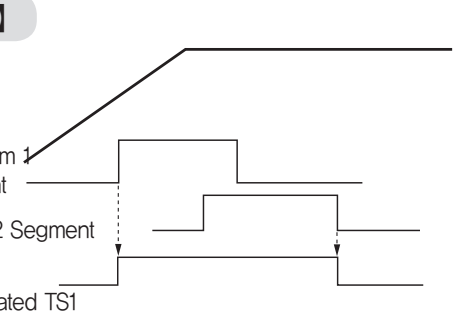
【Ex.1】 Normal Setting :ON TIME is within a specified segment.

【Fig. 1–1】



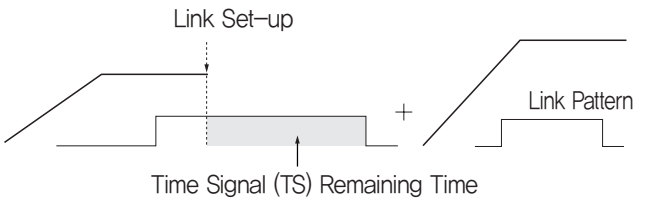
2) Double Time Signal (TS)

【Fig. 1–2】

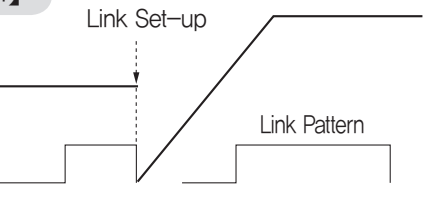


【Ex.2】 If Time Signal (TS) is set to as shown in Fig. 1–3, the actual Time Signal (TS) is as shown in Fig. 1–4

【Fig. 1–3】



【Fig. 1–4】



● Operation Mode at the error occurrence

• Operation Mode at the error occurrence

① Fatal Error (incl. DC Error)
In the event of fatal error such as a DC error, the controller automatically shifts to RESET mode.
If the Output Mode is AUTO, the Preset–Out (PO) is automatically activated.

② Burn–Out
The Burn–Out does not affect Operation Mode. However, if the Output Mode is AUTO, the Preset–Out (PO) is automatically activated. The error message will be displayed but the setting will remain unchanged.
In Fixed Control (FIX) mode, the error message will be displayed and the Preset Out (PO) is automatically activated.
In Program Mode, the error message will be displayed and the Preset Out (PO) is automatically activated.
SV and TIME will remain unchanged.

③ Cold Junction Compensation (RJC), OVER, and Communication Error
Cold Junction Compensation (RJC), OVER, and Communication error does affect neither Operation Mode nor Output. In the case of Cold Junction Compensation error, the error message will be displayed but the RJC will be turned OFF for normal control. In the case of OVER or Communication error, the error message will be displayed but the control will be normal.

■ Quick group (G.QUICK)

PROG screen ➜ Push ▲▼ key and go G.QUICK. ➜ Push [SET] key ➜ USE=OFF display. Change it to USE=ON? by ▲▼ key. Push [SET] key to select it. Sequentially select other parameter and make up quick menu.

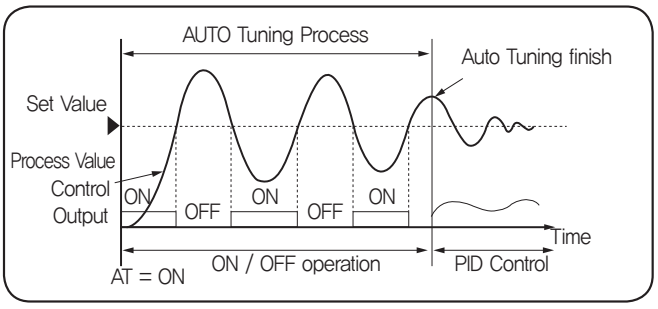
To cancel Quick Menu, PROG screen ➜ Push ▲▼ key and go G.QUICK. ➜ Push [SET] key 〉 Set USE=OFF. ➜ Push [SET] key to select it.

10-2. Operation Menu (OPER)

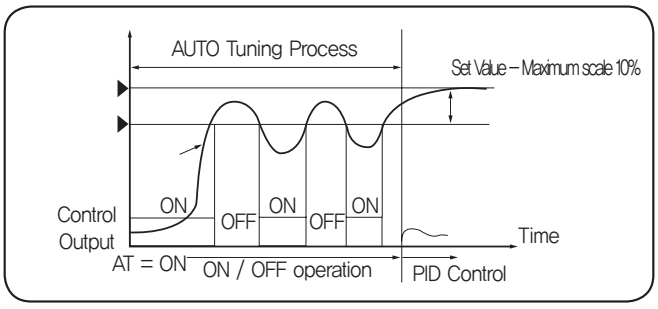
■ Auto Tuning Group (G.AT)

• What is the Auto-Tuning?

The Auto-Tuning (AT) is used to let the controller measure process characteristics and automatically set the most appropriate values for the PID parameters. During the default AT process, the control output will function in an ON/OFF mode, and the controller will use the responses to calculate the needed PID values (For instance, AT Gain is achieved as shown in Figures below; Cycle is 2.25). There are two types of Auto-Tuning Mode (AT.MD)– Standard AT (STD) and Low PV AT (LOW PV).



【Standard Auto Tuning 】



【Low PV Auto Tuning】

● Standard Auto-Tuning (AT.MD=STD)

1) LEVEL is OFF :

• Turn ON AT on Auto Tuning Group (G. AT) in Fixed Control (FIX) mode. Referring current SV and SVNO, the AT is performed and the gain value is assigned in relevant PID GROUP.

【Ex.1】 If SV is 50 ℃ and SVNO is 2;
AT occurs at 50 ℃, and the gain value is assigned to relevant PID GROUP.

• Turn ON AT in Program Control mode.
AT is performed at NSV and the gain value is assigned in relevant PID GROUP.

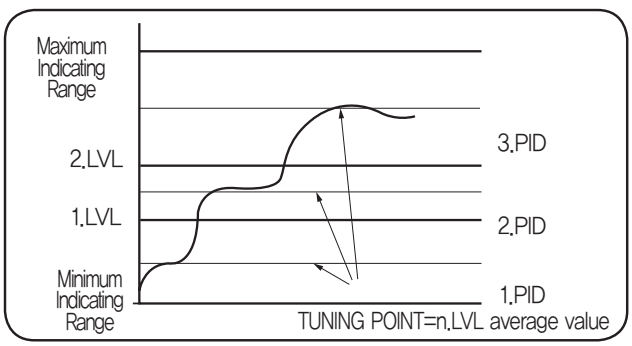
【Ex.2】 If PID NO is 3 in Segment-3, SV is 20 ℃;
AT is performed in Segment-3 and the gain value is assigned in relevant PID GROUP-3.

2) LEVEL is ON:

• Turn ON AT on Auto Tuning Group (G. AT) in Fixed Control (FIX) mode. AT is performed at NSV and the gain value is assigned in relevant PID GROUP.

【Ex.1】 If 1.LVL is 100'C, 2.LVL is 200'C, SV is 50'C, SV NO is 2, AT is performed at 50'C and the gain value is assigned to PID GROUP-1. (SVNO is ignored).

• Turn ON AT in Program Control mode. AT is performed at NSV and the gain value is assigned in relevant PID GROUP.



【Ex.2】 If 1.LVL is100'C, 2.LVL is 200'C, SV is 20, PID NO is 3 in Segment–3,
AT is performed at 20'C and the gain value is assigned to PID GROUP–1 (PID NO is ignored).

※ Turn AUTO AT in Program Control mode;
(1.LVL - RL) / 2 + RL: The gain value is assigned to PID GROUP–1.
(2.LVL - 1.LVL) / 2 + 1.LVL: The gain value is assigned to PID GROUP–2.
(RH - 2.LVL) / 2 + 2.LVL: The gain value is assigned to PID GROUP–3.

- **Low PV Auto–Tuning**

  The basic process is same to that of Standard Type AT.
  However, the Tuning Point is [SV– 10% of Max. Scale].

- **Auto–Tuning Description**

  1) Other Functions during the Auto–Tuning

  • If the Auto Tuning is performed during the program running, the TIME and SV will pause. After Auto–Tuning is complete, the controller will resume.

  • Inner Signal, Time Signal, and Alarm will stop during the Auto–Tuning process. ON/OFF setting of both Inner Signal and Time Signal will remain unchanged because TIME and SV is being paused during the Auto–Tuning process.

  2) AT Running Display

  The AT LED will blink at a 500ms time interval.

  3) Changing SV during the Auto–Tuning

  If the SV is changed during the Auto–Tuning process, the original Tuning Point (TP) will be maintained for the duration of the AT process. After Auto Tuning is complete, the controller will change to the new SV.

  4) Changing PID Parameter during the Auto–Tuning

  The PID values can be changed during the Auto Tuning process. After Auto Tuning is complete, it will then use the auto–tune calculated PID values. Values changed after Auto–Tuning will remain unchanged until AT runs again.

  5) Abnormal Shutdown of the Auto Tuning process

  • If the forced AT shutdown occurs, the PID values will remain unchanged.
  • If the error (incl. Burn–out, DC error) occurs, the Auto Tuning process will stop and the PID values will remain unchanged.
  • If the second Auto Tuning cycle exceeds 24 hours, the error message will be displayed.
  • Shifting to RESET or MANUAL Control Mode will stop the Auto Tuning process.

  6) AT Perform/Cancel

  • Method–1
    To perform: Turn on AT / or select AUTO on the AT Group.
    To cancel: Turn off AT on the AT Group.
  • Method–2
    To perform : Press both SET and UP key simultaneously longer than 3 seconds on the Operating Display.
    To cancel : Press both SET and UP key simultaneously longer than 3 seconds on the Operating Display.

■ PID Group (G.PID)

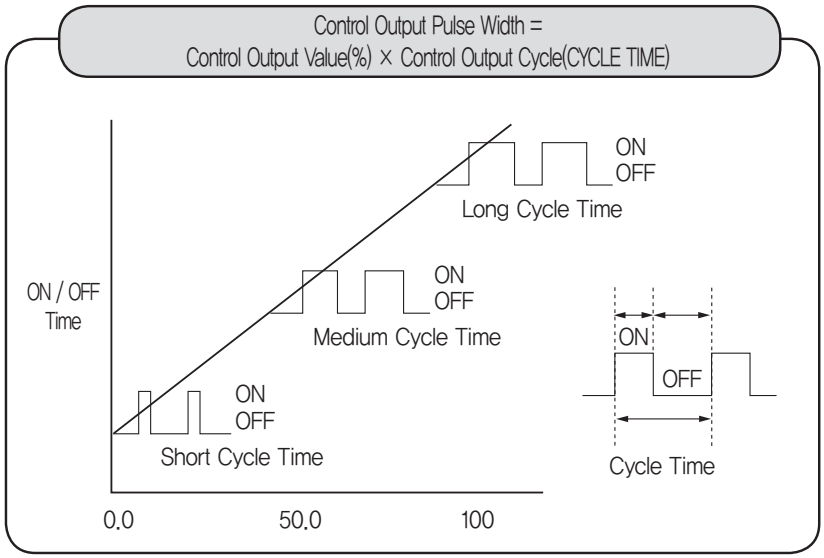
● Anti-Reset Wind Up (ARW)

- When the control outputs reach the high limit value (OLH, OLL), they stop ordinary output action for integral control and use the Anti-Reset Windup (ARW).
- When the setting is AUTO and the time for integral time (I) is not 0, the ARW is calculated automatically.
  1) DV ≥ 0 & High limit output value
  2) DV < 0 & Low limit output value

● Control Output Calculation

1) Time Proportional PID Control

The ON/OFF pulse is proportional to the control output value (PID calculation). The width of pulse is calculated by the control output value multiplying by the Cycle Time (based on a percentage of its full scale, default is 100%). User can select the output mode (Relay Output, Voltage Pulse Output).
The control is better as the Cycle Time is shorter. Frequent ON/OFF may shorten the Relay lifetime. Generally, 10 to 30 seconds of Cycle Time is recommended.



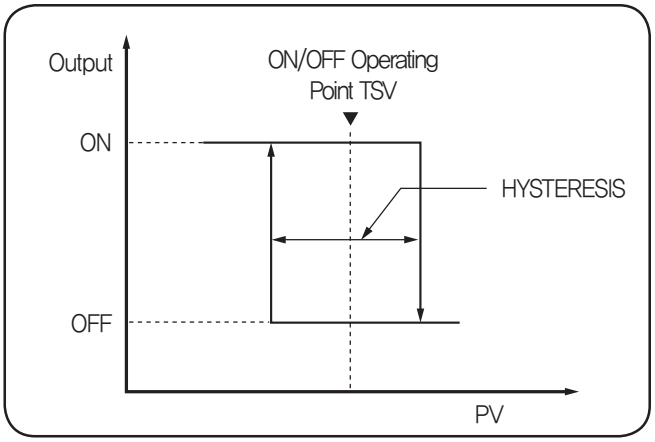
【Fig. 2.1】 Time Proportional PID Control

2) Continuous PID Control

The Continuous PID Control will output the current of 4~20mA.
The Cycle is 100ms time interval.

3) ON/OFF Control

ON/OFF Control will output either ON or OFF signal Output as per the deviation between Target SV and PV.(Output Hysteresis setting is available)

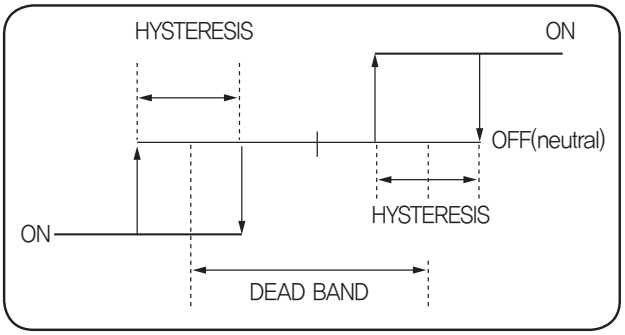


【Fig. 2.2】 ON/OFF Control

4) Heating/Cooling Control

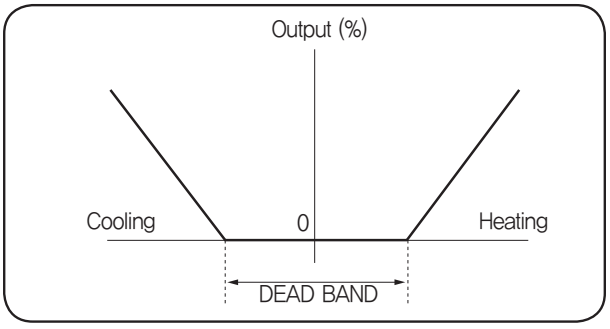
• Both Heating and Cooling Output can be calculated by PID For both Heating/Cooling, the controller may use either PID Control or ON/OFF Control. If the Proportional Band of the Heating (P) is set to 0, the Control Output is ON/OFF. If the Proportional Band of the Cooling (Pc) is set to 0, the Control Output is ON/OFF. Also, Relay Output, Voltage Pulse Output and Current Output are available.

• In Heating/Cooling Control, the Dead Band can be set from 100 to 50%. The Dead Band of ON/OFF Control is shown in Fig. 2–3



【Fig. 2–3】+ SV Dead Band
(ON/OFF Control for both Heating and Cooling)

• The Dead Band of PID Control is shown in Fig. 2–4 below.
The -SV Dead Band in PID Control (for both Heating and Cooling) is shown in Fig. 2.5.
In this case, the Heating Output and Cooling Output meet at particular point.



【Fig. 2.4】+ SV Dead Band
(PID Control for both Heating and Cooling)

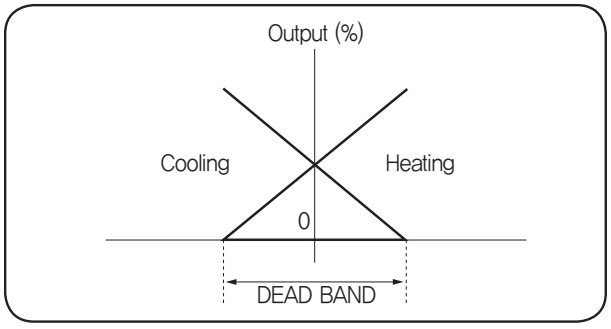


Fig. 2.5】–SV Dead Band
(PID Control for both Heating and Cooling)

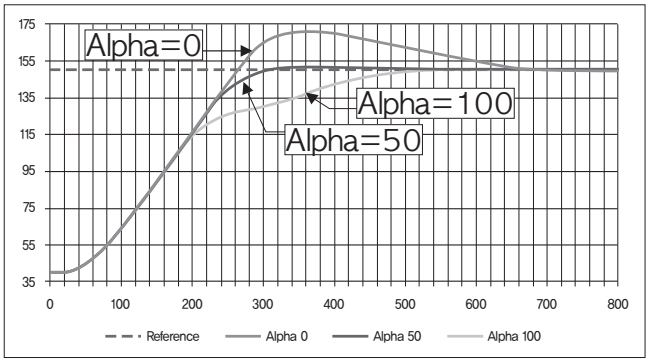
5) PID Control (Heating/Cooling Control)

• PID Select

PID is selected and calculated by the condition 1 and 2 below:
① Output (MV) ＞ 50 % + 0.25%: Select the PID for Heating.
② Output (MV) ＜ 50 % -0.25%: Select the PID for Cooling. In other conditions, the setting remains unchanged.
③ For the first PID calculation, the Output is to set 50 %, and the PID for Heating is used (if P≠0, Pc≠0).
In the Manual Control Mode, the Heating/Cooling Output can be controlled by Key or Communication.
The Manual Control Output is to control the PID Control Output before the Heating/Cooling output calculation.
Although the Cooling PID calculation range is 0 ~ 50%, the output range is adjusted to 0~100%.
Likewise, although the Heating PID calculation range is 50~100%, the output range is adjusted to 0~100%.

• 2–DOF PID Alpha (AP)

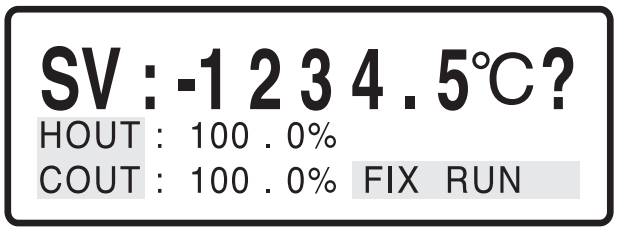
Response in a typical closed loop control system can be divided in response to the disturbance and the response to the setting change. And the existing PID (1 degree of freedom) algorithm have a limit to optimize only one response for the two responses.
To overcome this limitation, we applied two degree of freedom PID algorithm and got an optimized response to the setting change and a proper response to the disturbance.
Alpha (AP) parameter is used to adjust the response characteristics of the set value (SV) change.



■ Fixed Control Setting Group (G.SV)

● SV (Set Value)

• Four SVs are available in FIX Mode. Selection can be made by SVNO.
• In FIX Mode, use [▼ ▲] key to change the required value on the Display-1(Setup).



● Initialization and Data Change (INITIALIZE & RANGING)

1) F.INIT=ON: All parameters of program group are fully initialized.
2) P.INIT=ON: All parameters (except program group) are initialized.
3) If IN, UNIT, FR-H or FR-L is changed, either EU or EUS Unit parameter is changed.
4) Changing to OUT will initialize all parameters of Output Group.
5) Changing Alarm Type will initialize AnDB and AL-n.

■ Control Group (G.CTL)

● LEVEL and PID

If LEVEL is ON, LEVEL PID will be used.

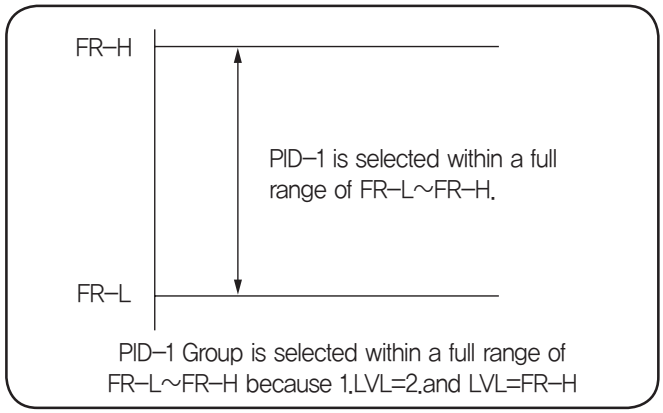
1) LEVEL function is OFF :
• In FIX Mode, the program is controlled by PID GROUP assigned by current SV.
【Ex.】If SVNO=3, and 3.SV is 50.0, the program is controlled by SV=50.0 (equal to the SVNO) and the PID GROUP-3 is selected
• In PROG Mode, the program is controlled by PID GRUP assigned by current SEG.
【Ex.】If PIDNO-1 of SEG-1 is 3, and PIDNO-2 of SEG-2 is 2, while SEG-1 is running, the PID GROUP-3 is selected because PIDNO-1 is 3. After SEG-1 is complete, the program moves to SEG-2 and PID GROUP-2 is selected.

2) LEVEL function is ON :
• Four LEVELs within a input range will be assigned to respective PID GROUP.
• If LEVEL is turned ON, the PID GROUP is automatically selected regardless of SVNO or PIDNO.
• The ideal PID control value may vary depending on a range of temperature control. The LEVEL function assigns each PID data to each range for efficiency and productivity.

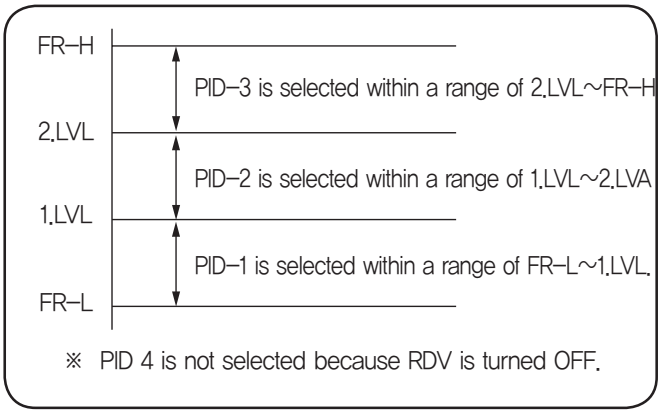
3) LEVEL PID Parameters

Code	Parameter	Description	Default Value
1.LVL	LEVEL 1	Between PID-1 and PID-2	EU (100 %)
2.LVL	LEVEL 2	Between PID-2 and PID-3	EU (100 %)
RDV	LEVEL DV	Deviation Range of PID-4	OFF

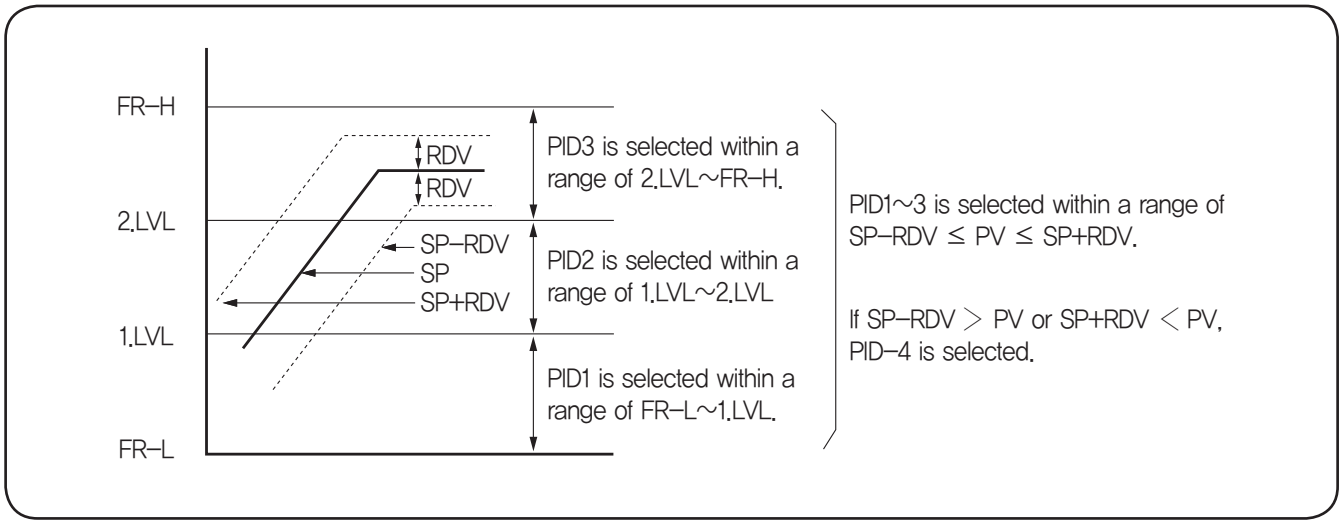
【Ex.1】Initial Conditon:1.LVL=2.LVL=FR-H, RDV=OFF



【Ex.2】 LEVEL PID: FR-L < 1.LVL < 2.LVL < FR-H,RDV=OFF



【예2】 LEVEL PID : FR-L < 1.LVL < 2.LVL < FR-H, RDV = ON



※ PID4 : If RDV is temporarily out of a specified range, the operation is corrected by PID-4.
If correction fails, the control is made by relevant PID NO.

- Time Unit (TIME)

1) Time unit of NP200 is determined by TIME parameter.
2) hh.mm refers hour(s) and minute(s) respectively while mm.ss refers minute(s) and second(s) respectively.
3) Changing TIME parameter will not affect other parameters.
4) Changing TIME parameter will affect other parameters as below :
   • PRG Group: n.WTM, n.TM, nTS ON TM, and n.TS OFF TM
   • PTEND Group: END.TM

● Digital Input (DI)

1) DI 1, 2, 3
① Functions of DI 1, DI 2, and DI 3

DI	Operating Mode	ON	OFF
DI 1	RESET / FIX / PROG	RUN	RESET
DI 2	PROG	HOLD ON	HOLD OFF
DI 3	PROG RESET / FIX	STEP PTEND OFF	× ×

2) DI 4, DI5, DI6, and DI7 (optional)
① Function of DI 4, DI5, DI6, and DI7 (O: Contact ON, X: Contact OFF)

PT.NO	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DI 4	X	○	X	○	X	○	X	○	X	○	X	○	X	○	X	○
DI 5	X	X	○	○	X	X	○	○	X	X	○	○	X	X	○	○
DI 6	X	X	X	X	○	○	○	○	X	X	X	X	○	○	○	○
DI 7	X	X	X	X	X	X	X	X	○	○	○	○	○	○	○	○

② DI, Function Key and Communication
- If DI parameter of Group Control is turned ON (DI=ON): Pattern number can be changed by DI 4~7 (Only if, DI is valid)
- If DI parameter of Group Control is turned OFF (DI=OFF) : DI 4~7 is invalid, and the pattern number can be changed by either Key or Communication.

⚠ CAUTION

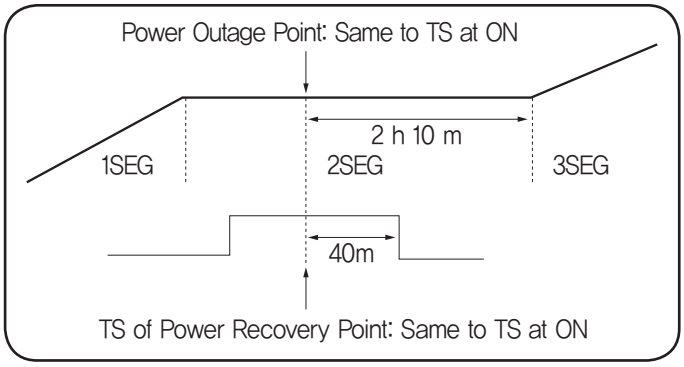
●DI Wiring
– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the DI wiring work.
– Dry Contact (such as Relay) must be used.
– Dry Contact must comply with minimum requirements: Voltage (5V) and Current (1mA) at OFF.
– If any, the Transistor must comply with minimum requirements: Voltage (2V or lower) at ON, Current (100uA or lower) at OFF

● Modes at the Power Outage and Recovery

The power interruption for a short period of time (less than 2 seconds) will not affect program modes. When the power is recovered, the program will run again.

Prior to Power–Cut		After Power–Recovery	
Operation Mode	Output Mode	Operation Mode	Output Mode
RESET (PWR.MD = COOL ⇔ HOT)	MAN	RESET	MAN
	AUTO		AUTO
FIX, PROG (PWR.MD = COOL)	MAN	RESET	MAN
	AUTO		AUTO
FIX, PROG (PWR.MD = HOT)	MAN	FIX, PROG	MAN
	AUTO		AUTO

【Ex.】If the controller has a Hot Start (PWR.MD=HOT) in PROG & AUTO Mode, the User may follow as below :



1) Input the parameters such as PTN NO., SEG NO. (Ex: SEG-2),
   Remaining Time (Ex: 2 h 10 m), and REPEAT NO.
2) Input the remaining values of TS (Ex: 40 minutes), if the TS.MD is TIME.
   Or, turn on TS, if the TS.MD is ON/OFF.
3) Input the values of HOLD, if the power outage & recovery occurred during the HOLD process.
4) Input the values of WAIT, if the power outage & recovery occurred during the WAIT process.
5) Input the values of MV when the power is recovered.
6) Input the values of Status (incl. IS, ALARM) and check such values again at the starting point.
7) When the controller is powered up and the program starts, STC is not checked.

10-3. Function Menu (FUNC)

■ Inner Signal Group (G.IS)

• NP200 programs five Inner Signal Groups.
• The Inner Signal is effective in FIX Mode and PROG Mode.

●Inner Signal Mode (IS.MD)

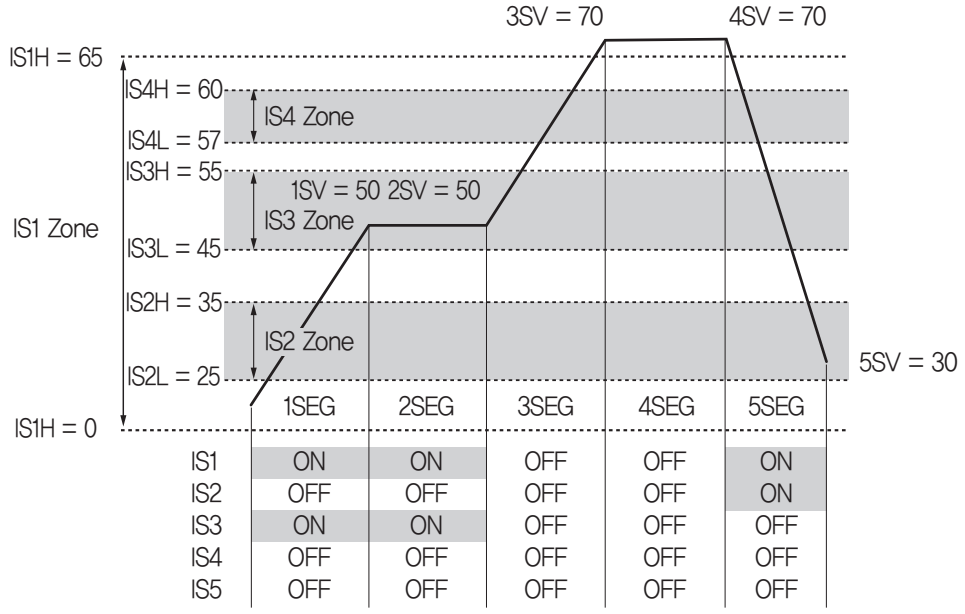
IS.MD=TSV	When the Target Set Value (TSV) of current program segment enters into the inner signal zone, the output set to inner signal will activate. The activation occurs throughout the current program segment zone.
IS.MD=NSV	When the Current Set Value (NSV) of current program segment enters into the inner signal zone, the output set to inner signal will activate. The activation occurs while NSV remains in the inner signal activation zone.
IS.MD=PV	If the current indicated value is entered into the inner signal (IS) segment, it outputs the inner signal (IS).

※ There is no difference between TSV and NSV in FIX Mode.

● Inner signal Parameter Description

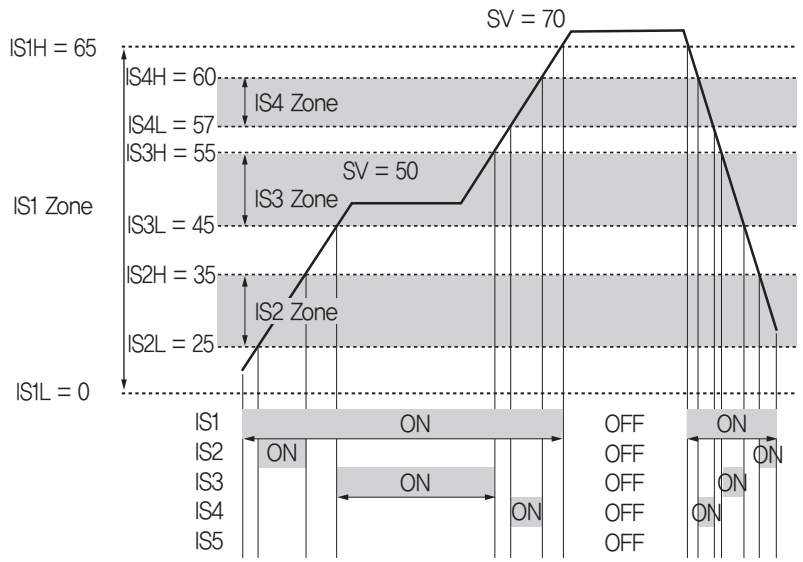
ISn (n = 1~5)	Used to set the Inner Signal ON/OFF. If OFF, the Inner Signal is immediately turned OFF.
ISnH (n = 1~5)	Used to set the high limit of Inner Signal.
ISnL (n = 1~5)	Used to set the low limit of Inner Signal. Inner Signal ranges from ISnH to ISnL.

【Ex.1】 IS.MD=TSV, IS5=OFF



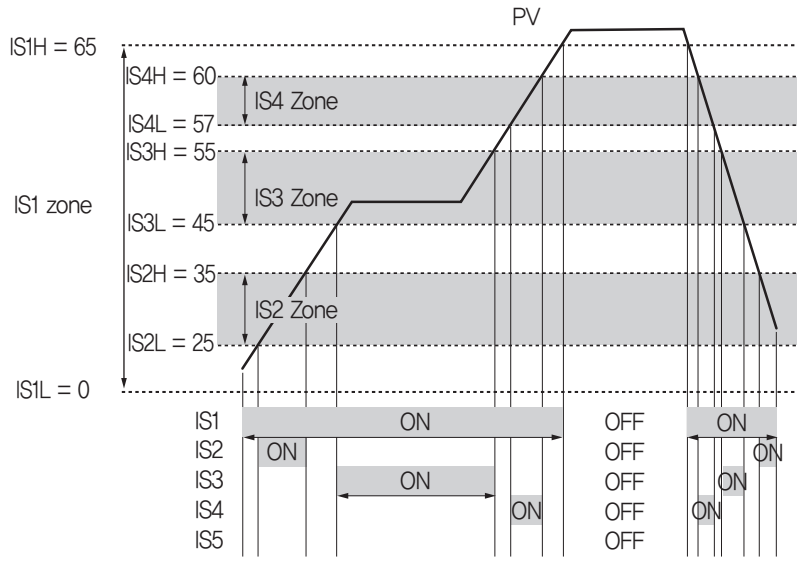
1 SEG	• IS1: 1SV(50) is in IS1 Zone(0~65) ➜ ON • IS2: 1SV(50) is not in IS2 Zone(25~35) ➜ OFF • IS3: 1SV(50) in in IS3 Zone(45~55) ➜ ON • IS4: 1SV(50) is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF
2 SEG	• IS1: 2SV(50) is in IS1 Zone (0~65) ➜ ON • IS2: 2SV(50) is not in IS2 Zone (25~35) ➜ OFF • IS3: 2SV(50) is in IS3 Zone(45~55) ➜ ON • IS4: 2SV(50) is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF
3 SEG	• IS1: 3SV(70) is not in IS1 Zone(0~65) ➜ OFF • IS2: 3SV(70) is not in IS2 Zone(25~35) ➜ OFF • IS3: 3SV(70) is not in IS3 Zone(45~55) ➜ OFF • IS4: 3SV(70) is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF
4 SEG	• IS1: 4SV(70) is not in IS1 Zone(0~65) ➜ OFF • IS2: 4SV(70) is not in IS2 Zone(25~35) ➜ OFF • IS3: 4SV(70) is not in IS3 Zone(45~55) ➜ OFF • IS4: 4SV(70) is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF
5 SEG	• IS1: 5SV(30) is in IS1 Zone(0~65) ➜ ON • IS2: 5SV(30) is in IS2 Zone(25~35) ➜ ON • IS3: 5SV(30) is not in IS3 Zone(45~55) ➜ OFF • IS4: 5SV(30) is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF

【Ex.2】 IS.MD=NSV, IS5=OFF



ON Condition	• IS1: Current SV is in IS1 Zone(0~65) ➜ ON • IS2: Current SV is in IS2 Zone(25~35) ➜ ON • IS3: Current SV is in IS3 Zone(45~55) ➜ ON • IS4: Current SV is in IS4 Zone(57~60) ➜ ON • IS5: IS5 has no value ➜ OFF
OFF Condition	• IS1: Current SV is not in IS1 Zone(0~65) ➜ OFF • IS2: Current SV is not in IS2 Zone(25~35) ➜ OFF • IS3: Current SV is not in IS3 Zone(45~55) ➜ OFF • IS4: Current SV is not in IS4 Zone(57~60) ➜ OFF • IS5: IS5 has no value ➜ OFF

【Ex.3】 IS.MD=PV, IS5=OFF



ON Condition	• IS1: If the current PV is within the range IS1(0~65), ON • IS2: If the current PV is within the range IS2(25~35), ON • IS3: If the current PV is within the range IS3(45~55), ON • IS4: If the current PV is within the range IS4(57~60), ON • IS5: Because IS5 is not set, OFF
OFF Condition	• IS1: If the current PV is not within the range IS1(0~65), ON • IS2: If the current PV is not within the range IS2(25~35), ON • IS3: If the current PV is not within the range IS3(45~55), ON • IS4: If the current PV is not within the range IS4(57~60), ON • IS5: Because IS5 is not set, OFF

■Alarm Group (G.ALARM)

● Alarm Mode (AL.MD)

The Alarm Parameter is to set Alarm Mode (AL.MD). The types of Alarm are as below :

1) ALL : Alarm will trigger in all modes (incl. Reset (RST), Fixed Control (FIX), and Program (PROG)).
2) FIX & PROG : Alarm will trigger in Fixed Control (FIX) and Program (PROG) mode.
3) FIX : Alarm will trigger only in Fixed Control (FIX) mode.
4) PROG : Alarm will trigger only in Program (PROG) mode.

● The Alarm will not trigger if the alarm condition occurs during the following activities :

1) During the power–up
2) The type of alarm is changed
3) The SV is changed during Fixed Control (FIX) Mode (not applicable to PROG mode)

● Alarm Type

1) Forward Activation of Control Output (When the Alarm triggers : ON)

Alarm Type	Code Number	ON Condition	OFF Condition
High Limit Alarm	1 (11)	PV ≥ ALM	PV < ALM-HYS
Low Limit Alarm	2 (12)	PV ≤ ALM	PV > ALM+HYS
High Limit Deviation Alarm	3 (13)	DEV ≥ ALM	DEV < ALM-HYS
Low Limit Deviation Alarm	4 (14)	DEV ≤ -ALM	DEV > -ALM+HYS
High and Low Limit Deviation Alarm	7 (17)	DEV ≥ ALM (DEV ≤ -ALM)	DEV < ALM-HYS (DEV > -ALM+HYS)
High and Low Limit Range Deviation Alarm	8 (18)	DEV ≤ ALM DEV ≥ -ALM	DEV > ALM-HYS (DEV < -ALM+HYS)

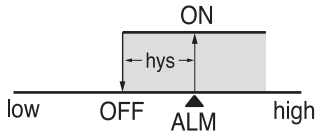
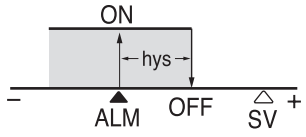
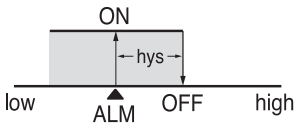
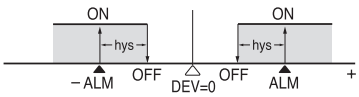
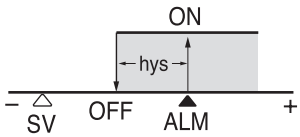
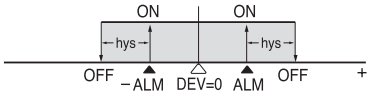
※ Code number in bracket refers to the NOT–triggering activity. PV: Process Value, ALM: Alarm Set Value, DEV : Deviation Set Value (PV–SV)

2) Reverse Activation of Control Output (When the Alarm triggers: OFF)

Alarm Type	Code Number	ON Condition	OFF Condition
High Limit Alarm	9 (19)	PV ≥ ALM	PV < ALM-HYS
Low Limit Alarm	10 (20)	PV ≤ ALM	PV > ALM+HYS
High Limit Deviation Alarm	5 (15)	DEV ≥ ALM	DEV < ALM-HYS
Low Limit Deviation Alarm	6 (16)	DEV ≤ -ALM	DEV > -ALM+HYS

Code number in bracket refers to the NOT–triggering activity. PV: Process Value, ALM: Alarm Set Value, DEV: Deviation Set Value (PV–SV)

● Alarm Functions

Alarm Type	Figure	Alarm Type	Figure
PV High Limit Alarm		Low Deviation Alarm	
PV Low Limit Alarm		High and Low Deviation Alarm	
High Deviation Alarm		High and Low Limit Range Deviation Alarm	

● Types of Alarm

Alarm Code	Alarm Type	Default Value	Set Range
1, 9, 11, 19	High Limit Alarm	EU (100 %)	EU (0∼100 %)
2, 10, 12, 20	Low Limit Alarm	EU (0 %)	EU (0∼100 %)
3, 5, 13, 15	High Limit Deviation Alarm	EUS (0 %)	EUS (0∼100 %)
4, 6, 14, 16	Low Limit Deviation Alarm	EUS (0 %)	EUS (0∼100 %)
7, 17	High and Low Limit Deviation Alarm	EUS (0 %)	EUS (0∼100 %)
8, 18	High and Low Limit Range Deviation Alarm	EUS (0 %)	EUS (0∼100 %)

※ The Dead Band (DB) value of Alarm Output is default: EUS(0.5 %), Setting Range: EUS(0∼100 %).
If AnTY is inactive (OFF), both AL–n and AnDB is not displayed.

⚠ CAUTION

● Alarm Output Wiring

• Use a non–voltage contact switch such as relay when the controller supplies the needed voltage (above 240 V AC) + resistance (above 1A) or voltage (above 30 V DC) + resistance load (above 1A).
• Use a bleeder resistor to draw more infinitesimal current, if required.
• The lifetime of relay is approximately 100,000 operations. If the load inductance is over the controller specifications, the output may need a RC filter or diode to properly handle frequent relay switching operations.

■ User Output Group (G.UO)

• The User Output (U1∼U10) for terminal ((U1∼U10) is selectable.
• The U10 is disabled when the cooling output is a relay, if a controller is the Heating/Cooling model..
• Output will be a cooling regardless of U10. The cooling output has a priority over the U10.
• The setting of User Output (from U1 to U10) can be identical.
• The SGAL Input is activated when one of the four alarms is turned ON, if U5 ∼ U10 is set to output SGAL.

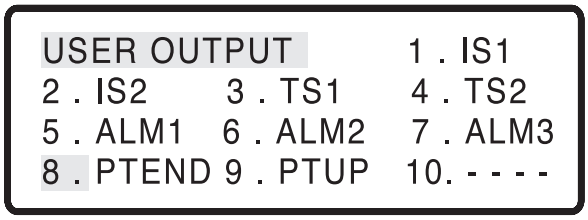
● User Output (UO) Parameters

OFF	User Output (UO) is inactive (OFF).
ALM1∼4	User Output activates (ON) when the Alarm 1∼4 is active.
TS1∼TS5	User Output activates (ON) when the Time Signal 1∼5 is active.
IS1∼IS5	User Output activates (ON) when the Inner Signal 1∼5 is active.
PTEND	User Output activates (ON) when a program ends (if PTEND BIT is ON).
PROG	User Output activates (ON) during the program running.
FIX	User Output activates (ON) during the fixed control mode.
RESET	User Output activates (ON) when the reset mode.
HOLD	User Output activates (ON) when the hold mode.
WAIT	User Output activates (ON) when the wait mode.
MAN	User Output activates (ON) during the manual control mode.
PTUP	User Output activates (ON) during the ascending ramp segment.
PTDOWN	User Output activates (ON) during the descending ramp segment.
PTSOAK	User Output activates (ON) during the soak segment.

● The setting and status of UO can be checked in the Display-4 (User Output) as figure below.

【Display below means】

- U1 is IS1
- U2 is IS2
- U3 is TS1
- U4 is TS2
- U5 is ALM
- U6 is ALM2
- U7 is ALM3
- U8 is PTEND Signal
- U9 is PATTERN UP
- U10 is inactive



The active (or running) Output No. is highlighted. For instance, the UO-8 is active in Figure above.
The Pattern is completed, and the Pattern End Signal (PTEND SIGNAL) is active.

■ Retransmission Group (G.TRANS)

● Retransmitting Output (RET)

RET	PV	SV	MV	SPS	remark
Retransmission Output Type	PV	SV	Output (MV OUT)	Sensor Power Supply	Retransmission is invalid when the OUT is 4, 5, 7 or 8.

⚠ CAUTION

● Retransmission Wiring

– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the installation/removal of transmitters.

– Use the same terminal for both Retransmission Output and SPS.
Set the parameter to select either Retransmission Output or SPS because both outputs use same terminal.

● Sensor Power Supply Wiring: 24 V DC (20 mA Max.)

– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the installation/removal of sensors.

– The Retransmission Output and SPS will be disabled when the output type is Current Output, if the controller is the Heating/Cooling model..

– The Retransmission Output will be inactive while the SPS is being active.

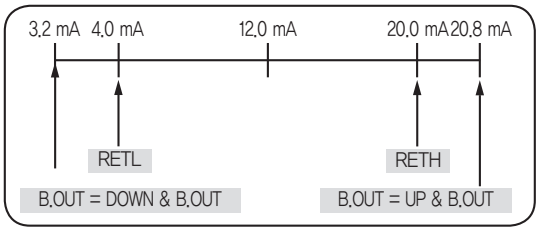
● Retransmission Range

1) RETH (High Limit), RET=PV, SV Type Retransmission :
The Valid Range is T.C, RTD=RETL+1digit~FR-H, mV, V=RETL+1digit~SL-H.

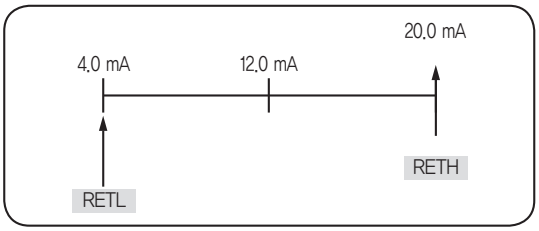
2) RETL (Low Limit), RET=PV, SV Type Retransmission :
The Valid Range is T.C, RTD=FR-L~RETH-1digit, mV, V=SL-L~RETH-1digit.

● RET Scale

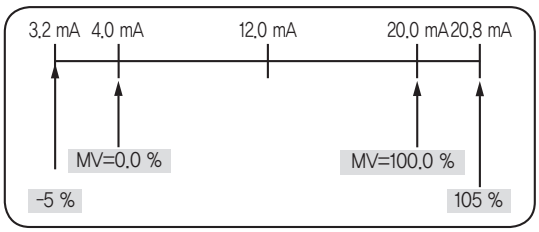
1) PV: 3.2 mA~20.8 mA



2) SV: 4.0 mA~20.0 mA



3) MVOUT: 3.2 mA~20.8 mA



4) Sensor Power Supply (SPS):
Output is 24 V DC 20mA Max.
Select either RET Output or SPS.

10-4. Set-up Menu (STUP)

■ Communication Group (G.COMM)

NP200 Series employees either RS485 or RS422 Half-Duplex Communication (2-wire or 4-wire) and links up to 31 computer terminals. The parameters to set the Communication Group and Communication Modes are as below :

Code	Description	Setting	Display Condition	Default Value
PR-S	RS485/RS422. Used to set the communication protocol	PC LINK(SV:0)/PC LINK SUM(SV:1) MODBUS ASCII (SV:2)/MODBUS RTU(SV:3)	Optional	0
BPS	Used to set the communication speed (B.P.S)	600 (SV : 0), 1200 (SV : 1), 2400 (SV : 2), 4800 (SV : 3), 9600 (SV : 4), 19200 (SV : 5), 38400(SV: 6)		4
PRI	Used to set the communication parity	NONE(SV:0) / EVEN(SV:1) / ODD(SV:2)		0
STP	Used to set the communication stop bit	1-BIT (SV:1) / 2-BIT(SV:2)		1
DLN	Used to set the communication length	7-BIT(SV:7) / 8-BIT(SV:8) (SV is 8 except PC LINK)		8
ADR	Used to set the communication address	From 1 through 99 (Max. ~31)		1
RP.T	Used to set the communication response time	0~10. Response Time = (Process Time + Response Time) X 10ms		0

⚠ CAUTION

- PC-LINK Communication/LADER Communication Wiring

– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the installation/removal of communication terminal.
– Connect terminating resistors (220Ω1/4W) to slave and master controllers at communication channel ends
– Disconnect SDA from RDA / SBD from RBD when the master controller employees the 2-wire communication

■ Output Group (G.OUT)

⚠ CAUTION | Set other groups only after both Input and Output group setting is complete

⚠ CAUTION

- Control Output Wiring

– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the installation/removal of Control Output
– Use shielded wires to Voltage Pulse Output and Current Output connections.

- **Output Type**

• The output type is determined by the OUT Parameter of OUT GROUP.
※ For more information, see Chapter 5. Input & Output 〉Control Output Types (see page 8)

- **Output Cycle**

• The output cycle (HCT, CCT) is valid when the output is either Relay or SSR (Solid State Relay).
• HCT refers the Heating Cycle Time (Output 1).
• CCT refers the Cooling Cycle Time (Output 2).

● Output Limit (Limit)

- The OL–H is the High Limit and OL–L is the Low Limit when the OUT is in 1~3.
  -5.0 % ≤ OL-L ≤ MVOUT ≤ OL-H ≤ 105.0 %
- The OL–H is the High Limit of Heating Output and OL–L is the High Limit of Cooling Output when the OUT is 4~12 if a controller is the Heating/Cooling model.
  ① 0.0 % ≤ H.OUT ≤ OL–H
  ② 0.0 % ≤ C.OUT ≤ OL–L

● Emergency Output

- The PID calculation stops and the Preset–Out (PO) is activated when the A/D error occurs in AUTO Mode, or in BURN OUT or RESET Mode.
- The Preset–Out (PO) is activated by HEO Value when the OUT is 0~3. (However, when the OUT is 0; if HEO is 0% or below, the OUT is 0%; if HEO is 0% or above, the OUT is100 %)
- The PO and CEO is responsible for the Preset–Out of Heating and Cooling respectively when the OUT is 4~12, if a controller is the Heating/Cooling model.
- The output is MAN regardless of error event or mode when the controller is in MAN Mode.

● Output Action (Direct/Reverse Action : O.ACT)

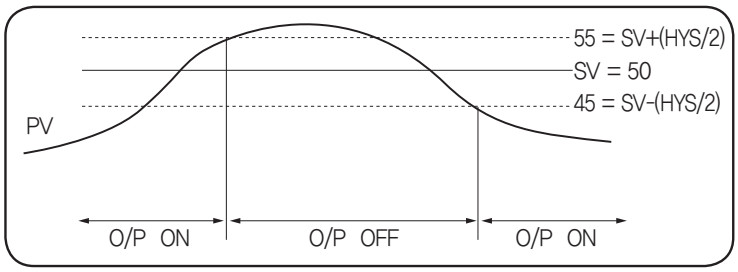
- The Direct Action refers an increasing control output when the deviation (PV–SV) is positive (+) while the Reverse Action refers an increasing control output when the deviation is negative (–).
- O.ACT=DIR: Direct action
- O.ACT=REV: Reverse action
- O.ACT is selectable when the OUT is 0~3 (Except Heating/Cooling model).
- The Heating Output is Reverse Action and the Cooling Output is Direct Action when the OUT is 4~12, if a controller is the Heating/Cooling model.

● Hysteresis (HYS)

- The HYS is to set the OUT=0 (ON/OFF) or 4~12 (Heating/Cooling).
- If OUT is 0, the Hysteresis is for ON/OFF operation whereas if OUT is 4~12, the Hysteresis is for Heating/Cooling operation.
- When the OUT is 0 (ON/OFF), the Hysteresis EUS (0~100 %). The Output ON/OFF is {SV–(HYS/2)}~{SV+(HYS/2)}.

【Ex.】 If, SV=50, HYS=10, O.ACT=REV

- When the OUT is 4~12 (H/C TYPE), the HYS is 0.0~10.0%. The Hysteresis of ON/OFF operation is determined when the Proportional Band of Heating and/or Cooling (P and/or Pc) is 0.



● Auto and Manual Mode (A/M)

⚠ CAUTION	Use △,▽ Key to change the required control output values in MAN Mode. Do not use SET/ ENT Key.

Use △,▽ Key to change the required control output values in MAN Mode. Do not use SET/ ENT Key.
NP200 employees two functional output modes - Auto Control Mode (AUTO) and Manual Control Mode (MAN). In AUTO Mode, a controller automatically calculates the required outputs through PID. In MAN Mode, the User can manually increase/decrease the outputs.

1) Altering AUTO and MAN Mode
① Press DISP key to move to Display–5 (Output Mode Display). Press SET key to alter either AUTO or MAN Mode.
② Altering AUTO and MAN Mode is available in RESET, FIX or PROG Mode.
③ Altering AUTO and MAN Mode is unavailable when the LOCK is ON (also the Display–5 is not available).

■ Input Group (G.IN)

⚠ CAUTION | Set other groups only after both Input and Output group setting is complete.

⚠ CAUTION

● Sensor/Probe Input Wiring

– To prevent personal injury or property damage caused by electric shock, please disconnect the controller device from the external power source during the installation/removal of input (such as sensor or probe).

– Connecting wrong polarity may cause damage or malfunction. Keep the input signal and output wiring as far as possible away from the power and ground circuit.

– Use shielded wires and ground the shielding to an independent grounding point.

● Input Types: Thermocouple, RTD, Voltage Direct Current (VDC)

• For more information, see Chapter 5. Input & Output 〉 Input Type and Range in this literature (See page 8)

• Changing input type will initialize EU and EUS parameters.

● Input Range Unit

Changing input unit will automatically convert the temperature range.
The Unit is valid in Thermocouple or RTD input type.
Unit : ℃ (Celsius), ℉(Fahrenheit)

● User Unit (U.UNIT)

The User Unit is used to indicate the unit on the operating display.
The unit is valid in the direct voltage input type.
Unit : ℃, %, %RH, Pa, –(N/A)

※ UNIT and U.UNIT
The UNIT is used for temperature input range of Thermocouple or RTD (Resistance Temperature Detector) and it affect all parameters of EU and EUS. However, the U.UNIT is valid only for the direct current input type and affects the operating display. The U.UNIT is virtual unit assigned by the User and does not affect parameter of EU or EUS.

● Input Range

Thermocouple, RTD	Set the Input Range Code for determining input range of Thermocouple/RTD. For the Input Range Code, see Chapter 5. Input & Output 〉 Input Type and Range (see page 8) in this literature. The Input Range is determined by changing FR–H and FR–L within a specified range. However, the decimal point cannot be changed (DP–P is invalid). SL–H and SL–L is invalid.
Direct Voltage Input (DC, V, mV)	Set the Input Range Code for determining input range of Direct Voltage. The Input Range is determined by changing FR–H and FR–L within a specified range. Also, SL–H and SL–L is to scale the display value. (Input Command 100% is determined by SL–H, and Input Command 0 % is determined by SL–L). The decimal point can be changed by DP–P.

1) FR–H, FR–L (T/C, RTD, mV, V)

• Setting Range : Setting is available within a default range of each input type. However, FR–H 〉 FR–L

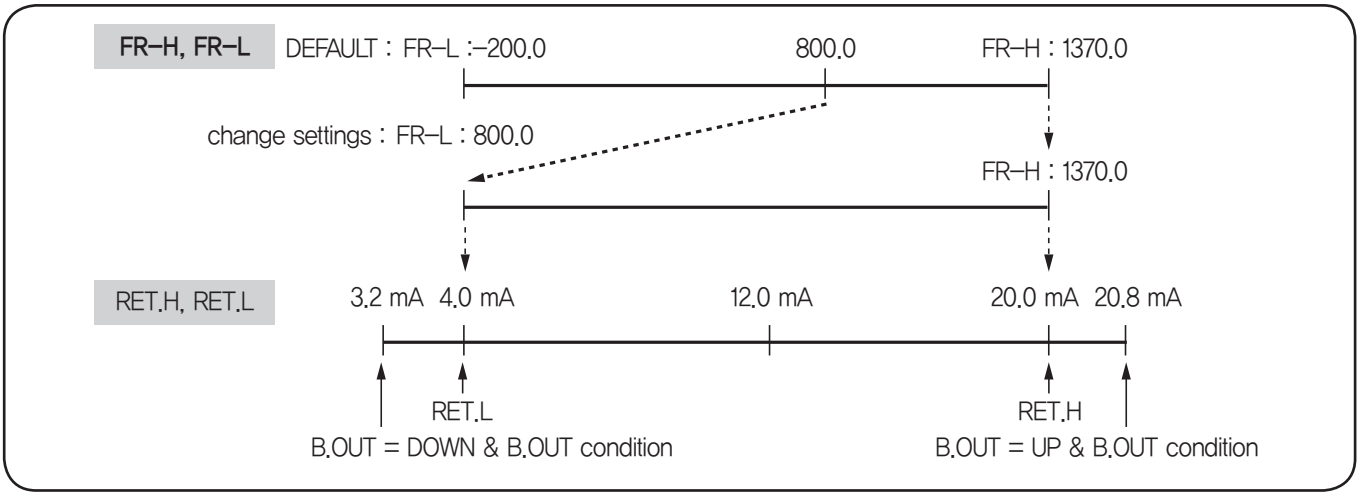
• Changing FR–H or FR–L will initialize SL–H, SL–L, EU, and EUS parameters.

2) SL–H, SL–L, DP–P (Valid if the input type is mV, V)

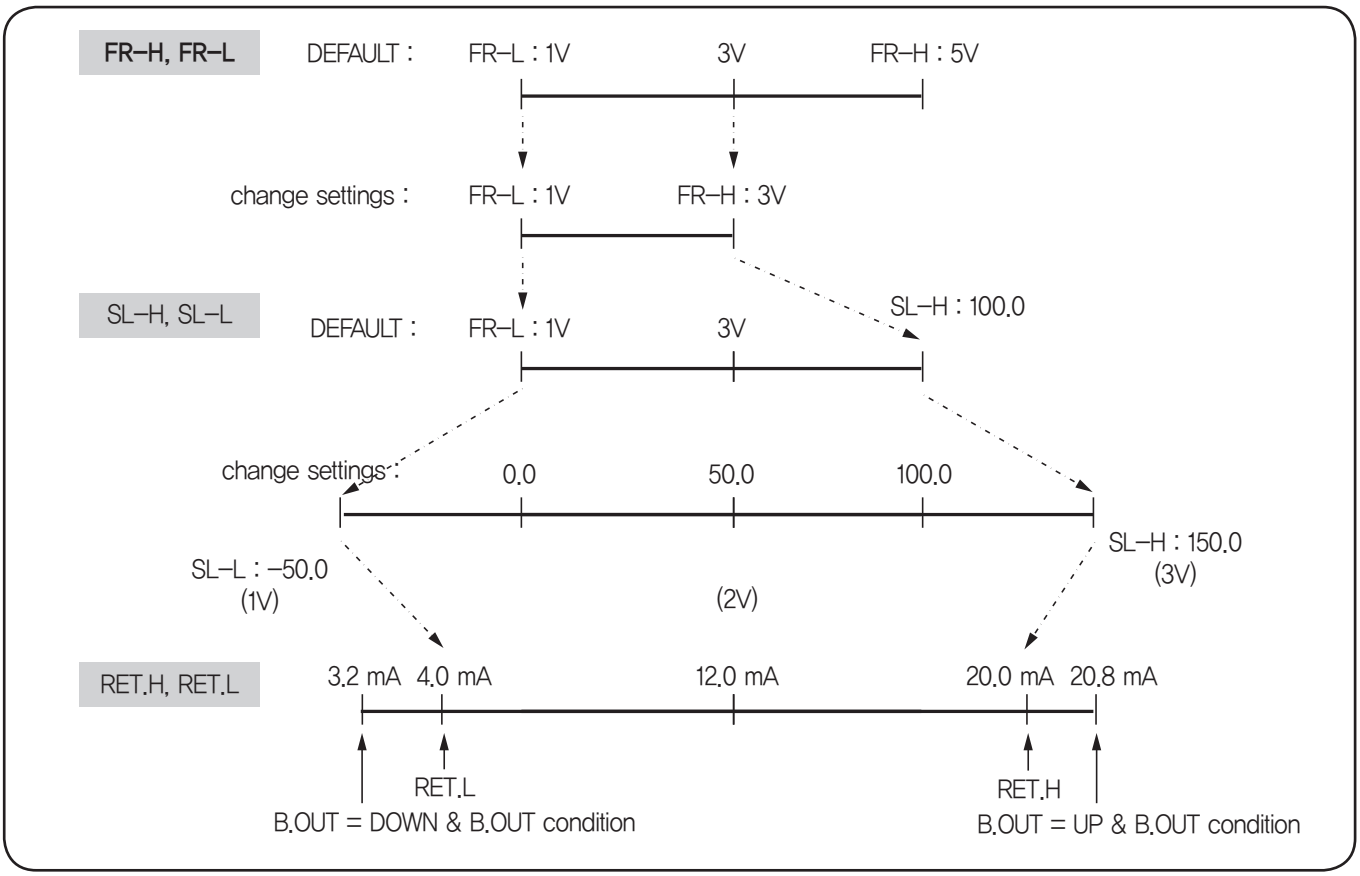
• Default Value : SL–H=100.0, SL–L=0.0. (However, the decimal point is determined by DP–P)
Setting Range : Setting is available within a range from –2,000 through 14,000 regardless of FR–H~FR–L setting range. However, SL–H 〉 SL–L

• Changing SL–H or SL–L setting will initialize EU and EUS parameters. (Except FR–H and FR–L)

【Example.1】 IN = K1 type



【Example.2】 IN = 1/5V type



● Input Filter

• Remove the noise when noise enters the input
• Setting range FILT: OFF, 1~120s

● Input Correction(BIAS)

• Adjust the deviation of the indicated value(PV) and the display value.
• Displayed Indicated value(PV) = input value + input compensation value(BIAS)
• Setting range of BIAS : EU (-100~100%)

● Burn-Out Detection

The Burn-Out (B.OUT) function determines the control outputs including PV up/or down scale, retransmission output and Alarm when an input disconnection/failure occurs (such as sensor). The Burn-Out is used in the input range of Thermocouple and RTD.

- When the Burn-Out is detected (B.OUT=UP, DOWN), the retransmission and alarm operation is affected and a Control Output is the Preset-Out.
- When the Burn-Out is not detected (B.OUT=OFF), the PV is rejected and a Control Output is normal (No Preset-Out occurs).

B.OUT (Burn-Out)		UP (Up Scale)	DOWN (Down Scale)	OFF (OFF)
Thermocouple/RTD (DC, V, mV is invalid)	Detection	○	○	X
	PV	105 %	-5 %	Rejected
Remark			RTD is +105% temporarily.	Up, Down or OFF

● PV Limiter

- -OVR or OVR presents on PV Display when the PV is in either -5% or 105% of the input range. (a controller runs as per either -5% or 105% of PV)
- PV 〉 EU (105 %): PV=105 %, PV Display= OVR
- EU(-5 %) ≤ PV ≤ EU(105 %): PV= PV
- PV 〈 EU (-5 %): PV= -5 %, PV Display=-OVR

● PV during the A/D Error

- The error message presents on PV Display when an A/D error occurs.
- A controller runs an alarm and retransmission operations as per 105% of PV.

● Reference Conjunction Compensation (RJC)

- The reference conjunction compensation is automatically performed when the input type is a Thermocouple.
- When the RJC error occurs, the error message and PV presents on PV Display and a controller runs as per RJC=0 ℃.

■ Lock Group (G.LOCK)

● Lock Functions

Key, Menu, and Password locking prevents the accidental or unauthorized change.

Function	Code	Parameter	Description
KEY LOCK	PWD	Password	Access is denied if password entry is incorrect.
	▽/△	Down Up Key Lock	DOWN & UP key is locked and PARAMETER EDIT is disabled.
	PT.NO	Pattern Number Lock	PT.NO UP and PT.NO DOWN key are locked and PTN NO. EDIT is disabled.
	RUN	Run Key Lock	RUN/HOLD key is locked and PROG RUN is disabled.
	A/M	Auto / Man Lock	Display-5 (Output Mode Display) is disabled. Shifting between AUTO and MAN Mode is disabled.
Menu	PROG	PROG Menu Lock	PROG Menu is disabled.
	OPER	OPER Menu Lock	OPER Menu is disabled.
	FUNC	FUNC Menu Lock	FUNC Menu is disabled.
PASSWORD (set-up)	PWD.C	Password Chage	Access to SETUP Menu is denied if password entry is incorrect.
	P.INIT	Parameter Initialize	Pattern is initialized.

11. Specifications

■ Input Specification

Input	Multi range type (Refer to “Input type Kinds and Range”)
Sampling time	100 ms
Input resolution	Basically for the numbers below the decimal point
Input impedance	T/C & mV input: 1 MΩ min, DC mV input: approx 1 MΩ
Allowable signal source resistance	T/C: Max 250 Ω, DC mV/V: Less than 2 kΩ
Allowable wiring resistance	RTD input: Less than 150 Ω/ 1 wire
Allowable input voltage	DC mV/Thermocouple/RTD: ±10 V, DC V: ±20 V
Noise removal rate	NMRR: more than 40 dB (50/60 Hz ±1 %) CMRR: more than 120 dB
Standard	Thermocouple/RTD (KS / IEC / DIN)
Input signal break detection (Burn – out)	T/C: Up Scale / Down Scale RTD: Up Scale Detected voltage in signal break: Approx. 50 nA
Accuracy	Max scale 0.1 %

■ Output

● Output type

Relay output	Contact capacity : 240 V AC 3 A, 30 V DC 3 A (registance). Composition of contac t : 1c Output operation : time proportioned or ON/OFF Time proportion cycle time : 1 ~ 1000 s Output limit : 0.0 ~ 100.0 % Highest value(OL–H) and Lowest value(OL–L). (Trial for MAN / AT is possible). ON/OFF hysterisis : 0 ~ 100 % Time resolution : the small one in either 0.1 % or 10 ms
SSR output	ON voltage : more than 25 V DC (Load resistance more than 600 Ω when cut off happened there’s limit on electric current of around 30 mA) OFF voltage : less than 0.1 V DC Output operation: Time proportioned Cycle time : 1 ~ 1000 s Output limit : 0.0 ~ 100.0 % Highest value(OL–H) and Lowest value(OL–L). (Trial for MAN / AT is possible). Time resolution : the small one in either 0.1 % or 10 ms
SCR output (4~20 mA d.c.)	Output current range : 4 ~ 2 mA DC output renewal cycle : 100 ms Load resistance: less than 600 Ω Output operation : consecutive PID Output ripple : less than 0.1 % of FS. (p–p) (150 Hz) Accuracy : ±0.3% of FS. (range from 4 ~ 20mA DC) Resolution : around 3,000 Output limit : 0.0 ~ 100.0 % Highest value(OL–H) and Lowest value(OL–L). (Trial for MAN / AT is possible).
Manual operation	Conversion to MANUAL operation is possible at the number 5 of operation screen and communication. A → M: output tracking M → A: bumpless

■ Certifications

Certification	UL (ongoing)
	C–UL (ongoing)
	CE (ongoing)

● Retransmission output

Current output	Current output range: 4 – 20 mA DC Resistance load: less than 600 Ω Accuracy : ±0. % of FS. (4 – 20 mA DC) Resolution : Approx. 3,000 Output ripple : Max 0.1 % of FS. (p–p) (150 Hz) Output renewal cycle time : 100 ms
Retransmission output	Retransmission signal: PV (Process value) / SV (Set value) / MV (Volume of output) / SPS (Power supply for sensor) Scaling: PV (Process value) / SV (Set value)

※SPS(Power supply for sensor): Retransmission output of PV/SV/MV can not be used when you use SPS.

■ Interface

Standard	EIA RS485
Number of devices	31. Address setting: 1~99 range
Communication type	2 wire or 4 wire half–duplex
Synchronization	Start - stop synchronous mode
Communication order	None
Communication distance	Max 1.2 km
Communication rate	600 / 1200 / 2400 / 4800 / 9600 / 19200 / 38400 bps
Start Bit	1 Bit
Data length	7 or 8 Bit
Parity	None, Even, Odd
Stop Bit	1 or 2 Bit
Protocol	PC–LINK, PC–LK–S, MODBUS ASCII, MODBUS RTU
Response time	Handling time + (RP.T X 10 ms)

■ Power Supply

Power supply voltage	100 – 240 V AC (90V ~ 250V)
Frequency	50 – 60 Hz
Power Consumption	Max 6.0W / MAX 10 VA
Insulation resistance	20MΩ min(at 500V DC) : Between primary terminal and secondary terminal Between primary terminal and ground Between ground and secondary terminal
Dielectric Strength	2300V AC 50/60 Hz for 1 minute : Between primary terminal and secondary terminal Between primary terminal and ground 1500V AC 50/60 Hz for 1 minute : Between F.G terminal and secondary terminal
Power supply for sensor	24 V DC 20 mA Max (select between retransmission output or SPS)

■ Function

Measuring Input	Bias	–100.0 ~ 100.0% for measuring input range. Valid setting a correction value
	Scaling	According to setting of SL–H, SL–L of measuring range, scaling is available.
	Input filter	OFF, 1 ~ 120 s
Control	Fix SV	4 kinds
	Pattern	30 Patterns, 99 segments are available in each pattern
	Segment	300 Segments
	PID Group	4 kinds
	Auto Tuning	According to SV, AT is operating. (Select STD or low PV)
	Proportional band (P)	0.1% ~ 999.9%
	Integral time (I)	OFF, 1 ~ 6000sec
	Differential time (D)	OFF, 1 ~ 6000sec
	ON/OFF control	Select ON/OFF control in output group
	PID converter	Level PID/Segment PID selectable
	Manual reset	–0.5 ~ 105.0%. (Valid when I=OFF)
	Direct/reverse action	Select direct or reverse action in output group
	Emergency output	–0.5 ~ 105.0% of output value
	ON/OFF hysteresis	0.0 ~ 100.0% of range (in case of ON/OFF control, it is up to hysteresis value in output group.)
	Heating/cooling hysteresis	–100.0 ~ 50.0% of output value
	Auto/Man	Convert at the 5th operation screen
	Anti reset wind up (ARW)	AUTO, 50.0 ~ 200.0% at the PID group
Retransmission output	Retransmission signal	PV, SV, MV, SPS (select TRANS in retransmission group)
	Scaling	Setting PV, SV
Alarm	Setting points	Max 10 points
	Type of alarm	High/low alarm, High/low deviation alarm
	Setting range	Process alarm: 0~100% of range Deviation alarm: –100~100% of range
	Alarm hysteresis	0.0~100.0% of instrument range

■ Condition for transportation & storage

Temperature	-25 ~ 70 ℃
Humidity	5 ~ 95 %RH (no icing)
Shock	Fall from less than 1m

■ Structure

Material	Plastic case
Weight	696 g (including bracket and box)
Panel cutout	92(W) X 92(H)

■ Operating Environment

Setting surroundings	Consecutive vibration: vibration width is less than 1.2mm (5 ~14 Hz) Consecutive vibration: 4.9㎨ (4 ~ 150Hz) Short time vibration: 14.7 ㎨ less than 15 seconds (each 3 directions) Shock: 147㎨ less than 11ms (3 times at each 3 directions)
Conditions for normal operation	Temperature: 0 ~ 50℃ Humidity: 35 ~ 85%RH (no icing) Magnetic range: less than 400AT/m Warm Up Time: more than 30 minutes
Effects of temperature in the surrounding environment	T/C voltage input: ±1㎶/℃ or ±0.01% of FS/℃ RTD input: less than ±0.05FS/℃ Analog output: less than ±0.05% of FS/℃ (consecutive output)
Effects of voltage fluctuation rate	Analog input: ±1㎶/10V or ±0.01% of FS/10V Analog input: less than ±0.05% of FS/10V

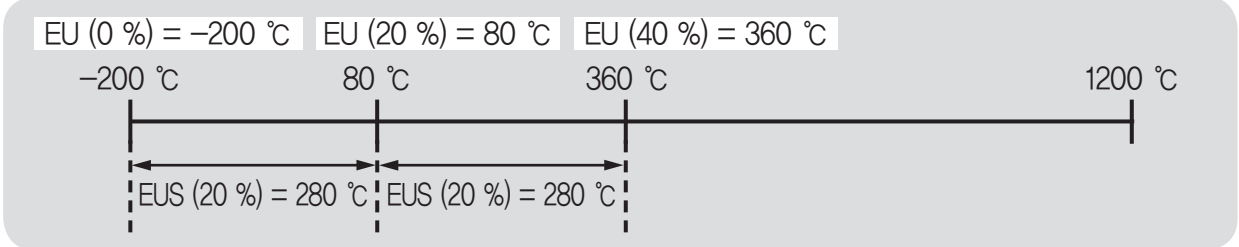
■ Operating indicators

Display	Display process value (5 digit with 7 segment) Set value and parameter display (LCD) Condition display (Individual LED)		
NP200	SW1 : RUN / HOLD	LED 1 : PROG	LED 8 : U2
	SW2 : RESET	LED 2 : RESET	LED 9 : U3
	SW3 : STEP	LED 3 : FIX	LED 10 : U4
	SW4 : PT.NO DOWN (▽)	LED 4 : HOLD	LED 11 : U5
	SW5 : PT.NO UP (△)	LED 5 : OUT	LED 12 : U6
	SW6 : SET	LED 6 : MAN / AT	LED 13 : U7
	SW6 : FIX	LED 7 : 	LED 14 : U8
	SW8 : DISP	LED 5 :	LED 15 : U9
	SW9 : DOWN (▽)	LED 6 : 	LED 16 : U10
	SW10 : UP (△)	LED 7 : U1	

■ Engineering Units

(a) EU: The value of engineering units according to the range of a material

(b) EUS: Range of engineering units according to the span of a material



- As per EU 40% = 360℃,
  Total span is 1400 in the range between –200℃ ~ 1200℃.
  Therefore 1400 x (40/100) = 560 and 40% of the total span is 360℃ deducting –200℃ from 560.
- As per EU 20% = 280℃,
  Total span is 1400 in the range between –200℃ ~ 1200℃.
  Therefore 1400 x (20/100) = 280 and 20% of the total span is 80℃ deducting –200℃ from 280.

12. NP200 Communication Map (after ver. 011)

● NP200 D Register Mapping Table

	Process	Control	IS	SV/PID	ALM & UO	LOCK	OUT & IN
Address	0000	0100	0200	0300	0400	0500	0600
0		CMPT	ISMD	SVNO	A1TY	TRANS	OUT
1	✳ NPV	COMOP	IS1	SV1	A2TY	TRANS.H	O.ACT
2	✳ NSV	CMAM	IS1H	SV2	A3TY	TRANS.L	HCT
3		CMMOUT	IS1L	SV3	A4TY	ADJ.H	CTC
4	✳ SSV	LEVEL	IS2	SV4	A1DB	ADJ.L	HYS
5	✳ MVOUT		IS2H	ATMD	A2DB		HEO
6	✳ HOUT	ARW	IS2L	✓ AT	A3DB		CEO
7	✳ COUT	TMU	IS3		A4DB		OL-H
8	✳ PIDNO	DI	IS3H		AL-1		OL-L
9		PWR.MD	IS3L	ALPHA	AL-2		
10			IS4	1.P	AL-3	PRS	INP
11			IS4H	1.I	AL-4	BPS	UNIT
12			IS4L	1.D	ALMD	PRI	FR-H
13	✳ ALMSTS		IS5	1.MR		STP	FR-L
14	✳ UOSTS		IS5H	1.PC		DLN	DP-P
15	✳ DISTS		IS5L	1.IC		ADR	SL-H
16				1.DC		RPT	SL-L
17	✳ ERRSTS			1.DB			FILT
18	✳ NOWSTS			1.LVL			BIAS
19	✳ COMOP		ENDTIME				B.OUT
20	✳ CPTNO			2.P	UO1	UPDN	RJC
21	✳ CSGNO			2.I	UO2	PT.NO	U.UNIT
22	✳ CSGSV			2.D	UO3	RUN	
23	✳ CSGTM			2.MR	UO4	A/M	
24	✳ RSGTM			2.PC	UO5	PROG	
25	✳ BRSGTM			2.IC	UO6	OPER	
26	✳ BWRSGTM			2.DC	UO7	FUNC	
27	✳ CRPT			2.DB	UO8	P.INIT	
28	✳ TRPT			2.LVL	UO9	F.INIT	
29	✳ PTSTS				UO10	FCFIRM	
30				3.P		PWD	
31				3.I			
32				3.D			
33				3.MR			
34				3.PC			
35				3.IC			
36				3.DC			
37				3.DB			
38							
39							
40				4.P			
41				4.I			
42				4.D			
43				4.MR			
44				4.PC			
45		✳ INFO.SYS		4.IC			
46		✳ INFO.OPT		4.DC			
47		✳ INFO.SP1		4.DB			
48		✳ INFO.SP2		LVLD			
49		✳ INFO.HW					
50		✳ INFO.FW					

✳ READ ONLY READ / WRITE

✓ Out of control due to communication READ / WRITE (Abnormal communication after Write)

	COMM CTL	PT SET	PT INFO	SV INFO		TM INFO	
Address	0700	0800	0900	1000	1050	1100	1150
0	CPTNO_S	WZ	TUPT				
1	CPTNO_D	WTM	NPT1	MSV1	MSV51	MTM1	MTM51
2	CSEGNO	REPEAT	NPT2	MSV2	MSV52	MTM2	MTM52
3	CFCMD	TS.MD	NPT3	MSV3	MSV53	MTM3	MTM53
4	CFANS	ST.SV	NPT4	MSV4	MSV54	MTM4	MTM54
5		ST.MD	NPT5	MSV5	MSV55	MTM5	MTM55
6		END.SEG	NPT6	MSV6	MSV56	MTM6	MTM56
7		END.MOD	NPT7	MSV7	MSV57	MTM7	MTM57
8		END.TM	NPT8	MSV8	MSV58	MTM8	MTM58
9		LINK.PT	NPT9	MSV9	MSV59	MTM9	MTM59
10		PTFSUM	NPT10	MSV10	MSV60	MTM10	MTM60
11			NPT11	MSV11	MSV61	MTM11	MTM61
12			NPT12	MSV12	MSV62	MTM12	MTM62
13			NPT13	MSV13	MSV63	MTM13	MTM63
14			NPT14	MSV14	MSV64	MTM14	MTM64
15			NPT15	MSV15	MSV65	MTM15	MTM65
16			NPT16	MSV16	MSV66	MTM16	MTM66
17			NPT17	MSV17	MSV67	MTM17	MTM67
18			NPT18	MSV18	MSV68	MTM18	MTM68
19			NPT19	MSV19	MSV69	MTM19	MTM69
20		NPT	NPT20	MSV20	MSV70	MTM20	MTM70
21		PID	NPT21	MSV21	MSV71	MTM21	MTM71
22		ALM	NPT22	MSV22	MSV72	MTM22	MTM72
23		SV	NPT23	MSV23	MSV73	MTM23	MTM73
24		TM	NPT24	MSV24	MSV74	MTM24	MTM74
25		TS1	NPT25	MSV25	MSV75	MTM25	MTM75
26		TS1ON	NPT26	MSV26	MSV76	MTM26	MTM76
27		TS1OFF	NPT27	MSV27	MSV77	MTM27	MTM77
28		TS2	NPT28	MSV28	MSV78	MTM28	MTM78
29		TS2ON	NPT29	MSV29	MSV79	MTM29	MTM79
30		TS2OFF	NPT30	MSV30	MSV80	MTM30	MTM80
31		TS3	TUSEG	MSV31	MSV81	MTM31	MTM81
32		TS3ON		MSV32	MSV82	MTM32	MTM82
33		TS3OFF		MSV33	MSV83	MTM33	MTM83
34		TS4		MSV34	MSV84	MTM34	MTM84
35		TS4ON		MSV35	MSV85	MTM35	MTM85
36		TS4OFF		MSV36	MSV86	MTM36	MTM86
37		TS5		MSV37	MSV87	MTM37	MTM87
38		TS5ON		MSV38	MSV88	MTM38	MTM88
39		TS5OFF		MSV39	MSV89	MTM39	MTM89
40		SUM		MSV40	MSV90	MTM40	MTM90
41				MSV41	MSV91	MTM41	MTM91
42				MSV42	MSV92	MTM42	MTM92
43				MSV43	MSV93	MTM43	MTM93
44				MSV44	MSV94	MTM44	MTM94
45				MSV45	MSV95	MTM45	MTM95
46				MSV46	MSV96	MTM46	MTM96
47				MSV47	MSV97	MTM47	MTM97
48				MSV48	MSV98	MTM48	MTM98
49				MSV49	MSV99	MTM49	MTM99
50				MSV50		MTM50	

● Read and Write Register Area

Address	Address
0001 ~ 0050	Read Only
0145 ~ 0150	
0900 ~ 1199	
0100 ~ 0144	Read & Write
0200 ~ 0899	

● NP_200 Bit Map Information

Data		ALMSTS	UOSTS	DISTS	ERRSTS	NOWSTS	PTSTS
Address		0013	0014	0015	0017	0018	0029
Bit	0	ALM1	UO1	DI1		RESET	PT_UP
	1	ALM2	UO2	DI2	CALL_ERR	FIX	PT_SOAK
	2	ALM3	UO3	DI3	PV_POVR	PROG	PT_DOWN
	3	ALM4	UO4	DI4	PV_MOVR	HOLD	
	4		UO5	DI5	BOUT	WAIT	
	5		UO6	DI6	RJC_ERR	AT	
	6		UO7	DI7	ADC_ERR	MAN	
	7		UO8			FERR	
	8		UO9		AT_ERR		
	9		UO10		SYS_ERR		
	10						
	11						
	12						
	13						
	14				COM_ERR		
	15						

● Terms Description

D REGISTER	Description	
0001	NPV	Current PV
0002	NSV	Current SV
0004	SSV	Start SV (Read the value when programing is running)
0005	MVOUT	Current output amount
0006	HOUT	Heating output amount
0007	COUT	Cooling output amount
0008	PIDNO	Current PID No.
0013	ALMSTS	Alarm Status (Refer to Bit Map Information)
0014	UOSTS	User Output Status (Refer to Bit Map Information)
0015	DISTS	DI Status (Refer to Bit Map Information)
0017	ERRSTS	ERROR Status (Refer to Bit Map Information)
0018	NOWSTS	MODE Status (Refer to Bit Map Information)
0019	COMOP	MODE SET (1:RUN/2:HOLD/3:STEP/4:RESET/5:FIX)
0020	CPTNOY	Currently running Pattern Number
0021	CSGNO	Currently running Segment Number
0022	CSGSV	Currently running target value in segment
0023	CSGTM	Currently running set time in segment
0024	RSGTM	Elapsed time
0025	BRSGTM	Remaining time
0026	BWRSGTM	Waited time
0027	CRPT	Current repetition number
0028	TRPT	Repetition number in the current running pattern
0029	PTSTS	Pattern Status (Refer to Bit Map Information)
0100	CMPT	Operating Pattern Number
0101	COMOP	MODE SET (1:RUN/2:HOLD/3:STEP/4:RESET/5:FIX)
0102	CMAM	AUTO/MAN Switch (1:AUTO/2:MAN)
0103	CMMOUT	Output by Manual

D REGISTER	Description		
0104	LEVEL	Level PID	G.Control
0106	ARW	Anti-Reset Wind up	G.PID
0107	TMU	Time Unit	G.Control
0108	DI	Digital Input Enable	G.Control
0109	PWR.MD	Power ON Mode	G.Control
0200	ISMD	Inner Signal Mode	G.IS
0201~0215	ISx	Inner Signal x (X is the symbol that represents the IS number)	G.IS
	ISxH	Inner Signal x High (X is the symbol that represents the IS number)	G.IS
	ISxL	Inner Signal x Low (X is the symbol that represents the IS number)	G.IS
0219	ENDTIME	Time Unit	G.Control
0300	SVNO	Set Value No Select	G.SV
0301~0304	SVx	Set Value x (X is the symbol that represents the SV number)	G.SV
0305	ATMD	Auto Tuning Mode select	G.AT
0306	AT	Auto Tuning	G.AT
0309	ALPHA	Alpha	G.PID
0310~0347	x.P	proportional band (X is the symbol that represents the PID number)	G.PID
	x.I	integration time (X is the symbol that represents the PID number)	G.PID
	x.D	derivative time (X is the symbol that represents the PID number)	G.PID
	x.MR	Manual reset (X is the symbol that represents the PID number)	G.PID
	x.PC	Cooling proportional band (X is the symbol that represents the PID number)	G.PID
	x.IC	Cooling integration time (X is the symbol that represents the PID number)	G.PID
	x.DC	Cooling derivative time (X is the symbol that represents the PID number)	G.PID
	x.DB	Heating/Cooling dead band (X is the symbol that represents the PID number)	G.PID
0318	1.LVL	PID Lecel 1	G.PID
0328	2.LVL	PID Lecel 2	G.PID
0348	LVLD	Reference DEV	G.PID
0400~0411	AxTY	Alarm Type (X is the symbol that represents the ALARM number)	G.ALARM
	AxDB	Alarm Dead Band (X is the symbol that represents the ALARM number)	G.ALARM
	AL-x	Alarm Point (X is the symbol that represents the ALARM number)	G.ALARM
0412	ALMD	Alarm Mode	G.ALARM
0420~0429	UOx	User Output (X is the symbol that represents the UO number)	G.UO
0500	TRANS	Transmission output selection	G.TRANS
0501	TRANS.H	Transmission output high value	G.TRANS
0502	TRANS.L	Transmission output low value	G.TRANS
0503	ADJ.H	Transmission output high correction value	G.TRANS
0504	ADJ.L	Transmission output low correction value	G.TRANS
0510	PRS	RS485, RS422 Protocol selection	G.COMM
0511	BPS	Baud Rate	G.COMM
0512	PRI	Parity	G.COMM
0513	STP	Stop Bit	G.COMM
0514	DLN	Data Length	G.COMM
0515	ADR	Address	G.COMM
0516	RPT	Response Time	G.COMM
0520	UPDN	Down/Up Key Lock	G.LOCK
0521	PT.NO	Pattern Number Lock	G.LOCK
0522	RUN	Run Key Lock	G.LOCK
0523	A/M	Auto/MAN Lcok	G.LOCK
0524	PROG	PROG Menu Lock	G.LOCK
0525	OPER	OPER Menu Lock	G.LOCK
0526	FUNC	FUNC Menu Lock	G.LOCK
0527	P.INIT	Parameter initialization	G.LOCK
0528	F.INIT	Program initialization	G.FILE
0530	PWD	Password Change	G.LOCK
0600	OUT	Output selection	G.OUT
0601	O.ACT	Direct/reverse action	G.OUT
0602	HCT	Heat cycle time	G.OUT
0603	CTC	Cool cycle time	G.OUT

D REGISTER	Description		
0604	HYS	Dead band (Hysteresis (ON/OFF control))	G.OUT
0605	HEO	Heat Emergency Output	G.OUT
0606	CEO	Cool Emergency Output	G.OUT
0607	OL-H	Output high limit	G.OUT
0608	OL-L	Output low limit	G.OUT
0610	INP	Input type selection	G.IN
0611	UNIT	Input range unit selection	G.IN
0612	FR-H	Upper range	G.IN
0613	FR-L	Lower range	G.IN
0614	DP-P	Decimal point input	G.IN
0615	SL-H	High scale	G.IN
0616	SL-L	Low scale	G.IN
0617	FILT	PV bias	G.IN
0618	BIAS	PV bias	G.IN
0619	B.OUT	Show PV during input (sensor) disconnection	G.IN
0620	RJC	RJC ON/OFF	G.IN
0621	U.UNIT	User unit selection	G.IN
0700	CPTNO_S	Pattern number to edit or pattern number source to copy	
0701	CPTNO_D	Pattern number destination to copy	
0702	CSEGNO	Segment number to edit	
0703	CFCMD	Edit command [see below]	
0704	CFANS	Edit result [see below]	
0800~0840		SEG value to edit (see program parameter)	
0900	TUPT	Total number of used patterns	
0901~0930	NPTx	Quantity of used segment in each pattern (X is the symbol that represents the pattern number)	
0931	TUSEG	Total number of used segments	
1001~1099	MSVxx	SV per each segment of the running pattern (xx is the symbol that represents the segment number)	
1101~1199	MTMxx	TM per each segment of the running pattern (xx is the symbol that represents the segment number)	

- [see] CFCMD (D0703) : Edit command

Value	command	Description
1	INIT	D0700~D0704 Init
2	FREAD	After reading the CSEGNO of the CPTNO_S display it under the D0800
3	FWRITE	Write the content under the D0800 in the CSEGN of the CPTNO_S
4	CPYPTF	Copy the PT content of the CPTNO_S into the PT of the CPTNO_D
5	DELPTF	Delete the PT of the CPTNO_S
6	INSSEG	Insert in the CSEGNO of the CPTNO_S
7	DELSEG	Delete the CSEGNO content of the CPTNO_S
8	PTUPLOAD	After uploading the PT content of the CPTNO_S, show under the D1000

- [see] CFANS (D0704) : CFANS result

Value	command	Description
1	DONE	Execution OK
2	NO PT	No corresponding pattern (No SEG or Range Out)
3	NO SEG	No corresponding pattern (No SEG content or Range Out)
4	PT RUN	Correspondent Pattern running
5	PAR ERR	Other command error

■ Communication example (PC-LINK STD)

The example below is about the Pattern reading and writing after using the PC-LINK_STD protocol.
For the LINK-SUM, MODBUS RTU/ASCII please change the example below according to the protocol.

● READ EXAMPLE

1) Check the Seg quantity saved in each pattern of the NP200	
Sender	(STX) 01DRS,30,0901 (CR) (LF)
Receiver	(STX) 01DRS,OK,0005,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000, 0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000 (CR) (LF)
2) Read PT=1, SEG=0 (execution command)	
Sender	(STX) 01DWR,03,0700,0001,0702,0000,0703,0002 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
3) Result check (execution result)	
Sender	(STX) 01DRR,01,0704 (CR) (LF)
Receiver	(STX) 01DRR,OK,0001 (CR) (LF)
4) Check PT=1, SEG=0 content (result value)	
Sender	(STX) 01DRS,11,0800 (CR) (LF)
Receiver	(STX) 01DRS,OK,0000,0000,0001,0000,F830,0000,000A,0000,0000,0001,000C (CR) (LF)
5) Read PT=1, SEG=1 (execution command)	
Sender	(STX) 01DWR,03,0700,0001,0702,0001,0703,0002 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
6) Result check (execution result)	
Sender	(STX) 01DRR,01,0704 (CR) (LF)
Receiver	(STX) 01DRR,OK,0001 (CR) (LF)
7) Check PT=1, SEG=1 content (result value)	
Sender	(STX) 01DRS,21,0820 (CR) (LF)
Receiver	(STX) 01DRS,OK,0000,0001,0000,0 7D0,0005,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0064 (CR) (LF)

● WRITE EXAMPLE

1) Write PT=1, SEG=0 (PT=1, SEG=0 content deletion, command execution)	
Sender	(STX) 01DWR,03,0700,0001,0702,0000,0703,0005 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
2) Result check (execution result)	
Sender	(STX) 01DRR,01,0704 (CR) (LF)
Receiver	(STX) 01DRR,OK,0001 (CR) (LF)
3) PT=1, SEG=0 selection	
Sender	(STX) 01DWR,02,0700,0001,0702,0000 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
4) Write to 800 address (write SEG0 value)	
Sender	(STX) 01DWS,10,0800,0000,0000,0001,0000,F830,0000,000A,0000,0000,0001 (CR) (LF)
Receiver	(STX) 01DWS,OK (CR) (LF)
5) Write PT=1, SEG=0 (execution command)	
Sender	(STX) 01DWR,01,0703,0003 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
6) Check result (execution result)	
Sender	(STX) 01DRR,01,0704 (CR) (LF)
Receiver	(STX) 01DRR,OK,0001 (CR) (LF)
7) PT=1, SEG=1 selection	
Sender	(STX) 01DWR,02,0700,0001,0702,0001 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
8) Write to 821 address (write SEGx value)	
Sender	(STX) 01DWS,19,0821,0001,0000,0 7D0,0005,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000,0000 (CR) (LF)
Receiver	(STX) 01DWS,OK (CR) (LF)
9) Write PT=1, SEG=1 (execution command)	
Sender	(STX) 01DWR,01,0703,0003 (CR) (LF)
Receiver	(STX) 01DWR,OK (CR) (LF)
10) Result check (execution result)	
Sender	(STX) 01DRR,01,0704 (CR) (LF)
Receiver	(STX) 01DRR,OK,0001 (CR) (LF)

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