



Operation manual

Refrigerated & Heating Bath Circulators (Programmable Model)

Models : RW3-0525P, RW3-1025P, RW3-2025P, RW3-3025P,
RW3-0535P, RW3-1035P, RW3-2035P, RW3-3035P

Manual No. : 57601L002 Version : 8.0



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 unit or the information in this manual, contact our Sales Department. If your unit fails to operate properly, or if you have questions concerning spare parts or Service Contracts, contact our Service Department.

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Table of Contents

1.0	Safety	1
1.2	How to use the manual	2
1.1.1	Introduction	2
1.1.2	Chapter summary.....	2
1.1.3	Model number nomenclature	3
1.3	Responsibility	3
1.2.1	General liability.....	3
1.2.2	Responsibility of the users.....	4
1.2.3	Preventative maintenance	5
1.4	Symbols used in this manual	5
1.3.1	Signal word panels	5
1.3.2	Safety symbols.....	6
1.3.3	Non-safety symbols	7
1.5	Precautions for use	7
1.4.1	Warning statements.....	8
1.4.2	Caution statements	10
2.0	Functional description	12
2.1	Introduction	13
2.2	Features	13
2.2.1	Excellent performance.....	13
2.2.2	Improved safety	14
2.2.3	Improved convenience	15
2.3	Structure.....	16
3.0	Installation.....	21
3.1	Components.....	22
3.2	Preparing before installation	23
3.2.1	Environmental setting	23
3.2.2	Precautions for use.....	23
3.2.3	Bath heat transfer liquid supplement.....	24
3.2.4	Power connection.....	28
3.3	The Labels attached to the Instrument.....	29
4.0	Operation.....	30
4.1	Control panel.....	31
4.2	Controller operation	32
4.3	Main menu	33
4.4	External Sensor Usage	34

4.5	Basic mode	3 5
4.5.1	Temperature control start & stop	3 6
4.5.2	Temperature setting	3 7
4.5.3	Timer setting	3 8
4.5.4	Amount of pump circulation	3 9
4.6	Program mode	4 0
4.6.1	Program start and stop [Select prog]	4 1
4.6.2	Program setting - general [Set prog]	4 3
4.6.3	Input program step	4 7
4.6.4	Setting of program parameter	4 8
4.6.5	Scheduler	5 1
4.6.6	Program Reset	5 2
4.6.7	Digital Output program Ch.	5 3
4.6.8	Check the saving program [View prog]	5 3
4.7	Configuration	5 5
4.7.1	General	5 6
4.7.2	Information	5 6
4.7.3	Reset	5 6
4.7.4	Digital Input / Output	5 7
4.7.5	Temp. Sensor Calibration	5 7
4.7.6	Touch screen calibration	6 0
4.8	Auto tuning	6 1
4.9	Safety function	6 2
5.0	Maintenance	6 3
5.1	Maintenance period	6 4
5.2	Cleaning the unit	6 5
5.2.1	Cleaning the unit	6 5
5.2.2	Accessories	6 6
5.3	Move	6 6
5.4	Storage	6 6
6.0	Trouble shooting	6 7
6.1	Instruction on problem	6 8
6.2	Power	6 8
6.3	Problem generating during the operation	6 9
6.4	Warning sign	7 0
7.0	Accessories	7 1
7.1	Accessories	7 2

8.0	Dedicated S/W.....	7 3
8.1	Monitoring program installation	7 4
8.2	Communication protocol.....	7 6
8.2.1	Physical layer.....	7 6
8.2.2	System number for each model	7 6
8.2.3	Modbus protocol address definition	7 6
8.2.1	Modbus protocol description.....	7 9
8.2.2	Decimal point setting and read	8 4
9.0	Appendix.....	8 5
9.1	Technical specification	8 6
9.2	Digital Input / Output.....	8 8
9.2.1	Digital Input.....	8 8
9.2.2	Digital Output.....	8 8
9.2.3	Digital Output program Ch.....	9 2
9.3	DI/DO relay maximum ratings.....	9 4
9.4	Product Disposal	9 6
9.5	Warranty.....	9 6
9.5.1	Warranty period.....	9 6
9.5.2	Technical Service Contact Points.....	9 6
9.5.3	Certificate of Product Warranty.....	9 7

1.0 Safety

1.2 How to use the manual

1.1.1 Introduction

This manual is intended for individuals requiring information about the use of the 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 unit.

The Operation chapter includes a description of controller features, key name, and the 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.

	Refrigerated & Heating bath Circulator (Programmable) Series			
Model	RW3-0525P	RW3-1025P	RW3-2025P	RW3-3025P
	RW3-0535P	RW3-1035P	RW3-2035P	RW3-3035P

1.3 Responsibility

This unit 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 unit 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 unit 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 this unit.
- When the unit 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 unit 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 equipment 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 unit.

Before removing or adjusting parts of the device, shut off all the electrical supply, remove accessories. The unit 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 unit until all workers clean the area. The device must be checked if there are no problems with the unit before operating the equipment.

1.4 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

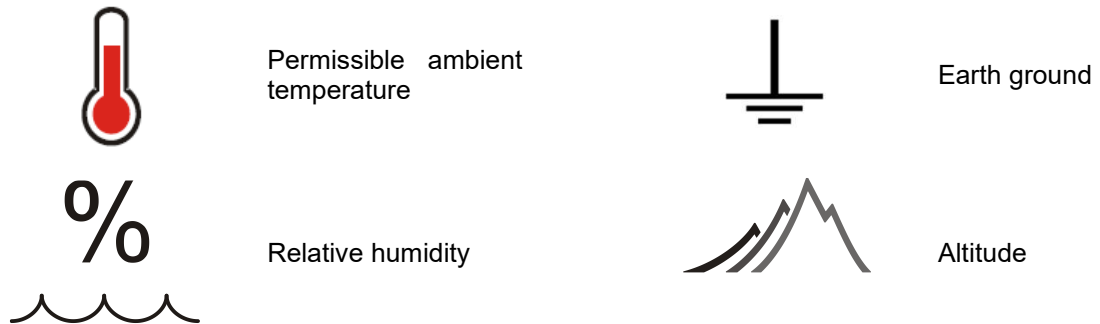
Mandatory			
	Read manual		Wear gloves
	Wear a face mask		Wear goggles

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.



1.5 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 unit. If you have any questions concerning the operation of your unit 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 secure enough space for installation. The refrigeration unit is back side of the equipment.

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

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.

Heating media 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 unit.

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 power outlet.

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 the 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, 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 Refrigerated & 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 unit 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 4.8 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 4.7.5 Temp. sensor calibration].
- External sensor
An external sensor is provided as an option. You can control the temperature of various

experimental devices through external sensors.

2.2.2 Improved safety

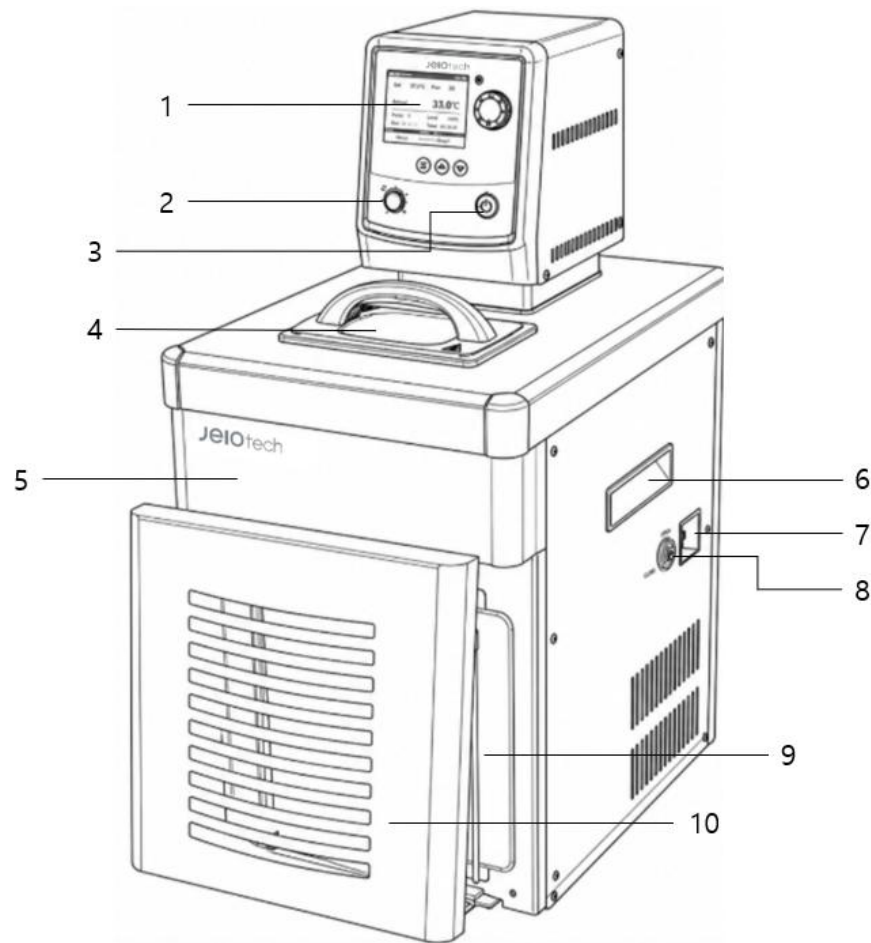
- We have firstly developed CLS (Custom Logical Safe)-Control system in this industry for convinces in use and safety to users.
- CLS-Control system¹ means "Control system which has logical safety device specialized for individual model". Laboratory must have Thermal safety secure because there are a lot of inflammable reagent. This system is highest safety secure control device (patent no. 0397583 and 0328729) and makes the unit 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, unit stops temperature control and shows warning alerts.
- When Bath heat transfer liquid is not enough during running the machine, 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 unit 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 unit was in run on basic mode before power interruption, the operation starts again with previous set temperature.
If the unit was in run on program mode, the operation starts from the step which suddenly stopped by power interruption.

2.3 Structure



[RW3-0525P 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 (8) Drain Valve to open and close the drain hole. Caution that bath fluid may be hot.

(8) Drain valve

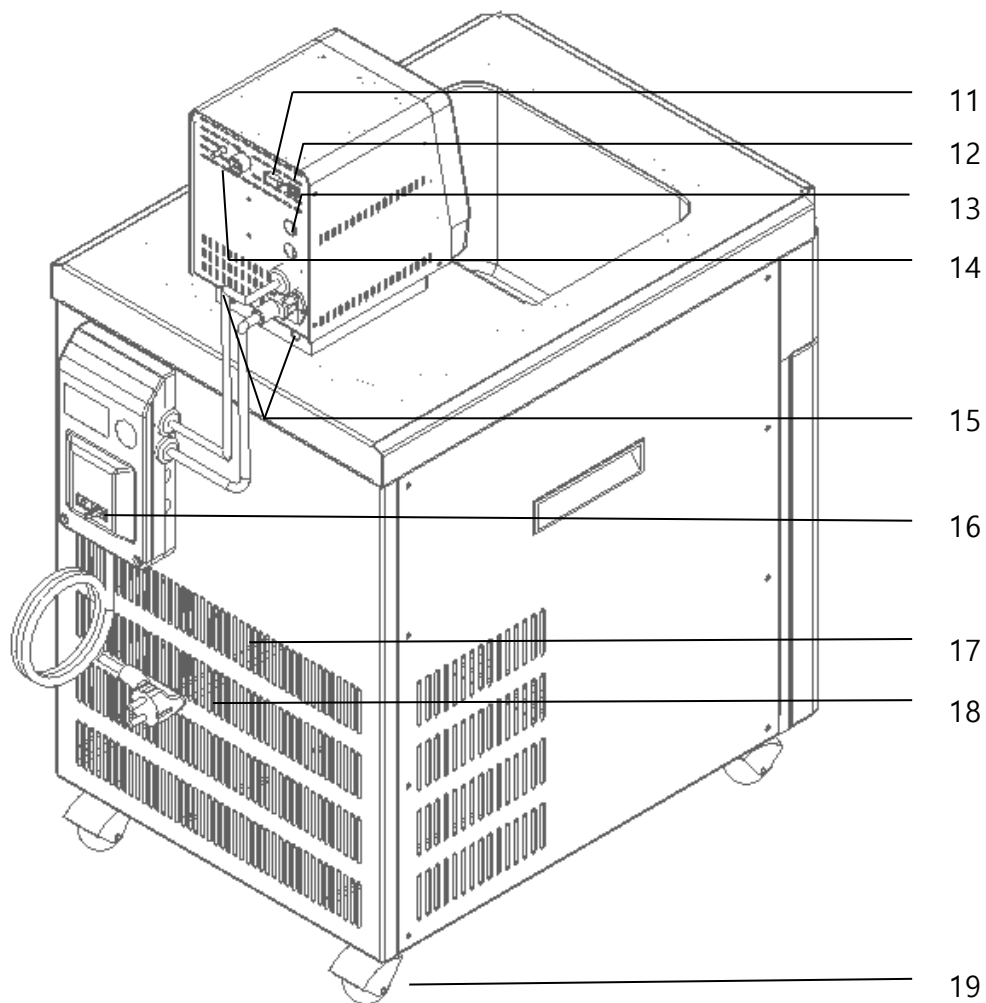
Turn the drain valve clockwise to drain out the bath fluid. User can easily turn the valve with hand or flat-head screwdriver. After high temperature test, user must wear protective gloves.

(9) Condenser filter

Condenser filter protects the built in refrigerator from foreign substance.

(10) Condenser cover

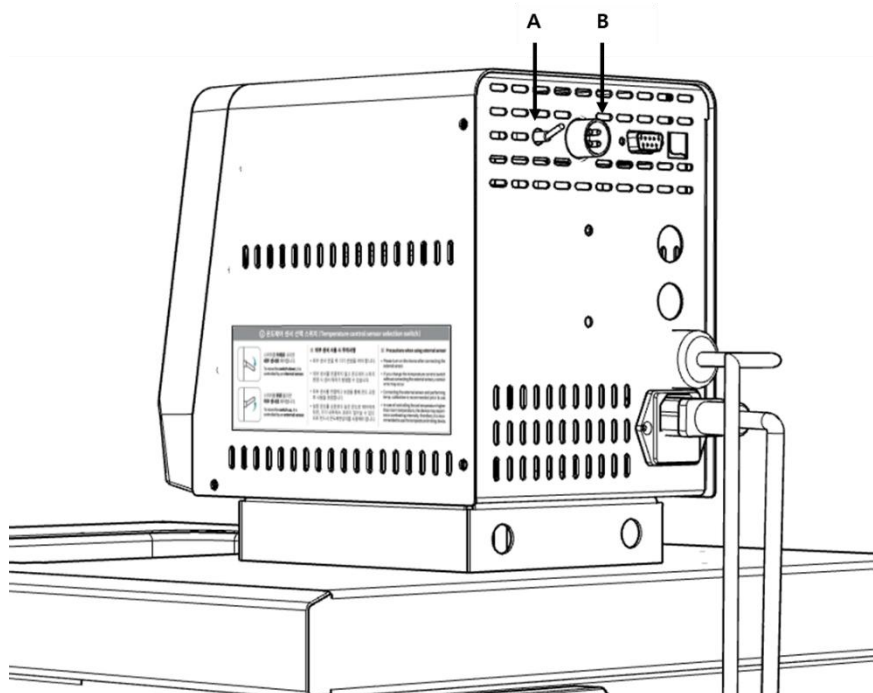
Detachable cover for easy cleaning the condenser.



[RW3-0525P backside]

- (11) Communication port (RS-232C)
User can monitor and control the unit via RS-232C protocol interface to computer device. The control values can be stored and printed out.
- (12) Communication port (USB-B)
User can monitor and control the unit via USB-B port to computer device. The control values can be stored and printed out.
- (13) DI/DO port
It is Digital Input / Output port to connect external instrument.

(14) Temperature control switch & connector (Option)



A) Temperature control switch

It is a switch that can select the temperature control sensor as an external sensor or an internal sensor.

To move the switch down, it is controlled by an internal sensor.

To move the switch up, it is controlled by an external sensor. [Refer to 4.4 External sensor usage]

B) External sensor connection connector

It is a connector to connect an external temperature sensor.

(15) 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.

(16) Main Circuit breaker

Circuit breaker protects the equipment from over-current.

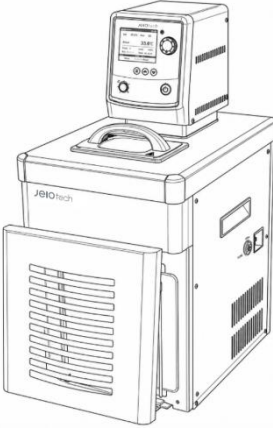
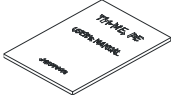
- (17) Refrigerator Unit
This is the unit composed of optimum refrigerating system.
Better ventilation, higher efficiency of the refrigeration.
- (18) Power cord
Power cord to supply power to the unit.
- (19) Castors
Castors for easy relocation or installation.

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 unit 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 unit 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 unit 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 Precautions 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, in case of the lowest temperature, if viscosity is 50 centistokes(cSt) and it is higher within 5°C than ambient temperature, it is recommended not to exceed 10 centistokes(cSt).
 - Heat transfer liquid should be non-flammable.
If heat transfer liquid is flammable, its flashing point should be over 40°C and available to circulate in the pump. On this occasion, it must be used below at 5°C which is lower than flashing point of the combustible fluid
 - 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 µS/cm. If it is used for a long time, it causes corrosion of the metal.

 CAUTION

Bath fluid is a crucial component in laboratory equipment, significantly enhancing the accuracy and efficiency of temperature control devices. It is essential to select the appropriate bath fluid based on the operating temperature, by evaluating the characteristics and limitations of each type of bath fluid.

1. Water
 - Applicable Temperature Range: 10° C to 90° C
 - Key Features:
 - Widely used due to high thermal conductivity and low cost.
 - High heat capacity results in minimal temperature fluctuation.
 - Precautions:
 - Frequent replenishment needed when used at high temperatures.
-

- Recommended to use distilled water or deionized water (electrical conductivity 1~20 $\mu\text{S}/\text{cm}$).
 - Risk of corrosion if ultrapure water (below 1 $\mu\text{S}/\text{cm}$) is used.
2. Ethylene Glycol/Water Mixture (EGW)
- Applicable Temperature Range (50% EGW): -30°C to 90°C
 - The lowest usable temperature for EG varies depending on the mixture ratio (periodic checks on the mixture ratio are necessary).
 - Key Features:
 - Provides excellent stability at low temperatures.
 - Low vapor pressure ensures minimal evaporation.
 - Precautions:
 - The quality of water is crucial for EGW mixtures; therefore, use distilled water or DI Water.
 - Regularly check the mixture ratio of water and EG (use an antifreeze hydrometer to check the freezing point).
 - At temperatures above room temperature, EG can decompose or the mixture can become corrosive, reducing pH.

Freezing Point of Ethylene Glycol based Water Solutions

Freezing points of ethylene glycol based water solutions at various temperatures are indicated below

Ethylene Glycol Water Solution Heat-Transfer Fluid - Freezing Point											
Ethylene Glycol Solution (% by volume)		0	10	20	30	40	50	60	80	90	100
Freezing Point	($^{\circ}\text{F}$)	32	25.9	17.8	7.3	-10.3	-34.2	-63	≈ -51	≈ -22	9
	($^{\circ}\text{C}$)	0	-3.4	-7.9	-13.7	-23.5	-36.8	-52.8	≈ -46	≈ -30	-12.8

〈Ref.: The Engineering ToolBox〉

3. Silicone Oil
- Applicable Temperature Range: -60°C to 250°C
 - Key Features:
 - Usable across a wide temperature range and chemically stable.
 - Low vapor pressure, suitable for long-term use.
 - Precautions:
 - At low temperatures, a low viscosity is required; it is optimal to choose a fluid with less than 10 cSt at the operating temperature.
 - At high temperatures, it is essential to check the flash point and ignition point. The maximum operating temperature of the bath should be at least 25°C lower than the flash point of the bath solution.
 - Using silicone hoses may lead to hose swelling and dissolution,

resulting in oil leaks and failure. Use of metal, Viton, or PTFE hoses is recommended.

- Deposits may form on pipes or bath surfaces; thus, periodic cleaning and replacement are necessary.
- Decomposition can occur at temperatures above 150° C; ventilation is necessary for long-term use at high temperatures.
- Gelling or polymerization may occur at high temperatures, thus periodic oil replacement is needed.
- If neglected, a jelly-like substance may adhere to the drain's internal parts; in such cases, cleaning with a silicone cleaner is recommended.

4. Perfluorocarbons, PFCs

- Applicable Temperature Range: -57° C to 165° C
- Key Features:
 - Non-flammable and highly stable chemically and thermally.
 - Low density and low viscosity contribute to excellent cooling efficiency.
- Precautions:
 - High cost limits its use to specialized applications.
 - Adequate ventilation is essential during prolonged use.

WARNING

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



- Ethyl Alcohol (Ethyl alcohol)
 - Automobile antifreeze including additives
 - Tap water
 - Deionized water with a specific resistivity > 1 MΩ-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 equipment damage or accident that is caused by using improper heat transfer liquid.
-

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

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 always. Discharged liquid may get someone burned.
 - Please check if a hose is damaged and replace it regularly.
 - **When using silicone oil, please use the hose made of other material differently from silicone hose.** If silicone hose is used, it may be broken and you would be burned by the discharged liquid
-

-
- Please discharge after cooling Hot liquid on the room temperature. Please check the temperature of the liquids.
-

3.2.4 Power connection

Check to make sure that the line voltage & Hertz matches the supply voltage & Hertz 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.

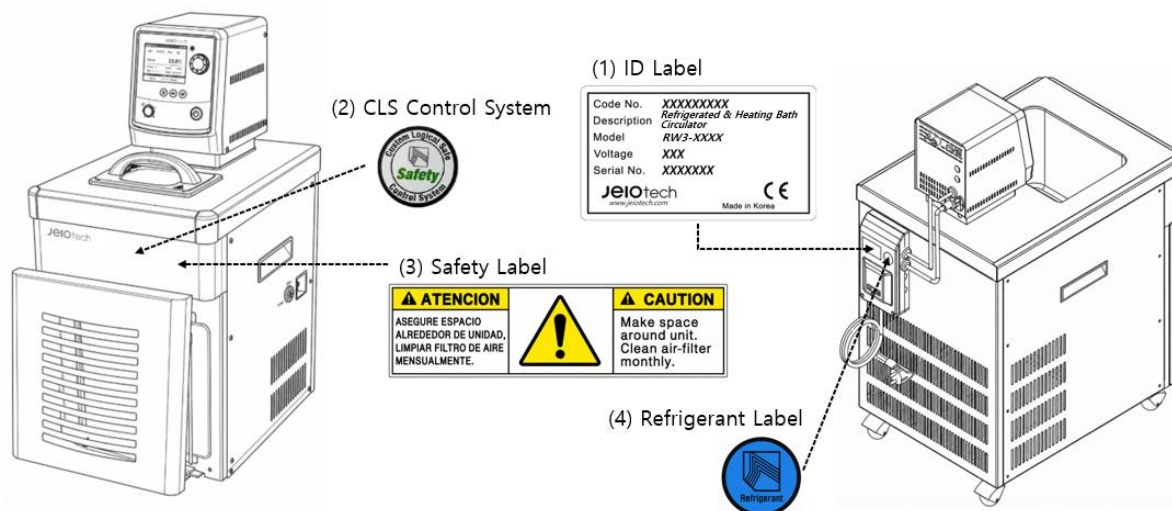


- Incorrect line voltages will cause the risk of fire, electric shock, and personal injury.



- Wear safety clothes, gloves, glasses.
 - Do not touch the unit 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.

4) Refrigerant Label

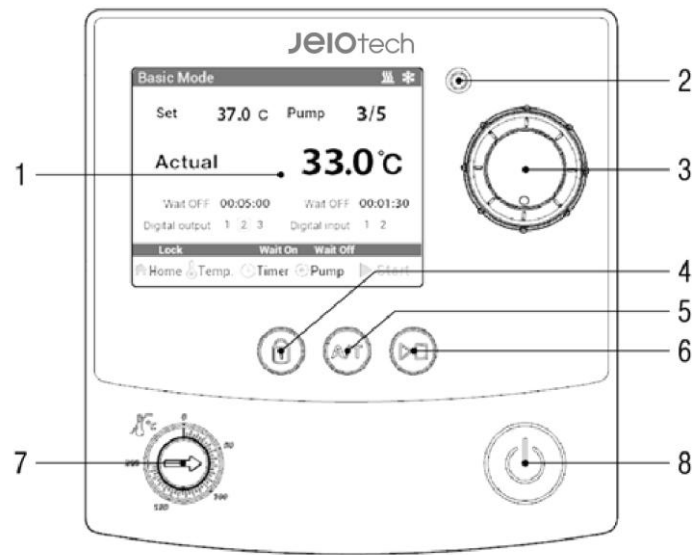
This label indicates that the product uses refrigerant.

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 4.7.1 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 4.8 Auto tuning].
- (6)  : Operation start and stop button
- (7) Over Temp. Limiter : You can set the maximum temperature limit value. If the temperature of inside chamber exceed this value, you can hear alarm sound and operation will stop. [refer to 4.9].
- (8)  : Power on / off

CAUTION

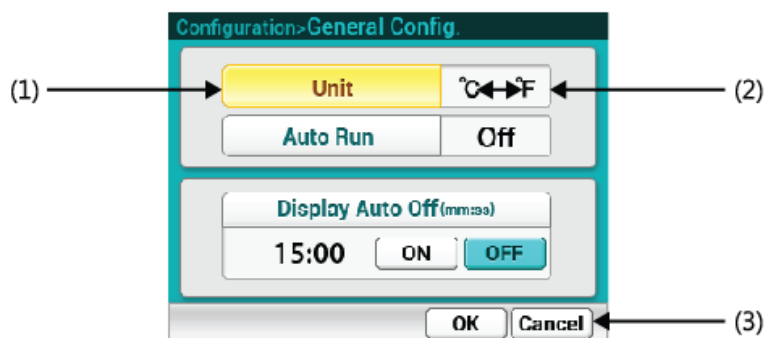
- Please fill in the amount of heating liquid (distilled water, Alcohol, Oil etc.) to fit the experimental purpose in the bath before connecting the power.
- Please connect the silicon hose at the In/Out line.
- Please be careful that the water or organic solvent not to flow to control panel.

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.

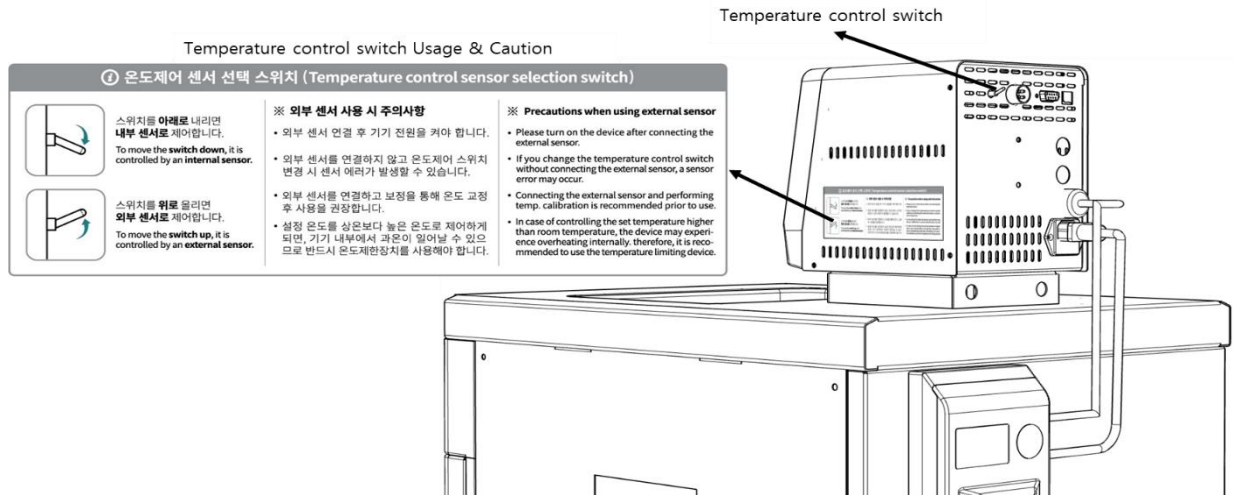
[Main Menu window]



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 External Sensor Usage

After connecting the external sensor on the rear of the product, select the temperature control sensor switch as the external sensor, and the temperature measured by the external sensor is displayed and controlled on the temperature display window. Check the temperature control switch sticker on the side of the product. Control is possible by selecting either external or internal sensors on the rear of the product.



- (1) Insert the temperature sensor input terminal into the connector on the back of the device.
- (2) Select the temperature control sensor switch as external sensor (upper).
- (3) When the power of the device is turned on, the temperature measured by the external sensor is displayed and controlled on the temperature display window.

⚠ CAUTION

- When using an external sensor, the measured temperature is measured high because the resistance increases according to the length of the sensor. Connecting the external sensor and performing temperature calibration is recommended prior to use. [Refer to 4.7.5 Temp calibration]
- If you change the temperature control switch without connecting the external sensor, a sensor error may occur. You must turn on the device after connecting the external sensor.

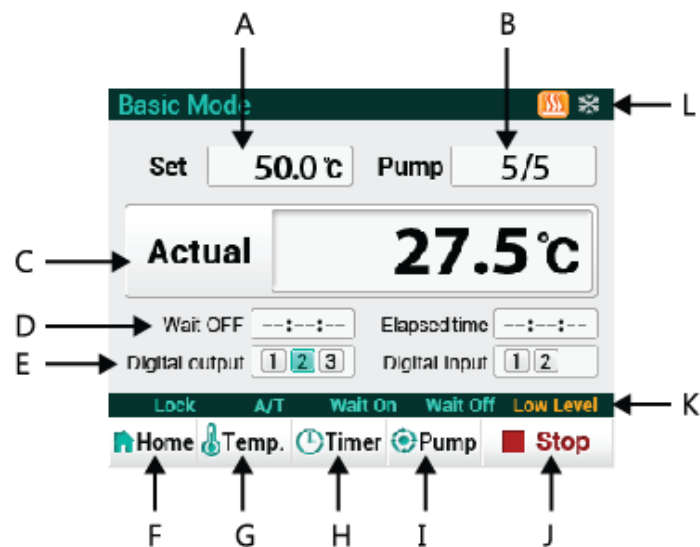
⚠ WARNING

- In case of controlling the set temperature higher than room temperature, the device may experience overheating internally. Therefore, it is recommended to use the temperature limiting device. [Refer to 2.3 Structure]

4.5 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	Continuou s run	Elapsed time	Related to time (Wait on, Wait off, Elapsed Time)
E	Digital output		Digital input		Digital Output/Input
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		

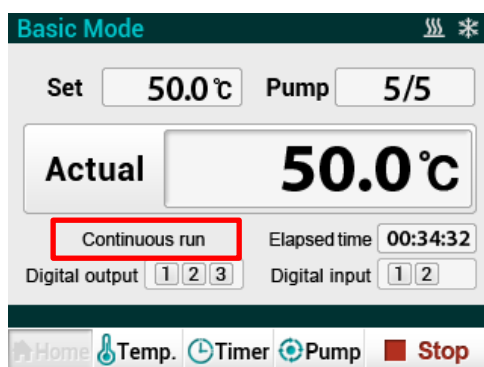
L			Heater / Compressor operation
---	---	---	-------------------------------

4.5.1 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]

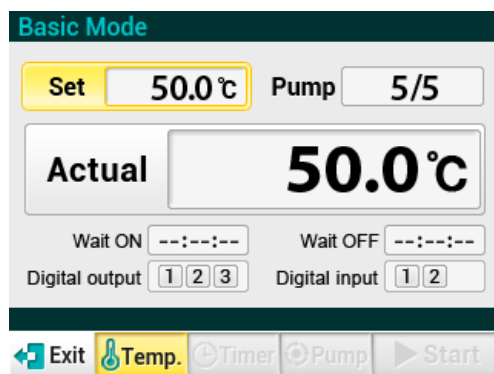


NOTICE

- 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.

4.5.2 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

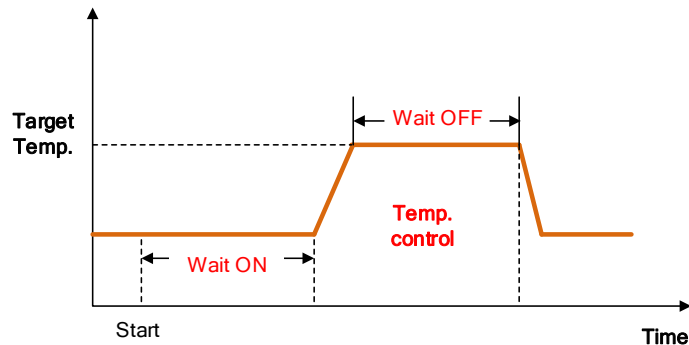
- You can input the temperature from -50 ~ 250°C, but you can control the temperature -25 ~ 150°C (RW-0525P, RW-1025P, RW-2025P, RW-3025P) or -35 ~ 150°C (RW-0540P, RW-1040P, RW-2040P, RW-3040P).
- After setting the temperature and push the START button, you can control the temperature.
- During the control the temperature, if you change the temperature by (1) ~ (3), this unit will control the changed temperature immediately.

4.5.3 Timer setting

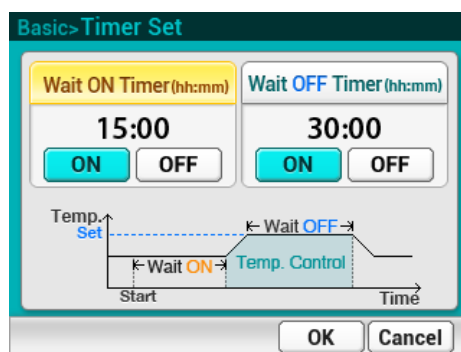
Wait on timer: After a set time, the equipment will be operated for temperature control.

Wait off timer: After arriving at a set temperature, the 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.

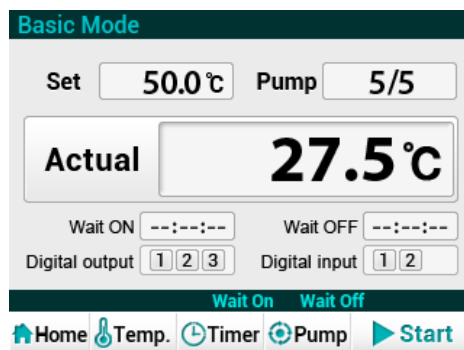


- (1) In Basic mode, you can push the Timer button and go to Timer set.
- (2) You can set a time as minute at Wait on timer / Wait off timer and choose ON/OFF. Factory setting value is Wait on timer / Wait off timer 00:00, OFF.



[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.



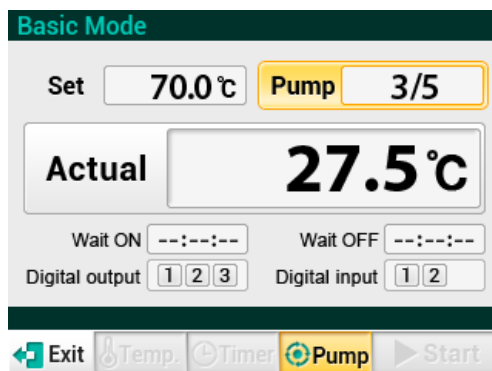
[Example - Wait on timer – 15 hours, Wait off timer – 30 hours]

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 unit will apply changed timer value immediately. You don't need to push START button again.

4.5.4 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.
- (4) When you do not push the dial knob and if you push EXIT button, setting value will be canceled.

CAUTION

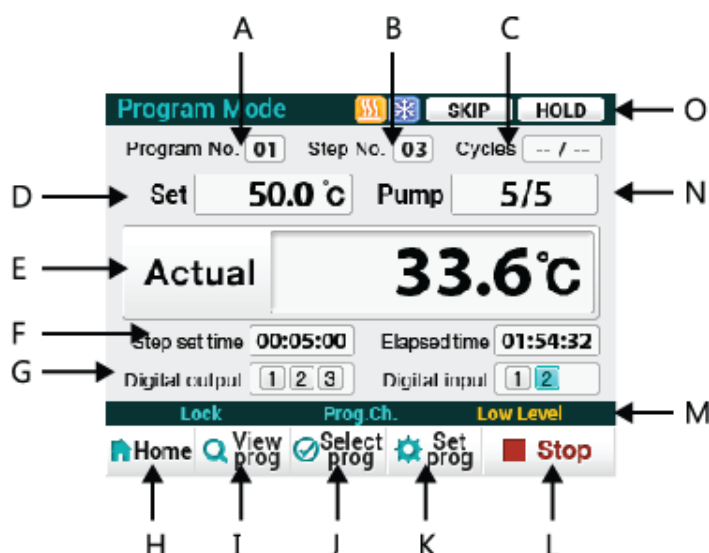
- If you set the amount of pump circulation under 4, please consider viscosity of solution by temperature change. In low temperature condition, viscosity of solution will be increased. It will cause malfunction or when you use external

circulation, it will not work properly.

4.6 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]

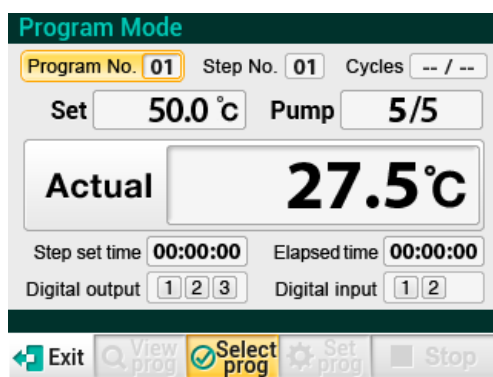


	Display		Function
A	Program No.		Program number
B	Step No.		Running step number.
C	Cycles		Present cycle number and Total cycle number
D	Set		Set temperature (during the operation of Program mode, you can see real temperature control point as per ramp setting of increase(decrease))
E	Actual		Actual temperature
F	Step set time	Elapsed time	Related to time

G	Digital output	Digital input	Digital Output/Input
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	Device status notification window (lights up when applied to each item.)
	Wait on	Wait off	
N	Pump		Amount of Pump circulation
O	SKIP	HOLD	Step / time hold, maintain the present temperature
			Heater / Compressor operating

4.6.1 Program start and stop [Select prog]

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

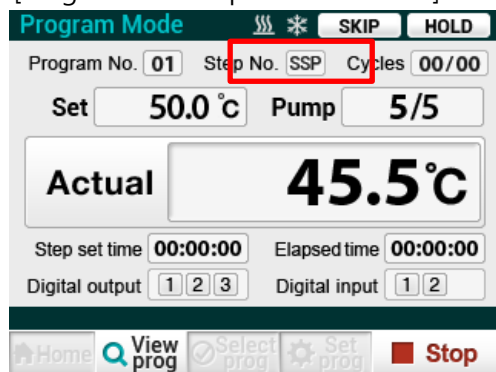


- (2) Please set the program number by using the dial knob.
- (3) Please push the dial knob.
If you do not push the dial knob and push EXIT button, the setting value will be canceled.
- (4) You can run  the program as push the controller button over 1 second or push

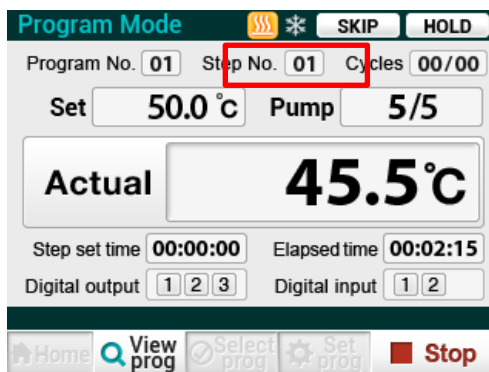
the START button in touch screen.

When finish the program running, program control will be stopped with sound and this unit 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

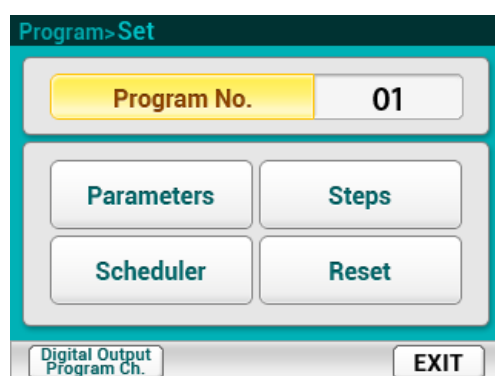
- Before operating the program mode, please check Set value of Parameters, Steps, Scheduler in Prog. [refer to **4.6.2 Program setting**]
- If you run the program mode without step setting value, you can see the warning sign. Please touch the warning sign in touch screen. Then it will disappear and turn 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 unit will running the next Step.
- When finish the program operating, the equipment will be operated by Closure Command setting value with beep sound.
- You can check the program information in 'View Prog' button. [refer to 4.6.8]
- When you push  button and Start/Stop button in touch screen, controller

input will be inactivated about 3 seconds. After 3 seconds.

4.6.2 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 4.6.4]	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 4.6.3]	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 4.6.5]	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 4.6.6]		You can reset the selected program to factory setting.
Digital Output Program Ch. [refer to. 4.6.7]	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

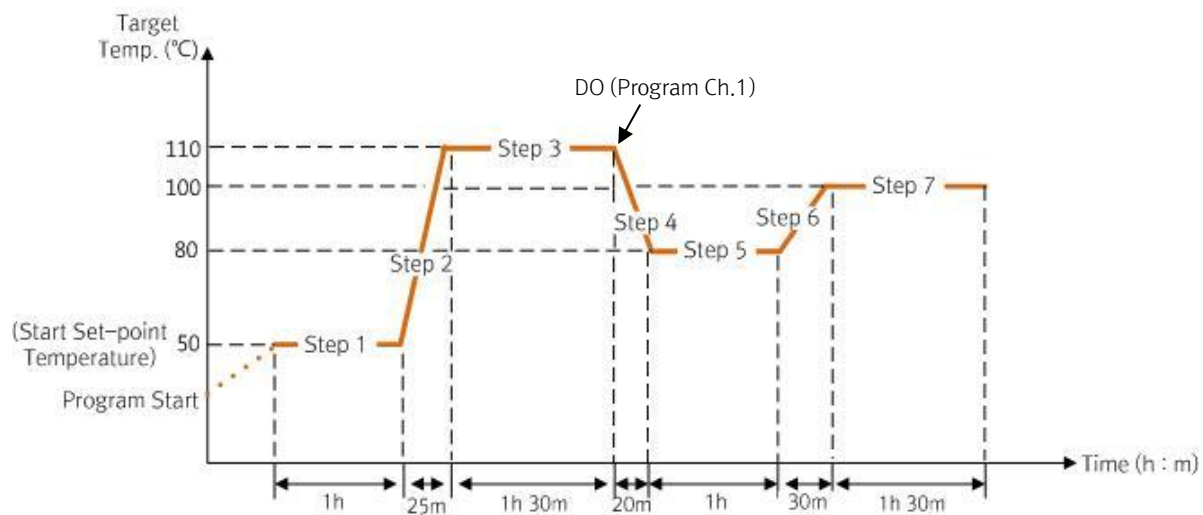
- You can come out to program operating window by push the EXIT button.
At this time, number of Program No. will be selected in program setting window.

[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, the equipment will control the temperature as below graph.

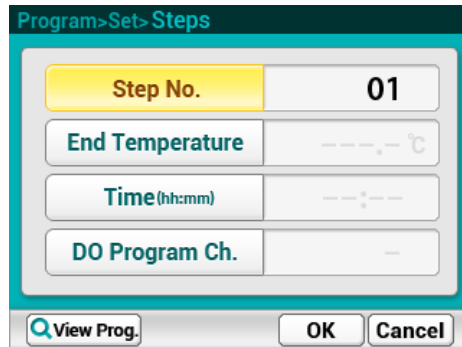
If you do not set the time or temperature in Step, below step will not be operated.

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	-	-	-	



4.6.3 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 Time Event number 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

Eng 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 unit 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 4.6.4 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.

4.6.4 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.

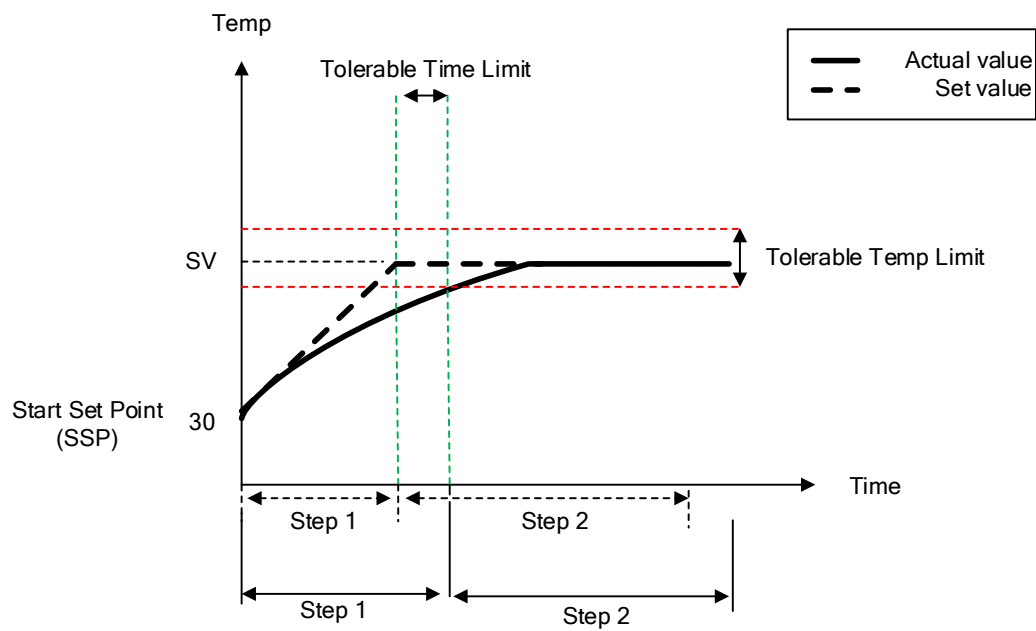
Program>Set>Parameters	
Pump Level	5
Start Set point (SSP)	50.0 °C
Tolerable Temp. Limit	1.0 °C
Tolerable Time Limit (hh:mm)	00:00
OK Cancel	

- (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.

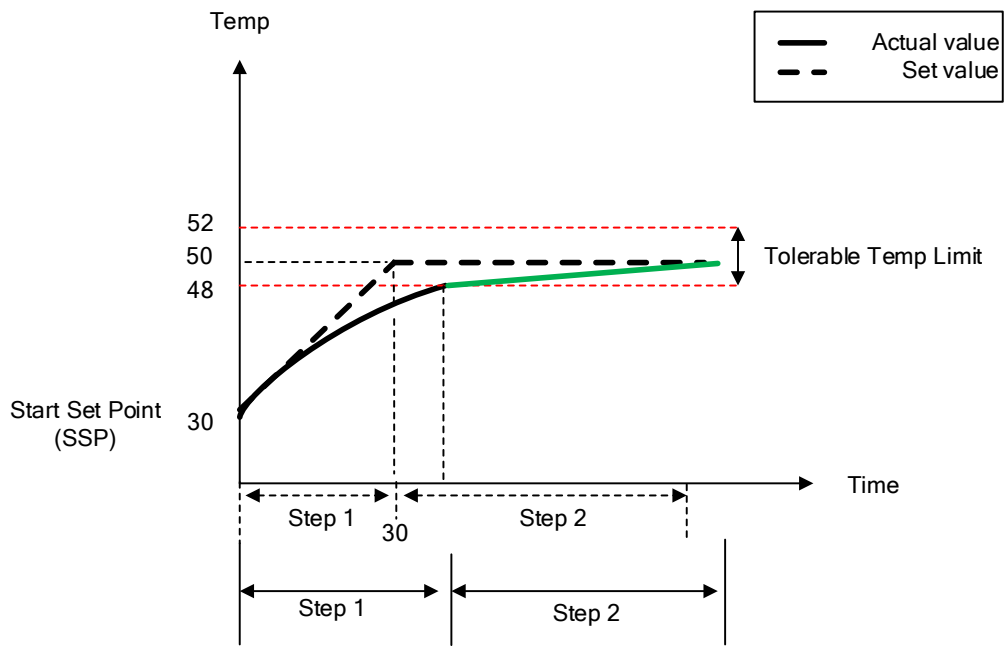
- C. Tolerable Temp. Limit : Tolerable Temp. Limit : In the case of the temp not reaching to the set point in the set time, the unit move to next step only when the temp reaches to the set point in a accuracy range. Initial figure is 1.0°C.
- D. Tolerable Time Limit : In the case of the temp not reaching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

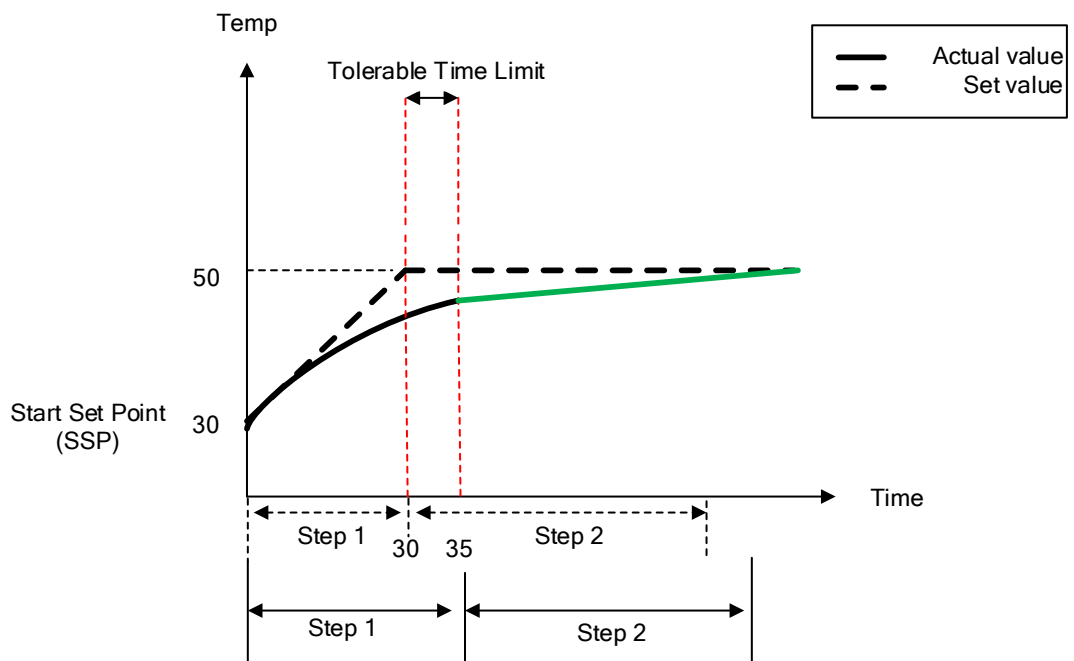
In the case of the temp not reaching 50°C [set value] in 30 minutes [set time], the next step starts when the temp reaches to 48°C [set value - Tolerable Temp Limit].



(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].



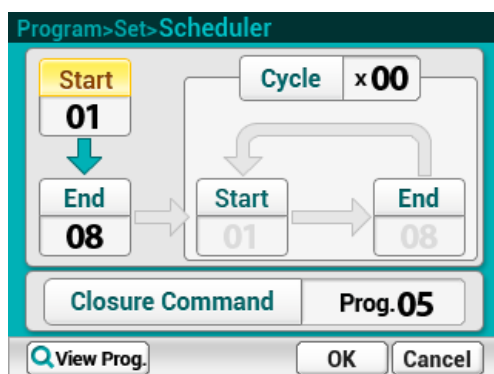
- (4) Press 'OK' to save parameter values.
Press 'Cancel' not to save parameter values.

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.

4.6.5 Scheduler

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



- Press 'program No.' on program set screen. Turn dial knob to select program No.
- Press 'Scheduler' to move to the scheduler set screen.
- 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.

4.6.6 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.

4.6.7 Digital Output program Ch.

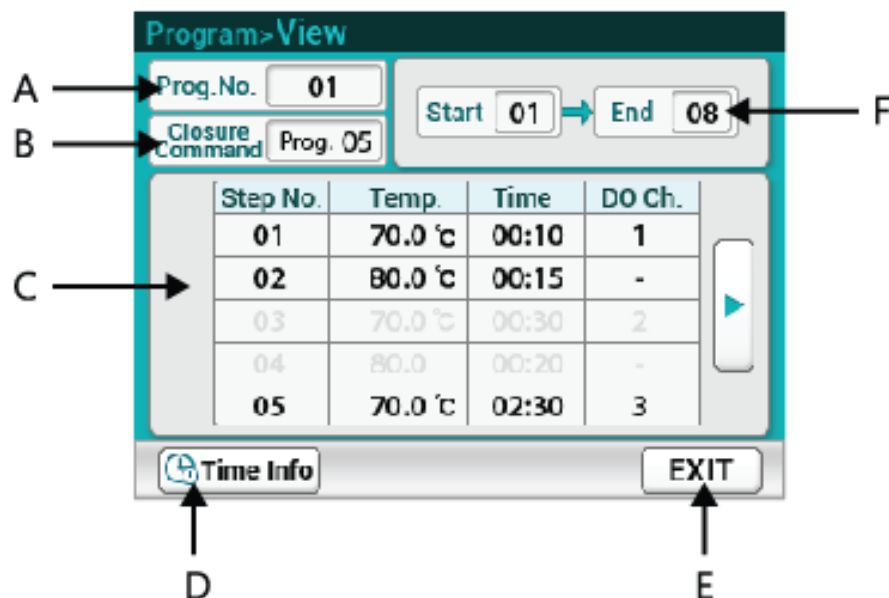
Program running has the function of sending the digital signal to external equipment.
Please refer to the **9.2 Digital Input / Output operating manual**.

4.6.8 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]

The screenshot shows a window titled "Program>View>Time Info (hh:mm)". Inside, there is a list of program statistics for Program No. 01:

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

An "EXIT" button is located at the bottom right of the window.

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.

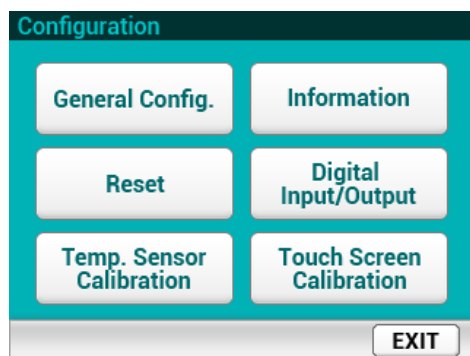
4.7 Configuration

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]



4.7.1 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 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.

4.7.2 Information

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

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

4.7.3 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 unit has PDI control for temp and updates the control point to the best PDI figure by Auto Tuning function. [refer to 4.8 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.

4.7.4 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.

4.7.5 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

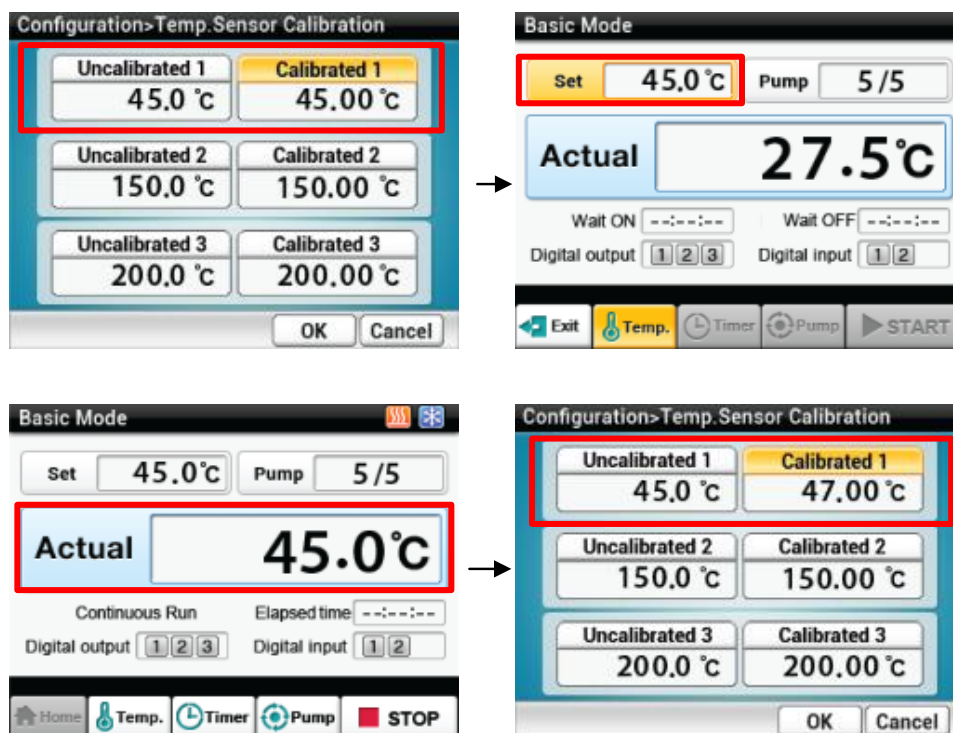
menu.

- (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

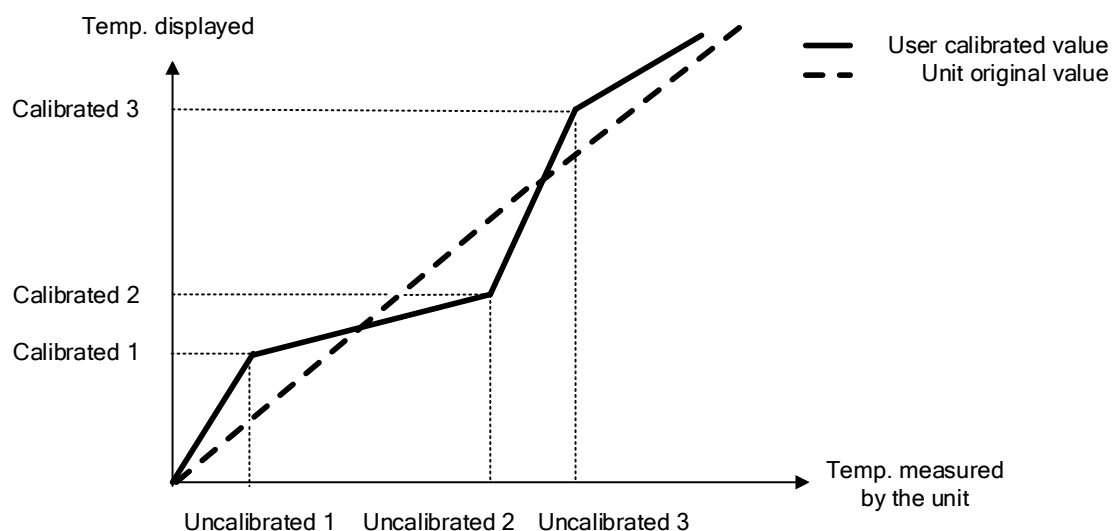
- In the case of put the value on the uncelebrated display, do not put the same value on Uncalibrated1, uncelebrated 2, uncelebrated 3.
-

(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 unit 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.

4.7.6 Touch screen calibration

Correct 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.

4.8 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 unit during the Auto tuning implementation.
 - A/T starts with A/T sign appearance after touch  button for three seconds during the unit operation.
-

4.9 Safety function

(1) Over Temperature Limiter

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

(4) Malfunction of Temp sensor

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

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		●			
Refrigeration System Related					
Clean the condenser filter			●		
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				●	

WARNING

- Check the general, system(control), and electric wire related checklist according to the inspection cycle.
 - If the inspection cycle is not followed, the manufacturer is not liable for any damage to the equipment or fire that may occur.
-

5.2 Cleaning the unit

The unit 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 unit once a month. And immediate cleaning is required when the unit is contaminated.

5.2.1 Cleaning the unit

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 unit (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 unit 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 unit using the method that different form manual, contact to the manufacturer and confirm whether the method damage the unit 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 unit completely.

5.3 Move

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

 CAUTION

- Do not move the unit in plugged.
 - Do not make mechanical shock or vibration on the unit.
 - 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 unit with dry towel.
- (3) Pack it and place it in the dry area.

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 unit.

- (1) Check the power.
- (2) Check the START button on the touch screen.
- (3) 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.
	Circuit breaker is down	Raise the circuit breaker
	Inner circuit damage	Request 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	Request 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 unit off the heater power and make alarm noise. - Unplug the cord and cool it down, restart the unit.
	Inner circuit damage	Request 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	• Supply the thermal liquid • Set the Over temp. Limiter to the value of 15% increasing
If the temp. is not increasing or decreasing	• No operation	• Touch Start to operate the unit
No temp control	• Check the existence of equipment that generating high frequency noise near the unit. • No operation of Auto tuning • Malfunction of temp. sensor • Inflow of the foreign substance or oil	• Remove the equipment that generating high frequency noise near the unit. • 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 knob and put it again. • Check the Lock function • Ask service
When the touch screen is not available	• The parts is damaged caused by media(sample) or over temperature	• Check the Lock function 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 unit.
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 unit
The oven temperature is now higher than the temperature set on 'OVER TEMP.LIMIT'. Please check 'OVER TEMP.LIMIT' or cool down the oven. Then start again.	• The present temp of the bath is higher than Over temp. limit setting temp	• Cool down the unit and restart the unit. • 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	Cat. No.	Description
Spring wire rack	AAA51522	RW3-2025P, RW3-2035P (185(W) x 159(D) x 170(H), mm)
	AAA51523	RW3-3025P, RW3-3035P (248(W) x 219(D) x 198(H), mm)
Test tube rack	AAA44581	RW3-2025P, RW3-2035P, RW3-3025P, RW3-3035P (for 86 test tubes, 8mm dia., 2ea)
	AAA44582	RW3-2025P, RW3-2035P, RW3-3025P, RW3-3035P (for 86 test tubes, 10mm dia., 2ea)
	AAA44583	RW3-2025P, RW3-2035P, RW3-3025P, RW3-3035P (for 58 test tubes, 12mm dia., 2ea)
	AAA44585	RW3-2025P, RW3-2035P, RW3-3025P, RW3-3035P (for 32 test tubes, 16mm dia., 2ea)
	AAA44586	RW3-2025P, RW3-2035P, RW3-3025P, RW3-3035P (for 19 test tubes, 25mm dia., 2ea)
	AAA41531	RW3-1025P, RW3-1035P (for 50 test tubes, 8mm dia., 1ea)
	AAA41532	RW3-1025P, RW3-1035P (for 50 test tubes, 10mm dia., 1ea)
	AAA41533	RW3-1025P, RW3-1035P (for 33 test tubes, 12mm dia., 1ea)
	AAA41535	RW3-1025P, RW3-1035P (for 16 test tubes, 16mm dia., 1ea)
	AAA41539	RW3-1025P, RW3-1035P (for 10 test tubes, 25mm dia., 1ea)
Stainless steel cover	AAA51531	RW3-0525P, RW3-0535P
	AAA51532	RW3-1025P, RW3-1035P
	AAA51533	RW3-2025P, RW3-2035P
	AAA51534	RW3-3025P, RW3-3035P
External sensor	AAA51571	External sensor board + External Sensor (3m)
	AAA51572	External sensor board + External Sensor (5m)

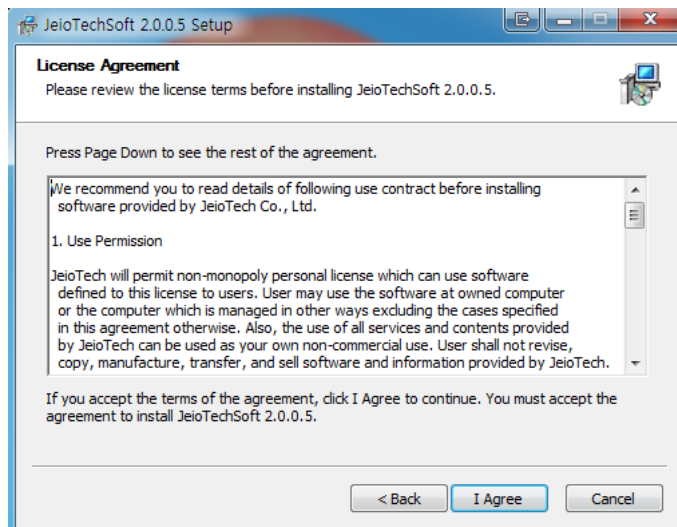
8.0 Dedicated S/W

8.1 Monitoring program installation

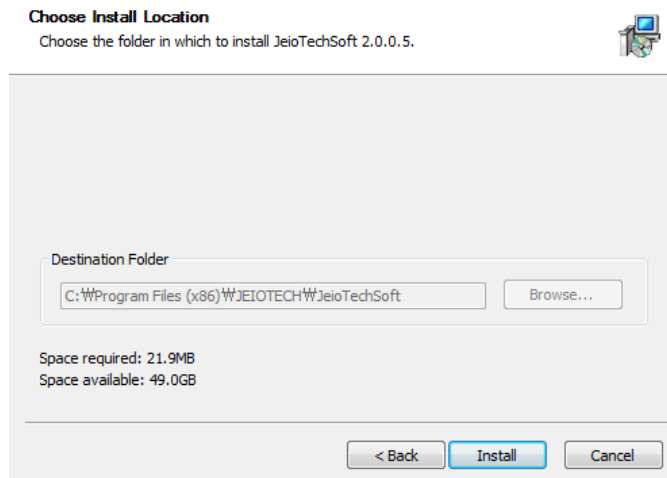
- (1) The software is automatically installed. When user put the "Next" button, the screen showed "License Agreement" page.



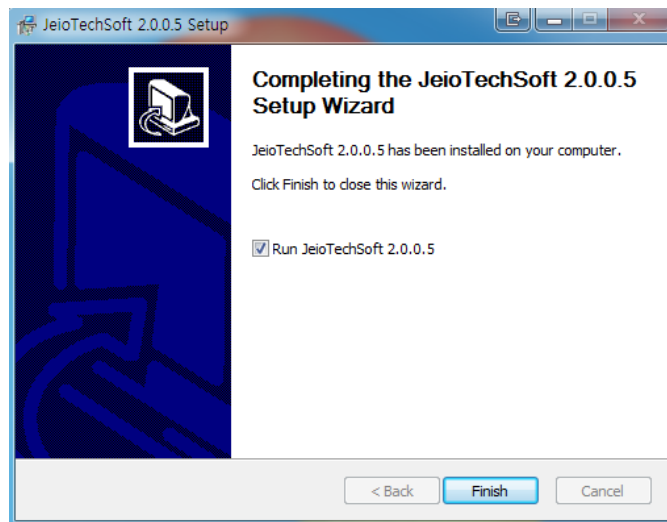
- (2) Please consider and carefully read "License" contents before install the JeioTechSoft.



(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
RW3 Program type	1101H	Circulator	RW3-0525P
	1102H	Circulator	RW3-1025P
	1103H	Circulator	RW3-2025P
	1104H	Circulator	RW3-3025P
	1105H	Circulator	RW3-0535P
	1106H	Circulator	RW3-1035P
	1107H	Circulator	RW3-2035P
	1108H	Circulator	RW3-3035P

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(통신 테스트 용)	1	2
			0x0002	BEEP_KEY(통신 테스트 용)	1	2
R/I	2	MOD_SYS_NAME	X	장비 명	1	2
R/I	3	MOD_SYS_VER	x	펌웨어 버전	1	2
W/S, R/I	4	MOD_FAN_SPEED	0~5	Fan speed	1	2
W/S,	5	MOD_AUTO_RUN	0/1	auto run	1	2

R/I						
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,	985	MOD_TIME_EVENT4		time event4 read/set	5	10

W/M						
W/S	990	MOD_SET_PTN	1 ~ 10	program mode pattern select	1	2
R/I, W/M	981	MOD_MAN_SV_SET	low temp lmt ~ high temp lmt	manual mode set value read/set	4	8
R/I, W/M	985	MOD_MAN_ON_TIME	60L ~ 359940L	manual mode wait on time read/set	2	4
R/I, W/M	987	MOD_MAN_OFF_TIME	60L ~ 359940L	manual mode wait off time read/set	2	4
W/S	989	MOD_MAN_ONT_ON OFF	1/0	manual mode wait on time on/off	1	2
W/S	990	MOD_MAN_OFFT_ON OFF	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	993	MOD_SYS_RUN_STOP	1/0	system operation start/stop	1	2
R/I	994	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_INFO	X	program time info	10	20
R/I	1041	MOD_SYS_TEMP_LIMIT	X	system temp limit	8	16

NOTICE

- Verify the address and refer to the word count to issue commands.
- The specified address must be decreased by 1.
Example) Equipment ON / OFF Protocol (MOD_SYS_RUN_STOP Address: 993 - 1 = 992 (0x3e0))
Equipment ON Protocol: 07 06 03 e0 00 01 49

8.2.1 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		
		Modbus function code	0	R/W data	0~5	
W.S	data	0 : stop 5 : Max				

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

MOD_OFFSET_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	
		Modbus function code	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	Modbus function code	4	W data	The value which is between the upper and lower limit

	set value (double)	W.M	data		value of equipment
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_DO 1	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_DO 2	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 code	0	1~4	5~8	9	10~13					
		W.M	type	X1	X2	Delay time	Dead zone					
MOD_DIO_DO 3	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				address			
		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				1 ~ end 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
		R.I	address		Off timer
		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
		W.S	data		1 : scr program
					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 SV	4~7 PV	8 Heat	9 Act timer	10~11 Set	

			12~13	14	ratio	16	17	time
			Remain time	Dio status	System indicate	T_pro gress	Pu mp	18~24
								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 operation
			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_ REPORT	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	Elapse d time	Dio status	System indicate	T_progres s	Pump
	Dio status	1byte	MSB					
			Dummy	Dummy	Di2	Di1	Dummy	Do3
				LSB				
	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_INFO	Program time information	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					

8.2.2 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		Basic	RW3-0525P	RW3-1025P		RW3-2025P		RW3-3025P
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)		-25 to 150/-13 to 302					
	Stability at -10°C (bath fluid : ethanol, °C/°F)		0.05/0.09	0.05/0.09		0.05/0.09		0.08
	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					
	Insulation		Polyurethane foam 30mm					
Dimensions	Bath Opening/ depth (W x L, D, mm/inch)		150 x 99, 160 /5.9 x 3.9, 6.3	211 x 154, 180 /8.3 x 6.1, 7.1		290 x 214, 00 /11.4 x 8.4, 7.9		300 x 264, 230 /11.8x 10.4, 9.1
	Overall (W x D x H, mm/inch)		308 x 480 x 733 /12.1 x 18.9 x 28.9	366 x 530 x 780 /14.4 x 20.9 x 30.7		416 x 602 x 825/ 16.4 x 23.7 x 32.5		446 x 662 x 895/ 17.6 x 26.1 x 35.2
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					
	Max. pressure, Max. flow rate (28.0 liters / minute)		5.9 psi(406.8 millibar)					
Cooling	At -20°C (W)		80	150		300		470
	At 0°C (W)		230	270		420		630
	At 20°C (W)		320	380		550		740
Electric requirements (230V,50/60Hz)			11A	11A		12.5A		13.5A
Electric requirements (120V,60Hz)			12.6A	12.6A		-		-
Weight (kg/lbs)			38.0/83.8	44.0/97		60.0/132.2		67.0/147.7
Permissible ambient condition	temperature (°C)		5 ~ 40					
	Relative humidity (%)		50 ~ 80					
	Altitude		Up to 2,000m					
	Indoor use pollution		Degree 2					
	Installation category (Over voltage category)		II					

※ 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.

Item / Model		Basic		RW3-0535P	RW3-1035P	RW3-2035P	RW3-3035P
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)		-35 ~ 150/-31 to 302				
	Stability at -10°C (bath fluid : ethanol, °C/°F)		0.05/0.09	0.05/0.09	0.05/0.09	0.08	
	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				
	Insulation		Polyurethane foam 30mm				
Dimensions	Bath Opening/ depth (W x L, D, mm/inch)		150 x 99, 160 /5.9 x 3.9, 6.3	211 x 154, 180 /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, 9.1	
	Overall (W x D x H, mm/inch)		308 x 480 x 733 /12.1 x 18.9 x 28.9	366 x 530 x 780 /14.4 x 20.9 x 30.7	416 x 602 x 825/ 16.4 x 23.7 x 32.5	446 x 662 x 895/ 17.6 x 26.1 x 35.2	
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				
	Max. pressure, Max. flow rate (28.0 liters / minute)		5.9 psi(406.8 millibar)				
	Max. suction flow rate (liters / minute)		10.0				
Cooling	At -20°C (W)		80	150	400	440	
	At 0°C (W)		150	330	660	700	
	At 20°C (W)		280	450	800	880	
Electric requirements (230V,50/60Hz)			12.5A	12.5A	13.5A	14.5A	
Electric requirements (120V,60Hz)			12.5A	12.5A	13.5A	14.5A	
Weight (kg/lbs)			38.0/83.8	44.0/97	60.0/132.2	67.0/147.7	
Permissible ambient condition	temperature (°C)		5 ~ 40				
	Relative humidity (%)		50 ~ 80				
	Altitude		Up to 2,000m				
	Indoor use pollution		Degree 2				
	Installation category (Over voltage category)		II				

※ 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 unit with the signal of external equipment, and the Digital Output function which send signal to external equipment.

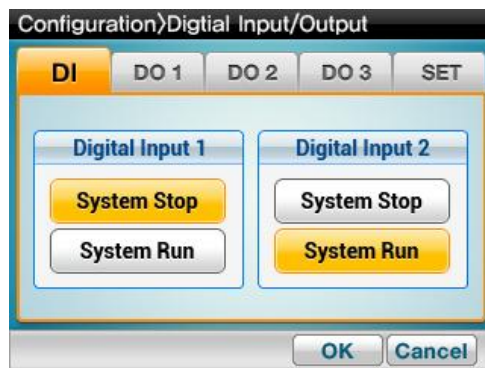
9.2.1 Digital Input

It is the function that stop or run the system when the unit 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.

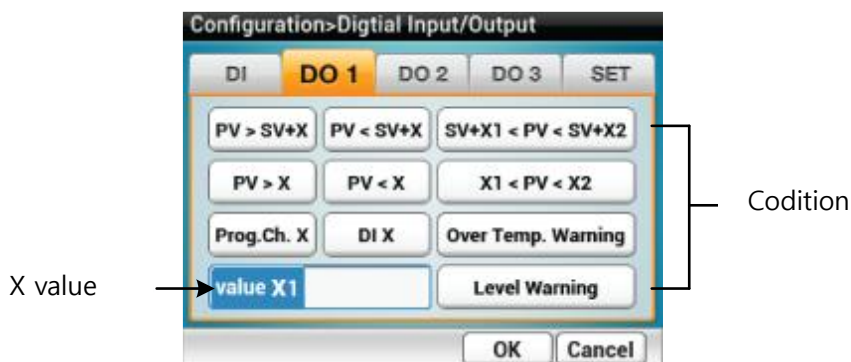
9.2.2 Digital Output

It is the function that send the signal to the external equipment through the port that connected between the units, 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. X 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.

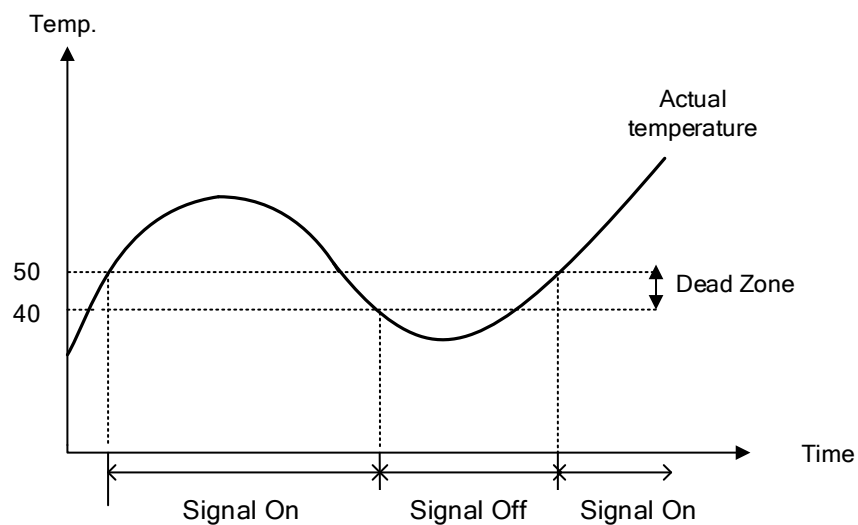
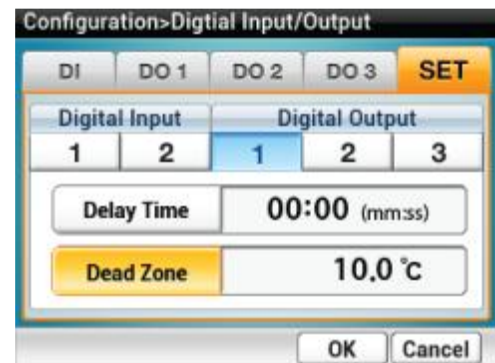
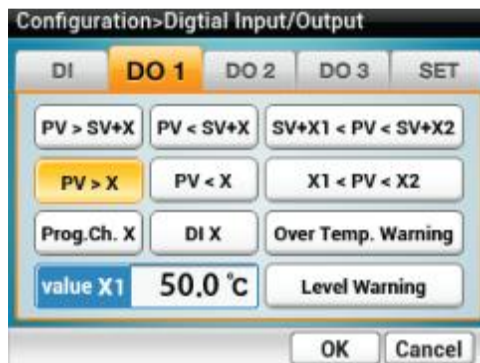
Delay Time	DI signal is generated after over Delay Time. It can be put from 0min 0sec to 59min 59sec.
Dead Zone	Put the $\pm$ tolerance limit regarding the temp. set on (2). It can be put from 0min 0sec to 59min 59sec.

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

(Example)

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

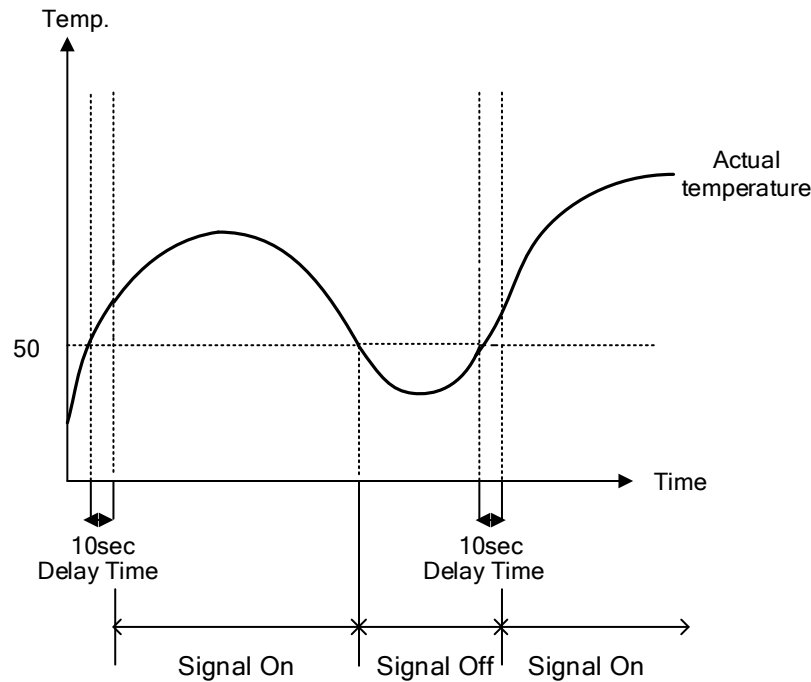
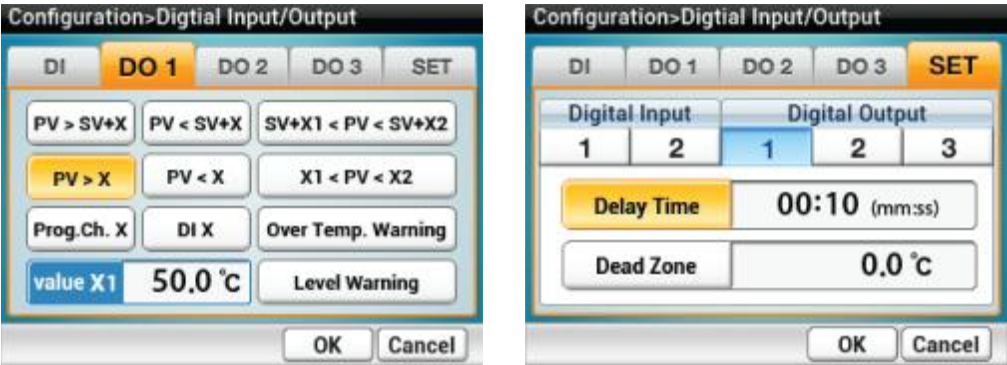
[Digital Output setting display]



(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.

(4)

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

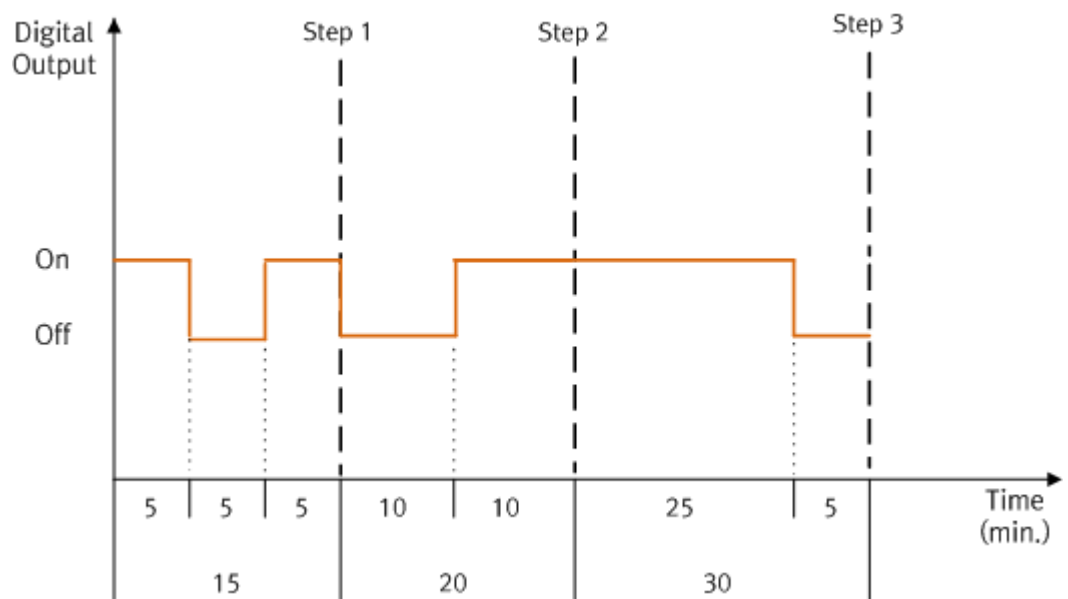
stat.

(Example)

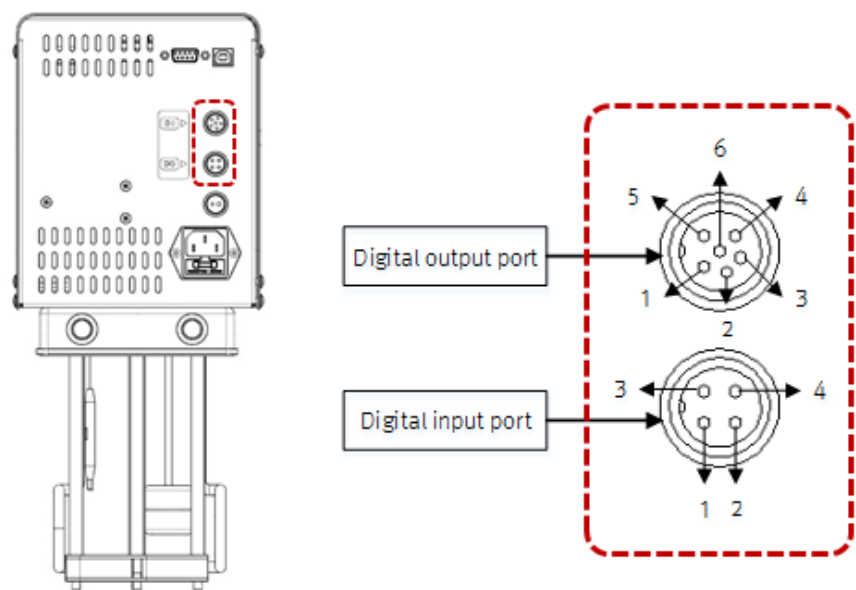
In the case of setting the DO Program Ch. as below chart, digital signal is made as below graph.

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	

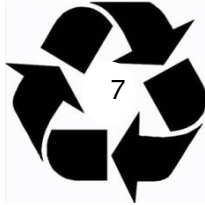
WARNING



Please, cut off the unit 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 equipment should be cleaned and decontaminated to protect workers servicing the equipment, 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 equipment 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.
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- 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.