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Marine type

Container Refrigeration Unit

Service Manual

**LXE10E100 or later
(DECOS III h)**

DAIKIN INDUSTRIES, LTD.

TR 15-02

Please read contents of this manual prior to operating unit.

This manual covers the minimum necessary information to maintain equipment at peak operating standards for LXE10E100 or later equipped with controller DECOS III h. This includes safety information, unit specifications, general unit information, maintenance procedures and related information (such as wiring and schematic diagrams), and how to enable and disable power supply.

In addition, refer to the manuals listed below.

- Parts List
- Operation Manual of Personal Computer Software

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SAFETY PRECAUTIONS

Always observe the following points before operating or inspecting a unit.

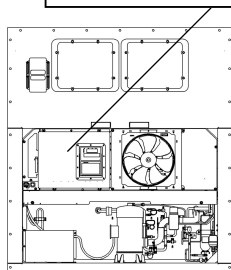
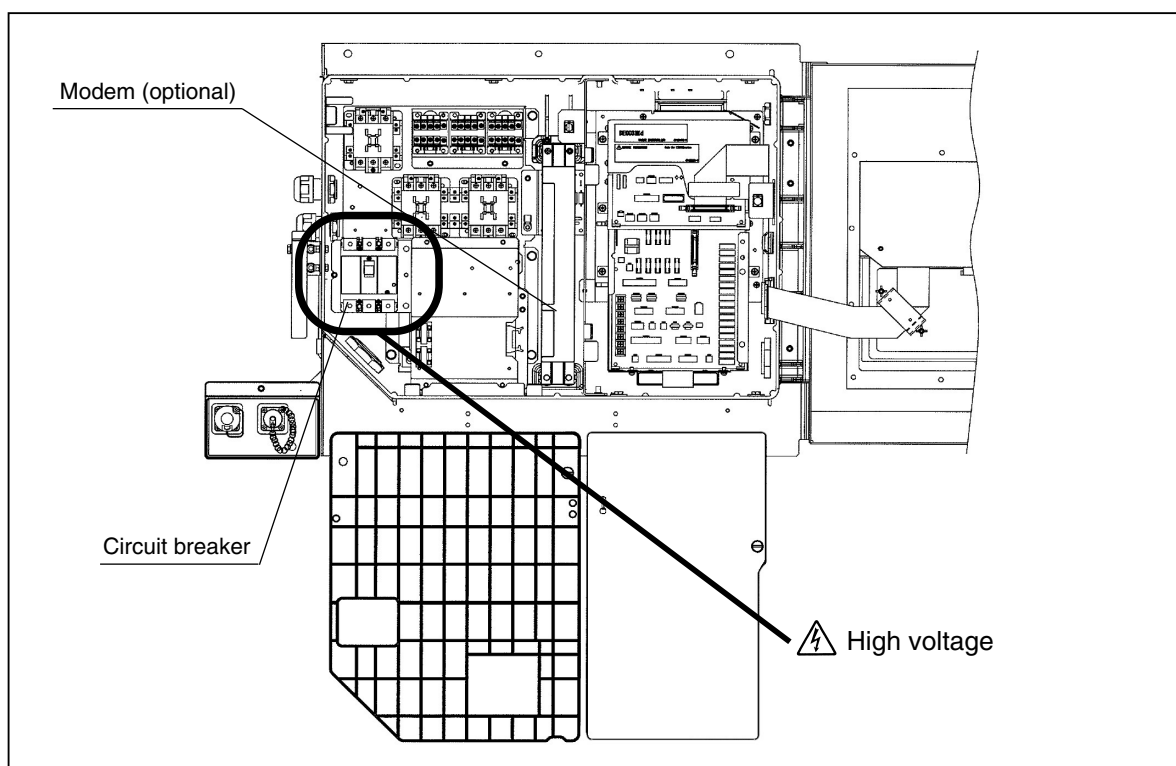
DANGER

Always shut off the main power supply of the facility before disconnecting the power plug.



Always turn off the main power supply of the facility before inspecting the interior of the control box.

※ This is important because high voltage remains at the circuit breaker even though the circuit breaker in the control box is turned off.



 **WARNING**

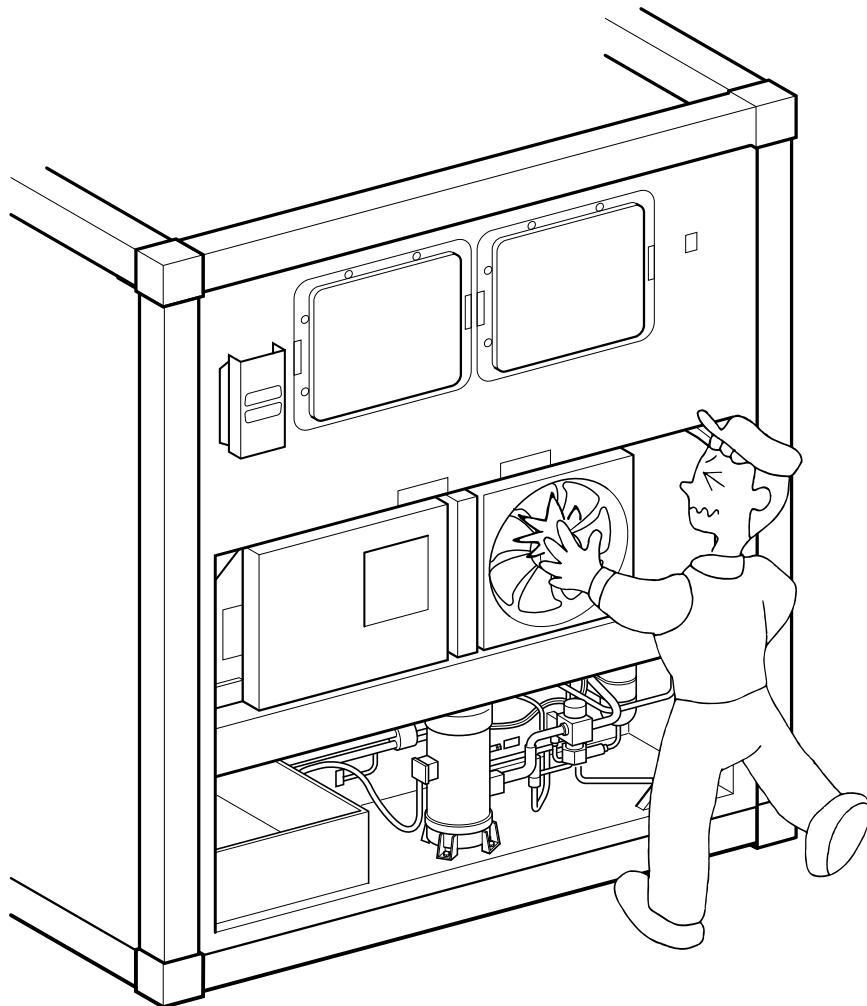


Do not touch the condenser fan while power to the unit is ON.

Before removing the condenser fan cover, turn off the circuit breaker and disconnect the power plug.

During air-cooled operation : Condenser fan may start and stop automatically by high pressure control switch.

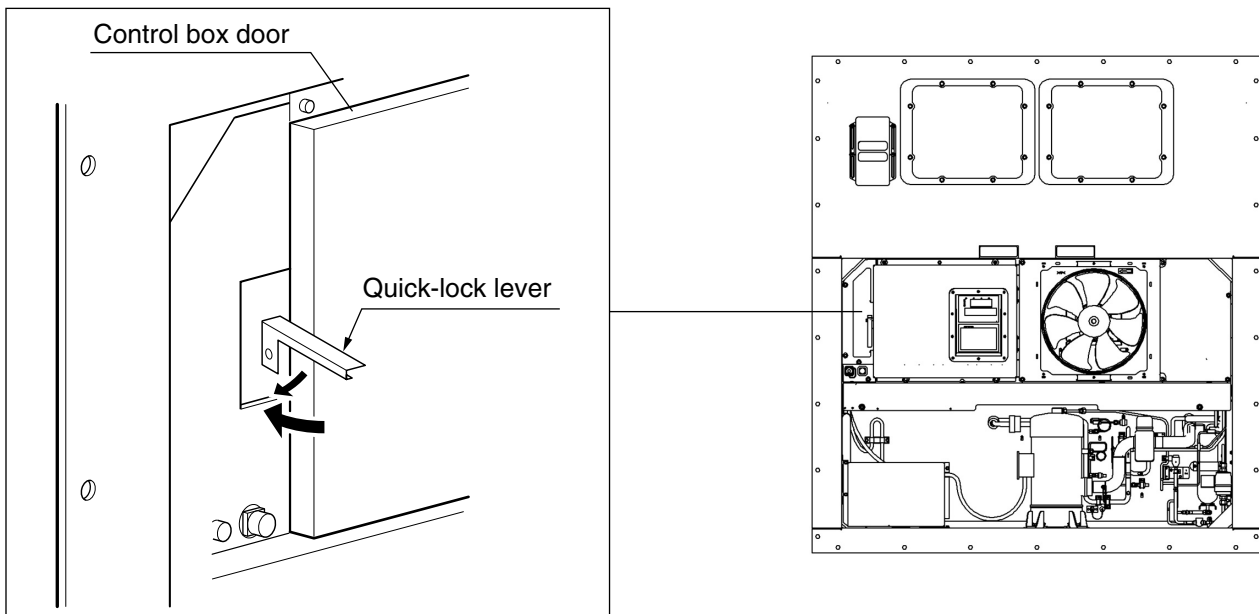
During water-cooled operation: Condenser fan may start and stop automatically by the control box.



 **WARNING**

Before starting unit, run the generator.

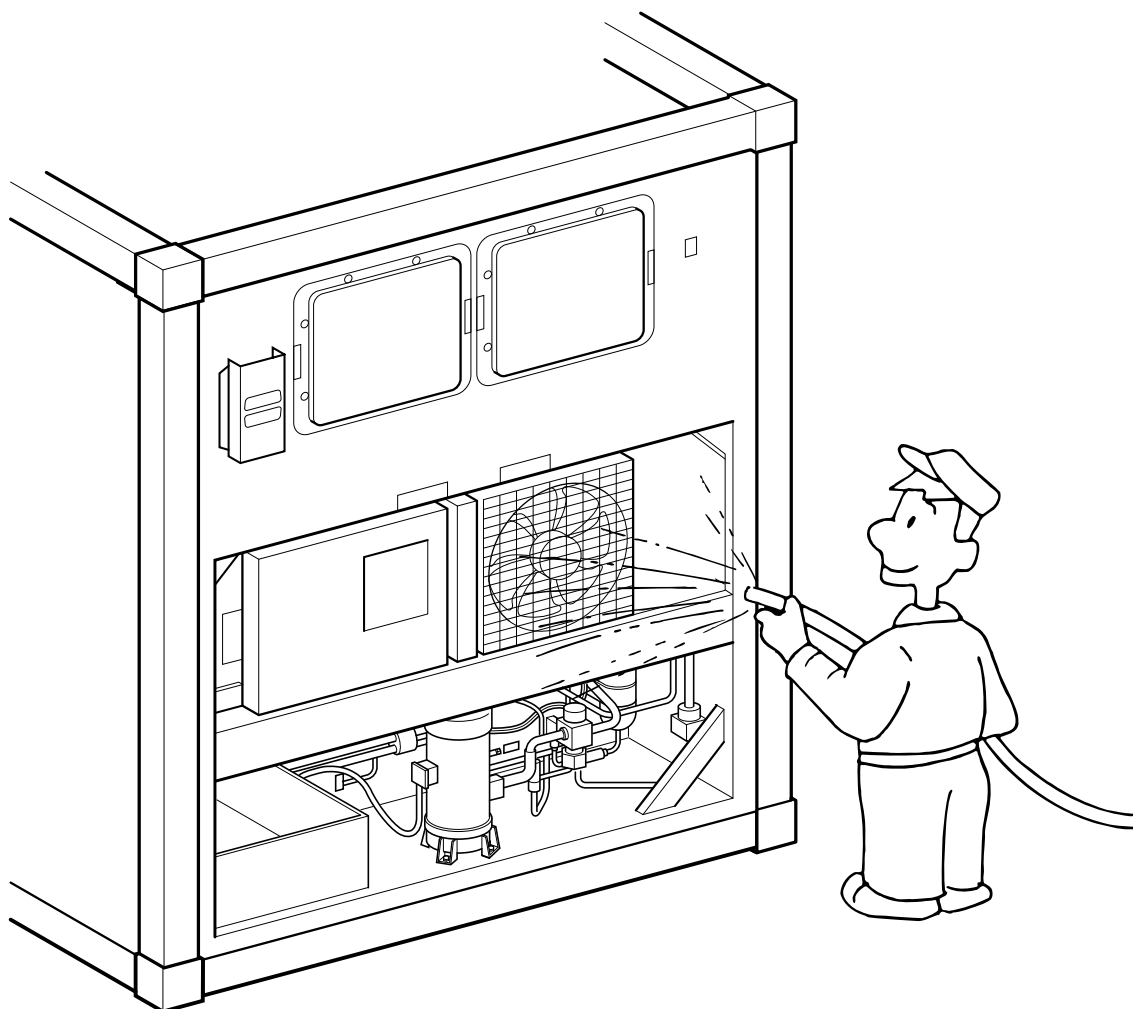
Securely close control box cover.
Otherwise, it will allow water entry.



WARNING

Wash the refrigeration unit with fresh water at PTI.

1. Carefully wash condenser with fresh water to remove salt deposits.
Do not use high-pressure water to wash.
Water may penetrate inside the condenser, which may lead to malfunctions.



2. Corrosive gases generated from the cargo may corrode the copper pipes and aluminum internal evaporator fins.
Corrosive gases include but not limited to chlorine, ammonia, sulfuric acid, acetic acid, sulfur dioxide.

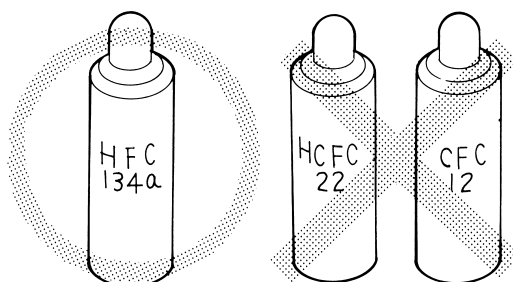
WARNING

Refrigerant and refrigerant oil

**Be sure to only charge the unit with refrigerant HFC 134a.
Never attempt to use any other refrigerant (CFC12, HCFC22, etc) with the refrigeration unit.**

Never mix the refrigerant with air. Never inject air or gas including oxygen gas into the unit for the purpose of tests such as pressure tests.

Charging the unit with a different refrigerant or being negligent in the usage method of the unit may lead to explosions.



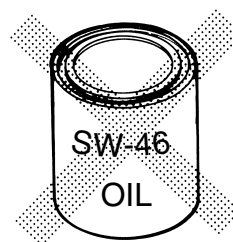
**Use only Daikin specified refrigerant oil (IDEMITSU, Daphne Hermetic Oil FVC46D).
If any other refrigerating machine oil not specified is charged, it may cause problems with the unit.**



DAPHNE
HERMETIC OIL
FVC46D



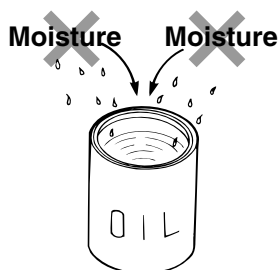
SUNISO
3GS-DI



Only use oil taken from a fresh container.

Do not leave oil can open for 5 hours or longer to avoid moisture entry.

Using any refrigerant oil which has absorbed moisture may cause damage with the unit.



**Use only those service tools certified for dedicated to HFC134a. (gauge manifold, etc)
Do not use any tools for CFC12 or HCFC22.**

Service ports with exclusive quick joints for HFC134a are provided in the refrigeration unit to avoid improper refrigerant or refrigerant oil from entering refrigeration system. (Refer to clause 3.1.2)

The charging hose and gauge port are not interchangeable with those of previous models using other refrigerants.

CLASS 1 PRODUCT SPECIFIED BY THE LAW CONCERNING THE RECOVERY AND DESTRUCTION OF FLUOROCARBONS OF FLUOROCARBONS

HFC IS USED FOR THIS PRODUCT AS A REFRIGERANT.

- (1) EMISSION OF FLUOROCARBONS INTO THE ATMOSPHERE WITHOUT PERMISSION IS PROHIBITED.
- (2) RECOVERY OF FLUOROCARBONS IS MANDATORY WHEN SCRAPPING AND SERVICING THIS PRODUCT.
- (3) THE KIND OF FLUOROCARBON AND ITS AMOUNT ARE STATED IN THE MANUFACTURER'S LABEL OR THE ADDITIONALLY CHARGED AMOUNT LABEL.

When replacing the power cable, work must be carried out by the manufacturer, the distributor, or personnel qualified to conduct electrical work.

Important information regarding the refrigerant

This product contains greenhouse gases covered by Kyoto Protocol.
Do not discharge refrigerant into atmosphere.

Refrigerant type : R134a
GWP (1) value : 1430

(1) GWP=global warming potential

The refrigerant quantity is indicated on the unit name plate.

1. INTRODUCTION

1.1 Operation range

Use the units within the following range.

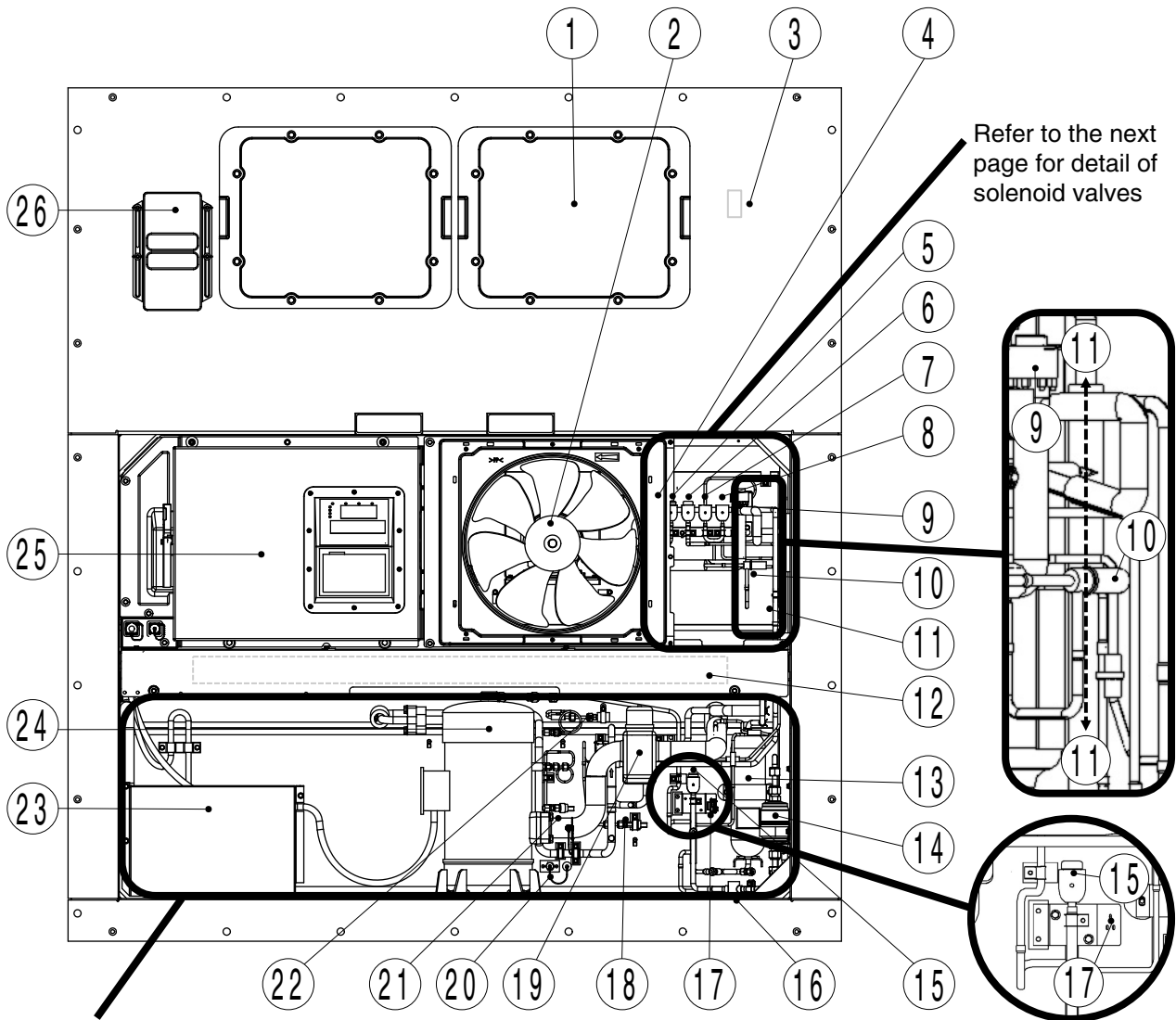
Item	Operation range
External temperature range	-30°C to +50°C (-22°F to + 122°F)
Internal temperature range	-30°C to +30°C (-22°F to + 86°F)
Voltage	50Hz: 380V/400V/415V, 60Hz: 440V/460V Voltage fluctuation rate should be within ±10%
Vibration and shock	Horizontal: 5G, Vertical: 2G

1.2 Specification

Item		Model	LXE10E100H
Condenser cooling system		Air cooled type	
Controller		DECOS III h	
Power supply		AC 3-phase 380V/400V/415V 50Hz, 440V/460V 60Hz	
Compressor		Full hermetic scroll type (Output: 5.5kW)	
Evaporator		Cross fin coil type	
Air-cooled condenser		Cross fin coil type	
Evaporator fan		Propeller fan	
Evaporator fan motor		Three-phase squirrel-cage induction motor	
Condenser fan		Propeller fan	
Condenser fan motor		Three-phase squirrel-cage induction motor	
Defrosting	System	Hot-gas defrosting system	
	Initiation	On demand defrost and manual switch or Time	
	Termination	Evaporator outlet sensor and return air sensor or Time	
Refrigerant flow control		Electronic expansion valve	
Capacity control		Capacity control with hot gas bypass and suction modulating valve	
Protective devices /Safety devices		Circuit breaker, PT/CT board (for over current protection). Compressor thermal protector Condenser fan-motor thermal protector Evaporator fan-motor thermal protector High-pressure switch, Fusible plug, Fuse (Glass tube fuse)	
Refrigerant charged amount (R134a)		4.5 (kg)	
Refrigerant oil		IDEMITSU, Daphne hermetic oil FVC 46D	
Weight		For details, refer to the Name plate, unit performance	

1.3 Names of components

1.3.1 Front view



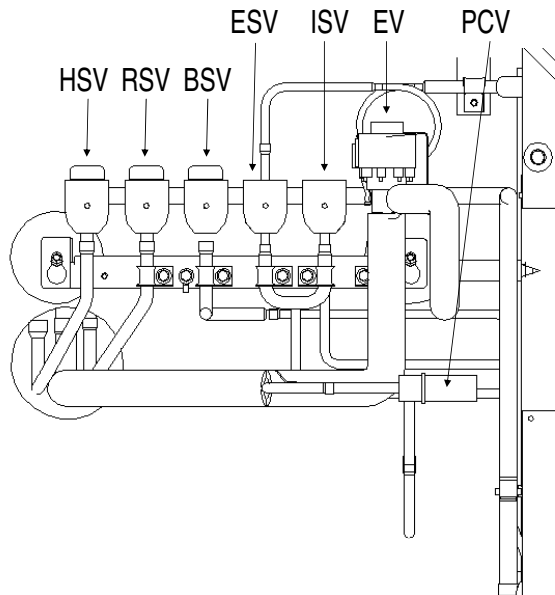
Refer to the next page for detail of solenoid valves

Refer to the next page for detail of compressor and refrigeration control device location

- | | |
|--|---------------------------------------|
| ① Access panel | ⑬ Liquid receiver |
| ② Condenser fan motor (CFM) | ⑭ Drier |
| ③ Thermometer check port (Return air, optional)
※Thermometer check port is not fitted to some models. | ⑮ Liquid solenoid valve (LSV) |
| ④ Hot-gas solenoid valve (HSV) | ⑯ Sight glass |
| ⑤ Reheater Solenoid Valve for dehumidification control(Optional) | ⑰ Ambient temperature sensor (AMBS) |
| ⑥ Discharge gas by-pass solenoid valve (BSV) | ⑱ Low pressure transducer (LPT) |
| ⑦ Economizer solenoid valve (ESV) | ⑲ Suction modulating valve (SMV) |
| ⑧ Injection solenoid valve (ISV) | ⑳ Thermometer check port (Supply air) |
| ⑨ Electronic expansion valve (EV) | ㉑ High pressure transducer (HPT) |
| ⑩ Pressure Control Valve (PCV) | ㉒ High pressure switch (HPS) |
| ⑪ Economizer heat exchanger | ㉓ Storage space for power cable |
| ⑫ Air-cooled condenser | ㉔ Compressor (CM) |
| | ㉕ Control box |
| | ㉖ Ventilator |

●LXE10E100G

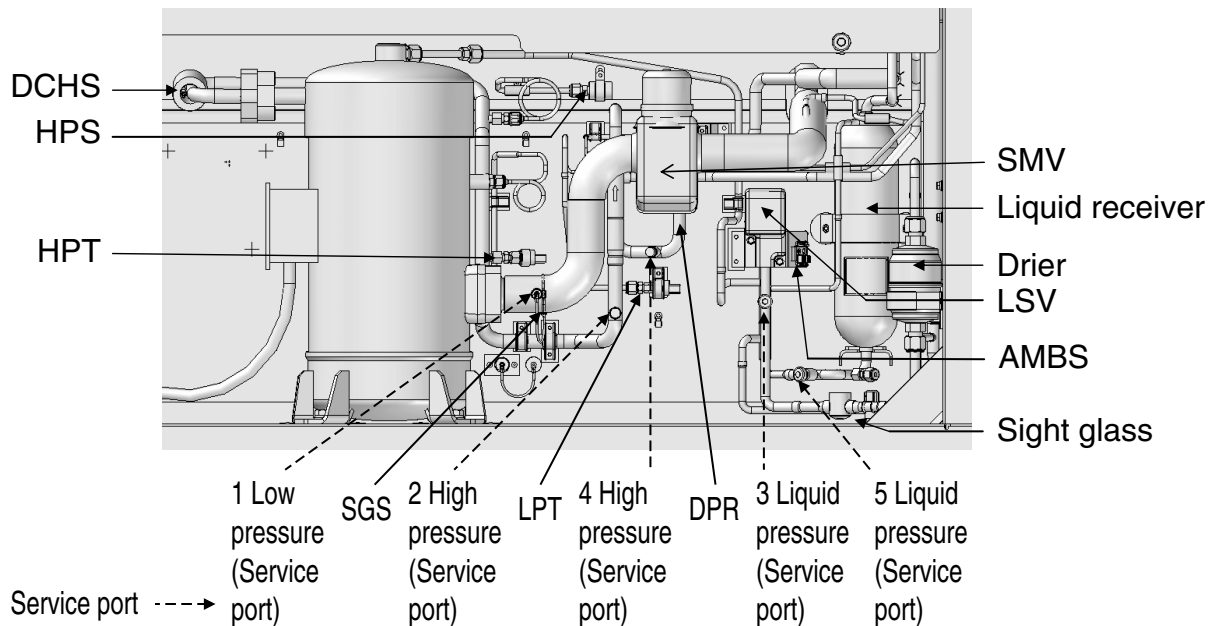
· Solenoid valve location



[Valve]

- BSV :Discharge gas bypass Solenoid Valve
- EV :Electronic Expansion Valve
- ESV :Economizer Solenoid Valve
- HSV :Hot gas Solenoid Valve
- ISV :Injection Solenoid Valve
- PCV :Pressure Control Valve
- RSV :Reheater Solenoid Valve (Optional)
for dehumidification control

· Compressor and refrigeration control device location



[Sensor]

- AMBS: Ambient temperature sensor
- DCHS: Discharge Gas Temperature Sensor
- HPS : High Pressure Switch
- HPT : High Pressure transducer
- LPT : Low pressure transducer
- SGS : Compressor suction pipe temperature sensor

[Valve]

- SMV : Suction modulating valve
- DPR : Discharge Pressure Regulator Valve
- LSV : Liquid solenoid valve

[Service port]

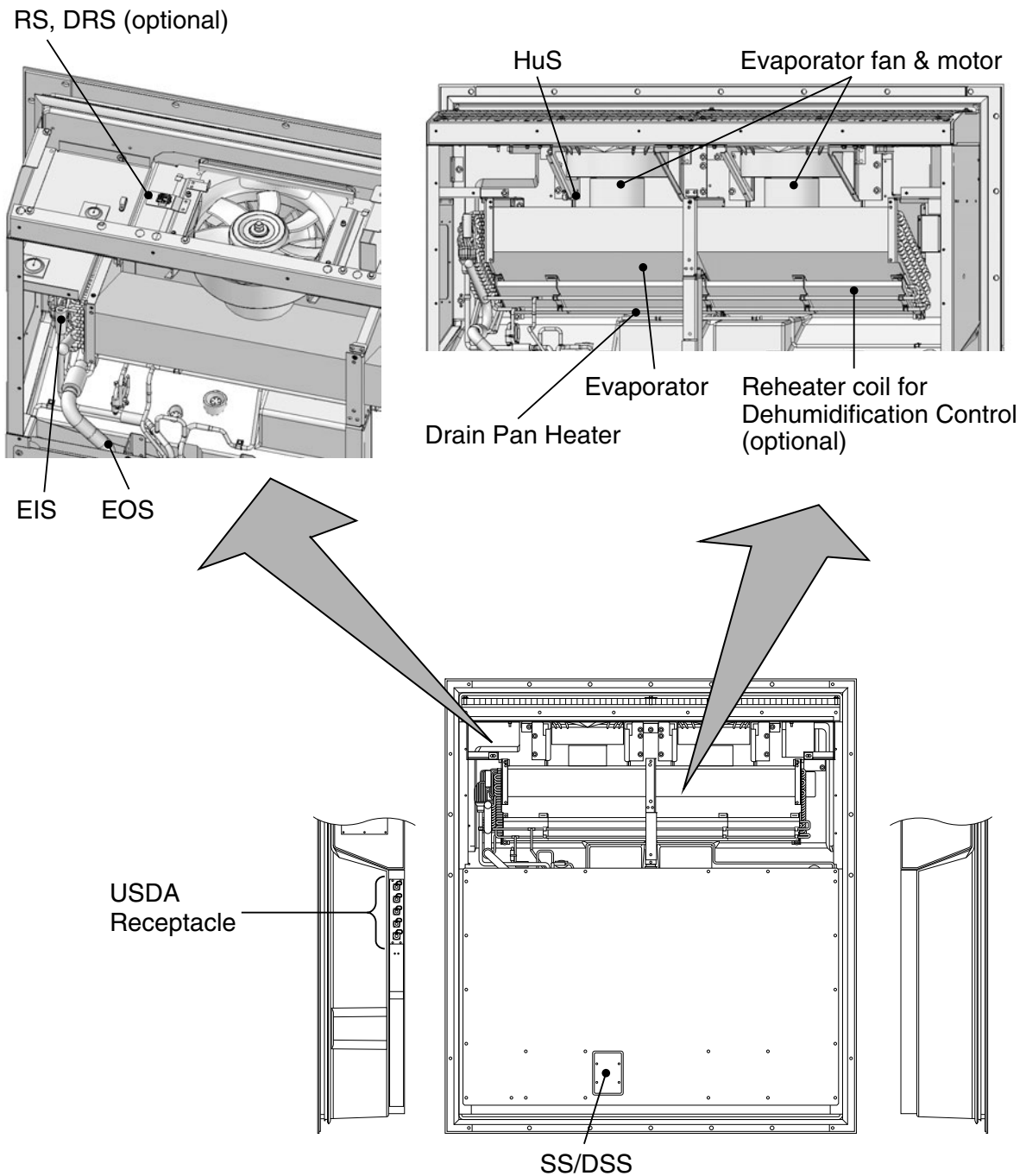
- ① Low pressure
 - ② High pressure
 - ③ Liquid pressure
 - ④ High pressure
 - ⑤ Liquid pressure
- For operation pressure check
- Refrigerant recovery or vacuum dry
- For Refrigerant charging
(For details, refer to page 3-5.)

Solenoid valve operation and description

- BSV** : Discharge gas by-pass solenoid valve
BSV bypasses discharge gas to the suction side of the compressor to maintain low pressure at low ambient temperatures.
- E V** : Electronic expansion valve
EV controls the evaporator outlet superheat by using the temperature sensor at the evaporator outlet and inlet to control the refrigerant flow rate to the evaporator.
If EV coil fails or controller malfunctions an emergency magnet can be used to manually set the opening.
- ESV** : Economizer solenoid valve
By turning ON ESV, the economizer circuit is activated to make liquid refrigerant supercooled larger, which can increase cooling performance significantly. This function is activated during frozen operation. It is also activated when discharge pipe temperature abnormality is detected during a chilled operation at $RS < 5^{\circ}\text{C}$.
- HSV** : Hot gas solenoid valve
HSV supplies discharge gas (hot gas) from the compressor to the evaporator to defrost.
- ISV** : Injection solenoid valve
ISV is activated when the following cases occur:
1)When compressor discharge gas temperature is too high (for the protection of the compressor and lubricant)
2)When refrigerant flow rate is too low during defrosting operation. The defrosting time can be shortened with appropriate amount of refrigerant.
- LSV** : Liquid solenoid valve
LSV closes for pump down operation and during the automatic pumping-down and defrosting operations.
- PCV** : Pressure control valve
PCV relieve the refrigerant to low pressure side when the pressure becomes abnormally high.
- RSV** : Reheater solenoid valve (to control dehumidification)
RSV is activated during dehumidification operation to supply discharge gas (hot gas) from the compressor to the reheater coil.
- SMV** : Suction modulating valve
SMV automatically adjusts its opening to control the refrigerant flow rate by using the supply air temperature sensor SS during chilled operation.
The valve is fully open during pull-down or frozen operation. In case of SMV coil abnormality or the controller malfunctions, the emergency magnet can be used to fix the opening in full

1.3.2 Rear and side section

●LXE10E100H



DRS:Return Air Temperature Sensor for Datacorder (optional)
 DSS:Supply Air Temperature Sensor for Datacorder
 EIS :Evaporator Inlet Temperature Sensor
 EOS:Evaporator Outlet Temperature Sensor
 HuS :Humidity Sensor

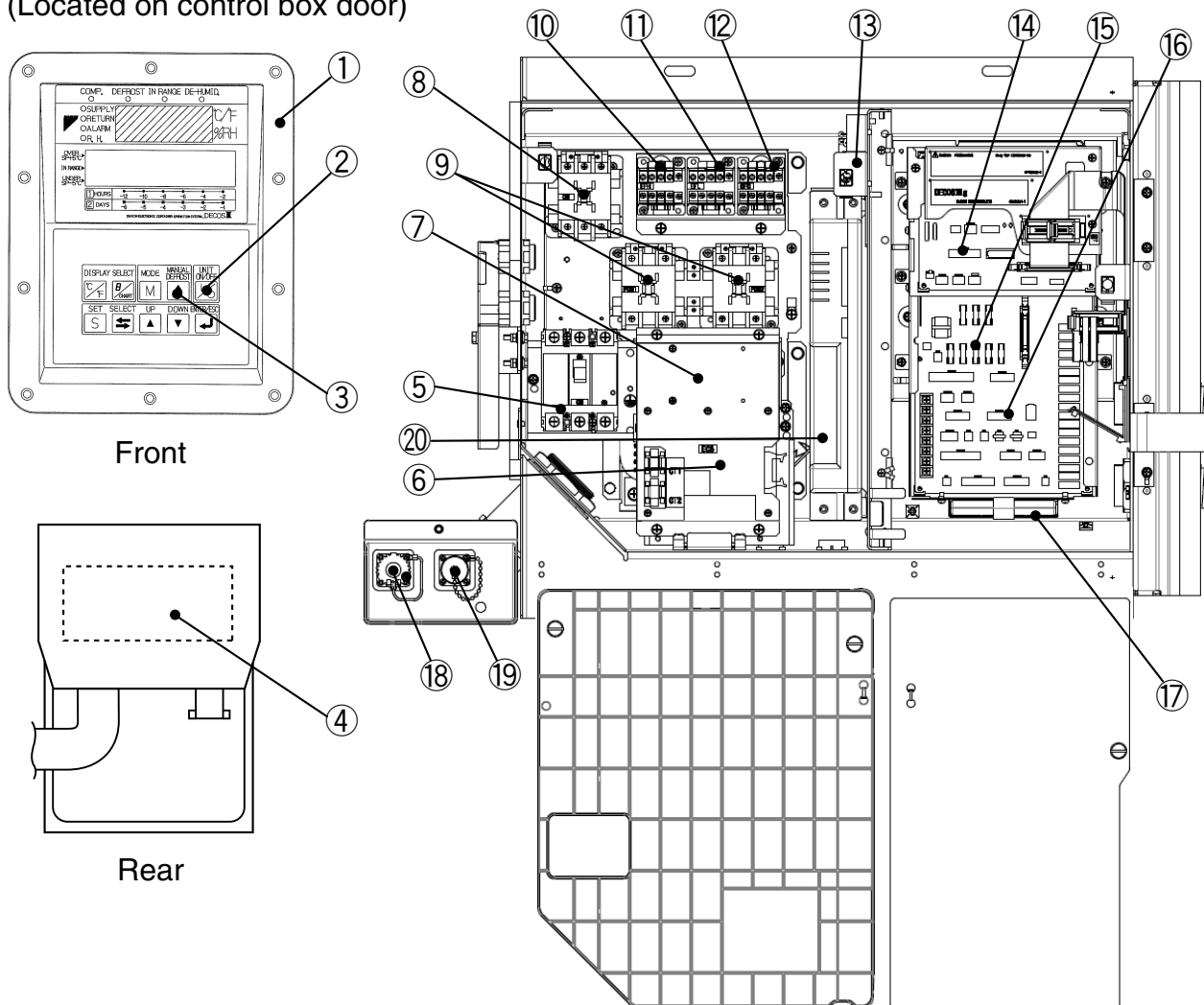
RS :Return Air Temperature Sensor
 SS :Supply Air Temperature Sensor

1.3.3 Control box

● Display panel

(Located on control box door)

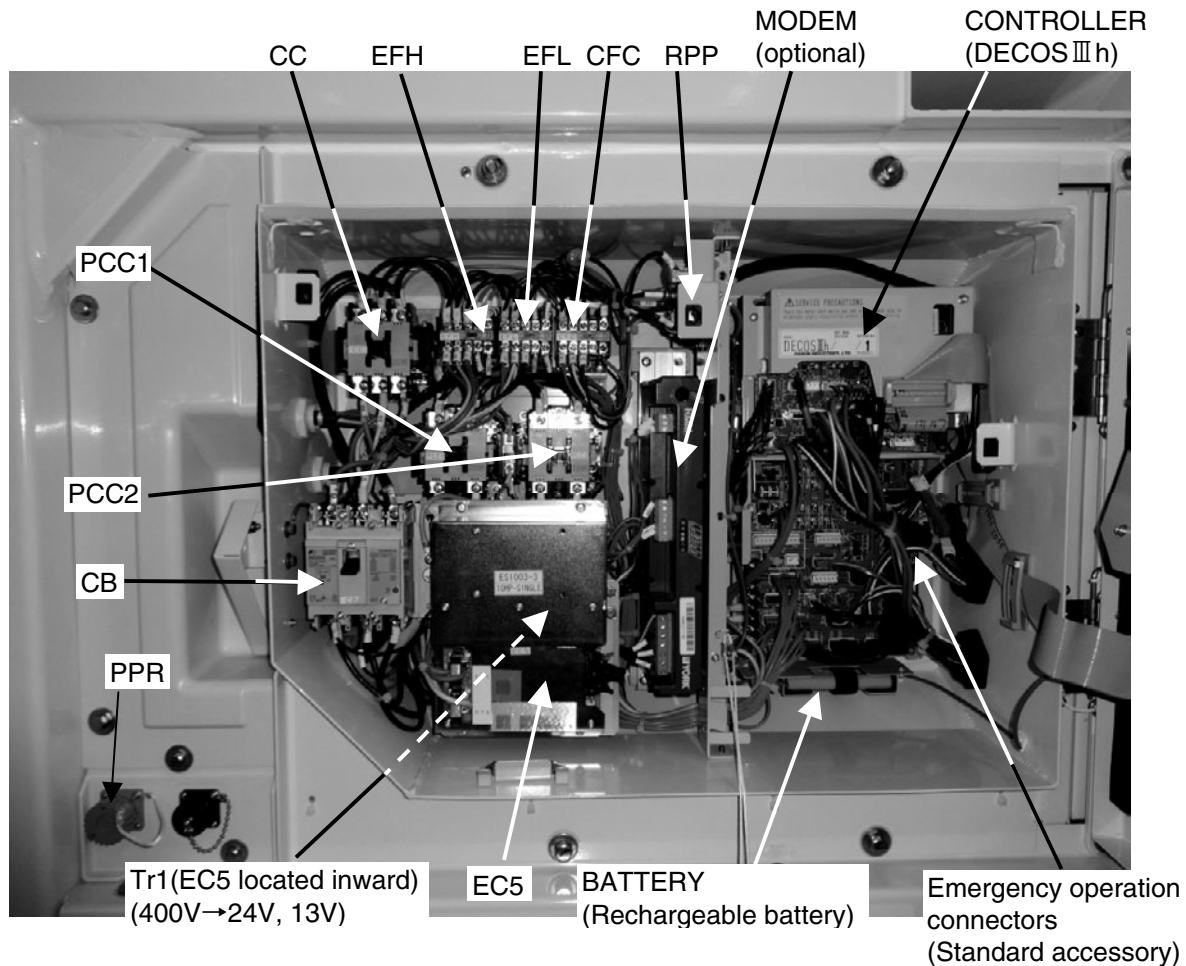
● Internal control box components



- ① Display panel
- ② UNIT ON/OFF key
- ③ MANUAL DEFROST key
- ④ Display board
- ⑤ Circuit breaker (CB)
- ⑥ PT/CT board (EC5)
- ⑦ Transformer for control circuit (Tr1)
- ⑧ Magnetic contactor for compressor (CC)
- ⑨ Phase correction contactor (PCC1, PCC2)
- ⑩ Magnetic contactor for high speed evaporator fan (EFH)
- ⑪ Magnetic contactor for low speed evaporator fan (EFL)
- ⑫ Magnetic contactor condenser fan (CFC)
- ⑬ Reversed phase protector (RPP)
- ⑭ Controller CPU board (EC1)
- ⑮ Fuse (Fu1-4, 6-9)
- ⑯ Controller I/O board (EC2)
- ⑰ Battery (BATTERY)
- ⑱ PC Port Receptacle (PPR)
- ⑲ Remote monitoring receptacle (RM, optional)
- ⑳ Modem (RCD, optional)

· Control box Inside detail

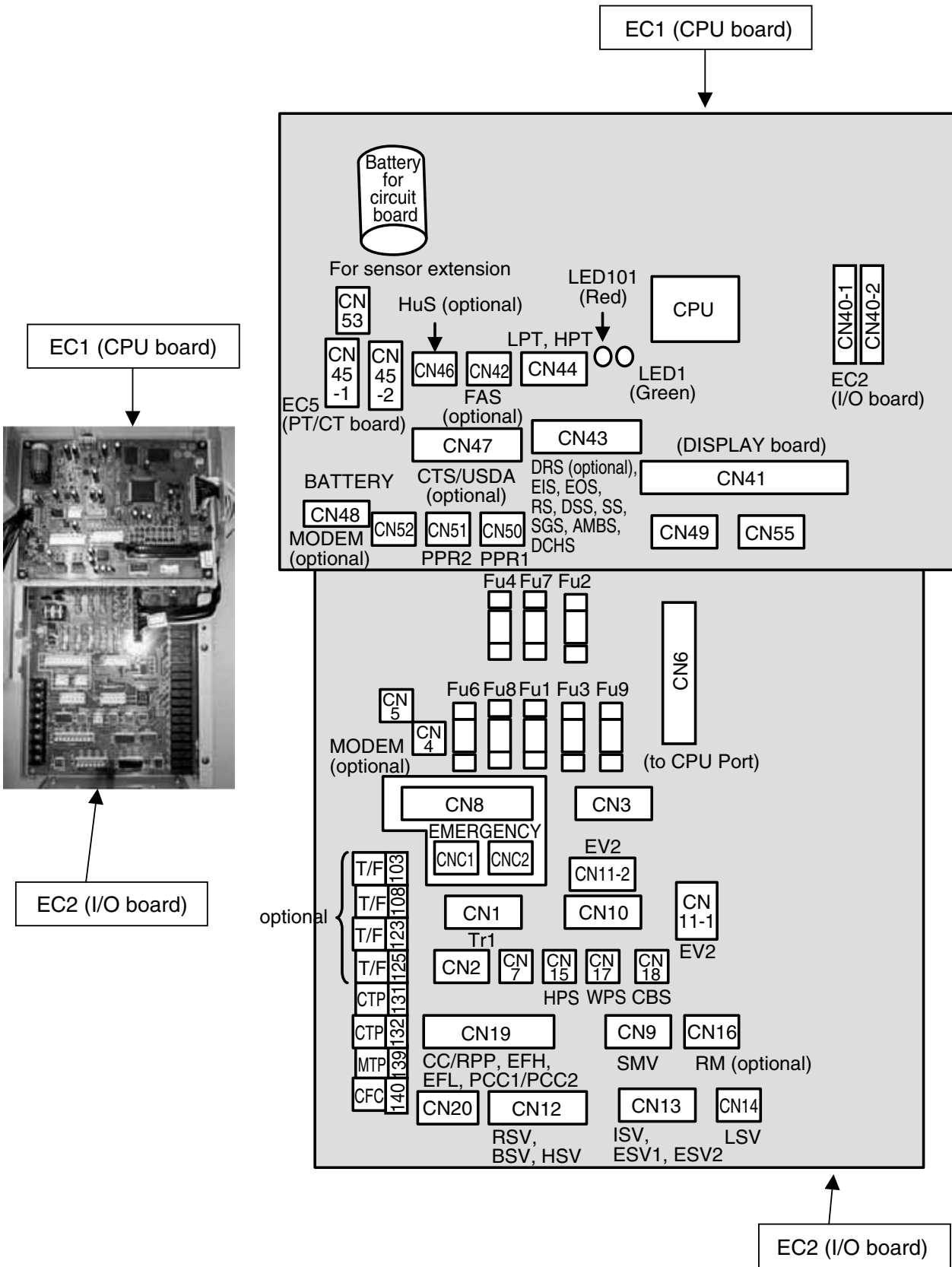
Controller Name plate



[Control Box]

- BATTERY :Back-up Battery
- CB :Circuit Breaker
- CC :Magnetic Contactor, Compressor
- EC5 :PT/CT Board
- EFH :Magnetic Contactor, Evaporator Fan Motor, High Speed
- EFL :Magnetic Contactor, Evaporator Fan Motor, Low Speed
- CFC :Magnetic Contactor Condenser Fan
- PPR :PC Port Receptacle
- PCC1 :Phase Correction Contactor 1
- PCC2 :Phase Correction Contactor 2
- Tr1 :Transformer
- RPP :Reversed Phase protector

· Control box Inside detail



1.4 Protection device specifications

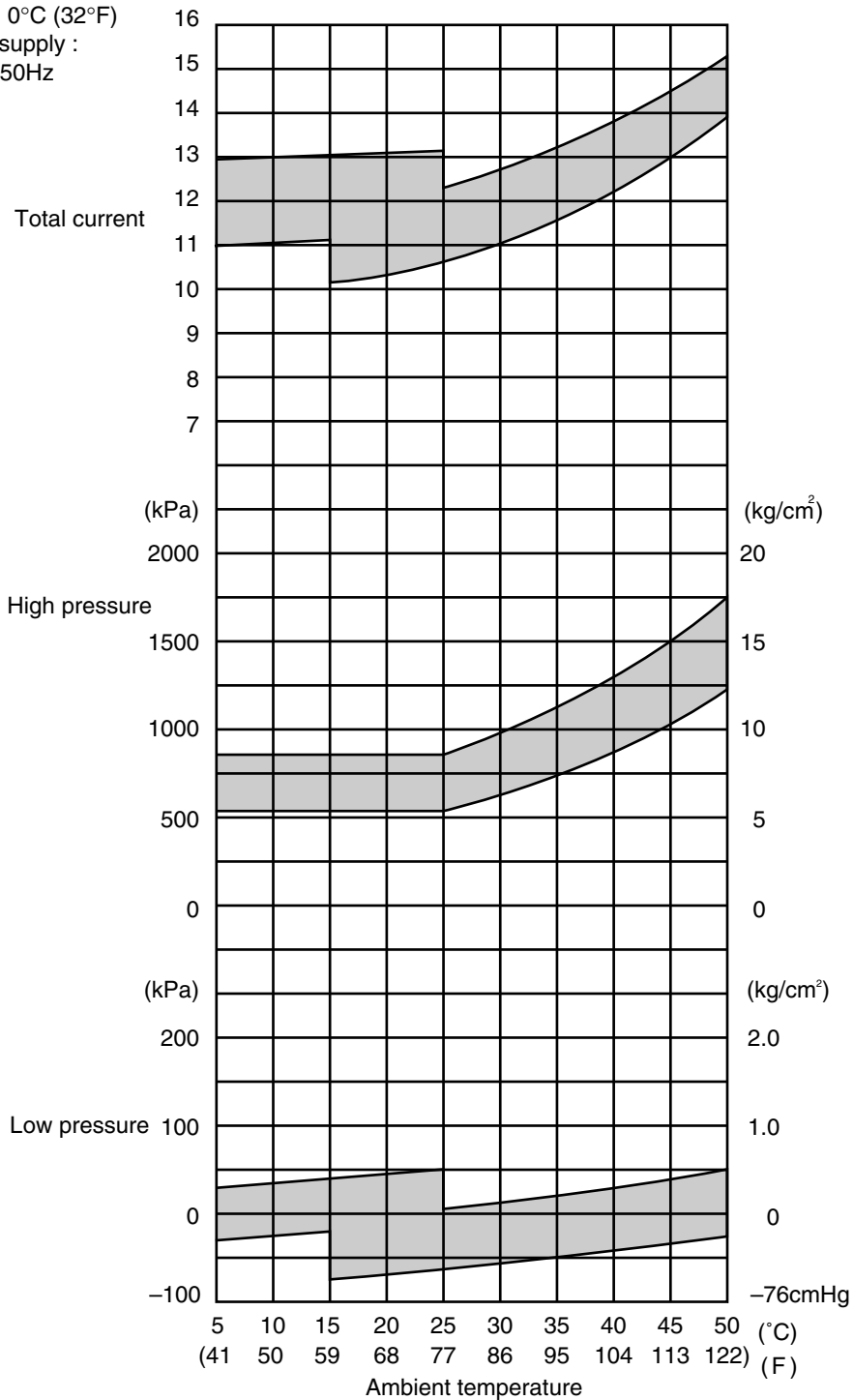
	Device name		Actuation	Set point	Detection method	Symbol
Pressure switch	High-pressure switch		OFF	2400kPa (24.47kg/cm ²)	High-pressure switch	HPS
			ON	1900kPa (19.37kg/cm ²)		
Electronic controller	High-pressure control for Condenser fan		OFF	800kPa (8.2kg/cm ²)	High-pressure transducer	HPT
			ON	1000kPa (10.2kg/cm ²) ※1		
	Discharge gas temperature protection set point	Pull down	OFF	135°C (275°F) Reset in 3 minutes	Discharge gas temperature sensor	DCHS
		Other operation set point LPT ≤ 50kpa	OFF	123°C (262°F) Reset in 3 minutes		
Overcurrent protection set point		OFF	26.0A Reset in 3 minutes	PT/CT board	CT2	
Current	Circuit breaker		OFF	30A		CB
	Fuse		–	10A ※2		Fu
Motor	Evaporator fan motor thermal protector		OFF	145°C ± 5°C (293°F ± 9°F)		
			ON	94°C ± 15°C (201°F ± 27°F)		
	Condenser fan motor thermal protector		OFF	135°C ± 5°C (275°F ± 9°F)		MTP
		ON	86°C ± 15°C (186.8°F ± 27°F)			
Compressor motor thermal protector		OFF	140°C ± 5°C (284°F ± 9°F)		CTP	
		ON	118°C ± 11°C (244.4°F ± 19.8°F)			
–	Fusible plug		–	95~100°C (203°F~212°F)		

※1 When dehumidification is ON in dehumidification mode, the setting figure may change between 900~2100kPa automatically (Refer to "High Pressure Control" Page 1-23)

※2 Refer to "Fuse Protection table" in section 6.10.

1.5 Running operating pressures and current

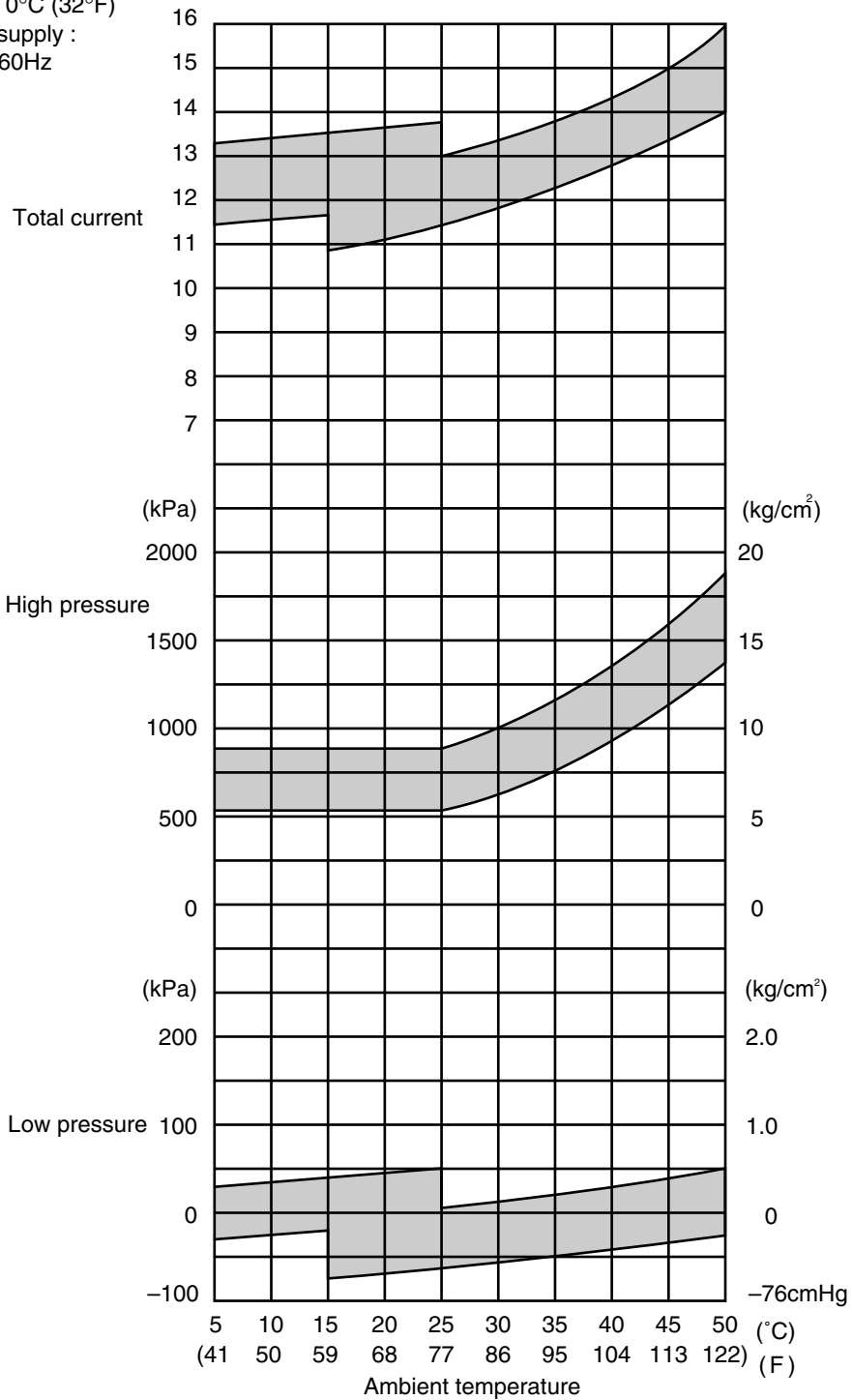
●Chilled mode
 Inside : 0°C (32°F)
 Power supply :
 415V / 50Hz



●Fan motor current

Item	Current A
Condenser fan motor running current	1.7 (415VAC)
Evaporator fan motor running current (2 motors)	3.1 (415VAC) Hi speed

●Chilled mode
 Inside : 0°C (32°F)
 Power supply :
 440V / 60Hz



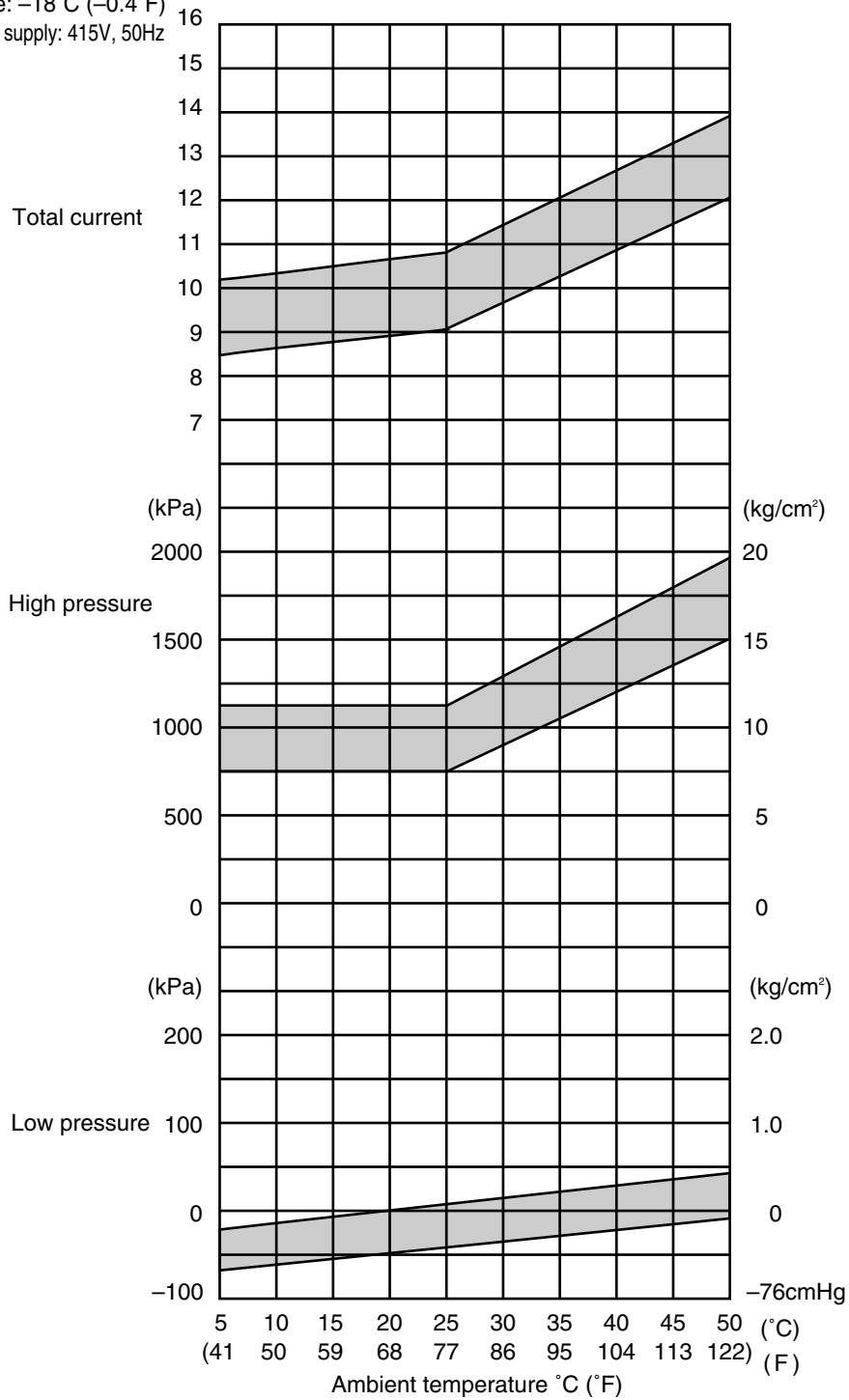
●Fan motor current

Item	Current A
Condenser fan motor running current	1.3 (440VAC)
Evaporator fan motor running current (2 motors)	2.6 (440VAC) Hi speed

●Frozen mode

Inside: -18°C (-0.4°F)

Power supply: 415V, 50Hz

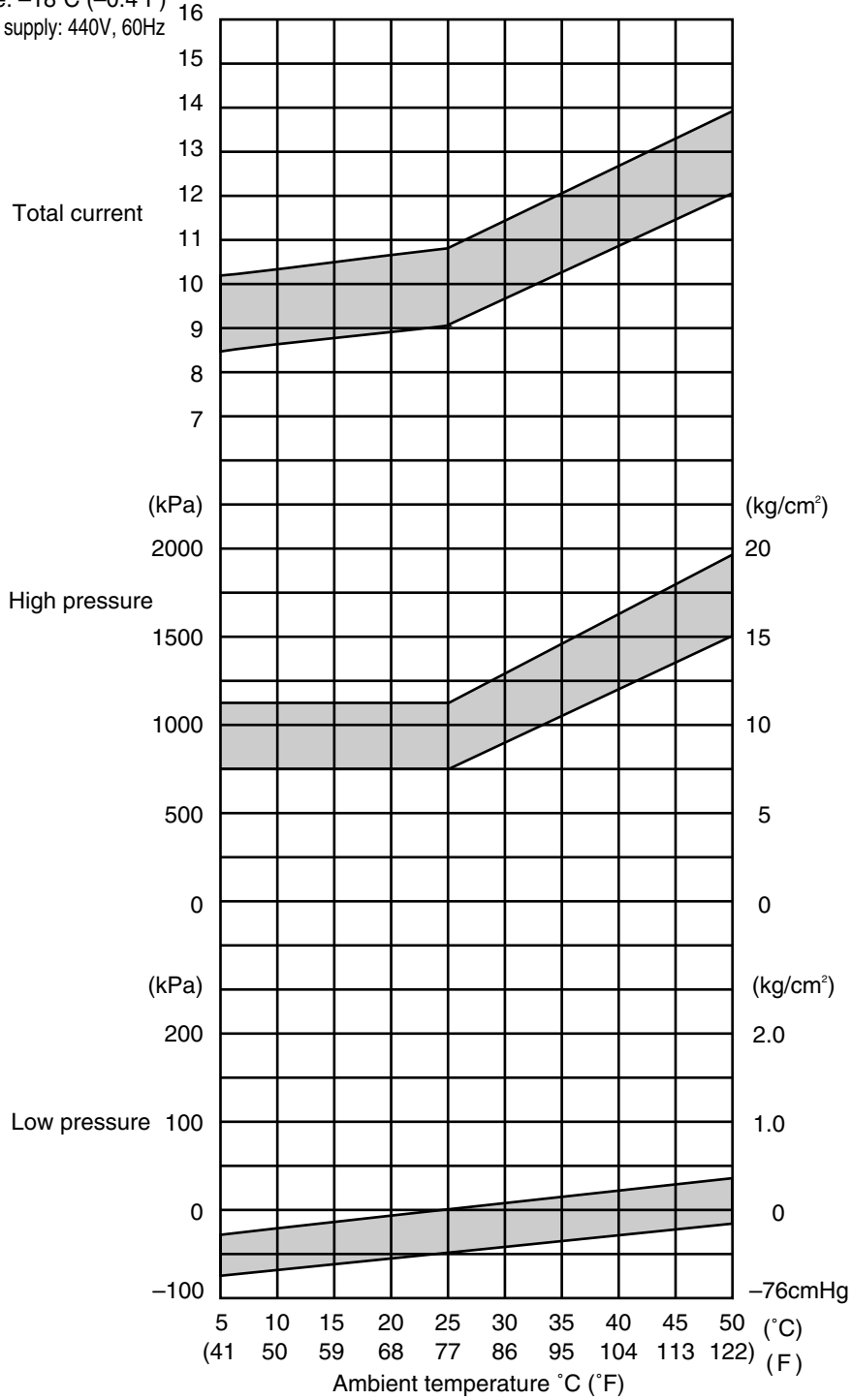


●Fan motor current

Item	Current A
Condenser fan motor running current	1.7 (415VAC)
Evaporator fan motor running current (2 motors)	1.3 (415VAC) Low speed

●Frozen mode

Inside: -18°C (-0.4°F)
 Power supply: 440V, 60Hz



●Fan motor current

Item	Current A
Condenser fan motor running current	1.3 (440VAC)
Evaporator fan motor running current (2 motors)	1.1 (440VAC) Low speed

1.6 Operation modes and control

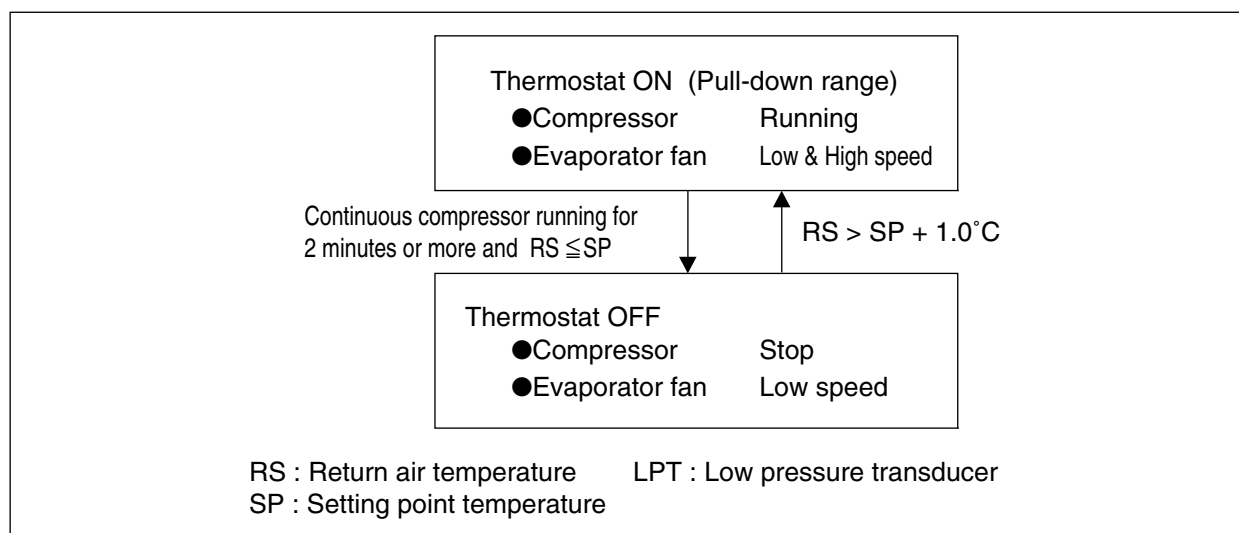
Two types of operation modes are available. chilled mode and frozen mode.

※For details, refer to clause 1.6.1 to 1.6.6

Operation mode	Set point	Control air sensor	Evaporator fan	Operation
Chilled mode	-9.9°C to 30.0°C (+14.1°F to +86.0°F)	Supply air temperature sensor	High speed	Capacity control operation with suction modulating valve and hot-gas bypass control
Frozen mode	-30.0°C to -10.0°C (-22.0°F to +14.0°F)	Return air temperature sensor	Low speed	Compressor ON/OFF control
Defrost mode	-	-	OFF	Hot-gas defrosting with refrigerant quantity control

1.6.1 Frozen operation

Control state transition and common control



Operation of magnetic contactor and solenoid valve

Component name		Thermostat ON	Thermostat OFF
Magnetic contactor	Compressor	CC	ON
	Evaporator fan. High speed	EFH	ON / OFF ※3
	Evaporator fan. Low speed	EFL	ON / OFF ※3
	Condenser fan	CF	ON / OFF ※1
Solenoid valve	Liquid solenoid valve	LSV	ON
	Economizer solenoid valve	ESV	ON
	Injection solenoid valve	ISV	ON / OFF ※2
	Hot-gas solenoid valve	HSV	OFF
	Discharge gas by-pass solenoid valve	BSV	OFF
	Reheat solenoid valve	RSV	OFF
Suction modulating valve	SMV	328pls (100%)	
Electronic expansion valve	EV	21~420pls (5~100%)	0pls (0%)

Note) ※1: High pressure control (Refer to Page 1-24)

※2: Injection control (Refer to Page 1-25)

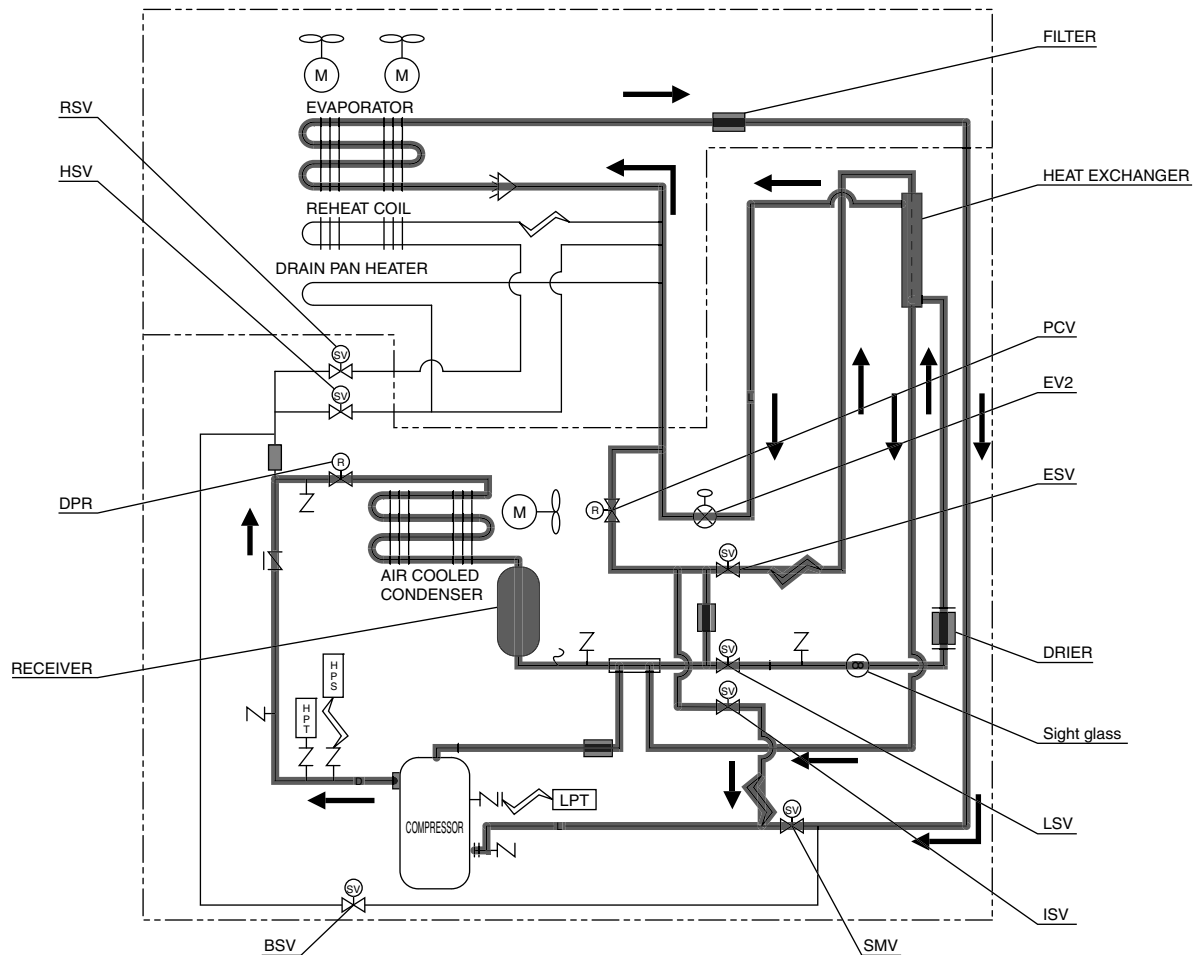
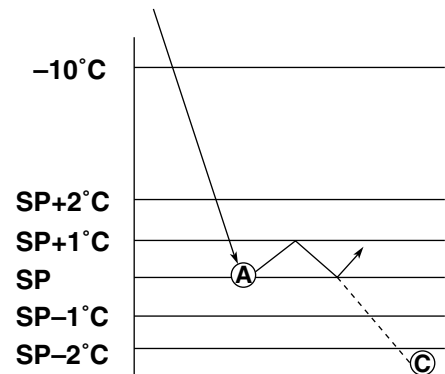
※3: Run at high speed operation if $RS > -5^\circ C$

(1) Set point temperature and control sensor

When the set point temperature (referred to as SP hereafter) is $-10.0^{\circ}\text{C}(+14.0^{\circ}\text{F})$ or lower, the compressor is cycled ON and OFF, in response to return air temperature.

(2) Control

- ① When the control temperature reaches SP (point A), the compressor and condenser fan are turned off.
- ② When the control temperature exceeds $\text{SP}+1.0^{\circ}\text{C}$, the compressor, liquid solenoid valve and condenser fan are turned on. However, the compressor runs for at least 2 minutes every time it is turned on. Even if the control temperature reaches SP or lower (point C) within 2 minutes after the compressor is turned on, the compressor, condenser fan and liquid solenoid valve are not turned off. (2 minutes compressor forced operation)

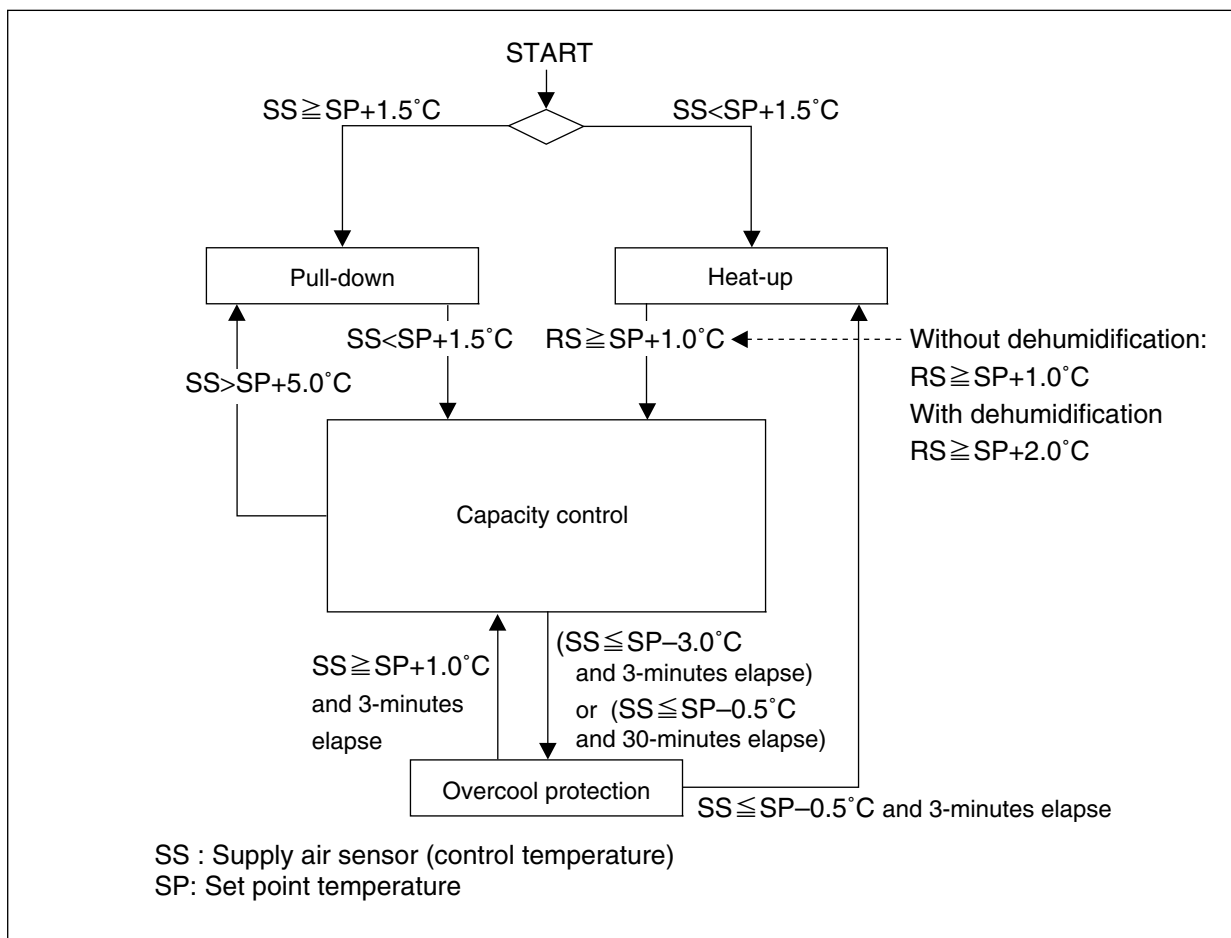


BSV :Discharge gas Bypass Solenoid Valve
 DPR:Discharge pressure regulator
 ISV :Injection Solenoid Valve
 LPT :Low Pressure Transducer
 LSV :Liquid Solenoid Valve
 PCV:Pressure Control Valve
 SMV:Suction Modulation Valve

HSV:Hot Gas Solenoid Valve
 RSV :Reheat Solenoid Valve
 ESV:Economizer Solenoid Valve
 EV :Electronic Expansion Valve
 HPS:High Pressure Switch
 HPT :High Pressure Transducer

1.6.2 Chilled operation

Control state transition and common control



Operation of magnetic contactor and solenoid valve

Component name		Pull-down	Capacity control	Heat-up	Overcool protection	
Magnetic contactor	Compressor	CC	ON	ON / OFF	OFF	
	Evaporator fan. High speed	EFH	ON	ON / OFF	ON	
	Evaporator fan. Low speed	EFL	OFF	ON / OFF	OFF	
	Condenser fan	CF	ON / OFF※1	ON / OFF	ON / OFF※4	OFF
Solenoid valve	Liquid solenoid valve	LSV	ON	ON	OFF	OFF
	Economizer solenoid valve	ESV	ON	OFF	OFF	OFF
	Injection solenoid valve	ISV	ON / OFF※2	ON / OFF※5	ON / OFF※3	OFF
	Hot-gas solenoid valve	HSV	OFF	ON / OFF※5	ON	OFF
	Discharge gas by-pass solenoid valve	BSV	OFF	ON / OFF※5	OFF	OFF
	Reheat solenoid valve	RSV	OFF	OFF	OFF	OFF
Suction modulating valve	SMV	328pls (100%)	10~328pls (3~100%)	328pls (100%)	328pls (100%)	
Electronic expansion valve	EV	21~420pls (5~100%)	48~420pls (11~100%)	0pls (0%)	189pls (45%)	

Note) ※1: High pressure control (P.1-24) ※2: Injection control (P.1-25) ※3: Charge control (P.1-26)
 ※4: Release control (P.1-26) ※5: Capacity control and hot gas by-pass (P.1-25)

(1) Set point temperature and control sensor

If the set point temperature is -9.9°C ($+14.1^{\circ}\text{F}$) or higher, the suction modulating valve is controlled by the supply air temperature to adjust the cooling capacity.

(2) Control

(a) Pull-down operation

Pull-down operation is carried out with fully opened suction modulating valve when control temperature (SS) is 1.5°C or higher above set point ①.

(b) Capacity control operation

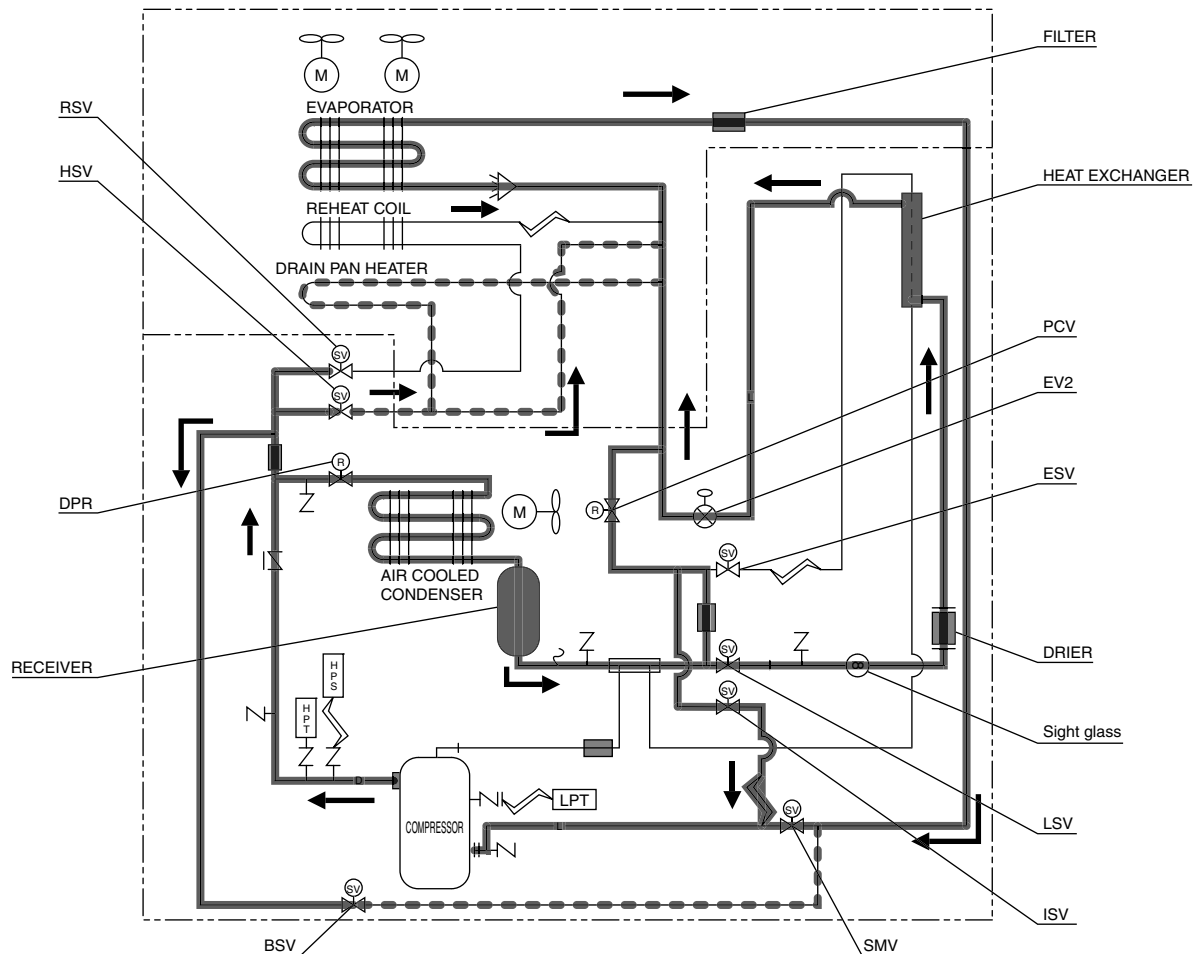
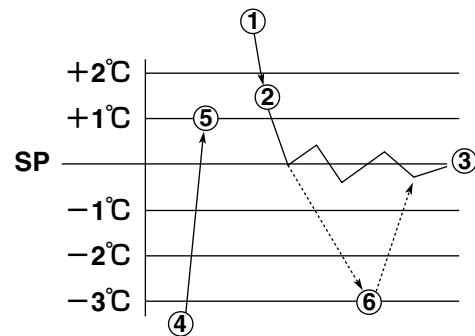
When the control temperature reaches point ②, the suction modulating valve is adjusted to control capacity. After rising and dropping, control temperature remains stable at the point ③. During the capacity control operation, hot gas by-pass (HSV, BSV) and liquid injection (ISV) are used in order to maintain the optimum operation condition of the refrigerant system.

(c) Heating

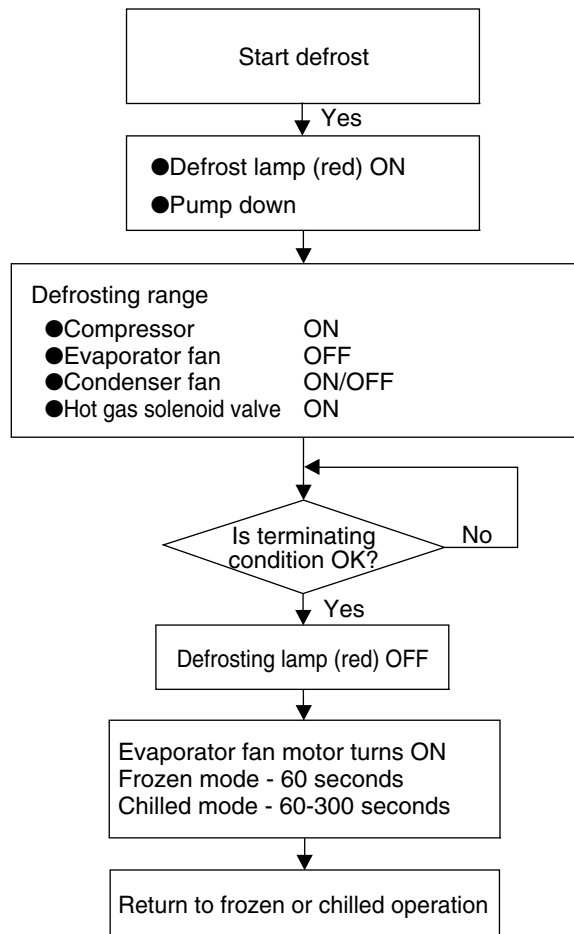
When control temperature (SS) is lower than the set point temperature by $+1.5^{\circ}\text{C}$ (④), heat-up operation using hot gas is conducted. This heating operation raises control temperature to set point temperature $+1.0^{\circ}\text{C}$ (⑤). It rises up to set point temperature $+2.0^{\circ}\text{C}$ during dehumidification operation.

(d) Overcool protection operation

Although the unit's operation is stable, if the control temperature lowers below set point temp by -3.0°C (⑥), compressor stops and only the evaporator fans continues to operate.



1.6.3 Defrost operation



Operation of magnetic contactor and solenoid valve

Component name		Pump down	Defrosting	
Magnetic contactor	Compressor	CC	ON	
	Evaporator fan. High speed	EFH	OFF	
	Evaporator fan. Low speed	EFL		
	Condenser fan	CF	ON/OFF ※2	
Solenoid valve	Liquid solenoid valve	LSV	OFF	
	Economizer solenoid valve	ESV	ON	
	Injection solenoid valve	ISV	OFF	ON/OFF ※1
	Hot-gas solenoid valve	HSV	OFF	ON
	Discharge gas by-pass solenoid valve	BSV	OFF	OFF
	Reheat solenoid valve	RSV	OFF	ON/OFF ※3
Suction modulating valve		SMV	328pls (100%)	328pls (100%)
Electronic expansion valve		EV	48~420pls (11~100%)	0pls (0%)

Note) ※1: Charging control (P.1-26)

※2: Release control (P.1-26)

※3: RSV:ON EOS>15°C

Defrost operation

(1) Defrosting system

Unit use hot gas defrost. High temperature and high pressure refrigerant (hot gas) from the compressor is sent to the evaporator and drain pan for defrosting. Since the evaporator is heated directly by the hot gas (refrigerant), defrosting can be performed efficiently.

(2) Defrost initiation

Defrosting initiation		Functions and timer setting
Pull down	Short timer	6 hours *1
	Automatic frost detection	Executed when the average temperature difference between the supply air and the evaporator outlet pipe is 5°C or higher during frozen operation
In-range	Defrosting interval	3 hours, 6 hours, 9 hours, 12 hours, 24 hours
		99 "On-demand defrosting" *2
Out of range	Out of range timer	30 minutes
		Executed 30 minutes after the control temperature rises out of the in-range
Manual defrosting (manual)		Executed by MSD key

* 1. 12 hours when the control temperature is -15.0°C or below

* 2. On-demand defrosting setting

If defrost timer is set for "99", on- demand defrost is carried out.

The on-demand defrosting is executed during the frozen operation, frost condition is monitored and unit will initiated defrost automatically.

(3) Defrost initiation conditions

Timer count	Condition for initiating defrost
Short timer Defrosting interval (frozen) Out-range timer Manual defrosting	$EOS \leq 20.0^{\circ}\text{C}$
Defrosting interval (chilled)	$EIS < 5.0^{\circ}\text{C} \& EOS \leq 20.0^{\circ}\text{C}$

Note 1: If the initiation conditions for defrosting are not satisfied during timer counting or manual defrosting operation, defrost operation is not executed based on frost condition.

Note 2: If unit is equipped with a reheat coil for dehumidification control (optional)

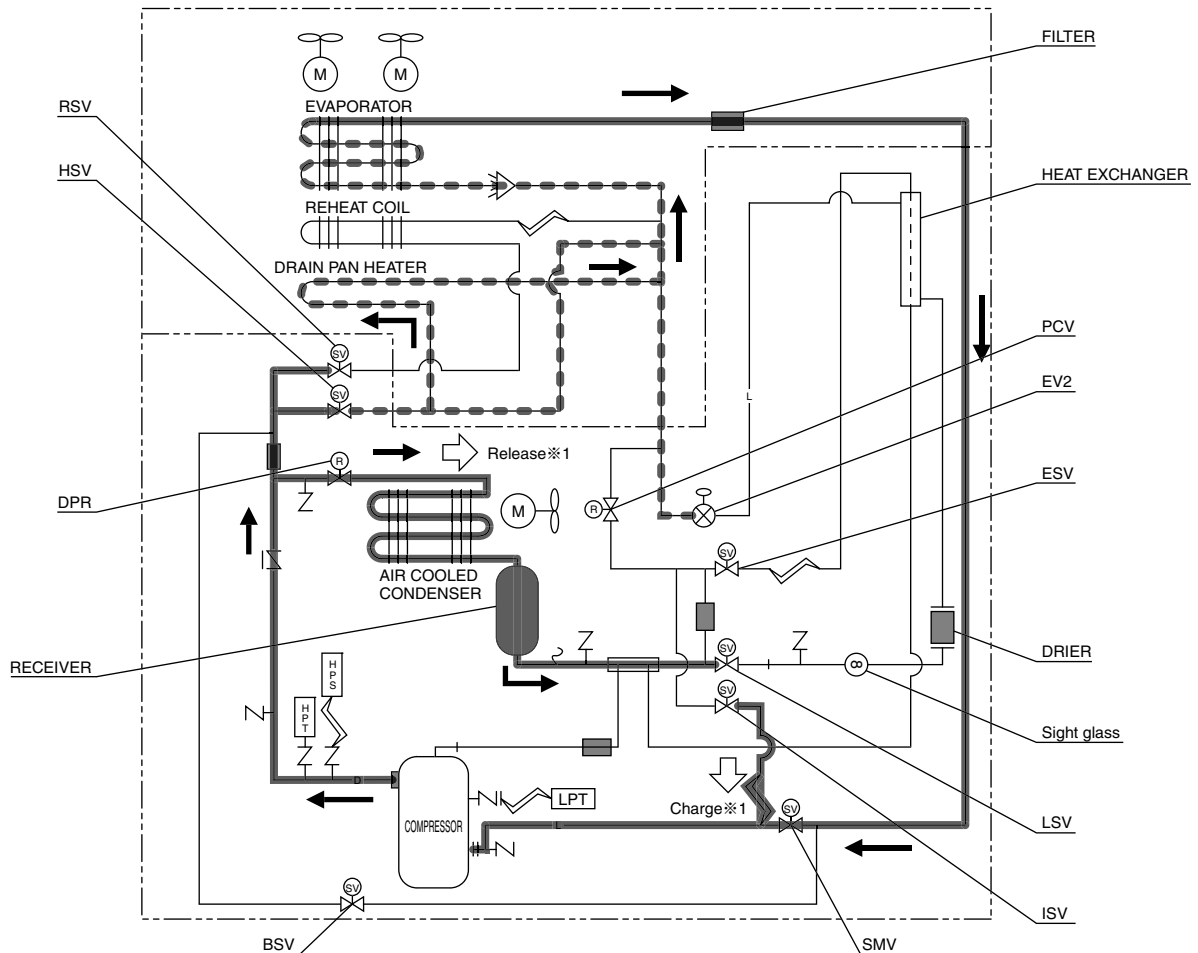
(REHEAT setting "ON"), when dHU setting is "OFF", defrost operation is executed regardless of temperature for initiation conditions.

(4) Defrost termination conditions

Defrost time	Defrosting termination conditions	
Within 45 minutes	EOS $\geq 20.0^{\circ}\text{C}$	
More than 45 minutes	Defrosting interval (frozen)	EOS $\geq 30.0^{\circ}\text{C}$
	Short timer	EOS $\geq 30.0^{\circ}\text{C}$ &RS/DRS(optional) $\geq 15.0^{\circ}\text{C}$
	Defrosting interval (chilled)	
	Out-range timer	
Manual defrosting		
100 minutes	Shutdown (100 minutes for the backup timer)	

Note 1

Defrost operation is terminated when a protection device is activated.



Note 2

* 1 : "Charge" and "Release" control during defrost operation

1.6.4 Dehumidification control operation (optional)

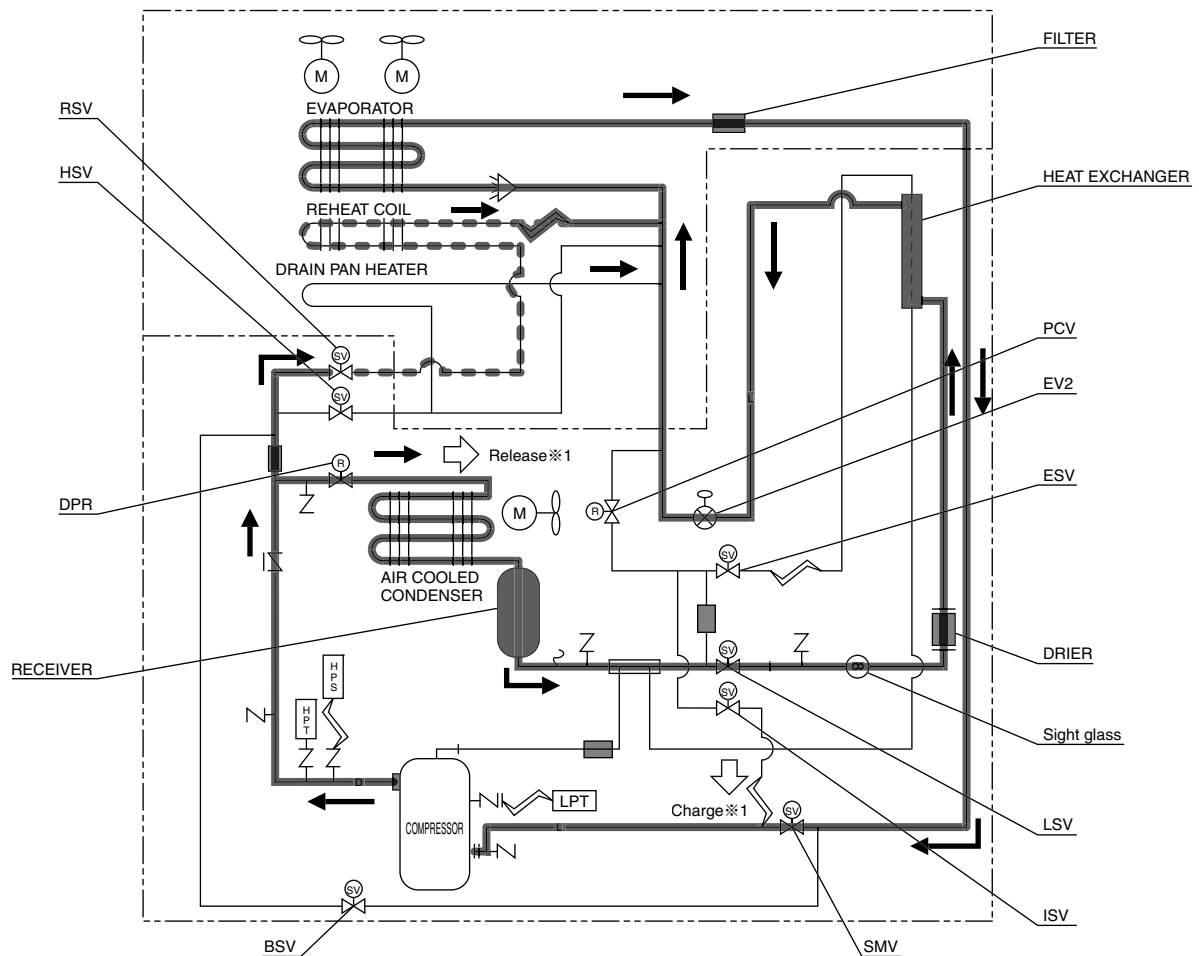
Dehumidification control, similar to defrost operation, uses high temperature refrigerant (hot gas) from the compressor. Hot gas flows to the reheat coil mounted to the bottom of the evaporator. This control is optional, available for units equipped with a reheat coil only.

1. To execute dehumidification control, setting the dehumidification control dHU to "ON" or "ON-A" is necessary. "ON" for the unit equipped with humidity sensor. And "ON-A" for the unit without humidity sensor. For setting procedures, refer to 2.2.2 (4. Mode operation)
2. Humidity setting range: 60 to 95%RH (when dHU is set to "ON"). For setting procedures, refer to 2.2.2 (2. Operation setting mode).
3. When dHU is set to "ON" or "ON-A", the "DEHUMID" lamp at the top of the control panel lights up.

Dehumidification control		dHU setting	DEHUMID lamp
When dehumidification control is executed	ON: for the unit equipped with humidity sensor	ON	ON*1
	ON-A: for the unit without humidity sensor	ON-A	ON*1
When dehumidification is not executed		OFF	OFF

* 1 When DEHUMID lamp is OFF

Set ON for the reheat coil installation "ON/OFF setting". For the setting procedures, refer to 2.2.2 (11. Basic function setting mode).



1.6.5 CA unit (optional)

- The CA (Control Atmosphere) unit controls the composition of the atmospheric gas within the container box of the Marine type Container Refrigeration Unit. Controlling the concentration of oxygen and carbon dioxide within the container box makes it possible to maintain the freshness of fruits and vegetables during transportation.
- The VPSA method (*) is used to adjust the concentration of oxygen, the air pump is used to draw in atmosphere, the built-in adsorption cylinders are used to separate the oxygen, the remaining low concentration oxygen gas is pressurized again with the air pump, and then low concentration oxygen gas is supplied to the inside of the container box. The carbon dioxide concentration is adjusted by the respiration of the fruits and vegetables and by supplied outside air into the container box by air pump.

(*) VPSA method for Vacuum Pressure Swing Adsorption. In this method, two adsorption cylinders are used to perform adsorption at atmospheric pressure and desorption in a vacuum.

Use the CA unit in the following set temperature range within the reefer box.

Item	Operation range
Refrigeration unit internal temperature range	-2°C to +20°C (+28.4°F to 68°F)

* For details on the CA unit, refer to the CA service manual for the Marine type Container Refrigeration Unit.

1.6.6 Common control

The following are controlled in different operation modes. (For the details, refer to the following pages.)

	Control name	Control content	Operation mode			
			Frozen	Chilled※	Dehumidification	Defrost
A	Compressor ON/OFF control	The compressor is operated on and off to adjust inside temperature.	✓			
B	Starting control	<ul style="list-style-type: none"> At the start of the operation with low ambient temperature, an oil temperature raising control is initiated. When a protection device activates at the operation start, a high pressure/current control is executed. 	✓	✓	✓	
C	Evaporator fan speed control	Evaporator fan is switched to high or low speed according to set point temperature.	✓	✓	✓	
D	Superheat control	In order to keep superheat of the evaporator optimum, the opening of the electronic expansion valve is controlled.	✓			
E	High-pressure control	In order to keep high pressure optimum, opening of the electronic expansion valve is controlled.	✓	✓	✓	
F	Injection	In order to prevent refrigerant oil from deteriorating, the injection solenoid valve control or electronic expansion valve control is carried out.	✓	✓	✓	
G	In-range control	When the control temperature is within SP $\pm 2^{\circ}\text{C}$, in-range light is turned on.	✓	✓	✓	
H	In-range masking control	After defrosting initiation, the in-range lamp is kept on for 100 minutes or 130 minutes if set point is less than equal to -20 degree C.	✓	✓	✓	✓
I	Capacity control	It conducts capacity control during chilled operation.		✓	✓	
J	Charging and releasing control	Heating capacity of defrosting and heating operation are controlled.		✓	✓	✓
K	Pump down control	The liquid refrigerant is collected into the liquid receiver (or water cooled condenser).	✓	✓	✓	✓
L	Economizer control	The economizer circuit is initiated to enhance cooling capacity.	✓	✓	✓	
M	Reheat coil control	The reheat solenoid valve (RSV) is controlled to carry out dehumidification.			✓	

※ Note) CA mode operations (optional) are included in chilled mode (the operation range is -2°C to $+20^{\circ}\text{C}$).

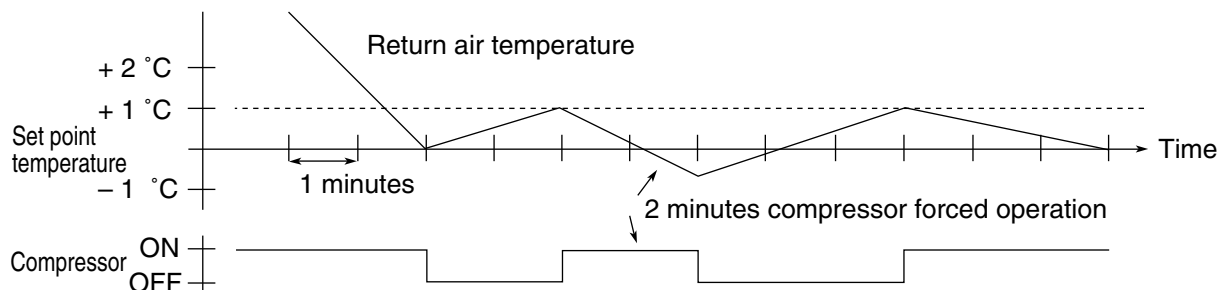
Common control

A : Compressor ON/OFF control

When the control temperature reaches the set temperature or lower, the compressor is stopped.

When the control temperature rises and becomes higher than the [set point temperature +1.0°C], the compressor runs again.

When the compressor starts running, it is forcibly run for 2 minutes. (2 minutes compressor forced operation) in order to prevent the compressor from deterioration due to shortage of lubricant.



B : Starting control

- Control when protective device activated

When the high pressure rapidly rises on starting or when the starting current is overcurrent, the compressor automatically stops to suppress high pressure and starting current.

- Temperature control of refrigerant oil

When ambient temperature is low, the temperature of refrigerant oil for compressor is also low and the viscosity of the oil may be high.

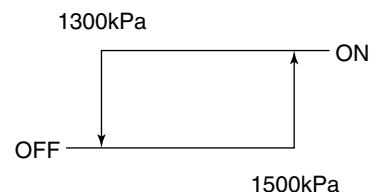
On starting the unit, by-pass discharge gas to suction side of the compressor by opening the solenoid valve (BSV) to raise the oil temperature rapidly ensuring a stable feed of oil.

In order to control the oil temperature of refrigerating unit or in the event the high pressure is low, operate the compressor with the condenser fan stopped. If the high pressure reaches 1500 kPa or more, the fan will restart to operate.

The temperature control for refrigerant oil should be executed not with power ON/OFF in normal operation but with power ON under low ambient temperature.

An oil temperature raising control can be executed when all of the following conditions are met.

- The time turning power supply ON
- Ambient temperature $\leq 10^{\circ}\text{C}$
- (Discharge gas temperature – ambient temperature) $\leq 4^{\circ}\text{C}$



C : Evaporator fan speed control

The speed of the evaporator fan is switched in accordance with operation modes. A stop time of 10 sec. is provided to switch the high speed to low speed and vice versa.

Chilled mode : High speed (sometimes Low speed)
Frozen mode : Low speed (sometimes High speed)

D : Superheat control

Evaporator superheat is adjusted to be optimum by controlling the opening of the electronic expansion valve based on evaporator inlet and outlet refrigerant temperature and compressor suction gas temperature.

E : High-pressure control

- By electronic expansion valve

When the ambient temperature is high during air-cooled operation, condensing pressure (high pressure) will increase and the high pressure switch may be activated.

In order to prevent this situation, high pressure is controlled to be 2350kPa or lower by adjusting the opening of the electronic expansion valve.

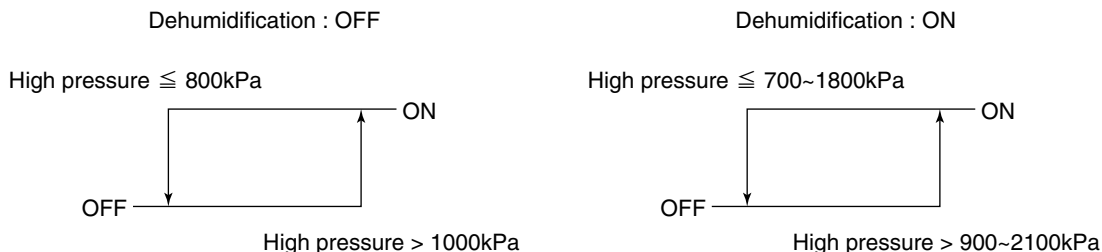
• By condenser fan control

When the ambient temperature is low during the air-cooled operation, condenser pressure (high pressure) will decrease. And low pressure will decrease.

In order to prevent this situation, when high pressure is within range or lower, condenser fan stops to prevent high pressure from rapidly dropping.

When the high pressure is in range or higher the condenser fan will restart.

This control varies upon dehumidification setting.



F : Injection control

In order to decrease the discharge gas temperature, liquid refrigerant is injected into the suction pipe.

• During normal compressor operation

The injection solenoid valve will be turned on or off to control discharge gas temperature lower than specification.

Injection control is monitored by discharge gas temperature and return air temperature.

Condition of Injection solenoid valve

- AMBS < 40°C Frozen mode Pull down at Chilled mode

	ISV ON	ISV OFF
RS ≤ 0°C	DCHS > 120°C	DCHS < 110°C
RS > 0°C	DCHS > 125°C	DCHS < 118°C

※ ISV is opened by AMBS or RS at AMBS > 40°C.

• Defrost and heat operation

ON/OFF injection operation is done by "charge control". For more details on charge control see page 1-25 section.

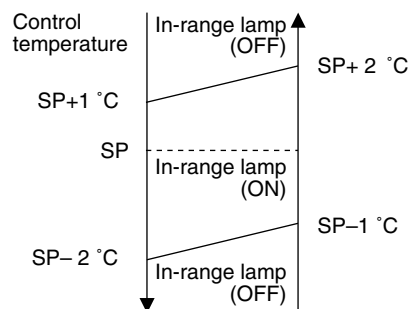
G : In-range control

When set point temperature is close to the setting value (SP), in-range lamp on the display panel is lit.

H : In-range masking control

If return air temperature is within range when defrost is initiated, in-range lamp will be kept turned on forcibly for set time as shown below regardless of return air temperature thereafter.

This will avoid misunderstanding that there is a problem as return air temperature temporarily rises during defrosting.



Setpoint ≥ -20.0°C	100 minutes
Setpoint ≤ -20.1°C	130 minutes

I : Capacity control

In the chilled mode operation, adjusting cooling capacity makes the supply air temperature stable at the set point temperature (SP).

The capacity control is executed by adjusting the opening of suction modulating valve (SMV) between 3 to 100 %.

J : Charge and release control

Charge control or release control is executed to maintain the heating capacity optimum during defrost and heating operation.

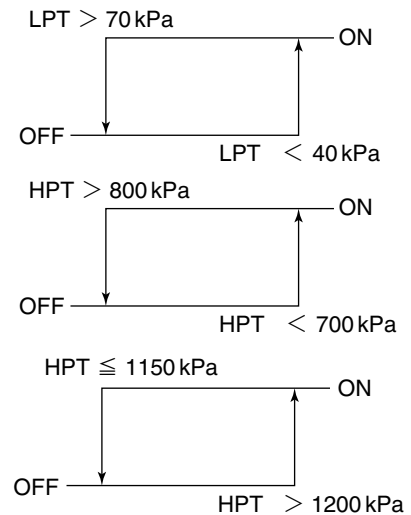
- Charge control

① The LPT controls the suction pressure by using the ISV (Injection Solenoid Valve) to inject liquid refrigerant into the suction line.

② The HPT controls discharge pressure by using the ISV (Injection Solenoid Valve) to inject liquid refrigerant into the suction line.

- Release control

The discharge pressure (HPT) is detected and the condenser fan (CFM) is turned on, then, the refrigerant is released into the condenser.



K : Pump down control

When Defrost operation or Heating is initiated, Electronic Expansion Valve (EV) closes first to carry out Pump Down operation to collect the refrigerant in receiver. Pump-down operation is stopped when the low pressure becomes -20kPa or less.

L : Economizer control

This unit has an economizer circuit combining the intermediate injection into the scroll compressor with the refrigerant from heat exchanger. By turning ON the economizer solenoid valve (ESV) the economizer circuit is activated to keep a large amount of sub cooling liquid refrigerant and significantly increase cooling performance.

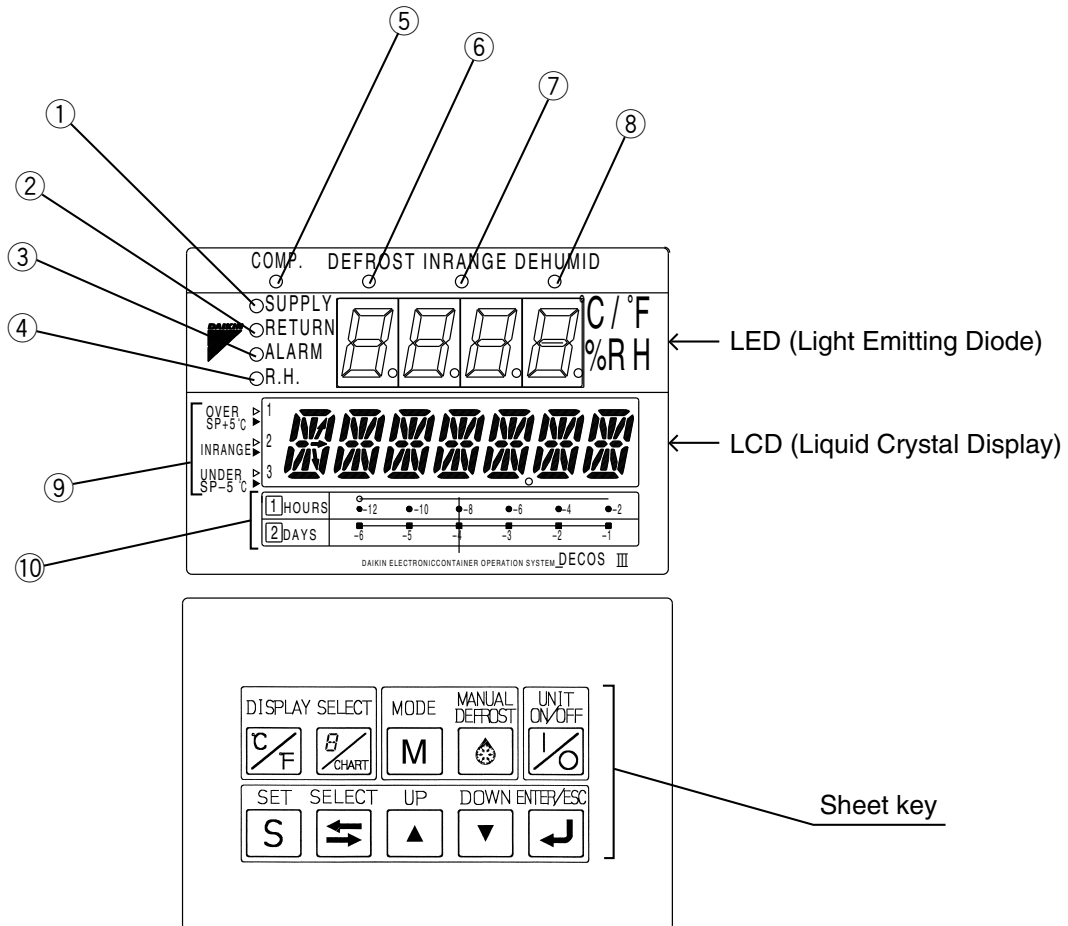
- The economizer control is operated only while the pull-down operation is in progress.

2. ELECTRONIC CONTROLLER

2.1 Electronic controller basic operation

2.1.1 Control panel

Name and function of each component



- | | |
|---|---|
| ① SUPPLY LED (Lights when "supply air temperature" is indicated.) | ⑦ IN RANGE LED (Lights when the control temperature is in range.) |
| ② RETURN LED (Lights when "return air temperature" is indicated.) | ⑧ DE-HUMID.LED (Lights when the controller is the dehumidification control. (optional)) |
| ③ ALARM LED (Blinks when alarm is generated.) | ⑨ Temperature base (Used for the graphic chart indication on the LCD.) |
| ④ R.H.LED (Lights when "relative humidity" is indicated.) | ⑩ Time base (Used for the graphic chart indication on the LCD.) |
| ⑤ COMP.LED (Lights when the compressor is running.) | |
| ⑥ DEFROST LED (Lights when the unit is under the defrosting operation.) | |

Function of operation key



●UNIT ON/OFF key

To start or to stop the unit operation.

Controller has a memory function.

If power supply is cut off suddenly while the unit is on, power supply is then turned on again, unit automatically starts the operation without pressing unit ON / OFF key again. If the power supply is cut off while the unit is off, the unit does not start operation unless unit ON / OFF key is pressed.



●MODE key

To carry out the following control

- ① Generator set (=Power consumption control)
- ② Automatic pump down
- ③ Dehumidification set



●SET key

When the power supply is ON:

- ① Change operation mode from the CURRENT INDICATION MODE to the OPERATION SETTING MODE.
- ② Select the item to be set in the operation setting mode.

When the power supply is OFF:

- ① To change operation modes from the POWER OFF MODE to the BATTERY OPERATION MODE.



●SELECT key

This is not normally used in the basic operation procedure. (This is mainly used in the maintenance procedure.)

UP



●UP key

To select the item to be set in the selected mode.

DOWN



●DOWN key

To select the item to be set in the selected mode.

ENTER/ESC



●ENTER/ESCAPE key

To determine the setting values or displayed contents in the selected mode.

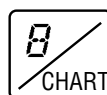
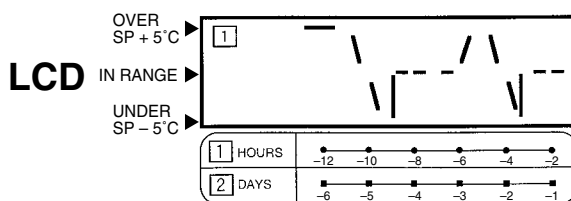



CHART key (DISPLAY SELECT key)

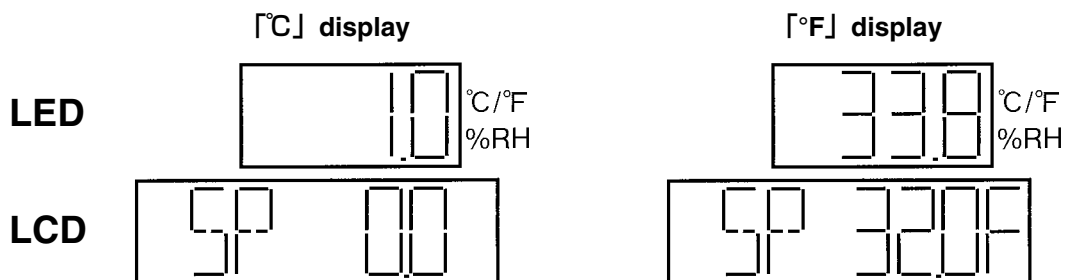
If CHARTLESS Function is "ON", this key is effective.

To display logged temperature data in a simple graphic chart on the LCD, press this key when the display reads "set point temperature" or other data. When this is pressed once again, the display returns to "set point temperature" or other data again.









- ① Indicates the temperature data required to be converted into "°F" on the LED or LCD.
 - ② Press the  key, then the temperature data displayed in "°C" is converted into "°F" for one minute.
- ※ If any other key is pressed during the "°F" indication, the display switches to "°C".



Manual defrost operation

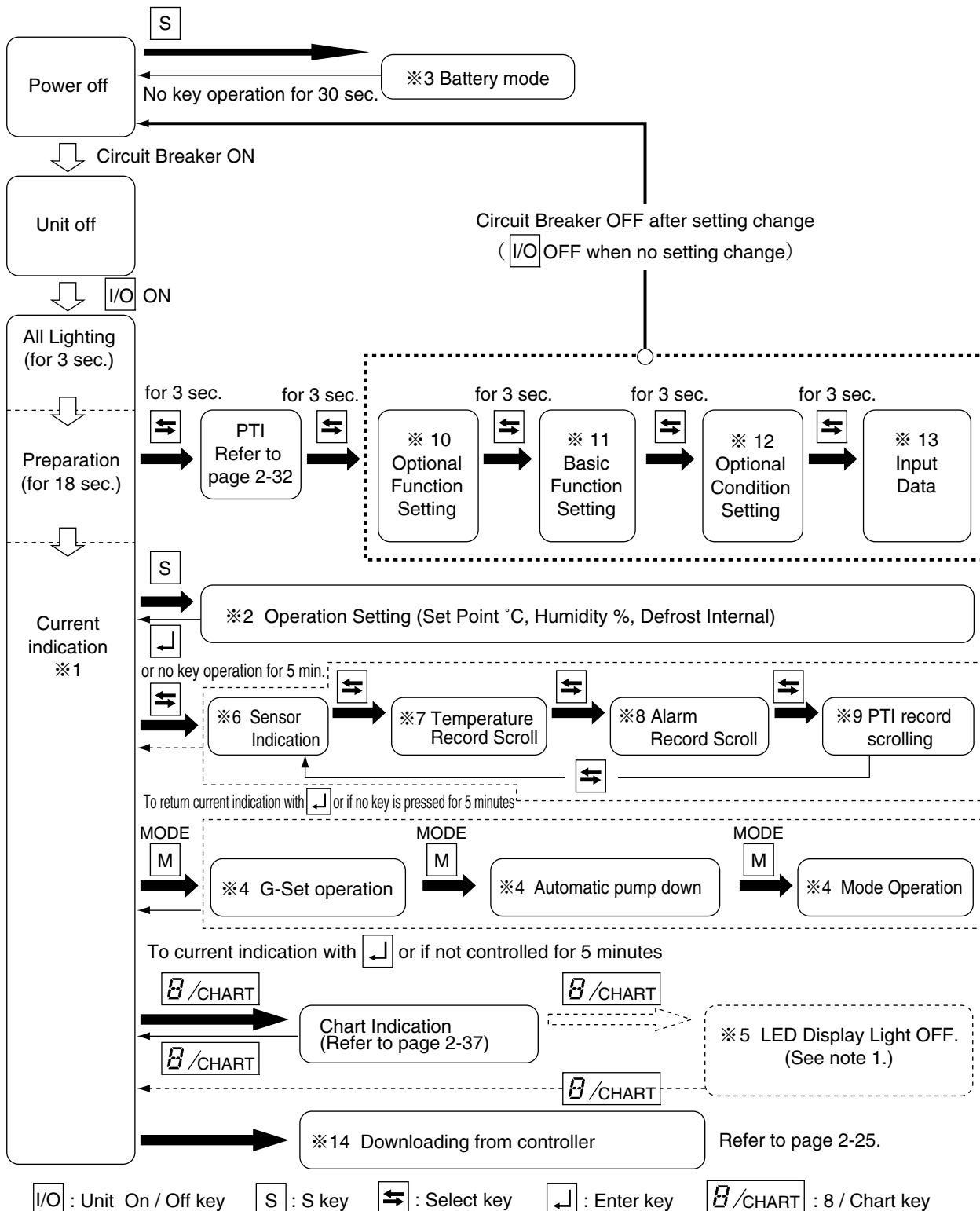


- ① Press the MANUAL DEFROST  key.
- ② Select "ON" indicated on the LED display using the  key or the  key, and press the  key to determine the setting, then the defrost operation starts.

2.2 Operation procedure

Note) If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

2.2.1 Operation procedure flow chart



I/O : Unit On / Off key S : S key ⇄ : Select key ↵ : Enter key 8/CHART : 8 / Chart key

Note 1. ※5 activates when the "DISP" in ※11 is set to "ON" in controller initial setting in page 2-21.

※1. Current indication mode (indication of operation conditions)		
Indicates the unit operation conditions.	<ul style="list-style-type: none"> ●Supply air temperature (SS) ●Return air temperature (RS) ●Defrost interval ●Alarm ●Set point humidity and humidity (optional) 	Page 2-7
※2. Operation setting mode		
Settings for cargo transportation	<ul style="list-style-type: none"> ●Temperature settings ●Defrost interval settings ●Humidity settings (optional) 	Page 2-8
※3. Battery mode (settings for operation conditions by using the battery)		
Setting can be initiated when main power supply is not available. Note : In environments with a low ambient temperature, the rechargeable battery may discharge, making it impossible to start up the unit in battery mode.	<ul style="list-style-type: none"> ●Temperature settings ●Humidity settings ●Defrost interval settings ●Unit ON/OFF setting 	Page 2-9
※4. Mode operation		
① G-Set operation : Maximum power consumption can be set in case of operation by generator. ② Automatic pump down : Pump down can be executed automatically. ③ Mode Operation : Dehumidification mode can be set. (optional)		Page 2-10
※5. LED display off mode		
LED display section on controller can be turned off.	●LED lights off	Page 2-11
※6. Sensor indication mode		
Sensor values can be indicated.	<ul style="list-style-type: none"> ●Discharge gas temperature (DCHS) ●Suction gas temperature (SGS) ●Modulating valve opening (SMV) ●Electronic expansion valve opening (EV) ●Supply air temperature (SS) ●Return air temperature (RS) ●Pulp temperature (USDA #1, #2, #3) ●Cargo temperature (CTS) ●Data recorder supply air temperature (DSS) ●Data recorder return air temperature (DRS) [optional] 	Page 2-12 Page 2-13 Page 2-14
<ul style="list-style-type: none"> ●High pressure (HPT) ●Low pressure (LPT) ●Total current (CT1) ●Compressor current (CT2) ●Voltage (PT1) ●Ambient temperature (AMBS) ●Evaporator inlet temperature (EIS) ●Evaporator outlet temperature (EOS) 		
※7. Temperature record scroll mode		
Temperature record of control sensor can be displayed in order (scroll indication) from the latest data.	<ul style="list-style-type: none"> ●Chilled mode: Supply air temperature ●Frozen mode: Return air temperature (up to 7 days) 	Page 2-15

※8. Alarm record scroll mode		
Alarms record can be displayed in order (scroll indication) from the latest data.	●Alarm indication (up to 7 days)	Page 2-17

※9. PTI record scroll mode		Page 2-18
Last 3 PTI results can be displayed.		

※10. Optional function mode		Page 2-19
Set optional functions if controller is replaced.	●USDA sensor available/not available setting ●Dehumidification control on/off setting	

※11. Basic function setting mode		
Set basic functions if the controller is replaced.	●Logging interval ●Data recorder sensor on/off ●Power supply ●Compressor horse power ●Indication (LED section) light off function on/off	Page 2-20 Page 2-21
●Controller type ●Compressor unload ●Reheat coil		

※12. Optional condition setting mode		
●Chartless function setting (d code, H code) ●Type of USDA sensor ●°C/°F set	●H001 ●H002 ●H003 ●H004 ●H005 ●H006	●d1-- ●d2-- ●d3-- ●d-1- ●d-2-
		Page 2-22 Page 2-23

※13. Input data mode		Page 2-24 Page 2-25
Set the container ID and the controller time.	●Container I.D. (No.) ●Controller time	

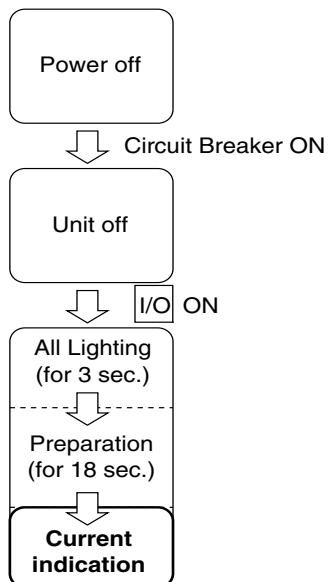
Personal computer and controller

※14. Controller software download mode		Page 2-25
It can transfer data logging between controller and personal computer. For the details, refer to the "Operation manual for personal computer software".		

2.2.2 Mode operation procedure

1. CURRENT (Operation state) INDICATION MODE

Supply air temperature (SS), return air temperature (RS), defrosting interval, alarms, set point humidity and humidity are indicated.



Turn on circuit breaker and UNIT ON/OFF key after turning the power supply on, then display panel switches to CURRENT INDICATION MODE. (Key operation in the CURRENT INDICATION MODE is possible after approx. 21 seconds from turning on the UNIT ON/OFF key.)

In the CURRENT INDICATION MODE, supply air temperature, return air temperature, defrosting interval, current alarm and current humidity (optional) are shown.

To select an item use the or allows keys. The value of the selected item is indicated on the LED display, LED display and LCD display.

Indication item	LED light on	LED display	LCD display
SUPPLY AIR TEMPERATURE (SS)	SUPPLY	Supply air temperature	Set point temperature
RETURN AIR TEMPERATURE (RS)	RETURN	Return air temperature	Set point temperature
DEFROSTING INTERVAL (Def)	Chilled mode: SUPPLY Frozen mode: RETURN	Chilled mode: SUPPLY air temperature Frozen mode: RETURN air temperature	Current defrosting interval setting
ALARM (Note 1)	ALARM	All detected alarms codes or ("Good" if there is no detected alarm)	Total number of detected alarms
HUMIDITY (optional, Note 2) (RH)	R.H.	Value of humidity sensor	Set point humidity

Note 1) ● Each pressing of the down key scrolls through detected alarm codes in sequence when two or more alarm codes are displayed.

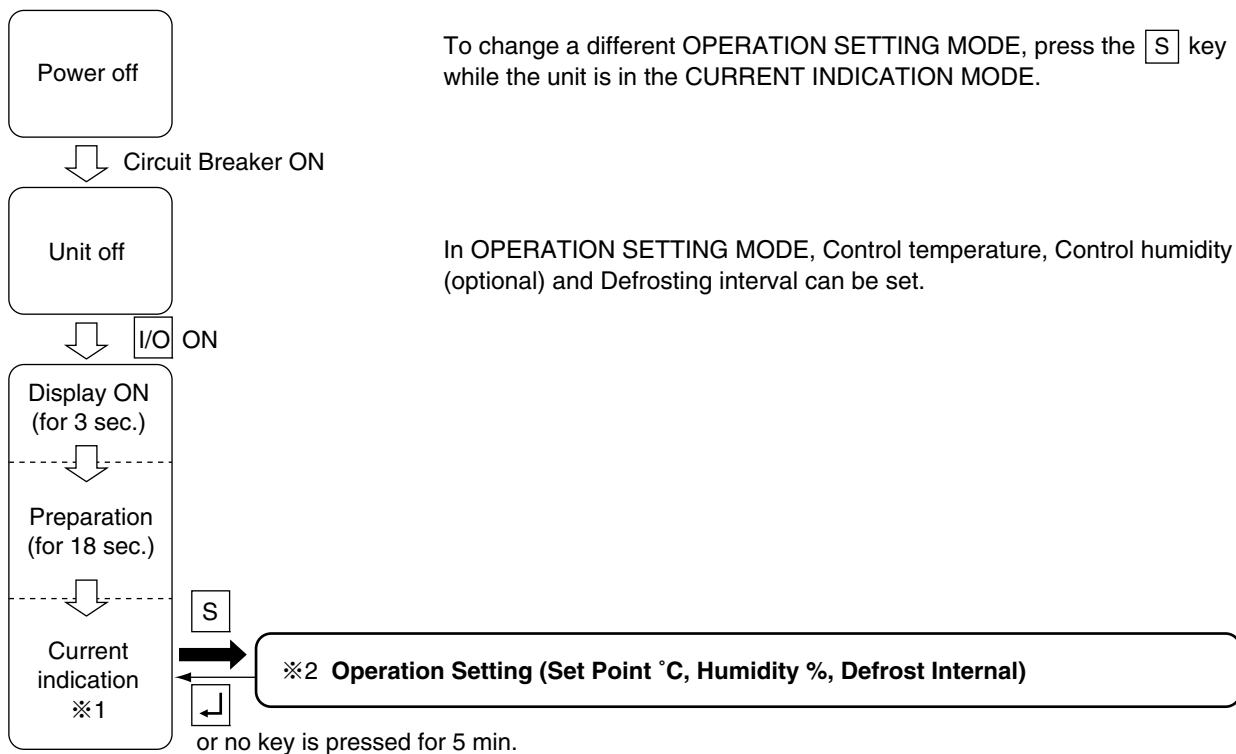
After indicating the last alarm, display goes to the next item.

Top number of the LCD display stands for the current alarm, while the denominator stands for the number of alarm codes existing.

Note 2) ● Value of the humidity sensor is displayed only when "Dehumidification Control on/off Setting" is set to "ON", otherwise this item is skipped and the next item is shown.

2. OPERATION SETTING MODE

Control temperature, defrosting interval and control humidity (optional) can be set.



Select an item using the **S** key. Value of the selected item is indicated on LED and LCD display.

Item	LED display	LCD display	Setting method
	-	-	-
Current setting temperature Note 2)		"SET-SPC" or "SET-SPF"	To change the value use the △ key or ▽ key. Press the ↵ key to confirm setting. Setting temperature range; -30 to 30°C.
Current setting humidity		"SET-SHU"	To change the value use the △ key or ▽ key. Press the ↵ key to confirm setting. Setting humidity range: 60 to 95%RH
Current defrosting interval		"SET-dEF"	To select a defrost interval 99, 24h, 12h, 9h, 6h, or 3h use the △ key or ▽ key. Press the ↵ key to confirm setting. "On demand defrosting" is conducted when "99" has been selected. (See page 1-19.)

Note 1) ●When the humidity control is not set, this indication does not appear.

Note 2) ●If temperature is set to °C setting temperature can be set at intervals of 0.1 °C.

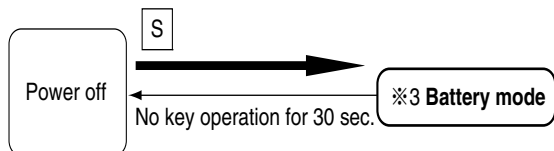
If temperature is set to °F setting temperature should be the value converted into °F based on °C rounded off the two decimal places.

3. BATTERY MODE

When main power is not available the following functions are available by using the built-in wake up battery.

- Inside supply air temperature (SS) and return air temperature (RS) are indicated.
- Setting for control temperature, control humidity and defrost interval.

To change to BATTERY MODE, press the **S** key while the unit is in POWER OFF STATUS.



In BATTERY MODE, return air temperature/supply air temperature can be displayed. Control temperature, Control humidity (optional), Defrosting interval and Unit ON/OFF key can be set.

Select an item using the **S** key. The value of the selected item is indicated on the LCD screen.

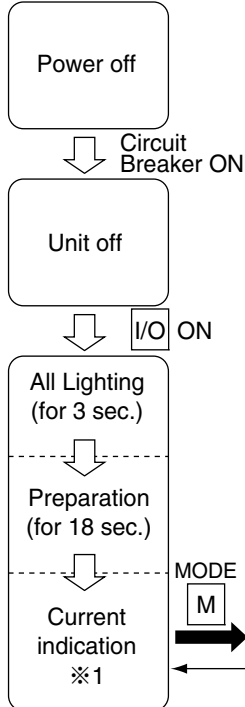
When no key operation is performed for 30 seconds in the BATTERY MODE, the battery mode turns off automatically.

Indications or setting items	LED display	LCD display	Setting method
Power OFF	—	—	—
Suction air temperature indication (RS)	(Unlit)	RS C	—
Discharge air temperature indication (SS)	(Unlit)	SS C	—
Ventilation amount indication (FA)	(Unlit)	FA	If FA SEN is set to "L" or "H"
USDA1, USDA2 and USDA3 (CTS) indication (Optional)	(Unlit)	Set to "3" or "4" or "AU" "1"US" "1"USDA1" "2"US" "2"USDA2" "3"USDA3" "3"USDA3" or "CS"	If USDA is set to "3" or "4", or "AU"
Low pressure indication (LPT)	(Unlit)	LPT	—
High pressure indication (HPT)	(Unlit)	HPT	—
F. PTI record indication	(Unlit)	F	—
S. PTI record indication	(Unlit)	S	—
C. PTI Chilled record indication	(Unlit)	FC	—
C. PTI Frozen record indication	(Unlit)	FF	—
Battery (BAT)	(Unlit)	bAT V	—
Software version (SOFT)	(Unlit)	VER	—
Control temperature setting (SP)	(Unlit)	SP C	To change temperature setting press the Δ key and ∇ key and confirm the value using the \leftarrow key to save. Temperature set range: -30 to +30°C
Control humidity setting (RH) (Optional)	(Unlit)	SHU	To change humidity setting press the Δ key and ∇ key and press the \leftarrow key to save. Humidity setting range: 60 to 95%RH
Defrosting (Def) interval setting	(Unlit)	dEF H	To select a defrost interval 99, 24h, 12h, 9h, 6h and 3h press the Δ key and ∇ key and press the \leftarrow key to save. The on-demand defrosting operation is carried out if "99" is selected.
Unit ON/OFF setting	(Unlit)	"UNIT ON" or "UNIT OFF"	Select "UNIT ON" or "UNIT OFF" by pressing the Δ key and ∇ key and press the \leftarrow key to save.

4. MODE OPERATION

Press the **MODE** **M** key to go to MODE operation.

In mode operation the following options are available.



1. Generator setting

Total power consumption can be reduced to desired Max setting for the specific generator or power facility.

The selections are "off (No limit)", "15" "14" "13" "12" "11" KVA.

2. Automatic pump down

Pump down can be executed automatically.

(Refer to "Automatic pump down" in section 3.1.3)

3. Dehumidification mode setting

Dehumidification mode can be executed in this mode (Refer to Dehumidification control operation in section 1.6.4).

When dehumidification mode is set to "ON", set temperature can be selected from the following range.

① Inside humidity : 95%~60% RH

To get to optional display press the **↵** or if no key is pressed for 5 minutes

Setting item	LED display	LCD display	Setting method
Current indication mode	—	—	—
G-Set operation Note 1)	Power consumption upper limit setting Setting values OFF, 11, 12, 13, 14, 15 unit: kVA	G-SET	Select the power consumption upper limit setting by using the △ or ▽ key, and press ↵ key to save.
Automatic pump down operation	ON, OFF	P down	Select "ON" by using △ key and ▽ key, and press the ↵ key to save.
Dehumidification	ON, ON-A, OFF	dHu	To select desired setting press △ or ▽ key, and press ↵ key to save.
Humidity set	95% RH~60%RH	SET-Shu	Select desired setting press △ key or ▽ key, and press ↵ key to save.

Note 1) In case of the G-Set operation, G-Set is also turned OFF automatically when the power is turned OFF.

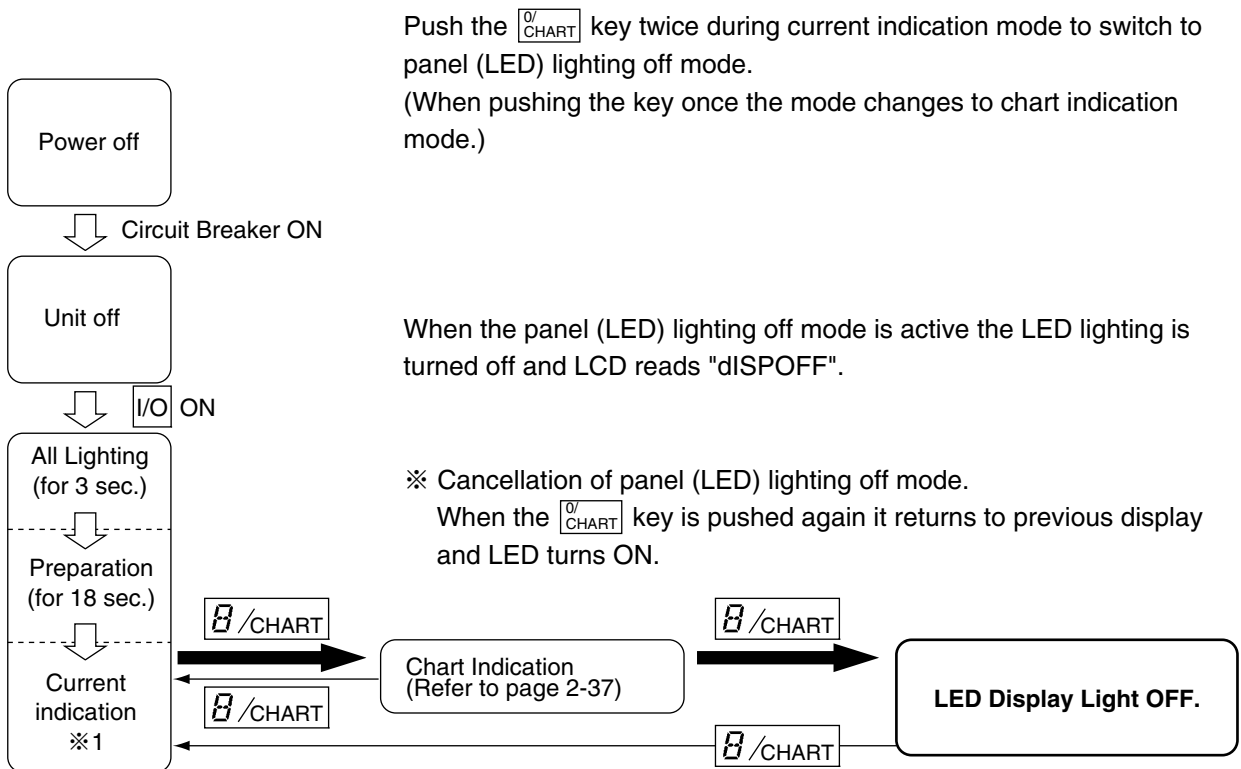
5. LED display LIGHT-OFF MODE

Controller LED display is turned off in this mode.

※ Activation of the panel (LED) lighting off mode.

To activate the panel (LED) lighting off mode, set the LED lighting off function "dISP" in "11. Basic function setting mode" to ON. Refer to page 2-21.

<Operation procedure>

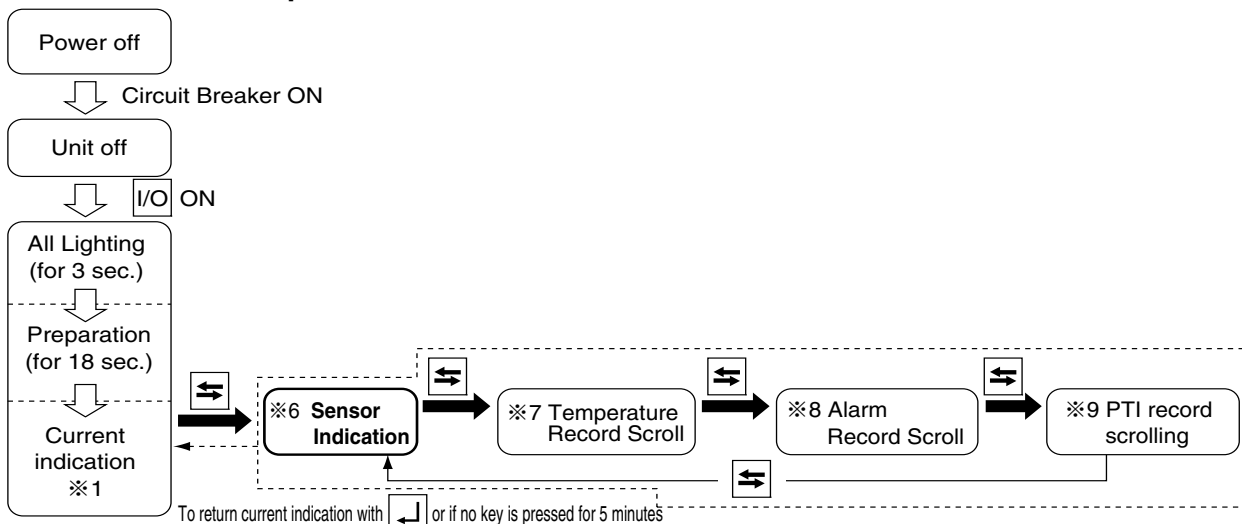


6. SENSOR INDICATION MODE

Suction valve (SMV) and electronic expansion valve (EV) sensor values can be checked. The following items are shown.

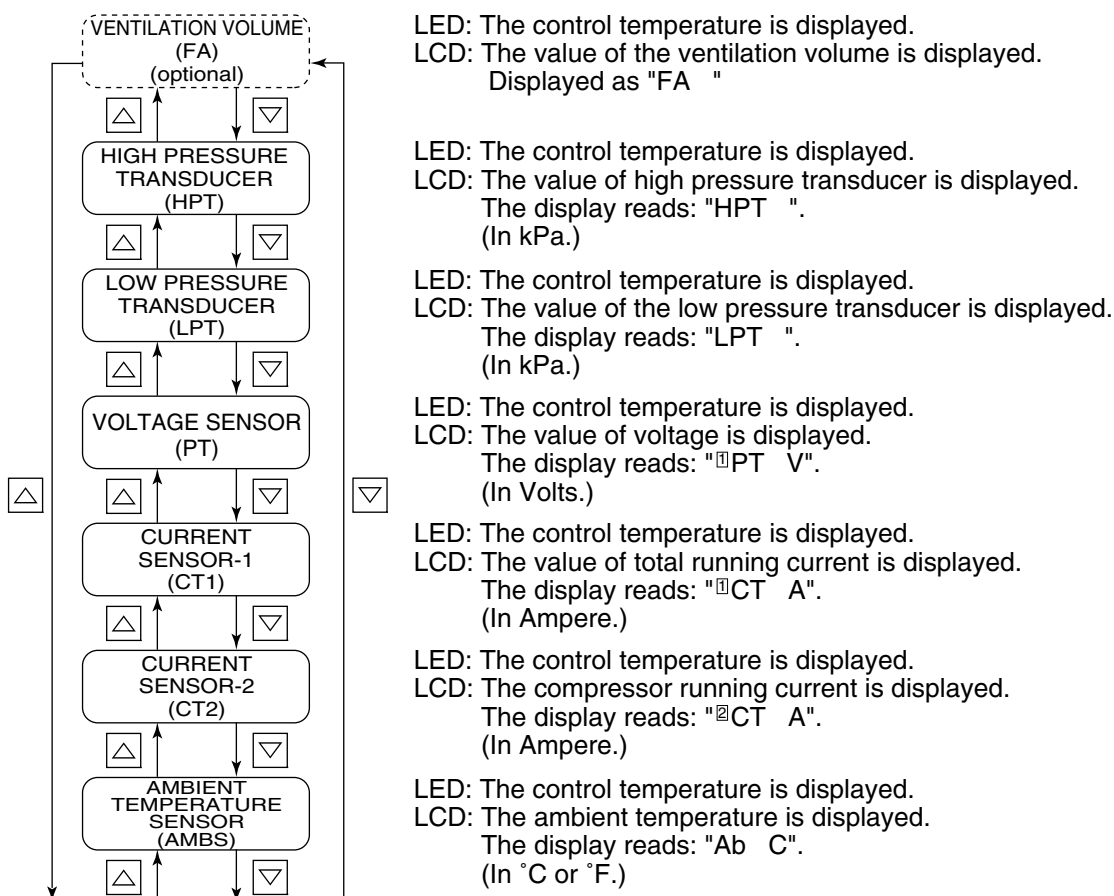
High pressure (HPT), low pressure (LPT), voltage (PT1), total current (CT1), compressor current (CT2), ambient temperature (AMBS), evaporator inlet temperature (EIS), evaporator outlet temperature (EOS), discharge gas temperature (DCHS), suction gas temperature (SGS), suction modulating valve opening, electronic expansion valve opening, supply air temperature (SS) (during PTI only), return air temperature (RS) (during PTI only), pulp temperature (USDA#1, UADA#2, USDA#3) (optional), cargo temperature (CTS) (optional), supply air temperature for data recorder (DSS), return air temperature for data recorder (DRS) (optional).

<Mode selection procedure>

























<Operation procedure>

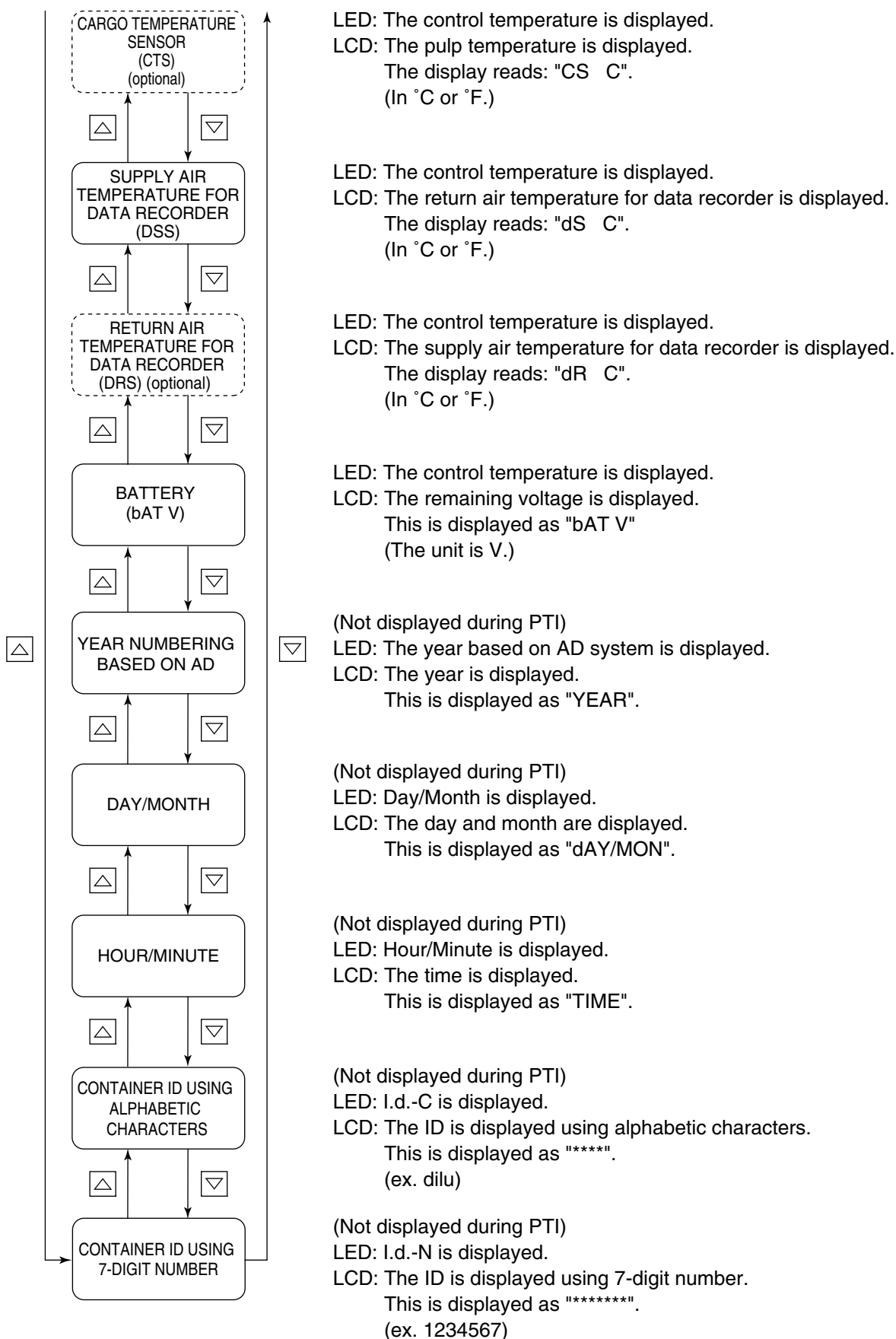
Whenever the or key is pressed, the display changes.



6. SENSOR INDICATION MODE (Continued from the previous page)

	EVAPORATOR INLET TEMPERATURE SENSOR (EIS)		<p>LED: The control temperature is displayed. LCD: The evaporator inlet temperature is displayed. The display reads: "EI C". (In °C or °F.)</p>
	EVAPORATOR OUTLET TEMPERATURE SENSOR (EOS)		<p>LED: The control temperature is displayed. LCD: The evaporator outlet temperature is displayed. The display reads: "EO C". (In °C or °F.)</p>
	DISCHARGE GAS TEMPERATURE SENSOR (DCHS)		<p>LED: The control temperature is displayed. LCD: The discharge gas temperature is displayed. The display reads: "dC C". (In °C or °F.)</p>
	SUCTION GAS SENSOR (SGS)		<p>LED: The control temperature is displayed. LCD: The suction gas temperature is displayed. The display reads: "SG C". (In °C or °F.)</p>
	SUCTION MODULATING VALVE OPENING (SMV)		<p>LED: The control temperature is displayed. LCD: The suction modulating valve opening is displayed. The display reads: "SMV %". (In % : 0 to 100%)</p>
	ELECTRONIC EXPANSION VALVE OPENING (EV)		<p>LED: The control temperature is displayed. LCD: The electronic expansion valve opening is displayed. The display reads: "EV %". (In % : 0 to 100%)</p>
	SUPPLY AIR TEMPERATURE SENSOR (SS)		<p>(Displayed only during PTI) LED: The PTI selection and the step No. are displayed. LCD: The supply air temperature is displayed. The display reads: "SS C". (In °C or °F.)</p>
	RETURN AIR TEMPERATURE SENSOR (RS)		<p>(Displayed only during PTI) LED: The PTI selection and the step No. are displayed. LCD: The return air temperature is displayed. The display reads: "RS C". (In °C or °F.)</p>
	PULP TEMPERATURE SENSOR 1 (USDA 1) <small>(optional)</small>		<p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "1US C". (In °C or °F.)</p>
	PULP TEMPERATURE SENSOR 2 (USDA 2) <small>(optional)</small>		<p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "2US C". (In °C or °F.)</p>
	PULP TEMPERATURE SENSOR 3 (USDA 3) <small>(optional)</small>		<p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "3US C". (In °C or °F.)</p>

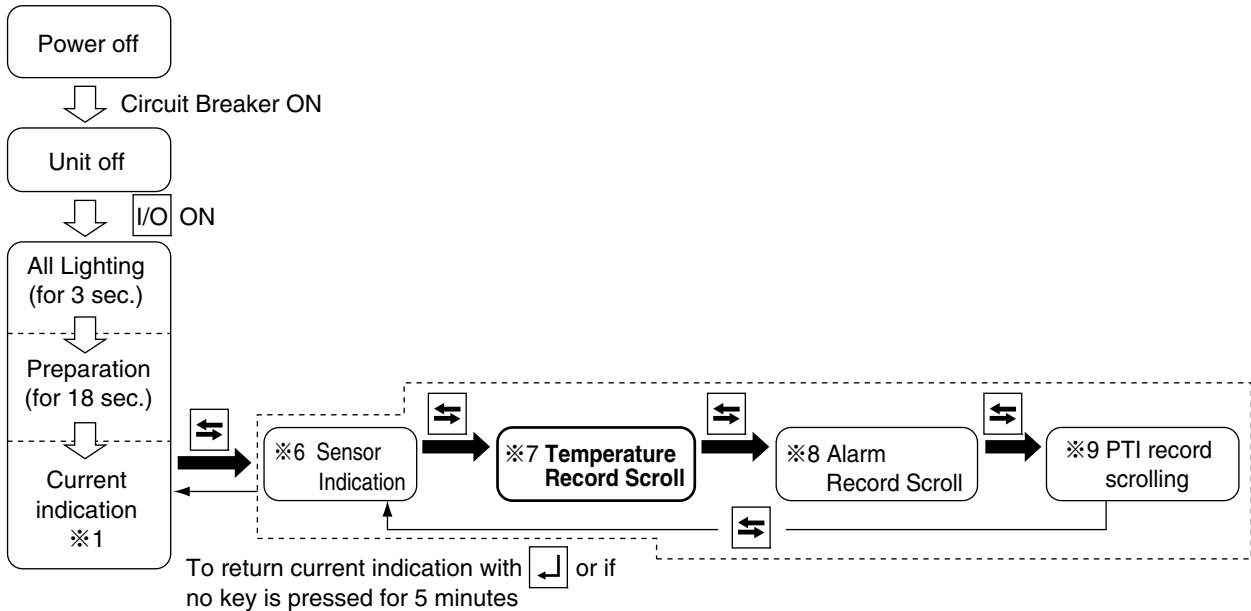
6. SENSOR INDICATION MODE (Continued from the previous page)



7. TEMPERATURE RECORD SCROLL MODE

The temperature history of the control sensor is displayed successively (one record per second) starting from the latest data. (A maximum of 7 days)

<Mode selection procedure>



<Operation procedure>

The LED indicates control temperature, and the LCD displays data/time and the data record temperature in succession. (In frozen mode return air temperature is the controlled temperature. In chilled mode supply air temperature is the control temperature.)

Press the key or key to pause the successive display of records. After the pause, the successive (scrolling) display will be resumed if no key is pressed for 10 seconds.

Keep the key pressed for 3 seconds to view the data again from the beginning.

To restore current indication mode, press the key.

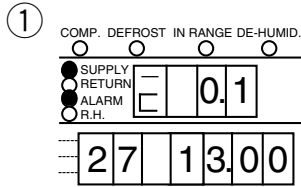
If no key is pressed for 5 minutes, display returns to current indication mode.

● Example of TEMPERATURE RECORD SCROLL DISPLAY MODE

※ It is assumed that control temperature is the supply air temperature (SS) and the logging interval is 1 hour and the current date and time is June 27, 2008, 14:00.

CAUTION

The displayed temperature is not the current instantaneous value but an average taken in a specific logging interval. Therefore, the printed control temperature on the trip report (instantaneous value) printed with the aid of personal computer may differ from the sensor data of the chartless function. This is not an error.

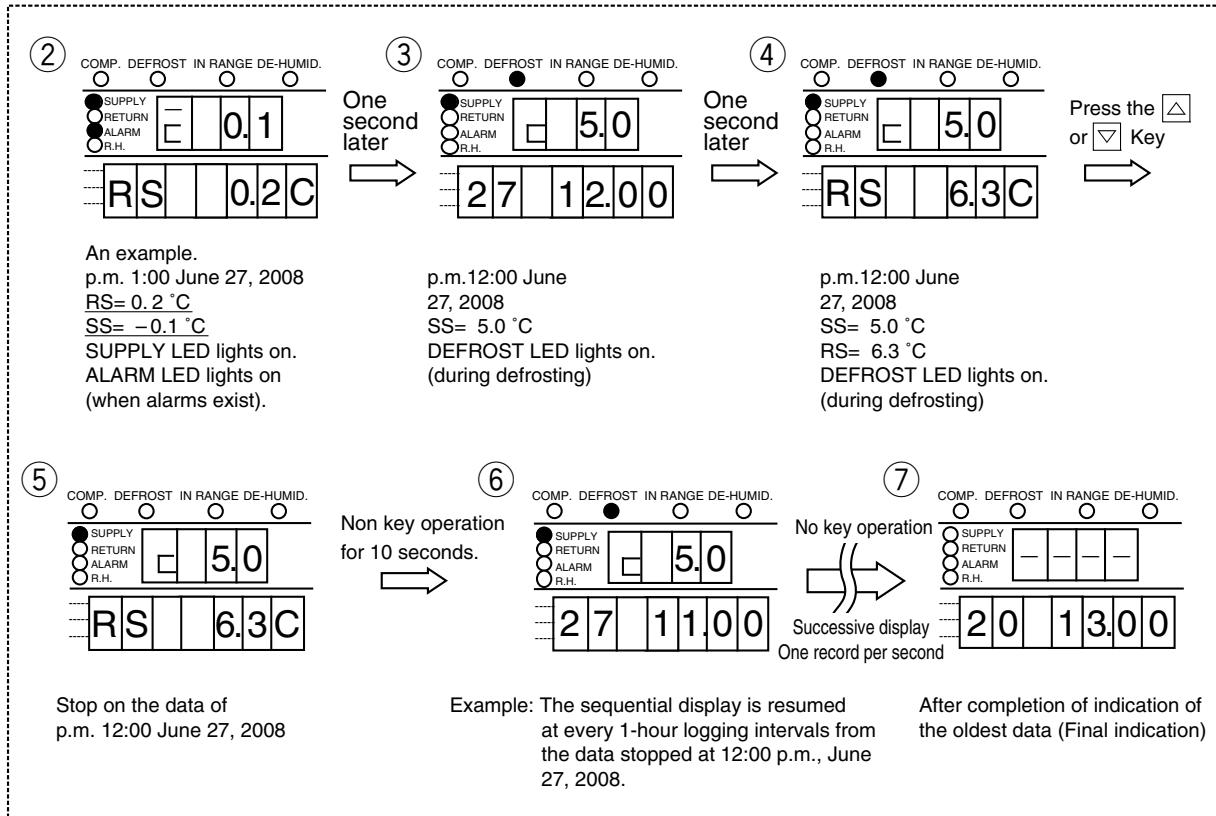


Example:
Operation data at 1:00 pm, June 27, 2008
SS= -0.1 °C
SUPPLY LED lights on.
ALARM LED lights on (when alarms exist).

One second later ↓

To restart press and hold the key for 3 seconds.

※ To return to previous mode press the key.
※ If key operation is not performed within 5 minutes, the current indication mode screen is resumed.

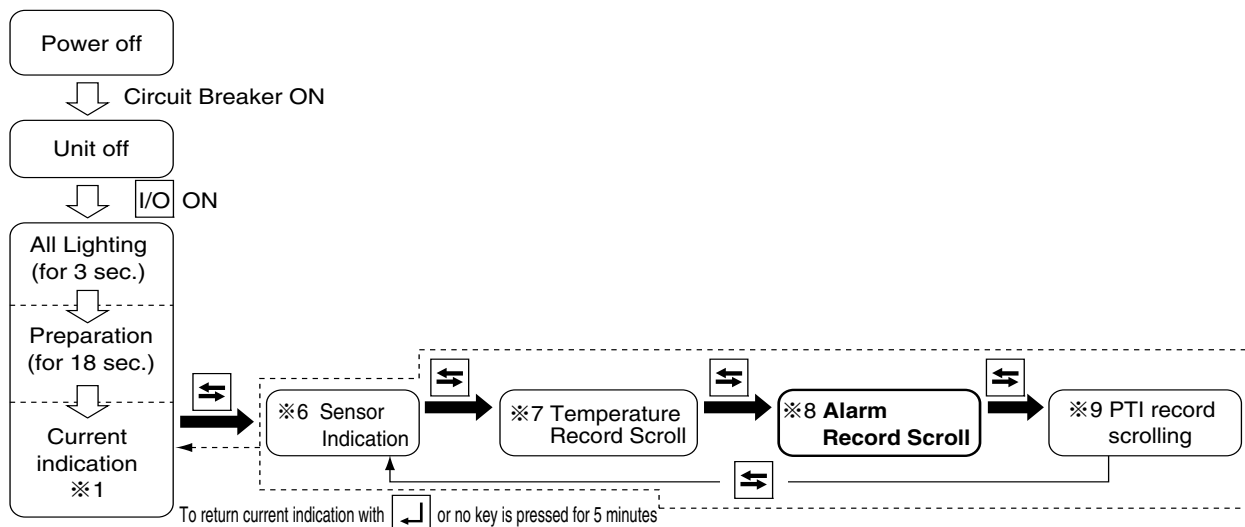


Note: "□" on the far left of LED display shows the temperature record scroll indication mode.

8. ALARM RECORD SCROLL MODE

The records of alarms are displayed sequentially (one record per second) starting from the latest one.
(Alarms for a maximum of 7 days)

<Mode selection procedure>



<Operation procedure>

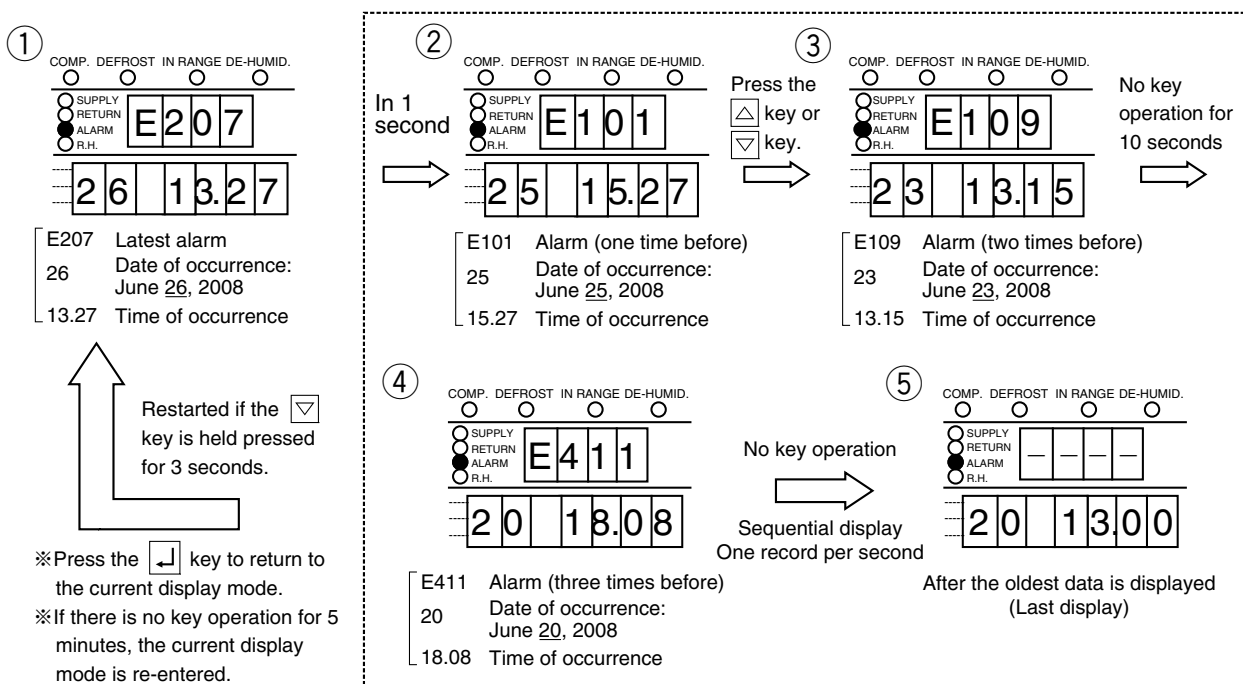
The alarm codes are displayed in the LED, and the alarm occurrence time and date are displayed in the LCD.

Press the key or key to pause the successive display of records. After the pause, sequential (scrolling) display will resume if there is no key pressed for 10 seconds.
Press the key pressed for 3 seconds to view data from the beginning.

Press the key to return to the current display mode screen.
If there is no key pressed for 5 minutes, current display mode screen reappears.

● Example of alarm record scroll mode display

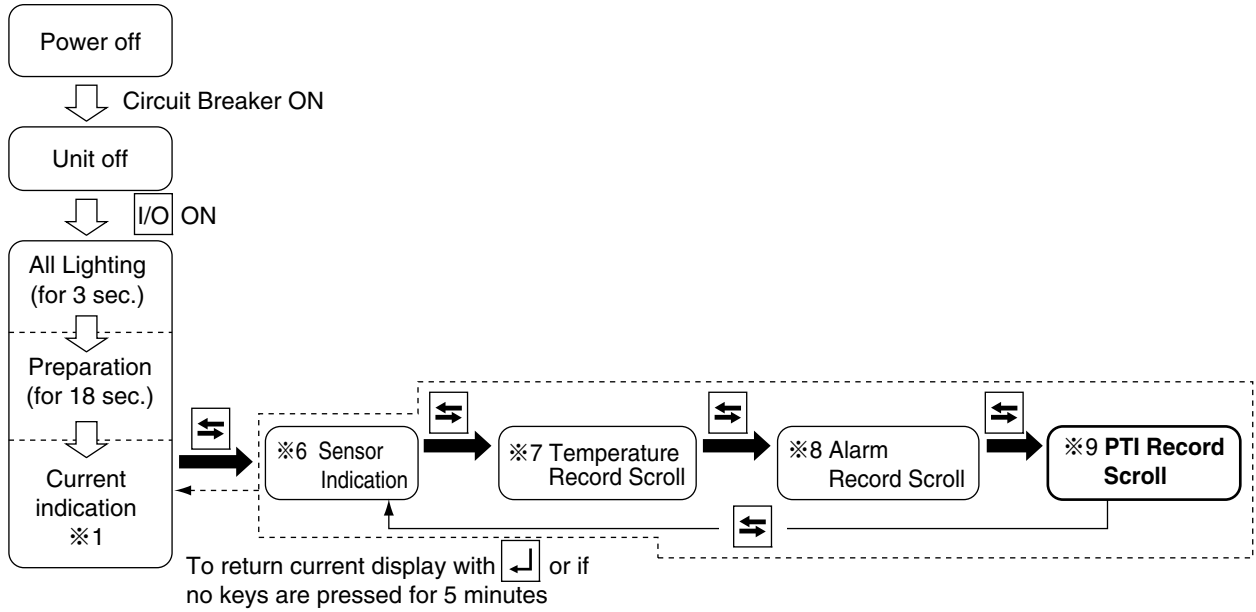
※The example below is based on the presumption that the current time is around 14:00, June 27,



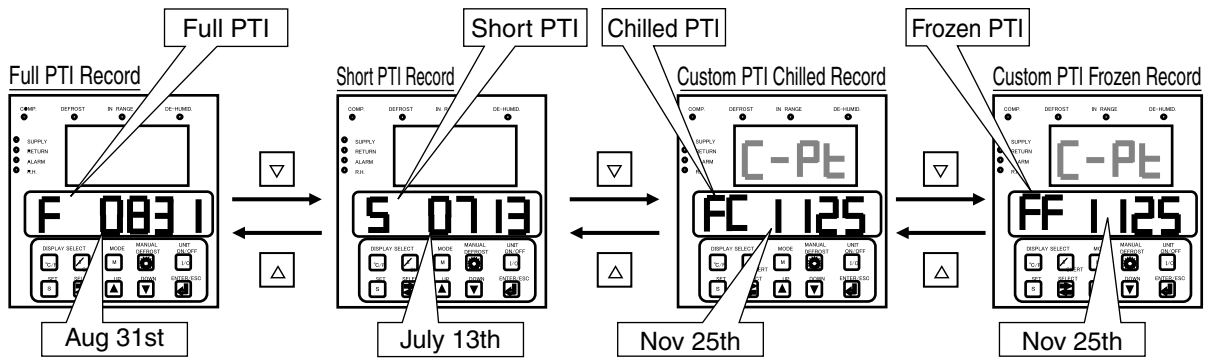
9. PTI RECORD SCROLL MODE

The record is shown in sequence (scroll) starting with the latest data.

<Mode selection procedure>



The controller displays the PTI type and the last completion (passing) date.

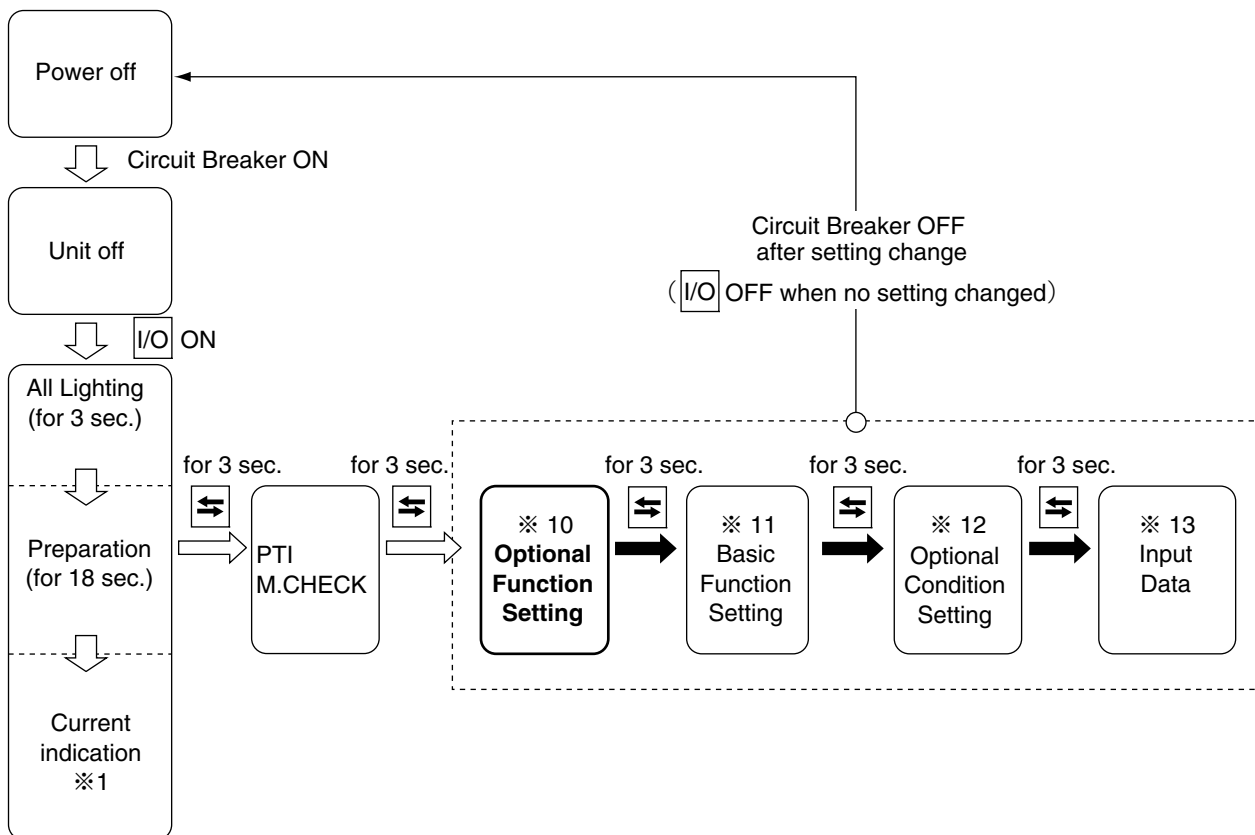


Below is displayed when there is no PTI data.
(applicable for scroll mode and battery mode)



10. OPTIONAL FUNCTION SETTING MODE

<Key operation to enter/exit>



<Key operation in this mode>

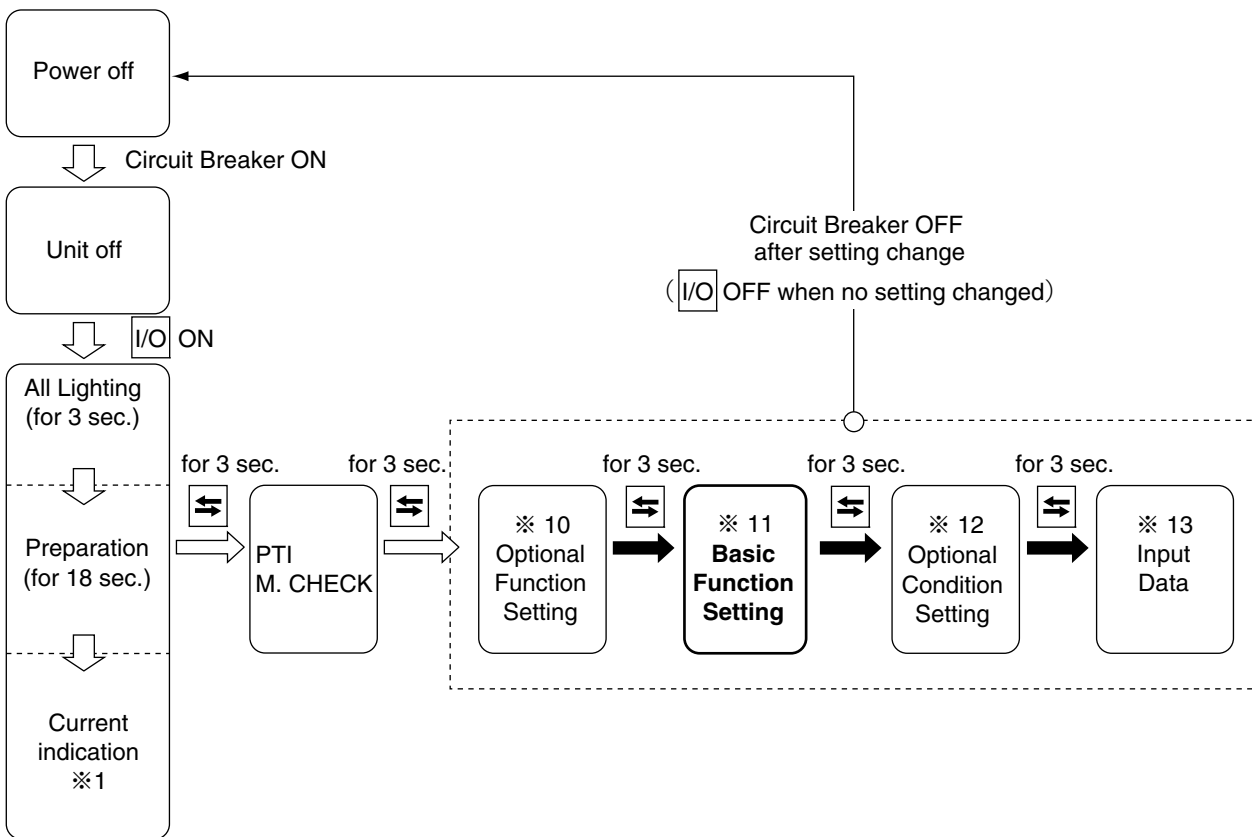
Whenever the **S** key is pressed, the display changes.

To save the setting, turn circuit breaker OFF after changing setting.

Indications or setting items	LED display	LCD display	Setting method
	OFF: USDA sensor not available 3 : 3 USDA sensors 4 : 3 USDA sensors and 1 cargo temperature sensor Au : To measure the temperature inside or cargo temperature for the purposes other than cold treatment transport, USDA sensor can record the temperatures ranging from -38°C to +40°C. Don't use USDA sensor for cold treatment transport because it does not meet the USDA standards.	USdA	Make selection using the △ key and ▽ key. Press the ↓ key to save selection. Note: "3" is set automatically if 2 USDA sensors are connected.
	ON : Dehumidification operation with dehumidification sensor installed ON-A: Dehumidification operation without dehumidification sensor OFF : No dehumidification operation Note : Check if the dehumidification coil is available or not available in section 2.2.2 (11. Basic function setting mode)	dHU	Make selection using the △ key and ▽ key. Press the ↓ key to save selection. Note: The dehumidification can be turned ON and OFF during the mode operation described in 2.2.2 (4. MODE OPERATION)

11. BASIC FUNCTION SETTING MODE

<Key operation to enter/exit>



<Key operation in this mode>

















Whenever the **[S]** key is pressed, the display changes.
 To save settings, turn circuit breaker OFF after the setting.

Indications or setting items	LED display	LCD display	Setting method
Controller setting	c: DECOS-III c f: DECOS-III f d: DECOS-III d g: DECOS-III g e: DECOS-III e h: DECOS-III h	dECOS-3	To make selection use the [△] key and [▽] key. Press the [↓] key to save the selection.
Logging interval setting	15, 30, 60 and 120 (The unit is minute)	LOG INT	To make selection use the [△] key and [▽] key. Press the [↓] key to save the selection.
Data recorder sensor available or not available setting	ON : Data recorder sensor available (With DSS and DRS optional) ※ OFF : Data recorder sensor not available (Without DSS and DRS optional) dSS : Data recorder sensor available (With DSS / Without DRS optional)	REC SEN	To make selection use the [△] key and [▽] key. Press the [↓] key to save the selection.
Power supply setting	Sing : In case of normal power supply dUAL: If the DUAL power supply (Optional) is available	OC-SET	To make selection use the [△] key and [▽] key. Press the [↓] key to save the selection.

※ Note) Do not select OFF.

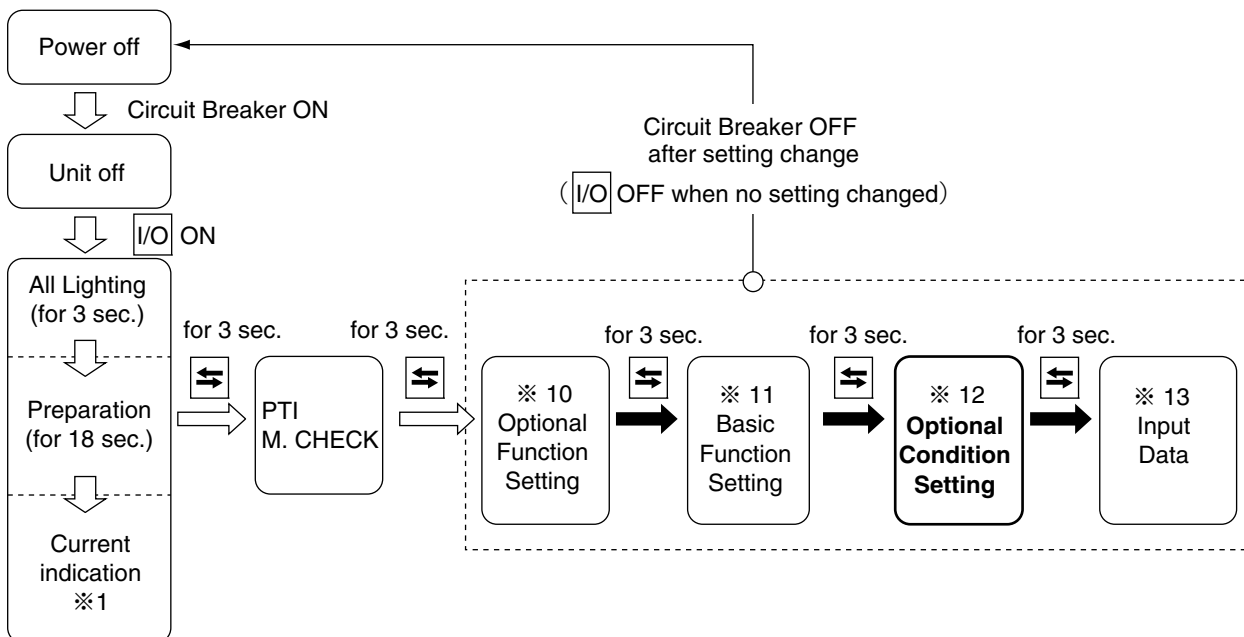
If it is selected to "OFF", cannot detect temperature difference between the control sensor and data recorder sensor.

11. BASIC FUNCTION SETTING MODE (Continued from the previous page)

<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 10px;">↓</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center; width: 150px;">Horsepower setting</div> <div style="margin: 5px 0;">↓</div> <div style="margin: 5px 0;">S</div> <div style="margin: 5px 0;">↓</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center; width: 150px;">Setting LED indicator lamp turning-off function available or not available</div> <div style="margin: 5px 0;">↓</div> <div style="margin: 5px 0;">S</div> <div style="margin: 5px 0;">↓</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center; width: 150px;">Compressor unloader system setting</div> <div style="margin: 5px 0;">↓</div> <div style="margin: 5px 0;">S</div> <div style="margin: 5px 0;">↓</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center; width: 150px;">Setting of dehumidification coil available or not available</div> <div style="margin: 5px 0;">↓</div> <div style="margin: 5px 0;">S</div> <div style="margin: 5px 0;">↓</div> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center; width: 150px;">Detection of ventilation amount (FA log) function setting</div> </div>	5 : If equipped with 5 horsepower compressor (Only some units of Decos III a) 10: If equipped with 10 horsepower compressor	HP	To make selection use the  key and  key. Press the  key to save the selection.
	ON : Turning-on function available OFF: Turning-off function not available	DISP	To make selection use the  key and  key. Press the  key to save selection. Note: If turned "ON", the LED illuminates by pressing the  key twice.
	33 : Unloader system available 100: Unloader system not available	COMP	To change setting press the  key and  key. Press the  key to save selection. Note: "33" is applicable only for LXE10D.
	ON : Dehumidification coil available OFF: Dehumidification coil not available Note: For the unit equipped with reheat coil, be sure to select ON.	REHEAT	To change setting press the  key and  key. Press the  key to save selection.
	OFF: Detection function not available H : Detection function available at the upper ventilator L : Detection function available at the lower ventilator	FA SEN	To change setting press the  key and  key. Press the  key to save selection.

12. OPTIONAL CONDITION SETTING MODE

<Key operation to enter/exit>



<Key operation in this mode>

Whenever the **[S]** key is pressed, the indication changes.

To save setting, turn circuit breaker OFF after changing setting.

Indications or setting items	LED display	LCD display	Setting method
	C: Temperature unit = °C, Pressure unit = kPa, F: Temperature unit = °F, Pressure unit = PSI	dEG C/F	To change setting press the [△] key and [▽] key. Press the [↓] key to save selection.
	ON : H code and D code are displayed. OFF: H code and D code are not displayed.	CHARTLS	To change setting press the [△] key and [▽] key. Press the [↓] key to save selection. Note: Refer to section 2.6.3 for details about H & d codes.
	1: ST9702-1 sensor 2: NTC type probe sensor	USDA1/2	To change setting press the [△] key and [▽] key. Press the [↓] key to save selection. Note: For details, refer to section 4.1.
	H001 code can be generated at temperature setting of 1, 2, 3, 4, 5, 10 (The unit is °C.)	H001	To change setting press the [△] key and [▽] key. Press the [↓] key to save selection. Note: Refer to section 2.6.3.2.
	The time at which the H002 code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is hour)	H002	To change setting press the [△] key and [▽] key. Press the [↓] key to save selection. Note: Refer to section 2.6.3.2

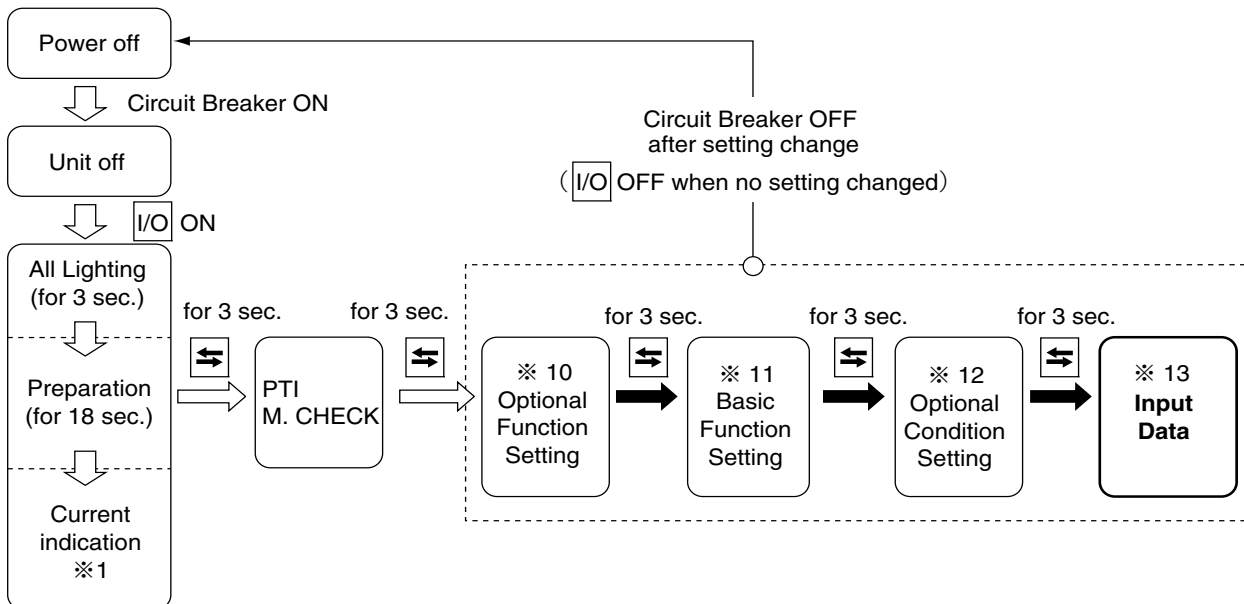
12. OPTIONAL CONDITION SETTING MODE (Continued from the previous page)

S	↓ S	H003 code generation time setting	The time at which the H003 code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is hour.)	H003	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.2.
	↓ S	H004 code generation time setting	The temperature at which the H004 code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is °C.)	H004	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.2.
	↓ S	H005 code generation count setting	H005 is generated by number of defrost cycles. Settings are 1, 2, 3, 4, 5, 10 (The unit is number of times.)	H005	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.2.
	↓ S	H006 code generation time setting	The time at which the H006 code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is number of times.)	H006	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.2.
	↓ S	d1-- code generation time setting	The time at which the d1-- code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is hour.)	d1--	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.3.
	↓ S	d2-- code generation time setting	The time at which the d2-- code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is hour.)	d2--	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.3.
	↓ S	d3-- code generation time setting	The time at which the d3-- code is generated can be set to 1, 2, 3, 4, 5, 10 (The unit is hour.)	d3--	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.3.
	↓ S	d-1- code generation time setting	d-1 code time interval settings are 1, 2, 3, 4, 5, 10 (The unit is hour.)	d-1-	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.3.
	↓ S	d-2- code generation time setting	d-2 code time interval settings are 1, 2, 3, 4, 5, 10 (The unit is hour.)	d-2-	To change setting press the <input type="button" value="△"/> key and <input type="button" value="▽"/> key. Press the <input type="button" value="↵"/> key to save selection. Note: Refer to section 2.6.3.3.

13. INPUT DATA MODE

Each of the following mode data can be inputted.
Container I.D. (No.) input and controller and controller time

<Key operation to enter/exit>



<Key operation in this mode>

Whenever the **S** key is pressed, the indication changes.
To confirm the setting, turn OFF the circuit breaker.

Indications or setting items	LED display	LCD display	Setting method
		SET I.d	Press the ↓ key to go to the lower screen.
	I.d.- C: To the screen in which the shipping company name is input I.d.- n: To the screen in which the number is input	XXXX (4 alphabetical characters)	To change setting press the △ key and ▽ key. Press the ↓ key to go to each input screen.
<Input of shipping company name> I.d.-C		XXXX (4 alphabetical characters) The characters being selected blink. First, the leftmost character starts to blink.	To change the blinking character press the △ key and ▽ key. If the ↓ key is pressed the blinking character moves to the right. If the ↓ key is pressed while the rightmost character is lit, the input is confirmed and the number input screen appears.
<Input of numbers> I.d.-n		XXXXXXX (7 numbers) The characters being selected blink. First, the leftmost character starts to blink	To change the blinking number press the △ key and ▽ key. If the ↓ key is pressed, the blinking number moves to the right. If the ↓ key is pressed while the rightmost number is lit, the input is confirmed. Note: If the number is incorrect, the input cannot be confirmed and the screen in which the shipping company name appears.

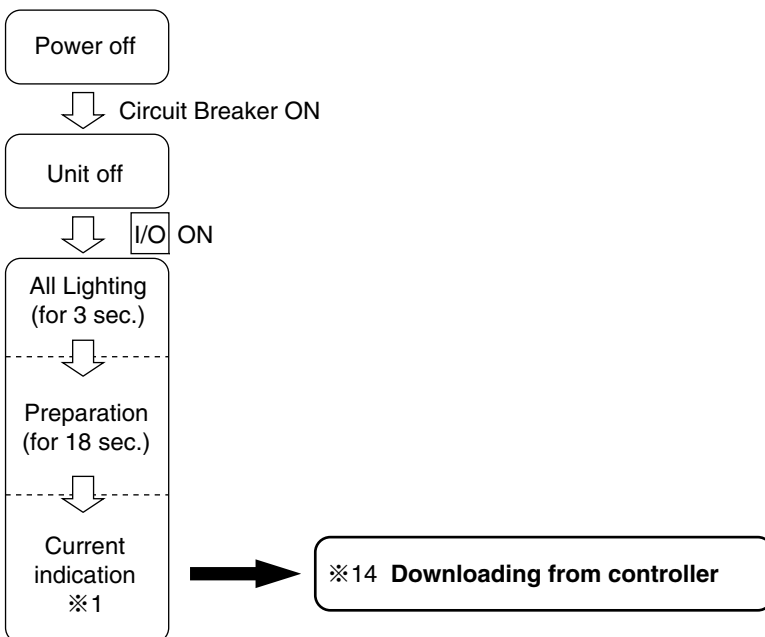
13. INPUT DATA MODE (Continued from the previous page)

	—	SET TIME	Press the key to go to the next "Year" setting screen.
	20XX (The A.D. year currently set)	YEAR	The value can be increased or decreased by pressing the key and key. Press the key to save selection and go to the next "Month" setting screen.
	XX (The month currently set)	MONTH	The value can be increased or decreased by pressing the key and key. Press the key to save selection and go to the next "Day" setting screen.
	XX (The day currently set)	dAY	Make the setting in the same manner as described above. Save selection to go to the next "Hour" setting screen.
	XX (The hour currently set)	HOUR	Make the setting in the same manner as described above. Save selection to go to the next "Minute" setting screen.
	XX (The minute currently set)	MINUTE	Make the setting in the same manner as described above.

14. CONTROLLER SOFTWARE DOWNLOAD MODE

The data on a personal computer and a controller are interchanged in this mode.
 For details, see the Operation Manual for Personal computer software.
 Downloading is possible even in "3. BATTERY MODE". page 2-9.

<Key operation to enter/exit>



2.3 Information interchange with personal computer

The electronic controller DECOS IIIh has a internal memory function to record the set point temperature, inside temperature, operation mode, occurrence alarm and the report of automatic PTI during transportation in addition to the normal operation control.

Users can retrieve the logging data and operations condition of the unit and save the information on a personal computer through the serial communication port (personal computer receptacle) provided on the controller front panel. The retrieved data is useful to analyze any problems that occurred during transportation and to prepare various kinds of reports.

In additional to, users can up-load the information such as the container No., cargo name, destination and other information from their personal computer to the controller.

Refer to the Operation Manual for Personal Computer Software for detail.

2.3.1 Data logging

The data logging function is to store operation data which is generated during operation.

There are seven kinds of logging data.

For Trip data, its logging interval can be selected from 15, 30, 60 (default) and 120 minutes.

※Controller has Max. 2 years capacity at 60 min log interval.

	Type	Logging data
1	ID data	<ul style="list-style-type: none"> ● Setting temperature ● Setting ventilation amount ● Setting humidity (Optional) ● Container ID
2	Trip data	<ul style="list-style-type: none"> ● Operation date (year, month, day) ● Operation time ● Setting temperature ● Supply air temperature for data recorder ● Return air temperature for data recorder (Optional) ● Set O₂ concentration, set CO₂ concentration (Optional) ● O₂ concentration, CO₂ concentration (Optional) ● Supply air temperature ● Return air temperature ● Outside air temperature ● Setting humidity (Optional) ● Humidity (Optional) ● Operation mode
3	USDA (Optional)	<ul style="list-style-type: none"> ● Pulp temperature sensor USDA #1 to #3 ● Year/month/day/time ● Logging interval of 1 hour
4	USDA+CTS (Optional)	<ul style="list-style-type: none"> ● Pulp temperature sensor USDA #1 to #3 ● Cargo temperature sensor CTS ● Year/month/day/time ● Logging interval of 1 hour
5	Event	<ul style="list-style-type: none"> ● Power ON/OFF ● Unit ON/OFF ● Setting temperature change ● Setting humidity change (Optional) ● Defrosting interval setting change ● Defrosting IN/OUT ● PTI startup and result ● Battery mode startup ● G-set setting ● FA log (optional)
6	Alarm	<ul style="list-style-type: none"> ● Alarm occurrence date (year/month/day) ● Alarm code
7	PTI	<ul style="list-style-type: none"> ● SHORT PTI ● FULL PTI ● CHILLED PTI ● FROZEN PTI ● CA_FULL PTI ● CA_SHORT PTI ● CA_CUSTOM PTI ● CA TEST
8	Software version	<ul style="list-style-type: none"> ● Version of the software installed in the controller
9	Controller serial number	Serial number of the controller

Logged data can be retrieved with the aid of personal computer software.

Refer to the Operation Manual for Personal Computer Software for detail.

2.4 INSTALLATION OF SOFTWARE

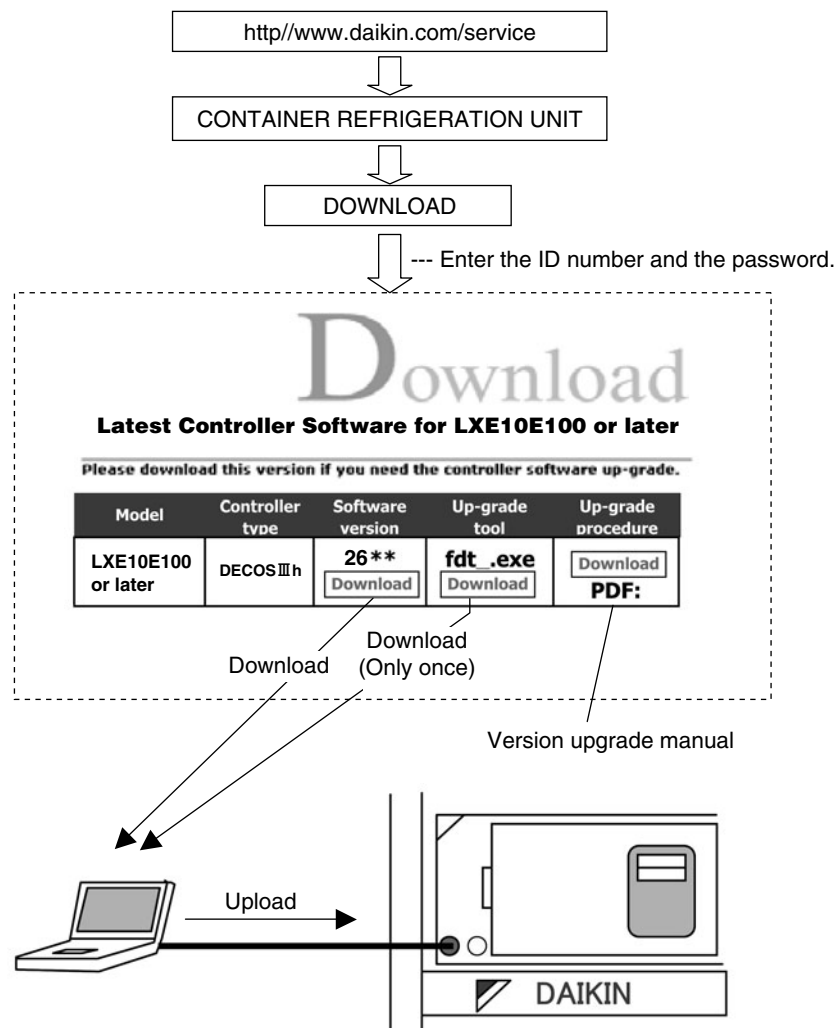
2.4.1 INSTALLATION OF LATEST VERSION SOFTWARE (VERSION UPGRADE)

● Items required

1. Personal computer (with Windows 2000 or Windows XP Windows Vista, Windows 7 installed)
2. Communication cable
3. Tool for software version upgrade
4. Software for controller DECOS III h

After controller replacement, software needs to be upgraded. Download the latest version software and tool for version upgrade (only once) from DAIKIN HOME PAGE by following the procedure shown below.

Note: The unit is operated by using the software already installed in the controller. However, ensure that the software is upgraded to implement optimal operation.



CAUTION

Never turn the power OFF or disconnect the battery connector while the software version upgrade is in progress. Otherwise, the software version upgrade will fail.

In such a case, retry the software version upgrade.

2.5 Pre-trip inspection

- Perform a pre-trip inspection of each component and take remedial actions if necessary so that the unit will operate normally. Pre trip inspection includes items listed below.

Precautions regarding long-term storage (three months or longer)

When the refrigeration unit is stored for a long time, give consideration to temperature and humidity. Additionally, it is recommended to manually turn the rotating shaft of the evaporator and the condenser fan motor periodically to prevent poor lubrication of rotating shaft parts.

Wash the inside of the box prior to storing the marine type container refrigerator. If the inside of the box is not sufficiently dried out, the temperature and relative humidity within the box will both increase in situations such as when the external temperature increases, which will lead to a harsh ambient environment for the fan motor.

Ensure that no water remains within the box during storage.

Note) If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

(1) Appearance inspection of unit

- ① Physical damage
- ② Wiring and refrigerant lines routed through flame casing insulation
- ③ Drain hose (dust and clogging)
- ④ Power cable and plug damage
- ⑤ Condition of refrigerant piping fasteners.
- ⑥ Condition of each sensor installation
- ⑦ Loose mounting hardware
 - Bolts and nuts ----- Casing frame, compressor, fan motor and control box
 - Cable glands ----- Control box
- ⑧ Conditions of control box cover seals (water-proof)
- ⑨ Magnetic contactor contact point.

(2) Inspection before unit operation

- ① Refrigerant leakage inspection

- ② Power voltage inspection

(Automatic PTI range)

(3) Operation inspection of safety device and control equipment

- ① Safety device HPS ----- Check for proper operation of switch when stopping the condenser fan motor.
- ② Control equipment Solenoid valve ----- Inspection of operation (open and close) and leakage
EFM ----- Speed switchover and rotating direction
EV, SMV ----- Check operation (open and close) and leakage

(4) Operation in each mode

- ① Pull-down → 0°C Pull-down time, voltage and current
- ② Chilled control 0°C Return, supply air temperature differential, voltage and current
- ③ Defrosting Defrosting time
- ④ Pull-down → -18°C Pull-down time, evaporator fan motor speed switchover (Temperature differential and rotating direction)
- ⑤ Frozen control -18°C ON/OFF, voltage and current

Remaining frost inspection

(5) PTI report preparation

● **Consumables**

- ① Rechargeable battery: 2 years
- ② Humidity sensor: Inspect every year. Replace when appropriate.
- ③ Refrigerant: Inspect at PTI. Repair as needed. (malfunction caused by moisture entering, etc.)
- ④ Power plug: Inspect during PTI. Repair as needed.
- ⑤ Power cable: Inspect during PTI. Repair as needed.

2.5.1 Manual inspection

Some items subject to manual inspection are listed below

No.	Inspection item	Inspection content	PTI	
General structure	1	Inspection for physical damage	✓	
	2	Loose mounting bolts	1) Unit frame	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
			5) Control box	✓
			6) Access panel	✓
3	Condition of panels, hinges and locks	✓		
4	Drain pan and drain hose cleaning	✓		
5	Control box inspection	Cover packing inspection and replacement	✓	
6	Sealing condition of holes through unit frame	Air leakage and clearance	✓	
Refrigerant system	1	Refrigerant leaks	✓	
	2	Refrigerant	Check for moisture in refrigeration system and Freon level	✓
	3	Inspect high pressure switch operations		✓
	4	Check solenoid valve operation and signs of leaking	1) Liquid solenoid valve	✓
			2) Economizer solenoid valve	✓
			3) Injection solenoid valve	✓
			4) Hot gas solenoid valve	✓
			5) Discharge gas by-pass solenoid valve	✓
	5	Check suction modulation valve operation and leaking		✓
6	Check electronic expansion valve operation and leaking		✓	
7	Check function of liquid moisture indicator		✓	
8	Check securing refrigerant line and gauge lines		✓	
9	Condenser coil condition	Clean with fresh water	✓	

	No.	Inspection item	Inspection content	PTI
Electrical system	1	Damage of power cable and plug		✓
	2	Inspect condition of internal wiring		✓
	3	Inspect electrical connections and tighten as needed	1) Magnetic switch	✓
			2) Electronic controller terminal block	✓
			3) Terminal block	✓
	4	Condition of monitoring receptacle cover		✓
	5	Inspect computer port cap		✓
	6	Inspect fuses	Burned out or not	✓
	7	Inspection of magnetic switch contact	Contact point inspection	✓
	8	Check electrical insulation	1) Power cable and plug	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
	9	Starting procedure inspection		✓
	10	Thermo sensor	1) Installation condition of sensor	✓
			2) Indication error inspection and replacement	✓
	11	PT/CT (voltage and current) Alarm codes		✓
12	Pressure sensor Alarms codes		✓	
13	Electronic controller	Check wake-up battery	✓	
14	Evaporator fan motor	1) Speed switchover	✓	
		2) Rotation direction	✓	
15	Condenser fan motor	Rotating direction	✓	
16	Evaporator fan	Deformation and damage inspection	✓	
17	Condenser fan	Deformation and damage inspection	✓	
Others	1	Check for abnormal noise and vibration during operation		✓
	2	Temperature control function	1) 0°C operation	✓
			2) -18°C operation	✓
	3	Defrost operation		✓
4	Clean unit with fresh water		✓	

2.5.2 Automatic PTI

● In order to initiate an automatic PTI the following conditions must be present

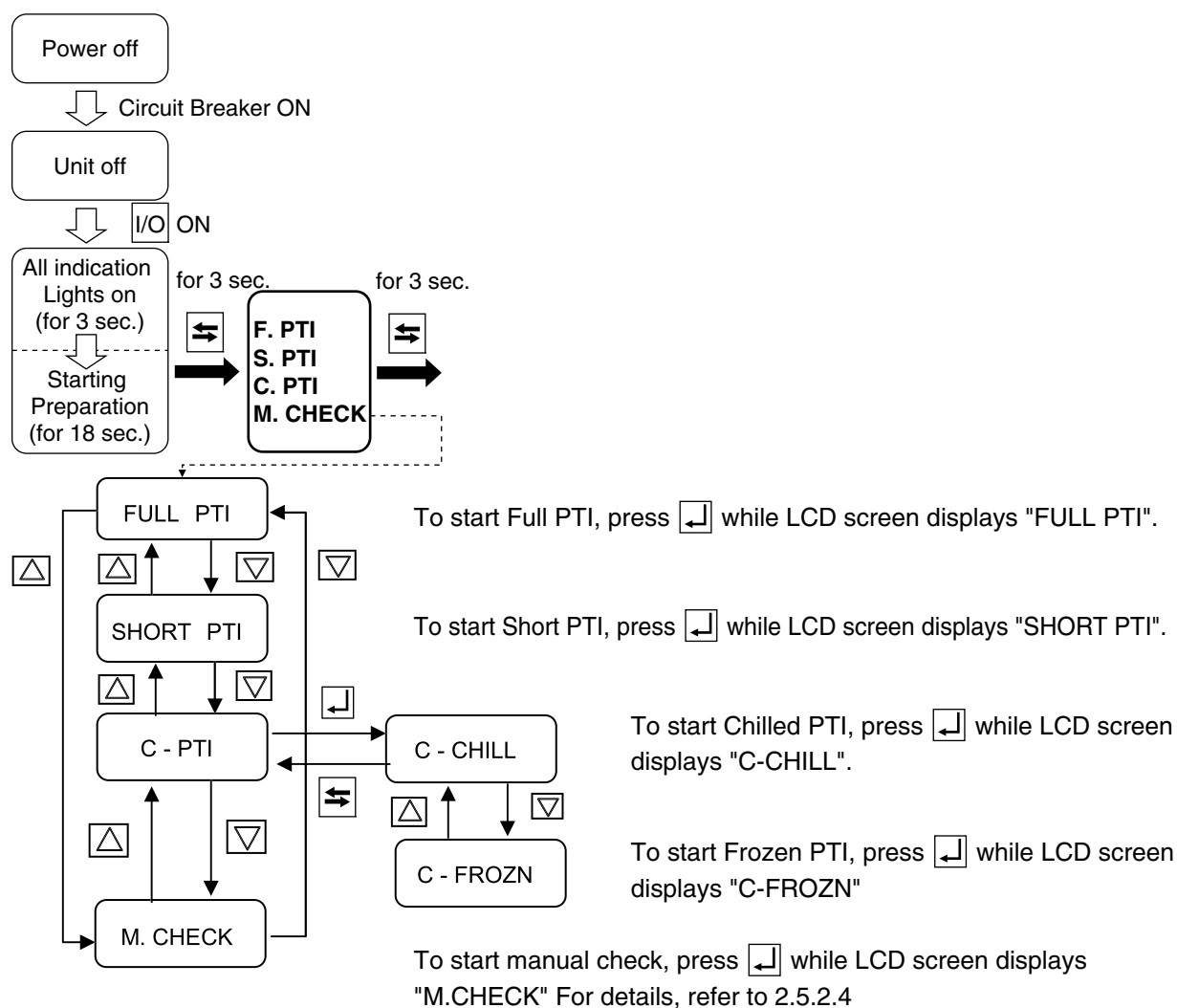
$43^{\circ}\text{C} \geq \text{ambient temperature} \geq -10.0^{\circ}\text{C}$

An accurate result of the PTI may not be provided if the ambient temperature is above 43°C or below -10°C , or if it has big difference between Cargo and ambient temperature. (As a guideline, the difference of temperature is more than 20°C). Alarm J501 will be indicated except for Short PTI

● Automatic PTI includes Short PTI, Full PTI, Custom PTI (Chilled PTI, and Frozen PTI)

PTI		Content
Short PTI		Performed in order to find parts abnormalities. PTI continues even if abnormalities are found during PTI. PTI terminates if controller detects a compressor failure or evaporator fan is locked.
Full PTI		Short PTI, Chilled PTI and Frozen PTI are performed. It terminates as soon as abnormalities are found after the completion of Short PTI
Custom PTI	Chilled PTI	Short PTI and Chilled PTI are performed. It terminates as soon as abnormalities are found after the completion of Short PTI
	Frozen PTI	Short PTI and Frozen PTI are performed. It terminates as soon as abnormalities are found after the completion of Short PTI

2.5.2.1 Automatic PTI selection mode



2.5.2.2 Short PTI (S.PTI)

●Displayed steps during short PTI

Step	Content	Short PTI	Full PTI	Custom PTI	
				Chilled PTI	Frozen PTI
P00	Basic data record (container No., date, time, compressor integrated run-hour, ambient temperature)	✓	✓	✓	✓
P02	All sensor alarm check, evaporator fan lock check	✓	✓	✓	✓
P04	Power conditions (voltage and frequency) check	✓	✓	✓	✓
P05	Compressor running check	✓	✓	✓	✓
P06	Actuating pressure check at OFF and ON of High pressure switch (HPS)	✓	✓	✓	✓
P08	Pump-down check	✓	✓	✓	✓
P10	Solenoid valve leakage check •Liquid solenoid valve (LSV) •Injection solenoid valve (ISV) •Hot gas solenoid valve (HSV) •Discharge gas by-pass (BSV) •Economizer solenoid valve (ESV)	✓	✓	✓	✓
P12	Supply and return air sensor (SS and RS), evaporator temperature sensor(EIS and EOS)accuracy check	✓	✓	✓	✓
P14	Pressure sensor (HPT and LPT) accuracy check	✓	✓	✓	✓
P16	Evaporator fan high and low-speed operation check	✓	✓	✓	✓
P18	Start up	✓	✓	✓	✓
P20	Economizer solenoid valve (ESV) opening or closing check ※1 ※2	✓	✓	✓	✓
P22	Discharge gas by-pass solenoid valve (BSV) opening or closing check ※2	✓	✓	✓	✓
P24	Standard pull-down operation	✓	✓	✓	✓
P26	Standard pull-down operation	✓	✓	✓	✓
P28	Suction modulating valve (SMV) operation check	✓	✓	✓	✓
P29	Electronic expansion valve (EV) operation check	✓	✓	✓	✓
P30	Injection solenoid valve (ISV) opening or closing check ※2	✓	✓	✓	✓
P32	Hot-gas solenoid valve (HSV) and SGS sensor accuracy check and Reheat coil solenoid valve (RSV -optional) opening or closing check	✓	✓	✓	✓
P50	Check pull-down to 0°C		✓	✓	
P60	Check controllability of chilled mode operation.		✓	✓	
P70	Check defrosting		✓	✓	✓
P80	Check pull-down from 0°C through -18°C		✓		✓
P90	Check controllability of frozen mode operation		✓		✓

※1 If the ambient temp is -10°C or lower, function check of the solenoid valve cannot be preformed correctly, jump terminals 121 and 102 on the terminal board, and check the operation of the solenoid valve.

※2 If the difference between ambient temperature and return air temperature is 15°C or higher, these steps will be skipped.

※3 Step No. are indicated in LED display.

Example: Step No.10	Short PTI	Full PTI	Custom PTI Frozen PTI	Custom PTI Chilled PTI
	SP 10	FP 10	CP 10	CP 10

2.5.2.3 Alarm list during PTI (Pre-trip inspection)

Alarms during automatic PTI are concerned with PTI inspection items in addition to those during normal operation.

Alarms generated at automatic PTI are indicated by J ※※※., separated from those during normal operation.

There are some alarms which are not displayed on the control panel, however they can be checked referring to the PTI report.

Check NO. (LED display)	Check content	Alarm Indication (LED display)	Alarm content	Remarks
P00	Basic data	No indication	Check basic-data	
P02	All sensor	Same as normal operation	Check basic-data	
	Evaporator fan lock check	J161	Evaporator fan failure	
P04	Power supply	No indication	Check basic-data	
P05	Starting	J051	Compressor malfunction	
P06	HPS	J061	Abnormal OFF value	
	”	J062	Not recovered (Not reset)	
	”	J064	High pressure does not rise.	
	”	J065	High pressure does not drop.	
P08	Pump-down	J081	Long pump-down	
P10	Liquid solenoid valve	J101	Valve leakage	
P12	RS, SS accuracy	J121	Sensor deterioration	
	EIS, EOS accuracy	Same as normal operation	Sensor deterioration	
P14	HPT, LPT accuracy	J141	Sensor deterioration	
P16	Evaporator fan motor	J161	Evaporator fan motor malfunction	
P20	Economizer solenoid valve	J201	Economizer solenoid valve malfunction	
P22	Discharge gas by-pass solenoid valve	J221	Discharge gas by-pass solenoid valve malfunction	
P24	Operation	No indication		
P26	Operation	No indication		
P28	Suction modulating valve	J281	Suction modulating valve does not activate	
P29	Electronic expansion valve	J291	Long pump-down	
P30	Injection solenoid valve	J301	Injection solenoid valve malfunction	
P32	Hot-gas solenoid valve	J321	Hot-gas solenoid valve malfunction	
	SGS accuracy	Same as normal operation	Sensor deterioration	
	Reheat coil solenoid valve	J322	Reheat coil solenoid valve malfunction	
P50	Pull-down cooling capacity	J501	Out of ambient temperature conditions	Press the select key for 3 seconds to restart when alarms are displayed in J code
P50	0°C pull-down check	J502	Long pull-down time	
P60	0°C holding check	No indication		
P70	Defrosting	J701	Out of starting conditions	
		J702	Long defrosting time	
P80	Pull-down cooling capacity	J801	Long pull-down time	
P90	-18°C control	No indication		

Refer to section 5.3 for more information.

2.5.2.4 Manual check (M.CHECK)

In M. CHECK, each functioning component is inspected. However, unlike in S.PTI and F.PTI, there is no alarm indication etc.

<Inspection items>

Compressor operation time, evaporator fan high-speed operation current, evaporator fan low-speed operation current, condenser fan operation current, battery lifespan (number of years or months), horsepower indication, time elapsed since starting the trip, operation time of evaporator fans 1 & 2, operation time of the condenser fan, and software version

<Control method>

Setting items	LED display	LCD display	Setting method and description
	Accumulated operation time of the compressor	CC × 10H	<p>Press the key to display the number in the LED meaning the accumulated operating time of the compressor.</p> <hr/> <p>Operation time = Number in LED × 10 [hours] Keep the key pressed for 3 seconds to reset the accumulated operation time to 0.</p>
	Evaporator fan operation current at high speed	EFH A	<p>Press the key to operate the evaporator fan in high speed, operating current of the fan is indicated on the LED display.</p> <hr/> <p>The unit is A.</p>
	Evaporator fan operation current at low speed	EFL A	<p>Press the key to operate the evaporator fan at low speed, operating current of the fan is indicated on the LED display.</p> <hr/> <p>The unit is A.</p>
	Evaporator fan operation current	CF A	<p>Press the key to operate the condenser fan, operating current of the fan is indicated on the LED display.</p> <hr/> <p>The unit is A.</p>
	Time elapsed since starting a trip	TS H	<p>Press the key to show the time elapsed since starting the trip.</p> <hr/> <p>The unit is [hour]. Keep the key pressed for 3 seconds to start the trip with the time elapsed reset to 0 [hour].</p>
	Evaporator fan 1 accumulated operation time	EF1 × 10H	<p>Press the key to show the accumulated running time of evaporator fan 1 on the LED display.</p> <hr/> <p>Operation time = Number in LED × 10 [hours] Keep the key pressed for 3 seconds to reset the accumulated running time to 0. Evaporator fan 1 is located on the right view from the inside.</p>

	<p>Accumulated operation time of evaporator fan 2</p>	<p>EF2 × 10H</p>	<p>Press the key to display the accumulated operation time of evaporator fan 2 in the LED.</p> <hr/> <p>Running time = Number in LED × 10 [hours]</p> <p>Keep the key pressed for 3 seconds to reset the accumulated running time to 0. Evaporator fan 2 is located on the left view from the inside.</p>
	<p>Accumulated operation time of the condenser fan</p>	<p>CF × 10H</p>	<p>Press the key to display the accumulated running time of the condenser fan on the LED display.</p> <hr/> <p>Running time = Number in LED × 10 [hours]</p> <p>Keep the key pressed for 3 seconds to reset the accumulated run time to 0.</p>
	<p>Software version</p>	<p>SOFTVER</p>	<p>Press the key to display software version on the LED display.</p>
	<p>Ventilation amount (FA)</p>	<p>FA CAL</p>	<p>Ventilation amount(FA) is indicated on LED display when pressing . If ventilation amount is displayed despite the ventilator exit totally closed, press for 3 seconds to calibrate ventilation amount to zero.</p>

2.6 Chartless function

The controller provides temperature recorder function.

In the case of recorder-equipped units, checking temperature on the chart recorder will provide ease of monitoring the trip status.

Since recent controllers are available for long and accurate temperature recording, non-recorder-equipped units have been reduced. In place of the recorder the following three "Chartless functions" are available.

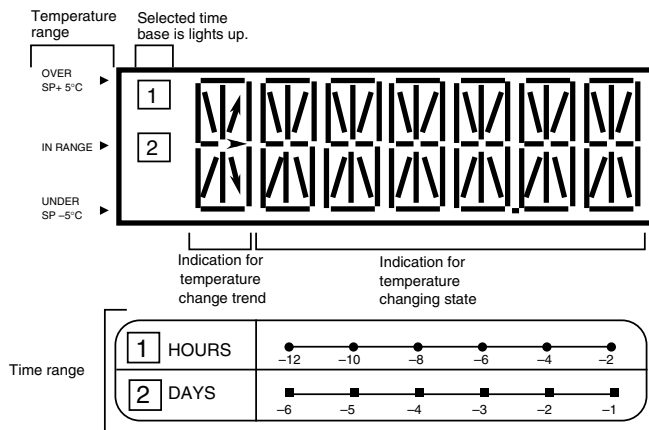
- Chart Indication Function
- Pull Down Time Indication Function
- Chartless Code display Function

2.6.1 Chart indication function

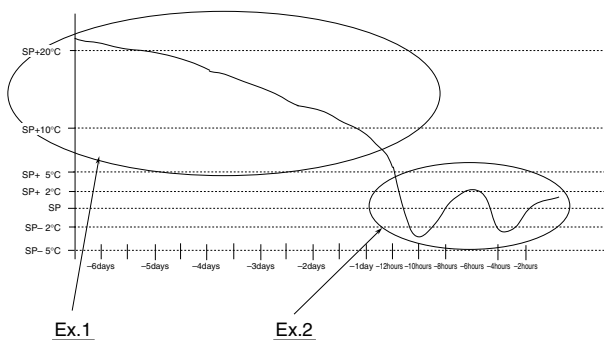
Temperature recorder data is indicated in a graphic chart on the LCD panel in chart display mode.

- The displayed log period is selected from 12 hours (1 HOURS on the time base) or 6 days (2 DAYS on the time base).
- The displayed intervals are 2 hours for 12 hours log (1 HOURS). One day for 6 days log (2 DAYS).
- Display of data during the defrosting is flickered and the indication of the other chart data is steady.

● LCD panel

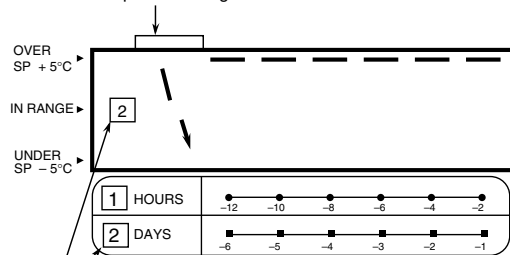


● Example of chart indication



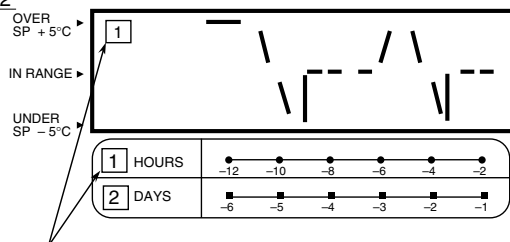
Ex.1

The arrow indicates the temperature change trend when all segments are in the same temperature range.



The graphic chart of the temperature change for 6 day log (time base : 2 (DAYS))


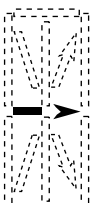

Ex.2



The graphic chart of the temperature change for 12 hours log (time base : 1 (HOURS))

●Displaying temperature change trend:

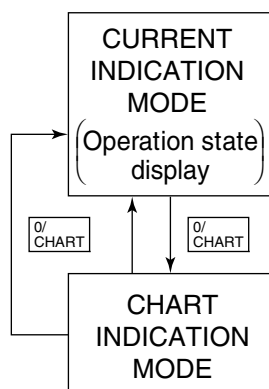
- The temperature change trend is shown on the left side of LCD.
- However, this display is shown only when all segments are in the same temperature range.


Trend indication	Condition
<p>Temperature rise trend</p> 	$\left(\begin{array}{l} \text{The latest} \\ \text{data on the} \\ \text{chart} \end{array} - \begin{array}{l} \text{the oldest} \\ \text{data on the} \\ \text{chart} \end{array} \right) > \text{※ set point of H001} \\ \text{(ALARM indication} \\ \text{setting)}$
<p>Temperature stable tendency</p> 	$\left(\begin{array}{l} \text{The latest} \\ \text{data on the} \\ \text{chart} \end{array} - \begin{array}{l} \text{the oldest} \\ \text{data on the} \\ \text{chart} \end{array} \right) < \text{set point of H001}$ <p>or</p> $\left(\begin{array}{l} \text{the oldest} \\ \text{data on the} \\ \text{chart} \end{array} - \begin{array}{l} \text{The latest} \\ \text{data on the} \\ \text{chart} \end{array} \right) < \text{set point of H001}$
<p>Temperature fall tendency</p> 	$\left(\begin{array}{l} \text{the oldest} \\ \text{data on the} \\ \text{chart} \end{array} - \begin{array}{l} \text{The latest} \\ \text{data on the} \\ \text{chart} \end{array} \right) > \text{set point of H001}$



※The trend display varies depending on setting of H001.

For details about the setting of H001, refer to page 2-22~23, "OPTIONAL CONDITION SETTING MODE."

< Operation procedure >



To shift to the chart indication mode, press the  key while the unit is in the current indication mode.

In the chart indication mode, the LCD displays a simple graphic chart. The left side of LCD screen displays temperature base and the horizontal section at the bottom of LCD displays time. The No. indicated at the time base is the same as the No. on the left side of LCD, which indicates the simple graphic chart is of 12 hours log or 6 days log display. To select base to be used press the  or  key.

When the  key is pressed, Display goes back to previous mode.

2.6.2 P code (Pull down time indication)

The control temperature and pull-down time are displayed alternately during pull-down operation. When the pull-down is completed, the P code will be deleted.

P001: Pull-down last for 1 hour.

P002: 2 hours passed since pull-down started.

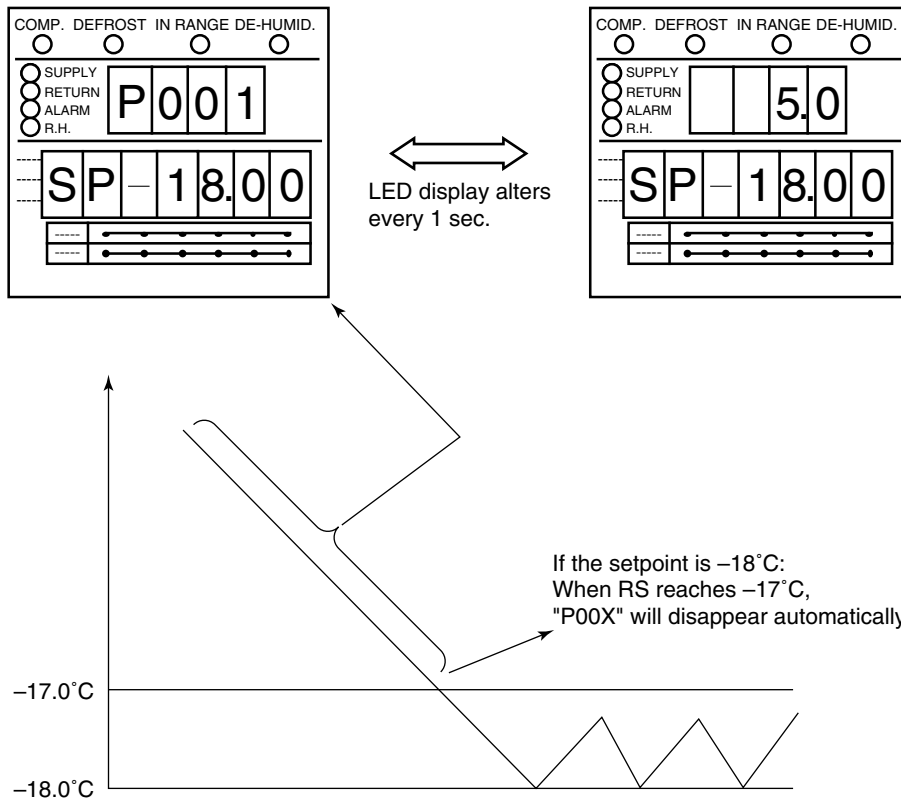


Figure1

2.6.3 Chartless code display function

The chartless code represents the coded inside air temperature.

Select "ON" for the chartless code setting to display the code on the LED display.

For the chartless code setting, refer to the "OPTIONAL CONDITION SETTING MODE" on pages 2-22~2-23.

- P code: Indicates pull-down time.
- H code: Indicates abnormal temperature records.
- d code: Indicates operation history.

2.6.3.1 List of chartless code

C: chilled mode, F: Frozen mode

	Code	Description	Operation mode	Figure
Abnormal temperature record	H001	Alarm is displayed when control temperature does not decrease by <u>3°C</u> or more, every 4 hours during pull-down operation.	C, F	2
	H002	The alarm is displayed when the total out-of- in-range reaches <u>2 hours</u> . (Count is not performed during defrost.)	C, F	3
	H003	The alarm is displayed when the integrated time of state "below SP-1°C" reaches <u>2 hours</u> .	C	4
	H004	The alarm is displayed when the integrated time of state "below SP-2°C" reaches <u>2 hours</u> .	C	4
	H005	The alarm is displayed when control air temperature is Out-of Range and defrosting was performed successively <u>three times</u> when the control air temperature does not return to in-range.	C, F	5
	H006	The alarm is displayed when over 2 deg.C temperature difference between control sensor and recording sensor more than <u>1 hour</u> .	C, F	6
Operation history	d3XX	When temperature stays +3°C above set point for <u>1 hour</u> , XX = 01 will be displayed.	C, F	7
	d2XX	When temperature stays +2°C above set point for <u>1 hour</u> , XX = 01 will be displayed.	C	7
	d1XX	When temperature stays +1°C above set point for <u>1 hour</u> , XX = 01 will be displayed.	C	7
	d-1X	When temperature stays -1°C below set point for <u>1 hour</u> , XX = 01 will be displayed.	C	7
	d-2X	When temperature stays -2°C below set point for <u>1 hour</u> , 2X = 21 will be displayed.	C	7
PXXX	XXX: When the total pull-down time reaches one hour, will display XXX=001 appears.	C, F	1	

Note 1) The Circled value setting can be changed. Setting in the box varies according to the Circled value setting.

Note 2) To delete the H code or d code, press the ↵ key for 3 seconds during the relevant code indicated.

Note 3) H code and d code are deleted when the power supply is turned off for 3 days.

2.6.3.2 H-code

H001 = Alarm is displayed when control temperature does not decrease by 3°C or more every 4 hours during pull-down operation.

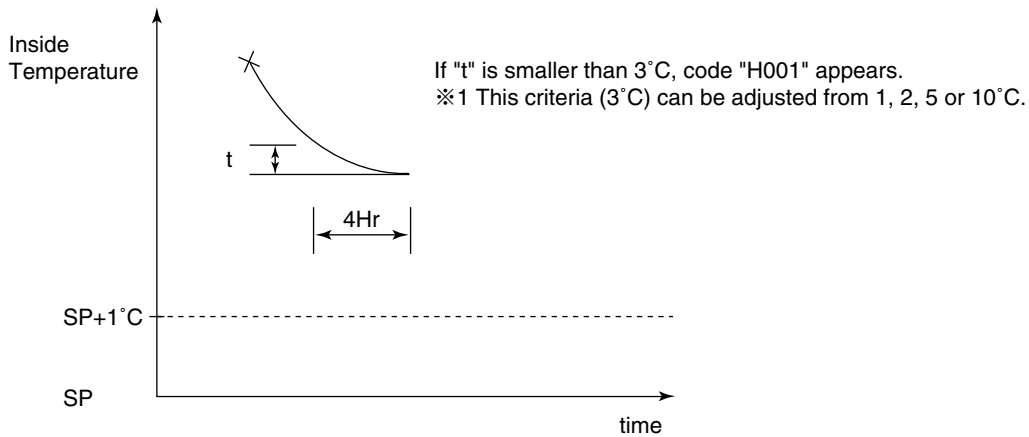


Figure2

H002 = Alarm is displayed when the total time out of range reaches 2 hours. (Counting is not performed during defrosting).

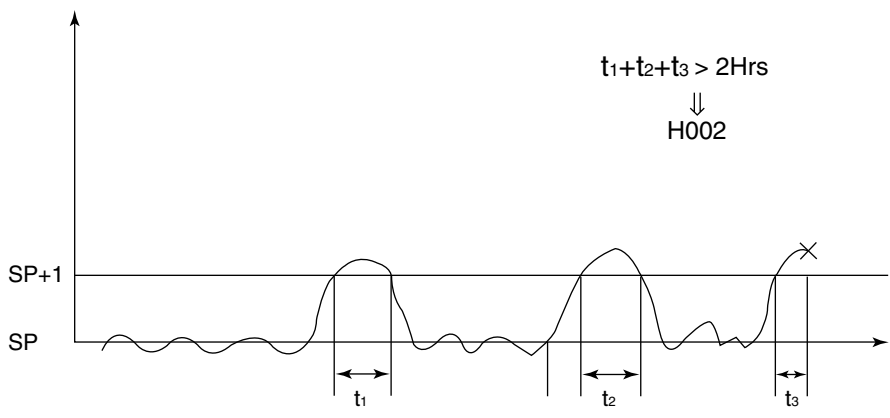


Figure3

H003 = Alarm will be displayed when the total time below setpoint -1°C for 2 hours.

H004 = Alarm will be displayed when the total time below setpoint -2°C for 2 hours.

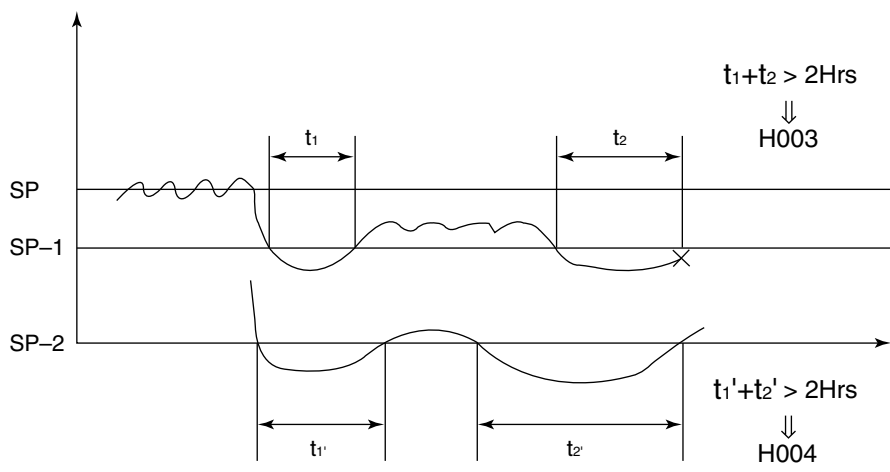


Figure4

H005 =Alarm is displayed when control air temperature is out of range and defrost was performed three times while control air temperature does not return to in-range.

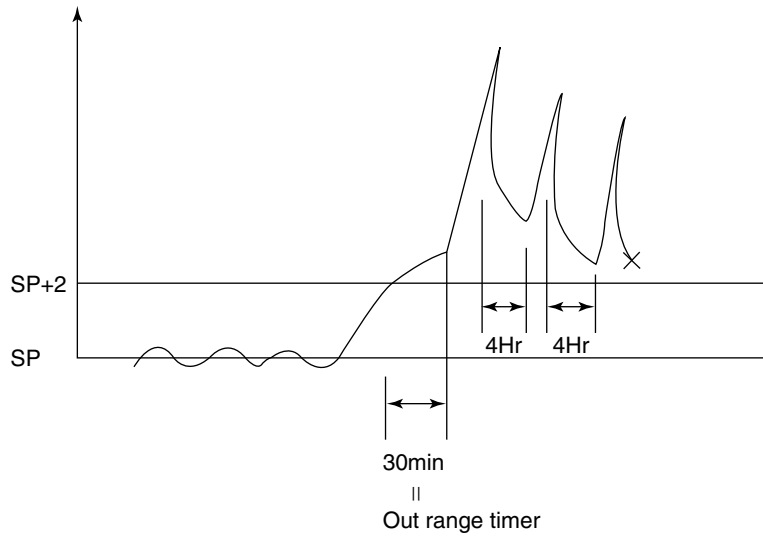
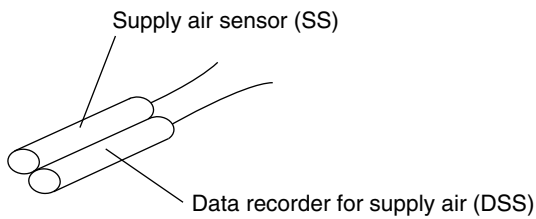


Figure5

※2

H006 =Alarm is displayed when the temperature difference between control sensor and recording sensor is 2°C for 1 hour, or more.



$$|DSS-SS| > 2^{\circ}C \rightarrow \text{H006}$$

Figure6

※1 Do not set the data recorder sensor ON/OFF setting to "OFF" in basic function setting mode. If it is selected to "OFF", cannot detect temperature difference between the control sensor and data recorder sensor.

※2 Regardless of whether the chartless code display function is set to "ON" or "OFF," this function will be activated.

2.6.3.3 d-code:

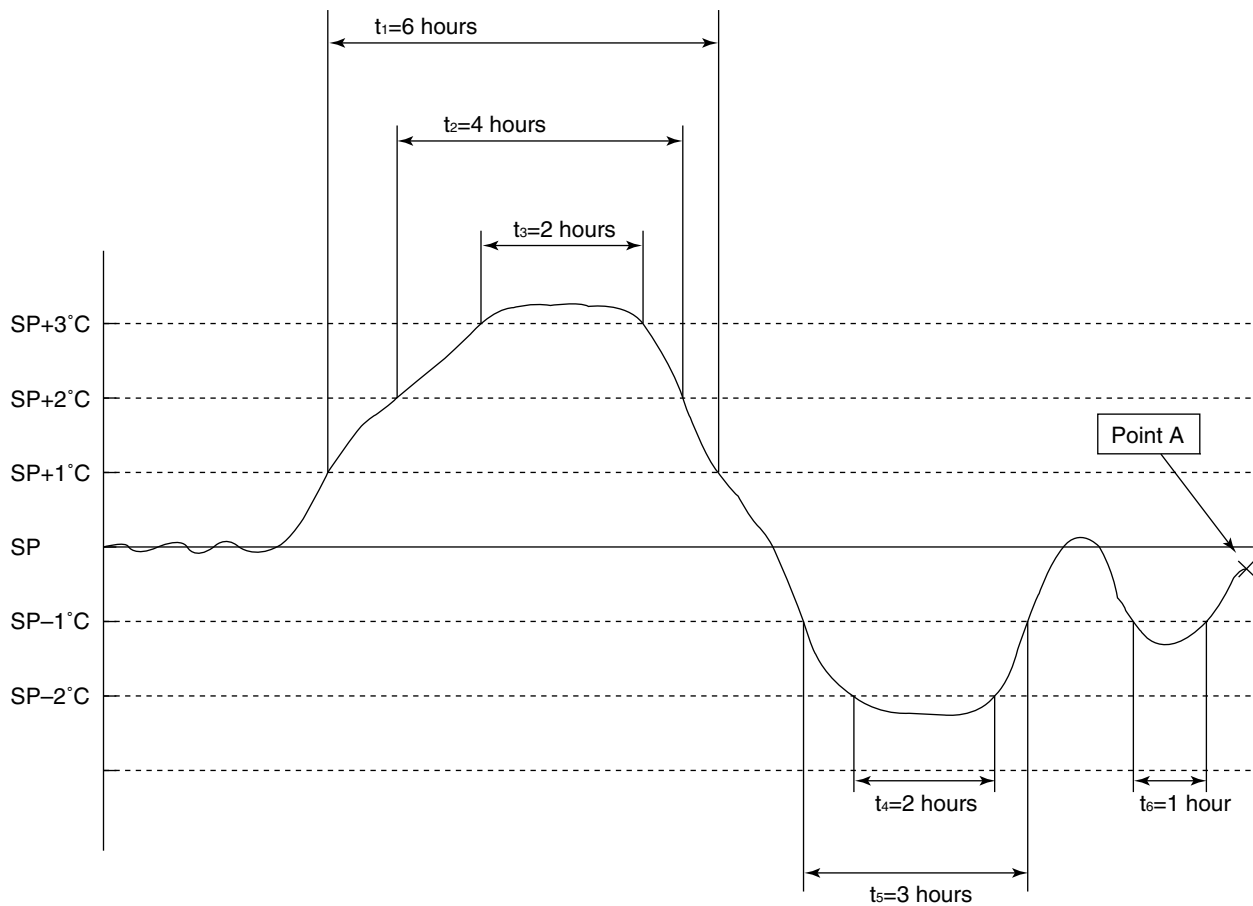
The d-code shows the current operation state of the unit.

Example d101:

- This code "d101" will be displayed when the total time above set point $+1^{\circ}\text{C}$ reaches 1 hour.
The code "d102" will then be displayed when the total time above set point $+1^{\circ}\text{C}$ reaches 2 hours.

Example d-21:

- This code "d-21" will be displayed when the total time below set point -2°C reaches 1 hour.
The code "d-22" will then be displayed when the total time below set point -2°C reaches 2 hours.



Example : If inside temperature was recorded above graph, controller shows the following "d code" when user checks codes at "point A"

- d106 (above setpoint $+1^{\circ}\text{C}$ for 6 hours)
- d204 (above setpoint $+2^{\circ}\text{C}$ for 4 hours)
- d302 (above setpoint $+3^{\circ}\text{C}$ for 2 hours)
- d-22 (below setpoint -2°C for 2 hours)
- d-13 (below setpoint -1°C for 3 hours)
- d-11 (below setpoint -1°C for 1 hour)

Figure7

2.7 Communication modem

DECOS III h controller can transmit operation data through power line, if slave modem is installed in control box.

The slave modem shall be complied with ISO10368. The following items can be monitored and/or send commands via master modem: (*1)

	Item	Description	
1	Inquiries (Remote monitoring)	<ul style="list-style-type: none">● Inside temperature and humidity● Set point temperature● Defrosting interval● Container No.● Logger header information● Alarm● Operation mode	<ul style="list-style-type: none">● Sensor data● Trip data● Alarm data
2	Commands (Remote control)	<ul style="list-style-type: none">● Set point temperature changing● Defrosting interval changing● Manual defrosting initiation	<ul style="list-style-type: none">● Container No. changing● Unit ON/OFF changing● Header information changing

(*1) According to the relationship among slave modem, Master modem and controller, items which can monitor and/or 2-way communication are different. Please contact DAIKIN sales office if you have a specific item to monitor or send commands.

3. SERVICE AND MAINTENANCE

3.1 Maintenance service

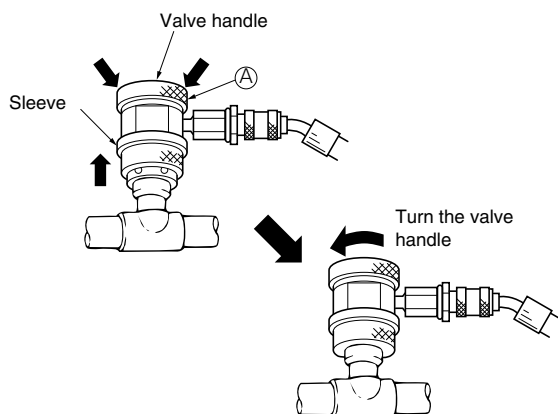
3.1.1 Recover refrigerant

- ① When recovering refrigerant from the refrigerant system, be sure to use a refrigerant recovery unit to protect the ozone layer around the earth from depletion.
- ② Observe all environmental laws relating to the country where the repair is performed.

3.1.2 Gauge manifold

(1) Attaching manifold gauges

Turn the valve handle of coupler counterclockwise (push pin is retracted). Slide the sleeve upward and press against the service port. Then, securely push the valve handle (section A) until a click sound is heard. After the coupler is inserted into the service port, release the sleeve. Next, turn the valve handle clockwise. Lower the push pin, and open the check valve at the service port.

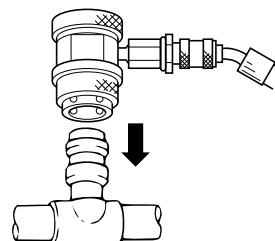


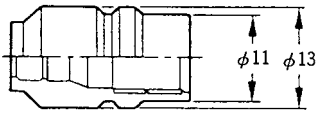
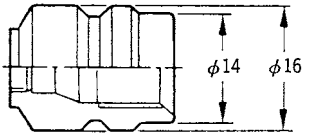
Note: Do not fully turn the valve handle clockwise. Otherwise the push pin may be broken.

WARNING

1. Use the pressure indicating function of the controller to check the working pressure as much as possible instead of using the gauge manifold in order to prevent foreign particles or moisture from mixing into the refrigerant system.
2. Do not use any pressure gauge, gauge manifold, charge hose and charging cylinder that has been used for CFC12 in order to prevent refrigerant or refrigerant oil of a different kind from mixing. Use the exclusive tools for HFC 134a.
3. The service ports are provided for easier securing.

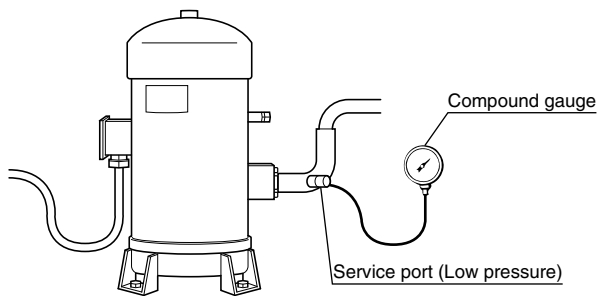
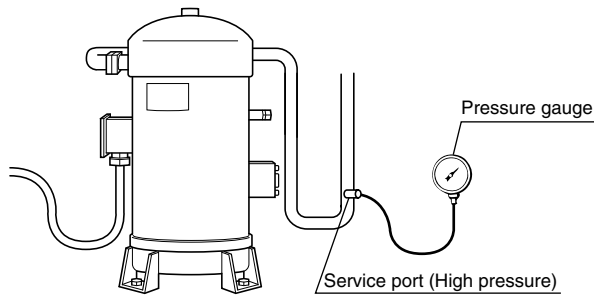
※ Quick joint system



HFC134a (SAE quick joints)	
Low pressure side	
High pressure side	

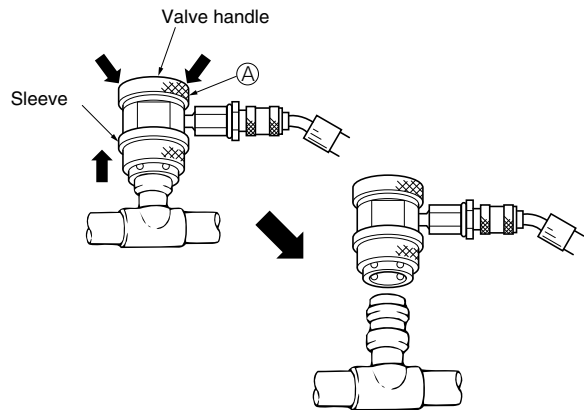
Be sure to use the gauge manifold with the quick joints shown above.

● Location of service ports on the high and low side of refrigeration system are illustrated below.



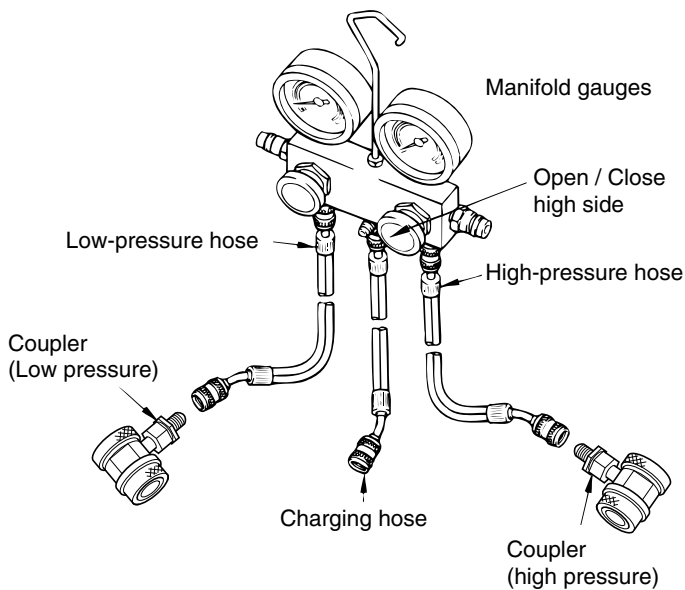
(2) Removal of gauge manifold

Turn valve handle of coupler counterclockwise (the push pin is retracted). Slide the sleeve upward while pushing down the valve handle (section A) to disconnect the quick joint from the service port.

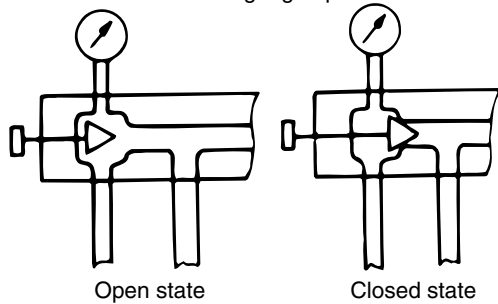


CAUTION

Be sure to install service caps to the service ports after removal of manifold gauges.



Manifold gauge operation

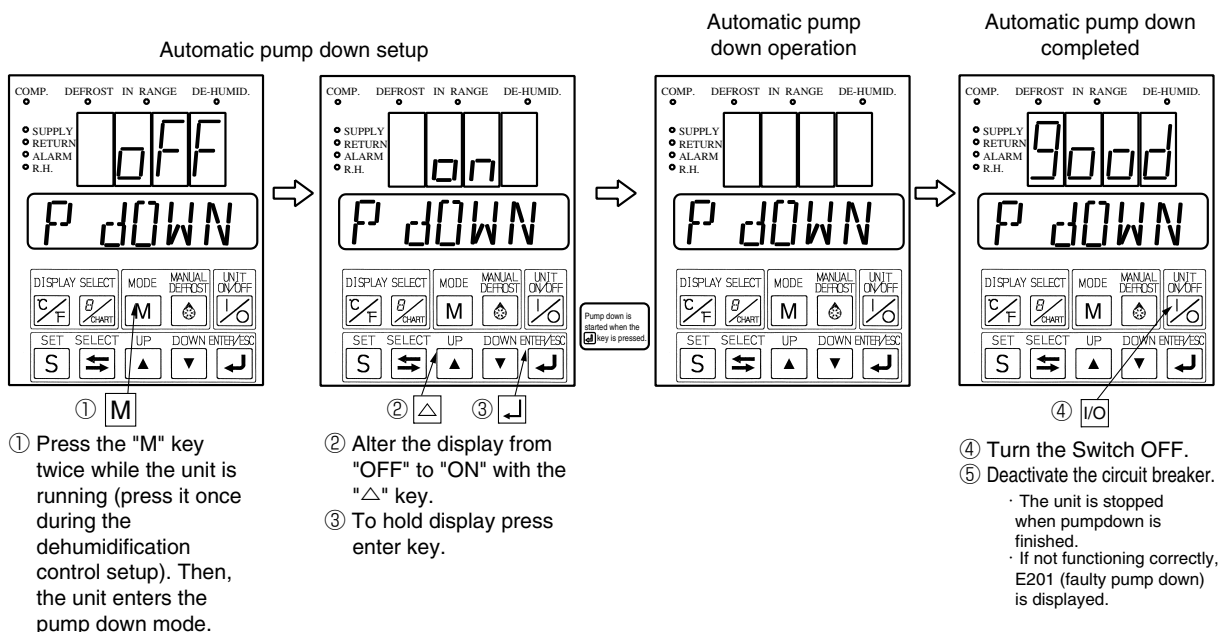


Open and closed states of manifold gauge

3.1.3 Automatic pump down

An automatic pump down is performed to prevent damage to compressor due to extremely low suction pressure or front seated service valve.

(1) Access to automatic pump down operation mode



(2) Use of automatic pumpdown

[1] Replacement of drier

※ After the automatic pumpdown operation is completed, pressure on each side of the drier is slightly higher than the atmospheric pressure.

Thus, although no ambient air will enter into the piping, even when the drier is replaced, replace it quickly in a short period. (For details, see section 3.2.5)

※ Therefore, the system inside does not need to be dried with vacuum after the drier is replaced.

[2] Recovering refrigerant

※ Before recovering refrigerant, perform automatic pump down operation.

(As for the details, see (3) of section 3.1.4)

[3] Charging refrigeration system (third step)

※ If the ambient temperature is low and refrigerant cannot be charged to the specified amount because of pressure balance, initiate an automatic pump down. (See (4) of section 3.1.4)

(3) Automatic pump down operation

Once the automatic pump down is started, all of the service works from refrigerant collection into the receiver, to the equalizing in suction piping system, can be executed automatically.

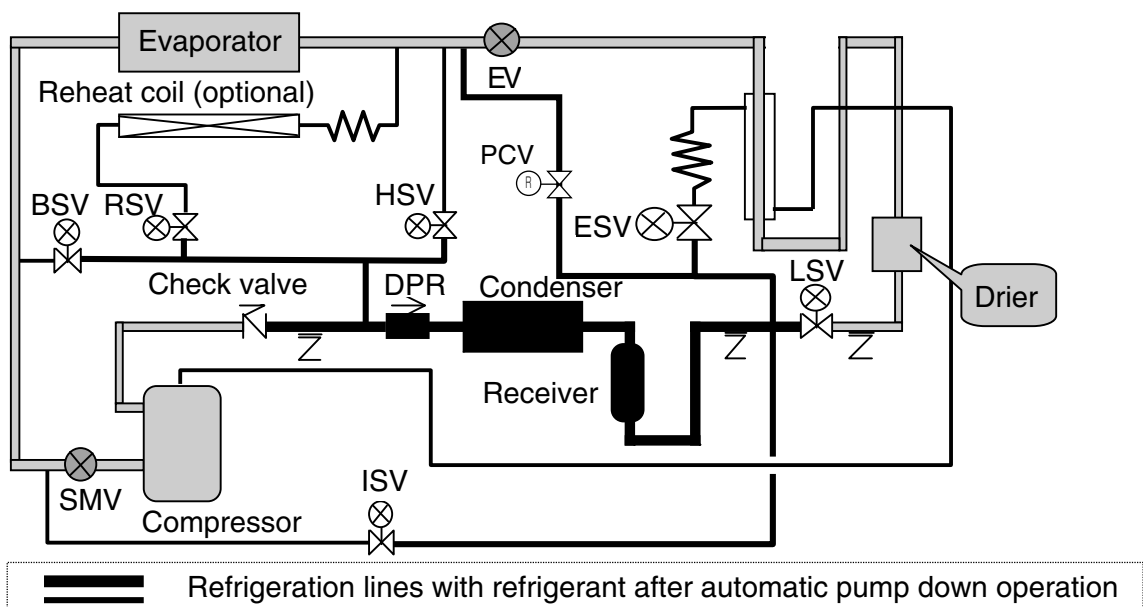
When "Good" is displayed, automatic pump down has finished and low side components can be serviced.

Step	①	②		③	④	⑤
	[Preparation] Turn on Automatic pump down. Normal operation for 30 minute ※ 1	[Pump down] ※2 Pump down start Compressor stop at $LP \leq -10kPa$		Compressor stop for 20 seconds.	[Pressure equalizing] All stop for 40 seconds. Prevention of air mixing (vacuum) in the system	[Termination] EV full close Termination "GOOD"
COMP	ON	ON	OFF	OFF	OFF	OFF
EFM	High speed	High speed	High speed	OFF	OFF	OFF
CFM	ON	ON	ON	OFF	OFF	OFF
LSV	ON					
ESV		ON				
ISV					ON (2nd) ※3	
HSV					ON (1st) ※3	
BSV						
RSV						
SMV	328pls(100%)	328pls(100%)	328pls(100%)	328pls(100%)	328pls(100%)	328pls(100%)
EV	77pls(18%)	146pls(34%)	146pls(34%)	146pls(34%)	146pls(34%)	0pls(fullclose)

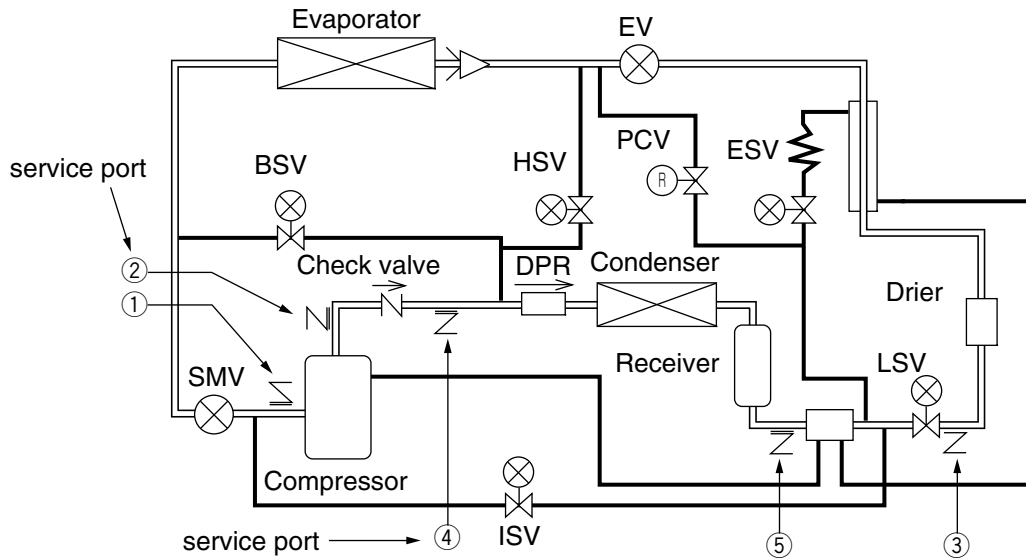
※1. If HPT exceeds 1700 kPa, no operation is executed for thirty seconds.

※2. The pumpdown operation described in ② ⇒ ③ shown in the table above is repeated depending on the status 20 seconds after the compressor is stopped (ten times, maximally).

※3. If LPT exceeds 0 kPa 40 seconds after the unit is stopped completely, next operation of shifting from "HSV ON" to "ISV ON" is not executed.



3.1.4 Refrigerant recovery and charge



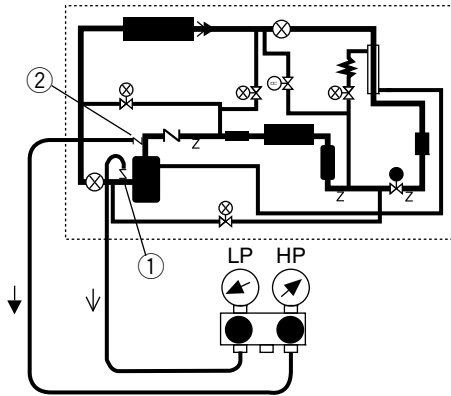
Service work		Service port	Remarks
Pressure Check	High pressure	②	
	Low pressure	①	
Refrigerant charge (R134a) <LXE10E100H> 4.5 kg For details, refer to the model name plate.	[1] Refrigerant Recovery	⑤	Recover refrigerant from port ⑤ after Automatic Pump-Down finishes.
		④ & ⑤	Completely recover refrigerant remaining by using service ports ④ & ⑤.
	[2] Vacuum & Dehydration	④ & ⑤	After recovering, evacuate system using ports ④ & ⑤. *The connection at port ④ is same size at ①.
	[3] Liquid charging	⑤→③※1 (④※2)	After evacuating, charge liquid refrigerant using port ⑤ first and them ③. Close gauge manifold and keep charging hose connected to ④. If not reached to the specified amount, go to next item below.
		③※1 (④※2)	1. Operate Automatic Pump-Down first and stop it using ON/OFF switch after compressor stops during the Auto pump down operation. 2. Charge liquid refrigerant from port ③.

Note)※1 Charging liquid refrigerant from ① causes malfunction of the compressor.

Note)※2 It is possible for air to enter when you remove ④ for vacuuming before finishing [3] liquid charging.

(1) Check refrigeration pressures

Check high pressure from the service port ② on the compressor discharge. Check low pressure from the service port ① on the compressor suction.



(2) Recovery non-condensable gas

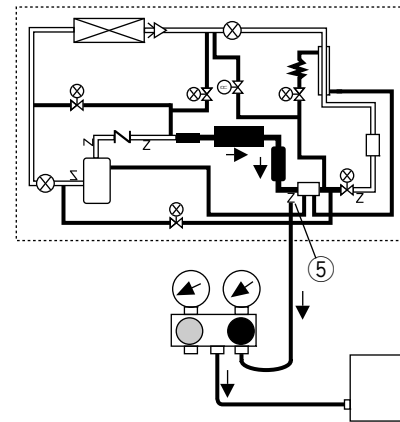
If air or other non-condensable gases are present in the refrigeration system they will gather in the condenser and the pressure inside the condenser will rise significantly and the thermal conductivity of the condensing surface will be decreased, resulting in deterioration of refrigeration performance. It is very important to remove non-condensable gases.

If the discharge pressure is abnormally high, check whether air or other non-condensable gases are present by following the procedure below.

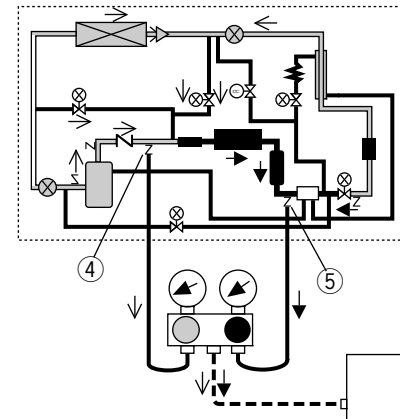
- After carrying out the automatic pump-down operation to collect refrigerant in the liquid receiver, stop the unit once. Operate the condenser fan in accordance with the condenser fan check procedure included in the manual check procedure, and wait until the air inlet and outlet temperatures are equal. Non-condensable gases are present if there is any difference between the saturation pressure and the condensation pressure corresponding to temperature of the outside air.

(3) Refrigerant Recovery

- ① Operate Automatic Pump Down.
- ② Recover refrigerant from port ⑤.



- ③ Completely recover refrigerant remaining using ports ④ & ⑤.



(4) Vacuum-dehydrating, and refrigerant charging

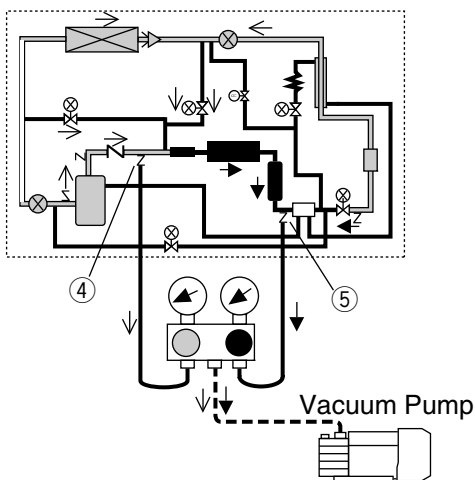
If all refrigerant has leaked out and air has entered the refrigeration system, repair leak and evacuate system. Then charge with proper amount of refrigerant.

[Required tools]

- 1. Refrigerant cylinder (content of 20kg) equipped with fittings HFC134a
- 2. HFC R134a manifold gauge with quick joints
- 3. Weighing scale (up to 50kg)
- 4. Vacuum pump

(a) Vacuum dehydrating

After recovering refrigerant, replace filter drier and evacuate system using service ports ④ and ⑤ at the liquid receiver outlet line and discharge pressure regulating valve inlet, then evacuate to 76cmHg. Disconnect the vacuum pump, while holding the refrigeration in a vacuum. However, if air enters in the refrigerant circuit, vacuum up the circuit to 76cmHg and then vacuum the system for another 2 hours or more.



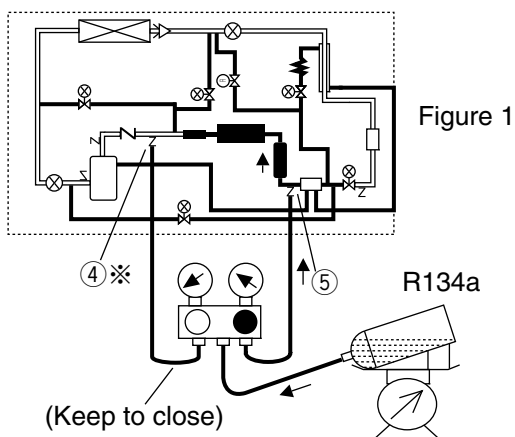
(b) Cylinder weight recording

Place a refrigerant cylinder on a scale and record the cylinder weight.

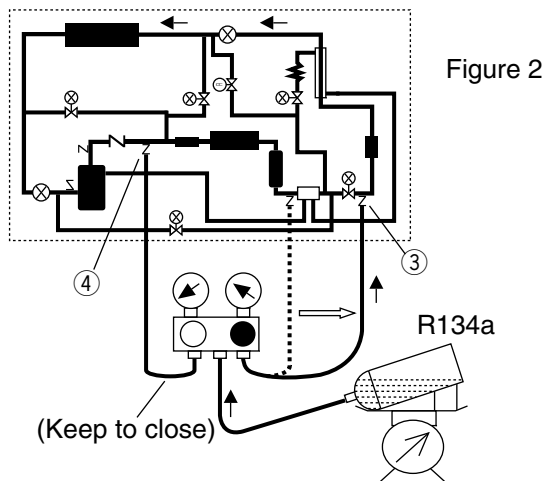
(c) Charging of liquid refrigerant

1. After vacuum & dehydration, charge the liquid refrigerant using port ⑤.
(Approx. 50% of the specified amount will be charged.)

Note)※It is possible for air to enter when you remove charging hose from service port ④ for vacuuming before finishing liquid charging.



2. Move manifold gauge hose to port ③ and add the liquid refrigerant. Then if it reached to the specified amount close valve on refrigerent cylinder. And remove all charging hose.



If it is not reached to the specified amount because pressures are equal, close valve on refrigerant cylinder and go to next 3 & 4.

3. Operate Automatic Pump Down first. When the compressor stops during the operation, stop the Auto. P. D. operation using Unit ON/OFF switch.

4. Open ref. cylinder valve and add liquid refrigerant using port ③. If reached to the specified amount close the valve on ref. cylinder.

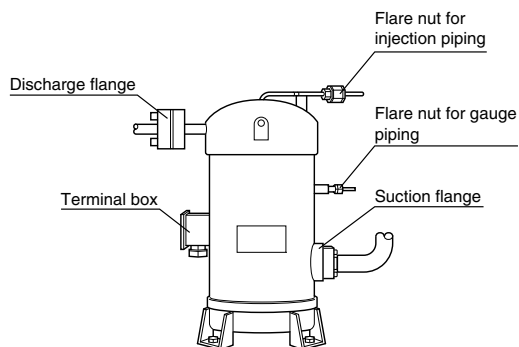
⚠ CAUTION

Carry out the operation check after the replacing and charging of refrigerant, then replace the drier.

3.2 Main components and maintenance

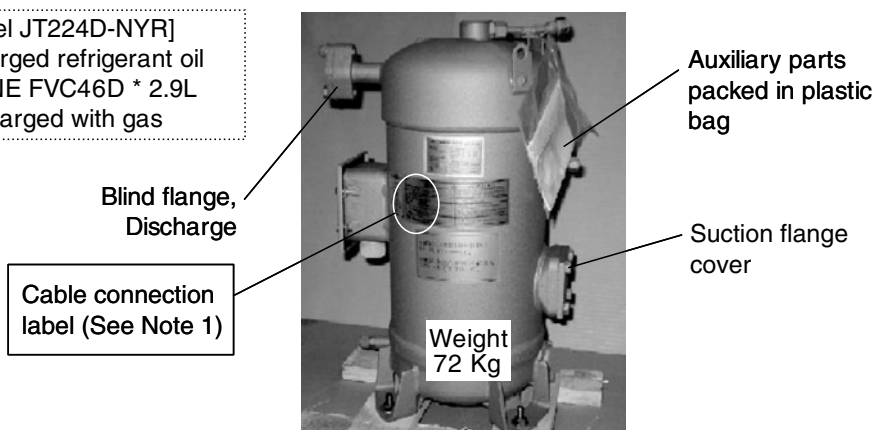
3.2.1 Scroll compressor

Compressor is a hermetic scroll type compressor with a built-in motor so there are less places for refrigerant to leak. Before delivery unit has been charged with refrigerant oil.



(1) Preparation of replacement compressor

[Model JT224D-NYR]
 * Precharged refrigerant oil DAPHNE FVC46D * 2.9L
 * Precharged with gas

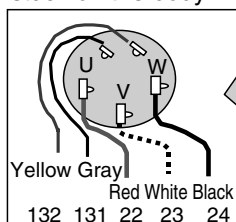


[Auxiliary parts]

Instruction card	Suction Gasket	Discharge Gasket	Securing tape for suction flange	Insulation tape for suction flange	Cable connection label for LXE10E-1
2 pcs	1 pcs	1 pcs	1 pcs	1 pcs	1 pcs
					(See Note 1)

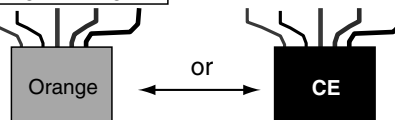
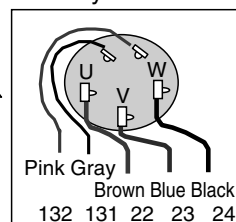
Note 1. Stick the auxiliary cable connection label onto the label stuck on the compressor body. This is only for LXE10E-1.

Cable connection label stuck on the body



Stick on

Auxiliary cable connection label



(For LXE10E-1)

Note 2. Do not replace precharged refrigerant oil out after removing the flange covers.



CAUTION

The preparation of refrigerant oil is not required.
 The compressor has been charged with the oil.

(2) Removal of compressor

Recover refrigerant

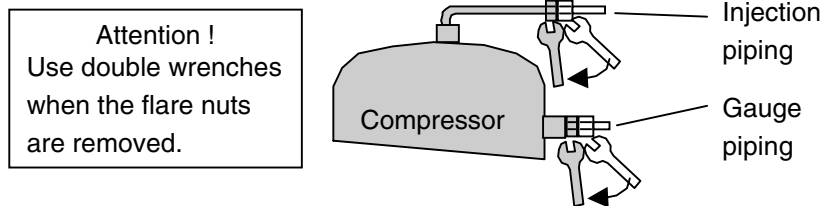
1. Recover refrigerant using service port ④ on discharge line and ⑤ at receiver/water cooled condenser outlet.
(Refer to the section 3.1.4 Refrigerant Recovery and charge)
2. Back seat discharge and suction service valves on compressor.

Disconnect cables and mounting bolts

3. Switch off the power.
4. Open the terminal box cover and disconnect wires.

Disconnect pipings

5. Remove the flare nuts on compressor injection line and compressor pressure gauge lines.

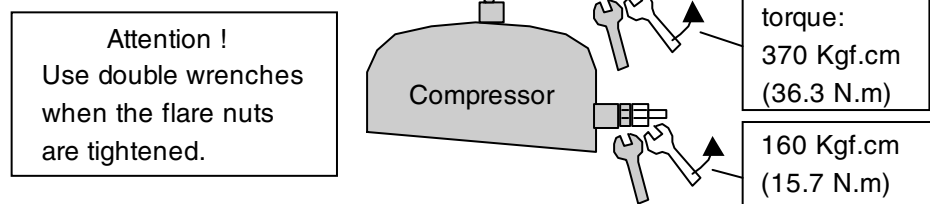


6. Remove the insulation tape on suction flange and discharge flange.
7. Remove the bolts for suction and discharge flange.
8. Remove compressor mounting bolts.

(3) Installation of compressor

Connect pipings and fix mounting bolts

1. Before connecting lines, screw in compressor mounting bolts but do not tighten.
2. Tighten the flare nuts on compressor injection line and gauge line on compressor body.



3. Install suction and discharge service valves on compressor flanges using supplied gasket.
4. Tighten compressor mounting bolts.

Tightening torque
257 Kgf.cm (25.2 N.m)

435 Kgf.cm (42.7 N.m)

Connect cables

5. Connect wires to the terminals.

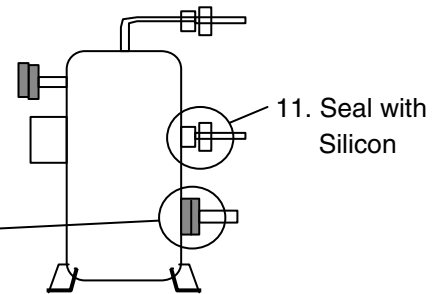
Attention ! Pay attention to the cable connection.
Incorrect wiring may run the compressor in wrong direction and may cause compressor failure.

Charge refrigerant

6. Open the discharge and suction service valves.
7. Evacuate and dehydrate from service ports ④ and ⑤.
8. Then charge refrigeration system using service ports ⑤ and ③.
(Refer to the section 3.1.4 Refrigerant Recovery and charge)
9. Leak check refrigeration system especially at suction/discharge flanges and flare nuts for injection gauge/gauge piping.
10. Install insulation tape and securing tape.
To suction flange using zip tie's.

11. Seal with silicon sealant around the flare nut for gauge piping.

10. Install insulation tape



CAUTION

The preparation of refrigerant oil is not required.
The compressor has been charge with the oil.



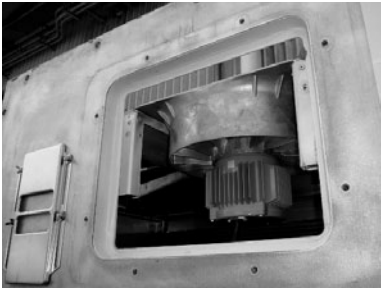
CAUTION

The unit does not have suction stop valve. Be sure to adhere packing tape at suction piping section to prevent moisture from entering.

3.2.2 Procedure to remove evaporator fan motor

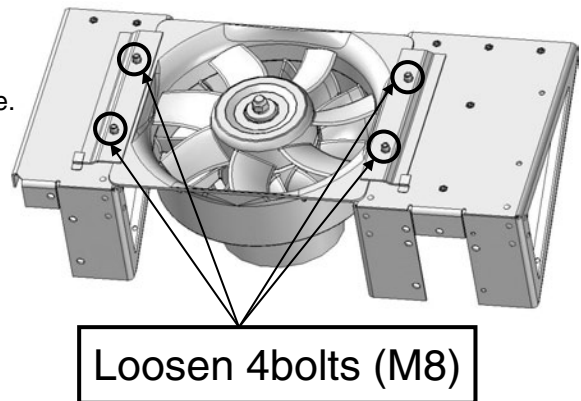
(1) Removing

- a. Remove access panel.

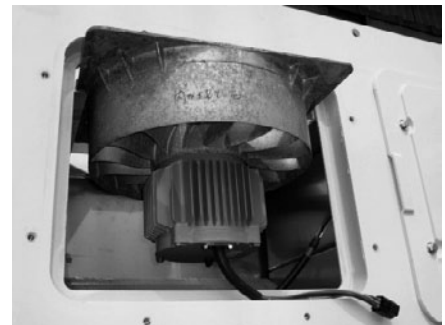
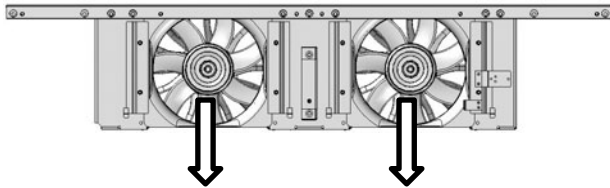


- b. Loosen 4 pcs bolts (M8) from fan blade mounting plate.

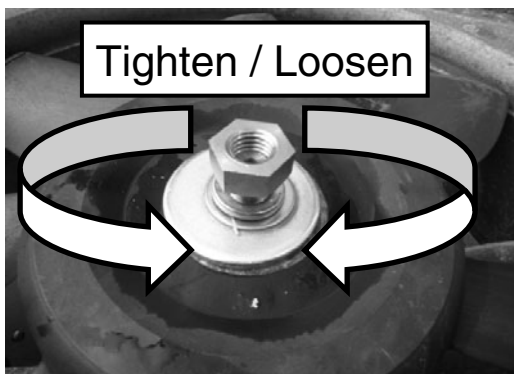
- c. Disconnect evaporator fan motor connector.



- d. Remove fan assembly toward front side.



- e. Remove fan mounting plate and replace fan motor.
(Mounting nut (M14) is reverse direction.)



(2) Installation

- f. Re-stall fan in a reverse way of removing.
Make sure to connect fan motor power plug connector securely.

3.2.3 Electronic expansion valve

● Model Coil : HCM-MD12DM

Body : HCM-BD35DM

This unit adopts an electronic expansion valve.

The electronic expansion valve controls the optimum refrigerant flow rate automatically, using the temperature sensor mounted on evaporator inlet and outlet pipes.

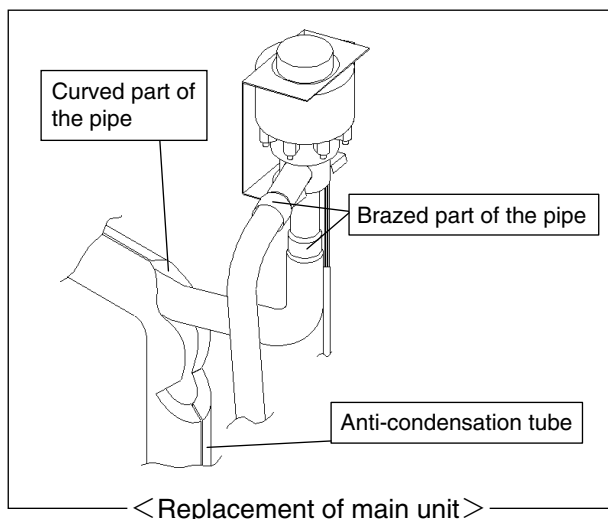
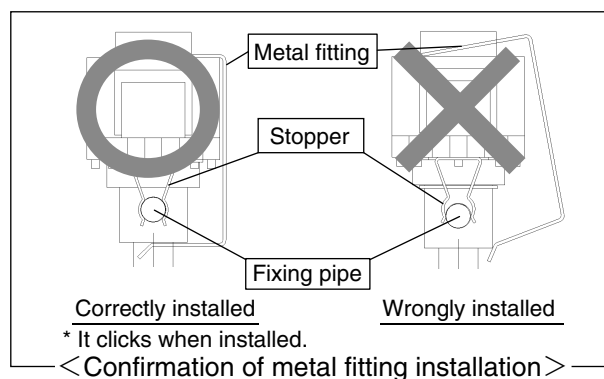
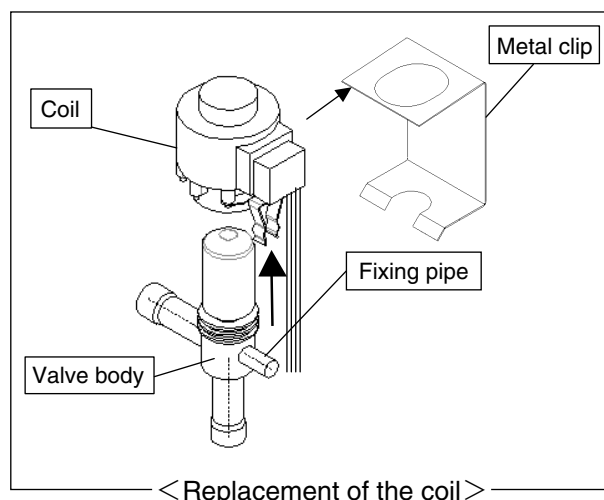
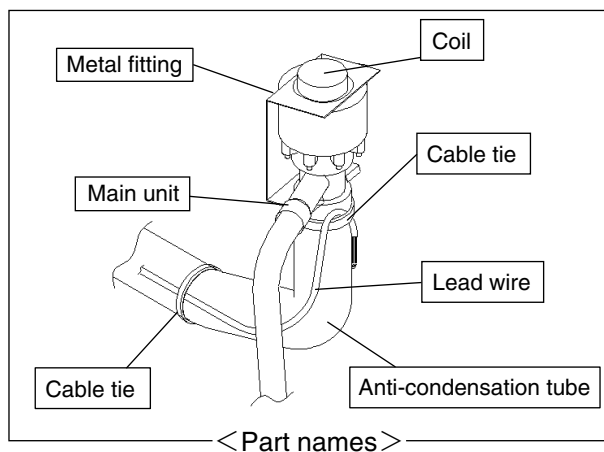
In case of emergency including controller malfunction, refer to the chapter on troubleshooting, section 5.4, Emergency operation.

(1) Replacing coil

- ① Remove cable tie securing coil lead wire.
 - ② Disconnect coil connector.
 - ③ Remove the metal clip and the coil.
 - ④ Install new coil.
 - ⑤ Install metal clip.
 - ⑥ Plug in coil connector. (*)
 - ⑦ Install cable tie's as shown in illustration.
- (*) Note) There are types with a connector that is a different shape.
Ensure that the connector is attached to the correct socket position on the I/O board side before use.

(2) Replacing body

- ① Remove the binding band fixing the coil lead wire.
- ② Remove the anti-condensation tube at the curved part of the pipe.
- ③ Remove the metal clip and the coil.
- ④ Un-solder expansion valve body.
- ⑤ Solder in the new valve body.
→Brazed the new valve body while cooling it with a wet cloth.
Maximum body temperature : 120°C (248°F) or less
- ⑥ Mount the coil and the metal clip.
- ⑦ Install the anti-condensation tubing.
- ⑧ Fix the coil lead wire with cable tie.



Attention (When installing the coil and the metal fitting)

- Securely attach the coil stopper to the valve body fixing pipe.
→If wrongly attached, the expansion valve may function abnormally, damaging the compressor.
- Take care not to allow the metal clip to damage or pinch wires.
→Malfunction of the expansion valve may arise.

3.2.4 Suction modulation valve

The flow rate of suction gas is controlled between 10 to 328pls (3 to 100%) by a stepping motor in order to control capacity.

1. Replacing the coil

● To remove coil

- (1) Disconnect the SMV lead wire connector ① from the inside of control box.
- (2) Cut cable tie ③ at the upper rubber cover ① and lower rubber cover ②, then remove the rubber cover ①.
- (3) Cut the tie wrap ⑤ located above the coil ④, then remove it.
- (4) Remove the coil ④ and the lower cover assembly ②.

● Reinstalling the coil

- (1) Install lower rubber cover assembly ② and the coil ④.

Note) Engage the dimple ⑧ of coil bracket ⑦ with the dimple (protrusion) ⑨ of coil ④, and adjust the angle as shown in the Fig. D.

Since the angle adjustment is important for control of suction modulating value, carry out the adjusting accurately.

- (2) Install ④ and coil bracket ⑦. Install cable tie ⑤ so that the coil ④ and the position of the dimple on coil bracket ⑦ are together.

Note) Ensure that the cable tie is in groove.

- (3) Route wires as shown in the Fig. A and Fig. D and fix them with the cable tie so there is no slack in the wires.

- (4) Install the upper rubber cover ①.

Note) Align upper cover to fit with the rim of lower rubber cover ⑩.

- (5) Install cable tie's ③ on upper and lower covers.

Note) Secure wire and wire loom so that water does not get between loom and wire. (Secure wire with cable ties.)

- (6) Connect plug inside of control box.

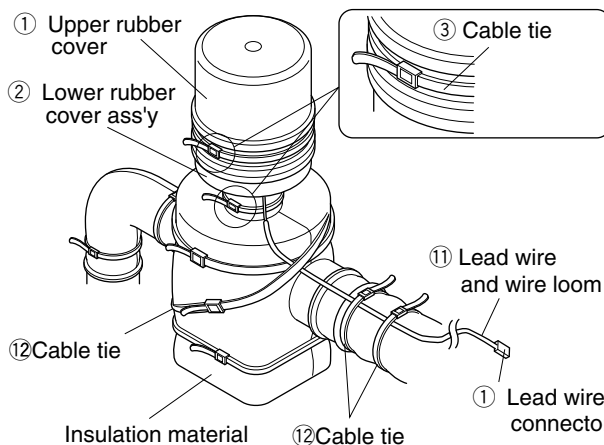


Fig. A

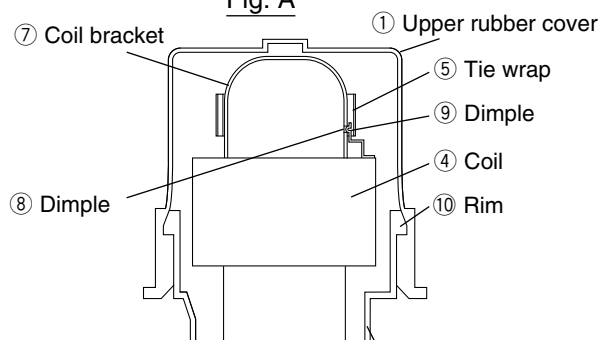


Fig. B

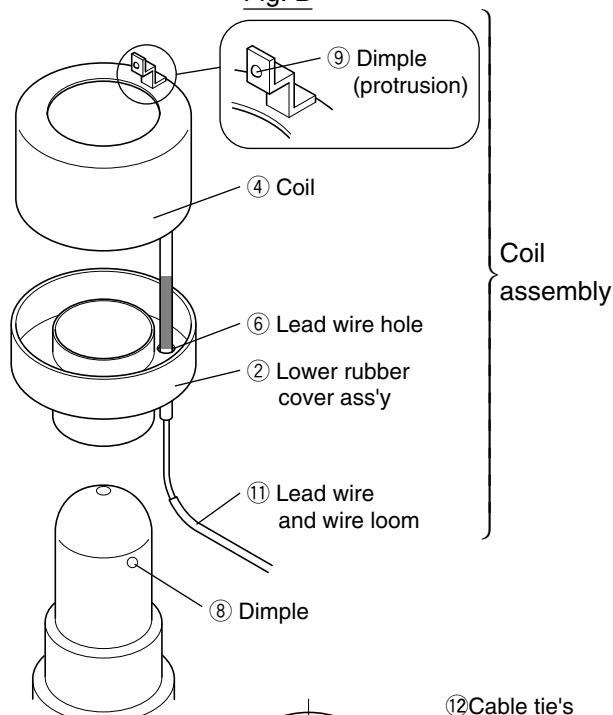


Fig. C

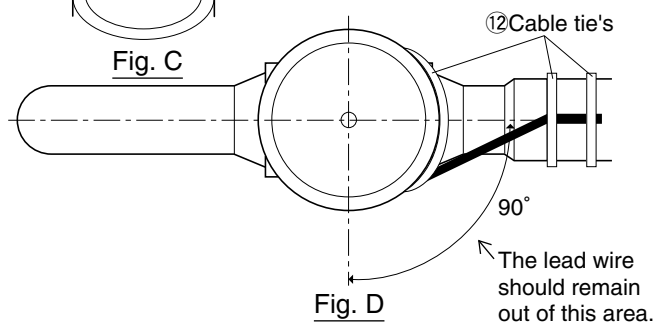
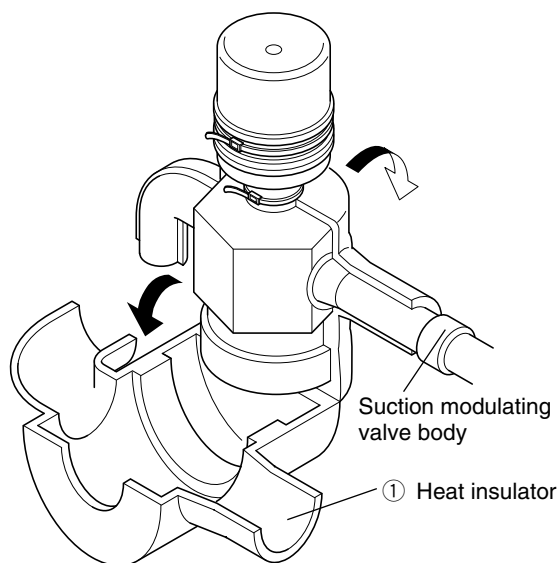
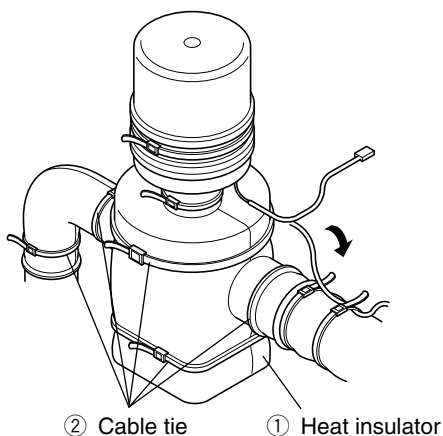


Fig. D

2. Replacement of body

- (1) Remove the coil. Refer to the section 1. "Replacing the coil" for removing procedure.
- (2) Remove the heat insulator ① for the SMV after cutting cable tie's ②.
- (3) Heat up the brazed joint on the line of SMV body and remove body.
- (4) Assemble braze new SMV body while keeping the temperature of the SMV below 120°C (248°F) by covering the body with wet cloths.
Note) When brazing, to keep the temperature of body, including valve body, coil, lead wire, etc. below 120°C by supplying water.
Be sure to prevent water from entering into the wire insulation.
- (5) Install the heat insulator ① and fasten it with cable tie's ②.
- (6) Install coil. Refer to the section 1. "Replacing the coil" for removing procedure on the previous page.

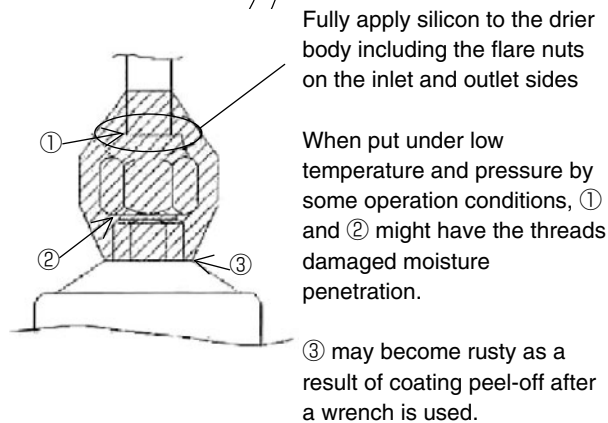
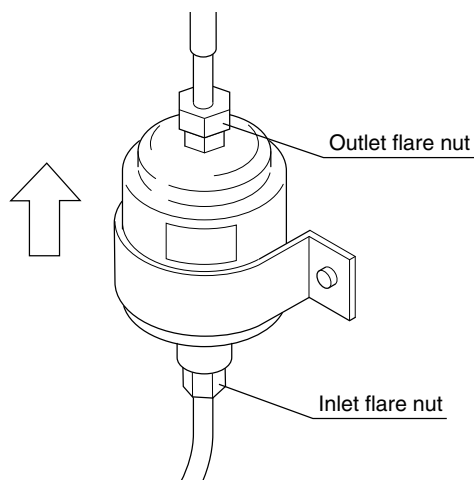


3.2.5 Drier

The drier absorbs moisture from the refrigerant. It also works as a filter to remove particles in the refrigeration system. Replace the drier if it does not absorb moisture, is plugged, or if the system has been opened to the atmosphere. When installing the new drier, refer to arrows on drier.

(1) Replacement procedure

- ① Conduct the automatic pump down to collect liquid refrigeration receiver. Refer to page 3-3 and 3-4 for the automatic pump down.
- ② Then, quickly replace the drier with a new one after loosening the flare nuts on the inlet and outlet side of the drier.
- ③ After replacing drier, be sure to check for leaks.
- ④ Check green color of the Sight glass after system start up.
- ⑤ Apply silicon to the drier body including the flare nuts on the inlet and outlet sides

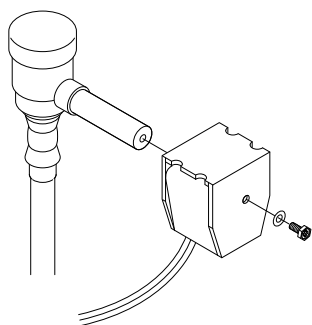


3.2.6 Solenoid valve

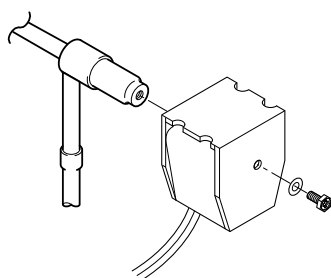
Two kinds of solenoid valves are employed for the unit.

Coils are similar and replacement procedure is also almost the same for all types of valves.

Valve name	Symbol	Valve type	Type of coil
Economizer Solenoid valve.	ESV	NEV-202DXF	NEV-MOAB507C
Injection Solenoid valve.	ISV		
Liquid Solenoid valve.	LSV	VPV-803DQ	
Discharge gas by-pass Solenoid valve.	BSV		
Hot gas Solenoid valve.	HSV		
Reheat Solenoid valve. (optional)	RSV		



VPV-803DQ
Fig. 1



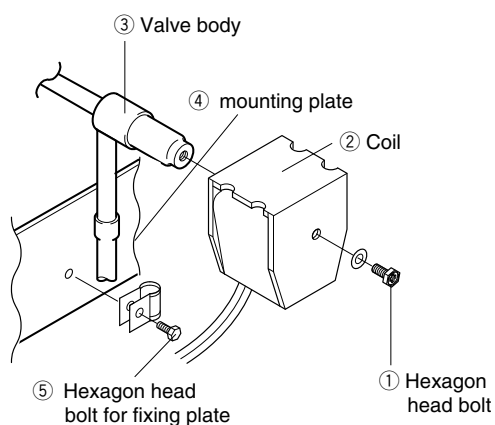
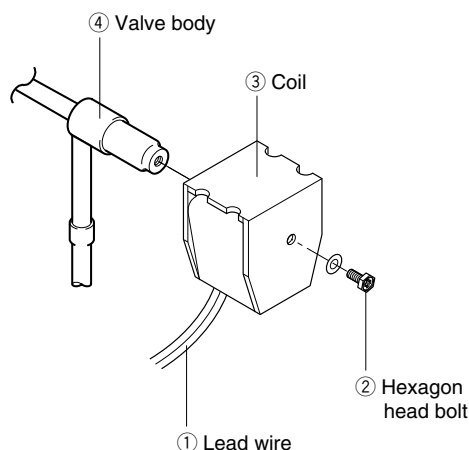
NEV-202DXF
Fig. 2

(1) Replacing the coil

- ① Remove connector from the inside of the control box, and cut and recover cable ties.
- ② Remove the hexagonal head bolt on top of the coil and remove coil.
- ③ Replace the coil with a new one and restore the hexagonal head bolt install cable tie's and connector on the original position.
When reassembling the coil, tightening torque should be 1.10 ~1.34 N m (11.21 ~13.66kgf·cm).

(2) Replacement of valve body

- ① Remove the hexagonal head bolt on top of the coil and remove.
- ② Remove the hexagonal head bolt of the mounting plate and cut the two pipes on each side of the valve body.
Disconnect the remaining pipes at the brazed joint sections.
- ③ Solder in new valve body while keeping the temperature of the valve body below 120 °C (248 °F).
- ④ Install coil and hexagonal head bolt of the mounting plate and the connector inside control box.

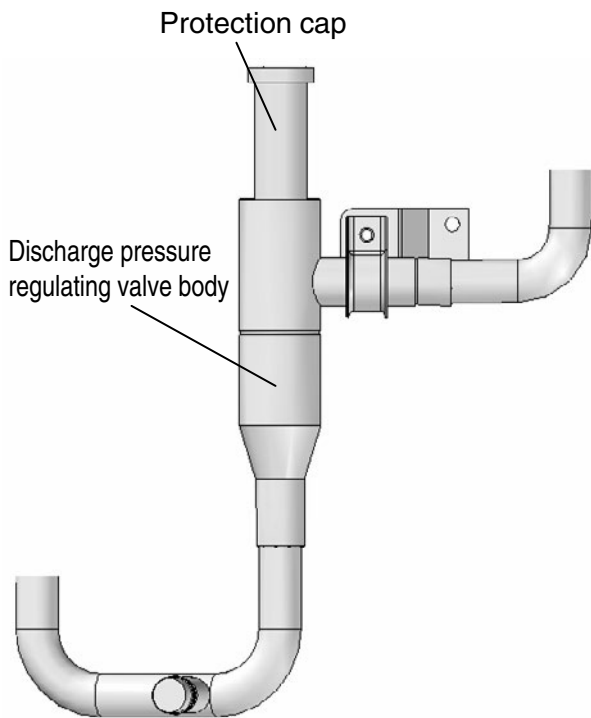


3.2.7 Discharge pressure regulating valve

- Model KVR15

(1) Valve replacement

- ① Remove the protection cap to conduct brazing for the valve body.
Be sure not to turn the regulating screw inside the valve, since the pressure has been adjusted to 690 kPa (7.0 kg/cm²).
- ② When brazing, it is required to keep the valve body below 140 °C by covering the body with wet cloth.
- ③ After brazing install and tighten the protection cap.
The tightening torque should be 8 to 10 N·m.
Apply lock-tight, etc. on the screw section to avoid loosening of the cap.
- ④ Leak check refrigeration system.

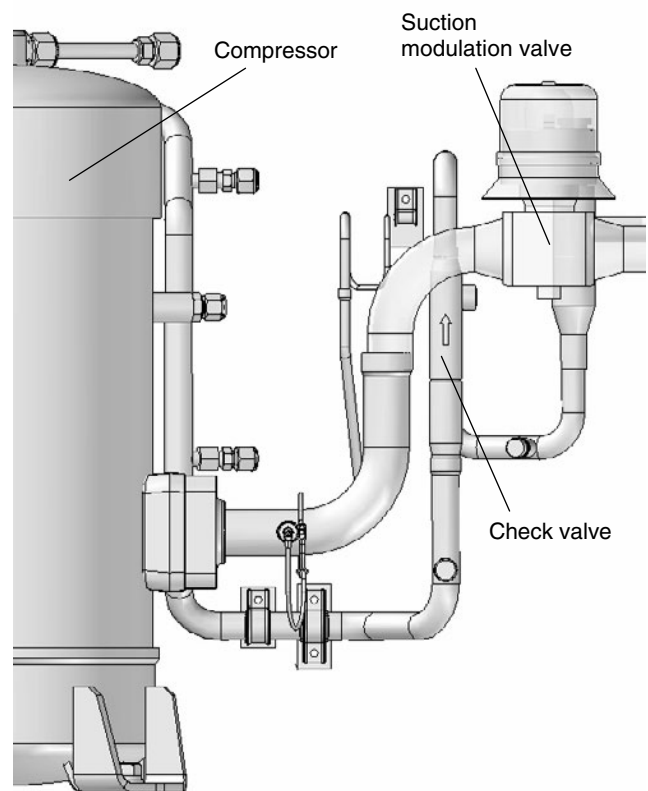


3.2.8 Check valve

- Model LCVP11-5D [LCV(B)5 is available]

(1) Replacement procedure

- ① Remove refrigerant line clamp at check valve, then un-solder valve.
- ② Install the new check valve taking care to install it in the correct direction, which is the same direction as the arrow shown illustrated below.
- ③ While brazing keep valve cool below 120 °C (248 °F) with a wet cloth.
- ④ After replacing the valve, Leak check refrigeration system.



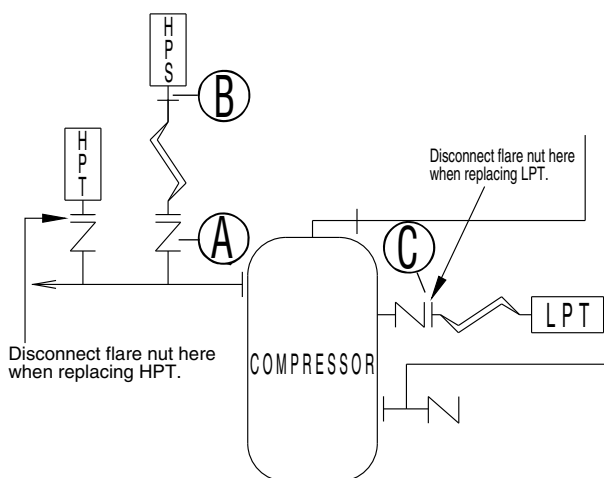
3.2.9 High-pressure switch (HPS)

- Model ACB-KB15
- Set point OFF : 2400kPa (24.47kg/cm²)
ON : 1900kPa (19.37kg/cm²)

When discharge pressure rises abnormally, compressor stops for safety. HPS activates when the high pressure is greater than or equal to 2400kPa due to poor water flow of the cooling water or condenser fan is failed.

(1) Replacement procedure

- ① Disconnect plug inside control box.
- ② In order to prevent refrigerant from flowing out, disconnect the high-pressure gauge piping from the gauge joint (with check valve) Ⓐ on the compressor side.
- ③ Remove the flare nut Ⓑ and mounting screws of HPS on the casing at the left side of the compressor.
- ④ Replace the HPS. tighten flare nut Ⓑ, then flare nut Ⓐ .
- ⑤ After tightening Ⓐ, slightly loosen the flare nut Ⓑ, remove air, and retighten Ⓑ.
- ⑥ After replacing, check for refrigerant leaks.



3.2.10 High pressure transducer (HPT)

Model		NSK
Transducer type		NSK-BH030F-391
Identification color	Transducer	Green body
	Connector	Nothing

The HPT is located in the refrigerant circuit. High pressure value is displayed on the controller display.

(1) Replacement procedure

The replacement procedure is the same as that for the low pressure transducer. Make sure mounting position and plug connection is correct.

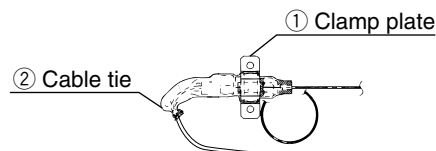
3.2.11 Low pressure transducer (LPT)

Model		NSK
Transducer type		NSK-BC010F
Identification color	Transducer	Black body
	Connector	Nothing

The LPT is located in the refrigerant circuit. Low pressure value is displayed on the controller display.

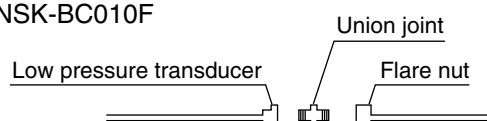
(1) Replacing the transducer

- ① Disconnect wire connection from the control box.
- ② In order to prevent refrigerant loss, disconnect the low-pressure transducer line from the gauge joint (with check valve) Ⓒ on the compressor side.
- ③ Remove two screws on the clamp plate securing low pressure transducer in place, and cut the cable tie.

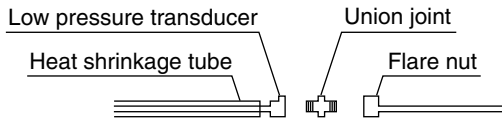



- ④ Remove the heat shrink tubing, and disconnect the connector from the low pressure transducer.

- NSK-BC010F



- ⑤ Insert the pressure transducer cable through the new heat shrink tubing, and connect the union joint and connector to the new low pressure transducer. If paint on the low pressure transducer is peeled off, apply clear lacquer.

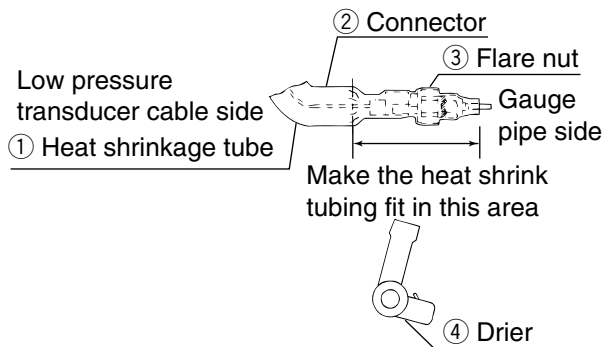




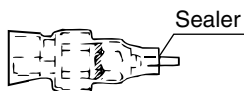
CAUTION

Do not expose the low pressure transducer to hot air of a drier for excess time.
Otherwise, the transducer may be damaged.

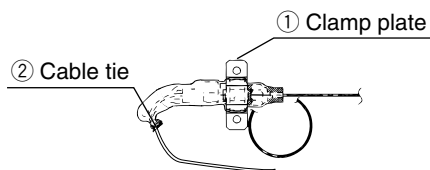
- ⑥ Apply the heat shrinkage in the following position, then shrink it with hot air of a drier.



- ⑦ Apply sealer between the heat shrink tubing and the flare nut. (Sealer :KE4898)

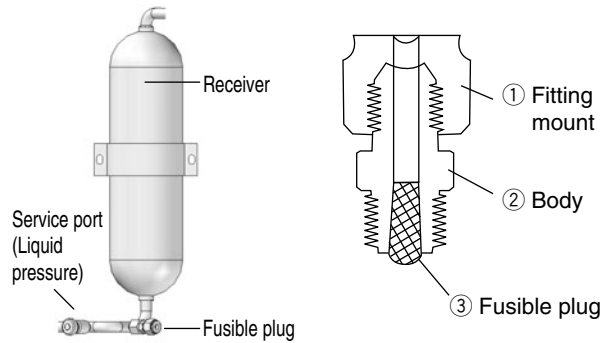


- ⑧ Secure low pressure transducer to the clamp plate, and install cable tie. Direct heat shrink tubing tube end of cable side down to prevent water from entering tube.



Direct heat shrink tubing end down

3.2.12 Fusible plug



● Replacing fusible plug

Refrigeration system pressures rise abnormally fusible plug will release pressure automatically by melting.

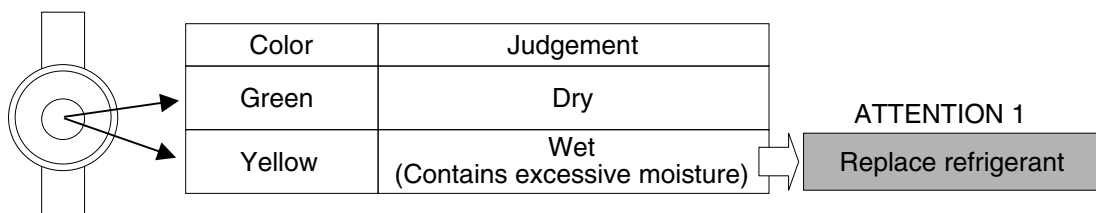
If the fusible plug is activated, the fusible alloy ① melts and refrigerant blows out (Melting point: 95°C ~100°C).

For replacement, ①-③ shall be replaced.

3.2.13 Sight glass

Sight glass Indicator shows refrigerant flow rate and moisture content in the refrigeration system.

(1) Sight glass



(2) Determining for refrigerant flow rate (normal, shortage or overcharge)

Operation		Judgement		
Frozen operation	RS < approx. 0°C Full	Normal	Refrigerant charge is normal if the indicator is full of liquid when RS is under approx. 0°C	ATTENTION 2 Due to EEV control, it is possible to show as full or bubbles repeatedly during pull-down. Determine normal or not normal when return temperature has reached -5°C.
	RS < approx 0°C Bubbles	Shortage	Refrigerant charge is suspected to short if the indicator always showing bubbling of refrigerant when RS is under approx 0°C	
	RS > approx 0°C Bubbles	Normal in most cases	Refrigerant charge is normal with flashing in the indicator in most cases, when RS is above approx 0°C	ATTENTION 3 As bubbling here does not mean gas shortage, do not charge with additional refrigerant.
Chilled operation	Bubbles	Normal in most cases	Refrigerant charge is normal with bubbling in the indicator in most cases during chilled operation with capacity control.	Possibly caused by overcharging

CAUTION

If the amount of refrigerant is excessive or insufficient, completely recover all refrigerant and charge with a correct amount of refrigerant.

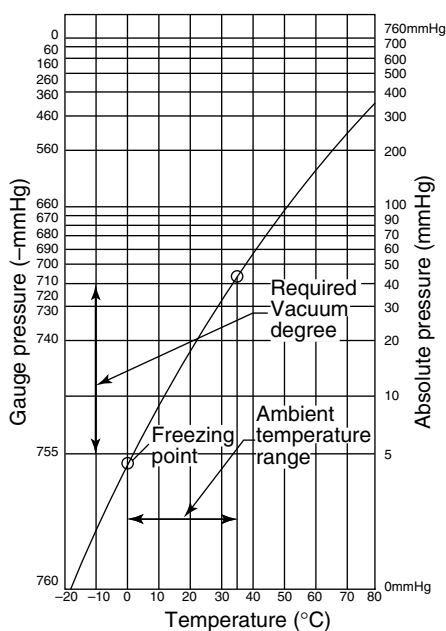
Additionally charging refrigerant exceeding the specified amount may cause a failure to the compressor.

3.2.14 Evacuation and dehydrating

After repairing refrigeration system, vacuate system before charging.

Evacuation is performed to remove moisture from refrigeration system using the vacuum pump. As the pressure lowers below normal atmosphere (760mmHg), the boiling point of water drops. If the boiling point drops beyond the atmospheric temperature, water will be vaporized.

Example: If the atmospheric temperature is 7.2 °C (45 °F), evacuation will be impossible unless pressure goes lower than -752mmHg. Important to maintain vacuum pump for optimized evacuation.



(1) Vacuum pump selection

When selecting a vacuum pump consider.

- ① Select a vacuum pump whose vacuum achievability is excellent. (A vacuum degree of -755mmHg or lower can be achieved.)
- ② The displacement must be relatively large (approx. 40 ℓ /min. or more). Before evacuation, be sure to confirm that the pump can achieve of -755mmHg or lower by using a micron gauge.

Boiling point of water (°C)	Atmospheric pressure(mmHg)	Vacuum degree(mmHg)
40	55	-705
30	36	-724
26.7	25	-735
24.4	23	-737
22.2	20	-740
20.6	18	-742
17.8	15	-745
15.0	13	-747
11.7	10	-750
7.2	8	-752
0	5	-755

(Reference) Kinds of vacuum pumps and achievable vacuum degree

Type	Achievable vacuum degree Displacement	Application	
		For vacuum-dehydrating	For air exhausting
Oil rotary type (oil-necessary type)	-759.98mmHg 100 ℓ /min.	Applicable	Applicable
Oil less rotary type (oil-unnecessary type)	-750mmHg 50 ℓ /min.	Inapplicable	Inapplicable
	-759.98mmHg 40 ℓ /min.	Applicable	Applicable

Take care that this type is often used as the most convenient type.

When using an oil type pump, it is important to replace the oil and check the achievability every 1 to 2 months.

(2) Evacuation procedure

There are two evacuation procedures, normal and special. Normal evacuation is used most often. If there is any moisture in the refrigeration system use special evacuation practices.

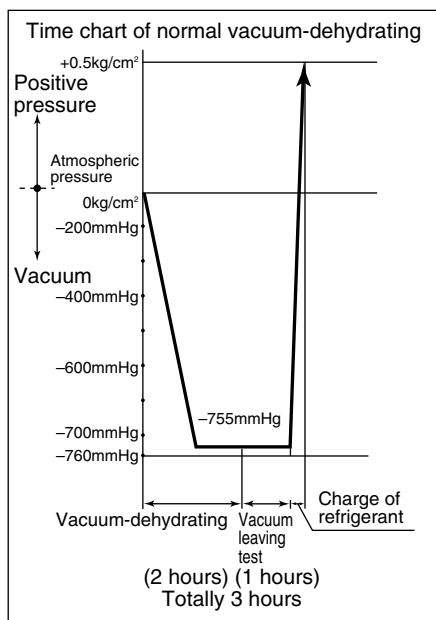
① Vacuum-dehydrating(first time)

Connect the gauge manifold to the service ports of the liquid line and the outlet of discharge pressure regulator. Evacuate to -755mmHg or lower.

If a pressure of -755mmHg or lower can not be achieved even after evacuating for 2 hours, moisture or leakage may exist in the system. In this case, run the pump another hour or more. If a pressure of -755mmHg or lower can not be achieved even after evacuating for 3 hours or more, check for leakage.

Note: Evacuate the system from service ports ④ of both liquid and outlet of the check valve ⑤, because the liquid solenoid valve is closed .

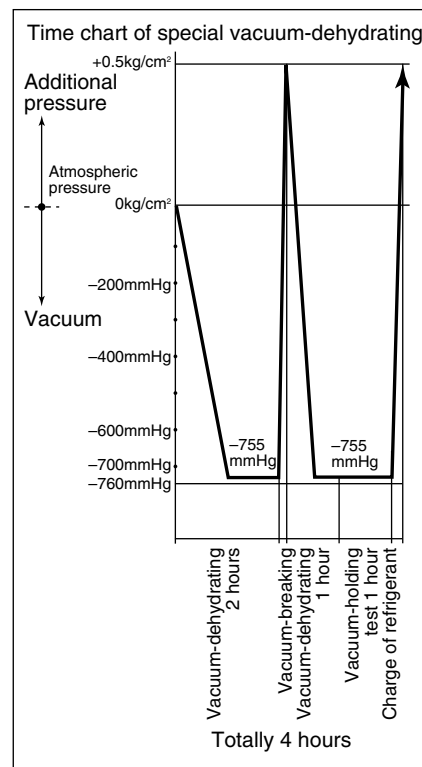
- ② Evacuation Holding Test
Hold the system at a pressure of -755mmHg or lower for 1 hour or longer and confirm that the vacuum reading does not rise on the vacuum gauge. If it rises, moisture or leakage may exist in the system. However, take care not to leak air from the gauge manifold. If air enters, it is recommended to use the copper tube directly instead of gauge manifold.
- ③ Charging of refrigerant
After the evacuation-holding test, make the circuit vacuous again for approx. 10 minutes. Then, charge the specified amount of refrigerant through the service port on the liquid line using the charging cylinder.



[Special evacuation-dehydrating]
Evacuation-breaking process with nitrogen gas is integrated one time or more in the same way as normal evacuation-dehydrating process.

- ① Evacuation-dehydrating (first time) 2 hours
 - ② Evacuation-breaking (first time)
Insert nitrogen gas pressurized to 0.5kg/cm^2 from the service port on suction pipe. Since nitrogen gas breaks the vacuum the effect of the vacuum-dehydrating is enhanced. However, if there is a lot of moisture, it can not be removed by this method. Therefore, do not allow water entry or produce water during the refrigerant piping work.
 - ③ Evacuation-dehydrating (second time)
Run the vacuum pump. (The achievable vacuum must be -755mmHg or lower.) If pressure of -755mmHg or lower can not be achieved even after evacuation, repeat step ② vacuum-breaking and ③ Evacuation-dehydrating.
 - ④ Vacuum holding test 1 hour
 - ⑤ Additional charge of refrigerant
- Same as normal vacuum-dehydrating

Note: Make sure to use nitrogen gas for vacuum-breaking. (If any oxygen gas is used, it may explode.)



($1\text{mmHg}=0.0013\text{kg/cm}^2=0.133\text{kPa}$)

3.3 Periodic inspection items

Always to operate the unit as specified, conduct periodic inspections of each part in addition to pre-operation and make adjustments or repairs where necessary.

The following table shows an example of inspection plan.

No.	Inspection item	Inspection content	2 nd year	4 th year	8 th year	
general structure	1	Inspect for physical damage	✓	✓	✓	
	2	Loose mounting bolts	✓	✓	✓	
	3	Condition of panels, hinges and locks	✓	✓	✓	
	4	Control box inspection	1) Cover seal inspection and replacement	✓	✓	✓
			2) Loose cable gland	✓	✓	✓
			3) Internal cleaning	✓	✓	✓
	5	Casing frame sealing holes condition	Air leakage and clearance	✓	✓	✓
	6	Seal inspection and replacement	Ventilator cover seals	✓	✓	✓
	7	Painted area recondition	1) Compressor	✓	✓	✓
			2) Water-cooled condenser/liquid receiver	✓	✓	✓
			3) Solenoid valve (coil cap)	✓	✓	✓
			4) Unit frame		✓	✓
	8	Repainting	1) Compressor			✓
2) Water-cooled condenser/liquid receiver					✓	
3) Condenser fan motor					✓	
4) Condenser fan					✓	
Refrigerant system	1	Refrigerant leaks	✓	✓	✓	
	2	Compressor	Water entering to compressor electrical terminals	✓	✓	✓
	3	Drier	Visual check	✓	✓	✓
	4	Function inspection and replacement of Sight glass			✓	
	5	Condition of refrigerant lines and gauge lines clamp hardware		✓	✓	✓
	6	Condition of refrigerant line thermal insulation		✓	✓	✓
	7	Evaporator coil cleaning (BY water)		✓	✓	✓
	8	Condenser coil cleaning	1) Water-cleaning	✓	✓	✓
			2) Steam-cleaning (after pumping down the refrigerant)		✓	✓
9	Water-cooled condenser inspection	1) Water-leakage inspection	✓	✓	✓	
		2) Operation of water pressure switch	✓	✓	✓	

Note) If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

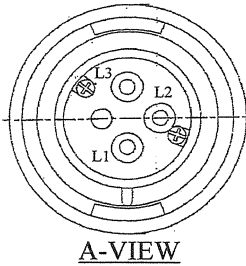
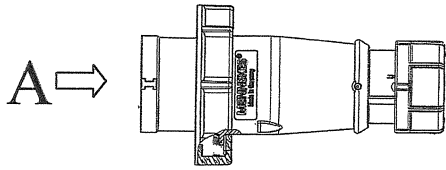
No.	Inspection item	Inspection content	2 nd year	4 th year	8 th year
1	Damage of power cable and plug		✓	✓	✓
2	Inspect condition of internal wiring		✓	✓	✓
3	Terminal looseness inspection and retighten if necessary	1) Magnetic switch	✓	✓	✓
		2) Electronic controller terminal block	✓	✓	✓
		3) Terminal block	✓	✓	✓
4	Condition of monitoring receptacle cap		✓	✓	✓
5	Condition of personal computer receptacle cap		✓	✓	✓
6	Fuse conditions	Good or Bad	✓	✓	✓
7	Magnetic contactor inspection and replacement	1) Contact point inspection	✓	✓	
		2) Replace compressor contactor			✓
		3) Replace condenser fan contactor			✓
		4) Replace evaporator fan contactor			✓
8	Electrical insulation check	1) Power cable and plug	✓	✓	✓
		2) Compressor	✓	✓	✓
		3) Condenser fan motor	✓	✓	✓
		4) Evaporator fan motor	✓	✓	✓
9	Thermo sensor	1) Installation condition of sensors	✓	✓	✓
		2) Inspection of sensor and sensor lead for damage	✓	✓	✓
		3) Display error inspection and replacement	✓	✓	✓
10	PT/CT (voltage and current) indication error inspection		✓	✓	✓
11	Pressure sensor indication error inspection		✓	✓	✓
12	Electronic controller	LCD panel replacement		✓	✓
13	Evaporator fan motor	Inspect bearings	※	※	※
14	Condenser fan motor	Inspect bearings	※	※	※
15	Evaporator fan	Deformation and damage inspection	✓	✓	✓
16	Condenser fan	Deformation and damage inspection	✓	✓	✓

※It is recommended to manually turn the rotating shafts once every three months.
This is to prevent poor lubrication of rotating shaft parts.

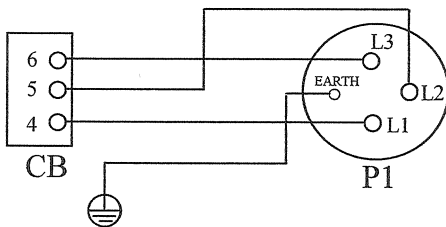
3.4 Wiring diagram for external junction port

3.4.1 Power plug (P1)

- Location

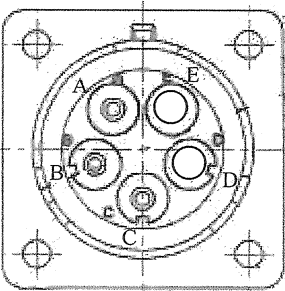


- Wiring diagram

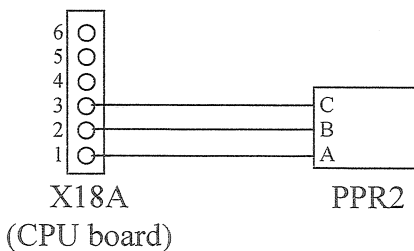
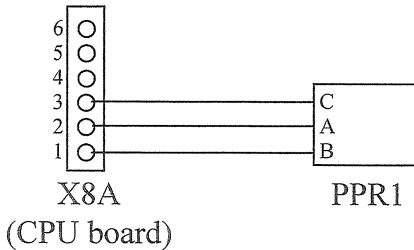


3.4.2 PC port (PPR1,2)

- Location (Seen from front on)



- Wiring diagram

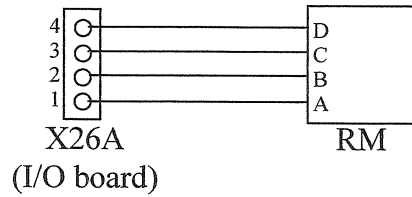


3.4.3 Remote monitoring connector (RM) (Optional)

- Location (Seen from front on)



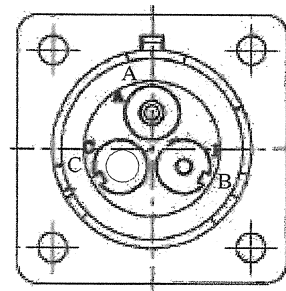
- Wiring diagram



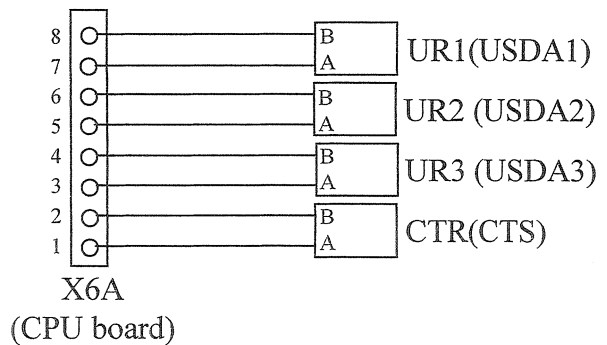
3.4.4 USDA sensor 1-3 junction port (USDA1-3) (Optional)

Cargo temperature sensor junction port (CTR) (Optional)

- Location (Seen from front on)



- Wiring diagram



4. OPTIONAL DEVICES

The following optional devices are available for some models. For other optional devices, refer to the "Optional function" manual and parts list.

4.1 Cold treatment transport

Models equipped with USDA sensor and receptacle (optional for both) can perform cold treatment transport.

4.1.1 Setting the number of USDA sensor connections

It is necessary to set the number of USDA sensor connections prior to cold treatment transport. The setting procedures are described below

Setting the number of USDA sensor connections

The number of USDA sensor connections can be 3 or 4. Set "3" or "4" in accordance with the number of connections based on the cold treatment transport standards (USDA). If there is no USDA transportation, set "OFF"

Note 1: For the setting procedures of the number of USDA sensor connections, refer to 2.2.2 (10. Optional function setting mode)

Setting the number of USDA sensor connections

USDA setting "OFF", "3", "4"	Number of connections
OFF	When there is no USDA transportation
3	3
4	4

4.1.2 USDA sensor calibration

USDA sensors must be calibrated for each trip. Connect PC with installed DCCS software and operate according to procedures. Select "USDA SENSOR CALIBRATION" when the number of USDA sensor connections is 3 and select "4 PULP SENSOR CALIBRATION" if the number of them is 4. For details, refer to DCCS operation manual

Checking USDA sensor type setting

If a significantly different calibration value is obtained at calibration it is possible that the USDA sensor model setting is incorrect. USDA sensor type includes "ST9702-1" type and "NTC" type. Refer to 4.1.5 in the USDA sensor. Make sure that USDA1/2 is set to "1" for "ST9702-1" type and "2" for the "NTC" type.

If the setting is wrong, correct it.

Note 1: To set USDA1/2 to "1" or "2", refer to 2.2.2 (12. Optional condition setting mode)

Note 2: Setting error does not allow the controller to recognize the sensor property and correct data cannot be recorded. Be sure to connect correctly

USDA sensor model setting

USDA1/2 setting to "1" or "2"	Sensor type Probe type
1	ST9702-1
2	NTC

4.1.3 USDA report

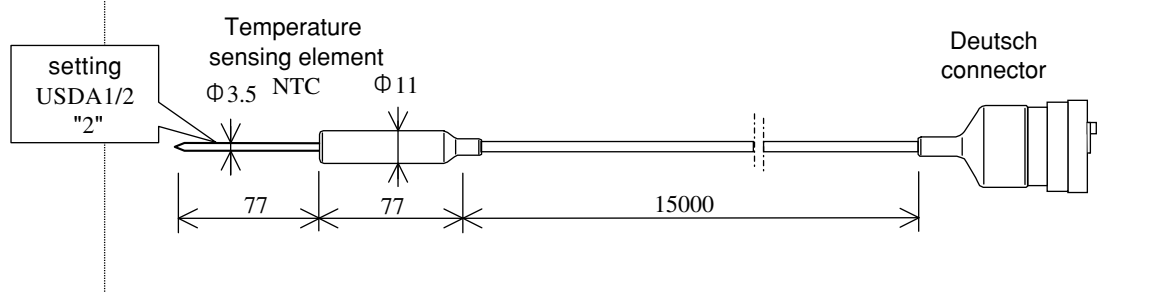
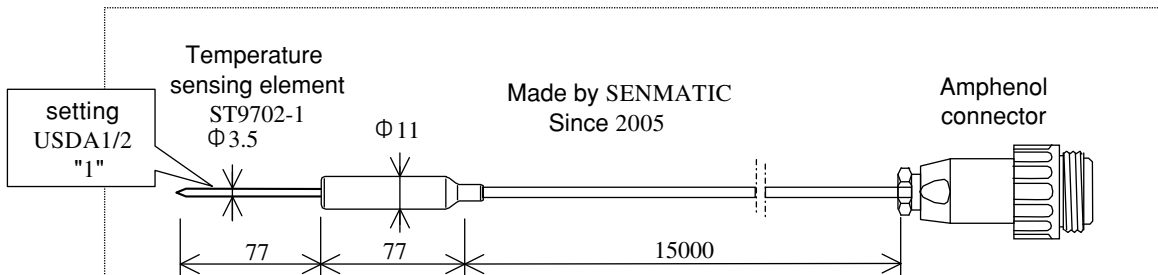
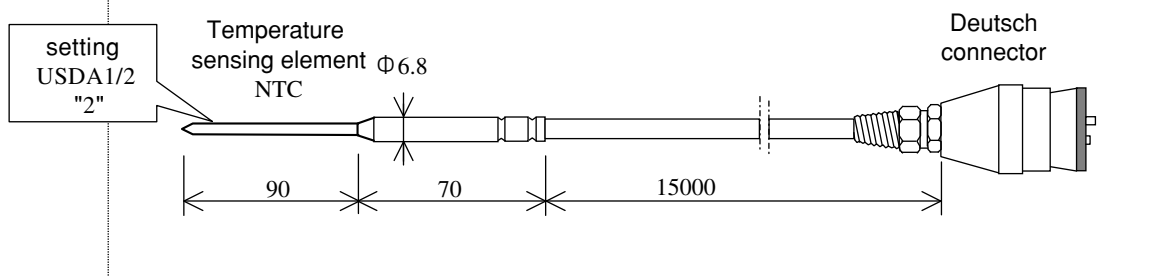
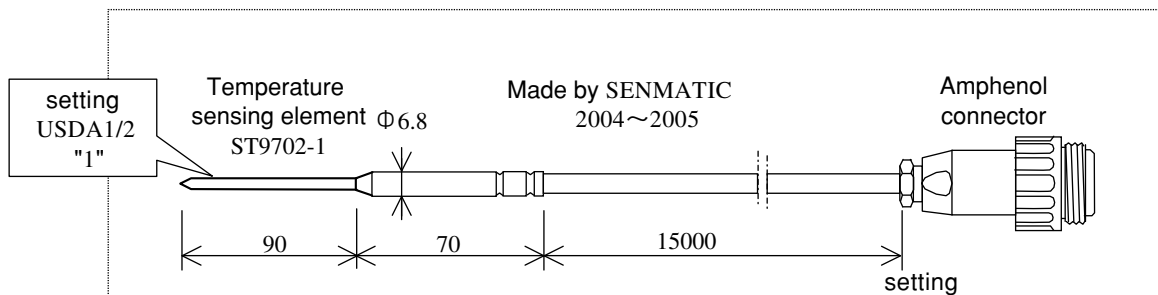
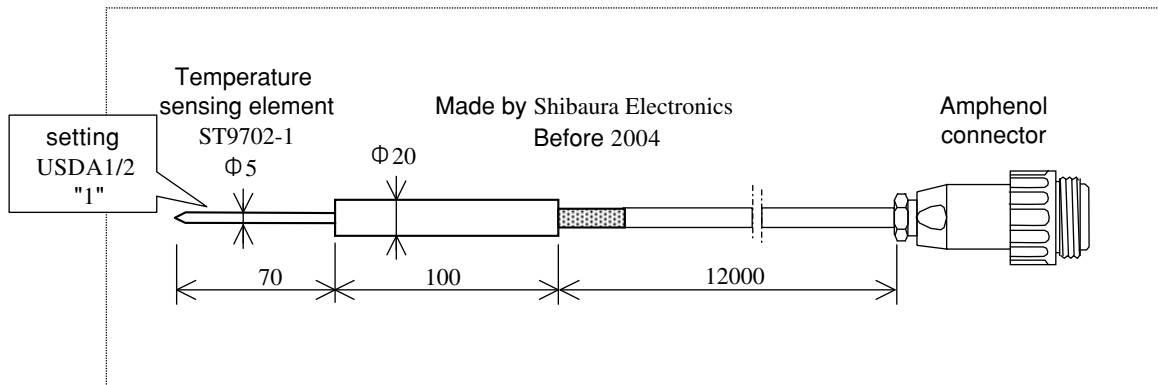
Temperature record data during cold treatment transport can be prepared in the format that conforms with USDA standards which is downloadable from the PC with DCCS software. Select "USDA TREATMENT REPORT" when the number of USDA sensor connections is 3 and select "4 PULP SENSORS TREATMENT REPORT" when the number of them is 4. For details, refer to DCCS operation manual

4.1.4 Battery check and replacement

Temperature data must be recorded for 72 hours after the power is turned off. Be sure to check the backup batteries for the controller prior to voyages.

Rechargeable batteries : Check battery voltage mentioned in 5.6 section.

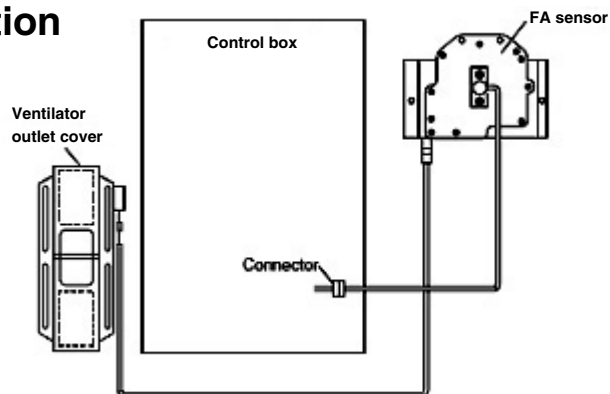
4.1.5 USDA sensor types and setting



4.2 Ventilator outlet opening detection (FA sensor)

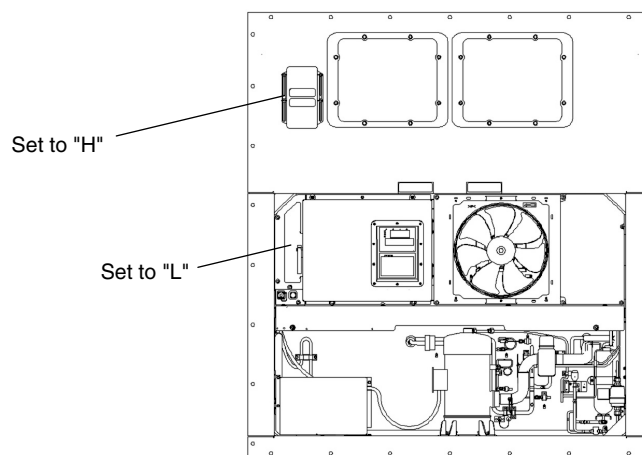
● Type: 5ZZ2157

Consisting of the body (wire reel and position meter) and the wire. The top of the wire is connected to the ventilator outlet cover so that the ventilator outlet opening can be detected.

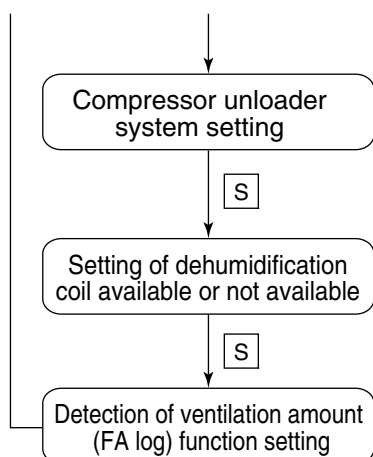





Setting method

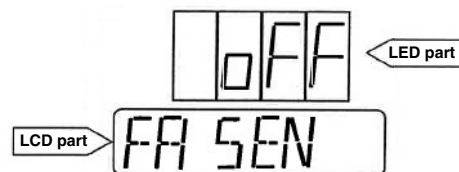
To validate the ventilator outlet opening detection function, it is necessary to configure the settings in accordance with the installation positions of the ventilator outlet in the "basic function setting mode" mentioned below



11. Basic function setting mode



LED display	LCD display	Setting method
OFF : Detection function not available	FA SEN	Make selection using the  key and  key. Press the  key to confirm the selection
H : Detection function available at the upper ventilator opening		
L : Detection function available at the lower ventilator opening		



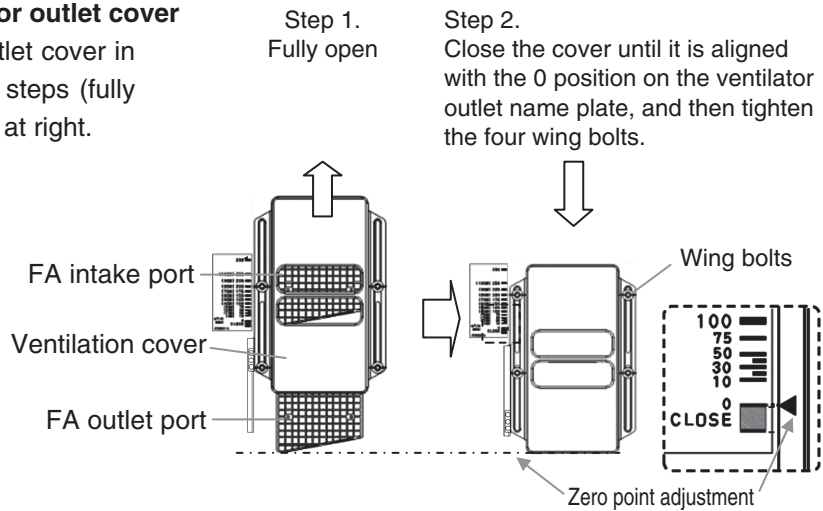
* Applicable models: LXE10E H Type (DECOS-III H) and later
 * The calibration method for the FA sensor varies depending on the model.

FA sensor calibration (zero point adjustment) method

When setting the ventilation amount (FA amount), calibrate the position of the ventilator outlet cover and the FA sensor (zero point adjustment) in advance in accordance with the steps below.

1. Positioning the ventilator outlet cover

Position the ventilator outlet cover in accordance with the two steps (fully open ⇒ 0 position) given at right.



2. Calibrating the FA sensor

After the positioning of the ventilator outlet cover has been completed, carry out the FA sensor calibration.

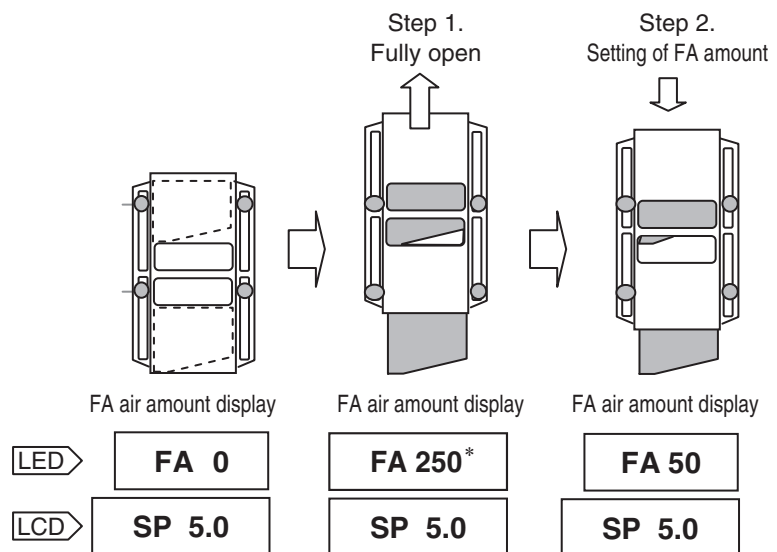
Refer to "FA calibration" in the manual check selection mode (P. 2-35, 2.5.2.4 M.CHECK) for details of the calibration operation.

Ventilation amount (FA amount) setting method

Step 1: Fully open the ventilator outlet cover.

Step 2: Move the cover downward until the FA amount which is displayed on the LED reaches the setting value.

Tighten the four wing bolts to secure the cover.



If the cover is moved upward in step 2, repeat the procedure starting from step 1.

Display the FA amount on the LCD in accordance with the method given in 6. SENSOR INDICATION MODE (P.2-12) or 3. BATTERY MODE (P.2-9).

* The maximum FA amount for each product will be displayed.

Setting of FA amount
 In case of 50m³/h

Function description

1. Ventilation amount log function

Ventilation amount data can be provided to the controller as an event log

2. Data logging details

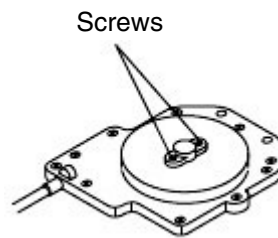
- Ventilation amount (FA) converted from the ventilator outlet opening degree (indicated in m³/h)
- Time, data, month, year for data logging

3. Log timing

- When the unit starts to run
- Once a day (12:00 am)
- When the ventilation outlet opening changes

Replacement method

- ① Remove the lead wire (connector connection) in the control box
- ② Remove the screws that hold the ventilator outlet cover to the top of the wire
- ③ Remove the screws hold the body to the casing and replace sensor assembly including wire
 - * Be sure to replace sensor assembly including the wire
- ④ After replacing, seal with silicon sealant around the screws holding the position meter in the sensor body



4.3 Daikin Temperature Management System (optional)

DTMS function

This is a temperature control function to reduce power consumption. To conserve energy, this system controls the compressor's ON-OFF switching, High-Low switching for the evaporator fan speed while maintaining present temperature control

Control details

		DTMS
Chilled mode	Operating range	$-9.9^{\circ}\text{C} \leq \text{SP} \leq -2.6^{\circ}\text{C}$, $-1.0^{\circ}\text{C} \leq \text{SP} \leq +30.0^{\circ}\text{C}$ *2
	Temperature control range	Same as normal chilled operations *2 ($\text{SP}-0.5^{\circ}\text{C} \leq \text{SS} \leq \text{SP}+0.5^{\circ}\text{C}$)
	Compressor	ON-OFF operation *3
	Condenser fan motor	OFF when the compressor is OFF
	Evaporator fan motor	High-Low-Off switching operation *3
Frozen mode *1	Operating range	Whole frozen range ($-10.0^{\circ}\text{C} \geq \text{SP} \geq -30.0^{\circ}\text{C}$)
	Temperature control range	Same as normal frozen operations ($\text{SP} \leq \text{RS} \leq \text{SP}+1.0^{\circ}\text{C}$)
	Compressor	ON-OFF operation
	Condenser fan motor	OFF when the compressor is OFF
	Evaporator fan motor	Low-OFF operation

* 1 Energy-saving control applicable to the frozen mode in DTMS II

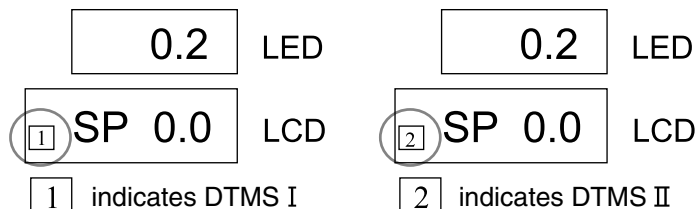
* 2 Operating range for DTMS I : $-1.0^{\circ}\text{C} \leq \text{SP} \leq +30.0^{\circ}\text{C}$

* 3 The unit operation is different from normal operation under DTMS operation.

Special instruction for DTMS function

1) "1" or "2" is displayed in LCD screen during DTMS operation

Example of screen indication



2) Operation control

DTMS is not activated for the following cases even if DTMS is set to ON (dFLt)

- | | |
|---|--|
| 1) During dehumidification operations | 7) During automatic PTI |
| 2) When USDA is set to ON (USDA=3 or 4) | 8) During high-load operations (chilled mode only) |
| 3) During pull down operations | · When there is a huge gap between SS and RS |
| 4) During defrosting operations | · When the compressor's ON-OFF switching cycle becomes short |
| 5) During heating operations | |
| 6) Out of in-range | 9) When protection devices are activated |

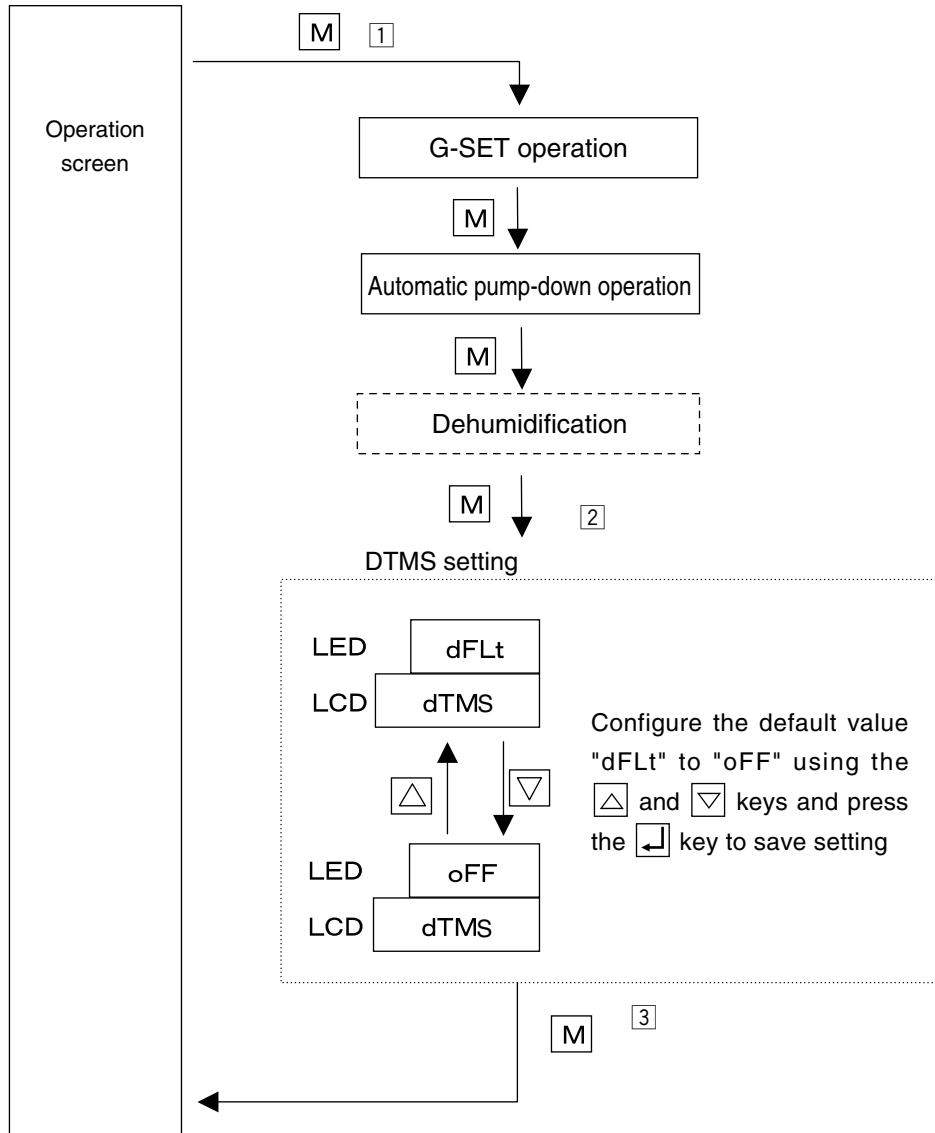
3) Cancellation of DTMS operation

When DTMS function is unnecessary for some transportation, cancel the operation in accordance with the procedures described in the next page. But DTMS function is automatically switched to ON (dFLt) at the completion of the PTI mentioned below

- 1) When F-PTI is completed 2) When Chilled PTI is completed 3) When Frozen PTI is completed

Setting method for DTMS operation cancellation

- 1 Press and hold the **M** key until the DTMS setting screen is displayed
- 2 When the DTMS setting screen is displayed, select "oFF" using the **△** and **▽** keys and press the **↵** key to save setting
- 3 Press the **M** key to go back to the normal operation screen

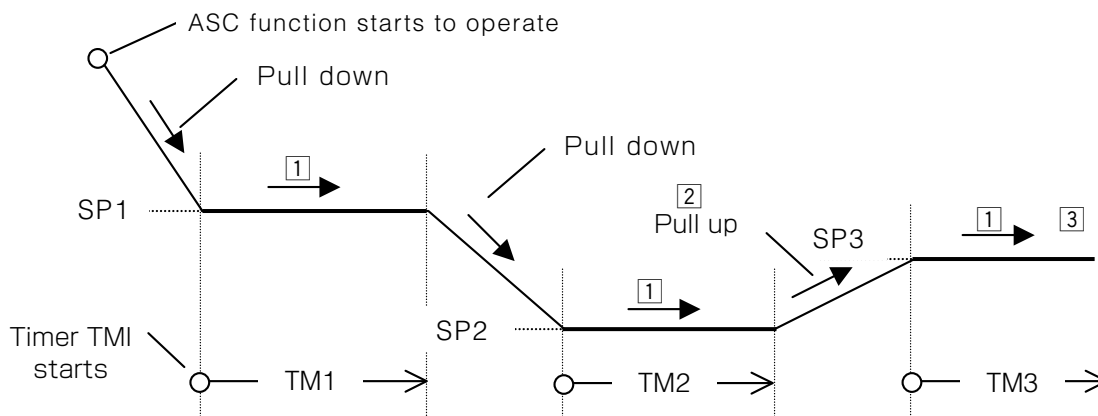


4.4 Automatic setpoint change: ASC (optional)

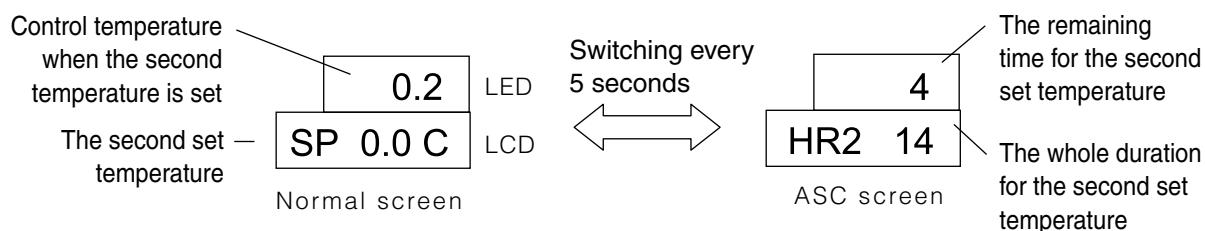
ASC function

It is necessary to change the set temperature over time for some types of cargos. ASC function can specify set temperature and its duration

For example, as shown below, ASC function allows the set temperatures to change automatically by specifying in advance first set temperature (SP1) and its duration (TM1), second set temperature (SP2) and its duration (TM2), third set temperature (SP3) and its duration (TM3), pull down and the pull up operations. For some types of cargoes, dehumidification control settings are configured as well.



- ① ASC screen and the normal screen alternate every 5 seconds during the in-range control
In the following example, the second set temperature SP2 (0.0°C) and its duration TM2 (14Hr)



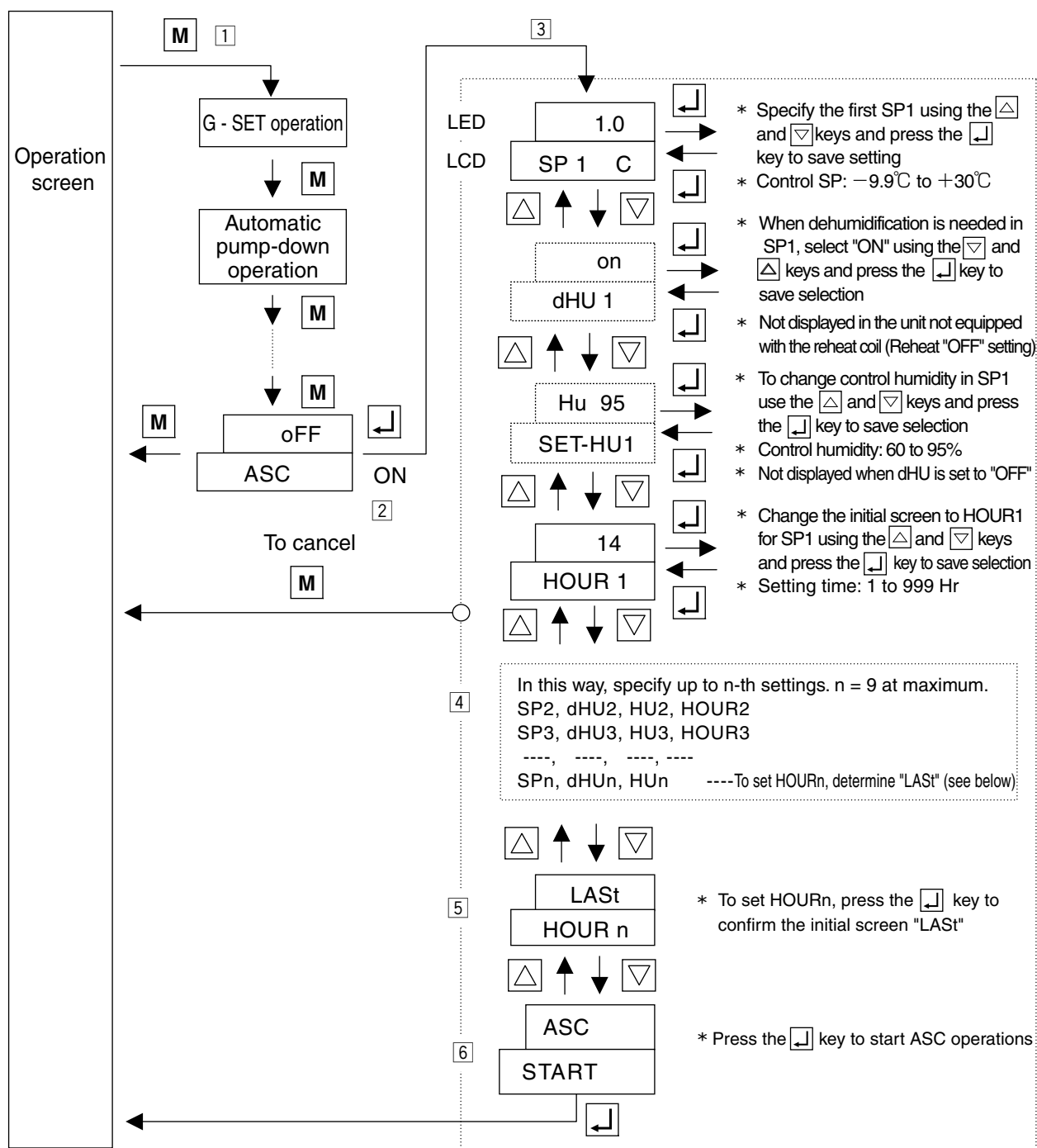
- ② The temperature inside rises gradually (0.5°C/Hr) to prevent rapid temperature rise during the pull up operation
- ③ Up to 9 patterns are available for set temperatures (up to 8 for setting time). There is no duration limit for the last set temperature

Special instructions for ASC operation

- 1) It is impossible to change the set temperature and set duration during ASC operation.
To change the settings, configure ASC settings to "OFF" and "ON" again.
- 2) When power is turned off (unit off) during ASC operation, ASC operation restarts at next power-on
- 3) The following items are recorded as event log
ASC "ON"/ "OFF", SP1, TM1, dHU1 "ON"/ "OFF", RH1, SP2 ----, SP3 ---
- 4) The last set temperature is displayed on the modem. Settings cannot be changed via the modem
- 5) Cancellation of ASC operation
①When configuring ASC to "OFF" ②When F-PTI is completed ③When Custom PTI (Chilled & Frozen) is completed

Setting ASC function

- 1 When the unit is running, press and hold the **M** key until ACS setting screen is displayed
- 2 When ACS setting screen is displayed, select "ON" using the **△** and **▽** keys and press **↵** key to save setting
- 3 Specifying the set temperature (SP1 for first item) ⇒ move to the next item using the **▽** key ⇒ dehumidification control (dHU1) on/off setting ⇒ control humidity HU 1% setting ⇒ HOUR1 (Hr) setting
- 4 Specifying SP2, SP3.....SPn. n=9 at maximum
- 5 To determine HOURn for the last SPn, press the **↵** key to go to "LAST" screen
- 6 To start ASC operations, press the **↵** key in ASC START screen



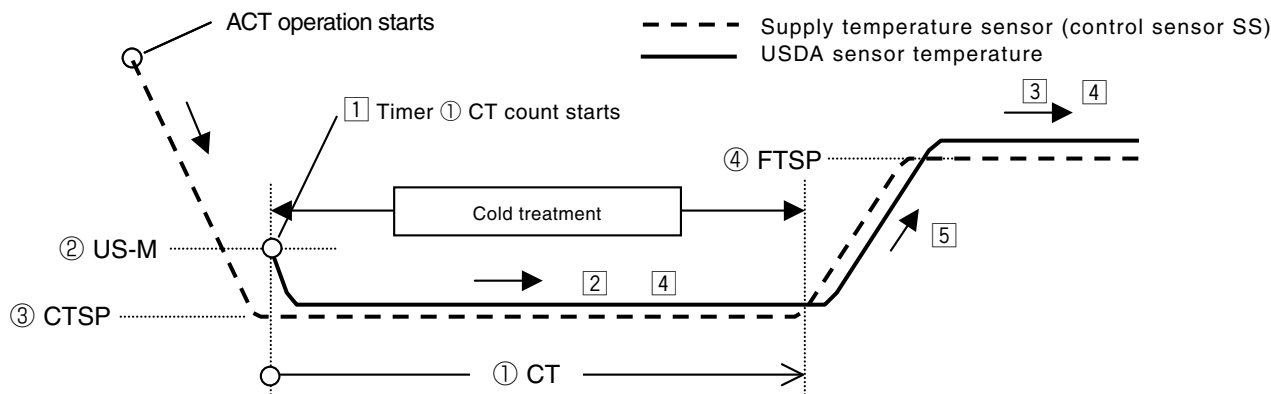
4.5 Automatic cold treatment: ACT (optional)

ACT function

When cold treatment is completed during USDA transport (when the standard period has passed with the standard pulp temperature kept equal to or less than the base temperature), ACT function switches the temperature to preset temperature automatically to continue operation.

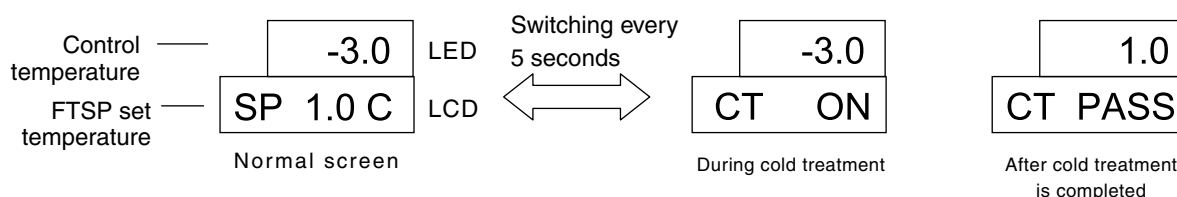
To activate ATC, the following 4 items must be set

- ① Cold treatment period (day) -----CT
- ② Maximum pulp temperature (°C) -----US-M
- ③ Set temperature during cold treatment (°C) -----CTSP
- ④ Set temperature after cold treatment is completed (°C) -----FTSP



- ① When USDA sensor temperature has fallen or equal to or cold treatment pulp temperature (US-M), timer for cold treatment period (CT day) starts to count.
- ② When the temperature exceeds US-M during cold treatment, results are logged, CT counting is cancelled. When the temperature falls or equal to or below US-M is repeated, counting restarts to recount cold treatment days (CT day).
- ③ After cold treatment is completed, operation starts at FTSP set temperature.
- ④ CTSP and FTSP can be changed during ACT operations (CT day and US-M cannot be changed)
- ⑤ Temperature inside rises gradually (0.1°C per hour) to prevent rapid temperature rise.

- ACT screen and the normal screen alternate every 5 seconds during ACT operation.



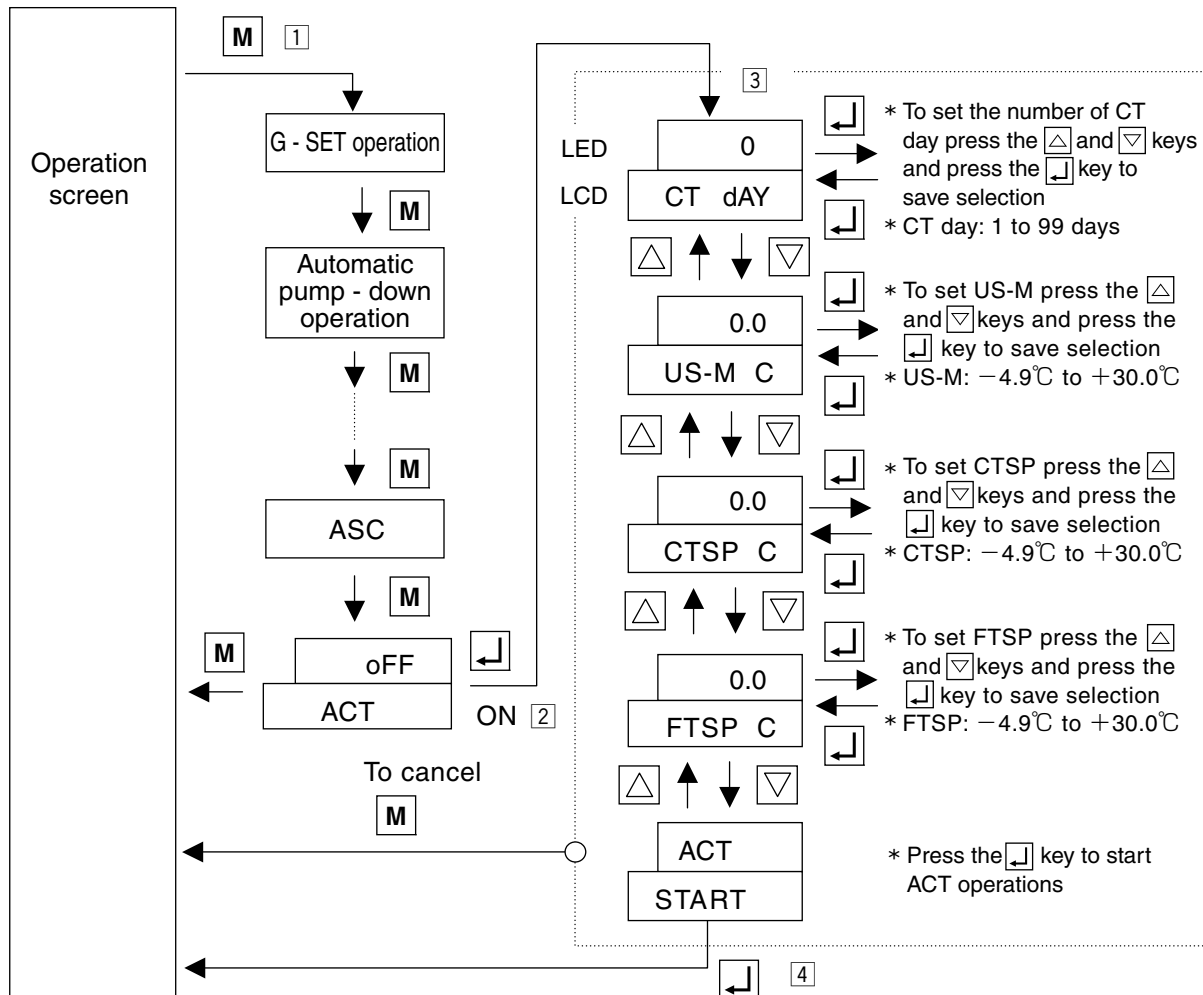
Special instructions for ACT function

- 1) Cancellation of ASC operation
 - 1) When ASC is set to "OFF"
 - 2) When F-PTI is completed
 - 3) When Chilled PTI is completed
 - 4) When Frozen PTI is completed
- 2) Power off (unit off) during ACT operation and operations when restarting

Stop time	ACT operation when restarting
Less than 1 hour	ACT operation continues
1 hour or more to less than 48 hours	CT counting is reset and ACT operation continues
48 hours or more to less than 72 hours	ACT operation cancelled (can run at set temperture FTSP)
72 hours or more	ACT operation cancelled

Settings of ACT function

- 1 With the unit running, press and hold the **M** key until the ACT setting screen is displayed
- 2 When the ACT setting screen is displayed, change "OFF" to "ON" using the **△** and **▽** keys and press the **↵** key to save setting
- 3 Specifying the number of CT days for first item ⇒ to move to the next item press the **▽** key ⇒ configuring US-M, CTSP, and FTSP in order.
- 4 To start ACT operations, press the **↵** key in ACT START screen



5. TROUBLESHOOTING

5.1 Alarm diagnosis

When an alarm occurs, confirm cause of failure and take action according to the table below.

Note 1: If electronic controller connections are bad, alarms codes may also be generated.

Check connectors of controller.

Note 2: If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

Alarm	Controller action
F xxx	Alarm stops the unit.
E xxx	Unit continues operation. Unit is in backup operation or restart, alarm indication only.

●F Alarm

Diagnosis	Page	Alarm code	Alarm content	Controller action
001	5-3	F101	<ul style="list-style-type: none"> High pressure switch (HPS) is open If HPS is opened before compressor starts Fuse (Fu1) is open Faulty controller 	Unit stopped
002	5-4	F109	<ul style="list-style-type: none"> LPT drops below -90kPa within 2 seconds after compressor starts to operate 	Unit stopped
003	5-5	F111	<ul style="list-style-type: none"> A communication error in the CPU and I/O board 	Restart after 3 minutes
004	5-5	F301	<ul style="list-style-type: none"> Temperature setting request 	Unit stopped
005	5-6	F315	<ul style="list-style-type: none"> PT / CT board failure 	
006	5-6	F401	<ul style="list-style-type: none"> Air temperature sensors [SS][DSS][RS] failure 	Unit stopped
006	5-6	F403	<ul style="list-style-type: none"> Air temperature sensors [RS][DRS-optional][SS] failure 	
007	5-7	F405	<ul style="list-style-type: none"> High pressure sensor (HPT) fault (E415) & discharge gas temperature sensor (DCHS) fault (E405) 	
007	5-7	F407	<ul style="list-style-type: none"> Low pressure sensor (LPT) fault (E413) & high pressure sensor (HPT) fault (E415) 	
007	5-7	F409	<ul style="list-style-type: none"> Low pressure sensor (LPT) fault (E413) & discharge gas temperature sensor (DCHS) fault (E405) 	
008	5-8	F603	<ul style="list-style-type: none"> Suction modulation valve [SMV] failure (DECOS-III c, d settings only) Incorrect controller model setting 	Unit stopped
009	5-8	F701	<ul style="list-style-type: none"> Main power is greater than 535V or less than 300V within 2 seconds during unit start Main power frequency abnormality 	Unit stopped
010	5-9	F705	<ul style="list-style-type: none"> S phase is open 	
011	5-9	F803	<p>If any of the following conditions apply (DECOS-III g and earlier settings)</p> <ul style="list-style-type: none"> Compressor magnetic switch arcing / Connector of compressor disconnected Failures are present in any 2 of HPT sensor, LPT sensor and DCHS sensor E107 is generated twice due to EV opening error 	Unit stopped
012	5-10	F805	<ul style="list-style-type: none"> Compressor magnetic switch arcing 	
013	5-10	F807	<ul style="list-style-type: none"> Compressor connection disconnected 	
014	5-10	F809	<ul style="list-style-type: none"> Refrigerant shortage (E107) x2 (DECOS-III g and earlier settings) Refrigerant shortage (E809) x2 (DECOS-III h setting only) 	

●E Alarm

Diagnosis	Page	Alarm code	Alarm content	Controller action
001 015 015 016	5-3 5-11 5-11 5-12	E101 E103 E105 E107	<ul style="list-style-type: none"> · High pressure switch (HPS) is open during normal operation · Compressor operating current is high (electronic type OC) · Compressor operating current is high (microcomputer type OC) · The discharge gas temperature is excessively high 	Restart after 3 minutes
002	5-4	E109	<ul style="list-style-type: none"> · Refrigerant shortage is detected (EV opening large) (DECOS-III g and earlier settings) · Low pressure stays at -90kPa or less for 2 seconds during normal operation · Low pressure stays at 400kPa or higher for 5 minutes 	
017 018	5-13 5-13	E201 E203	<ul style="list-style-type: none"> · Pump down is not completed within 120 seconds · Overcooling prevention (Supply sensor is less -3 degree C below Set Point) continues for 3 minutes in the chilled mode · If supply sensor 0.5 degree C lower than set point for 30 minutes in chilled mode 	Alarm display only Restart after 3 minutes
019	5-14	E207	<ul style="list-style-type: none"> · Defrosting is not completed within 100 minutes 	Alarm display only
020	5-14	E303	<ul style="list-style-type: none"> · Humidity setting request / dHU is set to ON when REHEAT set to OFF 	Alarm display only
021 021 021 022	5-15 5-15 5-15 5-15	E305 E307 E311 E315	<ul style="list-style-type: none"> · Defrost timer setting request · Calendar setting request · Trip start setting request · PT/CT board failure 	Alarm display only Alarm display only Alarm display only Restart after 3 minutes
023 023 023 023 024 024 024 024 024 024 025 025 026 026 026 027 027 027 027 028 027	5-16 5-16 5-16 5-16 5-17 5-17 5-17 5-17 5-17 5-17 5-18 5-18 5-18 5-18 5-18 5-19 5-19 5-19 5-19 5-20 5-19	E401 E402 E403 E404 E405 E406 E407 E409 E411 E413 E415 E417 E421 E423 E425 E427 E429 E431 E433	<ul style="list-style-type: none"> · Supply air temperature sensor (SS) fault · Data recorder supply air temperature sensor (DSS) fault · Return temperature air sensor (RS) fault · Data recorder return air sensor (DRS optional) fault · Discharge gas temperature sensor (DCHS) fault · Suction gas temperature sensor (SGS) fault · Evaporator inlet temperature sensor (EIS) fault · Evaporator outlet temperature sensor (EOS) fault · Ambient temperature sensor (AMBS) fault · Low pressure sensor (LPT) fault · High pressure sensor (HPT) fault · Voltage sensor (PT1) fault · Current sensor (CT1) fault · Current sensor (CT2) fault · USDA sensor (USDA1 optional) fault · USDA sensor (USDA2 optional) fault · USDA sensor (USDA3 optional) fault · Humidity sensor (HuS optional) fault · Cargo temperature sensor (CTS optional) fault 	Backup operation Backup operation Backup operation Backup operation Alarm display only Backup operation Backup operation Backup operation Alarm display only Backup operation Backup operation Alarm display only Restart after 3 minutes Alarm display only Alarm display only Alarm display only Alarm display only Alarm display only Alarm display only
029	5-20	E603	<ul style="list-style-type: none"> · Suction modulating valve (SMV) wiring fault, drive circuit fault or controller setting error 	Backup operation
030	5-21	E607	<ul style="list-style-type: none"> · Contact point of manual defrost key (key pad) faulty 	Alarm display only
031	5-21	E707	<ul style="list-style-type: none"> · Instantaneous voltage failure shutdown · Power supply voltage failure shutdown during operation (greater than 535V, less than 334V) 	Restart after 3 minutes
032 033	5-22 5-22	E801 E805	<ul style="list-style-type: none"> · CPU board battery failure · FA sensor failure 	Alarm display only
034	5-23	E807	<ul style="list-style-type: none"> · Initial setting [FA SEN] is set incorrectly. · The ventilator is opened during frozen operation mode 	
035	5-23	E809	<ul style="list-style-type: none"> · Refrigerant shortage is detected (EV opening large) (DECOS-III h setting only) 	Restart after 3 minutes

001 F101 • E101		
Alarm Logic	<p>F101</p> <ul style="list-style-type: none"> · High pressure switch (HPS) is opened · If HPS is opened before the compressor starts as soon as power turns on or if compressor has not been activated 5 times during start operation · Fuse Fu1 is open <p>E101</p> <ul style="list-style-type: none"> · High pressure switch (HPS) is opened during operation 	
Possible Causes	<ul style="list-style-type: none"> · HPS or HPS circuit failure · Condenser air restriction / Short circuiting / CFM reverse rotation / Ambient temperature is greater than 50 degree C · Solenoid valve leaks internally during pull down (BSV, HSV) · Discharge line of compressor is restricted · Fuse Fu1 is open · Non-condensable gas · Refrigerant overcharge · Compressor failure / Controller failure 	
Trouble Shooting	<p>1. High temperature switch (HPS)</p> <ul style="list-style-type: none"> · Check value of HPS activating while watching to High temperature transducer (HPT) 	1. Replace HPS if HPS is activated at less than 2400kPa while watching HPT
	<p>2. Condenser fan motor (CFM)</p> <ul style="list-style-type: none"> · Check if there is a restriction or short circuiting of air passage for air cooled condenser · Check CFM for reverse rotation or stopped 	2. Repair as needed
	<p>3. Solenoid valve leaks internally during pull down</p> <ul style="list-style-type: none"> · Check outlet line of solenoid valve BSV, HSV during pull-down 	3. Solenoid valve may have failed solenoid valve outlet is hot Replace as needed
	<p>4. Discharge line of compressor</p> <ul style="list-style-type: none"> · Check discharge pressure control valve (DPR) and discharge check valve for restriction 	4. Check difference of pressure at each port. Replace body as needed
	<p>5. Non-condensable gas</p> <ul style="list-style-type: none"> · Refer to page 3-6 section of [Recovery non-condensable gas] 	Remove refrigerant from unit if refrigerant system failure. Charge with specified amount of refrigerant
	<p>6. Refrigerant overcharge</p>	
	<p>7. Compressor failure</p> <ul style="list-style-type: none"> · Check if compressor is locked (refer to page 5-25). Replace compressor as needed 	
Controller Action	F101 Unit stopped	
	E101 Restart after 3 minutes. 9 restart attempts. Retry after 4 hours If unit has E101 within 30 minutes of power on. 4 restart attempts. Retry after 4 hours	

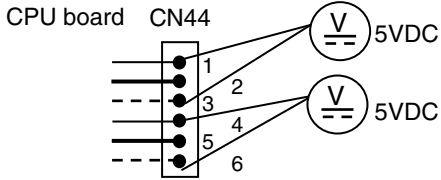
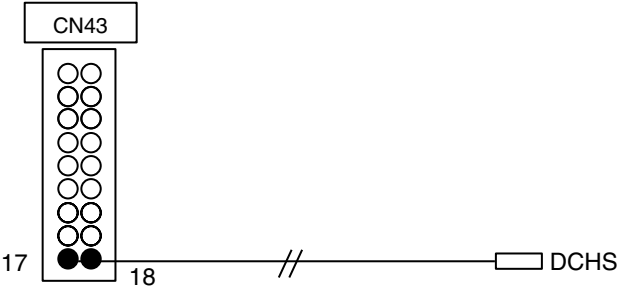
002 F109 • E109		
Alarm Logic	<p>F109</p> <ul style="list-style-type: none"> · Low pressure transducer (LPT) drops lower than –90kPa within 2 seconds after the compressor starts to operate. Fuse 3 is open <p>E109</p> <ul style="list-style-type: none"> · Low pressure transducer (LPT) failure during normal operation. Fuse Fu3 is open 	
Possible Causes	<ul style="list-style-type: none"> · Reduced air flow · Position of Discharge gas temperature sensor (DCHS) is incorrect · Low pressure transducer (LPT) cycle is faulty / Fuse Fu3 is open or cycle is failure · Clogging at refrigerant cycle (SMV, EV, LSV, Drier) · Refrigerant shortage / Moisture in refrigerant system · CPU board fault 	
Trouble Shooting	<p>1. Check air flow of evaporator</p> <p>1) Excessive frosting</p> <p>2) Reverse rotation of evaporator fan and check the current draw</p>	<p>1) Activate manual defrosting</p> <p>2) Check air direction by opening ventilator and check current on fan motor secondary side of magnetic contactor</p>
	<p>2. Check mounting position of discharge gas temperature sensor (DCHS)</p>	<p>2. Repair as needed</p>
	<p>3. Check Low pressure transducer (LPT)</p> <p>1) Connect manifold gauge, compare the value of pressure gauge and LPT (refer to page 3-1). LPT value is shown on display mode sensor (refer to page 2-12)</p>	<p>1) If the difference in pressure is more than 30kPa, replace LPT after checking wire connection</p>
	<p>4-1. Liquid solenoid valve (LSV)</p> <p>1) Remove the CN14 on I/O board, check resistance value of the sensor</p> <p>2) LCV ON/OFF check. Listen for clicking sound of LSV body</p>	<p>1) The resistance value is $15.2\Omega \pm 10\%$ at 20 degree C</p> <p>2) Replace LSV body if it does not make a sound</p>
	<p>4-2. Liquid line check</p> <p>1) Suction modulating valve (SMV) / Expansion valve (EV) / Liquid solenoid valve (LSV) / Drier</p>	<p>1) Check for restrictions</p> <p>Replace as needed, and charge with specified amount of refrigerant</p>
	<p>5. Electronic expansion valve (EV)</p> <p>1) Remove the CN11 on I/O board, check resistance value of coil</p> <p>2) Touch EV body and check for chatter when opening (pulse) along with EV opening operation (refer to 2-13 page)</p> <p>3) Fully open the valve body using emergency magnet (refer to page 5-40) then operate the unit without mounting coil</p>	<p>1) The resistance value is $46\Omega \pm 3\Omega$</p> <p>2) Check coil or controller</p> <p>Coil should chatter with EV opening operation</p> <p>3) If the alarm is still detected, the valve body is not working</p> <p>Replace EV body</p>
	<p>6. Refrigerant shortage</p> <p>1) If bubbles are present in site glass all the time and box temp is –5 degree C in frozen mode check for restriction and low on refrigerant. Recover refrigerant and charge with specified amount of refrigerant</p>	
Controller Action	<p>F109 Unit stopped</p> <p>E109 Restart after 3 minutes. 9 restart attempts. Retry after 4 hours</p>	

003	F111
Alarm Logic	F111 A communication error between CPU and I/O board
Possible Causes	Controller fault · CPU board fault (EC1) · I/O board fault (EC2)
Trouble Shooting	· Check connector CN40-1 and CN40-2 on CPU board and CN6 on I/O board · Check wiring and connectors on board
Controller Action	F111 Unit stopped

004	F301
Alarm Logic	F301 Request temperature setting
Possible Causes	Request temperature setting
Trouble Shooting	Set setting (refer to page 2-8) operation setting mode
Controller Action	F301 Unit stopped

005	F315
Alarm Logic	F315 PT/CT board failure
Possible Causes	PT/CT board failure There is no input from the PT/CT board (Due to burnout of PT transformer temperature fuse)
Trouble Shooting	<ul style="list-style-type: none">· Check connectors CN45-1 and CN45-2 for securing and disconnecting on CPU board, and CN1 and CN2 on PT/CT board· Check open circuit from 10 to 11 on PT/CT board (EC5)· Replace PT/CT board if connector and wiring is normal
Controller Action	F315 Unit stopped

006	F401 • F403
Alarm Logic	F401 Supply air temperature sensor (SS) fault. And both DSS and RS fault F403 Return air temperature sensor (RS) fault. And both DRS (option) and SS
Possible Causes	Unit can not be controlled due to backup operation is not available <ul style="list-style-type: none">· Lead line of sensor is disconnected / Lead line is short circuited· Connector disconnected· Sensor failure· CPU board failure
Trouble Shooting	<ul style="list-style-type: none">· Check sensor resistance value. (refer to sensor specifications table in page 6-2) Replace as needed
Controller Action	F401 Unit stopped F403 Unit stopped

007	F405 • F407 • F409	
Alarm Logic	F405 High pressure sensor (HPT) fault (E415) & discharge gas temperature sensor (DCHS) fault (E405) F407 Low pressure sensor (LPT) fault (E413) & high pressure sensor (HPT) fault (E415) F409 Low pressure sensor (LPT) fault (E413) & discharge gas temperature sensor (DCHS) fault (E405)	
Possible Causes	Device malfunction Pressure transducer faulty / Broken wire/ Connector disconnected / short circuit Sensor failure / Controller failure / Broken wire/ Connector disconnected / short circuit	
Trouble Shooting	1. Check connector CN44 and make sure it is properly installed	1. Proceed to the next step if the alarm still occurs
	1-1. Connect gauge manifold, compare the value of pressure gauge and HPT 1-2. Connect gauge manifold, compare the value of pressure gauge and LPT LPT or HPT value shows by monitoring data or display mode sensor. (refer to page 2-12)	1-1. Replace HPT if the difference is greater than 100kPa 1-2. Replace LPT if the difference is greater than 30kPa
	2. Remove connector CN44 on CPU board and check if there is 5VDC from the controller LPT : CN44 No.1-2-3 (Black-White-Red) HPT : CN44 No.4-5-6 (Black-White-Red) Black-Red : 5VDC 	2. If the input to transducer is 5VDC, check the transducer If input is less than 5V, check controller and wiring
	3. Check connector CN43 and make sure it is properly installed	3. Proceed to the next step if the alarm still occurs
4. Remove CN43 connector and check sensor resistance 	4. Sensor is functioning if it matches the resistance and temperature sensor characteristics table (refer to pages 6-2 and 6-3)	
Controller Action	F405 Unit stopped F407 Unit stopped F409 Unit stopped	

008	F603
Alarm Logic	F603 <ul style="list-style-type: none"> · Incorrect controller model setting · If the suction modulating valve (SMV) does not fully close after commands from controller (DECOS-III c, d settings only)
Possible Causes	<p>Incorrect controller model setting</p> <ul style="list-style-type: none"> · Incorrect initial setting of controller type <p>Faulty suction modulation valve (SMV)</p> <ul style="list-style-type: none"> · Faulty SMV body · Broken coil · Faulty operation cycle · Connector disconnected / Fuse Fu7 is open <p>Controller failure</p>
Trouble Shooting	<ul style="list-style-type: none"> · Check controller type DECOS III [h] · Check connector CN9 on I/O board · Replace fuse Fu7 if open · Check value of resistance for SMV. Blue-Yellow : 113Ω at degree 20 C / Orange-White : 113Ω at degree 20 C · Check SMV coil disconnected. Replace as needed (refer to page 3-13) · Check SMV body. Replace as needed (refer to page 3-14)
Controller Action	F603 Unit stopped

009	F701				
Alarm Logic	F701 Main power supply voltage error <ul style="list-style-type: none"> · Main power is greater than 535V or less than 300V when start within 2 seconds · If phase (in-phase or reverse-phase) is unknown · If main power frequency is greater than or equal to 70Hz, or less than equal to 40Hz 				
Possible Causes	<ul style="list-style-type: none"> · Main power is greater than 535V or less than 300V · Faulty voltage detection : Connector disconnected / Faulty PT on PT/CT board (other than disconnection and short circuit) / S phase is open · Main power frequency is greater than or equal to 70Hz, or less than equal to 40Hz 				
Trouble Shooting	<table border="1"> <tr> <td>1. Main power check · Check if the main power supply remains in allowable range (300V-535V)</td> <td>1. Supply power is in range Damage to parts may accrue</td> </tr> <tr> <td>2-1. R,S,T phase missing check · Check if there is a missing phase on the power side of circuit breaker 2-2. Check if there is a broken wire (open) on the secondary side of circuit breaker · Between C/B and CN2 (PT/CT board) · Between C/B and Tr1 and CN1 (I/O board)</td> <td>2-1. Replace or repair if there is problem in power plug or cable 2-2. If a phase is missing repair as needed Repair if there is a broken wire (open) on the secondary side of circuit breaker</td> </tr> </table>	1. Main power check · Check if the main power supply remains in allowable range (300V-535V)	1. Supply power is in range Damage to parts may accrue	2-1. R,S,T phase missing check · Check if there is a missing phase on the power side of circuit breaker 2-2. Check if there is a broken wire (open) on the secondary side of circuit breaker · Between C/B and CN2 (PT/CT board) · Between C/B and Tr1 and CN1 (I/O board)	2-1. Replace or repair if there is problem in power plug or cable 2-2. If a phase is missing repair as needed Repair if there is a broken wire (open) on the secondary side of circuit breaker
1. Main power check · Check if the main power supply remains in allowable range (300V-535V)	1. Supply power is in range Damage to parts may accrue				
2-1. R,S,T phase missing check · Check if there is a missing phase on the power side of circuit breaker 2-2. Check if there is a broken wire (open) on the secondary side of circuit breaker · Between C/B and CN2 (PT/CT board) · Between C/B and Tr1 and CN1 (I/O board)	2-1. Replace or repair if there is problem in power plug or cable 2-2. If a phase is missing repair as needed Repair if there is a broken wire (open) on the secondary side of circuit breaker				
Controller Action	F701 Unit stopped				

010	F705	
Alarm Logic	F705 S phase is open	
Possible Causes	Power supply voltage abnormal : S phase is open / Main power supply is faulty Faulty power supply equipment : Faulty power plug contacts / Power cable contact faulty / Faulty PT/CT board	
Trouble Shooting	1. Check if there is phase missing on power supply equipment side	1. Provide correct power supply if there is a power phase missing.
	2. Check if there is a broken wire (open) in power plug or power cable on the power side of circuit breaker	2. Repair as needed.
	3. Check for broken wire (open) on the secondary side of circuit breaker · Between C/B and CN2 on PT/CT board (EC5) · Between C/B and Tr1 and CN1 on I/O board (EC2)	3. Repair as needed
Controller Action	F705 Unit stopped	

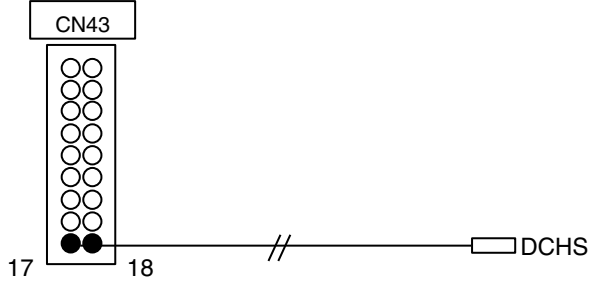
011	F803 (DECOS-III g and earlier settings)	
Alarm Logic	If any of the following conditions is apply 1. Excessive arcing on compressor magnetic switch / Compressor connection disconnected 2. Failures are present in any 2 of HPT sensor, LPT sensor and DCHS sensor 3. E107 is generated twice due to EV opening error	
Possible Causes	1. Excessive arcing on compressor magnetic switch / Compressor connection disconnected 2. Abnormal sensor / Controller failure / Wiring disconnected / Connector disconnected / short circuit 3. Refrigeration system restriction : Drier / Filter · Refrigerant shortage · ISV malfunction / Restriction at ESV outlet line capillary / Mounting position of discharge gas temperature sensor	
Trouble Shooting	1. Repair as needed · Check compressor motor coil opening / Check terminal / Check voltage 2. Refer to alarm E405 (page 5-17) diagnosis 024 and E413, E415 diagnosis 025 (page 5-18) , repair as needed 3. Refer to alarm diagnosis 011 (page 5-9) and perform repair as needed	
Controller Action	F803 Unit stopped	

012	F805
Alarm Logic	If any of the following conditions is apply 1. Excessive arcing on compressor magnetic switch
Possible Causes	1. Excessive arcing on compressor magnetic switch
Trouble Shooting	1. Repair as needed · Check compressor motor coil opening / Check terminal / Check voltage
Controller Action	F805 Unit stopped

013	F807
Alarm Logic	If any of the following conditions is apply 1. Compressor connection disconnected 2. I/O board malfunction (compressor miniature relay)
Possible Causes	1. Compressor connection disconnected 2. I/O board malfunction (compressor miniature relay)
Trouble Shooting	1. Repair as needed · Check compressor motor coil opening / Check terminal / Check voltage
Controller Action	F807 Unit stopped

014	F809
Alarm Logic	If any of the following conditions is apply 1. E107 is generated twice due to EV opening error (DECOS-III g and earlier settings) 2. E809 is generated twice due to EV opening error (DECOS-III h setting only)
Possible Causes	1. Refrigeration system restriction : Drier / Filter · Refrigerant shortage · ISV malfunction / Restriction at ESV outlet line capillary / Mounting position of discharge gas temperature sensor
Trouble Shooting	1. Refer to alarm diagnosis 011 (page 5-9) and repair as needed (DECOS-III g and earlier settings) 2. Refer to alarm diagnosis 035 (page 5-23) and perform repairs as needed (DECOS-III h setting only)
Controller Action	F809 Unit stopped

015	E103 (Electronic type OC) E105 (Micro computer type OC)
Alarm Logic	E103 Compressor operating current is high (Electronic type OC) E105 Compressor operating current is high (Micro computer type OC)
Possible Causes	<p>E103 Single phase operation due to faulty contact</p> <ul style="list-style-type: none"> · Compressor magnetic contactor / Compressor wires / Compressor terminal · Compressor locked / Compressor thermal protector CTP activated Faulty / PT/CT board (EC5) / Faulty controller (CPU and I/O board) · Wrong initial set up of PT/CT board (Jumper wire)(Single or Dual power supply, 10HP or 5HP) <p>E105 Single phase operation due to faulty contact</p> <ul style="list-style-type: none"> · Compressor magnetic contactor / Compressor wires / Compressor terminal · Compressor locked / Faulty PT/CT board / CPU board failure · Incorrect initial setting of controller (Single or Dual power supply, 10HP or 5HP)
Trouble Shooting	<p>If PT/CT board is replaced.</p> <ul style="list-style-type: none"> · Check power setting Single or Dual · Check horsepower setting 10HP or 5HP (refer to jumper check table) <p>Remove possible cause (listed below) of overload or starting error of the compressor.</p> <ul style="list-style-type: none"> · High differential pressure when unit is starting up / Liquid refrigerant / Excessive oil / Overcharge refrigerant / Compressor motor coil failure / Compressor motor shaft failure
Controller Action	E103 Restart after 3 minutes (continuous restart) E105 Restart after 3 minutes (continuous restart)

016	E107	
Alarm Logic	E107 · The discharge gas temperature becomes abnormally high temperature · If EV opening error keeps 5 minutes (DECOS-III g and earlier settings) Refer to alarm diagnosis 035 (page 5-23) and perform repairs as needed (DECOS-III h setting only)	
Possible Causes	Refrigeration system restriction : Drier / Filter · ISV malfunction / Restriction for ESV outlet line capillary / Mounting position of discharge gas temperature sensor	
Trouble Shooting	Discharge gas temperature is abnormal 1. Check mounting position of discharge gas temperature sensor 	Replace the sensor if resistance value is not with specification.
	2. Liquid line Check drier and filter for restriction. Replace parts if needed	Replace as needed if it is restricted.
	3. Check drier for restriction and ISV outlet line strainer. Replace parts if needed	ISV is open when DCHS temperature is high. Repair as needed if ISV does not open.
Controller Action	E107 [If discharge gas temperature is abnormal] Restart after 3 minutes. 9 restart attempts. Retry after 4 hours. If unit can't operate after 9 attempts, Retry after 4 hours repeatedly.	

017	E201
Alarm Logic	E201 Pump down is not completed within 120 seconds
Possible Causes	<ul style="list-style-type: none"> · The solenoid valves can not close (debris) Liquid solenoid valve (LSV) / Hot gas solenoid valve (HSV) / Discharge gas bypass solenoid valve (BSV) · Compressor failure · Low pressure transducer (LPT)
Trouble Shooting	<p>Check EV and LSV (refer to page 5-4) If EV or LSV is functioning correctly, check below items</p> <p><During pump-down operation before defrost operation starts> Connect manifold gauge, start manual defrost operation and check whether the LPT at pump-down completion is lower than -40kPa within 300 seconds and verify with the low-pressure gauge</p> <p><In case of auto pump-down operation> Check whether the LPT at pump-down completion is lower than -40kPa and verify with the low pressure gauge</p> <p>*If LPT reading reaches to desired pressure, it is normal. Monitor unit operation *If LPT reading does not reach to desired pressure, suction capacity of the compressor may be insufficient</p>
Controller Action	E201 Alarm display only

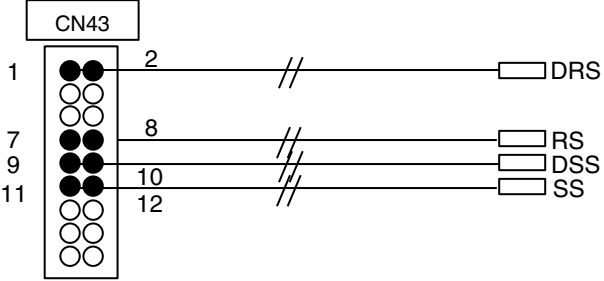
018	E203
Alarm Logic	E203 <ul style="list-style-type: none"> · If supply sensor is 3°C lower than set point for 5 minutes in chilled mode · If supply sensor is 0.5°C lower than set point for 30 minutes in chilled mode
Possible Causes	<ul style="list-style-type: none"> · Cooling load is reduced rapidly · Faulty low pressure transducer (LPT) · Faulty discharge gas temperature sensor (DCHS) · Faulty suction modulation valve (SMV) · Faulty discharge gas bypass solenoid valve (BSV) · Fuse circuit disconnected (Fuse 2) · Evaporator fan motor abnormality
Trouble Shooting	<p><If the control temperature is not stable></p> <ul style="list-style-type: none"> · Replace LPT if pressure difference between pressure gauge and sensor reading is greater than 30kPa · Check installation of DCHS · Reset SMV opening if SMV opening is fixed at around 79pls (24%) · Check wiring and connector CN12 on I/O board for BSV if SMV opening is except 79pls <p><If the temperature continues to fall></p> <ul style="list-style-type: none"> · Replace Fuse Fu2 if it is open · Check evaporator fan motor magnetic contacts have failed · Check SMV wiring and connector CN9 on I/O board
Controller Action	E203 Restart after 3 minutes

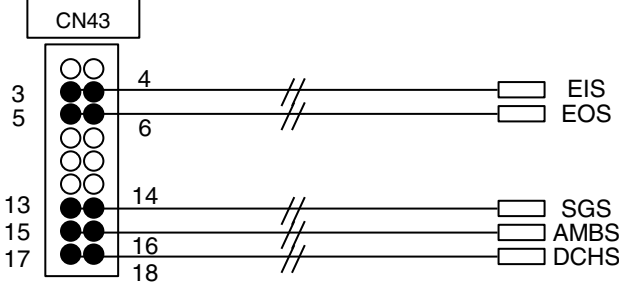
019	E207
Alarm Logic	E207 Defrost can not be completed within 100 minutes
Possible Causes	<p>Malfunction</p> <ul style="list-style-type: none"> · Faulty sensor (EOS, RS, HPT, LPT, DCHS) / Controller failure / HSV, ISV failure <p>Refrigerant system not functioning correctly</p> <ul style="list-style-type: none"> · Low on refrigerant / Excessive frosting
Trouble Shooting	<ul style="list-style-type: none"> · Remove rest frost by manual defrost · Also, check whether defrost completes within 100 minutes on screen (refer to page 2-13) <p>If defrost completes, it is normal. Monitor unit operation</p> <p>If defrost does not complete, there may be low hot-gas temperature, Insufficient hot-gas circulation</p> <p>Check sensors (EOS, RS, HPT, LPT, DCHS) and valves (HSV, ISV), replace as needed (refer to alarm diagnosis 023,024,025)</p>
Controller Action	E207 Alarm display only

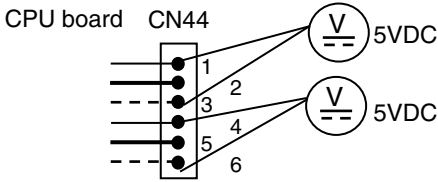
020	E303
Alarm Logic	<p>E303</p> <ul style="list-style-type: none"> · Request humidity setting · The dHU is set to ON when REHEAT set to OFF
Possible Causes	<ul style="list-style-type: none"> · Dehumidification dHU set to "ON" with humidity RH % not set · The dHU is set to ON when REHEAT set to OFF · Controller failure (CPU board failure)
Trouble Shooting	<ul style="list-style-type: none"> · Check installing of humidity sensor (optional) · Confirm unit is equipped with sensor and check humidity sensor settings and reheat setting (refer to page 2-19 and 2-21)
Controller Action	E303 Alarm display only

021 E305 • E307 • E311	
Alarm Logic	E305 Request defrost timer setting E307 Calendar setting request E311 Trip start setting request
Possible Causes	E305 Request defrost timer setting E307 Calendar setting request E311 Trip start setting request / CPU board failure
Trouble Shooting	E305 Request defrost timer setting Set defrost interval time E307 Calendar setting request Set calendar (day / hour / minute / month / year) on the screen "SET TIME" refer to page 2-25 E311 Trip start setting request Set 0 (press ENTER key for 3 seconds) to display trip time on the screen "TS H" refer to page 2-35 ※If E801, replace rechargeable battery
Controller Action	E305 Alarm display only E307 Alarm display only E311 Alarm display only

022 E315	
Alarm Logic	E315 PT/CT board failure
Possible Causes	PT/CT board failure There is no input from the PT/CT board
Trouble Shooting	<ul style="list-style-type: none"> · Check connectors CN45-1 and CN45-2 for securing and disconnecting on CPU board, and CN1 and CN2 on PT/CT board · Check open circuit from 10 to 11 on PT/CT board (EC5) · Replace PT/CT board if connector and wiring is normal
Controller Action	E315 Restart after 3 minutes. 9 restart attempts. Retry after 4 hours

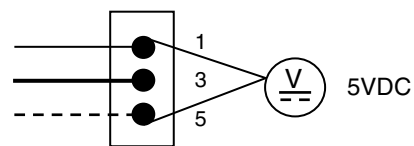
023	E401 (SS) • E402 (DSS) • E403 (RS) • E404 (DRS-optional)	
Alarm Logic	E401 Supply air sensor (SS) is not functioning correctly E402 Supply air sensor for Data-recorder (DSS) is not functioning correctly E403 Return air sensor (RS) is not functioning correctly E404 Return air sensor for Data-recorder (DRS optional) is not functioning correctly	
Possible Causes	Device malfunction Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit	
Trouble Shooting	1. Check connector CN43 and make sure it is properly installed	1. Proceed to the next step if the alarm still occurs
	2. Remove CN43 connector and check sensor resistance 	2. Sensor is functioning if it matches the resistance and temperature sensor characteristics table (refer to page 6-2 Check CPU board)
Controller Action	E401 Abnormal SS ⇒ 1 st backup by DSS ⇒ 2 nd backup by RS = SP-2°C E402 Abnormal DSS ⇒ backup by SS E403 Abnormal RS ⇒ 1 st backup by DRS (optional) ⇒ 2 nd backup by SS = SP-5°C E404 Abnormal DRS (optional) ⇒ backup by RS	

024	E405 (DCHS) • E406 (SGS) • E407 (EIS) E409 (EOS) • E411 (AMBS)	
Alarm Logic	E405 Discharge gas temperature sensor (DCHS) is not functioning correctly E406 Suction gas temperature sensor (SGS) is not functioning correctly E407 Evaporator inlet pipe temperature sensor (EIS) is not functioning correctly E409 Evaporator outlet pipe temperature sensor (EOS) is not functioning correctly E411 Ambient temperature sensor (AMBS) is not functioning correctly	
Possible Causes	Device malfunction Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit	
Trouble Shooting	1. Check connector CN43 and make sure it is properly installed	1. Proceed to the next step if the alarm still occurs
	2. Remove CN43 connector and check sensor resistance 	2. Sensor is functioning if it matches the resistance and temperature sensor characteristics table (refer to pages 6-2 and 6-3)
Controller Action	E405 Alarm display only E406 Backup operation (refer to page 5-44) E407 Backup operation (refer to page 5-44) E409 Backup operation (refer to page 5-44) E411 Alarm display only	

025	E413 (LPT) • E415 (HPT)	
Alarm Logic	E413 Low pressure transducer (LPT) is not functioning correctly E415 High pressure transducer (HPT) is not functioning correctly	
Possible Causes	Device malfunction · Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit · Pressure transducer faulty · Controller faulty	
Trouble Shooting	1. Check connector CN44 and make sure it is properly installed	1. Proceed to the next step if the alarm still occurs
	1-1. Connect gauge manifold, compare the value of pressure gauge and HPT 1-2. Connect gauge manifold, compare the value of pressure gauge and LPT LPT or HPT value shows by monitoring data or display mode sensor. (refer to page 2-12)	1-1. Replace HPT if the difference is greater than 100kPa 1-2. Replace LPT if the difference is greater than 30kPa
	2. Remove connector CN44 on CPU board and check if there is 5VDC from the controller LPT : CN44 No.1-2-3 (Black-White-Red) HPT : CN44 No.4-5-6 (Black-White-Red) Black-Red : 5VDC 	2. If the input to transducer is 5VDC, check the transducer If input is less than 5V, check controller and wiring
Controller Action	E413 Backup operation E415 Backup operation	

026	E417 (PT1) • E421 (CT1) • E423 (CT2)	
Alarm Logic	E417 Voltage sensor (PT1) is not functioning correctly E421 Current sensor 1 (CT1) is not functioning correctly E423 Current sensor 2 (CT2) is not functioning correctly	
Possible Causes	Device malfunction · Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit	
Trouble Shooting	· Check connector for securing and disconnecting CN1 and CN2 on PT/CT board (EC5) · Check PT/CT board. Replace PT/CT board as needed	
Controller Action	E417 Alarm display only E421 Alarm display only E423 Restart after 3 minutes	

027	E425 (USDA1-optional) • E427 (USDA2-optional) E429 (USDA3-optional) • E433 (CTS-optional)	
Alarm Logic	E425 USDA sensor 1 (USDA1) is not functioning correctly E427 USDA sensor 2 (USDA2) is not functioning correctly E429 USDA sensor 3 (USDA3) is not functioning correctly E433 Cargo temperature sensor (CTS) is not functioning correctly	
Possible Causes	<ul style="list-style-type: none"> · Setting are incorrect · Device malfunction Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit	
Trouble Shooting	<ul style="list-style-type: none"> · Check optional function setting mode refer to page 2-19 · If it is set to "4" or "3" on USDA setting, it needs to match actual sensor number · Check setting is turned OFF when unit has no USDA connection (optional) 	
	<ul style="list-style-type: none"> · Check connector CN47 on CPU board, USDA connector and cable is open or short circuit · Check components and wiring for open or shorted circuit. Repair as needed <div style="text-align: center; margin: 10px 0;"> <p style="display: flex; justify-content: space-around; margin-top: 5px;"> CN47 (CPU board) Sensor component (Inside of Cargo) </p> </div>	
	Check the resistance value of each sensor USDA and Cargo temperature sensor (CTS)	Sensor is functioning if it matches the resistance and USDA sensor characteristics table (Section 6-8 refer to USDA sensor characteristics table)
	<div style="margin-bottom: 5px;">CN47</div>	Caution! There are different USDA sensor characteristics type "1" and "2". The condition setting mode option shows the what refer to page 2-22.
Controller Action	E425 Alarm display only E427 Alarm display only E429 Alarm display only E433 Alarm display only	

028	E431 (HuS-optional)
Alarm Logic	E431 Humidity sensor (HuS) is not functioning correctly
Possible Causes	<ul style="list-style-type: none"> · Setting are incorrect · Device malfunction Sensor failure / Controller failure / Broken wire / Connector disconnected / short circuit
Trouble Shooting	<ul style="list-style-type: none"> · Check installing humidity sensor (optional) · *Humidity setting operation can not be set without connecting to humidity sensor · Check connector CN46 on CPU board for secure connection · Remove connector CN46, check if there is 5VDC from the controller HuS:CN46 No.1-2-3 (Black-Yellow-Red) Black-Red : Input voltage 5VDC CPU board CN46  <ul style="list-style-type: none"> · If the input to transducer is 5VDC, replace the transducer. If the input is less than 5V, check the controller
Controller Action	E431 Alarm display only

029	E603
Alarm Logic	E603 <ul style="list-style-type: none"> · Suction modulation valve (SMV) is not functioning correctly · Electronic expansion valve (EV) connection is not connect
Possible Causes	SMV malfunction <ul style="list-style-type: none"> · I/O board failure / SMV coil failure / controller failure EV is disconnected <ul style="list-style-type: none"> · EV wiring is disconnected / EV connector is disconnected
Trouble Shooting	SMV malfunction <ul style="list-style-type: none"> · Check CN9 connector on I/O board for proper connection or broken wire EV is disconnected <ul style="list-style-type: none"> · Check CN11 connector on I/O board for proper connection or broken wire
Controller Action	E603 Backup operation

030	E607
Alarm Logic	E607 Sheet key (key pad) contact point failure
Possible Causes	Display board short circuit / CPU board short circuit
Trouble Shooting	Check connectors CN31 and CN32 on Display board (EC3) for proper connection or broken wire Check connector CN41 on CPU board (EC1) for proper connection or broken wire Check connector pins and secure socket correctly Replace the sheet key if the alarm still occurs
Controller Action	E607 Alarm display only

031	E707
Alarm Logic	E707 Main power supply voltage out of range
Possible Causes	Supply power is abnormal, unit stopped during operation If main power is greater than 535V for 15 seconds or less than 334V during operation
Trouble Shooting	Repair main power supply Once the unit is stopped, restarts after 3 minutes 9 attempts. If voltage is within specification unit will run
Controller Action	E707 Restart after 3 minutes. 9 restart attempts. Retry after 4 hours

032	E801
Alarm Logic	E801 Battery on CPU board is drained
Possible Causes	<ul style="list-style-type: none"> · Battery failure · Battery on CPU board is drained
Trouble Shooting	Replace lithium battery or CPU board if needed
Controller Action	E801 Alarm display only

033	E805 (FAS-optional)
Alarm Logic	E805 FA sensor (optional) failure
Possible Causes	<ul style="list-style-type: none"> · Setting is incorrect · FA wiring is installed incorrectly · FA sensor failure · Controller (defective CPU board)
Trouble Shooting	Check settings (refer to page 2-21 Basic function setting mode) <ul style="list-style-type: none"> · "H" setting is use for upper ventilator · "L" setting is use for lower ventilator · "OFF" setting is used when no ventilator is available
	Check if FA wiring is correctly installed Replace the FA sensor If you move the lever of ventilation door fully open or fully closed, and alarm still occurs
Controller Action	E805 Alarm display only

034	E807 (FAS-optional)
Alarm Logic	E807 Ventilation port is open in the frozen mode ※Alarm generates only if unit has FA sensor (FAS-optional).
Possible Causes	Ventilation door is still open when unit is in the frozen mode
Trouble Shooting	Make sure to fully close ventilation in frozen operation
Controller Action	E807 Alarm display only

035	E809 (DECOS-III h setting only)	
Alarm Logic	If EV opening error keeps 5 minutes	
Possible Causes	· Refrigerant shortage	
Trouble Shooting	1. EV opening error Check EV coil and body with alarm diagnosis 002 EV check (refer to page 5-4)	Replace the parts as needed
	2. Refrigerant level Unit might be low on refrigerant. Make sure there are no leaks and then charge system with specified amount.	
Controller Action	E809 [If EV opening error continues 5 minutes] Restart after 3 minutes. F809 alarm occur when E809 is generated two times. Unit stopped.	

5.2 Refrigeration system and electrical system

If the unit does not work properly, refer to the following table to find causes of trouble and provide appropriate measures.

	Symptom	Cause	Checkpoint	Remedy
I Unit does not operate	A. Compressor, Evaporator fan, Condenser fan does not run.	Faulty power supply	Voltage on primary side of circuit breaker It should be within the voltage range shown on page 1-1.	Check power supply Check power supply plug Check for disconnected cable
		Condenser fan does not run	Ensure that the condenser fan is stopped while high pressure is under control. (Increase the high pressure compulsorily, and make sure that the condenser fan stops when the HPT is 1000 kPa or more.)	Unit is normal if the condenser fan is stopped while the HPT is 1000 kPa or more
			Megger check secondary side of magnetic contactor (Evaporator fan motor, condenser fan motor, compressor)	Replace faulty device
		Controller	Unit switch ON/OFF check	Turn switch ON
			Alarm presence (F code)	See the instructions for alarm code of electronic controller in section 5.1
		Secondary side of power supply transformer	Check for disconnection of Fu1 (fuse) Check for malfunction in select models shown in section 6.10	Replace fuse Replace faulty device
	Check for disconnection on secondary side of transformer (Tr) Connector type terminal board: Check 24V between lead wires 101 and 104		Replace the transformer	
	B. Evaporator fan runs, but condenser fan and compressor do not run.	Not functioning (thermo-OFF status)	Display of controller (ALARM display)	See the alarm code when ALARM is generated
	C. Evaporator fan and compressor run, but condenser fan does not run.	Not functioning (high pressure control)	Check of operation of HPT (E101) by controller display	Refer to section 5.1 page 5-3
		External components	Visual check debris and damage (including relevant parts such as controllers)	Remove debris
	D. Condenser fan and compressor run, but evaporator fan does not run.	Electrical system of evaporator fan faulty · CTP activation · Motor failed (disconnection) · Disconnected coil of magnetic contactor	· Motor coil resistance · Ensure that the magnetic contactor is turned ON · Voltage on secondary side of magnetic contactor (three-phase)	· Replace the fan motor · Replace the magnetic contactor
		Debris	Visual check for foreign matters caught in and deformation (including relevant parts such as controllers)	Remove debris
	E. Compressor runs, but evaporator fan and condenser fan do not run.	Not malfunction (defrost)	Check LED light status (red) of DEF on control panel	

	Symptom	Cause	Checkpoint	Remedy
I Unit does not operate	F. Evaporator fan and condenser fan run, but compressor does not run (throbs)	<ul style="list-style-type: none"> · Faulty compressor power supply · Burnt-out of compressor motor (disconnection) · Compressor terminal board connections bad (disconnection, entering of water) <p>Magnetic contactor coil disconnected</p> <p>Faulty controller (Ry)</p>	<pre> graph TD Q1{Is the magnetic contactor for compressor energized?} Q2{Is the voltage between the wiring 133 and 134 24V AC?} R1[Check for disconnection of compressor motor coil Check the terminals Check the voltage] R2[Faulty magnetic contactor coil for compressor] R3[Faulty controller Ry] Q1 -- YES --> R1 Q1 -- NO --> Q2 Q2 -- YES --> R2 Q2 -- NO --> R3 </pre>	
	Stopped if the main power supply voltage drops and compressor stops with E103 or E105 error.		All the three phases should be AC 300 V or higher	

	Symptom	Cause	Checkpoint	Remedy
I	Unit does not operate The compressor does not run	Fuse circuit disconnected Faulty controller Faulty PT/CT board	<pre> graph TD Q1{Is the fuse Fu1 circuit disconnected?} Q1 -- YES --> R1[Replace fuse Fu1] Q1 -- NO --> R2[Replace the controller or PT/CT board] </pre>	
	Controller power supply does not turn on	<ul style="list-style-type: none"> · R or T-phase is open · Faulty power supply (voltage drop) · Power cable disconnected · Faulty power plug · Fu7 circuit disconnected · Faulty transformer 	<pre> graph TD Q2{Is the voltage of three-phase power supply on the primary side of the circuit breaker 300 V or less?} Q2 -- YES --> R3["* R or T-phase is open * Faulty power supply (voltage drop) * Disconnection of power cable * Faulty power plug"] Q2 -- NO --> Q3{Is fuse Fu7 circuit disconnected?} Q3 -- YES --> R4[Replace fuse Fu7] Q3 -- NO --> Q4{Is the voltage at CN1 of TB1 20 V or less?} Q4 -- YES --> R5[Replace transformer TrC] Q4 -- NO --> R6[Replace the controller] </pre>	
II	Unit operates but soon stops			
	A. Unit operates but soon stops (full stop)	Refer to the Alarm list (page 5-1)	_____	_____
	B. Evaporator fan runs, but condenser fan and compressor stop soon.	Thermo OFF (normal)	_____	_____
	C. Compressor runs, but condenser fan and evaporator fan stop.	Defrost (normal)	_____	_____

Symptom	Cause	Checkpoint	Remedy
III Inside temperature does not drop The high pressure is excessively high The low pressure is excessively low Frosted compressor body or suction line	Refrigerant shortage Refrigeration system blockage (Including solenoid valves) Air in refrigeration system	Gas leak check YES → Freon leak ⇒ Repair leaks NO →	
	Faulty discharge pressure control valve DPR	Is the difference in pressure between the ports ② and ⑤ 1000 kPa or more? YES → Clogged section between the ports ② and ⑤ or DPR operation is faulty ⇒ Replace the DPR NO →	
	Air in refrigeration system	Check for entering of air YES → Air is entering ⇒ Replace refrigerant NO →	Note: Recover refrigerant when replacing
	Faulty liquid solenoid valve LSV	Is the difference in pressure between the ports ⑤ and ③ 100 kPa or more? YES → Blocked section between the ports ⑤ and ③ or blocked LSV ⇒ Replace the LSV NO →	
	Drier plugged	Is temperature difference in drier inlet and outlet more than 5°C? YES → Check for clog in a drier ⇒ Replace the drier NO →	
Faulty high pressure transducer HPT	Is pressure difference between pressure gauge and HPT more than 100kPa? YES → Faulty HPT ⇒ Replace the HPT NO → Gas shortage ⇒ Replace the refrigerant		

	Symptom	Cause	Checkpoint	Remedy
III Inside temperature does not drop	The high pressure is excessively high	Solenoid valve internal leak	Check for leak at solenoid valve during pull-down. Is the temperature in the piping on the BSV, HSV, outlet side high?	YES → Leak from solenoid valve ⇒ Replace the solenoid valve BSV: Discharged gas bypass solenoid valve HSV: Hot gas solenoid valve
	Reverse rotation of condenser fan	Reverse rotation of condenser fan	Does the condenser fan rotate in reverse?	YES(Reverse rotation) → Check the wiring on secondary side of solenoid contactor for condenser fan NO(Normal rotation)
III	The high pressure is excessively high	· Ambient temperature is high · Block air flow	Is the discharge air temperature at condenser 50°C or higher?	YES → Out of operation range Restore discharge air circulation
	The high pressure is excessively high	· Is the condenser water-cooled? · Low water level · Water temperature is high	Is the condenser water-cooled?	YES → Is the water valve fully open? YES → Shortage of water volume ⇒ Check water source NO → Fully open the valve
	The high pressure is excessively high	Clogged heat exchanger of condenser	Visually check for obstructions on air cooled condenser	YES → Clogged ⇒ cleaning NO → Fully open the valve
	The high pressure is excessively high	· Entering air · Overcharge · Wrong refrigerant type	Check for entering of air	YES → Is HPS open? YES → Overcharge Entering of air, wrong refrigerant type ⇒ Replace the refrigerant NO → Air in system wrong refrigerant type ⇒ Replace the refrigerant
	The high pressure is excessively high	Compressor internal leak	Check for leaks at the solenoid valve S-PTI alarm J101? (P10)	YES → Faulty compressor ⇒ Replace the compressor NO → Overcharge ⇒ Replace the refrigerant Water cooling: Water temperature is high, water cooled condenser is dirty ⇒ Check the facility, or clean or replace the water cooled condenser

	Symptom	Cause	Checkpoint	Remedy
III Inside temperature does not drop	The low pressure is excessively low	<ul style="list-style-type: none"> Electronic expansion valve (EV) not functioning Suction modulating valve (SMV) not functioning Low air volume (frosted evaporator) 	Reset opening of EV, SMV (Circuit breaker ON) ↓ Is pull-down possible? <ul style="list-style-type: none"> YES → Normal NO ↓ 	
			Manual defrost ↓ Is pull-down possible? <ul style="list-style-type: none"> YES → Normal NO ↓ 	
		Low air volume (reverse rotation of evaporator fan)	Is suction and discharge air reversed when the ventilator is opened? <ul style="list-style-type: none"> YES (Fan rotates reverse) → Check evaporator fan magnetic contactor wiring NO (Fan rotates normally) ↓ 	
		Low air volume (evaporator fan stopped)	Is the current at evaporator fan motor 0? (on the secondary side of magnetic contactor) <ul style="list-style-type: none"> YES → Replace the fan motor NO ↓ 	
		Low air volume (Fan blade missing on damage)	Open the access panel and check if the evaporator fan blade is removed <ul style="list-style-type: none"> YES → Install the propeller fan NO ↓ 	
		Displacement of discharge line temperature sensor DCHS (detection of humidity)	Is the DCHS sensor installed inappropriately? <ul style="list-style-type: none"> YES (Inappropriate) → Correct installation of sensor NO (Correct) ↓ 	
		Faulty electronic expansion valve coil	Faulty resistance of electronic expansion valve coil (46Ω phase) <ul style="list-style-type: none"> YES (Inappropriate) → Replace the electronic expansion valve coil NO (Normal) ↓ * See page 3-12	
		Entering of water in refrigerant system Water choke	Is pull-down possible? <ul style="list-style-type: none"> YES → Normal NO ↓ Replace electronic expansion valve body Replace drier	

	Symptom	Cause	Checkpoint	Remedy
III Inside temperature does not drop	Suction pressure is high	Solenoid valve internal leak(BSV, HSV) Solenoid valve internal leak(ISV) Pressures at compressor are not correct	<pre> graph TD Start[Normal operation] --> D1{Is HSV, BSV outlet line hot?} D1 -- YES (Hot) --> R1[Leak from solenoid valve => Replace] D1 -- NO (Cold) --> D2{Is the ISV outlet line hot?} D2 -- YES (Hot) --> R2[Leak from solenoid valve => Replace] D2 -- NO (Cold) --> C[] C --> CB[Circuit breaker OFF->ON] CB --> D3{Is pull-down possible?} D3 -- YES --> R3[Finish] D3 -- NO --> R4[Replace the compressor] </pre>	*HSV: Hot gas solenoid valve BSV: Discharge gas bypass solenoid valve *ISV: Injection solenoid valve

Symptom	Cause	Checkpoint	Remedy
IV Inside temperature does not rise (during heating operation) Discharge pressure is low The discharge gas temperature is low Low side pressure is excessively high	Faulty operation of valve (HSV)	Heating operation Is the outlet line of HSV cold? YES → Faulty operation of HSV ⇒ Replace NO →	
	High pressure transducer HPT failure (pressure reading is not correct)	Is the difference in pressure between pressure gauge and HPT 100 kPa or more? YES → Faulty HPT ⇒ Replace NO →	
	Low pressure transducer LPT failure (pressure reading is not correct)	Is the difference in pressure between the pressure gauge and LPT 30 kPa or more? YES → Faulty LPT ⇒ Replace NO →	
	Displacement of HPT, DCHS (Evaporator fan stopped)	Is the DCHS or heat insulator installed improperly? YES → Correct installation of DCHS NO →	※ DCHS: Discharge gas temperature sensor
	Evaporator fan stopped	Is the magnetic contactor (high speed) for evaporator fan motor turned OFF? YES → Faulty DCHS temperature detection ⇒ Replace NO →	
	Reduced heating air volume (Evaporator fan stopped or dropped off)	Is the evaporator fan motor stopped? YES → Faulty motor ⇒ Replace NO →	
	Pressure leak to condenser due to leak from discharge pressure control valve (DPR) ISV is leaking and not able to control refrigerant flow	HPT < 700kPa ? YES → Leak from DPR ⇒ Replace the DPR NO → Leak from ISV ⇒ Replace the ISV	

Symptom	Cause	Checkpoint	Remedy
V Control is unstable (during chilled proportional control operation) Box temperature can not be controlled	Faulty low pressure transducer LPT	Operating temperature is fluctuating ↓ Is pressure reading between gauge and LPT 30 kPa or more?	YES → Replace the LPT
	Faulty discharge line temperature sensor DCHS	NO ↓ Is the DCHS or heat insulator installed improperly?	YES → Correct installation of DCHS
	Suction modulation valve opening failure	NO ↓ The SMV opening is fixed to approx. 79pls (24%)	YES → Reset the opening of SMV (Circuit breaker ON)
	Solenoid valve (BSV) contact failure	NO ↓ Check the BSV connector or lead wire	※ BSV: Discharge gas bypass solenoid valve

Symptom	Cause	Checkpoint	Remedy	
V Box temperature fluctuating (during chilled proportional control operation)	Box temperature continues to decrease	<p>Temperature continues to decrease</p> <p>Check if Fu2 circuit is disconnected</p> <p>YES → Replace the Fu2</p> <p>NO</p> <p>Is the HSV outlet line cold?</p> <p>YES → Check operation of the HSV ⇒ Replace the HSV</p> <p>NO</p> <p>Check the SMV Check controller wiring and connector</p>		
	Box temperature continues to increase	<p>Box temperature continues to increase</p> <p>Is the opening of the SMV 118pls (36%) or more?</p> <p>NO → [Loop back to start]</p> <p>YES</p> <p>Is the BSV outlet line hot?</p> <p>YES → Check operation of the BSV ⇒ Replace the BSV</p> <p>NO</p> <p>Manual defrost ※ As for the manual defrost, refer to page 1-19.</p>		
VI Abnormal noise or vibration	Abnormal noise	Malfunction of compressor	Auditory check	Replace
	Abnormal noise	Fan motor of evaporator, condenser · Worn bearings	Auditory check	Replace the unit
		· Interference with fan guide	Auditory check Visual check	Replace failed parts
	Abnormal vibration	Compressor, fan motor · Loosen bolt	Auditory check Visual check	Tighten bolts
Refrigerant line · Removed or loosen cramp		Auditory check Visual check	Correct the cramp	

Symptom	Cause	Checkpoint	Remedy
<p>VIII</p> <p>Does not perform water cooled operation</p>	<p>Evaporator fan continues to run</p> <p>Water pressure switch WPS will not operate</p> <ul style="list-style-type: none"> Water pressure is low Water temperature is excessively high Water flow rate is low <p>Temperature in the control box is high</p> <p>Water pressure switch WPS is short-circuited</p>	<p>The condenser fan continues rotating</p> <p>The high pressure is excessively high</p> <p>Is the condenser fan stopped when the CBS is cooled?</p> <p>WPS has continuity</p>	<p>Check the water pressure, water temperature, and water volume</p> <p>CBS OK</p> <p>*CBS: Control box temperature sensor</p> <p>Faulty WPS</p> <p>Faulty CBS</p>
<p>IX</p> <p>Others</p>	<p>The remote monitoring RM has no output.</p> <p>Disconnection of Fu9</p> <p>Short-circuit of RM circuit</p> <ul style="list-style-type: none"> Faulty controller Short-circ of RM circuit on ship 	<p>Is the fuse Fu9 circuit disconnected?</p> <p>Is there any short circuit or disconnection on the secondary side of RM junction port (on ship)?</p> <p>Is there any short circuit or disconnection on the primary side of RM connection port (on unit)?</p> <p>Check the controller⇒Replace</p>	<p>Replace the Fu9</p> <p>Check the wiring on ship ⇒Correct it</p> <p>Check the wiring ⇒Correct</p> <p>Check for short circuit or disconnection at round crimp type terminal board: from No.23, 24, 25, 26 to RM connection port or connector type terminal board: from CN26 to RM connection port</p>

5.3 Troubleshooting for automatic PTI (J-code)

Note) If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

Step	Content	Alarm code	Conclusion	Possible cause	Check method
P00	Basic data record	No indication	No conclusion		
P02	Alarm check on all sensors	Same as normal operation	Same as normal operation	Same as normal operation	Same as normal operation
	Evaporator fan lock check	J161	Same as normal operation	Evaporator fan lock Evaporator fan and motor failure	Check evaporator fan and motor
P04	Power supply check	No indication	Same as normal operation	Same as normal operation	Same as normal operation
P05	Compressor startup running check	J051	Same as normal operation	Same as normal operation	Same as normal operation
P06	HPS check	J061	Out of range	(1) HPS malfunction	(1) Check HPS
		J062	Switch open	(2) High pressure transducer (HPT) malfunction	(2) Compare to Gauge manifold
		J064	High pressure does not rise.	(3) Gauge manifold leaking	(3) Remove Gauge manifold.
		J065	High pressure does not drop.	(Unit is not malfunctioning)	
P08	Pump down check	J081	Pump down is taking too long	Blocked with contamination of liquid solenoid valve	Try again S-PTI
				Leakage of hot gas by-pass solenoid valve	Touch the outlet pipe of the solenoid valve.
				Leakage of discharge gas by-pass solenoid valve	Touch the outlet pipe of the solenoid valve.
P10	Solenoid valve check	J101	Solenoid valve leaking by	Liquid solenoid valve malfunction	Check Liquid solenoid valve
				Suction modulating valve malfunction	Check Suction modulating valve
				Injection valve malfunction	Check Injection valve
P12	RS, SS accuracy check	J121	Excessively large temperature difference between RS and DRS Excessively large temperature difference between SS and DSS	SS malfunction	Compare the SS with DSS on the control panel.
				RS malfunction	Compare the RS with the DRS(optional) on the control panel. Without DRS, compares RS with SS
	EIS, EOS accuracy check	Same as normal operation	Compare the EIS, EOS with SS	EIS, EOS malfunction	Compare the EIS, EOS with SS
P14	HPT, LPT accuracy check	J141	Excessively large pressure difference between HPT and LPT	HPT malfunction	Compare the high pressure valve with the gauge manifold of HPT (on the control panel).
				LPT malfunction	Compare the low pressure valve with the gauge manifold of LPT (on the control panel)
P16	Evaporator fan H/L speed operation check	J161	Evaporator fan speed abnormal	Evaporator fan and motor malfunction. Magnetic contactor (EFH/L) and wiring malfunction.	Check Evaporator fan and motor. Check magnetic contactor (EFH/L) and wiring.
P20	Check economizer solenoid valve (ESV)	J201	ESV does not open.	ESV coil malfunction	Check ESV coil, wiring and terminals.
				ESV malfunction	Check capillary tube temperature on ESV outlet.

Step	Content	Alarm code	Conclusion	Possible cause	Check method
P22	Check discharge gas by-pass solenoid valve (BSV)	J221	BSV does not open.	BSV coil malfunction	Check BSV coil, wiring and terminals.
				BSV malfunction	Check outlet line temperature of BSV
P24	Standard Pull down operation	No indication			
P26	Standard Pull down operation	No indication			
P28	Check suction modulating valve (SMV) (Open SMV to 3%)	J281	(LPT : decrease 20kPa)	SMV coil malfunction Faulty controller connection wiring	Refer to section 3.2.4. Check appearance. (Replace coil bracket) Check wiring and connector
P29	Electronic expansion valve check	J291	Pump down time is too long.	Electronic expansion valve wiring malfunction	Check knocking sound of the coil Disconnect and connect the coil connector.
				Electronic expansion valve coil failure.	Check knocking sound of coil.
				Hot gas by-pass solenoid valve	Touch the outlet line of solenoid valve.
				Leakage of discharge gas by-pass solenoid valve leaking	Touch the outlet line of the solenoid valve.
P30	ISV opening or closing check	J301	ISV does not open.	ISV coil malfunction	Check ISV coil, wiring and terminals.
				ISV malfunction	Check capillary tube temperature on ISV outlet.
P32	HSV opening or closing check	J321	HSV does not open.	HSV coil malfunction	Check HSV coil, wiring and terminals.
	SGS accuracy check	Same as normal operation	Compare SGS with EOS	Sensor deterioration	SGS malfunction
	RSV opening or closing check	J322	RSV does not open.	RSV coil malfunction	Check outlet line temperature of RSV
P50	Pull-down cooling capacity	J501	Out of ambient temperature condition	Unit is not wrong Ambient temperature is lower than -10°C Ambient temperature is higher than 43°C	Check ambient temperature.
		J502	Pull down time is too long.	Same as normal operation ※	Same as normal operation ※
P60	0°C control	No indication	No conclusion		
P70	Defrosting operation check	J701	Out of starting condition. (EOS is 20°C or more.)	Wrong installation of EOS.	Check the installation of EOS.
				Hot gas solenoid valve leaking	Touch solenoid valve outlet line.
		J702	Defrost time is too long.	Wrong installation of EOS. EOS malfunction.	Check the installation of EOS. Check EOS.
P80	Pull-down cooling capacity	J801	Pull down time is too long.	Same as normal operation ※	Same as normal operation ※
P90	-18°C control	No indication	No judgement		

Note :※"Same as normal operation" means that it is same as judgement, countermeasure and check method at normal operation. (Refer to from Page 5-24 to 5-35)

5.4 Emergency operation

5.4.1 Controller emergency operation

In case of the controller malfunction, emergency operation can be done by using emergency operation kit. However, CA operation is not possible.

(1) Components to be prepared (emergency operation kit)

- Short-circuit connector ... Installed in front of the controller inside the control box
- Emergency magnet ... (Part No. 1896110)

(2) On-site work

The following steps are required for emergency operation.

- ① Wiring change for short circuit operation
 - 1) Wiring change for cutting off the power to CPU board
 - 2) Wiring change to force running of Compressor, Condenser Fan and Evaporator Fans.
 - * Install the short-circuit connector in front of the controller.
 - * For the details, refer to section 5.4.2 "Controller short circuit operation"
- ② Opening of electronic expansion valve
 - * The emergency magnet is used to open valve.
 - * For the details, refer to section 5.4.3 "Electronic expansion valve emergency operation"
- ③ Suction Modulation Valve fully open.
 - * Use Emergency Magnet for full opening.
 - * For details, refer to "Suction modulation valve emergency operation" in section 5.4.4.

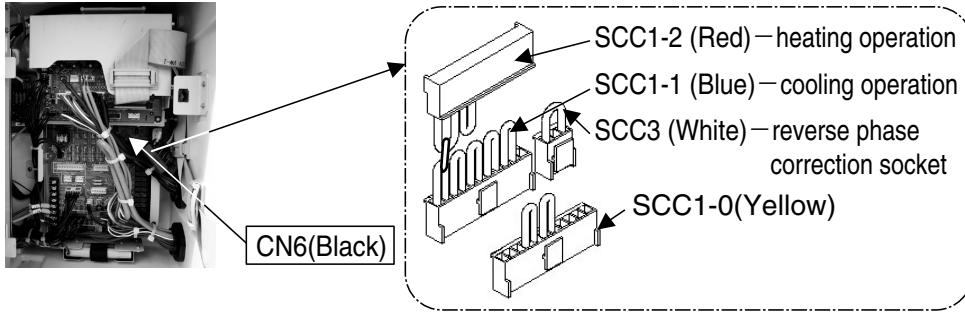
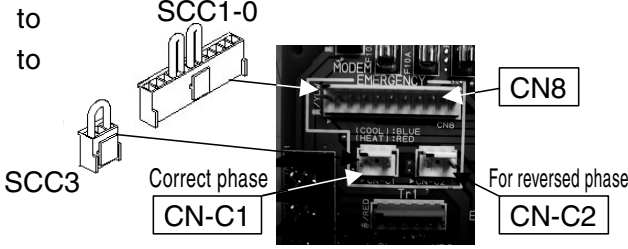
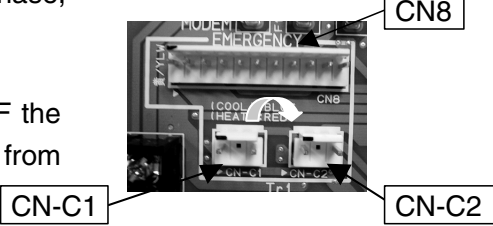
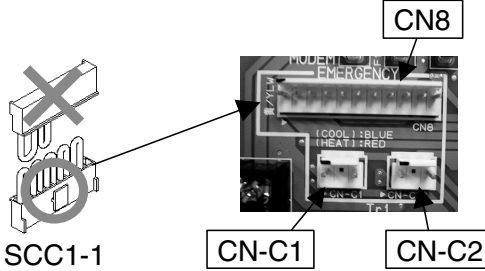
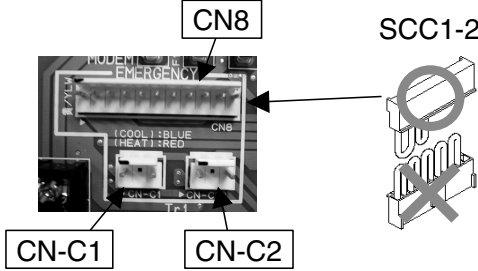
(3) Operating condition at emergency

Temperature can not be controlled. Turn the circuit breaker on or off to maintain set temperature.

Mode	Available function of protection devices	Operating condition of unit
Cooling operation	HPS : High pressure switch CTP : Compressor thermal protector	<input type="radio"/> Compressor runs continuously. <input type="radio"/> Evaporator fan runs at low speed continuously. <input type="radio"/> Condenser fan runs continuously. <input type="radio"/> Electronic expansion valve operates at full open. <input type="radio"/> Suction modulating valve operates at full open.
Heating operation	_____	<input type="radio"/> Compressor stops. <input type="radio"/> Evaporator fan runs at high speed continuously. <input type="radio"/> Condenser fan stops.

5.4.2 Controller short circuit operation

●LXE10E100F or later

	Cooling operation	Heating operation
Power OFF	① Turn OFF the circuit breaker.	
Preparation	② Remove connector (black) from CN6 located on the I/O board. ③ Remove connectors attached to the controller, SCC1-0 (yellow), SCC1-1 (blue), SCC1-2 (red) and SCC3 (white).	
		
Power supply reversed phase confirmation	④ Connect SCC1-0 (yellow) to CN-8 and SCC3 (white) to CN-C1, respectively.  ⑤ Turn ON the breaker. If the power supply is in reversed phase, the condenser rotates inversely. ⑥ In case of reverse phase, Turn OFF the breaker and remove SCC3 (white) from CN-C1 and insert in CN-C2. 	
Forcible operation of compressor and condenser fan	<Cooling Operation> 1. Turn OFF breaker. 2. Pull SCC1-10 (yellow) from CN8 and insert SCC1-1 (blue). 3. Turn ON breaker. 	<Heating Operation> 1. Turn OFF the breaker. 2. Pull SCC1-0 (yellow) from CN8 and insert SCC1-2 (red). 3. Turn ON the breaker. 
Caution when turning the power off	Check power supply reversed phase again when running the unit after having turned the power OFF.	

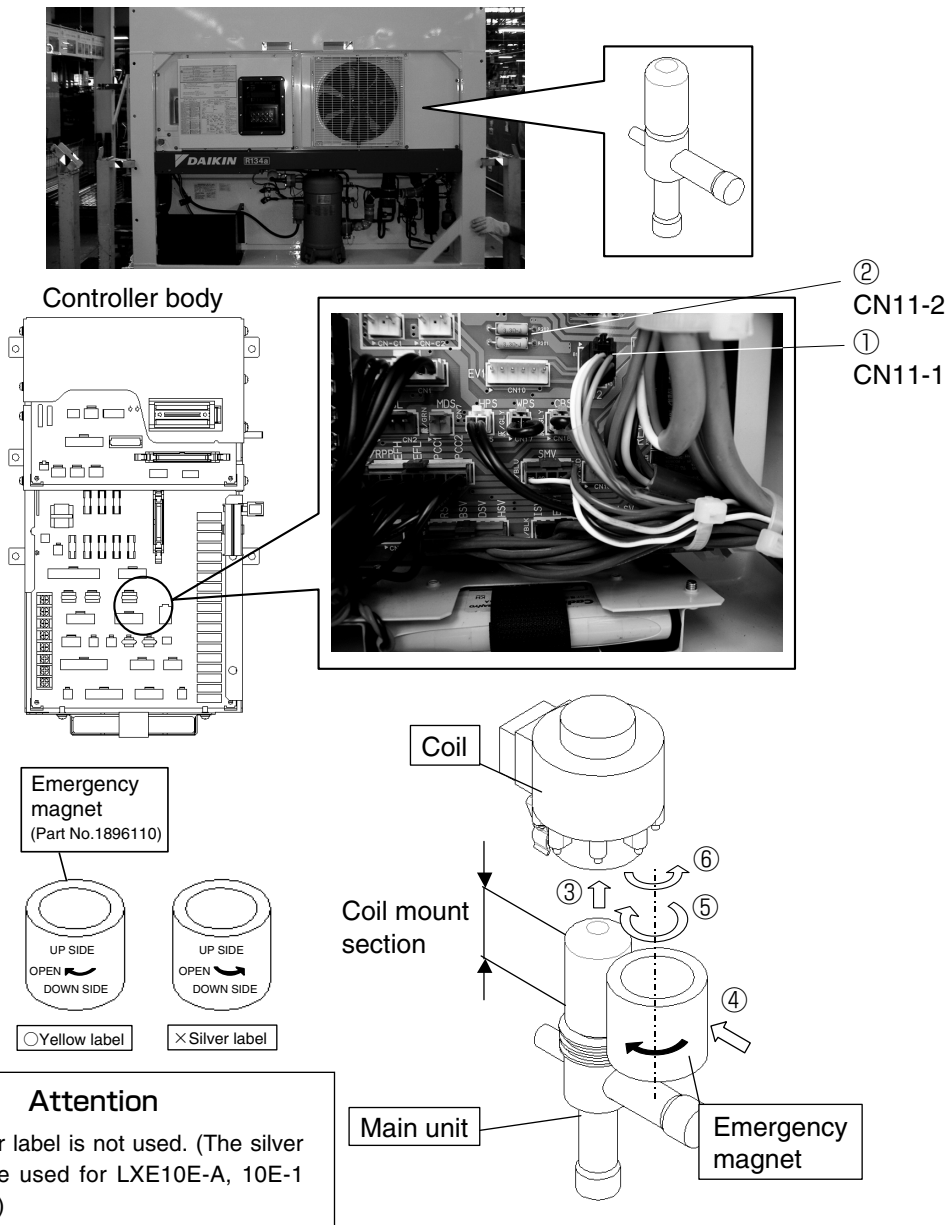
5.4.3 Electronic expansion valve emergency operation

If controller does not work or the electronic expansion valve coil has failed the emergency magnet can be used to fully open electronic expansion valve.

- ① Disconnect the CN11-1 connector or CN11-2 connector from the power supply I/O board of the controller to turn off power to the electronic expansion valve.
- ② Locate the emergency magnet.
- ③ Remove the electronic expansion valve coil.
- ④ Bring the emergency magnet into contact with the coil mount section of the electronic expansion valve body with indication "UP SIDE" located upward. (The emergency magnet is magnetically attracted to the coil mount section by moving magnet located inside.)
- ⑤ Turn the emergency magnet in the OPEN direction (clockwise) mounted on valve.
→ Ensure that the valve is fully open. (There is a small click sound.)
- ⑥ Turn emergency magnet mounted on the valve 90° to 180° counterclockwise.

To shorten the operation time, it is recommended that the opening be adjusted.

Note : slightly closed if there is frost around the compressor due to the operation in wet conditions or the degree of superheat is small.



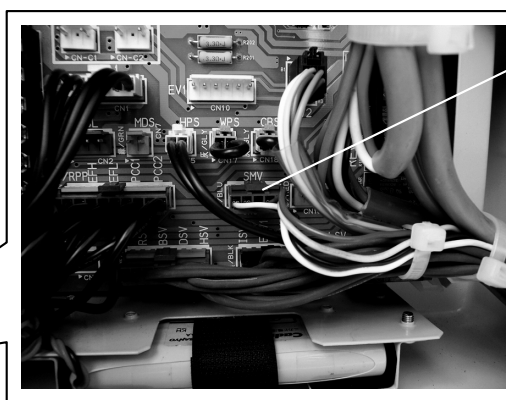
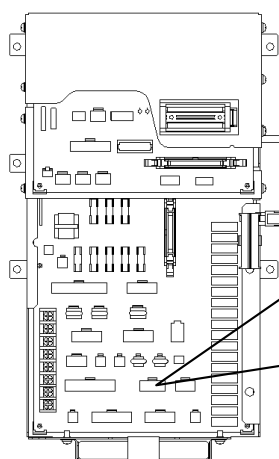
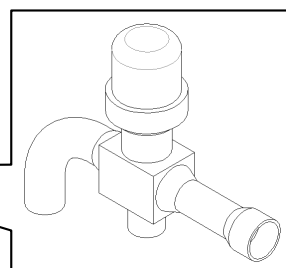
5.4.4 Suction modulation valve emergency operation

If controller does not work or the suction modulation valve coil has failed, emergency magnet can be used to fully open the suction modulation valve.

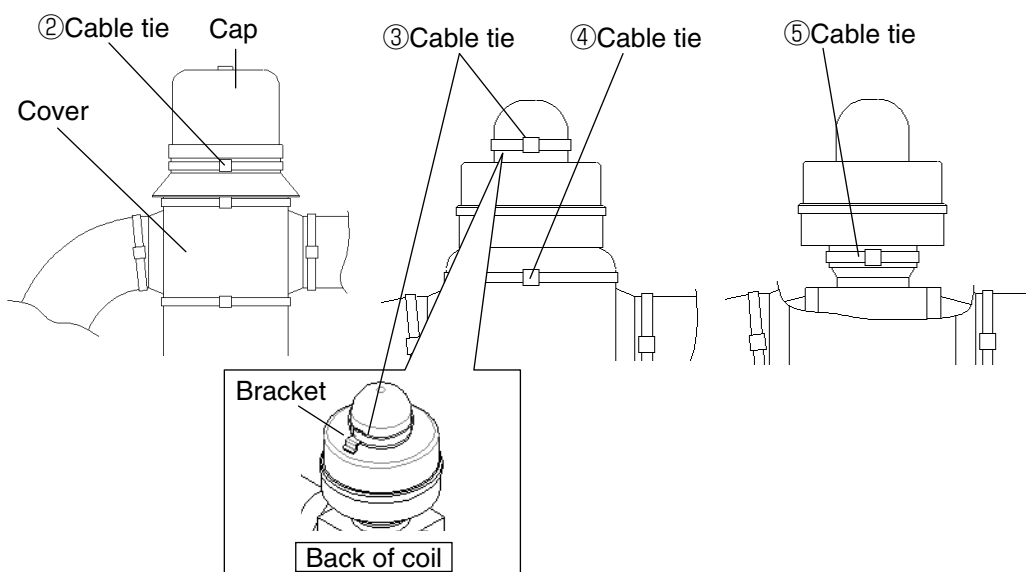
- ① Disconnect CN9 connector from the power supply I/O board of the controller to remove power to the suction modulation valve coil.
- ② Remove cable tie on suction modulation valve cap, and then remove the cap.
- ③ Remove cable tie on upper section of the suction modulation valve coil.
- ④ Remove cable tie on suction modulation valve cover to expose the lower section of the suction modulation valve coil.
- ⑤ Remove cable tie on the lower section of the suction modulation valve coil.



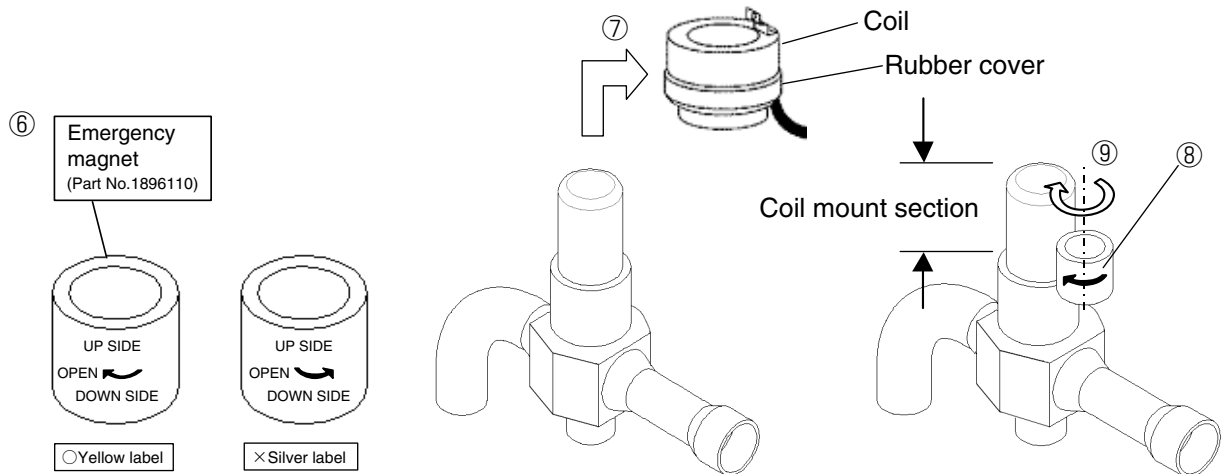
Controller body



①
CN9



- ⑥ Locate emergency magnet.
- ⑦ Remove suction proportional coil. (Removed together with the coil's lower rubber cover)
- ⑧ Bring the emergency magnet into contact with the coil mount section of the suction modulation valve with indication "UP SIDE" located upward. (The emergency magnet is magnetically attracted to the coil mount section by the driving magnet located inside.)
- ⑨ Turn the emergency magnet in the OPEN direction (clockwise) in the same place.
→ Ensure that the valve is fully open. (There is a small clicking sound.)



Attention

- The silver label is not used. (The silver labels are used for LXE10E-A, 10E-1 and 10D.)

5.5 Alarm display and backup function

5.5.1 Alarm grouping

Code	Description	Abnormal LED		
		Operation	AUTO	PTI
FXXX	Critical error such as the box temp is out of range or the unit shut down.	○	○	
EXXX	Box temperature is in range. Backup operation is executed in most cases.	●	○	
HXXX	Information code: When the temperature inside is out of in-range (alternative to the temperature recorder)	●		
DXXX	Information code: When the temperature inside is out of in-range (alternative to the temperature recorder)	●		
JXXX	Displayed in J code when judged as abnormal by AUTO PTI		○	
PXXX	The unit is in the pull down process. "XXX" indicates the pull down time	○		

○LED on ●LED off

5.5.2 Backup operation at the time of control sensor (SS, RS) abnormality

Control sensor	Alarm at the time of control sensor abnormality	Operation at each control mode		Backup at the time of control sensor abnormality	
		Chilled	Frozen	First stage	Second stage
SS	E401	Backup	Normal operation continued	DSS	RS-2.0°C
RS	E403	Normal operation continued	Backup	DRS (optional) ※1	SS+5.0°C

SS : Supply air temperature sensor

RS : Return air temperature sensor

DSS : Supply air temperature for data recorder

DRS (optional) : Return air temperature sensor for data recorder

※1 It controls by SS +5.0°C when malfunction occurs in RS without DRS (optional)

5.5.3 Backup operation at the time of sensor abnormality

Abnormal sensor		Mode	Backup operation method
AMBS	Ambient temperature air sensor	All modes	Only abnormal indication (Operation continued)
DCHS	Discharge gas temperature sensor	Chilled	Only abnormal indication (Operation continued)
		Frozen	Only abnormal indication (Operation continued)
		Defrosting	
EIS	Evaporator inlet sensor	Chilled	See the next page No 2
		Frozen	See the next page No 1
		Defrosting	Only abnormal indication (Operation continued)
EOS	Evaporator outlet sensor	Chilled	See the next page No 2
		Frozen	See the next page No 1
		Defrosting	Defrosting initiation: permission given at any time Defrosting termination: terminating when the timer has reached 100 minutes or EIS has exceeded 90°C or RS has exceeded the set temperature
SGS	Suction gas temperature sensor	Chilled	Only abnormal indication (Operation continued)
		Frozen	See the next page No 1
		Defrosting	Only abnormal indication (Operation continued)
HPT	High pressure sensor	Chilled, Frozen	Only abnormal indication (Operation continued)
		Defrosting	Charge: Only abnormal indication (Operation continued) Release: Executed by LPT
LPT	Low pressure sensor	Chilled, Frozen	Only abnormal indication (Operation continued)
		Defrosting	Charge: Executed by HPT Pump down: No pump down (Operation continued)

1.Backup for temperature sensors (EIS, EOS, SGS) at frozen mode (superheat control)

No.	Evaporator inlet temperature sensor EIS	Evaporator outlet temperature sensor EOS	Suction gas temperature sensor SGS	Backup operation
1	Normal	Normal	Normal	superheat control
2	Normal	Normal	Abnormal	superheat control
3	Normal	Abnormal	Normal	Liquid refrigerant back prevention to compressor by EIS and SGS
4	Normal	Abnormal	Abnormal	Expansion valve fixed opening rate control
5	Abnormal	Normal	Normal	Liquid refrigerant back prevention to compressor by EOS and SGS
6	Abnormal	Normal	Abnormal	Expansion valve fixed opening rate control
7	Abnormal	Abnormal	Normal	Expansion valve fixed opening rate control
8	Abnormal	Abnormal	Abnormal	Expansion valve fixed opening rate control

2.Backup for temperature sensors (EIS, EOS, SGS) at chilled mode (superheat control)

No.	Evaporator inlet temperature sensor EIS	Evaporator outlet temperature sensor EOS	Suction gas temperature sensor SGS	Backup operation
1	Normal	Normal	Normal	Super heat control
2	Normal	Normal	Abnormal	Super heat control
3	Normal	Abnormal	Normal	Super heat control by discharge gas
4	Normal	Abnormal	Abnormal	Super heat control by discharge gas
5	Abnormal	Normal	Normal	Super heat control by discharge gas
6	Abnormal	Normal	Abnormal	Super heat control by discharge gas
7	Abnormal	Abnormal	Normal	Super heat control by discharge gas
8	Abnormal	Abnormal	Abnormal	Super heat control by discharge gas

5.6 Backup Battery

Note) If you have set the CA unit's on board ON/OFF setting to "ON," refer to the CA service manual for the Marine type Container Refrigeration Unit.

5.6.1 Function

When main power supply is not available, backup battery can be used as power supply to display and set the following items.

Refer to section 2.2.2 (3. Battery mode).

1) Display function

Return air temperature indication (RS)
Supply air temperature indication (SS)
Ventilation amount indication (FA)
USDA & CTS temperature indication
High pressure indication (HPT)
Low pressure indication (LPT)
Full-PTI record indication
Short-PTI operation day record indication
Chilled-PTI operation day record indication
Frozen-PTI operation day record indication
Remaining battery voltage indication (BAT)

2) Setting function

Control temperature setting (SP)
Control humidity setting (RH)
Defrosting interval setting (Def)

5.6.2 Checking the remaining battery voltage

1) Checking the remaining battery voltage

The remaining battery voltage can be checked during operation in accordance with section 2.2.2 (6. Sensor indication mode).

When the unit does not run or main power is not available the remaining battery voltage can be checked see section 2.2.2 (3. Battery mode).

The remaining voltage

7.6V or more: The battery has been charged.

7.5V or less : The battery may have failed. Verify battery voltage and replace.

7.1V or less : The battery has failed. Verify battery voltage and replace.

● Things to keep in mind when checking the remaining voltage

Make sure that the unit has run for 14 hours at least or main power supply has recharged for 14 hours at least with the circuit breaker ON (the unit OFF) before checking the remaining voltage. Recharging for 14 hours at least is a must.

Note 1: Because of the battery property, accurate remaining voltage cannot be obtained if not fully charged.

Note 2: The remaining voltage during recharging, under the recharger's influence, is indicated (blinking) higher than it should be.

2) Rechargeable battery

The battery life is approximately 2 years. In the event of using the battery for 2 years or more, data logging etc. may not be executed when the power is turned off even if the LCD screen indicates that the remaining voltage is 7.6V or more.

3) The remaining voltage for dry batteries can be checked, but replace the new ones before a voyage as needed basis such as refrigerated transport (USDA). Don't judge by the remaining voltage.

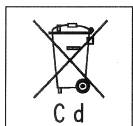
5.6.3 Handling used batteries

The rechargeable battery included with the unit is labeled with the symbols below.

These symbols mean that the battery in question must not be mixed in with unsorted household waste.

If there is a chemical symbol printed at the bottom of the symbol, this means that the battery contains over a certain concentration of heavy metal.

Battery waste must be processed at a special processing facility for reuse. Checking that battery waste is disposed of appropriately contributes to the prevention of potential negative impacts on environmental and human health.



NiCad battery
⇒ Cadmium (Cd) : Lead (>0.002%)



NiMH battery

In addition, the used batteries, please send to our certified stores or the satellite parts centers as follows.

Please send batteries replaced in EU member nations to the following address.

DAIKIN REFRIGERATION OFFICE
FASCINATIO BOULEVARD 562 CAPELLE
A/D IJSSEL NETHERLANDS 2909 VA
TEL: +31-(0)10-286-2090
FAX: +31-(0)10-286-2099

6. APPENDIX

6.1 Standard tightening torques for bolts

	Bolt size	Main part	Tightening torque		
			N · m	kgf · cm	lbf · ft
Stainless steel	M4	Small parts	1.6	16	1.2
	M5	Solenoid valve coil mounting bolt	1.2	12.2	0.9
		Except Solenoid valve coil mounting bolt	3.0	30	2.3
	M6	Access panel	5.2	53	3.8
	M8	Evaporator fan motor Condenser fan motor Control box Service door	12.3	125	9.1
	M10	Evaporator fan motor mounting base Compressor suction flange Compressor discharge flange	25.2	257	18.6
M12	Compressor	42.7	435	31.5	

Note: Tolerance of tightening torque is within $\pm 10\%$.

6.2 Standard tightening torque for flare nut

Pipe size		Main part	Tighten torque		
mm	in.		N · m	kgf · cm	lbf · ft
$\phi 6.4$	2/8	Compressor pressure port	15.7	160	11.3
$\phi 9.5$	3/8	—	36.3	370	26.8
$\phi 12.7$	4/8	Drier	54.9	500	40.5

Note: Tolerance of tightening torque is within $\pm 10\%$.

6.3 Resistance of motor coil and solenoid valve coil

Symbol	Parts name	Value of resistance Ω	Remarks
CM	Compressor motor coil	1.780 Ω (@75°C)	
CFM	Condenser fan motor coil	21.5 Ω (20°C)	
EFMH	Evaporator fan motor coil (high speed)	23.0 Ω $\pm 10\%$ (20°C)	
EFML	Evaporator fan motor coil (low speed)	89.2 Ω $\pm 10\%$ (20°C)	
LSV	Liquid solenoid valve coil	15.2 Ω $\pm 10\%$ (20°C)	
HSV	Hot gas solenoid valve coil		
ISV	Injection solenoid valve coil		
ESV	Economizer solenoid valve coil		
BSV	Hot gas by-pass solenoid valve coil		
RSV	Reheater solenoid valve		
EV	Electronic expansion valve coil	White - Red : 46 $\pm 3\Omega$ Orange - Red : 46 $\pm 3\Omega$ Yellow - Brown : 46 $\pm 3\Omega$ Blue - Brown : 46 $\pm 3\Omega$	<p>White — (COM) = Red — Orange — Yellow Brown Blue (COM)</p>
SMV	Suction modulation valve coil	Blue - Yellow : 113 Ω (20°C) Orange - White : 113 Ω (20°C)	<p>Blue — Yellow — Black White</p>

※The values of resistance are at room temperature excluding those of compressor.

**6.4 Temperature conversion table and temperature sensor
(SS/RS/DSS/DRS (optional) /EIS/EOS/SGS/AMBS) characteristics table**

Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
-40	-40	53.54	+1	+33	6.557
-39	-38	50.52	+2	+35	6.270
-38	-36	47.69	+3	+37	5.997
-37	-34	45.04	+4	+39	5.737
-36	-32	42.55	+5	+41	5.490
-35	-31	40.21	+6	+42	5.255
-34	-29	38.01	+7	+44	5.031
-33	-27	35.95	+8	+46	4.818
-32	-25	34.01	+9	+48	4.616
-31	-23	32.19	+10	+50	4.423
-30	-22	30.47	+11	+51	4.239
-29	-20	28.86	+12	+53	4.064
-28	-18	27.34	+13	+55	3.897
-27	-16	25.91	+14	+57	3.737
-26	-14	24.57	+15	+59	3.586
-25	-13	23.30	+16	+60	3.441
-24	-11	22.10	+17	+62	3.303
-23	-9	20.98	+18	+64	3.171
-22	-7	19.91	+19	+66	3.045
-21	-5	18.91	+20	+68	2.925
-20	-4	17.96	+21	+69	2.810
-19	-2	17.07	+22	+71	2.700
-18	0	16.23	+23	+73	2.596
-17	+1	15.43	+24	+75	2.496
-16	+3	14.68	+25	+77	2.400
-15	+5	13.96	+26	+78	2.308
-14	+6	13.29	+27	+80	2.221
-13	+8	12.65	+28	+82	2.137
-12	+10	12.05	+29	+84	2.057
-11	+12	11.48	+30	+86	1.980
-10	+14	10.94	+31	+87	1.907
-9	+15	10.43	+32	+89	1.837
-8	+17	9.940	+33	+91	1.769
-7	+19	9.480	+34	+93	1.705
-6	+21	9.044	+35	+95	1.643
-5	+23	8.631	+36	+97	1.584
-4	+24	8.239	+37	+98	1.527
-3	+26	7.867	+38	+100	1.473
-2	+28	7.514	+39	+102	1.421
-1	+30	7.178	+40	+104	1.371
-0	+32	6.860	+41	+105	1.323
			+42	+107	1.277
			+43	+109	1.232
			+44	+111	1.190
			+45	+113	1.149
			+46	+114	1.110
			+47	+116	1.072
			+48	+118	1.036
			+49	+120	1.002
			+50	+122	0.968

6.5 Temperature conversion table and temperature sensor (DCHS) characteristics table

Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
10	50	478.765	51	123	75.191
11	51	455.208	52	125	72.229
12	53	432.939	53	127	69.398
13	55	411.880	54	129	66.692
14	57	391.960	55	131	64.105
15	59	373.110	56	132	61.630
16	60	355.269	57	134	59.264
17	62	338.376	58	136	56.999
18	64	322.377	59	138	54.832
19	66	307.220	60	140	52.758
20	68	292.857	61	141	50.772
21	69	279.241	62	143	48.871
22	71	266.330	63	145	47.049
23	73	254.085	64	147	45.305
24	75	242.467	65	149	43.633
25	77	231.442	66	150	42.031
26	78	220.975	67	152	40.496
27	80	211.037	68	154	39.024
28	82	201.598	69	156	37.612
29	84	192.629	70	158	36.258
30	86	184.107	71	159	34.959
31	87	176.005	72	161	33.713
32	89	168.302	73	163	32.517
33	91	160.976	74	165	31.369
34	93	154.006	75	167	30.267
35	95	147.374	76	168	29.208
36	96	141.061	77	170	28.192
37	98	135.051	78	172	27.216
38	100	129.328	79	174	26.278
39	102	123.876	80	176	25.376
40	104	118.681	81	177	24.510
41	105	113.731	82	179	23.677
42	107	109.012	83	181	22.877
43	109	104.512	84	183	22.107
44	111	100.221	85	185	21.366
45	113	96.127	86	186	20.654
46	114	92.221	87	188	19.969
47	116	88.493	88	190	19.309
48	118	84.935	89	192	18.675
49	120	81.537	90	194	18.064
50	122	78.291			

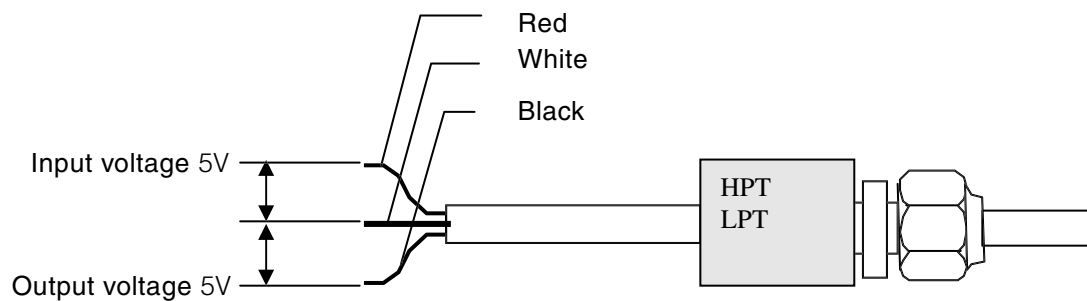
6.6 High and low pressure sensor characteristic table

For high pressure sensor

pressure (kPa·G)	output (V)	pressure (kPa·G)	output (V)
0	0.50	1100	1.62
100	0.60	1200	1.72
200	0.70	1300	1.83
300	0.81	1400	1.93
400	0.91	1500	2.03
500	1.01	1600	2.13
600	1.11	1700	2.23
700	1.21	1800	2.34
800	1.32	1900	2.44
900	1.42	2000	2.54
1000	1.52	2100	2.64

For low pressure sensor

pressure (kPa·G)	output (V)	pressure (kPa·G)	output (V)
-500	-1.03	300	1.42
-400	-0.72	400	1.72
-300	-0.42	500	2.03
-200	-0.11	600	2.34
-100	0.19	700	2.64
0	0.50	800	2.95
100	0.81	900	3.25
200	1.11	1000	3.56



6.7 HFC134a, temperature - vapor pressure characteristics table

Temperature		Vapor pressure			Temperature		Vapor pressure		
°C	°F	kPa	kg/cm ² ·G	PSIG	°C	°F	kPa	kg/cm ² ·G	PSIG
-40	-40	-49	-0.50	-7.1	20	68	470	4.79	68.1
-39	-38.7	-46	-0.47	-6.6	21	69.8	488	4.97	70.7
-38	-36.4	-44	-0.44	-6.3	22	71.6	507	5.16	73.5
-37	-34.6	-41	-0.41	-5.9	23	73.4	525	5.35	76.1
-36	-32.8	-37	-0.38	-5.3	24	75.2	544	5.55	78.8
-35	-31	-34	-0.34	-4.9	25	77	564	5.75	81.7
-34	-29.2	-31	-0.31	-4.4	26	78.8	584	5.95	84.6
-33	-27.4	-27	-0.27	-3.9	27	80.6	604	6.16	87.5
-32	-25.6	-24	-0.24	-3.4	28	82.4	625	6.37	90.6
-31	-23.8	-20	-0.20	-2.9	29	84.2	647	6.59	93.8
-30	-22	-16	-0.16	-2.3	30	86	668	6.81	96.8
-29	-20.2	-12	-0.12	-1.7	31	87.8	691	7.04	100.1
-28	-18.4	- 8	-0.07	-1.1	32	89.6	713	7.27	103.3
-27	-16.6	- 3	-0.03	-0.4	33	91.4	737	7.51	106.8
-26	-14.8	1	0.01	0.1	34	93.2	760	7.75	110.2
-25	-13	6	0.06	0.8	35	95	785	8.00	113.8
-24	-11.2	11	0.11	1.5	36	96.8	810	8.25	117.4
-23	- 9.4	16	0.16	2.3	37	98.6	835	8.51	121.0
-22	- 7.6	21	0.21	3.0	38	100.4	861	8.77	124.8
-21	- 5.8	27	0.27	3.9	39	102.2	887	9.04	128.6
-20	- 4	32	0.33	4.6	40	104	914	9.31	132.5
-19	- 2.2	38	0.39	5.5	41	105.8	941	9.59	136.4
-18	- 0.4	44	0.45	6.3	42	107.6	969	9.88	140.5
-17	1.4	51	0.51	7.3	43	109.4	998	10.17	144.7
-16	3.2	57	0.58	8.2	44	111.2	1027	10.47	148.9
-15	5	64	0.64	9.2	45	113	1057	10.77	153.2
-14	6.8	71	0.71	10.2	46	114.8	1087	11.08	157.6
-13	8.6	78	0.79	11.3	47	116.6	1118	11.39	162.1
-12	10.4	85	0.86	12.3	48	118.4	1149	11.72	166.6
-11	12.2	93	0.94	13.4	49	120.2	1182	12.04	171.3
-10	14	100	1.02	14.5	50	122	1214	12.38	176.0
- 9	15.8	108	1.10	15.6	51	123.8	1248	12.72	180.9
- 8	17.6	117	1.18	16.9	52	125.6	1281	13.06	185.7
- 7	19.4	125	1.27	18.1	53	127.4	1316	13.42	190.8
- 6	21.2	134	1.36	19.4	54	129.2	1351	13.77	195.8
- 5	23	143	1.45	20.7	55	131	1387	14.14	201.1
- 4	24.8	152	1.55	22.0	56	132.8	1424	14.51	206.4
- 3	26.6	162	1.65	23.4	57	134.6	1461	14.89	211.8
- 2	28.4	172	1.75	24.9	58	136.4	1499	15.28	217.3
- 1	30.2	182	1.85	26.3	59	138.2	1538	15.67	223.0
0	32	192	1.96	27.8	60	140	1577	16.07	228.6
1	33.8	203	2.07	29.4	61	141.8	1617	16.48	234.4
2	35.6	214	2.18	31.0	62	143.6	1658	16.90	240.4
3	37.4	225	2.29	32.6	63	145.4	1699	17.32	246.3
4	39.2	237	2.41	34.3	64	147.2	1741	17.75	252.4
5	41	249	2.53	36.1	65	149	1784	18.19	258.6
6	42.8	261	2.66	37.8	66	150.8	1828	18.63	265.0
7	44.6	274	2.79	39.7	67	152.6	1872	19.09	271.4
8	46.4	287	2.92	41.6	68	154.4	1918	19.55	278.1
9	48.2	300	3.06	43.5	69	156.2	1964	20.02	284.7
10	50	314	3.20	45.5	70	158	2010	20.50	291.4
11	51.8	328	3.34	47.5	71	159.8	2058	20.98	298.4
12	53.6	342	3.48	49.5	72	161.6	2107	21.48	305.5
13	55.4	357	3.63	51.7	73	163.4	2156	21.98	312.6
14	57.2	372	3.79	53.9	74	165.2	2206	22.49	319.8
15	59	387	3.95	56.1	75	167	2257	23.01	327.2
16	60.8	403	4.11	58.4	76	168.8	2309	23.54	334.8
17	62.6	419	4.27	60.7	77	170.6	2362	24.08	342.4
18	64.4	436	4.44	63.2	78	172.4	2415	24.62	350.1
19	66.2	453	4.62	65.6	79	174.2	2470	25.18	358.1
					80	176	2525	25.74	366.1

Conversion rate : 1kgf/cm² · G=98.0665kPa

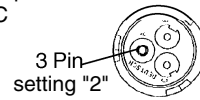
1kPa = 0.145PSIG

6.8 USDA sensor characteristics table

●NTC type USDA Sensor Characteristics, USDA1, USDA2, USDA3, CTS (Option)

Set sensor type "2" in ※12 Optional condition setting mode in paragraph 2.2 for NTC type USDA sensor.

Receptacle for NTC



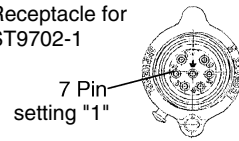
Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
-20	-4	97.391	10	50	19.893
-19	-2	91.883	11	52	18.964
-18	0	86.721	12	54	18.083
-17	1	81.882	13	55	17.249
-16	3	77.343	14	57	16.457
-15	5	73.034	15	59	15.709
-14	7	69.087	16	61	14.995
-13	9	65.333	17	63	14.320
-12	10	61.805	18	64	13.678
-11	12	58.491	19	66	13.069
-10	14	55.379	20	68	12.491
-9	16	62.442	21	70	11.041
-8	18	49.684	22	72	11.419
-7	19	47.087	23	73	10.922
-6	21	44.641	24	75	10.450
-5	23	42.338	25	77	10.001
-4	25	40.167	26	79	8.574
-3	27	38.120	27	81	8.157
-2	28	36.190	28	82	8.779
-1	30	34.369	29	84	8.411
0	32	32.651	30	86	8.060
1	34	31.028	31	88	7.725
2	36	29.494	32	90	7.406
3	37	28.047	33	91	7.102
4	39	25.678	34	93	6.812
5	41	25.385	35	95	6.535
6	43	24.162	36	97	6.271
7	45	23.005	37	99	6.200
8	46	21.910	38	100	5.779
9	48	20.874	39	102	5.550

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●ST9702-1 type USDA Sensor Characteristics, USDA1, USDA2, USDA3, CTS (Option)

Set sensor type "1" in ※12 Optional condition setting mode in paragraph 2.2 for ST9702-1 type USDA sensor.

Receptacle for ST9702-1



Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
-20	-4	36.240	10	50	9.196
-19	-2	34.470	11	52	8.821
-18	0	32.800	12	54	8.465
-17	1	31.220	13	55	8.124
-16	3	29.720	14	57	7.800
-15	5	28.310	15	59	7.490
-14	7	26.970	16	61	7.194
-13	9	25.710	17	63	6.911
-12	10	24.510	18	64	6.641
-11	12	23.370	19	66	6.383
-10	14	22.290	20	68	6.136
-9	16	21.270	21	70	5.901
-8	18	20.300	22	72	5.675
-7	19	19.380	23	73	6.460
-6	21	18.510	24	75	5.253
-5	23	17.680	25	77	5.056
-4	25	16.900	26	79	4.867
-3	27	16.150	27	81	4.685
-2	28	15.440	28	82	4.513
-1	30	14.770	29	84	4.348
0	32	14.120	30	86	4.189
1	34	13.520	31	88	4.036
2	36	12.940	32	90	3.891
3	37	12.380	33	91	3.751
4	39	11.860	34	93	3.617
5	41	11.360	35	95	3.488
6	43	10.880	36	97	3.365
7	45	10.430	37	99	3.247
8	46	9.999	38	100	3.133
9	48	9.588	39	102	3.024
10	50	9.196	40	104	2.919

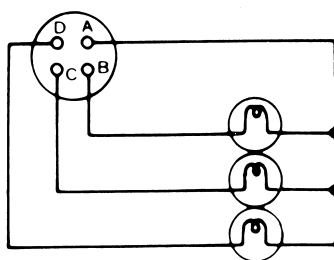
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6.9 Electric wiring pilot lamps and monitoring circuit (option)

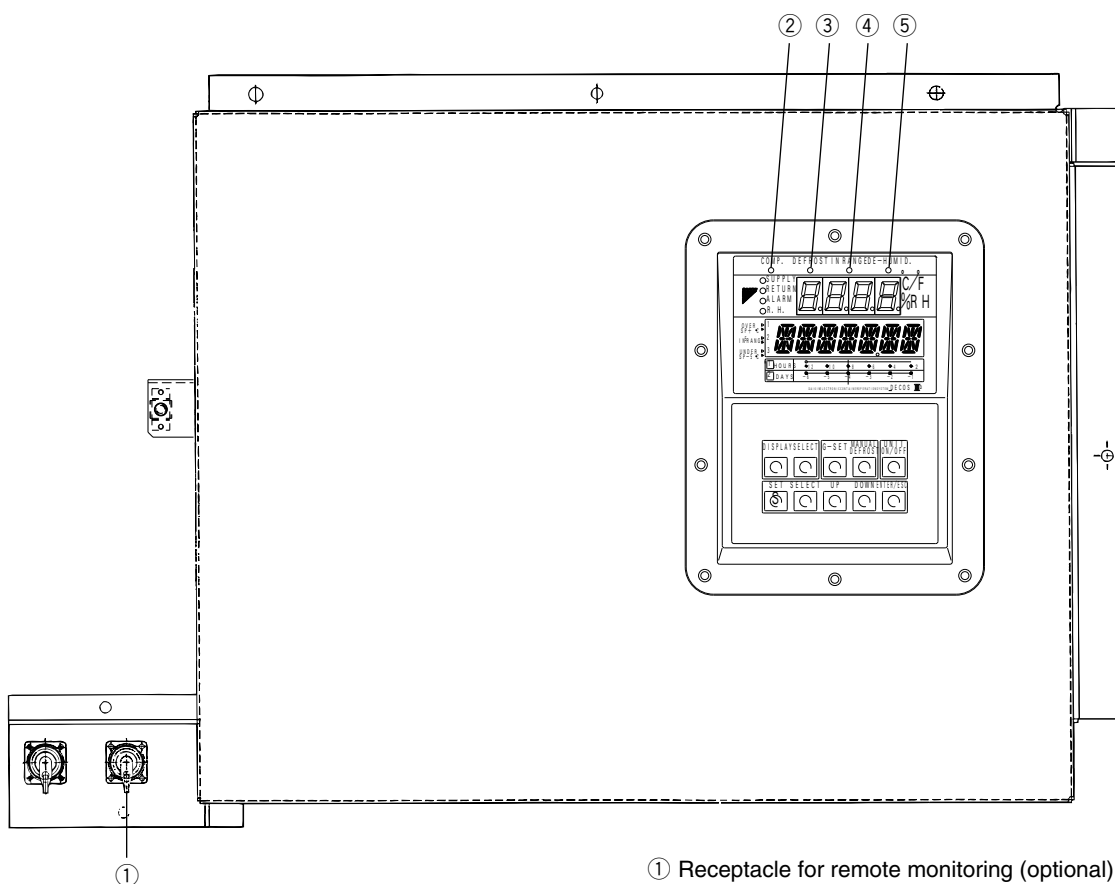
Four pilot lamps which indicate operating mode are mounted on the controller in the control box.

Pilot lamp	Color	Operating condition
COMP.	Green	The compressor is running
DEFROST	Red	The unit is under defrosting operation
IN RANGE	Orange	The inside temperature is within the proper range (within $\pm 2.0^{\circ}\text{C}$ ($\pm 3.6^{\circ}\text{F}$) of the preset temperature).
DE-HUMID.	Yellow	The unit is set to the dehumidification control operation. (optional)

Also, the receptacle for remote monitoring of the indicator lamp can be remotely mounted. The connection is as shown below.



- A: Earth
- B: Compressor (green)
- C: Defrost (red)
- D: In range (orange)



- ① Receptacle for remote monitoring (optional)
- ② COMP. (green)
- ③ DEFROST (red)
- ④ IN RANGE (orange)
- ⑤ DE-HUMID. (yellow)

6.10 Fuse protection table

	Protection of:
Fuse 1 (250V, 10A)	<ul style="list-style-type: none">• High pressure switch (HPS)• Compressor contactor (CC)• Evaporator fan contactor high speed (EFH)• Evaporator fan contactor low speed (EFL)• Condenser fan contactor (CFC)• Compressor terminal protector (CTP)• Phase correction contactor (PCC1, PCC2)
Fuse 2 (250V, 10A)	<ul style="list-style-type: none">• Gas bypass solenoid valve (BSV)• Reheater solenoid valve (RSV) for dehumidification
Fuse 3 (250V, 10A)	<ul style="list-style-type: none">• Hot gas solenoid valve (HSV)• Liquid solenoid valve (LSV)• Injection solenoid valve (ISV)• Economizer solenoid valve (ESV)
Fuse 4 (250V, 10A)	<ul style="list-style-type: none">• Modem
Fuse 6 (250V, 10A)	<ul style="list-style-type: none">• Recorder
Fuse 7 (250V, 10A)	<ul style="list-style-type: none">• CPU board• Electronic expansion valve (EV)• Suction modulating valve (SMV)• LED display• LCD screen
Fuse 8 (250V, 10A)	<ul style="list-style-type: none">• Spare
Fuse 9 (250V, 10A)	<ul style="list-style-type: none">• Remote monitoring receptacle (RM)

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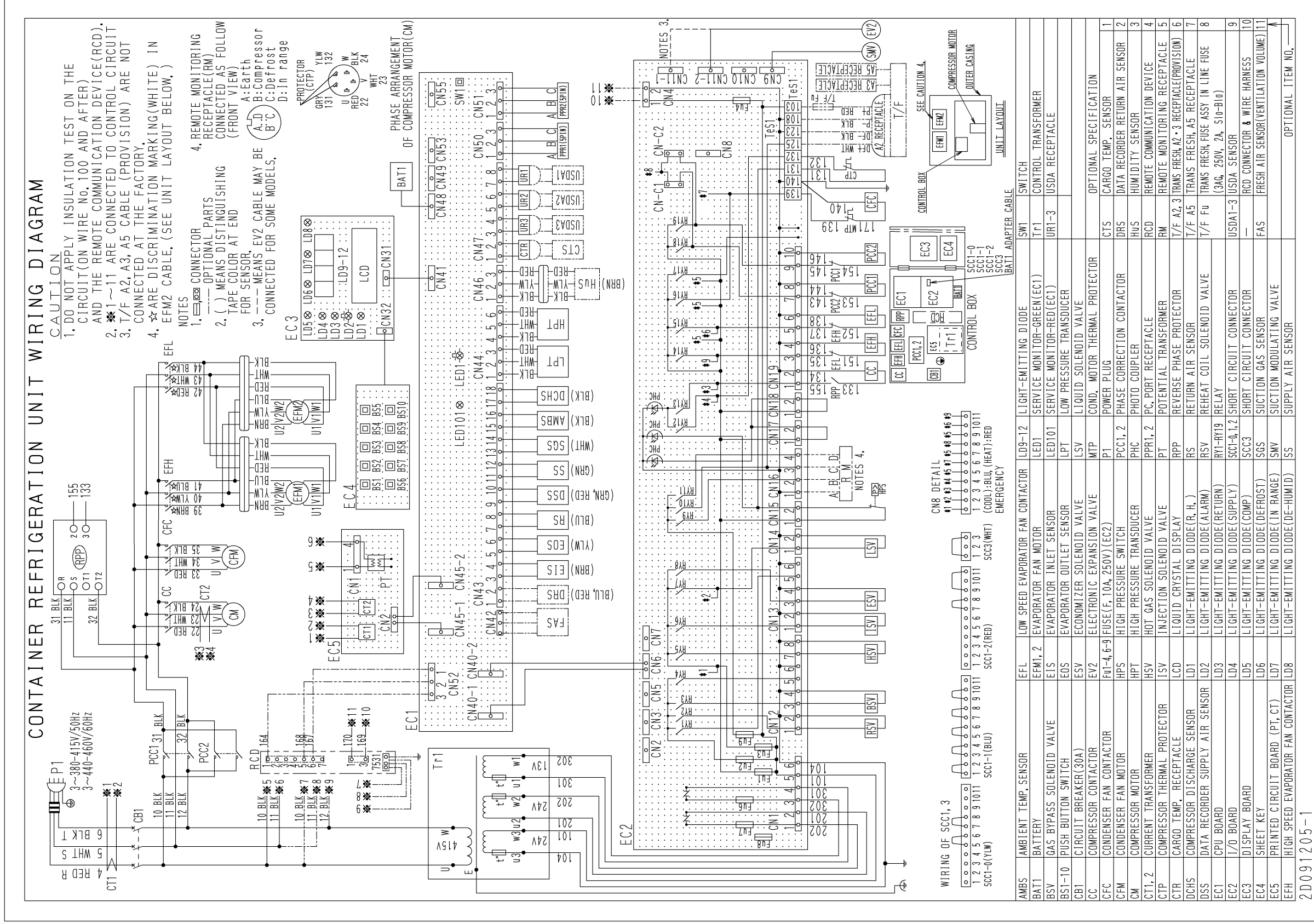
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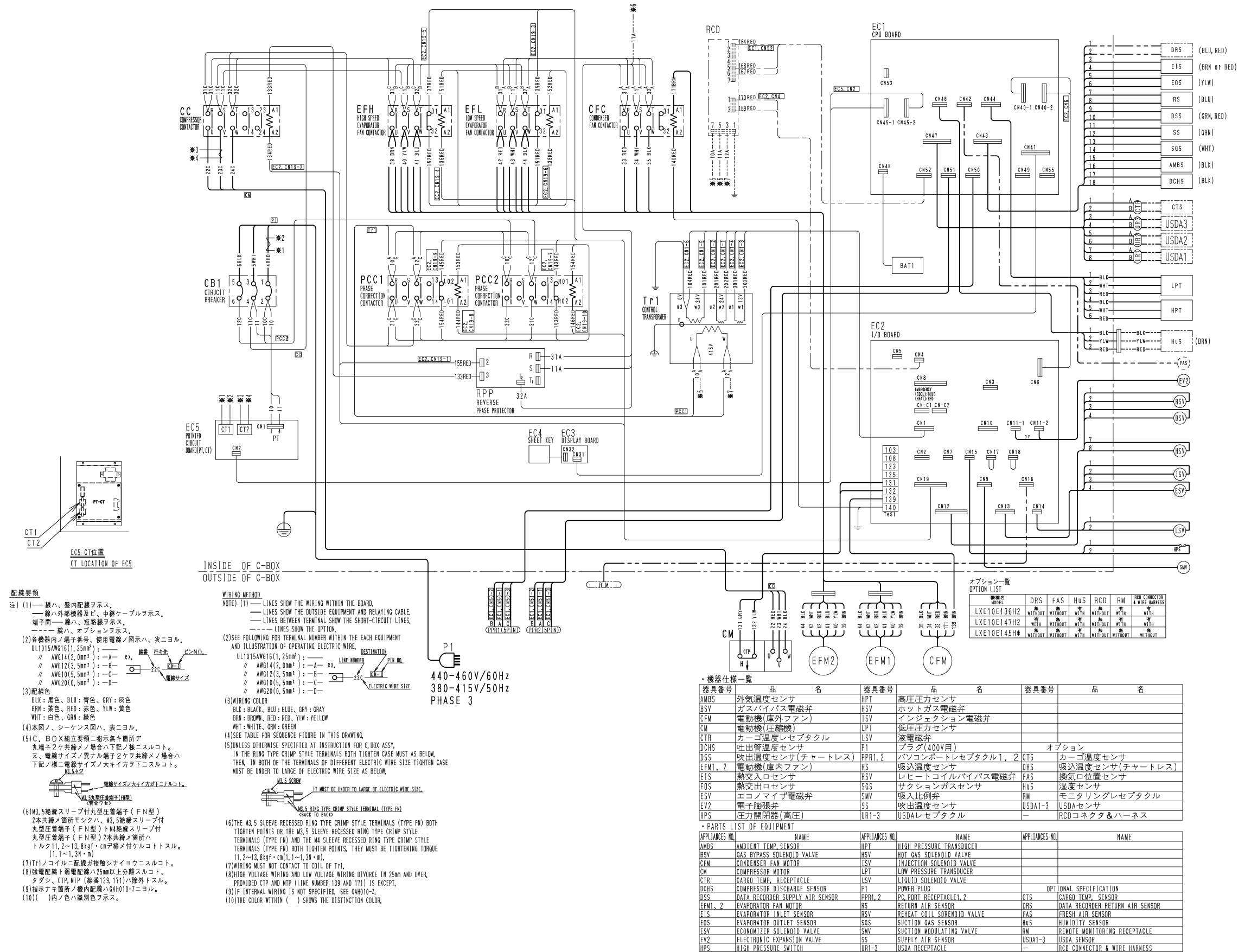
6.11 Schematic wiring diagram (LXE10E136H, 147H)



EACH MODEL TO EQUIP FOLLOWING OPTIONS.

MODEL	OPTIONAL ITEM NO.
• LXE10E136H2	3-5, 10
• LXE10E147H2	2, 3-5, 10
• LXE10E145H*	3

6.12 Stereoscopic wiring diagram (LXE10E136H, 147H)



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