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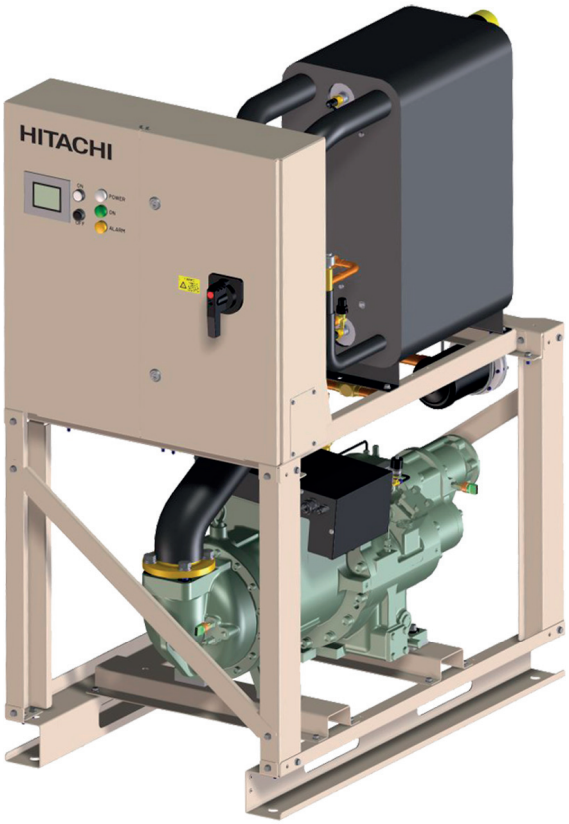
SAMURAI SERIES
CONDENSERLESS WATER CHILLERS
-MODULAR-R134a-SCREW TYPE-



Service Manual

RCME-(40-60)CLH

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1. General information

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1.1 General notes

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If you have any questions, contact your service contractor of HITACHI.

Check and make sure that the explanations of each part of this Technical Catalogue correspond to your water chiller model.

Refer to the models codification to confirm the main characteristics of your system.

Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

It is assumed that this unit will be operated and serviced by English speaking people. If this is not the case, the customer should add safety, caution and operating signs in the native language of the personal.

This water chiller has been designed for the working range described in the corresponding chapter.

1.2 Safety and applied symbols

During normal system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid damage to the unit, the installation or the building or property.

Situations that jeopardise the safety of those in the surrounding area or that put the unit itself at risk will be clearly indicated in this manual.

To indicate these situations, a series of special symbols will be used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

DANGER

- ***The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others in the proximity of the unit.***
- ***Hazards or unsafe practices which could result severe personal injury or death.***

In the texts following the danger symbol you can also find information on safe procedures during unit installation.

CAUTION

- *The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.*
- *Not taking these instructions into account could lead to minor injuries to you and others in the proximities of the unit.*
- *Not taking these instructions into account could lead to unit damage.*

In the texts following the caution symbol you can also find information on safe procedures during unit installation.

NOTE

- *The text following this symbol contains information or instructions that may be of use or that require a more thorough explanation.*
- *Instructions regarding inspections to be made on unit parts or systems may also be included.*

1.3 Product guide

1.3.1 Classification of water chiller models

◆ Basic modules

Unit type (Modular water chiller): RCM					
	E = Made in Europe				
		Position-separating hyphen (fixed)			
			Capacity (HP): 40, 50, 60		
				CL = Condenser Less	
					H = R134a refrigerant
RCM	E	–	XX	CL	H

1.3.2 Product guide: Water chillers

◆ Basic modules

❄

3N~ 400V 50Hz

Unit	Code
RCME-40CLH	8E042340
RCME-50CLH	8E052340
RCME-60CLH	8E062340

2. Control Functions

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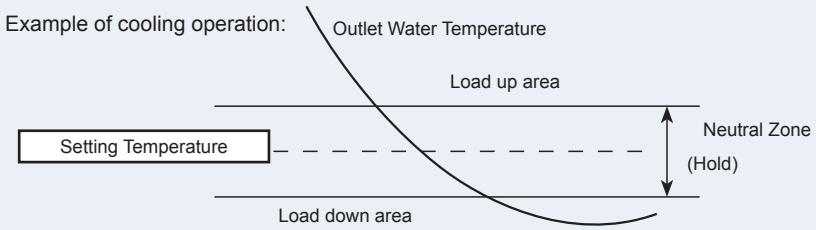
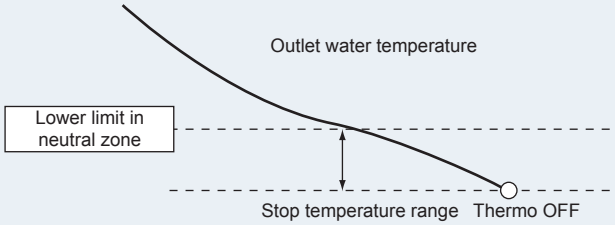
2.1 Control functions on the module

◆ List of the main control functions

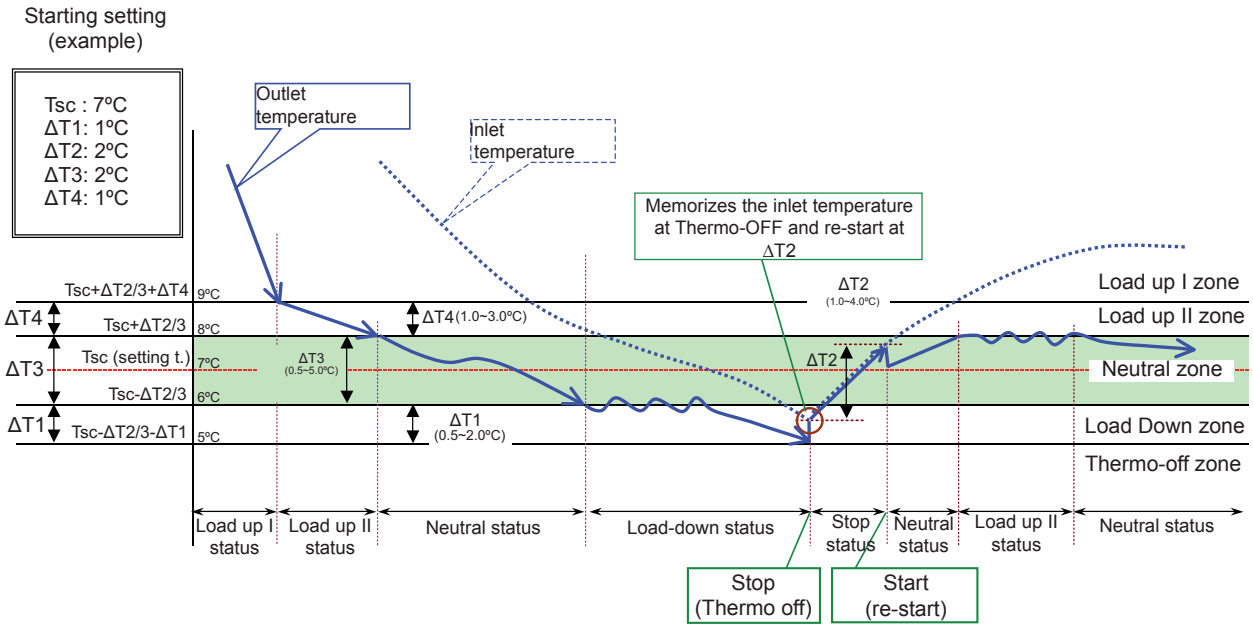
Item	Description
Automatic water temperature control	**1** Slide valve control The outlet water temperature of the chiller unit is detected with a thermistor, and the stroke of slide valve is controlled continuously by time-sharing.  Capacity control range: 100~25%, Stop.
	2 Thermo ON-OFF control When operation load becomes light, outlet water temperature falls below the "Stop temperature range" against the lower limit temperature in neutral zone. By doing so, the compressor stops (Thermo OFF). The settings of stop temperature range can be changed locally between 0.5 and 2.0ºC (in 0.5ºC steps). Example of cooling operation:  Also, in case that water temperature increases above "Recovery temperature range" against inlet temperature when Thermo ON is set, the compressor starts (Themo ON). (However, there is a time guard with a minimum of 3 minutes) It is possible to change the settings of recovery temperature range, but take into account that the water volume necessary to maintain the frequency of compressor run/stop will be different.
Compressor Control	Once that "Compressor delay time" has passed after pump startup, compressor starts up with Y-Δ control, performs startup unload control during 60 seconds, and then shifts to capacity control. The settings of Compressor delay time can be changed in the range between 30 seconds and 10 minutes (in 30 second steps). Set a delay time adjusted to the characteristics of the installation, to prevent compressor startup until a sufficient flow of cold water can be ensured after pump startup. Default: 30 seconds.
Recovery from momentary power failure	Compressor is temporarily stopped when a momentary power failure (drop of more than 20% of power source voltage detected for a period between 13 milliseconds and 2 seconds) occurs, and it is automatically restarted after time guard time has passed. Also, momentary power failure detection signal is output during 10 seconds upon detection of momentary power failure.
Automatic recovery from power interruption (Option)	It is possible to restart automatically after recovery from a power interruption (or power source OFF) exceeding 2 seconds. **NOTE** • *It returns to the state immediately before the occurrence of power interruption. In case that the unit was stopped before power interruption, it remains stopped.* • *Since this function is optional, it is necessary to make the settings for the enabling of this function at the time of local installation.* • *Since there is the possibility that operation starts abruptly upon power ON, given the circumstances at the time of power OFF, be careful enough when enabling this function.*
Reverse prevention	The status of the three phases of power input is monitored, to prevent operation in reverse and open phase.

Item	Description
Anti-freezing for winter (Automatic pump operation)	In order to prevent freezing caused by a decrease of water temperature in winter or under other low ambient temperature conditions, pump operation order is output automatically. **NOTE** *Starting conditions can be selected locally from the 3 types below.* • *Water temperature under 15ºC (mainly for systems where the total pump head from the chiller unit to the load side is supported by a common pump. It protects the entire chiller and load side equipment)* • *Water temperature under 5ºC (mainly for systems where the head of chiller unit side and of load side are supported by separate pumps). It only protects the chiller unit side)* • *Disable function: When selecting "Disable function", other freeze prevention measures, such as extraction of water in winter or winding a heater around the heat exchanger are necessary. Refrigerant may leak if the water side heat exchanger freezes.*
Incorrect operation prevention	It is not possible to switch between remote and main unit control during operation of the chiller unit. An alarm is output with respect to such incorrect operation, and to wrong DIP switch settings. Also, an alarm is output to prevent danger, in case that an operation order is input from a remote when settings are for main unit control.
Demand control	Compressor operation can be limited by external signal input. Forced thermo OFF: Compressor is stopped forcedly during external signal input. Current limit function: Operation capacity is limited to make the running current lower than the setting value of current limit control, during external signal input. Limit value can be changed by local settings. Forced load-up: Load-up output is conducted forcedly during external signal input. Capacity hold: Capacity control is ignored forcedly during external signal input.
2 temperature setting	Cooling operation have 2 setting temperatures each, and it is possible to select which setting temperature is valid by external signal input. In case of operating with a different extraction temperature, such as heat storage or air conditioning, it is not necessary to change the setting temperature of the main chiller unit.
Forced load up from external contact	Forced load up is conducted during outdoor order (non-voltage a contact) input. It is possible to select whether "the pump shall stop" or "the pump can be kept working" in the event of a thermo OFF, when thermo OFF judgement at the main unit is enabled. (This function cannot be used when the function to control the number of units is used)
Information about overhaul period	Compressor operation time for preventive maintenance is monitored, and when it reaches the overhaul period, the "Overhaul mark" is shown on the LCD screen.
Disabling of remote stop alarm clear (Option)	It is possible to disable the release of alarms by remote stop order input. **NOTE** • *Normally, alarms can be released by stop control from either remote or the main unit.* • *Since this function is optional, it is necessary to make the settings for the enabling of this function at the time of local installation.*
Limit of waiting time for pump feedback (Option)	It is possible to determine pump interlock abnormality and output an alarm in case that no pump feedback signal is input after a certain amount of time has passed upon startup of the chiller unit. This time can be changed by local settings, between 1 and 30 minutes (in 1 minute steps). **NOTE** *The default feedback waiting time is "unlimited".*
Thermo OFF judgement delay (Option)	It is possible to delay the judgement time of thermo OFF to avoid immediate thermo OFF when water temperature reached thermo OFF judgement value due to fluctuations in the amount of cold water flow, caused by momentary variations in load or the activation of valves, etc. **NOTE** • *Since this function is optional, it is necessary to make the settings for the enabling of this function at the time of local installation.* • *Thermo OFF is produced when reaching operation limit temperature, even if being in judgement time.*

Item	Description
Thermo OFF judgement due to inlet temperature	It is possible to determine thermo OFF from the inlet water temperature (return temperature from load) of the chiller unit. It is possible to change the settings of thermo OFF temperature. **NOTE** *Since this function is optional, it is necessary to make the settings for the enabling of this function at the time of local installation.*
Preservation of alarm data	When an alarm occurs, the contents of the alarm, as well as the date and time of occurrence are recorded. The most recent 10 cases are stored, and then they are deleted from the oldest. Also, for the most recent 3 cases, the data of each sensor (right before occurrence, 10 seconds before and 20 seconds before) as well as data regarding each setting and operation conditions are stored, and it is possible to check them later on. This supports the early identification of the causes of alarm occurrence.
Water Temp Set	Setting is possible in 0.5ºC units.
Display	Main unit side LCD device: Displays the status of the chiller unit (Run, stop, contents of alarm, operating pressure and temperature, etc.) 7-Segment (for backup of the LCD): Displays the status of the unit and content of alarms with individual codes Pilot lamps: Lit on for power source: white, run: red, alarm: orange Remote display Outputs operation of the chiller unit, pump operation, alarm, warning and defrosting
Control of Master/ Slave group (Module Control) (Option)	When installing multiple units, operation as one entire heat system is possible by connecting each chiller unit through H-LINK. It is possible to connect a maximum of 8 units to one group. **NOTE** • *Since this function is optional, it is necessary to make the settings for the enabling of this function at the time of local installation.* • *An exclusive controller is not required, but optional parts may become necessary depending on the structure of the local system.*

2.1.1 Water control

Outlet water temperature of Chiller Unit is detected by Thermistor, and based on this value, compressor ON/OFF and the most suitable capacity is determined. Following shown the continuous capacity control and change of water temperature.



◆ Method of outlet temperature detection

1. Load-up I control at over 9°C (The capacity is changed a lot in order to approximate the target temp. quickly)
2. Load-up II control at 8~9°C (The capacity is changed moderately)
3. In neutral zone (6~8°C), load is balanced and performance is not changed.
4. Under neutral zone (below 6°C) load-down control is performed and performance is decreased.
5. Stop temp: Compressor is stopped at 5°C. The inlet temp of that time is saved.
6. When inlet temp becomes 2°C higher than that of at stop, re-start signal is output and unit is re-started after at least 3 min guard.

2.1.2 Water temperature control

1 Automatic temperature adjustment
Compressor run/stop and capacity control are performed by detecting water temperature of the chiller unit with thermistors.

Item / Model	Water Temp Set		ON/OFF Temperature Difference		Stop Temperature Range	
	Available range (ºC)	Step (ºC)	Setting range (ºC)	Step (ºC)	Setting range (ºC)	Step (ºC)
Water-cooled cooling only	4~30	0.5	0~4 Default: 2	1	0.5~2.0 Default: 1.0	0.5

NOTE

- *Return temperature range indicates the amount of change in inlet water temperature of the chiller unit to determine thermo ON after thermo OFF. (Temperature increases).*
- *It is possible to change settings locally depending on usage purpose, but since the necessary volume of water will change, change the settings only upon confirmation of the amount of the retained volume of water in the entire local system.*

	Output Cycle	Load up I Output time	Load up II Output time	Load down Output time
Setting range (Seconds)	10~120 (Default: 30)	10~120 (Default: 10)	2~120 (Default: 2)	2~120 (Default: 2)
Step (Seconds)	10	1	1	1

	Neutral Zone Range	Load up II range
Setting range (ºC)	1~5 (Default: 2)	1~3 (Default: 1)
Step (ºC)	1	1

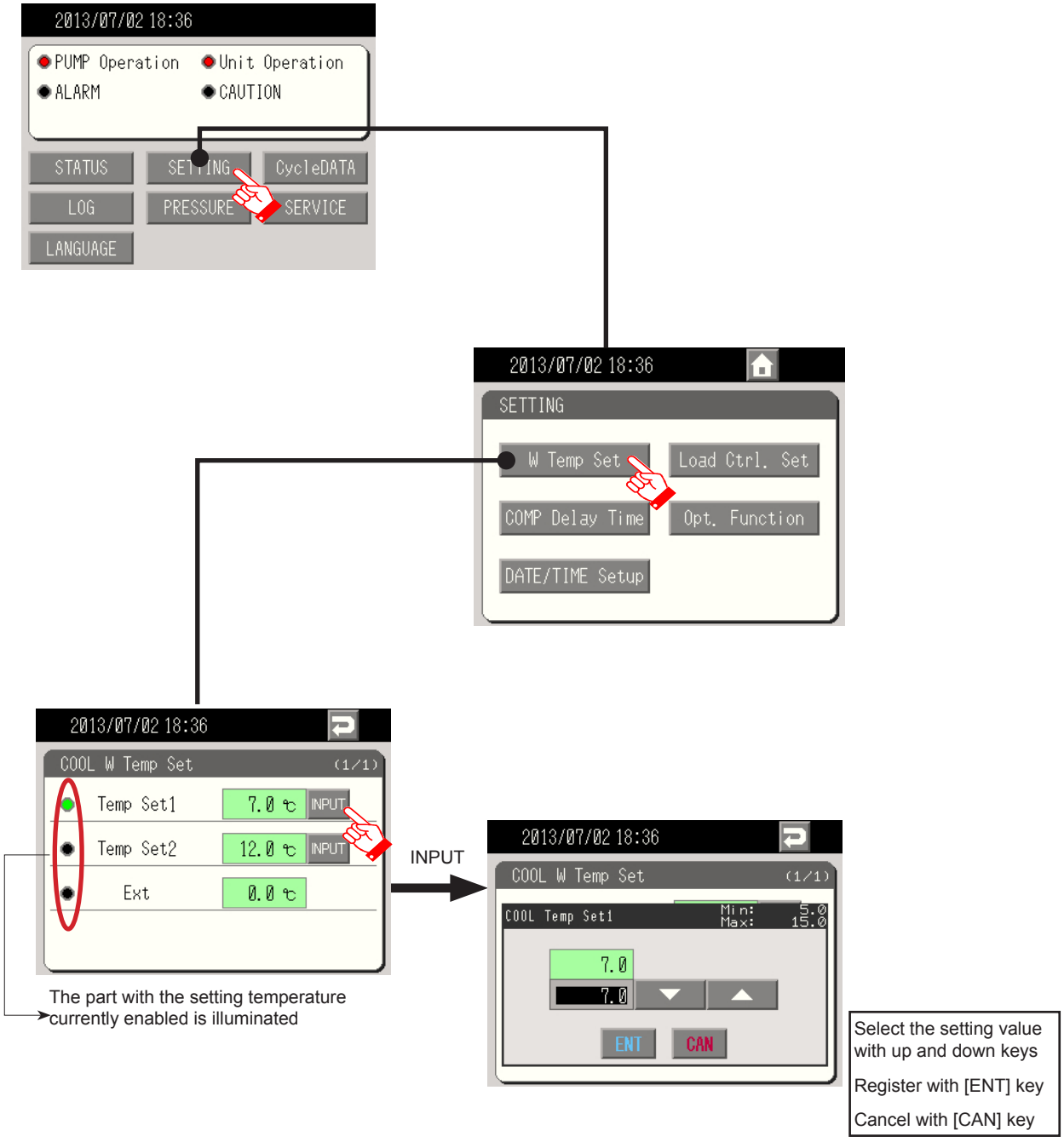
NOTE

- *Return temperature range indicates the amount of change in inlet water temperature of the chiller unit to determine thermo ON after thermo OFF. (Temperature increases).*
- *It is possible to change settings locally depending on usage purpose, but since the necessary volume of water will change, change the settings only upon confirmation of the amount of the retained volume of water in the entire local system.*

2

2 Method to change settings

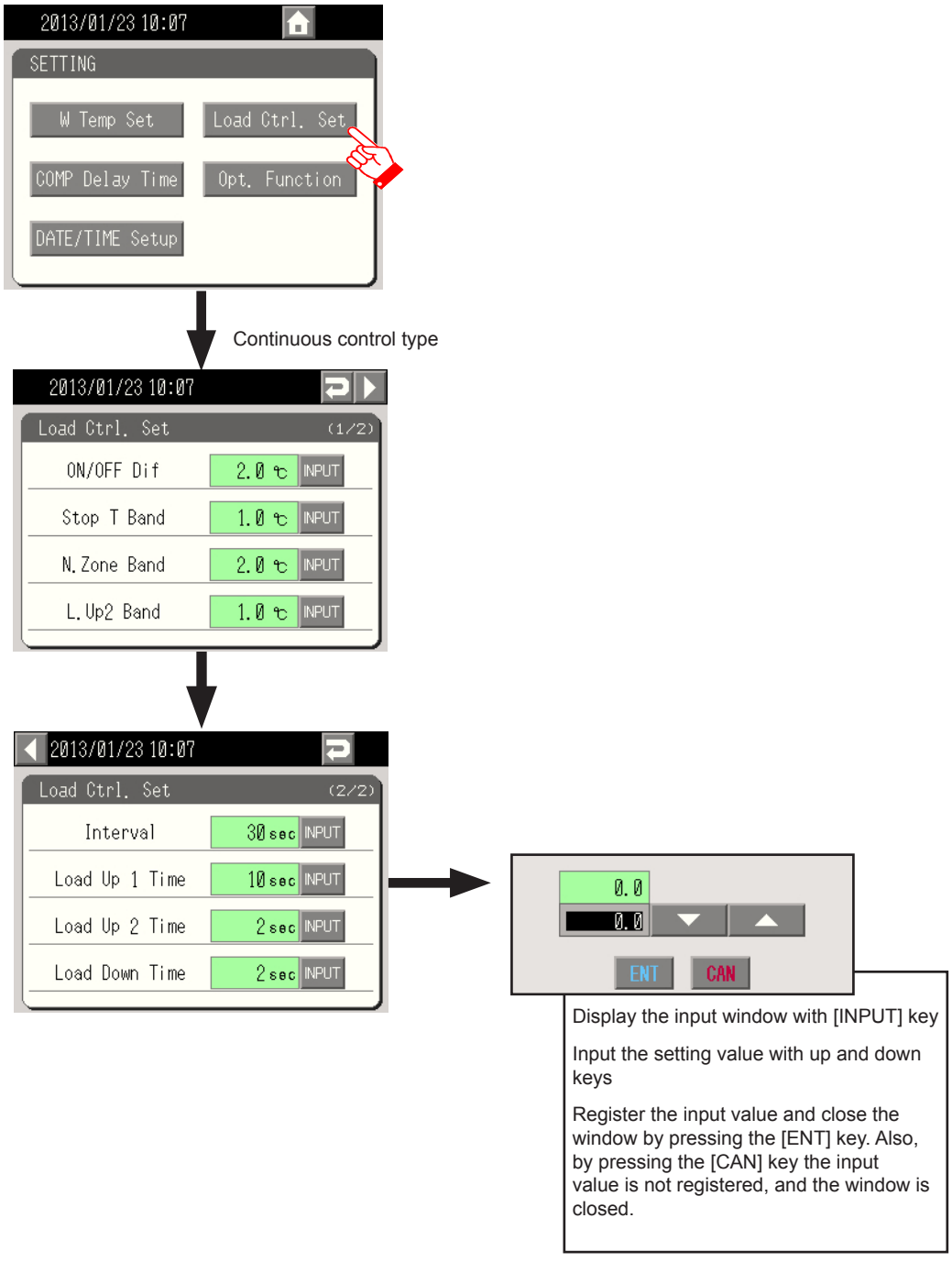
a. Water temperature settings



NOTE

- *[Set1]: This is the setting value of the master chiller unit, and water temperature control is normally performed against this setting value.*
- *[Set2]: This is the setting value when 2 temperature setting function is enabled (see "2.1.11 2-temperature setting function").*
- *[Ext]: The setting value from an external source is displayed, such as when (a slave unit) following the setting of the master units, or when connecting to a group controller.*

b. Setting of other water temperature control settings



Display the input window with [INPUT] key

Input the setting value with up and down keys

Register the input value and close the window by pressing the [ENT] key. Also, by pressing the [CAN] key the input value is not registered, and the window is closed.

2.1.3 Compressor Control

1 Startup control
The chiller unit receives an operation order, the cool water pump starts up, and after interlock is complete and compressor delay time (initial setting: 0.5 minutes) has passed, compressor is started up. In continuous control type, startup takes place in a state in which the slide valve is moved to the smallest load position.
Compressor delay time can be adjusted. change the setting value to one which is adequate for the local facilities, to avoid compressor startup before ensuring a sufficient cold water flow.

2 Normal
Operation is performed with the smallest load for 1 minute after compressor startup.
After finishing startup control, control is shifted to normal water temperature control.

3 Stop

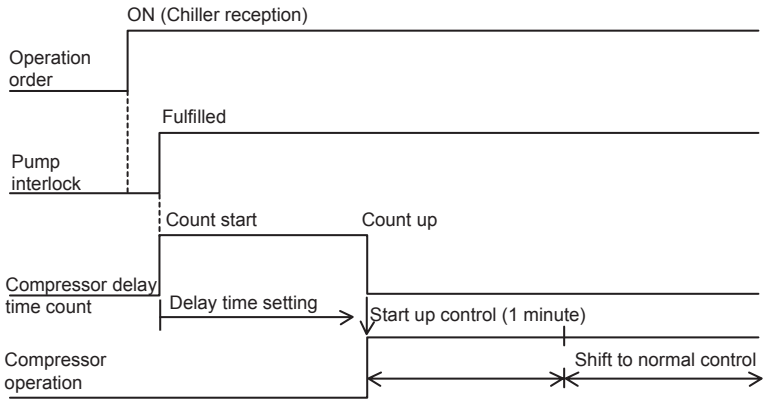
a. At Themo OFF

Continuous control type stops suddenly. At this time, the compressor sounds as if it was counter-rotating, due to the pressure differential between high and low pressure.

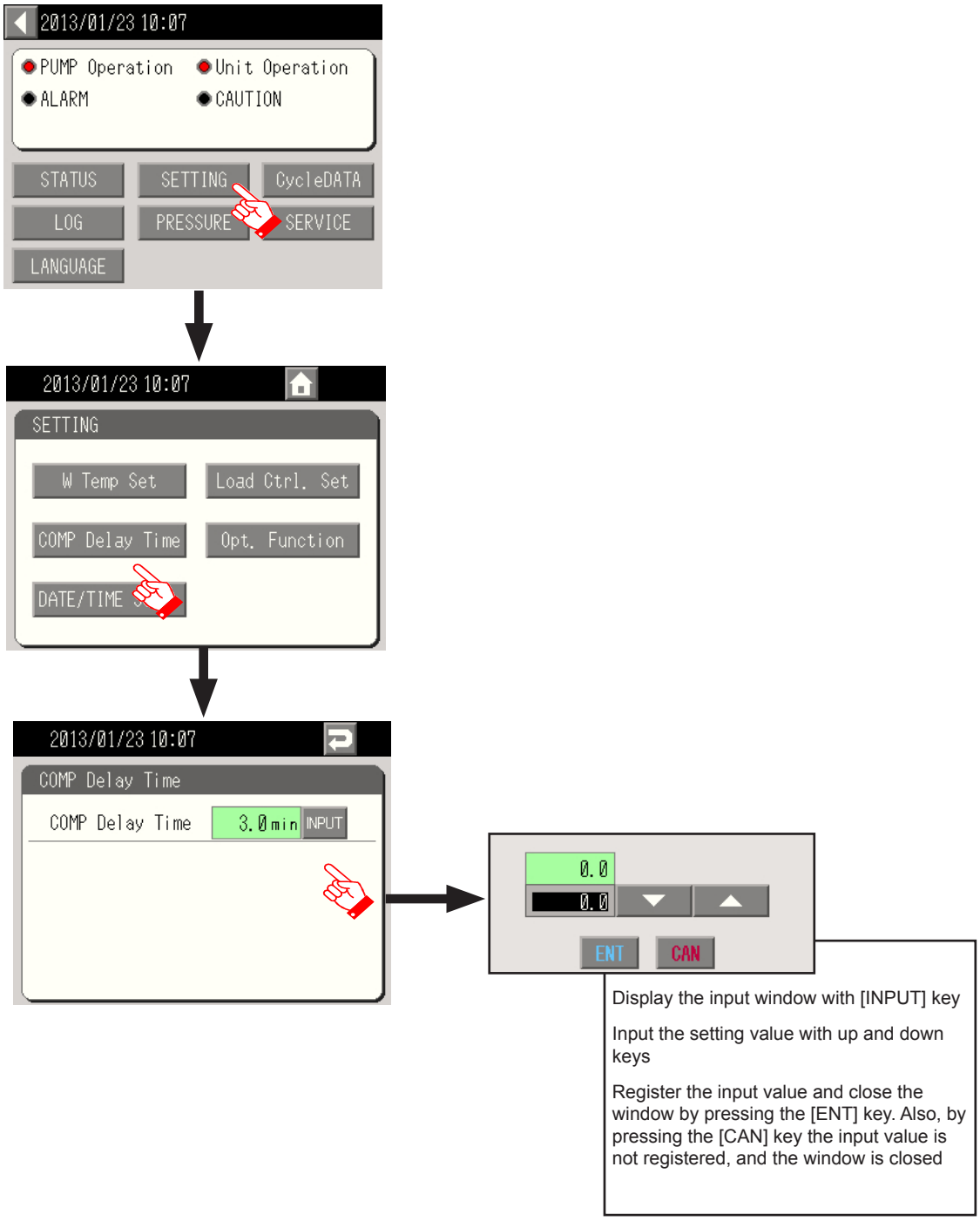
b. Upon alarm (including retry) · momentary power failure · reception of stop order

Stops suddenly. At this time, the compressor sounds as if it was counter-rotating, due to the pressure differential between high and low pressure.

Time chart



4 Setting method of compressor delay time



Display the input window with [INPUT] key

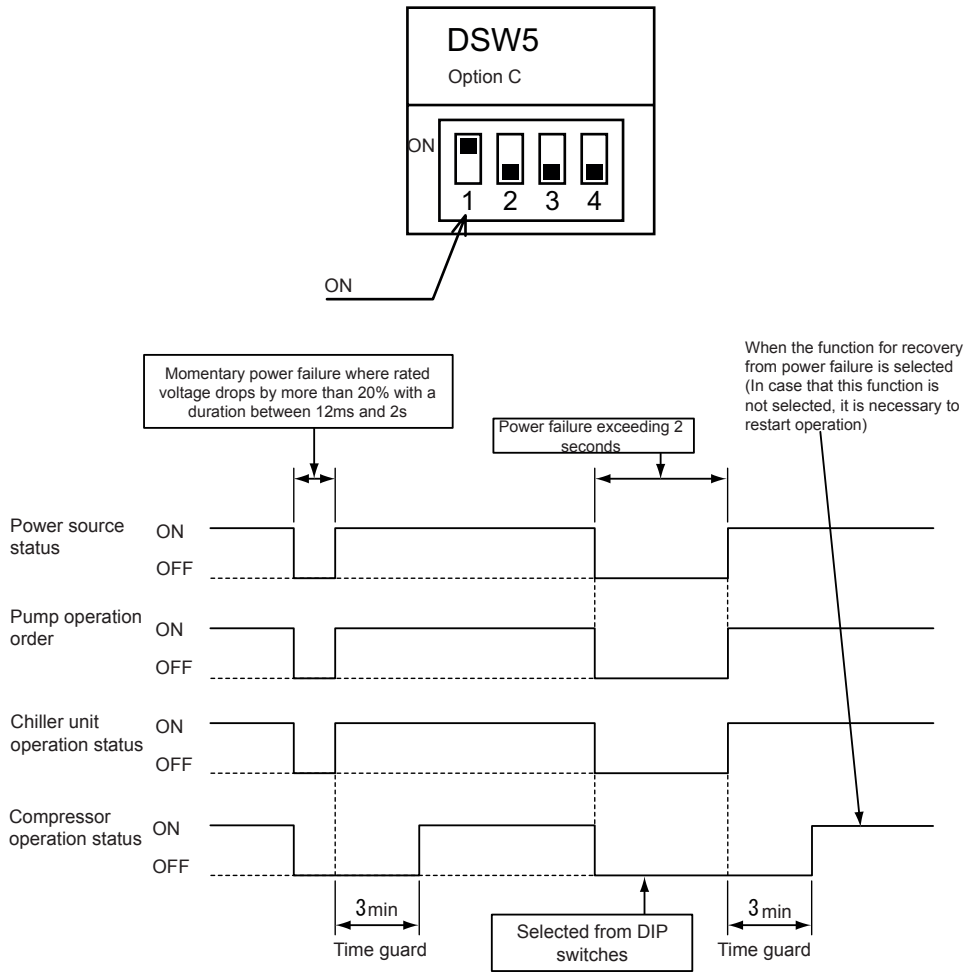
Input the setting value with up and down keys

Register the input value and close the window by pressing the [ENT] key. Also, by pressing the [CAN] key the input value is not registered, and the window is closed

2.1.4 Control for recovery from power interruption (Option)

When this function is enabled, even in the case of power interruptions exceeding 2 seconds in length, operation restarts automatically in the operation mode as before the power failure, once a 3-minute guard has passed. To enable this function, the DIP switch of option C on the settings PCB (PCB_A) (DSW5-1#) has to be set to ON.

◆ **Setting PCB (PCBA)**



NOTE

- *When this function is enabled, recovery upon restoration of the power supply returns to the state before the power interruption. In case that the chiller unit was in operation before the power interruption, it restarts upon recovery of the power source. Depending on the situation, this may lead to unintentional automatic startup of the chiller unit.*
- *The control for recovery from power interruption restarts in the same state as before the occurrence of the power interruption. Therefore, in case that the power interruption occurs while the unit is stopped, it remains stopped even upon recovery of the power source.*

2.1.5 Prevention of simultaneous startup

This function prevents simultaneous startup when supplying power to multiple units (in case that all modules are working individually, not in a master-slave group)

In case that multiple chiller units are installed, it may be thought that all of them will start operation simultaneously when 3 minutes have passed after entering in recovery from power interruption. (Note: When using the function to control the number of units, simultaneous startup is prevented by performing sequential startup automatically.) To prevent this phenomenon, it is possible to shift the settings of time guard (3 minutes).

◆ Setting method

By means of DIP switch setting (DSW3-1#, 3-2# ,3-3#), the following number of seconds are added to the time guard (3 minutes).

DIP switches (DSW3-1#, 3-2#, 3-3#) are used for address setting when using the functions to control the number of units, but the addition of time to the 3-minutes guard is effective even if these functions are not used. In this case, it is not necessary to connect transmission cables between each chiller unit.)

Unit No.	DSW3 (PCB_A)				Added time
	#1	#2	#3	#4	
1	OFF	OFF	OFF	OFF	0 s
2	OFF	OFF	ON	OFF	5 s
3	OFF	ON	OFF	OFF	10 s
4	OFF	ON	ON	OFF	15 s
5	ON	OFF	OFF	OFF	20 s
6	ON	OFF	ON	OFF	25 s
7	ON	ON	OFF	OFF	30 s
8	ON	ON	ON	OFF	35 s

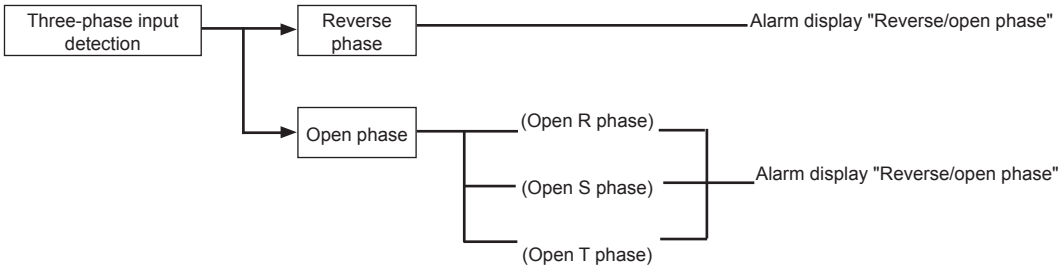
Example: When setting 2 chiller units as unit 1 and unit 2, upon recovery from momentary power interruption unit 1 restarts after 3 minutes and unit 2 restarts after 3 minutes and 5 seconds.

NOTE

Power reactivation needed

2.1.6 Reverse prevention control

The state of three-phase input is detected in this chiller unit, and it does not operate in case of reverse or open phase.

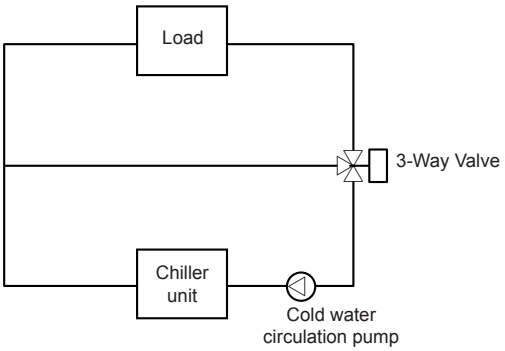


2.1.7 Anti-Freezing Control for Winter

When operation is stopped during winter, the temperature of cold water decreases and may induce freezing of the water-side heat exchanger or the piping system. The outdoor temperature and cold water temperature are detected, to operate the cold water circulation pump automatically, and protect the chiller unit from freezing.

There are 2 modes to define the run/stop conditions of the cold water circulation pump. Select the most appropriate mode depending on the system structure and usage purpose.

1 Mode I (Factory default)
Mode I is used mainly for systems composed of 1 chiller unit, or those with fixed flow. Since the entire water circuit is protected, the cold water pump is operated from a comparatively high water temperature.
Example of system where Mode I is recommended

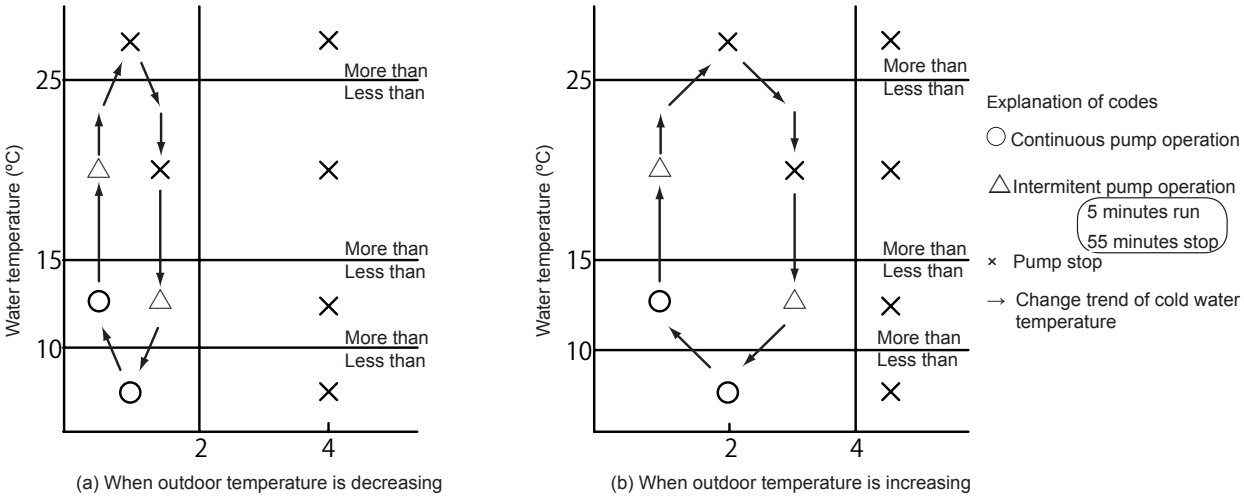


a. When outdoor temperature is under 2ºC

When outdoor temperature falls under 2ºC, the operation order of cold water circulation pump is output, and the continuous operation of the cold water pump starts automatically. Here, when cold water temperature becomes higher than 15ºC, operation becomes intermittent, with the pump running for 5 minutes, then stopped during 55 minutes. When cold water temperature rises even further, above 25ºC, the cold water circulation pump operation order output is set to OFF.

b. Automatic release of anti-freezing operation

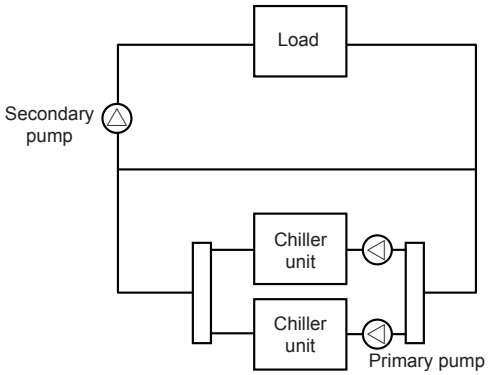
This operation is released when outdoor temperature becomes higher than 4ºC.



Explanation diagram of automatic operation control of the pump to prevent freezing in winter (Mode I)

2 Mode II

Mode II is used mainly for systems containing multiple chiller units, or those with variable flow. To avoid alteration of the water temperature of the rest of chiller units in operation, the pump is operated with a low water temperature.



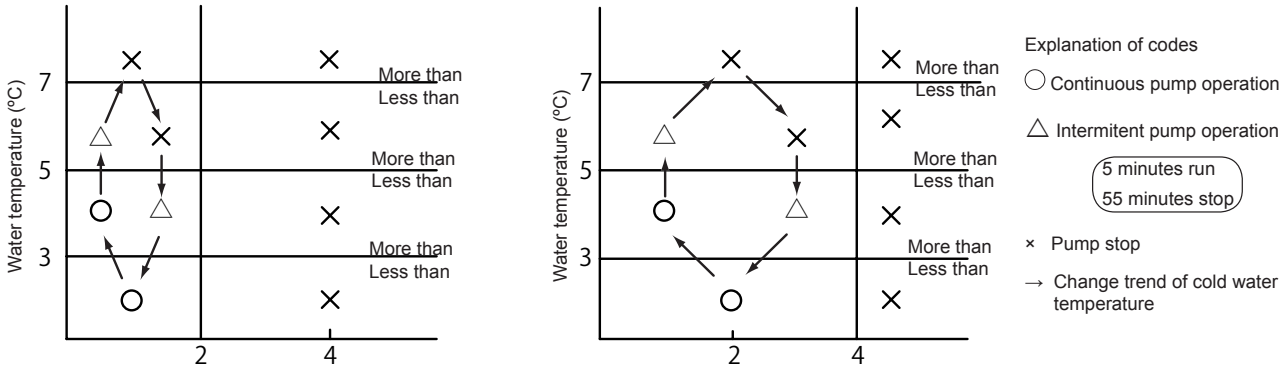
a. When outdoor temperature is under 2ºC

When outdoor temperature falls under 2ºC, the operation order of the pump is output, and the continuous operation of the cold water circulation pump starts automatically. Here, when cold water temperature becomes higher than 5ºC, operation becomes intermittent, with the pump running for 5 minutes, then stopped during 55 minutes.

When cold water temperature rises even further, above 7ºC, the pump operation order output is set to OFF.

b. Automatic release of anti-freezing operation

This operation is released when outdoor temperature becomes higher than 4ºC.

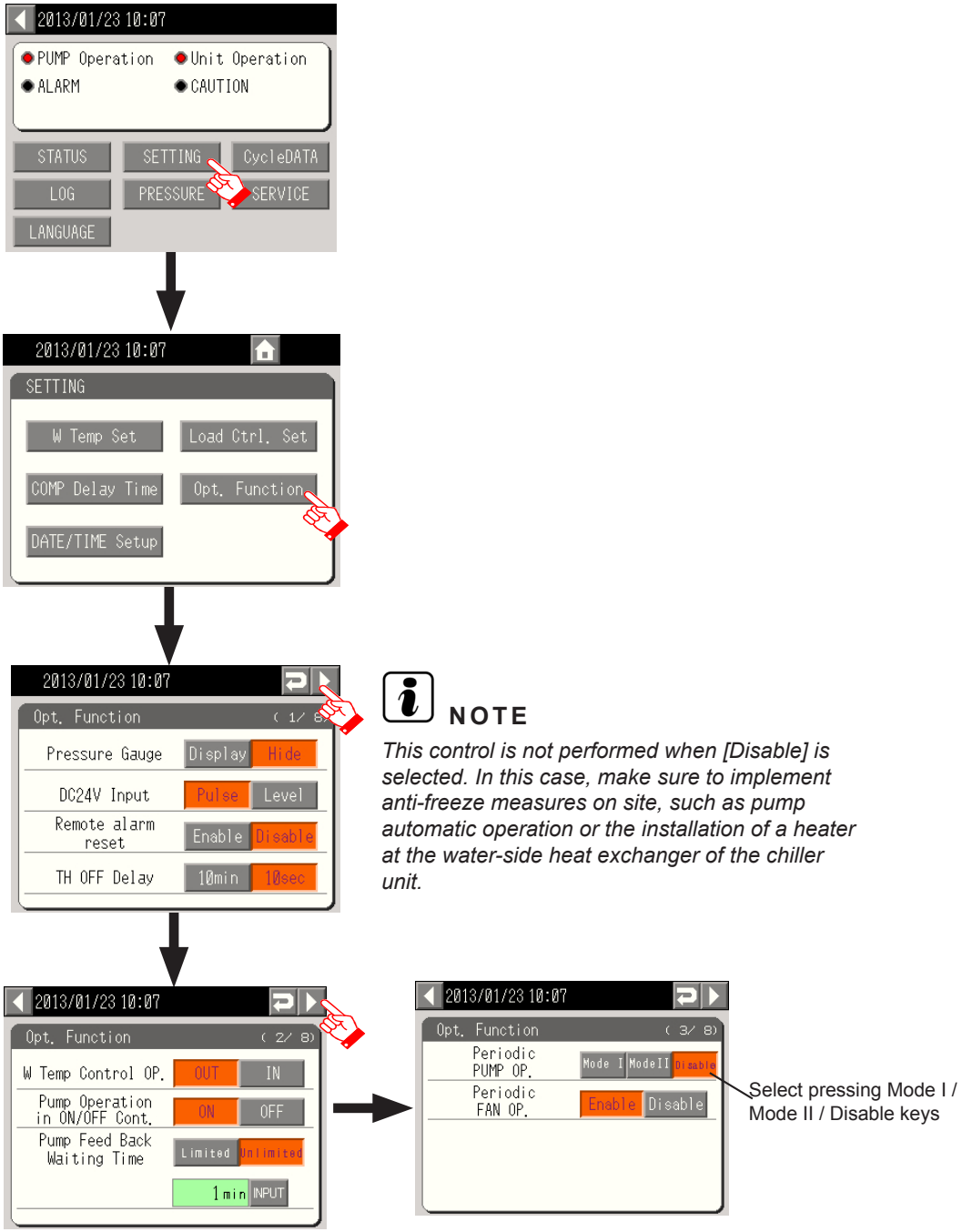


Explanation diagram of automatic operation control of the pump to prevent freezing in winter (Mode II)

NOTE

When the outdoor temperature of the cold water circulation system is lower than that of the installation place of the chiller unit itself, then it is necessary to install a separate outdoor temperature thermostat in the place with the lowest temperature, and connect it in parallel with the operation order circuit of the pump.

◆ Mode selection method



NOTE

This control is not performed when [Disable] is selected. In this case, make sure to implement anti-freeze measures on site, such as pump automatic operation or the installation of a heater at the water-side heat exchanger of the chiller unit.

2.1.8 Control for prevention of wrong operation and wrong settings

In the following cases, an alarm is output as wrong operation.

1 Wrong activation of the operation controls
A wrong operation alarm is displayed when there is a remote input (including external thermo signal) while the unit is stopped, regardless of "local/remote switch" being switched to local (local operation mode). Also, while on remote operation mode, even if there is a local input (run switch on the control display part of the main unit) while the unit is stopped, it is ignored and no alarm is displayed.

2 Wrong local/remote activation
When switching the operation mode from local to remote, or from remote to local, using the "local/remote switch" while the chiller unit is in operation, the chiller unit is stopped and a wrong operation alarm is displayed.

3 Wrong setting of DIP switches
A wrong setting alarm (40-40) is displayed upon power ON in case that DIP switches are set to an impossible setting.

2.1.9 Demand control

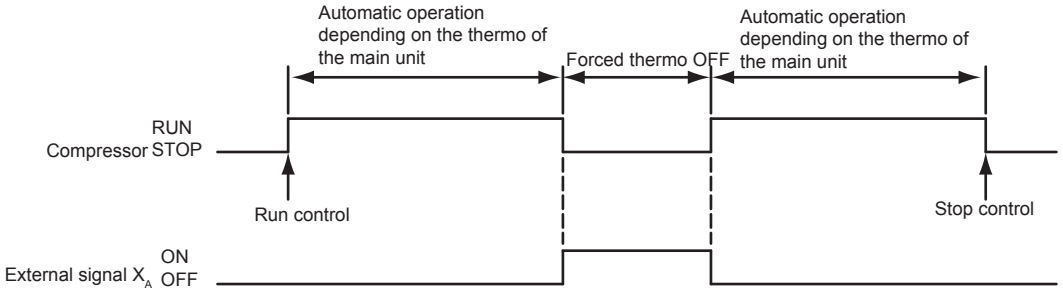
It is a control that allows to cause a forced thermo OFF of the chiller unit with orders from the local control panel (by means of peak cut, etc.) or to restrain the maximum limit of compressor operating capacity. Since it also allows to force a change of the operation capacity, in response to the load of the facility, it is a convenient function to perform temperature control from the local control panel.

◆ Forced thermo OFF function

a. Contents of activation
When it is required to stop the compressor temporarily, output that order through the relay contact.
When this signal is received, the chiller unit forces the compressor to stop, and it becomes thermo OFF status. (The operation of the cold water pump continues)

Also, when this order is released, the main unit returns to normal operation by thermo ON.

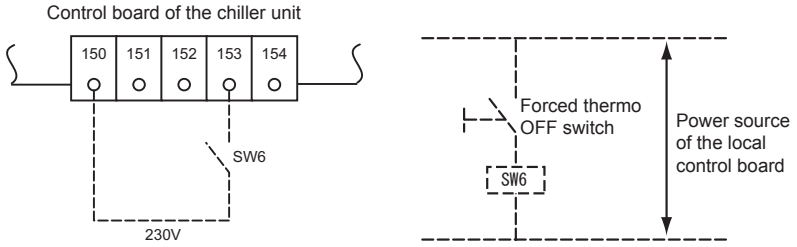
b. Time chart



NOTE

In case of using the function to control the group (Master/Slave), forced thermo OFF order only applies to the chiller units that have received it. When using this function, arrange the wiring to all the chiller units.

c. Wiring method
Arrange wiring as shown below.



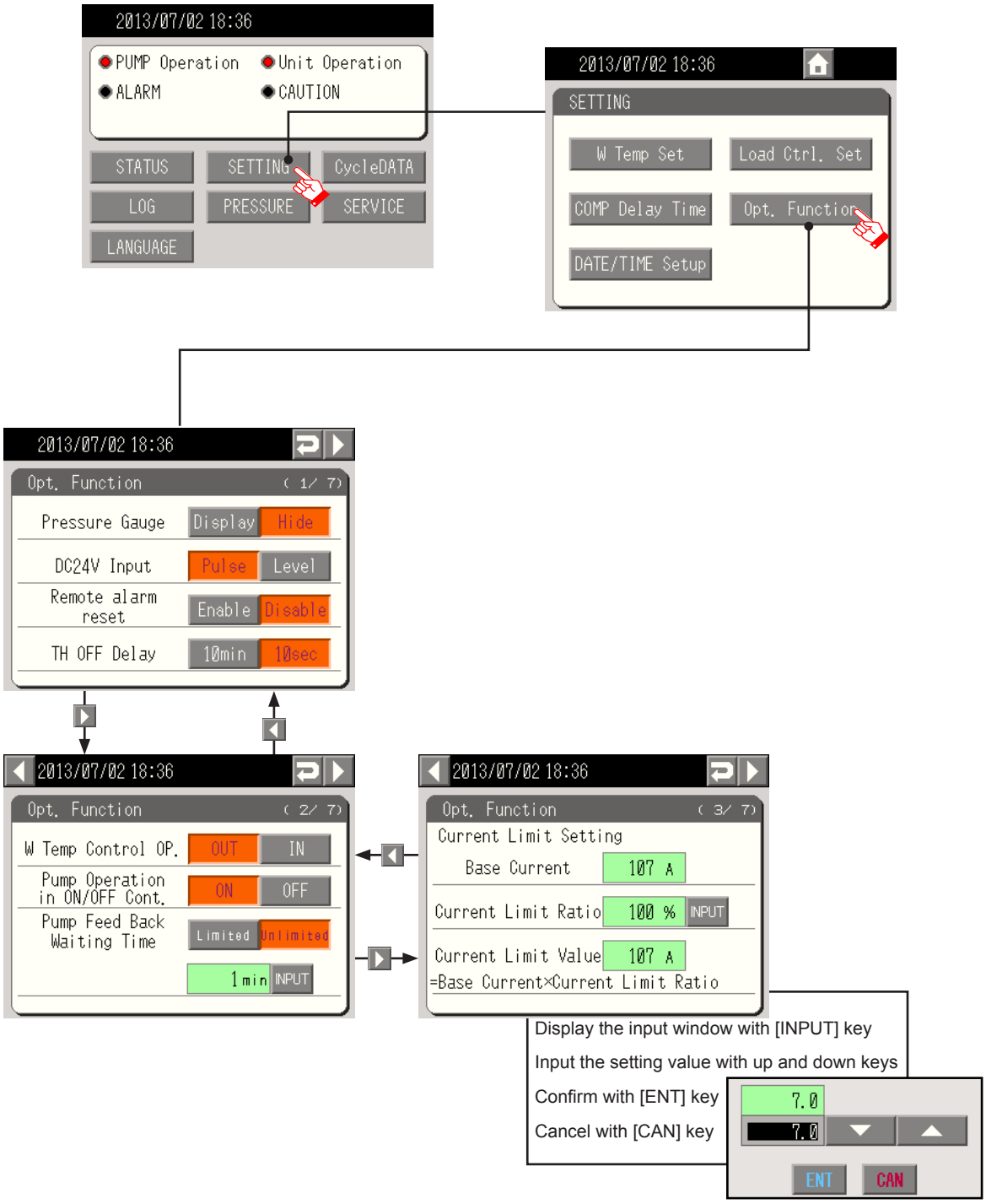
◆ Current limit function (Power demand control)

a. Contents of activation

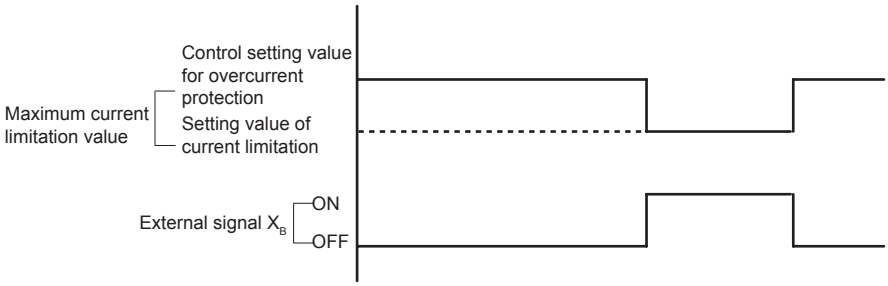
It is possible to operate below a maximum current limitation ratio previously set at the LCD screen. The selection to enable or release the setting value is performed with the order signal from the local control board.

Also, the overcurrent protection control is always enabled, even in a state where this function is disabled.

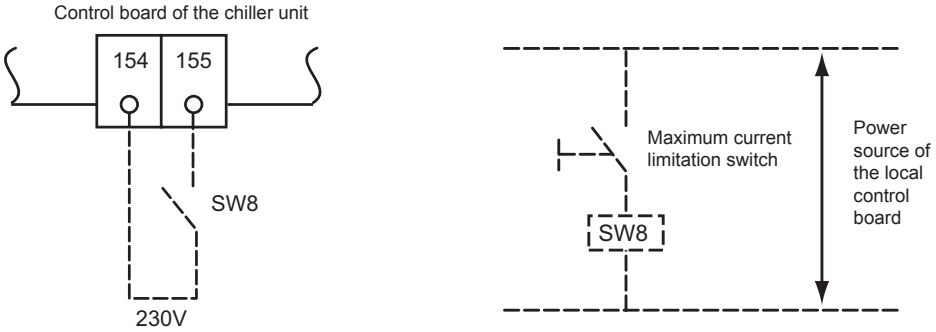
b. Setting method when cooling mode is set



c. Time chart



d. Wiring method



NOTE

- *When using the function to control the number of units (however excluding the connection to group controller), arrange the wiring to unit no.1 (master unit). This function becomes enabled in all the units when inputting the signal to unit no.1 (setting value is also common with the setting value of unit no.1), Signal input to chiller units with address settings between unit no.2 and 8 are invalid.*
- *In case of connection to a group controller, the valid enabling and setting value orders are those sent from the group controller. Signal input to the main unit of the chiller unit and its setting values are invalid.*

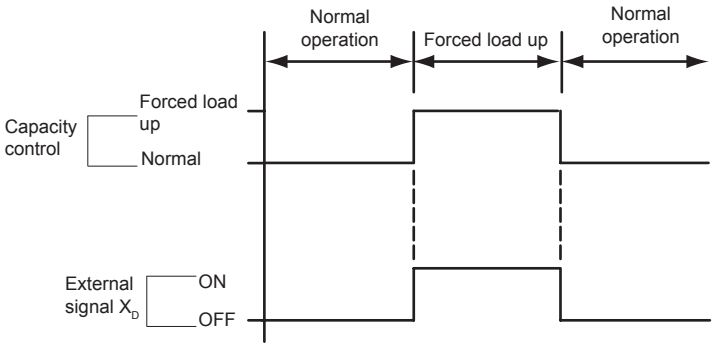
2.1.10 Forced load up capacity control from external signal

It is possible to force load up according to usage purpose.

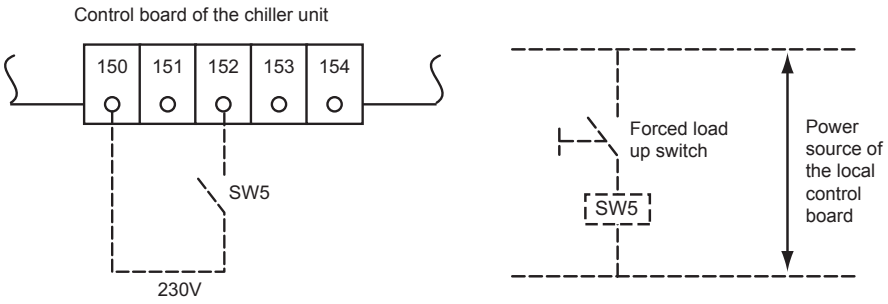
a. Contents of activation

It is possible to force load up from the orders of local control panel.

b. Time chart



c. Wiring method



NOTE

- *Thermo OFF judgement, protection devices and protection control from the setting temperature of the main unit are always enabled, and this control gives them priority.*
- *When using the function to control the number of units (however excluding the connection to group controller),arrange the wiring to unit no.1 (master unit). This function becomes enabled in all the units when inputting the signal to unit no.1.*
- *In case of connection to a group controller, the valid orders are those sent from the group controller. Signal input to the main unit of the chiller unit is invalid.*

2.1.11 2-temperature setting function

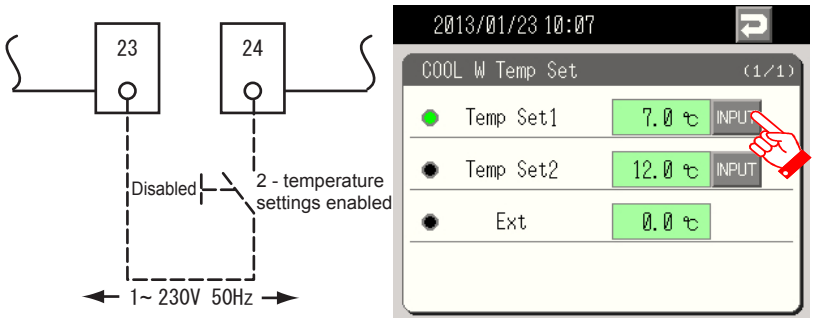
Regarding to the temperature setting of water temperature control, it is possible to set 2 different temperatures, and select which of these to be used as a setting temperature by means of a remote signal.

This change is useful to cope with differences of load in usage, such as those between day and night operation.

◆ Measurement method

Install the switch for exchanging the 2 temperatures between terminals [23] and [24].

When [23]-[24] are short-circuited, the mark next to "Temp Set2" on the water temperature setting screen is illuminated, to indicate that the 2 temperature setting has become enabled.



NOTE

- *Before operating the chiller unit, select which temperature to use as setting temperature from the 1st and the 2nd (switch selection), then operate the chiller unit (it is possible to switch during operation, but it may cause instability of the operation, such as instant thermo OFF, etc.)*
- *When using the function to control the number of units (however when not connected to a group controller), wire to unit 1 (master unit). The setting becomes enabled in all the units when input to unit 1.*
- *In case of connection to a group controller, the valid orders are those sent from the group controller. Signal input to the main unit of the chiller unit is invalid.*

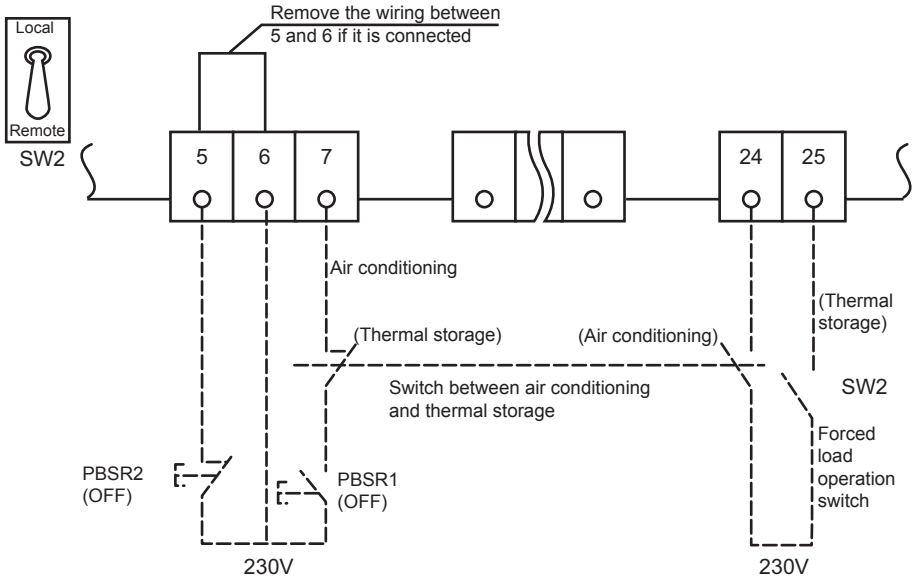
2.1.12 External thermo operation from external contact

In case of setting the chiller unit to run/stop with the order of an external contact such as that of a (locally supplied) external thermo, capacity control function is disabled and operation is performed at 100% load. This function is mainly oriented to thermal storage operation.

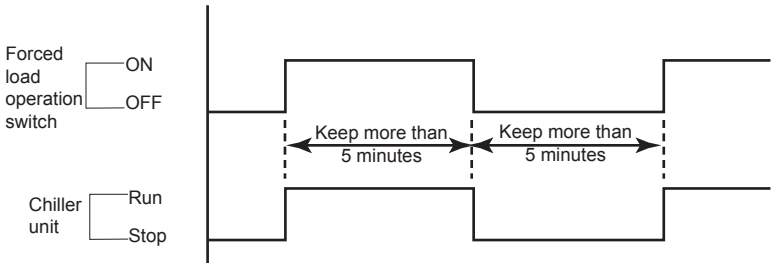
It is not possible to use this function together with the function to control the number of units.

◆ Setting method

1 Set the local/remote switch (SW2 on PCBa) to remote side.
2 Connect the forced load operation switch to [24]-[25] of terminal block.
3 The wiring side used together by normal remote operation (air conditioning operation) and forced load operation (thermal storage operation) is shown.



◆ Time chart



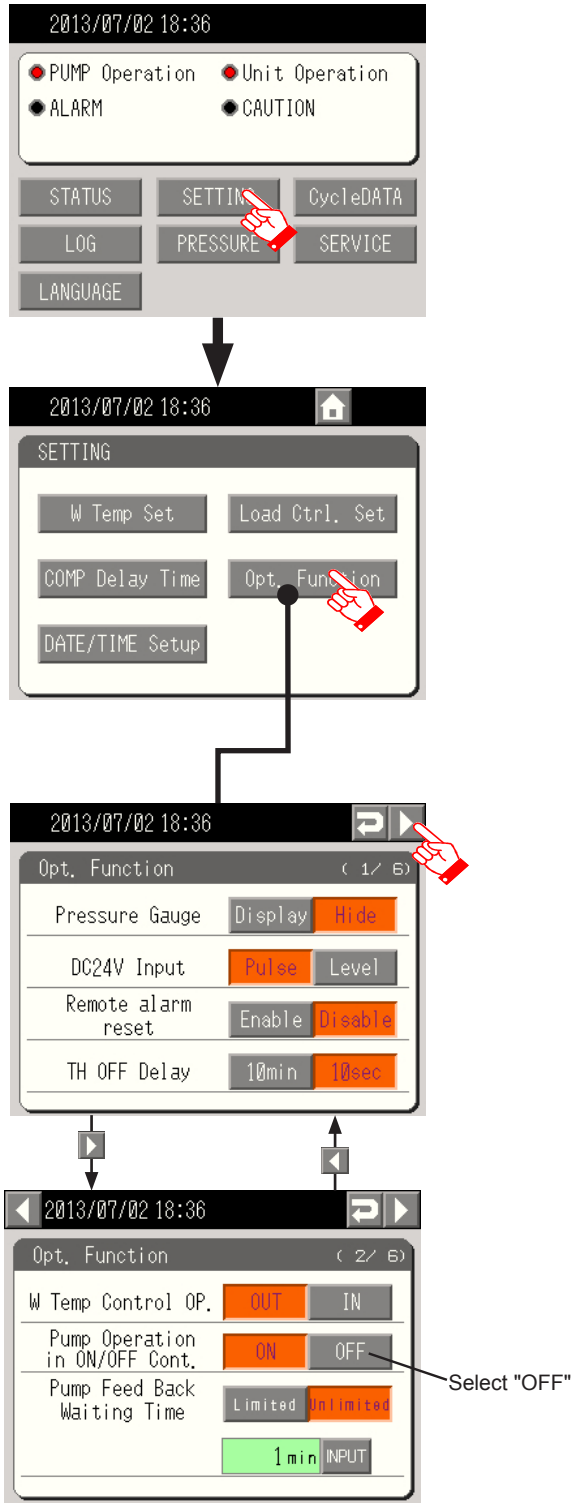
NOTE

- *Forced load run/stop from local external contact cannot be performed by pulse signal.*
- *Normal operation order and thermal storage order must be input to the chiller unit separately.*
- *For local external contact orders, ensure a minimum interval of 5 minutes of continuous operation order (5 minutes of stop time, too).*
- *For the additional wiring, put it separately inside a metallic pipe, or use a shielded wire.*
- *Always operate the air conditioning/thermal storage switch while the chiller unit is stopped.*

Thermo OFF temperature of the main unit remains enabled even during forced load operation. When performing thermal storage from an external thermo, set the external thermo to activate before the thermo OFF temperature of the main unit. In case of stop by thermo OFF temperature of the main unit, operation restarts automatically.

When performing thermal storage from the main unit thermo, it is possible to prevent restart by turning the pump OFF with optional function "Pump operation in ON/OFF Cont.".

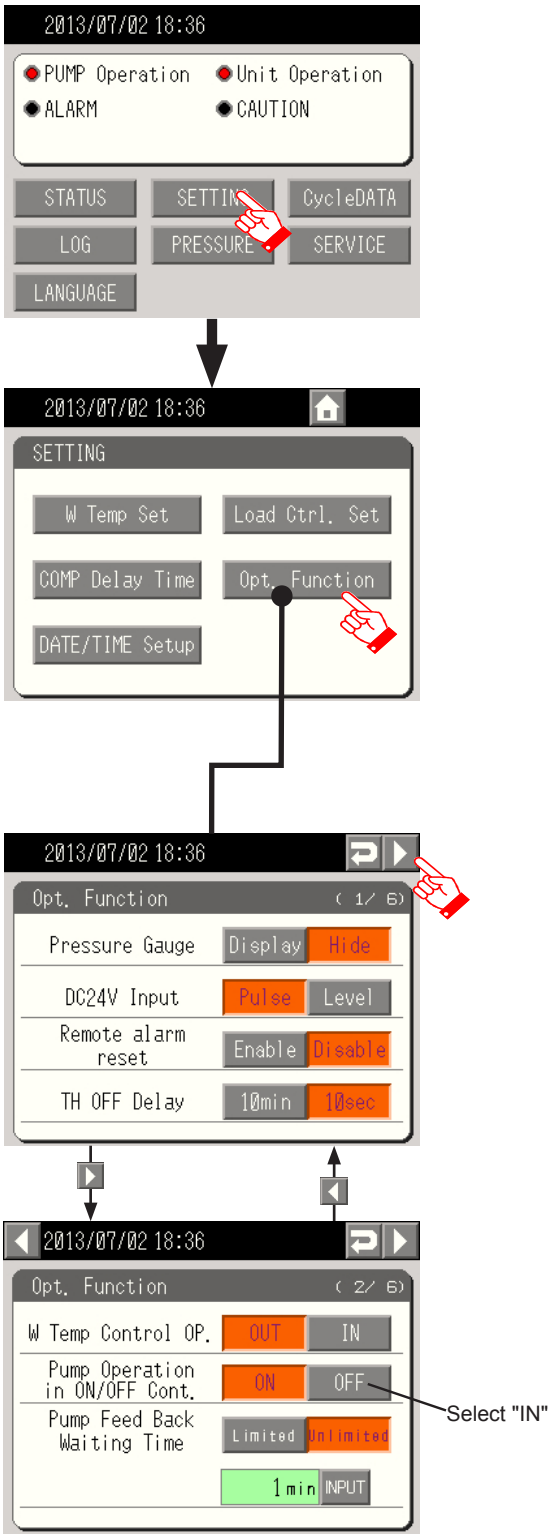
◆ Setting method



2.1.13 Water Temperature of the Control Target

It is possible to select which water temperature to use for capacity control and thermo OFF judgement, either "Inlet" or "Outlet". Use the outlet water temperature (factory default setting) in normal conditions.

◆ **Setting method**



2.1.14 Operation from DC24V contact input

◆ Outline

The procedure to control operation from the DC24V contact of the local central controller is shown below.

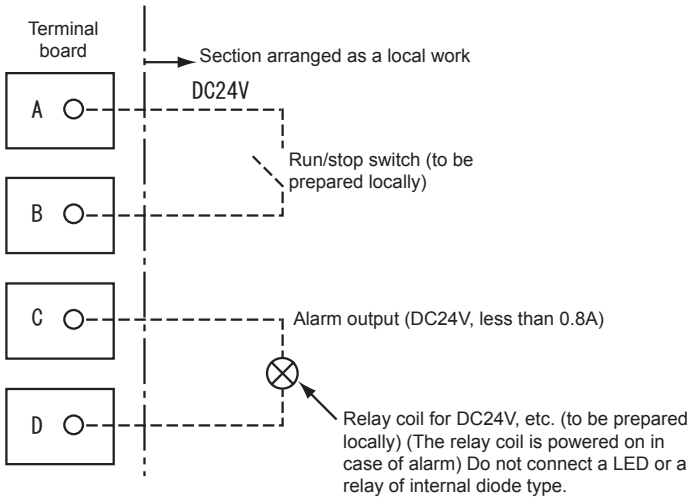
- Level input
- Pulse input (1 switch)
- Pulse input (2 switches)

Arrange the settings and additional wiring necessary for each of them, as shown in the following sections. Available only in remote mode during independent operation of the chiller unit.

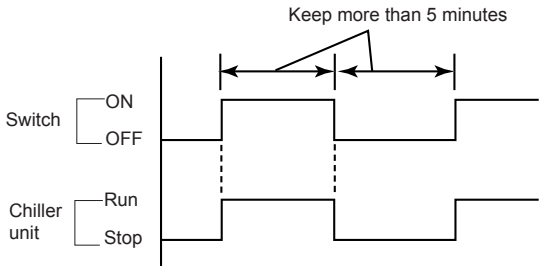
◆ Level input

a. Signal aspect and basic sequence

For wiring



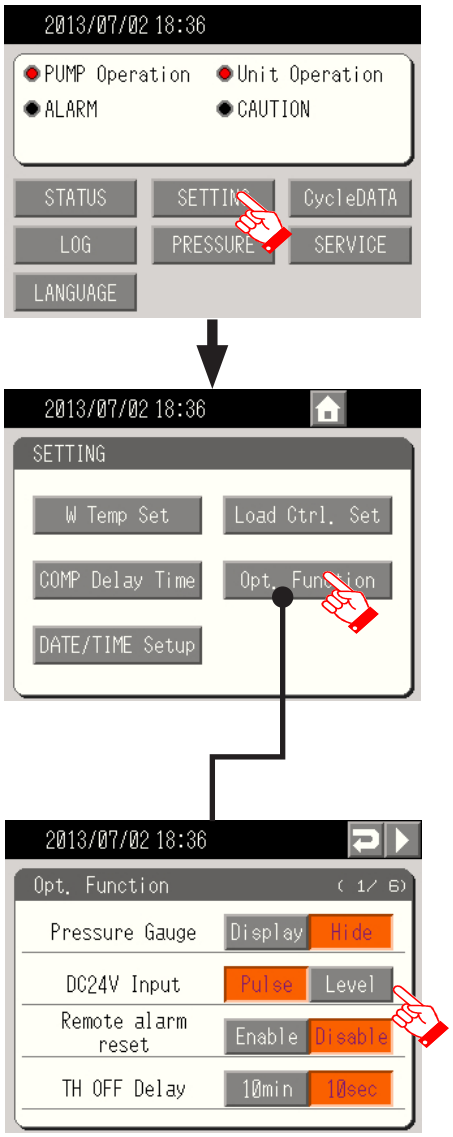
Time chart



NOTE

Level input indicates a continuation of switch ON status when the system is in operation as shown in the diagram above.

b. Setting method



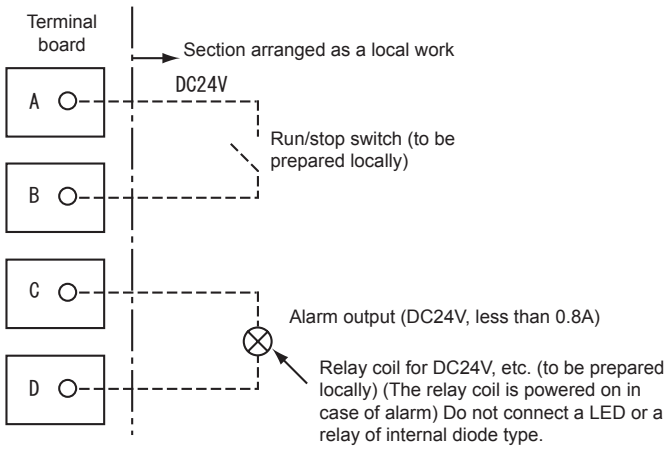
NOTE

- *Do not bundle the additional wiring together with other control circuits, and in particular with wiring for 230V or 400V.*
- *Put the additional wiring separately inside a metallic pipe, or use a shielded wire.*

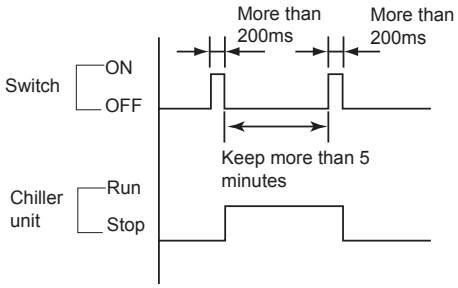
◆ Pulse input type 1

a. Signal aspect and basic sequence

For wiring



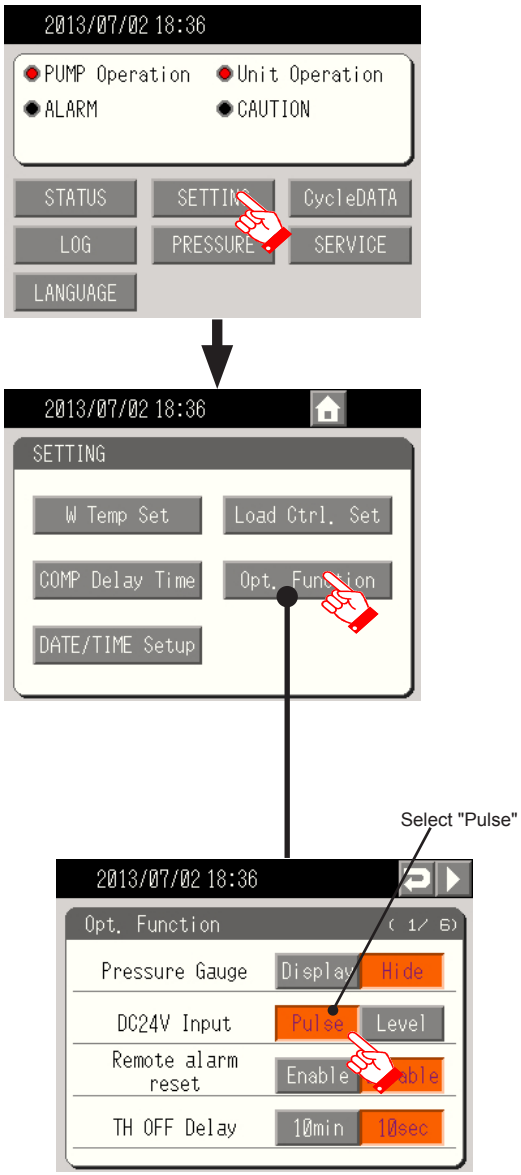
Time chart



NOTE

Pulse input indicates an ON input of the same switch when changing the status of the chiller unit, as shown in the diagram above.

b. Setting method



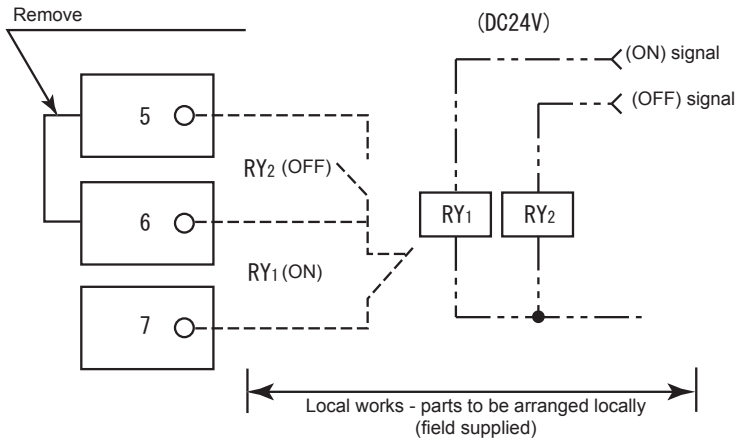
NOTE

- *Do not bundle the additional wiring together with other control circuits, and in particular with wiring for 230V or 400V.*
- *Put the additional wiring separately inside a metallic pipe, or use a shielded wire.*

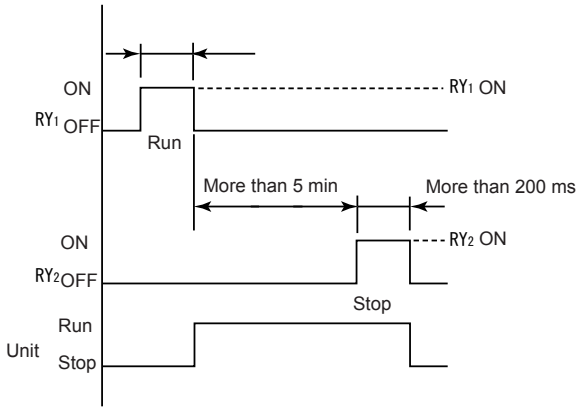
◆ Pulse input type 2 (external DC24V source)

a. Signal aspect and basic sequence

For wiring



Time chart



b. Setting method

Since it applies remote control, it is not required to change any settings at the LCD screen.

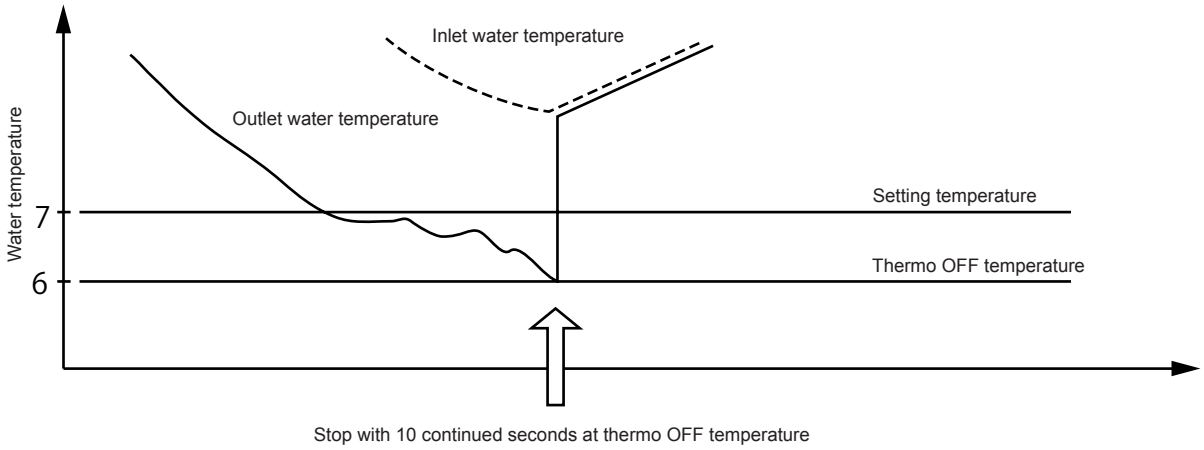
NOTE

- *Do not bundle the additional wiring together with other control circuits, and in particular with wiring for 230V or 400V.*
- *Put the additional wiring separately inside a metallic pipe, or use a shielded wire.*

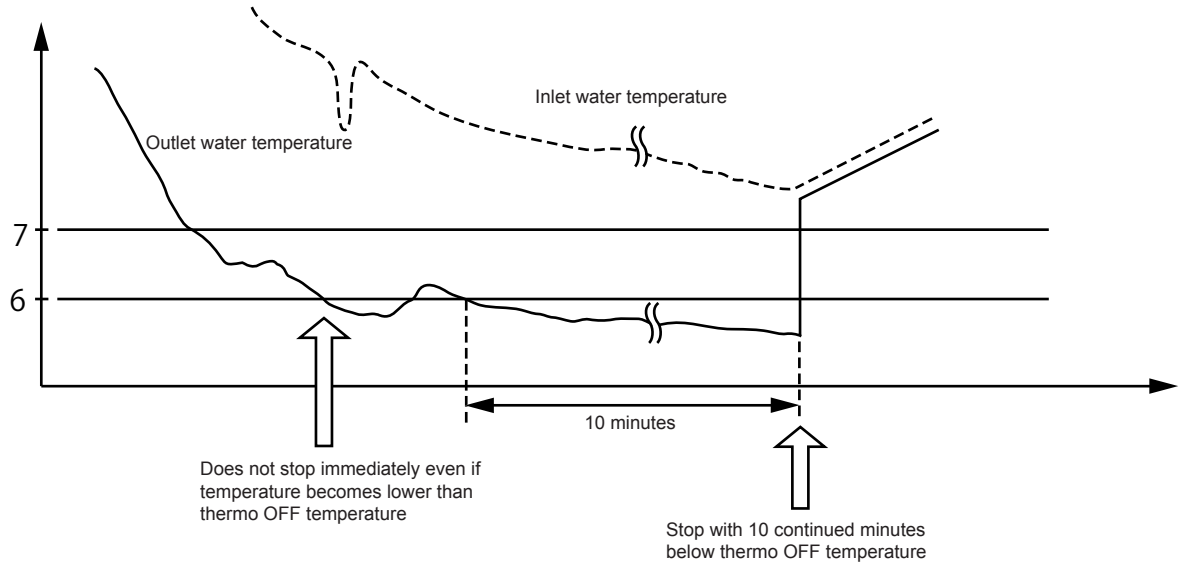
2.1.15 Thermo OFF function selection

This function prevents thermo OFF of the chiller unit due to sudden changes of temperature or flow.

Example of standard settings:

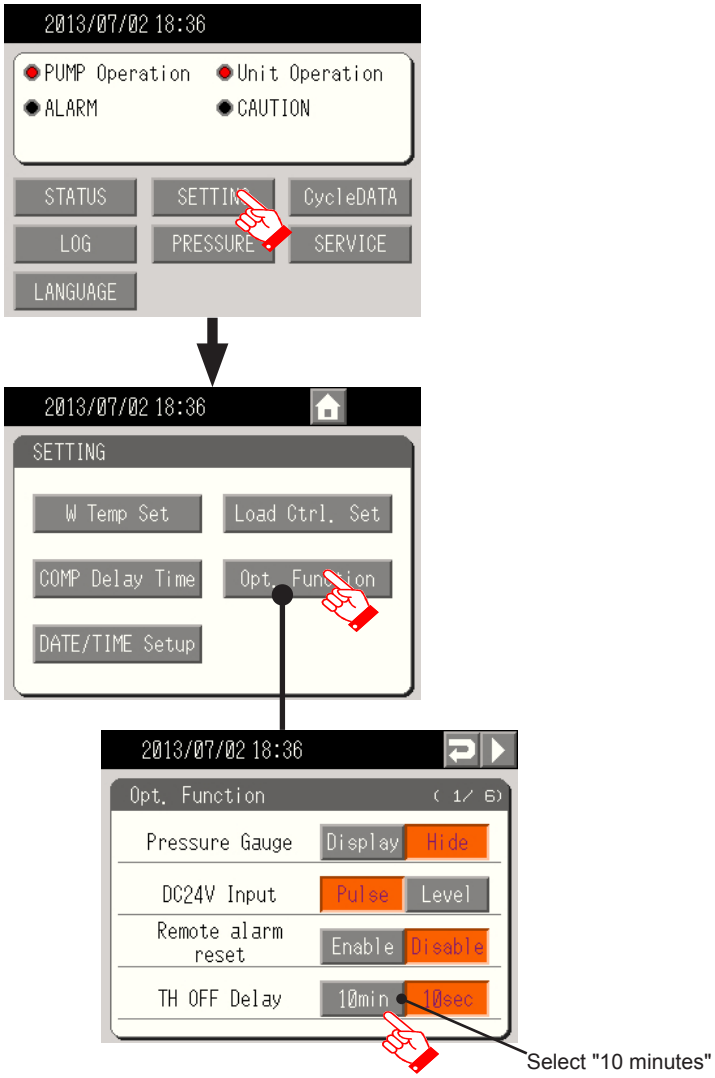


Example of thermo OFF judgement extension



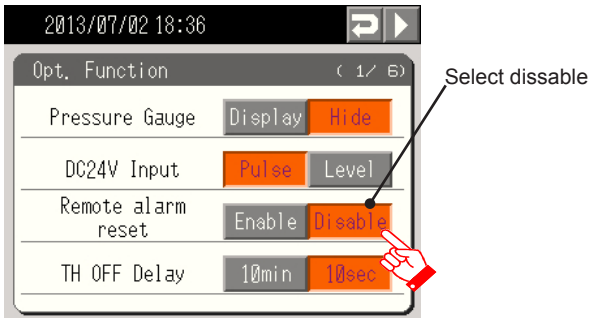
This function is used in cases in which the water flow is reduced temporarily, such as when opening and closing the valves installed in the water piping system, or when switching the number of cold (hot) water circulating pumps in operation. However, in case that water temperature reaches the limit of the working range, thermo-OFF occurs even within 10 minutes.

◆ **Mode selection method**



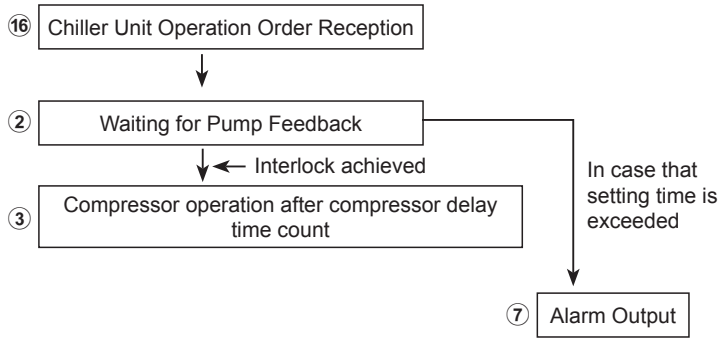
2.1.16 Selection of enabling/disabling of alarm release by means of remote stop

The release of an alarm in case that the chiller unit has stopped due to an alarm is achieved by stop control (it is possible to stop both from the stop button of the main unit or from remote stop control). But it is possible to configure this alarm release to make it valid only from the stop button on the main unit (alarm cannot be released by remote stop control). This function is valid for places where there is a remote device for automatic stop order when an alarm is emitted.



2.1.17 Limitation setting for pump feedback waiting time

Flow at the start of operation of the chiller unit



The flow in the upper figure is followed upon start of operation of the chiller unit.

The state of ② is kept in case that there is no input of pump feedback signal between ② and ③, or when the difference between inlet and outlet temperature of cold water is too large. This function shifts to ⑦ "Alarm" in case that the state of ② continues for a certain amount of time.

Initial value for the standard specification:

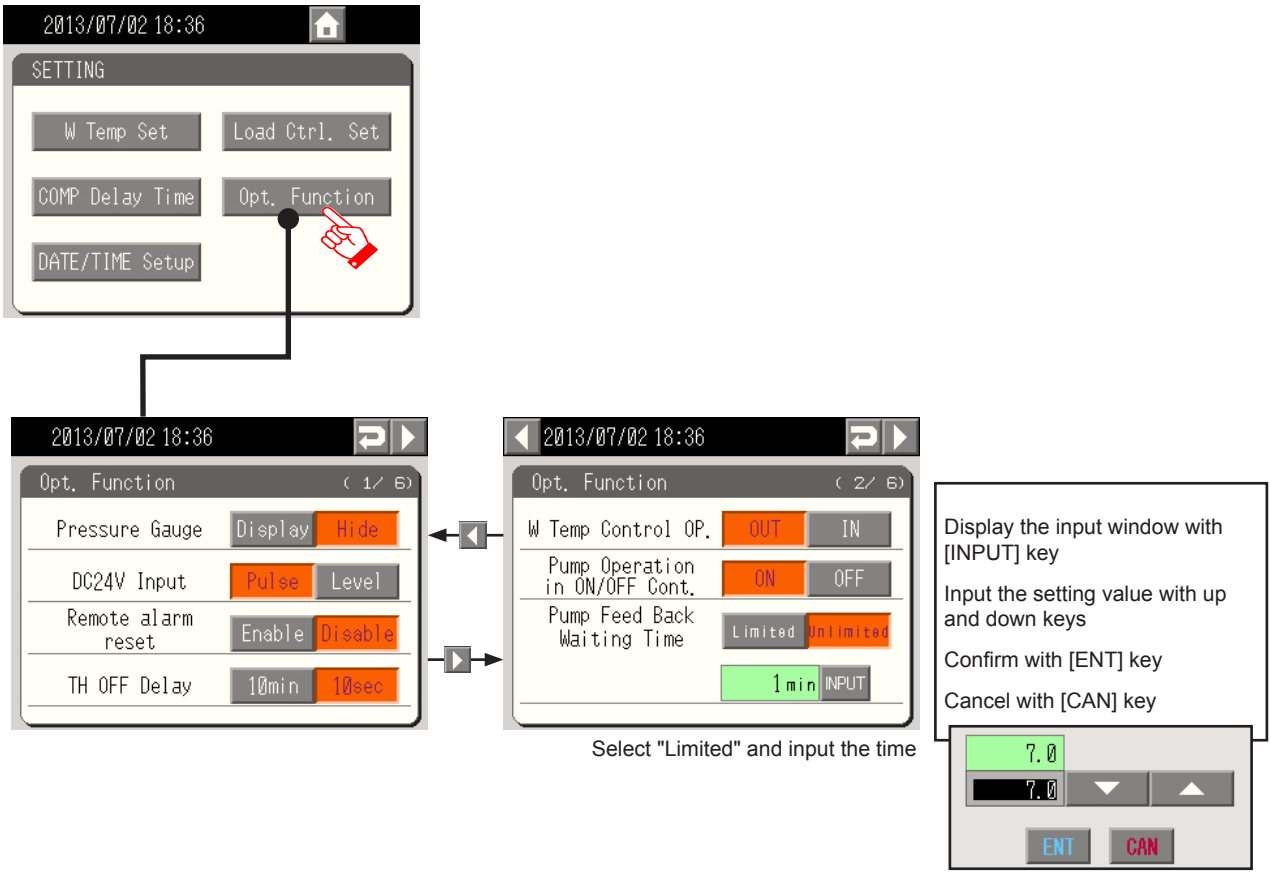
- Unlimited
- Initial value for the specification with pump mounted: 5 minutes
- Setting range: 1~30 minutes

The display at this time is

LCD: Pump interlock abnormality

Segment: 5P-5P

◆ Setting method

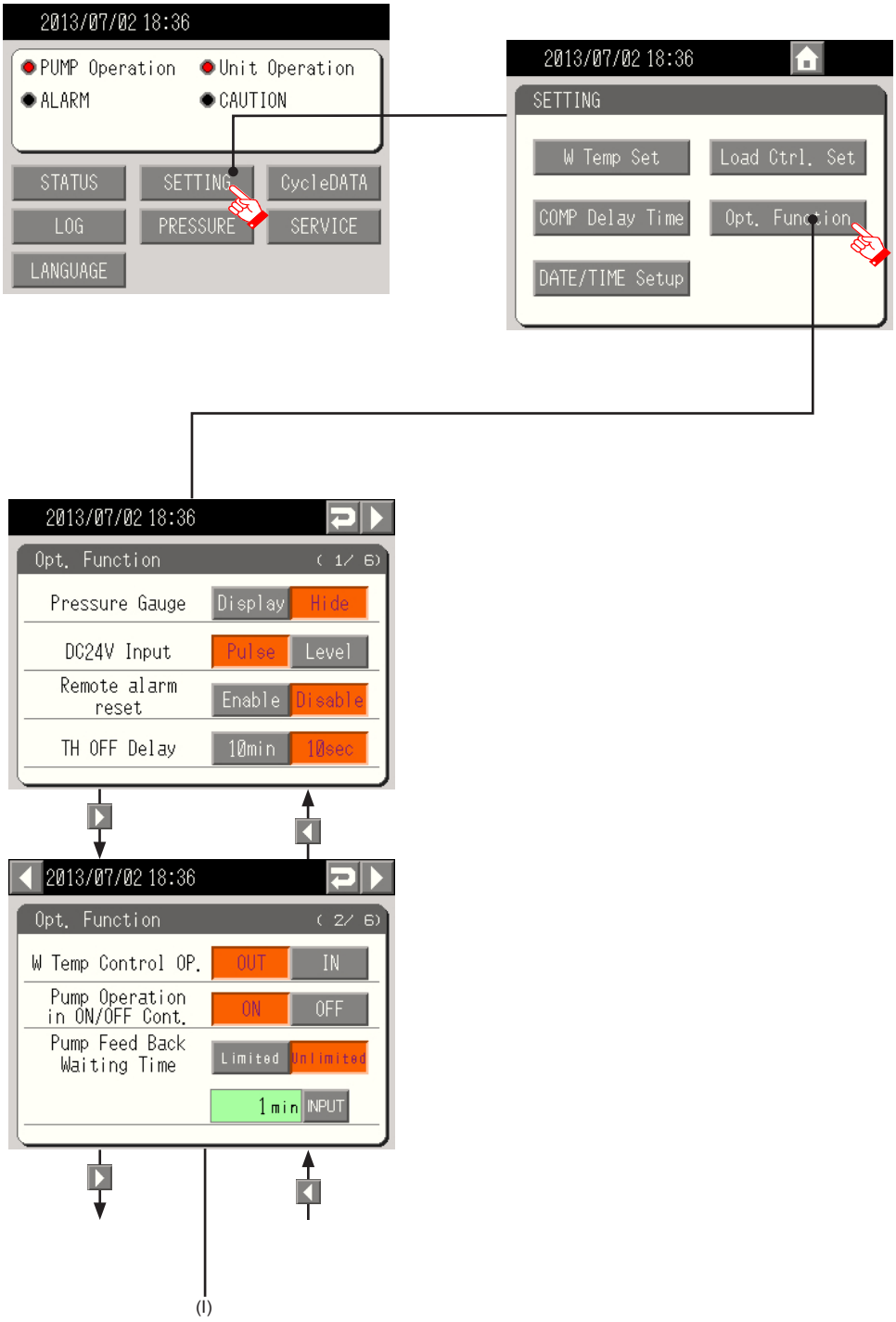


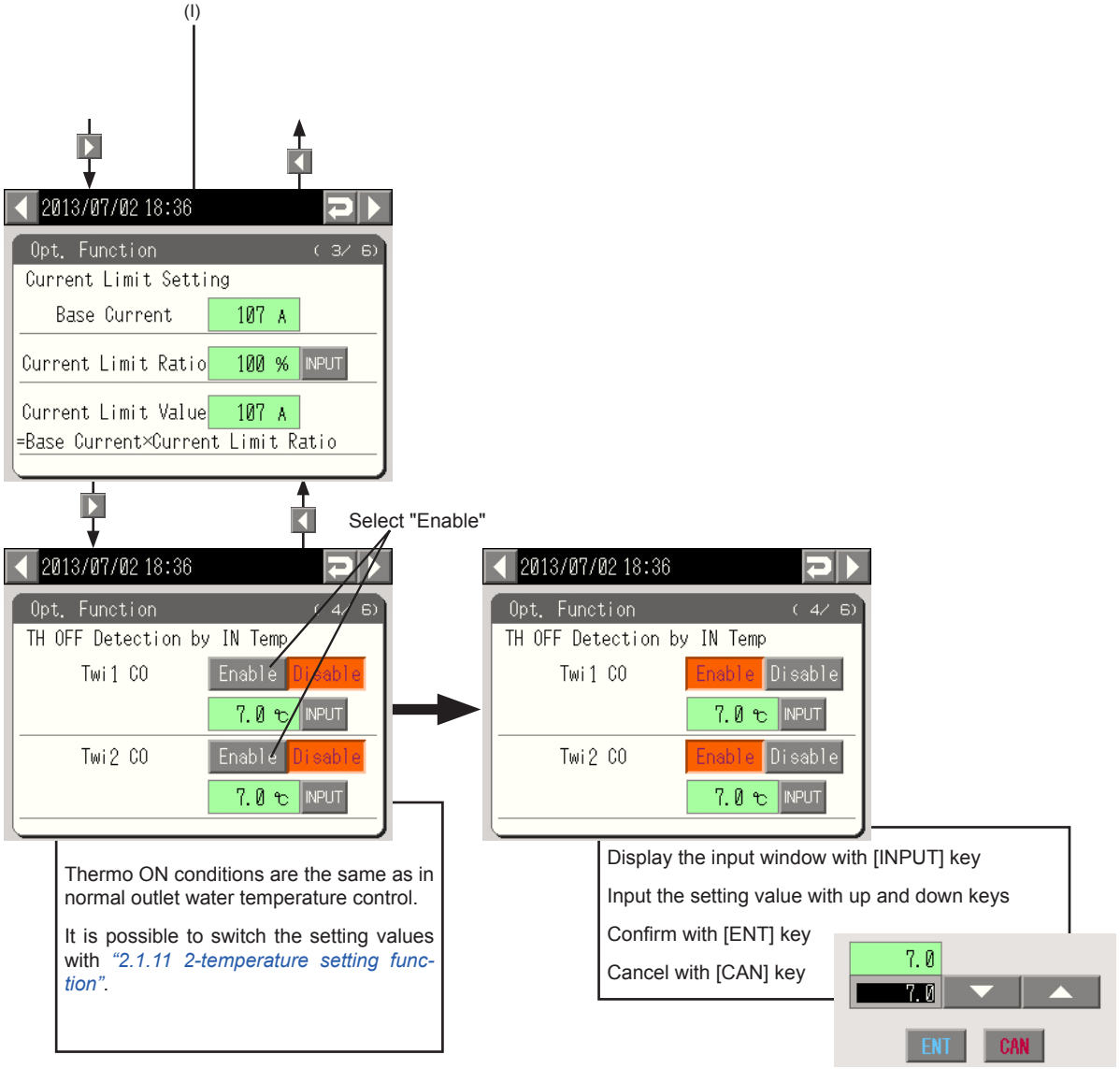
2.1.18 Inlet water temperature thermo OFF function

Normally thermo OFF judgement is carried out from outlet water temperature, but when enabling this setting, the judgement of thermo OFF is carried out also from inlet water temperature. (Thermo OFF judgement by outlet water temperature is also enabled)(Water temperature control is carried out from outlet water temperature even in case that this function is enabled)

It is effective when there is the need to set thermo OFF with the return water temperature from the load.

◆ Setting method



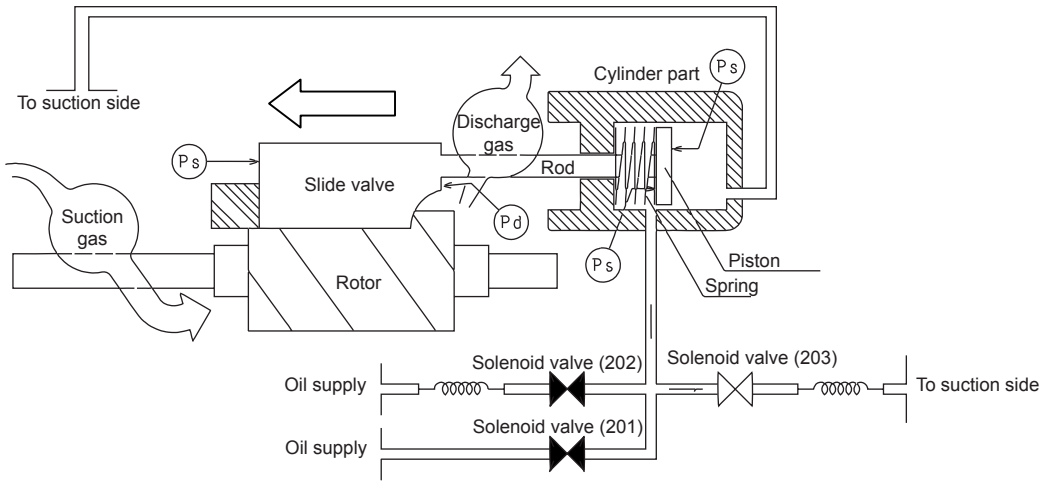

(I)
2013/07/02 18:36
Opt. Function (3/ 6)
Current Limit Setting
Base Current 107 A
Current Limit Ratio 100 % INPUT
Current Limit Value 107 A
=Base Current×Current Limit Ratio
Select "Enable"
2013/07/02 18:36
Opt. Function (4/ 6)
TH OFF Detection by IN Temp
Twi1 CO Enable Disable
7.0 ℃ INPUT
Twi2 CO Enable Disable
7.0 ℃ INPUT
Thermo ON conditions are the same as in normal outlet water temperature control.
It is possible to switch the setting values with "2.1.11 2-temperature setting function".
Display the input window with [INPUT] key
Input the setting value with up and down keys
Confirm with [ENT] key
Cancel with [CAN] key
7.0
7.0
ENT
CAN

2.2 Control of the cooling cycle

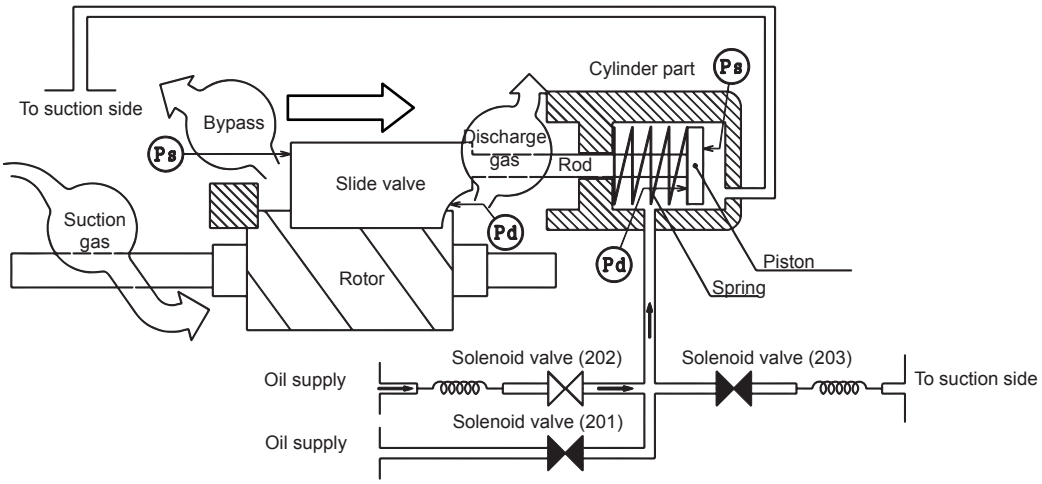
2.2.1 Compressor Control

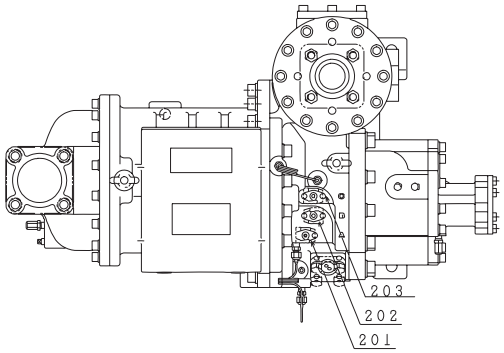
The compressor mounted on this product is equipped with a system to adjust the amount of discharge (slide valve). The slide valve is installed on the screw rotor, and performs the adjustment of the amount of discharge with the change of bypass amount by hydraulic activation.

In the case of load up



In case of load down





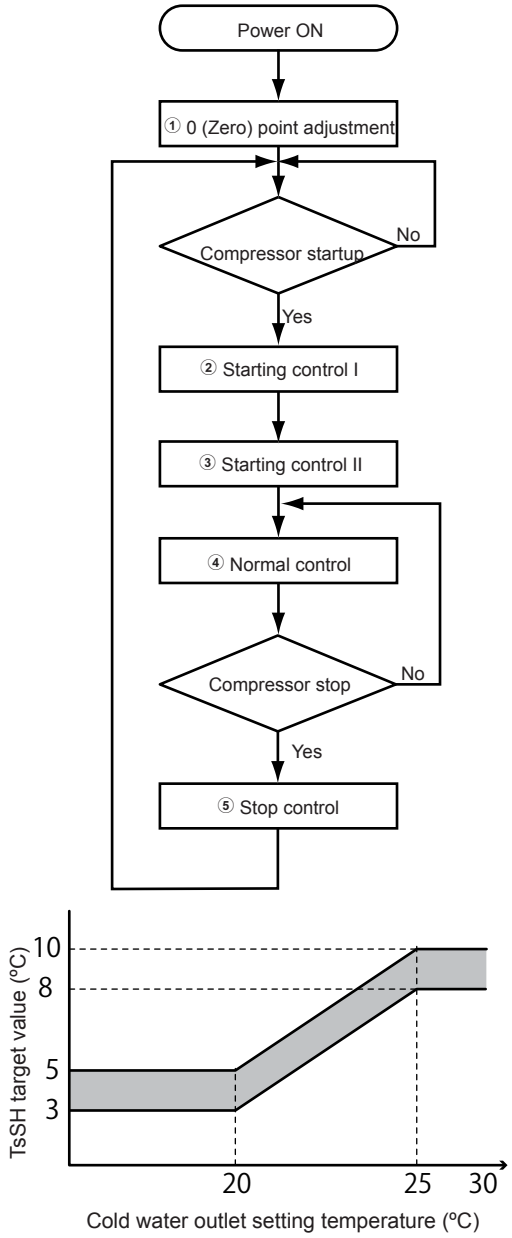
The solenoid valves for each operation are shown below:

Solenoid valve	201	202	203
Start up	ON	OFF	OFF
Load up	OFF	OFF	ON
Load down	OFF	ON	OFF
Intermediate hold	OFF	OFF	OFF

2.2.2 Expansion Valve Control

The expansion valve used in this product is an electronic expansion valve. The electronic expansion valve is composed by the main unit and a coil. The control functions of the electronic expansion valve are as shown below.

1 Basic control



① 0 (zero) point adjustment

0 (zero) point adjustment is conducted as an initialization (detection of base point) upon power ON. This control is performed to make the control pulses recognized by the microprocessor and the actual pulse number to match at 0, by outputting a full closure order (under 0 pulse) for the opening of the expansion valve. During execution, the operation information of the LCD screen displays “Adjusting 0 (zero) point of the expansion valve”, while the segment display becomes “Cn-E0” (n stands for unit number).

② Startup control I

The opening is predetermined for 1 minute after compressor startup.

③ Startup control II

The opening is controlled within a predetermined amount of variation until the discharge gas superheat (TdSH), which is calculated from the high pressure detected by the high pressure sensor (Pd) and the discharge gas temperature detected by the thermistor (Td) can be kept above 10ºC.

④ Normal control

The opening is controlled to achieve the target value of suction gas superheat (TsSH), which is calculated from the low pressure detected by the low pressure sensor (Ps) and the suction gas temperature detected by the thermistor (Ts).

Also, in the case of cooling operation, the target value of TsSH is calculated from the setting value of cold water outlet temperature, as shown in the figure below.

⑤ Stop control

After compressor stop and setting to full closure, standby at 0 pulses.

NOTE

The opening range used during the operation of the expansion valve lies between 120 and 5960 pulses.

2 Protection controls

The basic control follows the contents of section 1, but the following functions are also implemented for the protection of the product.

a. Low pressure over-increase prevention control

In case of continued operation conditions of low pressure higher than 0.5 MPa, the valve is forced to close and momentarily set somewhat close in comparison with the opening under normal control.

b. Discharge gas superheat decrease prevention control

During normal operation (during suction gas superheat control), in case of continued operation conditions of discharge gas superheat temperature lower than 5ºC, the valve is forced to close and momentarily set somewhat close in comparison with the opening under normal operation.

c. Discharge gas temperature overheat prevention control

In case of continued operation conditions of discharge gas temperature higher than 80ºC, overheating of discharge gas temperature is prevented by controlling the opening so as to make discharge gas temperature become 75ºC.

d. Evaporated gas temperature decrease prevention control

In case of continued operation conditions of evaporated gas temperature (refrigerant inlet temperature of the water cooler) lower than -4ºC, the valve is forced to open and momentarily set somewhat open in comparison with the opening under normal control.

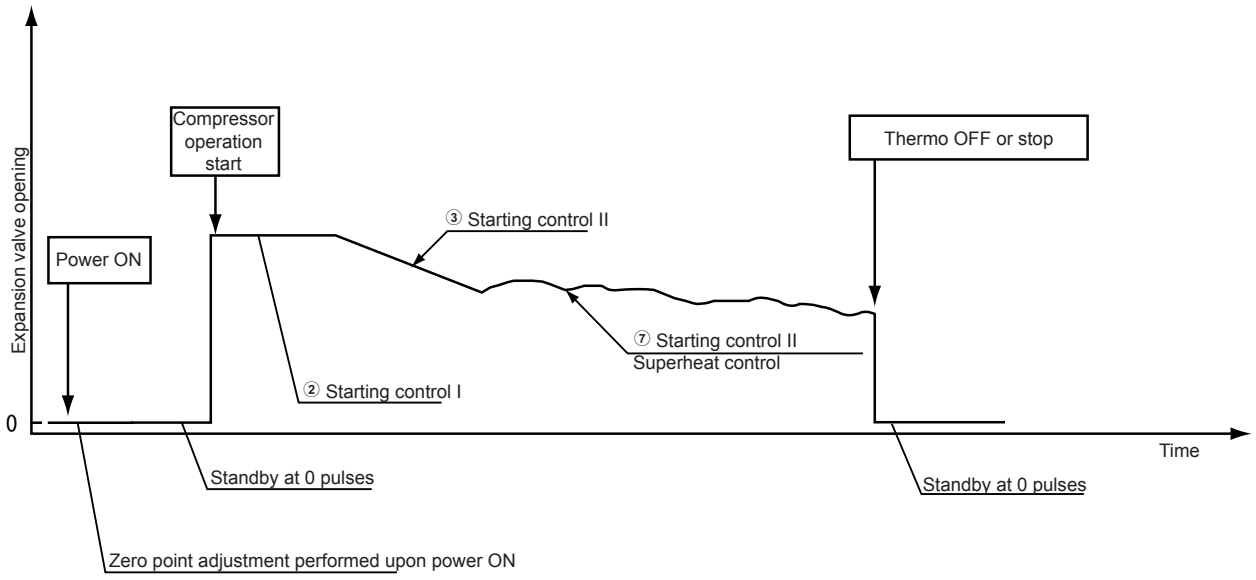
e. Forced control

In case of continued conditions of suction gas superheat higher than 8ºC, with a cold water output setting temperature higher than 25ºC, the valve is forced to open and momentarily set somewhat open in comparison with the opening under normal control.

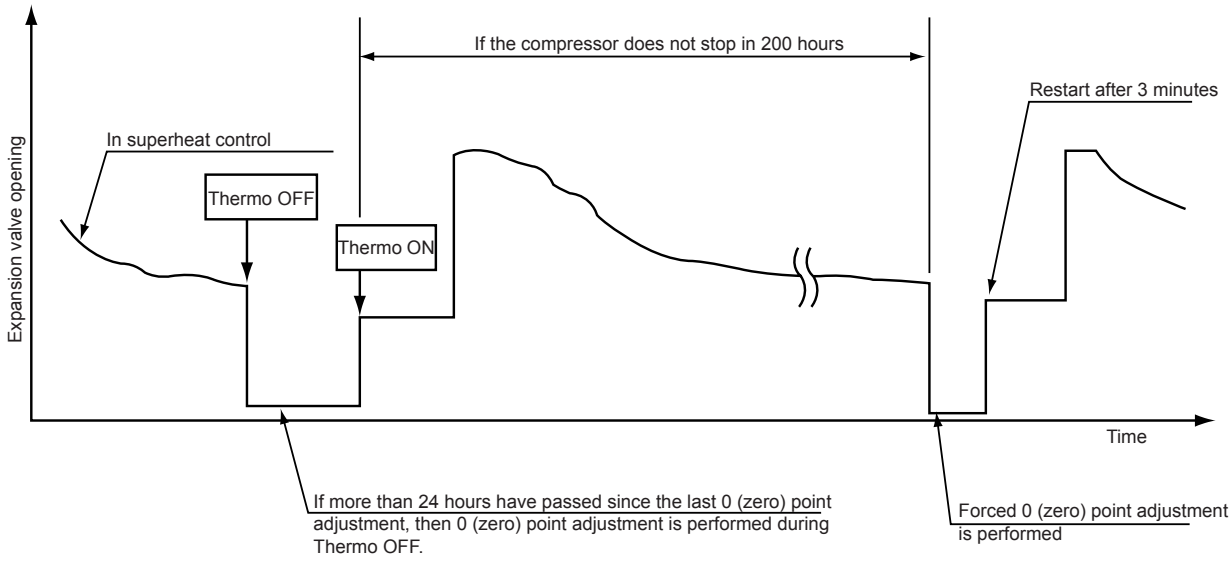
f. 0 (zero) point adjustment control

As a correction of the deviation between the “number of control pulses” and “number of actual pulses” of the expansion valve opening, generated due to continuous operation over a long period of time, a 0 (zero) point adjustment is performed “the first time that all compressors are stopped when more than 24 hours have passed since the last 0 (zero) point adjustment”. In case that all compressors are not stopped at once for more than 200 hours, then the compressors are forced to stop status (Forced thermo OFF), 0 (zero) point adjustment is performed, and they are restarted after a 3-minute guard. It is possible to cancel this forced 0 (zero) point adjustment from “Service”, but it is highly encouraged to leave it “Enabled”. If setting it to “Disabled”, protection controls may be activated frequently in case of drastic variations of load.

◆ Image diagram of basic control



◆ Image diagram of 0 (zero) point adjustment



2.2.3 Overcurrent protection control

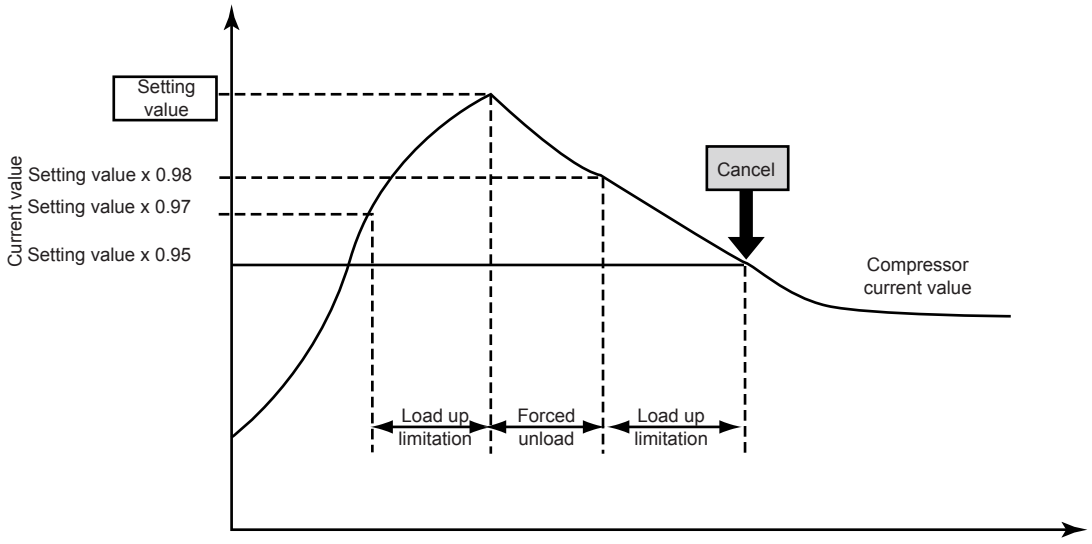
There is a function to force unload in case that the upper limit of running current of the unit is about to be exceeded. It is possible to change the setting value of overcurrent protection control from the "Service" menu.

◆ Activation of overcurrent protection

When the running current of the unit reaches the upper limit of running current, the power source capacity load is abated by means of forced unload operation. (See figure below).

Load down control is continued until reaching 98% of setting value for current limit. Load up control is restricted too between 95% and 100% of setting value for current limit.

It is also possible to change the setting value for current limit from the settings in "Service".



Activation of over current protection control

2.3 Control of Master/Slave group

2.3.1 Summary of control of Master/Slave group

In addition to the operation as a single chiller unit, this product allows the operation of multiple chiller units as a single heat source system.

1 Features

- The function to control the Master/Slave group comes equipped as standard, and thus an exclusive controller is not necessary.
- It is possible to connect up to 8 modules to 1 group.
- The modules within 1 group should be set with module number addresses between 1 and 8, and the module designated as unit 1 controls the number of units
- There is a mode that determines the number of units in operation from the variations in inlet temperature of the chiller unit (1-pump system).

2.3.2 Setting method

1 For standard specifications (RCME-CLH), the following settings are done locally.

a. Connection of transmission wires
Connect the terminal boards of the chiller units that compose a same chiller group (a maximum of 8 units) with transmission wires.

b. Setting of terminal resistance
Perform the setting of the terminal resistance. Choose one unit, which may be any from unit 1 to 8, and switch ON (up) DSW7-1 of its CPU PCB (PCB_C).

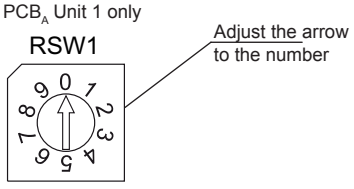
c. Setting of address
For all the chiller units in the same group, configure address settings.
Set the addresses in ascending order, without leaving gaps. (Example: Set unit numbers from 1 to 5, if there are 5 units connected).
Missing or duplicated numbers will result in transmission error.

◆ **DSW3 of setting PCB (PCB_A)**

	#1	#2	#3	#4
Unit 1 (Master)	OFF	OFF	OFF	OFF
Unit 2 (Slave 1)	OFF	OFF	ON	OFF
Unit 3 (Slave 2)	OFF	ON	OFF	OFF
Unit 4 (Slave 3)	OFF	ON	ON	OFF
Unit 5 (Slave 4)	ON	OFF	OFF	OFF
Unit 6 (Slave 5)	ON	OFF	ON	OFF
Unit 7 (Slave 6)	ON	ON	OFF	OFF
Unit 8 (Slave 7)	ON	ON	ON	OFF

d. Setting of number of connected units

For the chiller unit set as unit 1 by address setting, configure the setting of the number of chiller units connected to the same group. (This setting is not required for units 2 to 8).



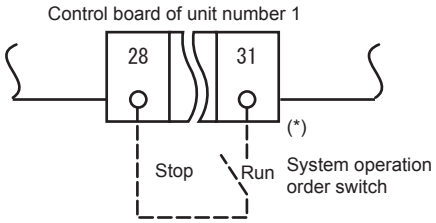
NOTE

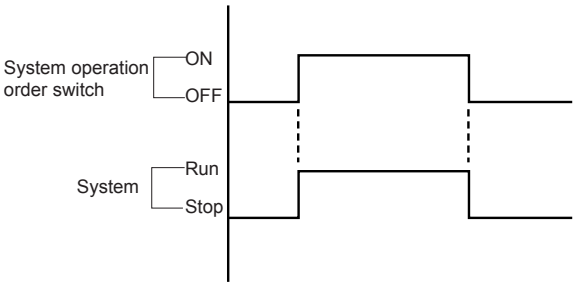
- *Refer to the instructions for water piping works for the attachment position of each sensor.*
- *Plug in the connector of each sensor into the control PCB of the chiller unit set as unit 1 by address settings.*

2.3.3 Operation method

One group composed of multiple modules using the functions to control the number of units is called a "system".

1 Operation Order (Required)
Input "System Operation Order" for the chiller unit set as Unit 1.
It is also possible to put the system to operation from the "Local system operation switch" installed inside the electrical box.



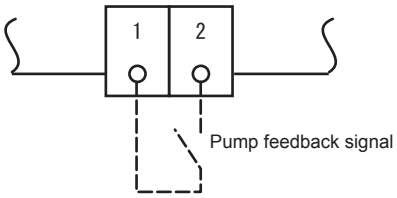


**System operation orders are level signals*

NOTE

Pay attention to the fact that it is different from the Run/Stop Order (Terminal No. 5,6,7) in the case of standalone operation of the Chiller Unit.

2 Pump Interlock Wiring (Required)
Input the feedback signal of the pump to all the chiller units. (also necessary in the case of batch pump)
Chiller units without pump feedback signal input will not operate.



3 Pump operation order wiring (Not required for specifications with pump mounted)
Connect the wiring, since pump operation signal is output from each chiller unit. Since it is possible to output the pump operation signal of all chiller units during system operation in the case of 1-pump systems, then in the case of batch pump, attach wiring to the chiller unit set as unit 1 only. (Connect interlock wiring to all the units)

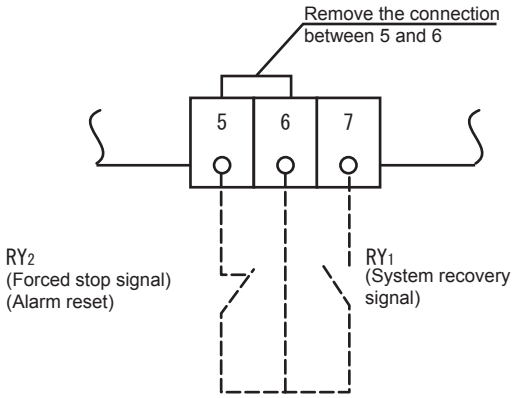
4 Remote display wiring

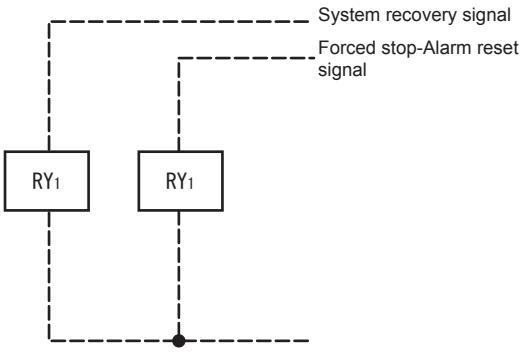
	Output from unit 1 only	Output from each unit	Notes
System Operation	○		Output from terminal No.23.
Chiller Unit (Module) Operation		○	
Pump Operation		○	
Alarm		○	
Warning		○	

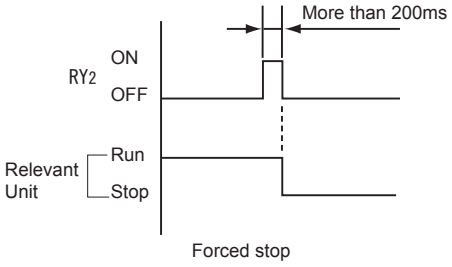
5 Remote Forced Stop (Alarm Reset) / System Recovery Wiring

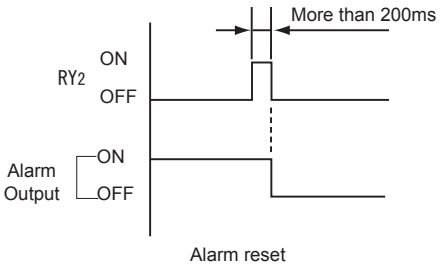
Connect to each chiller unit to force stop of a chiller unit in operation from a remote location, to reset an alarm, or to return to the system a chiller unit that had been excluded from the target of the control of Master/Slave group. (When a chiller unit is stopped because of an alarm, or by a forced stop order, it becomes excluded from the target of the control of Master/Slave group (detached). It is necessary to perform system recovery operation in order to regain the target of the control of Master/Slave group.

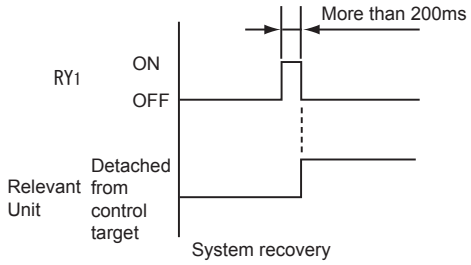
Also, in case of using it to reset an alarm, it is necessary to enable the optional function (LCD screen setting) "Remote stop reset" at each of the chiller units.











NOTE

- *It is also possible to perform forced stop by the push button switch (Stop) and to perform system recovery by the push button switch (Run) in the module.*
- *Led RL_2 on: on order*
- *Led RL_2 off: off order*

6 External thermo operation
Functions concentrated in unit 1 (master unit)
By inputting the signal of the following wiring to unit 1, their settings become enabled for all the chiller units in the same group.

- 2-temperature setting
- Night shift
- Maximum current limitation

2.3.4 Other functions of the control of Master/Slave group

1 About Detachment
Modules stopped by an alarm stop or by a forced stop during operation, as well as modules that have lost communication with Master module, become excluded from the target of the control of Master/Slave group. (The same applies for Master module).
This state is called "Detachment". Also, modules with the local/remote switch in the PCB_a (SW2) set to local side become detached, too. It is not possible to output operation orders to modules under detachment. (It is possible to operate modules in local setting with the Run button in the control panel of the modules as well as with forced operation order) Also, system operation continues even if a detachment event occurs.

2 About recovery method to system from detachment state
Modules that have been once detached are not subject to the control of Master/Slave group unless performing recovery operation. (However, modules that have become detached because of transmission abnormality are recovered automatically as soon as transmission is restored) Perform recovery operation after removing the causes of the Alarm and other factors. (Either one of 1 or 2 listed below).

NOTE

Recovery operation: set the local/remote switch in thePCBa (SW2) to remote, and perform the following operation:

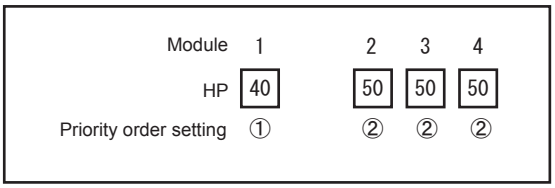
- *Press down the ON button in the control panel of the module which is under detachment.*
- *"System Recovery Signal": input from control (according to system conditions).*

3 System Operation at Alarm occurrence
Exclude the modules affected by alarm stop, and continue system operation with the rest of the modules. (The same applies in case that Master module is stopped by an alarm stop) However, processing of transmission abnormalities differs according to the selected control of Master/Slave group.
Operation of chiller units that have lost communication with Master module.

4 Start-up Order
In case of starting up multiple Modules upon system startup, they are started up sequentially in 10-second intervals.

5 Rotation Control
When starting up the modules, the modules with the shortest operation time have priority. (Comparison is carried out between units with the same priority order settings, though) When stopping modules, the modules with the longest operation time have priority. If the operation with the minimum number of operating units continues for a long time, forced rotation control is conducted.

6 Priority order setting
It is possible to set the desired order of priority in operation, when there are machines with different capacities or when inverter type and continuous control type are mixed together.
(Maximum 8 steps)



In this case, module 1 is operated first, as it has the highest priority, and then a rotation control is performed among modules 2 to 4, which have the same priority order.

7 Function to cancel the control of Master/Slave group
It is possible to cancel the functions to control the number of units when simultaneous thermo ON/OFF of all the units is required with without performing the control of Master/Slave group. (Possible in 1-pump systems only)

NOTE

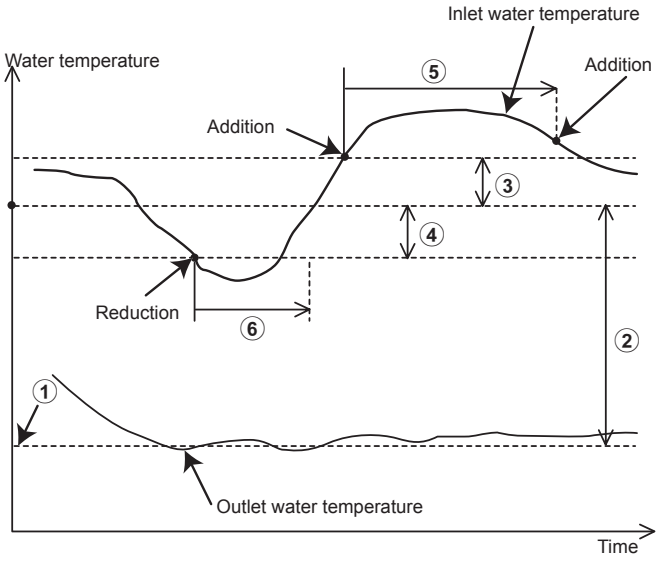
Setting method: In 1-pump system settings, set both waiting time for effect of addition and waiting time for effect of reduction to "0".

◆ Practical operation

1 At system start-up
First one chiller unit with the highest priority order is started up, and thermo ON/OFF judgement is conducted.
When the conditions to start up the compressor are fulfilled, the rest of modules are started up in sequence.

2 During normal operation
The control of Master/Slave group is not performed.
In case that any module within the same group is set to thermo OFF, the other modules are stopped.
When the conditions for thermo ON are fulfilled, the rest of modules are started up in sequence.

2.3.5 Setting items



① Water temperature setting

Sets the temperature in degrees of the outlet water from the chiller unit to which the water temperature has to be controlled.

Settings are performed at the Master module LCD screen of unit 1. The setting method is the same as with the settings of individual operation. By changing the settings of Master module, the settings of slaves 2~8 are also changed automatically.

Refer to *"2.1 Control functions on the module"*

② Setting temperature difference

Sets the target difference between water inlet and outlet temperature to increase the number of units in operation.

③ Temperature range of addition

Sets the range of change of inlet water temperature to add units, in case that the difference of temperature reaches the temperature difference set at ②.

④ Temperature range of reduction

Sets the range of change of inlet temperature to reduce units, in case that the difference of temperature reached the temperature difference set at ②.

⑤ Waiting time for effect of addition

Sets the time during which the next addition process is prohibited, after having added once (start-up of 1 unit).

Recommended > 3 minutes

⑥ Waiting time for effect of reduction

Sets the time during which the next reduction process is prohibited, after having reduced once (stop of 1 unit).

Recommended > 3 minutes

⑦ Number of Units at Startup

Sets the number of modules to be started up upon system start-up.

⑧ Maximum number of operating units

Sets the upper limit of the number of modules that can be operated at the same time.

⑨ Minimum number of operating units

Sets the minimum number of modules to be operated at light load operation.

⑩ Pump operation

Selects batch or individual.

When selecting individual, pump operation order is linked to the run/stop of the module.

When selecting batch, all the modules which are target of the control of group (Master/Slave) during system operation set pump operation order to ON continuously.

⑪ Priority setting

It is possible to set a priority order, when it is necessary to operate a certain unit preferentially.

It is possible to set up to 8 steps for priority order.

In case that there are multiple modules with the same priority order, they operate in rotation.

Number of the module	1	2	3	4	5	6	7	8
Priority setting	1	1	1	2	2	2	2	3

This 3 units are operated with the maximum priority, with a rotation based on operation time

In case that there is a load exceeding the amount of 3 units, one unit out of these 4 is chosen for startup, with a rotation based on operation time.

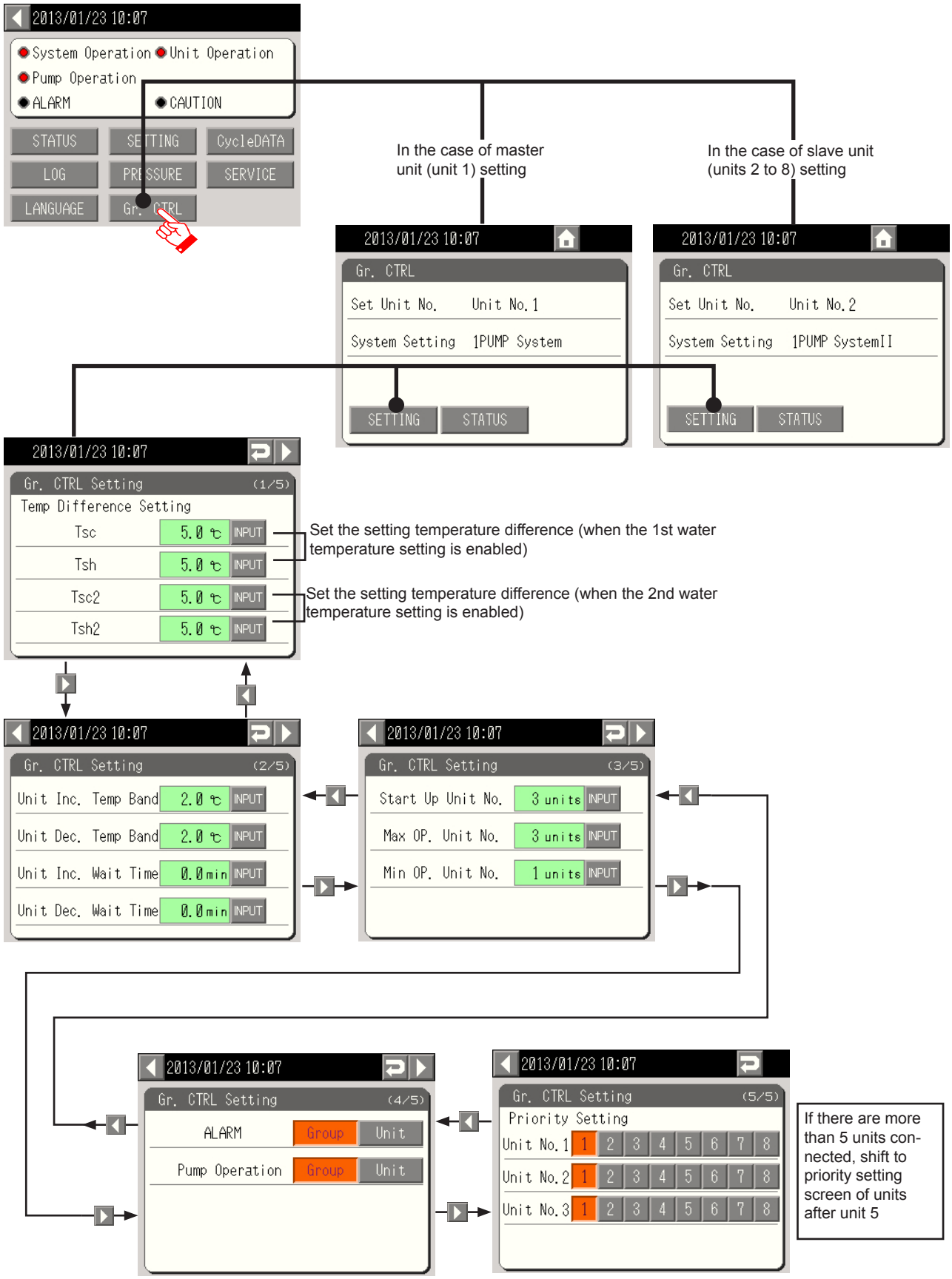
This unit is the last one to start up

NOTE

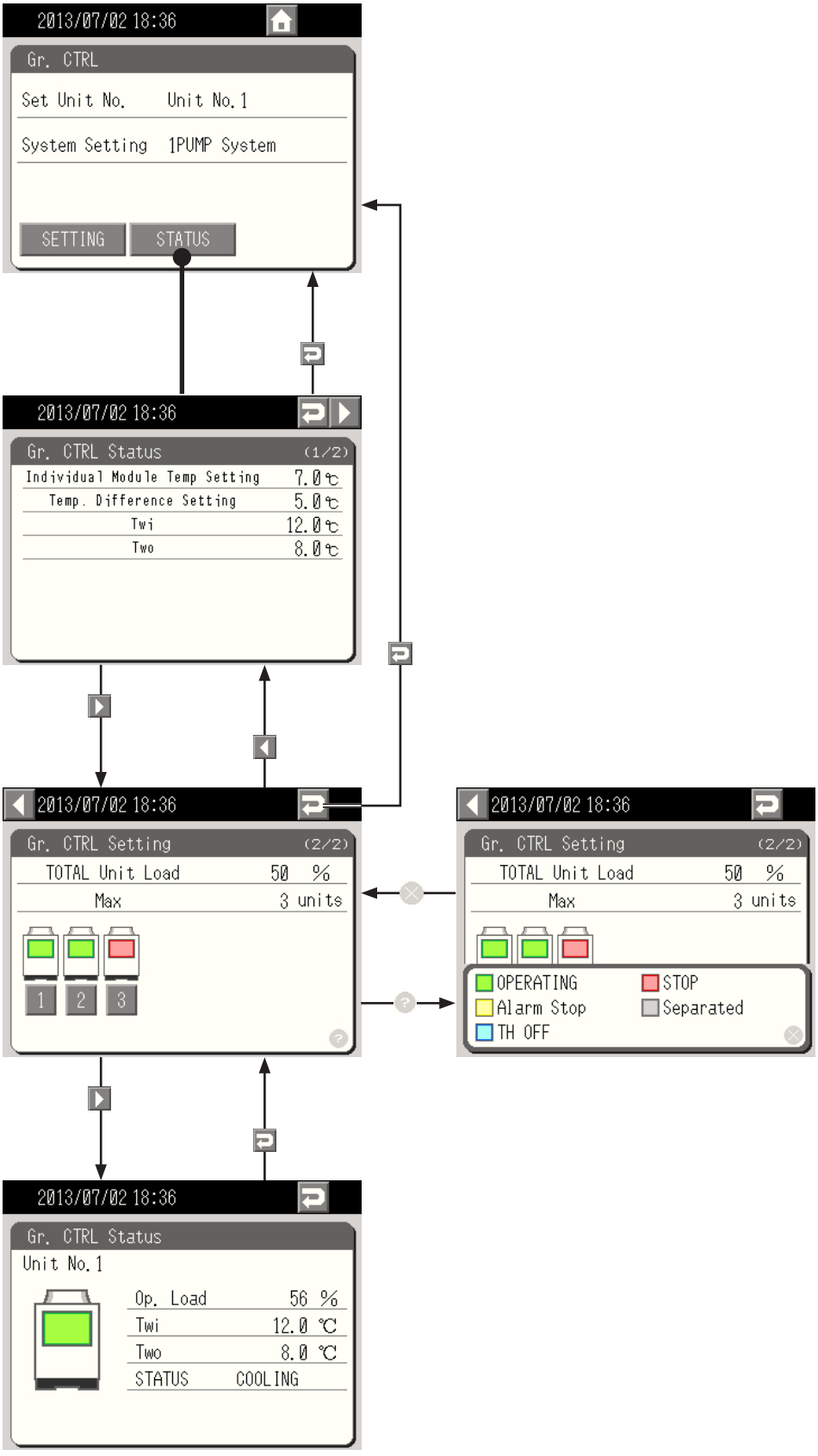
- *The operation time of units with higher priority order becomes longer.*
- *Settings ② to ⑪ are performed at the Number of units setting screen. Refer to "2.3.6 Method for setting and confirmation of operation conditions through the LCD screen".*

2.3.6 Method for setting and confirmation of operation conditions through the LCD screen

Conducts the setting of the control of Master/Slave group and confirmation of operation conditions through the LCD screen.



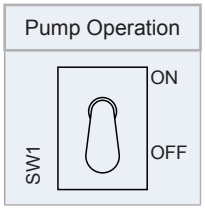
[Status screen of the control of Master/Slave group]



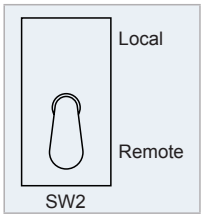
2.4 Run operation

2.4.1 Setting of switches on the setting PCB

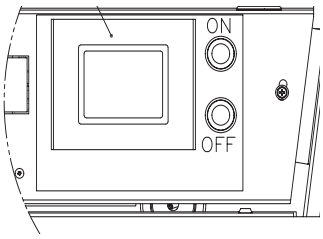
1 Pump operation switch
By setting the switch ON while the module is stopped, pump operation order is output.



2 Local / Remote switch
Switches whether the operation control of the module is performed locally or remotely. By setting it to local for instance during inspection or maintenance works, an alarm is output to the remote side in case that any operation order was input remotely.

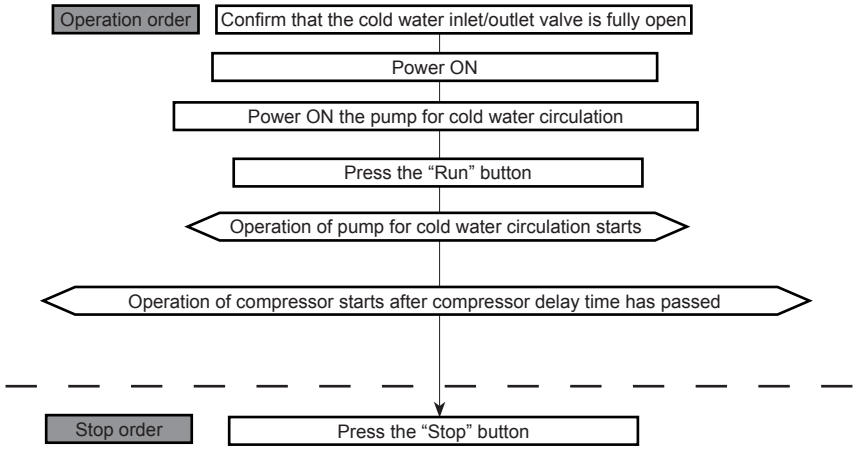


3 ON - OFF button
Performs as ON button for operation when in local control setting. The OFF button is always enabled, regardless of local/remote setting.
When OFF button is pushed the module is detached from the group. The rest of the modules will keep operation according to the master module settings and input conditions.
When pushing ON button the module recovers the operation on the group and restarts the operation according to the needs of the system.



2.4.2 Operation control of the module

1 In the case of remote control

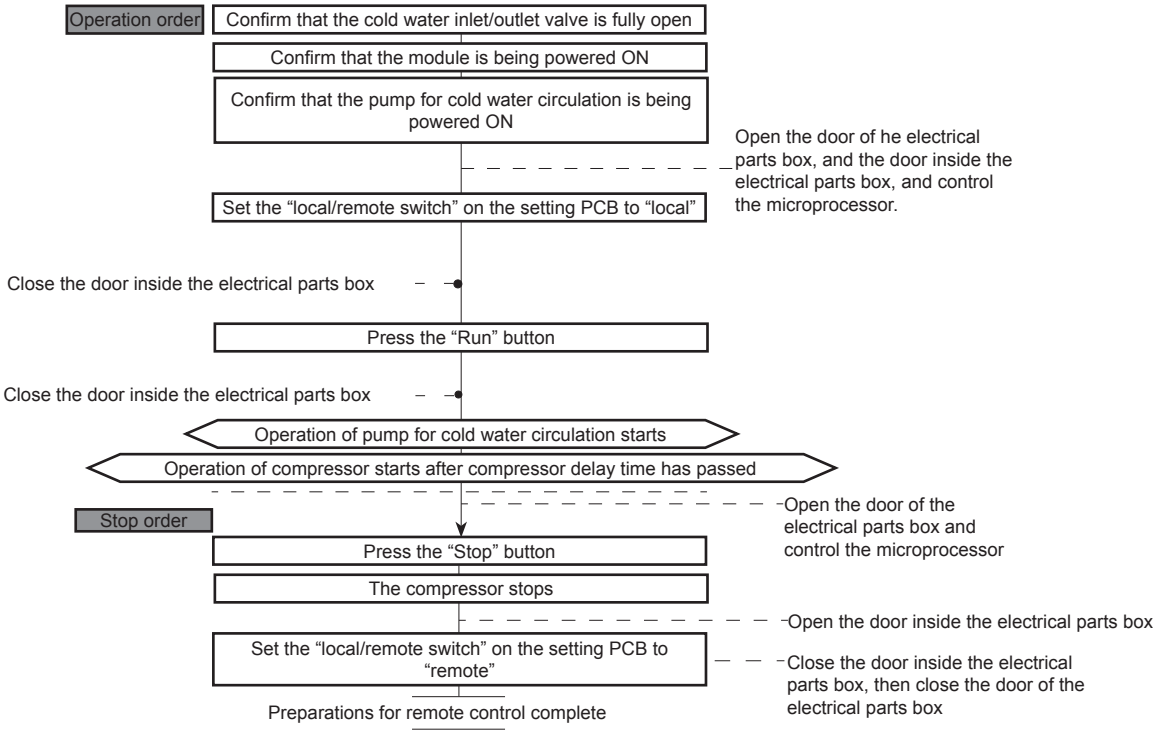


NOTE

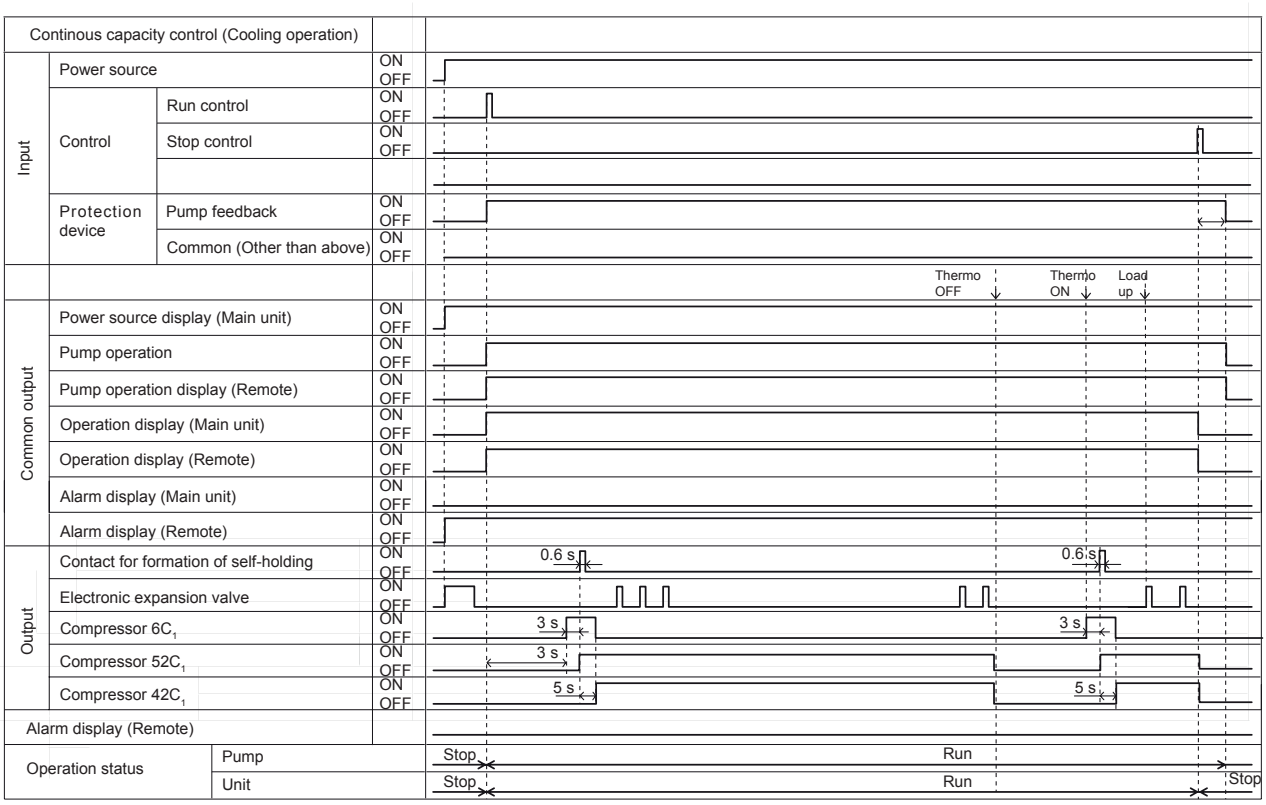
*It is possible to stop the module by means of the stop switch in the Master module, even if it is in remote operation. It is also possible to stop by rem*ote controller switch even during local operation.

2 In the case of local control

It is possible to control this product remotely. Follow the procedure below in case that it is absolutely necessary to control it from the Master module, such as during test run or in servicing.



2.5 Time chart



3. Servicing

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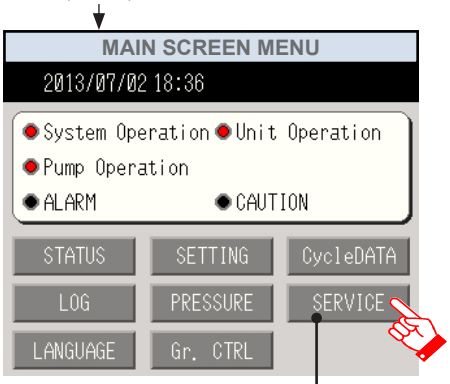
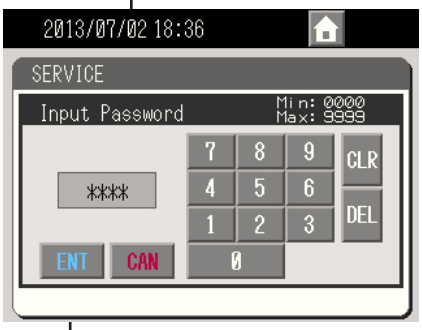
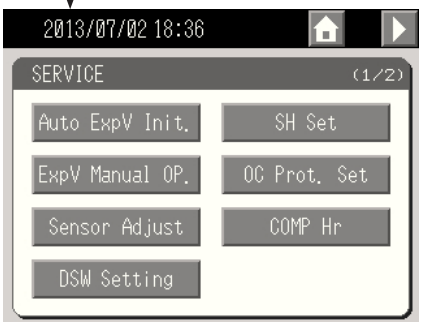
3.1 LCD display for Service Menu

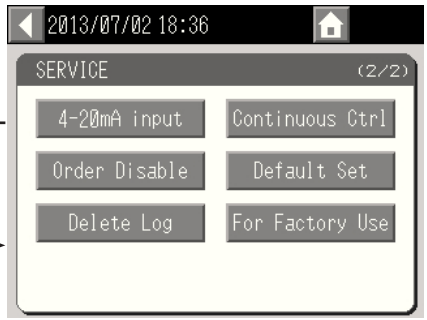
(2 sec.)





ENT





NOTE

Acces password for authorized personnel only.

Password: 1225

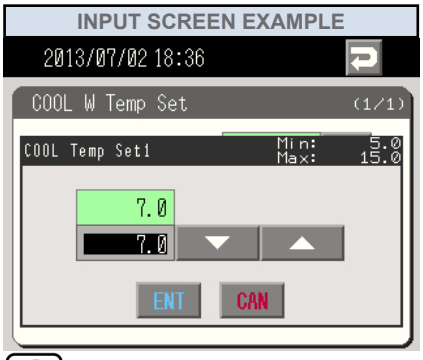
CAUTION

It is recommended not to change the following items from the Service menu:

- *Superheat setting*
- *4-20mA input*

NOTE

"For Factory Use" is for a factory purpose only and an additional password is required.



NOTE

This screen will be shown after clicking on the INPUT button.

Increases the value.

Decreases the value

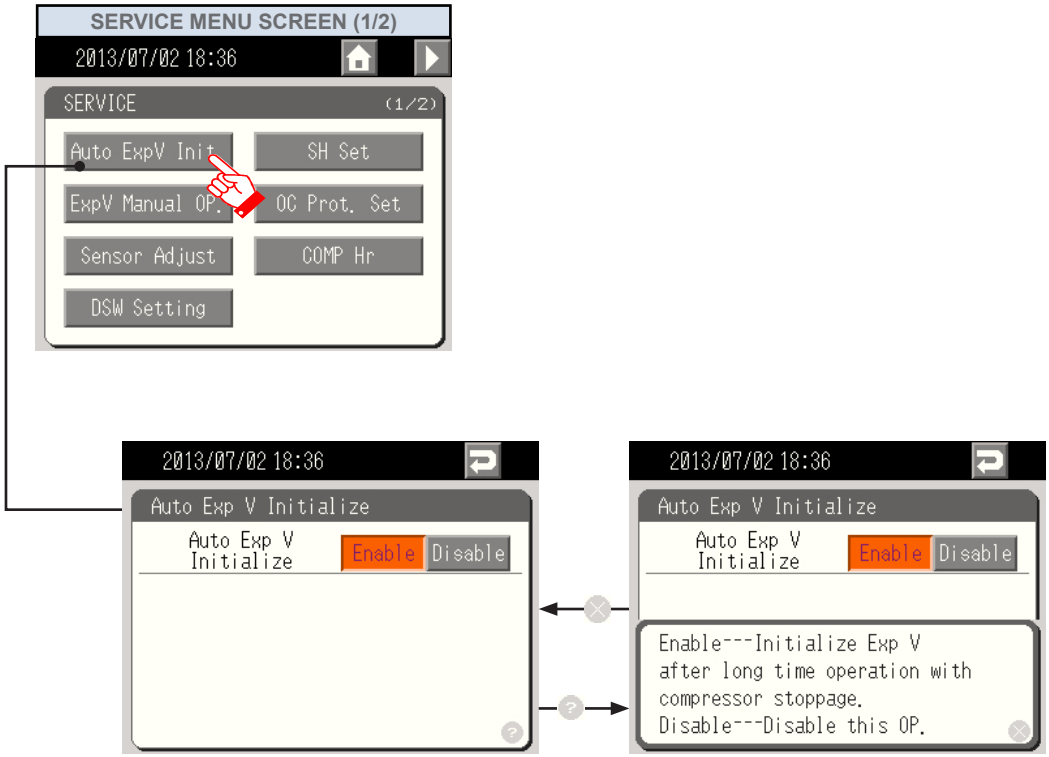
ENT *Accepts the value*

CAN *Cancels the operation*

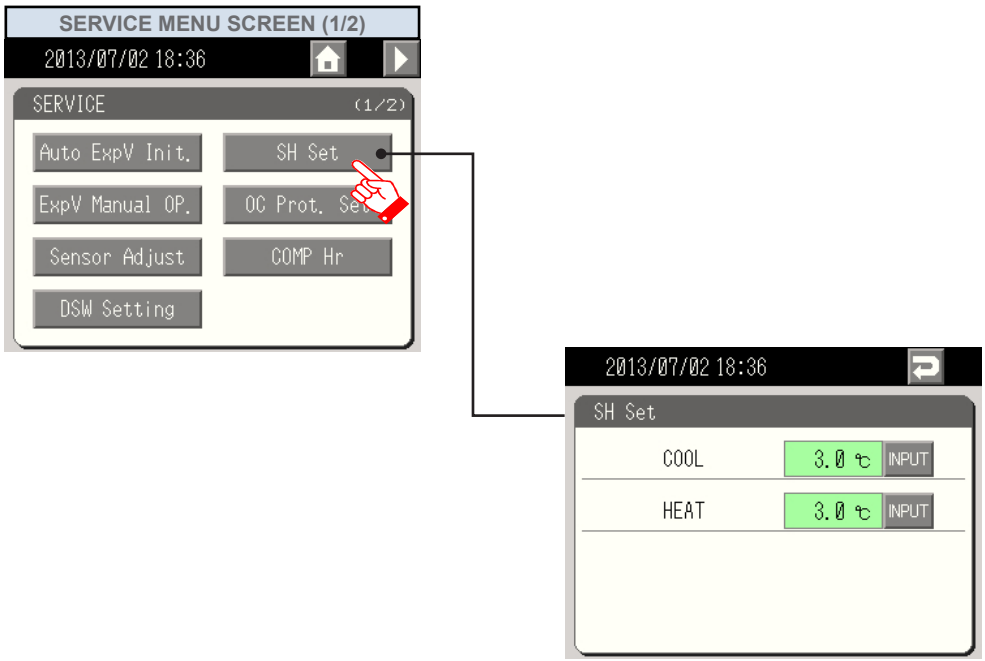
Pictogram description	
	Back to main menu
	Back to main screen menu
	Next screen
	Previous Screen

3

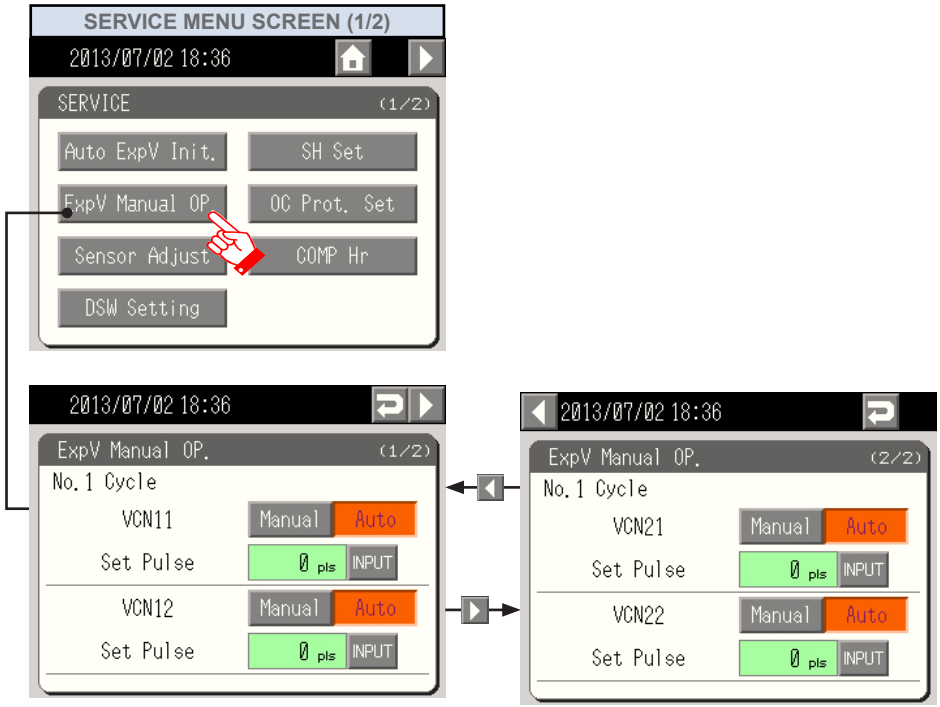
◆ Auto expansion valve initialize



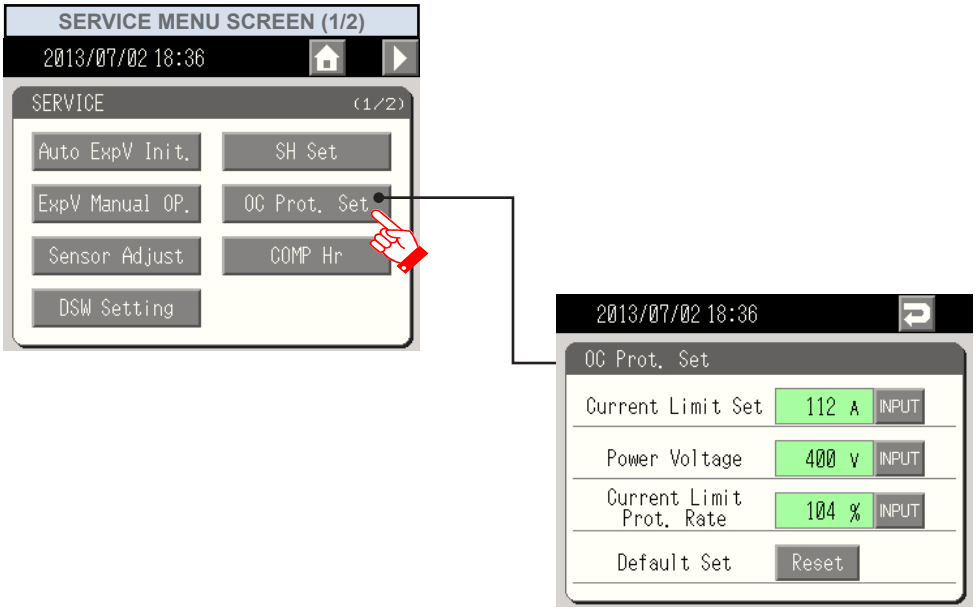
◆ Superheat setting



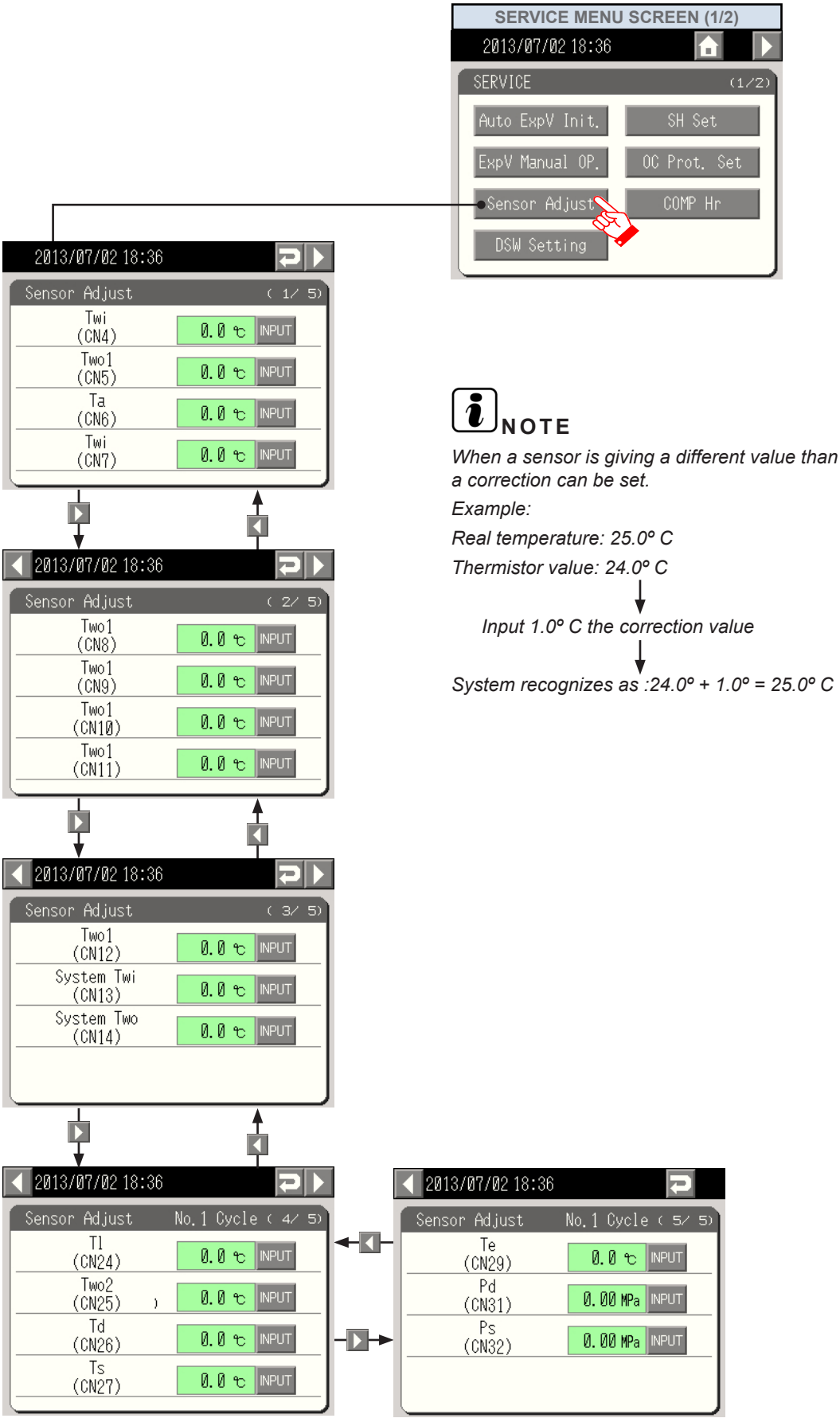
◆ Expansion valve manual operation



◆ Overcurrent protection setting



◆ Sensor adjust



NOTE

When a sensor is giving a different value than the actual value, a correction can be set.

Example:

Real temperature: 25.0° C

Thermistor value: 24.0° C

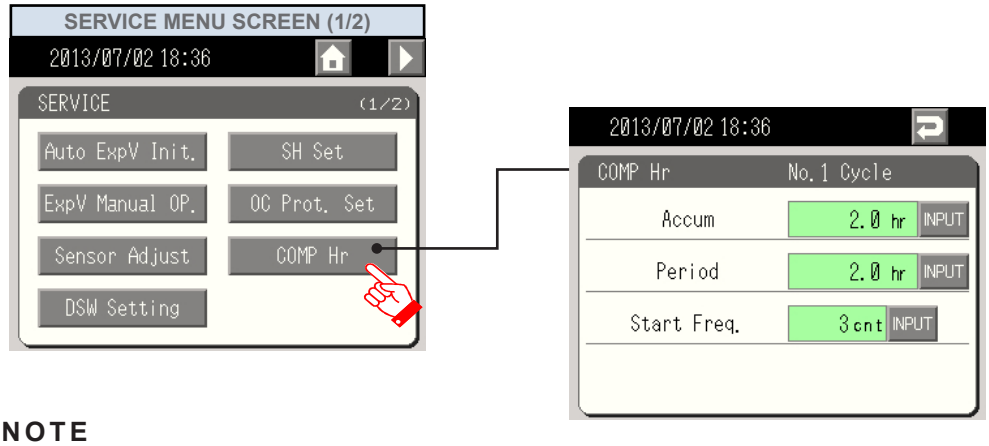
↓

Input 1.0° C the correction value

↓

System recognizes as :24.0° + 1.0° = 25.0° C

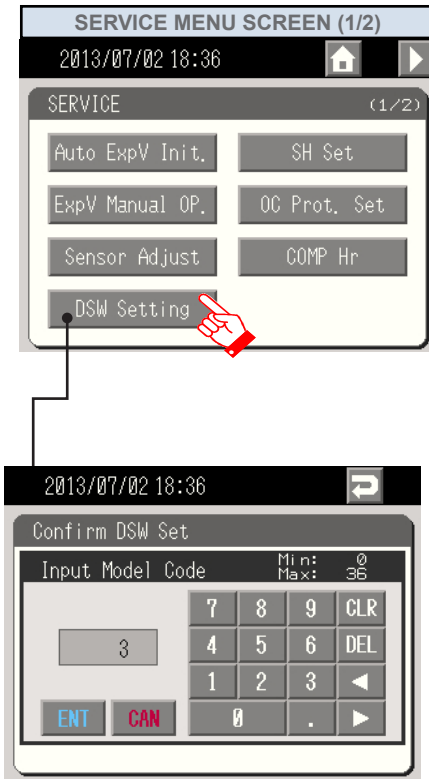
◆ Comp Hr Setting



NOTE

When PCBb is replaced, the previous information related to compressor operating time and number of restarts can be entered form the service menu

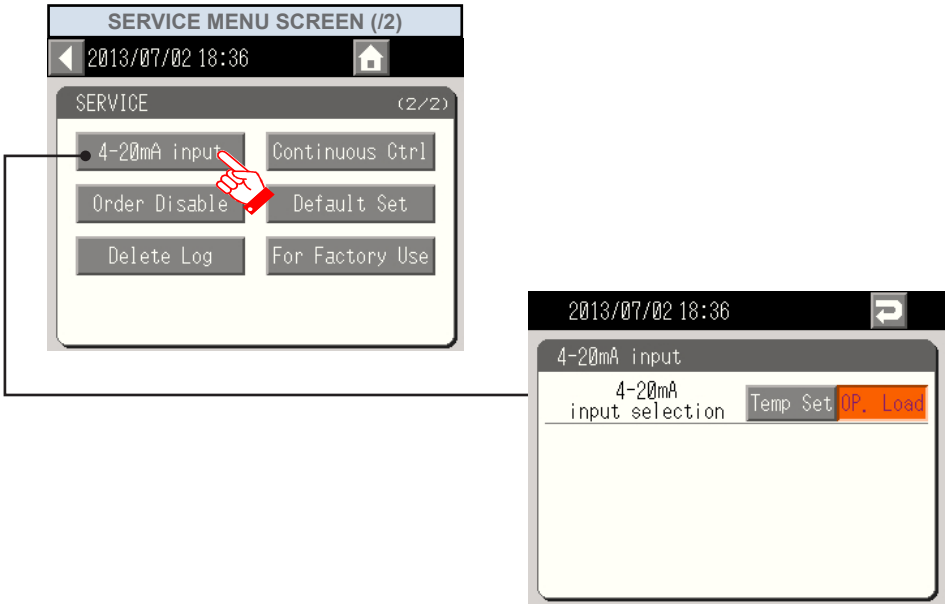
◆ Confirm DSW set



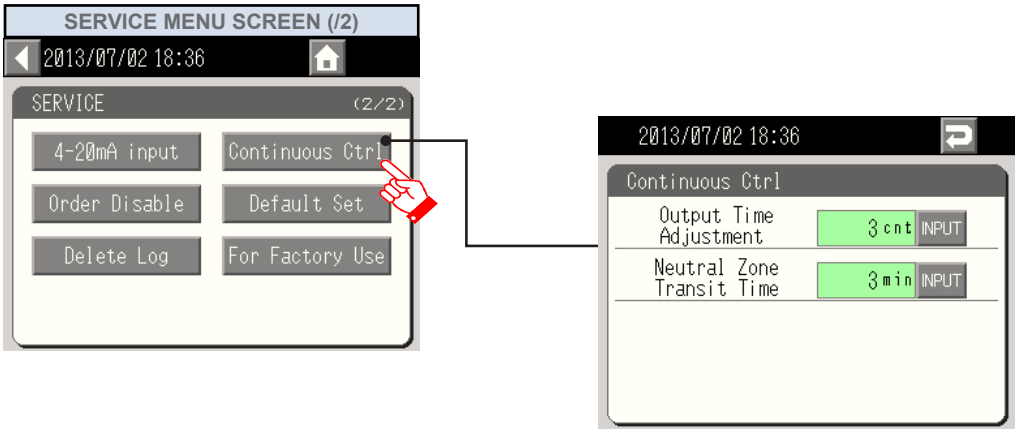
NOTE

This function is not yet implemented.

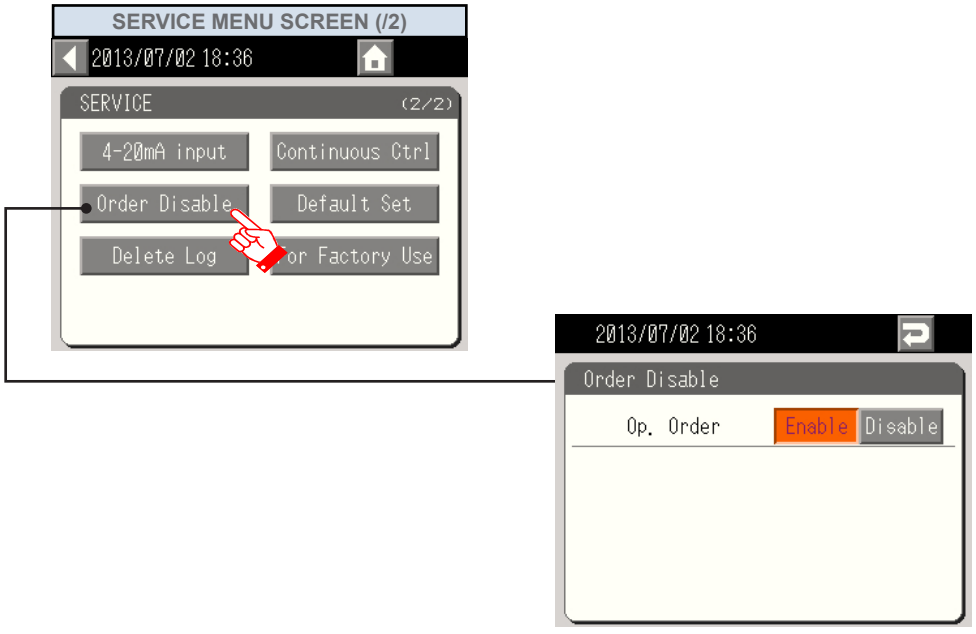
◆ 4-20 mA input



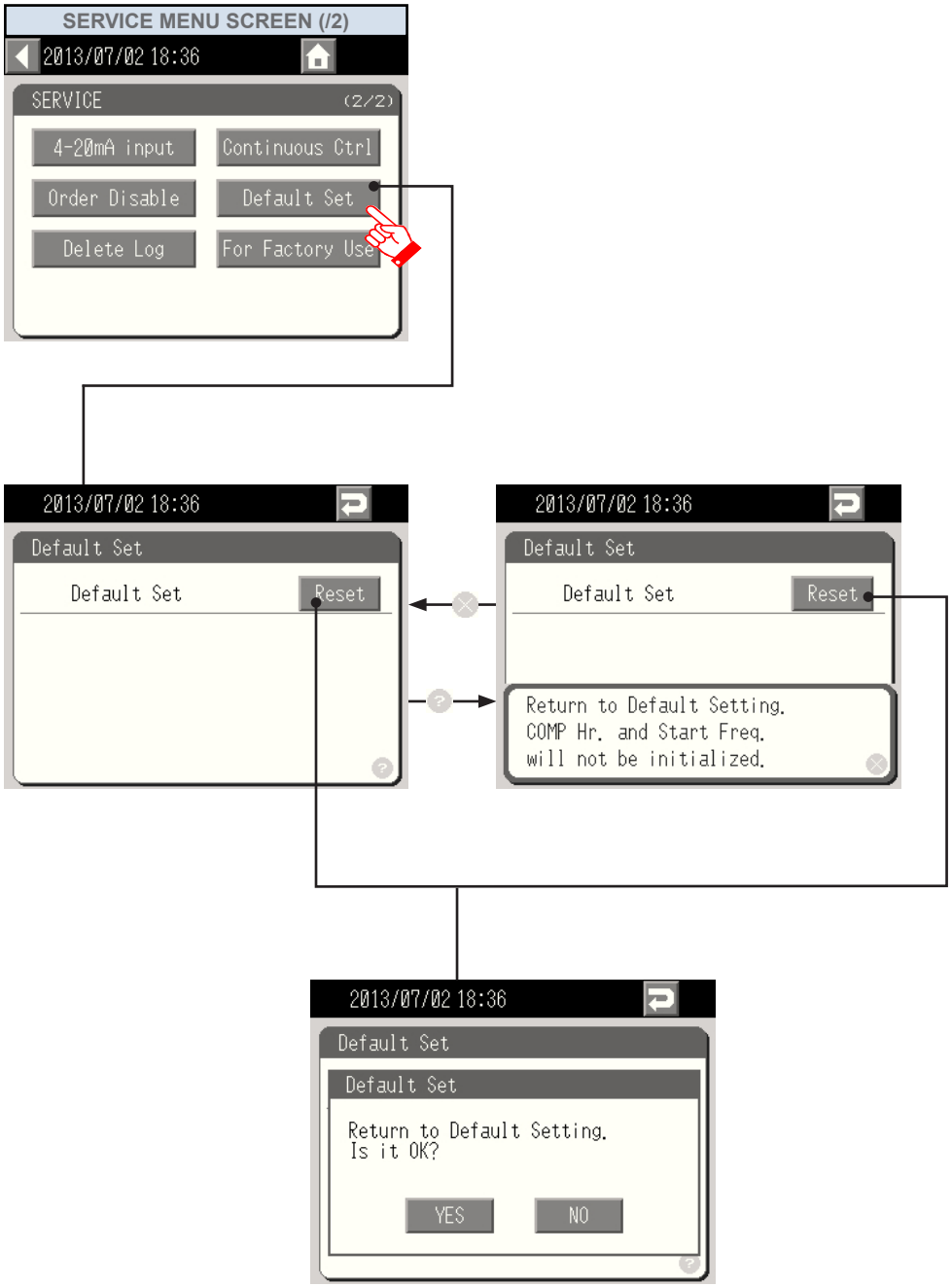
◆ Continuous control



◆ Order dissable



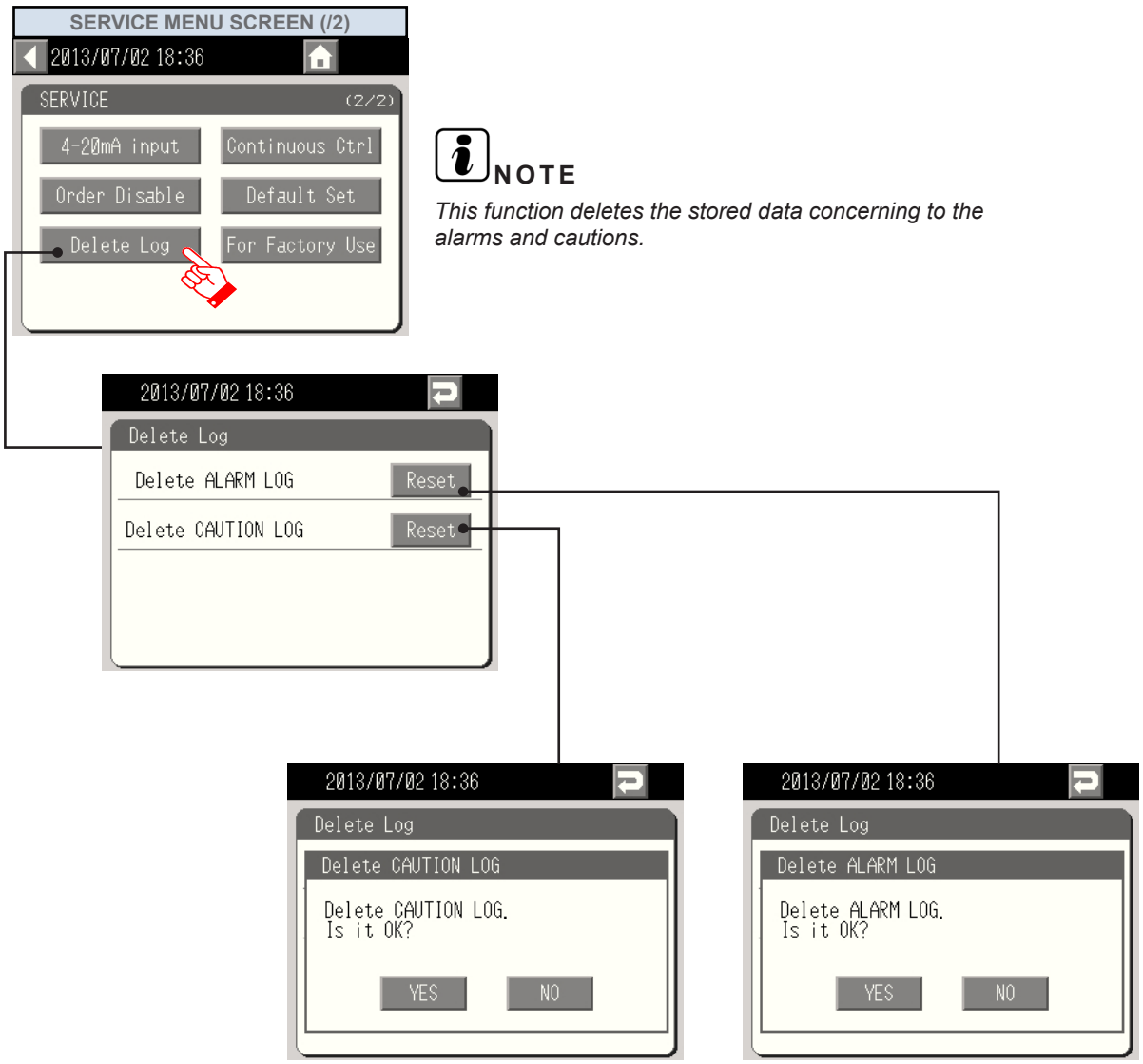
◆ Default Set



NOTE

- *This function resets all data and returns to the initial values, except for the warning and alert history and accumulated operating time-period and operating time of the compressor.*
- *When a wrong DIP switch (DSW) setting is performed, do an initialization after set the DIP switch (DSW) correctly.*

◆ Delete log



NOTE

This function deletes the stored data concerning to the alarms and cautions.

3.2 General notes

Before starting to remove any component, take into account the following notes:

DANGER

- ***Before performing any of the service operations described in this chapter, turn all the main switches off and place security lockers or convenient warning indicators in order to prevent them from turning on accidentally.***
- ***It is recommended to turn the power supply off for some operations.***
- ***In all electrical works be sure there is no voltage. Check it with a multimeter.***

CAUTION

- *In case of sharped edged parts, as covers, use security gloves to avoid getting injured.*
- *In case of blocked or stuck parts, use appropriated tools and eventually lubricants to release them.*
- *When performing brazing work, besides security gloves it is a must to wear convenient eye protection.*

NOTE

The images and pictures shown in this chapter, except when the contrary is indicated, correspond to the RCME-50WH model. Processes described are equally valid to all RCME-WH models.

NOTE

- *When brazing operations are required, check to ensure whether there are flammable materials around when using the burner for pipe connections. Oil, and lubricants used may ignite, as well the cleaning clothes and cleaning papers.*
- *Do not expose the refrigerant to the atmosphere for a long period in order to avoid mixing the water and foreign particles with the refrigerant. After removing compressor, replace it quickly. If exposed for a long period, seal the suction and the discharge pipe. Seal pipe ends using caps or tape.*
- *To reassemble perform the procedures in reverse way.*
- *To prevent contamination of the refrigerant with water or foreign particles, do not expose open to atmosphere for long periods.*

3.3 Cycle components

CAUTION

- *All operations in the refrigerant cycle require to collect the refrigerant. In those cases proceed as explained in"3.3.3 Recovering the refrigerant"*

DANGER

Turn OFF all the power source switches and ensure that the module is totally stopped before to get inside.

- ***Be careful, some parts and components can be at high temperature.***

Access inside the module for servicing can be easily done. The unit is open (except the electrical box) and the inner parts are easily accessible.

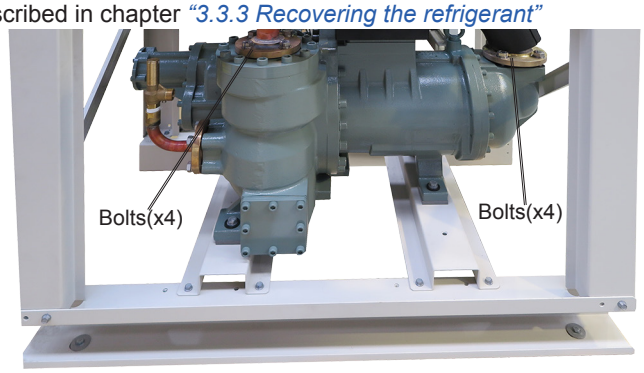
3.3.1 Compressor removal

◆ When Removing the Compressor

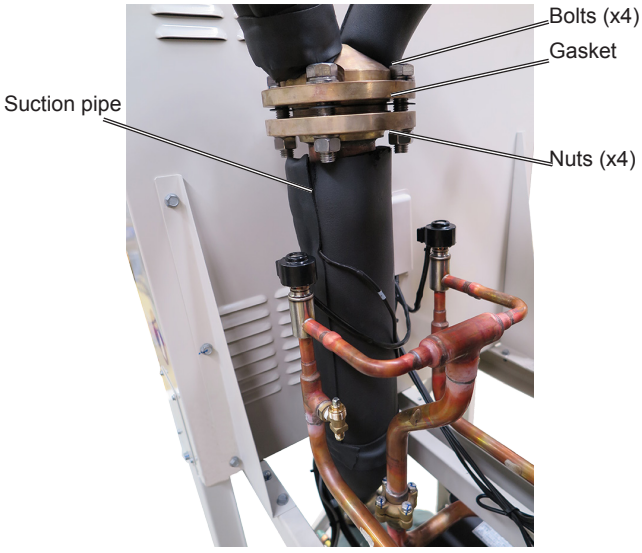
Remove the compressor while completing the following procedures.

1 Before any other operation, collect all refrigerant as described in chapter *"3.3.3 Recovering the refrigerant"*

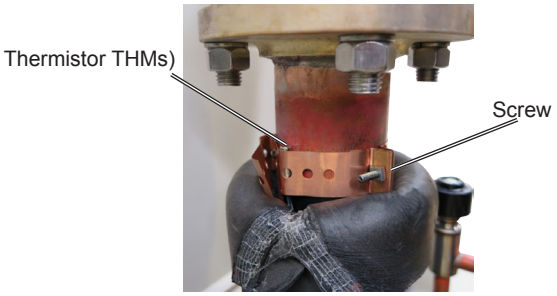
2 Remove the bolts on the discharge and suction flanges of the compressor.



3 Remove the 4 bolts at the upper flange of the suction pipe.

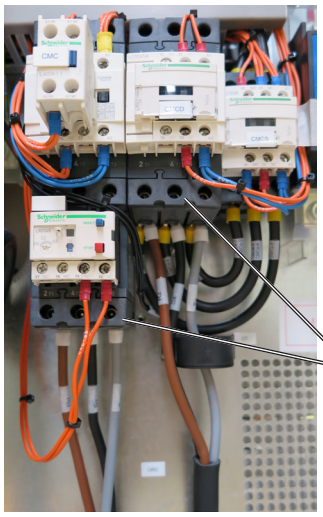


4 Loosen the screw at the metallic band, which fixes the Thermistor. Softly pull the thermistor backwards.

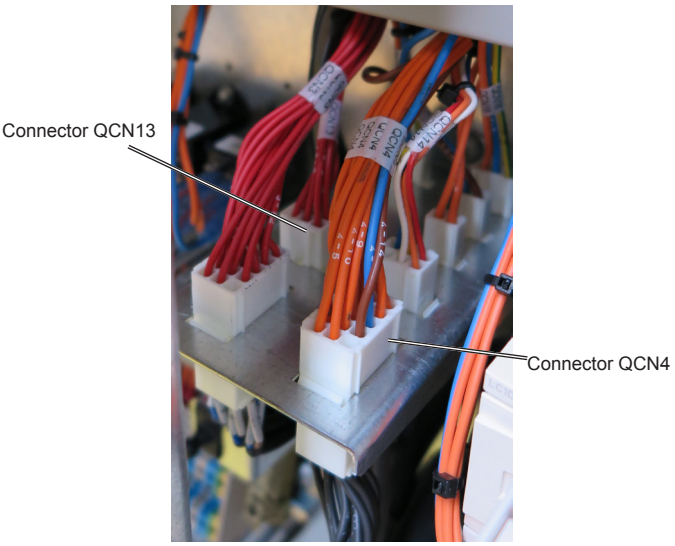


5 Remove all the wiring of the compressor.

a. Power supply wiring

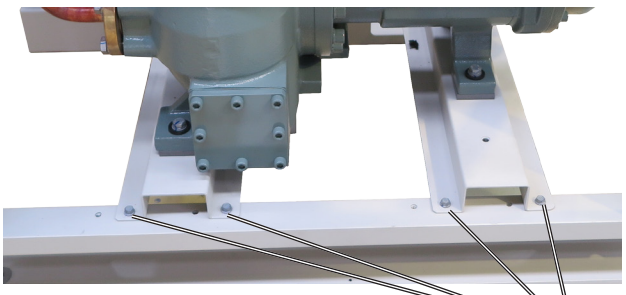


b. Control wiring connector (QCN4) and Pd and Ps cables (QCN13).



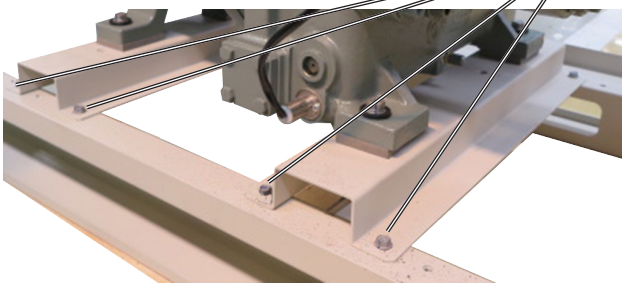
6 Remove the 8 screws fixing the compressor. Unscrew the screws fixing the structure (HEX10), as shown in the picture

Right side. From E Box

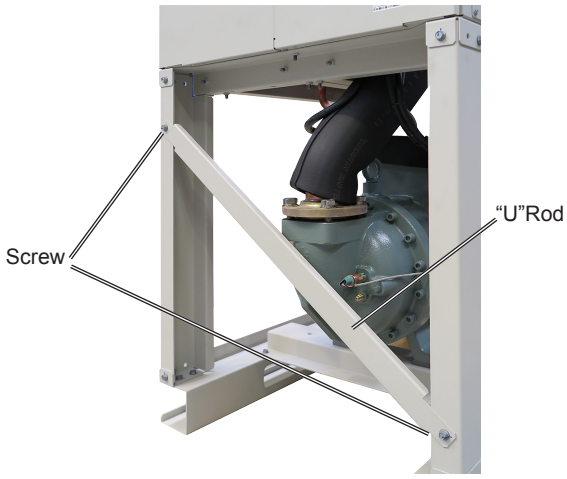


Screws (x8)

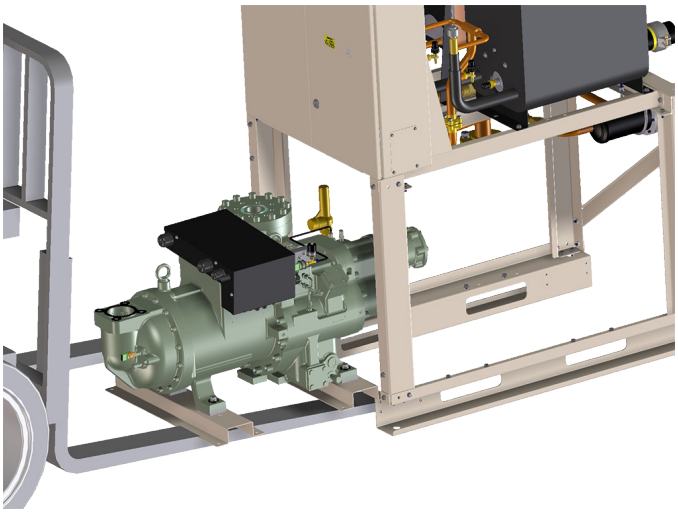
Left side. From E Box



7 Remove the “U” rod, fix to the structure.



8 Use a portable crane or a lift truck to remove the compressor: Introduce the forks under the compressor supports and gently pull backwards.

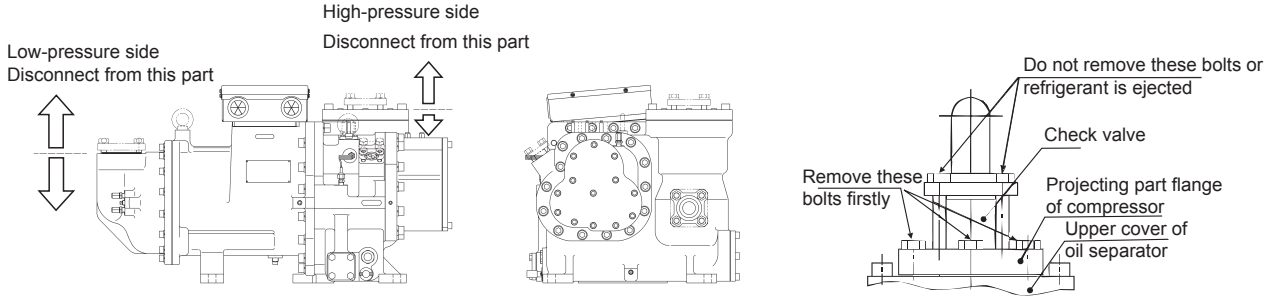


CAUTION

Compressor is heavy, two persons and a portable crane or similar are required.

3.3.2 Overhaul work

Perform the work according to “Semi-hermetic Hitachi Screw Compressor Manual”.
When removing a compressor from the refrigeration cycle, high pressure part shall be separated between the projecting part flange of compressor and the upper cover of oil separator. Do not separate high pressure part between the check valve and the projecting part flange of compressor, as collected refrigerant would be spilled out.



◆ Replacement of oil inside compressor

To replace the oil of the compressor proceed as explained below:

1 Collect all refrigerant as described in chapter *"3.3.3 Recovering the refrigerant"*

2 With a module capacity of 50~75%, perform the operation ensured by suction gas superheat for about 10 minutes, and after recovering the refrigerant as explained in *Recovery of refrigerant* in the Installation and Operation manual, turn power off and perform the following operation.

3 Oil extraction work

Remove the plugs for oil extraction (A-B) at 2 places in screw compressor, and measure the amount of extracted oil. It is not possible to extract the oil from the inside of compressor by just removing one plug, so always remove the 2 plugs.

4 Check of oil strainer

Remove the oil strainer cover (C), and confirm the state of the internal oil strainer. In case of finding any abnormality such as dirt or any damage, clean or replace the part as adequate.

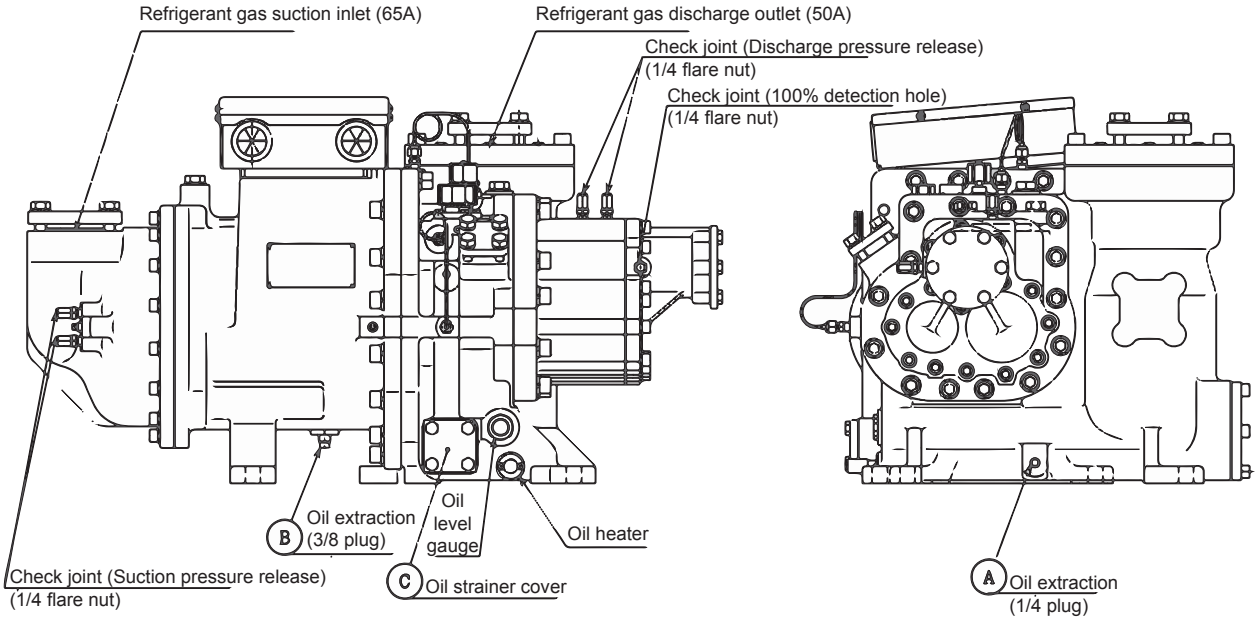
5 Oil charge work

Attach the oil strainer, the oil strainer cover (C) and the oil extraction plugs (A-B). Connect the charge hose to the check joint (Discharge pressure outlet). Let the oil be absorbed by the charge hose while performing vacuum from the check joint of the suction side. (Charge the amount of oil that had been extracted in the above point "Oil extraction work")

6 After completing the operation, perform vacuum again and charge refrigerant (check in the Installation and Operation Manual, *Maintenance* chapter).

NOTE

- *Use a clean charge hose.*
- *In order to avoid absorption of atmospheric moisture by refrigerant oil, use a container with a small opening and complete the operation in the shortest time possible (within 20 minutes as a criterion).*



3.3.3 Recovering the refrigerant

◆ **With a vacuum pump**

a. Make sure that the system is powered off.

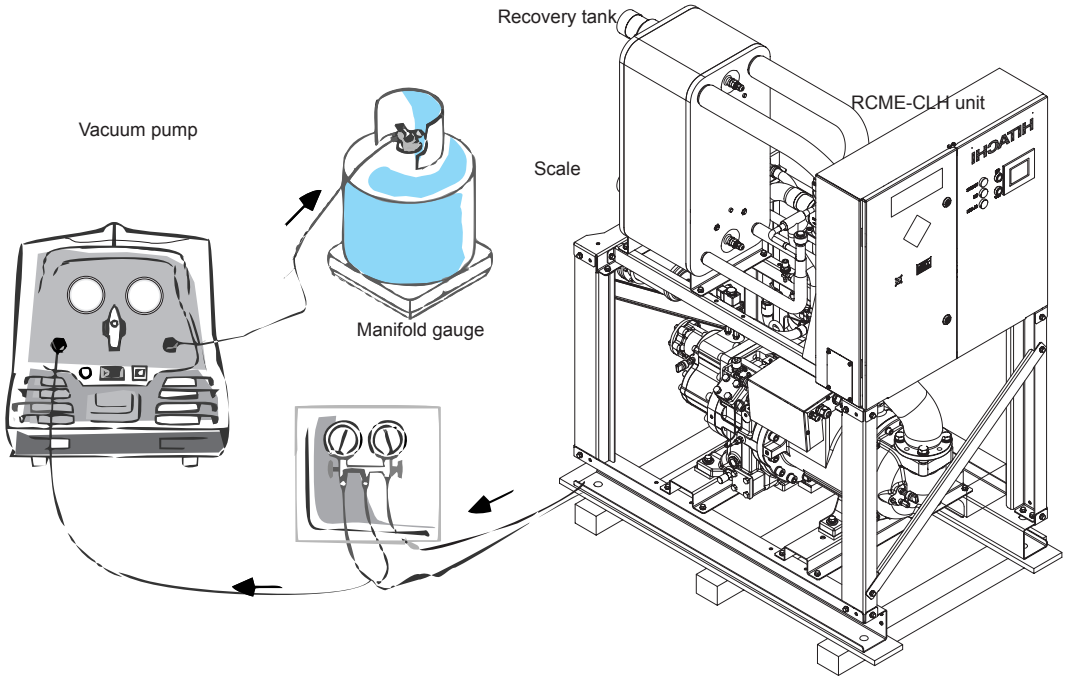
b. Completely close the stop valve.

c. Connect the vacuum pump system to the check joints of the refrigerant line.

d. Check for any leakage at the flare nuts connections.

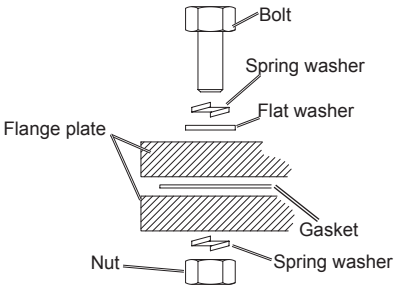
e. Operate the vacuum pump for 1 or 2 hours, or until the pressure decreases lower than a pressure of 756 mmHg in vacuum.

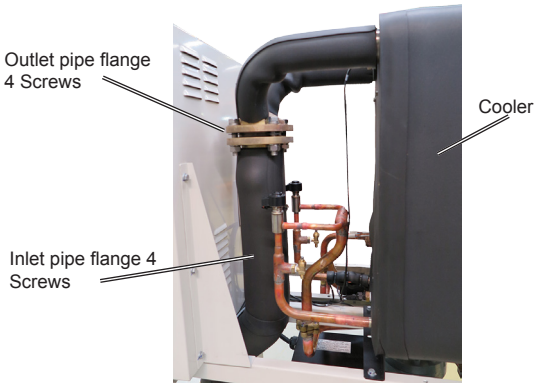
f. Use a scale to take note of the quantity of refrigerant charged into the tank in order to provide the same quantity when charging the circuit.



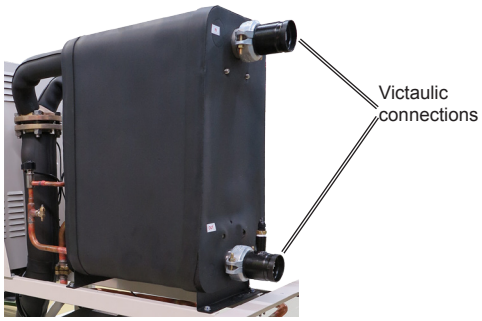
3.3.4 Replacement of the cooler

1 Unscrew the 4 screw of the refrigerant inlet pipe flange and the 4 screws of the outlet refrigerant pipe flange.





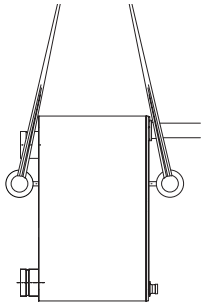
2 Remove the 2 Victaluic connections from the water connections.



3 Screw eyebolts to both sides of the cooler to the bolts for that purpose. Fasten a textile belt to proceed to lift the cooler.

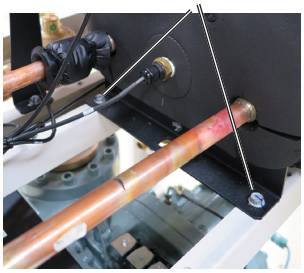
CAUTION

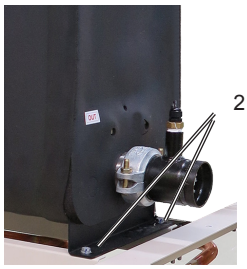
Do not never use chains or metallic ropes to lift the cooler as they can damage it.



4 Unscrew the 4 screw of the foot plate heat exchanger.

2 Screws





2 Screws

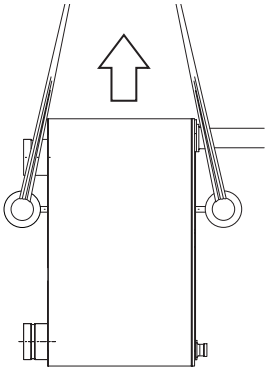
5 Remove de cooler. Softly lift the cooler and place it on a strong and stable surface.

CAUTION

In spite of water shut-off valves are closed, water inside the plate heat exchanger and water pipe remain.

CAUTION

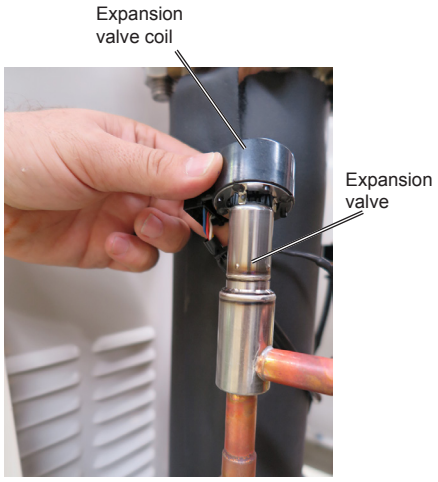
Plate heat exchanger is heavy, two persons and a portable crane or similar are required.



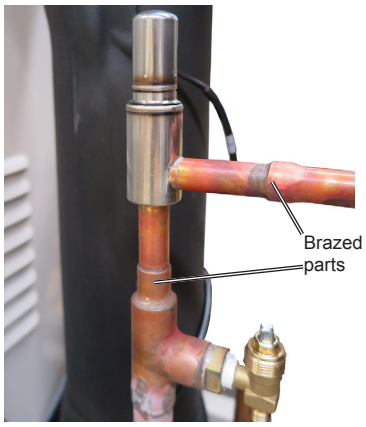
3.3.5 Replacement of expansion Valve

1 Collect the refrigerant as explained in section *"3.3.3 Recovering the refrigerant"*

2 Firmly hold the coil of the expansion valve and pull out upward. It is easier to remove the expansion valve coil if it is rotated while pulling it up.



3 Remove the brazed parts using a blowtorch and previously cooling the pipe side with wet cloth in order to avoid brazing material entering the pipe circuit.



Pay attention to the following points when replacing an expansion valve.

a. This unit uses an electronic expansion valve, which is normally closed when the compressor stops. For this reason, when the valve upstream of the expansion valve (liquid outlet valve of the heat exchanger) is closed, refrigerant may accumulate between the liquid outlet valve of the heat exchanger and the expansion valve. In case of removing the brazed part of the expansion valve, always conduct this work after selecting expansion valve manual output function at the service menu in order to force the opening of the expansion valve, and release both the primary and the secondary side.

b. After replacement of the expansion valve, the value managed by the control and the actual opening do not match. In order to fix this, always conduct a zero point adjustment (power reactivation).

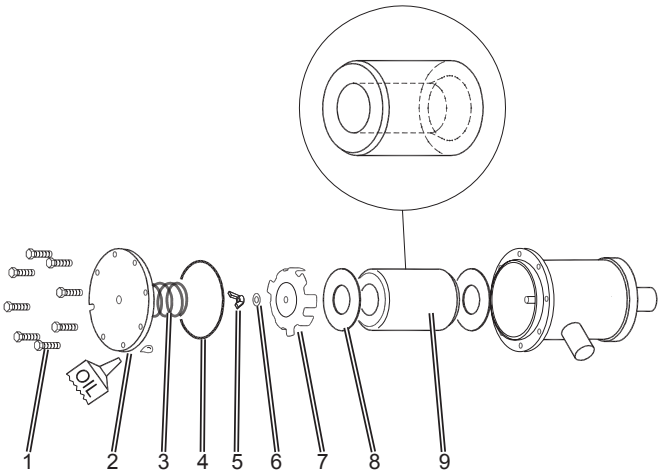
3.3.6 Filter drier

There are two possible main maintenance operations to do with the filter drier: the substitution of the inner core due to its adsorption saturation or the substitution of the whole unit due to some damage.

◆ Solid core substitution

Follow the next steps in order to proceed to replace the inner core of the filter drier:

1. Remove the 8 screws (1) that fixes the top cover (2). Carefully, remove the spring (3), the top cover gasket (4), the wing nut (5) and the lock washer (6).
2. Retire the top plate (7) and then the felt gasket (8)
3. Take the solid core (9) out and proceed to the replacement.
4. When reassembling after replacing the solid core, perform the procedure in the reverse order than removing.



NOTE

At reassembling, oil or grease the top cover gasket and the thread of the cover screws.

◆ Filter drier unit replacement

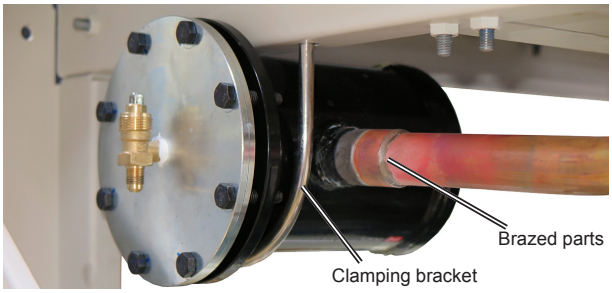
Replace the filter drier unit if any leakage or malfunction is detected. Proceed following the steps explained below:

1. Protect the surroundings of the unit from the heat of the blowtorch.
2. Remove the brazed parts using a blowtorch and previously cooling the pipe side and the filter drier unit with wet cloth in order to avoid brazing material enter inside the pipes.
3. Unscrew the nuts of the clamping bracket to release the filter drier.

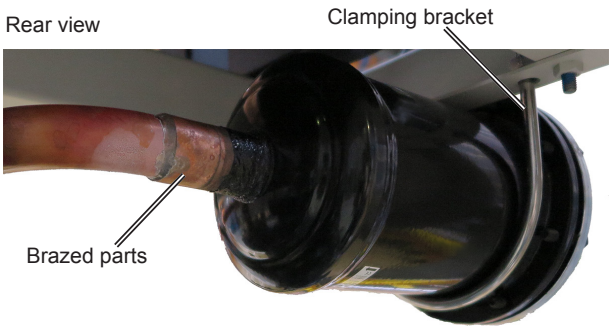
CAUTION

After blowtorch operations, filter drier and the surroundings may be too warm. Take special care to use insulation protection.

Front view



Rear view



3.3.7 Replacement of the check valve

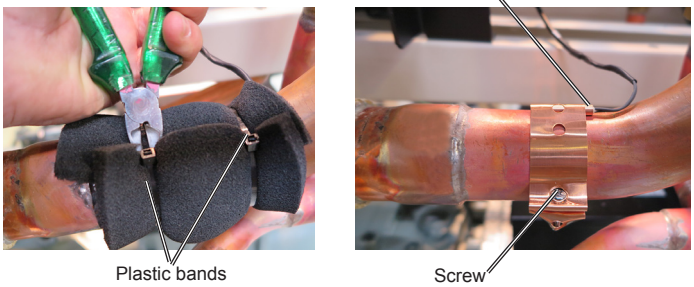
The best way to replace the check valve is disassembling it from its location and later, unbrazing it from the pipes. Follow the next steps for a correct disassembling:

1 Remove the thermistor (THMd).

a. Cut and remove the plastic bands that fixes the insulation of the discharge pipe thermistor (THMd).

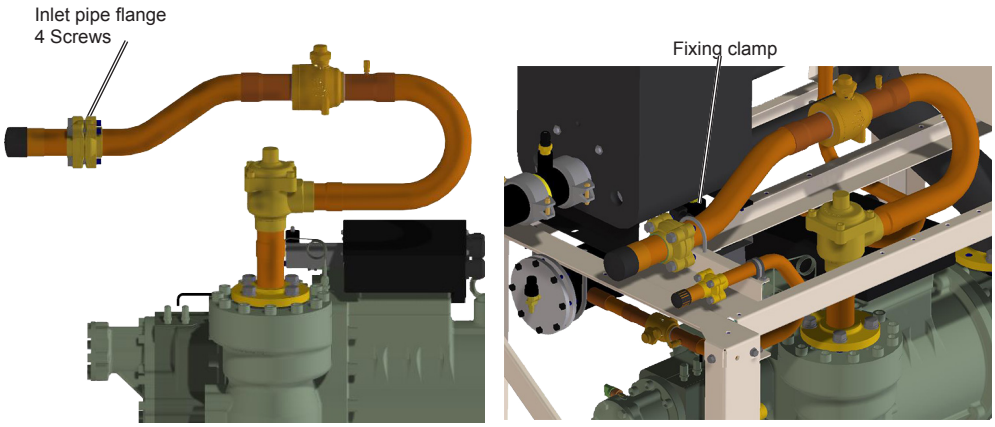
b. Loosen the screw fixing the thermistor.

c. Remove the thermistor.



2 Remove the 4 screws of the inlet pipe flange.

3 Remoce the fixing clamp.

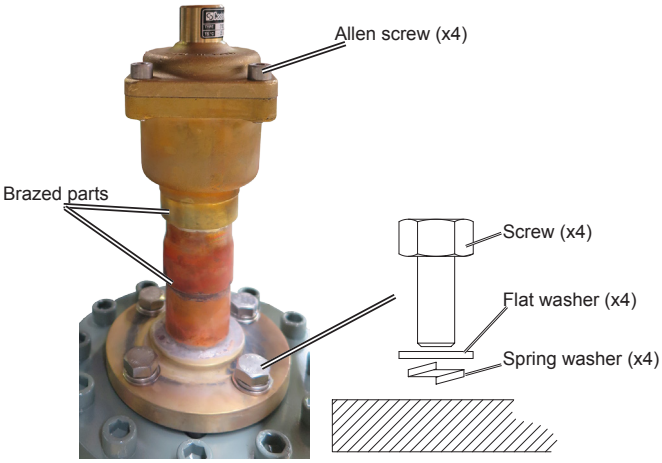


4 Remove the 4 screws that fixes the check valve to its location at the discharge outlet.

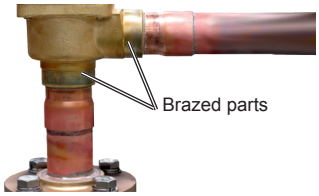
5 Remove the 4 Allen screws that fixes the cover of the check valve.

Once disassembled

6 Remove the cover of the check valve to protect the inner parts from the heat of the blowtorch when disassembling the pipes.

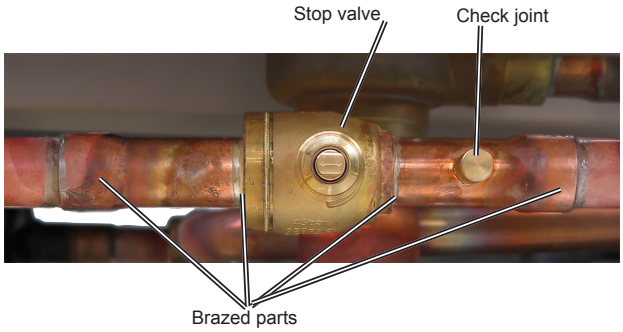


7 Remove the brazed parts using a blowtorch and previously cooling the pipe side and the check valve unit with wet cloth in order to avoid brazing material enter inside the pipes.



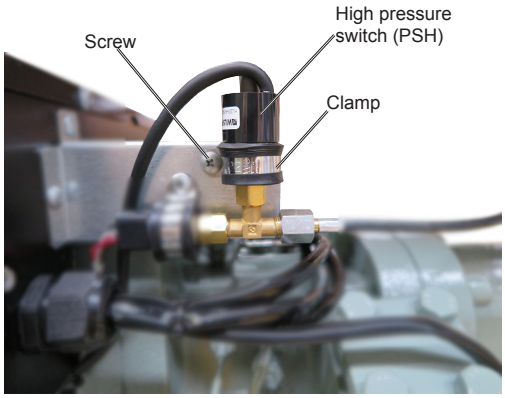
3.3.8 Replacement of the stop valve (with check joint)

1 Remove the brazed parts using a blowtorch and previously cooling the pipe side and the stop valve unit with wet cloth in order to avoid brazing material enter inside the pipes.



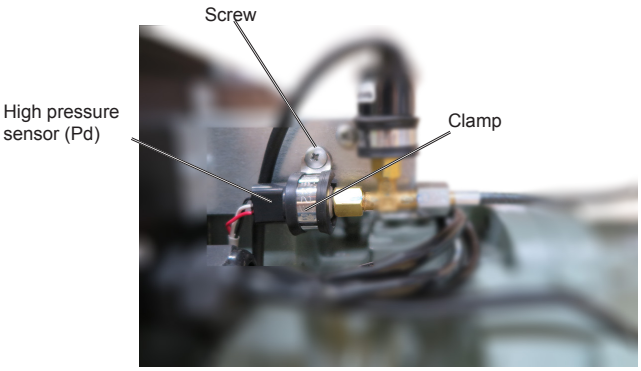
3.3.9 Replacement of the high pressure switch (PSH)

1 Disconnect the cables (9 and 10 of the Pressure switch from the E-box of the compressor terminal board).
2 Remove the screw of the clamp that fixes the switch.
3 Unscrew the switch and proceed to its replacement
4 When reassembling proceed in reverse order than removing.



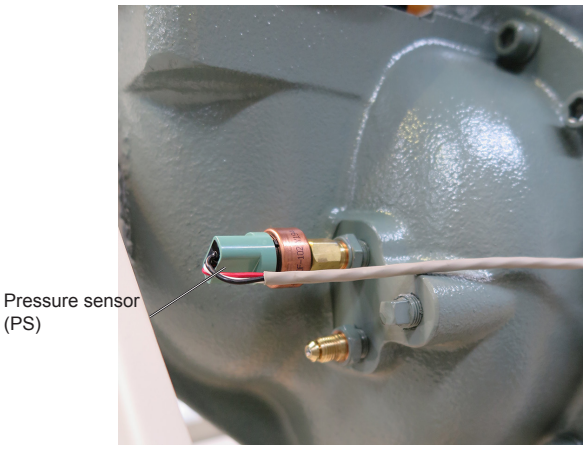
3.3.10 Replacement of the pressure sensor (Pd)

1 Disconnect the cables (4, 5 and 6 of the pressure sensor from the E-box of the compressor terminal board).
2 Remove the screw of the clamp that fixes the switch.
3 Unscrew the switch and proceed to its replacement
4 When reassembling proceed in reverse order than removing.



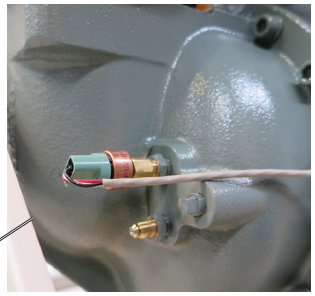
3.3.11 Replacement of the pressure sensor (Ps)

1 Disconnect the cables (1, 2 and 3 of the Pressure sensor from the E-box of the compressor terminal board).
2 Unscrew the sensor and proceed to its replacement
3 When reassembling proceed in reverse order than removing.



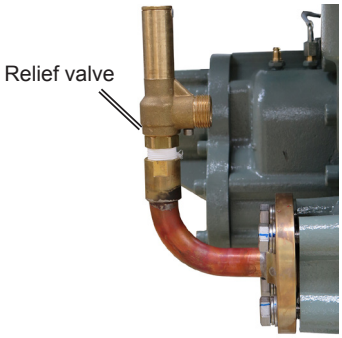
3.3.12 Replacement of the pressure sensor (PS)

1 Disconnect the cables (7 and 8 of the pressure sensor form the E-box of the compressor terminal board).
2 Unscrew the sensor and proceed to its replacement
3 When reassembling proceed in reverse order than removing.



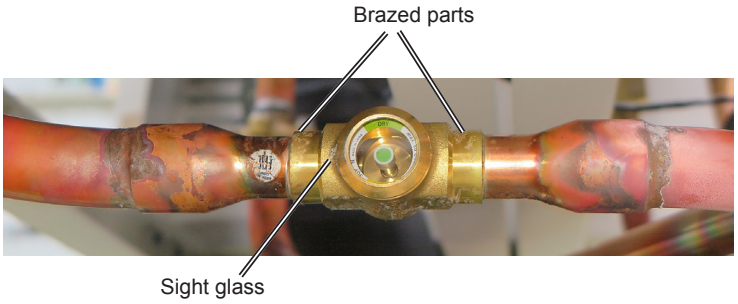
3.3.13 Replacement of the pressure relief valve

1 Remove the relief valve unscrewing the valve with a spanner.
2 When reassembling after replacing the relief valve, proceed in the reverse order than removing. Use Teflon tape on the thread to avoid any leakage.



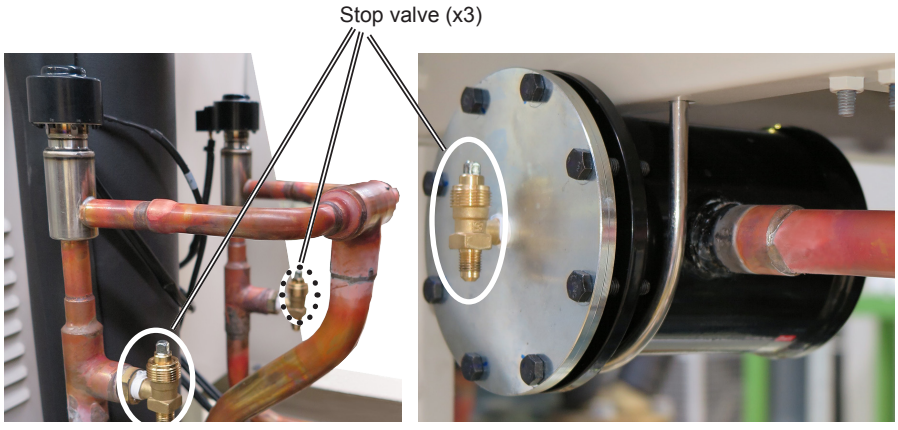
3.3.14 Replacement of the sight glass

To remove the sight glass proceed as follows:
1 Remove the brazed parts using a blowtorch and previously cooling the pipe side and the sight glass with wet cloth in order to avoid brazing material enter inside the pipes.
2 When reassembling after replacing the sight glass, perform the procedure in the reverse order than removing.



3.3.15 Replacement of the stop valve (x3)

There are 3 stop valves located along the refrigerant cycle: 2 are located close the expansion valves and 1 is located at the filter drier, as shown in the pictures below.

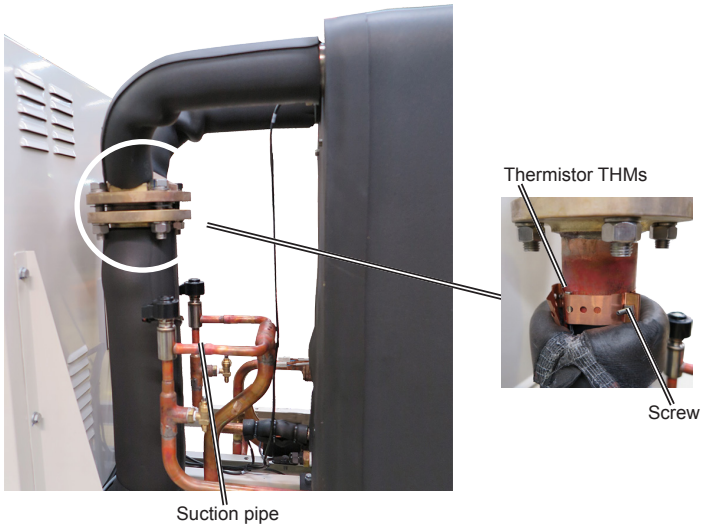


At expansion valves At filter drier

To replace the stop valves, unscrew the stop valve with a spanner. Remove and replace the stop valve. Use Teflon tape to seal the thread and avoid any leakage.

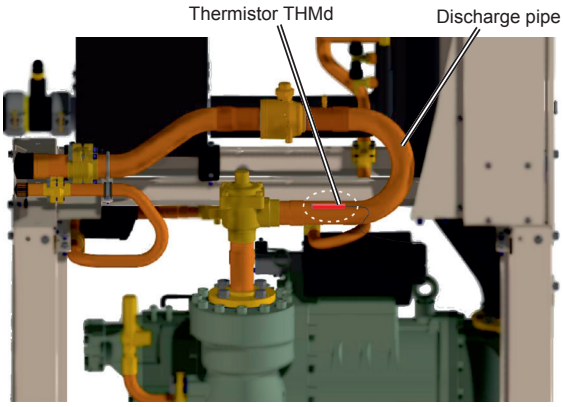
3.3.16 Repalacement of the thermistor (Suction, THMs)

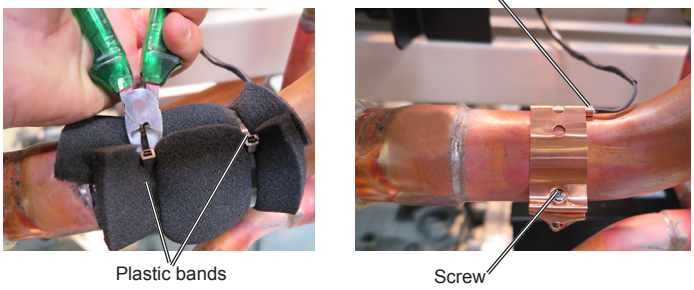
1 Remove the insulation of the suction pipe.
2 Loosen the screw fixing the thermistor.
3 At the E-box, disconnect the CN27 contact (or the Faston terminals 7 and 8 of multiple contact QCN3)
4 Remove the thermistor.
5 When reassembling after replacing the thermistor (THMd), perform the procedure in the reverse order than removing.



3.3.17 Replacement of the thermistor (Discharge, THMd)

1 Cut and remove the plastic bands that fixes the insulation of the discharge pipe thermistor (THMd).
2 Loosen the screw fixing the thermistor.
3 At the E-box, disconnect the CN26TD contact (or the Faston terminals 9 and 10 of multiple contact QCN3)
4 Remove the thermistor.
5 When reassembling after replacing the thermistor (THMd), perform the procedure in the reverse order than removing.



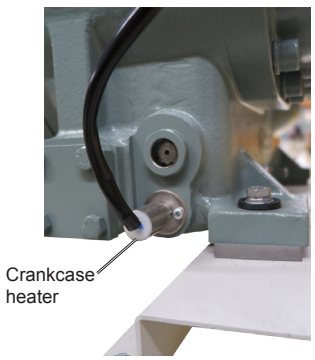


3.3.18 Replacement of the crankcase heater (CH)

1 Disconnect the cables (17 and 18 of the crankcase heater form the E-box of the compressor table board).
2 Unscrew the heater and proceed to its replacement
3 When reassembling proceed in reverse order than removing.

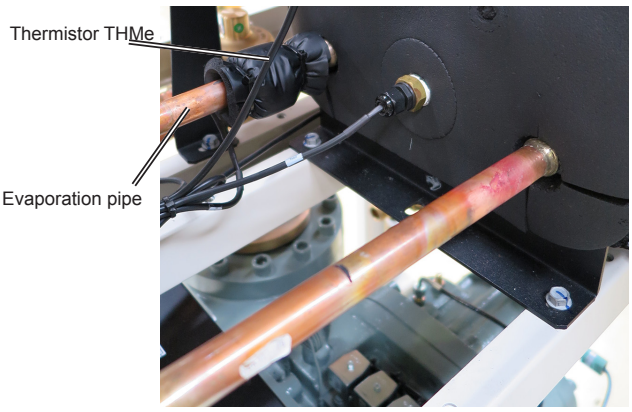
CAUTION

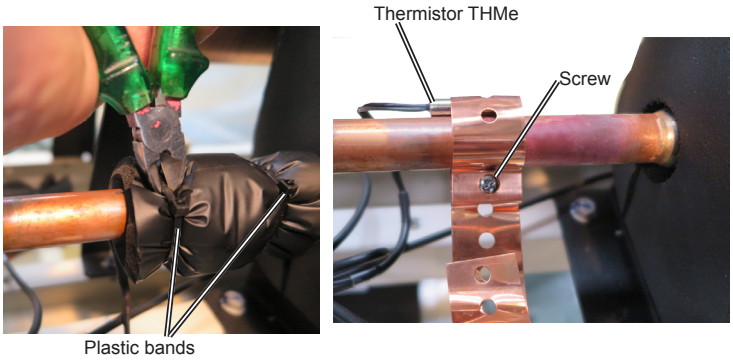
Wait for the crankcase heater to cool before manipulate. Protect your hands with appropiate gloves.



3.3.19 Replacement of the thermistor (Evaporation, THMe)

1 Cut and remove the plastic bands that fixes the insulation of the discharge pipe thermistor (THMe).
2 Loosen the screw fixing the thermistor.
3 At the E-box, disconnect the CN26TD contact (or the Faston terminals 9 and 10 of multiple contact QCN3)
4 Remove the thermistor.
5 When reassembling after replacing the thermistor (THMe, perform the procedure in the reverse order than removing.





3.3.20 Replacement of the thermistor (Cooler water inlet, THMwi)

1 Unscrew the nut of the cable gland
2 Gently pull the sensor wiring upwards.

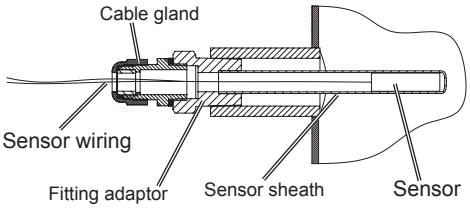
CAUTION

Sensor sheath is full of sealing silicone. Use gloves and eye goggles for protection in order to avoid possible injuries to eyes and skin.

3 Disconnect the 3 and 1 Faston terminals or the CN5 connector at the E-box
4 Replace the thermistor in reverse order than removing.

NOTE

Use sealant silicone inside the sensor sheath to protect and avoid any leakage.



3.3.21 Thermistor (Cooler water outlet, THMwo2)

1 Unscrew the nut of the cable gland
2 Gently pull the sensor wiring upwards.

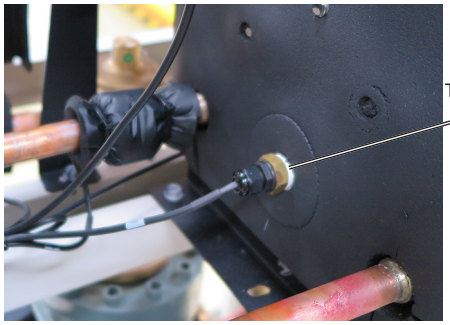
CAUTION

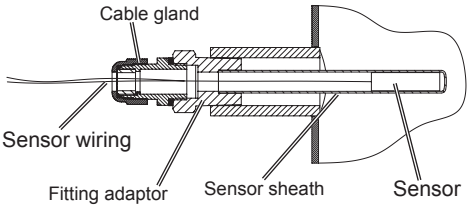
Sensor sheath is full of sealing silicone. Use gloves and eye goggles for protection in order to avoid possible injuries to eyes and skin.

3 Disconnect the 3 and 1 Faston terminals or the CN5 connector at the E-box
4 Replace the thermistor in reverse order than removing.

NOTE

Use sealant silicone inside the sensor sheath to protect and avoid any leakage.





3.3.22 Thermistor (Cooler water outlet, THMwo)

To remove the thermistor THMwo, proceed as follows:

1 Unscrew the nut of the cable gland
2 Gently pull the sensor wiring upwards.

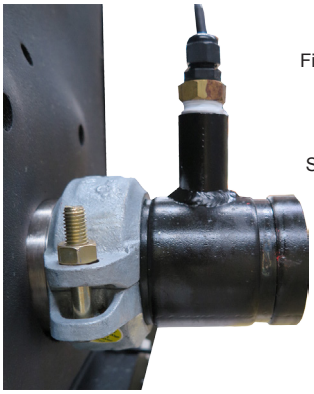
CAUTION

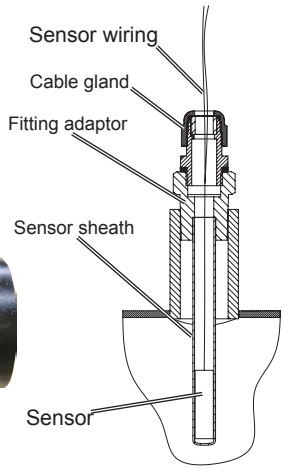
Sensor sheath is full of sealing silicone. Use gloves and eye goggles for protection in order to avoid possible injuries to eyes and skin.

3 Disconnect the 3 and 1 Faston terminals or the CN5 connector at the E-box
4 Replace the thermistor in reverse order than removing.

NOTE

Use sealant silicone inside the sensor sheath to protect and avoid any leakage.





3.3.23 Replacement of the solenoid valves (SVa, SVb, SVc)

1 Remove the screw with a Phillips screwdriver.

1 Gently pull the coil and remove it from the valve.

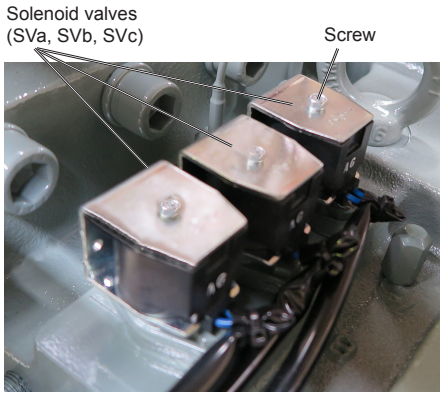
1 Remove 2 M6 screws that fixes the valve in the compressor.

1 Replace the valve in reverse order than removing.

NOTE

Table of connections at compressor E-box

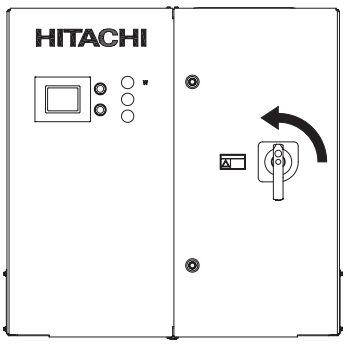
SVa	SVb	SVc
15/16	13/14	11/12

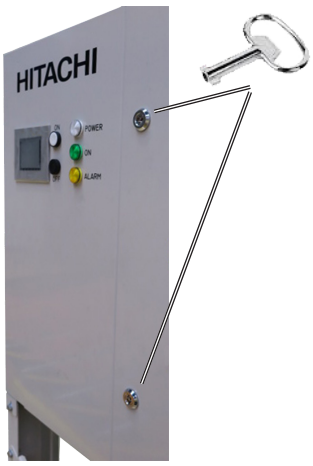


3.4 Electrical components

3.4.1 The E-box

1 Turn the main switch off. If main switch is not turned off it is not possible to open the door.
2 Open the E-box door using the provided key for electrical box cam locks.





NOTE

When the right door is open, the left one may easily open by pulling backwards. When Ebox shall be closed, remember to close the left door first.

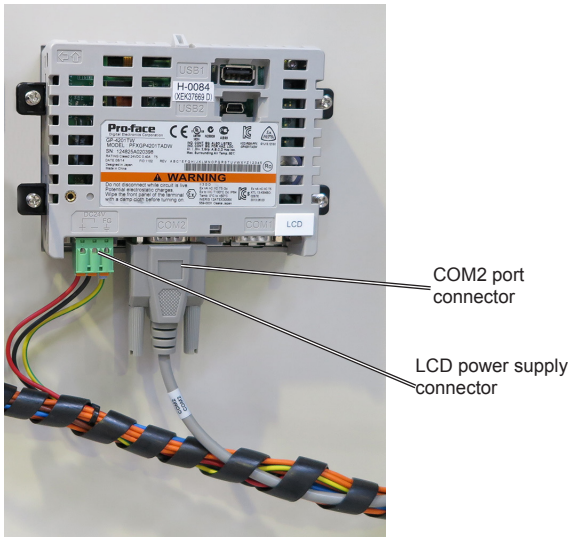
3.4.2 Removal of the LCD screen

The removal of the LCD screen have to be done from the inner of the left door at the E-box.

1 Remove the wirings.

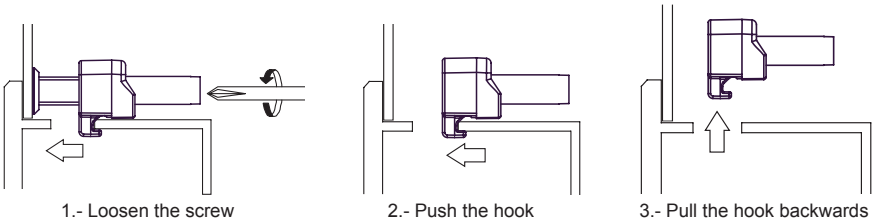
a. Remove the COM2 connector. Using a flat screwdriver, loosen the 2 screws of the COM2 port connector and pull backwards the connector.

a. Remove the DC24V connector by pulling backwards.



2 Using a Phillips screwdriver, loosen the 4 screws fixing the LCD screen to the door panel.

3 For a correct removal of the LCD screen, follow the next steps

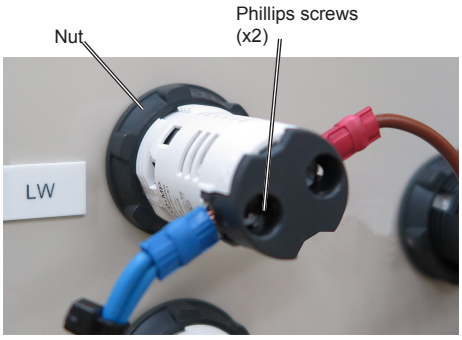


3.4.3 Replacement of lamps and push buttons

Lamps and push buttons are placed in the left door of the E-box. To replace anyone of the open the E-box until get access to the left door and proceed as follows:

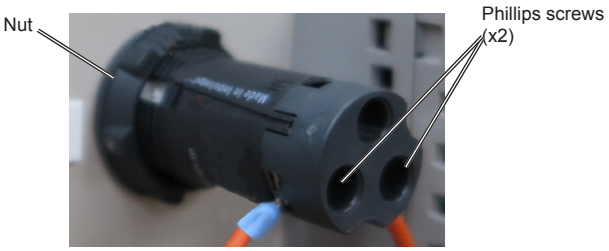
◆ **Replacement of the lamps**

1 Remove the wirings connected to the lamp holder using a Phillips screwdriver.
2 Remove the nut fixing the lamp holder to the E-box door.
3 Replace the lamp and proceed to assembly in reverse order than removing



◆ **Replacement of the push buttons**

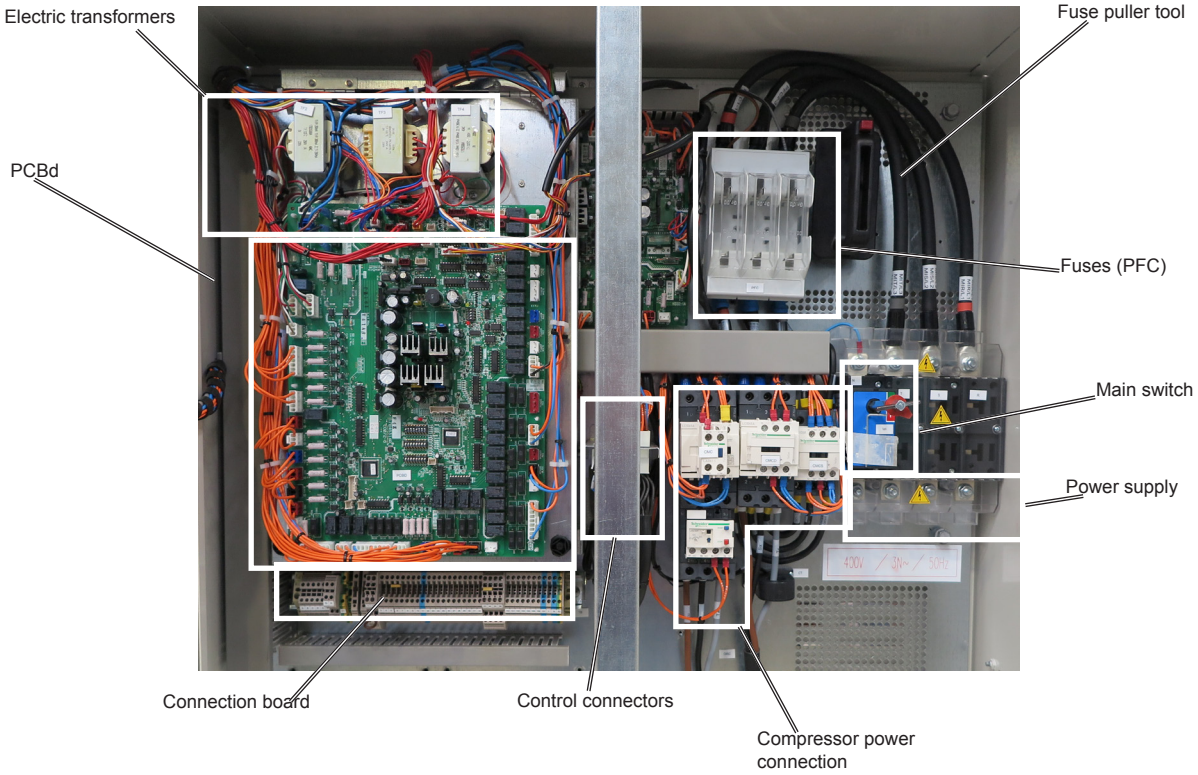
1 Remove the wirings connected to the push button using a Phillips screwdriver.
2 Remove the nut fixing the push button holder to the E-box door.
3 Replace the push button and proceed to assembly in reverse order than removing



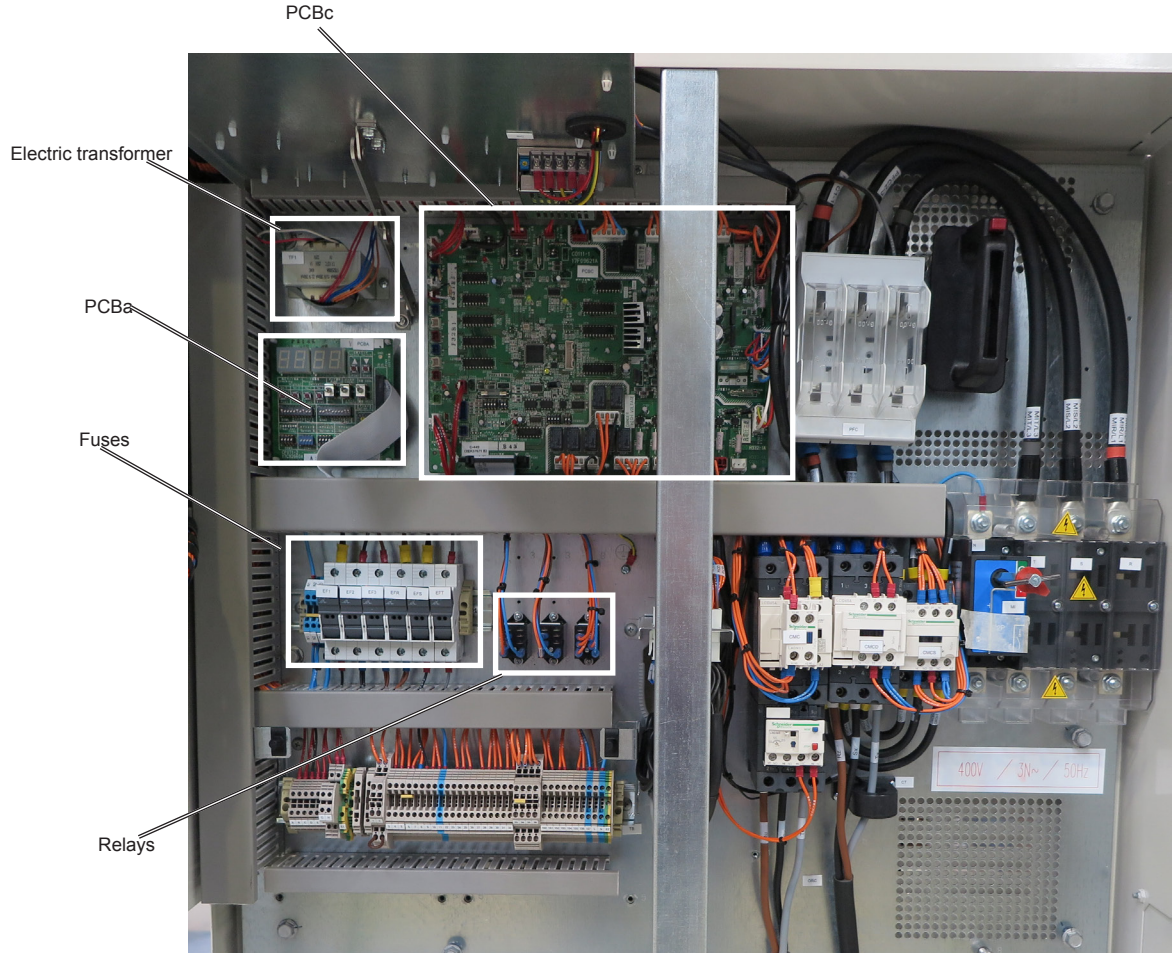
3.4.4 Access to electrical components

PCB's are placed on 2 levels into the E-box. By simply opening the left door there is the PCBd. In a second level, there are PCBa and PCBc. Also, there are most of the main electric power and control electric components. The steps to access to those components and how they can be removed are explained below:

First level components

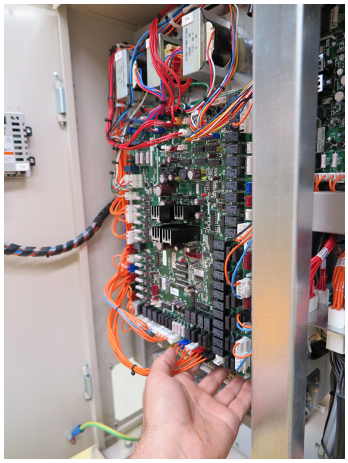


Second level components

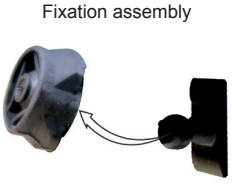


◆ Access to second level electric components

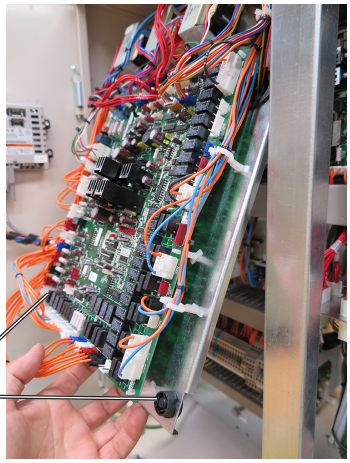
To have acces to the main control and power components of the unit into the E-box, follow the next steps:



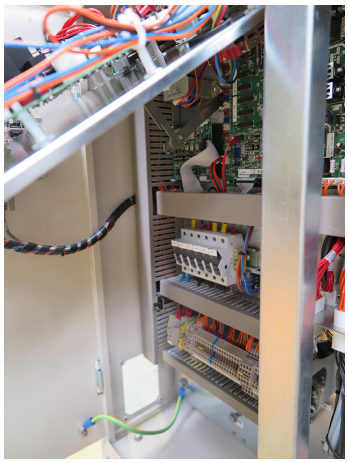
1 Firmly pull the plate

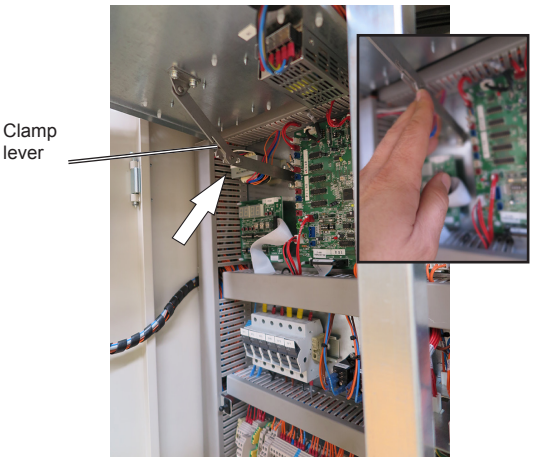


2 Pull until release the fixation assembly



3 Keep pulling until the plate is in horizontal at the top

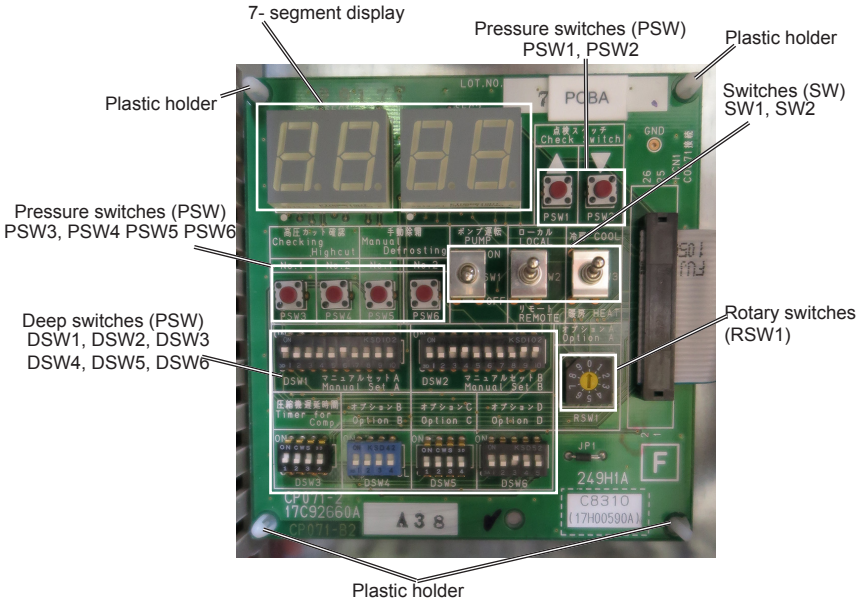


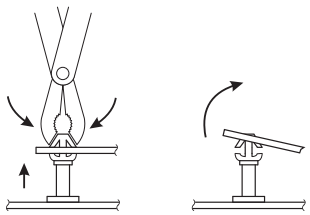


4 Push the clamp lever to fix the plate in horizontal position at the top.

3.4.5 Removal of the PCB's

◆ **PCBa**

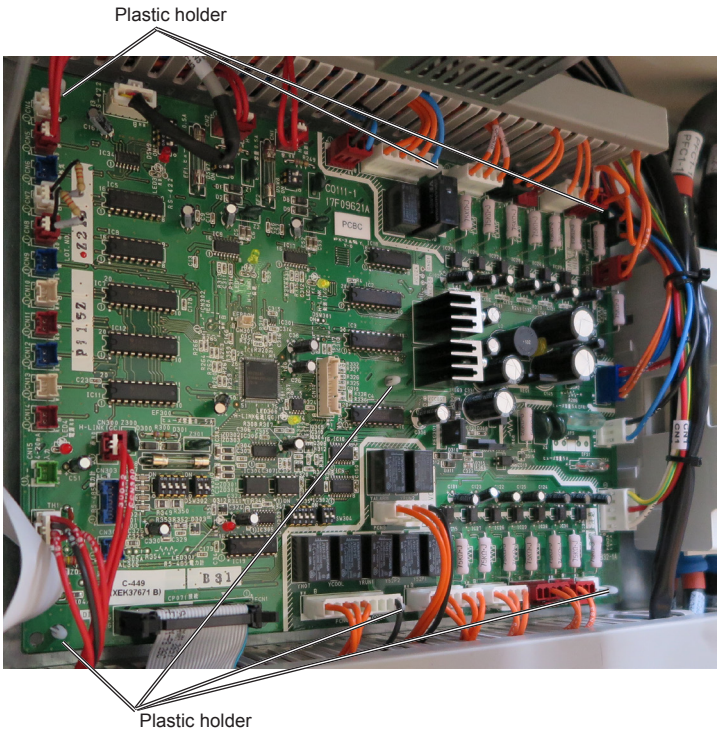


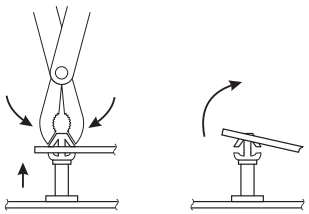


a. Remove the PCB by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.

b. Pull the PCB out from the PCB plate.

◆ PCBc

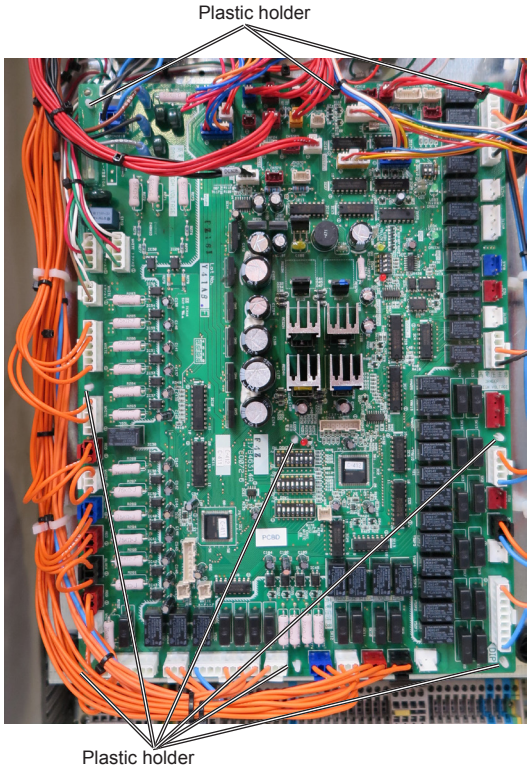


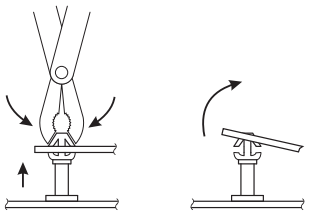


a. Remove the PCB by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.

b. Pull the PCB out from the PCB plate.

◆ PCBd





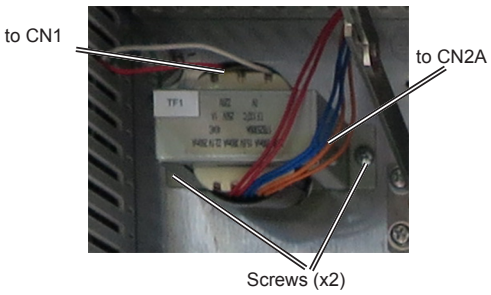
a. Remove the PCB by pressing the expanded part of the 4 plastic holders, using long-nose pliers, as shown in the picture below.

b. Pull the PCB out from the PCB plate.

3.4.6 Transformer (TF1)

To have access to electrical transformer TF1, follow the steps described in *"Second level components"* in chapter *"3.4.4 Access to electrical components"*

1 Remove all the wirings corresponding to TF1. As shown in the image.
2 Remove the 2 screws that fix the TF1 to the plate

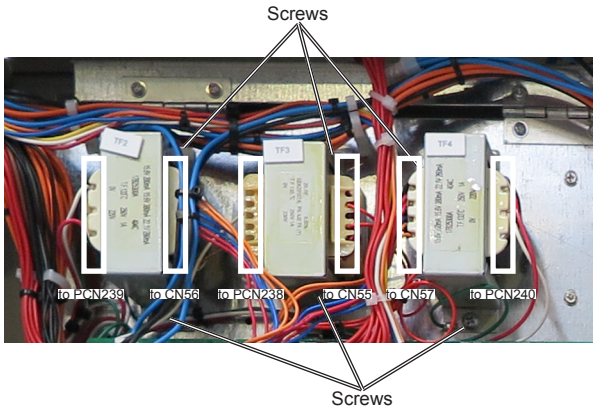


3.4.7 Transformers (TF2, TF3, TF4)

To remove any of the TF2, 3 or 4, simply open left door of the E-box, and follow the next steps according to the transformer to remove.

1 Remove all the wirings corresponding to the transformer to remove. (As shown the image)

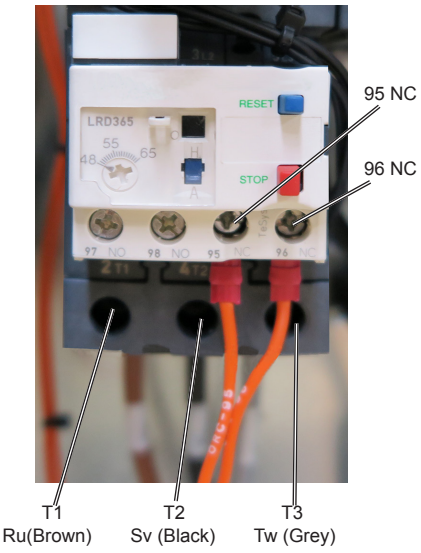
1 Remove the 2 screws that fix the transformer to the plate.



3.4.8 Overcurrent relay (ORC)

To remove the overcurrent relay (ORC), open the E-box, and follow the next steps.

1 Remove all the wirings.
2 Remove the 2 screws that fix the ORC to the plate.



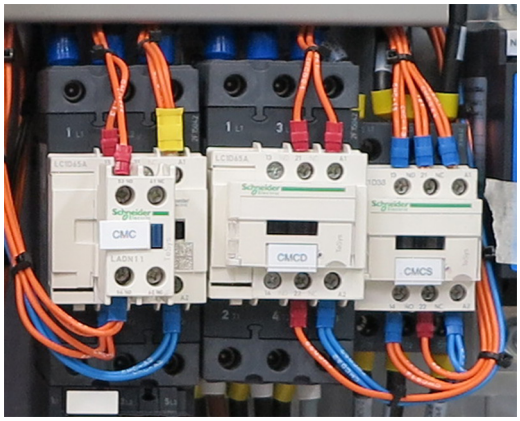
3.4.9 Contactors (CMC, CMCD, CMCS)

CAUTION

In RCME-WH units, contactors are used for the delta start automation. Take note where each cable is connected in order to avoid any mistake when reassembling. An incorrect connection may result in a compressor damage.

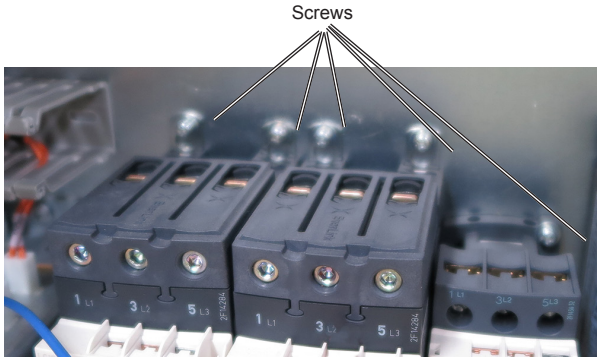
To proceed to the removal of contactors, follow the steps described below.

1 Remove all the wiring with a Phillips screwdriver.



2 Remove the screws that fixes the contactors to the plate.

3 When reassembling, proceed in reverse order than removing.

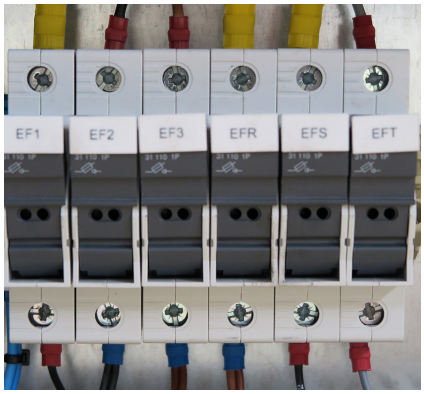


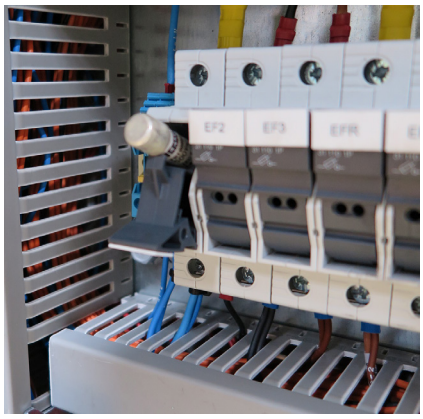
Use a Phillips screwdriver to remove the screws. 2 screws at the top and 1 screw at the bottom.

3.4.10 Fuses (EF1, EF2, EF3. EFR, EFS, EFT)

"EF" fuse series are mounted on DIN rail. To replace any damaged fuse proceed as described below.

1 Once the damaged fuse is detected, simply push the holder down. The damaged fuse appears. Pull it and proceed to its replacement



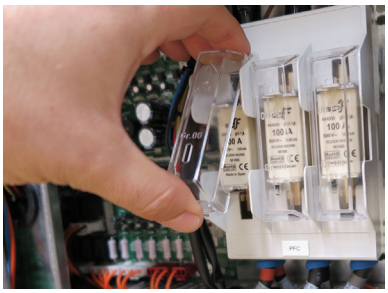


3.4.11 Fuses (PFC)

◆ Removal of the fuses

Once the damaged fuse is detected proceed to its replacement following the next steps:

1 Open the plastic cover that protects the fuse



2 Take the fuse puller tool.

a. Push the red button.

b. Slide the fuse puller tool up or down.

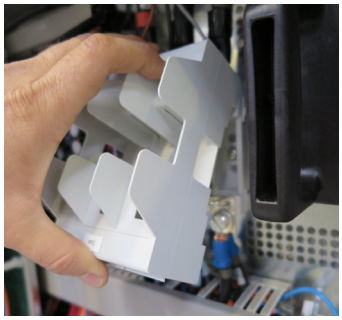
c. Pull the fuse puller backwards.

3 On the damaged fuse, put the fuse puller tool and firmly push to fix the tool on the fuse. Once the fuse is trapped pull the tool backwards.

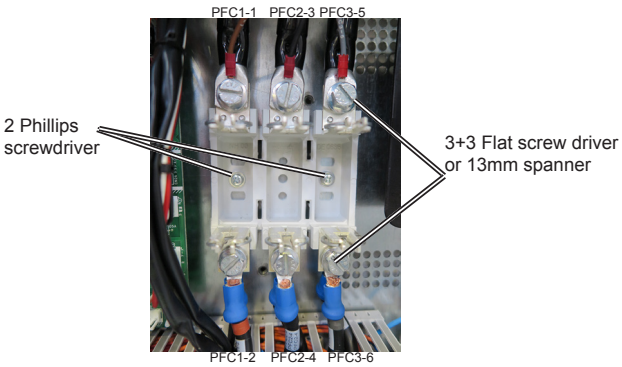
◆ Removal of the PFC fuse holder

In case the fuse holder has suffered any damage and replacement is needed, follow the step described below.

1 Pull the fuse housing backwards.



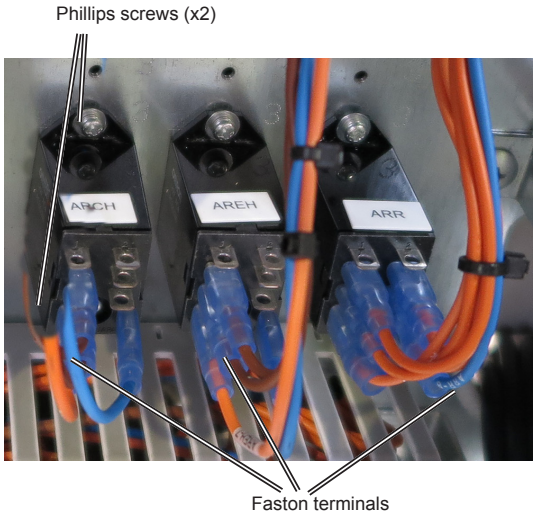
2 Remove the Hex screws and wiring.
3 Remove the Phillips screws and replace the fuse holder.



4 When reassembling, perform the procedure in the reverse order than removing.

3.4.12 Relays

To remove any of the relays, proceed as follows:
1 Detach the Faston terminal from its connection
2 Remove the 2 screws fixing the relay to the plate.
3 Replace the relay.

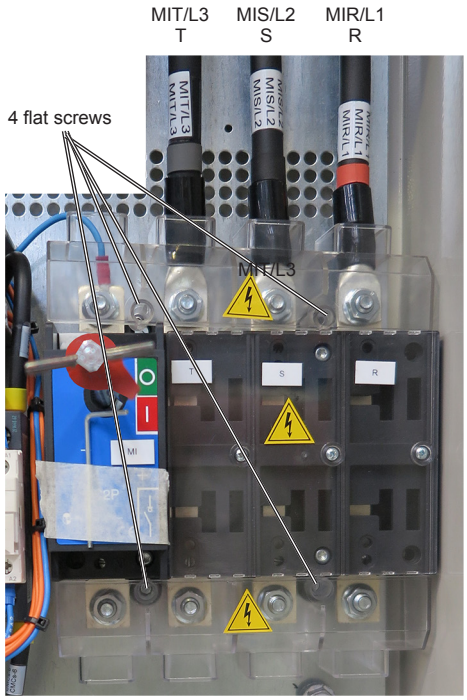


4 When reassembling, proceed in the reverse order than removing.

3.4.13 Main Switch

To remove the main switch, follow the next steps

1. Turn the switch of in order to be able to open the E box door
2. Open the E-box door.
3. Remove the wiring. Unscrew the nuts from the terminals with a 13 mm spanker.
4. Remove the 4 screws with a flat screwdriver.
5. When reassembling, proceed in the reverse order than removing.



4. Troubleshooting

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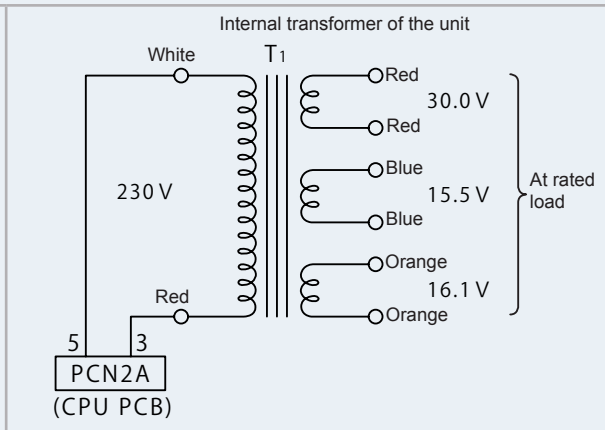
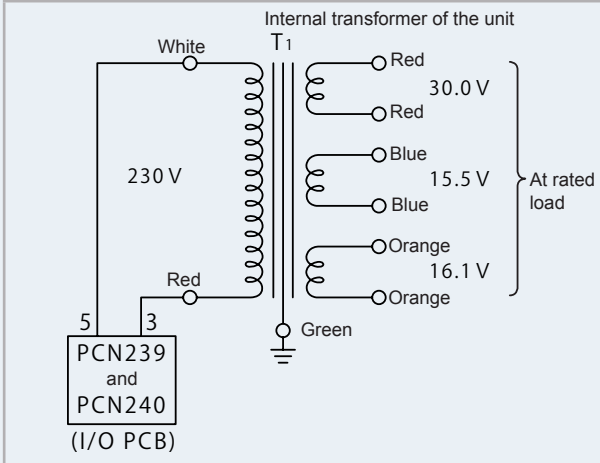
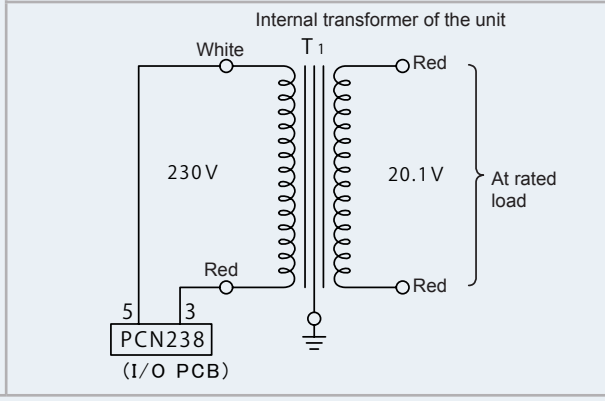
4.1 Inspection of power source and connections

In case that there is any abnormality in the activation of the chiller unit, first perform the following check.

No.	Check Item	Inspection Method
1	Is the power source breaker or the fuse broken?	Examine the secondary voltage of the breaker and the passage of electric current through the fuse with a tester.
2	Is the secondary voltage of the transformer flowing out correctly?	Remove the connection of the secondary side of the transformer, and measure the (AC) voltage with a tester. Confirm that the voltage shown on the transformer is being output. Voltage and circuit   
3	Is there any loose wiring or miswiring?	Confirm that there are is no looseness in the wiring connections with PCB, etc., or that there are no mistakes in local wiring, using the electrical wiring diagrams as a reference. • Plugs for connection of wiring of the sensors (each of them) • Plugs for connection of flat cable • Plugs for connection of transformer connection • Plugs for each connection of 230V circuit

4.2 Inspection of PCB

The standard setting of switches, etc., on the PCB is as *Control System* chapter in the Installation and Operation Manual. Confirm that they are being set correctly.

4.3 Confirmation of operating value of protection devices and automatic operation devices

The activation values of protection devices are as follows:

Name		Operating value	
Low/High pressure interruption device	High pressure	2.02MPa	
		(Manual recovery)	
	Low pressure	0.13MPa or below	
		(Electronic control)	
		0.01MPa or below	
		(Electronic control)	
Overcurrent relay (for compressor)		230V Type	400V Type
	RCME-40WH	100A	48A
	RCME-50WH	130A	55A
	RCME-60WH	160A	65A
	RCME-70WH	160A	80A
Suction gas decrease prevention control		-5ºC	
Compressor Internal Thermostat		115ºC	
Control for prevention of discharge gas overheat		140ºC	
Fusible plug		72ºC	
Control Circuit Fuse		10A, 5A, 3A	
Safety valve (for compressor)		2.10MPa (Diameter φ35mm)	

The setting values of automatic operation devices are as follows.

Item (Unit)			Setting value	Notes
Time settings for startup control	Time guard setting	min	Variable: 30 s ~ 10 min (Standard value: 30 s) (*)	Electronic control
	Startup unload	min	1 min	

NOTE

- *(*) The operation order of the cold water circulation pump is output at the same time that chiller unit operation starts.*
- *Set a time that allows to ensure a flow of cold water upon activation of the cold water circulation pump.*

4.4 Protection control function

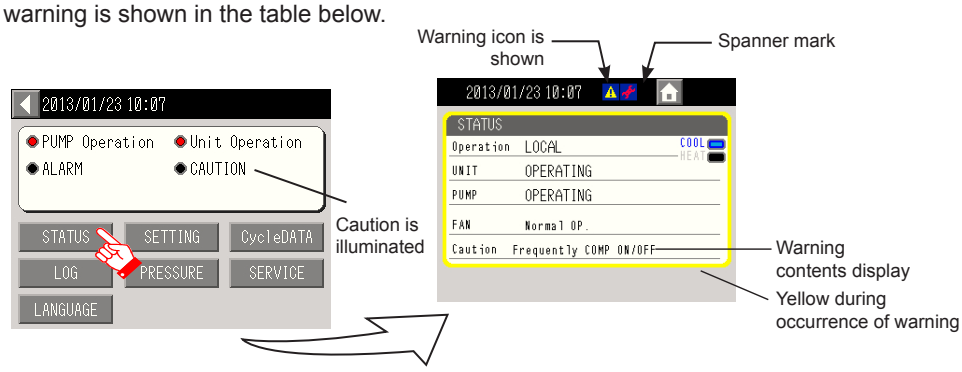
This Chiller unit is provided with protection control functions to release abnormal statuses before reaching alarm because of abnormality occurrence.

Name of protection control (Compressor frequency control)	Conditions for Operation	Description of Control	Release conditions	Display	
				LCD	Segment
Overcurrent protection (Unit current)	① I1 > Setting value×0.97 ② I1 > Setting value * I1: Unit current	① Load up prohibition ② Forced load down	① I1 < Setting value×0.95 ② I1 < Setting value×0.98	Current limited	U1-P3
Differential Pressure Protection	① Pd-Ps ≤ 0.3MPa ② Pd-Ps ≤ 0.25MPa * Pd: High pressure Ps: Low pressure	① Load down prohibition ② Forced load up	① 60 seconds passed and Pd-Ps > 0.3MPa ② Ps > 0.3MPa	Differential pressure limited	U1-P0
Outlet Water Temperature Decrease Prevention	① Twp ≤ 2ºC ② Twp ≤ 1.5ºC * Twp: Outlet water temperature (Protection)	① Load up prohibition ② Forced load down	① 30 seconds passed and Twp > 2ºC ② Twp > 2ºC	Outlet water temperature limited	U1-P6
Discharge Pressure Over-increase Prevention	Cooling ① Pd ≥ 1.41MPa ② Pd ≥ 1.44MPa *Pd: High pressure	① Load up prohibition ② Forced load down	Cooling ① 10 minutes have passed or Pd ≤ 1.39MPa ② Pd ≤ 1.41MPa → To Control ①	High pressure over-increase limited	U1-P2
	Cooling ① Pd ≥ 1.84MPa ② Pd ≥ 1.87MPa *Pd: High pressure	① Load up prohibition ② Forced load down	Cooling ① 10 minutes have passed or Pd ≤ 1.82MPa ② Pd ≤ 1.84MPa → To Control ①	High pressure over-increase limited	U1-P2
Suction Pressure Decrease Prevention	Water-cooled systems (Cooling only) ① Ps < 0.18MPa ② Ps < 0.14MPa * Ps: Low pressure	① Load up prohibition ② Forced load down	Water-cooled systems (Cooling only) ① Ps < 0.20MPa ② Ps < 0.16MPa	Low pressure decrease limited	U1-P6
Cooler inlet refrigerant temperature decrease prevention (at Cooling operation)	Tr < -4ºC * Tr: Cooler inlet refrigerant temperature	Load up prohibition	60 seconds passed	Cooler refrigerant temperature limited	U1-P6

4.5 Caution indication

In case of occurrence of sensor abnormalities while the chiller unit is stopped, or of abnormalities that would not trigger an alarm stop, a warning is output to the outside and warning display is conducted. The mark ⚠ is shown on the LCD Screen during warning external output.

The content of warning is shown in the table below.



Warning indication	Contents of warning	Notes
Freeze prevention	Water temperature is 1°C or below	When compressor is stopped while the chiller unit is in operation *1
Inlet water temperature thermistor abnormality (CN4)	Disconnection or short-circuit of the inlet water temperature thermistor	When the chiller unit is stopped *2
Outlet water temperature thermistor abnormality (CN5)	Disconnection or short-circuit of the outlet water temperature thermistor	When the chiller unit is stopped *2
Cooler inlet thermistor abnormality (CN29)	Disconnection or short-circuit of the cooler inlet (evaporating temperature) thermistor	When the chiller unit is stopped *2
Discharge gas thermistor abnormality (CN26)	Disconnection or short-circuit of the discharge gas thermistor	When the chiller unit is stopped *2
Liquid temp thermistor abnormality (CN24)	Disconnection or short-circuit of the liquid temperature thermistor	When the chiller unit is stopped *2
Outlet rear side thermistor abnormality (CN25)	Disconnection or short-circuit of the (rear side) outlet water temperature thermistor	When the chiller unit is stopped *2
Suction gas thermistor abnormality (CN27)	Disconnection or short-circuit of the suction gas thermistor	When the chiller unit is stopped *2
Discharge pressure sensor abnormality (CN31)	Disconnection or short-circuit of the high pressure sensor	When the chiller unit is stopped *2
Suction pressure sensor abnormality (CN32)	Disconnection or short-circuit of the low pressure sensor	When the chiller unit is stopped *2
Water supply header thermistor abnormality (CN13)	Disconnection or short-circuit of the water supply header thermistor	When using the function to control the number of units / When system is stopped (in 2-pump system I or II)
Water return header thermistor abnormality (CN14)	Disconnection or short-circuit of the water return header thermistor	
CPU-I/O Transmission	Transmission abnormality between CPU-I/O PCBs	When the chiller unit is stopped *2
COMP Run/Stop Frequency	Frequency of compressor run/stop higher than 6 times/hour	
Transmission of Control of Master/Slave group	Transmission abnormality between Unit No.1 and Unit No.2 and the following	When using the function to control the number of units / When system is stopped *2
Incorrect Setting of Control of Master/ Slave group	Incorrect setting of DIP Switch / Rotary Switch	When using the function to control the number of units / When system is stopped *2
Insufficient number of operable units	Number of operable chiller units < Setting value of minimum number of operating units	When using the function to control the number of units
Overhaul Period	Operating time period of compressor higher than 40000 hours *3	Warning mark is not displayed. Spanner mark is displayed
I/O internal transmission	CO072 (I/O PCB) Abnormality	When chiller unit is stopped *2

**1. It becomes an alarm when compressor is in operation.*

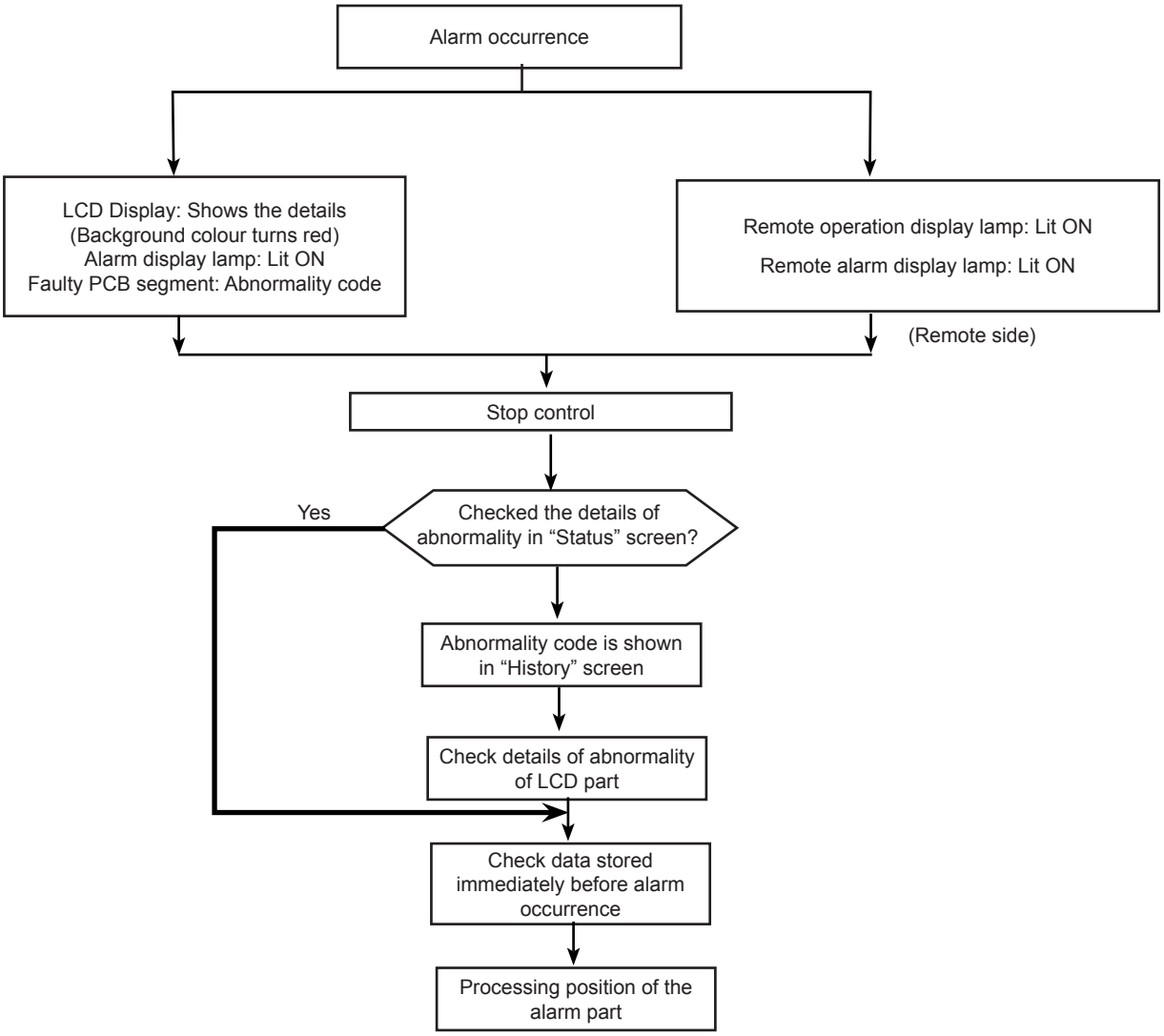
**2. It becomes an alarm when the chiller unit is put to operation while in alarm output status.*

**3. The spanner mark disappears when operating time period of the compressor is changed to less than 40000 hours.* Warning display is automatically released when the abnormal condition is cleared.

4.6 Summary of fault diagnosis

1 Alarm

In case of an alarm, the alarm light at the remote side and the alarm light on the display PCB of the main unit become illuminated, and the background of the LCD Screen of the main unit side becomes red. In case of stopping a unit in which an alarm has occurred, perform a stop operation instead of turning power OFF.

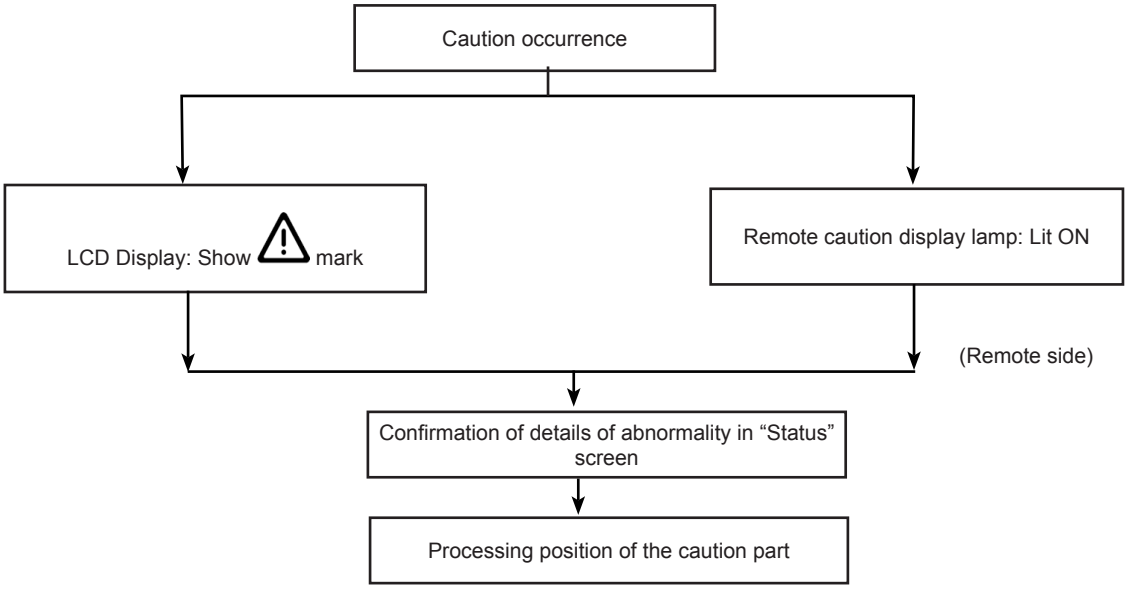


NOTE

- *When performing a stop operation, the background of the alarm display becomes white for a moment, and the “Alarm history check function” allows to display the details of the abnormality that has been activated before.*
- *When turning the power OFF and then ON again, the display returns to the initial state, but the “Alarm history check function” allows to display the details of the abnormality that has been activated before.*
- *Even if power is turned OFF, the “Data stored immediately before alarm occurrence” is maintained.*
- *The “Data stored immediately before alarm occurrence” is stored only for the last 3 alarm occurrences. For alarms prior to the fourth latest, only history is stored.*

2 Caution

Abnormalities that are not a hindrance for operation, but could lead to serious failure if neglected, are output as warnings.



3 Troubleshooting of the LCD Screen

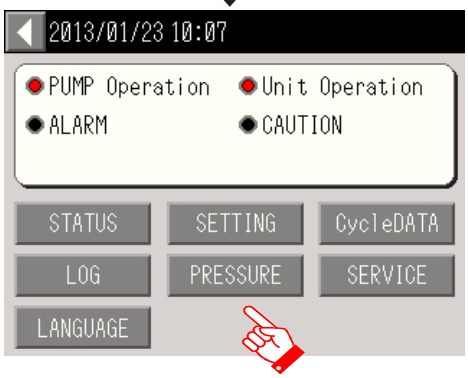
In case that the screen does not proceed further from the display of the following figure ① on the below upon power ON, it is because transmission between the LCD Screen and the CPU PCB is not taking place.

- Check wiring between the LCD Screen and the CPU PCB
- Check wiring between the CPU PCB and transformer

Transition of the LCD Screen upon power ON

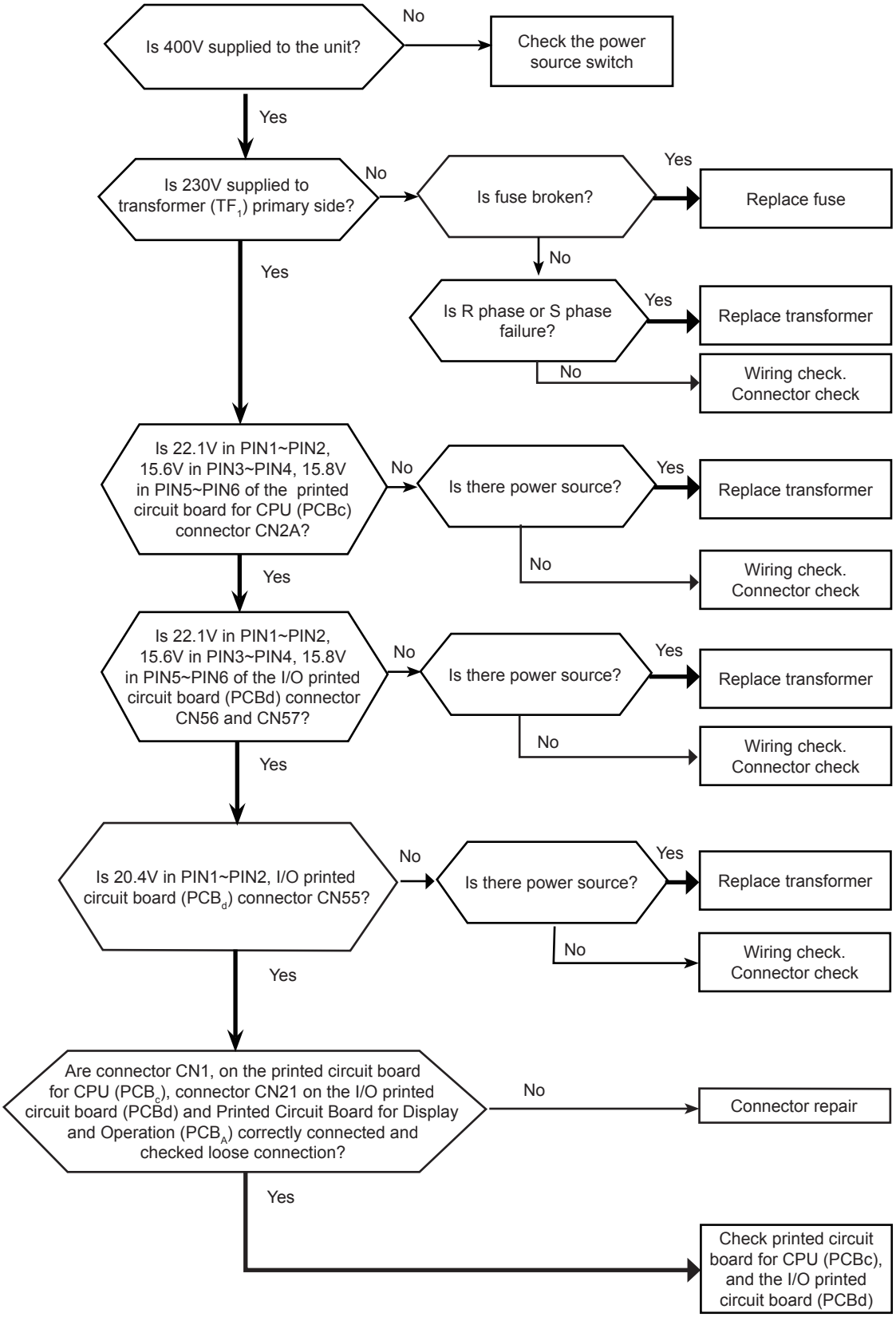
①

②



4.7 Method for fault diagnosis

Summary of checks for fault diagnosis



4.8 Troubleshooting by alarm code

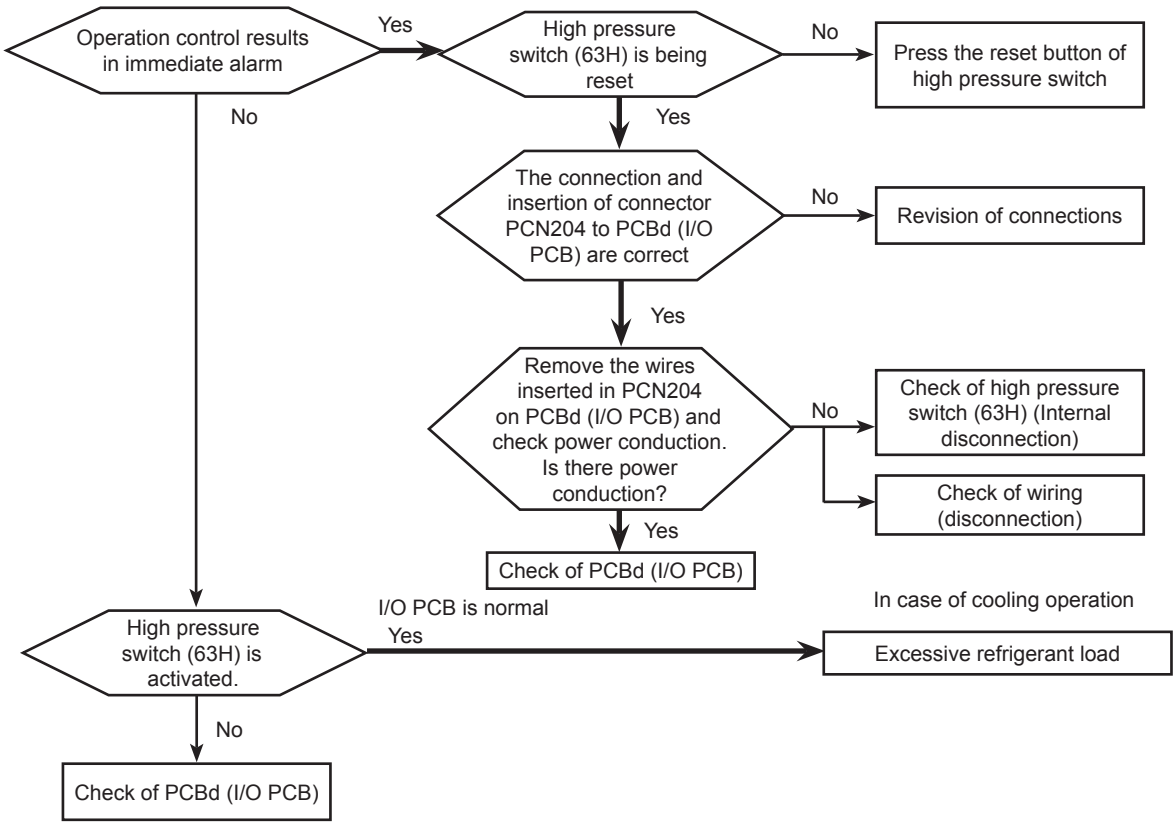
Alarm code	E1-H1	High Pressure Switch

Alarm stop reason

Discharge pressure (Pd) increases up to 2.02MPa, activating high pressure switch (63H).

PCB monitoring position

PCBd (I/O PCB) PCN204 (High pressure interruption device (63H))



Alarm code		Discharge pressure over-increase

Alarm stop reason

Discharge pressure (Pd) becomes higher than 1.92MPa for more than 10 seconds. (Enabled for electronic control)

NOTE

Causes alarm stop with 3 occurrences in 30 minutes. Retry control is performed until the second one. (Compressor stops, and restarts automatically after 3 minutes)

Retry indication

LCD: By touching “Inspection”, “Pd Retry” is shown in “No.1 Cycle”.

Retry code

C1-P2

PCB monitoring position

PCBd (I/O PCB) CN31PD (Discharge pressure sensor)

Alarm code		Low pressure interruption device

Alarm stop reason

Suction pressure (Ps) becomes lower than 0.01MPa for more than 3 seconds. (Enabled for electronic control)Alternatively, interruption of PCN205 short line.

PCB monitoring position

PCBd (I/O PCB) CN32PS (Suction pressure sensor), PCN205 (Short line)

Alarm code	C1-L1	Low pressure interruption control

Alarm stop reason

Suction pressure (Ps) becomes lower than 0.14MPa for more than 90 seconds. (Electronic control, only enabled in cooling)

NOTE

Causes alarm stop with 3 occurrences in 30 minutes. Retry control is performed until the second one. (Compressor stops, and restarts automatically after 3 minutes)

Retry indication

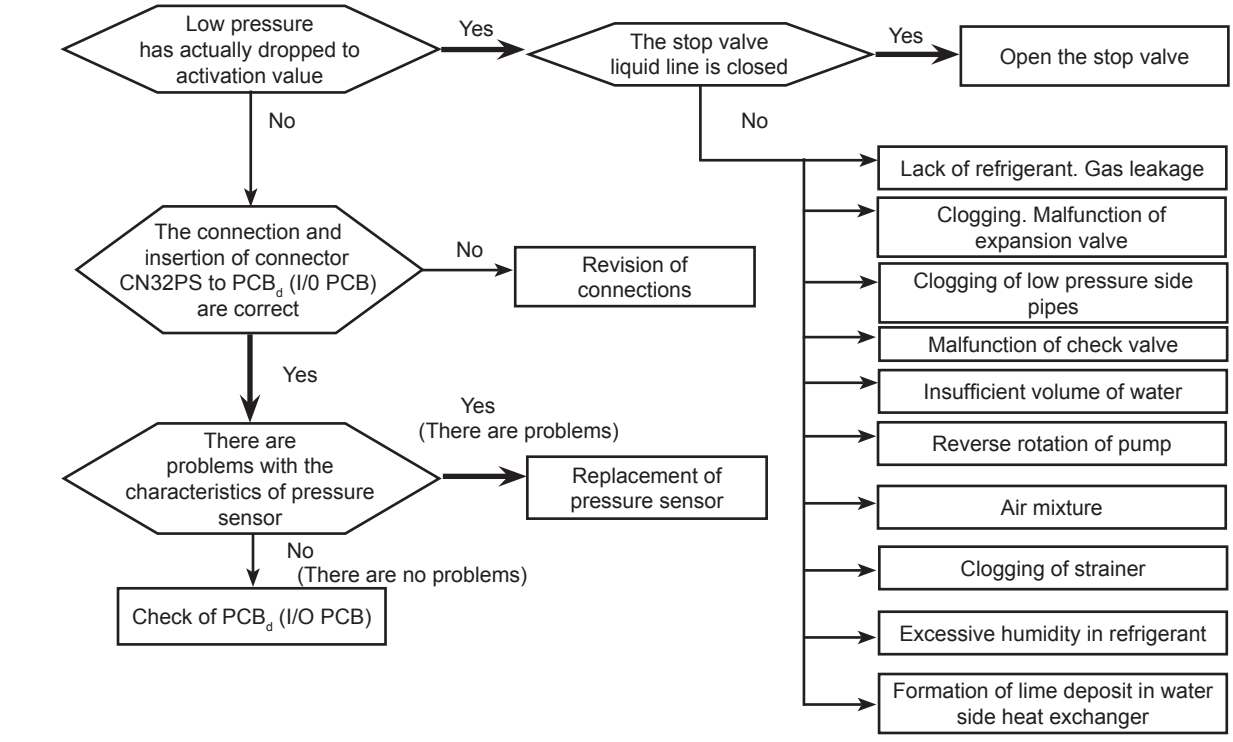
LCD: By touching “Inspection”, “Ps Retry” is shown in “No.1 Cycle”.

Retry code

C1-P6

PCB monitoring position

PCBd (I/O PCB) CN32PS (Suction pressure sensor)



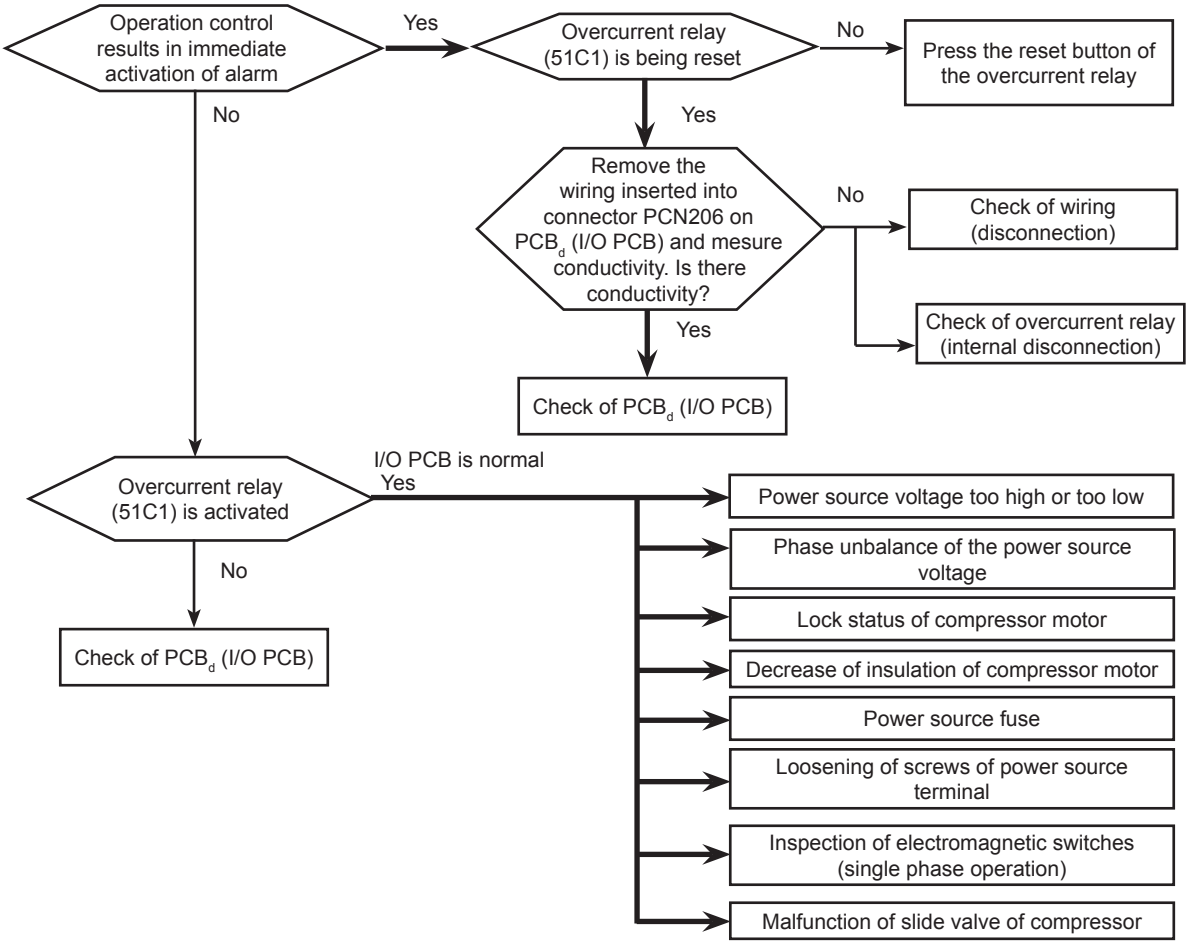
Alarm code	E1-51	Compressor overcurrent

Alarm stop reason

The running current for one compressor is increased above the value for activation of the overcurrent relay, thus activating the (thermal) overcurrent relay.

PCB monitoring position

PCBd (I/O PCB) PCN206



Alarm code	C1-61	Discharge gas temperature increase

Alarm stop reason

1 Temperature of refrigerant discharged from Compressor rises up to 130ºC for more than 1 minute.
2 During count of point 1, temperature rises even more, above 140ºC for more than 3 seconds.

NOTE

In the case of point 1, it causes alarm stop with 3 occurrences in 90 minutes. Retry control is performed until the second one. (Compressor stops, and restarts automatically after 3 minutes)

Retry indication

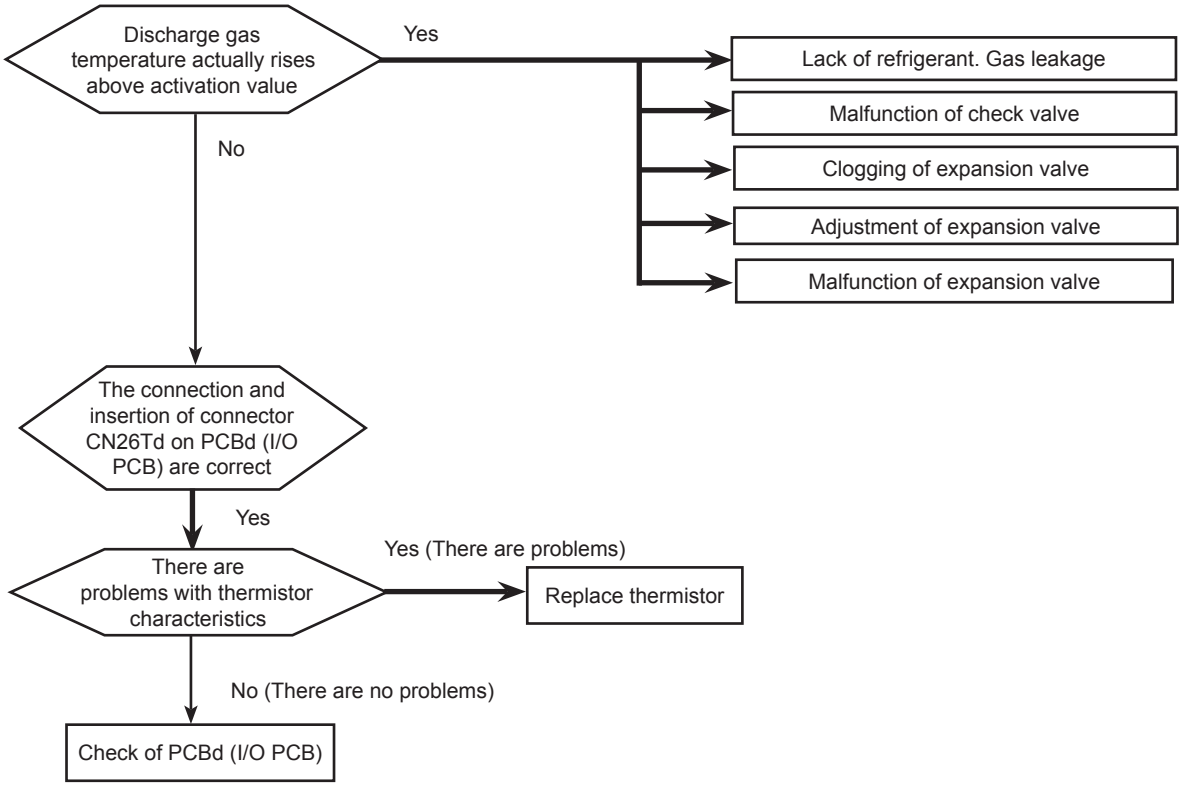
LCD: By touching "Inspection", "Td Retry" is shown in "No.1 Cycle".

Retry code

C1-P5

PCB monitoring position

PCBd (I/O PCB) CN26TD (Discharge gas thermistor)



Alarm code	C1-71	Compressor Internal Thermo Activation

Alarm stop reason

Compressor motor overheats, activating internal thermo. (Activation point: 115ºC)

NOTE

Causes alarm stop with 3 occurrences in 30 minutes. Retry control until the second one (Compressor stops, and restarts automatically once de thermostat returns to a normal operation temperature)

Retry indication

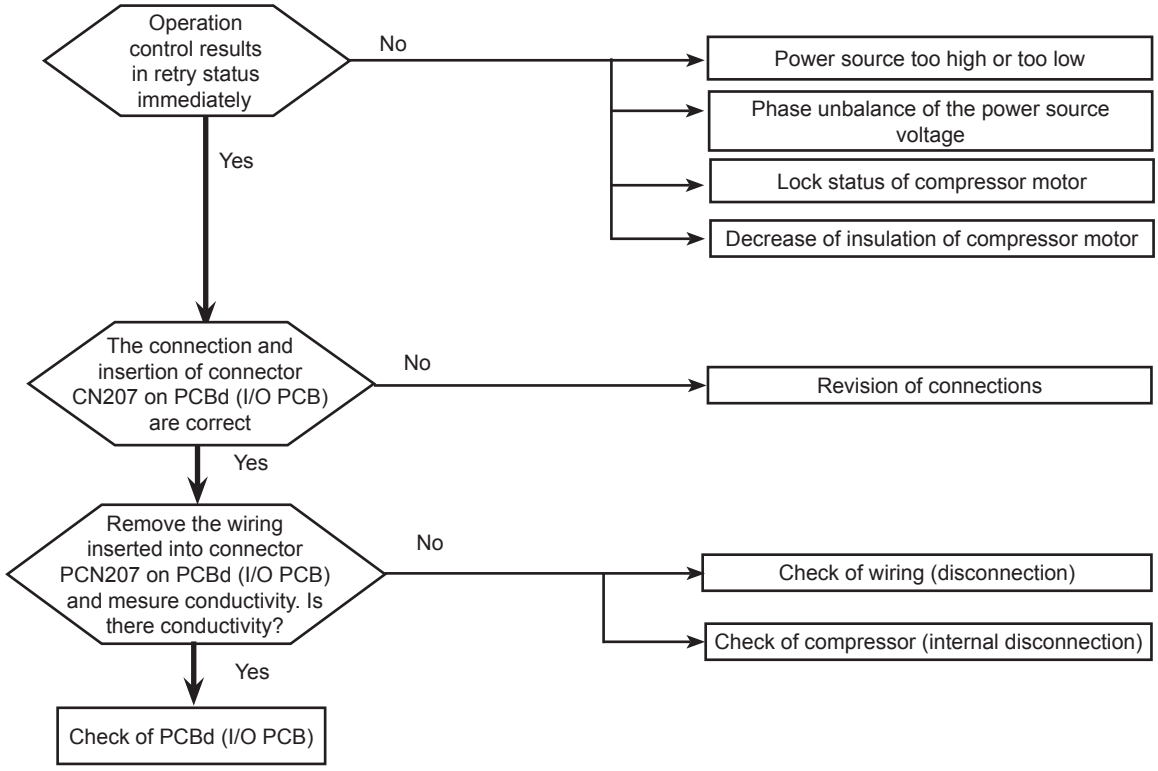
LCD: By touching “Inspection”, “49C Retry” is shown in “No.1 Cycle”.

Retry code

C1-P5

PCB monitoring position

PCBd (I/O PCB) PCN207 (Internal thermo for compressor (49C))



Alarm code	C1-91	Cooler Inlet Decrease

Alarm stop reason

Inlet refrigerant temperature of the heat exchanger (Te) becomes lower than -6.5ºC for more than 3 seconds. (only enabled in cooling).

NOTE

Causes alarm stop with 3 occurrences in 30 minutes. Retry control is performed until the second one. (Compressor stops, and restarts automatically after 3 minutes)

Inlet refrigerant temperature of the heat exchanger (Tr) becomes lower than -35ºC for more than 10 seconds. (only enabled in defrosting)

NOTE

Retry is not performed during during defrosting.

Retry indication

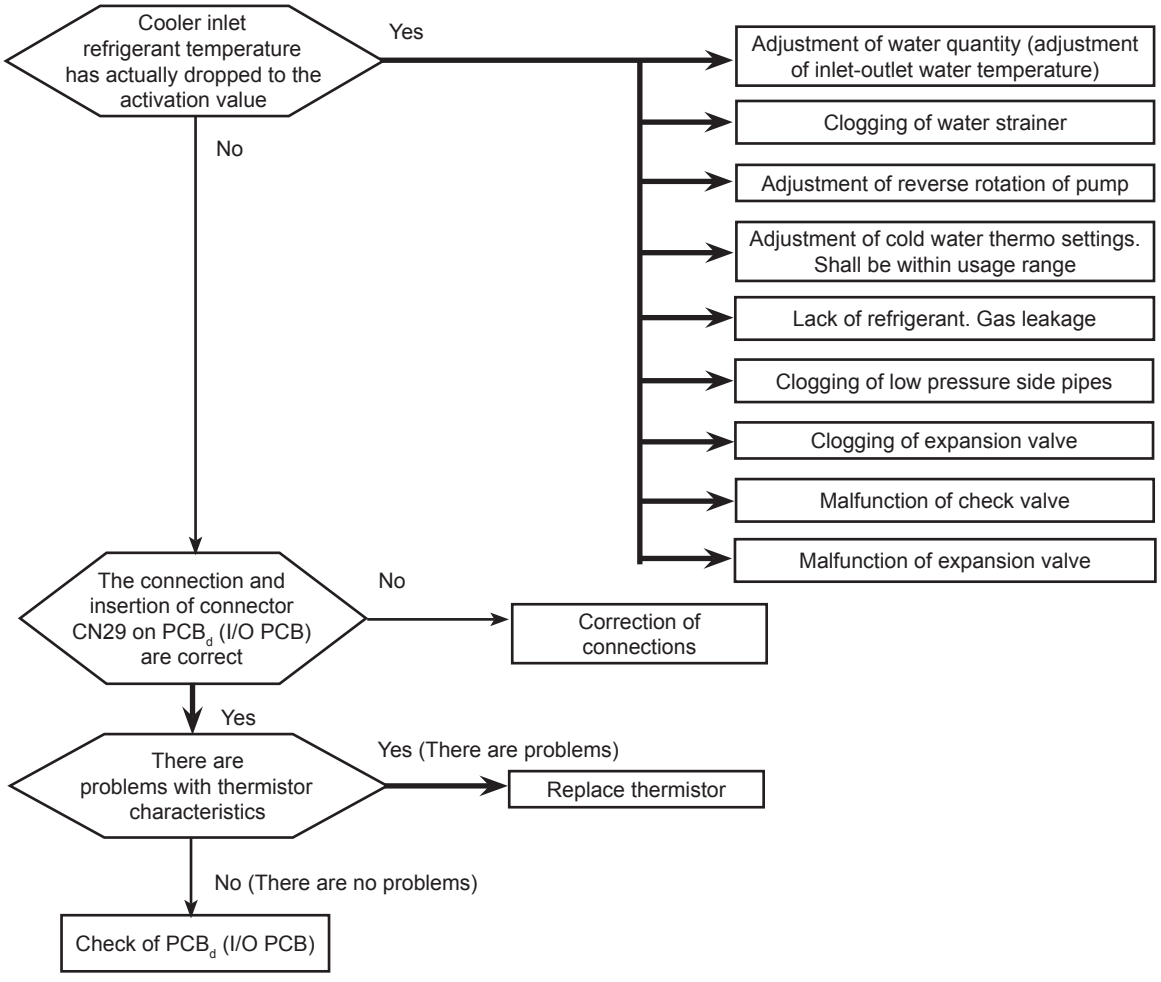
LCD: By touching “Inspection”, “Cooler Inlet Retry” is shown in “No.1 Cycle”.

Retry code

C1-P6

PCB monitoring position

PCBd (I/O PCB) CN29 (Cooler inlet thermistor)



Alarm code	C1-E1	Suction gas decrease

Alarm stop reason

Temperature of refrigerant suctioned into compressor (Ts) falls below -5ºC for more than 10 seconds.

NOTE

Causes alarm stop with 3 occurrences in 30 minutes. Retry control is performed until the second one. (Compressor stops, and restarts automatically after 3 minutes)

Retry indication

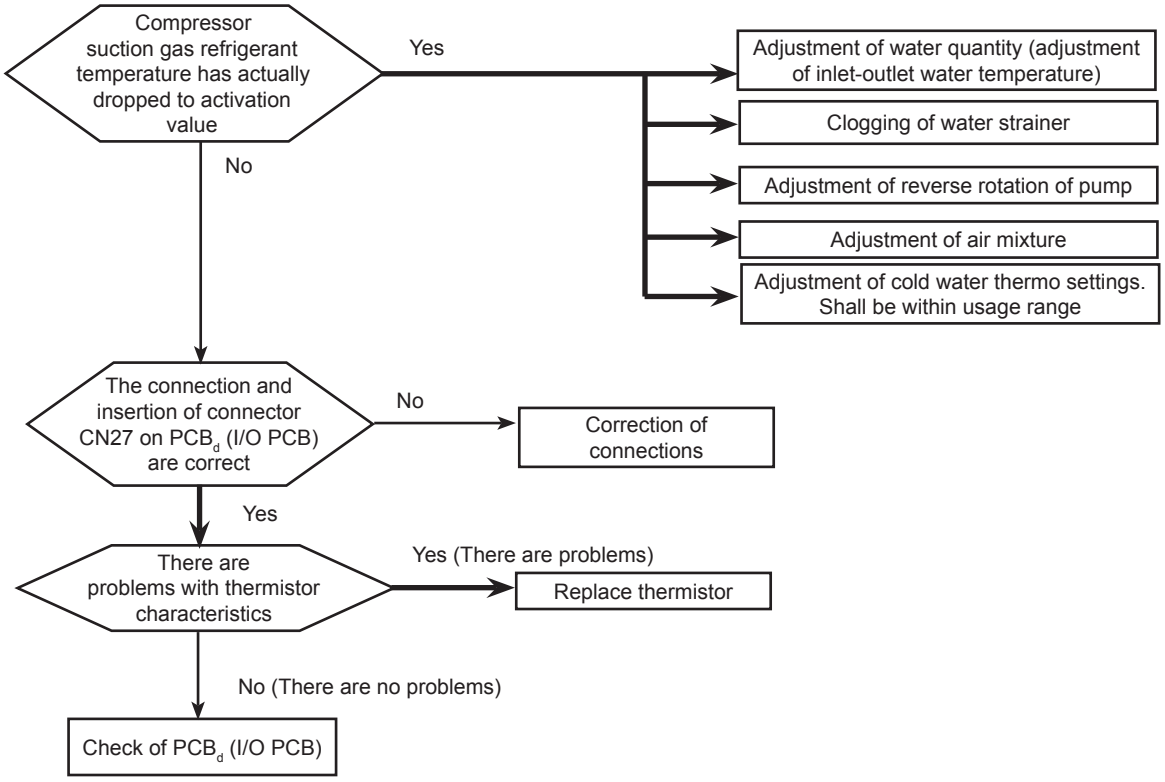
LCD: By touching “Inspection”, “Ts Retry” is shown in “No.1 Cycle”.

Retry code

C1-P6

PCB monitoring position

PCBd (I/O PCB) CN27 (Suction gas thermistor)



Alarm code	13-13 C1-13	Freeze protection · Freeze prevention

Alarm stop reason

Cold water temperature falls below 1ºC.

PCBc (CPU PCB) PCN12 short line is disconnected

NOTE

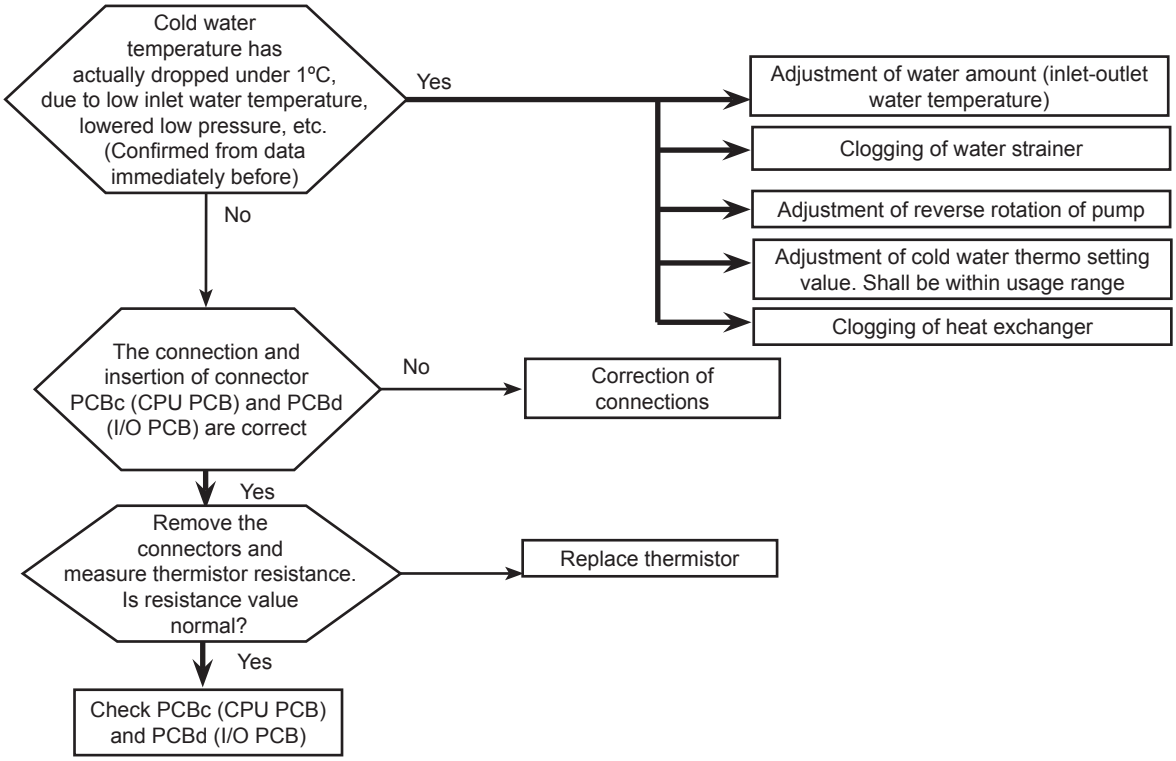
- *In case of detection by inlet water temperature thermistor or in case of detection by disconnection of PCN12 short line "13-13"*
- *In case of detection by outlet rear thermistor (for protection) or outlet water temperature thermistor (for control) "C1-13"*

PCB monitoring position

PCBc (CPU PCB) CN4 (Inlet water temperature thermistor (Twi)), CN5 (Outlet water temperature thermistor (for water temperature control Two1))

PCBd (I/O PCB) CN25 (Outlet rear thermistor Two2(for protection))

PCBc (CPU PCB) PCN12 (Short line)



NOTE

- *There is 1 inlet temperature thermistor attached to each chiller unit.*
- *There are 2 thermistors for detection of outlet water temperature attached to each chiller unit.*
- *The relation between detected thermistor and alarm indication, as well as their connected PCB codes are shown in the table below.*

Abnormality code	Detected thermistor	PCB code	Connector code
C1-13	Outlet rear thermistor Two2 (rear side (for protection))	PCBd	CN25
	Outlet water temperature thermistor Two1 (piping side (for control))	PCBc	CN5
13-13	Inlet water temperature thermistor Twi	PCBc	CN4

Alarm code	14-14 C1-14	Hot Water Over-Increase

Alarm stop reason

Outlet water temperature exceeds 62ºC during compressor operation.

PCBc (CPU PCB) PCN13 short line is disconnected

NOTE

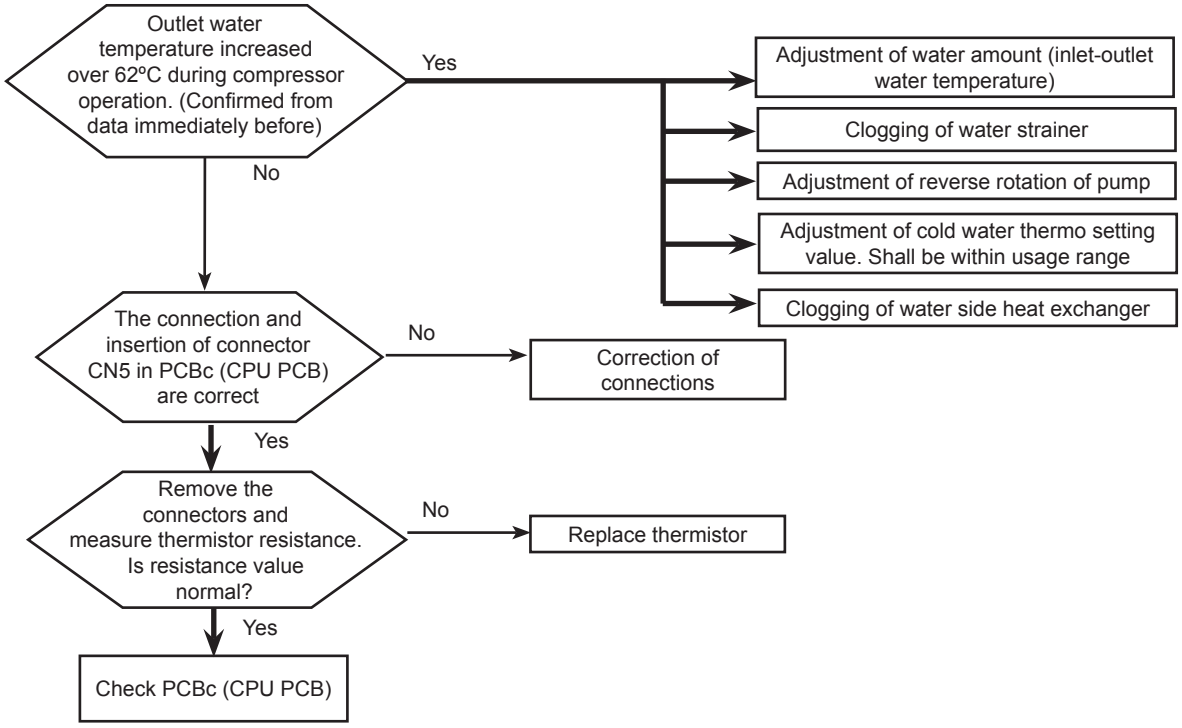
"14-14" in case that PCN13 short line is disconnected

"C1-14" in case of detection by outlet water temperature thermistor

PCB monitoring position

PCBc (CPU PCB) CN5 (Outlet water temperature thermistor Two1(for water temperature control))

PCBc (CPU PCB) PCN13 (Short line)



NOTE

- *Hot water overincrease is detected by the outlet water temperature thermistor for water temperature control.*
- *The relation between detected thermistor and alarm indication, as well as their connected PCB codes are shown in the table below.*

Abnormality code	Detected thermistor	PCB code	Connector code
C1-14	Outlet water temperature thermistor Two	PCBc	CN5

Alarm code	C1-21	Cooler inlet THM abnormality (CN29)

Alarm stop reason

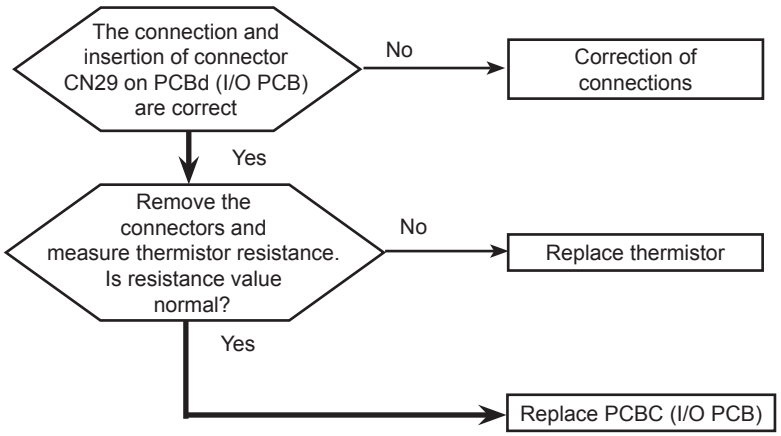
Thermistor for detection of inlet refrigerant temperature (Te) at the heat exchanger indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN29 (Cooler inlet thermistor (Te))

NOTE

Refer thermistor characteristics chapter



Alarm code	C1-23	Discharge gas THM abnormality (CN26)

Alarm stop reason

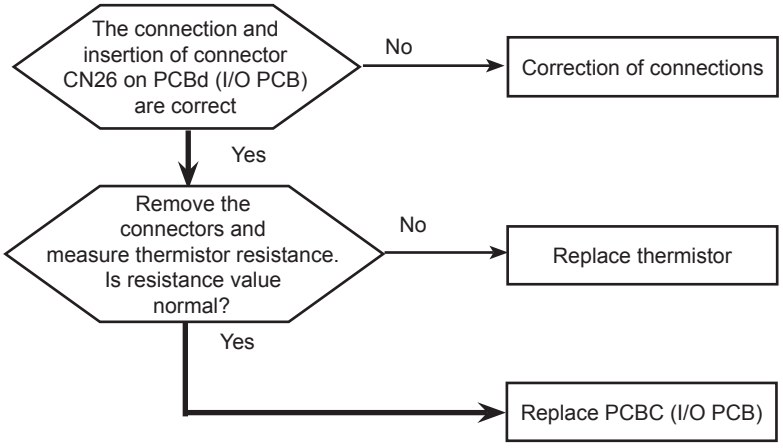
Thermistor for detection of discharge gas temperature (Td) indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN26 (Discharge gas thermistor (Td))

NOTE

Refer thermistor characteristics chapter.



Alarm code	E 1-24	Liquid THM abnormality (CN24)

Alarm stop reason

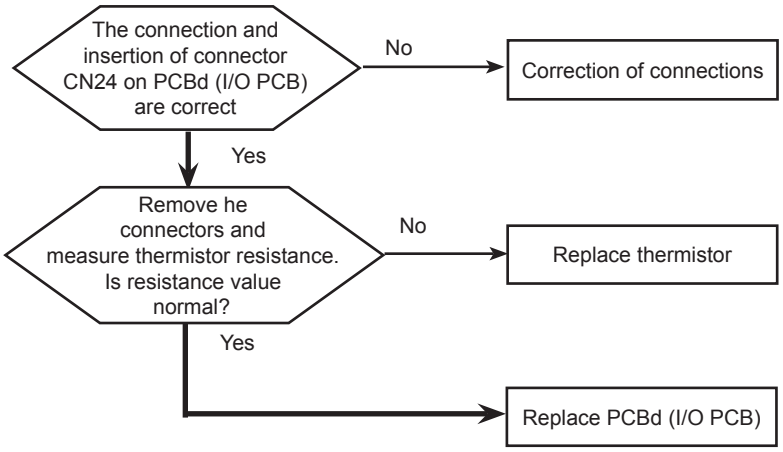
Thermistor for detection of heat exchanger outlet (TI) temperature indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN24 (Liquid thermistor (TI))

NOTE

Refer thermistor characteristics chapter



Alarm code	E 1-25	Outlet rear side THM abnormality (CN25)

Alarm stop reason

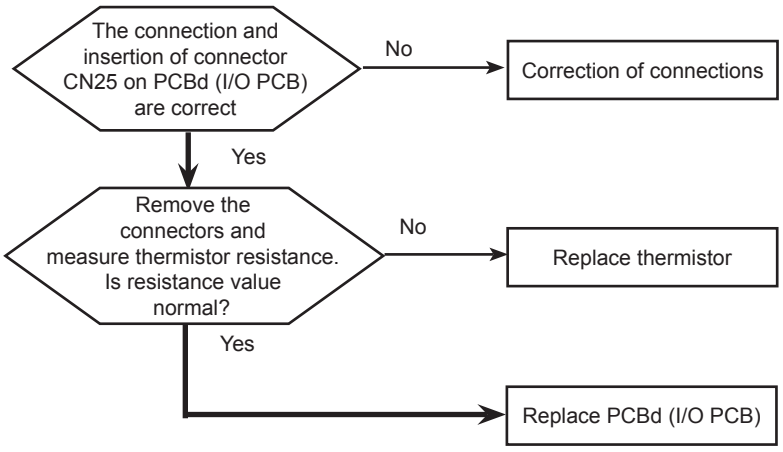
Thermistor for detection of heat exchanger outlet (Two2) (rear side = internal part of the heat exchanger) indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN25 (Outlet rear side thermistor (Two2))

NOTE

Refer thermistor characteristics chapter



Alarm code	C 1-26	Suction Gas THM Abnormality (CN27)

Alarm stop reason

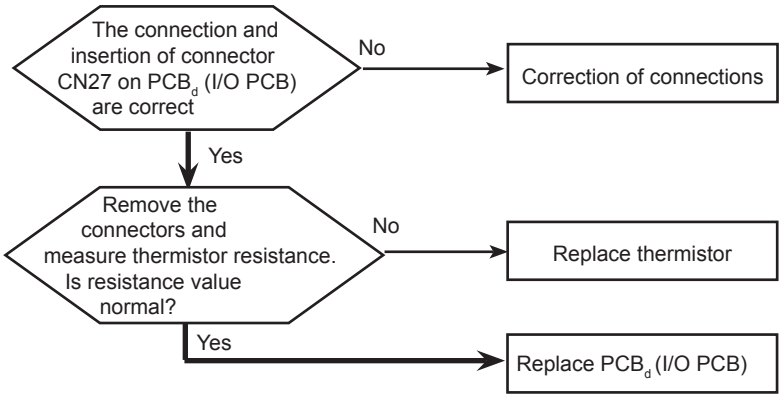
Thermistor for detection of temperature of gas suctioned (Ts) by compressor indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN27

NOTE

Refer thermistor characteristics chapter.



Alarm code	E 1-27	Discharge Pressure Sensor Abnormality (CN31)

Alarm stop reason

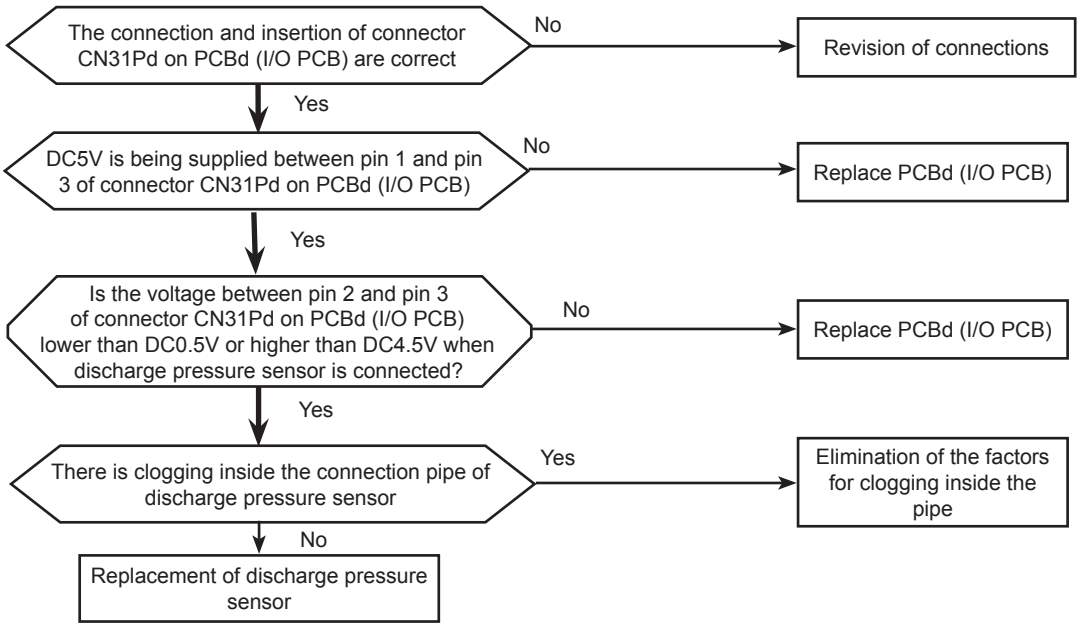
Discharge pressure sensor (Pd) of compressor indicates an abnormal value.

PCB monitoring point

PCBd (I/O PCB) CN31PD (Discharge pressure sensor (Pd))

NOTE

Refer pressure sensor characteristics chapter.



Alarm code	E 1-28	Suction pressure sensor abnormality (CN32)

Alarm stop reason

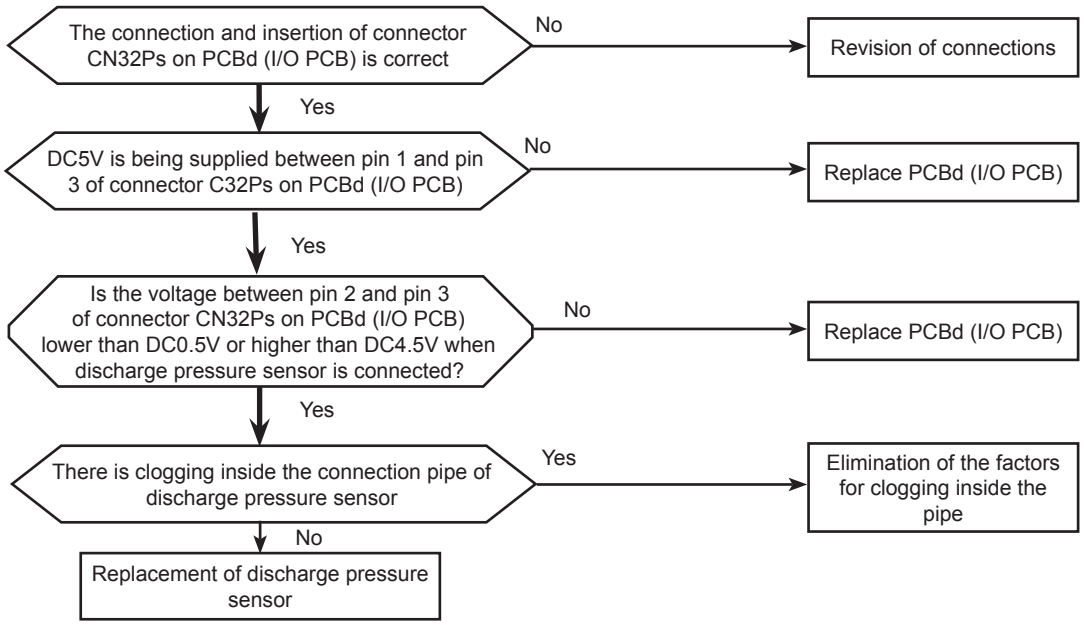
Suction pressure sensor (Ps) of compressor indicates an abnormal value.

PCB monitoring position

PCBd (I/O PCB) CN32PS (Suction pressure sensor (Ps))

NOTE

Refer pressure sensor characteristics chapter.



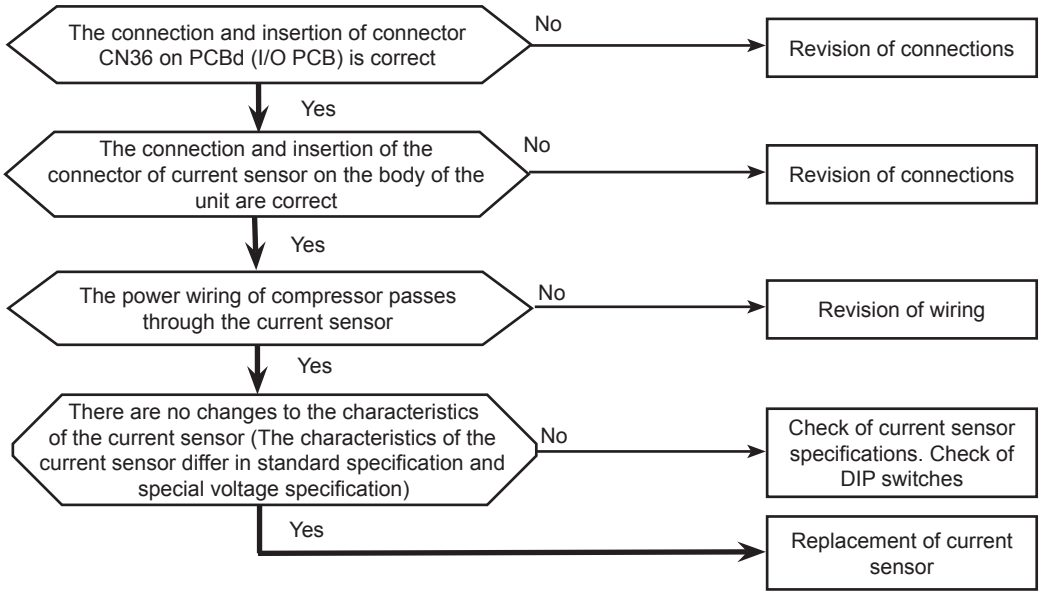
Alarm code	C1-39	Current sensor abnormality (CN36)

Alarm stop reason

Current sensor indicates an abnormal value (CT).

PCB monitoring position

PCBd (I/O PCB) CN36 (Current sensor (CT))



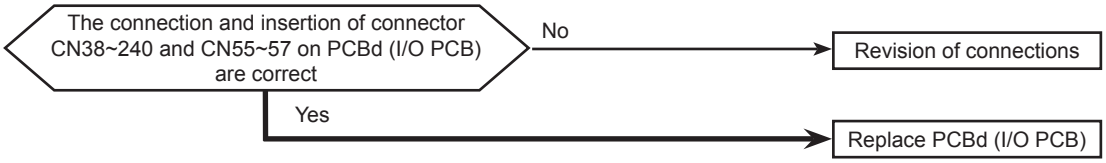
Alarm code	C1-03	I/O internal transmission

Alarm stop reason

Transmission is not performed correctly inside I/O PCB (PCBd).

PCB monitoring position

PCBd (I/O PCB) Main microcomputer ~ Sub microcomputer



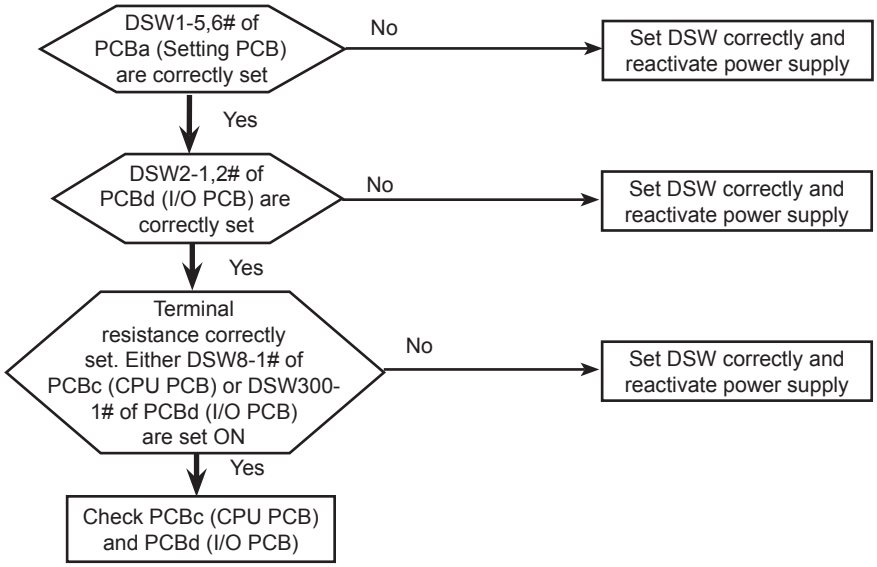
Alarm code	03-03	CPU—I/O transmission

Alarm stop reason

Transmission is not performed correctly between CPU PCB(PCBc) and I/O PCB (PCBd).

PCB monitoring position

PCBc (CPU PCB) CN1~PCBd (I/O PCB) CN21 (H-LINK transmission)



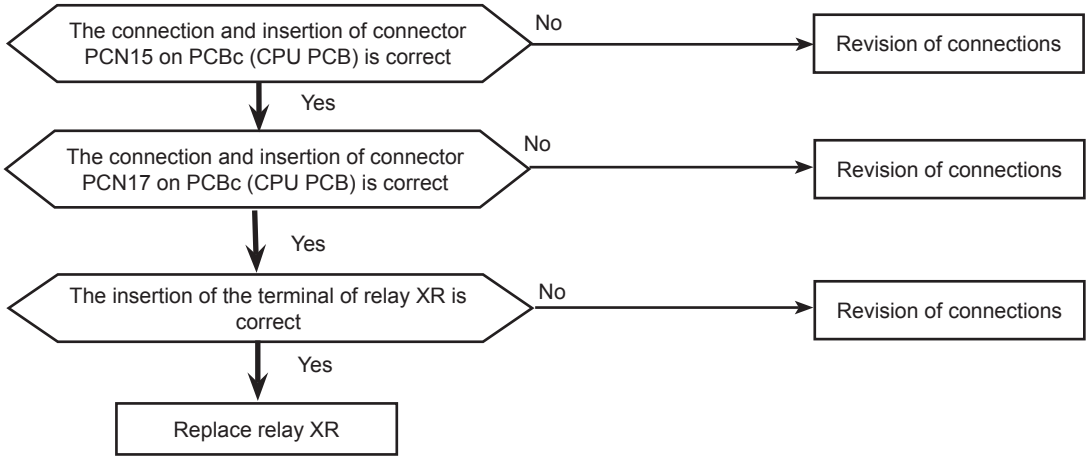
Alarm code	01-01	Startup Circuit Failure

Alarm stop reason

Startup circuit fails to self-hold after reception of operation signal, or upon automatic recovery from instant power failure.

PCB monitoring position

PCBc (CPU PCB) PCN15,PCN17



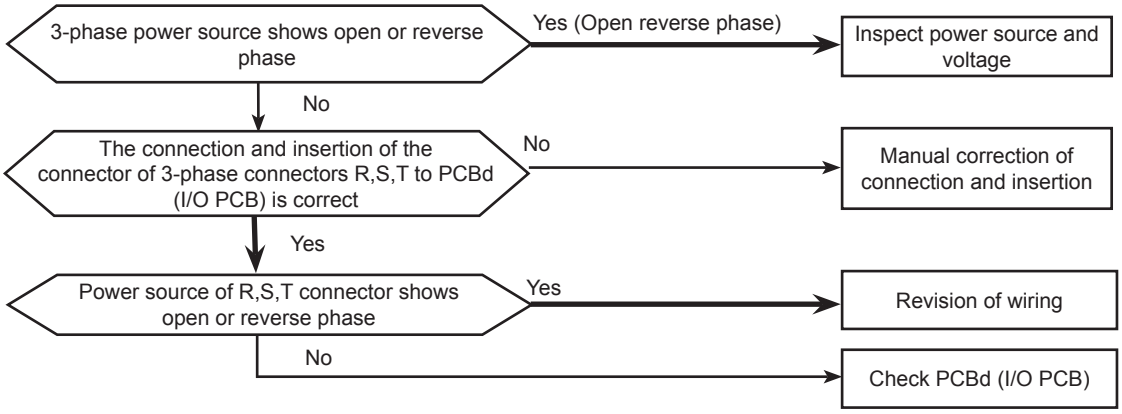
Alarm code	05-05	Reverse/Open Phase

Alarm stop reason

Power source connected locally is connected in reverse or in open phase.

PCB monitoring position

PCBd (I/O PCB) 3-phase support R, S, T



Alarm code	11-11	Inlet water temperature abnormality (CN4)

Alarm stop reason

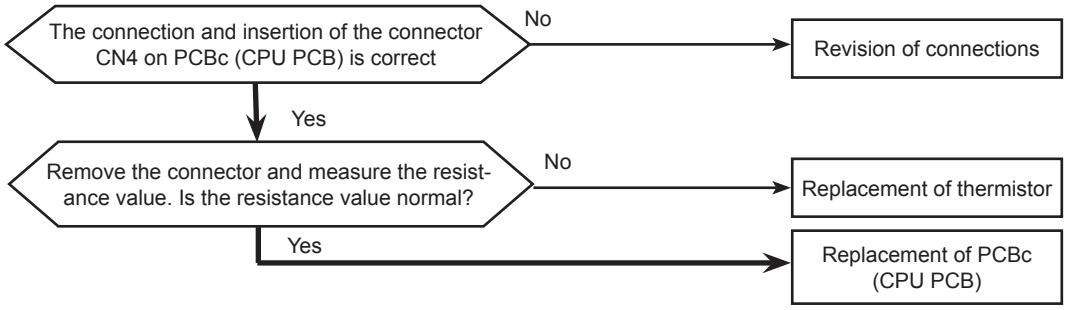
Thermistor for detection of inlet water temperature (Twi) indicates an abnormal value.

PCB monitoring position

PCBc (CPU PCB) CN4 (Inlet water temperature thermistor (Twi))

NOTE

Refer thermistor characteristics chapter.



Alarm code	12-12 C1-12	Outlet water temperature THM abnormality (CN5)

Alarm stop reason

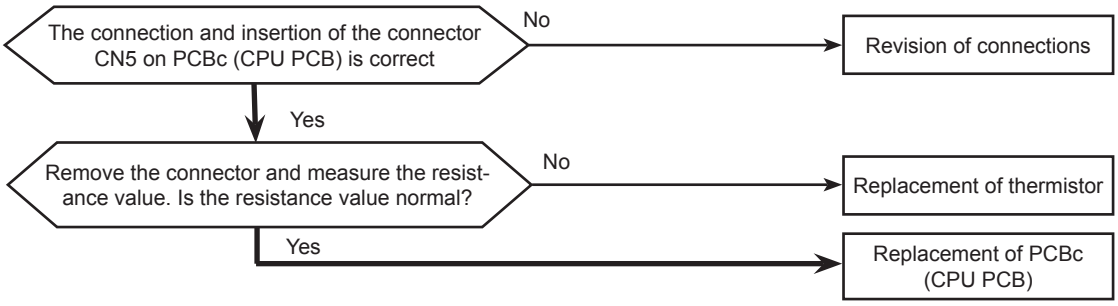
Thermistor for detection of outlet water temperature (for water temperature control Two1) indicates an abnormal value.

PCB monitoring position

PCB_c (CPU PCB) CN5 (Outlet water temperature thermistor (Two1))

NOTE

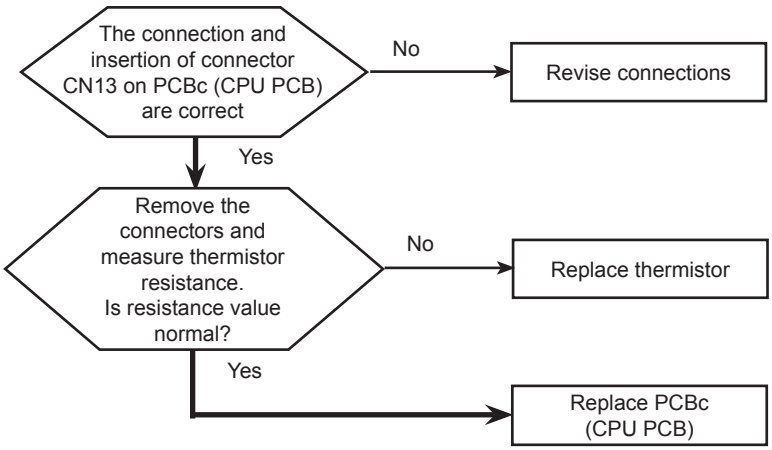
Refer thermistor characteristics chapter.



Alarm code	2C-2C	Water supply header temperature thermistor abnormality. (CN13)

Alarm stop reason

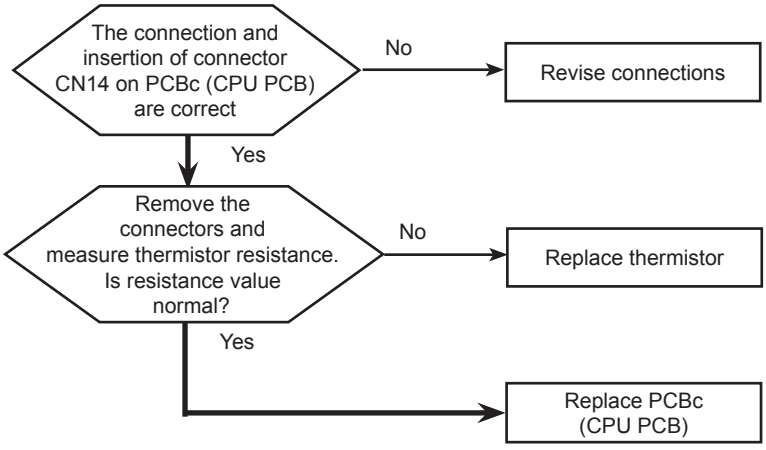
Thermistor for detection of water supply header temperature indicates an abnormal value.



Alarm code	2d-2d	Water return header temperature thermistor abnormality. (CN14)

Alarm stop reason

Thermistor for detection of water return header temperature indicates an abnormal value.



Alarm code	5P-5P	Pump Interlock Abnormality

Alarm stop reason

- Pump operation feedback signal turns OFF while Pump operation signal (Y52P1) is ON.

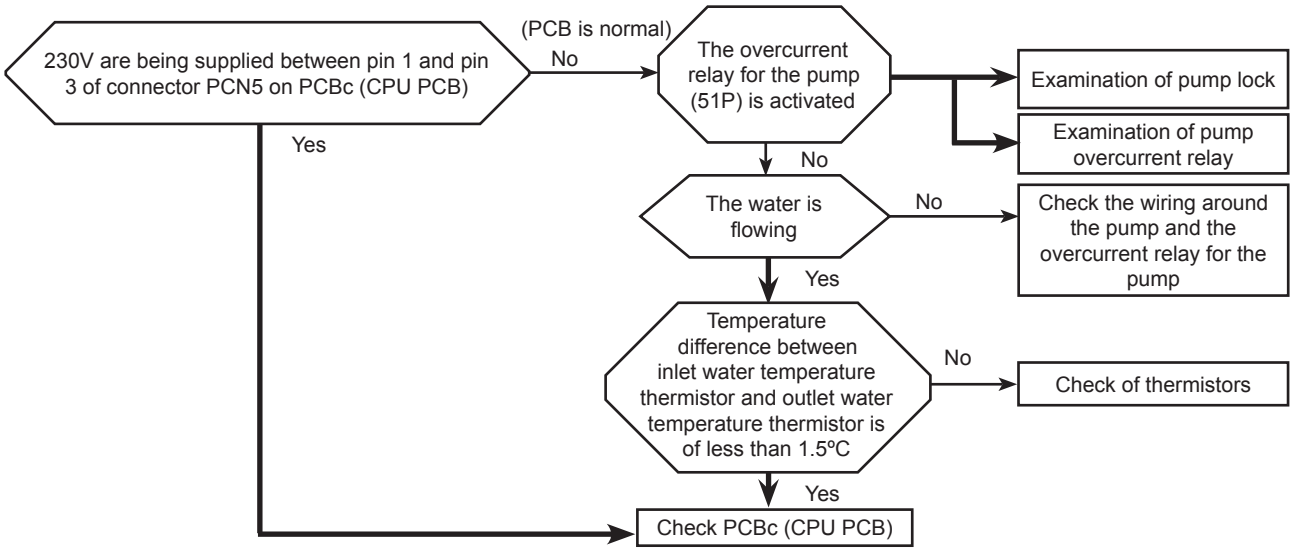
  NOTE

  It is enabled after establishment of interlock.

- Pump operation feedback signal is not input within the time defined at "Waiting time for pump feedback" in optional functions. Or in case that Cold (hot) water inlet/outlet temperature differential exceeds 1.5ºC, and water conduction conditions have not been confirmed.

PCB monitoring position

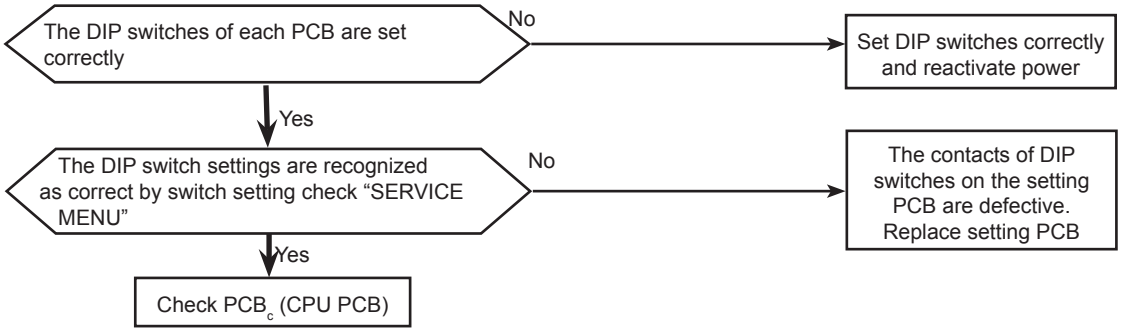
PCBc (CPU PCB) PCN5



Alarm code	40-40	Incorrect Setting

Alarm stop reason

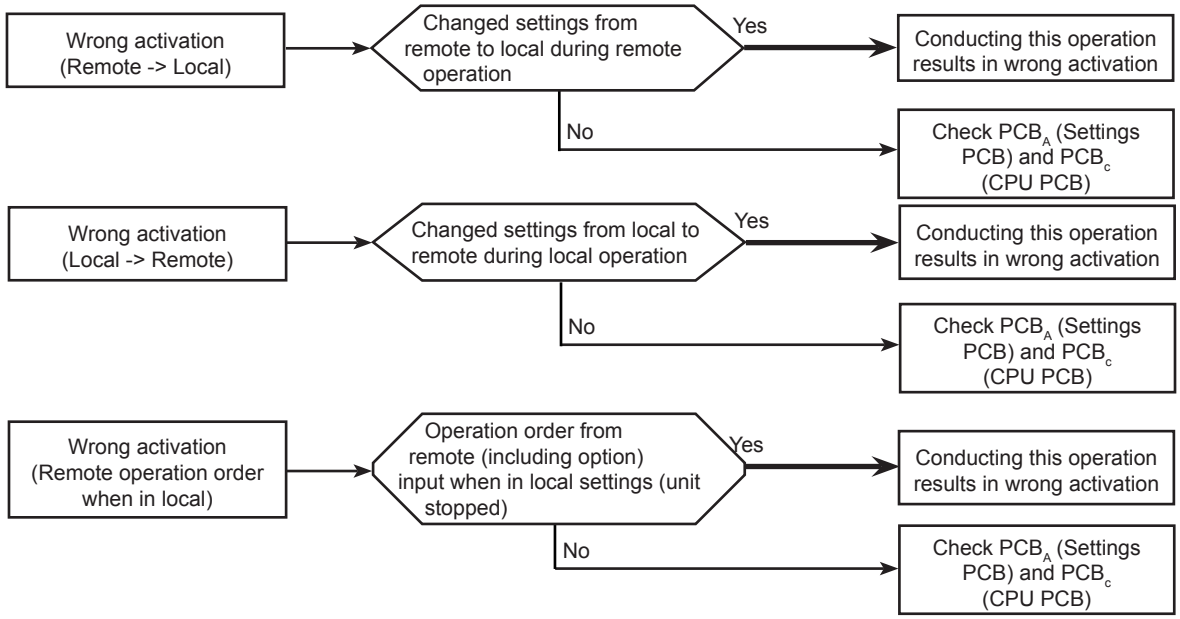
The settings of the DIP switch are unrecognisable.



Alarm code	40-40	Incorrect operation

Alarm stop reason

A forbidden operation is performed during operation.



Alarm code	40-40	Incorrect Setting of control of Master/Slave group

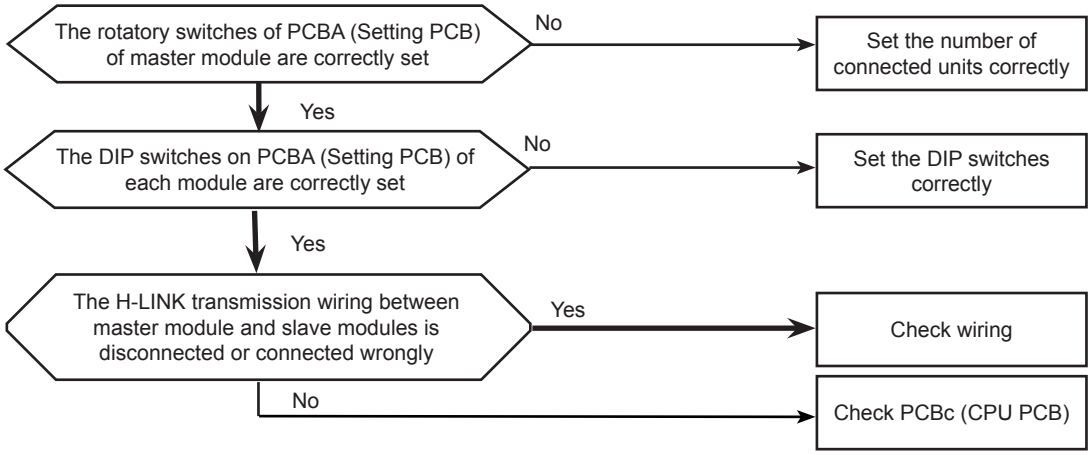
Alarm stop reason

The settings of the DIP relative to the function to control the number of units switch are unrecognisable.

PCB monitoring position

PCBa (Setting PCB) DSW3-1~3, DSW6-1~3

PCBa (Setting PCB) RSW1



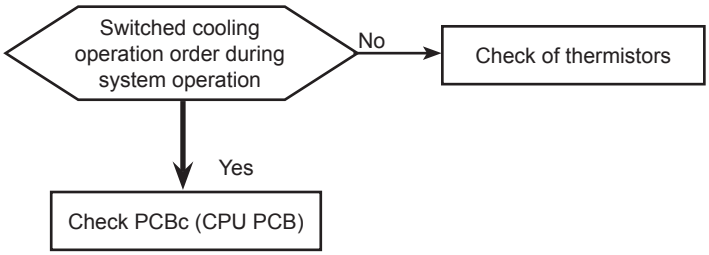
Alarm code	40-40	Wrong operation of Control of Master/Slave group

Alarm stop reason

Switching of cooling operation order to master module while the system is in operation, when using the function of control of Master/Slave group.

Retry indication

No indication



Alarm code	40-40	Transmission abnormality (Miswiring)

Alarm stop reason

The connection of wiring for transmission between modules (Transmission line between master and slaves) and the transmission wiring for connection of group controller is mixed.

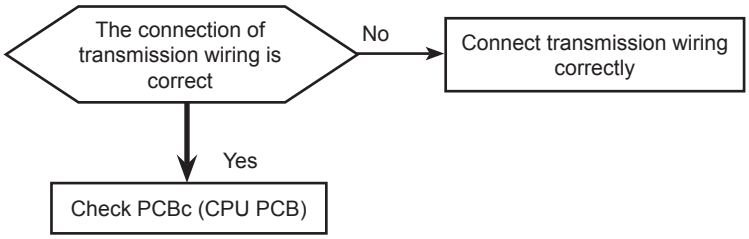
Retry indication

No retry

PCB monitoring position

PCBc (CPU PCB) CN2 (Transmission port between modules)

PCBc (CPU PCB) CN300 (Transmission port for group controller)



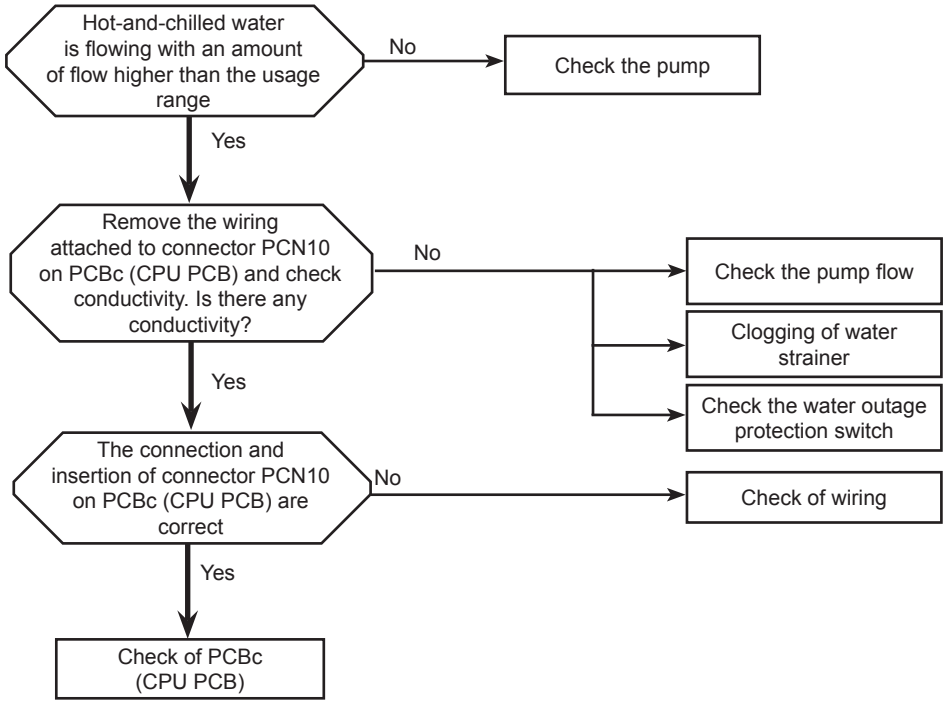
Alarm code	6E-6E	Cold Water Suspension (Option)

Alarm stop reason

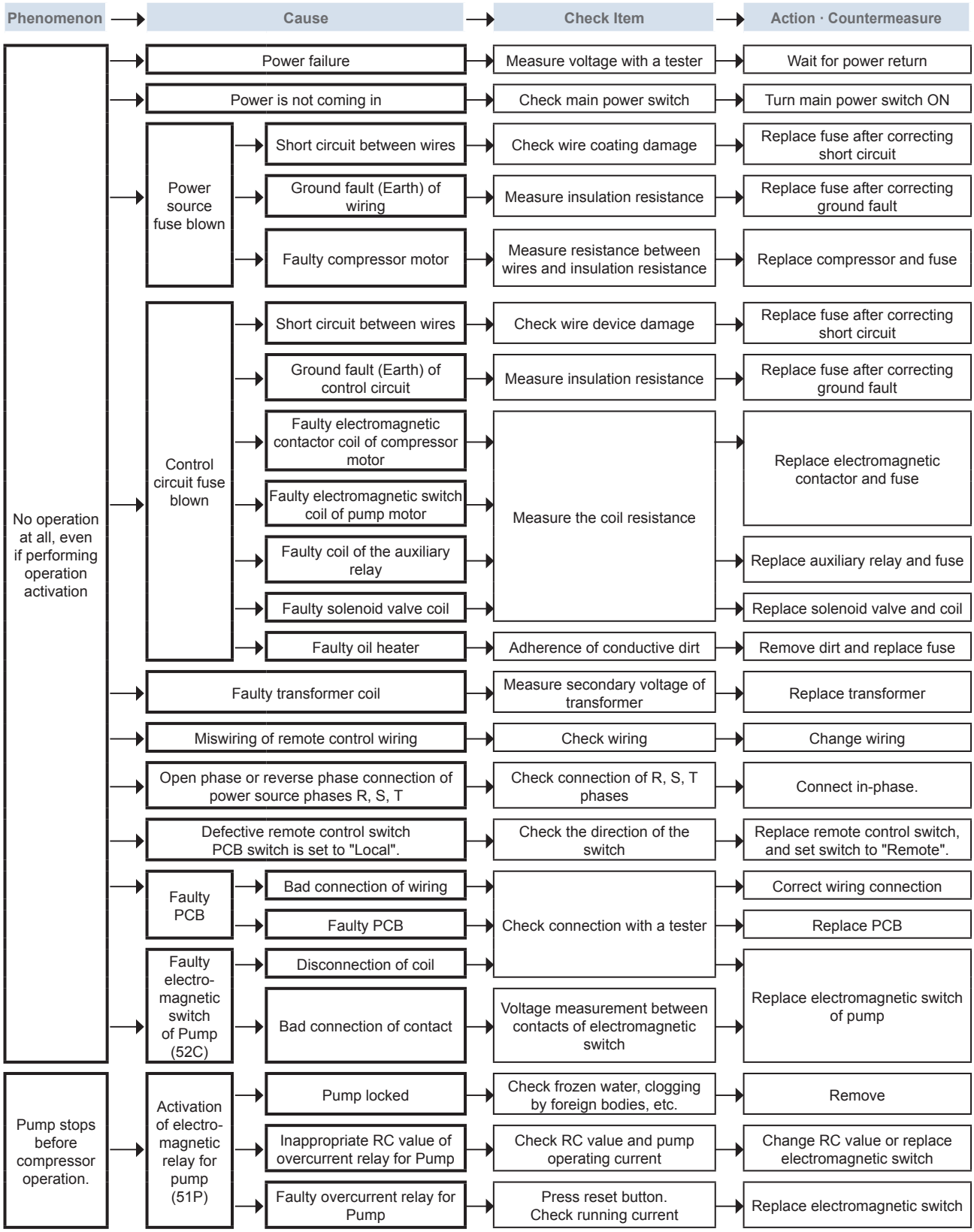
Suspension of water supply protection switch is activated.

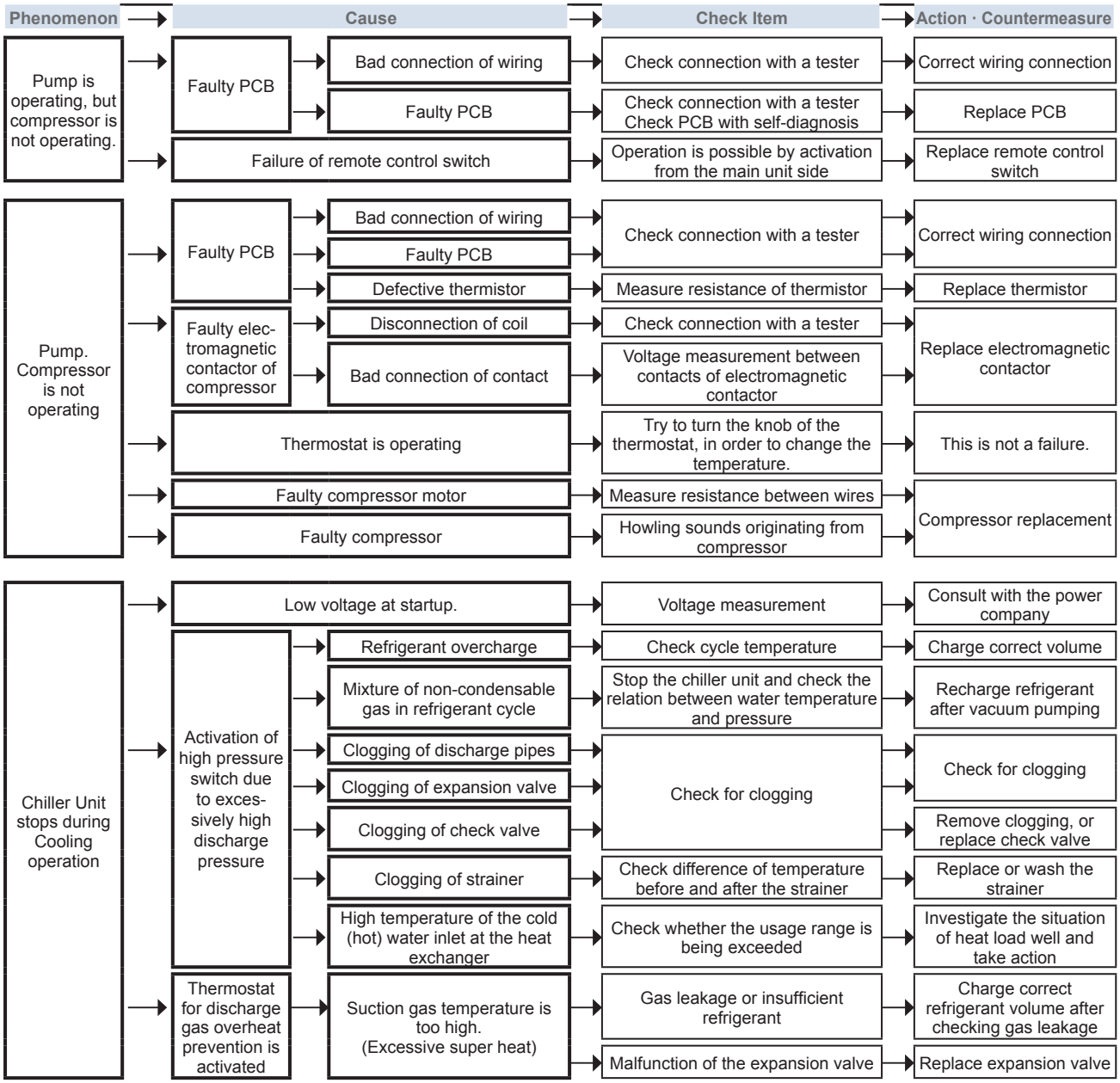
PCB monitoring position

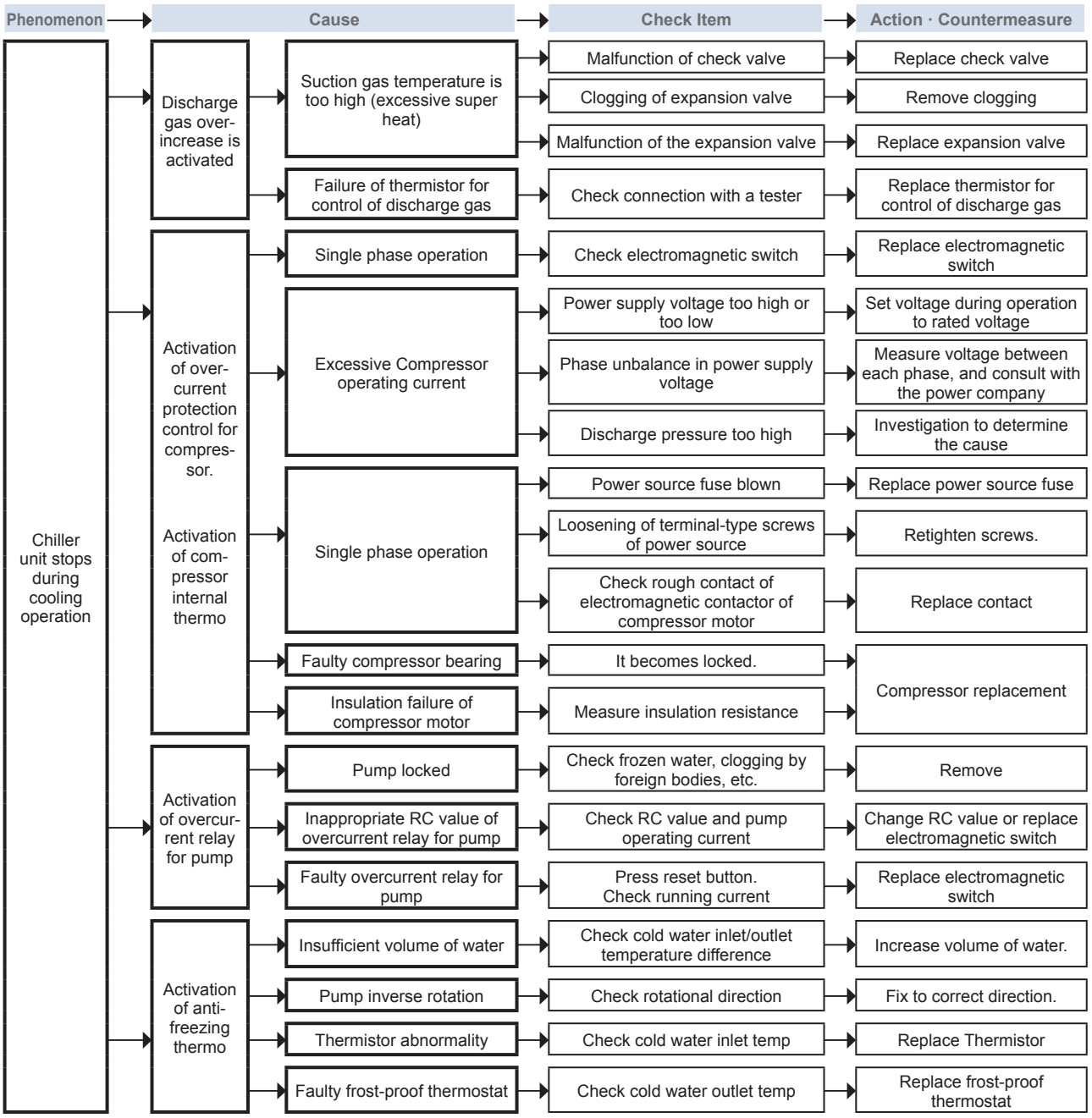
PCBc (CPU board) PCN10

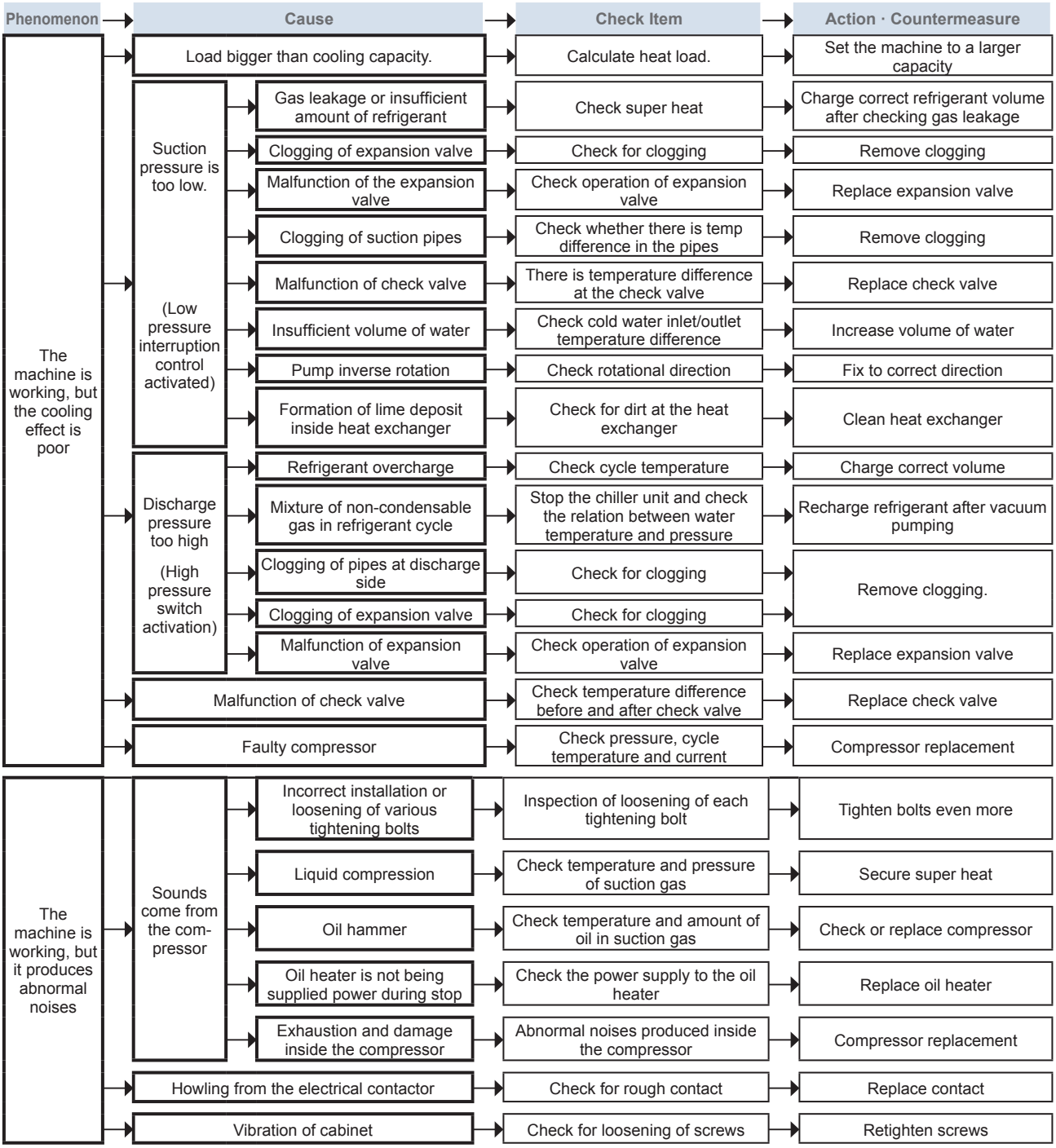


4.9 Analysis and countermeasure of abnormalities




Phenomenon
Cause
Check Item
Action · Countermeasure
Pump is operating, but compressor is not operating.
Faulty PCB
Bad connection of wiring
Check connection with a tester
Correct wiring connection
Faulty PCB
Check connection with a tester
Check PCB with self-diagnosis
Replace PCB
Failure of remote control switch
Operation is possible by activation from the main unit side
Replace remote control switch
Pump. Compressor is not operating
Faulty PCB
Bad connection of wiring
Check connection with a tester
Correct wiring connection
Faulty PCB
Defective thermistor
Measure resistance of thermistor
Replace thermistor
Faulty electromagnetic contactor of compressor
Disconnection of coil
Check connection with a tester
Replace electromagnetic contactor
Bad connection of contact
Voltage measurement between contacts of electromagnetic contactor
Thermostat is operating
Try to turn the knob of the thermostat, in order to change the temperature.
This is not a failure.
Faulty compressor motor
Measure resistance between wires
Compressor replacement
Faulty compressor
Howling sounds originating from compressor
Chiller Unit stops during Cooling operation
Low voltage at startup.
Voltage measurement
Consult with the power company
Activation of high pressure switch due to excessively high discharge pressure
Refrigerant overcharge
Check cycle temperature
Charge correct volume
Mixture of non-condensable gas in refrigerant cycle
Stop the chiller unit and check the relation between water temperature and pressure
Recharge refrigerant after vacuum pumping
Clogging of discharge pipes
Check for clogging
Check for clogging
Clogging of expansion valve
Clogging of check valve
Remove clogging, or replace check valve
Clogging of strainer
Check difference of temperature before and after the strainer
Replace or wash the strainer
High temperature of the cold (hot) water inlet at the heat exchanger
Check whether the usage range is being exceeded
Investigate the situation of heat load well and take action
Thermostat for discharge gas overheat prevention is activated
Suction gas temperature is too high. (Excessive super heat)
Gas leakage or insufficient refrigerant
Charge correct refrigerant volume after checking gas leakage
Malfunction of the expansion valve
Replace expansion valve


Phenomenon
Cause
Check Item
Action · Countermeasure
Chiller unit stops during cooling operation
Discharge gas over-increase is activated
Suction gas temperature is too high (excessive super heat)
Malfunction of check valve
Replace check valve
Clogging of expansion valve
Remove clogging
Malfunction of the expansion valve
Replace expansion valve
Failure of thermistor for control of discharge gas
Check connection with a tester
Replace thermistor for control of discharge gas
Activation of over-current protection control for compres-sor.
Single phase operation
Check electromagnetic switch
Replace electromagnetic switch
Excessive Compressor operating current
Power supply voltage too high or too low
Set voltage during operation to rated voltage
Phase unbalance in power supply voltage
Measure voltage between each phase, and consult with the power company
Discharge pressure too high
Investigation to determine the cause
Activation of com-pressor internal thermo
Single phase operation
Power source fuse blown
Replace power source fuse
Loosening of terminal-type screws of power source
Retighten screws.
Check rough contact of electromagnetic contactor of compressor motor
Replace contact
Faulty compressor bearing
It becomes locked.
Compressor replacement
Insulation failure of compressor motor
Measure insulation resistance
Activation of overcur-rent relay for pump
Pump locked
Check frozen water, clogging by foreign bodies, etc.
Remove
Inappropriate RC value of overcurrent relay for pump
Check RC value and pump operating current
Change RC value or replace electromagnetic switch
Faulty overcurrent relay for pump
Press reset button.
Check running current
Replace electromagnetic switch
Activation of anti-freezing thermo
Insufficient volume of water
Check cold water inlet/outlet temperature difference
Increase volume of water.
Pump inverse rotation
Check rotational direction
Fix to correct direction.
Thermistor abnormality
Check cold water inlet temp
Replace Thermistor
Faulty frost-proof thermostat
Check cold water outlet temp
Replace frost-proof thermostat

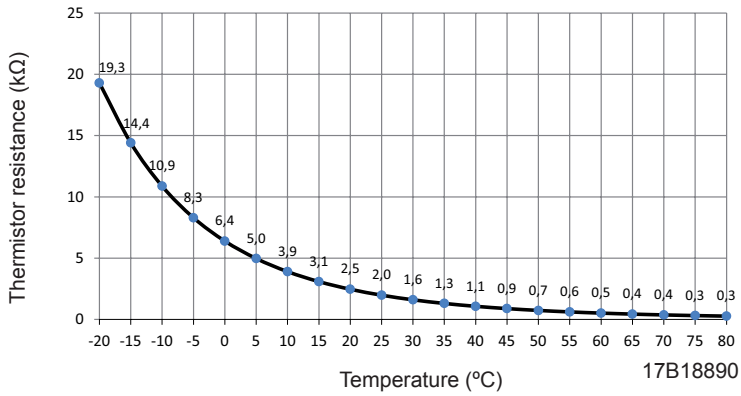

Phenomenon
Cause
Check Item
Action · Countermeasure
The machine is working, but the cooling effect is poor
Load bigger than cooling capacity.
Calculate heat load.
Set the machine to a larger capacity
Suction pressure is too low.
(Low pressure interruption control activated)
Gas leakage or insufficient amount of refrigerant
Check super heat
Charge correct refrigerant volume after checking gas leakage
Clogging of expansion valve
Check for clogging
Remove clogging
Malfunction of the expansion valve
Check operation of expansion valve
Replace expansion valve
Clogging of suction pipes
Check whether there is temp difference in the pipes
Remove clogging
Malfunction of check valve
There is temperature difference at the check valve
Replace check valve
Insufficient volume of water
Check cold water inlet/outlet temperature difference
Increase volume of water
Pump inverse rotation
Check rotational direction
Fix to correct direction
Formation of lime deposit inside heat exchanger
Check for dirt at the heat exchanger
Clean heat exchanger
Discharge pressure too high
(High pressure switch activation)
Refrigerant overcharge
Check cycle temperature
Charge correct volume
Mixture of non-condensable gas in refrigerant cycle
Stop the chiller unit and check the relation between water temperature and pressure
Recharge refrigerant after vacuum pumping
Clogging of pipes at discharge side
Check for clogging
Remove clogging.
Clogging of expansion valve
Check for clogging
Malfunction of expansion valve
Check operation of expansion valve
Replace expansion valve
Malfunction of check valve
Check temperature difference before and after check valve
Replace check valve
Faulty compressor
Check pressure, cycle temperature and current
Compressor replacement
The machine is working, but it produces abnormal noises
Sounds come from the com-pressor
Incorrect installation or loosening of various tightening bolts
Inspection of loosening of each tightening bolt
Tighten bolts even more
Liquid compression
Check temperature and pressure of suction gas
Secure super heat
Oil hammer
Check temperature and amount of oil in suction gas
Check or replace compressor
Oil heater is not being supplied power during stop
Check the power supply to the oil heater
Replace oil heater
Exhaustion and damage inside the compressor
Abnormal noises produced inside the compressor
Compressor replacement
Howling from the electrical contactor
Check for rough contact
Replace contact
Vibration of cabinet
Check for loosening of screws
Retighten screws

4.10 Thermistor characteristics

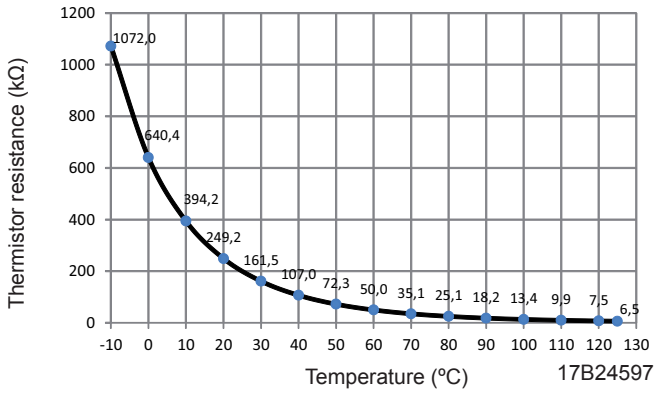
The thermistor is installed in this product to detect the cycle temperature such as water temperature (inlet-outlet of water side heat exchanger), and outlet liquid refrigerant temperature from the heat exchanger.

The thermistor temperature characteristics are shown in the below figures:

4.10.1 Thermistor temperature characteristics (All temperature except discharge gas)

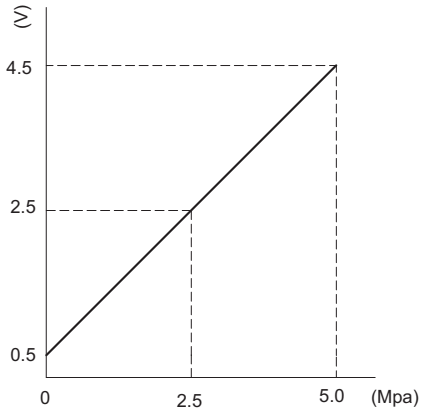


4.10.2 Thermistor temperature characteristics for discharge gas temperature

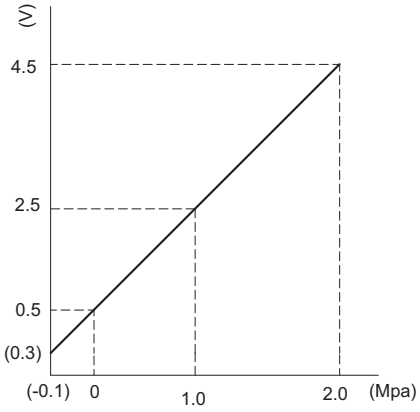


4.11 Pressure sensor characteristics

4.11.1 High-pressure sensor



4.11.2 Low-pressure sensor



4.12 Procedures for trouble

The following table shows efficient checking procedures for trouble.

Fault	Possible Cause	Check/Corrective Action
Compressor does not operate	Interlock Circuit for Chilled Water Pump is Open	1. Check the pump contactor. Repair or replace, if necessary. 2. Check for the faulty pump.
	Electrical Protective Devices Are Tripped.	Remove the causes, and reset the “ON” button. See the following causes.
	Incorrect Wiring Connection for Compressor Power Source	Interchange two of three terminals R, S and T at the main power source terminals.
Compressor stops on high pressure switch	Excessively High Discharge Pressure	See *High Discharge Pressure*
	Malfunction of High Pressure Switch	Readjust the setting or replace, if defective.
Compressor stops on overcurrent relay	Excessively High Discharge Pressure and Suction Pressure	See *High Discharge Pressure* and *High Suction Pressure*.
	High or low voltage, single-phase or phase imbalance	Check the power supply line and contactors. Repair, if necessary.
	Loose connection	Tighten the loose electrical connection or repair, if necessary.
	Faulty Compressor Motor	Check the compressor motor. Repair or replace, if necessary.
	Faulty Overcurrent Relay	Replace it, if necessary.

The following table shows efficient checking procedures for trouble.

Fault	Possible Cause	Check/Corrective Action
Compressor stops on freeze protection control.	Excessively Low Chilled water Outlet Temperature	Check for excessively low setting of the chilled water setting knob.
	Defective Thermistor	Check for malfunction of the thermistor. Replace, if necessary.
	Shortage of Chilled Water Flow	Check the rotation of the pump.
	Air in water Circuit	Purge air.
Compressor stops on internal thermostat or discharge gas temperature control.	High or low voltage, single-phase or phase imbalance	Check the power supply line and contactor. Repair, if necessary.
	Excessive Superheat	Check for refrigerant leakage.
	Defective Element	Check the contact of the internal thermostat during the cold condition.
	Excessive High Discharge Pressure and Low Suction Pressure	See *High Discharge Pressure* and *Low Suction Pressure*.
Insufficient cooling	High Discharge Pressure or Low Suction Pressure	See *High Discharge Pressure* and *Low Suction Pressure*.
	Improper Thermostat Setting	Readjust the setting.
	Defective Unload Mechanism	Adjust unload mechanism. Repair or replace unloaded parts, if necessary.
Noisy compressor	Slugging Due to Liquid Flooding Back to Compressor	Check the superheat of suction gas. Check the position of Expansion Valve coil. Repair or replace if necessary.
	Worn parts	Check for the sound of internal parts. Replace the compressor, if necessary.
Miscellaneous noise	Loose Fixed Screw	Tighten the screws of all parts.
Unloaded does not function	Trouble with the Thermistor	1. Adjust the setting temperature. 2. Replace the thermistor.
	Trouble with the Solenoid Valve	1. Check the coil in the solenoid valve. 2. Check oil passage for clogging.
	Worn Unloader Mechanism	Check the unloaded system parts in the compressor.
High discharge pressure	Defective Check Valve or partially Closed Liquid Line Valve	Check the valves and strainer. Replace, if necessary.
	Overcharged Refrigerant	Adjust the refrigerant quantity.
	Air or Non-Condensable Gas in the Refrigerant Cycle.	Purge the gas from the refrigerant cycle.
	Suction Pressure is Higher than Standard	See *High Suction Pressure*.
Low discharge pressure	Insufficient Refrigerant Charge	Add Refrigerant.
	Leakage from the Compressor Discharge Valve	Replace the valves. Replace the compressor, if required.
	Suction Pressure is Lower than Standard	See *Low Suction Pressure*
High suction pressure	High Inlet Temperature of Chilled Water	1. Check the insulation of the piping. 2. Check the installation specifications.
	Excessive Opening of Expansion Valve	Check the position of Expansion Valve coil, or replace, if defective.
Low suction pressure	Low Inlet Temperature of Chilled Water	Check the installation specifications.
	Improperly controlled Expansion Valve or Faulty Valve	Check the position of Expansion Valve coil. Repair or replace, if necessary.
	Insufficient Refrigerant Charge	Add Refrigerant.
	Excessive Oil in the Water Cooler	Purge Oil.
	Scales on Water Cooler Plates	Clean the plates.

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