



User manual

Heating Bath Circulators

(Programmable Model)

Model : CW3-05P, CW3-10P, CW3-20P, CW3-30P

Manual No. :52703L002 Version : 4.0

Jeiotech



WARNING

Before using this product, read this entire Operator's Manual carefully. Users should follow all of the Operational Guidelines contained in this Manual and take all necessary safety precautions while using this product. Failure to follow these guidelines could result in potentially irreparable bodily harm and/or property damage.

Thank you for purchasing Jeio Tech's products.

Jeio Tech Co., Ltd. is committed to customer service both during and after the sale. If you have questions concerning the operation of your product, or the information in this manual, contact our Sales Department. If your product fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Service Department.

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1.0 Safety

1.1 How to use the manual

1.1.1 Introduction

This manual is intended for individuals requiring information about the use of equipment. Use this manual as a guide and reference for installing, operating, and maintaining your Jeio Tech equipment. The purpose is to assist you in applying efficient, proven techniques that enhance equipment productivity

This manual covers only light corrective maintenance. No installation, service procedure or other maintenance should be undertaken without first contacting a service technician, nor should be carried out by someone other than a service technician with specific experience with laboratory equipment and electricity

1.1.2 Chapter summary

The safety chapter guides users to use the equipment with the best caution to prevent any possible accident. Make sure to read the chapter before use.

The Functional Description chapter outlines models covered, standard features, and safety features. Additional sections within the manual provide instructions for installation, pre-operational procedures, operation, preventive maintenance, and corrective maintenance.

The Installation chapter includes required data for receiving, unpacking, inspecting, and setup of the equipment.

The Operation chapter includes a description of controller features, key name, and equipment operation information.

The Maintenance chapter includes a description of equipment cleaning, moving, storage.

The Troubleshooting chapter serves as a guide for identification of most common problems. Potential problems are listed, along with possible causes and related solutions.

The accessories chapter includes all the attachable accessories' information.

The software chapter provides information for installing monitoring program, communication protocol.

The Appendix contains technical specifications, warranty and Jeio Tech technical support contact information.

1.1.3 Model number nomenclature

This manual covers below models. The following describes the model number nomenclature used in throughout the manual.

	Heating bath Circulator (Programmable) Series			
Model	CW3-05P	CW3-10P	CW3-20P	CW3-30P

1.2 Responsibility

the equipment has been designed to ensure maximum safety of the user, when used under normal conditions and in compliance with instructions during operation.

All users are required to run the device according to this manual. The user of the device should be fully aware of the safety rules marked on the equipment and all the attention

- Warning
- Risk on the manual should be complied.

1.2.1 General Liability

In any case, safety is the first priority. The owner of the equipment, user, and/or maintenance personnel must be fully aware of the safety which is the most important part of our everyday business.

If you are concern about the loss in efficiency, remember that accidental impact is always negative for the effectiveness of covering human resources and property.

Effective safety program is the most obvious way of increasing efficiency and productivity.

Ensuring and maintaining the safety of the equipment by checking it daily in addition to the regular maintenance of the equipment is a shortcut to improving the productivity.

The users must read this manual describing the functions and safety points of each part as a guided for safe operation.

1.2.2 Responsibility of the users

Users are most well- known for the equipment's performance and the limit because they are the ones running the equipment most of the time.

The safety of the user's maybe be easily be forgotten by the needs of efficiency or familiarity of using the device for a long time.

Precautions with regards to safety in the manual, or by other displayed safety information do not protect the users from injury while they are using the device.

Always read the safety instructions and run the equipment safely. In addition, the potential for dangerous situations always should be reported immediately to colleagues and superiors.

Things to read

- Do not touch any part of the body to the dangerous part of the device.
- Check the voltage, phase and capacity of the power supply and connect properly.
- Do not operate or service, adjust the device until you receive adequate training or are fully aware of the capabilities of the device.
- Remove unnecessary things, sample, or chemicals from the equipment.
- When the equipment does not operate normally or are neglected from use for a long time check all the settings before operating the equipment.
- Make sure that the equipment is operating normally when you move the equipment, or re-use after a long period.
- Stop operating immediately and report to the managers when you find the following states;
 - Unsafe operation and status
 - Shorts
 - Improper maintenance
- When you operating the equipment, do not wear loose clothing or jewelry, tie long hair or use hair cap.
- When not in use, turn off the power switch or cut off the power to the instrument by disconnecting the power plug.

1.2.3 Preventative Maintenance

Proper maintenance is essential for safety. The maintenance personnel must be aware of the importance of safety in maintenance of the equipment for effectiveness of the equipment.

Before removing or adjusting parts of the device, shut off all the electrical supply, remove accessories. The equipment must display a warning that it is working.

Please ensure that the device is properly connected to a grounded outlet.

After repair and maintenance, check the work performed and clean tools.

Do not apply the power to the equipment until all workers clean the area. The device must be checked if there are no problems with the equipment before operating the equipment.

1.3 Symbols used in this Manual

The following signal word panels, safety symbols and non-safety symbols are used to alert you to potential personal injury hazards or information of importance. Obey all safety messages that follow these symbols to avoid possible personal injury or death.

1.3.1 Signal word panels

Signal word panels are a method for calling attention to a safety messages or property damage messages and designate a degree or level of hazard seriousness. It consists of three elements: a safety alert symbol, a signal word and a contrasting rectangular background. The following signal word panels are in accordance with ANSI Z535.4-2007 and ISO 3864 standards.

Signal word panels	Uses
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a property damage message.

1.3.2 Safety symbols

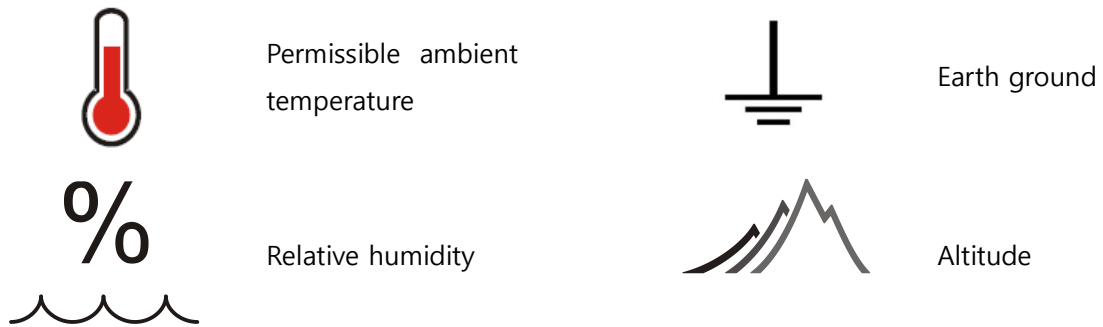
Mandatory			
	Read manual		Wear gloves
	Wear a face mask		Wear goggles

Prohibition			
	No direct sunlight		No corrosive fluids or cleaners
	No high frequency noise		No water

Warning			
	Safety alert symbol General caution		Hand crush or pinch
	Electrical shock		Foot crush
	Flammable or fire could be caused.		Lifting hazard
	Do not take the device apart deliberately.		

1.3.3 Non-safety symbols

The following graphic representations are intended to convey a message without words or to bring your attention to important information about the use of the equipment or a feature.



1.4 Precautions for use

This equipment is designed to provide safe and reliable operation when installed and operated within design specifications. Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your equipment. If you have any questions concerning the operation of your equipment or the information in this manual, contact our Sales Department.

To avoid possible personal injury or equipment damage when installing, operating, or maintaining this equipment, use good judgment and follow these safe practices.

1.4.1 Warning statements

	 WARNING	
Indicates a hazardous situation which, if not avoided, could result in death or serious injury		

Observe all warning labels.

DO NOT remove warning labels.

DO NOT move the equipment during operation.

DO NOT use or keep flammable gases near the equipment.

DO NOT install the equipment near environments where flammable gas may leak.

DO NOT use the equipment near environments where explosion can occur due to organic evaporating gases.

DO NOT put explosive and flammable chemicals (Alcohol, Benzene, and etc) on the equipment.

Please install on the sturdy surface laboratory which is set safety facility and make sure horizontal align correctly.

Please install the equipment in the flat place where prevent vibration and shock.

Check the voltage, phase and capacity of the power supply and connect properly.

Make sure to use the grounded power cord.

Do not expose the equipment to direct sunlight. (Ambient temperature range in 5°C ~ 40°C relative humidity lower than 80%)

DO NOT let moisture, organic solvents, dust, and corrosive gas enter the control panel.

DO NOT use the equipment in environments that contain industrial oil smoke and metallic dust.

DO NOT put explosive and flammable chemicals (Alcohol, Benzene, and etc) into the equipment.

heat transfer liquid should be 5°C(Fp -5°C) lower than the flashing point.

DO NOT operate the equipment when there is strange sound, smell and smoke coming from the equipment.

DO NOT disassemble, fix or change the equipment other than for those items described in this operating manual.

In case of inner electronic components service, only the person who is qualified can handle the problem.



1.4.2 Caution statements

 CAUTION	
Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.	

Wear safety gloves and be careful burn from the residual heat from the equipment.

After use, be sure to turn off the main power switch and unplug the power cord after.

Do not put heavy things on the power line. Do not put the equipment on the line.

Use grounded cord and consent.

Installation power outlet near instrument and may be convenient.

Do not touch it with wet hands and put the main plug correctly.

Do not inject any flammable objects, and conductive objects outside of equipment hole or vent.

Do not pour water directly on the outside of the equipment.

Do not let the equipment take any strong shock or vibration.

Do not install the equipment near devices generating strong high-frequency Noise (high-frequency welders, high-frequency sewing equipment, and large SCR control)

Do not clean the equipment by solvent and harsh detergents, please use neutral detergent and smooth cloths.

Unplug the power cord when cleaning the equipment.

Since the equipment is heavy, use the proper tools and carry the equipment with two or more people together.



Safety symbols are graphic representations—of a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages—intended to convey a message without the use of words. The following safety symbols are used in this manual.

2.0 Functional description

2.1 Introduction

This Heating Bath Circulator is for multi-purpose use such as following applications essential for medicine, pharmacology, and bioengineering.

This bath controls not only liquid heating media temperature inside of bath through internal circulation but also heat exchange and bath temperature maintenance through connecting to external devices.

2.2 Features

2.2.1 Excellent performance

- Program run enables temperature control in multiple steps. (Maximum 10 programmable pattern, Maximum 10 segments per a pattern). Also temperature Ramp function is available on program run.
- Program scheduler function enables programmable operating section setting, Repeat section setting, each program connection setting.
- PID feedback control
PID Feedback control will be provided maximize the temperature stability and minimizes temperature variation
- Digital Input / Output
Digital Input operates or stops temperature control with the signal from other devices. Also, when temperature reaches users' setting condition (ex: inner bath temperature > 100°C), signal can be sent to the other devices from the equipment with Digital Output function.
- Auto tuning
Perform Auto Tuning in order to get precise and rapid temperature control. PID value saved automatically after Auto Tuning. [Refer to 4.7 Auto tuning].
- Multi-point Temp. Calibration
In case of the temperature recorder or validation temperature sensor is different with displayed temperature; you can correct the error temperature deviation in 3 different temperature points. [Refer to 4.6.5 Temp. sensor calibration].

2.2.2 Improved safety

We have firstly developed CLS (Custom Logical Safe)-Control system in this industry for convinces in use and safety to users.

- CLS-Control system¹ means "Control system which has logical safety device specialized for individual model". Laboratory must have Thermal safety secure because there are a lot of inflammable reagent. This system is highest safety secure control device (patent no. 0397583 and 0328729) and makes the equipment suitable for this kind of environment.
- Check for abnormal operation
If any error founds during operation, Error message is shown and warning alarm gets start.
- A safety circuit has been adopted to protect the equipment from over-current and heater overheating.
- Over temperature protection device
Built-in over-temp. Protector will be cut off automatically the power when the heater is overheating.
- If temperature sensor is not working well during operation, the equipment stops temperature control and shows warning alerts.
- When Bath heat transfer liquid is not enough during running the equipment, warning alert will be displayed.

¹ Control system which has logical safety device specialized for individual model

2.2.3 Improved convenience

- LCD Touch screen and dial knob

Control and control status of the equipment can be viewed by 3.5 inch LCD Touch screen and dial knob.

- Temperature unit setting

Temperature unit can be set between Celsius or Fahrenheit.

- Pump circulating capacity adjustment

User can adjust pump circulating power from 0 to 5 steps

- Wait on timer, Wait off timer set

- Wait ON starts immediately after the timer setting.

- Wait OFF starts only after reaching the set temp

- Lock function

Push the button once to lock touch screen and key pads. Push the button once again to cancel lock function. (Configuration is not applied).

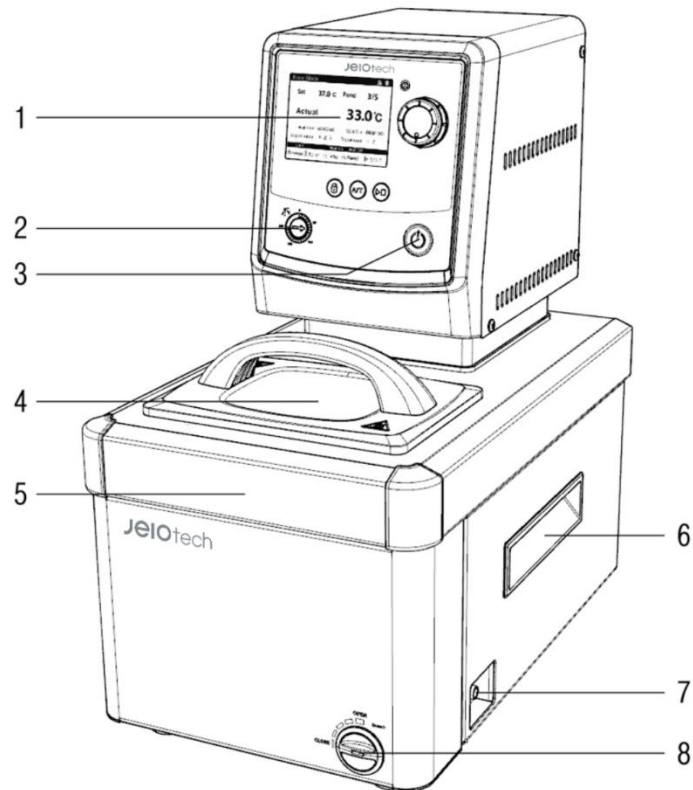
- Auto-run function

Auto-run function after power interruption: either Automatic Run or Manual Run.

If the equipment was in run on basic mode before power interruption, the operation starts again with previous set temperature.

If the equipment was in run on program mode, the operation starts from the step which suddenly stopped by power interruption.

2.3 Structure



[CW3-05P Front]

- (1) Control panel
Controller and other electronical parts are built in.
- (2) Over temperature limiter
If the heater temperature rises higher than set temperature it cut the power of the temperature controller, makes the over temperature warning on the screen and alarming beep sounds. If you resume the operation, please set knob of it about 15% higher than set temperature and press Start/Stop switch one then check the running status is on display.
- (3) Power button
Main power On/Off Switch.
- (4) Bath cover / refrigerating & heating bath
Bath covers are made of polyphenylene Sulfide (PPS) resin to protect user from high-temperature burns. Pump, Heater, Temperature sensor, and Temperature regulator are installed inside the Bath.

(5) Main body

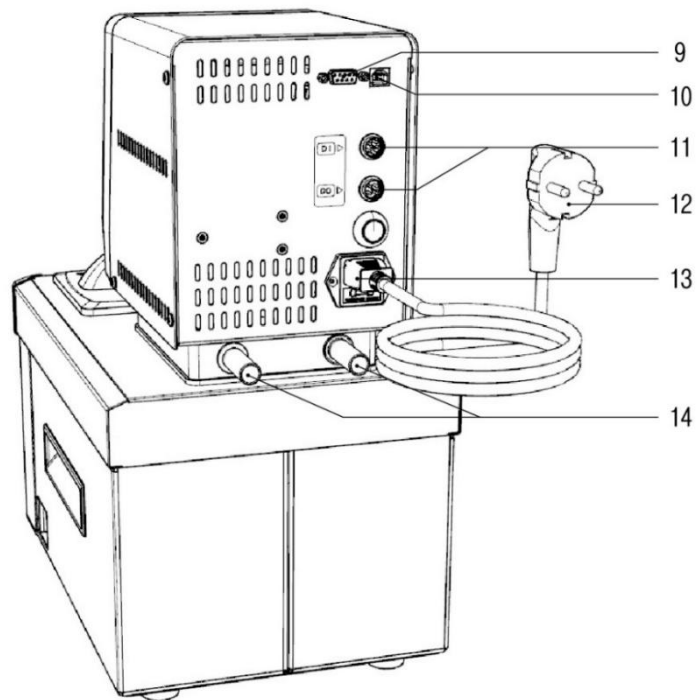
(6) Handle

(7) Drain

Bath fluid comes from this part. Turn (7) Drain Valve to open and close the drain hole. Caution that bath fluid may be hot.

(8) Drain valve

Turn the drain valve clockwise to drain out the bath fluid. User can easily turn the valve with hand or flat-head screwdriver. After high temperature test, user must wear protective gloves.



[CW3-05P backside]

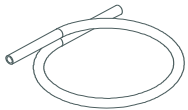
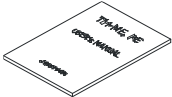
- (9) Communication port (RS-232C)
User can monitor and control the equipment via RS-232C protocol interface to computer device. The control values can be stored and printed out.
- (10) Communication port (USB-B)
User can monitor and control the equipment via USB-B port to computer device. The control values can be stored and printed out.
- (11) DI/DO port
It is Digital Input / Output port to connect external instrument.
- (12) Power cord
Power cord to supply power to the equipment.
- (13) Main Fuse holder
Fuses protect the equipment from over-current. When replacing fuses, check the line voltage & Hertz [refer to 5.5 fuse replacement].
- (14) Bath fluid In/Out line
In case of using Bath for inner circulation purpose, connect silicone hose to bath fluid In/Out line, In case of using Bath for external circulation purpose, follow the instructions attached on the equipment.

3.0 Installation

3.1 Components

After unpacking, please check the contents to ensure you have received all of the following unit components. Also, check the identification plate on the side of the equipment to make sure you received the model number your ordered.

If you didn't receive one or more of the components or if the model is incorrect, contact your local Jeio Tech office, or the distributor from which the equipment was purchased. Refer to **9.5 Warranty** to see the contact information

Item	Figure	Quantity	Description
Main body		1	-
Silicone hose		1	-
Operation manual		1	-

3.2 Preparing before installation

3.2.1 Environmental setting

The equipment can be operated properly under the following environmental conditions for a long time running without any problem.



No direct sunlight.



Please keep Ambient temperature 5°C~40°C

(The Optimum temperature is 25 °C)



Relative humidity not to exceed 80%



Altitude not to exceed 2000m (6,562 feet)

3.2.2 Precaution for use

- (1) Please install on the sturdy surface laboratory which is set safety facility and make sure horizontal align correctly.
- (2) When you install it, minimum space (over than 30 Cm in usual) required from other objects.
- (3) Do not install the equipment near environments where flammable gas may leak.
- (4) Do not install the equipment near machinery generating high frequency noise.
- (5) Do not install near other laboratory equipment, electric apparatus, and terminal electricity. Because, the vapor will be caused the damage.
- (6) Do not use the equipment in environments that contain industrial oil smoke and metallic dust.



WARNING

- Please install on the sturdy surface laboratory which is set safety facility and make sure horizontal align correctly. Avoid direct sunlight.

3.2.3 Bath heat transfer liquid supplement

- (1) Check if drain valve is closed.
- (2) Supply bath fluid up to the optimum level inside of the bath.
- (3) Connect silicone hose to In/out line.
- (4) Available heat transfer liquid and hoses
 - For the best temperature stability, Recommended viscosity of heat transfer liquid is with 50 centistokes (cSt) in case of the lowest temperature setting. If set temperature is around 15°C higher than environmental temperature, we recommend viscosity of heat transfer liquid is not over than 10 centistokes (cSt).
 - Heat transfer liquid should be non-flammable.
If heat transfer liquid is combustible, its flashpoint should be over 40°C. Circulation and pump of the liquid should be possible when the temperature of the liquid is even below 20°C. On this occasion, the equipment must be set at least 5°C lower than flashpoint of the combustible liquid. (Fp-5)
 - For use in the range of 10°C to 90°C, distilled water is recommended. It is recommended to use mixed water with ethylene glycol and distilled water in the range of below 10°C. Please do not use deionized water below 1 μ S/cm. If it is used for a long time, it causes corrosion of the bath.

WARNING

※ **WARNING : Please do not use the following liquids**



- Automobile antifreeze including additives
 - Tap water
 - Deionized water with a specific resistivity > 1 M Ω ·cm
 - Flammable liquid
 - Corrosive material such as acid and alkaline material
 - Solution with halogen: chlorides, fluorides, bromides, iodides or sulfur
-

-
- Sodium Hypochlorite
 - Solution with chrome salt
 - Glycerin
 - 100% glycol
 - JeioTech is not responsible for the equipment damage or accident that is caused by using improper heat transfer liquid.
-

- When silicone oil is used, please do not use silicone hoses. Silicon hoses can be broken. Please use hoses of other material (example: stainless steel, Teflon etc) and ask JeioTech or salesman if necessary.
- When hot heat transfer liquid is discharged, please cool the liquid to the room temperature level and discharge it.
- The following table is to show available hose types according to temperature range. Please refer to the table.

Material	Temperature Range
Buna N tubing	-40°C to 120°C
Viton® tubing	-32°C to 200°C
Braided Teflon® tubing	-50°C to 225°C
Silicone tubing (not to be used with silicone oil)	-30°C to 220°C
Metal tubing	-50°C to 200°C
Stainless steel fitting	-45°C to 225°C
Nylon fittings	-40°C to 90°C
Brass fittings	-40°C to 80°C

WARNING

- Please check connection of the hose all the time. Discharged hot liquid may get someone burned.
 - Please check hoses are damaged or leaked and replace it regularly.
 - When using silicone oil, please do not use silicone hose. If silicone hose and silicon oil are used together in the system, silicon hose may be broken and you can be burned by the discharged liquid.
 - Please discharge after cooling hot liquid down to the room temperature level. Please check the temperature of the liquids.
-

3.2.4 Power connection

Check to make sure that the line voltage & frequency matches the supply voltage & frequency specified on the identification plate before connecting to the main power.

WARNING



Electrical Shock Hazard.

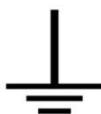
- Check to make sure that the correct line voltage, phase and capacity correspond to them specified on the identification plate.



- Do not use the branch socket or double-tap to prevent cable damage and fire caused by over current.

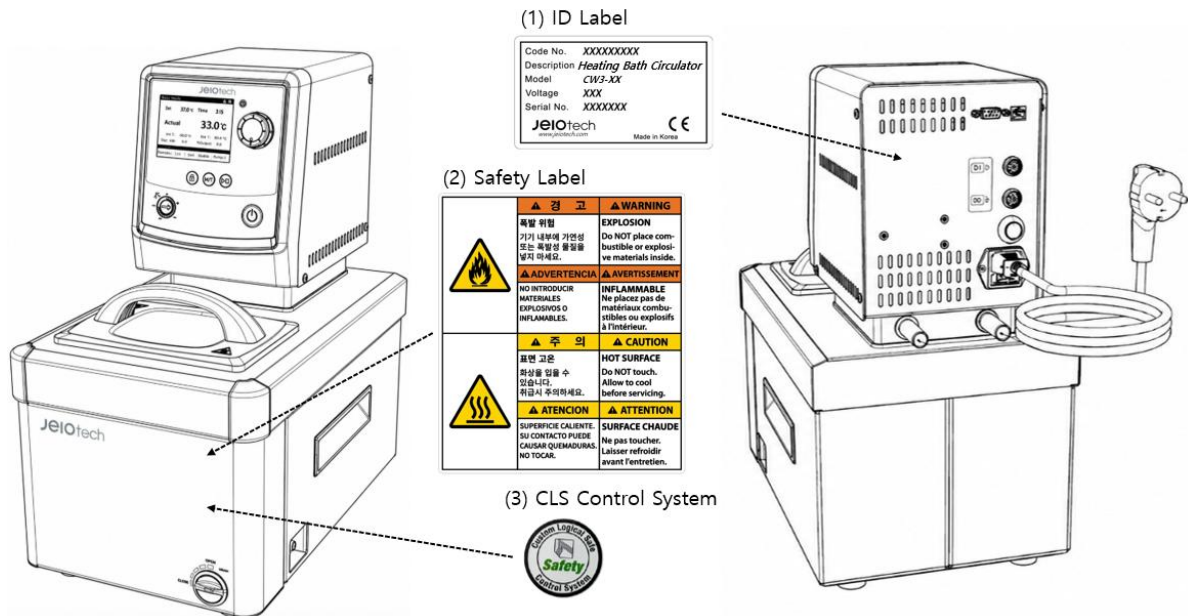


- Incorrect line voltages will cause the risk of fire, electric shock, and personal injury.



- Wear safety clothes, gloves, glasses.
 - Do not touch the equipment or plug with wet hands.
 - Use grounded power cord and consent.
-

3.3 The Labels attached to the Instrument



1) ID Label

An ID label of the basic information is attached on the panel of the rear side of the instrument. Before using it, please check the voltage, phase, and capacity of the power indicated on the ID label.

2) CLS Control System

It is a label that certifies that the CLS-Control system, the highest safety level control device is applied.

3) Safety Label

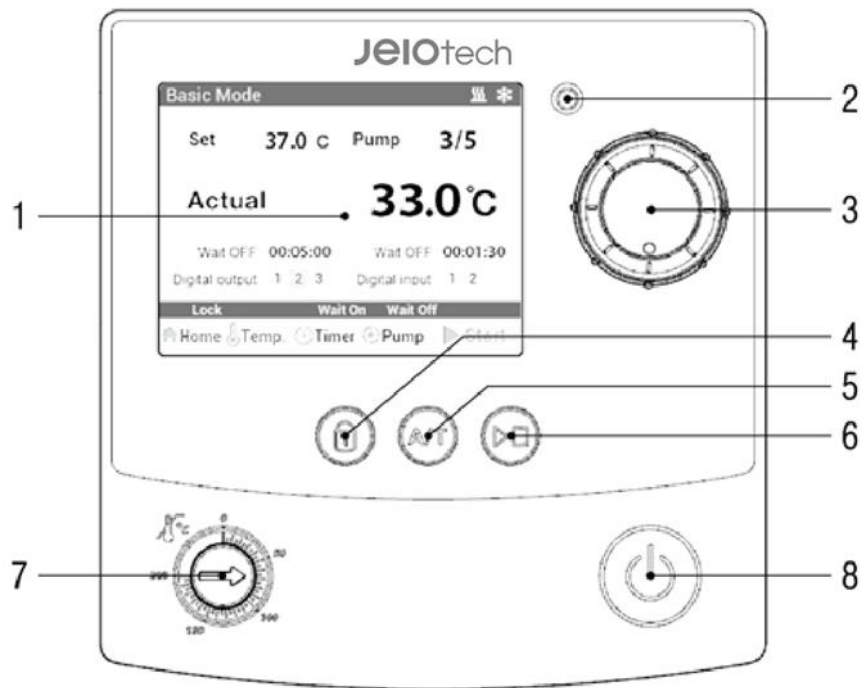
Safety labels are attached to the instrument to provide important information about potential risks or how to avoid them.

For safe operation, all users must check the safety label before using it and read the 1.4 Instructions for Safe Use (required reading) carefully to understand the relevant safety guidelines.

If the safety label is damaged, please ask the JEIOTECH branch or seller for a new label.

4.0 Operation

4.1 Control panel



- (1) LCD Touch Screen : You can check the operation setting, control status and set the display auto-off. [refer to 4.6.1 General].
- (2) Power indicator : It is function to check the power on or off. The LED light will be turned on when the power is on and it will be turned off when the power is off.
- (3) Dial Knob : You can turn it left or right and set the value. When you push the Dial knob, you can save the value.
- (4)  : Lock for all button (include LCD touch) , you can push this button about 3 seconds in Basic mode and Program mode
- (5)  : Auto tuning button [refer to 4.7 Auto tuning].
- (6)  : Operation start and stop button

⚠ CAUTION

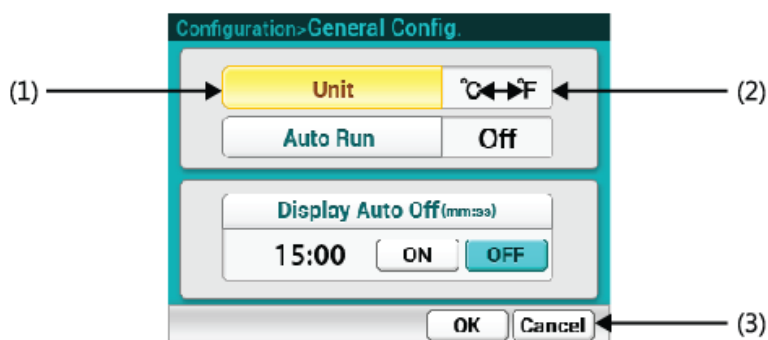
- Please fill in the amount of heating liquid (distilled water, Alcohol, Oil etc.) to fit the experimental purpose in the bath before connecting the power.
- Please connect the silicon hose at the In/Out line.
- Please be careful that the water or organic solvent not to flow to control panel.

4.2 Controller operation

This controller can set the value by touch screen, dial knob and button.

You can choose the touch screen menu and set the value as dial knob. After setting the value, you can save it by OK button. If you push Cancel button, setting value will not save.

[How to use the controller]



1. You can touch the screen menu. Then it will be changed the orange color.
2. You can set the Celsius or Fahrenheit by using the dial knob.
Set the other value same as (1) ~ (2)
3. After setting the value, you can save it by OK button. If you push Cancel button, setting value will not save.

NOTICE

- If you push the OK button, you can save the setting value as show the present LCD button. If you push Cancel button, the changed values will be canceled and returned to its original value.

4.3 Main menu

When power ON, you can see the Basic mode, Program mode, Configuration Menu with alert sound.

[Main Menu window]

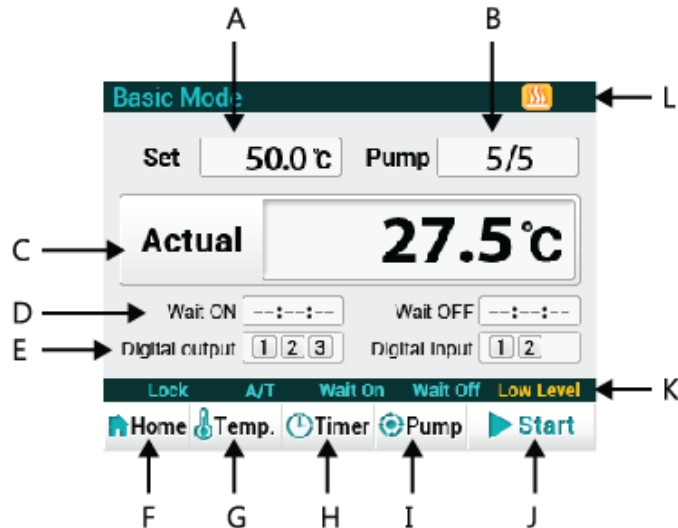


A	Basic Mode	You can set the temperature, timer [Wait on, Wait off], temperature control and stop.
B	Program Mode	You can see the program setting, control and stop.
C	Configuration	You can control and change the Fan speed, temperature unit, setting Reset, Digital Input/Output.

4.4 Basic mode

In Basic mode, you can control the inside of chamber temperature as one point. During the operation, you can change the temperature setting and timer value freely.

[Operation window of Basic mode]



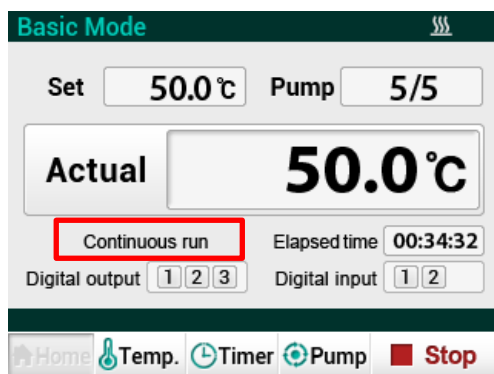
	Display				Function
A	Set				Set temperature
B	Pump				Amount of Pump circulation : 0~5 step
C	Actual				Actual temperature
D	Wait on	Wait off	D	Wait on	Wait off
E	Digital output		Digital input		E
F	Home				You can move to Main Menu window
G	Temp.				You can set the temperature
H	Timer				You can set the timer
I	Pump				You can set amount of Pump circulation
J	START (during operation: STOP)				Start and Stop
K	Lock	A/T	Level		Status notification
	Wait On		Wait Off		
L					Heater operation

4.4.1 Temperature control start & stop

If you want to control the temperature, you can push  button or START button in touch screen.

When finished, you can push  button over 1 second or STOP button in touch screen.

[Operation window of Basic mode]

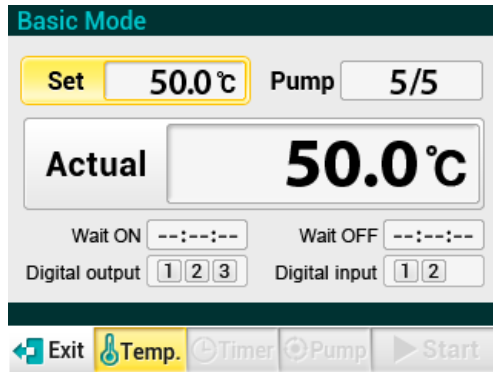


NOTICE

- When you operating the equipment in no or insufficiency of heating liquid condition, you can see warning sign. Please touch the warning sign in touch screen and fill in the bath and re operating it.
- When you push  button and Start/Stop button in touch screen, controller input will be inactivated about 3 seconds. After 3 seconds, controller input will be activated.

4.4.2 Temperature setting

- (1) Please push the Temp. button in Basic mode. Then it will be changed the orange color.



[When you change the set temperature as 70.0°C]

- (2) Please set the temperature by using the dial knob.

- (3) Please push the dial knob and save it.

If you do not push the dial knob and push EXIT button, the setting value will be Canceled

NOTICE

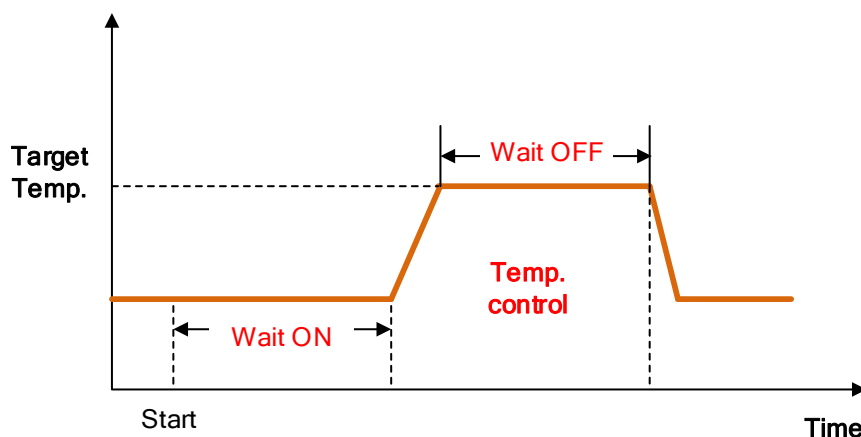
- You can input the temperature from -50 ~ 250°C, but you can control the temperature Amb+5 ~ 150°C.
- After setting the temperature and push the START button, you can control the temperature.
- During the control the temperature, if you change the temperature by (1) ~ (3), this equipment will control the changed temperature immediately.

4.4.3 Timer setting

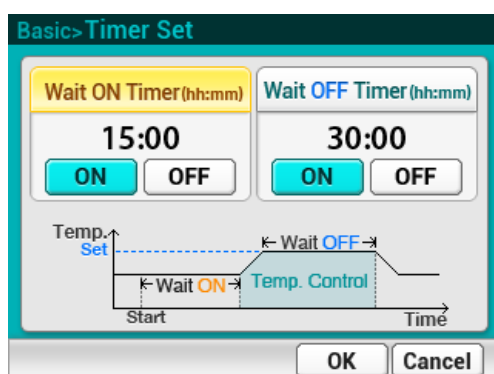
Wait on timer: After a set time, equipment will be operated for temperature control.

Wait off timer: After arriving at a set temperature, equipment will maintain the temperature during set time.

This graph in timer setting window will help your understanding for Wait on timer, Wait off timer. But the setting value will not reflect in graph.

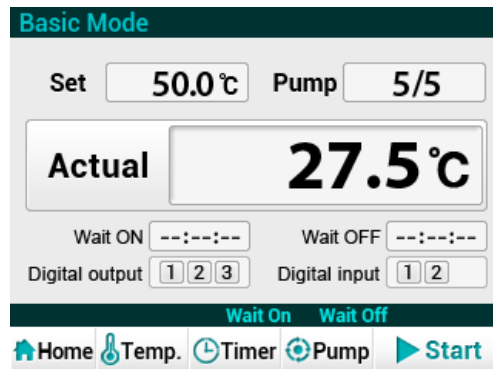


- (1) In Basic mode, you can push the Timer button and go to Timer set.
- (2) You can set a time as minute at Wait on timer / Wait off timer and choose ON/OFF.
Factory setting value is Wait on timer / Wait off timer 00:00, OFF.



[Example - Wait on timer-15 hours / Wait off timer-30 hours ON]

- (3) You can push the OK button and save Wait on timer / Wait off timer value.
Or you can push the Cancel button.



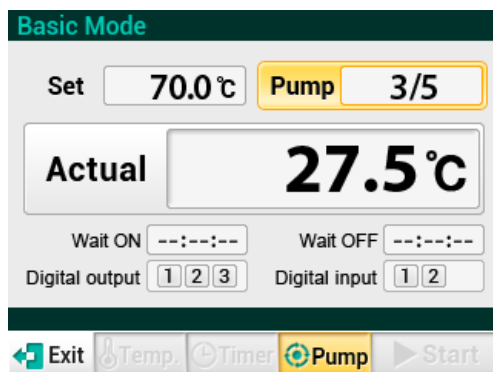
[Example - Wait on timer – 15 hours, Wait off timer – 30 hours]

NOTICE

- During the Wait on timer / Wait off timer operation, you can see the timer setting value in left side and Elapsed time in right side.
 - After setting the Timer and push the START button, you can control the temperature to setting value.
 - During the control the temperature, if you change the timer by (1) ~ (3), this equipment will apply changed timer value immediately. You don't need to push START button again.
-

4.4.4 Amount of pump circulation

- (1) In Basic mode, you can push the Pump button. Then it will be changed the orange color.



[When you change the amount of pump as 3]

- (2) Please change the amount of pump circulation by using the dial knob. You can change 0~5 step.
- (3) Please push the dial knob and save it.
When you do not push the dial knob and if you push EXIT button, setting value Will be canceled.

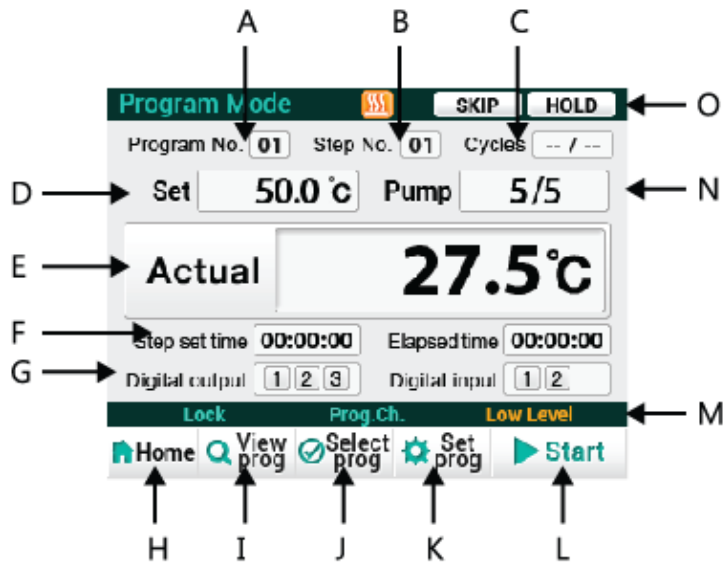
CAUTION

- If you set the amount of pump circulation under 4, please consider viscosity of solution by temperature change. In low temperature condition, viscosity of solution will be increased. It will cause malfunction or when you use external circulation, it will not work properly.
-

4.5 Program mode

In Program Mode, you can control the various temperature section sequentially. Through a program set up by each temperature range by setting the rise time, you can control a linear ramp. In addition, the program section repeat, settings, and at the end of a wide range of temperature conditions, control experiments can be performed easily.

[Program mode operation window]

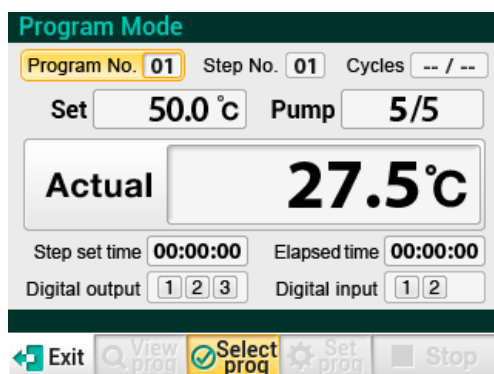


	Display		Function
A	Program No.		Program number
B	Step No.		Running step number.
C	Cycles		Present cycle number and Total cycle number
D	Set		Set temperature (during the operation of Program mode, you can see real temperature control point as per ramp setting of increase(decrease))
E	Actual		Actual temperature
F	Step set time	Elapsed time	F
G	Digital output	Digital input	G
H	Home		Move to Main Menu window
I	View prog		You can check program contents(Program No., Closure Command, Schedule, Steps, Time Info)
J	Select prog		Select program number

K	Set prog			Program setting (Parameters, Steps, Schedules, Reset)
L	START (STOP)			Program Start and Stop
M	LOCK	A/T	M	LOCK Wait on
	Wait on	Wait off	Level	
N	Pump			Amount of Pump circulation
	Display		Function	
				Heater operating

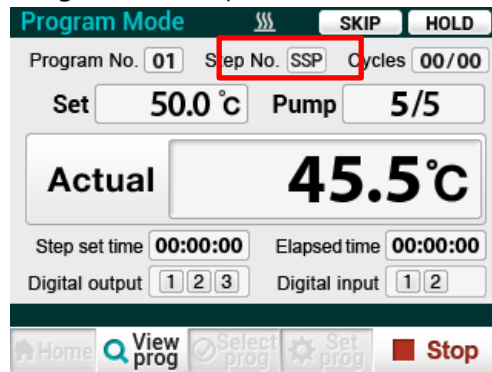
4.5.1 Program start and stop [Select prog]

- (1) Please push the Select Prog button in Program mode. Then it will be changed the orange color.

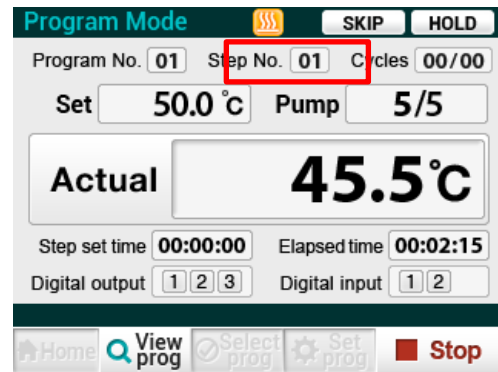


- (2) Please set the program number by using the dial knob.
- (3) Please push the dial knob.
If you do not push the dial knob and push EXIT button, the setting value will be canceled.
- (4) You can  run the program as push the controller button over 1 second or push the START button in touch screen.
When finish the program running, program control will be stopped with sound and this equipment will running as follow the setting finish condition (Stop, Continue, Program).

[Program mode operation window]



[If set SSP as 50.0°C, SSP running]



[Step 1 in Program 1 running]

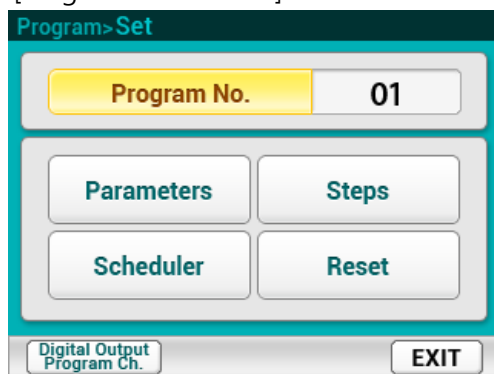
NOTICE

- Before operating the program mode, please check Set value of Parameters, Steps, Scheduler in Prog. [refer to 4.5.2 Program setting]
- If you run the program mode without step setting value, you can see the warning sign. Please touch the warning sign in touch screen. Then it will disappear and turn to operating window.
- During the program running, if you push the SKIP button, you can skip the ongoing Step.
- During the program running, if you push the HOLD button, you can stop the Elapsed time and maintain the present temperature.
- After finishing one Step, program control will be stopped with sound and this equipment will running the next Step.
- When finish the program operating, equipment will be operated by Closure Command setting value with beep sound.
- You can check the program information in 'View Prog' button. [refer to 4.5.8]
- When you push  button and Start/Stop button in touch screen, controller input will be inactivated about 3 seconds. After 3 seconds,

4.5.2 Program setting - general [Set prog]

In program Set window, you can choose Program No. by using the dial knob. Then you can adjust the Parameters value, input the Step, set the running section of step, Reset, set the Digital Output time Event for selected program..

[Program Set window]



Program No.		Choose the program number
Parameters [refer to 4.5.4]	Pump Level	Amount of Pump circulation : 0~5 step
	Start Set Point (SSP)	You can set 'Actual' or '-50 ~ 250°C' When you set Actual, first step will be start with start button. And if you set temperature, first step will be start when temperature arrive in set temperature.
	Tolerable Temp. Limit	During the Step control, when set temperature will not arrive within set time, it is allowable error between the target temperature and the actual temperature.
	Tolerable Time Limit (hh:mm)	During the Step control, when set temperature will not arrive within set time, it is max. extension time for Step.
Steps [refer to 4.5.3]	Step No.	Step number, Program pattern - 10, Max. Segments per a Pattern - 10
	End Temperature	Set temperature value for selected Step
	Time (hh:mm)	Set time of temperature control for selected Step
	DO Program Ch.	Input the number of Digital Output Time Event (If you don't want DO output, please select the "-")

Scheduler [refer to 4.5.5]	Start → End	Program operation Step range
	Cycle (Start → End)	Within selected Step, section repeat
	Closure Command	After finishing the selected program, you should set the next action (Stop, Prog. 01~10, Continue). In next action, Start set-point temp. is not applied
	View Prog.	You can check program information(Program number, Closure Command, Program Step section, Step setting value, Program operating time information)
Reset [refer to 4.5.6]		You can reset the selected program to factory setting.
Digital Output Program Ch. [refer. 4.5.7]	DO Program Ch.	When the program enters specific Step, it can give signal to external devices thru digital output. You can enter/use 4 type Program Ch. You can select Digital output port for signal of corresponding Program Ch. output in Configuration.
	Sequences	Set the Sequences of enter signal
	On time (hh:mm)	Sending out time of enter signal
	Off time (hh:mm)	Waiting time of enter signal

NOTICE

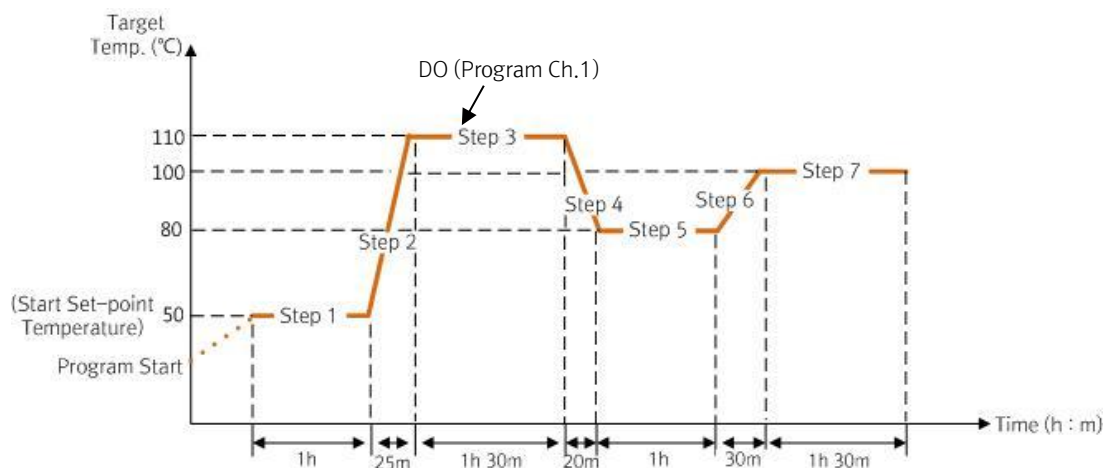
- You can come out to program operating window by push the EXIT button. At this time, number of Prgraom No. will be selected in program setting window.

[Example for input Program Step]

If you set the Start Set Point(SSP) value as 50°C and enter the Step 1~7 value as below and when you run the DO Program Ch.1 in Step 3, equipment will control the temperature as below graph.

If you do not set the time or temperature in Step, below step will not be operated.

Step	Start Set Point (SSP)	1	2	3	4	5	6	7
End Temperature	50	50	110	110	80	80	100	100
Time		1h	25m	1h 30m	20m	1h	30m	1h 30m
DO Program Ch.		-	-	1	-	-	-	



4.5.3 Input program step

- (1) In program mode window, please push Set Prog button.
- (2) Please select the program number by using the dial knob.
- (3) Please push the Steps button, you can move to Step setting window.

- (4) You can set the setting temperature, Time, DO Program Ch. for selected Step.
If you set Time Event in Do output but if it does not support external output, you can input "-".

Factory setting value is End Temperature : "----"°C, Time : --:--, DO Program Ch. : "-".

- (5) Please push the OK button and change the Step value.
Or you can push the Cancel button.

NOTICE

- The heating time to the set temperature could be longer by the circumstance or less step setting time. At this time, the equipment move to next step or extend the operating time current step to reach to the SV, according to the Tolerance Limit set by Program Parameter. [refer to 4.5.4 Program Parameter setting]
- The step do not operate in the case of no put of the Temp or Time.
- Push dial knob at "-" mode, in the case of no operation of DO Program Ch.

4.5.4 Setting of program parameter

- (1) Push the Program No. on the program mode and select the No. by moving the dial knob.
- (2) Move to Parameter setting mode by pushing Parameter.

Program>Set>Parameters	
Pump Level	5
Start Set point (SSP)	50.0 °C
Tolerable Temp. Limit	1.0 °C
Tolerable Time Limit (hh:mm)	00:00
OK Cancel	

- (3) Change the setting value.

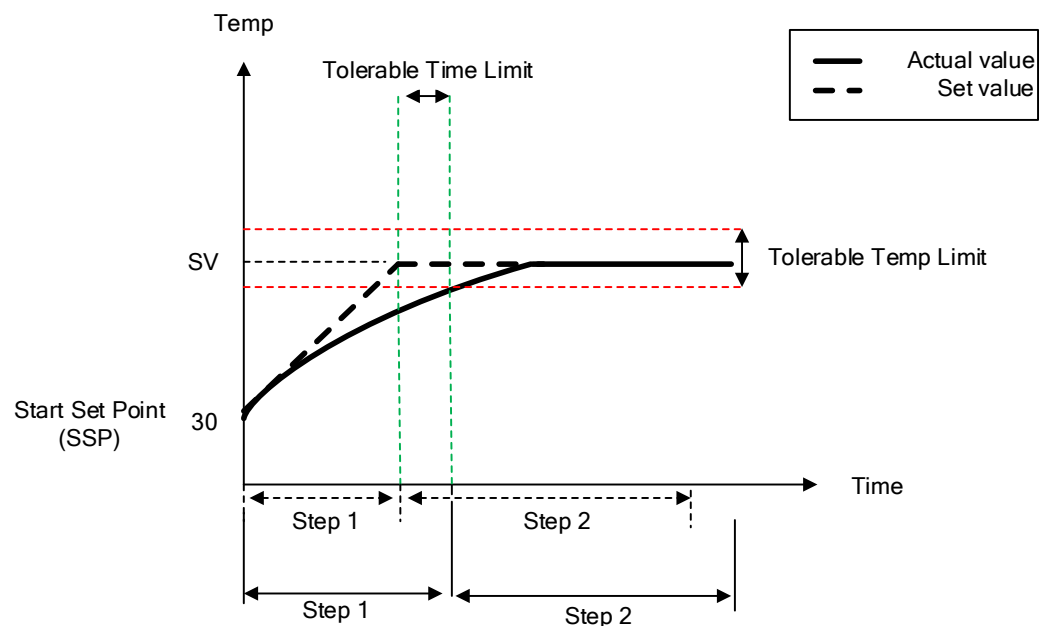
A. Pump Level : while program mode is operated, user can set or adjust the pump circulating level. The pump level can be set from 0~5 level. And the factory default pump level is be 5.

B. Start Set Point(SSP) : The first step proceeds after the temp reach to the Start Set-Point. It is available to select between Actual Value and -50 ~ 250°C. Initial figure is 50°C. (Press Start, the first step begins after the temp reach to 50°C. In the case of Actual Value, the temp control operating begins directly from the first step.)

The program mode controls temp by put the setting temp and time. In the case of not to reach to the setting temp, the step moves to next step without the reaching to setting temp. Tolerable Temp. Limit and Tolerable Time Limit are the preventing from above situation. Below are the function of it.

C. Tolerable Temp. Limit : Tolerable Temp. Limit : In the case of the temp not reaching to the set point in the set time, the equipment move to next step only when the temp reaches to the set point in a accuracy range. Initial figure is 1.0°C.

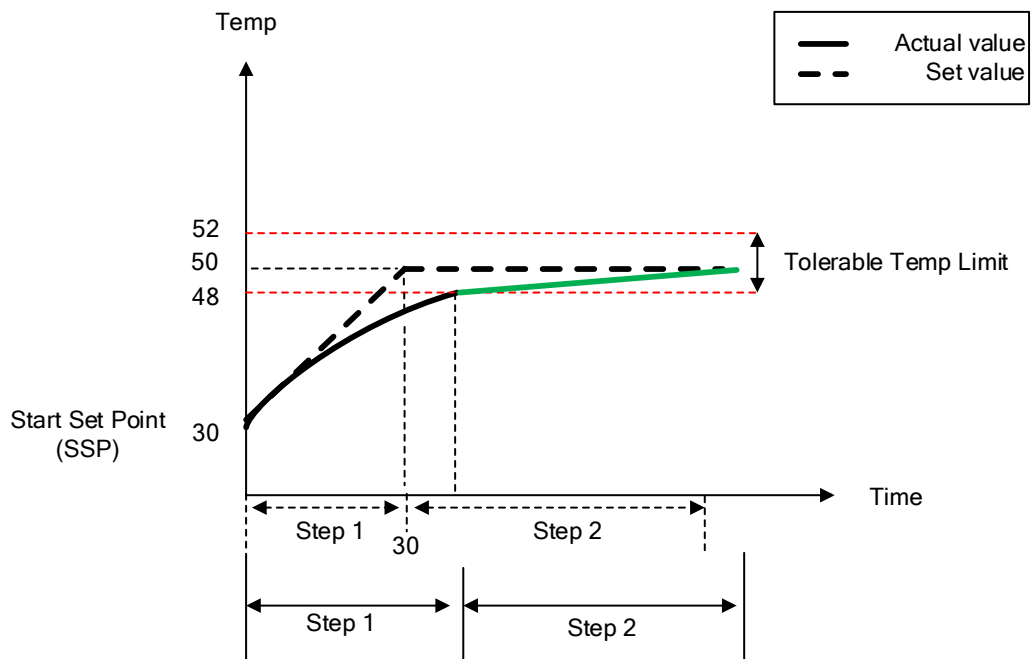
D. Tolerable Time Limit : In the case of the temp not reaching to the set point in the set time, postpone the time to move to next step. Move to next step only when the temp reach to the set temp in set tolerable time. The initial figure is 00:00.



(ex) In case of Tolerable Temp Limit is set as below

Start Set Point (SSP)	Step 1 set time (min)	Step 1 set value (°C)	Tolerable Temp Limit (°C)
30.0	30	50.0	2

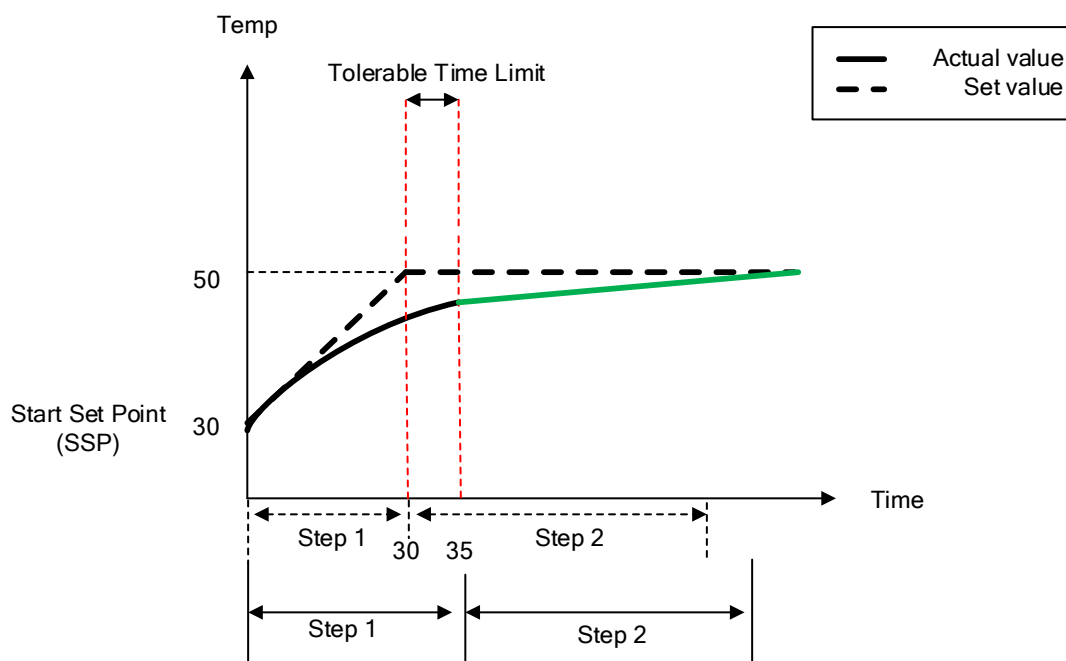
In the case of the temp not reaching 50°C [set value] in 30 minutes [set time], the next step starts when the temp reaches to 48°C [set value - Tolerable Temp Limit].



(ex) In case of Tolerable Temp Limit is set as below

Start Set Point (SSP)	Step set time (min)	Set value (°C)	Tolerable Time Limit (min)
30.0	30	50.0	5

In the case of the temp not reaching 50°C [set value] in 30 minutes [set time], the next step starts after 35 minutes [set time - Tolerable Time Limit].



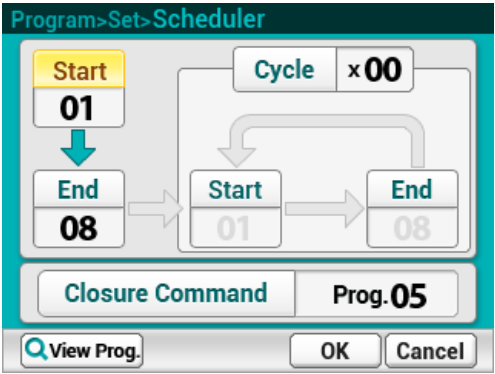
- (4) Press 'OK' to save parameter values.
Press 'Cancel' not to save parameter values.

NOTICE

- It is available get back to program operating display by put OK on the program setting mode. The number of program is selected on the program operating display.
- Program's parameter values are applied to the selected program.
- If you press 'EXIT' after program number change by turning the dial knob, the selected program number shows on display.

4.5.5 Scheduler

The selected program operating range set, repeat section set, the next operating set are available on scheduler set screen.



- A. Press 'program No.' on program set screen. Turn dial knob to select program No.
- B. Press 'Scheduler' to move to the scheduler set screen.
- C. Set operating range of the selected program. Also set repeat section in the range of the set range. The repeat section can be input from 0 to 99 times in operating range. When you operate program, it starts in order of arrow direction shown on scheduler set screen.
- D. Set the next operation by inputting closure command after the operating program. Default value is 'Stop'. Turn dial knob to select one between 'Stop', 'Prog. 01~10', 'Continue'

Stop	Temp control ends with alarm after completion of the selected program.
Prog. 01 ~ 10	It starts the inputted program no after completion of the selected program.
Continue	It maintains the set temp of the last progressed step.

- E. Press 'OK' to save the value.
Press 'Cancel' not to save the value.

NOTICE

- It is available get back to program operating display by put OK on the program setting mode. The number of program is selected on the program operating display.
 - Scheduler's default value is to operate all steps from Step 1 ~ Step 10 for one time.
 - If you select Prog. 1~10 in Closure Command, the selected program starts as the operating program is ended. In this case, Step 1 starts without collecting start set point of the selected program.
-

4.5.6 Program reset

- (1) Press 'Set Prog' on program mode screen.
- (2) Turn dial knob to select program No. If you select 'program No.' and press 'EXIT', the program No. on the screen will be changed to the selected program No.
- (3) Press 'Reset'.
- (4) Press 'OK' to initialize the selected program. Press 'Cancel' not to initialize the program.

4.5.7 Digital output program Ch.

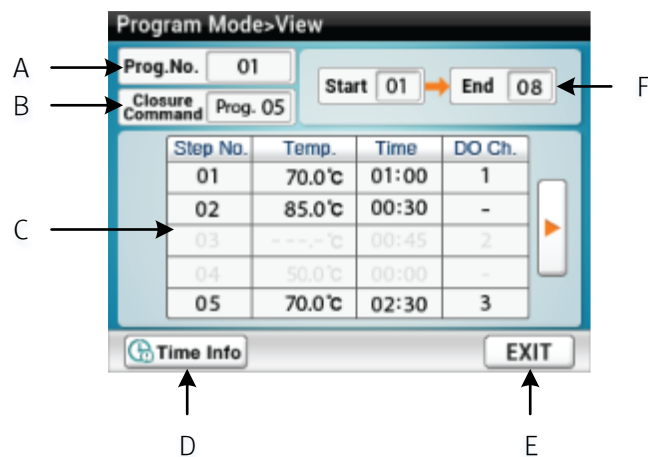
Program running has the function of sending the digital signal to external instrument. Please refer to the **9.2 Digital Input / Output operating manual**.

4.5.8 Check the saving program [View prog]

Press the View Prog button on operation viewing windows during the Program mode, Step input windows, or Scheduler input window. Then, user can check saving program information like below chart.

If the value inputting is not finished, the program will be Skip and show Gray color text.

[View Prog check window]



A	Prog. No.	Program number
B	Closure Command	After program finish, following progress setting.
C	Steps	• Check the saving Step information • User can check saving date the Step 1~5 and 6~10 by Right side / left side button.
D	Time Info	Check the program time information. User can see Time Info checking window.
E	EXIT	Exit the View Prog
F	Start → End	User can check the operating information which is saved program data in Scheduler.

[Time Info check window]

Program Mode>View>Program Time Info

Program No.	01
Remaining Time	04:00
Elapsed Time	00:00
Total Set Time	04:00
Delayed Time	00:00
Skipped Time	00:00

EXIT

Program No.	The selected program number
Remaining Time	Remaining time of the selected program
Elapsed Time	Elapsed time of the selected program
Total Set Time	Total time set for the selected program
Delayed Time	Total delayed time for the each step is not reached to set temperature during goals time.
Skipped Time	Total skipped time for user press the skip button.

NOTICE

- Displayed operate information on Time Info check screen is showed each Program No. operate information. In case of Scheduler setting, the program operate information on Closure command is not included.

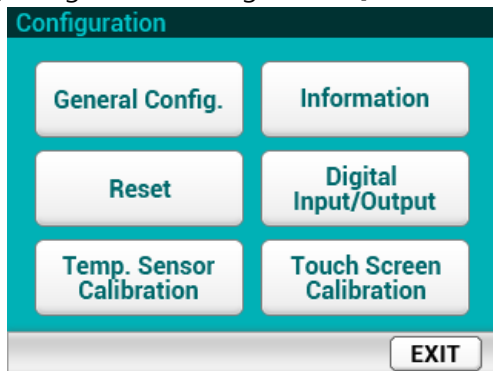
4.6 Configuration

It provides checking and changing of the setting such as fan speed adjusting, temp formula changing, system initializing, Digital Input/ Output.

Move to Configuration setting window on the Main Menu.

It provides checking and changing of the setting such as fan speed adjusting, temp formula changing, system initializing, Digital Input/ Output, calibration of temp sensor and touch screen.

[Configuration setting window]



4.6.1 General

It provides function of fan speed adjusting, changing formula of temp, Auto-run, display auto off time by dial knob.

- (1) Touch the General button on Configuration setting window.
- (2) Change the setting of fan speed, formula of temp, Auto-run, Display auto off setting time by dial knob.
Set the program by turning the dial knob or touching the screen with turning the dial knob.

Item	Function	Possible Value	
Unit	Change the temperature of the unit	°C / °F	
Auto-run	In the case of occurring black out caused by external factor and returned power, 1) Basic Mode: Temp returning to the temp before black out 2) Program Mode: step returning to the step before black out	ON / OFF	
Display Auto OFF	Automatic turn off of touch screen	10sec ~ 99min 59sec	Display Auto OFF

(3) Save the value by touching OK button.

4.6.2 Information

It provides the information of version of the equipment. Please update the version with recent one.

- (1) Touch Information button on the Configuration.
- (2) Check the version of the equipment.
- (3) Touch the EXIT button and move out from the Information.

4.6.3 Reset

(1) Touch the Reset button on the Configuration.

(2) Touch the item to be reset.

Item	Remarks
System Reset	Initialize the modified figure of Basic mode, Program mode, Configuration to factory initial value.
Configuration Reset	Initialize the lower setting items on Configuration setting mode to factory initial value.
PID Reset	The equipment has PDI control for temp and updates the control point to the best PDI figure by Auto Tuning function. [refer to 4.7 Auto tuning] PID Reset initializes the modified PID value by Auto tuning to factory initial value.
Digital Input / Output Reset	Initialize the setting value of Digital Input/ Output to factory initial value.
Temp. Sensor Calibration Reset	Initialize the modified value of Temp. Sensor Calibration to factory initial value.
Touch Screen Calibration Reset	Initialize the coordinate revision of touch screen to factory initial value.

(3) Reset by touch OK. It is available not to reset by touch CANCEL.

4.6.4 Digital input / output

Digital input / Output function is designed for the external equipment user and please refer to **9.2 Digital Input / Output operating manual** to use. Maximum two Digital Input setting and, three Digital Output setting are available.

4.6.5 Temp. sensor calibration

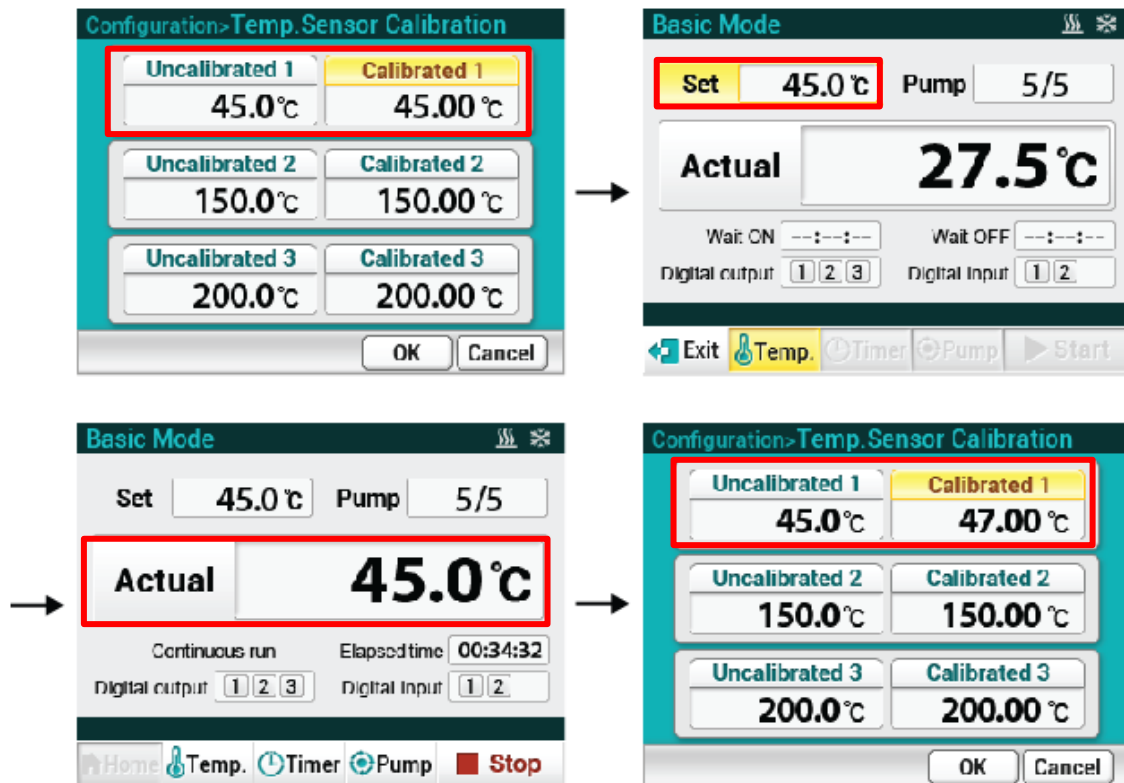
In the case of measuring of the inside temp of the chamber with temp sensor of user and existing the temp difference between sensor from user and sensor in the chamber, calibrate the sensor inside of chamber according to the sensor of user.

- (1) Touch the Temp. Sensor Calibration on Configuration setting mode.
- (2) Temperature calibration is available on three points. Select one point and put the target temp. on the uncelebrated menu. And put the same value on the calibrated menu.
- (3) Enter to 'Basic Mode' and put the target temp. and start the temp. regulating.
- (4) Wait till the actual temp. reaching to the set temp. and measure the temp. of chamber and stop the temp. regulating, using external temp. sensor.
- (5) Back to 'Configuration의 Temp. Sensor Calibration' and put the exact temp. that appeared on the external temp. sensor on the 'Calibrated'.
- (6) Save the modified value with OK button.

NOTICE

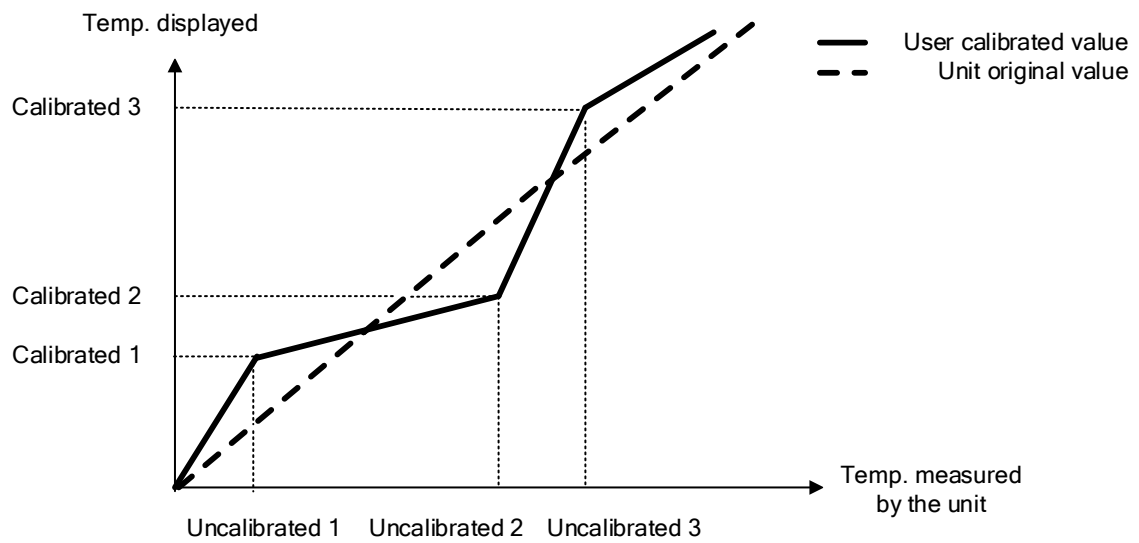
- In the case of put the value on the uncelebrated display, do not put the same value on Uncalibrated1, uncelebrated 2, uncelebrated 3.
-

(EX.) In the case of [the temp. of inside chamber: 45°C, the temp. of external sensor: 47°C



Put same target temp. in the Uncalibrated and Calibrated on the "Configuration-Temp. Sensor Calibration" menu. → Put the target temp. on the "Basic Mode-Set temp. → Start temp. regulating, Measure the temp. of chamber inside right after actual temp. reaching to the set temp., using external temp. sensor. → Change the Calibrated value to the value that measured by external temp. sensor on the "Configuration-Temp. Sensor Calibration"]

The set point value 45°C is calibrated to 47°C after saving the setting value with OK button.



This equipment is calibrated on max. 3 points through same process of above. The actual value read from the sensor can be changed to the accurate value by calibration.

4.6.6 Touch screen calibration

This is the function for correcting the coordinate of the touch screen.

- (1) Touch the Configuration button.
- (2) Touch Screen Calibration button.
- (3) Implement Touch Screen Calibration by touching OK button.
- (4) Touch the point that red circled.
- (5) Save the modified calibration value by touching OK.

4.7 Auto tuning

Implement the Auto Tuning for more fast and accurate temp control. The PID value is saved automatically after Auto Tuning.

- (1) Touch Basic mode button.
- (2) Touch Temp. button.
- (3) Put the temp that is aim of Auto tuning.
- (4)  Press the button for 3 seconds. A/T is appeared on screen with alarm.
- (5) Operate Auto Tuning with START button.
- (6) The A/T is disappeared and the temp is being controlled as Auto tuning temp Auto tuning after finishing Auto tuning.

NOTICE

- Auto tuning takes several minutes or several hours depending on the setting temp. Do not turn off the equipment during the Auto tuning implementation.
 - A/T starts with A/T sign appearance after touch  button for three seconds during the equipment operation.
-

4.8 Safety function

(1) Over Temperature Limiter

The equipment stops the operation with alarm when the temp exceeding maximum temp limit Over. Temperature Limit. Once the equipment turned off, move the Over temp. Limiter to the value of 15% increasing. And turn on the equipment with START button.

(2) Lock

The function that locking to prevent using touch screen and controller.



Touch button three seconds at the Basic mode, Program mode, and then Lock sign appears with alarm.

Cancel the Lock function with three seconds touching of the button.

(3) Low Fluid Level Alarm

In the case of the lack of thermal liquid, warning sign is appeared on the display with alarm. Check the warning sign on the touch screen and refill the thermal liquid and restart the equipment.

(4) Malfunction of Temp sensor

Once the equipment notices the malfunction of temp sensor, the temp control is stopped and warning sign appears. In that case, contact to Jeio Tech Service.

(5) Glass Fuse

Once the overcurrent occurs, the fuse be shorten and the equipment turned off. Refer to [fuse change 5.5] and change the fuse.

5.0 Maintenance

5.1 Maintenance period

Category	Inspection Interval				
	Daily	Weekly	Monthly	Quarterly	Yearly
General					
Check the power cord connection	●				
Check the power cord for moisture, disconnection, or damage	●				
Clean the surface of the equipment and accessories		●			
System(Control) Related					
Check the touch screen, operating button and dial nob		●			
Perform auto-tuning (after replacing the heat transfer liquid)				●	
Temperature					
Check the temperature setting value	●				
Check the operation of the over temperature limiter				●	
Calibrate the actual/displaying temperatures					●
Bath Related					
Check the bath interior for damage and cleanliness		●			
Check the heater coil and sealing condition (if any product abnormality occurs.)					●
Check hoses and connections for leakage or damage		●			
Check the assembly of accessories		●			
Check the condition of the heat transfer liquid and refill if necessary	●				
Check the operation of the low fluid level alarm				●	

5.2 Cleaning the equipment

The equipment maintains the best condition and operates with full efficiency and extend the life expectancy, only satisfied with periodical cleaning. We suggest that checking cleanliness every day, cleaning the chamber once a week, cleaning the surface of the equipment once a month. And immediate cleaning is required when the equipment is contaminated.

5.2.1 Cleaning the equipment

Unplug the power cord and discharge the thermal liquid clean it with soft and dry towel. Rub the unremoved part, using alcohol solvent (methanol, ethanol) with towel.

CAUTION

- Do not pour the water on the outside of the equipment (especially Control Panel), The water could cause short-circuit problem and etc.
 - Be caution on the damage of parts inside of chamber and system.
 - Do not use acid liquid, benzene, sharp stuff, soap water, cleaner, and hot water. It causes color change or damage on the equipment surface. Rubber and plastics parts could be changed in color, shape, and feature. Especially do not use the volatile.
 - materials. Use the neutral detergent only with towel. And dry it completely.
 - Clean up the inside of chamber with dry towel and wear toxic free glove and mask, when the toxic chemical material or gas generated in inside of chamber.
 - In the case of clean up the equipment using the method that different from manual, contact to the manufacturer and confirm whether the method damage the equipment or not.
-

5.2.2 Accessories

- (1) Check the foreign substance and put the accessories in the neutral detergent.
- (2) Clean it with distilled water.
- (3) Store it after dry the equipment completely.

5.3 Move

- (1) Unplug the power cord.
- (2) Discharge all the thermal fluid in the bath.
- (3) Pack the equipment and accessories as initial packing. Or pack it to prevent damage during the move.

 CAUTION

- Do not move the equipment in plugged.
 - Do not make mechanical shock or vibration on the equipment.
 - It could cause problem on the later use because of the inner damage
-

5.4 Storage

In the case of no long time use

- (1) Unplug the power cord.
- (2) Clean up the equipment with dry towel.
- (3) Pack it and place it in the dry area.

5.5 Replacement of fuse

The fuse be shorten and the equipment turned off when the overcurrent occur on the equipment. Then replace the fuse refer to below procedure. (Two fuse is included in the manual pocket.)

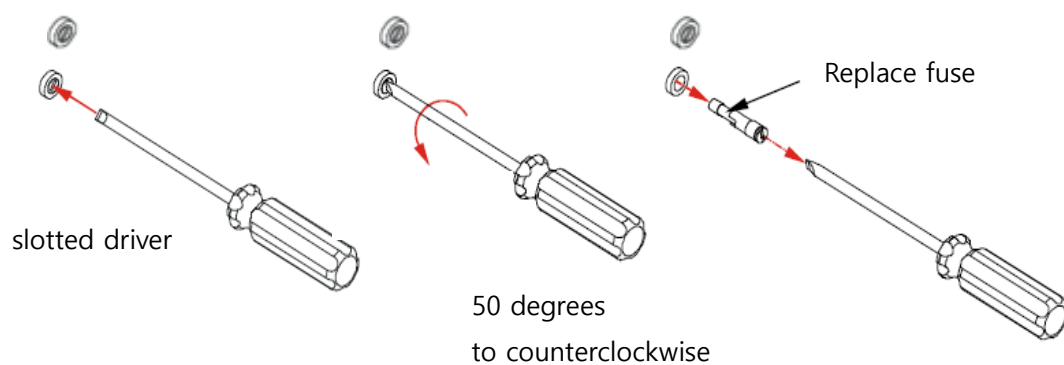
WARNING



Must turn off the power and check the power connection before replacing the fuse. In the case of the power is on, there could be severe injury and lead death.

5.5.1 Main fuse

- (1) Turn off the power pushing the power switch.
- (2) Insert slotted screwdriver ["-"] into the fuse holder. The fuse holder is separated when you rotate the slotted screwdriver by 50 degrees to counterclockwise. [Refer to 2.3 (10) Fuse Holder]
- (3) Replace the shorted fuse into spare fuse.



- (4) Implement step (2) reversely and complete the replacement.

5.5.2 Control fuse

- (1) Turn off the power pushing the power switch.
- (2) Insert slotted screwdriver ["-"] into the fuse holder. The fuse holder is separated when you rotate the slotted screwdriver by 50 degrees to counterclockwise. [Refer to 2.3 (10) Fuse Holder]
- (3) Replace the shorted fuse into spare fuse.
- (4) Implement step (2) reversely and complete the replacement.

6.0 Trouble shooting

6.1 Instruction on problem

Check the below statement and take action according to the instruction.

If the unindicated problems arise or you cannot solve the problem with the instruction, Contact to Jeio Tech Service part and solve the problem.

In the case of no operation of the equipment.

- (1) Check the power.
- (2) Check the Fuse.
- (3) Check if the Lock button is on
- (4) Check the START button on the touch screen.
- (5) Check the black out

6.2 Power

Problem	Cause	Instruction
No power on	Power supplied with wrong voltage and hertz	Check the voltage, phase and hertz.
	Circuit breaker going down and black out	Find the leakage
	The power cord inserted not perfectly	Insert the cord perfectly
	Damage on consent, plug, cable	Replace the damaged consent, plug and cable.
	Fuse short circuit	Replace the fuse
	Inner circuit damage	Ask service
Circuit breaker is shorten constantly	Too many cord plugged	Remove all the plugs inserted and use the consent in the allowed current volume.
	Inner circuit damage	Ask service
Power on but, no operation	Over heating causes protection system and cut off the power.	- Once over heating generated on the inner circuit, the equipment off the heater power and make alarm noise. - Unplug the cord and cool it down, restart the equipment.
	Inner circuit damage	Ask service

6.3 Problem generating during the operation

Problem	Cause	Instruction
If the alarm sound is keep beeping	• Shortage of thermal liquid • Problem on the setting temp of Over temp. Limiter	• Set the Over temp. Limiter to the value of 15% increasing • Supply the thermal liquid
If the temp. is not increasing or decreasing	• No operation	• Touch Start to operate the equipment
No temp control	• Check the existence of equipment that generating high frequency noise near the equipment. • No operation of Auto tuning • Malfuction of temp. sensor • Inflow of the foreign substance or oil	• Remove the equipment that generating high frequency noise near the equipment. • Operate Auto tuning • Ask service
When the thermal liquid is not circulating in the bath	• Pump circulation amount is set as '0' • Pump problem	• Check the pump circulation amount and put 1~5 • Ask Service
Problem of dial knob	• Knob problem	• Pull out the nob and put it again. • Check the Lock funtion • Ask service
When the touch screen is not available	• The parts is damaged caused by media(sample) or over temperature	• Check the Lock funtion whether it is operating or not • Ask service

※ Use the original parts for the replacement.

※ Technical maintenance cannot be implemented on the problem of the out of technical limits.

6.4 Warning Sign

The warning sign appears in the case of shortage of thermal liquid, temp sensor problem etc. Solve the problem and touch the warning sign refer to below table. Then the display changes to the operation mode

Warning Sign	Cause	Instruction
The low fluid level alarm is activated. Fill the bath with thermal fluid if required, and start again.	• Shortage of thermal liquid	• Refill the thermal liquid and restart the equipment.
The program setting is not completed. Please update the end temperature and time. And then start again.	• No stored program step	• Put the program step and start the equipment
The bath temperature is now higher than the temperature set on 'OVER TEMP.LIMIT'. Please check 'OVER TEMP.LIMIT' or cool down the bath. Then start again.	• The present temp of the bath is higher than Over temp. limit setting temp	• Cool down the equipment and restart the equipment. • Increase the set temp of Over temp. limiter
The temperature sensor is disconnected or detected an error. Contact Jeio Tech for service.	• Cut off cable of temp sensor • Problem of temp sensor	• Request service

7.0 Accessories

7.1 Accessories

Designation	Order No.	Description
Spring wire rack	AAA51522	CW3-20P (185(W) x 159(D) x 170(H), mm)
	AAA51523	CW3-30P (249(W) x 219(D) x 198(H), mm)
Test tube rack	AAA44581	CW3-20P, CW3-30P (for 86 test tubes, 8mm dia., 2ea)
	AAA44582	CW3-20P, CW3-30P (for 86 test tubes, 10mm dia., 2ea)
	AAA44583	CW3-20P, CW3-30P (for 58 test tubes, 12mm dia., 2ea)
	AAA44585	CW3-20P, CW3-30P (for 32 test tubes, 16mm dia., 2ea)
	AAA44586	CW3-20P, CW3-30P (for 19 test tubes, 25mm dia., 2ea)
	AAA41531	CW3-10P (for 50 test tubes, 8mm dia., 1ea)
	AAA41532	CW3-10P (for 50 test tubes, 10mm dia., 1ea)
	AAA41533	CW3-10P (for 33 test tubes, 12mm dia., 1ea)
	AAA41535	CW3-10P (for 16 test tubes, 16mm dia., 1ea)
	AAA41539	CW3-10P (for 10 test tubes, 25mm dia., 1ea)
Stainless steel cover	AAA51531	CW3-05P
	AAA51532	CW3-10P
	AAA51533	CW3-20P
	AAA51534	CW3-30P

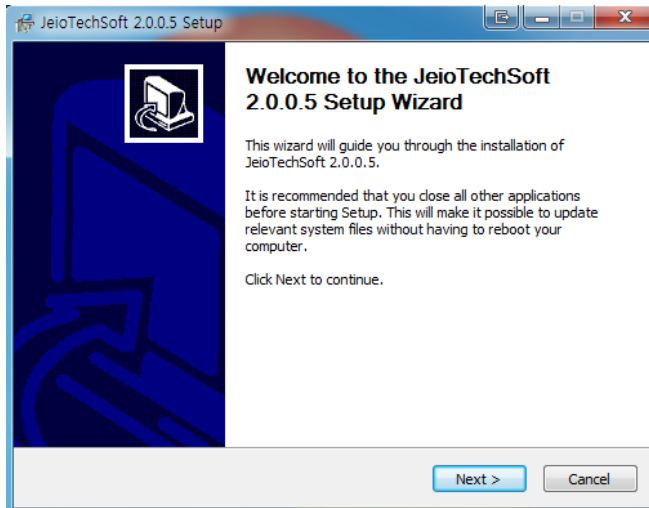
※ Regarding changing the accessories, please visit our webpage
(<http://www.JeioTech.com/eng/>), or contact to JeioTech sales department or the dealer.

8.0 Dedicated S/W

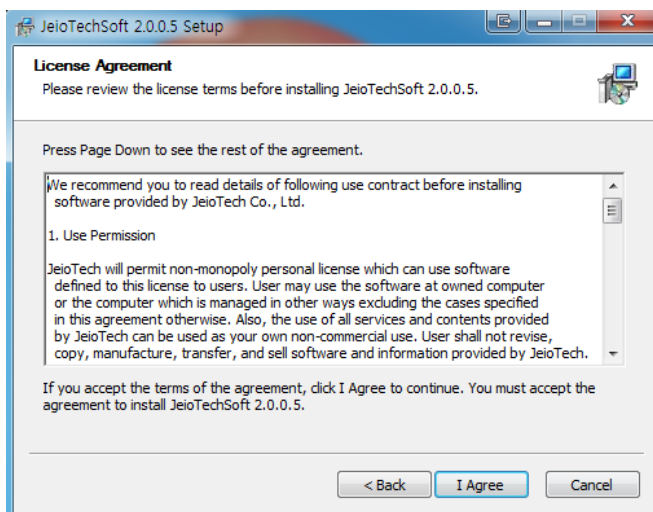
8.1 Monitoring program installation

Please, visit the below web and click "software download". And you will find software for your equipment. <https://www.JeioTech.com/eng/>

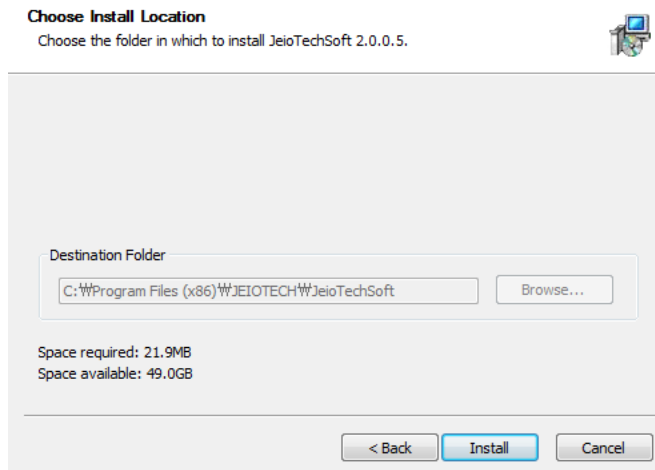
- (1) The software is automatically installed. When user put the "Next" button, the screen showed "License Agreement" page.



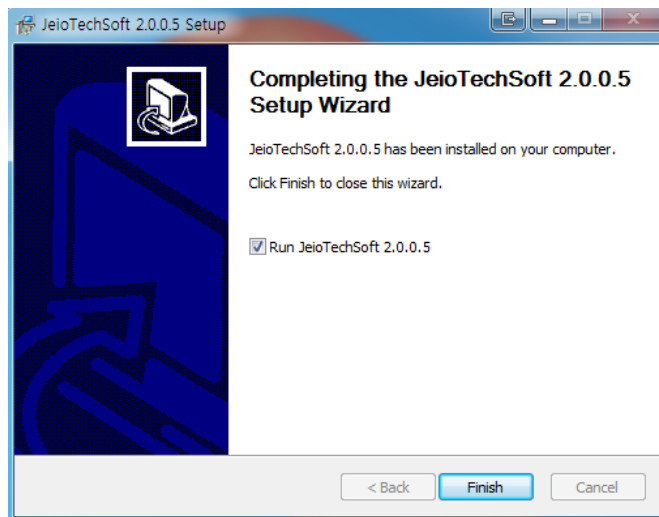
- (2) Please consider and carefully read "License" contents before install the JeioTechSoft.



(3) Set the software install location. And press the "Install" button.



(4) After install the software, you can see the "JeioTechSoft" icon on computer main screen.



NOTICE

- In case of JeioTechSoft program operating by connecting of RS-232 port, user can set the temperature, timer, and Pump circulation level by keyboard number keypad or arrow key ↑ ↓. Also in case of enter the "." place, you can use arrow key ← or → to move.
- In case of press the keyboard Delete key, the enter value will input "0".
- In case of user enter value greater than possible input value, the value will be entered maximum possible input value.

8.2 Communication protocol

It is possible to communication from this equipment to external device by RS-232C port. Providing JeioTech software can be supported the bothway communication, check the operating status, data recording, and data saving.

In addition, if you want to modify the software, please refer below communication protocol and communication reference.

Communication Reference :

http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf

8.2.1 Physical layer

- Communication port : RS-232C

8.2.2 System number for each model

ITEM	System Number	System	Model number
CW3 Program type	1101H	Circulator	CW3-05P
	1102H	Circulator	CW3-10P
	1103H	Circulator	CW3-20P
	1104H	Circulator	CW3-30P

8.2.3 Modbus protocol address definition

Modbus function code	Address	Command	Data	Description	Data length	
					word	byte
W/S	1	Beep	0x0001	BEEP_SYS_BOOT(for communication test)	1	2
			0x0002	BEEP_KEY(for communication test)	1	2
R/I	2	MOD_SYS_NAME	X	Equipment name	1	2
R/I	3	MOD_SYS_VER	x	Firmware Version	1	2
W/S, R/I	4	MOD_FAN_SPEED	0~5	Fan speed	1	2
W/S, R/I	5	MOD_AUTO_RUN	0/1	auto run	1	2
W/M , R/I	6	MOD_OFFSET_VALUE		offset set point/value	24	48
W/M	30	MOD_OFFSET_P1	low temp lmt ~ high temp lmt	offset set point1	4	8
W/M	34	MOD_OFFSET_P2		offset set point2	4	8
W/M	38	MOD_OFFSET_P3		offset set point3	4	8
W/M	42	MOD_OFFSET_V1	low temp lmt - 50. ~ high temp lmt + 50	offset set value1	4	8
W/M	46	MOD_OFFSET_V2		offset set value2	4	8
W/M	50	MOD_OFFSET_V3		offset set value3	4	8
R/I, W/M	54	MOD_DIO_DO1	1. do type 2. X1 3. X2 4. delay time 5. dead zone	digital out1	14	28
R/I, W/M	68	MOD_DIO_DO2		digital out2	14	28
R/I, W/M	82	MOD_DIO_DO3		digital out3	14	28
R/I, W/M	96	MOD_DIO_DI1	1. di type 2. delay time	digital in1	2	4
R/I, W/M	98	MOD_DIO_DI2		digital in2	2	4

R/I, W/M	100	MOD_PROG_PTN1	1. ptn link 2. end segment 3. SSP 4. wait zone 5. wait time 6. rpt cycle 7. rpt sseg 8. rpt eseg 9. seg temp 10. seg time 11. seg time event	program pattern1 read/set	87	174
R/I, W/M	187	MOD_PROG_PTN2		program pattern2 read/set	87	174
R/I, W/M	274	MOD_PROG_PTN3		program pattern3 read/set	87	174
R/I, W/M	361	MOD_PROG_PTN4		program pattern4 read/set	87	174
R/I, W/M	448	MOD_PROG_PTN5		program pattern5 read/set	87	174
R/I, W/M	535	MOD_PROG_PTN6		program pattern6 read/set	87	174
R/I, W/M	622	MOD_PROG_PTN7		program pattern7 read/set	87	174
R/I, W/M	709	MOD_PROG_PTN8		program pattern8 read/set	87	174
R/I, W/M	796	MOD_PROG_PTN9		program pattern9 read/set	87	174
R/I, W/M	883	MOD_PROG_PTN10		program pattern10 read/set	87	174
R/I, W/M	970	MOD_TIME_EVENT1	1. event sequence 2. on time 3. off time	time event1 read/set	5	10
R/I, W/M	975	MOD_TIME_EVENT2		time event2 read/set	5	10
R/I, W/M	980	MOD_TIME_EVENT3		time event3 read/set	5	10
R/I, W/M	985	MOD_TIME_EVENT4		time event4 read/set	5	10
W/S	990	MOD_SET_PTN	1 ~ 10	program mode pattern select	1	2
R/I, W/M	991	MOD_MAN_SV_SET	low temp lmt ~ high temp lmt	manual mode set value read/set	4	8
R/I, W/M	995	MOD_MAN_ON_TIME	60L ~ 359940L	manual mode wait on time read/set	2	4
R/I, W/M	997	MOD_MAN_OFF_TIM E	60L ~ 359940L	manual mode wait off time read/set	2	4

W/S	999	MOD_MAN_ONT_ON OFF	1/0	manual mode wait on time on/off	1	2
W/S	1000	MOD_MAN_OFFT_O NOFF	1/0	manual mode wait off time on/off	1	2
W/S	1001	MOD_MAN_ATUNE	1/0	manual mode auto tuning	1	2
W/S	1002	MOD_SCR_CHANGE	0 ~ 2	standby screen change	1	2
W/S	1003	MOD_SYS_RUN_STO P	1/0	system operation start/stop	1	2
R/I	1004	MOD_REPORT	X	system report	25	50
W/S	1029	PROG_SEG_SKIP	1	program mode segment skip	1	2
W/S	1030	PROG_SEG_HOLD	1/0	program mode segment hold	1	2
R/I	1031	MOD_PROG_TIME_IN FO	X	program time info	10	20
R/I	1041	MOD_SYS_TEMP_LMT	X	system temp limit	8	16

8.2.4 Modbus protocol description

Command	Description					
Beep	Buzzer sounds	Modbus function code	0	Write data	1	System boot beep
		W.S	Data		2	System key beep

MOD_SYS_NAME	Returns the equipment name. Refer, System number	Modbus function code	0	Return data	0	
		R.I	address		Upper	Lower
		Model num				

MOD_SYS_VER	Returns the firmware version.	Modbus function code	0	Return data	0	
		R.I	address		Upper	Lower
		version				

MOD_FAN_SPEED	Fan speed setting	Modbus function code	0	Return data	0		
		R.I	address		upper	Lower	
		Fan speed					
					R/W data	0~5	
		Modbus function code	0	0 : stop 5 : Max			
		W.S	data				

MOD_AUTO_RUN	Auto run setting during power outage	Modbus function code	0	Return data	0		
		R.I	address		upper	Lower	
		Auto run flag					
					R/W data	0	Auto run off
		Modbus function code	0	1		Auto run on	
		W.S	data				

MOD_OFFSE T_VALUE	System offset point/value	Modbus function code	0		Return data	0~3	4~7	8~11
		R.I	Address	Offset P1		Offset v1	Offset P2	
				12~15		16~19	20~23	
				Offset v2		Offset p3	Offset v3	
		Modbus function code	4	4	4	4	4	4
W.M	Offset p1	Offset v1	Offset p2	Offset v2	Offset p3	Offset v3		

MOD_OFFSET_P1	Offset1 point value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		
MOD_OFFSET_P2	Offset2 point value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		
MOD_OFFSET_P3	Offset3 point value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		
MOD_OFFSET_V1	Offset1 user set value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		
MOD_OFFSET_V2	Offset2 user set value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		
MOD_OFFSET_V3	Offset3 user set value (double)	Modbus function code	4	W data	The value which is between the upper and lower limit value of equipment
		W.M	data		

MOD_DIO_DO1	DO1 data	Modbus function code	0	Return data						0	1~4	5~8	9	10~13
		R.I	address							type	X1	X2	Delay time	Dead zone
		Modbus function code	0	1~4	5~8	9	10~13							
		W.M	type	X1	X2	Delay time	Dead zone							
MOD_DIO_DO2	DO2 data	Modbus function code	0	Return data						0	1~4	5~8	9	10~13
		R.I	address							type	X1	X2	Delay time	Dead zone
		Modbus function	0	1~4	5~8	9	10~13							

		code					
		W.M	type	X1	X2	Delay time	Dead zone

MOD_DIO_DO3	DO3 data	Modbus function code	0	Return data				0	1~4	5~8	9	10~13
		R.I	address					type	X1	X2	Delay time	Dead zone
		Modbus function code	0	1~4	5~8	9	10~13					
		W.M	type	X1	X2	Delay time	Dead zone					

MOD_DIO_DI1	DI1 data	Modbus function code	0	Return data		0	1
		R.I	address			type	Delay time
		Modbus function code	0	1			
		W.M	type	Delay time			
MOD_DIO_DI2	DI2 data	Modbus function code	0	Return data		0	1
		R.I	address			type	Delay time
		Modbus function code	0	1			
		W.M	type	Delay time			

Type		0~10
X1, X2	Type 0~5	The upper and lower limit value of equipment
	Type 6	1~4
	Type 7	1~2
Delay time		0~59:59(mm:ss)
Dead zone		The upper and lower limit value of equipment

Type	0~2
Delay time	0~59:59(mm:ss)

MOD_PROG _PTN 1~10	Pattern data 1~10	Modbus function code		0					
		R.I		addr ess					
		Return data	0	1	2	3~6	7~10	11~12	13
			Ptn link	Ptn start seg	Ptn end seg	SSP	Wait zone	Wait time	Rpt cycle
			14	15	16~19	20~21	22	23~26	27~28
			Rpt start seg	Rpt end seg	Seg1 temp	Seg1 time	Seg1 tevent	Seg2 temp	Seg2 time
			29	30~33	34~35	36	37~40	41~42	43
			Seg2 tevent	Seg3 temp	Seg3 time	Seg3 tevent	Seg4 temp	Seg4 time	Seg4 tevent
			44~47	48~49	50	51~54	55~56	57	58~61
			Seg5 temp	Seg5 time	Seg5 tevent	Seg6 temp	Seg6 time	Seg6 tevent	Seg7 temp
			62~63	64	65~68	69~70	71	72~75	76~77
			Seg7 time	Seg7 tevent	Seg8 temp	Seg8 time	Seg8 tevent	Seg9 temp	Seg9 time
			78	79~82	83~84	85			
			Seg9 tevent	Seg10 temp	Seg10 time	Seg10 tevent			
		Modbus function code	0	1	2	3~6	7~10	11~12	13
			Ptn link	Ptn start	Ptn end seg	SSP	Wait zone	Wait time	Rpt cycle
			14	15	16~19	20~21	22	23~26	27~28
			Rpt start seg	Rpt end seg	Seg1 temp	Seg1 time	Seg1 tevent	Seg2 temp	Seg2 time
			29	30~33	34~35	36	37~40	41~42	43
			Seg2 tevent	Seg3 temp	Seg3 time	Seg3 tevent	Seg4 temp	Seg4 time	Seg4 tevent
			44~47	48~49	50	51~41	55~56	57	58~61
			Seg5 temp	Seg5 time	Seg5 tevent	Seg6 temp	Seg6 time	Seg6 tevent	Seg7 temp
			62~63	64	65~68	69~70	71	72~75	76~77
Seg7 time	Seg7 tevent		Seg8 temp	Seg8 time	Seg8 tevent	Seg9 temp	Seg9 time		
78	79~82		83~84	85	86				
Seg9 tevent	Seg10 temp		Seg10 time	Seg10 tevent	Pump				
Link	0 : stop			Rpt cycle	100: Infinite loop				
	11 : continue				1~99:Repeat settings (0:No repeat)				
	1~10 : link number			Rpt start	1 ~ end seg				

			seg	
End seg	1~10	Rpt end seg	Rpt start seg ~ end seg	
End seg	1~10	Seg temp	The upper and lower limit value	
SSP	The value setting during input the upper and lower limit value	Seg time	0~359940L(Unit/ 1 min.)	
	Current value setting beyond the upper and lower limit value range.	Seg tevent	1~4	
Wait zone	The upper and lower limit value			
Wait time	0~359940L(Unit/ 1 min.)			

MOD_TIME_EVENT1~4	Time event data 1~4	Modbus function code	0	Return data	0	1~2	3~4
		R.I	Address		Sequence	On time	Off time
		Modbus function code	0	1~2	3~4		
		W.M	Sequence	On time	Off time		

Sequence	0	on→off
	1	off→on
On time	0~359940L (Unit/ 1 min.)	
Off time	1~3.59940L (Unit/ 1 min.)	

MOD_SET_PTN	Program pattern set	Modbus function code	0	Ptn num	0~10
		W.S	Ptn num		

MOD_MAN_SV_SET	SV value set	Modbus function code	0	Return data	4
		R.I	address		SV
		Modbus function code	4	Value	The equipment upper and lower limit value
		W.M	value		

MOD_MAN_ON_TIME	Wait on timer set	Modbus function code	0	Return data	2
		R.I	address		On timer

		Modbus function code	2		Value	0~359940L(Unit/ 1 min.)			
		W.M	value						

MOD_MAN_OFF_TIME	Wait off timer set	Modbus function code	0		Return data	2 Off timer				
		R.I	address							
		Modbus function code	2		Value	0~359940L(Unit/ 1 min.)				
		W.M	value							

MOD_MAN_ONT_ONOFF	Wait on timer on/off set	Modbus function code	0		Data	0 : wait on timer off			
		W.S	data	1 : wait on timer on					

MOD_MAN_OFFT_ONOFF	Wait off timer on/off set	Modbus function code	0		Data	0 : wait off timer off			
		W.S	data	1 : wait off timer on					

MOD_MAN_ATUNE	Auto tune on/off set	Modbus function code	0		Data	0 : auto tune off			
		W.S	data	1 : auto tune on					

MOD/SCR/CHANGE	Screen change	Modbus function code	0		Data	0 : scr home			
				1 : scr program					
		W.S	data			2 : scr manual			

MOD_SYS_RUN_STOP	System operation set	Modbus function code	0		Data	0 : system stop			
		W.S	data	1 : system start					

MOD_MAN_MODE_REPORT	Manual mode report	Modbus function code	0							
		R.I	Address							
		Return data	0~3	4~7	8	9		10~11		
			SV	PV	Heat ratio	Act timer		Set time		
	12~13		14	15	16	17	18~24			
	Remain time		Dio status	System indicate	T_pro gress	Pu mp	dummy			
	Dio status	1 byte	MSB							
			Dummy	Dummy	Di2	Di1		Dummy		
					LSB					
			Do3	Do2	Do1					

	System indicate	2byte	MSB									
			System mode			Hold		Otp_ warn	Door		Operatio n	
			Prog	Man		Step hold		Over temp warni ng	Door warni ng		System operatio n	
			Wait time		Time event		Otp	level	Door		Refrig	
			Prog time wait		Time event set		Otp		Door open			
									LSB			
			Woff	Won		Atune		Key_lock				
			Wait off set	Wait on set		Atune set		Key lock set				
			Temp progress		None		0					
					Up		1					
					Down		2					
					Keep		3					

MOD_PROG_MODE_RE PORT	Program mode report	Modbus function code			0				
		R.I			Address				
	Return data	0	1	2	3	4~7	8~11	12~15	
		Ptn num	Ptn cycle	Act cycle	Act set	SV	Ramp value	PV	
		16	17~18	19~20	21	22	23	24	
		Heat ratio	Act time	Elapsed time	Dio status	System indicate	T_progress	Pump	
	Dio status	1byte	MSB						
			Dummy		Dummy	Di2	Di1	Dummy	Do3
			LSB						
Do2			Do1						
Temp progress		None		0					
		Up		1					
		Down		2					

			Keep	3						
	System indicate	2byte	MSB							
			Mode	Sensor err	Hold	Otp_warn	Door/warn	Operation		
			Prog	Sensor	Step hold	Over temp warning	Door warning	System operation		
			Wait_time	Time event	Otp	level	Door	refrig	Woff	Won
			Prog time wait	Time event set	otp		Door open		Wait off set	Wait on set
					LSB					
			Atune		Key_lock					
			Atune set		Key lock set					

MOD_PROG_TIME_INF O	Program time informatio n	Mod function code		0			
		R.I		address			
		Return data	0~1	2~3	4~5	6~7	8~9
Remain time	Elapsed time		Total time	Delay time	Skip time		

MOD_SYS_TEMP_LMT	System temp limit	Mod function code		0
		R.I		address
		Return data	0~3	4~7
			High temp limit	Low temp limit

8.2.5 Decimal point setting and read

Decimal point read	Decimal point write
<pre>typedef union DOUBLE_2_INT_8_BYTE { double dData; unsigned char cData[8]; }D2I_DOUBLETTYPE_PACKET; D2I_DOUBLETTYPE_PACKET d2i_packet; memcpy(d2i_packet.cData, sData, 8); // sData(read buffer) double dSV = d2i_packet.dData;</pre>	<pre>D2I_DOUBLETTYPE_PACKET d2i_packet; d2i_packet.dData = dValue; for(int i = 0; i < 8; i++) { packetBuffer[i] = d2i_packet.cData[i]; // packetBuffer (send buffer) }</pre>

※ Caution : During the input register address, transfer adding -1 from specified address.
EX.) During the RUB/STOP Addr Address (5504) setting and reading, transfer and include 5503.

Serial communication setting
BaudRate : 9600bsp
ByteSize : 8
Parity : No parity
Stop Bits : 1

9.0 Appendix

9.1 Technical Specification

Item / Model		CW3-05P		CW3-10P		CW3-20P		CW3-30P			
Bath volume (L/cu ft)		5.0/0.2		10.0/0.4		20.0/0.7		30.0/1.1			
Temp.	Range (°C/°F)	amb.+5~ 150/ amb.+9~ 302									
	Accuracy (0°C, at 50°C/°F)	0.05/0.09						0.08			
	Uniformity (°C, at 50°C/°F)	±0.1									
	Heat up time to 70°C (min)	24		31		43		55			
	Controller	Microprocessor PID									
	Sensor	PT 100Ω									
Controller functions		Auto tuning, 3-point temp. calibration, Wait on / off timer (99hr 59min), Auto-run, Pump speed, Digital input /output, 10 programs / 10steps, Program scheduler									
Safety		CLS(Custom Logical Safe) – control system, IEC protection Class II, Over temp. limit, Low fluid level alarm									
Control panel		3.5”TFT LCD, 3buttons, 1dial knob									
Interface		RS-232C, USB									
Material	Internal	Stainless steel, 1.0t, Cubic type									
	External	Steel, 1.2t, double painted and baked									
Dimensions	Bath (W x L x D, mm)	150 x 99, 160/ 5.9 x 3.9, 6.3		211 x 154, 80/ 8.3 x 6.1, 7.1		290 x 214, 200/ 11.4 x 8.4, 7.9		300 x 264, 230/ 11.8x 10.4, 9			
	Overall (W x D x H, mm)	220 x 395 x 424/ 8.7 x 15.6, 16.7		281 x 450 x 444/ 11.1 x 17.7, 17.5		360 x 510 x 464/ 14.2 x 20.1, 18.3		370 x 560 x 494/ 14.6 x 22,19.4			
	Weight (kg/lbs)	12.5/27.6		15/33		17.5/38.6		19.5/43			
Pump	Step	1		2		3		4		5	
	Flow rate (l/min)	5.6		8		12.8		18.8		28	
	Height (m)	0.35		0.75		1.7		3.5		4.2	
	Material	Stainless steel mold pump									
	In / out (mm)	12.7									
Electric requirements (230V,50/60Hz)		8.5A		8.5A		8.5A		8.5A			
Electric requirements (120V,60Hz)		8.6 A		8.6A		8.6 A		8.6A			

※ the standard value is recorded by 25°C, 60%R.H. conditions, If the data did not mention specifically checking condition.

※ Above spec. could be changed without prior notice.

9.2 Digital Input / Output

It has the Digital Input function which regulate the temp. or stop the equipment with the signal of external equipment, and the Digital Output function which send signal to external equipment.

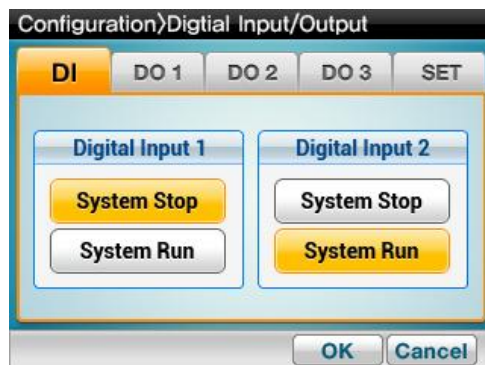
9.2.1 Digital Input

It is the function that stop or run the system when the equipment receive the signal from the external equipment and max. two program can be set.

(1) Touch 'Digital Input / Output' on the "Configuration"

(2) Put the DI setting value.

It can be set with "System Stop" and "System Run" and can be cancelled by touching the orange colored button.



(3) Touch the SET and put the Delay time.

DI signal is generated after over Delay Time the setting on (2) will be started.

Delay time is available for 0min 0sec ~ 59min 59sec.

(4) Touch OK and save the value that you put on Digital Input.

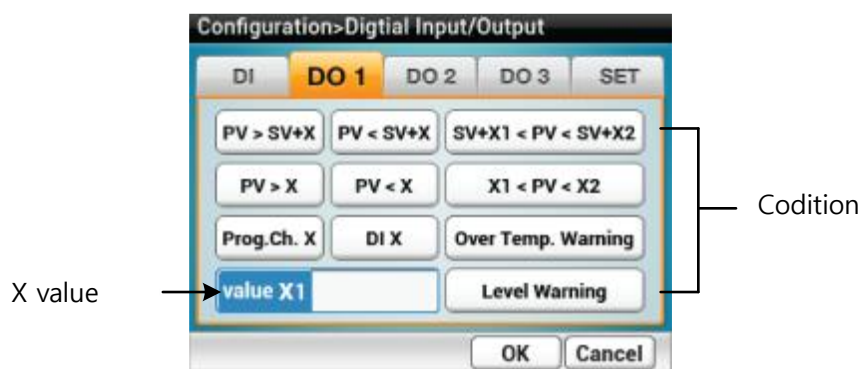
9.2.2 Digital Output

It is the function that send the signal to the external equipment through the port that connected between the equipments, in the case of the status satisfied as the user set and max. three program can be set.

(1) Touch 'Digital Input / Output' on the Configuration setting menu.

(2) Put the DO value.

Select the setting condition and move the dial knob for putting X in the case of value X is needed. Push the dial knob for completion. X value can be set from -50 to 250.



PV > SV+X	In the case of (Present temp. > Setting temp.+X), generate signal
PV < SV+X	In the case of (Present temp. < Setting temp.+X) generate signal
SV+X1 < PV < SV+X2	i) X1 < X2, in the case of (Setting temp.+X1 < Present temp. < Setting temp.+X2) generate signal ii) X1>X2 In the case of (Setting temp.+X1 < Present temp.) or (Setting temp.+X2 > Present temp.) generate signal
PV > X	In the case of (Present temp. > X) generate signal
PV < X	In the case of (Present temp. < X) generate signal

X1 < PV < X2	i) X1 < X2, In the case of (X1 < Present temp. < X2) generate signal ii) X1 > X2 In the case of (X1 > Present temp.) or (X2 < Present temp.) generate signal
Prog. Ch. X	In the case of the step which is DO Program Ch. <i>X</i> selected on step, Program mode, is proceeded, generate signal X: from 1 to 4[refer to 9.2.3]
DI X	In the case of <i>Digital Input X</i> is put, generate signal
Over Temp. Warning	In the case of <i>Over. Temp. Warning</i> occurred, generate signal
Level Warning	In the case of Level Warning, generate signal
Value X1	Menu to put setting value X

(3) Touch SET button and put the Delay time and Dead zone be set on DO.

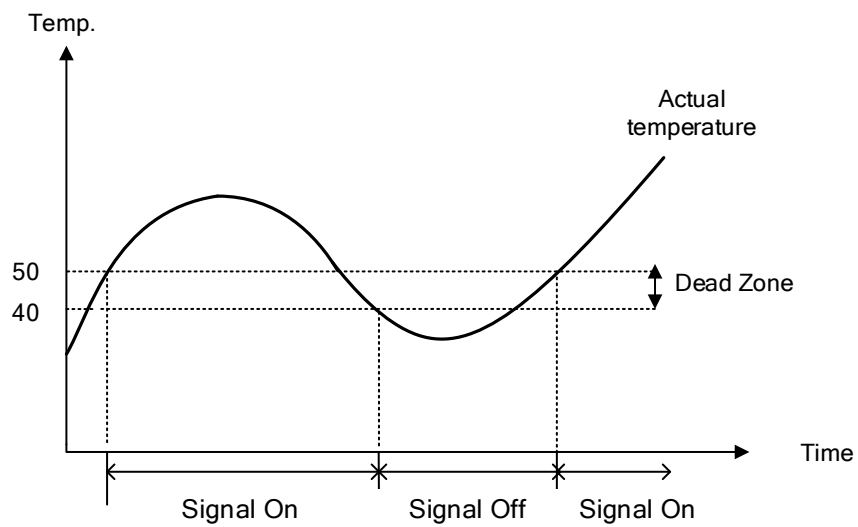
Delay Time	DI signal is generated after over Delay Time.⚠ It can be put from 0min 0sec to 59min 59sec.
Dead Zone	Put the ± tolerance limit regarding the temp. set on (2). It can be put from 0min 0sec to 59min 59sec.

(4) Save the put value by touch OK button.

(Example)

Condition	X	Dead Zone
PV > X	50°C	10°C

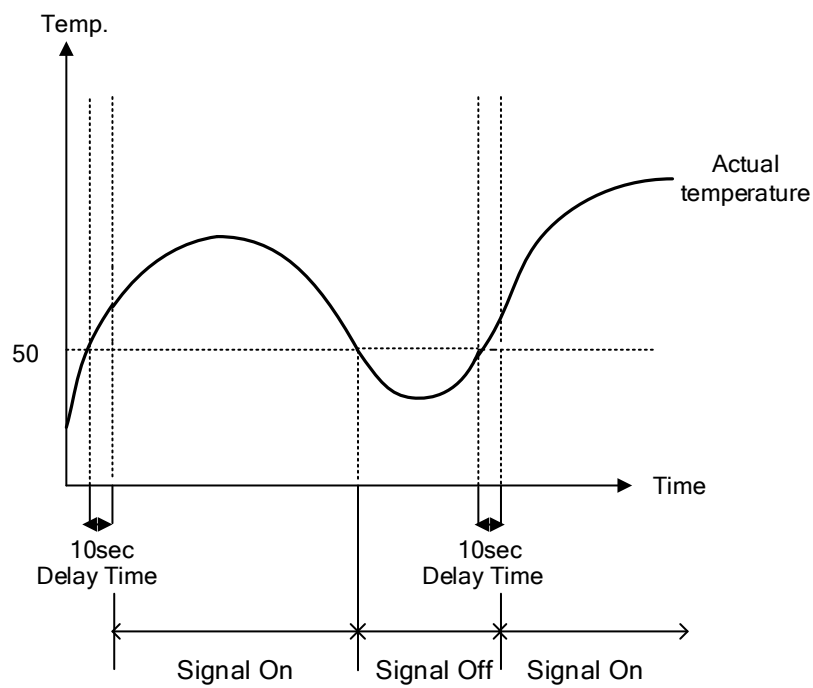
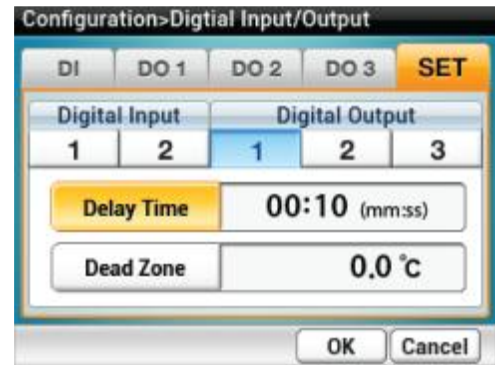
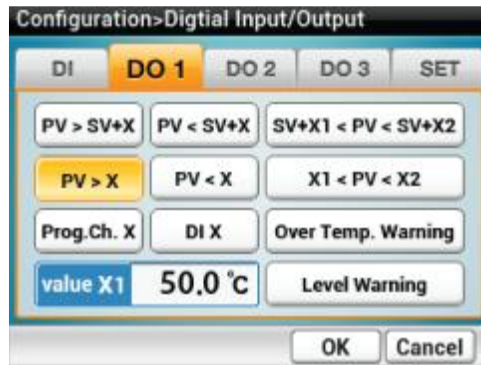
[Digital Output setting display]



(Example)

조건	X	Delay Time
PV > X	50°C	10sec

[Digital Output setting display]



9.2.3 Digital Output Program Ch.

It is available to send the signal to external equipment on specific step, by selecting Prog. Ch. X on the DO setting button of Digital Output and putting 'DO Program Ch.' when setting the program mode step.

NOTICE

- DO Program Ch. wouldn't be available when Prog. Ch. X is not selected on the DO setting.
- In the case of user does not want to sending signal to external equipment on specific step, put DO Program Ch. : "-".

It is available to designate pattern of signal output. The setting process is same as below.

- (1) Touch 'Set Prog' button on the Program mode display.
- (2) Touch 'Digital Output Program Ch.' Button.
- (3) Input 'Digital Output Program Ch.' setting value.

Items	Range of value
DO Program Ch.	Program Ch. 1~4
Sequences	On Time→Off Time or Off Time→On Time
On Time (hh:mm)	00hr 00min ~ 99hr 59min
Off Time (hh:mm)	00hr 00min ~ 99hr 59min

- (4) Push OK button and save the setting value.

In the case of 'On Time → Off Time', the signal will be generated as much as On Time setting value. After then, the signal will be disappeared as much as Off Time setting value on the specific step. If the step remains some more time, the On time, Off time will be repeated.

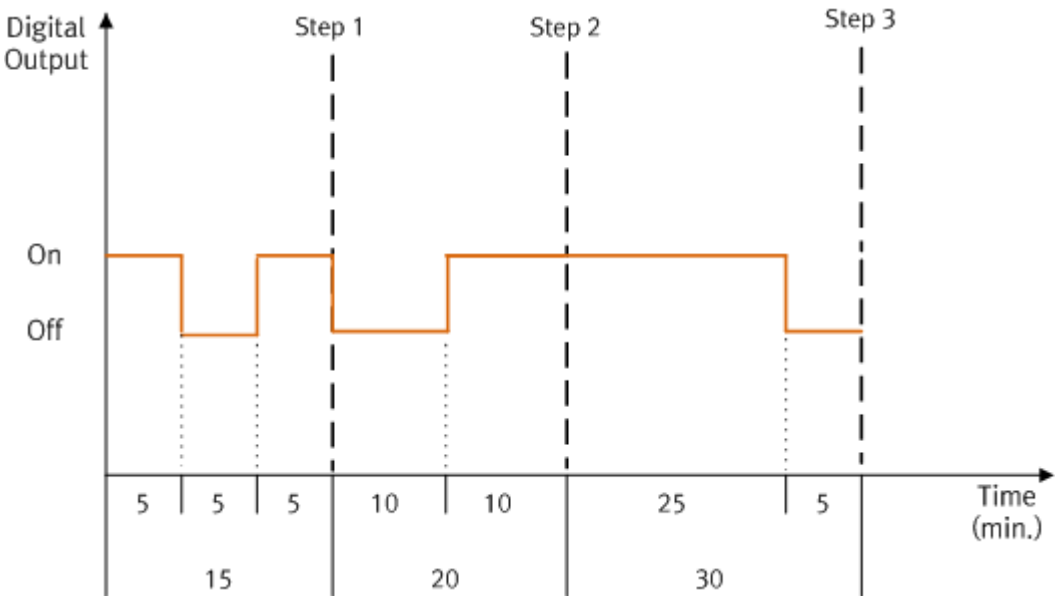
In the case of 'Off Time → On Time', the signal will be disappeared as much as Off Time setting value. After then, the signal will be generated as much as On Time setting value on specific value. If the step remains some more time, the Off time, On time will be repeated.

Once one step is finished, Program Ch. output will be finished and the next step will stat.

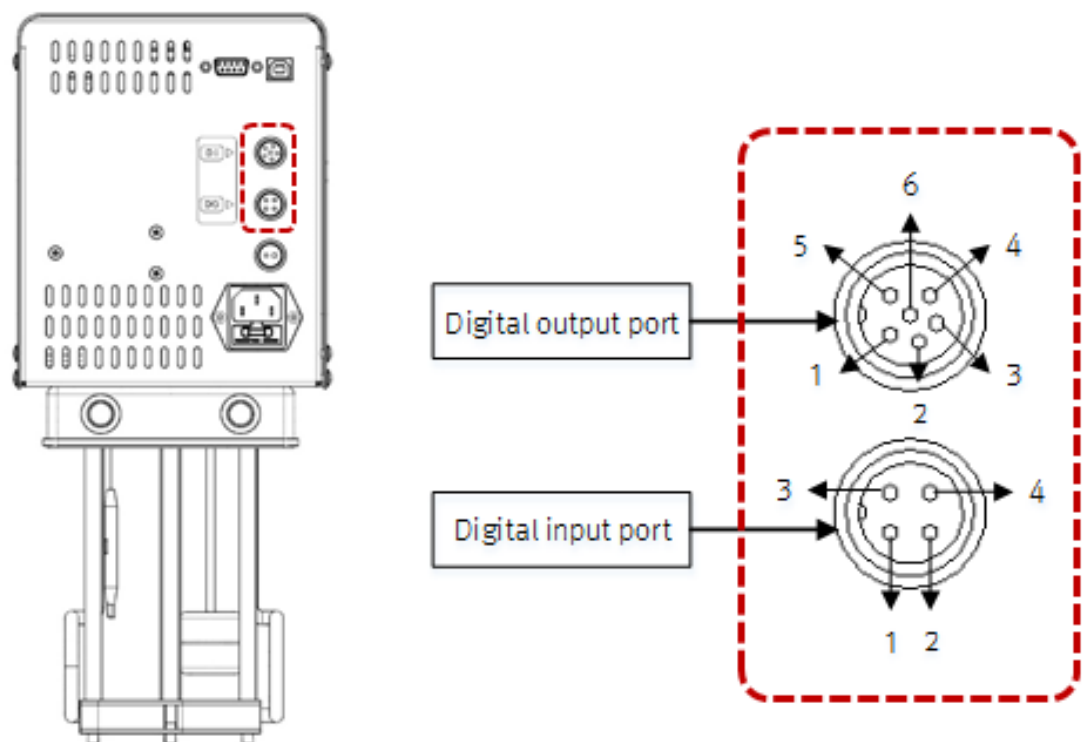
(Example) In the case of setting the DO Program Ch. as below chart, digital signal is made as below graph.

In the case of setting step time is longer than DO Program Ch. setting time, the signal will be repeated according to the Sequence order(Step 1). In the case of DO Program Ch. setting time is longer than setting step time, the signal will be made only during the step setting time(Step 3).

Step	Step setting time (min)	DO Program Ch. Setting Value		
		Sequence	On Time (min)	Off Time (min)
1	15	On Time → Off Time	5	5
2	20	Off Time → On Time	10	10
3	30	On Time → Off Time	25	25



9.3 DI/DO relay maximum ratings



Female Connector

- Digital output port : SCK-16-6(P)

- Digital input port : SCK-16-4(P)

Please contact JeioTech branch office or device vendor for more information.

Emitter (Input)			Detector (Output)	
DI1 pin number	No.1,3 pin		DO1 pin number	No. 1,2
DI2 pin number	No. 3,4 pin		DO2 pin number	No. 3,4
Input direction	Insert No. 2,4		DO3 pin number	No. 5,6
Reverse voltage	5.0V		Breakdown Voltage	±40V
Forward current	Min	5mA	Load current	±200mA
	Typical	10mA		
	Max	25mA		

Absolute Maximum Ratings
(Ta=25°C)

Digital Input	Digital Output
Reverse Voltage 5.0V	Output Breakdown Voltage ± 60V
Continuous Forward Current 50mA	Continuous Load Current ± 400mA
Peak Forward Current 1A	Power Dissipation 500mW
Power Dissipation 100mW	
Derate Linearly from 25°C 1.3mW/°C	



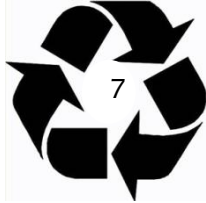
WARNING



Please, cut off the equipment during communication wire setting.
Because of electrical shock

9.4 Product Disposal

Before disposing of the incubated shaker or any of its components:



1. The product should be cleaned and decontaminated to protect workers servicing the product, the environment or the public purchasing surplus equipment because the product can potentially be contaminated with biological material, chemicals or radioisotopes. Check with your institution or laboratory for individual policies and procedures for disposal of laboratory equipment.

2. Please contact your local governing body for regulations regarding disposal of electrical, electronic, metal (brass, aluminum, steel and stainless steel), refrigeration and rubber components. Jeio Tech recommends the user find a local scavenger or laboratory equipment recycler to properly dispose of the product and its components.

9.5 Warranty

9.5.1 Warranty period

- (1) If the product fails during normal and proper use, the warranty period for manufacturing liability shall be two years from the date of delivery.
- (2) If you request a repair, please check the items below and let us know so that you can get a quicker and more accurate repair.

- | |
|---|
| <ul style="list-style-type: none">• Date of purchase:• Customer name / address / phone number / E-mail:• Fault status• Model• Serial number |
|---|

9.5.2 Technical Service Contact Points

- Technical Services
- Address: 153 (Youngsan-dong), Techno 2-ro Yuseong-gu, Daejeon-city, 34025, Republic of Korea
- Tel: +82 (0)2 -2627-3824
- Website: <https://www.JeioTech.com/eng/>
- E-mail: overseas@JeioTech.com

9.5.3 Certificate of Product Warranty

This is a guide to the product quality warranty and service terms provided by JEIOTECH Co., Ltd

All products are guaranteed to operate normally when installed under proper conditions, as specified in the user manual for each product, and used according to the intended purposes and permissible operating conditions.

The warranty period for product quality starts from the delivery date and is indicated in the catalog provided for each product or in the purchase order agreed upon with the customer. If a product malfunctions within the warranty period, JEIOTECH Co., Ltd. provides free repair services. However, among the transportation costs incurred during the repair process, any special costs resulting from the customer's site conditions (e.g., door or wall modifications, use of special handling equipment) are not covered under the warranty. Furthermore, JEIOTECH's liability under this warranty is limited to replacing the product or refunding the original purchase price at JEIOTECH's sole discretion if reasonable attempts to repair or replace the product fail.

Parts replaced during free repairs within the warranty period become the property of JEIOTECH Co., Ltd. Additionally, the warranty period is not extended due to free repairs. JEIOTECH is not responsible for any losses incurred by the customer due to delays in repairs caused by issues such as part shortages or shipping delays.

The following cases will be handled as paid repairs, even within the warranty period:

1. Non-defective cases

- * Requests to resolve issues arising from improper operating environments or abnormal installations.
- * Reinstallation requests or connections with external equipment other than the initial installation.
- * Requests for usage instructions or simple adjustments that do not require disassembly.
- * Inspections of non-defective products.
- * Cleaning or debris removal service requests.

2. Failures caused by user errors:

- * Malfunctions due to usage not in accordance with the user manual.
- * Issues resulting from improper operating environments or abnormal installations.
- * Malfunctions caused by incompatible chemical usage.
- * Malfunctions caused by irregular or improper electrical or utility supplies.
- * Damage due to product movement, storage, external impact, or dropping by the customer.
- * Malfunctions resulting from unauthorized modifications or repairs without prior written approval from JEIOTECH Co., Ltd.
- * Malfunctions caused by using consumables or optional components not specified by JEIOTECH Co., Ltd.
- * Repairs performed by personnel other than JEIOTECH or its authorized service agents.

3. Other cases

- * When the product model or serial number has been damaged, removed, manipulated, or altered.
 - * Malfunctions caused by fire, flooding, or other natural disasters.
 - * Failure due to consumable parts reaching the end of their lifespan (e.g., lamps, filters, fuses, gaskets, packings, hoses, heat transfer fluids).
 - * Natural wear and tear (e.g., discoloration, screen printing degradation).
 - * Damage or malfunction of product accessories (e.g., power cables, data cables, glass components) or options.
 - * Malfunctions caused by errors in computers, computer components, or connected network systems.
-
- Before JEIOTECH performs free or paid repairs or accepts the return of a product, the customer must ensure the product has been decontaminated of chemical and biological hazards.
 - Replacement parts used during repairs may differ from the original but will function correctly and be equivalent in performance.
 - JEIOTECH does not bear any responsibility for damage to stored samples, data loss, or any other direct or indirect damages caused by product malfunctions, regardless of the warranty period.
 - JEIOTECH does not guarantee issues related to computers, computer components, or network systems connected to the product, regardless of the warranty period.
 - This warranty is the sole and exclusive warranty provided. Any implied warranties imposed by applicable laws are limited to the warranty period stated herein. This warranty cannot be modified by any verbal advice, statements, or documents on behalf of JEIOTECH unless explicitly labeled as a "Warranty Amendment" and signed by an authorized representative of JEIOTECH.
 - This warranty applies only to products purchased for direct use by the customer. It does not cover products purchased for resale purposes without prior written approval from JEIOTECH.
 - This warranty does not apply to consumables and is non-transferable.

- The contents of this manual can be changed without prior notice to improve product performance and deliver accurate information.
- The copyright of this manual belongs to JeioTech.