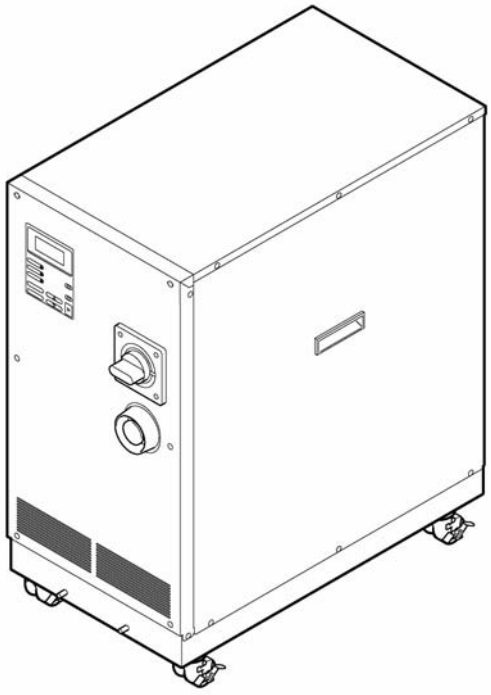
HRX-OM-K003-E
1st Edition: July 2006
6th Edition: August 2010

Operation Manual

Original Instructions

THERMO CHILLER

HRW002-H	***HRW008-H***	***HRW015-H***	***HRW030-H***
HRW002-H1	***HRW008-H1***	***HRW015-H1***	***HRW030-H1***
HRW002-H2	***HRW008-H1***	***HRW015-H2***	***HRW030-H2***
HRW002-HS	***HRW008-HS***	***HRW015-HS***	***HRW030-HS***
HRW002-H1S	***HRW008-H1S***	***HRW015-H1S***	***HRW030-H1S***
HRW002-H2S	***HRW008-H1S***	***HRW015-H2S***	***HRW030-H2S***



CE

Save This Manual Carefully for Use at Any Time

To the Customers

Thank you for purchasing our THERMO CHILLER HRW Series (hereinafter called “This system”).

For the long-term, safe use of this system, be sure to read and understand this manual thoroughly before performing operation of this system.

- Warnings and precautions defined in this manual shall be observed.

- This manual provides the explanations of the installation and operation of this system. Only those who have thorough understanding of the fundamental operating procedure or have basic knowledge and skills of handling industrial equipment for the installation and operation of this system are qualified to perform installation and operation.

- The contents of this manual and related documents supplied with this system shall be neither regarded as a provision of the contract nor utilized to correct or modify the existing agreements, commitments and relations.

- Copying, duplicating or transferring any part of or whole contents of this manual without the prior written consent of SMC Corporation is strictly prohibited.

- The Service Manual is supplied in addition to this manual and provides the explanations of the inspection, troubleshooting, and in-depth remedies of this system. The Service Manual is intended for service personnel that completed service training SMC provides. Only those who fall under the above condition are allowed to perform maintenance and repair of this system with the use of the Service Manual.

Note: The contents of this manual are subject to change without notice.

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Table of Contents

Chapter 1 Safety

Be sure to read and understand the important precautions defined in this manual thoroughly prior to system use.

1.1 Before Using this System

- This "Safety" chapter describes the safety-related items that users should be aware of upon handling this system.
- This system, which is operated under high voltage, is outfitted with the parts that cause a rise in temperature and rotating parts when it is in action, All personnel who work with or around this system are required to thoroughly read and understand the safety-related items in this manual prior to working with or around this system.
- This manual is not intended to be used as a manual for comprehensive safety and hygiene education. Such a manual should be provided by a safety training manager.
- All personnel who work on or around this system are to have proper training and education on dangers specific to this system and safety measures against potential hazards.
- A safety manager is responsible for observing safety standards. Operators and maintainers, however, are to have individual responsibilies for complying with the safety standard in his/her daily work.
- Operators and maintainers must individually take account of safety and assure a proper working area and working environment.
- The relevant personnel must receive proper safety education prior to work training on this system. Otherwise, personnel may be exposed to hazards. Never conduct work training without giving proper consideration to safety.
- Save this manual at a designated place for reference when necessary.

1.2 Danger, Warning, and Caution Used in This Manual

1.2.1 Hazard Levels

This system is designed with its first priority being the safety of workers and the prevention of system damage. This manual classifies the risks into the following three categories according to the severity and level of the hazard; Danger, Warning, and Caution. Read the statements carefully, thoroughly understand them before operating this system.

DANGER, WARNING and CAUTION signs are in order according to hazard severity (DANGER > WARNING > CAUTION). See below for the details.

⚠ DANGER

"DANGER" denotes that there is an imminent hazard which will cause serious personal injury or death during operation.

⚠ WARNING

"WARNING" denotes that there is a hazard which may cause serious personal injury or death during operation.

⚠ CAUTION

"CAUTION" denotes that there is a hazard which may cause minor personal injury during operation.

CAUTION

"CAUTION" without an exclamation symbol denotes that there is a hazard which may cause damage or failure of this system, facility, or devices.

[Tips]

Tips are provided when there is information personnel are required to be aware of for system operation and maintenance. If the task carries useful information, the relevant tips are given as well.

1.2.2 Definitions of “Serious injury” and “Minor injury”

■ “Serious injury”

This term describes injuries such as loss of eyesight, wound, burns, frostbite, electric shock, fracture, and toxication that leave aftereffects, and/or injury requiring hospitalization and/or prolonged staying in a hospital.

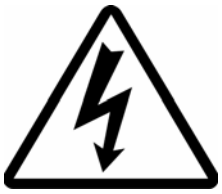
■ “Minor injury”

This term describes injuries that do not require hospitalization or prolonged staying in a hospital (injuries other than “serious injuries” described above).

1.2.3 Symbols

This manual provides the following symbols in addition to “Danger”, “Warning”, and “Caution” to present the warning details in easy-to-understand manner.

■ Symbol of electrical hazard



This symbol warns you of potential electrical shock.

■ Symbol of heat hazard

This symbol warns you of potential burns.

■ Symbol of “Don’ts”

This symbol denotes “Don’t” item which you must not do in operation of this system.

■ Symbol of “Dos”

This symbol denotes the “obligation” items which you must follow in operation of this system.

1.3 Hazard Warning Label

The hazard warning labels are applied to the sections of this system where potential hazards are present during system operation and maintenance.

The hazard warning labels are in appropriate sizes and colors to get attention of the operator. They contain symbols in addition to the descriptions of warnings.

1.3.1 Type of hazard warning label

The hazard warning labels affixed on this system are listed below.

■ Labels of high voltage hazard

[High voltage hazard]
This warning label is affixed on the part isolated with the cover panel of the system panel in which high voltage is applied.
Do not remove cover panels that are not designated in this manual.

Figure 1-1 Hazard warning label No.1

Figure 1-2 Hazard warning label No.2

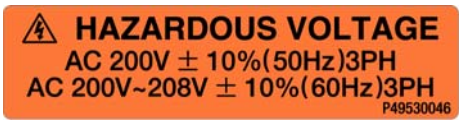


Figure 1-3 Hazard warning label No.3

■ Labels of hot surface hazard

[Hot surface hazard]
This warning label is affixed on the surface that is at high temperatures carrying potential burns if touched. Residual heat may cause burns despite the power being turned OFF. Be sure of the surface reaching room temperature before work.

Figure 1-4 Hazard warning label No.4

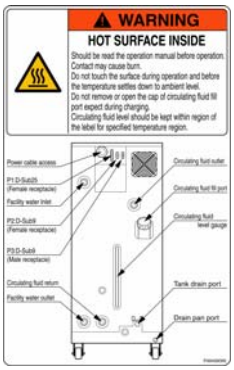


Figure 1-5 Hazard warning label No.5

1.3.2 Location of hazard warning label

⚠ WARNING

Do not peel off or deface the hazard warning labels.

⚠ WARNING

- **Confirm the locations of the hazard warning labels.**
- **Read the contents of the hazard warning labels carefully and keep them in mind.**

⚠ WARNING

Users are NOT allowed to change the locations of the hazard warning labels. Make sure to affix a new label to exactly the same location of the replaced label upon replacement of the peeled off or worn out label.

■ High voltage hazard

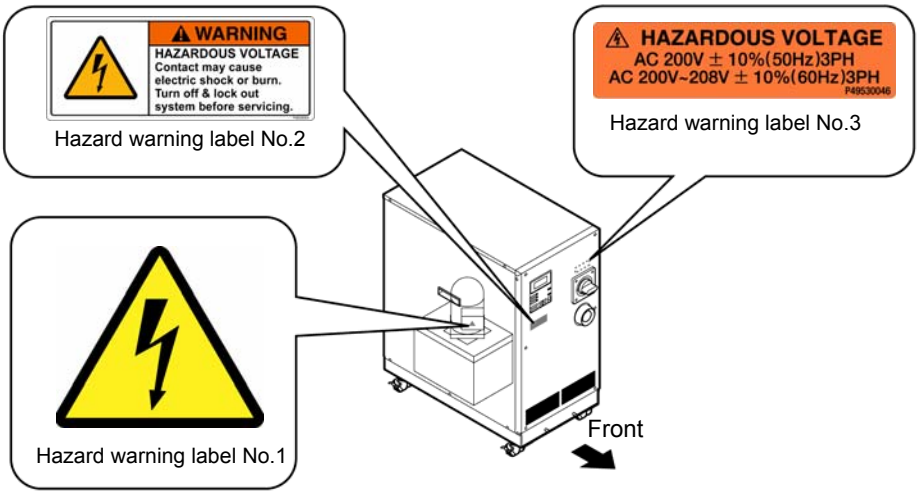


Figure 1-6 High Voltage Hazard

■ Hot surface hazard

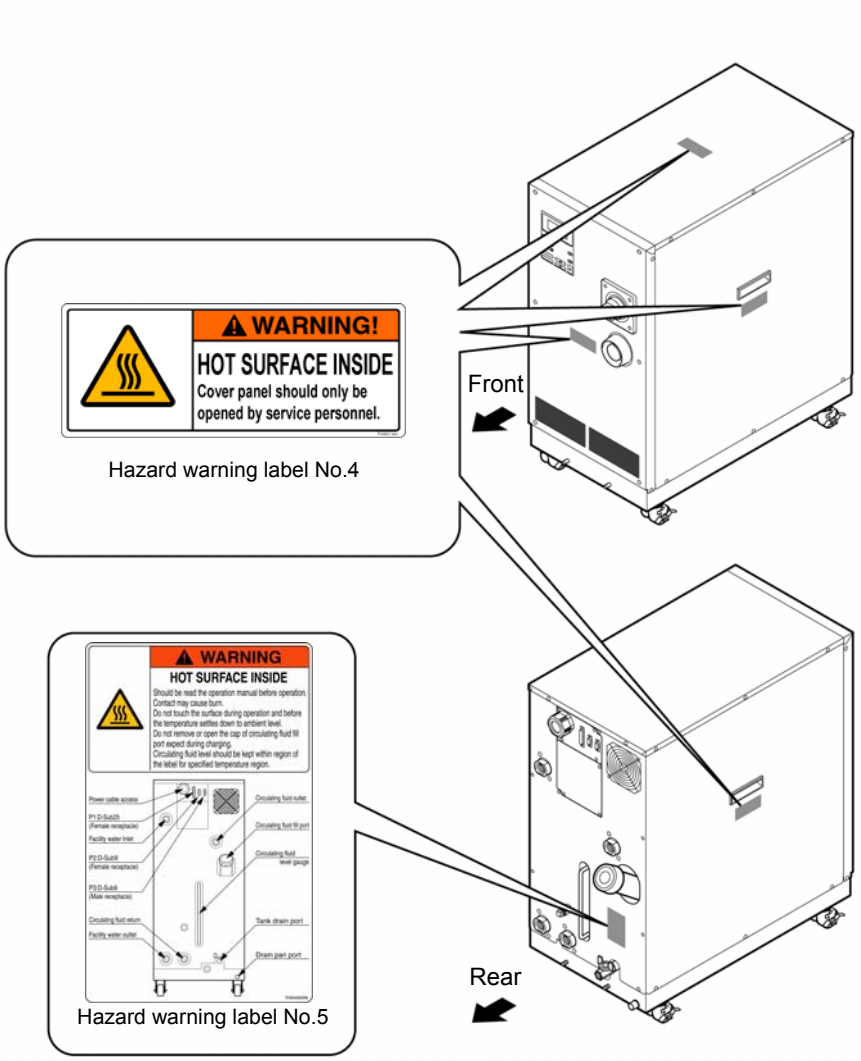


Figure 1-7 Hot Surface Hazard

1.4 Location of Model Label

Information on your system such as Serial No. and Model No. need to be furnished when you contact the store you purchased from. Serial No. and model No. are listed on the label as shown below.

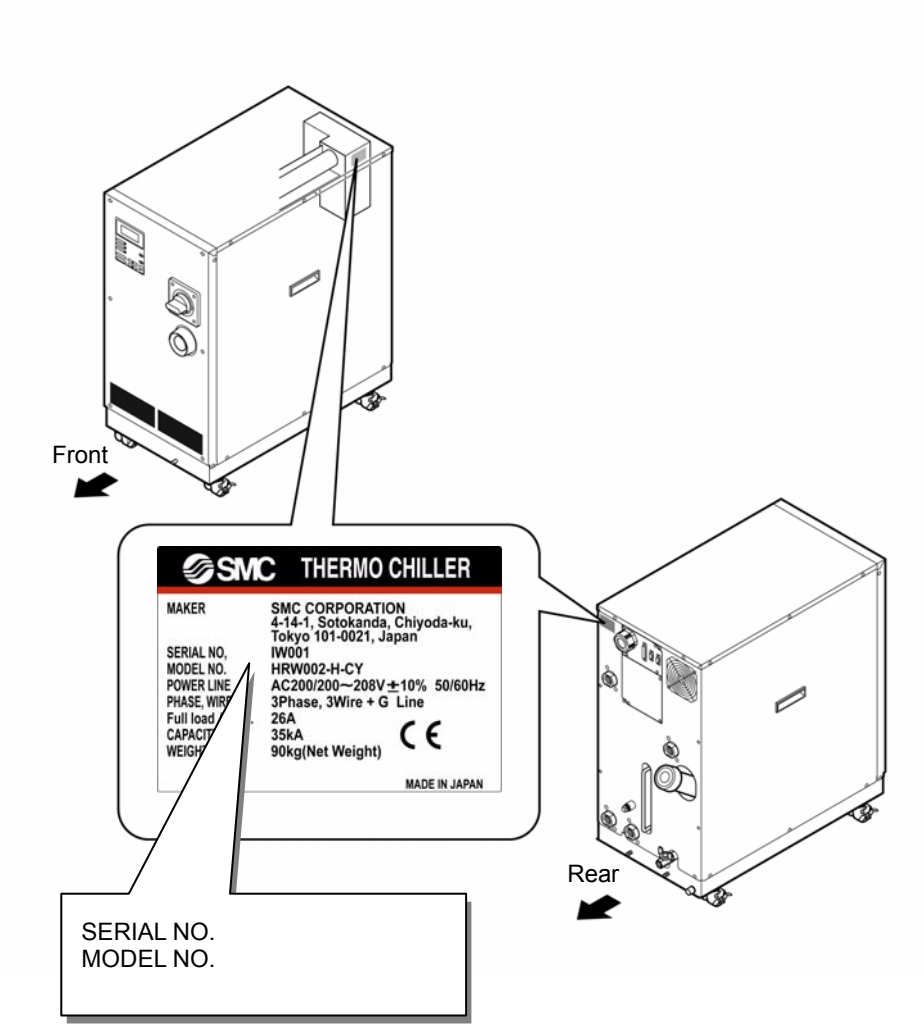


Figure 1-8 Location of Model Label

1.5 Safety Measures

1.5.1 Safety Precautions

While this system is protected by various safety measures including the safety interlocks, the following basic safety precautions should be observed to assure further safe operations.

⚠ WARNING

Follow the following instructions upon operation of this system. Failure to follow the instructions can lead to personal injury or hazardous accidents.

- Read and understand this manual thoroughly before operation of this system.
- Before operating the system during maintenance, inform all personnel who are working in the vicinity of the system to alert them of your action.
- Use appropriate tools and follow proper procedures.
- See “1.5.4 Protective equipment”to wear protective equipment properly.
- Refer to your safety manual for emergency evacuation.
- Use assistance to carry object over 20 kg.
- Check that all parts and screws are returned to the pre-work conditions at the end of work.
- Do not work when intoxicated or feeling ill. Accidents may occur if disregarded.
- Do not remove a panel unless permitted in this manual.

1.5.2 Safety Interlock system

■ Safety Interlock system

The function of the safety interlock system is not only protect personnel by restricting operation that may cause damage to this system or the facility around it but also eliminate the danger relating to safety. This system is outfitted with several interlock functions that are activated when improper operation or hazardous conditions occur. System operation shall be terminated when a safety interlock is activated

An alarm message is displayed on the LCD screen when a safety interlock is activated. See “Chapter 6 Error Message and Troubleshooting” for details on the alarms and remedies or see section “Troubleshooting” in a separate volume of the “Service Manual”.

■ Front panel

System repair may require the removal of the front panel.
The breaker handle operation is available only with the front panel attached.

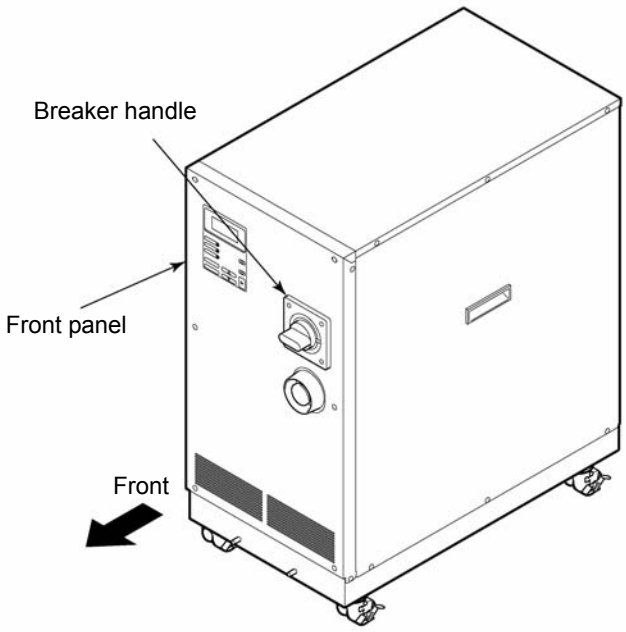


Figure 1-9 Front Panel

1.5.3 Lockout/Tagout

■ Summary

Lockout in this system disables the main breaker operation to prevent electric shocks.
Tagout, to be placed on a locked out main breaker, to prevent improper breaker operation (ON) conducted by other personnel.
See "■ Lockout procedure" in the following pages for practical lockout/tagout.

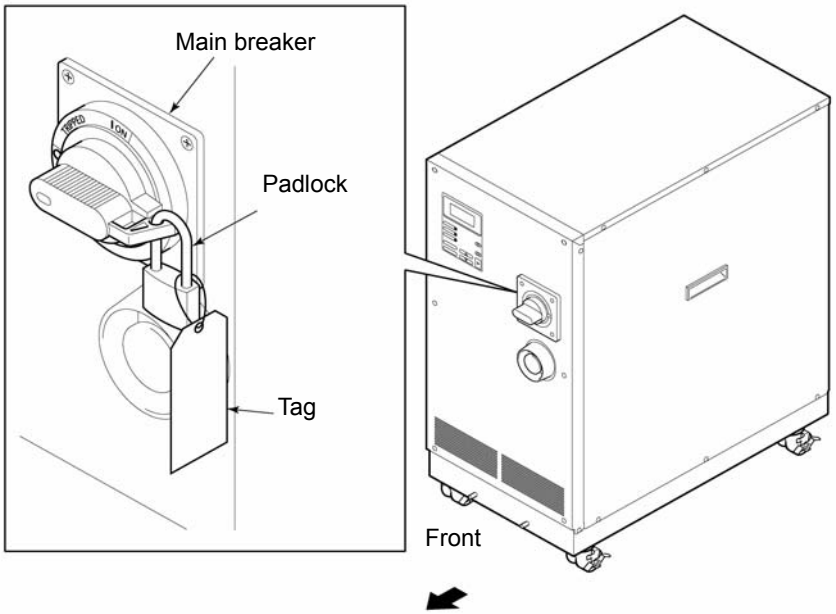


Figure 1-10 Lockout/Tagout

⚠ WARNING

- **Those who engage in service of this system should build an awareness of the importance of lockout. Thorough understanding of the procedures defined in this manual are required for system service.**
- **Lockout is allowed only when the system come to a full stop.**
- **A supervisor should be appointed to direct all personnel if multiple workers engage in system service.**
  The supervisor is to perform lockout based on a full understanding of overall process conditions.
- **Not only all personnel but new personnel that engage in service of this system should build an awareness of the importance of lockout and obtain thorough understanding of the lockout procedure.**
- **Any personnel working in an area with high voltage should be assigned with padlocks and tags. The key for the padlock is kept under the responsibility of the supervisor, and lockout release is performed upon completion of work.**

■ Lockout procedure

⚠ WARNING

All service personnel must observe the restrictions applied during lockout and are required to perform lockout in accordance with this procedure. No service personnel is allowed to start, energize, or use the locked out system.

1. Turn the breaker handle to 'OFF ○'.

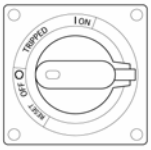


Figure 1-11 Breaker Handle at 'OFF ○'

2. Turn the breaker handle to 'RESET'.

● Hold the breaker handle with hand.
The handle turns back to 'OFF ○' if released.

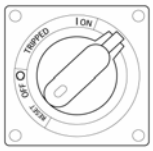


Figure 1-12 Breaker Handle at 'RESET'

3. Pull the lock mounting part out of the breaker handle, and turn the breaker handle to 'OFF ○'.

● The lock mounting part is to remain pulled out.

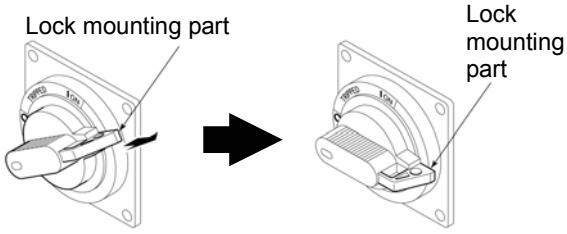


Figure 1-13 Pulling-out of Lock Mounting Part

4. Lock the lock mounting part with the padlock.

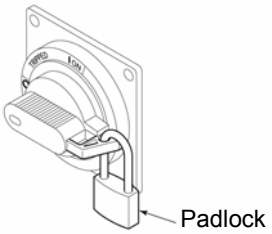


Figure 1-14 Breaker Lock

■ Releasing lockout

1. Remove the padlock from the lock mounting part.

2. Turn the breaker handle to 'RESET'.

The lock mounting part is pulled in.

● The handle turns back to 'OFF ○' if released.

1.5.4 Protective equipment

This manual defines protective equipment according to work type.

Wear proper protective equipment as shown below, according to work type.

⚠ WARNING

Read and understand the relevant operation manual thoroughly prior to use of protective equipment.

■ For system transportation, installation and removal

- Protective footwear
- Protective gloves
- Hard hat

■ For handling circulating fluid

- Protective footwear
- Protective gloves
- Protective mask
- Protective apron
- Protective goggles

■ For system operation

- Protective footwear
- Protective gloves

1.6 Emergency Measures

1.6.1 Emergency off [EMO] switch

Press the red emergency off [EMO] switch on the front of the system only if the need to shut off the power arises due to emergency such as natural disaster, fire, earthquake or personal injury.

The emergency off [EMO] switch is a large, red mushroom-shaped push button labeled with 'EMO' on it. The system comes to a halt if this button is pressed.

When press the emergency off [EMO] switch, the control power for this system is shut off to bring the system to a stop. The main breaker of this system, however, is designed not to trip, which enables the motor circuit to remain partially energized. "8.1.2 Communication specification" in Chapter 8 Appendix on page 8-4 to view the circuit diagram and see how the EMO switch is interconnected to the system.

Restart of this system is enabled only when this button is reset manually.

■ Location of emergency off [EMO] switch

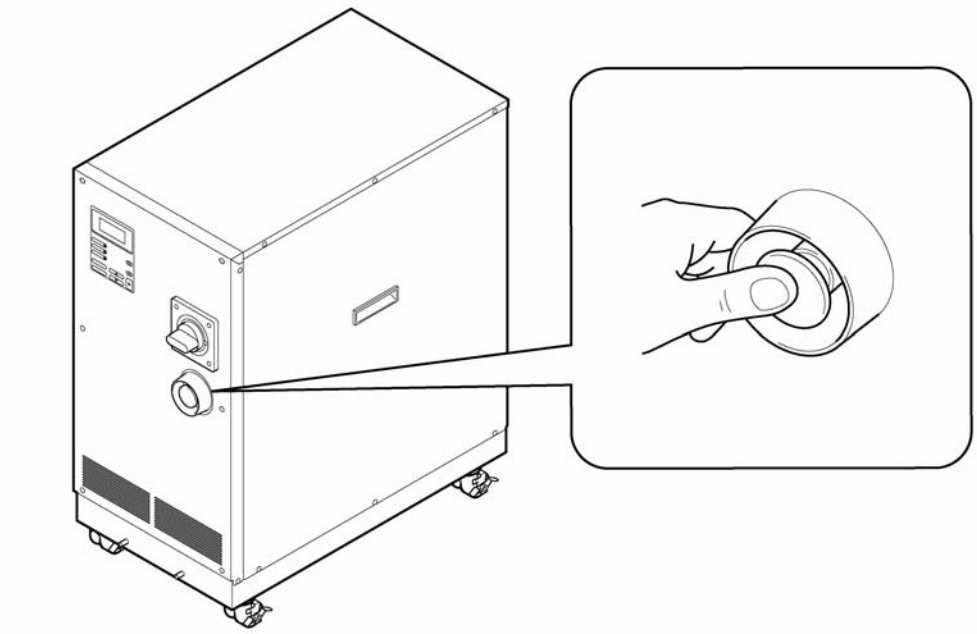


Figure 1-15 Location of Emergency Off [EMO] Switch

■ Reset of emergency off [EMO] switch

⚠ WARNING

No automatic recovery is applied to the emergency off [EMO] switch. Always eliminate the cause of activating the EMO before resetting. Potential serious accidents may occur if disregarded.

1. Before restarting, always make sure that the cause of the emergency off condition (The reason why the EMO switch was activated) has been eliminated from the power supplies, the system and peripheral equipment.

2. With the cause completely eliminated, turn the emergency off [EMO] switch clockwise to reset.

The EMO button returns to its original position.

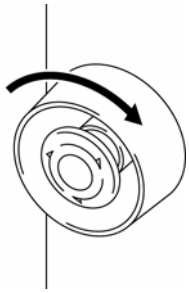


Figure 1-16 Emergency Off [EMO] Switch

⚠ WARNING

When the system is in remote mode, the remote mode is retained despite the power outage. Thus the system operation is to resume as the start signal is issued from your system.

3. The screen then changes from the “Model Indication screen” to “Status screen 1” as power is being restored to the system.

1.7 Waste Disposal

⚠ WARNING

Disposal of the fluid and system must be in accordance with regulations and rules of local authorities.

1.7.1 Circulating fluid disposal

As to the disposal of a circulating fluid (ethylene glycol solution, fluorinated fluid), consign the specialized industrial waste disposal agency with the contents detailed.

1.7.2 System disposal

As to the disposal of this system, consign the specialized industrial waste disposal agency in accordance with local laws and regulations.

1.8 Material Safety Data Sheet (MSDS)

Material Safety Data Sheet (MSDS) is supplied separately. Contact the system supplier if you need the MSDS regarding chemicals used in this system.

For each chemical you purchased, the relevant MSDS is to be obtained under your responsibility. Keep the MSDS along with this manual in the condition that allows all personnel to check the contents anytime to gain the understanding of potential hazards.

Chapter 2 Name of Each Section

2.1 Name of Each Section

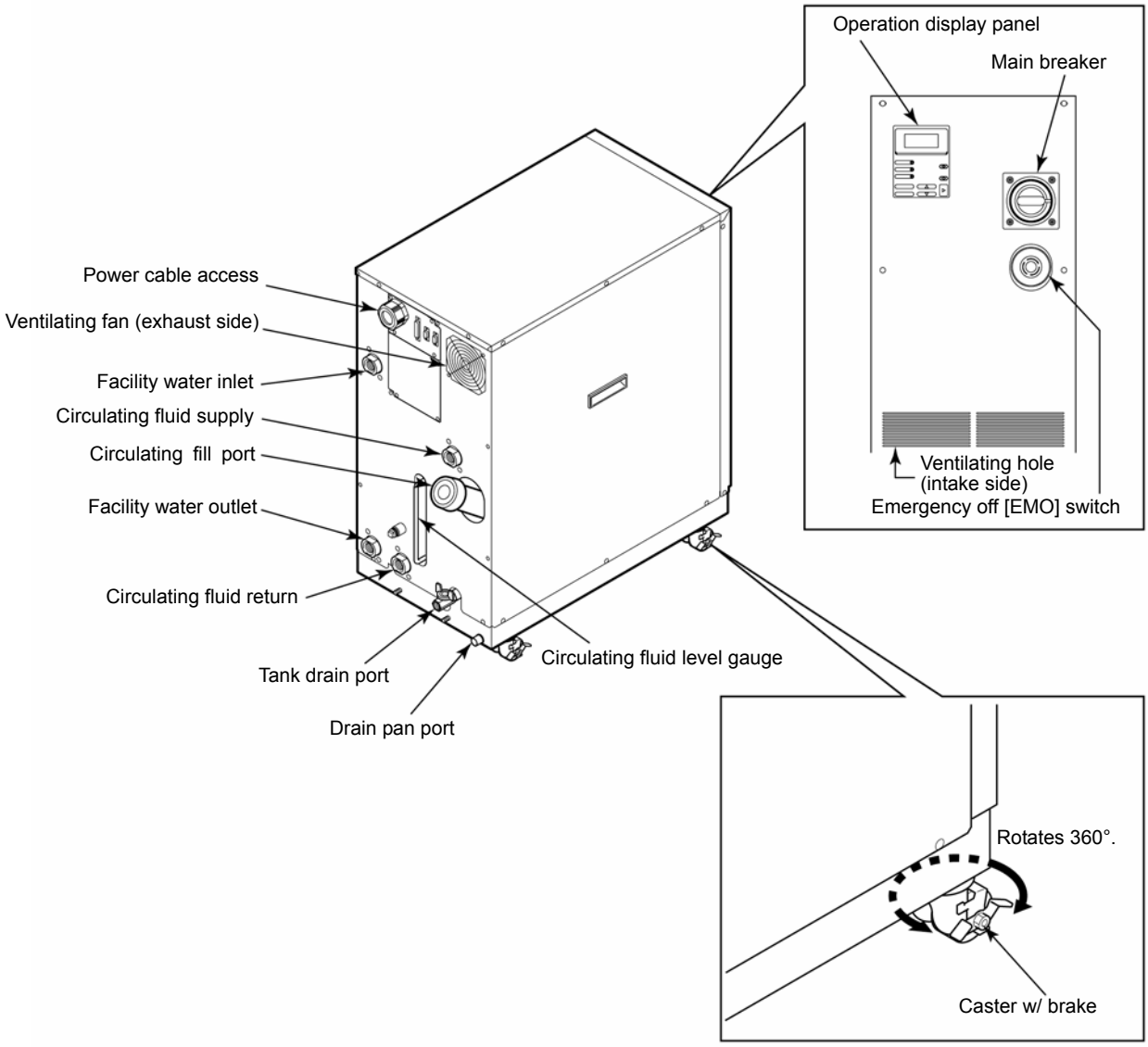


Figure 2-1 Name of Each Section

[Tips]

The casters have built-in brakes. The disengagement of the brakes is required when transporting the system.

Chapter 3 Transporting and Installation

⚠ WARNING

Proper procedure must be followed when using this system. Exercise caution to assure personnel safety during the installation, operation, maintenance, and inspection of the system.

⚠ WARNING

Only personnel, who have adequate knowledge and experiences with not only this system but associated equipment are allowed to perform transport, installation, and maintenance involving potential hazardous task.

3.1 Transporting

This system is heavy, which poses potential danger at transportation. When transporting this system, the following safety precautions should be observed to prevent system damage and breakdown.

⚠ WARNING

For transporting with the forklift, be sure to insert the fork into a designated position, referring to “3.1.1 Transporting with forklift” on page 3-2.

CAUTION

Do not set this system on its side during transportation.

CAUTION

Drain the remaining fluid out of the pipe as much as possible. The remaining fluid may spill if disregarded.

CAUTION

Exercise caution not to damage the panel and piping with the forklift when transporting the system.

3.1.1 Transporting with forklift

⚠ WARNING

- **Do not set this system on its side for transportation. Potential damage to this system carrying danger of personnel injury if disregarded.**
- **Do not insert the fork from the back as well as front.**

⚠ WARNING

- **This system is heavy, and requires a forklift to safely move it.**
- **Forklift insertion positions are on either left or right side of this system. Always insert the forks all the way through. Be careful not to hit the casters.**

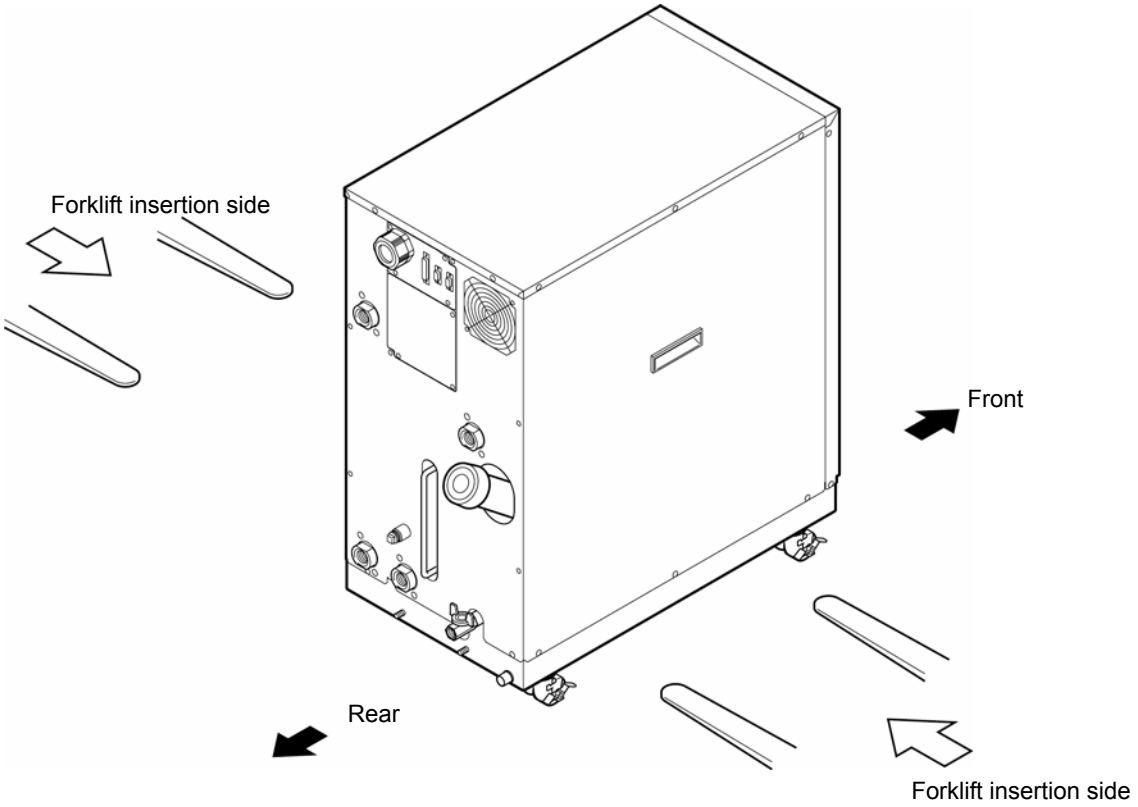


Figure 3-1 Transport with Forklift

3.1.2 Transporting with caster

⚠ WARNING

This system is heavy, which requires assistance for this work.
Exercise caution and look out for sloped surfaces such as ramps, etc.

⚠ CAUTION

Do not grab piping on the back of this system or panel handles when transporting with the casters.
Potential damage to piping and panels may occur if disregarded.

3.2 Installation

⚠ WARNING

System installation should be kept from areas with the potential of flammable gas leak. Ignition may occur if leaked gas is collected around the system.

⚠ WARNING

This system is NOT designed for outside use.
Potential electric shock, fire and system damage may occur if exposed to rain, water and dust.

⚠ CAUTION

This system is to be installed on a level floor that can withstand the weight of this system. Potential water leak and personal injury due to system tipping over may occur if disregarded.

3.2.1 Installation conditions

System installation is not allowed outside or in the conditions described below. Potential system malfunction and damage may occur if disregarded.

Clean room specifications are not applied to this system. The pump and ventilating fan installed in this system generate particles.

- Location that is exposed to water, water vapor, salt water, and oil
- Location that is exposed to dust
- Location that is exposed to corrosive gas, organic solvent, chemical solution, and flammable gas (this system is not flame-proof)
- Location where ambient temperature is out of the following range:

In transportation	-40 to 70°C (with no water or circulating fluid in piping)
In storage	0 to 50°C (with no water or circulating fluid in piping)
In operation	10 to 35°C

- Location where ambient humidity is out of the following range or where condensation forms:

In transportation and storage	15 to 85%
In operation	30 to 70%

- Location that is exposed to direct sun light or radiant heat
- Location that is near heat sources and poor in ventilation
- Location that is subjected to abrupt changes in temperature
- Location that is subjected to intense electromagnetic noise (intense electric field, intense magnetic field, or surges)
- Location that is subjected to static electricity, or condition that discharges static electricity to the system
- Location that is subjected to strong high frequencies
- Location that is subjected to potential lightning damage
- Location with altitudes of 1000m or higher (except for system storage and transport)
- Location that is affected by strong vibrations or impacts
- Condition that applies external force or weight causing the system deformation
- Condition with no adequate space for maintenance as required

3.2.2 Installation location and maintenance work area

This system does not have ventilating hole on the both right and left sides. Although this can be installed directly contacting to walls or devices, installation with maintenance space is recommended. (See “Figure 3-2”)

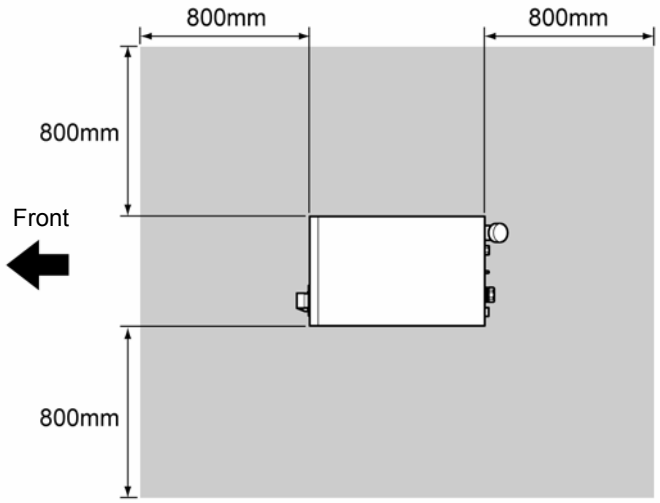


Figure 3-2 Recommended Installation Location

To save space, this system can be installed to allow access only in front and back for daily operation and inspection. For maintenance and repair work, additional access space is required for the left and right side of the system. We recommend a separate repair area, without taking space from installation site, to accommodate the needed extra space.

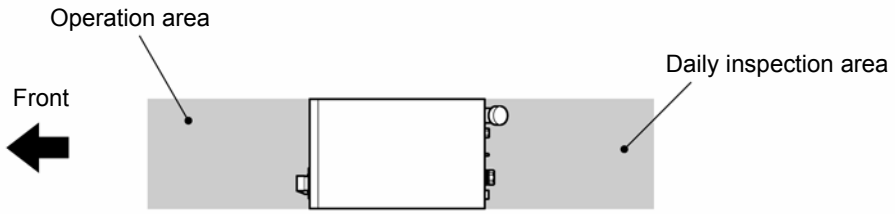


Figure 3-3 Installation Location

3.3 Procedure for Installation

CAUTION

- **Anti-seismic bracket is an optional part, which is required for the installation of this system (HRZ-TK002).**
- **Preparation of anchor bolts suitable for floor material is your responsibility. Prepare M12-anchor bolts (4 pcs.) for installation. See "8.6 Anchor Bolt Mounting Position" on page 8-13 for mounting of the anchor bolt.**

3.3.1 Installation

- System installation should be on a vibration-free stable level plane.
- See "Appendix 8.2 Outer Dimensions" in Chapter 8 on page 8-7 for the dimensions of this system.

3.3.2 Procedure for system securing

1. Transfer this system to the installation site.

2. Lock the brakes on casters.

3. Using a13-mm open end wrench, attach the anti-seismic brackets to the front and back.

CAUTION

Drain pan port is assigned to the bottom on the back of this system. Exercise caution not to damage the dain pan port when attaching the anti-seismic bracket.

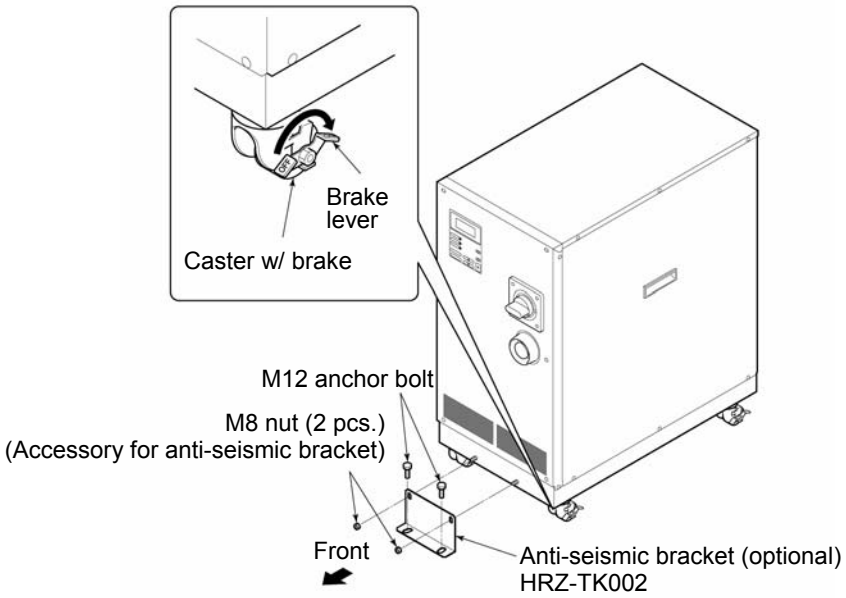
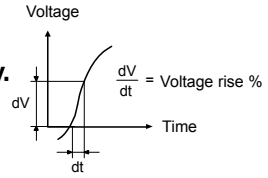


Figure 3-4 Anti-seismic Bracket Attachment

3.3.3 Wiring installation

⚠ WARNING

- **Only designated personnel are allowed to install wiring.**
- **Be sure to turn OFF the power prior to wiring to assure safety. Do not do any wiring when the system is energized.**
- **The system wiring requires not only a thorough connection with the designated cable but also securing to prevent loose connection. Poor connection and securing may cause electric shock, heat sports, fire or communication errors.**
- **Be sure to supply the power to this system according to specifications.**
- **Supply pure AC power. Potential malfunction may occur if a rectified AC with voltage rise (dv/dt) at zero crossing exceeds 40V /200μ sec.**
- **Always establish a connection to a ground for safety.**
- **Be sure that no ground connection is made to a water pipe, gas pipe and lighting rod.**



■ Power cable

The power cables are to be prepared under your responsibility, referring to the following table.

Table 3-1 Power Cable and Main Breaker (This System)

Item			Type
Power cable	Size (recommended)		10AWG×4-conductor
	Crimp contact (recommended)	Breaker	R5.5-8
		Earth bar	R5.5-8
	Torque (recommended)	Breaker	12.5N•m (1.84 ft-lbf)
		Earth bar	12.5N•m (9.22 ft-lbf)
Main breaker (This System)			30A

■ Communication connector

The communication connectors are to be prepared under your responsibility, referring to the following table.

Table 3-2 Communication Connector

Connector	Type (for your system)
Contact signal (P1 connector)	D-Sub 25-pin (male)
Serial RS-485 (P2 connector)	D-Sub 9-pin (male)

■ Selection of the breaker for the customer's equipment (primary side)

⚠ CAUTION

This product is equipped with the breaker which has different operating characteristics depending on each model. For the customer's equipment (primary side), use the breaker whose operating time is equal to or longer than the breaker of this product. If the breaker with shorter operating time is connected, the customer's equipment could be cut off du eto the inrush current of the motor of this product.

HRW002-H	**HRW008-H**	**HRW015-H**	**HRW030-H**
HRW002-H1	**HRW008-H1**	**HRW015-H1**	**HRW030-H1**
HRW002-H2	**HRW008-H2**	**HRW015-H2**	**HRW030-H2**
HRW002-HS	**HRW008-HS**	**HRW015-HS**	**HRW030-HS**
HRW002-H1S	**HRW008-H1S**	**HRW015-H1S**	**HRW030-H1S**
HRW002-H2S	**HRW008-H2S**	**HRW015-H2S**	**HRW030-H2S**

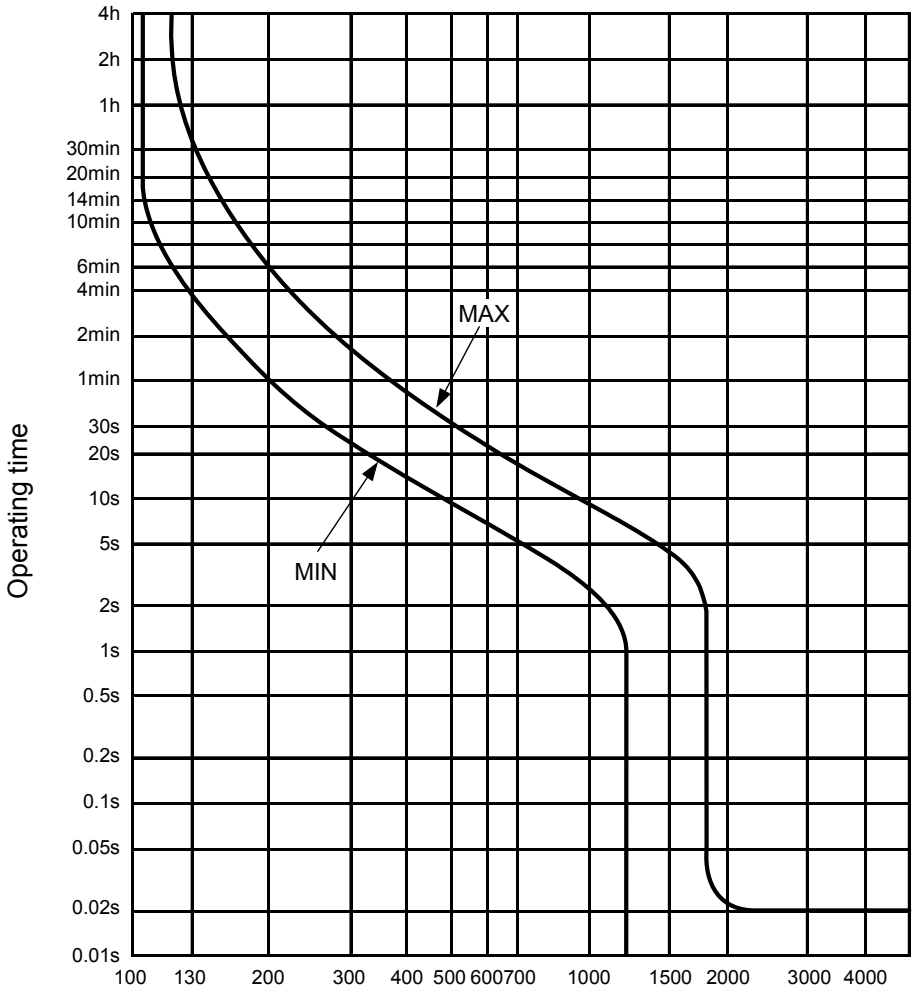


Figure 3-5 Breaker operating characteristics curve

3.3.4 Procedures for wiring installation

⚠ WARNING

Be sure to turn OFF the factory side (primary side) power before connection to this system.
Use the assigned procedure to peform lockout/tagout (Page 1-10).

1. Turn OFF the power breaker on customer side (primary side), and then use the assigned procedures to peform lockout/tagout.

[Tips]

Connection of the power cable with this system must be established first.
Do not connect the cable with the factory side at this point.

2. Turn OFF the main breaker of this system.

3. Undo the screws (2 pcs.) to remove the front panel.

Be sure to use a Phillips screwdriver.

4. Undo the screws (2 pcs.) to remove the breaker cover.

Be sure to use a Phillips screwdriver.

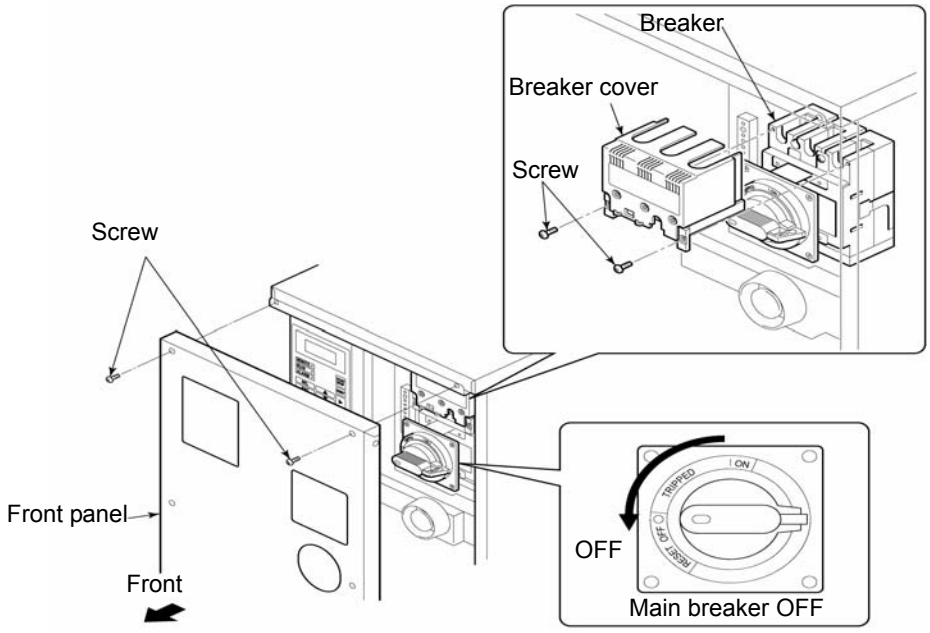


Figure 3-6 Main Breaker OFF and Removal of Front Panel/Breaker Cover

[Tips]

Make sure the breaker is at the 'OFF' position.
Otherwise, the removal of the front panel is not possible.

5. Loosen the cap and insert the power cable from the power cable access.

6. Connect the communication cables with P1 and P2.

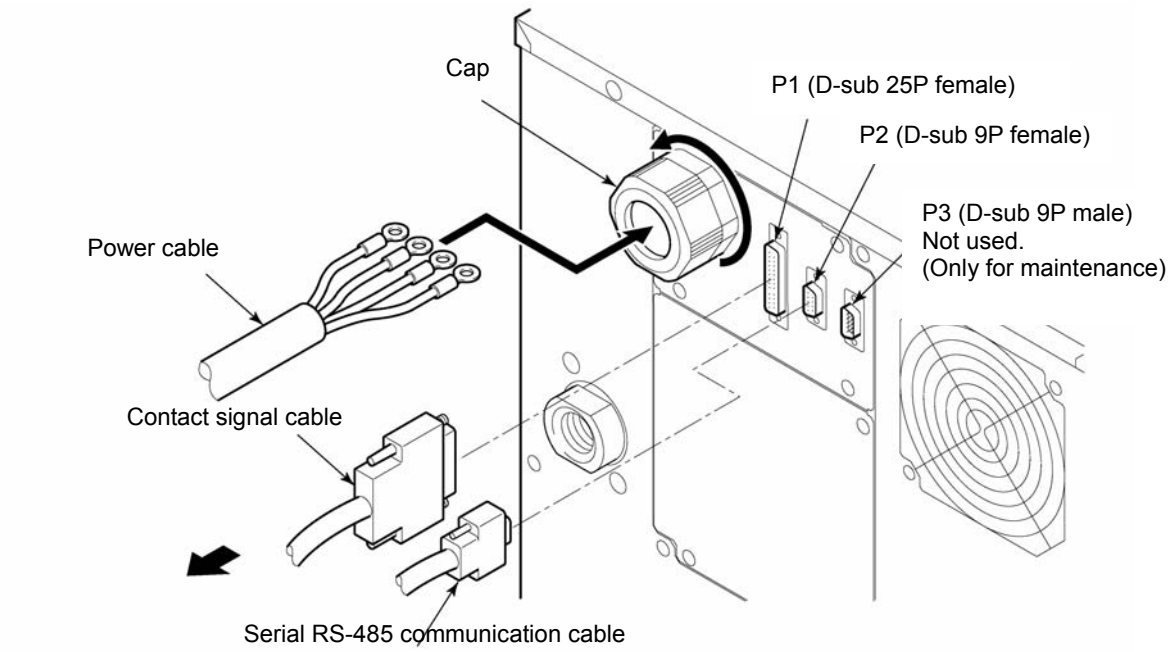


Figure 3-7 Power Cable Insertion and Communication Cable Connection

CAUTION

Correct phase rotation is required when attach the power cable to the breaker terminal.

CAUTION

Do not drop a screw or washer in the electrical unit when attaching the breaker cover and terminal.
Do not leave it in the unit if dropped in. Potential failure may occur if the power is turned ON without removing it.

[Tips]

See “Table 3-1 Power Cable and Main Breaker (This System)” on page 3-7 for the recommended cable size and crimp contact.

7. Connect the power cables to the breaker terminal.

Be sure to use a Phillips screwdriver. See Table 3-1 on page 3-7 for recommended torque.

8. Connect the grounding terminal (M8) of the power cable to the earth bar.

Be sure to use a 13-mm open end wrench.
Recommended torque: 12.5 N•m (9.22 ft-lbf)

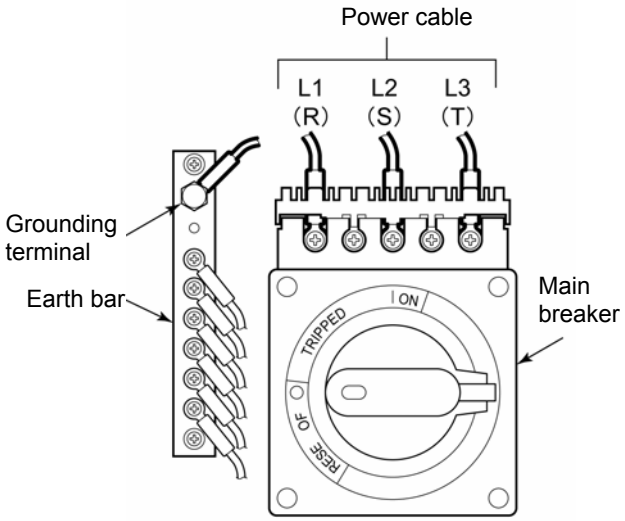


Figure 3-8 Connection of Power Cable and Grounding Terminal

[Tips]

See “Table 3-1 Power Cable and Main Breaker (This System)” on page 3-7 for torque value.

9. Attach the breaker cover to the breaker.

10. Attach the front panel.

11. Connect the power cable to the power breaker on customer side (primary side).

3.3.5 Installation of circulating fluid and facility water piping

⚠ CAUTION

- **Choose proper external piping with consideration for pressure, temperature and compatibility with the circulating fluid. Potential pipe rupture during operation may occur if disregarded.**
- **Always insulate external circulating piping. Potential insufficient cooling performance due to heat absorption from the pipe surface and potential insufficient heating performance caused by thermal radiation if disregarded.**
- **Use clean pipes and pipe fittings, free of particles, oil and moisture. Apply air blow to the parts before using. The presence of particles, oil or moisture in the circulating fluid circuit causes system failure attributed to insufficient cooling or froths in the circulating fluid in the tank.**
- **Install circulating fluid piping not to exceed 10m high. The maximum amount of circulating fluid in piping, including your system, should remain under 2.5L if 7m or higher circulating fluid piping is installed (for HRW***-H, -HS). An alarm may be raised, or potential fluid leak from the tank may occur at system stop if disregarded.**
- **Be sure to choose a circulating fluid pipe capable of letting the fluid flow at rated flow rate or better. See "Pump performance" defined in "Appendix 8.1.1 System specification" for the flow rate rating.**
- **Have a drip pan available incase of a fluid leak.**
- **Make sure of the locations of ports for the circulating fluid supply, return, facility water inlet, outlet and their corresponding connections are correct.**
- **Install valves in circulating fluid piping for flow rate adjustment and maintenance. As the value of flow rate displayed on the screen will be less than proper value when flow rate is excessive, flow rate adjustment should be started with the valves shut. See "Circulating fluid flow rate display range" defined in "Appendix 8.1.1 System specification" for the flow rate display range.**
- **Secure the piping connector section with a pipe wrench, and provide proper tightening to the pipe.**
- **Avoid physical shock when securing and tightening the connectors. Potential breakage and fluid leak may occur if disregarded.**

■ Pipe diameter

Table 3-3 Pipe Diameter

Pipe	Diameter	Recommended torque (Material: SS* vs SS)
Facility water inlet	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Facility water outlet	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Circulating fluid supply	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Circulating fluid return	Rc3/4	28 to 30N•m (20.7 to 22.1ft-lbf)
Tank drain port	Rc3/8 (with valve)	Piping not necessary
Drain pan port	Rc3/8	Piping not necessary

*: SS Stainless steel

■ Procedure for piping installation

Secure the pipe coupling section with a pipe wrench, and provide proper tightening to the pipe.

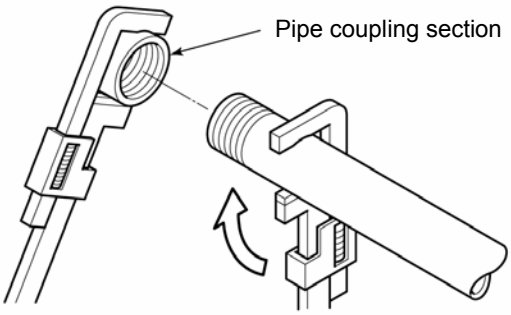


Figure 3-9 Pipe Tightening

■ Recommended piping installation

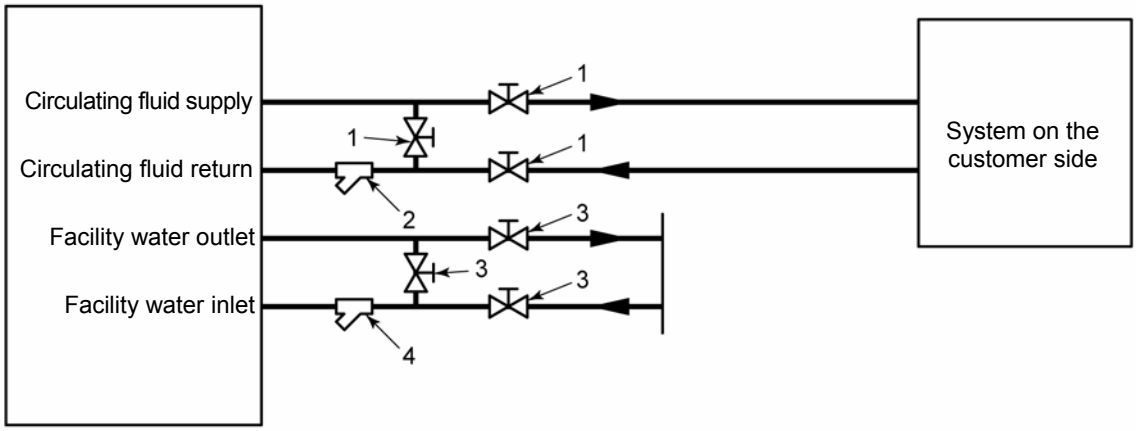


Figure 3-10 Recommended Piping Installation

Table 3-4 Recommended Pipe

No.	Name	Size	Material
1	Valve	Rc3/4	Stainless steel
2	Y-strainer (100μm)	Rc3/4	Stainless steel
3	Valve	Rc3/4	Stainless steel
4	Y-strainer (5μm)	Rc3/4	Stainless steel

Chapter 4 System Startup and Shutdown

⚠ CAUTION

Only personnel, who have adequate knowledge of and experiences with not only this system but associated equipment, are allowed to implement system startup and shutdown.

4.1 Pre-check

Check the following items prior to starting up the system.

4.1.1 Installation condition

- Make sure that the system is installed in a horizontal position.
- No heavy object is placed on this system. This system should not be applied with an undue force such as caused by piping installation.
- Re-check the items defined in “3.2 Installation” on page 3-3.

4.1.2 Cable connection

Make sure proper connection of the power cable, ground, and communication cables.

4.1.3 Installation of circulating fluid and facility water piping

Make sure that circulating fluid and facility water piping are installed properly.

4.1.4 Operating signal from your system

Make sure that no remote signal is being issued from your system. System startup takes effect upon power-ON if this system receives a remote signal and it is in remote mode.

4.1.5 Check emergency off [EMO] switch

Make sure of the location of the emergency off [EMO] switch before operating the system. See section 1.6.1 “Emergency off [EMO] switch” in Chapter 1 “Safety” for details.

4.2 Opening of Facility water Valve

CAUTION

Check that the facility water complies with not only the water quality standard defined in section 7.1 “Water Quality Management” on page 7-1 but the requirements provided in “8.1.1 System specification” in Chapter 8 Appendix on page 8-1.

Open the facility water valve for water supply.

4.3 Supply of Circulating Fluid

CAUTION

**Circulating fluids to use vary with system models.
See section 8.1.1 “System specification” in Chapter 8 for the designated circulating fluid for a specific model.**

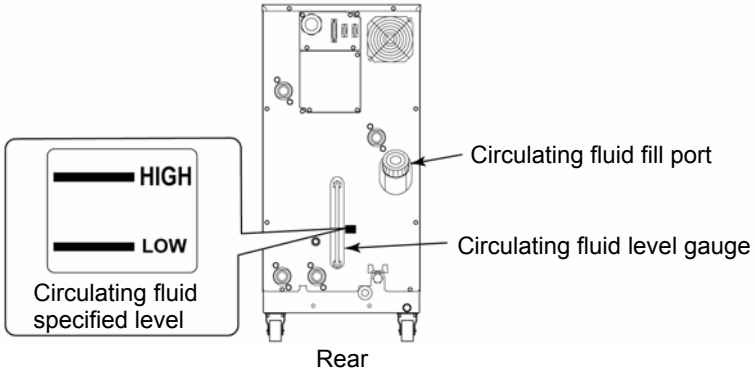


Figure 4-1 Circulating Fluid Fill Port and Circulating Fluid Level Gauge

4.3.1 Preparation of circulating fluid

■ When the circulating fluid is an ethylene glycol aqueous solution

Always check the concentration of the circulating fluid.

Normal concentration: 55 to 60%

CAUTION

- **High concentration EG in the circulating fluid may cause circulating pump overload, which triggers “Pump Breaker Trip FLT”.**
- **Potential cooling error may occur if the circulating fluid varies in concentration.**

■ When the circulating fluid is a fluorinated fluid

CAUTION

Make sure of no oil, moisture, and other foreign materials contaminate the circulating fluid. Potential cooling error or system failure, due to contaminant freezes internally, may occur if disregarded.

■ When the circulating fluid is water

CAUTION

Attention should be taken on water quality. Ensure water quality is within specified range, and other foreign materials contaminate the circulating fluid. Potential cooling error or system failure, due to contaminant freezes internally, may occur if disregarded.

4.3.2 Supply of circulating fluid

Remove the circulating fluid fill cap, and fill the circulating fluid until it reaches its specified level.
The circulating fluid specified level is a range between “HIGH” and “LOW” in Figure 4-1.

Be sure to tighten the cap until it clicks after fluid supply.
If the circulating fluid is supplied over the specified level, follow the procedure provided in section 7.3.1 “Draining of circulating fluid out of tank” on page 7-4 to drain excess fluid until it reaches the specified level.

[Tips]

Level between “HIGH” and “LOW” represent liquid level in normal running condition. Immediately as you start filling up the chiller, the internal transferring pump start pumping fluid from the Sub Tank into the Main Tank. Thus the fluid level in the level gauge will start to drop.
During initial priming of the external piping, addition fluid is needed. See section 8.1.1 “System specification” on page 8-1 for Sub Tank and Main Tank capacity.

⚠ WARNING

Circulating fluid must be supplied to be in the range between “HIGH” and “LOW”. Potential overflow of hot circulating fluid may occur due to excessive volume.
Total fluid volume use to fill up the system including initial priming should not exceed combined volume of Sub Tank and Main Tank.
If level is below the “LOW” mark, this system will trigger an alarm.

⚠ CAUTION

When supplying the circulating fluid, make sure that the fluid inside this system has dropped to room temperature for the prevention of burns.

⚠ CAUTION

Be sure to tighten the cap until it clicks after circulating fluid supply. Potential circulating fluid vaporization may occur if disregarded.

4.4 Requirement for System Startup

4.4.1 Turning ON power

1. Make sure that the main breaker for this system is OFF, and release lockout/tagout of the power breaker on customer side (primary side). Then, turn ON the power.

2. Turn ON the main breaker of this system.

The “Model Indication screen” are displayed in sequence on the LCD screen. The screen will change to the “Status screen 1” in approx. 20 seconds, and the system is ready to run.

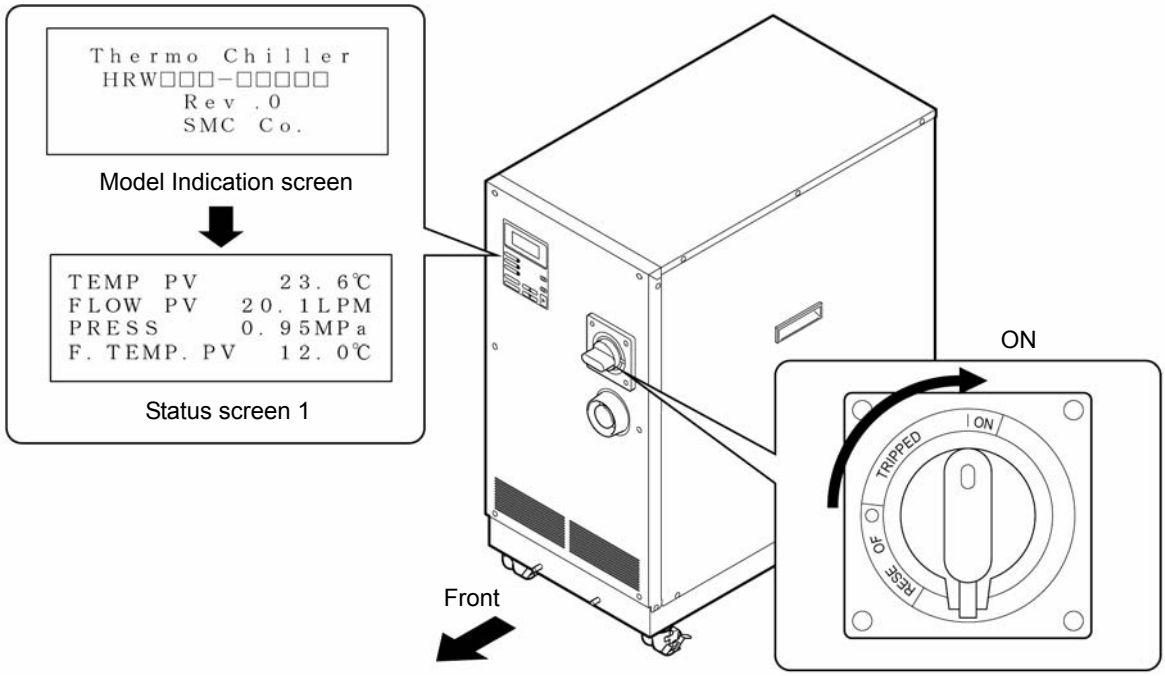


Figure 4-2 Main Breaker at ‘ON’

⚠ WARNING

Press the emergency off [EMO] switch immediately upon ocurrence of abnormal conditions. Be sure to turn OFF the main breaker afterwards.

4.4.2 Circulating fluid temperature setting

From the “Setting screen” on the LCD screen, set the circulating fluid at any temperature. See section 5.4 “Examples of System Operation” in “Chapter 5 System Operation” on page 5-11 for operating procedure.

[Tips]

See section 8.1.1 “System specification” in “Chapter 8 Appendix” on page 8-1 for the setting range of circulating fluid temperature.

4.5 System Startup and Shutdown

4.5.1 System startup

Press the [START/STOP] key on the operation display panel.

The ‘RUN’ lamp on the operation display panel comes on, and system operation is initiated

4.5.2 System shutdown

Press the [START/STOP] key on the operation display panel.

‘RUN’ lamp on the operation display panel goes out, and the system comes to a halt accordingly.

⚠ CAUTION

Internal equipment may remain at elevated in temperature immediately after system shutdown. Potential burns may happen if your skin comes in contact with these surfaces. Further work is allowed only when the system reaches room temperature.

CAUTION

Emergency off [EMO] switch and main breaker (OFF) should not be used for system shutdown unless it is an emergency.

Chapter 5 System Operation

5.1 Operation Display Panel

Use the operation display panel located in front of the system for the basic operations.

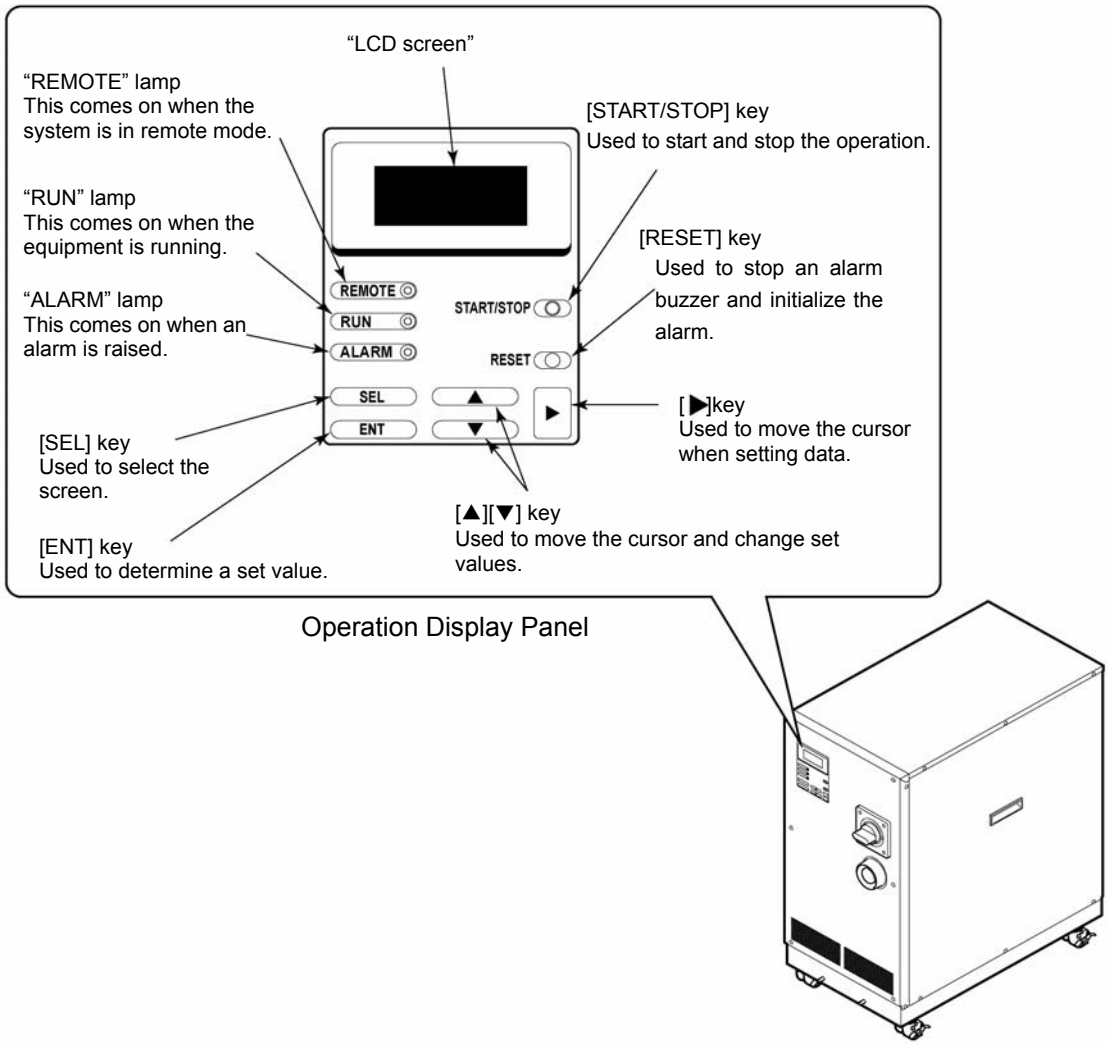


Figure 5-1 Operation Display Panel

CAUTION

Be sure to use your fingers only to operate the Operation Display Panel.
Using sharp object will damage the panel.

5.2 Flow Chart of Operation Screen

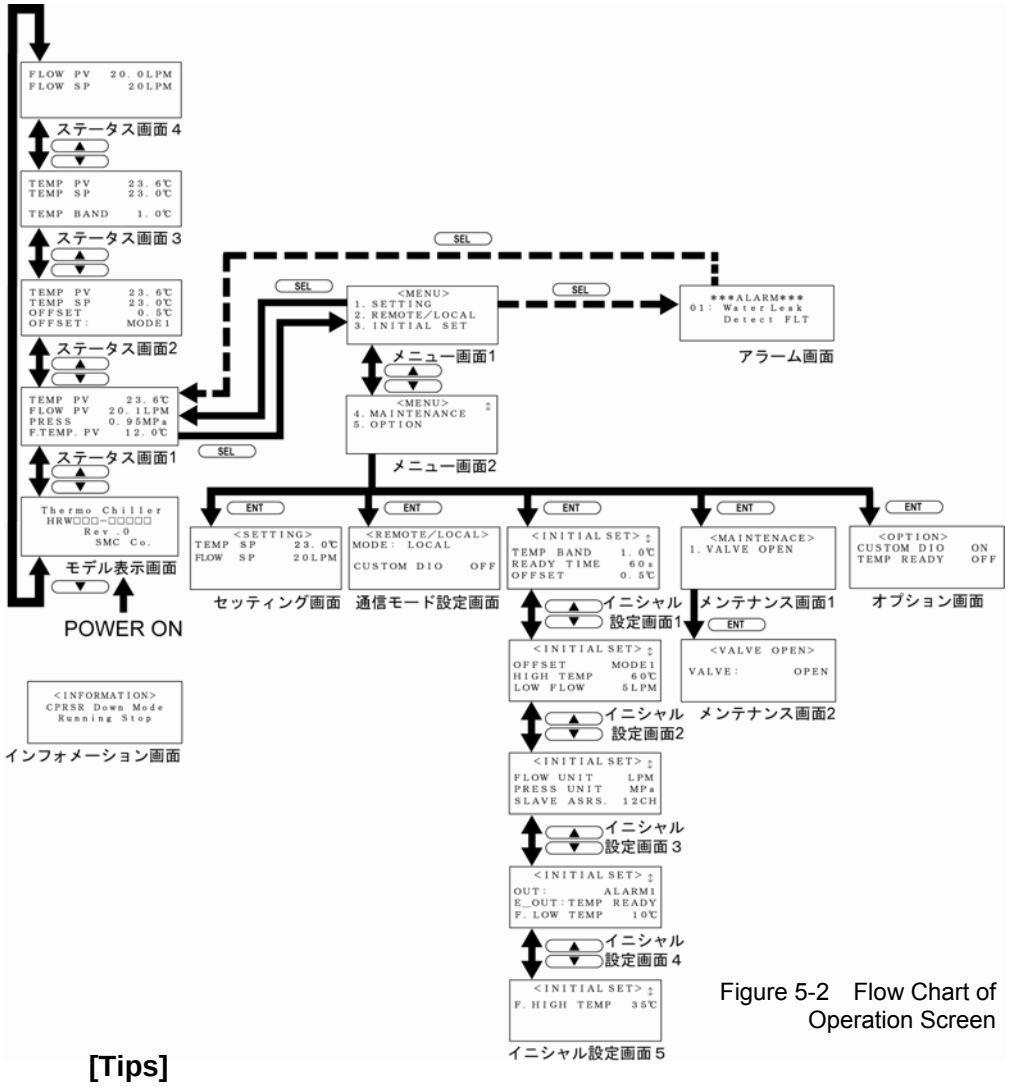


Figure 5-2 Flow Chart of Operation Screen

[Tips]

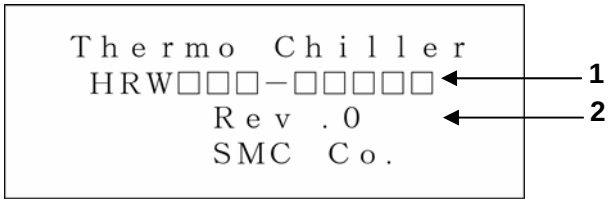
With the press of the [SEL] key, the screen is switched to the “Menu screen 1” regardless of the screen status.

Table 5-1 Descriptions of Operation Screens

Screen	Descriptions	Reference
Model Indication screen	Displays the model and revision No. of this system.	Page 5-3
Status screen 1, 2, 3, 4	Displays the operating condition of this system.	Page 5-3 Page 5-5
Menu screen 1, 2	Allows setting screen selection.	Page 5-5
Setting screen	Allows the setting of TEMP SP value.	Page 5-6
Mode Selection screen	Allows communication mode seleletion.	Page 5-6
Initial Setting screen 1, 2, 3, 4, 5	Allows the setting of set values.	Page 5-7
Maintenance screen 1, 2	Not used during system operation. Not allowed to use unless otherwise specified.	Page 5-9
Option screen	Allows the setting of option.	Page 5-9
Alarm Display screen	The alarm message is displayed in the event of an error in this system. Not displayed if no error.	Page 5-10
Information screen	Displayed upon system power-ON. Disables system operation when displayed.	Page 5-10

5.3 Operation Screen

5.3.1 Model Indication screen



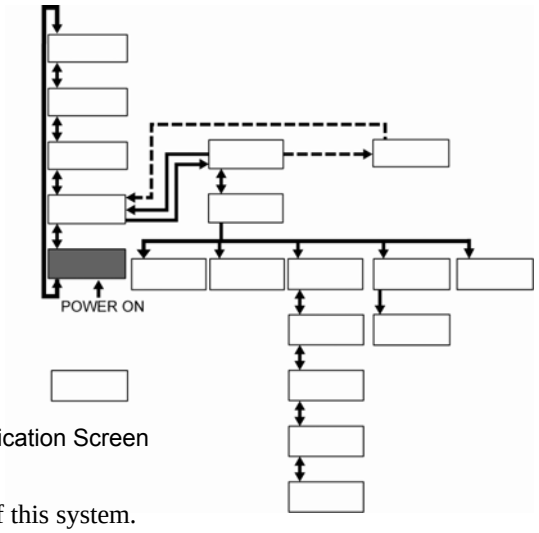


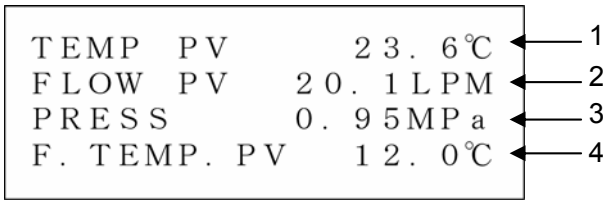
Figure 5-3 Model Indication Screen

The “Model Indication screen” is displayed upon power-ON of this system.
This screen remains ON for approx. 20 seconds and is automatically switched to the “Status screen 1”.
The “Alarm Display screen” is displayed if error occurs in this system.

Table 5-2 Model Indication Screen

No.	Item	Descriptions
1	-	System model
2	-	System revision No.

5.3.2 Status screen 1



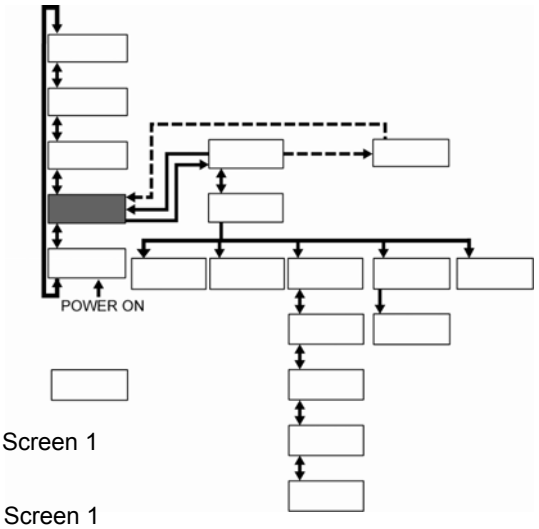


Figure 5-4 Status Screen 1

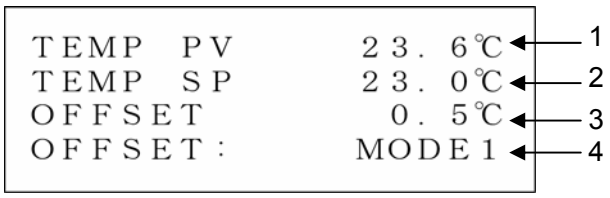
Table 5-3 Status Screen 1

No.	Item	Descriptions
1	TEMP PV	Discharge temperature of the circulating fluid (A value derived according to the offset[*1] if applied)
2	FLOW PV	Flow rate of the circulating fluid
3	PRESS	Discharge pressure of the circulating fluid
4	F. TEMP PV	Facility water inlet temperature

[Tips]

See “Appendix 8.4 Offset Function” in Chapter 8 on page 8-9 for details on offset (*1).

5.3.3 Status screen 2



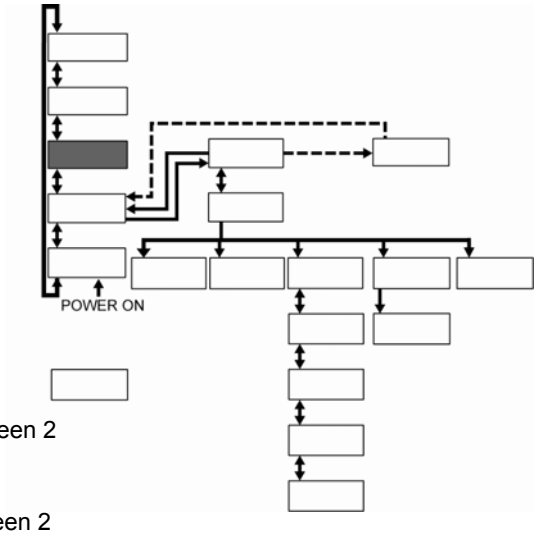


Figure 5-5 Status Screen 2

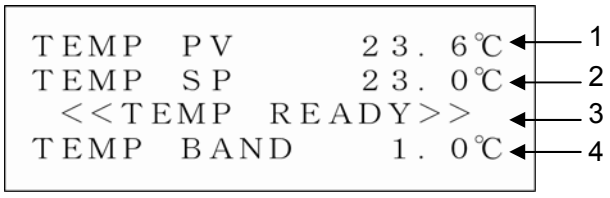
Table 5-4 Status Screen 2

No.	Item	Descriptions
1	TEMP PV	Discharge temperature of the circulating fluid (A value derived according to the offset[*1] if applied)
2	TEMP SP	Set circulating fluid temperature
3	OFFSET	Set offset
4	OFFSET	The current offset mode

[Tips]

See “Appendix 8.4 Offset Function” in Chapter 8 on page 8-9 on offset features (*1).

5.3.4 Status screen 3



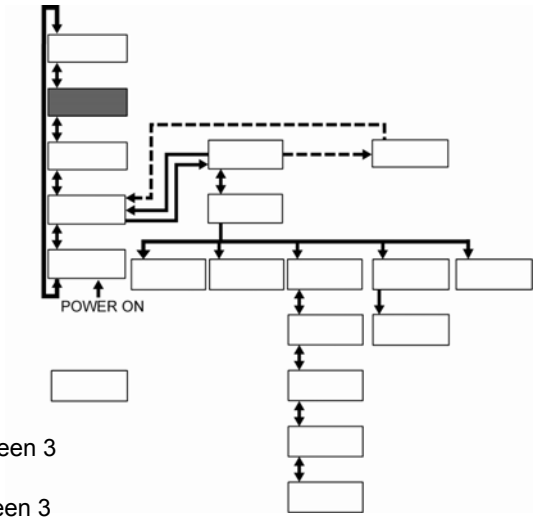


Figure 5-6 Status Screen 3

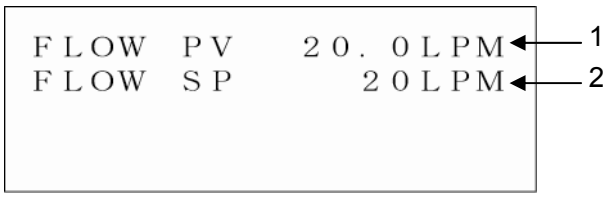
Table 5-5 Status Screen 3

No.	Item	Descriptions
1	TEMP PV	Discharge temperature of the circulating fluid
2	TEMP SP	Set circulating fluid temperature
3	<<TEMP READY>>	Displays the BAND/READY [Displayed when set value conditions are satisfied] [*1]
4	TEMP BAND	Set value of BAND range[*1]

[Tips]

See “Appendix 8.5 BAND/READ” in Chapter 8 on page 8-12 on offset features (*1).

5.3.5 Status screen 4



*Status screen 4 is only indicated on HRW∗∗∗-H∗S (pump inverter type).

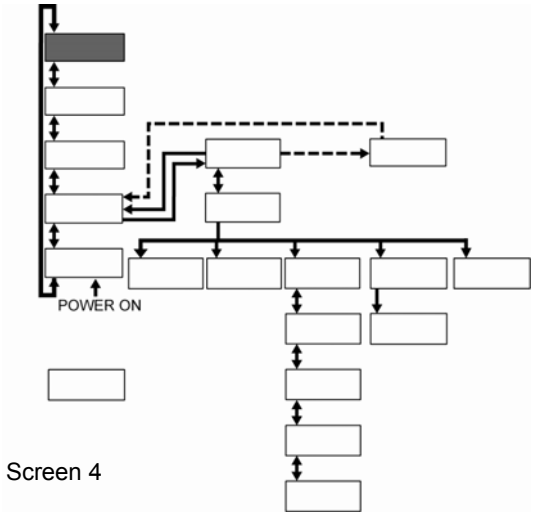


Figure 5-7 Status Screen 4

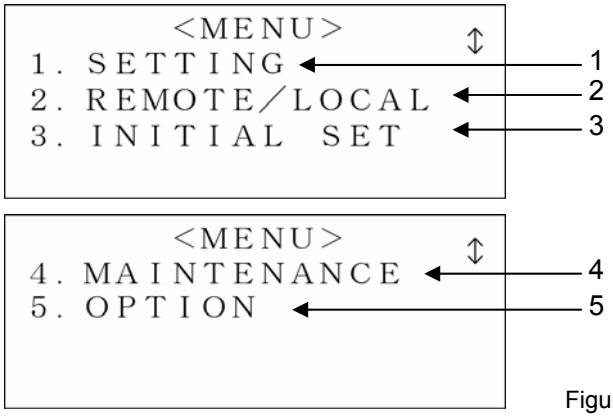
Table 5-6 Status Screen 4

No.	Item	Descriptions
1	FLOW PV*[1]	Discharge flow rate of the circulating fluid
2	FLOW SP*[1]	Set Discharge flow rate

[Tips]

When using accessory [by-pass piping set] flow becomes total of flow on customer side and flow on by-pass (*1).

5.3.6 Menu screen



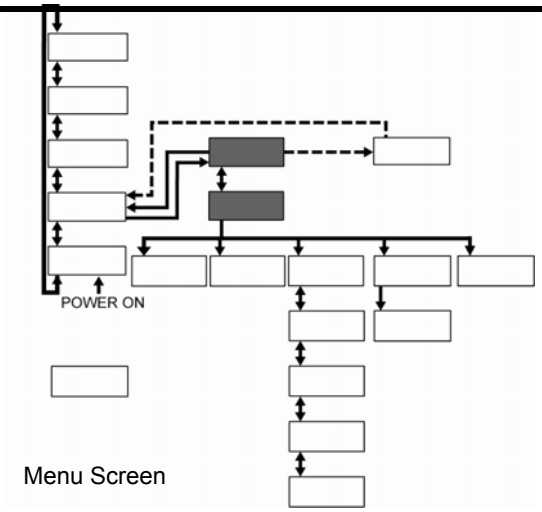
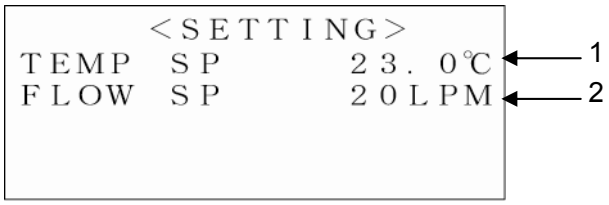


Figure 5-8 Menu Screen

Table 5-7 Menu Screen

No.	Item	Descriptions
1	SETTING	Swicthes to the “Setting screen” with the press of the [ENT] key.
2	REMOTE/LOCAL	Swicthes to the “Mode Selection screen” with the press of the [ENT] key.
3	INITIAL SET	Swicthes to the “Initial Setting screen 1” with the press of the [ENT] key.
4	MAINTENANCE	Swicthes to the “Maintenance screen 1” with the press of the [ENT] key.
5	OPTION	Swicthes to the “Option screen” with the press of the [ENT] key.

5.3.7 Setting screen



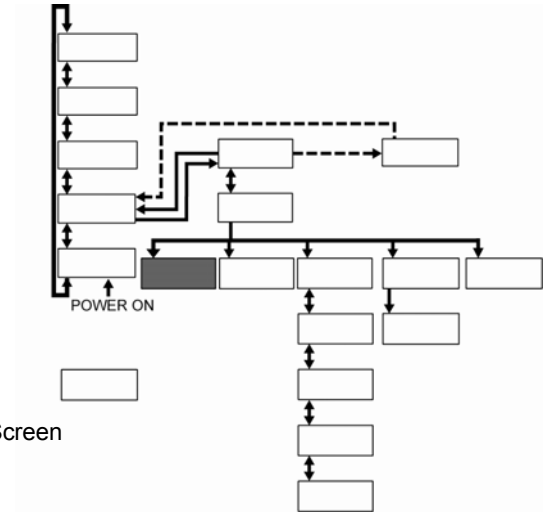


Figure 5-9 Setting Screen

This screen enables the setting of TEMP SP value.
Not available if the communication mode is in "SER REMOTE"[*1].

Table 5-8 Setting Screen

No.	Item	Setting range
1	TEMP SP	20.0 to 90.0°C
2	FLOW SP	10 to 40LPM(2.6 to 10.6GPM) FLOW SP is only indicated on HRW∗∗∗-H∗S and Setting is available[*2].

[Tips]

See "Mode Selection screen" in Chapter 5 on page 5-6 for details on "SER REMOTE" (*1).

See "Appendix 8.1.1 System specification" in Chapter 8 on page 8-1 for setting range. (*2).

5.3.8 Mode Selection screen

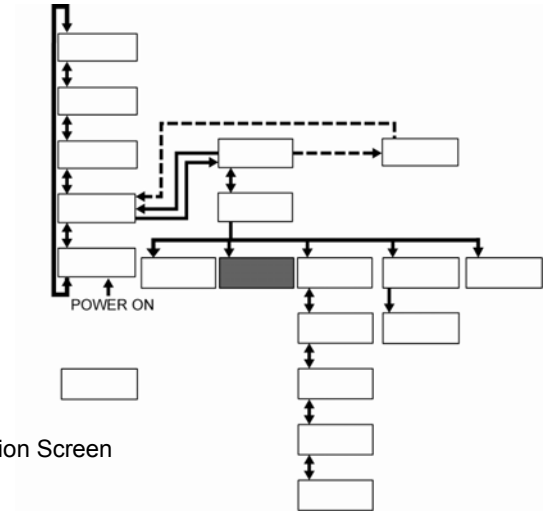


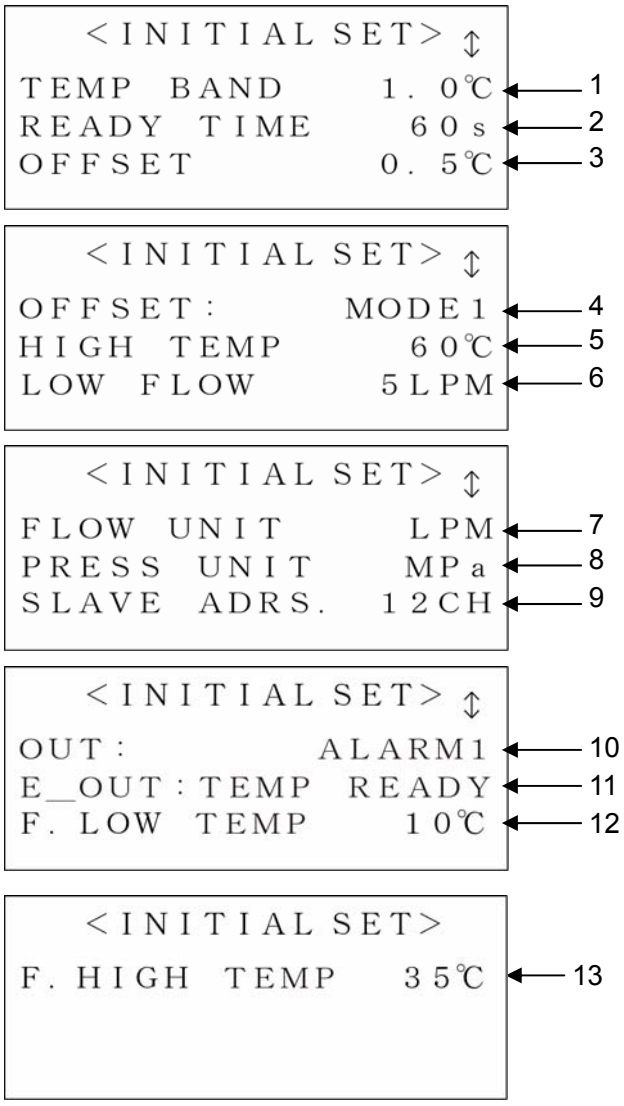
Figure 5-10 Mode Selection Screen

This screen enables the selection of the communication mode. The procedures for system start/stop and TEMP SP value setting may vary with the communication mode.
Other operations and settings are available only from the operation display panel.

Table 5-9 Mode Selection Screen

No.	Item	Setting	
1	MODE	LOCAL	System start/stop and TEMP SP value setting are available only from the operation display panel.
		DIO REMOTE	System start/stop is allowed only through contact signal. TEMP SP value setting is available only from the operation display panel.
		SER REMOTE	System start/stop and TEMP SP value setting are available only through serial RS-485 communication.

5.3.9 Initial Setting screen



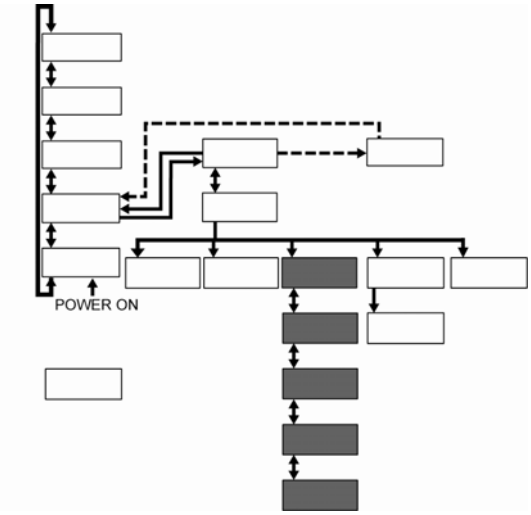


Figure 5-11 Initial Setting Screen

This screen enables the setting of set values.

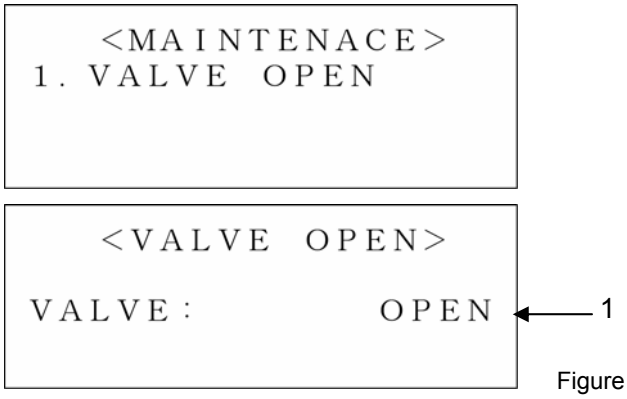
Table 5-10 Initial Setting Screen

No.	Item	Setting range	Descriptions
1	TEMP BAND	1.0 to 5.0°C [*1]	Allows the selection of the band width for TEMP SP.
2	READY TIME	10 to 480sec[*1]	Allows the setting of the time from TEMP PV value reaching BAND range to TEMP READY is displayed and put out.
3	OFFSET	-20.0 to 20.0°C [*2]	Calibrates variations in temperature between this system and your system. (See "Appendix 8.4 Offset Function" in Chapter 8 on page 8-9 for details.)
4	OFFSET	OFF, MODE1, MODE2, MODE3	
5	HIGH TEMP	20 to 93°C	Issues an alarm of "Reservoir High Temp WRN" if the circulating fluid exceeds the set temperature.
6	LOW FLOW	HRW002-H, H*S: 0, 2～16LPM 0, 0.5～4.2GPM HRW008-H, -H*S HRW015-H, -H*S HRW030-H, -H*S: 0, 8～50LPM 0, 2.1～13.2GPM	Issues an alarm of "Return Low Flow WRN" if the circulating fluid does not reach the set flow rate. Lift this alarm if the selection is "0".
7	FLOW UNIT	LPM, GPM	Allows the selection of the unit of flow rate.
8	PRESS UNIT	MPa, PSI	Allows the selection of the unit of pressure.
9	SLAVE ADRS.	1 to 16CH	Allows the selection of the slave address for serial RS-485 communication.
10	OUT	N/A ALARM1 to 23	Allows the selection of alarm signals for contact signal. (See Appendix 8.1.3 Alarm signal selection" on page 8-6 for details.)
11	E_OUT	TEMP READY, AUTO PURGE[*1]	Allows the selection of EVENTOutput. (See Appendix 8.1.2 Communication specification" on page 8-4 for details.)
12	F.LOW TEMP	5 to 10°C	Issues an alarm of "F.Water Low Temp WRN" if the facility water falls below the set temperature.
13	F.HIGH TEMP	35 to 50°C	Issues an alarm of "F.Water High Temp WRN" if the circulating fluid exceeds the set temperature.

[Tips]

Valid during option setting with "5.3.11 Option screen" on page 5-9.
See "Appendix 8.5 BAND/READ" in Chapter 8 on page 8-12 on BAND/READY function (*1).
TEMP SP+OFFSET value (*2) should be in the TEMP SP setting range defined in "Table 5-8 Setting Screen" on page 5-6.

5.3.10 Maintenance screen



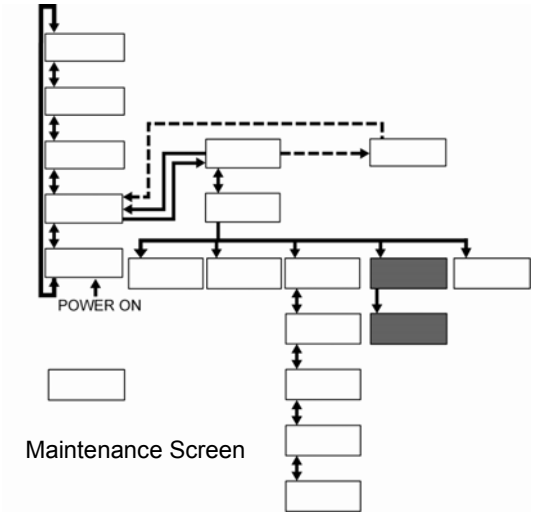


Figure 5-12 Maintenance Screen

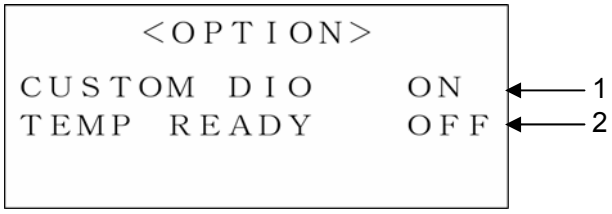
Table 5-11 Maintenance Screen

No.	Item	Setting	
1	VALVE	OPEN	The facility water solenoid valve is opened forcefully.
		CLOSE	The facility water solenoid valve is closed forcefully.

[Tips]

Available only if a solenoid value (optional) is provided.

5.3.11 Option screen



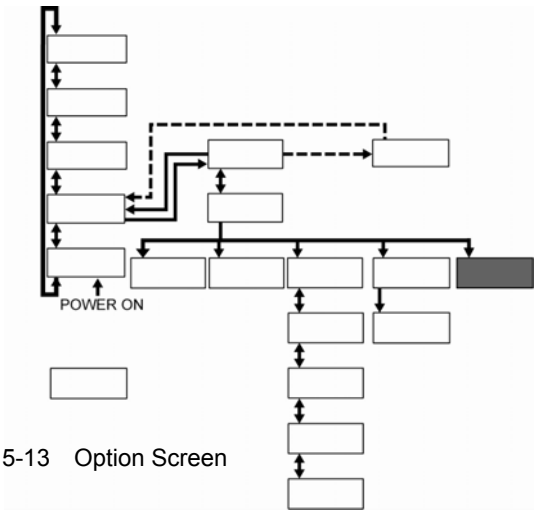
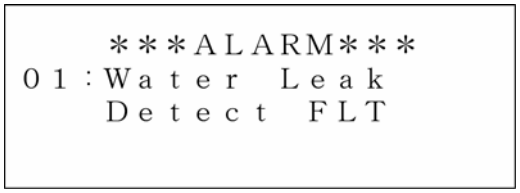


Figure 5-13 Option Screen

Table 5-12 Option Screen

No.	Item	Setting	
1	CUSTOM DIO	ON / OFF	Allows the selection of Valid / invalid. (See “Communication specifications” for details.)
2	TEMP READY	ON / OFF	Allows the selection of valid / invalid of BAND / READY function. This becomes valid after turning off the power, then supply the power again.

5.3.12 Alarm Display screen



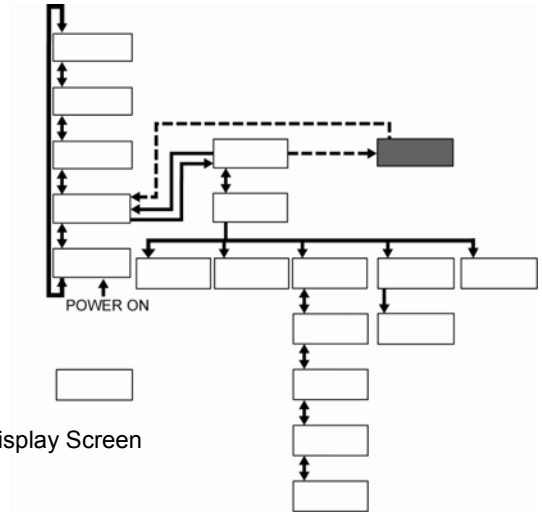
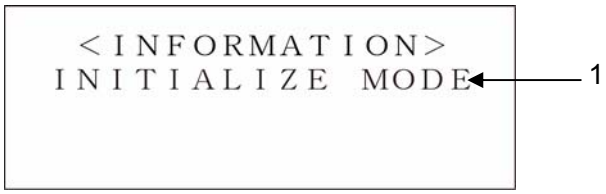


Figure 5-14 Alarm Display Screen

In the event of an error in this system, the current screen is switched to the Alarm Display screen to display the relevant alarm code. And message.
The Alarm Display screen is displayed only if an error is raised.
See section 6.2 “Troubleshooting” in “Chapter 6 Error Message and Troubleshooting” for alarm numbers and messages.

5.3.13 Information screen



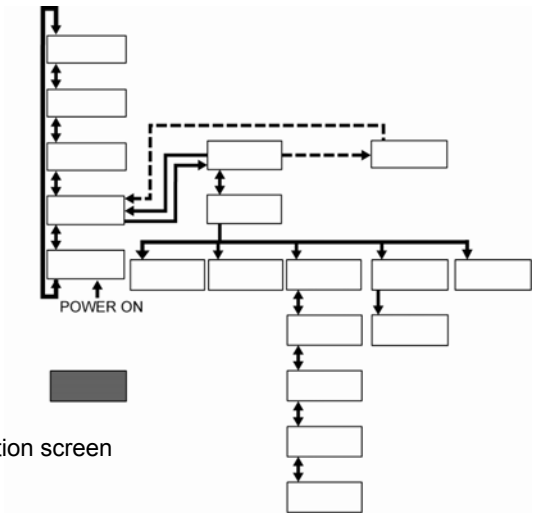


Figure 5-15 Information screen

The above “Information screen” may be displayed in response to system startup and shutdown.

Table 5-13 Information screen

No.	Item	Setting
1	Initialize Mode	Displayed upon system power-ON. Disables system operation when displayed.

5.4 Examples of System Operation

5.4.1 Example 1: Circulating fluid set temperature is changed from 25.0°C to 34.1°C.

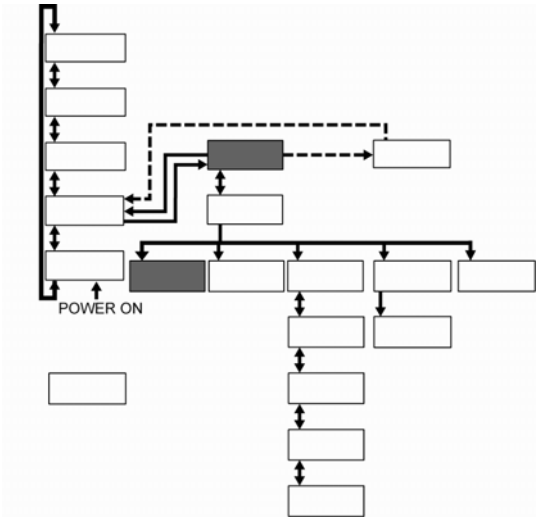


Figure 5-16 Change of Set Temperature from 25.0°C to 34.1°C

1. Press the [SEL] key to display the “Menu screen 1”.

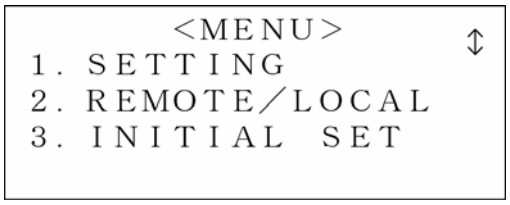


Figure 5-17 Menu Screen 1

2. With the use of the arrow keys ([▲], [▼]), move the cursor to “1. SETTING” and press the [ENT] key.

The “Setting screen” is displayed.

Figure 5-18 Setting Screen

3. Press the [ENT] key.

The cursor is now appear on the current value for TEMP SP, which enables change of the temperature set value.

Figure 5-19 Setting Screen: Cursor Display

4. Use the arrow keys ([▲], [▼], [▶]) to change the temperature to 34.1°C.

[▲] key: Used to add one value on which the cursor is placed.

[▼] key: Used to subtract one value on which the cursor is placed.

[▶] key: Used to move the cursor to the right.

Figure 5-20 Setting Screen: Change of Set Value

[Tips]

To cancel a selection, press the [SEL] key, not [ENT] key. With the press of the [SEL] key, the cancellation takes effect and the screen is switched to the "Menu screen 1".

5. Press the [ENT] key with a new set temperature (34.1°C) entered.

The cursor goes out, and the setting takes effect.

Figure 5-21 Setting Screen: Setting Confirmation

6. Press the [SEL] key to display the "Menu screen 1".

5.4.2 Example 2: Communication mode is switched from “DIO REMOTE” to “LOCAL”.

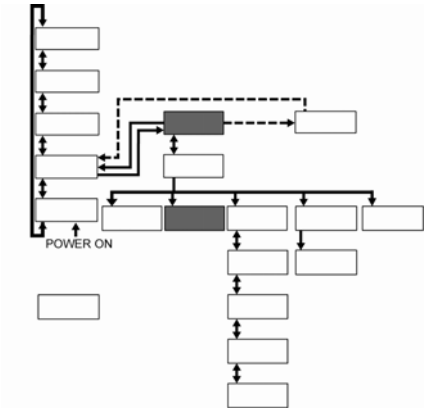


Figure 5-22 Switching of Communication Mode from “DIO REMOTE” to “LOCAL”

1. Press the [SEL] key to display the “Menu screen 1”.

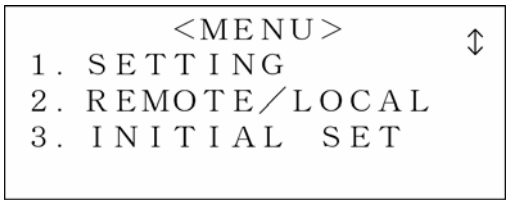


Figure 5-23 Menu Screen 1

2. With the use of the arrow keys ([▲], [▼]), move the cursor to “2. REMOTE/LOCAL” and press the [ENT] key.

The “Mode Selection screen” is displayed.

● The name of the current mode flashes.

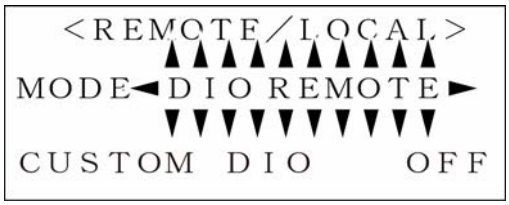


Figure 5-24 Mode Selection Screen: DIO REMOTE

3. Use the arrow keys ([▲], [▼]) to select “LOCAL”.

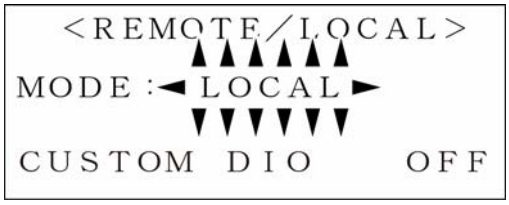


Figure 5-25 Mode Selection Screen: LOCAL

4. Press the [ENT] key.

The mode name stop flashing, and the selection takes effect.

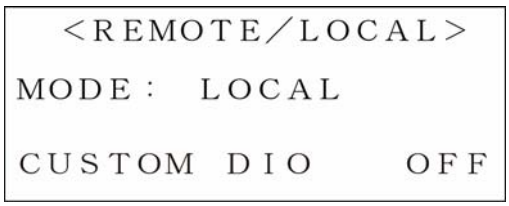


Figure 5-26 Mode Selection Screen: Setting Confirmation

[Tips]

To cancel a selection, press the [SEL] key, not [ENT] key. With the press of the [SEL] key, the cancellation takes effect and the screen is switched to the “Menu screen 1”.

5. Press the [SEL] key to display the “Menu screen 1”.

5.4.3 Example 3: Alarm signal of contact signal is changed from "N/A" to "ALARM1".

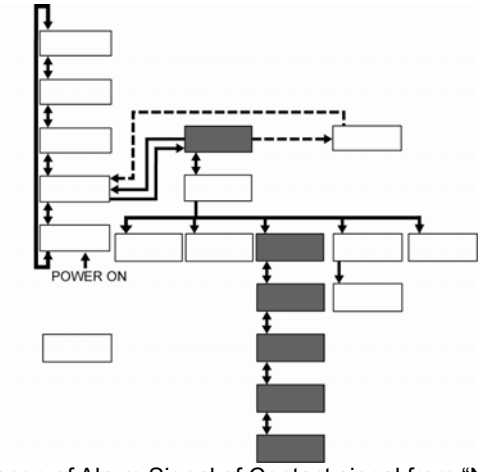


Figure 5-27 Change of Alarm Signal of Contact signal from "N/A" to "ALARM1"

1. Press the [SEL] key to display the "Menu screen 1".

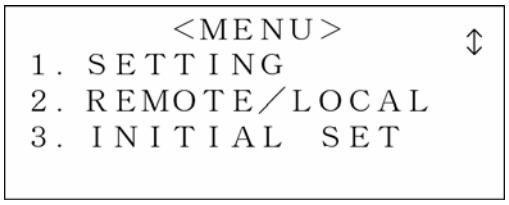


Figure 5-28 Menu Screen 1

2. With the use of the arrow keys ([▲], [▼]), move the cursor to "3. INITIAL SET" and press the [ENT] key.

The "Initial Setting screen 1" is displayed.

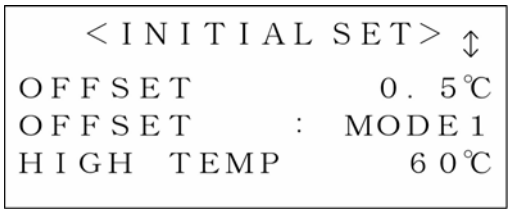


Figure 5-29 Initial Setting Screen 1

3. Use the arrow keys ([▲], [▼]) to display the "Initial Setting screen 3", which prompts "OUT" to flash.

● The name of the current mode flashes.

Figure 5-30 Initial Setting Screen 3: OUT

4. Press the [ENT] key.

Only the current mode flashes.

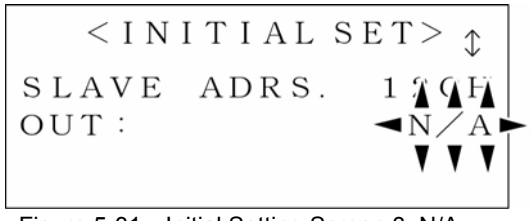


Figure 5-31 Initial Setting Screen 3: N/A

5. Use the arrow keys ([▲], [▼]) to select "ALARM1".

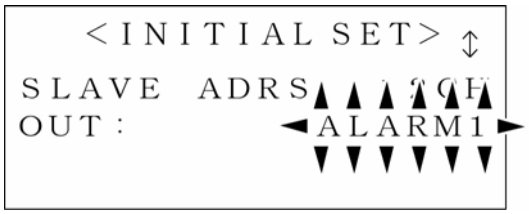


Figure 5-32 Initial Setting Screen 3: ALARM1

6. Press the [ENT] key.

"OUT" flashes again, and the selection takes effect.

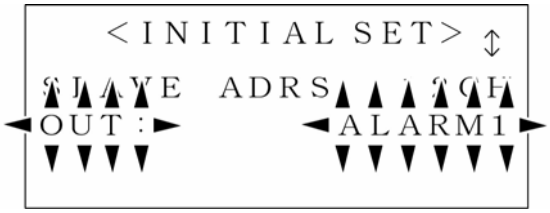


Figure 5-33 Initial Setting Screen 3: Setting Confirmation (OUT)

[Tips]

To cancel a selection, press the [SEL] key, not [ENT] key. With the press of the [SEL] key, the cancellation takes effect and the screen is switched to the "Menu screen 1".

7. Press the [SEL] key to display the "Menu screen 1".

Chapter 6 Error Message and Troubleshooting

6.1 Error Message

The following are to be performed in the event of an error in this system.

- The “ALARM” lamp comes on.
- Alarm buzzer comes on.
- The “Alarm Display screen” is displayed on the LCD screen.
- Error signal is issued through external communication.
  (See section 8.1.2 “Communication specification” in Chapter 8 on page 8-4 Appendix for details.)

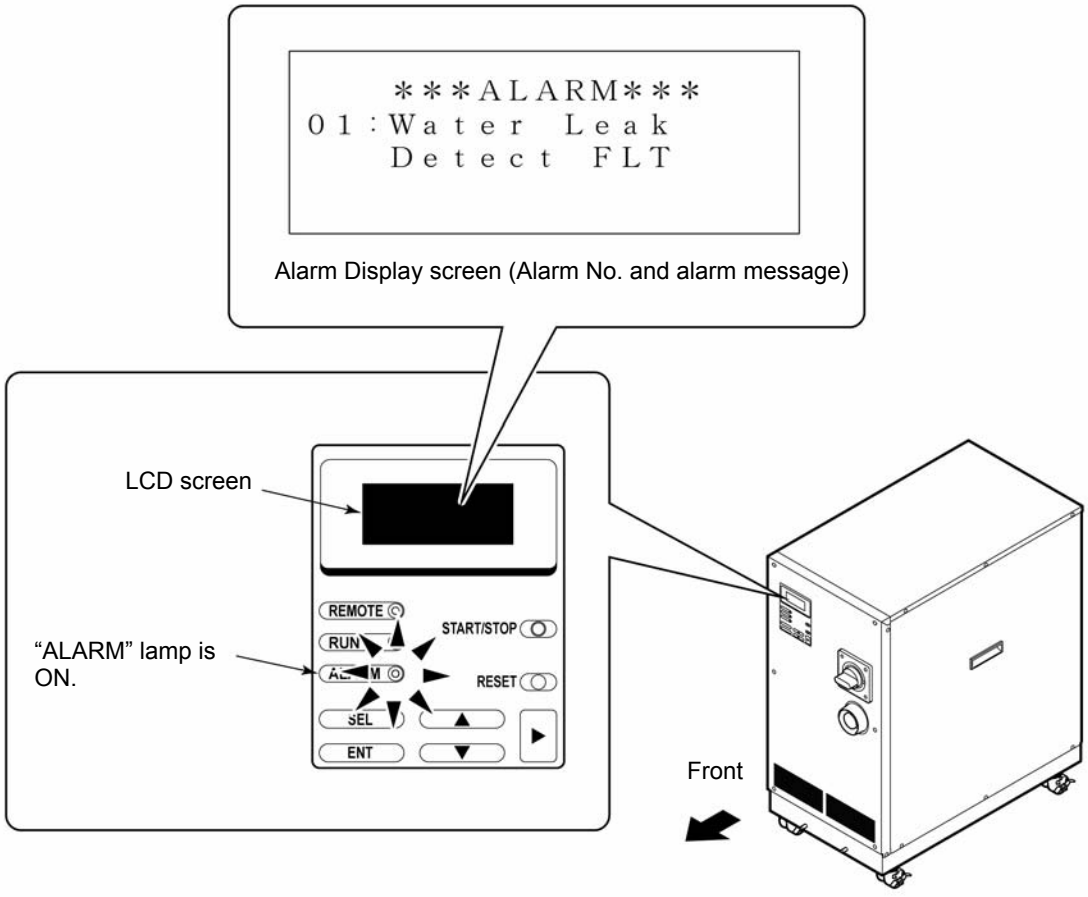


Figure 6-1 Error Occurrence

6.2 Troubleshooting

The procedure for error recovery varies with alarm types.

- Alarm Code.01 to 08, 10 to 19, 22, 24, 29, 30:
  Eliminate the error cause. Press the [RESET] key on the operation display panel or power cycle the main breaker to enable error recovery to take effect.
- Alarm Code.09:
  Eliminate the error cause. After replacing thermal fuse, press the [RESET] key on the operation display panel or power cycle the main breaker to enable error recovery to take effect.
- Alarm Code.21:
  Eliminate the error cause, and power cycle the main breaker to enable error recovery to take effect.
- Alarm Code.23, 26, 27:
  Automatic error recovery is implemented upon elimination of the error.
- Alarm Code.18, 24, 26, 27:
  This is an alarm for accessories (optional). No alarm of this type is issued if the system is outfitted with no accessories.
- Alarm Code.25:
  This alarm is only for HRW∗∗∗-H∗S (pump inverter type).

Table 6-1 Troubleshooting (1/2)

Code	Error message	System condition	Cause	Remedies
01	Water Leak Detect FLT	Stop	The fluid is pooled at the base of this system.	Check for fluid leak.
02	Incorrect Phase Error FLT	Stop	The power phase rotation is wrong.	Check that a proper connection is established between the power cable and main breaker of this system.
05	Reservoir Low Level FLT	Stop	An insufficient amount of the circulating fluid is observed in the tank.	Replenish the circulating fluid.
06	Reservoir Low Level WRN	Continued	An insufficient amount of the circulating fluid is observed in the tank.	Replenish the circulating fluid.
07	Reservoir High Level WRN	Continued	An excessive amount of the circulating fluid is observed in the tank.	Drain the circulating fluid.
08	Temp. Fuse Cutout FLT	Stop	The circulating fluid tank was raised in temperature.	Check the load specification. Replacement of the thermal fuse is required. Call the supplier for service.
09	Reservoir High Temp. FLT	Stop	The temperature of the circulating fluid exceeded the specified value.	Check the load specification.
10	Return High Temp. WRN	Continued	The temperature of the circulating fluid exceeded the specified value.	Check the circulating fluid flow rate and load specification.
11	Reservoir High Temp. WRN	Continued	The temperature of the circulating fluid exceeded your specified value.	Reset the setting temperature.

Table 6-1 Troubleshooting (2/2)

Code	Error message	System condition	Cause	Remedies
12	Return Low Flow FLT	Stop	The flow rate of the circulating fluid falls short of the specified value.	Check that the external valve is opened. Prepare a thicker external pipe or install bypass piping.
13	Return Low Flow WRN	Continued	The flow rate in this system falls short of your specified value.	Reset the setting flow rate.
15	Pump Breaker Trip FLT	Stop	The breaker for the circulating pump power line was tripped.	Check that the power supply to this system is compliant with the specification.
17	Interlock Fuse Cutout FLT	Stop	An overcurrent was passed through the control circuit.	Contact the system supplier for request of inspection and repair.
18	DC Power Fuse Cutout WRN	Continued	An overcurrent was passed through the solenoid valve (optional).	Contact the system supplier for request of inspection and repair.
19	FAN Motor Stop WRN	Continued	The ventilating fan came to a stop.	Check that the air vent on the back of the system is not blocked off.
21	Controller Error FLT	Stop	An error was detected in the control system.	Contact the system supplier for request of inspection and repair.
22	Memory Data Error FLT	Stop	An error was detected in data stored in the controller of this system.	Reset your specified value.
23	Communication Error WRN	Continued	An interruption of serial communication occurred between this system and your system.	Check that a signal is being issued from your system. Check for disconnection of the communication connector from this system.
24	DI Low Level WRN	Continued	Electrical resistivity of the circulating fluid falls short of your specified value.	Lower the setting for resistivity. Replacement of the DI filter is required.
25	Pump Inverter Error FLT	Stop	An error was detected in the system inverter.	Contact the system supplier for request of inspection and repair.
26	DNET Comm, Error FLT	Stop	An error was detected in the DeviceNet communication system.	Contact the system supplier for request of inspection and repair.
27	DNET Comm. Error WRN	Continued	DeviceNet communication was disconnected between this system and customer's system.	Check that a signal is being issued from your system. Check for disconnection of the communication connector from this system.
29	F.Water Low Temp. WRN	Continued	The temperature of facility water falled below your specified value.	Reset the setting temperature.
30	F.Water High Temp. WRN	Continued	The temperature of facility water exceeded your specified value.	Reset the setting temperature.

Chapter 7 System Maintenance

7.1 Water Quality Management

⚠ CAUTION

- **Only designated circulating fluid is permitted to use for this system. Potential system failure and fluid leak may occur if disregarded, which results in electric shock, ground fault, and freeze. Be sure to use fresh water (tap water) compliant with water quality standards in the table below for ethylene glycol aqueous solution and facility water.**
- **Keep bubbles out of the facility water circuit. Potential large variations in temperature of the circulating fluid may occur if bubbles are present in the facility water.**

Table 7-1 Water Quality Standards for Fresh Water (Tap Water)

	Substance	Facility water spec.	Circulating water spec.
Standards	Ph (25°C)	6.5 to 8.2	6.0 to 8.0
	Electrical conductivity (25°C) (μs/cm) *	100 to 800	0.5 to 300
	Chloride ion (mgCl-/L)	Max. 200	Max. 50
	Sulfate ion ($mgSO_4^{2-}$/L)	Max.200	Max.50
	Acid consumption (Ph4.8) ($mgCaCO_3$/L)	Max.100	Max.50
	Total hardness ($mgCaCO_3$/L)	Max.200	Max.70
	Calcium hardness ($mgCaCO_3$/L)	Max.150	Max.50
	Ionic silica ($mgSiO_2$/L)	Max.50	Max.30
	Iron (mgFe/L)	Max.1.0	Max.0.3
	Copper (mgCu/L)	Max.0.3	Max.0.1
	Sulfide ion (mgS^{2-}/L)	Not be detected	
	Ammonium ion ($mgNH_4^+$/L)	Max.1.0	Max.0.1
	Residual chlorine (mgCl/L)	Max.0.3	Max.0.3
	Free carbon dioxide ($mgCO_2$/L)	Max.4.0	Max.4.0
	Filtration (μm)	Max.5	

- According to the Water quality guideline for refrigeration air-conditioning equipment: JRA-GL-02-1994

CAUTION

If the periodic inspection finds a nonconforming substance in the facility water, clean the facility water circuit and recheck the quality of the facility water.

7.2 Inspection and Cleaning

⚠ WARNING

- **Do not touch any electrical parts with wet hands.**
  Keep wet hands away from electrical parts. Potential electric shock can occur if disregarded.
- **Keep this system from water. Potential electric shock or fire can occur if disregarded.**

⚠ WARNING

If the inspection and cleaning require the removal of the panel, be sure to re-attach the panel upon completion. Potential personal injury or electric shock may occur if operated with the panel opened or removed.

7.2.1 Daily inspection

Table 7-2 Daily Inspection

Inspection item	Inspection method	
Installation condition	Check of the condition of system installation	No heavy object is placed on this system. This system should not be subjected to external force.
		Temperature and humidity fall within the specified range.
Fluid leak	Check of the piping connector section	No leak of facility water and circulating fluid from the piping connector section
Fluid level	Reading of the level of the circulating fluid	Level falls within the circulating fluid specified level between “High” and “Low”.
Operation display panel	Display check	Clarity of letters and numbers on the LCD display should be assured.
	Function check	[RUN] lamp is ON.
Circulating fluid temperature	Confirm the reading on the LCD screen	Temperature should be within setpoint.
Discharge pressure of circulating fluid	Confirm the reading on the LCD screen	Reading should not have deviated much from last inspection.
Circulating fluid flow rate	Confirm the reading on the LCD screen	Reading should not have deviated much from last inspection.
Operating condition	Operating condition check	No abnormal noise, vibration, odor and smoke
Facility water	Check of the facility water	Temperature, flow rate and pressure fall within the specified range.
Circulating fluid supply port cap	Check by providing manual tightening	No looseness

7.2.2 Quarterly inspection

⚠ WARNING

Quarterly inspection requires an advance lockout/tagout of this system. See section 1.5.3 “Lockout/Tagout” in “Chapter 1 Safety” on page 1-10 for details.

Table 7-3 Quarterly Inspection

Inspection item	Inspection method
Circulating fluid	Circulating fluid is to be drained for check. Fluid should be free of particles, moisture and foreign substances.
	For ethylene glycol solution, confirm that the concentration falls within the specified range.
	Recommended to replace the water.
Facility water	Facility water quality should fall within the standards specified.
Ventilation hole and electrical parts	No particles and dust should be present.

7.3 Storage

The following should be performed for system long-term storage.

1. Drain the circulating fluid. See section 7.3.1 “Draining of circulating fluid out of tank” on page 7-4 for details.
2. Drain the facility water. See section 7.3.2 “Draining of facility water” on page 7-5 for details.
3. Cover the system with a plastic sheet for storage.

7.3.1 Draining of circulating fluid out of tank

⚠ CAUTION

- **Use the clean container for circulating fluid recovery. Reuse of the recovered circulating fluid with contaminated will cause insufficient cooling and system failure**
- **Be sure to wait until the circulating fluid obtains room temperature for its draining. Potential burns can occur if disregarded.**

1. Prepare the container for circulating fluid recovery at the back of this system.

2. Connect the drain hoses to the tank drain port. Insert the tip of the hose into the container.

- Prepare a drain hose (Rc3/8-diameter) on your responsibility.

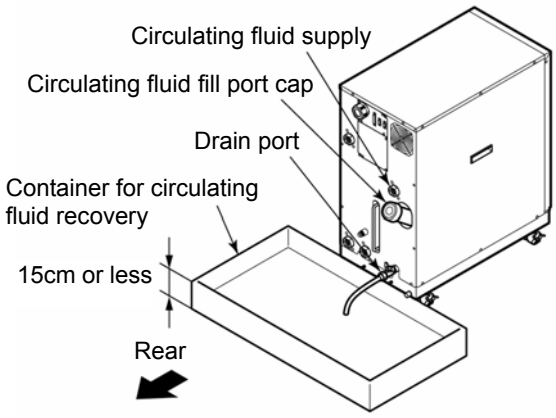


Figure 7-1 Container for Circulating Fluid Recovery

3. Remove the cap of the circulating fluid fill port.

4. Open the valves of the tank drain port to drain the circulating fluid.

5. Apply air purge from the the circulating fluid return to push the circulating fluid remaining in the heat exchange back in the tank and drain it.

CAUTION

If the recovered circulating fluid is contaminated by foreign substances, completely remove them. Do not reuse comtaminated fluid.
Potential insufficient cooling, system failure and froth in the circulating fluid may occur if disregarded.

CAUTION

Recovered circulating fluid must be sealed in a container to prevent contamination from moisture or foreign substances.
Stored in a cool, dark place.
Keep it from flame.

6. Upon completion of fluid draining, close the valve of the tank drain port.

7. Add plugs to seal off ports on the rear of this system.

- See section 7.3.2 “Draining of facility water” on pege 7-5 for plug attachment.

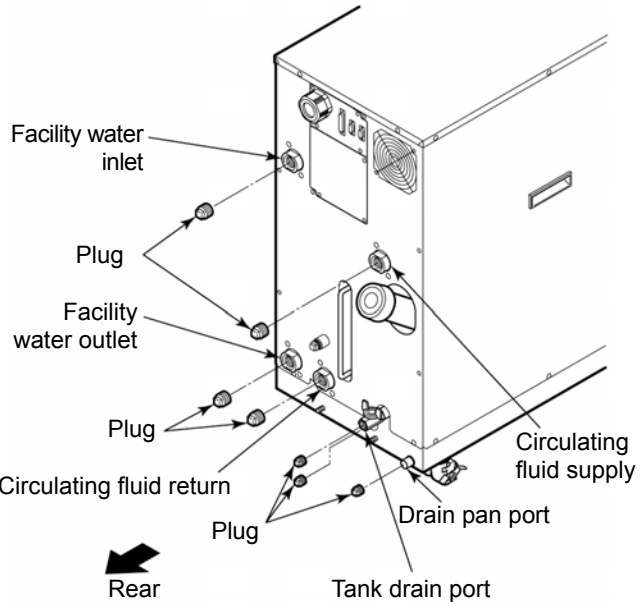


Figure 7-2 Plug Attachment

7.3.2 Draining of facility water

⚠ CAUTION

Be sure to drain the facility water only when it is at room temperature. Trapped fluid inside the system can still be hot. Potential burns can occur if disregarded.

1. Place the drain pan underneath the piping connections on the rear of this system.

- A 3L-capacity or bigger drain pan is required.

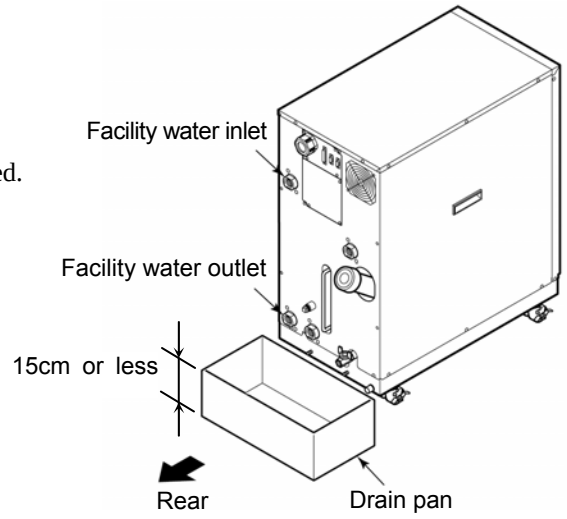


Figure 7-3 Drain Pan Attachment

2. Remove facility water piping.

● Remove the joints such as unions if present.

3. Drain the facility water using the facility water outlet port.

7.4 Periodic Replacement Parts

Replacement of consumables listed in the following table is recommended.
Contact the system supplier for request of part replacement.

Table 7-4 Periodic Replacement Part List

Part	Recommended replacement cycle*[1]
Circulating pump	Every 3 yrs
Ventilating fan	Every 3 yrs
Solenoid valve ass'y for facility water	Every 2 yrs
Inverter Coolong Fan*[2]	Every 3 yrs

*1 Note: A replacement cycle may vary with your usage condition.
*2 Note: Only HRW∗∗∗-H∗S is needed.

Chapter 8 Appendix

8.1 Specification

8.1.1 System specification

■ Specification for fluorinated fluid

Table 8-1 Specification for fluorinated fluid

Model			HRW002-H HRW002-HS	HRW008-H HRW008-HS	HRW015-H HRW015-HS	HRW030-H HRW030-HS
Cooling method			Water cooling			
Cooling capacity (50Hz/60Hz) * Under conditions below		kW	2	8	15	29
	Circulating fluid temp.	°C	Facility water temp. +15°C			
	Circulating fluid rated flow rate	L/min	4 (1.1 [gal]/min)	30 (7.9 [gal]/min)	40 (10.6 [gal]/min)	40 (10.6 [gal]/min)
	Facility water minimum necessary flow rate	L/min	10 (2.6 [gal]/min)	20 (5.3 [gal]/min)	25 (6.6 [gal]/min)	40 (10.6 [gal]/min)
Operating temperature range		°C	20 to 90			
Temperature stability *1		°C	± 0.3			
Circulating fluid *2			Galden® HT200 or Fluorinert™ FC-40			
Pump capacity (50Hz/60Hz) *3		MPa	0.40 / 0.60 (At 4L/min) (58 / 87 [PSIG] At 1.1 [gal/min])	0.45 / 0.65 (At 30L/min) (65 / 94 [PSIG] At 7.9 [gal/min])	0.40 / 0.60 (At 40L/min) (58 / 87 [PSIG] At10.6 [gal/min])	0.40 / 0.60 (At 40L/min) (58 / 87 [PSIG] At10.6 [gal/min])
Circulating fluid flow rate display range		L/min	2 to 16 (0.5 to 4.2 [gal/min])	8 to 50 (2.1 to 13.2 ［gal/min］)		
Operating range of circulating fluid flow rate *4		[L/min]	3 to 16 (0.8 to 4.2[gal/min])	9 to 50 (2.4 to 13.2[gal/min])		
Tank capacity *5		L	Approx. 13 (3.4 [gal])		Approx. 14 (3.7 [gal])	
Tank space capacity		L	Approx. 2.5 (0.7 [gal])			
Circulating fluid port			Rc 3/4			
Facility water	Facility water IN temp.	°C	10 to 35			
	Facility water IN pressure	MPa	0.3 to 0.7 (45 to 100 [PSIG])			
Facility water port			Rc 3/4			
Power supply			3-phase 50/60Hz AC200/200 to 208V±10%			
Main breaker size		A	30			
Main breaker amperes interrupting capacity		kA	35			
Dimensions *6		mm	W380×D665×H860 (W14.96xD26.18xH33.86 [inch])			
Weight (HRW∗∗∗-H / HRW∗∗∗-HS)*7		kg	Approx. 90 (198 [lbs]) / Approx. 95 (209 [lbs])		Approx. 100 (221 [lbs]) / Approx. 105 (232 [lbs])	
Communication			Serial RS-485 (Dsub-9pin), Contact signal (Dsub-25pin)			

*1: It indicates discharge temperature when connecting outlet and return of circulating fluid directly, flow rate of both circulating fluid and facility water are rated value, installation condition, power supply and facility water are within each specifications and stable. Stability is a value after heat load is steady for 10 minutes. There are some cases that the stability is out of +/- 0.3 deg C due to operating condition.
*2: Galden® is a registered trademark of Solvay Solexis, and Fluorinert ™ is a trademark of U.S. 3M.
*3: The capacity is derived at the Outlet of this system when the circulating fluid is at 20°C.
Pumping capacity under 60Hz is the maximum capacity for HRW∗∗∗-HS (pump inverter type).
*4: Applicable for HRW∗∗∗-HS (pump inverter type) only. According to piping specification on customer's side, there is the case this system cannot control the flow rate at setting value.
*5: This is a minimum amount of the fluid for operation of a discrete chiller outfitted with chiller internal piping and heat exchanger. Circulating fluid temp.: 20°C
*6: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.
*7: This is the mass of the system when it contains no circulating fluid.

■ Specification for ethylene glycol aqueous solution

Table 8-2 Specification for ethylene glycol aqueous solution

Model			HRW002-H1 HRW002-H1S	HRW008-H1 HRW008-H1S	HRW015-H1 HRW015-H1S	HRW030-H1 HRW030-H1S
Cooling method			Water cooling			
Cooling capacity (50Hz/60Hz) * Under conditions below		kW	2	8	15	27
	Circulating fluid temp.	°C	Facility water temp. +15°C			
	Circulating fluid rated flow rate	L/min	4 (1.1 [gal]/min)	15 (4.0 [gal]/min)	30 (7.9 [gal]/min)	40 (10.6 [gal]/min)
	Facility water minimum necessary flow rate	L/min	10 (2.6 [gal]/min)	15 (4.0 [gal]/min)	25 (6.6 [gal]/min)	40 (10.6 [gal]/min)
Operating temperature range		°C	20 to 90			
Temperature stability [*1]		°C	± 0.3			
Circulating fluid [*2]			Ethylene glycol solution：60%			
Pump capacity (50Hz/60Hz) [*3]		MPa	0.35 / 0.55 (At 4L/min) (51 / 80 [PSIG] At 1.1 [gal/min])	0.45 / 0.65 (At 15L/min) (65 / 94 [PSIG] At 4.0 [gal/min])	0.40 / 0.60 (At 30L/min) (58 / 87 [PSIG] At 7.9 [gal/min])	0.35 / 0.55 (At 40L/min) (51 / 80 [PSIG] At10.6 [gal/min])
Circulating fluid flow rate display range		L/min	2 to 16 (0.5 to 4.2 [gal/min])	8 to 50 (2.1 to 13.2 [gal/min])		
Operating range of circulating fluid flow rate [*4]		[L/min]	3 to 16 (0.8 to 4.2[gal/min])	9 to 50 (2.4 to 13.2[gal/min])		
Tank capacity [*5]		L	Approx. 13 (3.4 [gal])			
Tank space capacity		L	Approx. 2.5 (0.7 [gal])			
Circulating fluid port			Rc 3/4			
Facility water	Facility water IN temp.	°C	10 to 35			
	Facility water IN pressure	MPa	0.3 to 0.7 (45 to 100 [PSIG])			
Facility water port			Rc 3/4			
Power supply			3-phase 50/60Hz AC200/200 to 208V±10%			
Main breaker size		A	30			
Main breaker amperes interrupting capacity		kA	35			
Dimensions [*6]		mm	W380×D665×H860 (W14.96xD26.18xH33.86 [inch])			
Weight (HRW∗∗∗-H1 / HRW∗∗∗*H1S)[*7]		kg	Approx. 90 (198 [lbs]) / Approx. 95 (209 [lbs])			
Communication			Serial RS-485 (Dsub-9pin), Contact signal (Dsub-25pin)			

*1: It indicates discharge temperature when connecting outlet and return of circulating fluid directly, flow rate of both circulating fluid and facility water are rated value, installation condition, power supply and facility water are within each specifications and stable. Stability is a value after heat load (no load only for HRW030-H1) is steady for 10 minutes. There are some cases that the stability is out of +/- 0.3 deg C due to operating condition.
*2: Pure ethylene glycol needs dilution with fresh water before use.
Ethylene glycol with additives such as preservatives is NOT available.
*3: The capacity is derived at the Outlet of this system when the circulating fluid is at 20°C.
Pumping capacity under 60Hz is the maximum capacity for HRW∗∗∗-H1S (pump inverter type).
*4: Applicable for HRW∗∗∗-H1S (pump inverter type) only. According to piping specification on customer's side, there is the case this system cannot control the flow rate at setting value.
*5: This is a minimum amount of the fluid for operation of a discrete chiller outfitted with chiller internal piping and heat exchanger. Circulating fluid temp.: 20°C
*6: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.
*7: This is the mass of the system when it contains no circulating fluid.

■ Specification for flesh water and DI water

Table 8-3 Specification for flesh water and DI water

Model			HRW002-H2 HRW002-H2S	HRW008-H2 HRW008-H2S	HRW015-H2 HRW015-H2S	HRW030-H2 HRW030-H2S
Cooling method			Water cooling			
Cooling capacity (50Hz/60Hz) * Under conditions below		kW	2	8	15	30
	Circulating fluid temp.	°C	Facility water temp. +15°C			
	Circulating fluid rated flow rate	L/min	4 (1.1 [gal]/min)	15 (4.0 [gal]/min)	30 (7.9 [gal]/min)	40 (10.6 [gal]/min)
	Facility water minimum necessary flow rate	L/min	10 (2.6 [gal]/min)	15 (4.0 [gal]/min)	25 (6.6 [gal]/min)	40 (10.6 [gal]/min)
Operating temperature range		°C	20 to 90			
Temperature stability [*1]		°C	± 0.3			
Circulating fluid [*2]			Flesh water, DI water			
Pump capacity (50Hz/60Hz) [*3]		MPa	0.35 / 0.55 (At 4L/min) (51 / 80 [PSIG] At 1.1 [gal/min])	0.45 / 0.65 (At 15L/min) (65 / 94 [PSIG] At 4.0 [gal/min])	0.40 / 0.60 (At 30L/min) (58 / 87 [PSIG] At 7.9 [gal/min])	0.35 / 0.55 (At 40L/min) (51 / 80 [PSIG] At10.6 [gal/min])
Circulating fluid flow rate display range		L/min	2 to 16 (0.5 to 4.2 [gal/min])	8 to 50 (2.1 to 13.2 [gal/min])		
Operating range of circulating fluid flow rate [*4]		[L/min]	3 to 16 (0.8 to 4.2[gal/min])	9 to 50 (2.4 to 13.2[gal/min])		
Tank capacity [*5]		L	Approx. 13 (3.4 [gal])			
Tank space capacity		L	Approx. 2.5 (0.7 [gal])			
Circulating fluid port			Rc 3/4			
Facility water	Facility water IN temp.	°C	10 to 35			
	Facility water IN pressure	MPa	0.3 to 0.7 (45 to 100 [PSIG])			
Facility water port			Rc 3/4			
Power supply			3-phase 50/60Hz AC200/200 to 208V±10%			
Main breaker size		A	30			
Main breaker amperes interrupting capacity		kA	35			
Dimensions [*6]		mm	W380×D665×H860 (W14.96xD26.18xH33.86 [inch])			
Weight (HRW∗∗∗-H2 / HRW∗∗∗*H2S)[*7]		kg	Approx. 90 (198 [lbs]) / Approx. 95 (209 [lbs])			
Communication			Serial RS-485 (Dsub-9pin), Contact signal (Dsub-25pin)			

*1: It indicates discharge temperature when connecting outlet and return of circulating fluid directly, flow rate of both circulating fluid and facility water are rated value, installation condition, power supply and facility water are within each specifications and stable. Stability is a value after heat load (no load only for HRW030-H1) is steady for 10 minutes. There are some cases that the stability is out of +/- 0.3 deg C due to operating condition.

*2: Only a circulating fluid, which is compliant with water quality standard stipulated by The Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994/cooling water – circulation – make-up water), must be used. The lower limit of the electric conductivity if improper deionized water is used: 0.5μS/cm (the upper limit of the electric resistivity: 20MΩ•cm)

*3: The capacity is derived at the thermo chiller outlet when the circulating fluid is at 20°C.
Pumping capacity under 60Hz is the maximum capacity for HRW∗∗∗-H2S (pump inverter type).

*4: Applicable for HRW∗∗∗-H2S (pump inverter type) only. According to piping specification on customer's side, there is the case this system cannot control the flow rate at setting value.

*5: This is a minimum amount of the fluid for operation of a discrete chiller outfitted with chiller internal piping and heat exchanger. Circulating fluid temp.: 20°C

*6: This is the dimensions of panels, which is derived without protrusions such as a breaker handle.

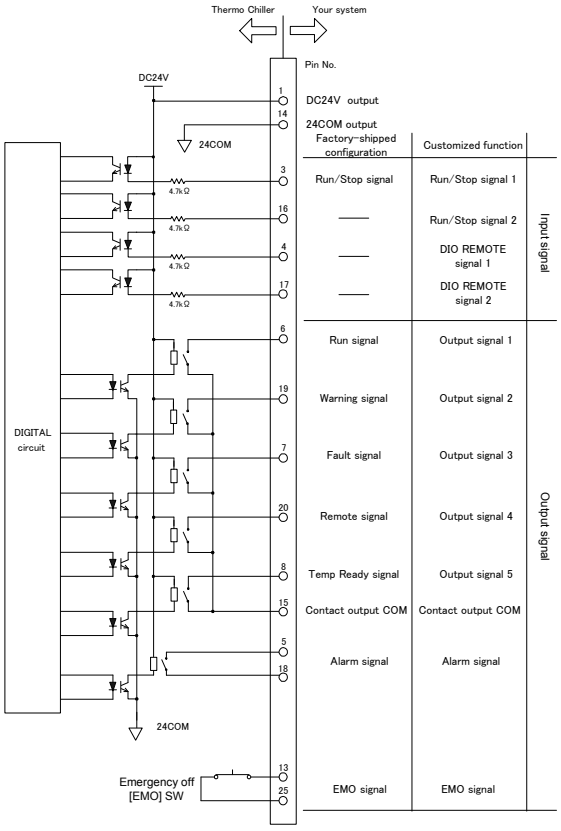
*7: This is the mass of the system when it contains no circulating fluid.

8.1.2 Communication specification

This section provides the general outline of communications utilized in this system. For detail specification, we provide a separate system manual “Communication Specification”, which is available through your local distributor.

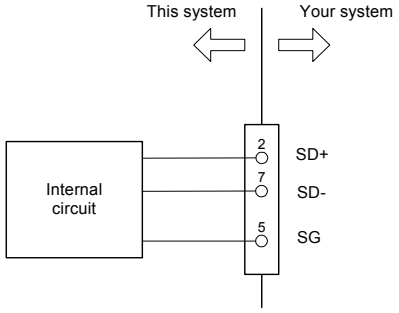
■ Contact signal

Table 8-4 Contact Signal

Item		Specification
Connector No.		P1
Connector type (this system)		D-sub25P female connector
Input signal	Insulation type	Photocoupler
	Rated input voltage	DC24V
	Used voltage range	DC 21.6V to 26.4V
	Rated input current	5mA TYP
	Input impedance	4.7kΩ
Output signal	Rated load voltage	Max.AC48V / Max.DC30V
	Max. load current	When using power source output from chiller :DC 200mA (resistance load, inductive load) When using power source of your system :AC / DC 800mA (resistance load, inductive load)
Alarm signal	Rated load voltage	Max. AC48V/ Max. DC30V
	Max. load current	AC/DC 800mA (resistance load, inductive load)
EMO signal	Rated load voltage	Max. AC48V/ Max. DC30V
	Max. load current	AC/DC 800mA (resistance load, inductive load)
Circuit block diagram		

■ Serial RS-485

Table 8-5 Serial RS-485

Item	Specification
Connector No.	P2
Connector type (this system)	D-sub9P female connector
Standard	EIA RS485
Protocol	Modicon Modbus
Circuit block diagram	

8.1.3 Alarm signal selection

User can designate one alarm signal for contact signal. See section 5.3.9 “Initial Setting screen” for signal selecting.
The following table presents the setting-alarm relationship. The alarm signal is turned OFF if the designated alarm detected. (Alarm signal is ON if no alarm is detected.)

Table 8-6 Alarm signal selection

Setting	Alarm	Alarm
N/A	Alarm signal remains ON (closed) under normal circumstances.	-
Alarm1	Water Leak Detect FLT	01
Alarm2	Incorrect Phase Error FLT	02
Alarm5	Reservoir Low Level FLT	05
Alarm6	Reservoir Low Level WRN	06
Alarm7	Reservoir High Level WRN	07
Alarm8	Temp. Fuse Cutout FLT	08
Alarm9	Reservoir High Temp. FLT	09
Alarm10	Return High Temp WRN	10
Alarm11	Reservoir High Temp. WRN	11
Alarm12	Return Low Flow FLT	12
Alarm13	Return Low Flow WRN	13
Alarm14	Heater Breaker Trip FLT	14
Alarm15	Pump Breaker Trip FLT	15
Alarm17	Interlock Fuse Cutout FLT	17
Alarm18[*1]	DC Power Fuse Cutout WRN	18
Alarm19	FAN Motor Stop WRN	19
Alarm21	Controller Error FLT	21
Alarm22	Memory Data Error FLT	22
Alarm23	Communication Error WRN	23
Alarm24[*1]	DI Low Level WRN	24
Alarm25[*2]	Pump Inverter Error FLT	25
Alarm26[*1]	DNET Comm. Error FLT	26
Alarm27[*1]	DNET Comm. Error WRN	27
Alarm29	F.Water Low Temp. WRN	29
Alarm30	F.Water High Temp. WRN	30

● Example
With parameter “OUT” on the Initial Setting screen set to “Alarm1”, alarm “Water Leak Detect FLT” is detected, the alarm contact signal is switched to OFF (open).

*1: Alarm 18, 24, 26 and 27 are alarms indicating accessories (optional).
*2: Alarms 25 is only for HRW∗∗∗-H∗S (pump inverter type). As other model is assigned with no alarm, the alarm signal always remains ON (closed).

8.2 Outer Dimensions

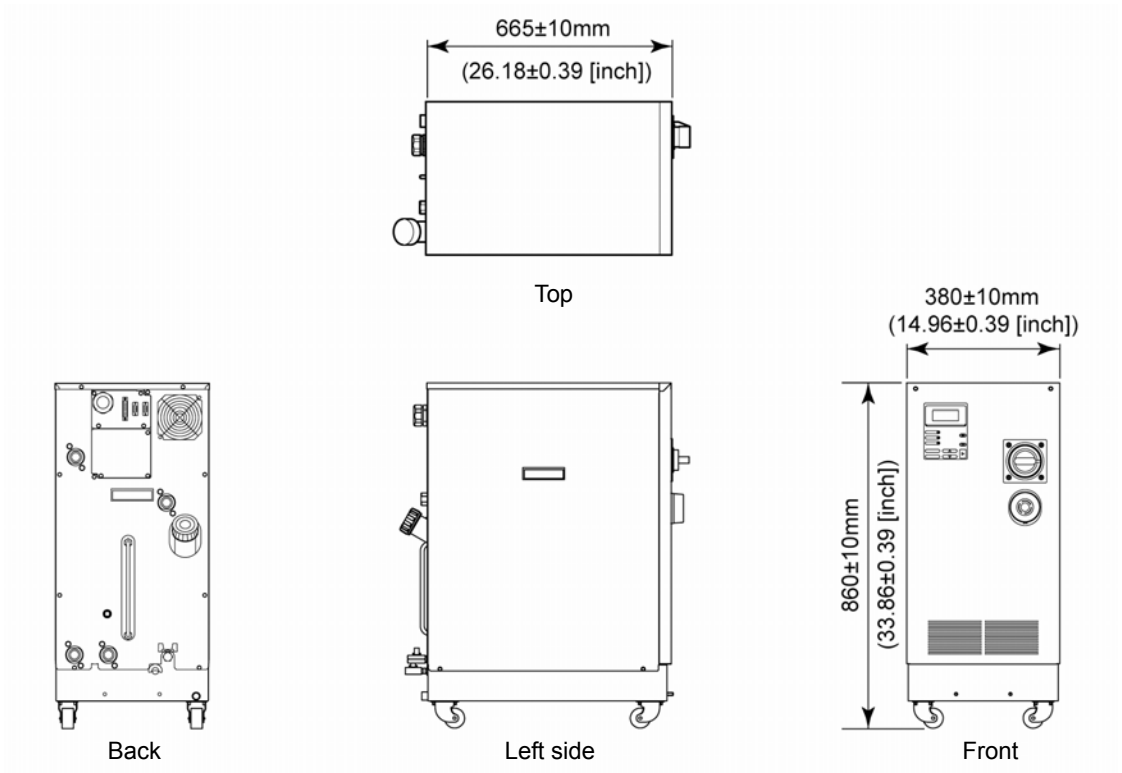


Figure 8-1 Outer Dimensions

8.3 Flow Chart

8.3.1 Part 1

HRW002-H, -HS HRW002-H1, -H1S HRW002-H2, -H2S

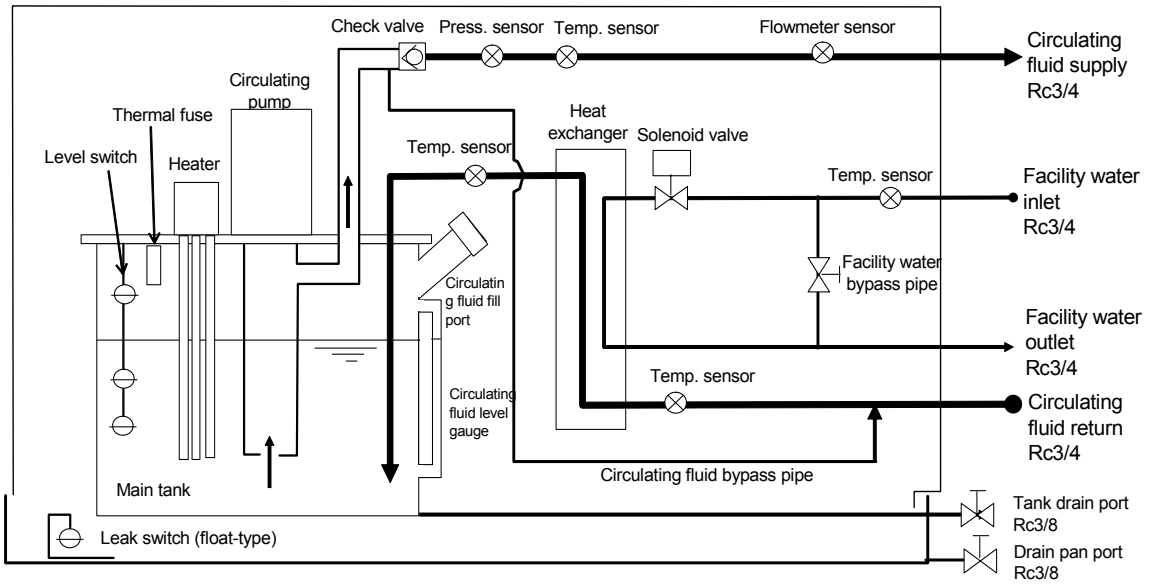


Figure 8-2 Flow Chart Part 1

8.3.2 Part 2

HRW008-H, -HS HRW008-H1, -H1S HRW008-H2, -H2S
HRW015-H, -HS HRW015-H1, -H1S HRW015-H2, -H2S
HRW030-H, -HS HRW030-H1, -H1S HRW030-H2, -H2S

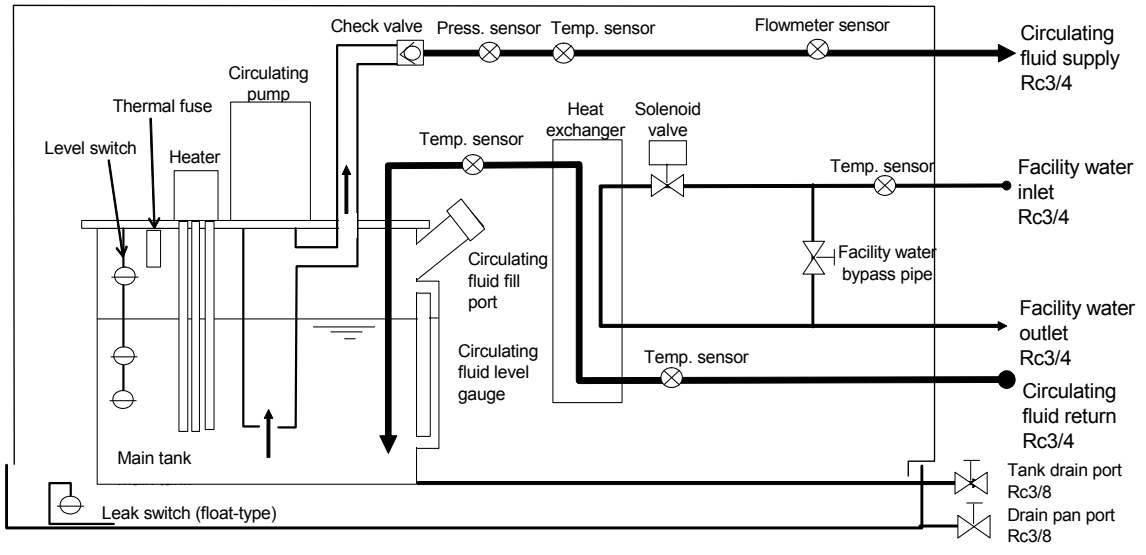


Figure 8-3 Flow Chart Part 2

8.4 Offset Function

Potential deviations in temperature between this system and your system may be concerned depending on the installation environment. The offset function falling into three types (MODE1 to 3) is assigned to calibrate deviations in temperature. See the following descriptions for the offset function. See section 5.3.9 “Initial Setting screen” for setting.

TEMP PV value, which is displayed on the Status screen, is output as circulating fluid temperature data in terms of communication.

● When MODE1 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be “TEMP SP value + OFFSET value”. TEMP PV value denotes the discharge temperature of the circulating fluid.

E.g.: TEMP SP value: +20°C, OFFSET value: +2°C
→ Circulating fluid discharge temp.: +22°C, TEMP PV: +22°C

● When MODE2 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be “TEMP SP value”.
TEMP PV value denotes “Circulating fluid discharge temp. value + OFFSET value”.

E.g.: TEMP SP value: +20°C, OFFSET value: +2°C
→ Circulating fluid discharge temp.: +20°C, TEMP PV: +22°C

● When MODE3 is selected

This mode is used to exercise temperature control to allow the discharge temperature of the circulating fluid to be “TEMP SP value + OFFSET value”. TEMP PV value denotes “Circulating fluid discharge temp. value - OFFSET value”.

E.g.: TEMP SP value: +20°C, OFFSET value: +2°C
→ Circulating fluid discharge temp.: +20°C, TEMP PV: +20°C

● When OFF is selected

If no mode is selected, temperature control is conducted to allow the discharge temperature of the circulating fluid to be “TEMP SP value”.

8.4.1 Example of offset function

When the discharge temperature of the circulating fluid is at 30°C, heat is dissipated by 1°C to allow the circulating fluid in your system to be 29°C. Under the above condition, the following process is to be performed with the utilization of MODEs 1 to 3.

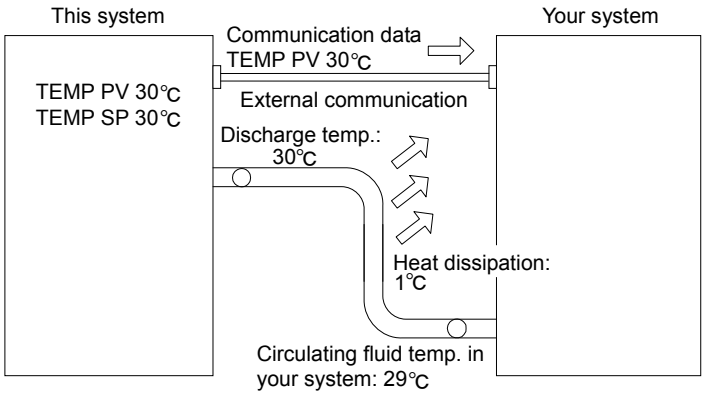


Figure 8-4 Example of Offset Function

■ When MODE1 is selected

This mode enables this system to exercise temperature control to obtain 31°C (TEMP SP value +OFFSET value), with OFFSET value set at 1°C. Once the discharge temperature of the circulating fluid becomes 31°C, 1°C-thermal dissipation is assured to allow the circulating fluid in your system to be 30°C. TEMP SP value is obtained for your system.
Note that “31°C” is recorded in TEMP PV and communication data.

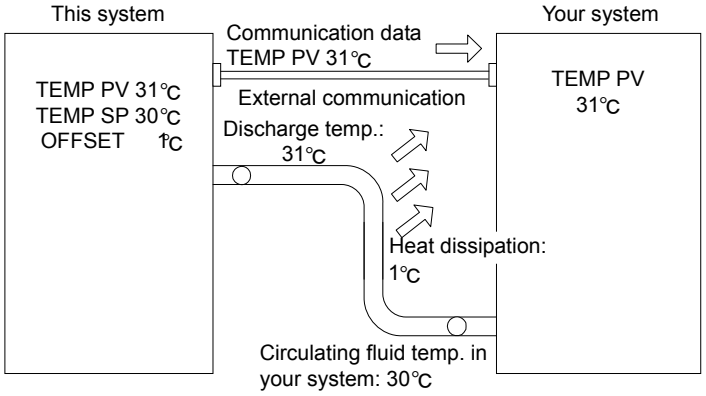


Figure 8-5 When MODE1 is selected

■ When MODE2 is selected

With OFFSET value set at -1°C, TEMP PV and communication data express "29°C" (circulating fluid discharge temp. value + OFFSET value) that agrees with the temperature of the circulating fluid in your system.

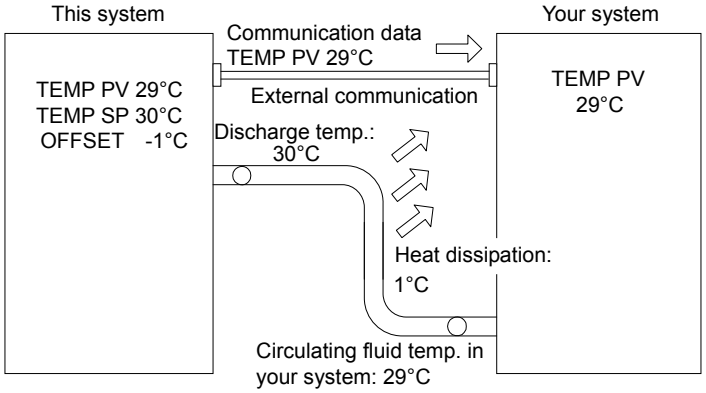


Figure 8-6 When MODE2 is selected

■ When MODE3 is selected

This mode enables this system to exercise temperature control to obtain 31°C (TEMP SP value +OFFSET value), with OFFSET value set at 1°C. Once the discharge temperature of the circulating fluid becomes 31°C, 1°C-thermal dissipation is assured to allow the circulating fluid in your system to be 30°C. TEMP SP value is obtained for your system. TEMP PV and communication data also express "30°C" (circulating fluid discharge temp. value - OFFSET value) that agrees with the temperature of the circulating fluid in your system.

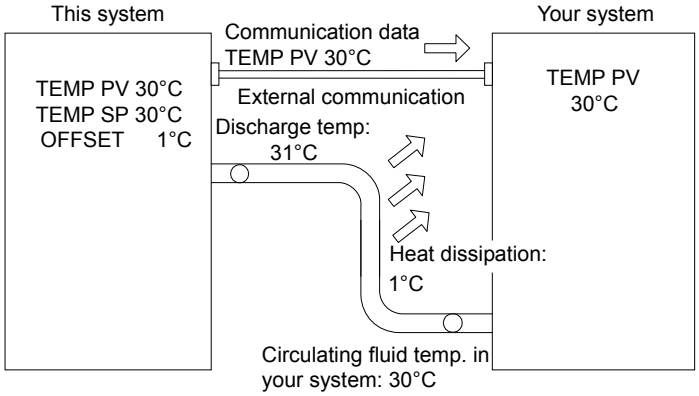


Figure 8-7 When MODE3 is selected

8.5 BAND/READY function

Sets BAND to TEMP SP value, and notifies TEMP PV value reaches within BAND range by the operation display panel or the communication.
See section “5.3.9 Initial Setting screen” on page 5-7, “5.3.11 Option screen” on page 5-9 for the procedure of the setting.

● When the setting is ON

Allows the setting of the BAND and REDY TIME. Allows the setting of the communication output.

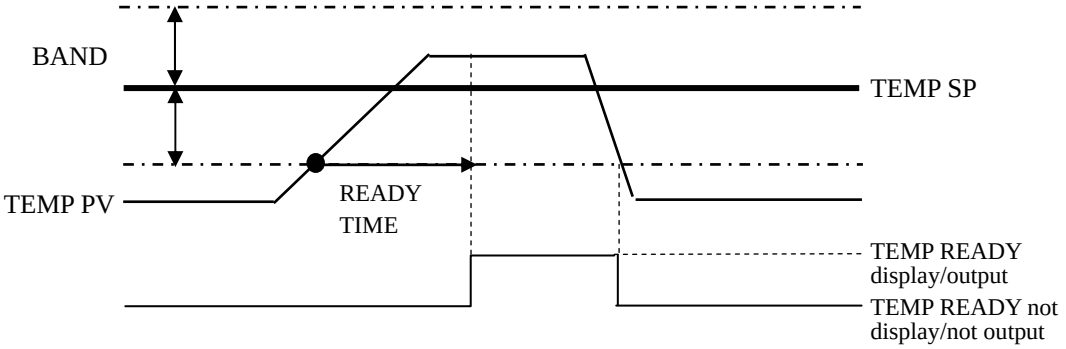


Figure 8-8 BAND/READY function

● Examples of Setting

TEMP SP: 20°C

BAND: 2°C

READY TIME: 60sec.

“TEMP READY” is displayed on the operation display panel 60-sec. after TEMP PV value becomes 18°C to start output by communication. Necessary condition is that TEMP PV value after 60sec. is 20+/-2.0°C or less. See “5.3.4 Status screen 3”on page 5-4 for the details of display position.

● When the setting is OFF

BAND/READY function becomes invalid.

8.6 Anchor Bolt Mounting Position

Lock the brakes on casters, and attach the anti-seismic bracket (optional: HRZ-TK002) to secure this system.

⚠ CAUTION

- **Anti-seismic bracket is an optional accessory, which is required for the installation of this system (HRZ-TK002).**
- **It is your responsibility to prepare anchor bolts suitable for your floor material.**
- **M12-anchor bolts (4 pcs.) are required.**

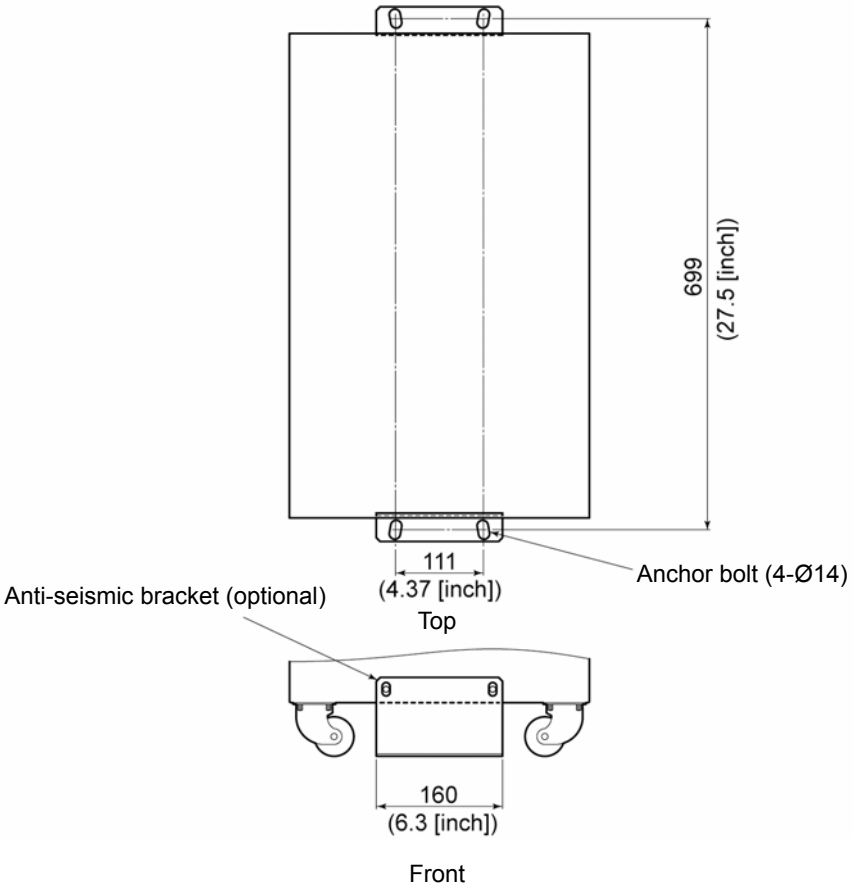


Figure 8-9 Anchor Bolt Mounting Position

8.7 Compliance

This system conforms to the following standards.

Table 8-7 Compliance

CE Marking	EMC Directive	2004/108/EC
	Low Voltage Directive	2006/95/EC
	Machinery Directive	2006/42/EC
SEMATECH	S2-93, S8-95	
SEMI	S2-0703, S8-0701, F47-0200	
UL	E229305 / UL1995	

Thermo Chiller Daily Inspection Sheet

To confirm daily inspection item on the Thermo Chiller, See “Table 7-2 Daily Inspection” in “7.2.1 Daily inspection” of “Chapter 7.

Model: _____

Serial No. _____

Your name	Date	Installation		Leakage		Fluid Level	Operation display panel		Circulating fluid temp.	Circulating fluid outlet press.	Circulating fluid flowrate	Operating condition	Facility water			Circulating fluid supply port cap	Judgment
		Temp. ℃	Humidity %	Circulating fluid Yes/No	Cooling water Yes/No	IN/OUT of range	Display	Function	℃	MPa	L/min	Error Yes/No	Temp. ℃	Flowrate L/min	IN press. MPa	Looseness Yes/No	
After installation (initial value)																	

Product Warranty

1. Warranty

If a failure is observed in our Thermo Chiller, repair shall be provided in accordance with the warranty period and preconditions defined below at SMC's option.

Repair involves the inspection and/or replacement and/or modification of a defective part.
Removed parts shall become the possession of SMC.

2. Warranty period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.

3. Warranty exemption

SMC's liability under this warranty shall not be available for the following troubles and damages.

(1) Troubles or damage caused by the neglect of our designated inspection (daily inspection, periodic inspection)
(2) Troubles or damages caused by mishandling such as using improper operating procedure and using with our specifications violated
(3) Troubles or damages caused by unauthorized modification.
(4) Troubles or damages caused by the use of a not-designated circulating fluid and facility water
(5) Troubles or damages caused by wearing out such as fading on the coated or plated surface
(6) Sensory phenomena that are considered no effect on the functions (such as noise, vibration)
(7) Troubles or damages caused by natural disaster such as earthquake, typhoon, water, inevitable events and fire
(8) Troubles or damages occurred under the installation conditions defined in the Operation Manual
(9) Troubles or damages that are not compliant with the "5. Warranty preconditions"

4. Escape clause

(1) Expenses of daily inspection and periodic inspection
(2) Expenses of repair consigned with neither SMC nor our authorized service station
(3) Expenses of transport, installation, and removal of this system
(4) Expenses of removal of non-genuine parts and replenishment of non-genuine fluids
(5) Unavailability and loss due to this system being disabled
(such as telephone bill, leave compensation, commercial loss)
(6) Expenses and compensation for terms other than provided in "1. Warranty"

5. Warranty precondition

Proper use and inspection of this system is required to assure safe use of this system. System warranty shall satisfy the following preconditions. Please take note that warranted repair shall not be available if these preconditions are disregarded.

(1) System operation shall be conducted by following operating procedure defined in the Operation Manual.
(2) Daily and periodic inspections designated in the Operation Manual shall be made as scheduled.
(3) Inspection record shall be entered in the Daily Inspection Sheet provided in the Operation Manual.

6. Request for warranted repair

As to warranted repair, please contact the supplier you purchased this system from for service.
Warranted repair shall be on request basis.

Unrequited repair shall be provided in accordance with the warranty period, preconditions and terms defined above. Therefore, the repair service shall be available on a chargeable basis if a failure is detected after the warranty period.