

TEMP1000

Operation Manual (Programmable Controller)



WELCOME

Thank you for purchasing furnace controller production.
Please use after read instruction manual for safety.
Free to contact to our sales Div. for
production inquiry and after service.



Various



SAMWON TECH

It is programmable controller which equips with the general control, heating and cooling function by supporting high definition TFT-LCD touch screen and recording function.

<http://www.samwontech.com>

Being the controller market leader in the 21st century with the best technology



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MSF-FCM-
S31-1000SERIES



This manual is used for TEMP1000
of operation method.

Contents

1. Operation and setting

1-1 Basic operation flow chart	4
1-2 Setting button operation	5
1-3 Parameter setting method	5

2. Main screen

3. Operation state screen setting

3-1 Stationary operation	13
3-2 Program operation	20
3-3 Auto tuning	29
3-4 Auto tuning and tuning point	34

4. Operation motion setting

4-1 Operation method setting	36
4-2 Fuzzy operation	38
4-3 Setting value change rate (SLOPE) operation	39

5. Appointed operation setting

6. Setting graph display and save

6-1 Pattern graph display	46
6-2 Presented value (PV) graph view	49
6-3 Presented value (PV) graph save setting	52
6-4 Memory save setting	53

7. Program setting

7-1 Program pattern setting	57
7-2 Pattern repetition setting	65
7-3 File editing	66
7-4 Time signal operation	69
7-5 Standby operation	73
7-6 Experiment name setting	75

8. Screen display setting

8-1 Screen display setting	78
8-2 DI error creation history view	80

9. Communication error

01. Cautions (Instructions) for safety

Thank you for your choice of our programmable controller (TEMP1000). This manual describes the method of operation of the product.

Cautions in this instruction manual

- Please deliver for the end user to possess always and keep it in the place accessible at any time.
- Use the product after full understanding of this operation manual.
- This operation manual does not warrant any other things because it is a description of the details for the function.
- A part or whole of this manual shall not be edited or copied randomly.
- The descriptions in this manual may be changed randomly without pre notice or warning.
- Even though this manual was made with elaboration, it will be appreciated if you inform to the purchasing point (Dealer shop and etc) or sales team in our company in case of deficiency, mistake or omission in the contents.

Cautions for the safety and modification (Change) of the product

- Please use this product after full understanding on the safety cautions in this manual for the protection and safety for this product and the system connected to this system.
- Our company is not responsible to the damages occurred by using or handling or unattended using not relying on this operation manual.
- Please install at the outside of this product when the additional protection and safety circuit is installed separately for the protection and safety for this product and the system connected to this system.
- The internal modification (Change) and addition to this product are prohibited.
- Do not disassemble, repair and modify of this product because it becomes the reasons for electric shock, fire and malfunction.
- In case of changing the part or the consumables of this product, please contact to the sales department of our company.
- Do not contact to the moisture with this product. It may cause the failure on this product.
- Do not apply the strong impact on this product. It may cause the damage and failure on this product.

With regard to the exemption for the responsibility of this product

- We are not responsible for any warranty on this product besides the defined cases in the quality assurance condition of our company.
- We are not responsible for the direct or indirect damages on the user of any third party due to the not expectable defect or the natural disaster in use of this product.

With regard to the quality assurance condition of this product

- The warranty period shall be one year from the purchasing of this product. Free of charge repair is available only for the cases of out of order occurred from normal use conditions.
- The repair due to the out of order occurred after the warranty period shall be repaired at the actual cost according to the defined condition by our company.
- The out of order occurred within the warranty period shall be repaired at the actual cost for the following cases in spite of within the warranty period.
 - (1) Out of order due to the mistake or fault of the user (Ex: Initialization by losing the password and etc.)
 - (2) Out of order due to the natural disaster (Ex: Fire and flood and etc)
 - (3) Out of order due to the movement of product after installation.
 - (4) Out of order due to the random disassemble, change or damage on the product.
 - (5) Out of order due to the electric power instability
 - (6) Others
- Please contact to the purchasing points or sales part of our company when after sales service is necessary because of the failure on the product.

Symbol marks for safety



(A) It means the "Handle with care" or "Cautions" in case of violation of this point, it may cause the death, severe injury or the extreme damage on the product.

- Product: It is marked on the points to be acknowledged certainly to protect the human body and device.
- Instruction manual: It describes the cautions to prevent the cases of endangered situation on the life and body of the user due to the electric shock and so on.



(B) It means "Ground terminal"

- Make the earth with the ground in case of product installation and controlling the product.



(C) It means the "supplementary explanation"

- It describes the points to supplement the explanation.



(D) It describes the "references"

- It describes the information and pages of reference to be referred.

Part 01

Operation and setting

1-1 Basic operation flow chart	4
1-2 Setting button operation	4
1-3 Setting button operation	5



01. Operation and setting

This product is programmable controller designed with dialogue style touch screen easy-to-use for the users.

1-1. Basic operation flow chart

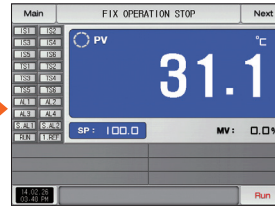
- The logo screen and the initial screen are displayed sequentially when the electric power is switched “ON” after installation of the product and it converts to the program stationary screen.
- It takes about 20 seconds for screen loading
- When **Main** button is touched at the top of the program stationary screen, it converts to the main screen.
- Refer to [13. System initial setting] in [Installation manual] for change in the initial screen.



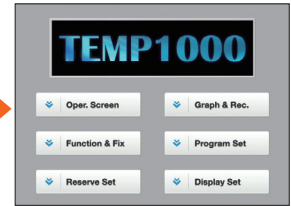
Logo screen



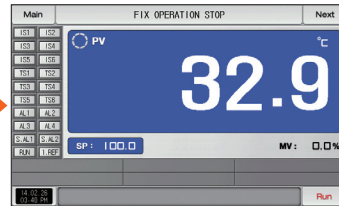
Initial screen



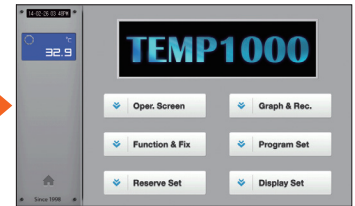
Stationary operation still screen(TEMP1500)



Main screen(TEMP1500)



Stationary operation still screen(TEMP1300/1900 WIDE)



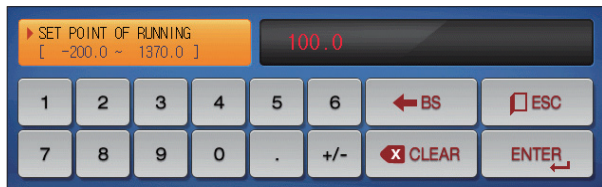
Main screen(TEMP1300/1900 WIDE)

1-2. Setting button operation

Button type	Button operation
	The "Set value" is touched in stationary operation/still screen and it is used for setting the set value wanted by the user.
	The "Pattern No." is touched in program still screen and it is used for setting the pattern number wanted by the user.
	It is used for inputting the general numbers and name.
	It is used for selection for one out of many types.
	It is used for selection for one out of more than 2 parameter setting. (ON/OFF/Inactive state)
	It is used for selection of Y/N for the corresponding parameter. (ON/OFF/Inactive state)
	It is used for general screen conversion.
	It is used for increasing or decreasing of the page within the same screen.
	It is used for the page conversion by the decrease and increase in time axis on the same screen.

1-3. Parameter setting method

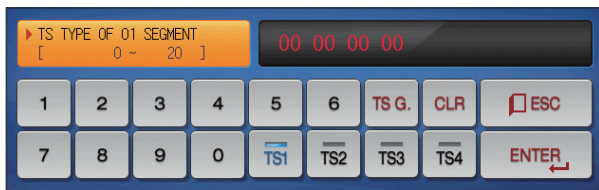
- When is selected in [1-2 Setting button operation], the input key of the setting value is shown as followings and the necessary data can be input.
- When the data out of the setting range is input, error message ("LIMIT ERROR") is shown on the input data display window with the error sound ("Beep").



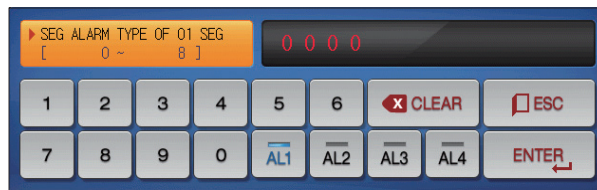
▲ Input key for setting only the numbers

Input key for setting the pattern experiment name and DI error name Refer to [11. DI function and operation setting] in [Operation manual] for DI error name input key.

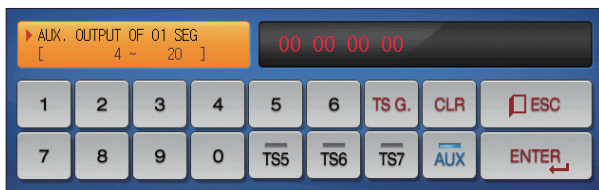




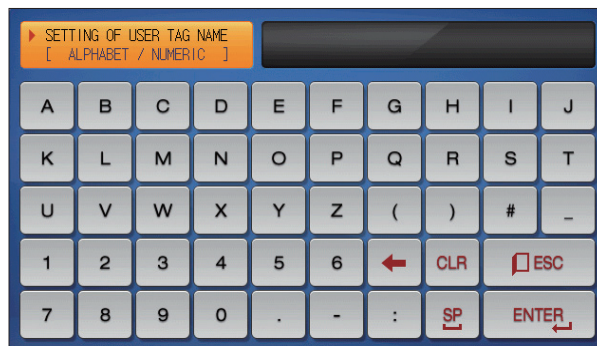
▲ Input key for time signal setting



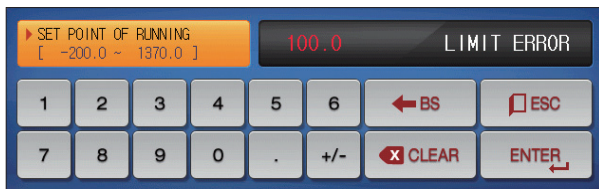
▲ Input of SEG alarm setting



▲ Input key for sub output setting
Refer to sub output in [4. Control & Transmitting output] in [Operation manual] for sub output setting.



▲ Input key for user tag name



▲ Display when it is out of the setting range



NOTE

Touch key lock release

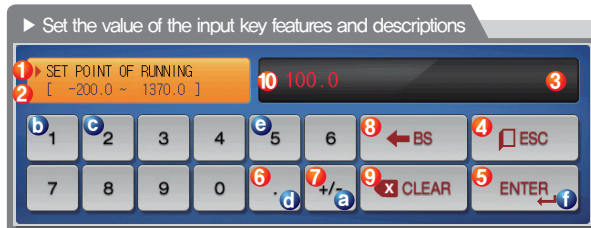
- Input OFF (Lock release state) for key lock because the set value is not input when "Key lock" is "ON."
- Refer to [4. Operation motion setting] for details

(1) Method for effectiveness of setting button and setting value

- This product is designed as follows when the setting data input button is touched or to check the effectiveness of the input setting data by sound.
- “Beep” : When the basic setting button is touched or the setting data is input normally
- “Beep and beep” : When the input data by the setting data input key is out of the input range.
- Do not press with sharp thing (Pencil and etc) or excessive force on the input key for basic setting button or setting value.
It may cause the mal operation of the device or damage on the touch panel.

(2) Setting value input method

- Every input data used in this product is set by the set data input key, test name input key and time signal input key.
- The input key for set data is appeared when button is touched in [1-2 Setting button operation] and the value to be set can be input.
- Refer to [7-4 Time signal operation] for time signal input.
- Refer to [11. DI function and operation setting] in [Operation manual] for DI error name input key.



Ex) Set data input method

Press the set data input button in the corresponding screen →

Press the “ENTER (f)” key finally after pressing the corresponding number in sequence (a)→(b)→(c)→(d)→(e)

①	It displays “Parameter.”
②	It displays “Setting range.”
	It displays “setting display window.”
③	<ul style="list-style-type: none"> • It displays “LIMIT ERROR” when it is out of the setting range. • It displays “INPUT ERROR” when there is an error in setting unit.
④	It is used to return to original screen after stopping the input.
⑤	It returns to the original screen by saving the input data.
⑥	It is used for input the decimal point.
⑦	It is used for input the symbol (+/-).
⑧	It is used for erasing the input data by one character.
⑨	It is used for erasing all input data.
⑩	It displays the already input setting data.

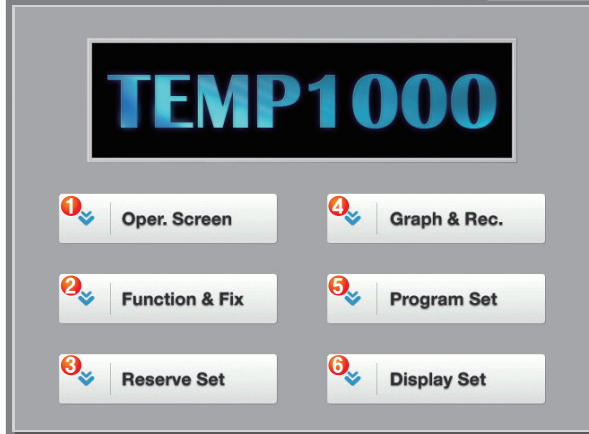
Part **02**

Main screen9



02. Main screen

[Fig. 2-1] Main screen(TEMP1500)



No.	Instruction	Description
①	Operation state screen	Moving to the operation screen
②	Setting operation motion	Moving to the setting screen for additional function and operation method
③	Programmed operation setting	Moving to the screen for setting current time, programmed operation time.
④	Graph & Saving	Moving to the screen to set Y/N for using graph display, graph record
⑤	Program setting	Moving to the program setting menu screen
⑥	Setting screen display	Moving to the screen for setting the screen brightness, Y/N for using buzzer sound, back light electricity saving, setting for background color and humidity display.

[Fig. 2-2] Main screen(TEMP1300/1900 WIDE)



- ① It displays the current date/time.
- ② It displays the present value (PV).
Button to move the operation screen.
- ③ • During operation, the button is displayed alternately in various colors.

References

- ▶ PV on the left side of the screen is displayed on the left side of all parameters in the TEMP1300/1900(WIDE) Product

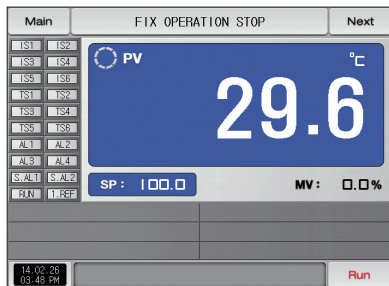
Part 03

Operation state screen setting

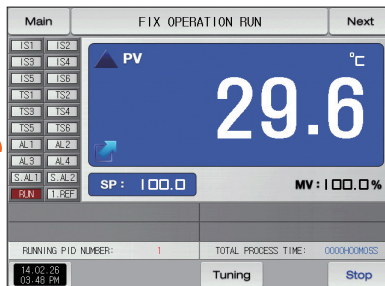
3-1 Stationary operation	13
3-2 Program operation	20
3-3 Auto tuning	29
3-4 Auto tuning and tuning point	34

Operation state screen setting

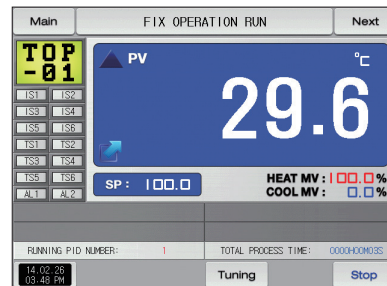
Next Flow chart



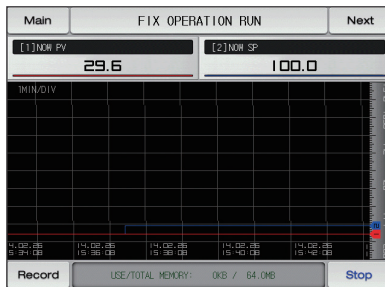
[Fig. 3-1] Stationary operation still screen 1



[Fig. 3-5] Stationary operation still screen 1 (General)



[Fig. 3-6] Stationary operation still screen 1 (Heating : Cooling)



[Fig. 3-12] Stationary operation still screen 3

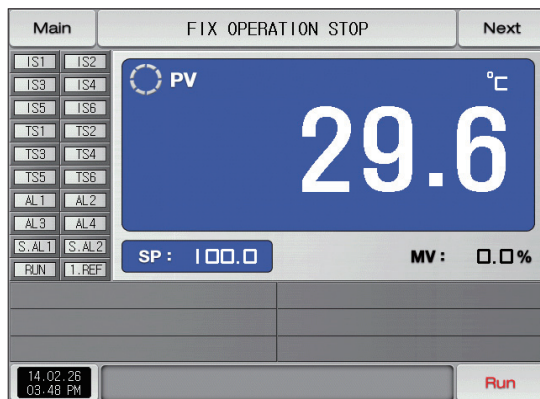


03. Operation state screen setting

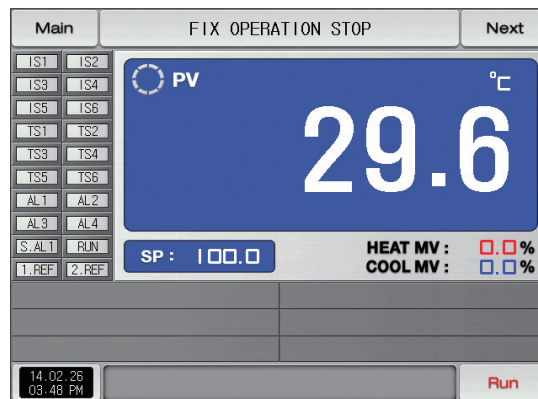
3-1. Stationary operation

(1) Stationary operation still screen 1

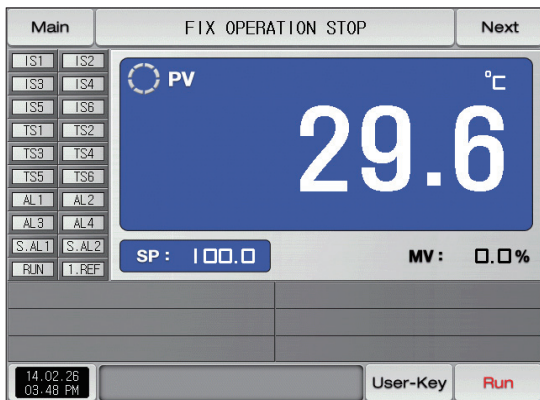
- When the operation state screen is selected in [Fig. 2-1 Main Screen], it is converted to “Stationary operation still screen 1.”
- Select the operation method with “Stationary” in [4. Operation motion setting]
- When at the right bottom of [Fig. 3-1] Stationary operation still screen 1 is touched by, it converts to [Fig. 3-5] Stationary operation still screen 1.



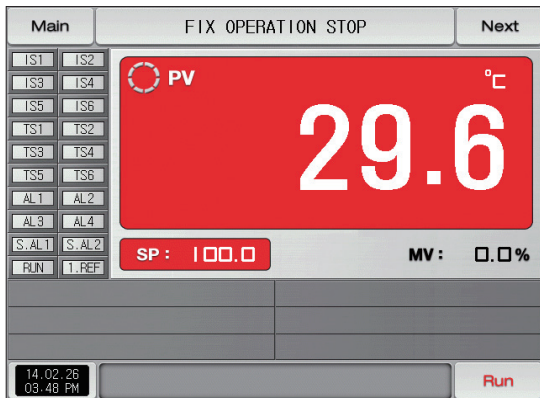
[Fig. 3-1] Stationary operation still screen 1 (General)



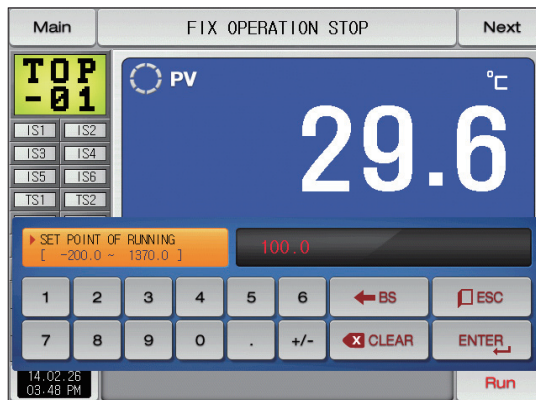
[Fig. 3-2] Stationary operation still screen 1 (Heating · Cooling)



[Fig. 3-3] Stationary operation still screen 1 (User Key)



▶ Operation the screen background color selectable red



[Fig. 3-4] Screen of Input for humidity setting about operation

References

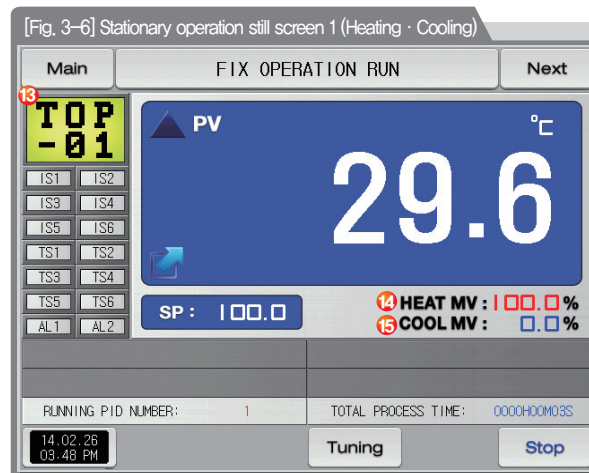
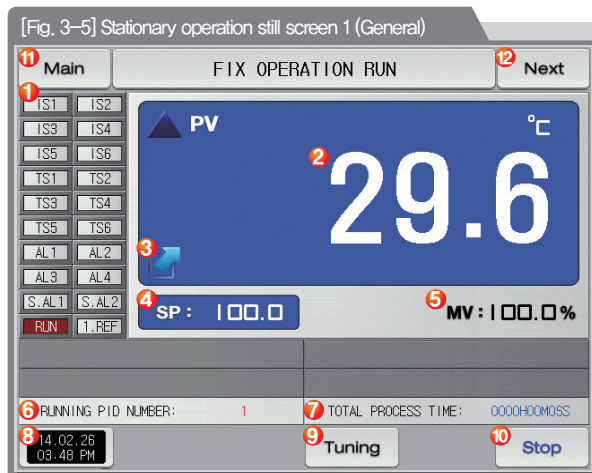
- ▶ When **SP : 100.0** is touched by for inputting the set data it is activated as shown in [Fig. 4-33] Screen for input key for setting target data of operation
- ▶ When the input of set data of completed, operate the stationary operation by selecting **Run**.

Parameter	Setting range	Unit	Initial value
Set value(SP)	EU(0.0 ~ 100.0%)	EU	EU(0.0%)

- ※ EU : Range of sensor input data
- ※ Refer to [Engineering units]

(2) Stationary operation #1 operation screen

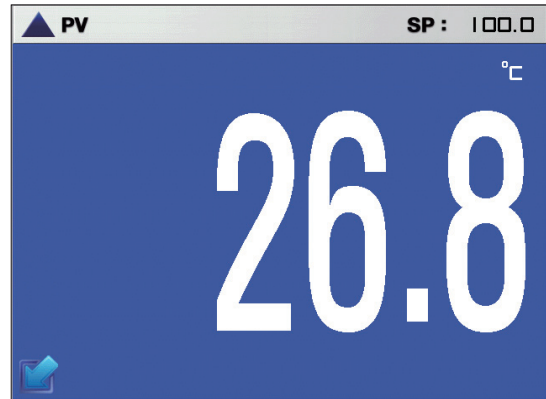
- It is a screen to display the display lamps for measuring data, setting data and output volume.
- When the “Setting data” is touched even in operation, the input key setting for operation is activated.



References

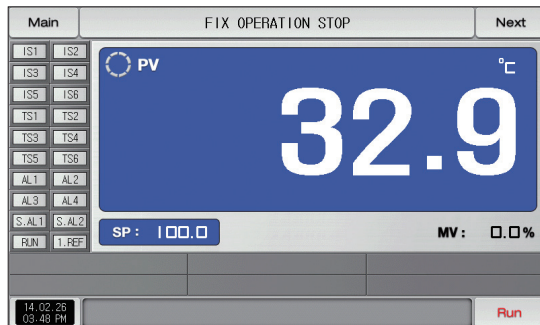
- ▶ ▲ : Setting data) Measuring data is displayed in temperature increase.
- ▶ ○ : Setting data= Measuring data is displayed in temperature maintaining.
- ▶ ▼ : Setting data< Measuring data is displayed in temperature decrease.

①	It displays the control output volume (MV). The "ON" state is displayed in red and "OFF" state is displayed in dark grey. <ul style="list-style-type: none"> Setting the state lamp in [12. System initial setting] in [Installation manual] Setting up to 20 for lamp in [12. System initial setting]
②	It displays the present value (PV).
③	Click to this place, PV display expand in operation screen <ul style="list-style-type: none"> Refer to [Fig. 3-7 Stationary operation #1 expanded screen]
④	It displays the setting data (SP) to be controlled
⑤	It displays the control output volume (MV).
⑥	It displays the currently applied PID group number. <ul style="list-style-type: none"> The applied PID group can be checked in [8. PID group] in [Installation manual]
⑦	It displays the total process time of stationary operation.
⑧	It displays the current date/time and LCD backlight is off when it is touched. <ul style="list-style-type: none"> Red LED lamp at the right top is ON when the backlight is OFF in still state.
⑨	Execution or releasing the auto tuning with set value (SP). <ul style="list-style-type: none"> Y/N of the tuning button display is set in [8. PID group] in [Operation manual]
⑩	Stationary Operation/stop button Moving to [Fig. 2-1 Main screen]
⑪	<ul style="list-style-type: none"> It displays the key pad to input the password when main button restriction is set. Refer to [Fig. 4-2 Screen in restriction setting of main button]
⑫	Moving from current screen to next screen It displays the user tag.
⑬	<ul style="list-style-type: none"> The setting for use of user tag and name can be made in [8-1 Screen display setting]
⑭	It displays the Heating output volume (H.MV).
⑮	It displays the Cooling output volume (C.MV).

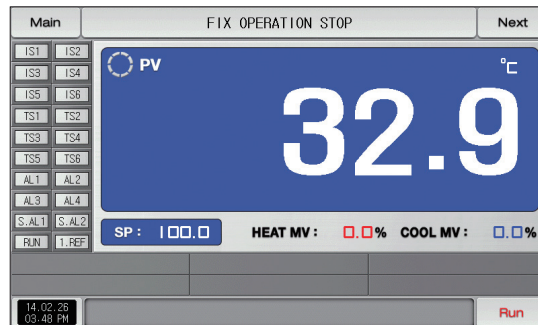


[Fig. 3-7] Stationary operation #1 expanded screen

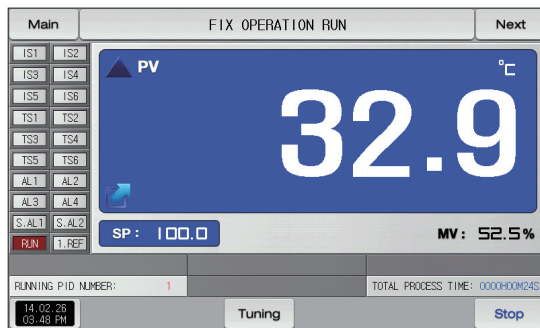
(3) Stationary operation screen 1 (TEMP1300/1900 WIDE)



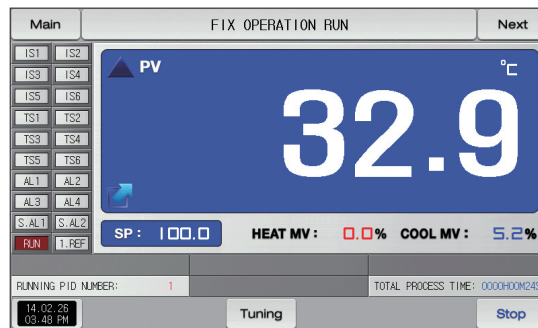
[Fig. 3-8] Stationary operation still screen 1 (General)



[Fig. 3-10] Stationary operation still screen 1 (Heating · Cooling)



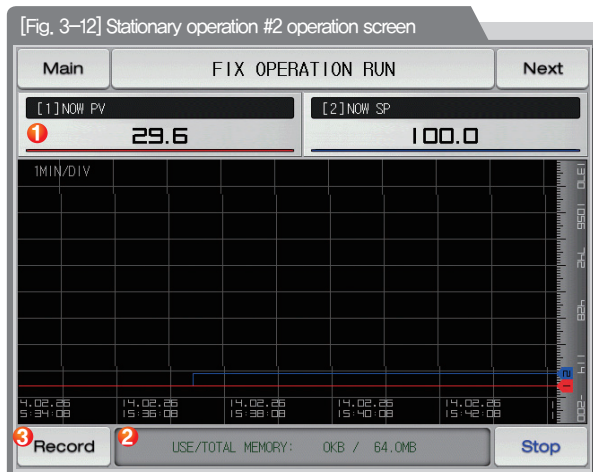
[Fig. 3-9] Stationary operation operation screen 1 (General)



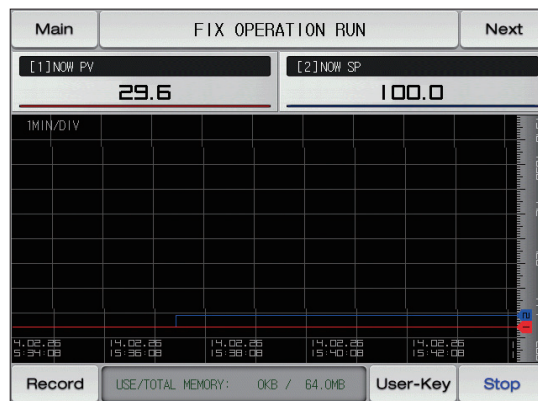
[Fig. 3-11] Stationary operation operation screen 1 (Heating · Cooling)

(4) Stationary operation #2 operation screen

- The above screen is to display the measuring date, setting data. The direction of graph is horizontal.
- (29.5) check box sets Y/N for data display.
- Possible to save recording values into the internal memory using this button
- The saved data into the internal memory are preserved when the electric power is "ON/OFF"
- Refer to [6-2 Present value (PV) graph view]



- ① It displays the measuring data, setting data of currently operated.
- ② It displays the capacity of internal memory.
 - About 180 days of saving is available when the sampling time is set in 1 second.

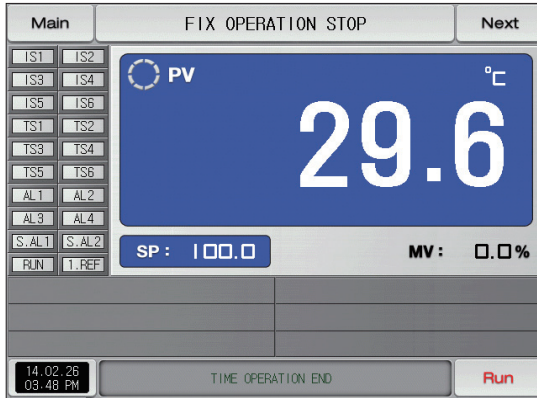


[Fig. 3-13] Stationary operation #2 operation screen (User Key)

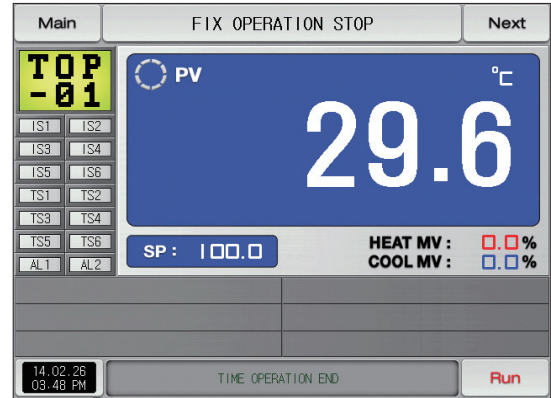
- ③ It is a button to save the measuring data, setting data of currently recorded into the Internal memory.

(5) Termination screen for operation of stationary time setting

- The stationary operation is terminated while it shows the message, “The time setting operation is terminated,” when the operation is terminated by the elapse of setting time in [4. Operation motion setting]
- The message is not appeared on the screen when it is forcibly terminated by pressing “Stop” button during operation.
- The message is disappeared by touching the corresponding part when the operation termination message is display in case of operation termination. (It is same with the program operation termination.)



[Fig. 3-14] Termination screen for operation of stationary time setting (General)

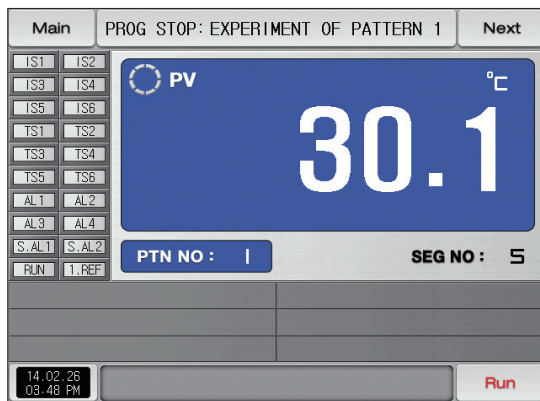


[Fig. 3-15] Termination screen for operation of stationary time setting (Heating · Cooling)

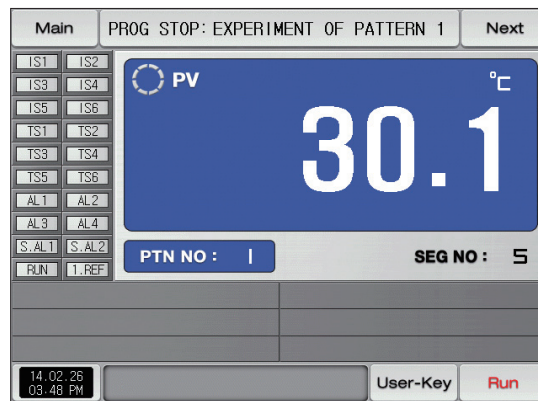
3-2. Program operation

(1) Program operation still screen 1

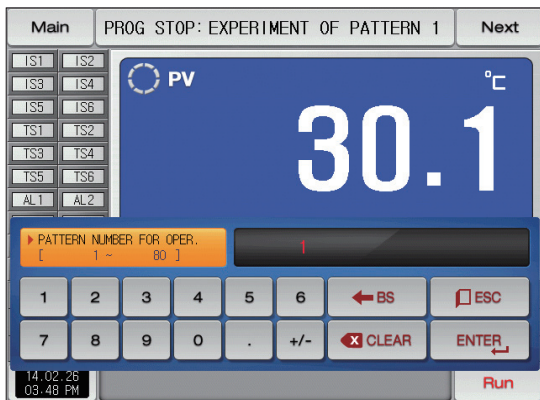
- It converts to “Program operation still screen 1” when the operation state screen is selected in [Fig. 2-1 Main screen].
- Select the operation method with “Pattern” in [4. Operation motion setting].
- Refer to [7-1 Program pattern setting] for pattern setting method.
- It converts to [Fig. 3-16 Program operation #1 operation screen] when **Run** is touched by on the right bottom in [Fig. 3-19 Program operation #1 still screen]



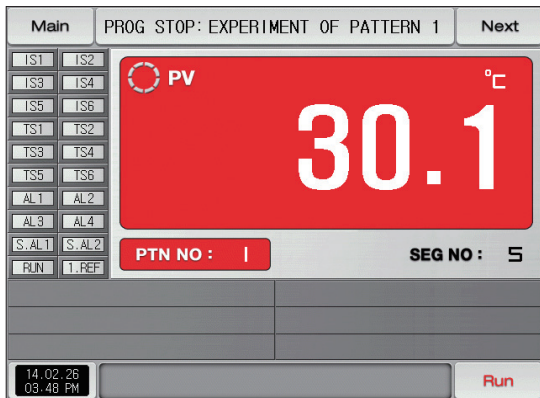
[Fig. 3-16] Program operation #1 still screen



[Fig. 3-17] Program operation #1 still screen (User Key)



[Fig. 3-18] Screen for pattern number setting input key to be operated



▶ Operation the screen background color selectable red

References

- ▶ When the button **PTN NO : 1** is touched by for inputting the pattern number setting to be operated, it is activated as shown in [Fig. 3-18] Screen for pattern number setting input key to be operated.
- ▶ Execute the program by selecting **Run** button when the input for the pattern number setting to be operated is completed.

Parameter	Setting range	Unit	Initial value
Pattern number	1~80	ABS	1

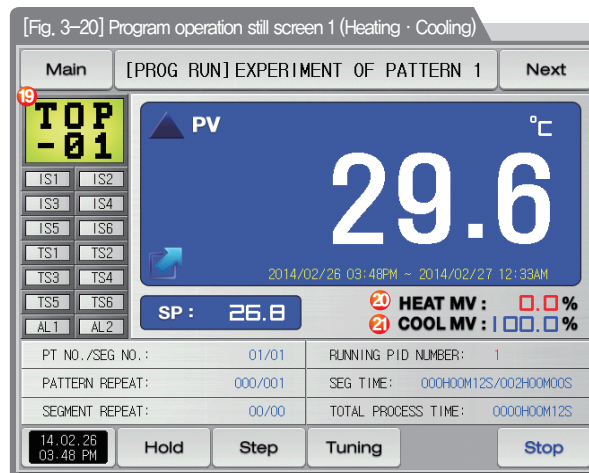
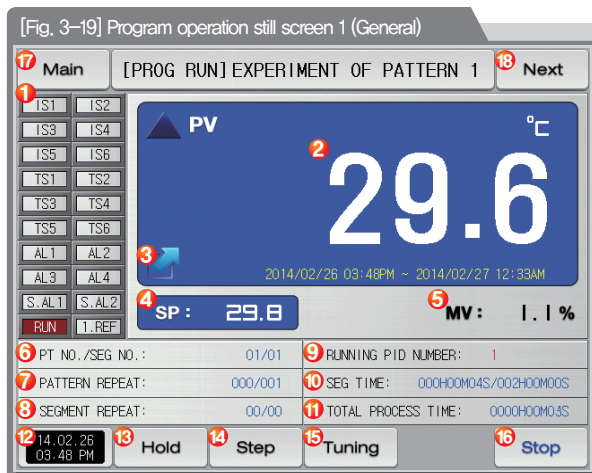


CAUTION Cautions in operation

- It is not operated when the program is not input into the pattern number on the screen.
- Refer to [7-1 Program pattern setting]

(2) Program operation #1 operation screen

- It is a screen to display the display lamps for measuring data, setting data and output volume.
- The pattern number cannot be set during operation.

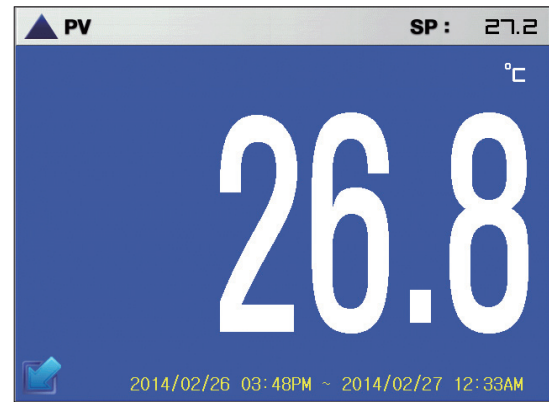


References

- ▶ It displays the direction of current pattern processing.
- ▶ ▲ : It displays the increase of the set value.
- ▶ ◻ : It displays the maintaining of the set value.
- ▶ ▼ : It displays the decrease of the set value.

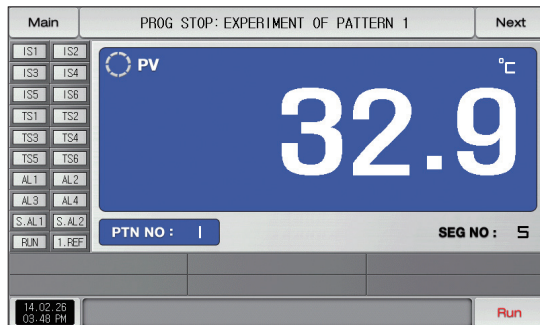
①	It displays the control output volume (MV). The "ON" state is displayed in red and "OFF" state is displayed in dark grey. <ul style="list-style-type: none"> Setting the state lamp in [12. System initial setting] in [Installation manual] Setting up to 20 for lamp in [12. System initial setting]
②	It displays the present value (PV).
③	Click to this place, PV display expand in operation screen. <ul style="list-style-type: none"> Refer to [Fig. 3-21 Program operation #1 expanded screen]
④	It displays the setting data (SP) to be controlled.
⑤	It displays the control output volume (MV).
⑥	It displays the currently operated program pattern number and segment number. <p>It displays the pattern repetition state.</p>
⑦	<ul style="list-style-type: none"> The figure in the front in <input type="text" value="PT NO./SEG NO.: 01/01"/> shows the frequency of repetition and the figure at the end shows the set repetition frequency.
⑧	<p>It displays the partial repetition state.</p> <ul style="list-style-type: none"> The figure in the front of <input type="text" value="SEGMENT REPEAT: 00/00"/> shows the frequency of repetition and the figure at the end shows the set repetition frequency.
⑨	<p>It displays the currently applied PID ground number.</p> <ul style="list-style-type: none"> The applied PID group can be checked in [8. PID group] in [Installation manual].
⑩	<p>It displays the segment process time and setting time of currently processing segment.</p> <ul style="list-style-type: none"> The time in the front of <input type="text" value="SEG TIME: 000H00M04S/002H00M00S"/> shows the segment processing time and the time at the end shows the set time in [6-1 Program pattern setting]
⑪	It displays the total process time of program operation.
⑫	<p>It displays the current date/time and LCD backlight is off when it is touched.</p> <ul style="list-style-type: none"> Red LED lamp at the right top is ON when the backlight is OFF in still state.
⑬	Maintaining (Hold On) or Release (Hold Off) the currently operating temperature set value.

⑭	Terminating the currently processing segment and forced moving to the next segment.
⑮	<p>Execution or releasing the auto tuning with set value (SP).</p> <ul style="list-style-type: none"> Y/N of the tuning button display is set in [8. PID group] in [Operation manual]
⑯	<p>Program Operation/stop button</p> <p>Moving to [Fig. 2-1 Main screen]</p>
⑰	<ul style="list-style-type: none"> It displays the key pad to input the password when main button restriction is set. Refer to [Fig. 4-2 Screen in restriction setting of main button]
⑱	Moving from current screen to next screen
⑲	<p>It displays the user tag.</p> <ul style="list-style-type: none"> The setting for use of user tag and name can be made in [8-1 Screen display setting]
⑳	It displays the Heating output volume (H,MV).
㉑	It displays the Cooling output volume (C,MV).

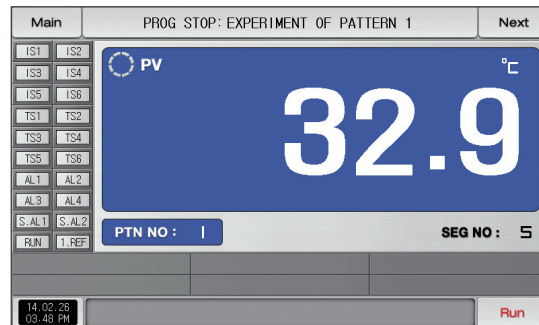


[Fig. 3-21] Program operation #1 expanded screen

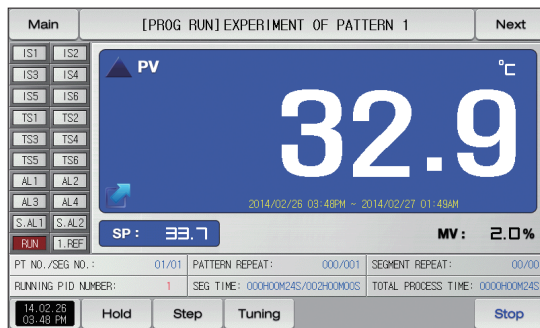
(3) Program operation screen 1 (TEMP1300/1900 WIDE)



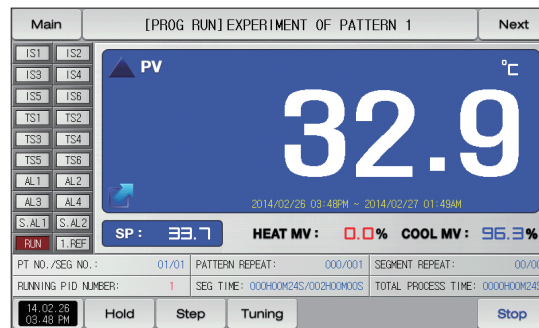
[Fig. 3-22] Program operation still screen 1 (General)



[Fig. 3-24] Program operation still screen 1 (Heating · Cooling)



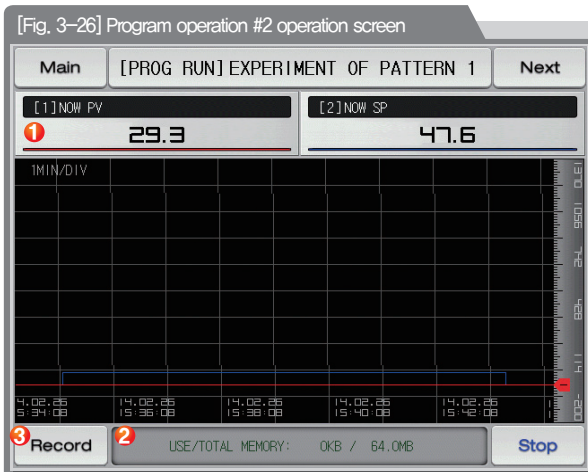
[Fig. 3-23] Program operation operation screen 1 (General)



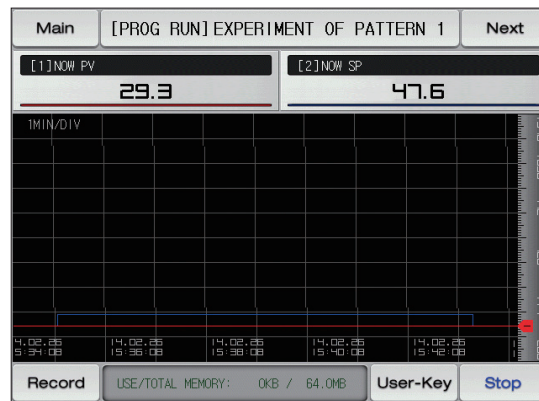
[Fig. 3-25] Program operation operation screen 1 (Heating · Cooling)

(4) Program operation #2 operation screen

- The above screen is to display the measuring date, setting data. The direction of graph is horizontal.
- (29.5) check box sets Y/N for data display.
- Possible to save recording values into the internal memory using this button
- The saved data into the internal memory are preserved when the electric power is "ON/OFF"
- Refer to [6-2 Present value (PV) graph view]



- ① It displays the measuring data, setting data of currently operated.
- ② It displays the capacity of internal memory.
 - About 180 days of saving is available when the sampling time is set in 1 second.

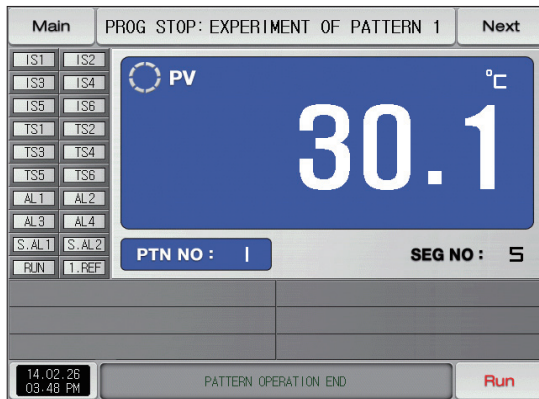


[Fig. 3-27] Program operation #2 operation screen (User Key)

- ③ It is a button to save the measuring data, setting data of currently recorded into the Internal memory.

(5) Termination screen for operation of program

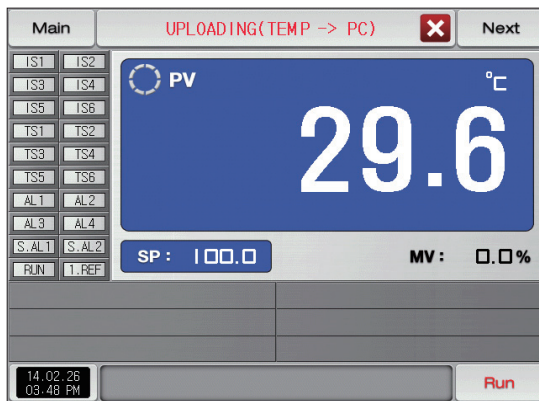
- The program operation is terminated while it shows the message, “The program operation is terminated,” when the operation for segment setting range saved into the pattern is terminated.
- The message is not appeared on the screen when it is forcibly terminated by pressing “Stop” button during operation.
- The message is disappeared by touching the corresponding part when the operation termination message is display in case of operation termination.
(It is same with the stationary operation termination.)



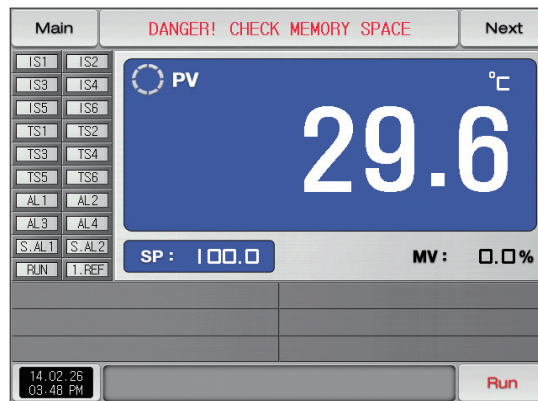
[Fig. 3-28] Termination screen for operation of program

(6) Other operation screen

- It is a screen to display warning in operation screen.



[Fig. 3-29] Screen for sending the saved PV file



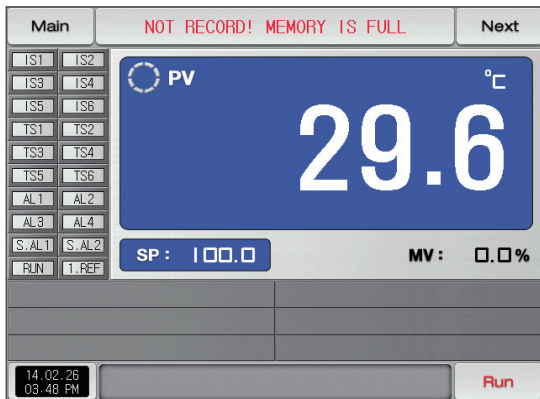
[Fig. 3-30] Screen for warning of shortage of memory capacity

References

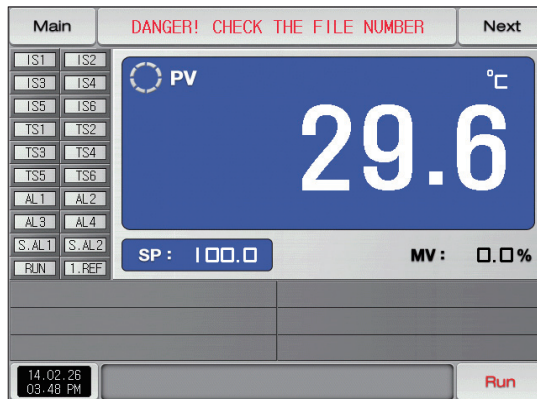
- ▶ It is a sending screen for saved PV file in internal memory to PC
It takes about 23 second to sending 0.1M byte.

References

- ▶ It is a screen when internal memory capacity is up to 60.8 megabytes.



[Fig. 3-31] Warning screen for no extra space in memory



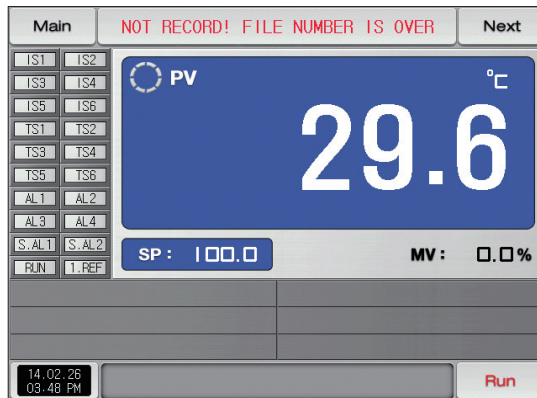
[Fig. 3-32] Warning screen for lack of saved file number

References

- ▶ Screen for no extra space in internal memory.

References

- ▶ [Fig. 3-32] is a screen when the number of saved files is over 240 in internal memory.
- ▶ [Fig. 3-33] is a screen when the number of saved files is full up to 256.



[Fig. 3-33] warning screen for full of saved file number

3-3. Auto tuning

- Auto tuning is classified into SEG PID method and zone PID method.
- The Hold and Step key shall not be used during program operation and auto tuning.

(1) Auto tuning (SEG PID method)

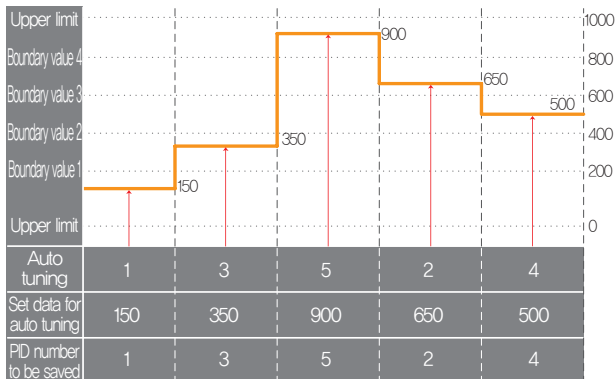
- The auto tuning is made based on the set value (SP) in SEG PID method and the tuning data is saved into "PID number" set in the auto tuning parameter.
- The segment is held during program operation and the segment is processed when the auto tuning is terminated.
- It is operated in set value (SP) at the termination of auto tuning in the stationary operation.



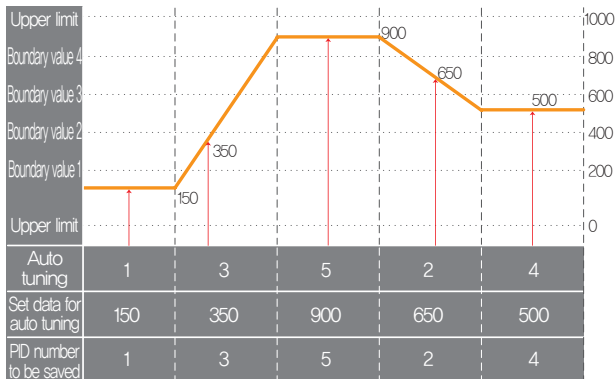
It sets the PID number.

- ①
- The tuning data are saved in selected number at the moment of auto tuning termination.

Parameter	Setting range	Unit	Initial value
Auto tuning	OFF, 1 ~ 6	ABS	OFF



Stationary operation auto tuning (SEG)



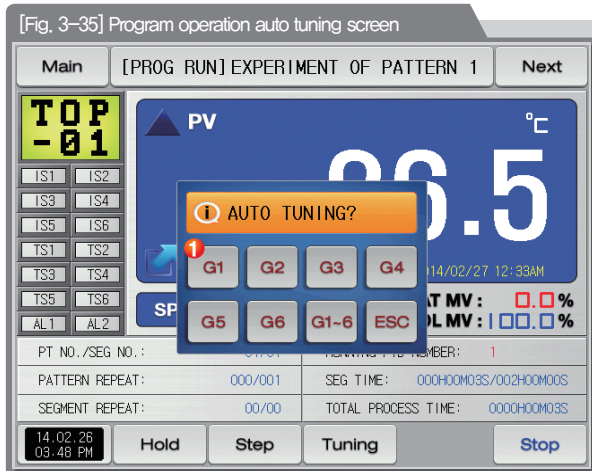
Program operation auto tuning (SEG)

References

- ▶ Stationary/program operation auto tuning (SEG)
 - Upper limit, Lower limit : It displays the range of input sensor.
 - Boundary value 1~4 : It displays the boundary value of PID number.
 - Auto tuning : It displays the PID number selected in auto tuning.
 - Set data for auto tuning : It displays the currently operating set data.
 - PID number to be saved : It displays the PID number to be saved after finishing the auto tuning.

(2) Auto tuning (Zone PID method)

- The tuning is made at the center point of the PID group boundary value set in the auto tuning parameter not with the set value (SP) in zone PID method.
- The segment is held during program operation and the segment is processed when the auto tuning is terminated.
- The set value (SP) at the termination of auto tuning is changed to the set value before auto tuning in the stationary operation.



It sets the PID number.

- ①
- The tuning data are saved in selected number at the moment of auto tuning termination.

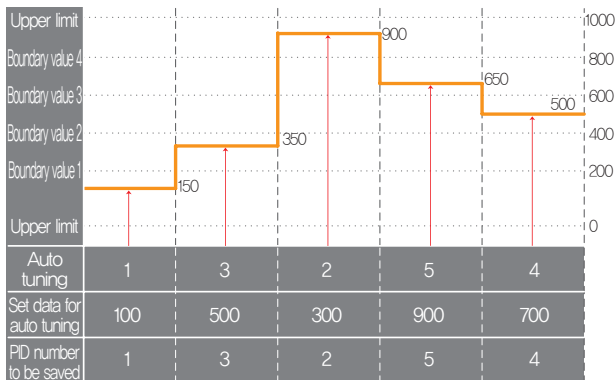
Parameter	Setting range	Unit	Initial value
Auto tuning	OFF, 1 ~ 6, Auto	ABS	OFF



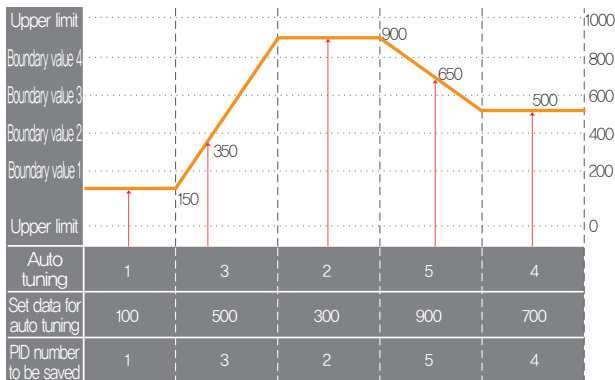
CAUTION

Cautions in operation

- Any number is not saved as PID number when the auto tuning is forcibly stopped with **G1-6**
- Any number is not saved as PID number in black out.



Stationary operation auto tuning (Zone)



Program operation auto tuning (Zone)

References

▶ Stationary/program operation auto tuning (Zone)

- Upper limit, Lower limit: It displays the range of input sensor.
- Boundary value 1~4: It displays the boundary value of PID number.
- Auto tuning: It displays the PID number selected in auto tuning.
- Set data for auto tuning: It displays the currently operating set data.
- PID number to be saved: It displays the PID number to be saved after finishing the auto tuning.

▶ The calculation for tuning point is made as follows.

① Tuning point: 1 (It executes the PID 1 range auto tuning.)

$$\text{– PID1 auto tuning set value} = \text{Lower limit} + \frac{\text{Boundary value1} - \text{lower limit}}{2}$$

② Tuning point: 2 (It executes the PID 2 range auto tuning.)

$$\text{– PID2 auto tuning set value} = \text{Boundary value1} + \frac{\text{Boundary value2} - \text{Boundary value1}}{2}$$

③ Tuning point: 3 (It executes the PID 3 range auto tuning.)

$$\text{– PID3 auto tuning set value} = \text{Boundary value2} + \frac{\text{Boundary value3} - \text{Boundary value2}}{2}$$

④ Tuning point: 4 (It executes the PID 4 range auto tuning.)

$$\text{– PID4 auto tuning set value} = \text{Boundary value3} + \frac{\text{Boundary value4} - \text{Boundary value3}}{2}$$

⑤ Tuning point: 5 (It executes the PID 5 range auto tuning.)

$$\text{– PID5 auto tuning set value} = \text{Boundary value4} + \frac{\text{Upper limit} - \text{Boundary value4}}{2}$$

References

⑥ Tuning point: 6 (It executes the PID 6 range auto tuning.)

$$\text{-- PID6 auto tuning set value} = \text{Lower limit} + \frac{\text{Boundary value1} - \text{lower limit}}{2}$$

⑦ Tuning point: Automatic

- The auto tuning for PID 1~6 ranges are executed in sequence.
- The auto tuned PID values are saved into PID 1~6 ranges.

$$\text{-- PID1 auto tuning set value} = \text{Lower limit} + \frac{\text{Boundary value1} - \text{lower limit}}{2}$$

$$\text{-- PID2 auto tuning set value} = \text{Boundary value1} + \frac{\text{Boundary value2} - \text{Boundary value1}}{2}$$

$$\text{-- PID3 auto tuning set value} = \text{Boundary value2} + \frac{\text{Boundary value3} - \text{Boundary value2}}{2}$$

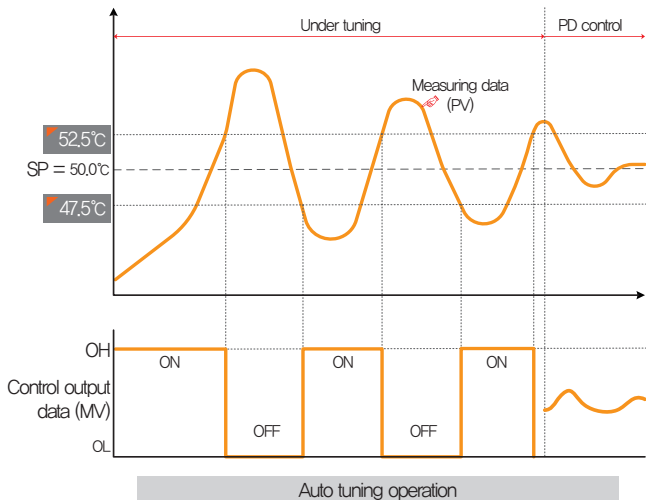
$$\text{-- PID4 auto tuning set value} = \text{Boundary value3} + \frac{\text{Boundary value4} - \text{Boundary value3}}{2}$$

$$\text{-- PID5 auto tuning set value} = \text{Boundary value4} + \frac{\text{Upper limit} - \text{Boundary value4}}{2}$$

$$\text{-- PID6 auto tuning set value} = \text{Lower limit} + \frac{\text{Upper limit} - \text{Lower limit}}{2}$$

3-4. Auto tuning and tuning point

- Auto tuning is a function to set the optimal PID integer automatically by measuring and calculating the object of control with controller.
- The controller generates the ON/OFF control output during "2.5 periods" during auto tuning and it calculates the PID data automatically based on the period and oscillation magnitude using the limit cycle to the object to be controlled.
- Auto tuning is available in the stationary and program operation.
- When the "Auto" is selected in auto tuning parameter, auto tuning is made in sequence and it is saved into the PID memory in sequence.



References

- ▶ An example of auto tuning depending on the set value.
 - Operation method: Stationary operation/Sensor input: Temperature (k2)
 - Range : 0.0°C~1000.0°C
 - Temperature auto tuning point : 0.25% → EUS 0.25% = 2.5°C
 - Set value (SP) : 50.0°C
 - Output lower limit (OL) : 0.0% / Output upper limit (OH) : 100.0%

52.5°C 47.5°C : Auto tuning point



CAUTION Cautions in operation

- Any change in set value (SP) in auto tuning does not change the tuning point. And the tuning is started with changed set value (SP) for target set value (TSP) after auto tuning termination.
- The auto tuning is stopped in case of "Sensor short" in input during auto tuning. At this time, the PID data is kept with the previous set value.
- When auto tuning is processed beyond 27 hours, the auto tuning is stopped.
- The PID set value can be changed during auto tuning, but the obtained PID data from calculating in auto tuning termination is reset with the obtained PID data.
- The PID set value is maintained with previous set value when the auto tuning is forcibly terminated.

Part **04**

Operation motion setting

4-1 Operation method setting	36
4-2 Fuzzy operation	38
4-3 Setting value change rate (SLOPE) operation	39

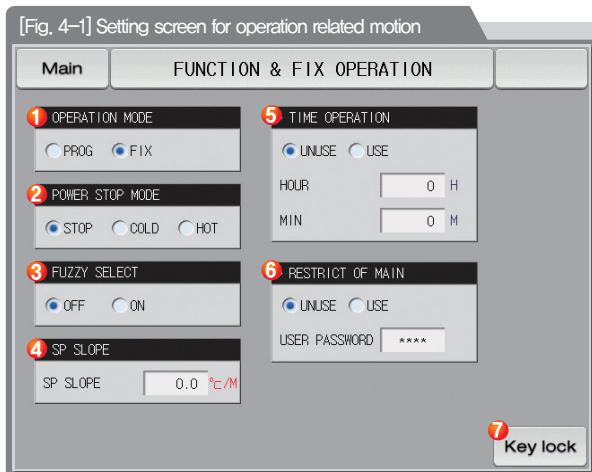


04. Operation motion setting

It is a screen for general additional functions and additional setting in stationary operation.

4-1. Operation method setting

- It converts to the “Setting screen for operation related motion” when the operation motion setting is selected in [Fig. 2-1 Main screen]



Setting with selection either of pattern or stationary operation for operation mode.(It cannot be changed during operation.)

- ①
- Pattern : Setting in program operation
- Stationary : Setting in stationary operation

Setting the recovery motion in black out

- Stop : A motion to return to the operation stop state after power on from the black out.
- ②
- Re-start : An operation from the beginning after power on from the black out.
- Continue : A motion to return to the previous operation state after power on from the black out.

In case that the external disturbances occur, stabilized the control.

- No operation : The indicated value is stabilized depending on time when the overshoot is made.
- ③
- Operation : The indicated value is stabilized faster than No operation case, as the overshoot controlling function is provided.

- ④
- Automatic increase or decreased with the set rate in case of set value change
- It is adopted in stationary operation only.

Total operation in set time and in [3-1(2) Stationary operation #1 operation screen

- ⑤
- The operation stops when the process time is coincided with the set time.
- It is adopted in stationary operation only.

⑥

The key pad to input the password is displayed when the main button is touched by in the operation screen for setting the main button restriction setting.

- Refer to [Fig. 4-2 Screen for main button restriction setting]

⑦

The parameter setting is impossible when **Key lock** button is touched by

- Screen rolling and key block releasing is possible.

**Return motion
in black out**
Program operation
**Stationary
operation**

Stop	Program stop	Stop
Re-start	Operation from the first segment	Operation
Continue	Operation from the segment before black out	Operation

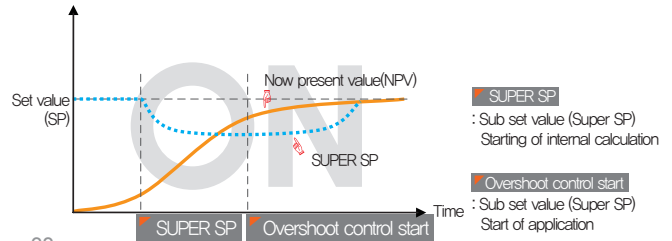
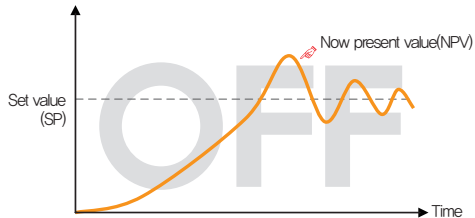
Parameter	Setting range	Unit	Initial value
Operation method	Pattern, stationary	ABS	Pattern
Returning motion in black out	Stop, re-start, continue	ABS	Stop
Fuzzy function	No operation, Operation	ABS	No operation
Set data change rate	EUS(0.00~100.00%)/Min	EUS/Min	EUS(00.00%)/Min
Time setting operation	No use, Use	ABS	No use
Hour	0~9999 hours	ABS	0
Minute	0~59 Min	ABS	0
Main button restriction	No use, Use	ABS	No use
Key block	No use, Use	ABS	No use



[Fig. 4-2] Main button restriction setting screen

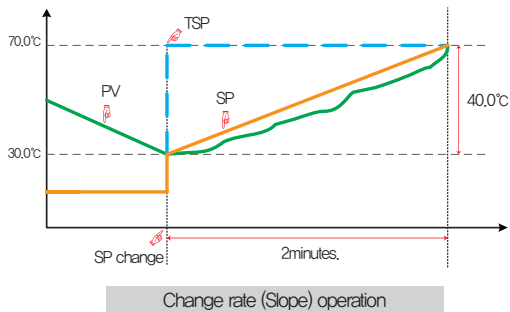
4-2. Fuzzy operation

- The overshoot may be taken place in case of severe change in operation or frequent changes in present value (SP).
More effective control can be made when the fuzzy function is operated at this time.
- Internal operation sequence of fuzzy function: It controls the overshoot by calculating the control output value (MV) with sub target value (Super SP) instead of present value (PV) from the overshoot control start time.



4-3. Setting value change rate (SLOPE) operation

- The set value is changed by fixed changing rate from the now present value (PV) to set value when the set value is changed.



References

- ▶ Operation method: Stationary operation
- ▶ Temperature change rate: 20,0°C/Min
- ▶ Change [Changed SP(TSP) – PV at the SP changing point] with slope of 20,0°C per minute: $(70,0-30,0)^{\circ}\text{C} = \text{Change } 40,0^{\circ}\text{C}$ with the slope of 20°C
- ▶ Increase the current set value (SP) from 30,0°C to 70,0°C with uniform increasing rate for 2 minutes.

Part **05**

Appointed operation setting 41



05. Appointed operation setting

- It converts to [Fig. 5-1 Time setting screen] when the appointed operation setting button is touched by in [Fig. 2-1 Main screen].
- It is a screen to set the current time and appointed operation time.

[Fig. 5-1] Time setting screen

Main CURRENT TIME & RESERVE TIME SET

1 CURRENT TIME	2 RESERVE TIME
YEAR: 2014 Y	YEAR: 2014 Y
MONTH: 7 M	MONTH: 7 M
DATE: 17 D	DATE: 17 D
AM/PM: PM ▼	AM/PM: PM ▼
HOUR: 2 H	HOUR: 4 H
MIN: 52 M	MIN: 0 M

3 Reserve

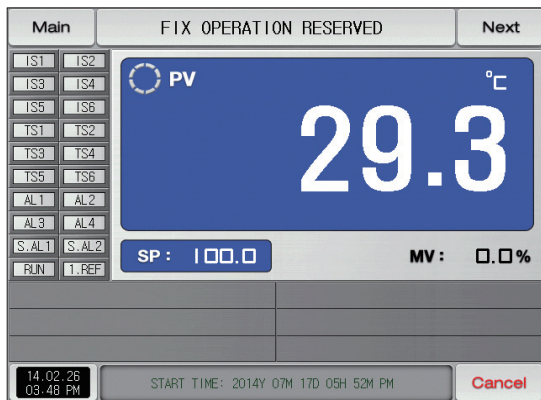
It sets the year, month, day and hour.

- ① • The current time is not changeable during recording the measured data and operating.

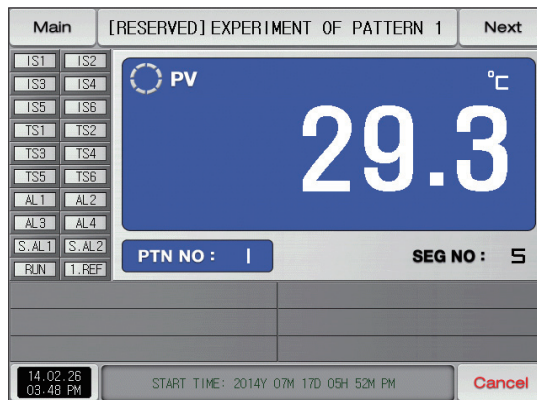
② It sets the year, month, day and hour for appointed operation.

The operation is possible in the set appointed time when is touched by.

- ③ • The appointed time is displayed on the operation screen as shown in [Fig. 5-2 Operation appointed setting screen] when is touched by.



[Fig. 5-2] Operation appointed setting screen
(Stationary operation)



[Fig. 5-3] Operation appointed setting screen
(Program operation)

Parameter		Setting range	Unit	Initial value
Current time	Year	2000~2009	ABS	–
	Month	1~12	ABS	–
	Day	1~31	ABS	–
	AM/PM	AM, PM	ABS	–
	Hour	1~12	ABS	–
	Minute	0~59	ABS	–
Appointed operation time	Year	2000~2009	ABS	2014
	Month	1~12	ABS	1
	Day	1~31	ABS	1
	AM/PM	AM, PM	ABS	AM
	Hour	1~12	ABS	12
	Minute	0~59	ABS	0
Appointment		Click for appointment.		

※ AM12:00: Night 00:00/PM12:00: PM 12:00

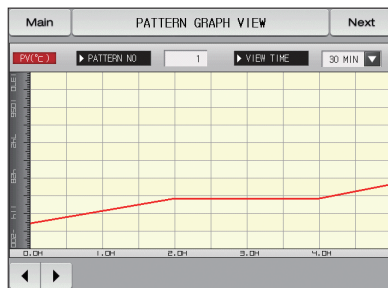
Part 06

Setting graph display and save

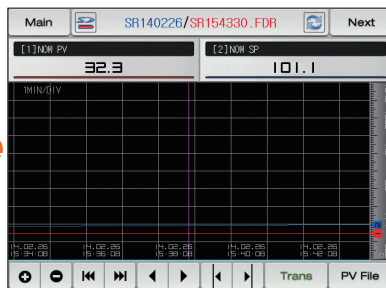
6-1 Pattern graph display	46
6-2 Presented value (PV) graph view	49
6-3 Presented value (PV) graph save setting	52
6-4 Memory save setting	53

Setting graph display and save

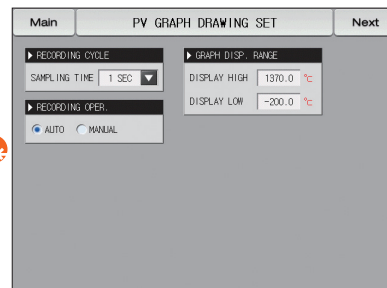
 Next **Flow chart**



[Fig. 6-2] Graph & Saving screen 1
(Pattern graph display)



[Fig. 6-5] Graph & Saving screen 2
(Graph display selection)



[Fig. 6-9] Graph & Saving screen 3




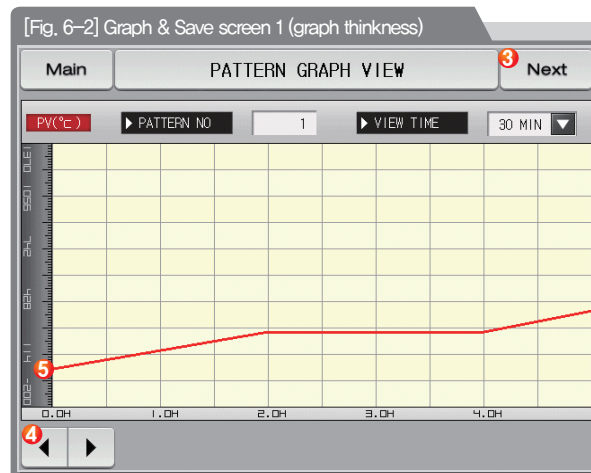
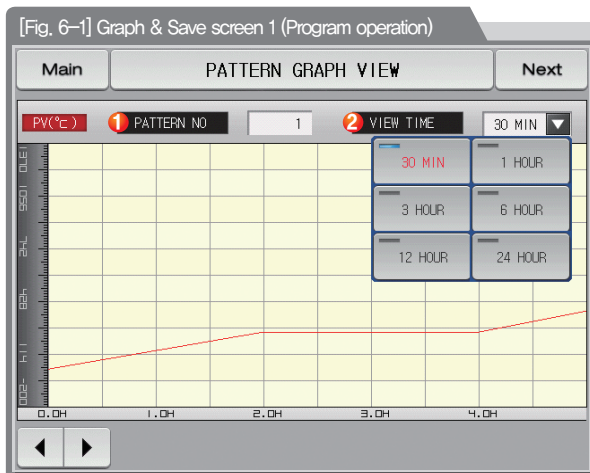
[Fig. 6-10] Graph&Save setting screen 4



06. Setting graph display and save

6-1. Pattern graph display

- It convert to the [Fig. 6-2 Graph & save #1 screen], when the[Graph & Save] is selected in [Fig. 2-1 Main screen].
- This screen displays the operation pattern and progress time in program operation.
- It is a screen to display the input pattern in [Fig. 7-2 Pattern editing screen].
-  can be changed in pattern graph display.



Setting the pattern No. to be displayed

①

• Display the input key to set the pattern No. when

is touched.

• Refer to [Fig. 6-4 Pattern No. input screen]

Setting the time on graph X axis

②

• Display of the input key to set the time on X axis when

is touched.

• The time on X axis can be changed during operation

③

Moving from current screen to next screen

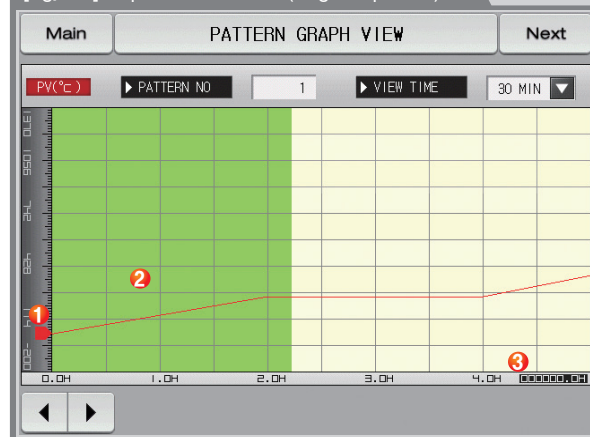
④

Change into the Previous/Next stage on the time axis when is touched on the current page.

⑤

It is possible to change of graph thickness

[Fig. 6-3] Graph & Save screen 1 (Program operation)



①

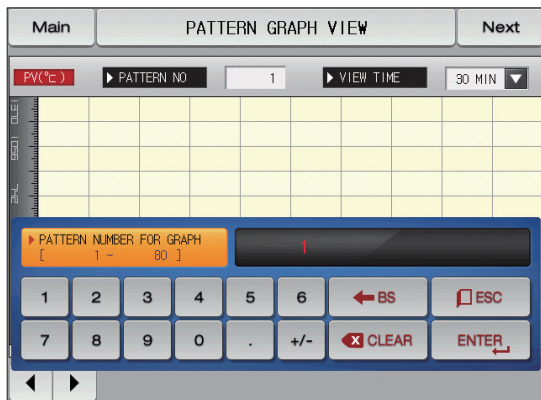
Display the current temperature during operation

②

Display in green for the operation ended part

③

Display the processing time for the set pattern in [7-1 Program pattern setting]







[Fig. 6-4] Pattern No. input screen

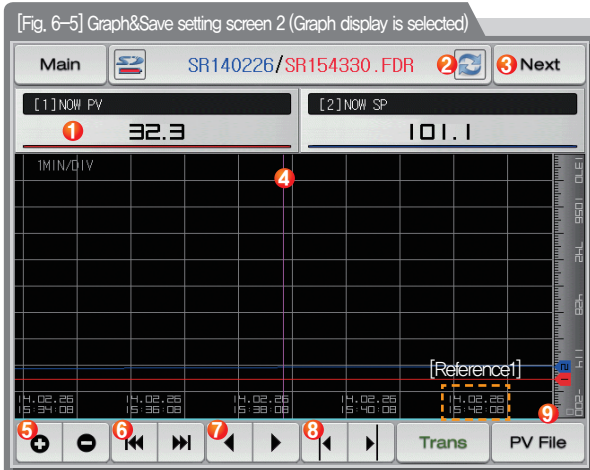
References

- ▶ It is a screen to input the pattern No. to be displayed in graph.
- ▶ The pattern No. can be input even during operation.





Parameter	Setting range	Unit	Initial value
Pattern No.	1 ~ 80	ABS	1
Display time	30 minutes, 1 hour, 3 hours, 6 hours, 12 hours, 24 hours	ABS	30 minutes

6-2. Presented value (PV) graph view



- It is a screen to display the data recorded in [3-1(4) Stationary operation 2 operation screen] and [3-2(4) Program operation 2 operation screen].
- The function of     is not operated in case of 1 page for recorded data.
- The searching scroll bar is not displayed in case of smaller recorded data.
- The date and time saved into the memory are displayed out the screen. [Reference 1]

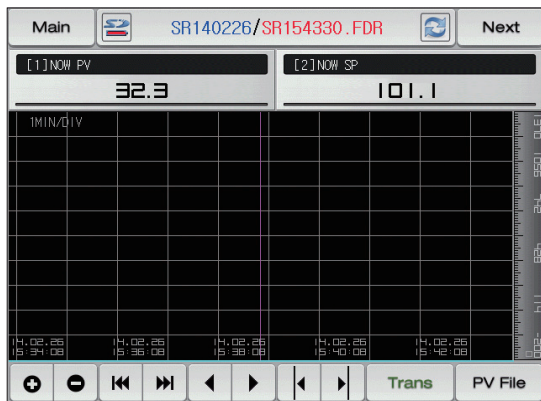


References

- ▶  : Icon to display of no card insertion or no recognition
- ▶  : Icon to display the SD card capacity (usage is less than 75%)
- ▶  : Icon to display the SD card capacity (usage is 75~90%)
- ▶  : Icon to display the SD card capacity (usage is more than 90%)

Purple at base line the measuring data, set data is displayed.

- When the checked  is touched, it is disappeared on the graph screen and when  is touched, it is displayed on the graph screen.
- ① Refer to [Fig. 6-5 and Fig. 6-6 Graph & Save setting screen 2]
- ② Display to update the graph screen immediately which is being saved.
- ③ Moving from current screen to next screen
- ④ Base line to display the data checkpoint
 - Using the touch screen and No.8 Button to move to the point where we want.
- ⑤ The time axis is expanded or reduced.
- ⑥ Moving to the beginning and end of the displayed PV graph page
- ⑦ Moving of graph screen by one page.
- ⑧ Moving the purple line on the graph screen up/down by 1 DOT
 - When the screen is touched, the indicated values are displayed while the purple line moves.
- ⑨ When the blue part on the bottom of the screen is touched, it moves to the corresponding page on the touched point of X coordinate.



[Fig. 6-6] Graph&Save setting screen 2
(Graph display is not selected)

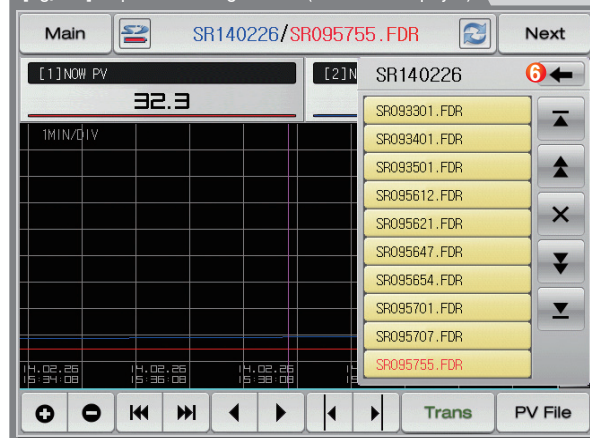
References

- ▶ It is a screen when there is not selection item in the set data, measuring data.
- ▶ It is a screen to display the saved file into the internal memory.
- ▶ Refer to [3-1(4) Stationary operation 2 operation screen] and [3-2(4) Program operation 2 operation screen] for saving into internal memory.





[Fig. 6-7] Graph&Save setting screen 2 (Saved folder is displayed)



[Fig. 6-8] Graph&Save setting screen 2 (Saved file is displayed)



Copy the recorded PV files into the internal memory to SD card.

- ①
 - The transmission is impossible when there is not SD card option or during saving the PV graph in operation screen.
- ② When **PV File** is touched, the files saved into the internal memory is displayed.
 - The currently opened folder or file is display in red.
- ③  Move to the start and end in case of data searching stored in the internal memory
- ④  Move to the up and down in case of data searching stored in the internal memory
- ⑤  Close the PV file
- ⑥  Move to the folder

6-3. Presented value (PV) graph saving setting

- This screen is to set the display range and sampling time which are necessary for graph recording in [3-1(4) Stationary operation 2 operation screen] and [3-2(4) Program operation 2 operation screen].



Setting the PV graph saving period

①

- It is not changeable during PV graph saving
- Saving about 180 days is possible when sampling time is set in 1 minute in saving into internal memory.

Setting Y/N for saving the data into the internal memory.

②

- Auto: Saving the data in synchronized with Operation/Stop automatically
- Manual: Saving the data by the saving key in the Operation screen 3 manually
- The saved data into the internal meemory are preserved when the electric power is "ON/OFF"

③

Setting the display range of graph

Parameter	Setting range	Unit	Initial value
Recording cycle	1Sec, 2Sec, 5Sec, 10Sec, 20Sec, 30Sec, 1Min	ABS	1 Sec
Saving operation setting	Auto, Manual	ABS	Auto
Graph display upper limit	EU (-2.50 ~ 102.50%)	EU	U(100.00%)
Graph display lower limit	(Graph display lower limit < Graph display upper limit)	EU	EU(0.0%)

6-4. Memory save setting

- It is a screen to set the transmitting of pattern and parameter to SD card.
- It is a screen displayed in SD card option only.



Setting the items and direction of transmitting in SD card and TEMP1000

- PTN : Download or upload the set pattern in [7-1 Program pattern setting]
- PARA : Download or upload the set parameter
- ① • ALL : Download or upload the pattern and parameter
- Download : Transmitting the selected transmitting items out of the internal data in TEMP1000 to SD card
- Upload : Transmitting the selected transmitting items out of the saved data in TEMP1000 to SD card

②

It displays the current capacity of SD card

- It displays when the SD card is inserted only

③

When the data is not in recording to SD card, is activated and download and upload are possible when is touched by.

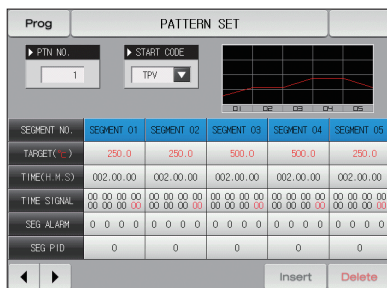
Parameter	Setting range	Unit	Initial value
Transmitting item	Pattern, PARA, ALL	ABS	Pattern
Transmitting direction	Download, Upload	ABS	Download

Part 07

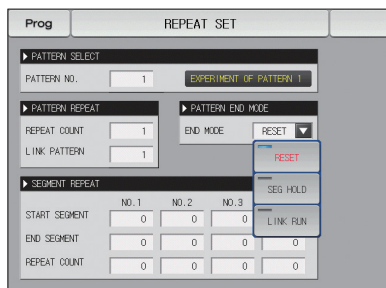
Program setting

7-1 Program pattern setting	57
7-2 Pattern repetition setting	65
7-3 File editing	66
7-4 Time signal operation	69
7-5 Standby operation	73
7-6 Experiment name setting	75

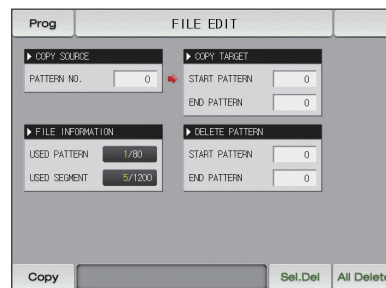
Program setting



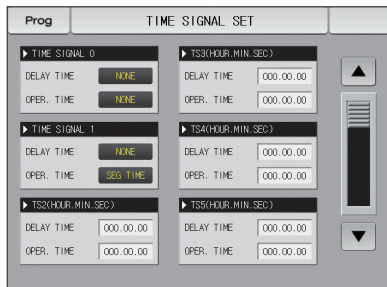
[Fig. 7-2] Pattern editing screen



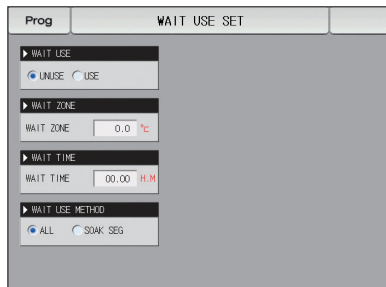
[Fig. 7-3] Pattern and segment repetition setting screen



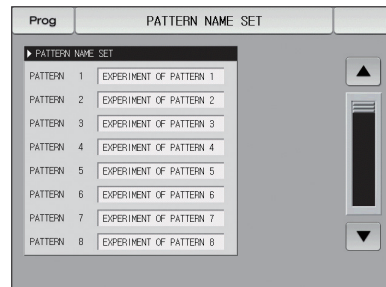
[Fig. 7-4] File editing screen



[Fig. 7-7] Time signal setting #1



[Fig. 7-11] Standby operation setting screen

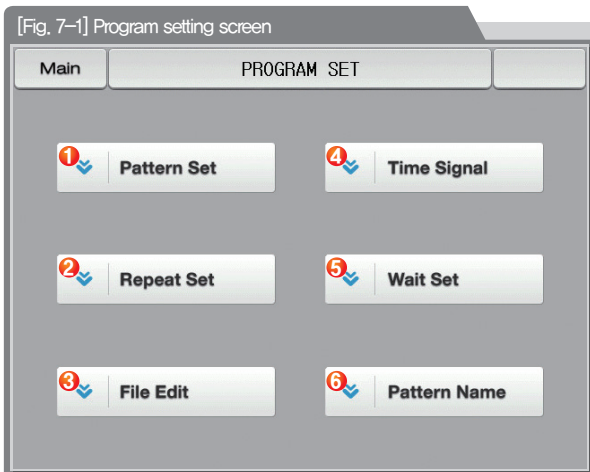


[Fig. 7-12] Experiment name setting screen



07. Program setting

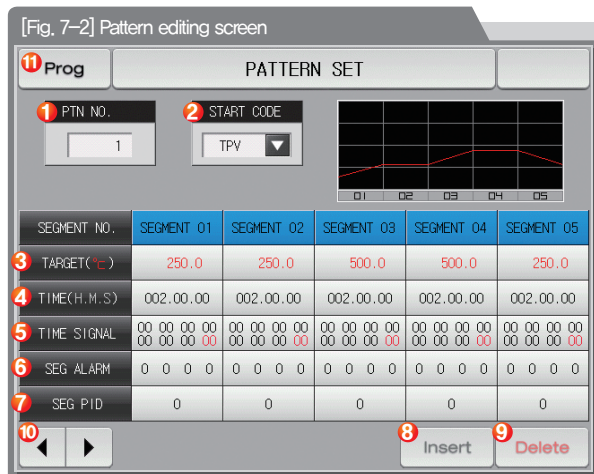
- It converts to [Fig. 7-1 Program setting screen] when the program setting button is touched by in [Fig. 2-1 Main screen].
- It is a screen group to set the parameters related to the program operation.



- ① Moving to the pattern editing screen
- ② Moving to the screen for repetitive setting of pattern and segment
- ③ Moving to the screen for setting pattern copy and deletion
- ④ Moving to the screen for time signal setting
- ⑤ Moving to the screen for setting the standby screen
- ⑥ Moving to the screen for experiment name

7-1. Program pattern setting

- It is a screen to set the segment depending on the pattern number.
- Refer to [7-4 Time signal operation] for time signal setting.
- Please refer to the [7-5 Standby operation] to find things about the standby operation.



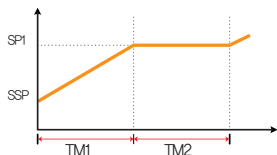
- ① Input the pattern number for segment setting
Setting the start condition for program operation.
 - TPV : It starts from the present PV for present set value SP in starting of program operation and progressed to the set time(TM1) for currently set value(SP1) in segment(SEG1)
 - SPV : The set value (SP) is processed to the set value (SP1) set in segment 1(SEG1) from present value (PV) in starting of the program operation. At this time, the residual time of operation time is calculated by regarding of time elapse to the program operation starting point by referring the set program pattern.
 - SSP : The set value (SP) is processed to the set value (SP1) set in segment 1(SEG1) from start set value (SSP) in starting of the program operation during the set time (TM1).
- ②
- ③ Setting the segment set data to be operated.
- ④ Setting the time of segment to be operated.
Setting the time signal and sub output of the segment to be operated.
 - 8 time signals can be set for each segment and each time signal is set by selection from 20 types of time signal.
 - Refer to [7-4 Time signal operation]
 - 1 sub output can be set for each segment and 4~20mA DC is output by inputting 4~20. Refer to [page 56].
- ⑤

- ⑥ Setting the SEG alarm of the segment to be operated.
- ⑦ Setting the SEG PID of the segment to be operated.
When one of the buttons **SEGMENT 01** (Segment 01~99) is touched by for segment insertion, the selected button **SEGMENT 01** (Segment 01~99) and **Insert** button are activated and the selected segment can be inserted when **Insert** is touched by
- ⑧
When one of the buttons **SEGMENT 01** (Segment 01~99) is touched by for segment deletion, the selected button **SEGMENT 01** (Segment 01~99) and **Delete** button are activated and the selected segment can be inserted when **Delete** is touched by
- ⑨ Moving to left/right on the screen by 5 segment units.
- ⑩ Moving to [Fig. 7-1 Program setting screen] when **Prog** is touched by



Program operation start

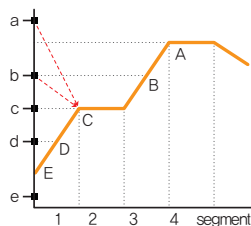
- The start of the program is processed depending on the starting condition (STC : Start code) setting.
- Set data priority program operation (STC = SSP)
: The set value (SP) is processed for the set time (TM1) to the set value (SP1) set in segment 1(SEG1) from start set value (SSP) in starting of the program operation.



- Slope priority program operation (STC = SPV)

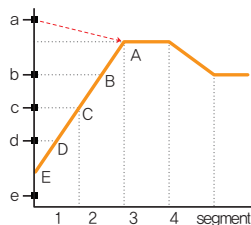
: The set value (SP) is processed to the set value (SP1) set in segment 1(SEG1) from present value (PV) in starting of the program operation. At this time, the residual time of operation time is calculated by regarding of time elapse to the program operation starting point by referring the set program pattern.

- ① When the segment 2 is the first maintaining range



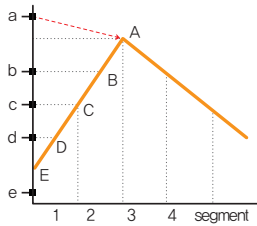
Now present value	Program operating starting point
a	C
b	C
c	C
d	D
e	E(SSP)

- ② When the segment 3 is the first maintaining range



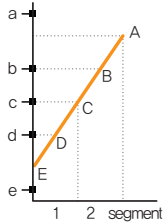
Now present value	Program operating starting point
a	A
b	B
c	C
d	D
e	E(SSP)

③ When there is no maintaining range



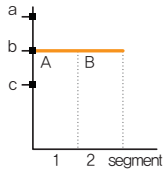
Now present value	Program operating starting point
a	A
b	B
c	C
d	D
e	E(SSP)

④ When there is only maintaining range without maintaining



Now present value	Program operating starting point
a	No operation
b	B
c	C
d	D
e	E(SSP)

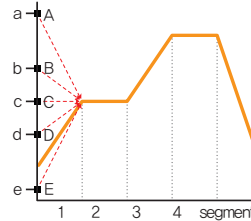
⑤ When the maintaining range is started from segment 1



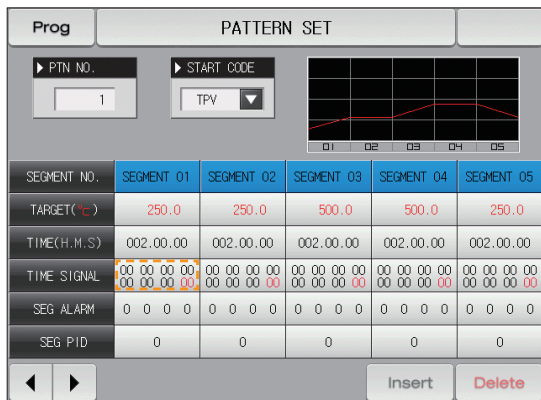
Now present value	Program operating starting point
a	B
b	B
c	A(SSP)

● Time priority program (STC = TPV)

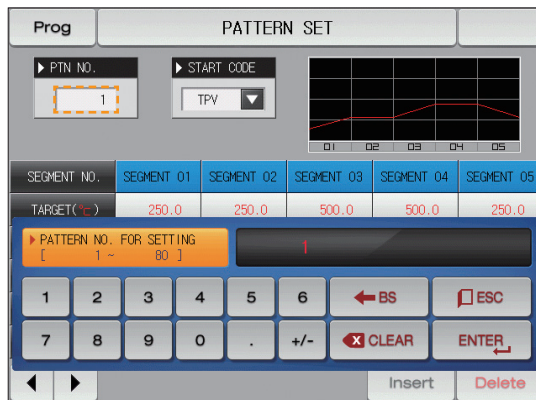
: The set value (SP) is processed to the set time (TMt) from present value (PV) to the present value (SPt) set in segment 1 (SEG1) regardless of the slope of set value (SP) or the start set value (SSP) in starting of the program operation.



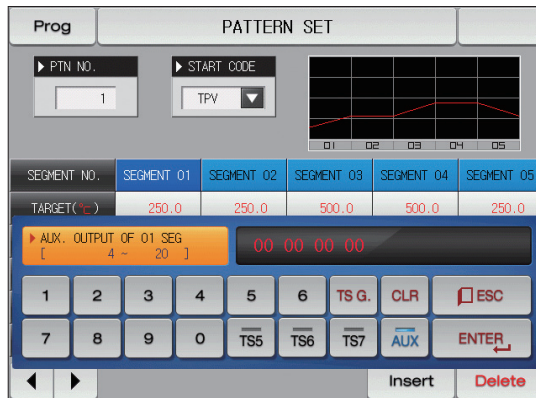
Now present value	Program operating starting point
a	A
b	B
c	C
d	D
e	E



▲ It is a screen for sub output setting.
Select the sub output in [4, Control & Transmitting output]
in [Installation manual]. It is displayed in red in pattern edition
screen and the sub output can be set.



▲ The input key to set the pattern number is displayed when the "Pattern number" button is touched by.



▲ The input key is displayed when $\left[\begin{array}{cccc} 00 & 00 & 00 & 00 \\ 00 & 00 & 00 & 00 \end{array} \right]$ (Time signal) is touched by. The button $\left[\begin{array}{c} TR0 \\ 0 \end{array} \right]$ to set the sub output is appeared when $\left[\begin{array}{c} AUX \\ 0 \end{array} \right]$ button on the right top is touched by.

Prog		PATTERN SET				
▶ PTN NO.		▶ START CODE		[Graph]		
1		TPV				
		TPV				
		SPV				
		SSP				
SEGMENT NO.	SEGMENT 01	SEGMENT 02	SEGMENT 03	SEGMENT 04	SEGMENT 05	
TARGET(°C)	250.0		500.0	500.0	250.0	
TIME(H.M.S)	002.00.00		002.00.00	002.00.00	002.00.00	
TIME SIGNAL	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	
SEG ALARM	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
SEG PID	0	0	0	0	0	
◀ ▶		Insert			Delete	

▶ When the "Starting condition" button is touched by, the input key to set the starting condition is displayed

Prog		PATTERN SET				
▶ PTN NO.		▶ START CODE		[Graph]		
1		SPV				
SEGMENT NO.	SEGMENT 01	SEGMENT 02	SEGMENT 03	SEGMENT 04	SEGMENT 05	
TARGET(°C)	250.0	250.0	500.0	500.0	250.0	
TIME(H.M.S)	002.00.00	002.00.00	002.00.00	002.00.00	002.00.00	
TIME SIGNAL	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	
SEG ALARM	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
SEG PID	0	0	0	0	0	
◀ ▶		Insert			Delete	

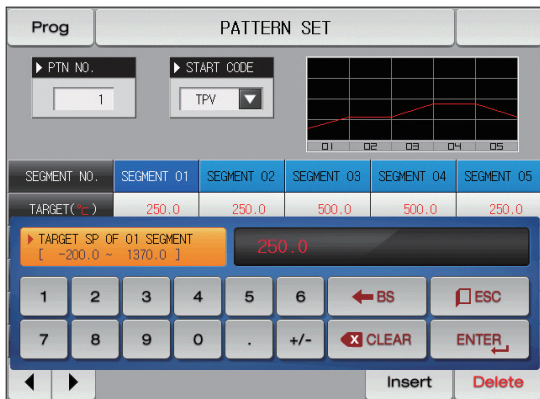
▲ It is a screen set with "SPV" for starting condition.

Prog		PATTERN SET				
▶ PTN NO.		▶ START CODE		[Graph]		
1		SSP				
		-200.0 °C				
SEGMENT NO.	SEGMENT 01	SEGMENT 02	SEGMENT 03	SEGMENT 04	SEGMENT 05	
TARGET(°C)	250.0	250.0	500.0	500.0	250.0	
TIME(H.M.S)	002.00.00	002.00.00	002.00.00	002.00.00	002.00.00	
TIME SIGNAL	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	
SEG ALARM	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
SEG PID	0	0	0	0	0	
◀ ▶		Insert			Delete	

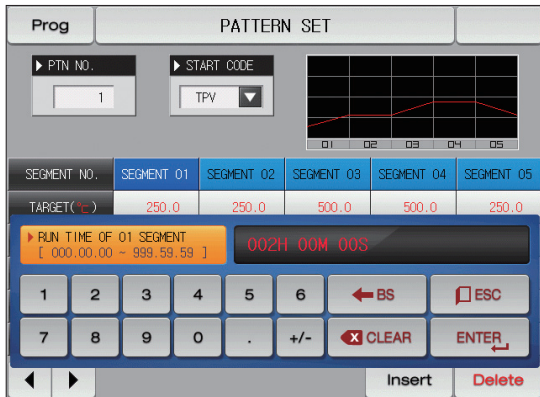
▲ It is a screen set with "SSP" for starting condition.

Prog		PATTERN SET				
▶ PTN NO.		▶ START CODE		[Graph]		
1		TPV				
SEGMENT NO.	SEGMENT 01	SEGMENT 02	SEGMENT 03	SEGMENT 04	SEGMENT 05	
TARGET(°C)	250.0	250.0	500.0	500.0	250.0	
TIME(H.M.S)	002.00.00	002.00.00	002.00.00	002.00.00	002.00.00	
TIME SIGNAL	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	
SEG ALARM	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	
SEG PID	0	0	0	0	0	
◀ ▶		Insert			Delete	

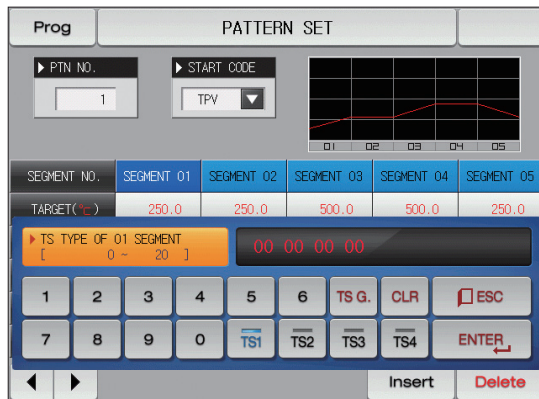
▲ [Insert], [Delete] buttons are activated when [SEGMENT 01] button is activated.



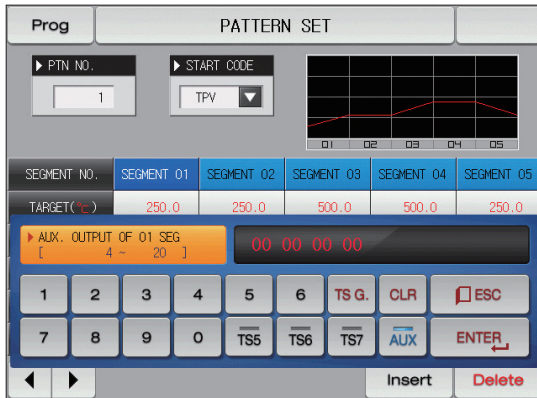
▲ The input key to set the set value is displayed when (Set value) button is touched by. 250.0



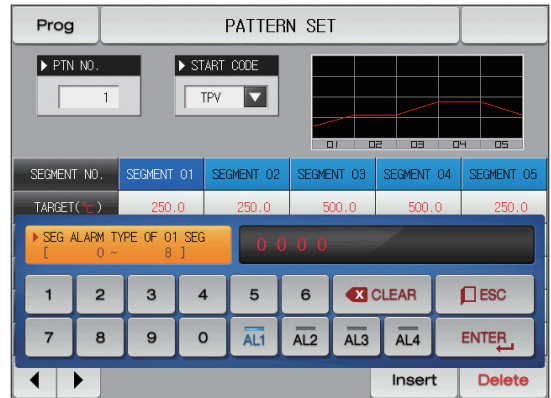
▲ The input key to set the segment time is displayed when 002.00.00 (Time) button is touched by.



▲ The input key to set the time signal is displayed when 00 00 00 00 (Time signal) button is touched by. The time signal can be set for TSetting~TS8 when TS.a button is touched by.



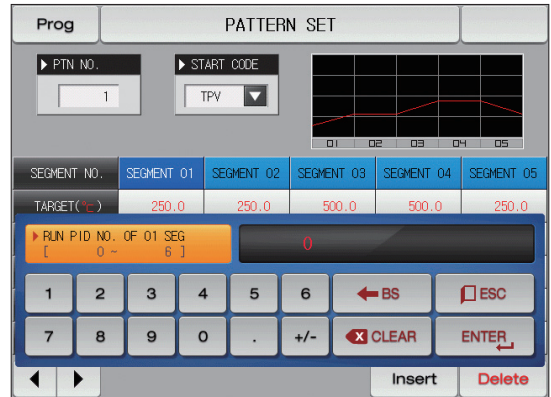
▲ The input key is displayed when (Time signal) is touched by. The button to set the sub output is appeared when button on the right top is touched by.



▲ The input key to set the segment alarm is displayed when (SEG alarm) button is touched by.

References

- ▶ Input by pressing for time signal and SEG alarm input.
- ▶ Select to escape from input screen.
- ▶ The wanted time signal group can be input by pressing TSetting~TS8 for the set value in [7-4 Time signal operation].
- ▶ Time signal #8 cannot be used in sub output use in OUT1~4 control output terminal.

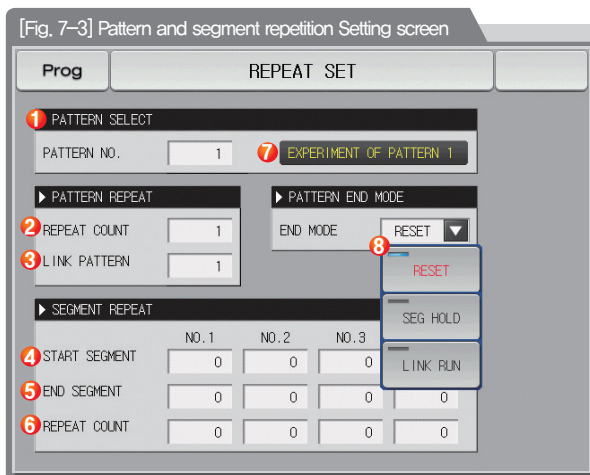


▲ The input key to set the segment PID is displayed when (SEG PID) button is touched by.

Parameter	Setting range	Unit	Initial value
Pattern number	1~80	ABS	1
Starting condition	TPV, SPV, SSP	ABS	TPV
Starting condition(SSP)	EU(0.0~100.0%)	EU	EU(0.0%)
Segment Target SP	EU(0.0~100.0%)	EU	EU(0.0%)
Segmen Time	-00.00.01(OFF)~999.59.59 (Hour, Min, Sec)	ABS	-00.00.01
Segment Time signal 1~8	0~20	ABS	0
Segment Sub output	4~20	ABS	0
Segment SEG alarm 1~4	0~8	ABS	0
Segment SEG PID	0~6	ABS	0

7-2. Pattern repetition setting

- It is a screen to set the function for entire or partial repetition of set pattern.
- The operation method in pattern operation termination can be set.

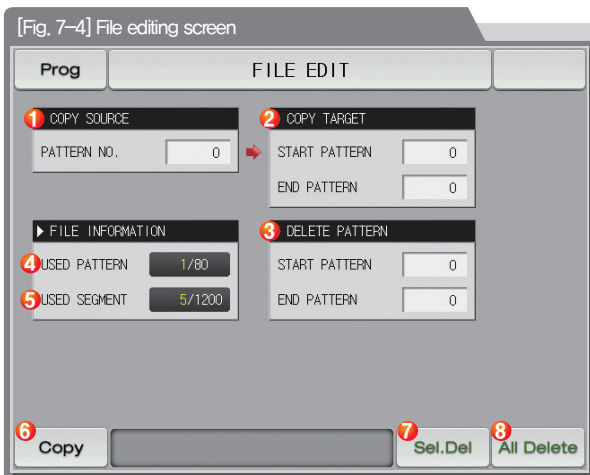


- ① It sets the pattern number to perform the repetitive operation.
- ② It sets the repetition operation frequency of the set pattern.
- ③ It sets the pattern number for repetitive operation in termination of set pattern operation.
- ④ It sets the segment to start the partial repetitive operation out of the set patterns.
 - It starts from start set value (SSP) in partial repetitive operation regardless of the start time condition (STC) when the start segment is "1."
- ⑤ It sets the segment to terminate the partial repetitive operation out of the set patterns.
- ⑥ It sets the repetition frequency of the partial repetitive operation out of the set patterns.
- ⑦ It displays the experiment name of the set pattern.
 - The change of the experiment name can be changed in [7-6 Experiment name setting]
 - The change is impossible as it is only for reading.
- ⑧ It decides the next operation when the set pattern operation is finished.
 - Operation stop : The pattern termination signal is generated and the operation state is in program stop.
 - SEG hold : It is operated in last operation set value and hold state is maintained.
 - Connection operation : The pattern set in the connection pattern is operated.

Parameter	Setting range	Unit	Initial value
Pattern No.	1~80	ABS	1
Repetition frequency	0(Indefinite repetition)~999	ABS	1
Connection pattern	1~80	ABS	1
Operation in pattern termination	Operation stop, SEG hold, Continuation operation	ABS	Operation stop
Start segment for repetition setting 1~4	0~99	ABS	0
Termination segment for repetition setting 1~4	0~99	ABS	0
Repetition frequency for repetition setting 1~4	0~99	ABS	0

7-3. File editing

- It is a screen to copy or delete the input segment values in [Fig. 6-1 Program pattern setting].
- The pattern number in operation cannot be deleted.
- The deleted pattern cannot be recovere.



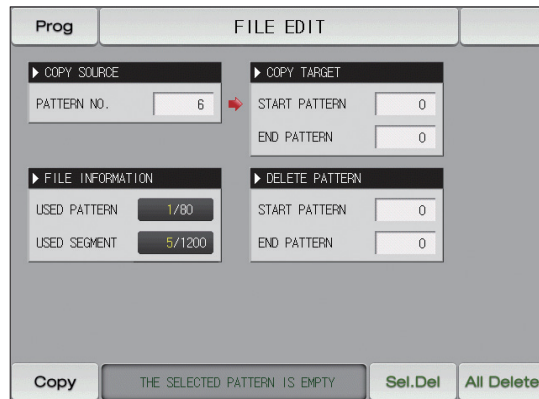
- ① It sets the original pattern number to be copied.
- ② It sets the first and last pattern number to be copied.
 - The first pattern is copied only when the last pattern is "0."
- ③ It deletes the first and last pattern number to be copied.
 - The first pattern is deleted only when the last pattern is "0."
- ④ It displays the total patterns set in [Fig. 7-1 Program pattern setting].
 - The change is impossible as it is only for reading.
- ⑤ It displays the total segments set in [Fig. 7-1 Program pattern setting].
 - The change is impossible as it is only for reading.
- ⑥ It copies the set pattern ① to the set pattern ②.
- ⑦ It initializes the set value of the pattern set in ③.
- ⑧ It initializes the set value of every pattern.



[Fig. 7-5] File editing screen #1

References

- ▶ The message : “It is a mistake of parameter setting.” appears at the bottom of screen for copying or deleting by wrong input of pattern number.



[Fig. 7-6] File editing screen #2

References

- ▶ The message : “There is no saved contents on the selected pattern.” Appears at the bottom of screen for copying or deleting without saved data in the pattern No.

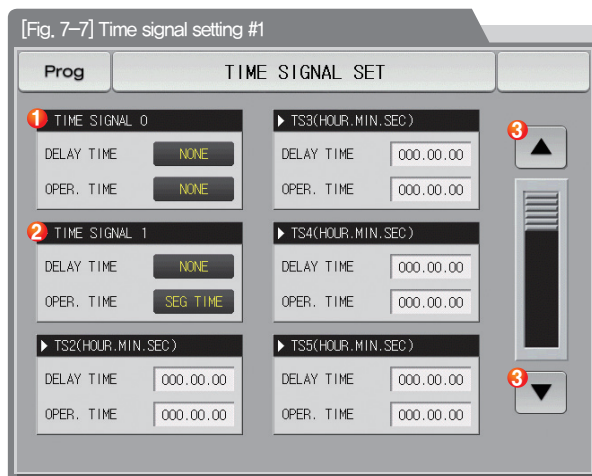
Parameter		Setting range	Unit	Initial value
Pattern number		1~80	ABS	0
Copy	Start pattern	0~80	ABS	0
	End pattern	0~80	ABS	0
Copy		No use, Use	ABS	No use
Selective deletion	start pattern	0~80	ABS	0
	end pattern	0~80	ABS	0
Selective deletion		No use, Use	ABS	No use
All deletion		No use, Use	ABS	No use

Message display	Explanation
"There is no saved information in the selected pattern."	It is displayed in case of copy when there is nothing saved in pattern number.
"The copy is completed in the selected pattern."	It is displayed in completion of selected pattern copy.
"The deletion is completed in the selected pattern."	It is displayed in completion of selected pattern deletion.
"The copy is completed in every pattern."	It is displayed in completion of every pattern deletion.
"The pattern to be copies is being used."	It is displayed in use of pattern.

7-4. Time signal operation

- The time signal operation is classified into ON/OFF operation, time setting operation and the set time signal is used for setting the time signal No. in segment setting in [7-1 Program pattern setting]

(1) Time signal ON/OFF operation



- ① The time signal is OFF during corresponding segment operation when "0" is selected.
 - The change is impossible as it is only for reading.
- ② The time signal is ON during corresponding segment operation when "1" is selected.
 - The change is impossible as it is only for reading.
- ③ Moving the screen up/down by 6 time signal units.

(2) Time signal time setting operation

- The time signal 2~20 (TS2~20) operate depending on delay time and operation time.

Prog	TIME SIGNAL SET		
▶ TS6(HOUR, MIN, SEC)	▶ TS9(HOUR, MIN, SEC)		▲ ▼
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		
▶ TS7(HOUR, MIN, SEC)	▶ TS10(HOUR, MIN, SEC)		
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		
▶ TS8(HOUR, MIN, SEC)	▶ TS11(HOUR, MIN, SEC)		
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		

[Fig. 7-8] Time signal setting #2

Prog	TIME SIGNAL SET		
▶ TS12(HOUR, MIN, SEC)	▶ TS15(HOUR, MIN, SEC)		▲ ▼
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		
▶ TS13(HOUR, MIN, SEC)	▶ TS16(HOUR, MIN, SEC)		
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		
▶ TS14(HOUR, MIN, SEC)	▶ TS17(HOUR, MIN, SEC)		
DELAY TIME 000.00.00	DELAY TIME 000.00.00		
OPER. TIME 000.00.00	OPER. TIME 000.00.00		

[Fig. 7-9] Time signal setting #3

[Fig. 7-10] Time signal setting #4

Prog
TIME SIGNAL SET
Prog

▶ TS18(HOUR, MIN, SEC)

DELAY TIME	000.00.00	▲
OPER. TIME	000.00.00	

▶ TS19(HOUR, MIN, SEC)

DELAY TIME	000.00.00	▼
OPER. TIME	000.00.00	

▶ TS20(HOUR, MIN, SEC)

1 DELAY TIME	000.00.00	▼
2 OPER. TIME	000.00.00	

①

The time signal is "ON" after setting time is elapsed in delay time from the corresponding segment starting point.

- However, the time signal is not operated when the corresponding segment time is bigger than delay time.

②

The time signal is "ON" by the delay time in corresponding segment is "ON" only for set time in operation time. .

- However, the time signal is "ON" for the corresponding segment operation when the (delay time + operation time) is bigger than corresponding segment time and it is not operated in the next segment.

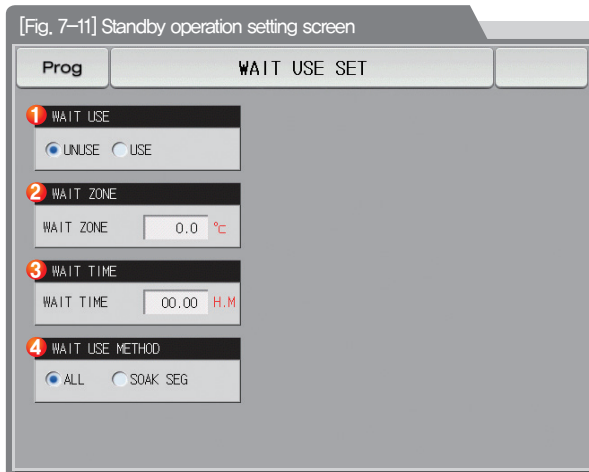
Parameter	Setting range	Unit	Initial value
Delay time	000.00.00(OFF)~999.59.59 (Hour, Min, Sec)	ABS	000.00.00
Operation time	000.00.00(OFF)~999.59.59 (Hour, Min, Sec)	ABS	000.00.00

(3) Example of operation in time signal input

Setting		Time signal operation		
Segment N time ≥ Delay time + Operation time	1. Delay time = 000,00,00	ON		
	OFF	Segment	(n-1)segment time	n segment time (n+1)segment time
	2. Delay time ≠ 000,00,00	ON		
	OFF	Segment	(n-1)segment time	n segment time (n+1)segment time
Segment N time < Delay time + Operation time	3. Delay time = 000,00,00	ON		
	OFF	Segment	(n-1)segment time	n segment time (n+1)segment time
It does not make influence on the next segment.	4. Delay time ≠ 000,00,00	ON		
	OFF	Segment	(n-1)segment time	n segment time (n+1)segment time

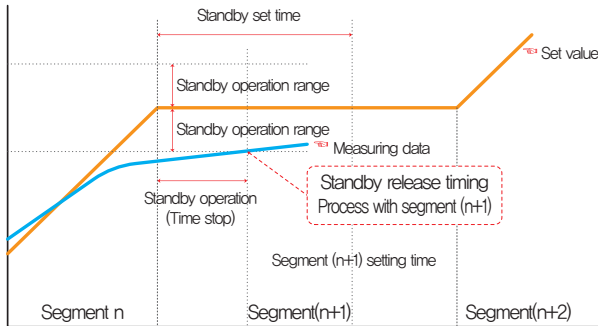
7-5. Standby operation

- It is a screen to set the range and time for standby operation during program operation.
- The set standby operation here is applied to [Fig. 6-1 Program pattern setting].
- Definition of standby operation
 - Standby operation entry condition : When the measure data is not in the standby operation setting range
 - Standby operation releasing condition : When the measure data is in the standby operation setting range
 - The standby time has indefinite value when the standby time is not set (Initial value).

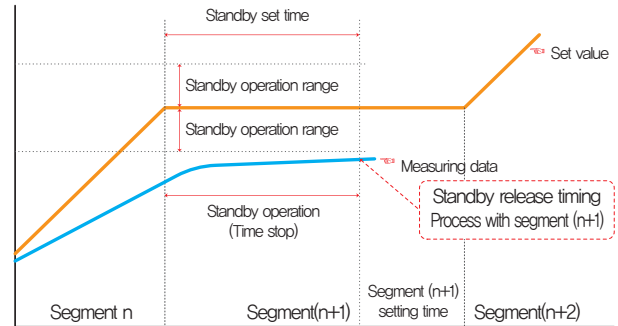


- | | |
|---|--|
| ① | It sets Y/N of standby operation. |
| ② | It sets the operation range to be applied for standby operation. <ul style="list-style-type: none"> • The standby motion is not operated when the range is set in "0.0." <p>The standby time to be applied is set when the measuring data is not in the standby operation range.</p> |
| ③ | It standbys indefinitely for entry to the standby operation range when the standby operation time is set in "00.00." |
| ④ | It decides either of "Entire" and "Maintain SEG" for standby operation method. <ul style="list-style-type: none"> • Entire : The standby operation is applied to the set entire segment in [7-1 Program pattern setting] • Maintain SEG : The standby operation is applied only to the set maintain range segment in [7-1 Program pattern setting] |

Parameter	Setting range	Unit	Initial value
Standby operation setting	No use, Use	ABS	No use
Standby operation range	EUS(0,00~100,00%)	EUS	EUS(0,00%)
Standby operation time	00,00~99,59(Hour, Min)	ABS	00,00
Standby operation method	ALL, SOAK SEG	ABS	ALL



In case of standby operation release within standby time (Wait time)



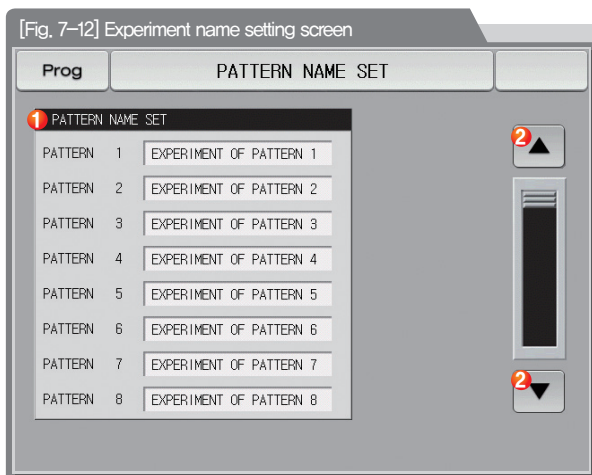
In case of no entry of the measuring data into standby operation range within the standby time (Wait time)

References

- ▶ It is a graph for interactive relation between standby operation and standby time.
- ▶ Standby operation range : It displays the temperature range with adoption of standby operation.

7-6. Experiment name setting

- The experiment name can be set for each pattern. Refer to [3-2(2) Program operation #1 operation screen]



- Input the experiment name of each pattern.
- Converting to the next or previous experiment name screen.



References

- The input key to set the experiment name is displayed when is touched by.

Parameter	Setting range	Unit	Initial value
Experiment name 1~80	0~9, A~Z, Special letter (Maximum 24 letters)	ABS	EXPERIMENT OF PATTERN 1~ 40

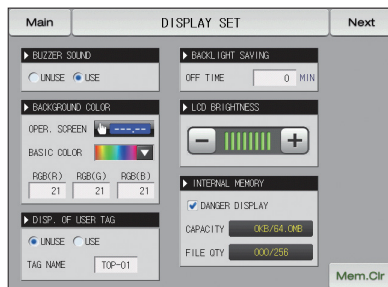
Part 08

Screen display setting

8-1 Setting display setting	78
8-2 DI error creation history view	80

Setting display setting

Next Flow chart



[Fig. 8-1] Screen display setting screen



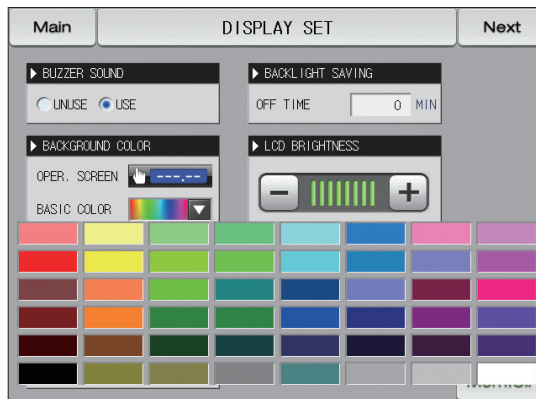
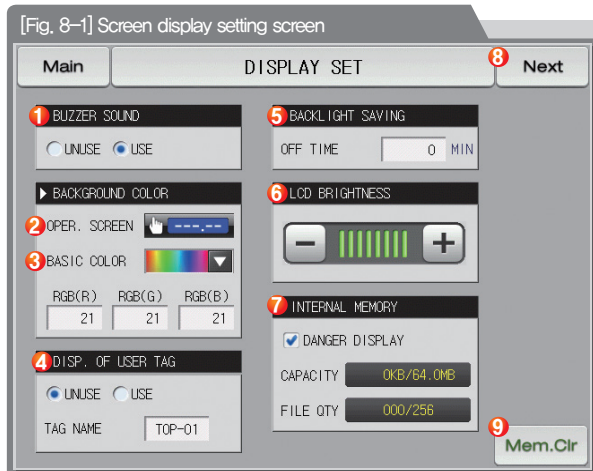
[Fig. 8-3] DI error creation history screen



08. Screen display setting

8-1. Screen display setting

- It converts to [Fig. 8-1 Screen display setting screen] when the screen display setting button is touched by in [Fig. 2-1 Main screen].



[Fig. 8-2] Screen to select the basic background color

- ① It sets Y/N of use buzzer sound.
 • The buzzer sound generated in DI error is operated when it is set for no use.
- ② Operation the screen background color selectable blue or red
 R(0~31), G(0~31), B(0~31) of each figures
- ③ • Click to the button of basic color selection, possible to select among 48 colors.
- ④ It sets Y/N for user tag display and tag name
 • Maximum 6 digits can be input and the set tag is displayed on the operation screen. Refer to [Fig. 3-6 Stationary operation #1 operation screen]
- ⑤ It sets the backlight electricity saving time.
 • The electricity saving time sets the operation timing of backlight OFF when there is not key operation.

- ⑥ The brightness of LCD is controlled by , button.
- ⑦ Total capacity of internal memory, used capacity, total files to be saved and display of saved files
 • Warning : set to the usage of warning (shortage of memory capacity , excess of saved files) using the button ,
- ⑧ Moving from current screen to next screen
- ⑨ It deletes every file saved in the internal memory.

References

- ▶ The files to be saved into the internal memory are limited to 256 files.
 Use after deletion of the files from the internal memory when it exceeds 256 files.

Parameter	Setting range	Unit	Initial value
Buzzer sound	No use, Use	ABS	Use
Background color	Oper screen color	ABS	Blue
	Basic color	ABS	R(21), G(21), B(21)
Electricity saving operation time	0 ~ 99 MIN	ABS	10
User tag	No use, Use	ABS	No use
Tag name	0~9, A~Z, (Maximum 6 letters)	ABS	TOP-01
LED brightness	1 ~ 8	ABS	8 steps

8-2. DI error creation history view

- It is a screen to display the type, date and time of error created DI.
- The error history is saved up to 30 cases and the later history is saved after deletion of the saved history.



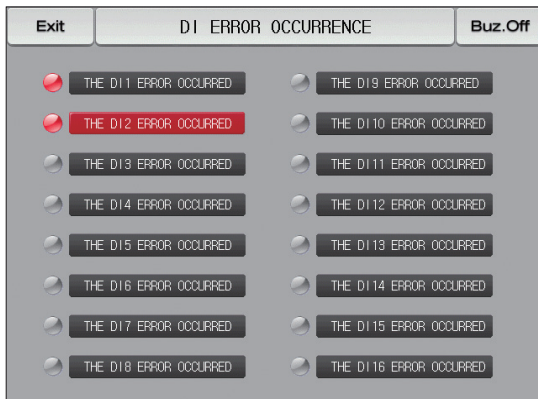
It displays the history of DI error creation.

- ①
 - The name set in [11-2 Error name] in [Operation manual] is displayed.
 - The change is impossible as it is only for reading.

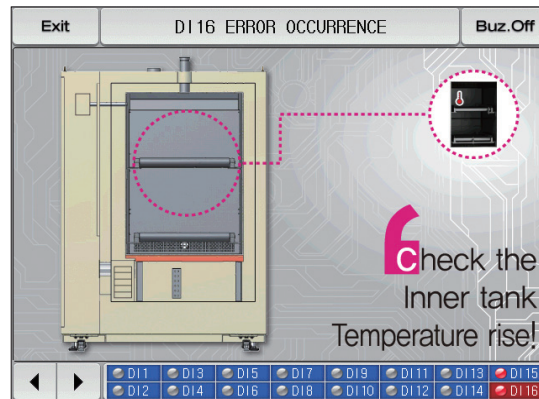
② It deletes the entire DI error creation.

③ It checks the previous or next error history.

Parameter	Setting range	Unit	Initial value
Entire deletion	No use, Use	ABS	No use



[Fig. 8-4] Screen for DI error display method by letter



[Fig. 8-5] Screen for DI error display method by photo

References

- ▶ It is a screen in case of DI error creation.
- ▶ The setting for letter and photo screen setting can be set in [11. DI function and operation setting] in [Installation manual].
- ▶ It is converted to the operation screen after escaping from the DI error screen when is touched by.
- ▶ The same DI error creation is neglected for 1 minute when the screen is changed by pressing button after DI creation. (Here, the neglecting means the DI error screen.)
 Ex) It neglects even D11 is created by escaping with "Return" in the stat of D11 creation and the DI error screen is displayed when D11 has been created even after 1 minute.
- ▶ button is to block the alarming sound when DI error is created.

EX) Explanation depending on lamp state

- DI error no creation ("OFF" state)



- DI error creation ("ON" state)



- Release after DI error creation ("ON" state after "OFF")

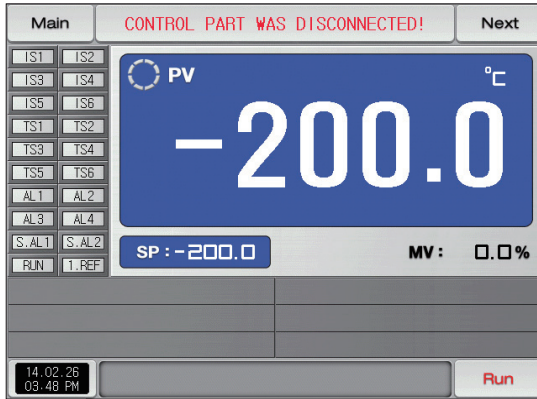


Part **09**

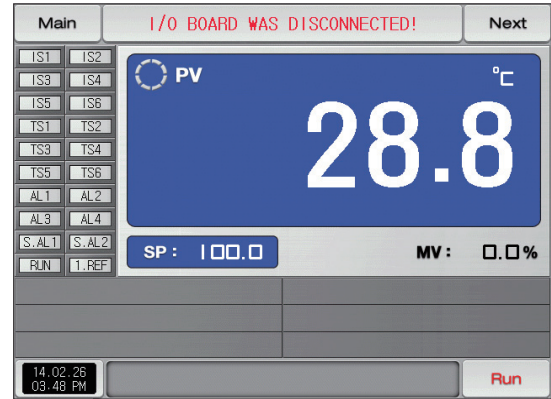
Communication error.....83



09. Communication error



[Fig. 9-1] Control part communication error screen



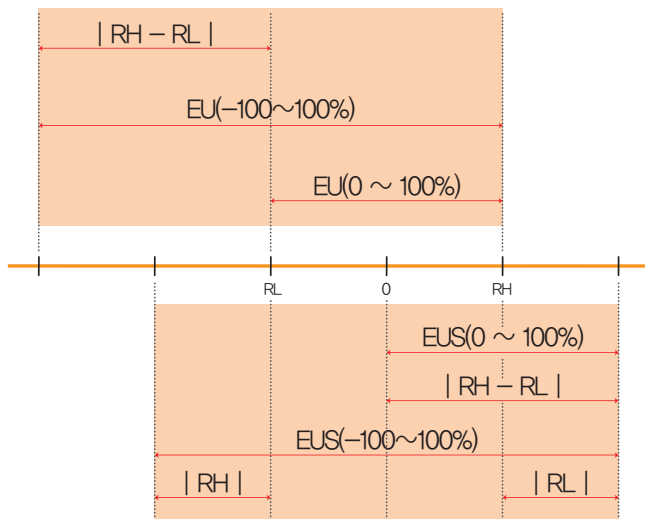
[Fig. 9-2] I/O board communication error screen

References

- ▶ When there is an error between display and control part
The message, "The control part is not connected," is displayed at the top of the screen as shown in [Fig. 10-1] Control part communication error screen.
- ▶ When there is an error between control part and I/O board communication
The message, "The I/O board is not connected," is displayed at the top of the screen as shown in [Fig. 10-2] I/O board communication error screen.
- ▶ Communication failure : Communication cable defect
Communication cable connection defect

Engineering Units - EU, EUS

- ⋮⋮⋮ When the sensor type (IN-T) or the upper limit, lower limit of input range is changed, the parameters expressed in EU(), EUS() are changed in proportion to current data. (However, the upper and lower range setting data is initialized.)
- ⋮⋮⋮ Download the instruction manual and communication manual from the homepage.
- ⋮⋮⋮ EU() : Value of engineering unit depending on the range of instrument
EUS() : Value of engineering unit depending on the span of instrument



RL: Lower limit of input range
RH: Upper limit of input range

► Range of EU() and EUS()

	Range	Center point
EU(0 ~ 100%)	RL ~ RH	$ RH - RL /2 + RL$
EU(-100 ~ 100%)	$-(RH - RL + RL) \sim RH$	RL
EUS(0 ~ 100%)	$0 \sim RH - RL $	$ RH - RL /2$
EUS(-100 ~ 100%)	$- RH - RL \sim RH - RL $	0

(Example)

- INPUT = T/C(k2)
- RANGE = -200.0°C(RL) ~ 1370.0°C(RH)

	Range	Center point
EU(0 ~ 100%)	-200.0 ~ 1370.0°C	585.0°C
EU(-100 ~ 100%)	-1770.0 ~ 1370.0°C	-200.0°C
EUS(0 ~ 100%)	0 ~ 1570.0°C	785.0°C
EUS(-100 ~ 100%)	-1570.0 ~ 1570.0°C	0.0°C



Queries related with after sales service for TEMP1000

Please inform the TEMP1000 model name, failure condition and contact point for queries of after sales service.

T : 032-326-9120

F : 032-326-9119



Customer contact for TEMP1000

Quotation request / Product request

Specification request / Data request/ Other request

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