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Programmable

Temperature & Humidity Controller

Operation Manual

TH510

HANYOUNG NUX

Notice

Hanyoung Nux Co., Ltd.

28, Gilpa-ro 71beon-gil, Nam-gu, Incheon, Korea
TEL : (82-32)876-4697
FAX : (82-32)876-4696
E-mail. overseas@hynux.com

Before starting

Many thanks for buying the Hanyoung Nux temperature/humidity controller TH510! The temperature/humidity controller TH510 is designed to control the temperature and humidity in thermo-hydrostats. It consists of display and control units The display can be attached to a panel or VESA-mounted and is connected to the control for communication. The control consists of power, control, and input/output modules and can be fixed on DIN rail or attached on a panel using screws. The operation manual describes product functions, how to install, cautions, and how to use. Read and understand this document before starting the product.
Make sure that this operation manual will be delivered to an end user and kept in an accessible location (This operation manual may be subject to changes for improvement and functional changes without prior notice).

1. Checking of components

First of all, check the specifications referring to your order and see if there is any exterior damage or missing component.

▶ Component

		
Display(TH510-1)	Power module(TM-PWR)	Control module(TH510-MAIN)
		
Input module(TM-DI)	Output module(TM-DO)	Input/output module(TM-DIO)
		 		
Communication cable(1.5 m)	Bracket 4EA	250 Ω resistor 2EA	3P communication Connector	SD card	Operation manual

▶ Suffix code

Model	Code			Description
TH510–	□	□	□	Programmable temperature/Humidity controller
Display	1			Display(5.7" TFT LCD)
	N			None
Input/output		1		8 input points/6 output points(1 module)+Power module +Control module
		2		8 input points/14 output points(2 modules)+Power module +Control module
		3		16 input points/16 output points(3 modules)+Power module +Control module
		N		No input/output
Language			S	Korean, English, and Chinese(Simplified)
			T	Korean, English, and Chinese(Traditional)

※ This product consists of the display and control(power, control, input, and output modules). (Up to 32 contact input/output points, respectively)

▶ Components

Product	Model	Description
Display	TH510–1N□	Display(5.7" TFT LCD)
Control module	TH510–MAIN	Temperature • Humidity control module
Power module	TM–PWR	Power module
Input module	TM–DI	Module with 16 input points
Output module	TM–DO	Module with 8 output points
Input/output module	TM–DIO	Module with 8 input and 6 output points

2. Safety cautions

The cautions are categorized into Danger, Warning, and Caution according to seriousness.

Danger	If not followed, it may lead to death or serious injury.
Warning	If not followed, it might lead to death or serious injury.
Caution	If not followed, it may lead to minor injury or damage to assets.

- The operation manual may be subject to changes for improvement without prior notice.
- To protect and secure the product and system connected, use the product according to the safety instructions of this manual.
- We are not liable for any damage caused by negligence or not following the instructions.
- To protect and secure the product and system connected, install any separate or external circuit outside of the product.
- Do not remove, repair, or modify it without prior consent. It may cause electric shock, fire, and malfunction.
- Avoid any strong impact. It may cause damage or malfunction to the product.
- To disconnect the main power, install a switch or circuit breaker.

3. Warranty

- We are not liable for any condition other than those specified warranty conditions.
- If a user or third party is damaged in using this product due to unforeseeable defect or natural disaster, we are not liable for any loss or indirect damage.
- The warranty is valid for 1 year from the date of purchase and it is applicable to any failure that occurs in normal use conditions, as specified in this manual.
- For any failure found after the warranty period, paid service may be provided according to our regulations.
- In any of the following circumstances, the product will be repaired at a cost even during the warranty period
  - Failure attributable to user (e.g. Initialization due to lost password)
  - Failure attributable to a natural disaster (e.g. fire, flood, etc.)
  - Failure attributable to relocation after installation
  - Failure attributable to unauthorized modification or damage
  - Failure attributable to unstable power supply
- If you require A/S, contact your dealer or Hanyoung Nux Co., Ltd..

Installation

1. Installation site & cautions

- It may cause electric shock so install in on the panel first.
- Avoid following locations.
  - Where people might unintentionally contact a terminal
  - Where there is strong vibration, impact, or electromagnetic field
  - Where it is exposed to a corrosive or inflammable gas
  - Where the temperature changes sharply or there is much humid, dust, or salt
  - Where it is directly exposed to direct sunlight or the temperature is extreme
  - places with combustibles and flammable objects
- The case and front section are made of fire-retardant polycarbonate but do not install the product directly on a flammable object.
- Keep away any device or wire that may cause noise. Enough preheating is required especially under 0℃. Keep away any heat-radiating device.
- For wiring, disconnect the entire power.
- This product works at 100 – 240 V a.c. / 50 – 60 Hz without special setting. Please make sure that the power is within the rating to avoid any product damage leading to fire or electric shock.
- Do not touch it with wet hand. You may be electrically shocked.
- Follow conventional cautions in order to reduce the risk of fire, electric shock, and injury.
- For grounding, refer to how to install. (Grounding resistance : 100 Ω or less)
- Keep ventilation and the radiating hole free.
- The overvoltage protection degree is Category II(IEC 60664-1) and the usage environment is Pollution Degree II.
- Do not use sharp objects or excessive force when operating the touch screen
- The external terminals(sensor input, communication, and control output terminals) must be connected to separate circuits with at least reinforced insulation from dangerous voltage sections.
- To disconnect the main power, install a switch or circuit breaker.

2. How to install

Danger

Before installing it, disconnect the power. Do not touch a terminal because it may lead to electric shock.

- Use 2-5mm thick panels.
- Insert this device from the front of panel.
- Connect dedicated clamps to the clamping grooves and fix them with bolts.
  (Before fully tightening the clamps, position them in place).

▶Display

(1) How to install the panel

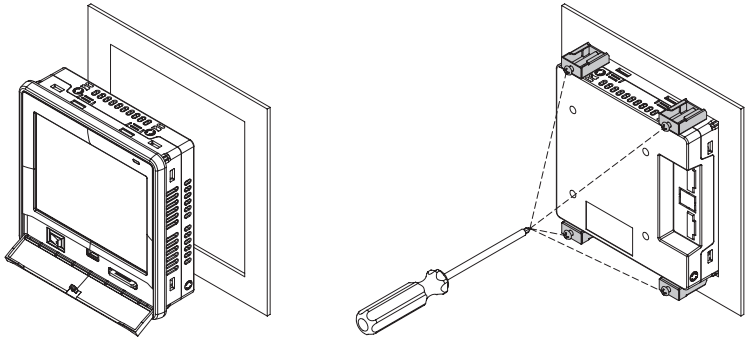
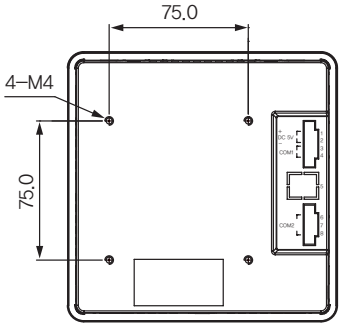


Fig. 1) How to install the panel

> **Caution** The tightening torque must be 0.5 N·m or less for clamping.
> Forcible tightening may lead to deformation or damage.

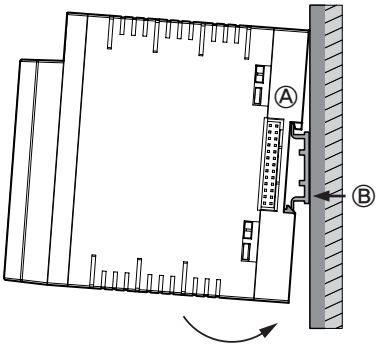
(2) How to install VESA mount

Connect an M4 X 7L bolt into a VESA hole.

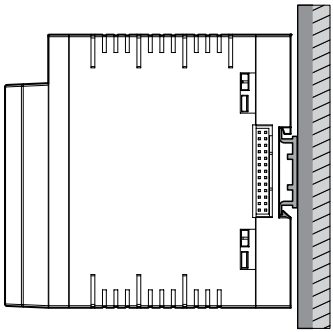


▶Control

1) How to install DIN rail



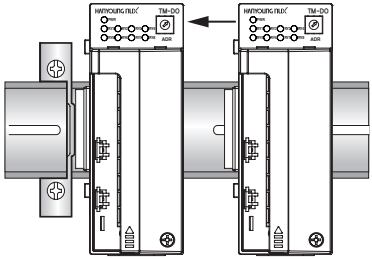
① Connect the top hook(A) of bottom of floor to the DIN rail and press it(B) in order to install it.



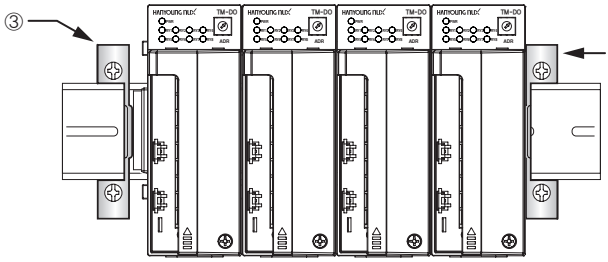
② Check if it is fixed by pushing up the mounting bracket.

● How to install module

TH510 series module can connect up to 7 units. Any module must be installed vertically.



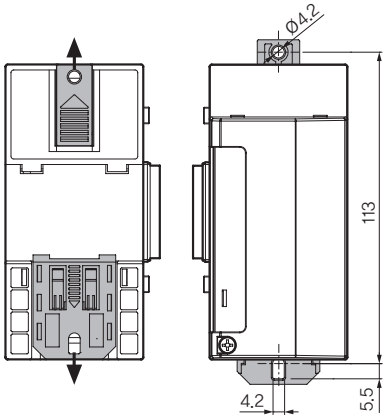
① Push a module aside in order to connect it to a connector.



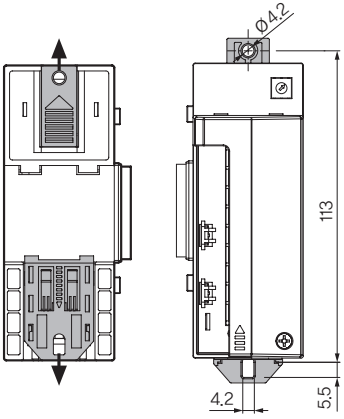
2) How to attach panel

① Referring to the hole dimensions on the left, find where to install it.
② Push outside the top and bottom hooks for fixing screws at the bottom of modules.
③ Fix it with an M3 screw.

● POWER

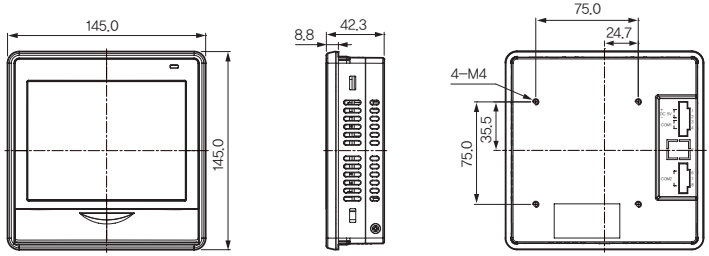


● Main, input/output, input, and output

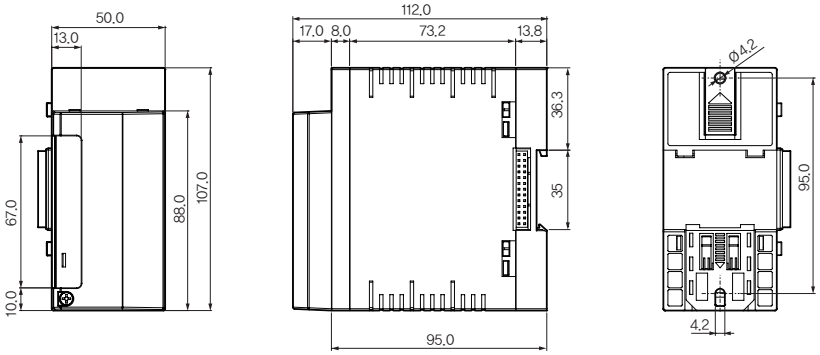


3. Exterior & panel dimensions

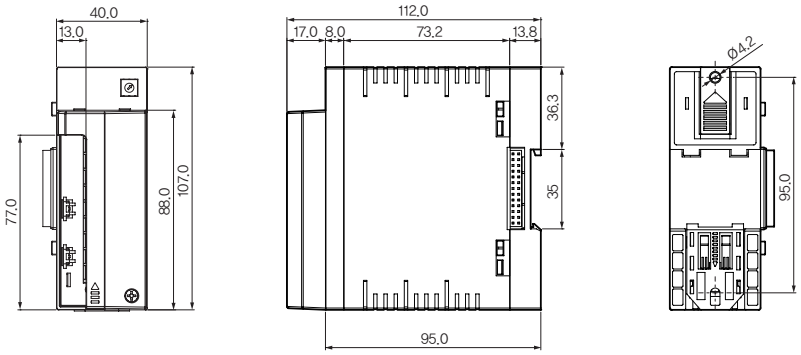
▶Display (Unit : ㎜)



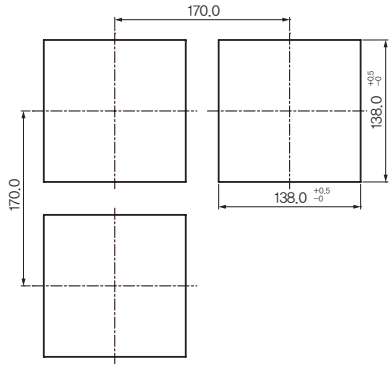
▶Power module (Unit : mm)



▶Control, input, output, and input/output modules (Unit : mm)



▶Panel dimensions (Unit : mm)



4. Wiring

Caution
Before wiring, disconnect the power.
Do not touch a terminal because it may lead to electric shock.

▶ Power connection

Vinyl-insulated wire(0.9 – 2.0 ㎟ (KSC 3304)) must be used.

Caution
Too much noise may lead to damage or malfunction to the device.
Use line filter to remove the noise.

▶ FG wiring

Vinyl-insulated wire(2.0 ㎟ (KSC 3304)) must be used. It must be grounded at 3 points or more with 100 Ω or less resistance.

▶ Relay output wiring

Caution
Inductive load(L) including motor, solenoid, and external relay may lead to malfunction. The CR filter for AC circuit and the diodes for DC circuit should be connected in parallel with the inductive load

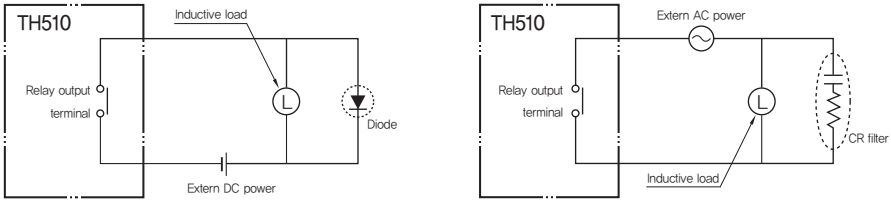


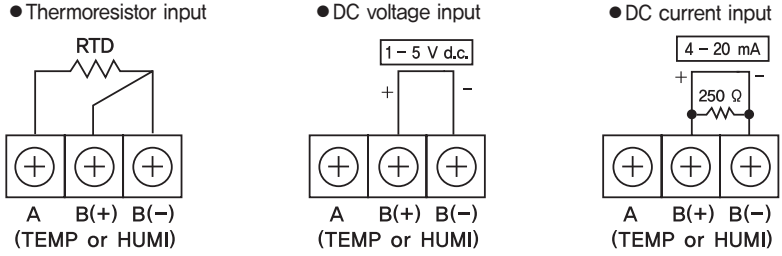
Fig. 2) Connection of relay

▶ Input wiring

Caution
Input wire must use shielded cable and be wired with certain distance from the power and ground circuits. RTD sensor must be 3-wire type with the same wiring resistance.

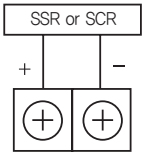
Caution
- Enclosure must be grounded at 3 points or more(100 Ω or less of grounding resistance) using 2 ㎟ or bigger cable.
- Input signal and output lines must be of shielded cable with 1 grounding point.
- Thermoresistor input must be wired with no resistance difference between 3 wires.
- Input/output signal line must be isolated from power line.
- To use current input, attach 250 Ω 0.1 % resistor at both ends of input terminal.

● Sensor input

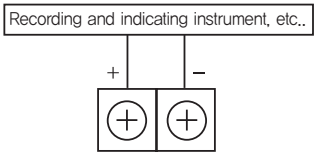


● Temperature / Humidity control and transmission output wiring

● Temperature/Humidity control output



● Temperature/Humidity transmission output



▶ Communication wiring

Connect terminating resistors(100 – 200 Ω, 0.25 W) at both ends of communication cable.

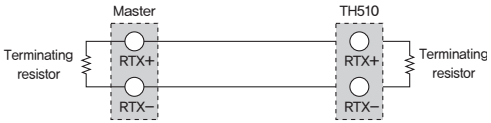


Fig. 3) How to wire for communication

▶ Terminal specifications

Power/Input/Output - M3 screw

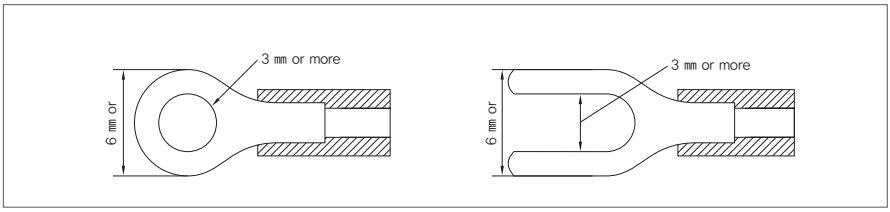
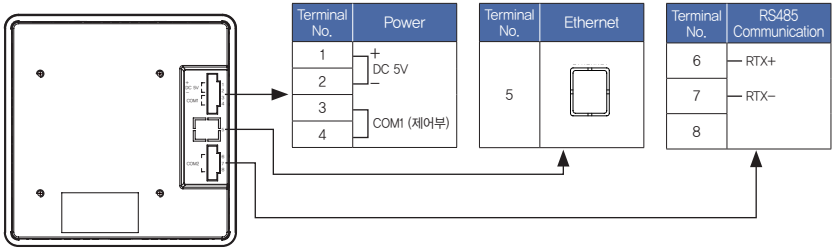


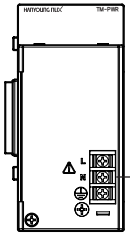
Fig. 4) Solderless terminal

5. Terminal connection diagram

▶ Display

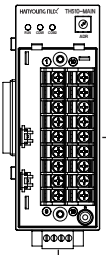


▶ Power module



Terminal No.	Power	
L	L	100 – 240 V a.c. 50 – 60 Hz 22 VA
N	N 100~240 V~ 50~60 Hz 22 VA	
⏚	F.G	

▶ Control module

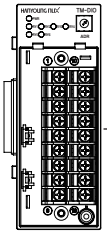


Terminal No.	Temperature	Terminal No.	Humidity
1	+ SSR/SCR	10	+ SSR/SCR
2	−	11	−
3	+ RET	12	+ RET
4	−	13	−
5		14	
6		15	
7	A RTD	16	A RTD
8	B + mV/V	17	B + mV/V
9	B −	18	B −

Power

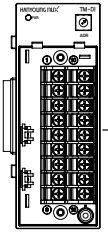
POWER 5 V d.c. ① ② ③ ④ TRX+ TRX−

▶ Input module



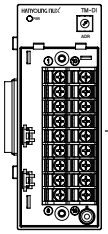
Terminal No.	Input(1~8)	Terminal No.	Input(9~16)
1	DI 1	10	DI 9
2	DI 2	11	DI 10
3	DI 3	12	DI 11
4	DI 4	13	DI 12
5	DI 5	14	DI 13
6	DI 6	15	DI 14
7	DI 7	16	DI 15
8	DI 8	17	DI 16
9	COM	18	COM

▶ Output module



Terminal No.	Output(1~4)	Terminal No.	Output(5~8)
1	RY1	10	RY5
2		11	
3		12	
4	RY2	13	RY6
5		14	
6	RY3	15	RY7
7		16	
8	RY4	17	RY8
9		18	

▶ Input/output module



Terminal No.	Input(1~8)	Terminal No.	Output(1~6)
1	DI 1	10	RY1
2	DI 2	11	COM
3	DI 3	12	RY2
4	DI 4	13	RY3
5	DI 5	14	COM
6	DI 6	15	RY4
7	DI 7	16	RY5
8	DI 8	17	COM
9	COM	18	RY6

Operation

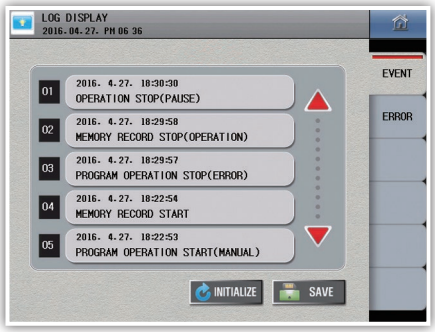
1. Name of section

Fig. 5) Main menu

[Front LED]

Back light OFF	STOP (Red lamp ON), RUN (Red lamp flashing)
Back light ON	STOP (Green lamp ON), RUN (Green lamp flashing)

2. Button operation



	Run button	Runs corresponding operation immediately.
	Select button	Select one of the displayed items
	Input box	Displays ansets numbers and characters. Press it to display the numeric or character input panel.

※ If the button is disabled or cannot be set, a beep alarm sounds and the execution is denied

3. How to control numeric input panel

Fig. 6) Numeric input panel

	Displays parameter names and setting ranges.
	Displays setting values.
Enter	Registers setting values.
BS	Remove the last digit of setting value.
CLR	Remove the entire setting value.
ESC	Cancel setting and hide input panel.

※ If the input exceeds the setting range, a beep alarm sounds and the execution is denied

4. How to control character input panel

Fig. 7) Character input panel

	Displays parameter names.
	Displays setting characters.
Enter	Registers setting characters.
◀	Remove the last digit of setting characters.
CLR	Remove the entire setting value.
ESC	Cancel setting and hide input panel.
Caps	Switch to Korean/English upper case/ English lower case
Space	Leave a space

5. Name of control

▶ Control module

[LED specifications]

RUN	Lamp ON with power connected. Lamp OFF with power disconnected.
COM1	Displays communication state of the display and control. (OFF when OK.)
COM2	Displays communication state of the control and I/O. (OFF when OK.)

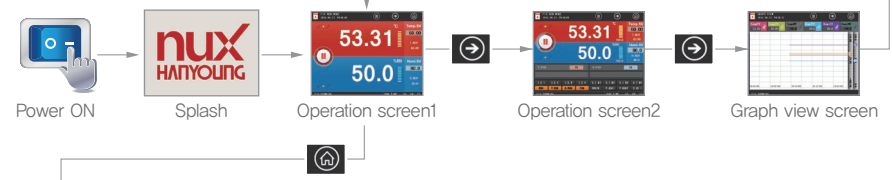
▶Input/output module

[LED specifications]

PWR	Lamp ON with power connected.
RLY1 ~ RLY8	Lamp ON with corresponding DO operation.

Screen block diagram

1. Screen block diagram




Menu screen


Operation screen

Operation screen1, Operation screen2, and Graph view screen


Operation setting

Operation setting : Constant–value/program, change rate, fuzzy, and channel tag settings
Function setting : Power saving operation, buzzer, recovery of power failure, operation screen, and switch time settings
Save setting : Save interval, media, and parameter upload/download settings
Graph : Background color and file save name


PV graph view

Saved graph view and copy data from internal memory to SD card


Program


Pattern setting

Edit pattern


Pattern management

Copy/Delete pattern information


Pattern name setting

Edit pattern name


Pattern alarm setting

Target, type, and parameter

Time signal setting

Time setting ON/OFF


Pattern graph


Time/schedule setting

Current time setting and weekly scheduling


Event

Display/Delete event history and save to SD card


System menu


Sensor input

Sensor type calibration


Control/ transmission output

Control output Transmission output


PID setting

PID section setting at gain


Inner signal

Target, type, and operation range

ON/OFF signal

ON/OFF signal


System alarm

Target and type


DI configuration

Input state, operation type, operation method, and name


DO configuration

Relay No. and parameter settings


System

Language, product specifications, communication setting, and memory

Function setting

If you press after giving power the screen below appears

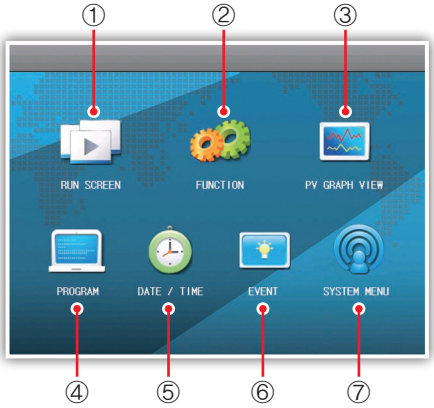


Fig. 8) Main menu

No.	Name	Description
1	Run screen	Go to operation screen[Constant-value/Program].
2	Function	Go to operation setting screen.
3	PV graph view	Go to saved PV graph screen.
4	Program	Go to program setting(pattern setting, graph, etc.) screen.
5	Date / Time	Go to current time and schedule setting screen.
6	Event	Go to event and error history screen.
7	System menu	Go to system setting[sensor input, control output, and PID] screen.

1. Run screen

Fixed control / program operations can be changed from [main menu] – [temperature operation setting] – [operation setting]. The operation start and finish can be executed from the operation screens 1 and 2 only

1–1 Fixed control screen

▶ Fixed control screen 1

Press the operation button in the left of the center in the fixed control screen in order to switch to the fixed operation screen 1

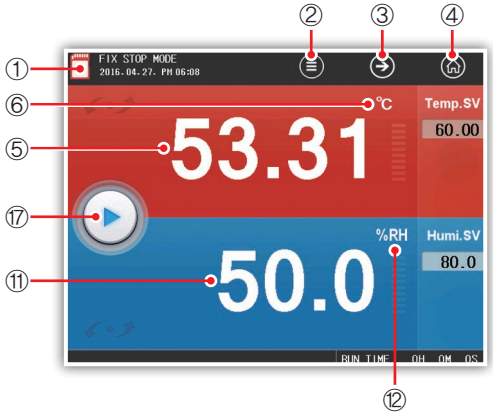


Fig. 9) Fix stop mode screen 1

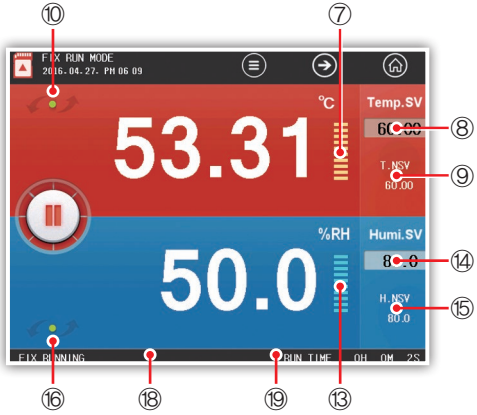


Fig. 10)Fix run mode screen 1

No.	Description
1	Show the SD card status
2	Execute the hidden menu window. To cancel the menu window, clic the same part again
3	Move to Operation 2nd screen
4	Move to Main Menu screen
5	Show the temperature Present value (PV)
6	Show the temperature unit
7	Show the temperature control output (MV)
8	Input the temperature Target Set Value (TSG)
9	Show the temperature present set value (NSV). Show only during operation
10	Show the temperature increase/decrease/maintenance status
11	Show the humidity Present value (PV)
12	Show the humidity unit
13	Show the humidity control output (MV)
14	Input the humidity Target Set Value (TSG)
15	Show the humidity present set value (NSV). Show only during operation
16	Show the humidity increase/decrease/maintenance status
17	Start/Stop button
18	Show a status message about the overall operation
19	Show the operation time

▶ Fixed control screen 2

To start the fix run mode, press the play button (19) in the left of the center in the fix stop mode 2

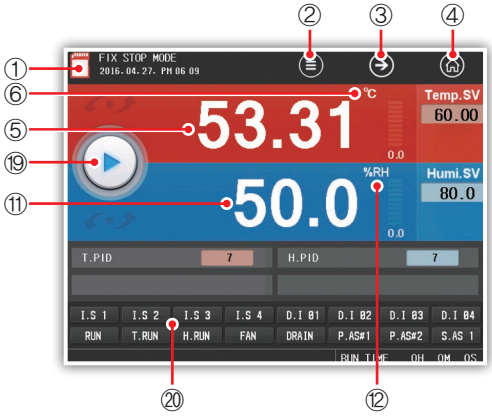


Fig. 11) Fix stop mode

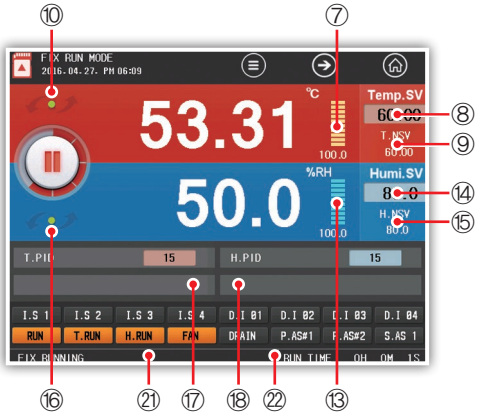


Fig. 12)Fix run mode

NO.	Description		
1	Show the SD card status		
2	Execute the hidden menu window. To cancel the menu window, clic the same part again		
3	Move to the Operation 3rd screen (Graph Viewer screen)		
4	Move to Main Menu screen		
5	Show the temperature Present value (PV)		
6	Show the temperature unit		
7	Show the temperature control output (MV)		
8	Input the temperature Target Set Value (TSG)		
9	Show the temperature present set value (NSV). Show only during operation		
10	Show the temperature increase/decrease/maintenance status		
11	Show the humidity Present value (PV)		
12	Show the humidity unit		
13	Show the humidity control output (MV)		
14	Input the humidity Target Set Value (TSG)		
15	Show the humidity present set value (NSV). Show only during operation		
16	Show the humidity increase/decrease/maintenance status		
17	Temperature PID number input window. Only if the zone selection mode is MANUAL it can be changed		
18	Humidity PID number input window. Only if the zone selection mode is MANUAL it can be changed		
19	Start/Stop button		
20	Show the status lamp of the input/output signal. The second status lamp window appears by clicking the Show part (show max 32, max 16 in one screen). * The status lamp shown in the operation screen can be set on (Main Menu)–(System Menu)–(System)–(Status lamp)		No setting in status lamp
		I.S.1	IS1 set in status lamp, IS1 does not occur
		I.S.1	IS1 set in status lamp, IS1 occurs
21	Show a status message about the overall operation		
22	Show the operation time		

▶ Fixed control screen 3

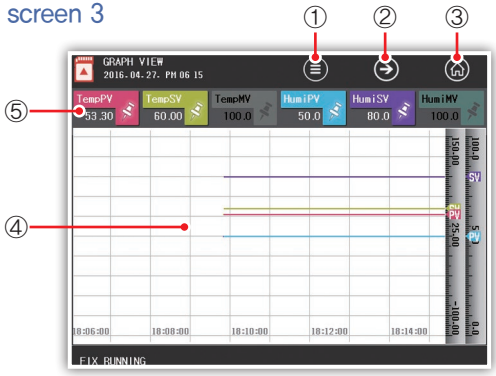


Fig. 13) Fixed control screen3

NO.	Description
1	Run hidden menu pane. Click the same to hide menu pane.
2	Go to constant-value operation 1 window.
3	Go to main menu screen.
4	Display measurement, setting value, and output of currently operating channel through a graph.
5	Set the data display with the check box. Graph is not displayed with OFF selected.

User can set background color(white/black), drawing(line and dot), and line thickness(1 or 2 pixels) of graph.
It can be changed in [Main menu] – [Operation setting] – [Graph].
※Once the operation is started, the graph is being drawn accordingly. The flow speed depends on the save interval.

▶ Fixed control screen menu window

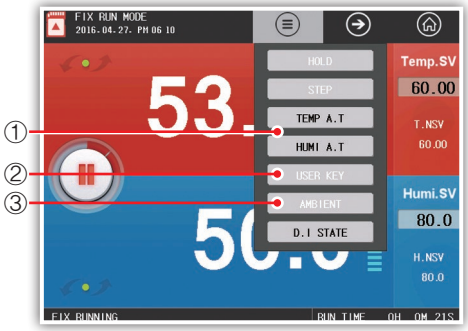


Fig. 14) Fixed control screen 1 menu window

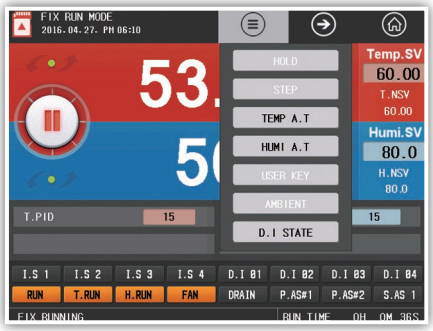


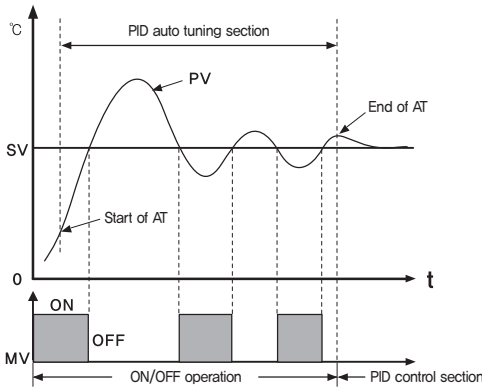
Fig. 14) Fixed control screen 2 menu window

No.	Description
1	When the auto tuning is in execution, it runs with current setting values.
2	Press User-defined button to run assigned relay in [Main menu] - [System menu] - [DO configuration].
3	Go to DI state check screen.

● How to Auto Tuning

PID auto tuning is a function for the controller to automatically measure characteristics of control target in order to calculate and set best PID values. Auto tuning gives ON/OFF control output based on the setting values and calculates PID integer by measuring hunting cycle and amplitude.
Enter setting values(SV) in the constant–value control mode; run; press button window; and press temperature or humidity auto tuning button to run auto tuning. With the auto tuning setting, if zone selection is set to AUTO, the calculated PID value of zone is automatically saved.
If zone selection is set to MANUAL, it is saved to a specified PID zone.

Caution
– If the auto tuning is not completed within 24 hours, it is abandoned. However, the control operation is continued.
– If the auto tuning is forcibly ended, PID value is maintained same as before the forcible end.



▶ Recording to SD card

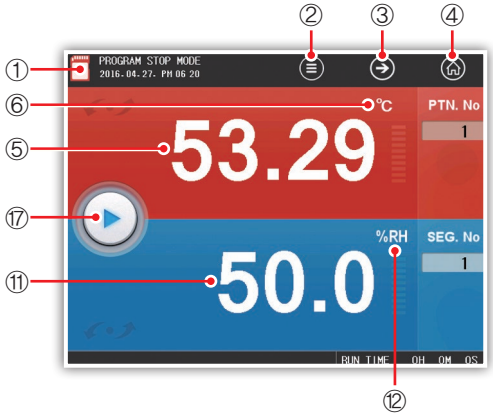
Firstly, insert an SD card as shown.

· You can check the SD card recognition as shown above.
· If the SD card is not recognized, you can't record to it.

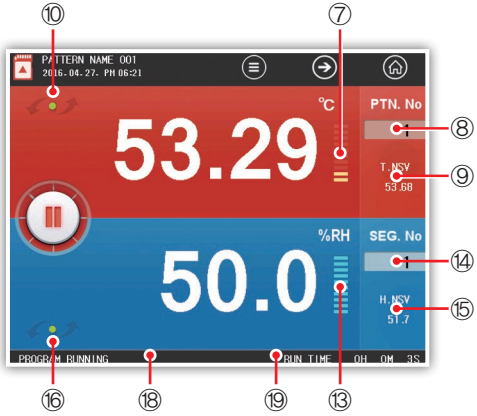
1–2 Program operation screen

▶ Program operation 1 screen

Press Run button in the center left of stop screen of program operation screen 1 in order to switch to the program operation 1 operation screen.



Picture 16) program operation fixed screen 1

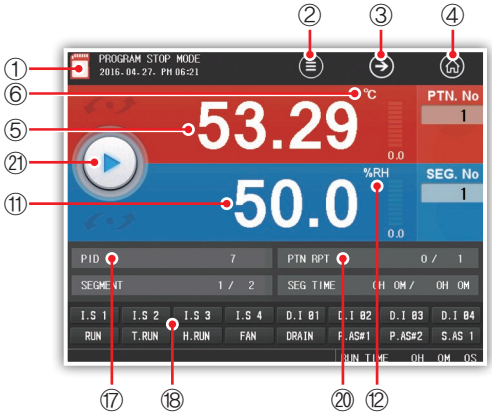


Picture 16) program operation operative screen 1

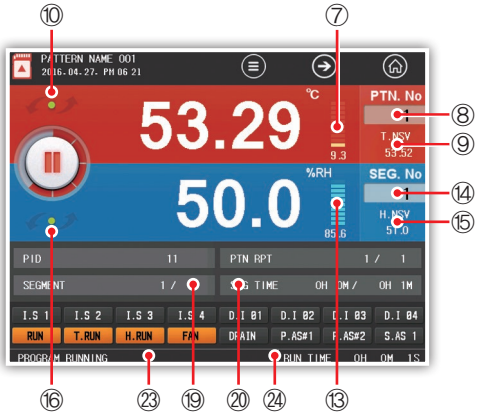
No.	Description
1	Displays state of SD card.
2	Run hidden menu window. Click the same to hide menu window.
3	Go to operation 2 screen.
4	Go to main menu screen.
5	Show the temperature Present value (PV)
6	Show the temperature unit
7	Show the temperature control output (MV)
8	Input the start pattern (show the pattern progression during the operation)
9	Show the temperature present set value (NSV). Show only during operation
10	Show the temperature increase/decrease/maintenance status
11	Show the humidity Present value (PV)
12	Show the humidity unit
13	Show the humidity control output (MV)
14	Input the start segment (show the segment in progress during the operation)
15	Show the humidity present set value (NSV). Show only during operation
16	Show the humidity increase/decrease/maintenance status
17	Start/Stop button
18	Show a status message about the overall operation
19	Show the operation time

▶ Program operation 2 screen

To run the Program operation screen 2 please press the play button (19) in the left of the center.



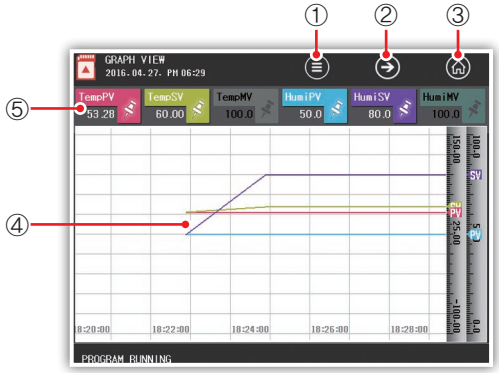
Picture 18) program operation fixed screen 2



Picture 19) program operation operative screen 2

No.	Description
1	Displays state of SD card.
2	Runs hidden menu window. Click the same to hide menu window.
3	Go to operation 3 screen (graph view)
4	Go to main menu screen.
5	Show the temperature Present value (PV)
6	Show the temperature unit
7	Show the temperature control output (MV)
8	Input the start pattern (show the pattern progression during the operation)
9	Show the temperature present set value (NSV). Show only during operation
10	Show the temperature increase/decrease/maintenance status
11	Show the humidity Present value (PV)
12	Show the humidity unit
13	Show the humidity control output (MV)
14	Input the start segment (show the segment in progress during the operation)
15	Show the humidity present set value (NSV). Show only during operation
16	Show the humidity increase/decrease/maintenance status
17	Show the temperature/humidity PID number in application
18	Show the pattern repetition status (number of the repetitions in progress / number of the repetitions set)
19	Show the progress status of the segments in progress (number of the segments in progress / quantity of the segments set)
20	Show the time of the segment in progress (segment progress time / segment set time)
21	Start/Stop button
22	Show the status lamp of the input/output signal. The second status lamp window appears by clicking the Show part (show max 32, max 16 in one screen). * The status lamp shown in the operation screen can be set on (Main Menu)–(System Menu)–(System)–(Status lamp)
23	Show a status message about the overall operation
24	Show the operation time

▶ Program operation 3 screen (Graph view screen)



Picture 20) program operation 3 screen

No.	Description
1	Runs hidden menu window. Click the same to hide menu window.
2	Go to program operation 1 screen.
3	Go to main menu screen.
4	Displays measurement, setting value, and output of current operation channel in a graph.
5	Set the data display with the check box. Graph is not displayed with OFF selected.

User can set background color(white/black), drawing(line and dot), and line thickness(1 or 2 pixels) of graph.
It can be changed in [Main menu] – [Operation setting] – [Graph].
※Once the operation is started, the graph is being drawn accordingly. The flow of graph depends on the save interval.

▶ Program operation screen menu window

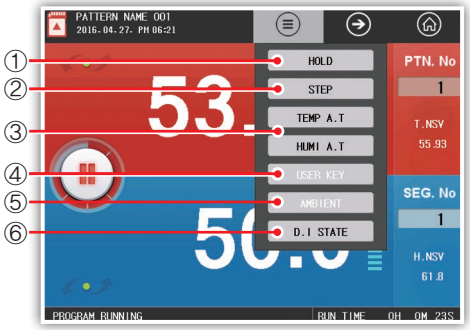


Fig. 21) Program operation screen 1 menu window

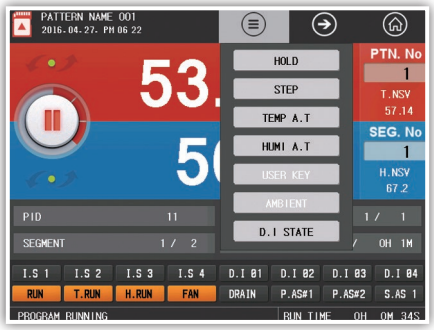


Fig. 22) Program operation screen 2 menu window

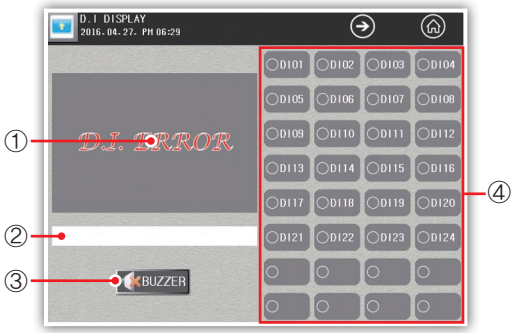
No.	Description
1	When Hold is enabled only during program operation, maintain the present set value during the execution
2	When Step is enabled only during operation, end the segment in progress now and force to move to the next segment
3	During the auto-tuning execution, proceed the auto-tuning with the present set value
4	By pressing the user key [Main Menu]-[System Menu]-[DO configuration], activate the relay assigned by the user acts
5	If you select Ambient, the SV goes to 25 degrees and maintains this temperature.
6	Move to the DI status check screen

● Step/Hold

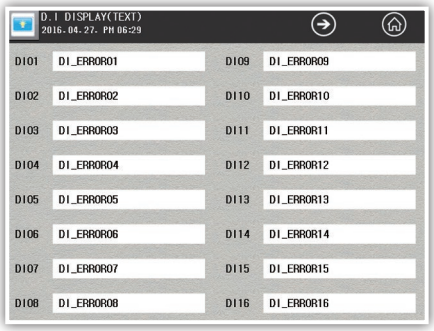
This function is enabled only during program operation. Enter a key or set Hold/Step in [System menu] - [DI configuration] - [Configuration type] and then set external contact input2(DI2) to ON for Hold or external contact input3(DI3) to ON for Step.

Parameter	Description
STEP	Stop the operation of current segment and continue with next segment operation. Run Step in Wait or Hold state to cancel it and continue with next segment.
HOLD	During Hold, press Hold button again to cancel it and run the program.

▶ DI state screen



Picture 23) DI status screen



Picture 23-1) DI status screen2

No.	Description
1	Displays selected DI image. The image can be copied in [System] - [Main menu] – [System menu]. Image is sized to 310 X 210.
2	Displays selected DI name. It can be set in [System] - [Main menu] – [System menu].
3	Turns off buzzer for DI.
4	Select DI. If DI is colored in red, DI contact is ON.

▶ PAUSE FUNCTION

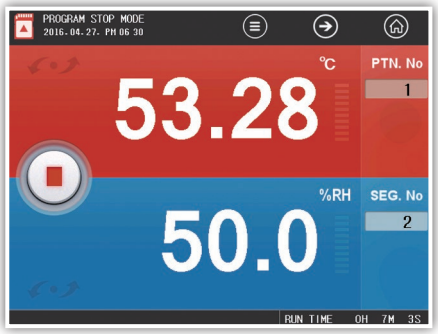


Fig. 24) Pause screen in program stop mode

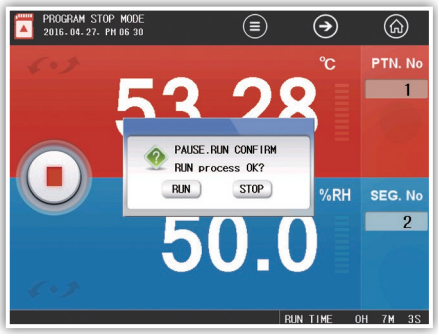


Fig. 25) Program operation in program stop mode

If the operation stops due to DI error, the pause function maintains the program during the error correction, and then goes again to the running program.

● Display messages in the operation screen

Message	Explanation
Fixed operation in progress	–
Program operation in progress	–
[Temperature] Auto tuning in progress	–
[Humidity] Auto Tuning in progress	–
HOLD operation in progress	–
WAIT operation in progress	–
Parameters loading	–
Control communication error	The communication with the control part does not work. Please verify the address of the connection.
[temperature] Input communication error	The temperature value communication in the control part does not work.
[humidity] Input communication error	The humidity value communication in the control part does not work.
IO[0] Module communication error	The module and communication in the input/output address 0 do not work
IO[1] Module communication error	The module and communication in the input/output address 1 do not work
IO[2] Module communication error	The module and communication in the input/output address 2 do not work
IO[3] Module communication error	The module and communication in the input/output address 3 do not work
IO[4] Module communication error	The module and communication in the input/output address 4 do not work
IO[0] Module communication error	The module and communication in the input/output address 5 do not work
Control FRAM error	Cannot read the parameters in the FRAM of the control part
Parameter error (CONFIG)	Error in the standard parameter value
Parameter error(PROG)	Error in the pattern, segment parameter value
PWM calibration error	Out of the PWM calibration value range

2. Operation setting

Screen for operation screen, operation, and data save settings.

▶ Operation setting

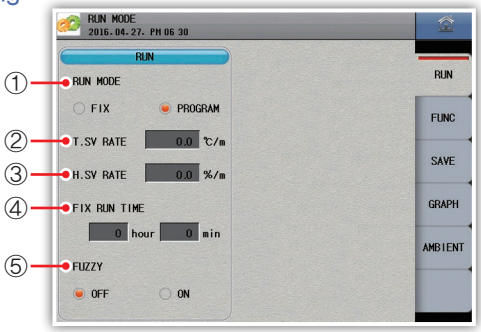


Fig. 26) Operation setting

① Select a control method.

Parameter	Description
Fixed	To control temperature with certain setting value(SV).
Program	To control measurement with change of setting values over time. It is controlled according to a pattern set in [Program] - [Pattern setting].

② During the constant value control, set the temperature change rate per hour(minute).
Activate in case of constant value control.

③ During the constant value control, set the humidity change rate per hour(minute).
Activate in case of constant value control.

④ During the constant value control, stop the operation automatically after operating the set time.
Activate in case of constant value control.

⑤ During the first operation, the present value may overcome the set value (overshoot). To suppress the overshoot you need to select the fuzzy function. If you select the fuzzy function, the temperature rising time may be delayed according to the load, and the present value may not reach the set value (undershoot).

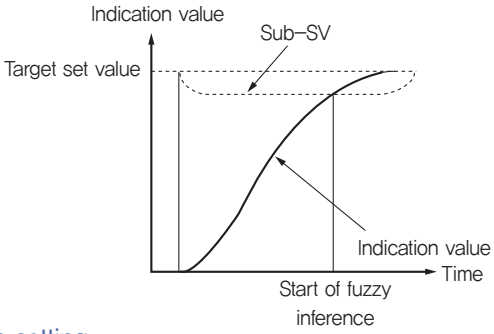
[Operation set parameters]

Parameter	Content	Initial value
Operation method	Fix/Program	Fix
T.SV change rate	0.0 ~ 3000.0 [℃ / minute]	0.0
H.SV change rate	0.0 ~ 3000.0 [% / minute]	0.0
Fixed operation time	0 ~ 9999 [minute]	0
Fuzzy function	Cancel/Set	Cancel

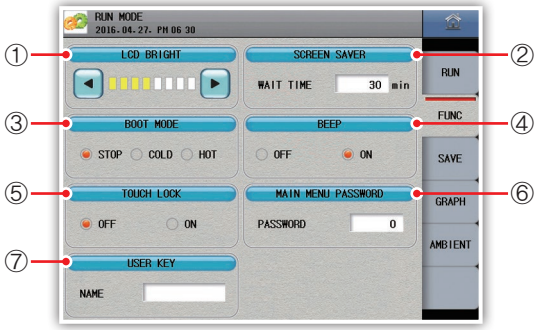
● Fuzzy function

It is to control over shoot using fuzzy inference and useful for the followings.

- To start control where set value and present value show big difference
- To reduce warming-up time
- Significant load change in normal operation
- Frequent changes of setting values



▶ Function setting



Picture 27) function setting

① Control brightness of LCD screen in 8 steps. Press "◀" to dim it and "▶" to brighten it.
② Function to turn off the back light after set time in order to protect the LCD. Time can be set by minute and set "0" to disable it. In the energy–saving mode, touch the screen to wake it up.
③ Select an operation type to recover from power failure.

Parameter	Constant–value control	Program control
STOP	Stopped	Stopped
COLD	Start operation with existing setting value.	Start operation from the 1st segment.
HOT		Start operation from the segment that was selected before blackout.

※ Run the normal operation when momentary power failure occurs within 5 seconds
④ Turn on/off buzzer for input and operation confirmations.
⑤ Use to limit the touch panel input. Only operation screen and move buttons enabled.
If password set in [System setting] - [System], enter the password to change it.
⑥ Use to limit entering to main menu. When trying to enter the main menu, password input box is prompted if any. Set "0" to disable it.
⑦ Change the name of user–defined button. If the language is Korean,
use Caps to enter "Korea –〉 English upper case –〉 English lower case".
If the language is English/Chinese, "English upper case –〉 English lower case" can be entered.

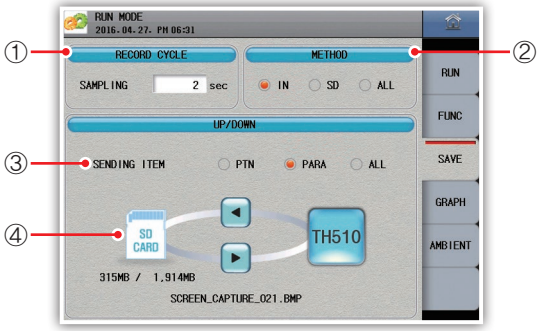
[Function setting parameter]

Parameter	Setting range	Default
Screen brightness adjustment	8 stages	3 stages
Power saving operation time	0 ~ 99 [minutes]	30 minutes
Recovery after power failure	STOP, COLD, HOT	STOP
BEEP sound	Cancel/Set	Set
Touch input lock	Cancel/Set	Cancel
Main menu password enter	0 ~ 9999	0
User button name	Up to 14 characters	User button

- Password input screen

Picture 28) password input screen

▶ Save settings



Picture 29) save settings

① Set data save interval.
② Select data storage.
③ Select setting items to be sent to SD card.
④ Upload/download setting values.

[Function setting parameter]

Parameter	Setting range	Default
Save interval (Sampling time)	1 ~ 360 [sec]	2
Storage media	Internal, SD, and All	All
Item to send	Pattern, Parameter, and All	Parameter
Download	–	–
Upload	–	–

● Upload/Download screen

Fig. 30) Download screen

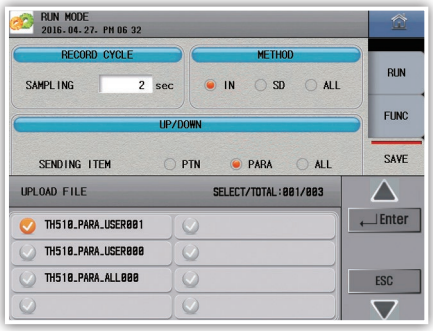


Fig. 31) Upload screen

▶ Graph

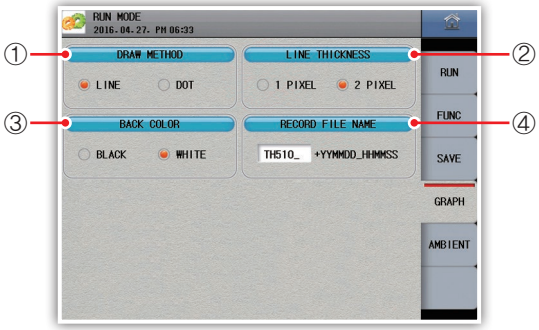


Fig. 32) Graph

1) Select line or dot graph shown in Operation screen 3 and PV graph view screen.
2) Select the thickness of line of graph shown in Operation screen 3 and PV graph view screen.
3) Select background colors for the operation screen 3, PV graph view, and pattern setting screen.
4) Set names of files saved in the internal memory or SD card.

Parameter	Setting	Default
Drawing type	Line and dot	Line
Line thickness	1 pixel and 2 pixels	2 pixel
Background color	Black and white	White
Name of saved file	Up to 6 characters (English, numeric, and symbol)	TH510_

● Screen by selection

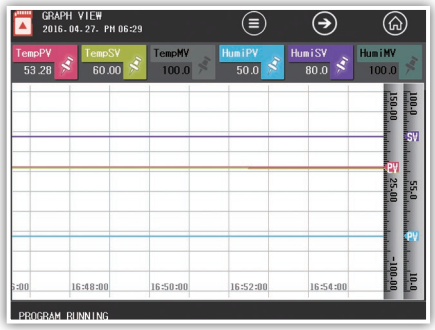


Fig. 33) Line thickness-2 pixels

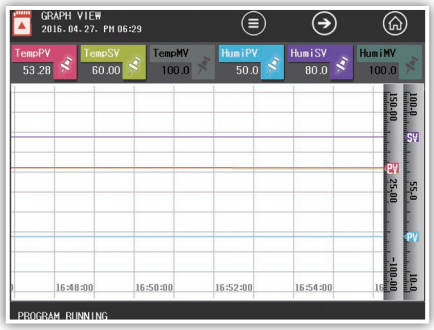


Fig. 34) Line thickness-1 pixel

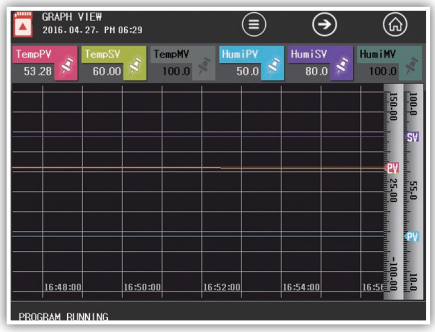
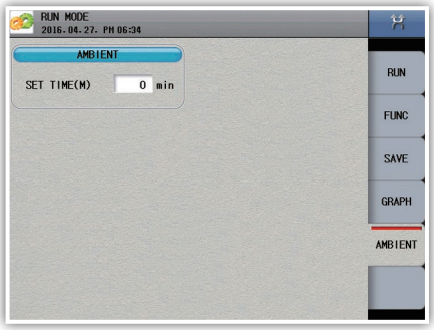


Fig. 35) Background color-Black

▶ Ambient



picture 36) ambient

① Set the ambient operation time

Parameter	Setting range	Default
ambient operation time	0~9999[min]	0

3. PV graph view

Screen to check graph of files saved in the internal memory or SD card.

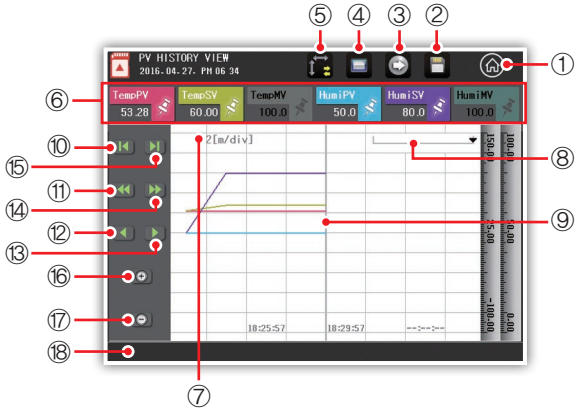


Fig. 37) PV graph view - Time scale

No.	Description
1	Go to menu screen.
2	Displays files saved in an SD card. Up to 512 files (enabled when not saved in SD card)
3	Transfers recorded data to SD card. (enabled when not saved in the internal memory)
4	Displays files saved in the internal memory. (enabled when not saved in the internal memory)
5	Select time and size scales.
6	Displays or hides graph of selected value.
7	Displays time unit by gradation.
8	Displays position of data specified by the base line.
9	Base line to display values.
10	Go to beginning of data.
11	Go to previous page.
12	Go to previous pixel. Press and hold it to move by 10 and 20 pixels.
13	Go to next pixel. Press and hold it to move by 10 and 20 pixels.
14	Go to next page.
15	Go to end of data.
16	Scale up time scale. It can't exceed the save interval.
17	Scale down time scale. Scale factors are x1, x2, x4, x8, and x16.
18	Displays storage position and name of displayed files. Ex) SD : TH510_140606_140605 – TH510_140606_140605 file stored in SD card

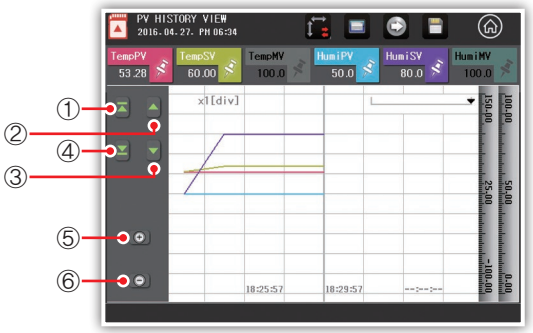


Fig. 38) PV graph view - Size scale

No.	Description
1	Go to max value of data.
2	Go to previous pixel. Press and hold it to move by 10 and 20 pixels.
3	Go to next pixel. Press and hold it to move by 10 and 20 pixels.
4	Go to min value of data.
5	Scale up size scale. Scale factors are x1, x2, x4, and x8.
6	Scale down size scale. The smallest scale factor is x1.

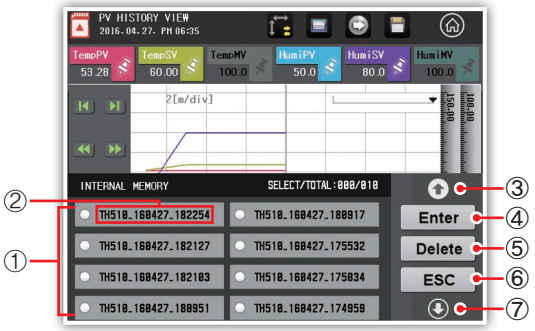
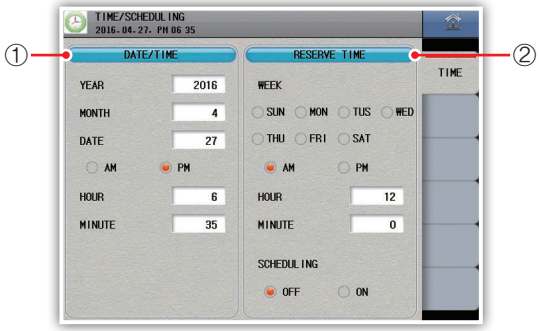


Fig. 39) PV graph view - File selection pane

No.	Description
1	Select a file.
2	This is the name of saved file. The name can be changed in "Graph of operation setting."
3	Go to previous page.
4	Displays graph of selected file.
5	Deletes a selected file.
6	Cancels selection.
7	Go to next page.

4. Time/schedule setting

Screen to set current time and schedule. Schedule can be repeated by day.



Picture 40) time/schedule setting

No.	Description
1	Set the present time. It is not possible to change while saving
2	Set the operation start schedule time

※ Selection of repeated days of the week available

Present time setting parameters

Parameter	Setting	Default
Year	2000 ~ 2099	–
Month	1 ~ 12	–
Date	1 ~ 31	–
AM/PM	AM/PM	–
Hour	1 ~ 12	–
Min.	0 ~ 60	–

Schedule time setting parameters

Parameter	Setting	Default
Operation day	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	–
AM/PM	AM/PM	AM
Hour	1 ~ 12	12
Minutes	0 ~ 60	0
Reservation confirm	cancel, set	cancel

5. Event

Screen to show event or error history.

▶ Event

Displays history of up to 80 events.

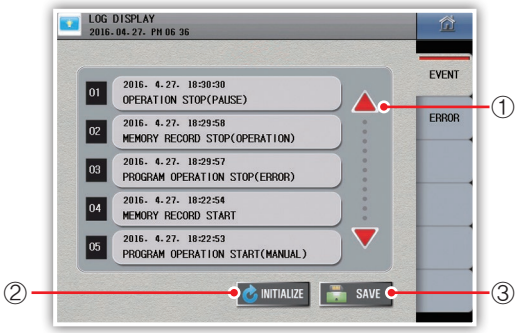


Fig. 41) Event history

No.	Description
1	Go to other pages. History of up to 80 items can be checked.
2	Initialize event history. (enabled when it is not being saved)
3	Save event history to SD card. (enabled when it is not being saved)

Event message	Description
Power on	TH510 turns on
Power off	TH510 turns off
Add SD card	SD card recognized
Remove SD card	SD card is removed
Fixed control start (manual)	Fix operation started by RUN button
Fixed control start(communication)	Fix operation started by communication
Fixed control start(DI1)	Fix operation started by Contact input (DI1)
Fixed control start(HOT)	Fix operation started by power failure recovery
Fixed control start(COLD)	Fix operation started by power recovery (COLD)
Fixed control start(reservation)	Fixed control started by scheduled time
Fixed control stop (manual)	Fixed control stopped by STOP button
Fixed control stop(communication)	Fix operation stopped by communication
Fixed control stop(DI1)	Fix operation stopped by Contact input (DI1)
Fixed control stop(error)	Fix operation stopped due to error
Fix operation normal end	Fix operation ended normally
Program operation start (manual)	Program operation started by RUN button
Program operation start(communication)	Program operation started by communication
Program operation start(DI1)	Program operation started by contact input (DI1)
Program operation start(HOT)	Program operation started by power recovery
Program operation start(COLD)	Program operation started by power recovery
Program operation start(reservation)	Program operation started by reservation function
Program operation stop (manual)	Program operation stopped by STOP button
Program operation stop(communication)	Program operation stopped by communication
Program operation stop(DI1)	Program operation stopped by contact input (DI1)
Program operation stop(error)	Program operation stopped due to error
Program operation normal end	Program operation ended normally

Event message	Description
Hold function start (manual)	Hold started by HOLD button
Hold function start(communication)	Hold started by communication
Hold function start(DI2)	Hold started by contact input (DI2)
Hold function stop(manual)	Hold stopped by HOLD button
Hold function stop(communication)	Hold stopped by communication
Hold function stop(DI2)	Hold stopped by contact input (DI2)
Step function action (manual)	Step in progress by STEP button
Step function action(communication)	Step in progress by communication
Step function action(DI3)	Step in progress by contact input (DI3)
Temperature auto-tuning start(manual)	Auto-tuning started by temperature auto-tuning button
Temperature auto-tuning start(communication)	Temperature auto-tuning started by communication
Temperature auto-tuning stop(manual)	Temperature auto-tuning stopped by button
Temperature auto-tuning stop(communication)	Temperature auto-tuning stopped by communication
Temperature auto-tuning correct power off	Temperature auto-tuning turned off correctly
Humidity auto-tuning start (manual)	Auto-tuning started by humidity auto-tuning button
Humidity auto-tuning start (communication)	Humidity auto-tuning started by communication
Humidity auto-tuning stop (manual)	Humidity auto-tuning stopped by humidity auto-tuning button
Humidity auto-tuning stop (communication)	Humidity auto-tuning stopped by communication
Humidity auto-tuning correct power off	Humidity auto-tuning turned off correctly
SD card save start	Saving in SD card started
SD card save stop	Saving in SD card stopped
SD card save stop (no memory)	Saving in SD card stopped because of SD card removal
SD card save stop (over capacity)	Saving in SD card stopped because of over capacity
SD card save stop (exceeded the number of files)	Saving in SD card stopped when the SD storage capacity is full (max 512 files)
Memory save start	Start the saving in the internal memory
Memory save stop	Stop the saving in the internal memory
Memory save stop (overcapacity)	The saving has been stopped because the internal memory capacity has been overcome
Memory save stop (number of files exceeded)	The saving has been stopped because the number of files produced in the internal memory exceeded the capacity (max 512 files)
Internal memory reset	Internal memory has been reset
Parameter reset	The parameters have been reset
SD card paameter upload (PTN)	The pattern data have been uploaded by the SD card
SD card paameter upload(PARA)	The parameters have been uploaded to the SD card
SD card paameter upload(ALL)	The pattern data and parameters have been uploated by the SD card
Parameter reset (SUM ERROR)	Parameters have been reset because of errors
Event history reset	Event history has been reset
Error history reset	Error history has been reset.
User logo upload	User logo has been uploaded
User button action	User button operated
User button cancellation	User button cancelled
Next operation start (manual)	Operation started by RUN button
PAUSE	Operation stopped by STOP button
Ambient start (manual)	Ambient operated manually
Ambient start(communication)	Ambient operated by communication
Ambient stop(manual)	Ambient operation stopped manually
Ambient stop(communication)	Ambient operation stopped by communication

▶ Error

Displays history of up to 40 errors.

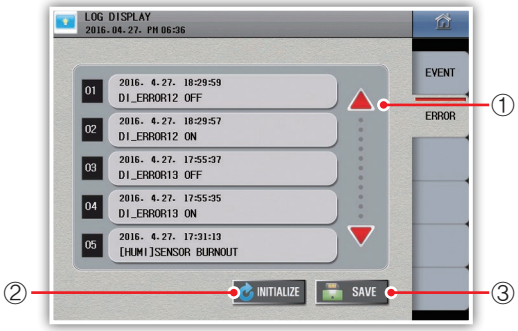


Fig. 42) Error history

No.	Description
1	Go to other pages. History of up to 40 items can be checked.
2	Initialize error history. (enabled when it is not being saved)
3	Save error history to SD card. (enabled when it is not being saved)

Error message	Description
[Temperature] sensor disconnection	Temperature sensor disconnected
[temperature] ADC error	Error in the temperature ADC converter
[temperature] calibration error	Error in the temperature calibration
[temperature] input connection error	error in temperature input connection
[Humidity] sensor disconnection	The humidity sensor is disconnected
[Humidity] ADC error	An error has occurred in the humidity ADC converter
[Humidity] calibration error	Error in humidity calibration
[Humidity] input connection error	Error in humidity input connection
I/O[nn] connection error	No connection in I/O[nn]
D.I nn occur	contact input (D.I nn) occurred
(D.I nn) cancel	contact input (D.I nn) cancelled
P. alarm nn occur	Pattern alarm (P. alarm nn) occurred
P. alarm nn cancellation	Pattern alarm (P. alarm nn) has been canceled
S alarm nn occurring	System alarm (S. alarm nn) occurred
S. alarm nn cancellation	System alarm (S. alarm nn) has been canceled

PROGRAM

Fig. 43) Main menu

Fig. 44) Program menu

Program control is the process of control measurements with a change in the set value according to the time. This is particularly widely used in environmental testing equipment such as thermostatic humidity chamber, electric furnace, etc. On this screen, you can set the parameters related to program controls.

1. Pattern setting

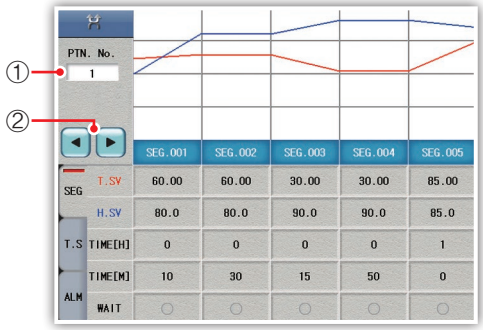


Fig. 45) Pattern setting

No.	Description
1	Change the pattern No. (Pattern 1 – 100)
2	Move by 5 segment. If a segment is selected, it is changed to Insert/Delete button.

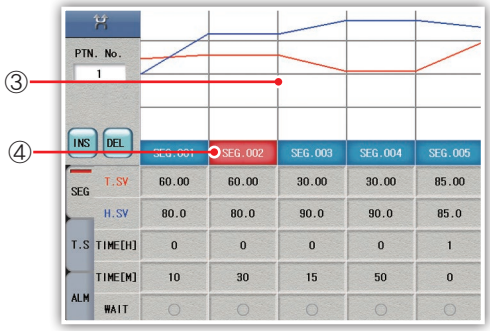


Fig. 46) Pattern insertion/deletion

No.	Description
3	Pattern graph is displayed.
4	Select a segment. Selected segment can be inserted/deleted.

▶ Seg

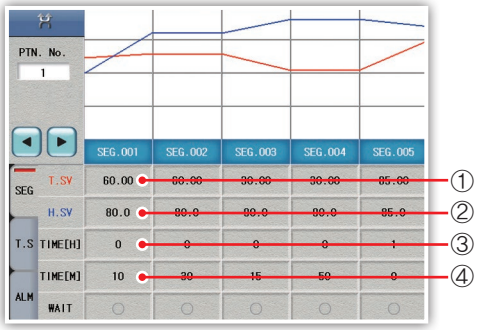


Fig. 47) segment setting

No.	Description
1	Set the temperature settings (value) of the segment.
2	Set the humidity settings (value) of the segment
3	Set the operation time of the segment
4	Select the standby feature in “standby/start pattern management”

[Segment parameters]

Parameter	Setting	Default
TemperatureSV	TemperatureEU(0 ~ 100) [℃]	EU(0)
HumiditySV	HumidityEU(0 ~ 100) [%]	EU(0)
Time	0 ~ 9999 [H]	0
	0 ~ 59 [M]	0
Waiting Release	Cancel, set	0

▶ T.S

Fig. 48) Time signal

Among 20 time signals, up to 4 of them can be selected for a segment.

[T.S parameter]

Parameter	Setting	Default
T.S #n	0~19	0

n : 1~4

▶ Alarm

Fig. 49) Alarm signal

Among 8 pattern alarms, up to 4 of them can be selected for a segment.

[Alarm parameter]

Parameter	Setting	Default
P.AL #n	0 ~ 8	0

n : 1~4

2. Pattern management

▶ Pattern information

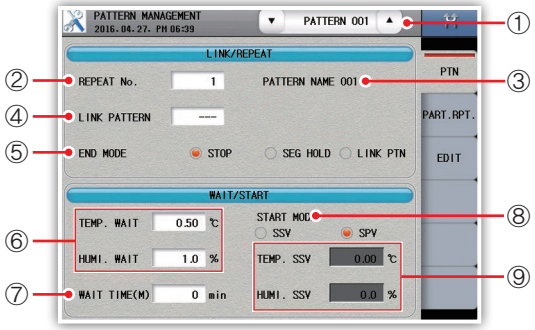


Fig. 50) Pattern information

① Select a pattern. Parameters can be set for individual patterns in this screen.
② Set the number of pattern cycles.
③ Displays name of selected pattern.
④ When current pattern operation is finished, set a pattern No. to continue operation.
If End mode is selected as a connected pattern, the connected operation is conducted.
⑤ Set end mode.

Parameter	Description
Stop operation	Stop operation when current pattern is finished.
Holding seg	Continue operation with setting values of last segment.
Connect	Continue operation with the pattern set to the connected pattern No.

⑥ If a measurement is out of wait operation range of setting value, it waits for a segment to continue during set wait operation time and then moves to next segment. Wait operation may be set by segment of the pattern.
⑦ Set wait operation time. Set “0” to wait operation time in order to skip wait operation.
⑧ Set Start mode.

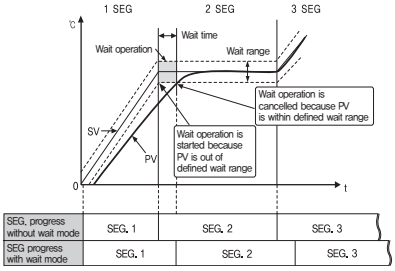
Parameter	Description
SSV	Start operation with start setting value.
SPV	Start operation with current specific value.

⑨ If SSV is set to Start mode, start SV can be set by channel.

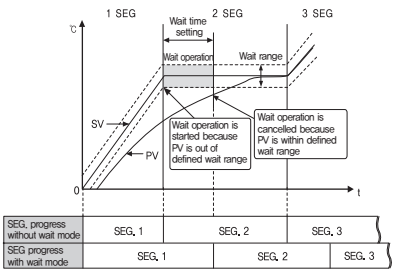
[Pattern information parameter]

Parameter	Setting range	Default
Number of pattern cycles	1 ~ 999	1
Connected pattern No.	0 ~ 100	0
End mode	Stop operation, Holding seg, and Connect pattern	Stop operation
Temperature Wait	Temperature EU(0 ~ 100) [℃]	0.0
Humidity Wait	Humidity EU(0 ~ 100) [%]	0.0
Wait operation (M)	0 ~ 9999 [M]	0
Start mode	SSV, SPV	SPV
Temperature Start SV	Temperature EU(0 ~ 100) [℃]	0.0
Humidity Start SV	Humidity EU(0 ~ 100) [%]	0.0

● Wait operation

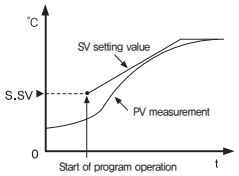


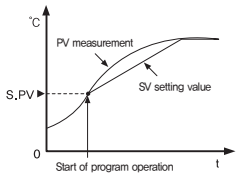
If measurement (PV) is out of wait range, it waits until the measurement(PV) enters the wait range for defined wait time.



If wait time is elapsed, it moves to next segment even though measurement(PV) is out of wait range.

● Operation start mode





▶ Part repetition

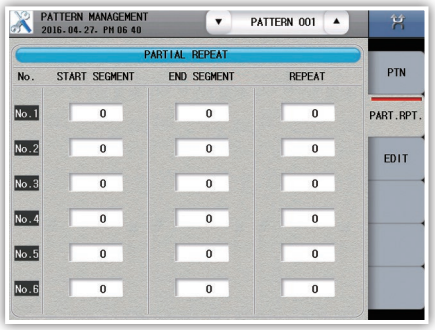


Fig. 51) Part repetition

Part repetition: total 6 per pattern setting possible, from n.1 in order progression.
1) Set the start segment number. If set 0, execute from next part repetition
2) Set the stop segment number. If set 0, execute from next part repetition
3) Set the part repetition count

[Part repetition Parameter]

Parameter	Setting range	Default
Start segment	0 ~ 100 SEG	0
Stop segment	0 ~ 100 SEG	0
Part repetition	0 ~ 99	0

▶ Copy/Delete

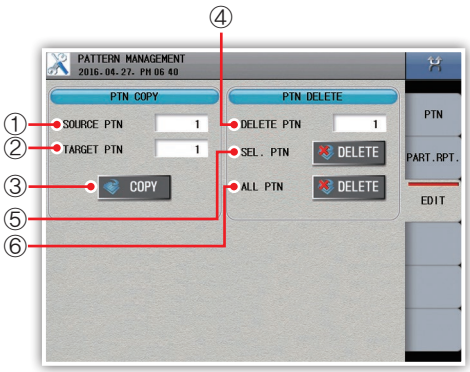


Fig. 52) Pattern copy/deletion

① Select an original pattern.
② Select a target pattern.
③ Copy the pattern.
④ Select a patter No. to delete.
⑤ Delete the pattern.
⑥ Delete all patterns.

[Copy/Delete parameter]

Parameter	Setting range	Default
Original pattern No.	1 ~ 100	1
Copied pattern No.	1 ~ 100	1
Deleted pattern No.	1 ~ 100	1

3. Pattern name setting

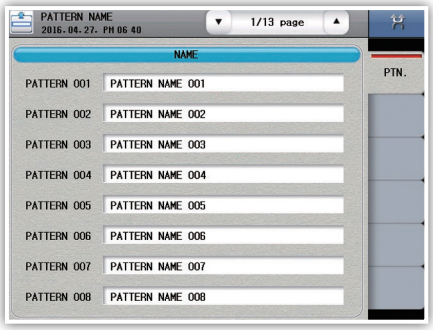


Fig. 53) Pattern name

① Go to other page. Up to 8 pattern names can be set per page.
② Change a pattern name. If the language is Korean, use Caps to enter "Korea –〉 English upper case –〉 English lower case". If the language is English/Chinse, "English upper case –〉 English lower case" can be entered

[Pattern name parameter]

Parameter	Setting range	Default
Pattern name nn	Up to 23 characters	PATTERN NAME nn

nn : 1 ~ 100

4. Pattern alarm setting

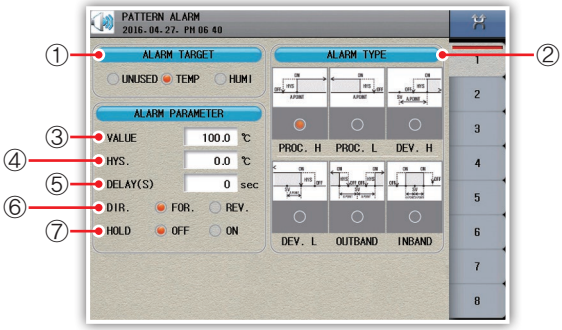
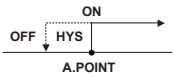
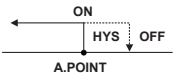
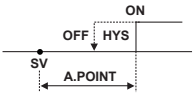
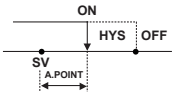
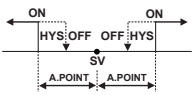
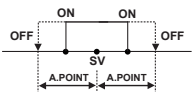


Fig. 54) Pattern alarm

① Select an alarm target.
② Select an alarm type.
③ Set a setting value(offset).
④ Set hysteresis.
⑤ Set delay.
⑥ Set direction of alarm. NORMAL OPEN or NORMAL CLOSE
⑦ Set hold function.

- Alarm operation

Absolute upper limit	Absolute lower limit	Upper limit of offset
		
Lower limit of offset	**Out of range**	**Within range**
		

[Pattern alarm parameter]

Parameter	Setting range	Default
Alarm target	None, Temperature, Humidity	None
Alarm type	Absolute superior limit, absolute inferior limit, deviation superior limit, deviation inferior limit, in–range, out–range	0
Setting value (offset)	Absolute superior limit, absolute inferior limit: EU (0~100), deviation superior limit, deviation inferior limit: EUS (–100 ~ 100), in–range, out–range: EUS (0~100)	0.0
Hysteresis	EUS(0 ~ 100)	0.0
Delay(S)	0 ~ 9999 [Min.]	0
Direction	Forward direction, reverse direction	Forward direction
Hold	Cancel, Set	Cancel

5. Time signal setting

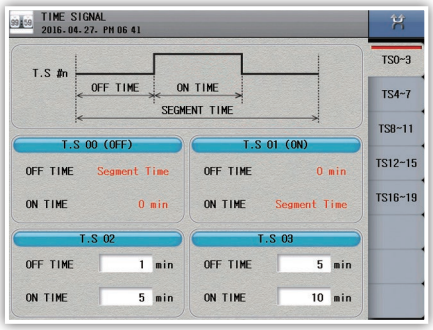


Fig. 55) Time signal

Up to 20 time signals can be set.
① Set OFF time. Time signal is on after waiting for defined time from the start point of segment.
② Set ON time. Time signal is on during defined time from the ON point of segment.

[Time signal parameter]

Parameter	Setting range	Default
OFF Time	0~9999 [M]	0
ON Time	0~9999 [M]	0

- Time signal operation

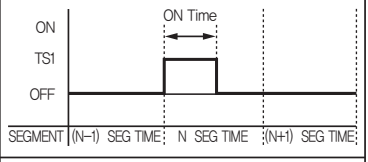
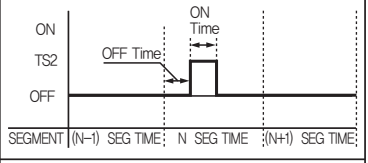
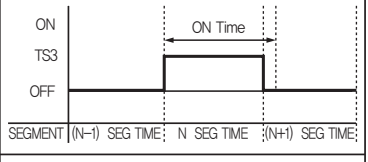
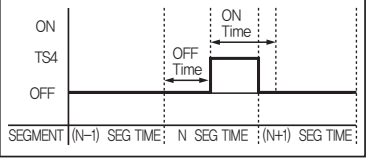
1. TS1 1) SEG TIME ≥ OFF TIME + ON TIME 2) OFF TIME = 0	
2. TS2 1) SEG TIME ≥ OFF TIME + ON TIME 2) OFF TIME ≠ 0	
3. TS3 1) SEG TIME < OFF TIME + ON TIME 2) OFF TIME = 0	
4. TS4 1) SEG TIME < OFF TIME + ON TIME 2) OFF TIME ≠ 0	

Fig. 56) Time signal operation

6. Pattern graph

For program operation, pattern and time are shown in a graph.

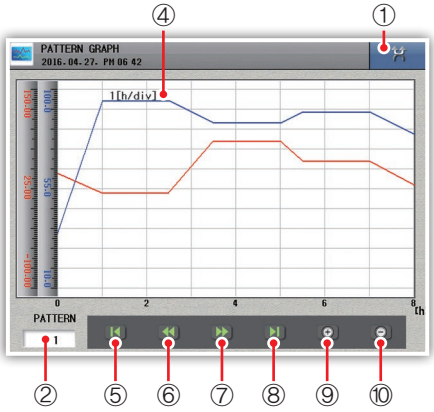


Fig. 57) Pattern graph

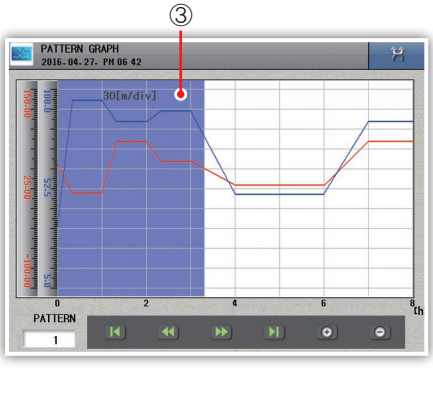


Fig. 58) Pattern graph – Operation

No.	Description
1	Go to program menu screen.
2	Change patter No. (No.1 – 100).
3	Blue background color is the progress of operation.
4	Displays time by gradation.
5	Go to beginning of pattern graph.
6	Go to previous screen.
7	Go to next screen.
8	Go to end of pattern graph.
9	Scale up time scale.
10	Scale down time scale.

System setting

▶ Access to system setting

Danger

Caution: System setting is a pre-installed basic setting condition so you need special attention when you change them. There is no need for operators to set system unless special case, strict care is required when changing System settings.

Fig. 59) Access to system setting

- Default password is "0".
- To restrict access of users, press System icon to enter System setting screen and change user password. (For more details, refer to page. 74)

1. Sensor input setting

▶ Temperature/Humidity Settings

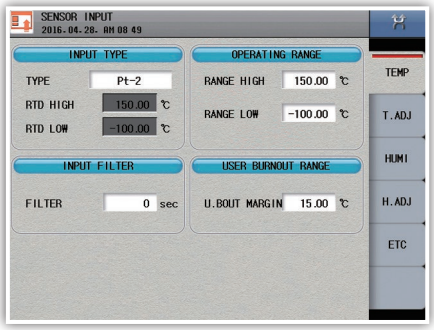


Fig. 60) Temperature sensor change

Fig. 61) Temperature sensor change

1. Sensor type
   – Select a sensor type. It can't be changed when it is being saved.
   – If the type of sensor is changed, related parameters(use range) are initialized so set the type of sensor first.
2. Use range
   – Enter range values to use. It can't be changed when it is being saved.
3. Input filter
   – Enter a digital filter value of input.
4. Burn–out range setting
   –Operators can set burn–out range.
   –For example, if operator set '10' with the temperature range –100~200, the equipment stops when the temperature is outside the range

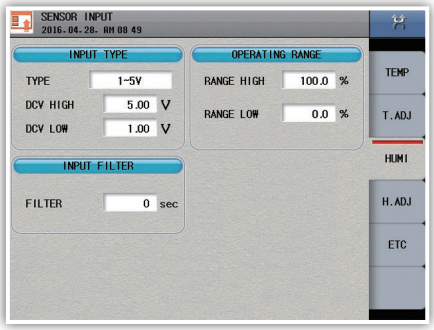


Fig. 62) Humidity sensor setting

Fig. 62) Humidity sensor change

1. DCV input upper/lower limit
   – If the sensor is DCV, define the input value of DC voltage. It can't be changed when it is being saved.

● Temperature

Parameter	Setting range	Default
Sensor Type	Please refer to the table of temperature range by sensor type	PT-2
RTD High setting limitation/ DCV Input High setting limitation	RTD only available with the default setting/DCV sensor range	RTD upper limit
RTD low setting limitation/ DCV input low setting limitation	RTD only available with the default setting/DCV sensor range	RTD lower limit
Temperature Range Upper-limit	-99.99~150.00	150.00
Temperature Range Lower-limit	-100.00 ~ 149.99	-100.00
Input filter	-0~120 Sec.	0 sec
User burn-out	0 ~ 50 ℃	15℃

● Humidity settings

Parameter	Setting range	Default
Sensor Type	Please refer to the table of temperature range by sensor type	1 – 5 V d.c.
RTD High setting limitation/ DCV Input High setting limitation	RTD only available with the default setting/DCV sensor range	DCV high setting limitation
RTD low setting limitation/ DCV input low setting limitation	RTD only available with the default setting/DCV sensor range	DCV low setting limitation
Temperature Range Upper-limit	-0.1 ~ 100.0	100.0
Temperature Range Lower-limit	0 ~ 99.9	0.0
nput filter	0 ~ 120 sec	0 sec

▶ Temperature/Humidity compensation

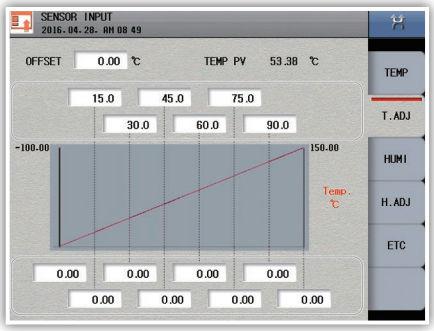


Fig. 64) Temperature compensation

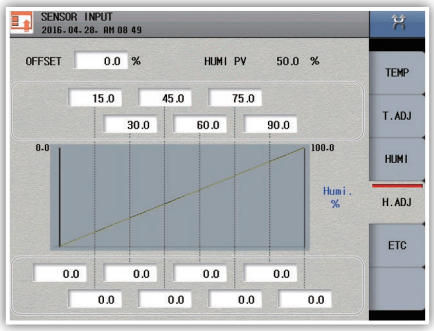


Fig. 65) Humidity compensation

1. Compensation Value
   – Calibrate the difference between the indicated temperature on the device and the actual temperature.
2. Compensation by the range
   – Used when compensation in a certain temperature range required
   – Set the temperature or humidity range requiring compensation
   – Set the offset value in each temperature or humidity range.

Parameter	Setting Range	Default Value
Compensation value	온도 EUS (0 ~ 100)	0
Compensation value at a certain temperature	-50.0 ~ 50.0	0

Caution

• Compensation on a certain point is changing the grade, users shall set the value according to their purpose and usage.

▶ Other Settings

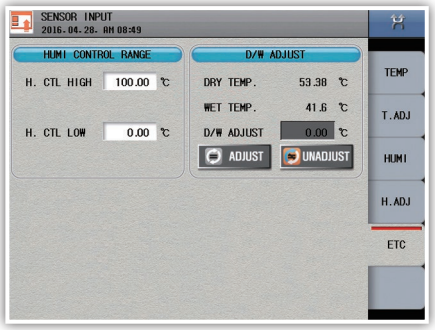


Fig. 66) Dry/Wet-bulb compensation

1. Humidity Control Rage
   - –Set the humidity range requiring humidity controlling
   - –If the value is outside the range, the value is not indicating, and control out put is off.
2. Dry/Wet-bulb Temperature Compensation
   - –Dry-bulb Temperature: The dry-bulb temperature is indicated
   - –Wet-bulb Temperature:The wet-bulb temperature is indicated
   - –Dry/Wet-bulb Adjustment:The value of sensors can be adjusted.
   - –The relative humidity is figured out by the difference between Dry and Wet-bulb temperatures, it is very important to adjust each temperature.
   - –Adjustment after when both temperature values are stable is recommended.
   - –'ADJUST': Apply the temperature/humidity compensation values
   - –'UNADJUST': Reset the adjustment

Parameter	Setting Range	Default
Upper control range	–99.99 ~ 150.00	100.00
Lower control range	–100.00 ~ 149.99	0.00
Dry/Wet-bulb adjustment	–100.00 ~ 100.00	0

Caution

Before adjustment, please make sure that adjustment is done when the values of dry & wet-bulb sensor are stable, and gauze is removed.
After adjustment, please place an gauze back to the sensor.

2. Control/transmission output setting

▶ Temperature/Humidity Control output

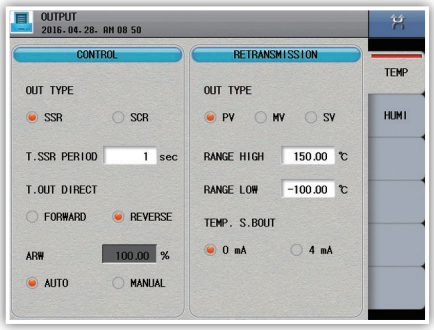


Fig. 67) Temperature Control output

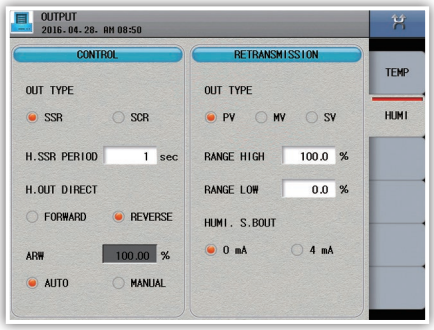


Fig. 68) Humidity Control output

1. Control mode
   – Select control mode
2. SSR Period
   – Set the control output period when SSR mode is selected
3. Output Direction
   – Set output direction
4. Anti Reset Wind-up
   – Select operation mode automatic/manual
   – When the mode is 'MANUAL', operator can set the ARW zone manually.

[Control Output Parameter]

● Temperature

Parameter	Setting Range	Default
Output mode	SSR, SCR	SSR
SSR Period	1 ~ 1000	1
Output Direction	Direct, Reverse	Reverse
ARW	AUTO, MANUAL	AUTO
ARW Zone	50 % ~ 200 %	100 %

● Humidity

Parameter	Setting Range	Default
Output mode	SSR, SCR	SSR
SSR Period	1 ~ 1000	1
Output direction	Direct, Reverse	Reverse
ARW	AUTO, MANUAL	AUTO
ARW Value	50 % ~ 200 %	100 %

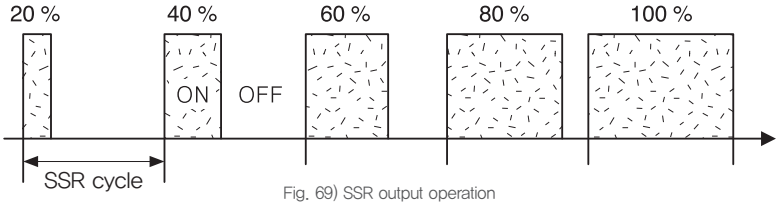


Fig. 69) SSR output operation

If Voltage pulse output[SSR] is selected, the output is 20 % – 100 %. According to the voltage pulse output cycle, control output is ON for certain time (OFF for the rest).

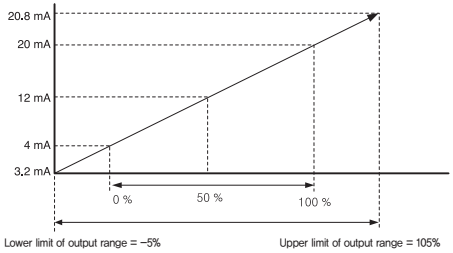


Fig. 70) Current output (SCR)

If current output is selected, it shows relation between control output(MV) and output range. If the lower limit is –5 % or upper limit is 105 %, it outputs 3.2 mA DC or 20.8 mA DC, respectively. Within the range, control output value is linearly converted and output.

▶ Temperature/Humidity Retransmission Output

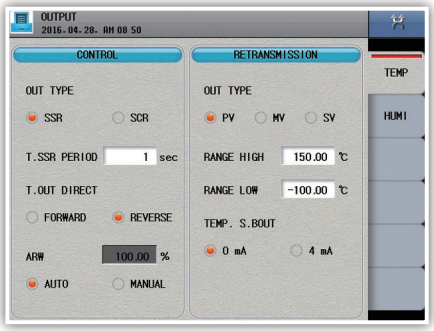


Fig. 71) Retransmission Setting

1. Output Type
   – The selected output type is used for inputing data to recorders etc. Output signal is 4–20mA d.c., select between PV, MV, SV.
2. Output Range
   – Set the upper/lower limit value
3. Sensor Burnt–out
   – Select between 0mA and 4mA.

[Retransmission Parameter]

Parameter	Setting Range	Default
Output Type	PV, MV, SV	PV
Output Upper Limitation Value	EU(0 ~ 100%)	EU 100%
Output Lower Limitation Value	EU(0 ~ 100%)	EU 0%
Temperature Burnt out Output	0 mA, 4 mA	0 mA

3. PID setting

▶ PID setting

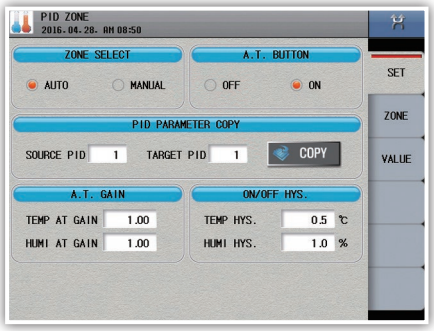


Fig. 72) PID setting

1. Zone selection type
   – Set PID zone selection type.
2. PID control type
3. Copy PID time constant
   – Original channel : No. of original channel
   – Target channel : No. of target channel
   – Original PID : No. of original PID
   – Target PID : No. of target PID
   – Enter 0 to original PID and copy it in order to copy all PID values of it to a target channel.
4. A.T. GAIN
   – Used to manually and finely optimize PID numerical values automatically calculated with constant values applied to individual PID items for calculating PID.
5. ON/OFF HYS.
   – Set hysteresis(width) for auto tuning or ON/OFF control.

Parameter	Setting range	Default
PID ZONE Mode	AUTO, MANUAL	AUTO
A.T. Button Dissplay	OFF, ON	ON
Temperature A.T. Gain	0.01 ~ 10.00	1.00
Humidity A.T. Gain	0.01 ~ 10.00	1.00
Temperature HYS.	0.0 ~ 250.0 ℃	0.5 ℃
Humidity HYS.	0 ~ 100.0 %	1.0 %

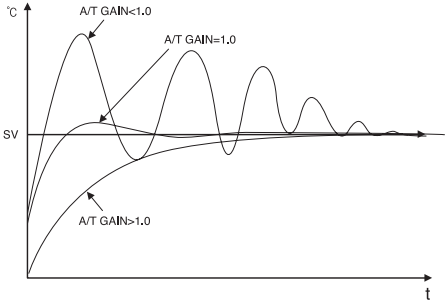


Fig. 73) Change of control characteristics(PV) according to changed auto-tuning gain

● Auto tuning gain(A/T gain)

Condition	Unit
GAIN 〈 1.0	With stronger derivative and integral controls than auto-tuned PID value, overall response speed becomes faster but the hunting may be more.
GAIN = 1.0	Auto-tuned PID value is used as is.
GAIN 〉 1.0	With weaker derivative and integral controls than auto-tuned PID value, overall response speed becomes slower but over shoot can be reduced for more stability.

▶ PID ZONE

PID zone consist of each 4 zones for temperature and humidity, total 16 PID zones are used for temperature/humidity simultaneous control.

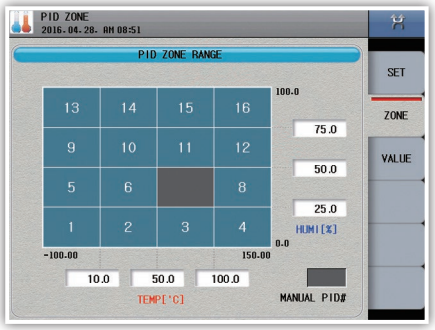


Fig. 74) PID zone

1. Temperature range value
   – The range is decided automatically by user's temperature setting range
2. Humidity range value
   – The range is decided automatically by user's humidity setting range
3. Manual PID Number
   – Setting range: 1~16
   –If the numbers are set manually, only manually-set zones are referred.

▶ PID value

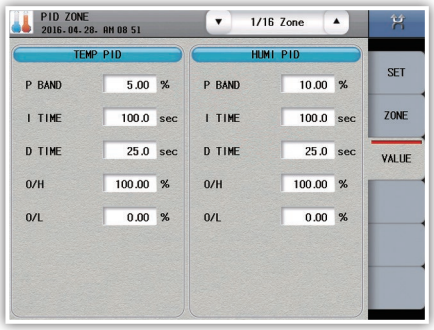


Fig. 75) PID value

1. Proportion(P) zone
   – Set proportional band. If the proportional band is larger, control output becomes smaller for the offset and thus the setting value is reached later. If the proportional band is smaller, control output becomes larger for the offset and thus the setting value is reached quicker but there might be hunting if it is too quick.

2. Integral(I) time
   – Set integral time. There can be offset only with proportional control. Integral is used to reduce the offset. If the integral time is too long, it is changed too late but if it is too short, there might be frequent hunting.

3. Derivative(D) time
   – Set derivative time. To compensate for sharp temperature change, control output is proportional to the angle of temperature change. If derivative time is longer, compensation becomes stronger.

4. Upper limit of output (O/H)
   – Set upper limit of output range.

5. Lower limit of output (O/L)
   – Set lower limit of output range.

Parameter	Setting range	Default
Proportion(P) zone	0.00 ~ 100.00	5.00
Integral(I) time	0.0 ~ 3000.0	100.0
Derivative(D) time	0.0 ~ 3000.0	25.0
Upper limit of output (O/H)	0.00 ~ 100.00	100.00
Lower limit of output (O/L)	0.00 ~ 100.00	0.00

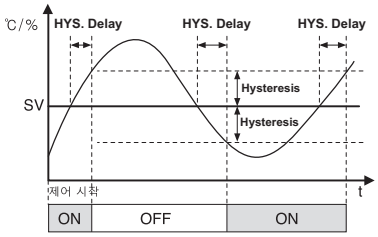


Fig. 76) ON/OFF control

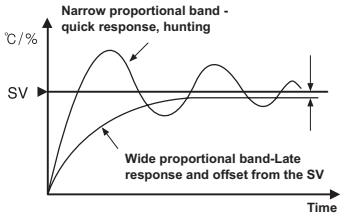


Fig. 77) Proportional control (P control)

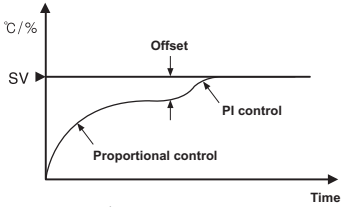


Fig 78) Proportional/proportional, Integral control(P control/P.I)control

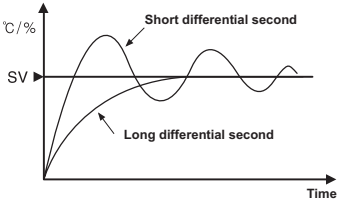


Fig 79) Proportional integral control (P.I control)

4. Inner signal

▶ Inner signal setting

– Set target, range direction, and type of individual inner signals.
– Up to 16 inner signals can be set

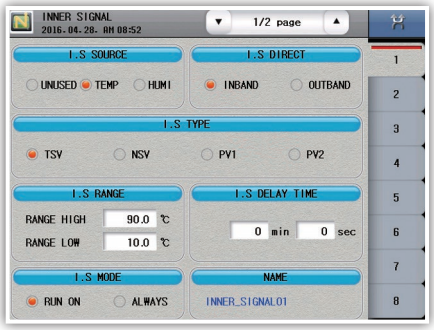


Fig 80) Inner signal – 1

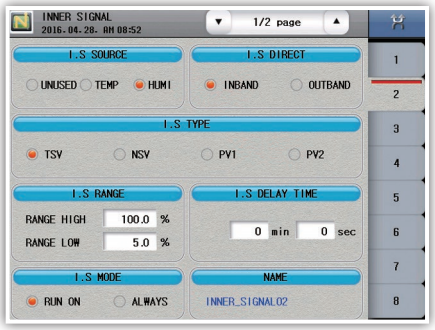


Fig. 81) Inner signal – 2

1. Target setting
   – Set a target of inner signal.
2. Range direction
   – Set the operation range of temperature to use inner signal.
3. Type
   – Set a target of inner signal to apply.
   – T.S.V : Based on target setting value
   – N.S.V : Based on current measurement
   – P.V1 : Based on operation range L and H for measurement
   – P.V2 : Based on setting values and their offset setting values

4. Operation range
 – Set upper and lower limits of operation range for target.
5. Operation delay
 – Set operation delay for target.
6. Operat;ion Mode
 – Always : always execute the inner signal
 – Running : execute the inner signal during operation only

Parameter	Setting range	Default
Target set	Unused, temperature, humidity	Unused
Range direction	Within range, Outside range	Within range
Signal points	TSV, NSV, PV1, PV2	TSV
Operation range upper limit	–99.9 ~ 150.0	0.0
Operation range lower limit	–100.0 ~ 149.9	0.0
Operation delay time	0~9999M 59S	0
Operation conditions	always, during operation	Running

▶ Inner signal name setting

– Click the icon on upper left of alarm setting screen in order to go to the inner signal name setting screen.

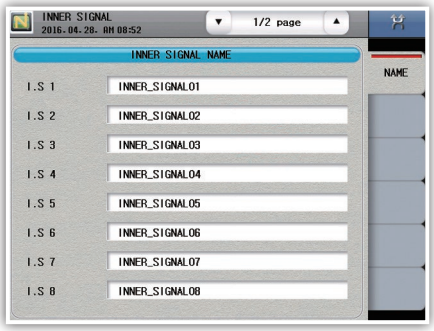


Fig. 82) Inner signal name

Fig. 83) Enter an inner signal name

1. Enter an inner signal name (using Korean, English, numeric, and symbol characters).
2. An inner signal name may include up to 24 characters (12 ones in Korean).

Parameter	Setting range	Default
Inner signal name	Korea, English, numeric, and symbol characters	INNER_SINGALnn

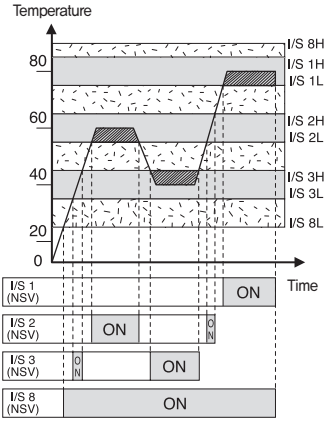


Fig. 84) Example of inner signal setting (NSV)

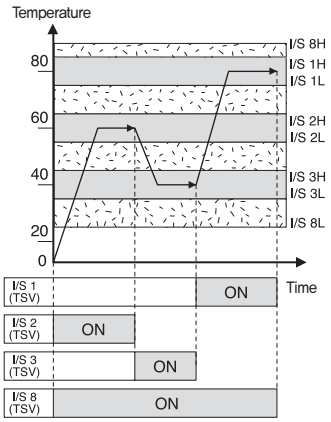


Fig. 85) Example of inner signal setting (TSV)

Fig. 81 is an example of setting inner signal(I.S) NSV. Inner signal No. 1 – 3 and 8 are set with temperature, NSV, and Within range so that the inner signal is turn on or off according to change of current setting value(SV).
Fig. 82 is an example of setting inner signal No.1 – 3 and 8 with temperature, TSV, and Within range. Based on TSV as a target setting value, the inner signal is turned on/off to show difference with NSV.
Fig. 83 is an example of setting inner signal No.1 – 3 and 8 with temperature, PV1, and Within range, and Fig. 84 is an example of setting inner signal No.1 and 2 with temperature, PV2, and type to set ascending/descending.

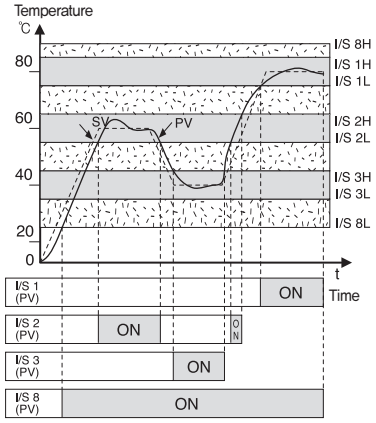


Fig. 86) Example of inner signal setting (PV1)

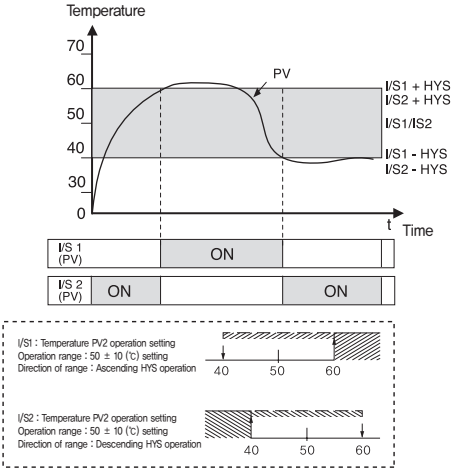


Fig. 87) Example of inner signal setting (PV2)

5. ON/OFF signal

▶ Temperature/Humidity setting

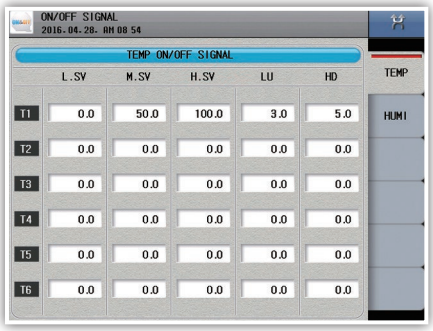


Fig. 88) ON/OFF - Temperature

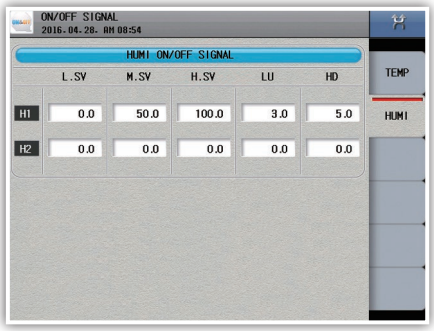


Fig. 89) ON/OFF - Humidity

6 Points for temperature, 2 points for humidity are available for ON/OFF signal

1. L.SV
   – Set lower limit of ON/OFF signal operation.
2. M.SV
   – Set median of ON/OFF signal operation.
3. H.SV
   – Set upper limit of ON/OFF signal operation.
4. LU
   – Set lower limit offset of ON/OFF signal operation.
5. HD
   – Set upper limit offset of ON/OFF signal operation.

[Temperature ON/OFF signal]

Parameter	Setting range	Default
L.SV	Temperature EU (0 ~ 100)	0.0
M.SV		0.0
H.SV		0.0
LU	Temperature EUS (0 ~ 100)	0.0
HD		0.0

Humidity ON/OFF signal]

Parameter	Setting range	Default
L.SV	Humidity EU (0 ~ 100)	0.0
M.SV		0.0
H.SV		0.0
LU	Humidity EUS (0 ~ 100)	0.0
HD		0.0

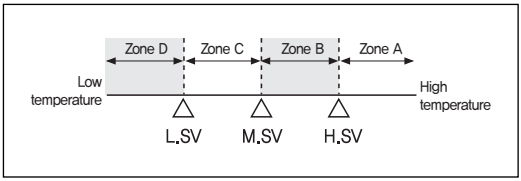


Fig. 90) ON/OFF zone separation

Setting item		Function
L.SV	Low set value	Set lower limit.
M.SV	Middle set value	Set median.
H.SV	High set value	Set upper limit.
Lu	Low limit deviation setting	Set lower limit offset.
Hd	High limit deviation setting	Set upper limit offset.
T1~T4	Temperature 1~4	Zone setting by temperature-side group (Group 4)
H1	H	Zone setting for humidity side (Group 1)

By L.SV, M.SV, and H.SV, the range has 4 zones: A, B, C, and D.
Setting condition is L.SV 〈 M.SV 〈 H.SV.

Zone separation	Description
Zone A (PV≥H.SV)	Always OFF regardless of offset
Zone B (M.SV≤PV<H.SV)	1) Hd=0(Always OFF regardless of offset) 2) Hd≠0(Refer to Fig. 91). OFF : PV<SV+Hd ON : PV≥SV+Hd
Zone C (L.SV≤PV<M.SV)	1) Lu=0(Always ON regardless of offset) 2) Lu≠0(Refer to Fig. 92). OFF : PV≤SV-Lu ON : PV>SV-Lu
Zone D (PV<L.SV)	Always OFF regardless of offset

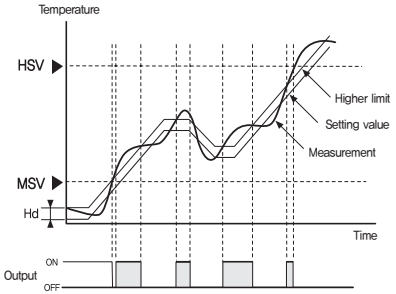


Fig. 91) Zone setting 1

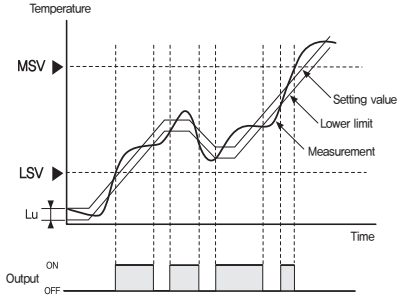


Fig. 92) Zone setting 2

6. System alarm

▶ Alarm setting

Temperature/humidity alarm set screen. Totally 8 alarm signals setting possible.

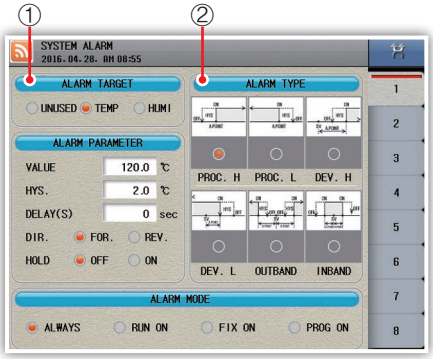


Fig. 93) System alarm - Temperature

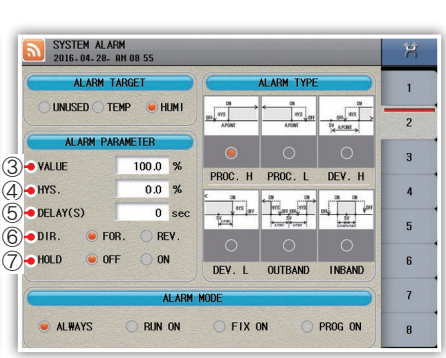
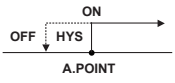
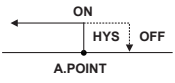
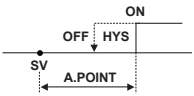
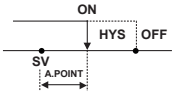
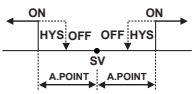
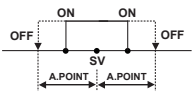


Fig. 94) System alarm – Humidity

1. Select an alarm target.
2. Select an alarm type.
3. Set a setting value(offset).
4. Set hysteresis.
5. Set delay.
6. Set direction of alarm. NORMAL OPEN or NORMAL CLOSE
7. Set hold function.
8. Set alarm conditions.
   - Always : Alarm is always provided.
   - During operation : Alarm is provided only during operation.
   - Constant value : Alarm is provided only during constant–value operation.
   - Program : Alarm is provided only during program operation.

Absolute upper limitation	Absolute lower limitation	Deviation upper limitation
		
Deviation lower limitation	**Outside the range**	**Within the range**
		

[System alarm parameter]

Parameter	Setting Range	Default
Alarm target	Disable, Temperature, Humidity	Disable
Alarm type	Absolute upper limitation, Absolute lower limitation,Deviation upper limitation,Deviation lower limitation,Outside the range, Within the range	0
Setting Value (Deviation)	Absolute upper limitation, Absolute lower limitation: EU(0~100)/0Deviation upper limitation, Deviation lower limitation: EUS(–100~100)/0.0 Within the rage, Outside the range: EUS(0~100)/0.0	0.0
Hysterisys	EUS(0 ~ 100)	0.0
Delay(Min.)	0 ~ 9999	0
Alarm direction	Direct, Reverse	Direct
Hold	On/Off	Off

▶ System alarm name setting

– Click the icon on upper left of alarm setting screen in order to go to the system alarm name setting screen.

Fig. 95) System alarm name

Fig. 96) Enter a system alarm name

1. Enter a system alarm name (using Korean, English, numeric, and symbol characters).
2. A system alarm name may include up to 24 characters (12 ones in Korean).

Parameter	Setting range	Default
System alarm name	Korea, English, numeric, and symbol characters	ALARM_NAMEnn

7. DI configuration

DI configuration has 7 tabs to set DI functions and operations for individual DI signals. IO specifications are optional for TH510 and configurable DI numbers are limited by the option so make sure to check the IO specifications.

▶ Common

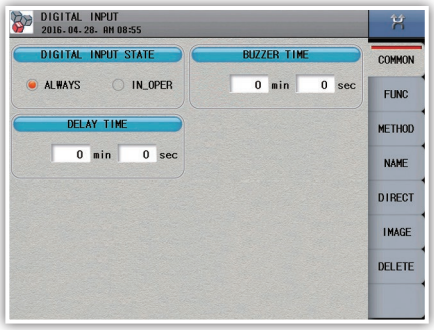


Fig. 97) DI common

1. DI input state
   – Set DI input operation condition.
2. Buzzer ON time
   – Enter time to maintain buzzer on for DI error.
   – Buzzer doesn't sound if DI1 ~ 3 operations are set to Run/Stop, Hold, and Step.
3. Detection delay
   – Enter delay time after DI is detected.

Parameter	Setting range	Default
DI input state	Always and During operation	Always
Buzzer ON time	0 ~ 9999 Min. 59 Sec.	0Sec.
Detection delay	0 ~ 9999 Min. 59Sec.	0Sec.

▶ Configuration type

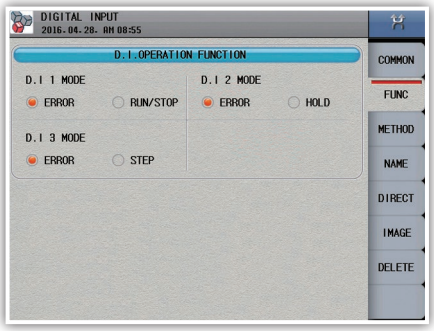


Fig. 98) DI configuration type

1. DI 1 operation type
   - Set function for DI 1 operation.
   - Error : DI 1 operation is used as an error.
   - Run/Stop : DI 1 error enables operation and release of it stops operation.

2. DI 2 operation type
   - Set function for DI 2 operation.
   - Error : DI 2 operation is used as an error.
   - Hold : DI 2 error holds current operation and release of it cancels hold. (For program operation)

3. DI 3 operation type
   - Set function for DI 3 operation.
   - Error : DI 3 operation is used as an error.
   - Step : DI 3 error forces transition from current segment to next one. (For program operation)

Parameter	Setting range	Default
DI 1 operation type	Error and Run/Stop	Error
DI 2 operation type	Error and Hold	Error
DI 3 operation type	Error and Step	Error

▶ Configuration setting

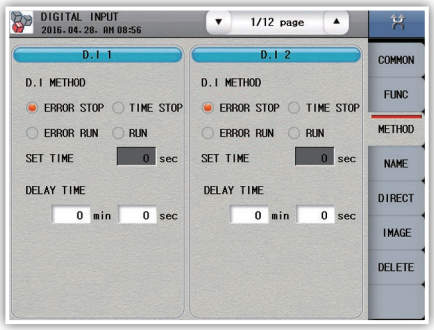


Fig. 99) DI configuration setting

1. Operation after detection
   - Error stop : DI error shows DI error screen and stops operation.
   - Time stop : DI error shows DI error screen and stops operation after the setting time is elapsed.
   - Error operation : DI error shows DI error screen and continues operation.
   - Operation : DI error doesn't show DI error screen and continues operation.
   - Setting time : For Time stop, it stops operation after the setting time is elapsed.

2. Detection delay : Delay after DI occurrence may be set by DI.

Parameter	Setting range	Default
Operation after detection	Error stop, Time stop, Error operation, and Operation	Error stop
Setting time	0 ~ 9999 sec	0 sec
Detection delay	0 ~ 9999 min 59 sec	0 sec

▶ DI name

Fig. 100) DI name

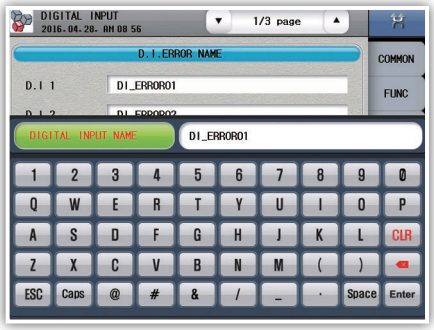


Fig. 101) Enter a DI name

1. Enter a DI error name (using Korean, English, numeric, and symbol characters).
2. Entered DI error name is shown on DI error screen for the error.
3. A DI error name may include up to 24 characters (12 ones in Korean).

Parameter	Setting range	Default
DI error name	Korean, English, numeric, and symbol characters	DI_ERRORnn

▶ Contact type

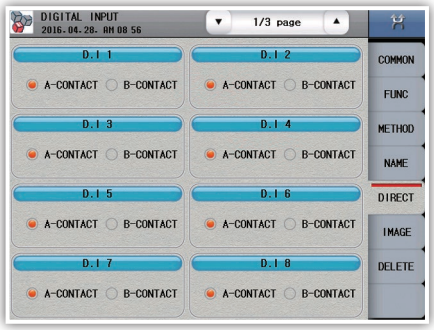


Fig. 102) DI contact type

1. Set contact type.
– Contact A : DI runs if a DI contact is connected. (Normal Open)
– Contact B : DI runs if a DI contact is disconnected. (Normal Close)

▶ Error image

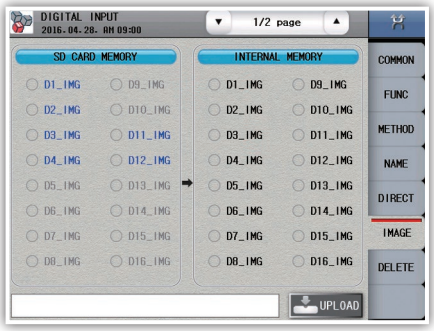


Fig. 103) DI error image setting

For a DI error, it shows a user–defined image what was uploaded to the internal memory.
If there is no user–defined image in the internal memory, basic image is shown.
1. State display : Upload progress is shown.
2. Upload : Upload selected image files of SD card to the internal memory.
(It can't operate when it is being saved)

> **Caution** An error image must have the resolution of 310X210 and name of Dnn_IMG.bmp (e.g. D1_IMG.bmp, D12_IMG.bmp). Files must be placed in Caution "TH510\DI_IMG" folder of root direction of SD card. Otherwise, they are not uploaded.

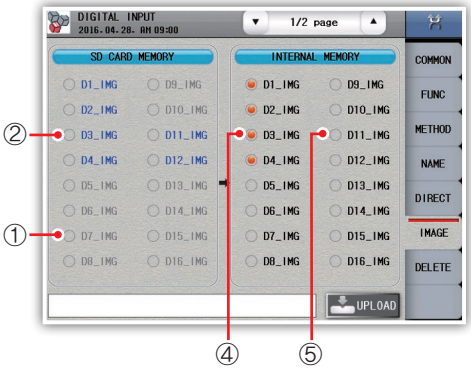


Fig. 104) DI error image upload

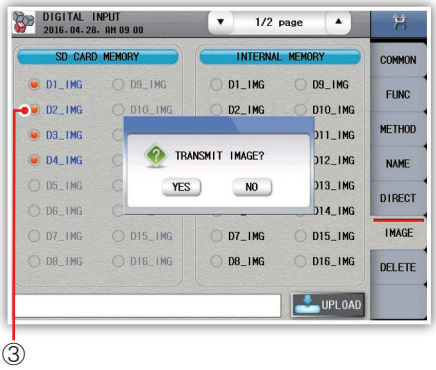


Fig. 105) Confirm DI error image upload

1. There is no user-defined image in SD card.
2. There is a user-defined image in SD card.
3. Select a user-defined image to upload from SD card to the internal memory.
4. There is a user-defined image already uploaded to the internal memory.
5. There is no user-defined image in the internal memory.

▶ Image deletion

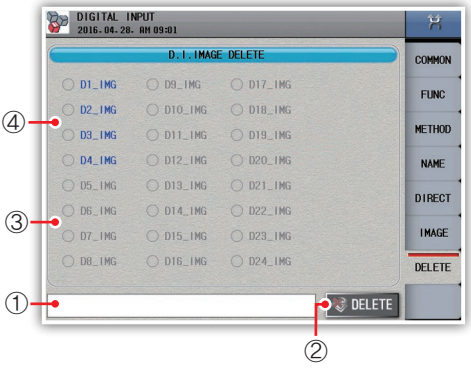


Fig. 106) DI error image deletion

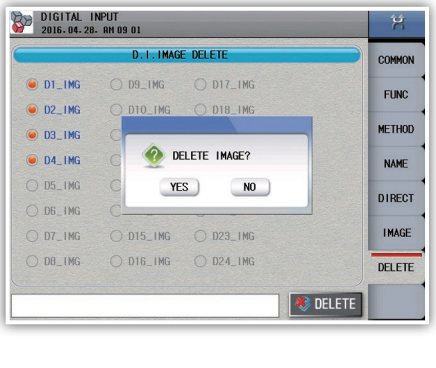


Fig. 107) Confirm DI error image deletion

1. State display : Image deletion progress is shown.
2. Delete : Delete a selected image files in the internal memory.
3. There is no user-defined image in the internal memory.
4. There is a user-defined image in the internal memory.
5. It is impossible to recover deleted images.

8. DO configuration

DO configuration setting has 8 tabs and assigns system signals to relay outputs. If duplicate relay numbers are set, the relays works even one of them is output.
IO specifications are optional for TH510 and configurable relay numbers are limited by the option so make sure to check the IO specifications.

▶ Inner signal

– Screen to set relays for inner signals.
– If an inner signal is transmitted, defined relay is ON.

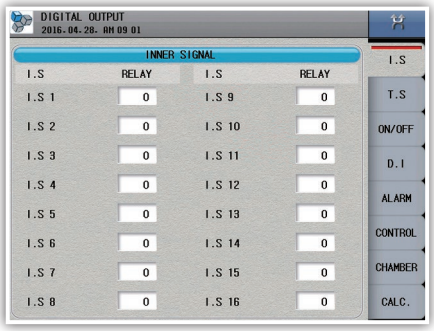


Fig. 108) DO – Inner signal

Parameter	Setting range	Default
Inner signal 1 ~ 16	Up to 0 ~ 32	0

▶ Time signal

– Screen to set relays for time signals.
– If a time signal is transmitted, defined relay is ON.

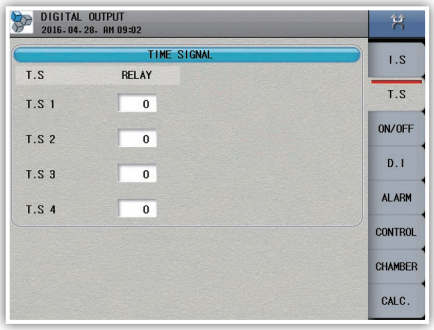


Fig. 109) DO – Time signal

Parameter	Setting range	Default
Time signal 1 ~ 4	Up to 0 ~ 32	0

▶ ON/OFF signal

– It is the screen in which you can set the relay and delay time about the ON/OFF signal of temperature (6) and humidity (2)

– The set ON/OFF signal, if the condition occurs, if after the setting time it turns ON, it operates just during the first ON

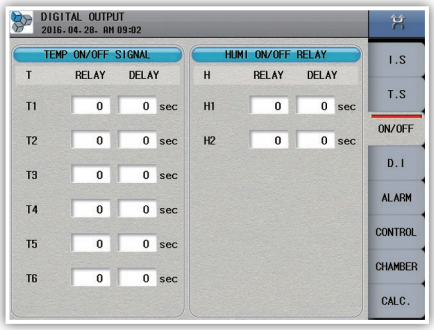


Fig. 110) DO - ON/OFF

Parameter	Setting range	Default
Temperature ON/OFF signal	Up to 0 ~ 32	0
Humidity ON/OFF signal	Up to 0 ~ 32	0

▶ DI signal

– Screen to set relays for DI signals.

– If a DI signal is transmitted, defined relay is ON.

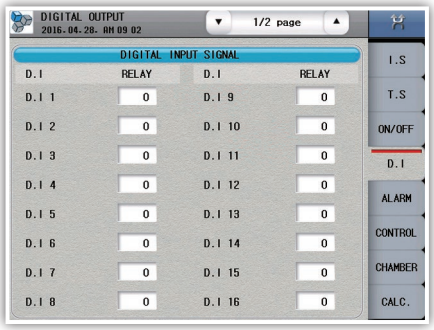


Fig. 111) DO - DI signal

Parameter	Setting range	Default
DI signal 1 ~ 32	Up to 0 ~ 32	0

▶ Alarm

– Screen to set relays for pattern/system alarms.
– If an alarm signal is transmitted, defined relay is ON.

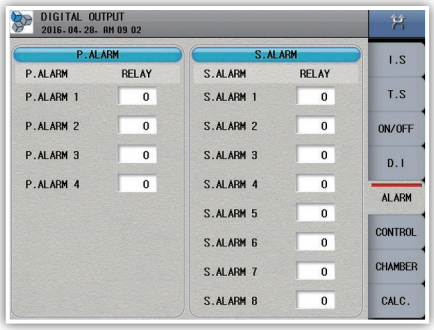


Fig. 112) DO - Alarm signal

Parameter	Setting range	Default
P. Alarm 1 ~ 4	Up to 0 ~ 32	0
S. Alarm 1 ~ 8	Up to 0 ~ 32	0

▶ Operation signal

– Screen to set relays for operations signals by channel.

Fig. 113) DO - Operation signal

1. Control signal
   – Set Temperature and Humidity operation signal relays and delay.
2. Sensor disconnection
   – Set Temperature and Humidity sensor disconnection signal relays and ON time.
3. Ascending section
   – Set ascending signal relay and offset.
   – Offset = Target setting value - Temperature or Humidity value
4. Holding section
   – Set holding section relay and ON time.
5. Descending section
   – Set ascending signal relay and offset.
   – Offset = Target setting value + Temperature or Humidity value.

Parameter	Setting range	Default
Temperature control signal rely	Max 0 ~ 32	0
Temperature control signal delay	0 ~ 9999	0 sec
Humidity control signal rely	Max 0 ~ 32	0
Humidity control signal delay	0 ~ 9999	0 sec
Temperature sensor burnout relay	Max 0 ~ 32	0
Temperature sensor burnout holding	0 ~ 9999	0 min
Humidity sensor burnout relay	Max 0 ~ 32	0
Humidity sensor burnout holding	0 ~ 9999	0 min
Temperature ascending range relay	Max 0 ~ 32	0
Temperature ascending range deviation	Temperature EUS(0 ~ 100 %)	0 ℃
Humidity ascending range relay	Max 0 ~ 32	0
Humidity ascending range deviation	Humidity EUS(0 ~ 100 %)	0 %
Temperature holding range relay	Max 0 ~ 32	0
Temperature holding range deviation	0 ~ 9999	0 min
Humidity holding range relay	Max 0 ~ 32	0
Humidity holding range deviation	0 ~ 9999	0 min
Temperature descending range relay	Max 0 ~ 32	0
Temperature descending range deviation	Temperature EUS(0 ~ 100 %)	0 ℃
Humidity descending range relay	Max 0 ~ 32	0
Humidity descending range deviation	Humidity EUS(0 ~ 100 %)	0 %

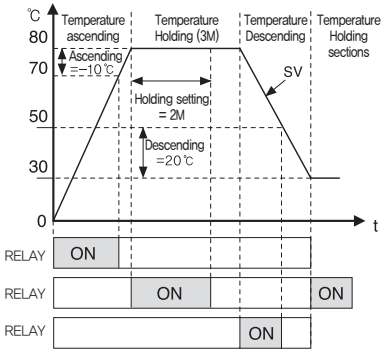


Fig. 114) DO – Ascending/Holding/Descending

Example of relay operation state by temperature ascending/holding/descending setting of setting value(SV). Example of relay operation state with ascending section setting temperature(–10 ℃), holding section setting temperature(2M), and descending section setting temperature(+20 ℃).

▶ Chamber signal

– Operator can set relay of signals relating to operation

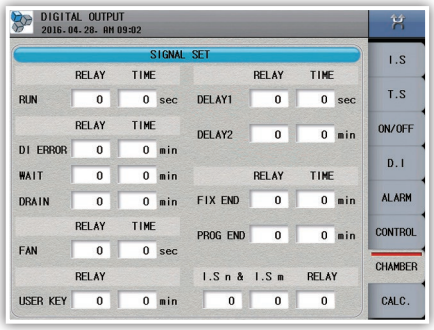


Fig. 115) DO–Chamber signal

No.	Name	Description
1	Running	Setting relay and delay time of running signal. After delay time, relay start operating
2	DI	Setting relay and holding time of DI signal. During the holding time, relay operating
3	Wait	Setting relay and holding time of wait signal. During the holding time, relay operating
4	Drain	Setting relay and time of drain signal. During the holding time, relay operating
5	FAN	Setting relay and time of FAN signal. Relay activates upon the equipment running, relay
6	User Key	Setting relay and delay time of user button. If you activate the button window in the operation screen it is possible to operate the user button arbitrarily.
7	Delay 1	After the IS1 output, correspondent relay operating after the delay during the set time(Sec).
8	Delay 2	After the IS1 output, correspondent relay operating after the delay during the set time(Min.)
9	Fixed running	If the fix operation turns off, correspondent relay operating during the set time
10	Programming running	If the program operation turns off, correspondent relay operating during the set time
11	IS complexion	Set the IS number and relay linked to the IS1. If the IS1 and linked IS number turn ON correspondent relay operating

▶ Operation signal

– Logic operation signal for output signal used to program up to 6 lines.
Logic operation is conducted from line No.1 to 6 in order.

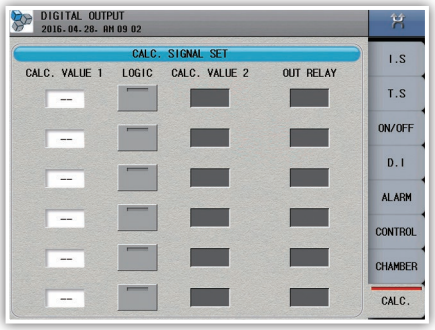


Fig. 115–1) DO - Operation signal

1) Operation value 1 and Operation value 2
– Select a relay for operation.
– If the operator is BYPASS, delay is set for the operation value 2.

2) Operator

AND	Output relay is ON if both operation value 1 and 2 are ON.
OR	Output relay is ON if either of operation value 1 and 2 is ON.
NOT	Output relay is OFF if the operation value 1 is ON. Output relay is ON if the operation value 1 is OFF.
XOR	Output relay is ON if the operation value 1 and 2 are different(ON/OFF or OFF/ON).
BYPASS	After the delay defined for the operation value 2, the signal of operation value 1 itself is output.

[Example of applying operation signal]

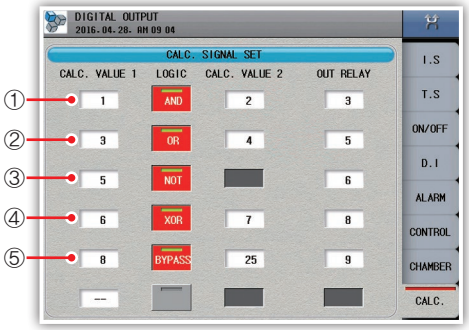


Fig. 115–2) Example of operation signal

1) If relay 1 and 2 are ON, relay 3 is ON.
2) If relay 1 or 2 is ON, relay 5 is ON.
3) If relay 5 is ON, relay 6 is OFF. If relay 5 is OFF, relay 6 is ON.
4) If relay 6 and 7 are different, relay 8 is ON.
5) When 25 seconds elapsed after relay 8 is ON, relay 9 is ON.

9. System

▶ System

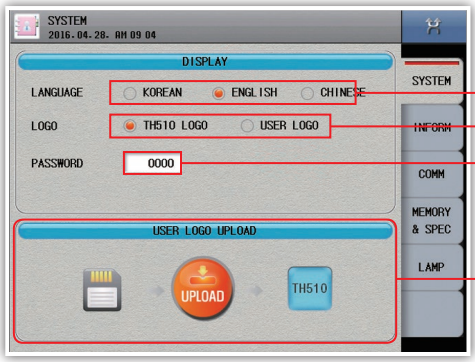


Fig. 116) System screen

- Select a language(Korean/English/Chinese).
- Select a splash.
- If a user password is set, it needs to be entered to enter system setting screen (If the user password is "0", it is disabled).
- Upload a splash using a SD card (disabled when it is being saved).

Caution: Logo image file must have the resolution of 640×480 and file name of TH510_LOGO.bmp. Files must be placed in "TH510\LOGO" folder of root direction of SD card. Otherwise, they are not uploaded.

[System parameter]

Parameter	Setting range	Default
Language	Korean, English, and Chinese(Simplified)	English
Splash	TH510 logo and User-defined logo	TH510 logo
User password	0 ~ 9999	0000

▶ Specifications

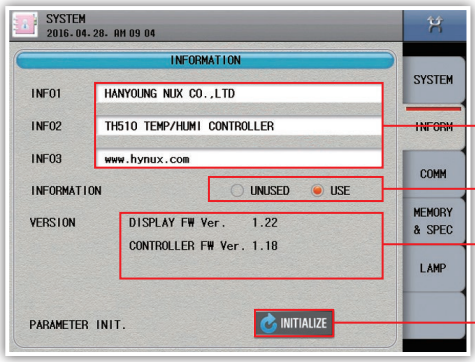


Fig. 117) Specifications screen

- Enter information to display during boot-up process.
- Select whether to display product information or not during boot-up process.
- Displays product version information.

Caution: Initializes parameters. Event or error history is not initialized. (It can't operate when it is being saved)

[Specifications parameter]

Parameter	Setting range	Default
Information 1	Character input panel(up to 30 characters)	HANYOUNG NUX CO.,LTD
Information 2	Character input panel(up to 30 characters)	TH510 TEMP/HUMI CONTROLLER
Information 3	Character input panel(up to 30 characters)	www.hynux.com
Information display on first screen	No and Yes	Yes

▶ Communication setting

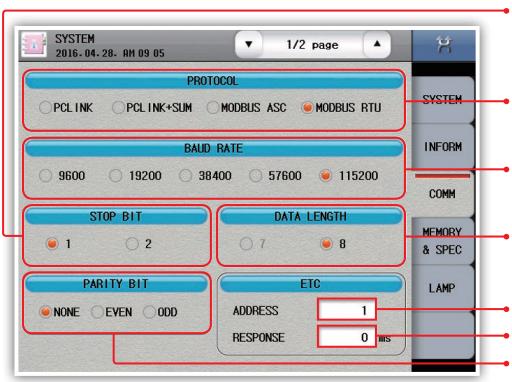


Fig. 118) Communication setting screen

[Communication setting parameter]

Parameter	Setting range	Default
Communication protocol	PCLINK, PCLINK+SUM, MODBUS ASC, MODBUS RTU	MODBUS RTU
Communication speed	9600, 19200, 38400, 57600, 115200	115200
Stop bit	1, 2	1
Data length	7, 8	8
Parity bit	NONE, EVEN, ODD	NONE
Unit No.	1 ~ 99 (Up 32 units can be connected, including master)	1
Response time	0 ~ 100 ms	0 ms

▶ Hardware address setting

– Screen to set hardware state of control module.

– Normal operation is enabled by matching hardware settings of control and input/output modules. If incorrect address is set for an output module, it may malfunction.

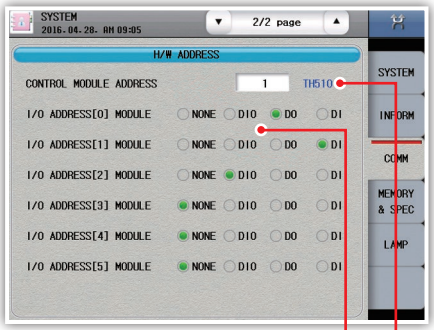


Fig. 119) Hardware address 1

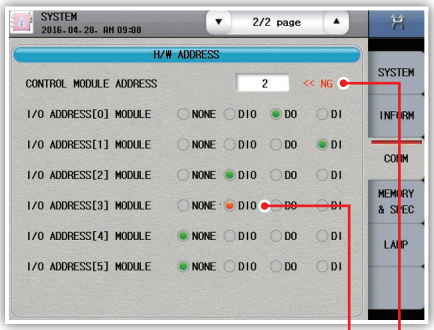
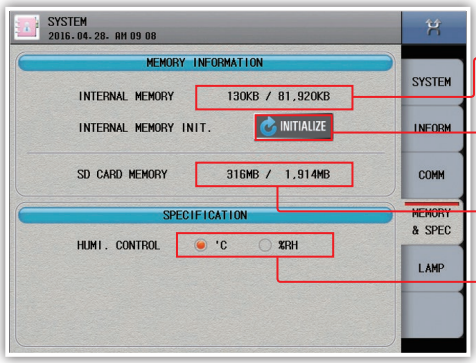


Fig. 120) Hardware address 2

1. TH510 display and communication are normal.
2. TH510 display and communication are abnormal.
3. Input/output module and communication are normal.
4. Input/output module and communication are abnormal.

▶ Memory



Displays used/free space of internal memory. Initialize error history. (It can't operate when it is being saved)

Caution: If initialized, data can't be recovered so send it to an SD card before.

Displays used/total space of SD card memory.

Select the humidity control standard.
℃ : control by wet-bulb temperature
%RH : control by relative humidity

Fig. 121) Memory screen

▶ Indicator

- Screen to set indicators on constant-value and program operation screens.
- Up to 32 indicators can be selected. Up to 16 of them can be displayed in 1 screen, and tap them to switch the touch screen.

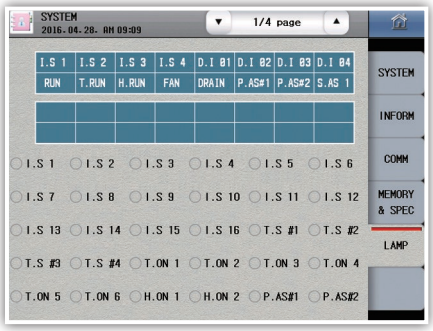
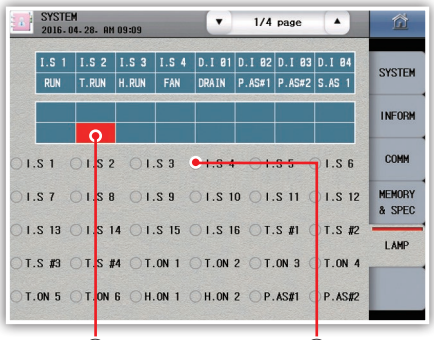


Fig. 122) Indicator



① Fig. 123) Indicator setting ②

1. Tap a cell to display in the indicator table above.
2. Select a type of indicator.

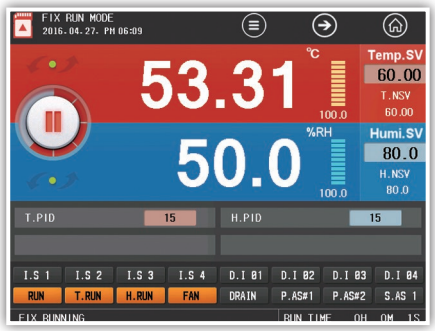


Fig. 124) Indicator display

▶ Firmware upgrade

Screen for upgrading firmware and entering test mode. This screen is not available during operation.
To access this screen, the password is required. (Default password : 0)

Caution

- You may not escape from this screen. You must reboot the display and control module.
- User attention is required for upgrading firmware so make sure to set the password.
  Default password is "0". Upgrade files can be downloaded from "Hanyoung Nux" website. Do not change a file name and place it in TH510_FWUP folder in the root directory of SD card to read it. If the firmware is upgraded, the parameters are initialized.

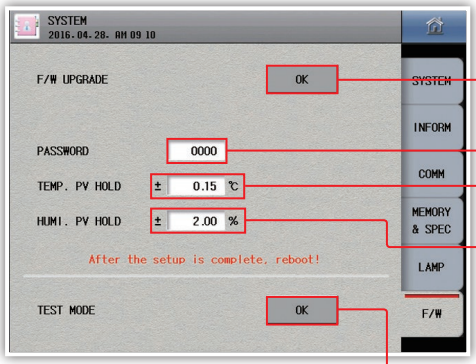


Fig. 125) Firmware upgrade

Access firmware upgrade pane.

Set a password for accessing F/W pane.

Compensate the small temperature hunting within the set temperature range.

Compensate the small humidity hunting within the set humidity range.
If set the PV HOLD value to 0 it turns off.

Caution Test mode is to test calibration before shipment.

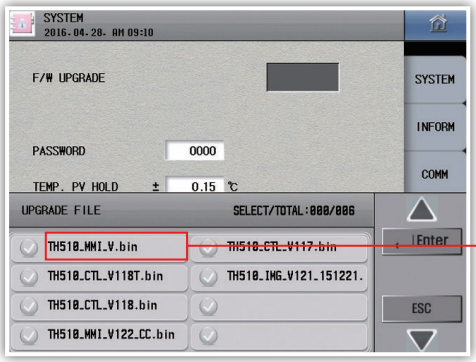


Fig. 126) Firmware upgrade input pane

Displays upgrade file name.

Specifications

1. Input specifications

[Range configuration by input type]

Input type			Temperature		Humidity	
			Measuring range (℃)	accuracy	Measuring range (%RH)	accuracy
Thermoresistor (RTD)	Pt100 Ω	Pt–1	–100.0 ~ 300.0	±0.1 % of F.S ±1 Digit	0.0 ~ 100.0	±1 % of F.S ±1 Digit
		Pt–2	–100.00 ~ 150.00			
	KPt100 Ω	KPt–1	–100.0 ~ 300.0			
		KPt–2	–100.00 ~ 150.00			
DC voltage (VDC)	1 – 5 V		–100.0 ~ 300.0	±0.1 % of F.S ±1 Digit		
	0 – 30 V		–100.0 ~ 300.0			

2. Hardware specifications

▶ Power input

Power voltage	100 - 240 V a.c. Voltage regulation ±10 %
Power frequency	50 - 60 Hz
Power consumption	30 V A max
Max. rating of internal fuse	250 V AC
Dielectric strength	Between 1st and 2nd terminals : Min. 1500 V AC for 1 min Between 1st and FG terminals : Min. 1500 V AC for 1 min Between 2nd and FG terminals : Min. 1500 V AC for 1 min
Insulation resistance	20 MΩ or 500 V DC between power and FG terminals

▶ Sensor input

Input type	2 types of thermoresistor (Pt–100, KPt–100), 2 types of DC voltage (1 – 5 V, 0 – 30 V)
Sampling cycle	250 ms
Measured current of thermoresistor(RTD)	Approx. 0.21 mA
Input resistance	DC voltage : 1 MΩ or more
Allowable wire resistance	Thermoresistor : Max. 10Ω/wire, DC voltage : 2 kΩ or less
Influence of wire resistance	Thermoresistor : ±0.3 ℃/10 Ω (3 wires must have the same wire resistance)
Allowable input voltage	DC voltage : ±33 V DC or less
Detection of sensor disconnection(Burn–out)	UP–Scale for disconnection

▶ Output specifications

Contact output(DO)	Up to 32 relay	A Contact	30 V DC 3 A max, 250 V AC 3 A
		B Contact	NO : 30 V d.c. 5 A max, 250 V AC 5 A
Control output	SSR output	ON : 18 V DC Pulse voltage(800 Ω or more load resistance)	
	SCR output	4 – 20 mA DC (600 Ω or less load resistance)	
Transmission output	Current output	4 – 20 mA DC	
	Load resistance	600 Ω or less load resistance	
	Output limit	–5.00 – 105.00 %	
	Output type	Specific value(PV), Setting value(SV), Output(MV), and random	
	Refresh interval	250 ms	

▶ Contact input

Max. number of input	32 Contacts
Input type	No–voltage contact input
ON/OFF sensing resistor	Minimum 1kΩ and less: On, maximum 10kΩ and more: Off recognition
Min. sensing time	0.25 sec
Operational conditions	During operation/Always
Contact function	Operation and stop/hold/step by DI ; User can define error screen.

▶ Communication specifications

Applied standard	RS485
Max. connection number	1:32 (address 1 ~ 99)
Communication type	2–wire
Synchronization	Asynchronous
Communication distance	Approx. 1.2 km or less
Communication speed	9600, 19200, 38400, 57600, 115200 bps
Data Length	7/8 bits
Parity Bit	NONE / EVEN / ODD
Stop Bit	1/2 bit(s)
Protocol	PC–Link / PC–Link+SUM / MODBUS ASC / MODBUS RTU
Response Time	0 – 100 ms

▶ Control function

Input	Input calibration(Sensor bias)	1 Temperature contact : EUS(0~100 %) 1 Humidity contact : EUS(0 ~ 100 %)
	Dry/wet-bulb sensor compensation	Compensate the dry/wet sensor difference after removing the gauze of the wet-bulb sensor.
	Scaling	DC voltage(VDC) : Input scaling according to conversion range
	Input filter(LPF)	0 ~ 120 sec
Control mode	Operation type	Constant-value / Program control
Control output	Temperature control output	SSR output or SCR (4 – 20 mA DC) output
	Humidity control output	
Control operation	Pattern	100 patterns(1 pattern/100 segments)
	Segment	2000 segments
	PID Group	16 groups(temperature 4 zones X humidity 4 zones)
	Auto tuning	Auto tuning according to target setting value
	Proportional band	0.00 ~ 100.00 % (For 0.00 %, ON/OFF control)
	Integral time	0.0 ~ 3,000 sec (OFF when 0 sec)
	Derivative time	
	ON/OFF control	Set 0.0 to proportional band(PB)
	Normal Open/Normal Close	According to selection of Normal Open/ Normal Close for control output
	Hysteresis	EUS (0 ~ 100 %)
Transmission output	Temperature, Humidity	4 – 20 mA DC Specific value(PV), Setting value(SV) and Output(MV)
	Scaling	Auto scaling for defined upper/lower limit range (4 – 20 mA DC)
Alarm setting	Alarm setting	System alarm : 8 points Assign 4 of 8 pattern alarms to a pattern
	Alarm type	Absolute high/low limit, deviation high/low limit, in range/out of range (alarm direction, hold)
	Absolute alarm setting range	EU (0 ~ 100 %)
	Offset information setting range	EUS (–100 ~ 100 %)
	Hysteresis	EUS (0 ~ 100 %)

3. Display specifications

Display	TFT color LCD (115.2 × 86.4 mm)
Number of Pixels	640 × 480 pixel
Back light	LED back light
Life cycle of back light	Approx. 40,000 h
Touch type	Resistive type (4 Wires)
Language	Korean/English/Chinese(Simplified)

4. Memory specifications

Internal memory	Non-volatile memory : 80 MB - Saving of 15 days at 1 S interval
External memory	SD card(2 GB) : Saving of 1 year at 1 S interval
Saving interval	1 – 360 S
Memory information	Program information, setting value, recovery, and temperature setting/ specific/output value

5. Installation environment

▶ Use environment

Ambient temperature	0 ~ 50 ℃
Temperature fluctuation	10 ℃/h or less
Ambient humidity	20 ~ 90 % RH (Without condensation)
Magnetic field	400 A/m or less
Altitude	2,000 m or less from the sea
Weight	Approx. 1.32 kg

▶ Storage environment

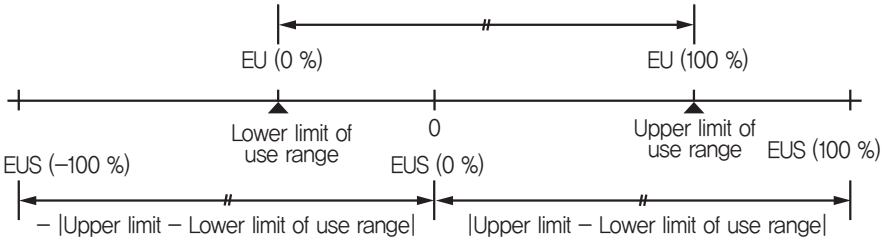
Ambient temperature	–20 ~ 70 ℃
Temperature fluctuation	20 ℃/h or less
Ambient humidity	5 – 95 % RH (Without condensation)

▶ Influence of ambient temperature

DC voltage	±0.003 % of F.S / ℃
Thermoresistor sensor	±0.03 ℃/℃

6. Engineering Units

- EU : Engineering unit value according to the range of product
- EUS : Engineering unit value according to the difference of upper and lower lmits(span) of product



	Range	E.g. (Pt–1: –200.0 – 640.0)
EU (0 ~ 100 %)	Lower limit – Upper limit of use range	–200.0 ~ 640.0
EUS (0 ~ 100 %)	0 – |Difference between upper and lower limits|	0 ~ 840.0
EUS (–100 ~ 100 %)	– |Difference between upper and lower limits| ~ +|Difference between upper and lower limits|	–840.0 ~ 840.0

TH5IO

Hanyoung Nux Co., Ltd.
28, Gilparo 71-beongil, Namgu, Incheon, Korea
TEL : (82-32)876-4697 FAX : (82-32)876-4696
www.hynux.com