



# Operation manual

## Refrigerated & Heating Bath Circulators

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

Manual No. :57003L002 Version : 5.0

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## **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.

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# 1.0 Safety

## 1.1 How to use the manual

### 1.1.1 Introduction

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

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 Series |          |          |          |
|-------|-----------------------------------------------|----------|----------|----------|
| Model | RW3-0525                                      | RW3-1025 | RW3-2025 | RW3-3025 |
|       | RW3-0535                                      | RW3-1035 | RW3-2035 | RW3-3035 |

## 1.2 Responsibility

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

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

### 1.2.1 General liability

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

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

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

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

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

### 1.2.2 Responsibility of the users

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

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

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

Always read the safety instructions and run the 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 equipment.
- When the equipment does not operate normally or are neglected from use for a long time check all the settings before operating the equipment.
- Make sure that the equipment is operating normally when you move the equipment, or re-use after a long period.
- Stop operating immediately and report to the managers when you find the following states;
  - Unsafe operation and status
  - Shorts
  - Improper maintenance
- When you operating the equipment, do not wear loose clothing or jewelry, tie long hair or use hair cap.
- When not in use, turn off the power switch or cut off the power to the 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 equipment.

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

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

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

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

## 1.3 Symbols used in this manual

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

### 1.3.1 Signal word panels

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

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

### 1.3.2 Safety symbols

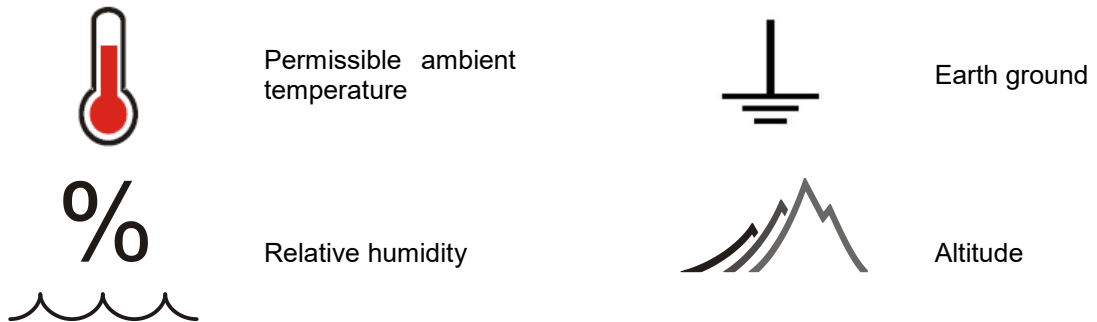
| Mandatory                                                                         |                  |                                                                                   |              |
|-----------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------------------|--------------|
|  | 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<br>General caution        |  | Hand crush or pinch |
|  | Electrical shock                              |  | Foot crush          |
|  | Flammable or fire<br>could be caused.         |  | Lifting hazard      |
|  | Do not take the device<br>apart deliberately. |                                                                                     |                     |

### 1.3.3 Non-safety symbols

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



## 1.4 Precautions for use

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

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

### 1.4.1 Warning statements

|                                                                                                    |
|----------------------------------------------------------------------------------------------------|
|  <b>WARNING</b> |
| 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 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 equipment.

DO NOT disassemble, fix or change the Product 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

|                                                                                                  |
|--------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b> |
| Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.   |

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

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

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

Use grounded cord and consent.

Installation power outlet near instrument and may be convenient.

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

Do not inject any flammable objects, and conductive objects outside of 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

- PID feedback control  
PID Feedback control will be provided maximize the temperature stability and minimizes temperature variation
- Auto tuning  
Perform Auto Tuning in order to get precise and rapid temperature control. PID value saved automatically after Auto Tuning. [Refer to 4.6 Auto tuning].
- Multi-point Temp. Calibration  
In case of the temperature recorder or validation temperature sensor is different with displayed temperature; you can correct the error temperature deviation in 3 different temperature points.[Refer to 4.6 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.
- Provide a dedicated S/W  
Provide a dedicated S/W to monitoring the equipment operation.

### 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 system<sup>1</sup> means "Control system which has logical safety device specialized for individual model". Laboratory must have Thermal safety secure because there are a lot

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<sup>1</sup> Control system which has logical safety device specialized for individual model

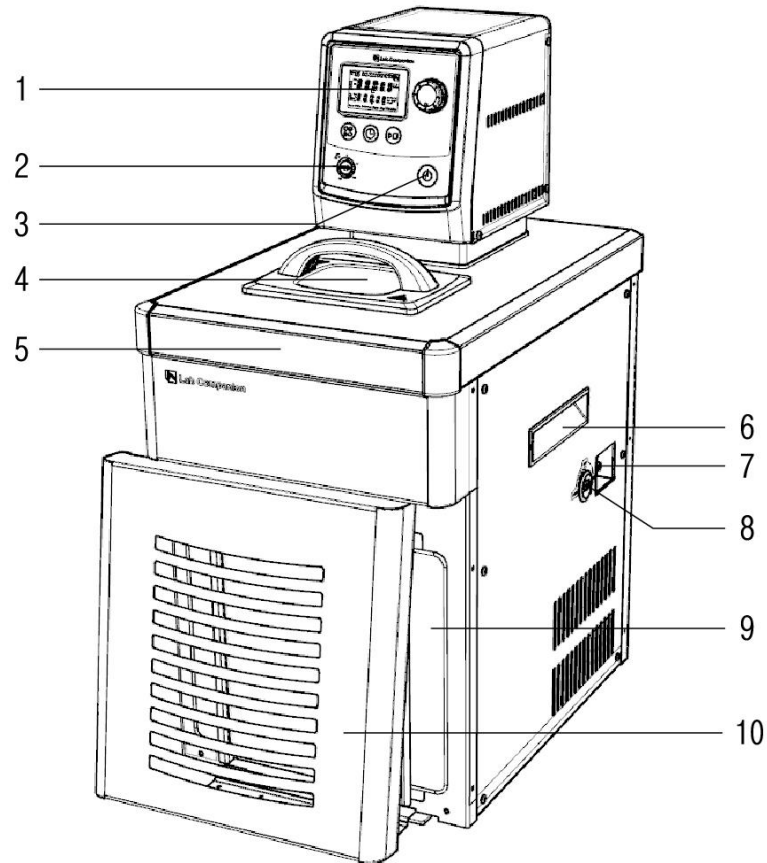
of inflammable reagent. This system is highest safety secure control device (patent no. 0397583 and 0328729) and makes the equipment suitable for this kind of environment.

- Check for abnormal operation  
If any error founds during operation, Error message is shown and warning alarm gets start.
- Overcurrent protection device
- Over temperature protection device  
Built-in over-temp. Protector will be cut off automatically the power when the heater is overheating.
- If temperature sensor is not working well during operation, the equipment stops temperature control and shows warning alerts.
- When Bath heat transfer liquid is not enough during running the equipment, warning alert will be displayed.

### 2.2.3 User's convenience

- VFD and dial knob  
Bright VFD display with quick adjustable dial knob
- Temperature unit setting  
Temperature unit can be set between Celsius(Cels) or Fahrenheit (Fahr).
- 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  
When user press the menu button about 3 second, the timer and knob dial will be locked.  
If user want to cancel the lock function, press the menu button again.
- Auto-run function  
Auto-run function after power interruption: either Automatic Run or Manual Run.  
If the equipment was in run on basic mode before power interruption, the operation starts again with previous set temperature.

## 2.3 Structure



[RW3-0525]

(1) Control panel

Controller and other electrical parts are built in.

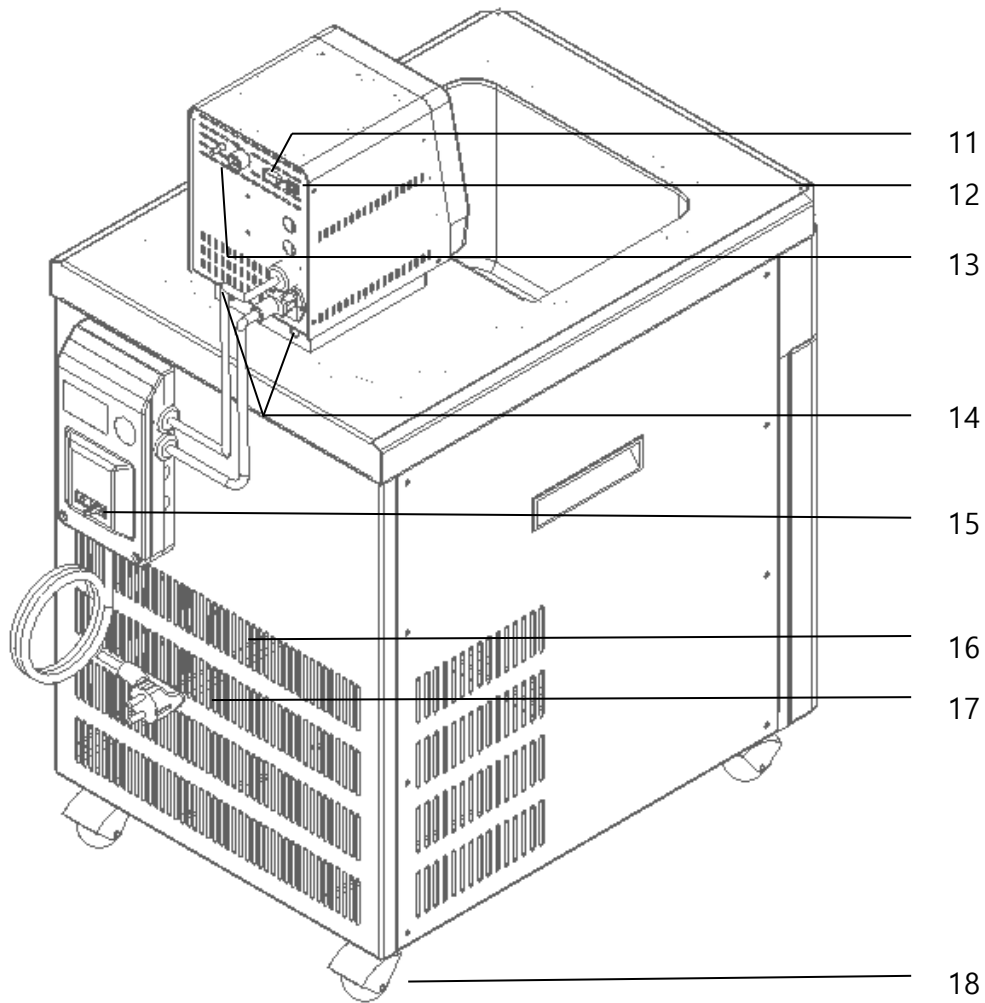
(2) Over temperature limiter

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.

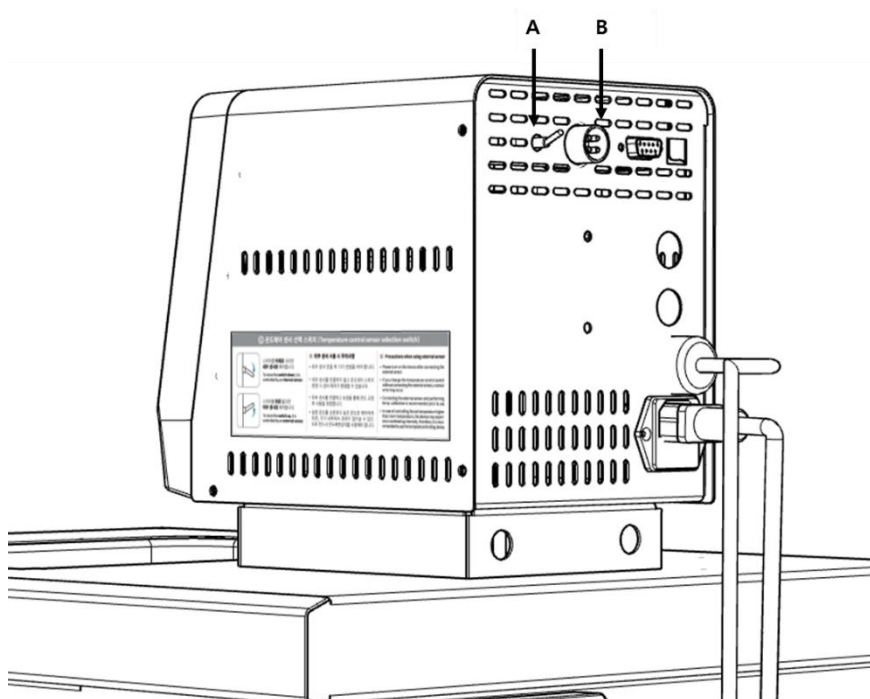
- (4) Bath cover / Refrigerating & heating bath  
Bath covers are made of polyphenylene Sulfide (PPS) resin to protect user from high-temperature burns. Pump, Heater, Temperature sensor, and Temperature regulator are installed inside the Bath.
- (5) Main body
- (6) Handle
- (7) Drain  
Bath fluid comes 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 equipment 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 equipment via USB-B port to computer device. The control values can be stored and printed out.

(13) 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.

(14) Bath fluid In/Out line

In case of using Bath for inner circulation purpose, connect silicone hose to bath fluid In/Out line, In case of using Bath for external circulation purpose, follow the instructions attached on the equipment.

(15) Main Circuit Breaker

Circuit breaker protects the equipment from over-current.

(16) Refrigerator Unit

This is the unit composed of optimum refrigerating system. Better ventilation, higher efficiency of the refrigeration.

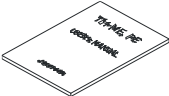
- (17) Power cord  
Power cord to supply power to the equipment.
- (18) Castors  
Castors for easy relocation or installation.

## 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 equipment to make sure you received the model number your ordered.

If you didn't receive one or more of the components or if the model is incorrect, contact your local Jeio Tech office, or the distributor from which the equipment was purchased. Refer to **9.3 Warranty** to see the contact information

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

## 3.2 Preparing before installation

### 3.2.1 Environmental setting

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



No direct sunlight.



Please keep Ambient temperature 5°C~40°C  
(The Optimum temperature is 25 °C)



Relative humidity not to exceed 80%



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

### 3.2.2 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 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. 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  $\mu$  S/cm).
      - Risk of corrosion if ultrapure water (below 1  $\mu$  S/cm) is used.
      - Should be used in well-ventilated laboratories.
-

- 
2. Ethylene Glycol/Water Mixture (EGW)
    - Applicable Temperature Range (50% EGW):  $-30^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ 
      - 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 indicate

| Ethylene Glycol Water Solution Heat-Transfer Fluid - Freezing Point |      |    |      |      |       |       |       |       |       |       |
|---------------------------------------------------------------------|------|----|------|------|-------|-------|-------|-------|-------|-------|
| Ethylene Glycol Solution<br>(% by volume)                           |      | 0  | 10   | 20   | 30    | 40    | 50    | 60    | 80    | 90    |
| Freezing Point                                                      | (°F) | 32 | 25.9 | 17.8 | 7.3   | -10.3 | -34.2 | -63   | ≈ -51 | ≈ -22 |
|                                                                     | (°C) | 0  | -3.4 | -7.9 | -13.7 | -23.5 | -36.8 | -52.8 | ≈ -46 | ≈ -30 |

<Ref.: The Engineering ToolBox>

3. Silicone Oil
    - Applicable Temperature Range:  $-60^{\circ}\text{C}$  to  $250^{\circ}\text{C}$
    - 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  $25^{\circ}\text{C}$  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  $150^{\circ}\text{C}$ ; 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:  $-57^{\circ}\text{C}$  to  $165^{\circ}\text{C}$
- 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
- Automobile antifreeze including additives
- Tap water
- Deionized water with a specific resistance  $>1$  meg ohm
- 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<br>(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.

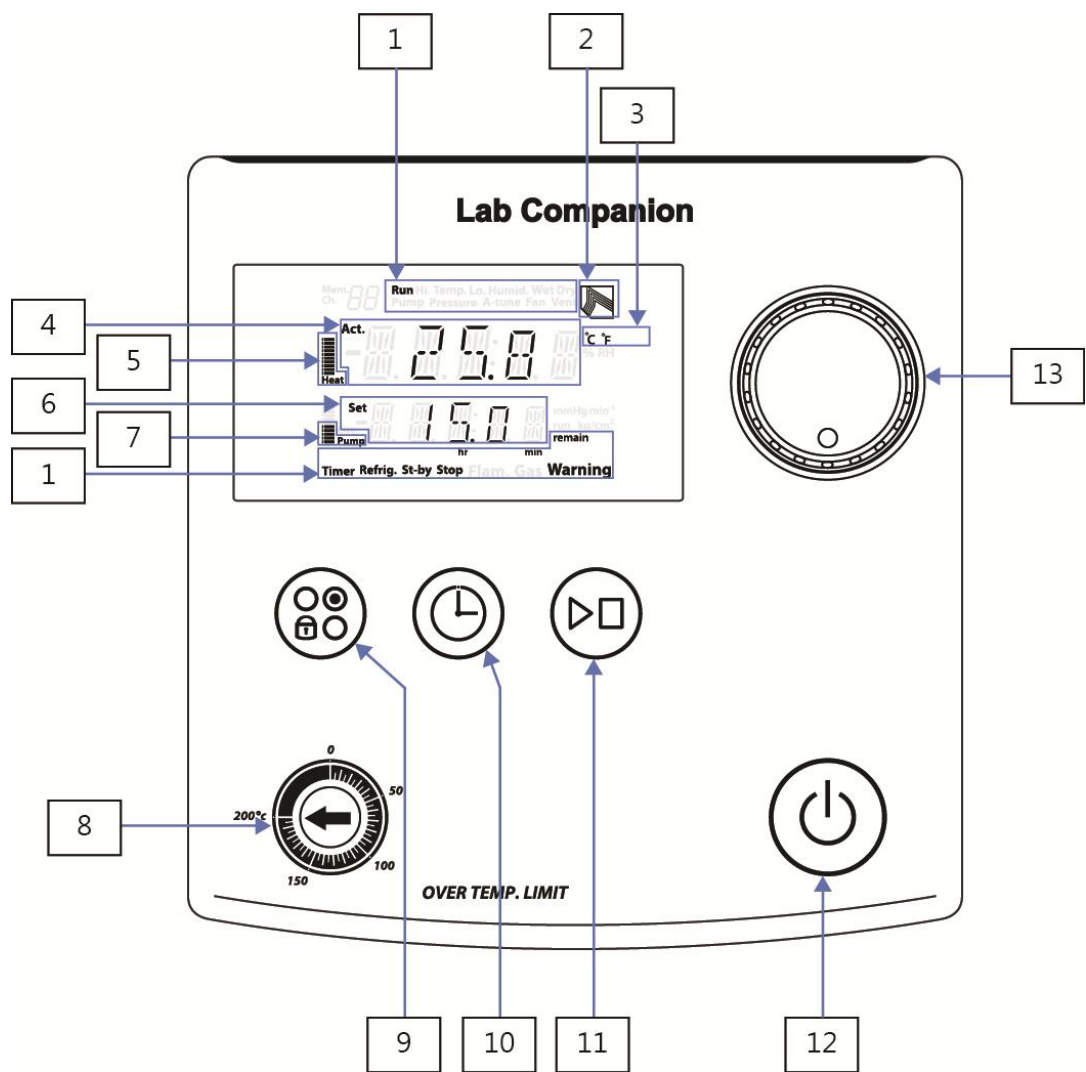


- Check to make sure that the correct line voltage, phase and capacity correspond to them specified on the identification plate.
- Do not use the branch socket or double-tap to prevent cable damage and fire caused by over current.
- Incorrect line voltages will cause the risk of fire, electric shock, and personal injury.
- Wear safety clothes, gloves, glasses.
- Do not touch the equipment or plug with wet hands.
- Use grounded power cord and consent.

## 4.0 Operation

# 4.1 Control panel

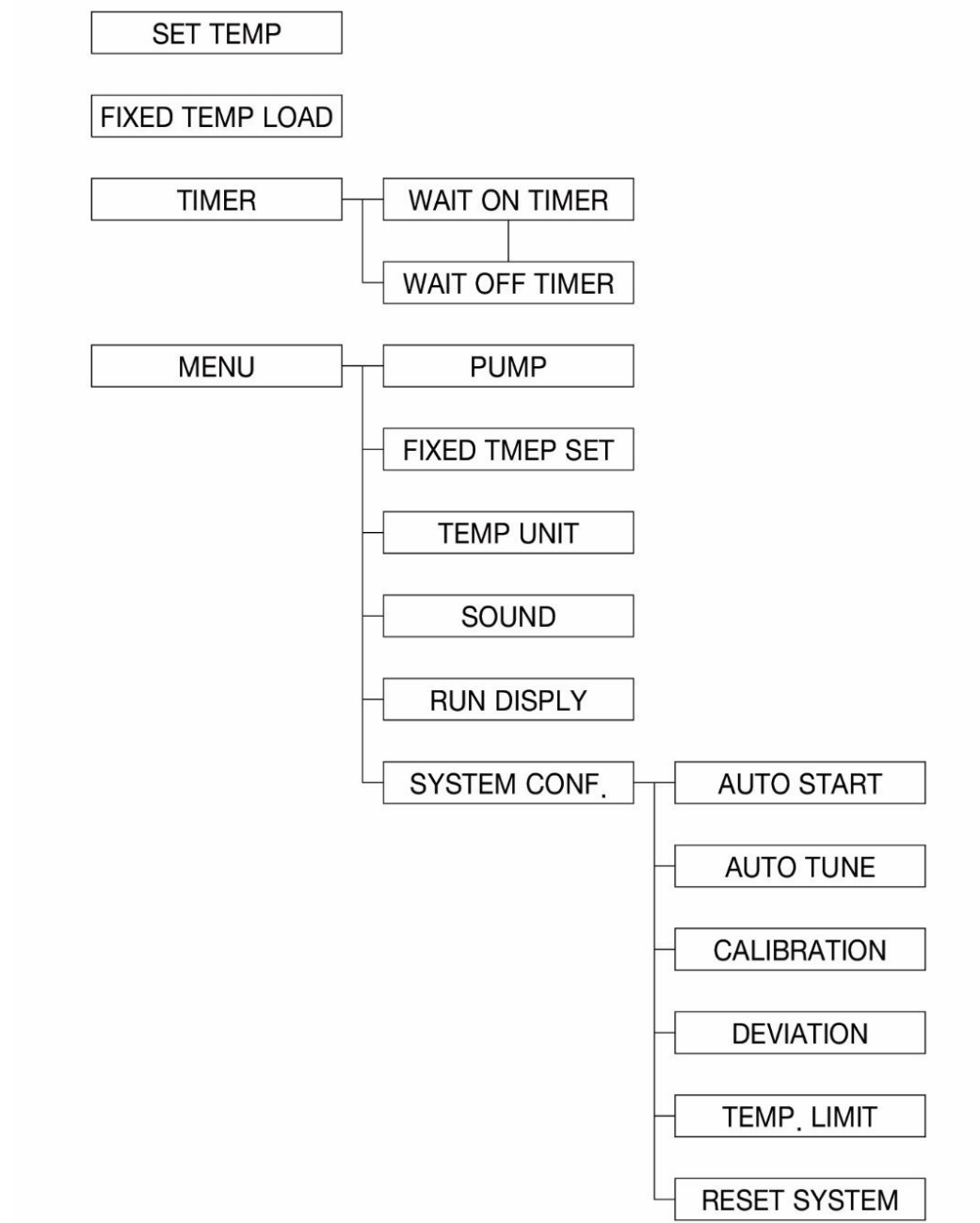
Bright VFD display with quick-adjustable dial knob and membrane buttons.



|    |                          |                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Status Display           | Current status of the equipment is displayed.<br><ul style="list-style-type: none"> <li>• Run: Running status</li> <li>• St-by: Stand-by status or indication during ON Timer</li> <li>• Stop: Stop status</li> <li>• Refrig.: Refrigerator running status</li> <li>• Warning: Warning indication</li> <li>• hr/min: hour/minute indication</li> <li>• remain: remain time during timer ON</li> </ul> |
| 2  | Logo(Lab Companion)      | Brand logo.<br>During computer interface communication, The logo flickers.                                                                                                                                                                                                                                                                                                                            |
| 3  | °C, °F                   | Temperature units.                                                                                                                                                                                                                                                                                                                                                                                    |
| 4  | Actual Display           | Present temperature. During setting menu, each menu is indicated instead of present temperature.                                                                                                                                                                                                                                                                                                      |
| 5  | Heating Rate             | Heating rate of the heater.                                                                                                                                                                                                                                                                                                                                                                           |
| 6  | Set Display              | Set temperature or menu setting value is indicated.                                                                                                                                                                                                                                                                                                                                                   |
| 7  | Pump Level               | Pump level during operation.                                                                                                                                                                                                                                                                                                                                                                          |
| 8  | Over temperature limiter | Extra over temperature limiter beside the temperature sensor which connected to the main controller. User can set the temperature limit.                                                                                                                                                                                                                                                              |
| 9  | Menu Button              | User can set the equipment's condition.<br>If you want to cancel any setting during temperature or menu setting,<br>then press menu button. If you push menu button for 3 seconds during operation, the controller can be locked or unlocked.<br>(but, when controller locked status, stopping operation is possible.                                                                                 |
| 10 | Timer Button             | Timer setting                                                                                                                                                                                                                                                                                                                                                                                         |
| 11 | Start/Stop Button        | Start/stop operation.                                                                                                                                                                                                                                                                                                                                                                                 |
| 12 | Power Switch             | Power ON/OFF                                                                                                                                                                                                                                                                                                                                                                                          |
| 13 | Dial Knob                | Turn Knob to increase or decrease value for setting.<br>User can turn knob during operation, to check the set value or remain time. Turn Knob to search Menu. Press knob and select menu. After changing the value, press knob to save it. If you push knob long to load the saved temperature value.                                                                                                 |

# 4.2 Control structure

The setup of the system has the following structure:



## 4.3 Basic operation

### 4.3.1 Operating

Turn on the green-color switch.

When the equipment is on, it starts initialization for refrigerator at first. After that you can see the basic display for control the temperature.

### 4.3.2 Temperature control

#### (1) Start temperature control

STEP1. Press Start/Stop button when the equipment is stand-by.

STEP2. Temperature control starts.

#### (2) Stop temperature control

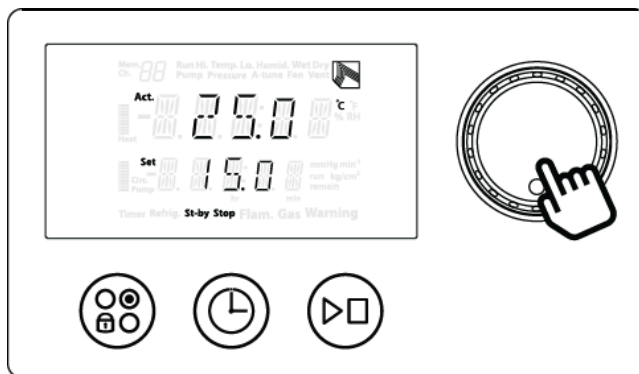
STEP1. Press Start/Stop when the equipment is running.

STEP2. Temperature control stops.

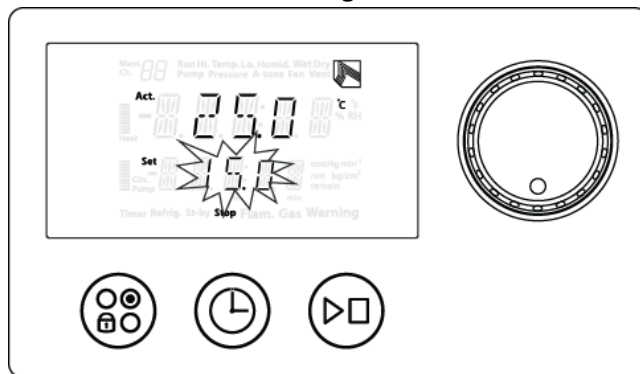
#### (3) Setting temperature

The method of setting temperature is as below.

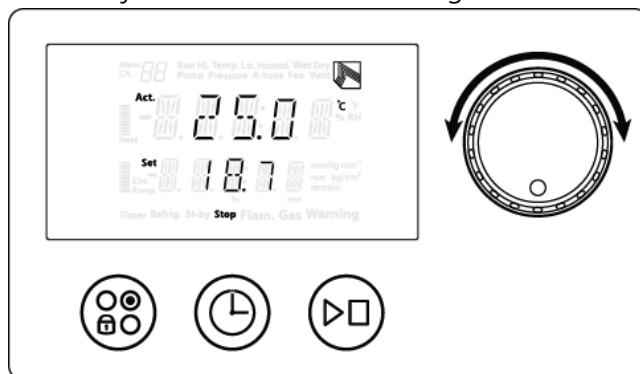
STEP1. Press the Dial Knob once.



The relevant value for setting blinks.



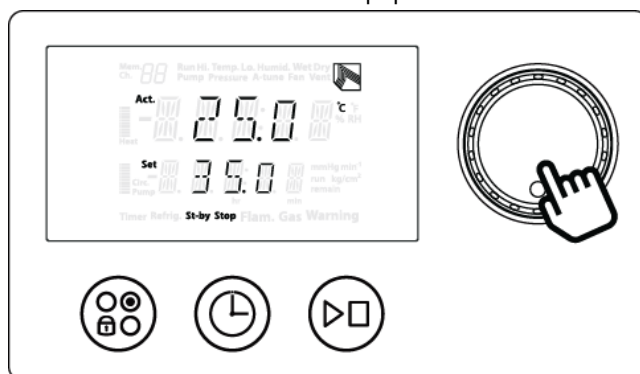
STEP2. Adjust the value with wheeling the Knob.



If there is no action of Knob for 3seconds, the value blinks again.

If there is no additional action of Knob for 20seconds, setting value will be canceled.

STEP3. Press the Knob. The equipment save the setting value.



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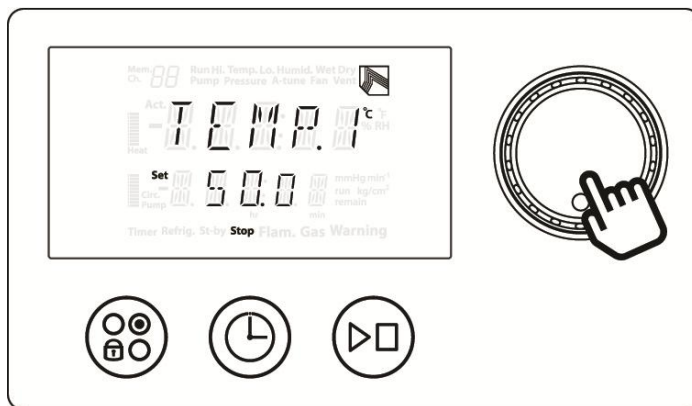
## NOTICE

- If you want to cancel the setting during setting display, Press MENU to go back to previous stage.
- 

### 4.3.3 SV storing function

The equipment has SV storing function up to 3 settings. Initial setup is 50, 80, 100°C. To change the saved setting, go to 4.5 configuration of the equipment, Fixed temp. set menu.

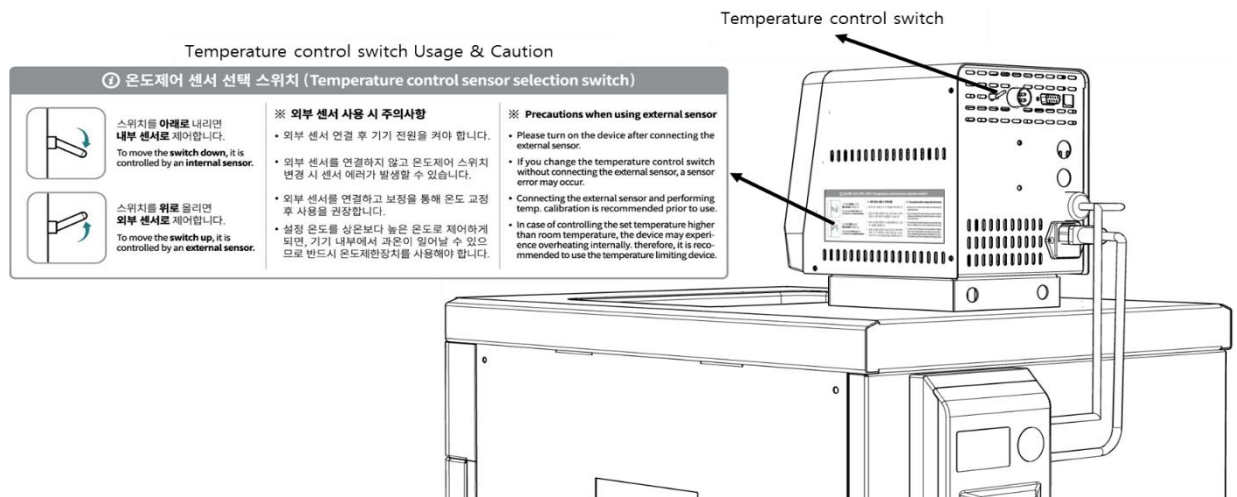
- (1) Press the knob for more than 3seconds.
- (2) You can see 'TEMP1' on the display and saved temperature as below.



- (3) Wheel the Knob toward right side, you can move on 'TEMP2', 'TEMP3', 'ESC' menu.
- (4) Press the knob to select the saved setting. You can cancel the function choosing ESC.
- (5) Press Start/Stop to run the equipment.

## 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 4.7.2 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 How to work a timer function

The equipment has 2 kinds of TIMER function which operates pressing TIMER button.

**Wait On Timer:** The equipment starts control the temperature after waiting for the set time.

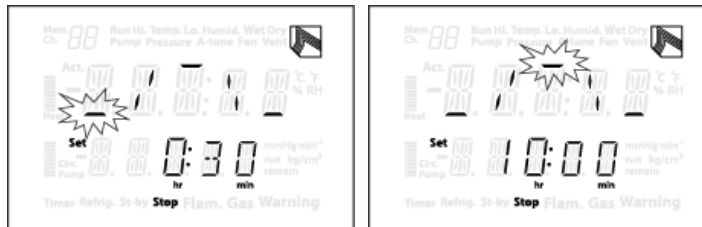
**Wait Off Timer:** The timer starts to run after the equipment reach the set temperature.

The equipment automatically stops after running for set time.

If the timer is set, you can see "timer" on your display.

### 4.5.1 Set-up the TIMER on

- (1) Press Timer button once. You can see the timer value on the display.



(Wait On Timer)

(Wait Off Timer)

- (2) Wheel the Knob to select the timer mode (Wait on, Wait off) and go to timer setting pressing the Knob.
- (3) Choose "TIMER SET" to set the time.
- (4) Press the knob after set the time.
- (5) Go back to Stand-by display pressing TIMER button or wheel the knob to "ESC".

---

## NOTICE

- If you change the timer setting, the equipment modify total running time after calculate pass-period. If you want to reset the timer, OFF the timer or stop the equipment at first.
  - When the equipment is running, you can set Wait Off Timer only.
-

### 4.5.2 TIMER OFF

- (1) Press TIMER once. You can see the timer set value on the display.
- (2) Press Knob to modify timer set.
- (3) Choose "TIMER OFF" and Press the Knob.
- (4) Press TIMER or choose ESC to go back to Main display.

### 4.5.3 Timer end

- (1) Alarm is on when Wait On timer ends.
- (2) Alarm is on and you can see "TIMER END" on the display when Wait Off timer ends.  
Press Knob to turn off the alarm.

## 4.6 Configuration of the equipment

This function is for changing general configuration of the equipment.

Press MENU to set CONF. SET.

|   |                      |                                                                                                                                                                                                                                                                                                        |
|---|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Pump Level           | Adjust speed of pump                                                                                                                                                                                                                                                                                   |
| 2 | Fixed Temp Set       | Set SV storing temperature.(maximum 3).                                                                                                                                                                                                                                                                |
| 3 | Temp Unit            | Adjust mark of Celsius or Fahrenheit                                                                                                                                                                                                                                                                   |
| 4 | Sound                | Adjust mute in electronic sound of the equipment.                                                                                                                                                                                                                                                      |
| 5 | Run Display          | Choosing status of display in wheeling the knob when the equipment is running. <ul style="list-style-type: none"><li>• <b>Return</b>: return to previous display after 3seconds.</li><li>• <b>Fix</b>: fix the changed display</li><li>• <b>Auto</b>: display in rotation for 3seconds each.</li></ul> |
| 6 | System Configuration | Adjust system configuration.                                                                                                                                                                                                                                                                           |

## 4.7 System configuration

The function adjust main setting which affects operation of the equipment. Be fully aware of this manual before adjust system configuration.

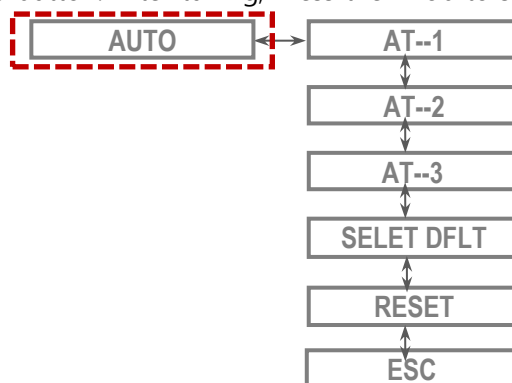
Pres MENU, choose CONF. SET and move to SYSTM CONF for setting.

|   |                  |                                                                                                                                                                                                     |
|---|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Auto Start       | Select availability of auto start function<br>• when the power supply forcibly blocked and resolved, restore previous running status.(the unit can not restore timer)                               |
| 2 | Auto Tune        | Perform Auto Tuning in order to get precise and rapid temperature control. PID value is saved automatically after Auto Tuning.                                                                      |
| 3 | Temp Calibration | Have calibration with the difference between user reference set value and performance value of sensor.                                                                                              |
| 4 | Temp Deviation   | Adjust calibration tolerance and delay time between SV and PV.<br>• Setting temperature: set Deviation Limit<br>• Alarm Delay: when allowable tolerance exceed setting time, Deviation alarm is on. |
| 5 | Temp Limit       | Lock the limit range of temperature which user uses frequently or range of temperature depending on solvent.                                                                                        |
| 6 | System Reset     | Reset the parameters to beginning value.                                                                                                                                                            |

### 4.7.1 Auto tune

The function is for update of PID control parameter for correct temperature control. If the equipment can not control temperature control properly in the temperature setting user's main using temperature, the equipment tune the parameter by Auto tuning to be temperature controlled well.

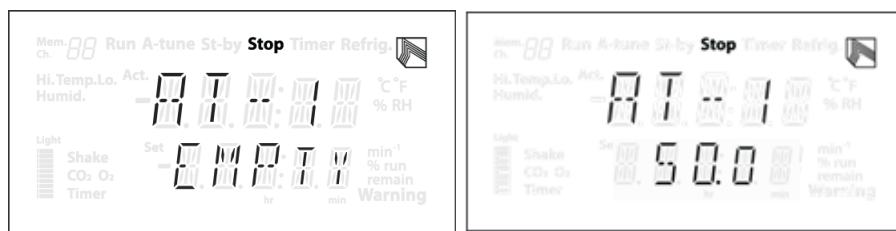
Input the temperature mainly user uses. Press Knob to start auto tuning. You can cancel the tuning by pressing Knob or Stop button. After tuning, Press the Knob to save the setting.



- (1) Menu > SYSTEM CONF > AUTO TUNE to enter the related menu and press Knob on the screen below.

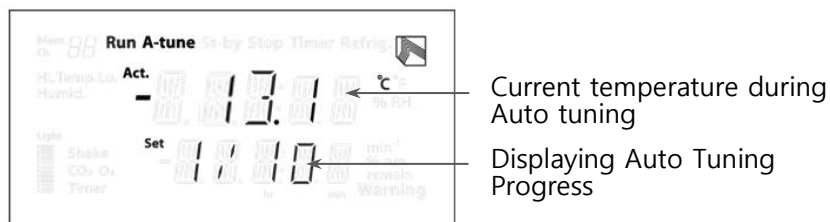


- (2) Select AT-1~3 using the knob on the screen below, input the main usage temperature.



[The screen to input main usage temperature as 50 degrees selecting AT-1]

- (3) Press Knob to start control with the temperature value entered and start auto-tuning.

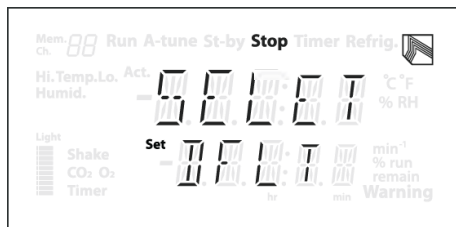


You can always cancel tuning by pressing knob or pressing the STOP button during tuning.

- (4) When the tuning is complete, a completion message appears below, and press knob to save the tuning value.



- (5) Select the Menu button > SYSTEM CONF> AUTO TUNE > SELECT to select the stored tuning value. Select the screen below if you want to use the initial value of the equipment without using a separate tuning value stored in AT-1 ~ 3.



- (6) The RESET menu is available if you want to reset the tuning values for AT-1 ~ 3. You can select Menu button > SYSTEM CONF> AUTO TUNE > RESET to initialize each of AT-1~3 individually.



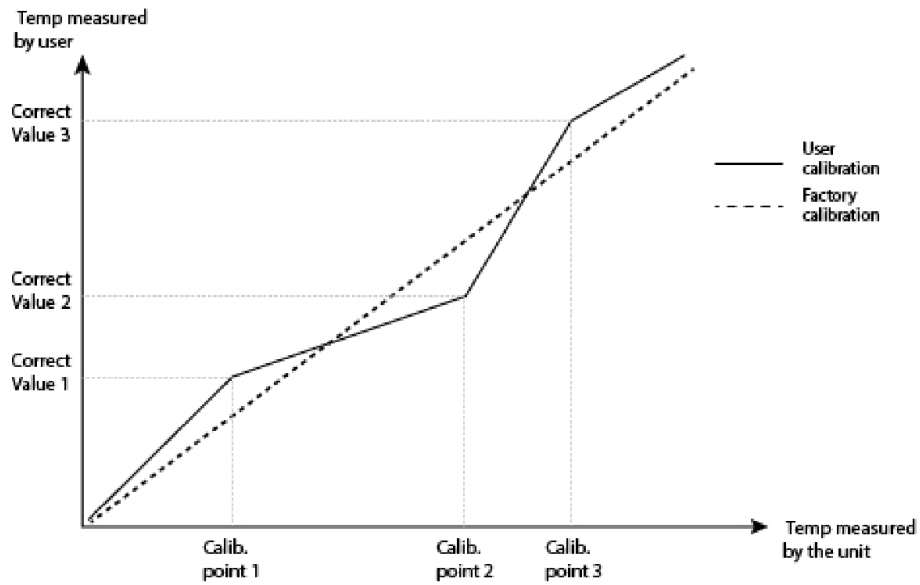
- (7) Rotate Knob to the end to select ESC or return to the main screen after 20 seconds of no input.

#### 4.7.2 Temp calibration

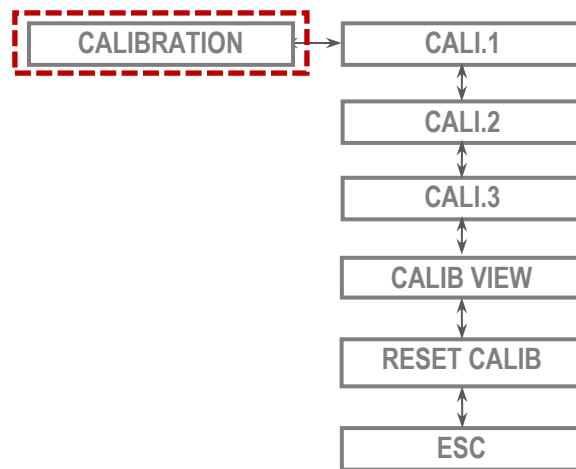
You can calibrate the temperature sensor using this function. The equipment can tune the temperature with 3 measure point and user reference measurement.

You can check the value of temperature at this function. Choose the temperature point among the 3 points. Locate the user reference thermostat sensor.

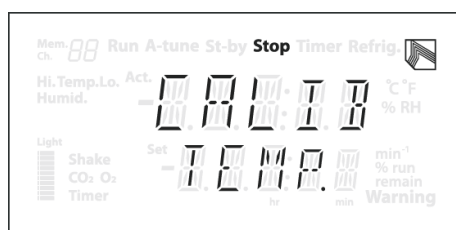
Choose the calibration temperature the user wants and press Knob to run the equipment. Wait until Actual Temperature catch up with setting temperature. After that, press Knob to input the value of reference thermostat sensor. Press Knob to save and the equipment will follow the temperature of the reference sensor.



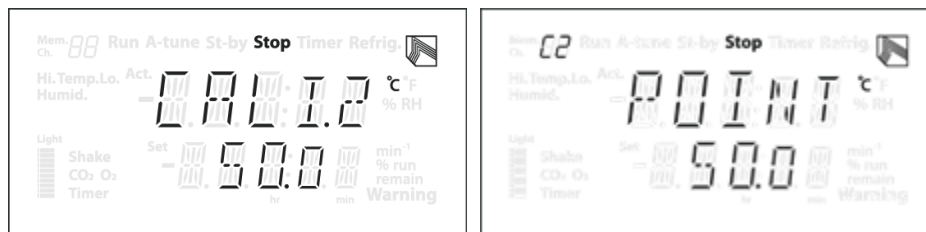
Temperature calibration can be performed at up to 3 points(CALI1, CALI2, CALI3) in the order shown below.



(1) Select Menu button > SYSTEM CONF> CALIB TEMP to enter the menu.



- (2) On the screen below, use Knob to select CALI 1-3 and enter the temperature that requires calibration, and press Knob.



[ex : If CALI 2 is selected and the temperature required for calibration is set to 50.0 degrees]

- (3) After device's actual temperature reaches set temperature, press the Knob to input the temperature you want to calibrate on the screen below.



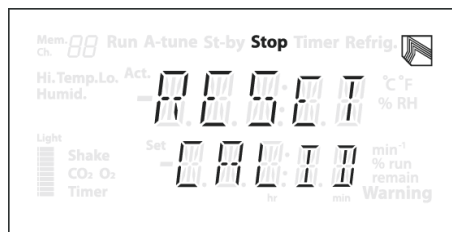
[When you set 52.0 degrees to the calibration value]

- (4) You can check the calibration value set in Menu Button > SYSTEM CONF1 > CALIB TEMP > CALIB VIEW.



[Check that CALI 2 is calibrated to 50.0 degrees and 52.0 degrees]

- (5) You can change the calibration value changed by the user in Menu Button > SYSTEM CONF > CALIB TEMP > RESET CALIB to the initial value.



- (6) Rotate Knob to the end to select ESC or return to the main screen after 20 seconds of no input.

## NOTICE

- If the error occurs such as exceed the range of over temperature during temperature control, the control stops.
- As the equipment calibrate the temperature in many points, if you input wrong adjustment, the equipment can not proceed the calibration.
- You can see the result of the calibration any time in CALIB VIEW. It displays C1, C2, C3for checking measure points. POINT represents measure points, VALUE represents the setting value of calibration.
- RESET CALIB can reset each Calibration.

### 4.7.1 Temp deviation

The equipment alarms for Deviation warning when the difference between SV and PV value is over allowable range. After the alarm, although the temperature restored to be normal, it takes time for end of Deviation alarm.

# 4.8 Warning and fault messages

The equipment has several functions that making the user to acknowledge the error on the equipment. This equipment can call attention by visual – audible alarm. This functions are divided into Warning and Fault based on seriousness of problem

## 4.8.1 Warning

In case of Warning, visual and audible alarm operated but equipment keeps operating. If user presses Knob, alarm sound is stopped but the visual alarm is remained until problem is solved.

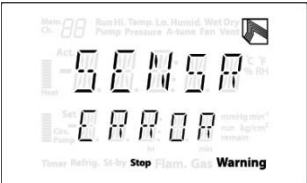
|   |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Temp Deviation | <p>* This message is displayed if the difference between set-up temperature and actual temperature is over than a allowance error which is beyond alarm delay.</p> <p>* Warning is stopped if the actual temperature reaches the set-up temperature after sometime to approach a permissible range.</p> <div></div> <div></div> |
|---|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## NOTICE

- In case of sound OFF in Configuration part, the sound alarm about WARNING is not operated.

4.8.2 Fault

Fault is the very serious problem level to stop the equipment forcibly.  
If user presses Knob, audible alarm is canceled but visual alarm is not canceled until the problem is solved. If the problem is not fixed after some time, the audible alarm is operated again and the shaking operation is stopped to protect shaking system.

|   |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Over temperature | <p>This message is displayed when the over temperature sensor is on. The actual temperature is out of range of setting value of over temperature sensor. The equipment stops to protect the equipment and solvents. Check the setting value of over temperature sensor.</p>  <p>The LCD display shows 'OVER TEMP' in large characters. Above it, 'Main 88' and 'Ch 88' are visible. Below the main display, there are smaller indicators for 'Act', 'Set', and 'Cn'. At the bottom, a status bar shows 'Timer Refig. 50-60 Stop Alarm Gas Warning'.</p> |
| 2 | Low Level        | <p>The water-level sensor is operated when the water level is low. The equipment stops running and alarm is on.<br/>You can re-activate the equipment pressing Start/Stop button after refill the solution.</p>  <p>The LCD display shows 'LOW LEVEL' in large characters. Above it, 'Main 88' and 'Ch 88' are visible. Below the main display, there are smaller indicators for 'Act', 'Set', and 'Cn'. At the bottom, a status bar shows 'Timer Refig. 50-60 Stop Alarm Gas Warning'.</p>                                                            |
| 3 | Sensor Fault     | <p>The temperature sensor has error. The equipment stops and the user should check the sensor.</p>  <p>The LCD display shows 'SENSOR ERROR' in large characters. Above it, 'Main 88' and 'Ch 88' are visible. Below the main display, there are smaller indicators for 'Act', 'Set', and 'Cn'. At the bottom, a status bar shows 'Timer Refig. 50-60 Stop Alarm Gas Warning'.</p>                                                                                                                                                                      |

4.8.3 Other messages

When the user press the Knob, the equipment recognizes the user checked the status.  
The visual alarm is turned off and move to main display.

|   |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Auto Start | <div>During operation, Forced power OFF or ON</div> <div>In configuration, if A.RUN Set-up value is ON "A.RUN" displayed. If OFF, "PWR.F" displayed.</div> <div><div>The screenshot shows a control panel display with various indicators. At the top, it says 'Run' and 'Temp. Lo. Humid. Wet Dry'. Below that, 'Act.' is followed by '60.8' and a temperature icon. To the left of 'Act.' is a 'Heat' icon. Below 'Act.' is a 'Set' icon and 'PWR.F'. At the bottom, it says 'Timer Refrig. St-by Stop Flam. Gas Warning'.</div><div>The screenshot shows a control panel display with various indicators. At the top, it says 'Run' and 'Temp. Lo. Humid. Wet Dry'. Below that, 'Act.' is followed by '60.8' and a temperature icon. To the left of 'Act.' is a 'Heat' icon. Below 'Act.' is a 'Set' icon and 'PWR.F'. At the bottom, it says 'Timer Refrig. St-by Stop Flam. Gas Warning'.</div></div> |
|---|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 5.0 Maintenance

## 5.1 Maintenance period

| Classification                                         | Period |        |
|--------------------------------------------------------|--------|--------|
|                                                        | Daily  | Weekly |
| Connection between equipment and power                 | ●      |        |
| Exterior cleanliness                                   | ●      |        |
| Damage and cleanness of inside of the bath             |        | ●      |
| Cleanness of surface of the equipment and accessories. |        | ●      |
| Check defects of Start/Stop button and Dial knob       |        | ●      |
| Check Over Temperature limiter                         | ●      |        |
| Check Low fluid level alarm                            |        | ●      |
| Connection between the equipment and accessories.      |        | ●      |

---

### **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 Cleanness

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

### 5.2.1 Cleaning the equipment

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

---

### **CAUTION**

---

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

### 5.2.2 Accessories

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

## 5.3 Moving the placement of the equipment

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

---

 **CAUTION**

---

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

## 5.4 Storage

In the case of no long time use

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

## 6.0Trouble shooting

## 6.1 Instruction on problem

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

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

In the case of no operation of the equipment.

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

## 6.2 Power

| Problem                               | Cause                                                                                                        | Instruction                                                                                                                                                                                                                 |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No power on                           | <ul style="list-style-type: none"><li>Power supplied with wrong voltage and hertz</li></ul>                  | <ul style="list-style-type: none"><li>Check the voltage, phase and hertz.</li></ul>                                                                                                                                         |
|                                       | <ul style="list-style-type: none"><li>Circuit breaker going down and black out</li></ul>                     | <ul style="list-style-type: none"><li>Find the leakage</li></ul>                                                                                                                                                            |
|                                       | <ul style="list-style-type: none"><li>The power cord inserted not perfectly</li></ul>                        | <ul style="list-style-type: none"><li>Insert the cord perfectly</li></ul>                                                                                                                                                   |
|                                       | <ul style="list-style-type: none"><li>Damage on consent, plug, cable</li></ul>                               | <ul style="list-style-type: none"><li>Replace the damaged consent, plug and cable.</li></ul>                                                                                                                                |
|                                       | <ul style="list-style-type: none"><li>Circuit breaker is down</li></ul>                                      | <ul style="list-style-type: none"><li>Raise the circuit breaker</li></ul>                                                                                                                                                   |
|                                       | <ul style="list-style-type: none"><li>Inner circuit damage</li></ul>                                         | <ul style="list-style-type: none"><li>Ask service</li></ul>                                                                                                                                                                 |
| Circuit breaker is shorten constantly | <ul style="list-style-type: none"><li>Too many cord plugged</li></ul>                                        | <ul style="list-style-type: none"><li>Remove all the plugs inserted and use the consent in the allowed current volume.</li></ul>                                                                                            |
|                                       | <ul style="list-style-type: none"><li>Inner circuit damage</li></ul>                                         | <ul style="list-style-type: none"><li>Ask service</li></ul>                                                                                                                                                                 |
| Power on but, no operation            | <ul style="list-style-type: none"><li>Over heating causes protection system and cut off the power.</li></ul> | <ul style="list-style-type: none"><li>Once over heating generated on the inner circuit, the equipment off the heater power and make alarm noise.</li><li>Unplug the cord and cool it down, restart the equipment.</li></ul> |
|                                       | <ul style="list-style-type: none"><li>Inner circuit damage</li></ul>                                         | <ul style="list-style-type: none"><li>Ask service</li></ul>                                                                                                                                                                 |

## 6.3 Problem generating during the operation

| Problem                                   | Cause                                                                                                                                                                                                                                                                         | Instruction                                                                                                                                                                              |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarming continuously                     | <ul style="list-style-type: none"> <li>• Shortage of thermal liquid</li> <li>• Problem on the setting temp of Over temp. Limiter</li> </ul>                                                                                                                                   | <ul style="list-style-type: none"> <li>• Check the Door sign on the screen and make sure the door close.</li> <li>• Set the Over temp. Limiter to the value of 15% increasing</li> </ul> |
| No temp increasing                        | <ul style="list-style-type: none"> <li>• No operation</li> </ul>                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Touch Start to operate the equipment</li> </ul>                                                                                                 |
| No temp control                           | <ul style="list-style-type: none"> <li>• Check the existence of equipment that generating high frequency noise near the equipment.</li> <li>• No operation of Auto tuning</li> <li>• Malfunction of temp. sensor</li> <li>• Inflow of the foreign substance or oil</li> </ul> | <ul style="list-style-type: none"> <li>• Remove the equipment that generating high frequency noise near the equipment.</li> <li>• Operate Auto tuning</li> <li>• Ask service</li> </ul>  |
| No thermal liquid circulation in the bath | <ul style="list-style-type: none"> <li>• Set the pump circulation amount as '0'</li> <li>• Pump problem</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Check the pump circulation amount and put 1~5</li> <li>• Ask Service</li> </ul>                                                                 |
| Problem of dial nob                       | <ul style="list-style-type: none"> <li>• Nob problem</li> </ul>                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>• Pull out the nob and put it again.</li> <li>• Check the Lock function</li> <li>• Ask service</li> </ul>                                         |

※ Use the original parts for the replacement.

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

## 7.0 Accessories

## 7.1 Accessories

| Designation              | Cat. No. | Description                                                                   |
|--------------------------|----------|-------------------------------------------------------------------------------|
| Spring wire rack         | AAA51522 | RW3-2025, RW3-2035<br>(185(W) x 159(D) x 170(H), mm)                          |
|                          | AAA51523 | RW3-3025, RW3-3035<br>(248(W) x 219(D) x 198(H), mm)                          |
| Test tube rack           | AAA44581 | RW3-2025, RW3-2035, RW3-3025, RW3-3035<br>(for 86 test tubes, 8mm dia., 2ea)  |
|                          | AAA44582 | RW3-2025, RW3-2035, RW3-3025, RW3-3035<br>(for 86 test tubes, 10mm dia., 2ea) |
|                          | AAA44583 | RW3-2025, RW3-2035, RW3-3025, RW3-3035<br>(for 58 test tubes, 12mm dia., 2ea) |
|                          | AAA44585 | RW3-2025, RW3-2035, RW3-3025, RW3-3035<br>(for 32 test tubes, 16mm dia., 2ea) |
|                          | AAA44586 | RW3-2025, RW3-2035, RW3-3025, RW3-3035<br>(for 19 test tubes, 25mm dia., 2ea) |
|                          | AAA41531 | RW3-1025, RW3-1035<br>(for 50 test tubes, 8mm dia., 1ea)                      |
|                          | AAA41532 | RW3-1025, RW3-1035<br>(for 50 test tubes, 10mm dia., 1ea)                     |
|                          | AAA41533 | RW3-1025, RW3-1035<br>(for 33 test tubes, 12mm dia., 1ea)                     |
|                          | AAA41535 | RW3-1025, RW3-1035<br>(for 16 test tubes, 16mm dia., 1ea)                     |
|                          | AAA41539 | RW3-1025, RW3-1035<br>(for 10 test tubes, 25mm dia., 1ea)                     |
| Stainless steel<br>cover | AAA51531 | RW3-0525, RW3-0535                                                            |
|                          | AAA51532 | RW3-1025, RW3-1035                                                            |
|                          | AAA51533 | RW3-2025, RW3-2035                                                            |
|                          | AAA51534 | RW3-3025, RW3-3035                                                            |

## 8.0 Dedicated S/W

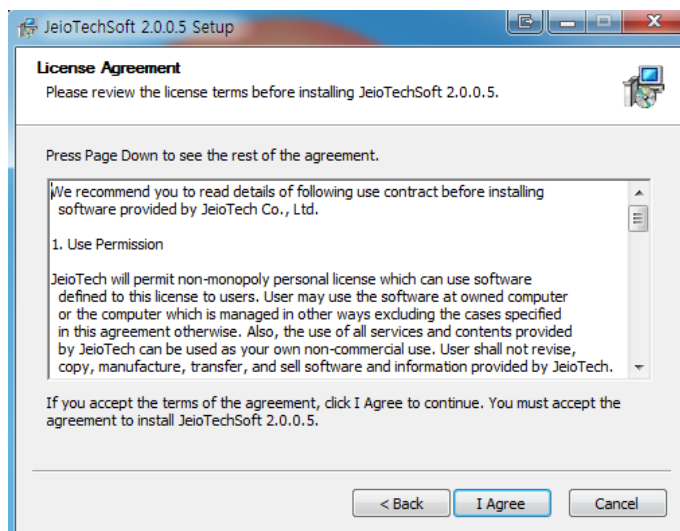
## 8.1 Monitoring program installation

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

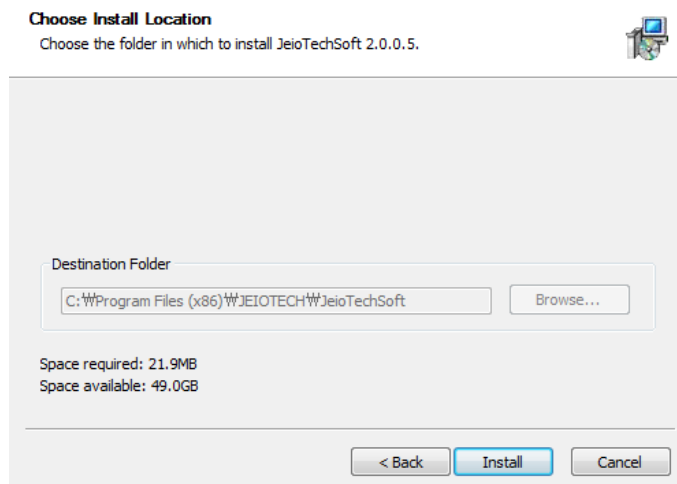
- (1) The software is automatically installed. When user put the "Next" button, the screen showed "License Agreement" page.



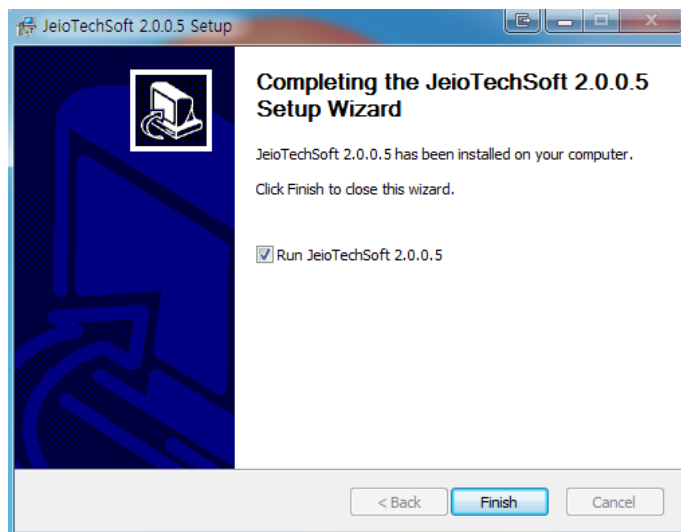
- (2) Please consider and carefully read "License" contents before install the JeioTechSoft.



- (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](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 name |
|------|---------------|------------|------------|
| RW3  | 2101H         | Circulator | RW3-0525   |
|      | 2102H         | Circulator | RW3-1025   |
|      | 2103H         | Circulator | RW3-2025   |
|      | 2104H         | Circulator | RW3-3025   |
|      | 2105H         | Circulator | RW3-0535   |
|      | 2106H         | Circulator | RW3-1035   |
|      | 2107H         | Circulator | RW3-2035   |
|      | 2108H         | Circulator | RW3-3035   |

### 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,<br>R/I          | 5       | MOD_AUTO_RUN    | 0/1                               | auto run                          | 1           | 2    |
|                      |         |                 |                                   |                                   |             |      |
| R/I,<br>W/M          | 981     | MOD_MAN_SV_SET  | low temp lmt<br>/high temp<br>lmt | manual mode set value<br>read/set | 4           | 8    |
| R/I,                 | 985     | MOD_MAN_ON_TIME | 60L ~                             | manual mode wait on time          | 2           | 4    |

|             |      |                    |                                   |                                       |    |    |
|-------------|------|--------------------|-----------------------------------|---------------------------------------|----|----|
| W/M         |      |                    | 3599940L                          | read/set                              |    |    |
| R/I,<br>W/M | 987  | MOD_MAN_OFF_TIME   | 60L ~<br>3599940L                 | manual mode wait off time<br>read/set | 2  | 4  |
| W/S         | 989  | MOD_MAN_ONT_ONOFF  | 1/0                               | manual mode wait on time<br>on/off    | 1  | 2  |
| W/S         | 990  | MOD_MAN_OFFT_ONOFF | 1/0                               | manual mode wait off time<br>on/off   | 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 |
| R/I         | 1031 | MOD_SYS_TEMP_LMT   | X                                 | system temp limit                     | 8  | 16 |
| R/I,<br>W/M | 1040 | MOD_DEVI_TEMP_SET  | low temp lmt<br>/high temp<br>lmt | system deviation temperatrue<br>range | 4  | 8  |
| R/I,<br>W/M | 1044 | MOD_DEVI_TIME_SET  | 0 ~ 3599L                         | system deviation time set             | 2  | 4  |

## 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

### 8.2.4 Modbus Protocol Description

| Command | Description   | Modbus function code | 0    |
|---------|---------------|----------------------|------|
| Beep    | Buzzer sounds | W,S                  | Data |

|            |   |                  |
|------------|---|------------------|
| Write data | 1 | System boot beep |
|            | 2 | System key beep  |

|              |                                                     |                      |         |
|--------------|-----------------------------------------------------|----------------------|---------|
| MOD_SYS_NAME | Returns the equipment name.<br>Refer, System number | Modbus function code | 0       |
|              |                                                     | R,I                  | address |

|             |             |
|-------------|-------------|
| Return data | 0           |
|             | Upper Lower |
|             | Model num   |

|             |                               |                      |         |
|-------------|-------------------------------|----------------------|---------|
| MOD_SYS_VER | Returns the firmware version. | Modbus function code | 0       |
|             |                               | R,I                  | address |

|             |             |
|-------------|-------------|
| Return data | 0           |
|             | Upper Lower |
|             | version     |

|              |                                      |                      |         |             |               |              |
|--------------|--------------------------------------|----------------------|---------|-------------|---------------|--------------|
| 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_MAN_SV_SET | sv value set | modbus function code | 0       | return data | 4        |  |
|                |              | R.I                  | address |             | sv       |  |
|                |              |                      |         |             |          |  |
|                |              | modbus function code | 4       | value       | 장비 상/하한값 |  |
|                |              | 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 ~ 3599940L(1 분단위) |  |
|                 |                   | 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 ~ 3599940L(1 분단위) |  |
|                  |                    | 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_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            |                 | return data   | 0 ~ 3        | 4 ~ 7     | 8          |
|                         |                    |        | R.I                  |          | address      |                 |               | sv           | pv        | heat ratio |
|                         |                    |        | 9                    | 10 ~ 11  | 12 ~ 13      | 14 ~ 15         | 16 ~ 19       | 20 ~ 23      | 24        |            |
|                         |                    |        | act timer            | set time | elapsed time | system indicate | high temp lmt | low temp lmt | dummy     |            |
|                         |                    |        |                      |          |              |                 |               |              |           |            |
|                         | system indicate    | 4 byte | MSB                  | 30       | 29           | 28              | 27            | 26           | 25        | 24         |
| dummy                   |                    |        | dummy                | dummy    | dummy        | dummy           | dummy         | dummy        | temp_cali |            |
| x                       |                    |        | x                    | x        | x            | x               | x             | x            | x         |            |

|  |  |  |         |       |        |                |               |               |           |                |
|--|--|--|---------|-------|--------|----------------|---------------|---------------|-----------|----------------|
|  |  |  | 23      | 22    | 21     | 20             | 19            | 18            | 17        | 16             |
|  |  |  | usb_con | dummy | dummy  | ltemp_de<br>vi | htemp<br>devi | temp<br>delay | temp hold | atune          |
|  |  |  | x       | x     | x      | x              | x             | x             | x         | x              |
|  |  |  | 15      | 14    | 13     | 12             | 11            | 10            | 9         | 8              |
|  |  |  | arun    | mute  | refrig | sensor         | dum           | door_warn     | otp       | water<br>level |
|  |  |  | x       | x     | x      | x              | x             | x             | x         | x              |
|  |  |  | 7       | 6     | 5      | 4              | 3             | 2             | 1         | LSB            |
|  |  |  | dummy   | dummy | dummy  | lock           | woff          | won           | timer     | operation      |
|  |  |  | x       | x     | x      | x              | x             | x             | x         | x              |

|                  |                   |                   |         |  |                |                 |                |
|------------------|-------------------|-------------------|---------|--|----------------|-----------------|----------------|
| MOD_SYS_TEMP_LMT | system temp limit | mod function code | 0       |  | return<br>data | 0~3             | 4~7            |
|                  |                   | R.I               | address |  |                | high temp limit | low temp limit |

|                   |                           |                      |         |  |                |           |  |
|-------------------|---------------------------|----------------------|---------|--|----------------|-----------|--|
| MOD_DEVI_TEMP_SET | temperature deviation set | modbus function code | 0       |  | return<br>data | 4         |  |
|                   |                           | R.I                  | address |  |                | devi temp |  |
|                   |                           | modbus function code | 4       |  | value          | 장비 상/하한값  |  |
|                   |                           | W.M                  | value   |  |                |           |  |

|                   |                                |                      |         |  |                |                  |  |
|-------------------|--------------------------------|----------------------|---------|--|----------------|------------------|--|
| MOD_DEVI_TIME_SET | temperature deviation time set | modbus function code | 0       |  | return<br>data | 2                |  |
|                   |                                | R.I                  | address |  |                | devi time        |  |
|                   |                                | modbus function code | 2       |  | value          | 0 ~ 3599L(1 초단위) |  |
|                   |                                | W.M                  | value   |  |                |                  |  |

## 8.2.5 Decimal point setting and read

|                    |                     |
|--------------------|---------------------|
| Decimal point read | Decimal point write |
|--------------------|---------------------|

|                                                                                                                                                                                                                                                             |                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre> typedef union DOUBLE_2_INT_8_BYTE {     double    dData;     unsigned char cData[8]; }D2I_DOUBLETTYPE_PACKET;  D2I_DOUBLETTYPE_PACKET d2i_packet;  memcpy(d2i_packet.cData,  sData,  8);  // sData(read buffer) double dSV = d2i_packet.dData; </pre> | <pre> D2I_DOUBLETTYPE_PACKET d2i_packet; d2i_packet.dData = dValue;  for(int i = 0; i &lt; 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                                                 |  | RW3-0525                                                                                                    |  | RW3-1025                                |  | RW3-2025                                |  | RW3-3025                               |  |     |  |
|-----------------------|--|-------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------|--|-----------------------------------------|--|-----------------------------------------|--|----------------------------------------|--|-----|--|
| 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<br>(bath fluid :<br>ethanol,°C/°F) |  | 0.05/0.09                                                                                                   |  |                                         |  |                                         |  |                                        |  |     |  |
|                       |  | Controller                                            |  | Microprocessor PID                                                                                          |  |                                         |  |                                         |  |                                        |  |     |  |
|                       |  | Sensor                                                |  | PT 100Ω                                                                                                     |  |                                         |  |                                         |  |                                        |  |     |  |
| Controller functions  |  |                                                       |  | Auto tuning, 3-point temp. calibration, Wait on / off timer (99hr 59min), Auto-run, Pump speed              |  |                                         |  |                                         |  |                                        |  |     |  |
| Safety                |  |                                                       |  | CLS(Custom Logical Safe) – control system, IEC protection Class II, Over temp. limit, Low fluid level alarm |  |                                         |  |                                         |  |                                        |  |     |  |
| Control panel         |  |                                                       |  | VFD, 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<br>(W x L, D, mm/inch)            |  | 150 x 99,<br>160/ 5.9 x<br>3.9, 6.3                                                                         |  | 211 x 154,<br>180/8.3 x<br>6.1, 7.1     |  | 290 x 214,<br>200/11.4 x<br>8.4, 7.9    |  | 300 x 264,<br>230/11.8x<br>10.4, 9     |  |     |  |
|                       |  | Overall<br>(W x D x H, mm/inch)                       |  | 309 x 480 x<br>733/12.2 x<br>18.9, 28.9                                                                     |  | 367 x 532 x<br>780/14.4 x<br>20.9, 30.7 |  | 387 x 602 x<br>825/15.2 x<br>23.7, 32.5 |  | 447 x 662 x<br>895/17.6 x<br>26.1,35.2 |  |     |  |
| 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,<br>Max. flow rate<br>(28.0 liters / minute) | 5.9 psi(406.8 millibar) |         |            |            |
| Cooling                              | At -20°C (W)                                               | 140                     | 180     | 310        | 465        |
|                                      | At 0°C (W)                                                 | 270                     | 360     | 610        | 700        |
|                                      | At 20°C (W)                                                | 400                     | 560     | 850        | 980        |
| 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<br>ambient<br>condition  | temperature (°C)                                           | 5 ~ 40                  |         |            |            |
|                                      | Relative humidity (%)                                      | 50 ~ 80                 |         |            |            |
|                                      | Altitude                                                   | Up to 2,000m            |         |            |            |
|                                      | Indoor use pollution                                       | Degree 2                |         |            |            |
|                                      | Installation category<br>(Over voltage<br>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 |  | RW3-0535                                                                                                                                                        |  | RW3-1035                                |  | RW3-2035                                |  | RW3-3035                               |  |     |  |
|-----------------------|--------------------------------------------------------|-------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------------------|--|-----------------------------------------|--|----------------------------------------|--|-----|--|
| 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<br>(bath fluid :<br>ethanol, °C/°F) |       |  | 0.05/0.09                                                                                                                                                       |  |                                         |  |                                         |  |                                        |  |     |  |
|                       | 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<br>(W x L, D, mm/inch)             |       |  | 150 x 99,<br>160/ 5.9 x<br>3.9, 6.3                                                                                                                             |  | 211 x 154,<br>180/8.3 x<br>6.1, 7.1     |  | 290 x 214,<br>200/11.4 x<br>8.4, 7.9    |  | 300 x 264,<br>230/11.8x<br>10.4, 9     |  |     |  |
|                       | Overall<br>(W x D x H, mm/inch)                        |       |  | 309 x 480 x<br>733/12.2 x<br>18.9, 28.9                                                                                                                         |  | 367 x 532 x<br>780/14.4 x<br>20.9, 30.7 |  | 387 x 602 x<br>825/15.2 x<br>23.7, 32.5 |  | 447 x 662 x<br>895/17.6 x<br>26.1,35.2 |  |     |  |
| 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                                                                                                                                                            |  |                                         |  |                                         |  |                                        |  |     |  |

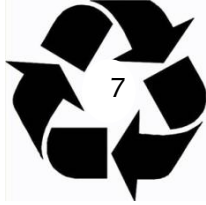
|                                      |                                                            |                         |         |            |            |
|--------------------------------------|------------------------------------------------------------|-------------------------|---------|------------|------------|
|                                      | Max. pressure,<br>Max. flow rate<br>(28.0 liters / minute) | 5.9 psi(406.8 millibar) |         |            |            |
| Cooling                              | At -20°C (W)                                               | 140                     | 180     | 310        | 465        |
|                                      | At 0°C (W)                                                 | 270                     | 360     | 610        | 700        |
|                                      | At 20°C (W)                                                | 400                     | 560     | 850        | 980        |
| 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<br>ambient<br>condition  | temperature (°C)                                           | 5 ~ 40                  |         |            |            |
|                                      | Relative humidity (%)                                      | 50 ~ 80                 |         |            |            |
|                                      | Altitude                                                   | Up to 2,000m            |         |            |            |
|                                      | Indoor use pollution                                       | Degree 2                |         |            |            |
|                                      | Installation category<br>(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 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 product and its components.

## 9.3 Warranty

### 9.3.1 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"><li>• Date of purchase:</li><li>• Customer name / address / phone number / E-mail:</li><li>• Fault status</li><li>• Model</li><li>• Serial number</li></ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 9.3.2 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](mailto:overseas@JeioTech.com)

### 9.3.3 Certificate of Product Warranty

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

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

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

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

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

#### 1. Non-defective cases

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

#### 2. Failures caused by user errors:

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

### 3. Other cases

- \* When the product model or serial number has been damaged, removed, manipulated, or altered.
  - \* Malfunctions caused by fire, flooding, or other natural disasters.
  - \* Failure due to consumable parts reaching the end of their lifespan (e.g., lamps, filters, fuses, gaskets, packings, hoses, heat transfer fluids).
  - \* Natural wear and tear (e.g., discoloration, screen printing degradation).
  - \* Damage or malfunction of product accessories (e.g., power cables, data cables, glass components) or options.
  - \* Malfunctions caused by errors in computers, computer components, or connected network systems.
- Before JEIOTECH performs free or paid repairs or accepts the return of a product, the customer must ensure the product has been decontaminated of chemical and biological hazards.
  - Replacement parts used during repairs may differ from the original but will function correctly and be equivalent in performance.
  - JEIOTECH does not bear any responsibility for damage to stored samples, data loss, or any other direct or indirect damages caused by product malfunctions, regardless of the warranty period.
  - JEIOTECH does not guarantee issues related to computers, computer components, or network systems connected to the product, regardless of the warranty period.
  - This warranty is the sole and exclusive warranty provided. Any implied warranties imposed by applicable laws are limited to the warranty period stated herein. This warranty cannot be modified by any verbal advice, statements, or documents on behalf of JEIOTECH unless explicitly labeled as a "Warranty Amendment" and signed by an authorized representative of JEIOTECH.
  - This warranty applies only to products purchased for direct use by the customer. It does not cover

products purchased for resale purposes without prior written approval from JEIOTECH.

- This warranty does not apply to consumables and is non-transferable.

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

- The copyright of this manual belongs to JEIOTECH.