

**DAIKIN**



**DAIKIN**

Marine type

Container Refrigeration Unit

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Service Manual

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

**DAIKIN INDUSTRIES, LTD.**

TR 08-03

Please read the contents of this manual prior to operation of the unit.

This booklet will provide you with the minimum necessary information required to operate the Daikin refrigerated unit LXE10E100 or later equipped with the new controller DECOS III e. It covers all of the unit's functions from basics such as the names of components, how to turn on the power supply, or change a setting temperature, to describing functions of product and maintenance service.

In addition, refer to the manuals listed below will be issued soon.

- 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.

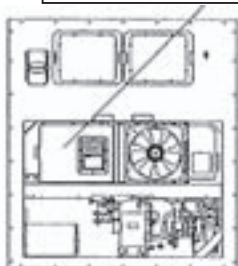
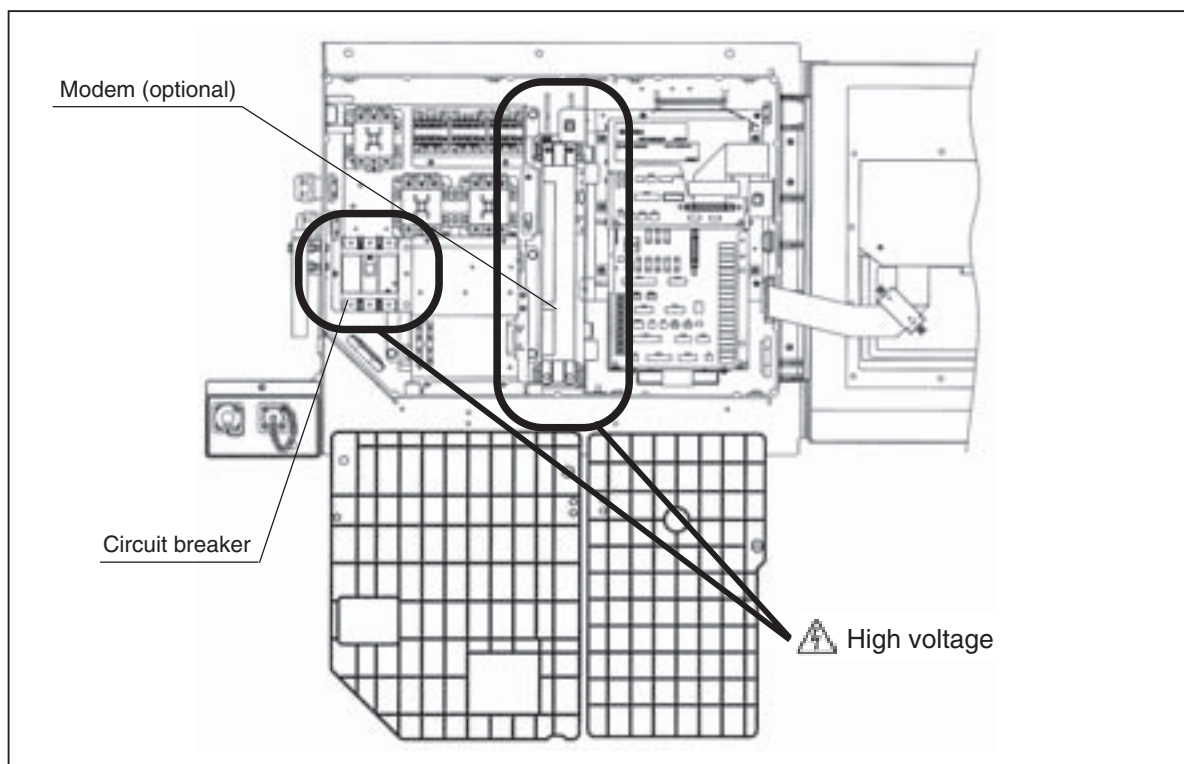
## DANGER

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 and the optionally provided modem even though the circuit breaker in the control box is turned off.



 **WARNING**

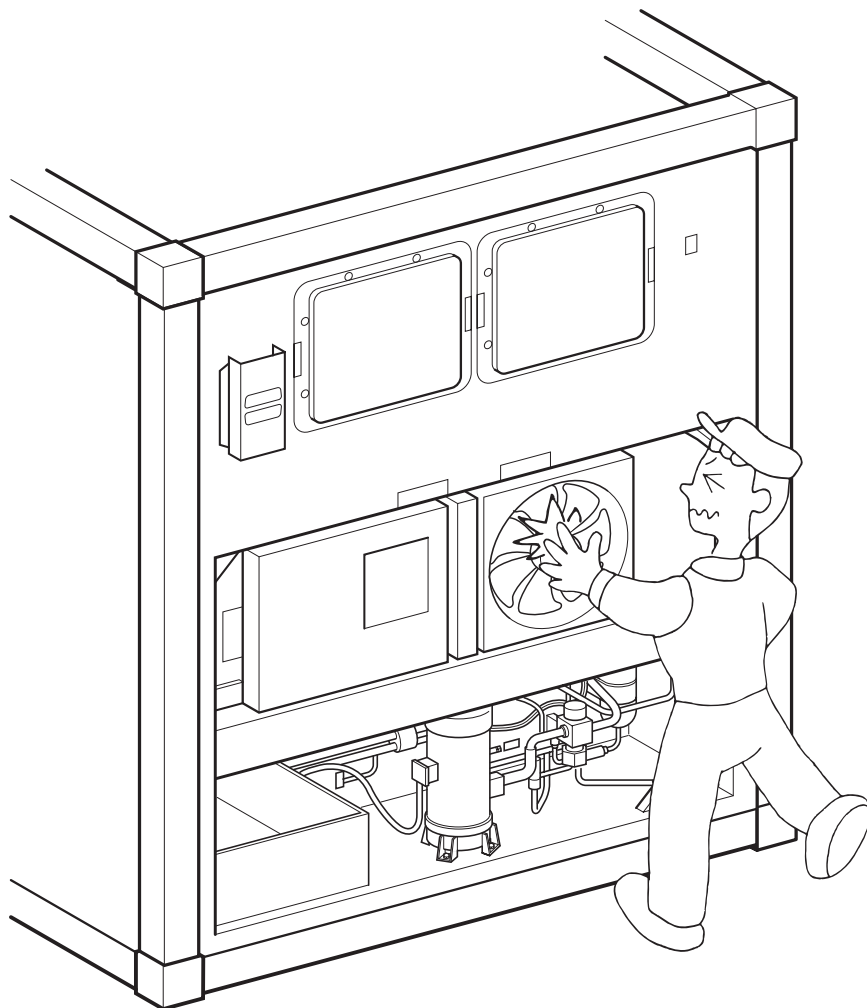


**Do not touch the condenser fan while power to the unit is ON.**

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 for the refrigerant high pressure control.

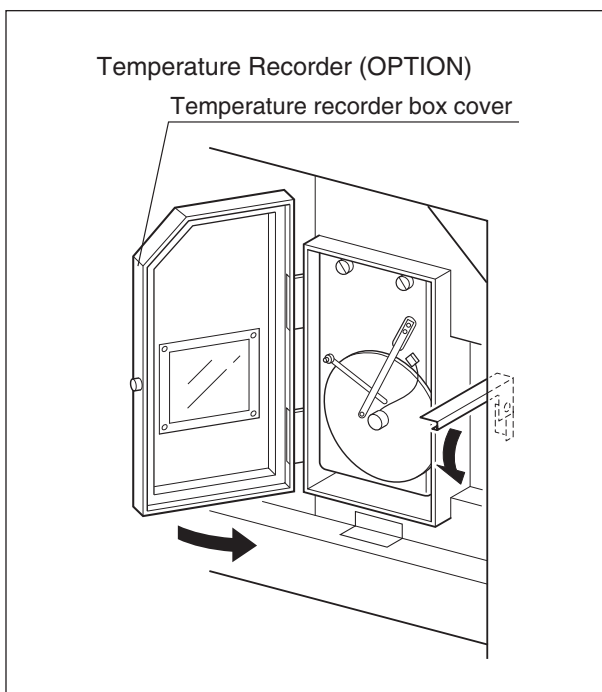
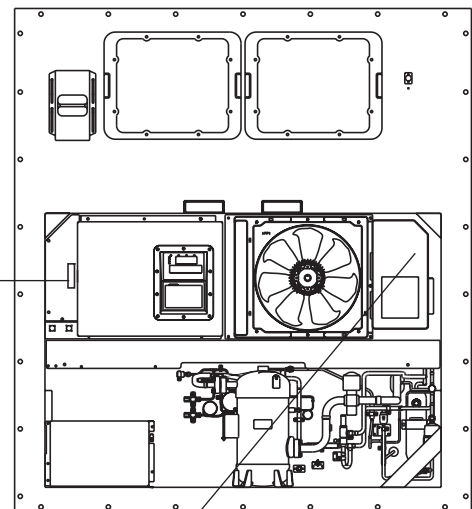
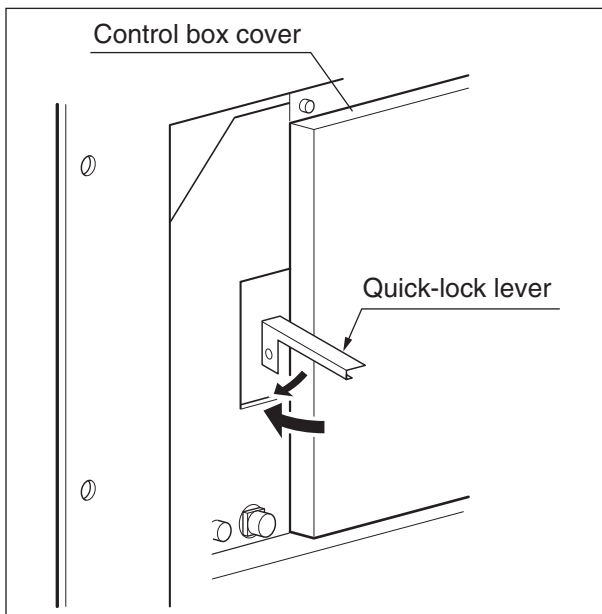
During water-cooled operation: Condenser fan may start and stop automatically for cooling of the control box.



 **CAUTION**

**Before starting the unit, run the generator.**

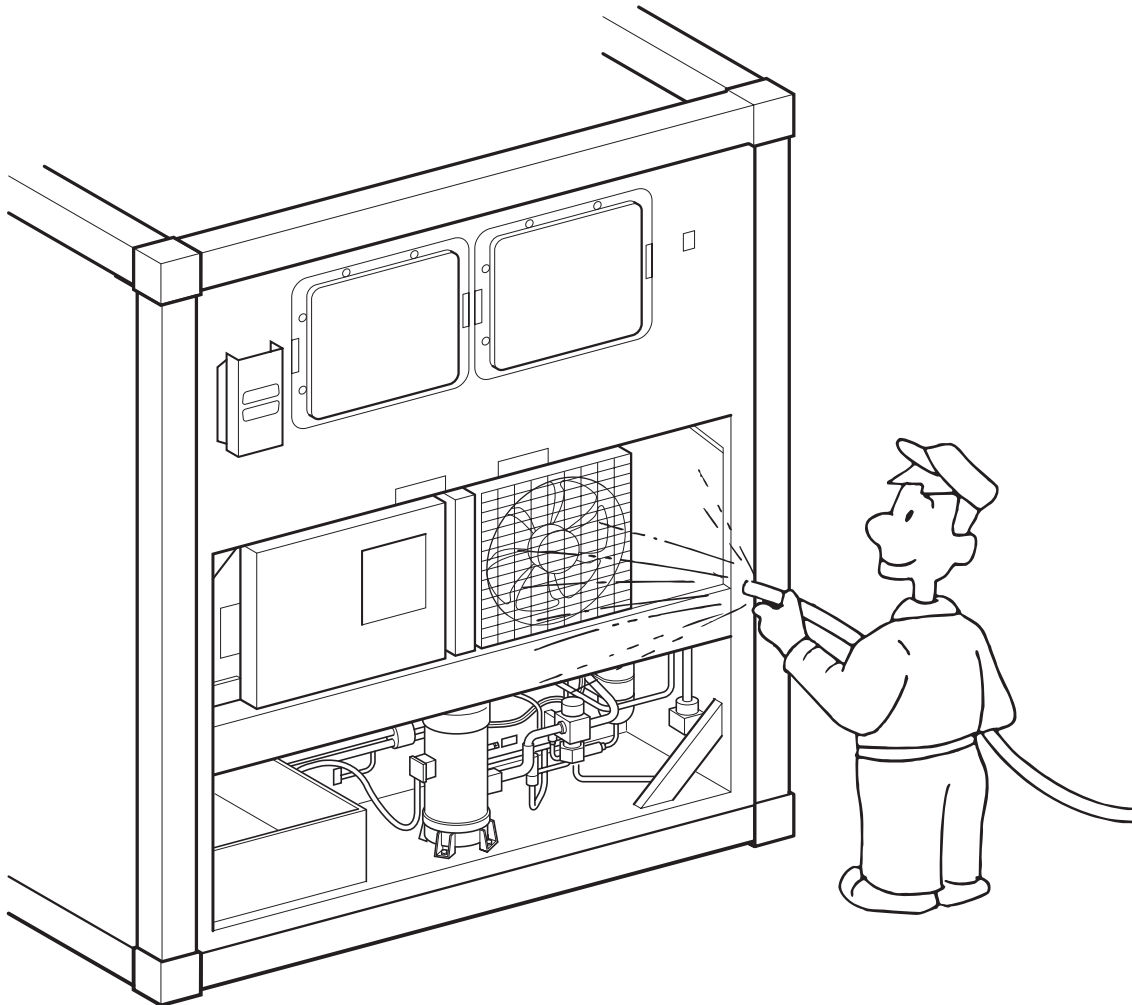
**Securely close the control box cover.**  
Otherwise, it will allow water entry.



## **CAUTION**

**Wash the refrigeration unit with fresh water at PTI.**

1. Carefully flush the external condenser with fresh water to remove the salt that sticks to it.



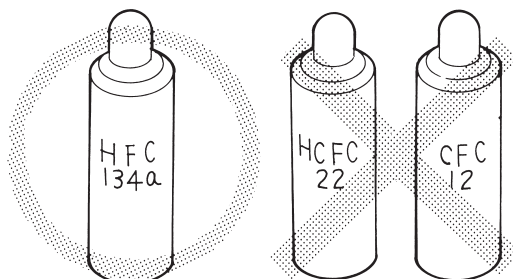
2. Corrosive gases generated from the cargo may corrode the copper pipes of the internal evaporator. Therefore, wrap up the cargo properly to prevent such corrosion.  
Major corrosive gases include chlorine, ammonia, sulfuric acid, acetic acid, sulfur dioxide etc.



# CAUTION

## Refrigerant and refrigerant oil

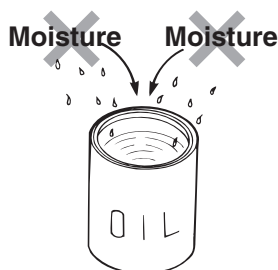
**Be sure to only charge the unit with refrigerant HFC 134a.**  
**Never attempt to use any other refrigerant (CFC12, HCFC22, etc) with the refrigeration unit.**  
If any other refrigerant not specified is charged, it may cause problems with the unit.



**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.



**Open the oil can, just before charging the oil, and use all the oil in the can once opened.**  
**Do not leave the can open for 5 hours or longer to avoid moisture entry.**  
Using any refrigerant oil which has absorbed moisture may cause problems with the unit.



**Use only exclusive tools for HFC134a. (gauge manifold, charging cylinder, 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 into the refrigeration circuit. (Refer to clause 4.1.2)  
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.

**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 : 1300

(1) GWP=global warming potential

The refrigerant quantity is indicated on the unit name plate.

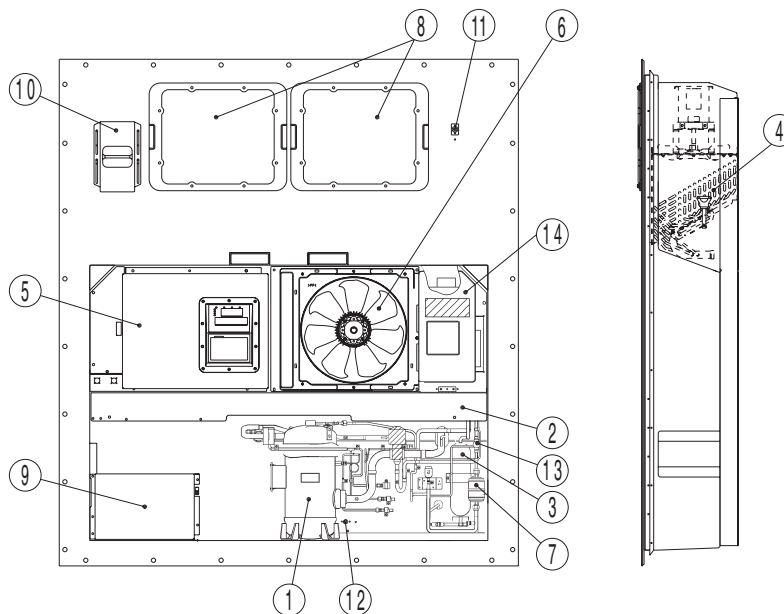
## 1. INTRODUCTION

### 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 Basic names of components



- |  |                                     |   |
|--|-------------------------------------|---|
| ① Compressor   | ⑧ Access panel                      |   |
| ② Air-cooled condenser   | ⑨ Storage space for power cable     |   |
| ③ Receiver   | ⑩ Ventilator                        |   |
| ④ Evaporator   | ⑪ Thermometer check port (optional) | (Use this port to measure the inside return air temperature.)   |
| ⑤ Control box  |                                     |   |
| ( Outside: switch, manual defrost switch, monitoring receptacle<br>Inside: circuit breaker ) |                                     |   |
| ⑥ Air-cooled condenser fan   | ⑫ Gas sampling port                 | (This is used to measure the inside supply air temperature and inside CO <sub>2</sub> concentration.) |
| ⑦ Drier  | Sampling port (Supply)              |   |
|  | ⑬ Liquid moisture indicator         |   |
|  | ⑭ Recorder (optional)               |   |

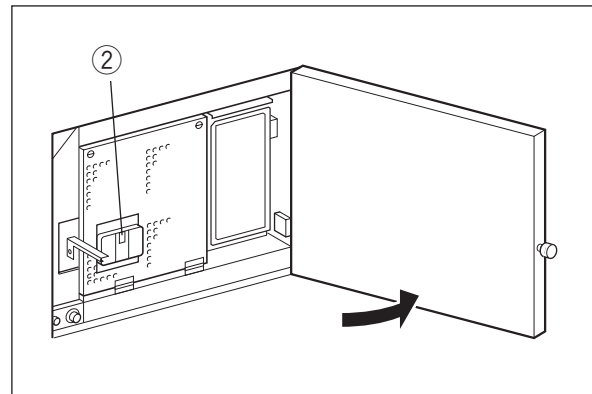
## 1.3 Basic operation of refrigeration unit

### 1.3.1 Starting operation

**(1) Connect the power plug to the power supply.**

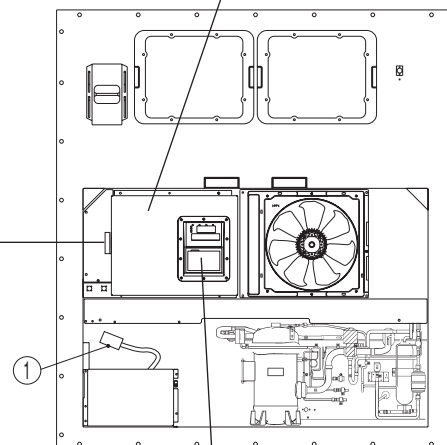
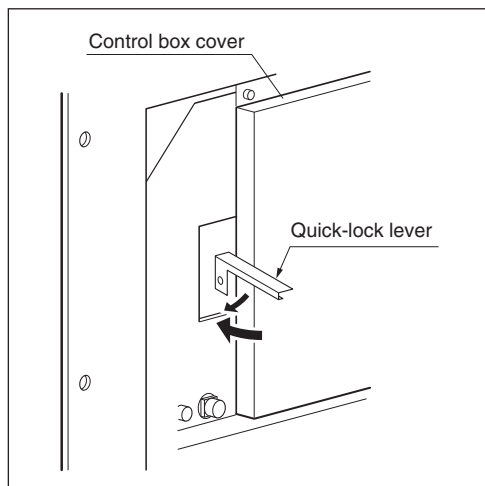
Insert the plug ① suited to the power source voltage, and fasten the plug firmly.

**(2) Turn on circuit breaker ② after checking that the power supply switch is turned on (Outside of the unit).**

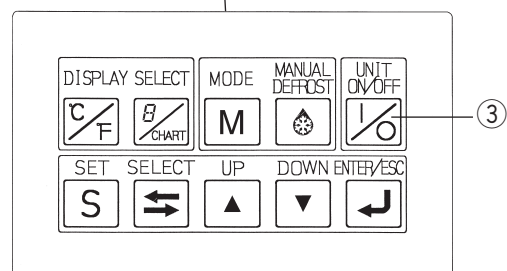


**(3) Close the control box cover.**

Ensure that the one-touch lever is firmly closed.

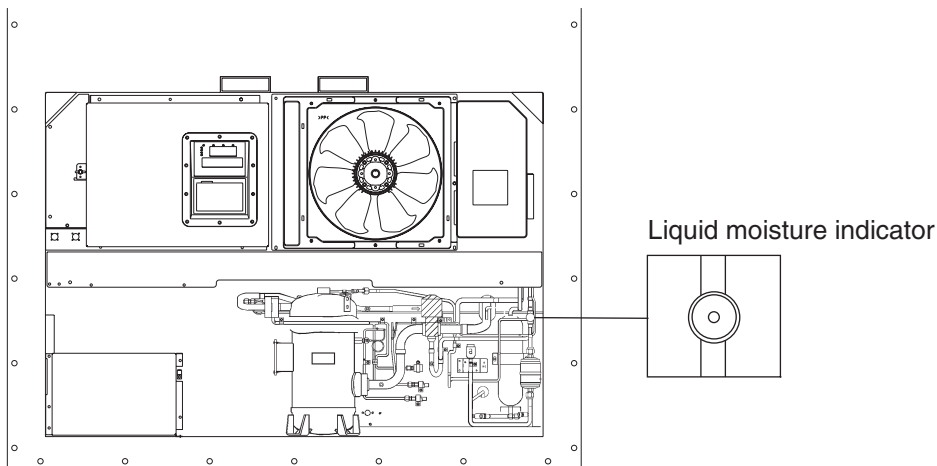


**(4) Press the UNIT ON/OFF key ③.**



### 1.3.2 Check items during operation

Check items(precautions)	Method of check
1. Check the compressor, fan, pipes, etc. for abnormal noise and vibration.	Visual and sound check
2. Check the refrigerant for shortage. Check the excessive charge.	Visual check by using the moisture indicator For the details, refer to clause 4.2.15.
3. Check the refrigerant for moisture inclusion. [When the moisture indicator is exposed to gas refrigerant during prolonged stop periods, it may turn yellow. This is not abnormal.]	Visual The moisture indicator colour; Green: normal Yellow: abnormal.
4. Check if the recorder is working according to the inside temperature.	Visual
5. Check operating conditions using the control panel.	Visual

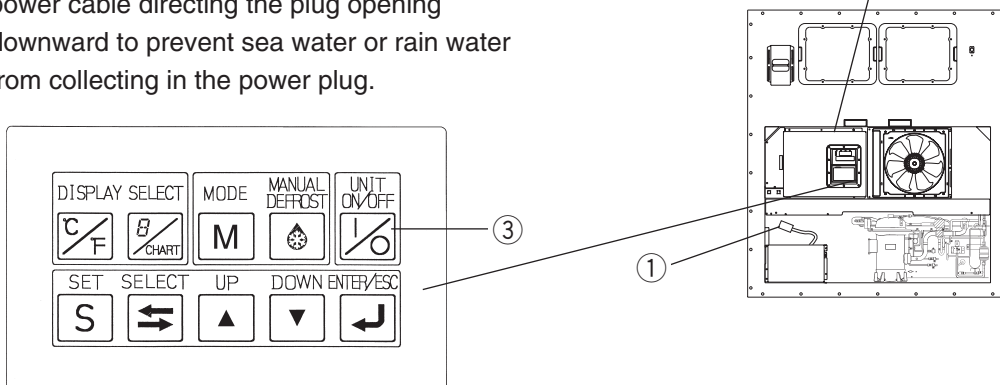
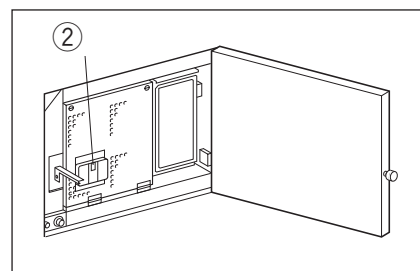


### 1.3.3 Procedure after operation

(1) Turn off the UNIT ON/OFF key ③, and turn off the circuit breaker ②.

(2) Close the control box cover.  
Ensure that the one-touch lever is firmly closed.

(3) Stow the power cable.  
Disconnect the power plug ①, and stow the power cable directing the plug opening downward to prevent sea water or rain water from collecting in the power plug.



### 1.3.4 Adjust the ventilation

Adjust the opening of the ventilation ⑩ according to the cargo.



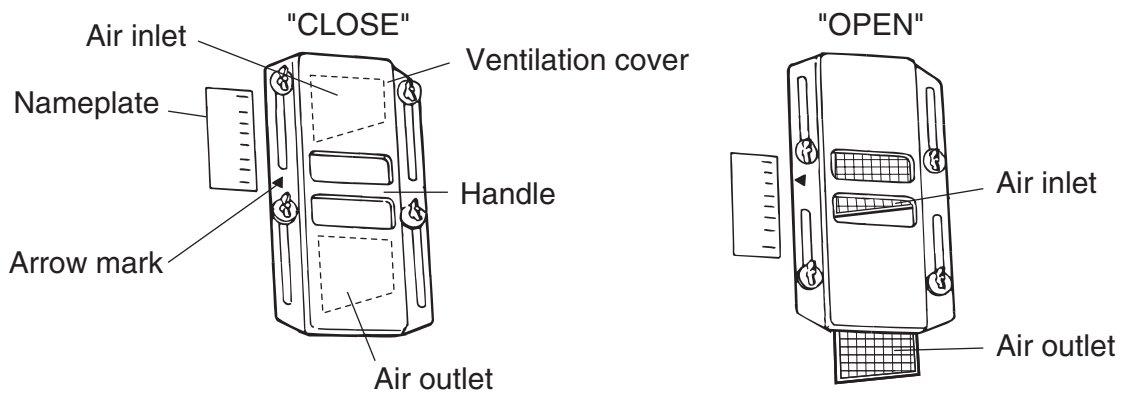
## CAUTION

Keep the ventilation closed when ventilation is not necessary or during transportation of the frozen cargo.

Set the arrow mark of the handle to "CLOSE" when ventilation is not required or during frozen operation.

When ventilation is required (chilled mode) slide the handle upward.

\*Set the arrow mark of the ventilation at the scale on the nameplate according to the required ventilation amount.



## 2. GENERAL DESCRIPTION

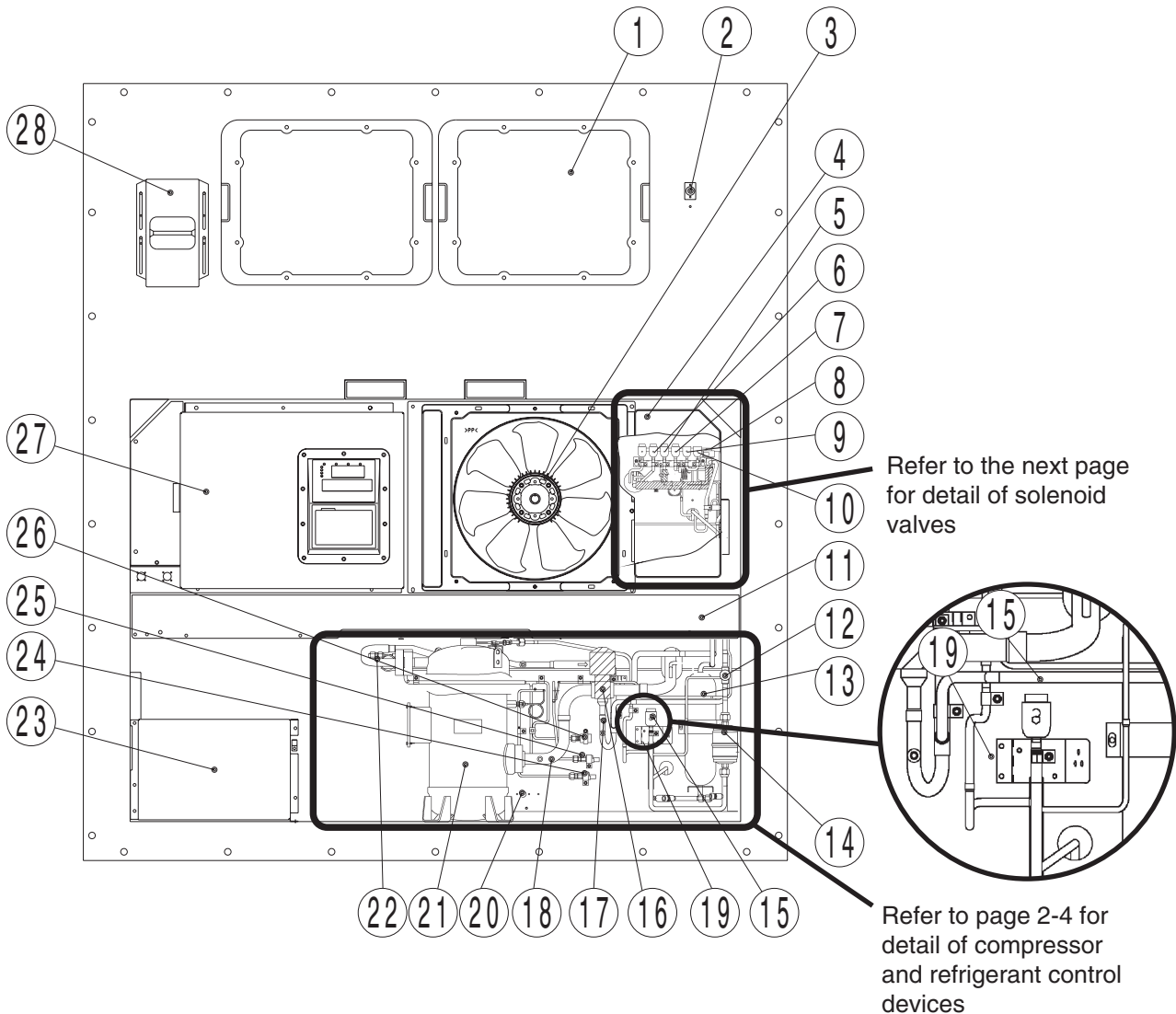
### 2.1 Main specifications

Item	Model	LXE10E100 or later
Condenser cooling system		Air cooled type
Controller		DECOS III e
Power supply		AC 3-phase 380V/400V/415V 50Hz, 440V/460V 60Hz
Compressor		Full hermetic scroll type (Motor 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	Dual timer, on-demand defrost and manual switch
	Termination	Detecting the temperature of evaporator outlet pipe and return air
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 : 5.2 (kg)
Refrigerant oil charged amount		IDEMITSU, Daphne hermetic oil FVC 46D : 3.4( ℓ )
Weight		For details, refer to the specifications of each model. (459kg in case of LXE10E136A1)

## 2.2 Names of components

### 2.2.1 Outside

#### ●LXE10E

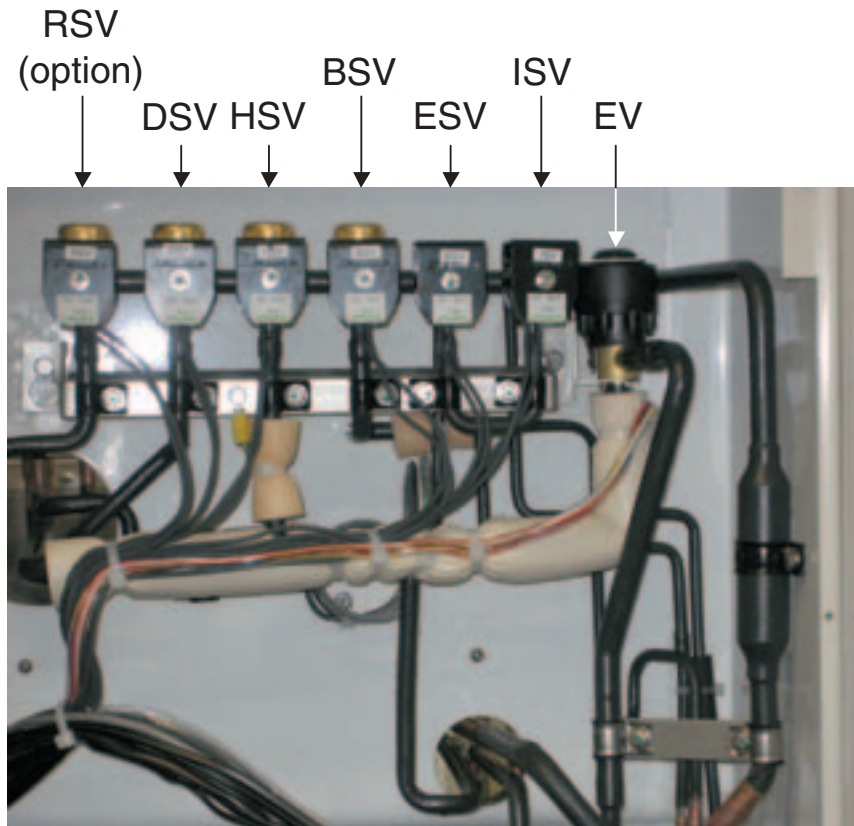


- |  |  |
|--|--|
| ① Access panel   | ⑩ Injection solenoid valve (ISV)                   |
| ② Thermometer check port (Return air, optional)<br>※Thermometer check port is not fitted to some models. | ⑪ Air-cooled condenser                             |
| ③ Condenser fan motor (CFM)  | ⑫ Liquid/moisture indicator                        |
| ④ Temperature recorder box (Option)  | ⑬ Liquid receiver                                  |
| ⑤ Hot-gas solenoid valve (HSV)   | ⑭ Dryer  |
| ⑥ Defrost solenoid valve (DSV)   | ⑮ Liquid solenoid valve (LSV)                      |
| ⑦ Discharge gas by-pass solenoid valve (BSV)   | ⑯ Ambient temperature sensor (AMBS)                |
| ⑧ Electronic expansion valve (EV)  | ⑰ Discharge pressure regulating valve (DPR)        |
| ⑨ Economizer solenoid valve (ESV)  | ⑱ Compressor suction pipe temperature sensor (SGS) |
| ⑪ Air-cooled condenser   | ⑲ Ambient temperature sensor (AMBS)                |
| ⑫ Liquid/moisture indicator  | ⑳ Thermometer check port (Supply air)              |
| ⑬ Liquid receiver  | ㉑ Compressor (CM)                                  |
| ⑭ Dryer  | ㉒ Discharge pipe temperature sensor (DCHS)         |
| ⑮ Liquid solenoid valve (LSV)  | ㉓ Storage space for power cable                    |
|  | ㉔ Low pressure transducer (LPT)                    |
|  | ㉕ High pressure transducer (HPT)                   |
|  | ㉖ High pressure switch (HPS)                       |
|  | ㉗ Control box                                      |
|  | ㉘ Ventilator                                       |
|  | ⑯ Suction modulating valve (SMV)                   |
|  | ⑰ Discharge pressure regulating valve (DPR)        |
|  | ⑱ Compressor suction pipe temperature sensor (SGS) |
|  | ⑲ Ambient temperature sensor (AMBS)                |
|  | ⑳ Thermometer check port (Supply air)              |
|  | ㉑ Compressor (CM)                                  |
|  | ㉒ Discharge pipe temperature sensor (DCHS)         |
|  | ㉓ Storage space for power cable                    |
|  | ㉔ Low pressure transducer (LPT)                    |
|  | ㉕ High pressure transducer (HPT)                   |
|  | ㉖ High pressure switch (HPS)                       |
|  | ㉗ Control box                                      |
|  | ㉘ Ventilator                                       |



●LXE10E

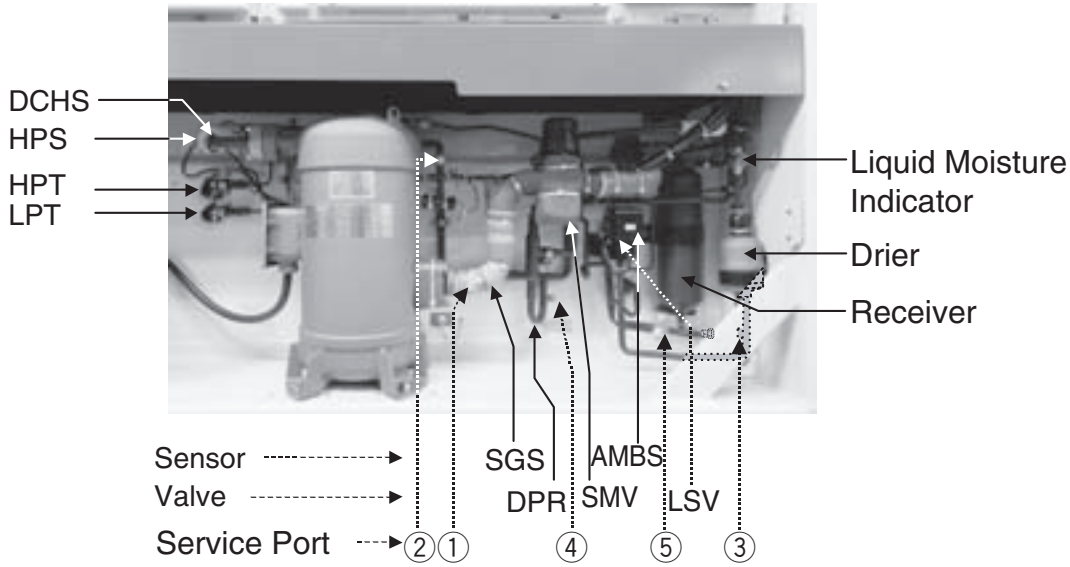
- Detail of solenoid valves



[Valve]

- BSV :Discharge gas bypass Solenoid Valve
- DSV :Defrost Solenoid Valve
- DPR :Discharge Pressure Regulator Valve
- EV :Electronic Expantion Valve
- ESV :Economizer Solenoid Valve
- HSV :Hot gas Solenoid Valve
- ISV :Injection Solenoid Valve
- RSV :Reheater Solenoid Valve (Optional)  
for dehumidification control

· Detail of compressor and refrigerant control devices



[Sensor]

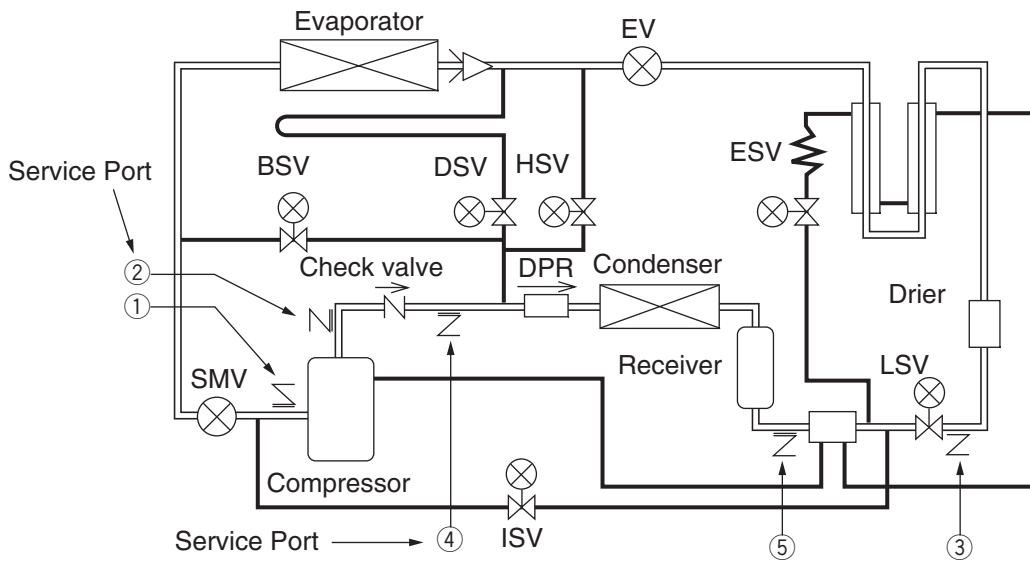
- AMBS: Ambient temperature sensor
- DCHS: Discharge Gas Temperature Sensor
- DPR : Discharge Pressure Regulator Valve
- HPS : High Pressure Switch
- HPT : High Pressure transducer
- LPT : Low pressure transducer
- LSV : Liquid solenoid valve
- SGS : Compressor suction pipe temperature sensor

[Valve]

- SMV : Suction modulating valve

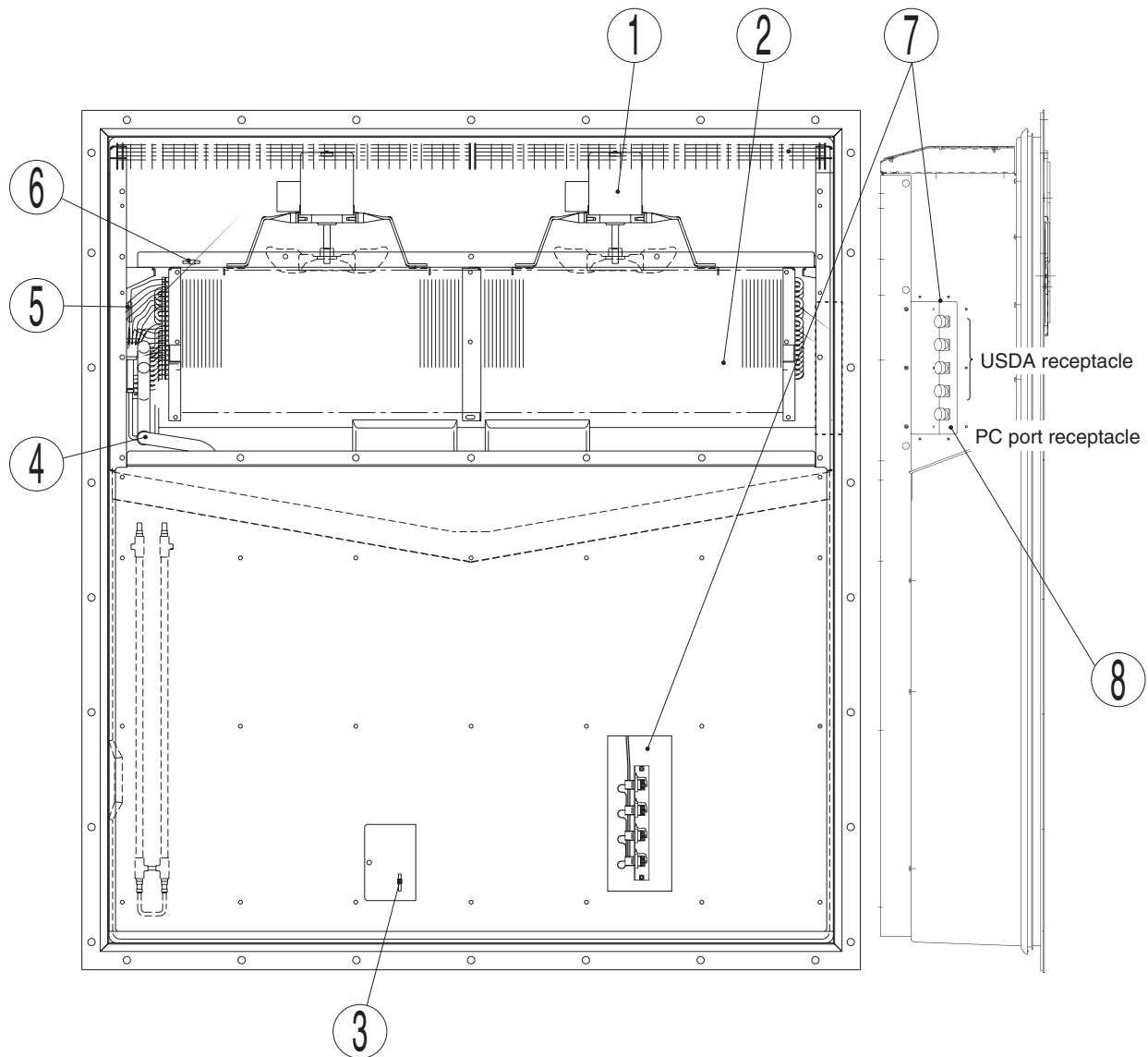
[Service port]

- 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 4-5.)



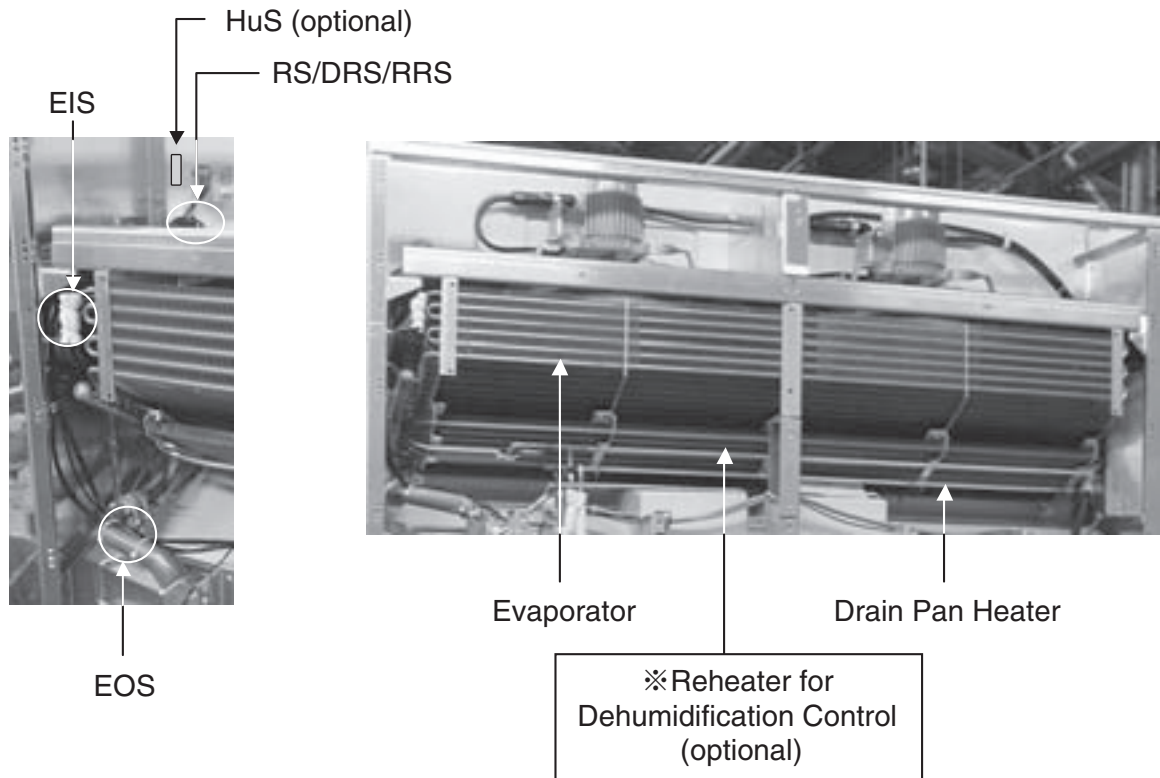
## 2.2.2 Inside

### ●LXE10E



- ① Evaporator fan motor (EFM)
- ② Evaporator
- ③ Supply air temperature sensor (SS)  
Data recorder supply air temperature sensor (DSS)  
Temperature recorder supply air temperature sensor (RSS, optional)
- ④ Evaporator outlet pipe temperature sensor (EOS)
- ⑤ Evaporator inlet pipe temperature sensor (EIS)
- ⑥ Return air temperature sensor (RS)  
Data recorder return air temperature sensor (DRS)  
Temperature recorder return air temperature sensor (RRS, optional)
- ⑦ USDA receptacle [Optional]  
Lateral and rear type depending on the models
- ⑧ PC port receptacle

· Inside Detail

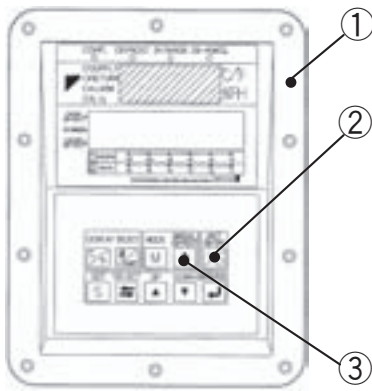


[Sensor]

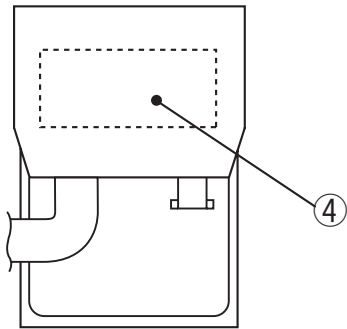
- DRS:Return Air Temperature Sensor for Datacorder
- DSS:Supply Air Temperature Sensor for Datacorder
- EIS :Evaporator Inlet Temperature Sensor
- EOS:Evaporator Outlet Temperature Sensor
- HuS :Humidity Sensor (Optional)
- RS :Return Air Temperature Sensor
- RRS:Return Air Temperature Sensor for Temperature Recorder (Optional)
- SS :Supply Air Temperature Sensor
- RSS:Supply Air Temperature Sensor for Temperature Recorder (Optional)

### 2.2.3 Control box

● Operation panel  
(Outside of the control box)

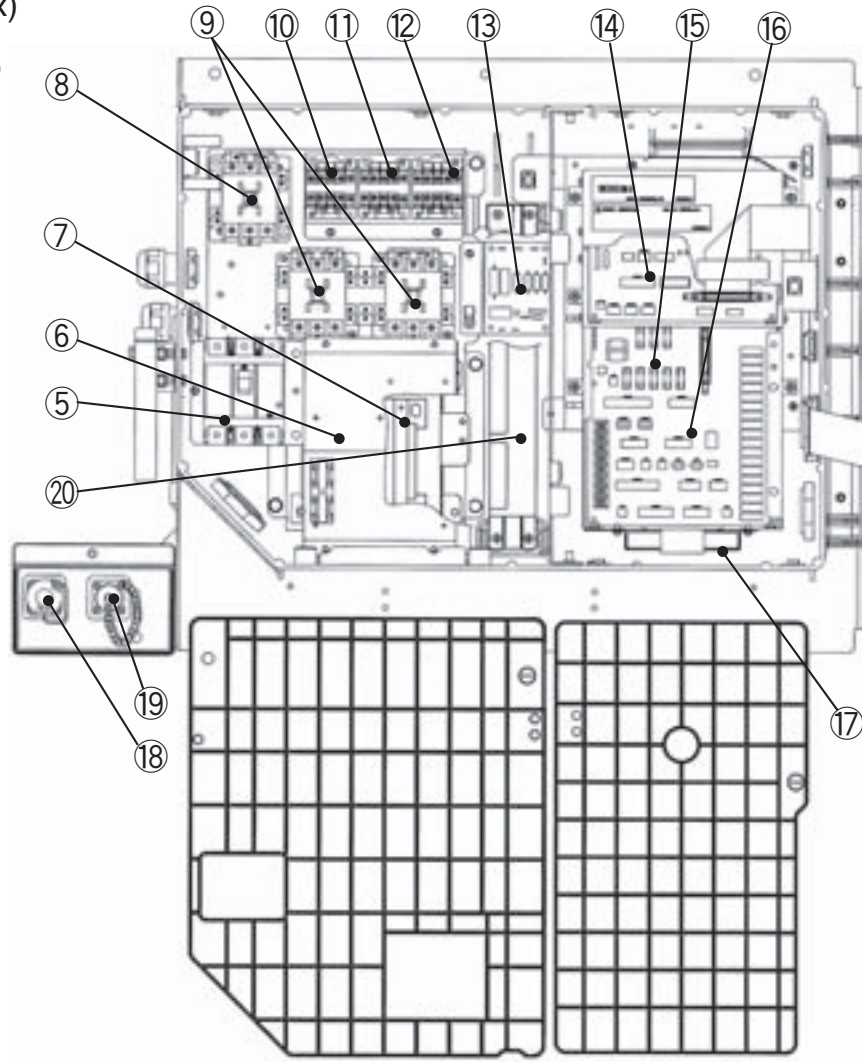


Front



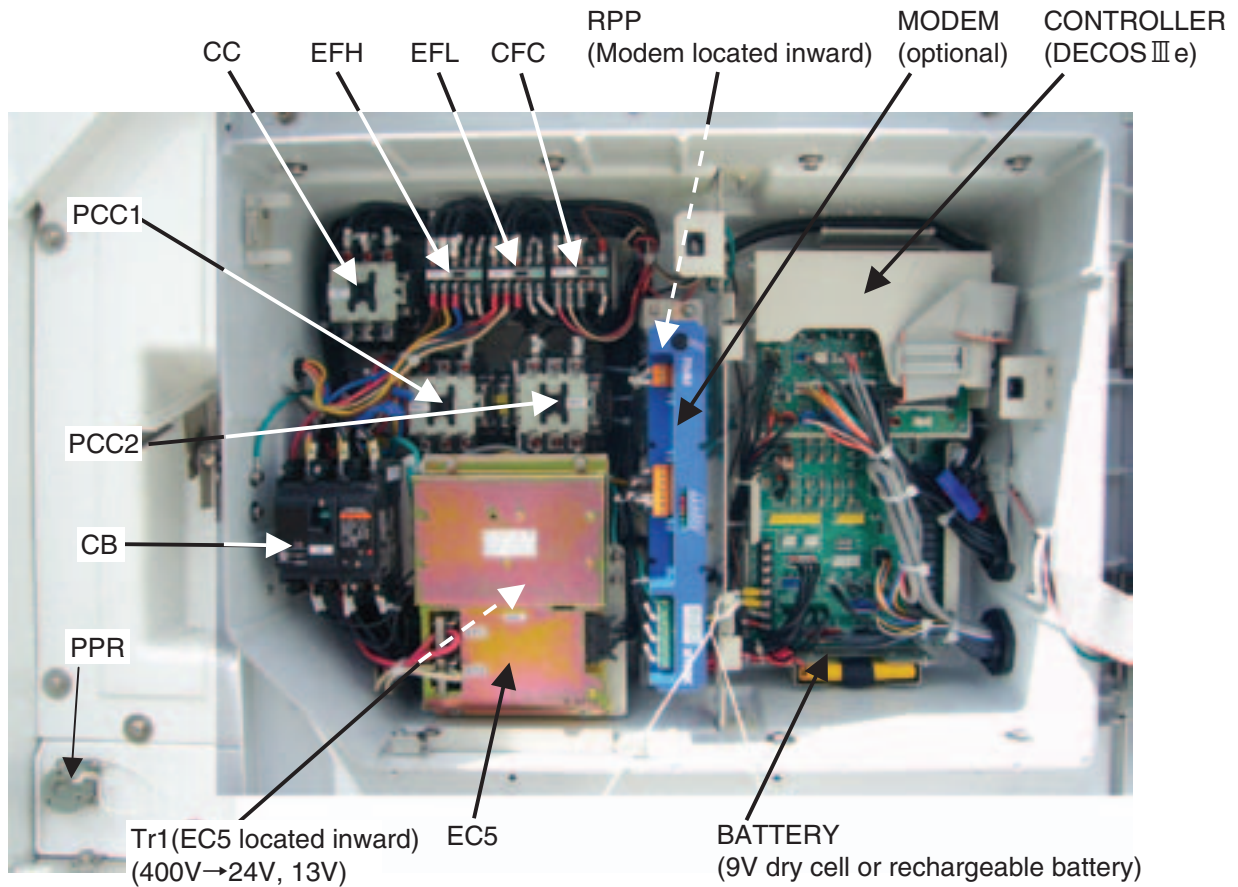
Rear

● Inside of the control box



- ① Controller operation 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 Reverse phase protection device .....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 .....MODEM, optional

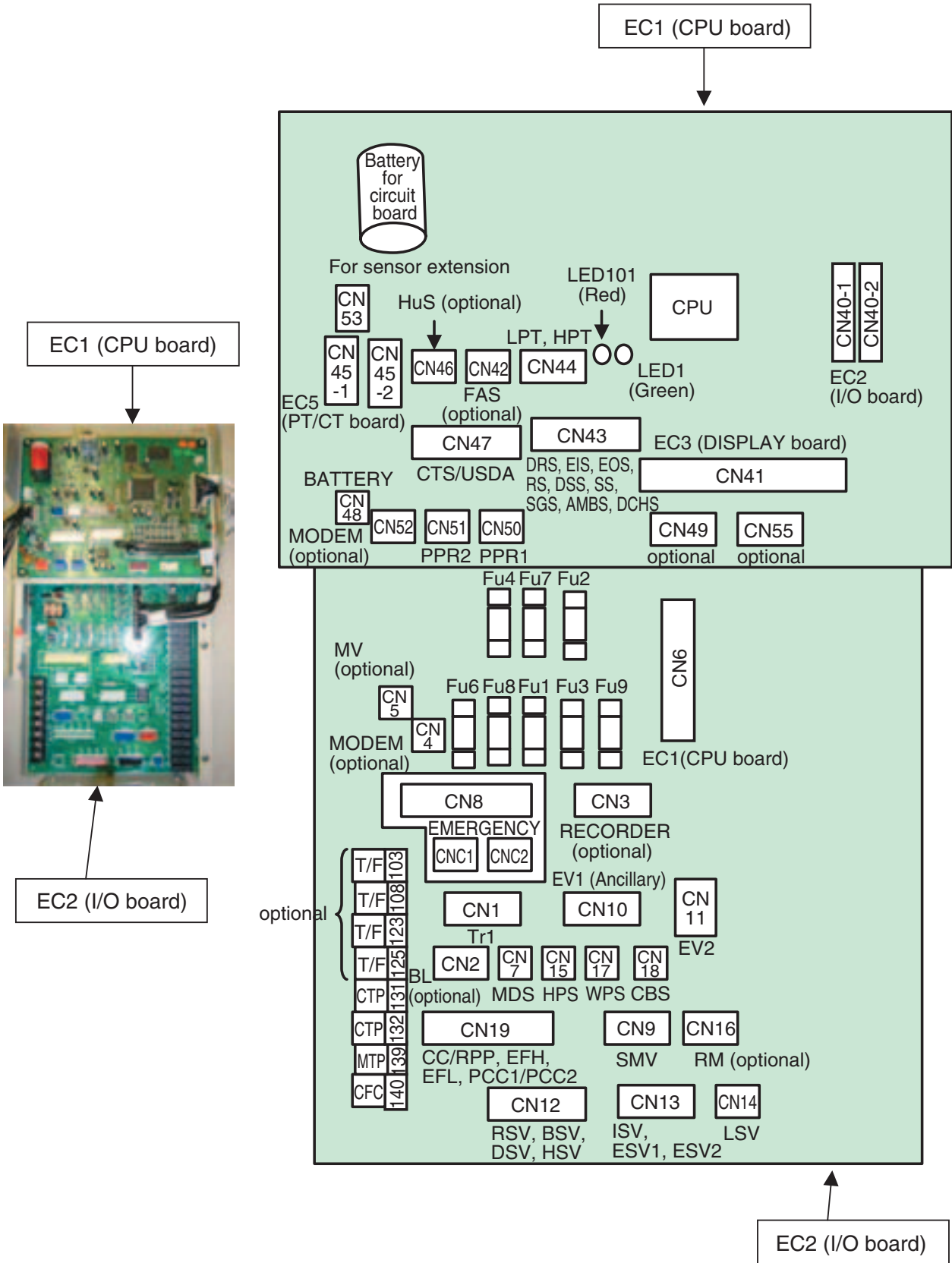
· Control box Inside detail



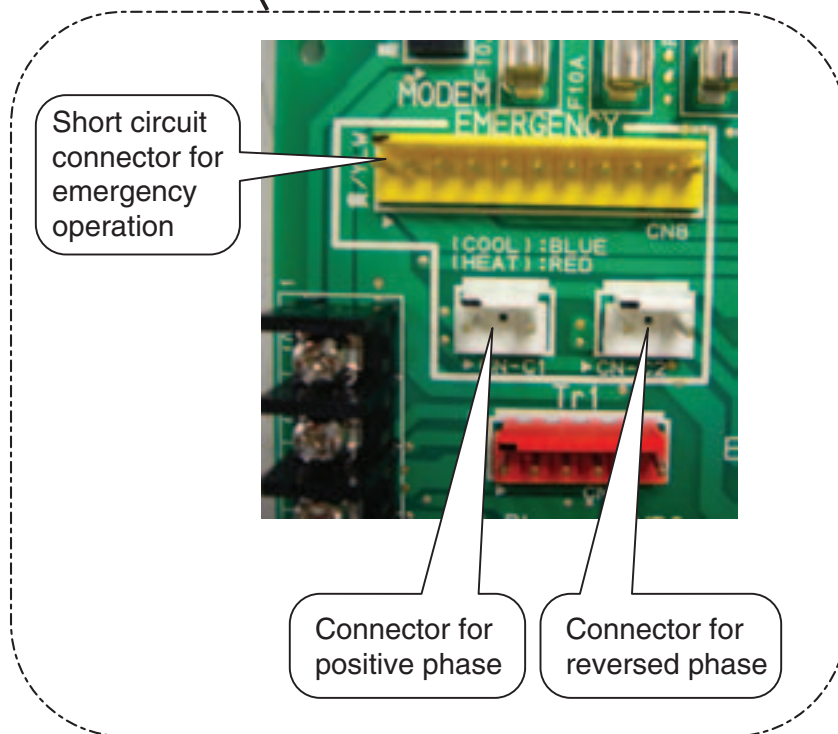
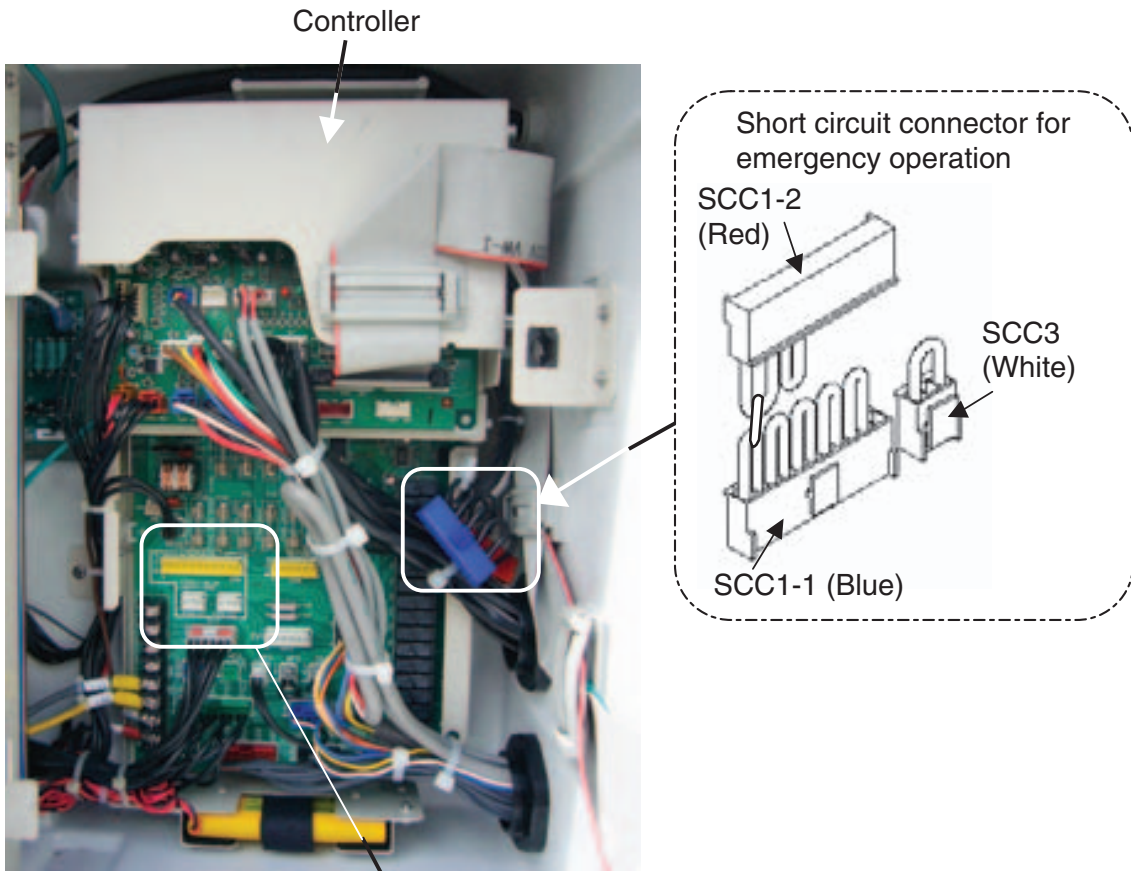
[Control Box]

- 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
- PCC1 :Phase Correction Contactor 1
- PCC2 :Phase Correction Contactor 2
- PPR :PC Port Receptacle
- RPP :Reverse Phase Protector
- Tr1 :Transformer

· Control box Inside detail



- Short Circuit Connector for emergency operation



Please refer to section 6.5.2 for details about connection.



## 2.3 Set point of functional parts and protection devices

	Device name		Actuation	Set point	Detection method	Symbol	
Pressure switch	High-pressure switch		OFF	2400kPa (24.47kg/cm <sup>2</sup> )	High-pressure switch	HPS	
			ON	1900kPa (19.37kg/cm <sup>2</sup> )			
Electronic controller	Mode selection	Chilled mode	ON	-9.9°C to +30.0°C (+14.1°F to +86.0°F)	Set point temperature		
		Frozen mode		-30.0°C to -10.0°C (-22.0°F to +14.0°F)			
	Defrosting interval	Initiation	Short	ON	4 hours ※1		
			Long		3, 6, 9, 12, 24 hours and 99 ※2		
	Defrosting timer	Back-up		OFF	90 minutes		
		In-range masking			90 minutes ※3		
		Out-range guard		ON	30 minutes ※4		
	Defrosting termination set point			OFF	30°C (86°F)	Evaporator outlet temperature sensor	EOS
					15°C (59°F)	Return air temperature sensor	RS and DRS
	High-pressure control for Condenser fan			OFF	800kPa (8.2kg/cm <sup>2</sup> )	High-pressure transducer	HPT
				ON	1000kPa (10.2kg/cm <sup>2</sup> ) ※5		
	Discharge gas temperature protection set point	Pull down LPT>50kpa	OFF	135°C (275°F) Reset in 3 minutes	Discharge gas temperature sensor		DCHS
OFF			128°C (262°F) Reset in 3 minutes				
Overcurrent protection set point (Cutout)			OFF	26.0A Reset in 3 minutes	PT/CT board	CT2	
Current control			ON	50Hz : 16.1A 60Hz : 17.4A	PT/CT board	CT1	
High pressure control			ON	2300 to 2350 kPa (23.5 to 24.0 kg/cm <sup>2</sup> )	High pressure sensor	HPT	
Current	Circuit breaker		OFF	30A		CB	
	Fuse		-	5A, 10A ※6		Fu	
Motor	Evaporator fan motor thermal protector		ON	150°C ± 5°C (302°F ± 9°F)			
			OFF	95 ± 15°C (203°F ± 27°F)			
	Condenser fan motor thermal protector		ON	135°C ± 5°C (275°F ± 9°F)		MTP	
			OFF	86°C ± 15°C (186.8°F ± 27°F)			
	Compressor motor thermal protector		ON	140 ± 5°C (284°F ± 9°F)		CTP	
			OFF	118 ± 11°C (244.4°F ± 19.8°F)			
-	Fusible plug		-	95~100°C			

※1 When Return air (RS) is lower than -20°C, defrost starts every 6 hours.

※2 When "99" is selected, refer to "on demand defrost" in clause 2.5.3.

※3 When Inside set point is -20.0°C or Lower, In-range masking is 120min.

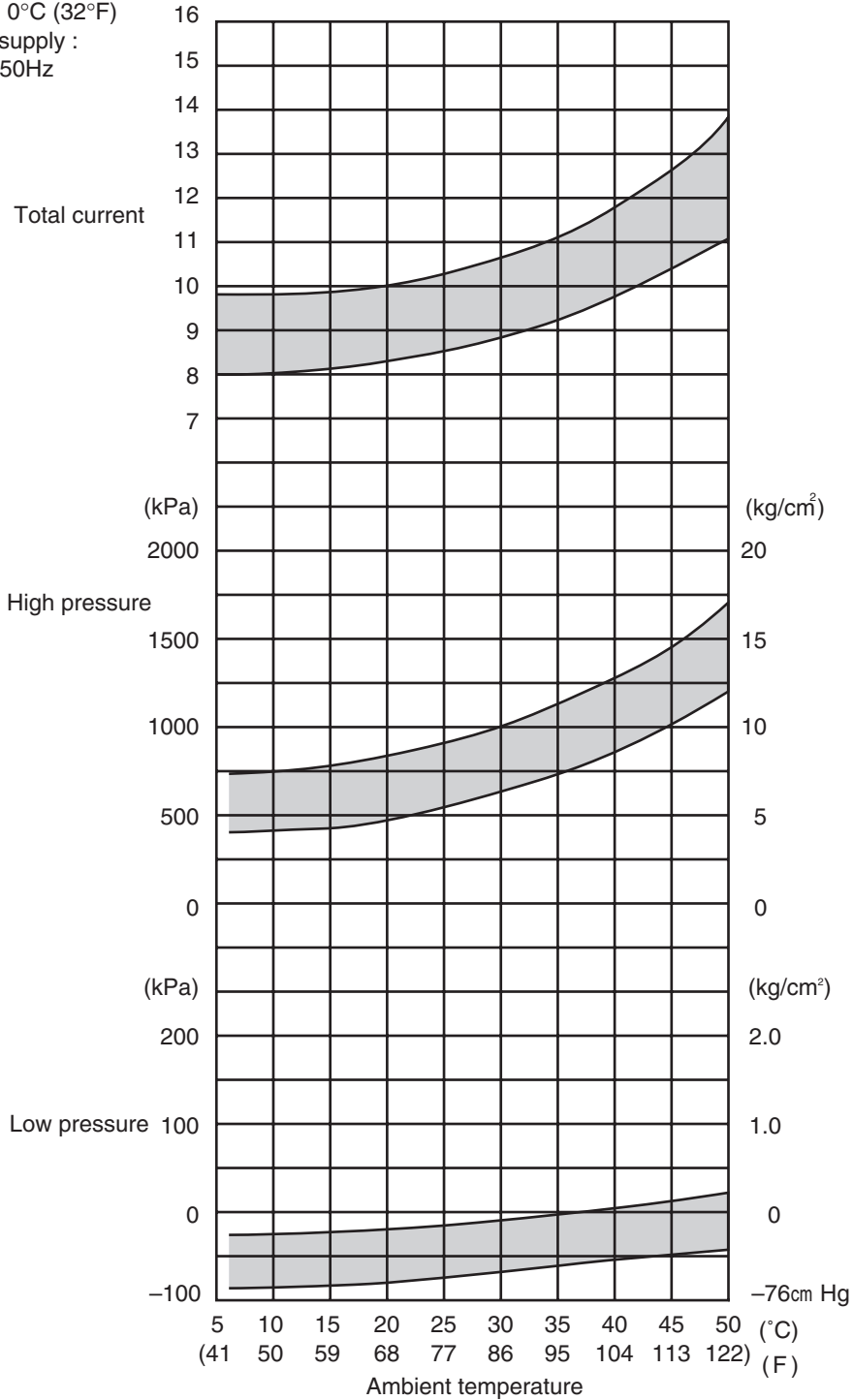
※4 After the inside temperature falls to Inrange, if the temperature rises to Outrange, the defrost starts 30 minutes later.  
Refer to "Defrosting mode" in clause 2.5.3

※5 When dehumidification is ON in dehumidification mode, the setting figure may change between 900~2100kPa automatically (Refer to "High Pressure Control" Page 2-26)

※6 Refer to "Fuse Protection table" in section 7.11.

## 2.4 Operating pressure and running current

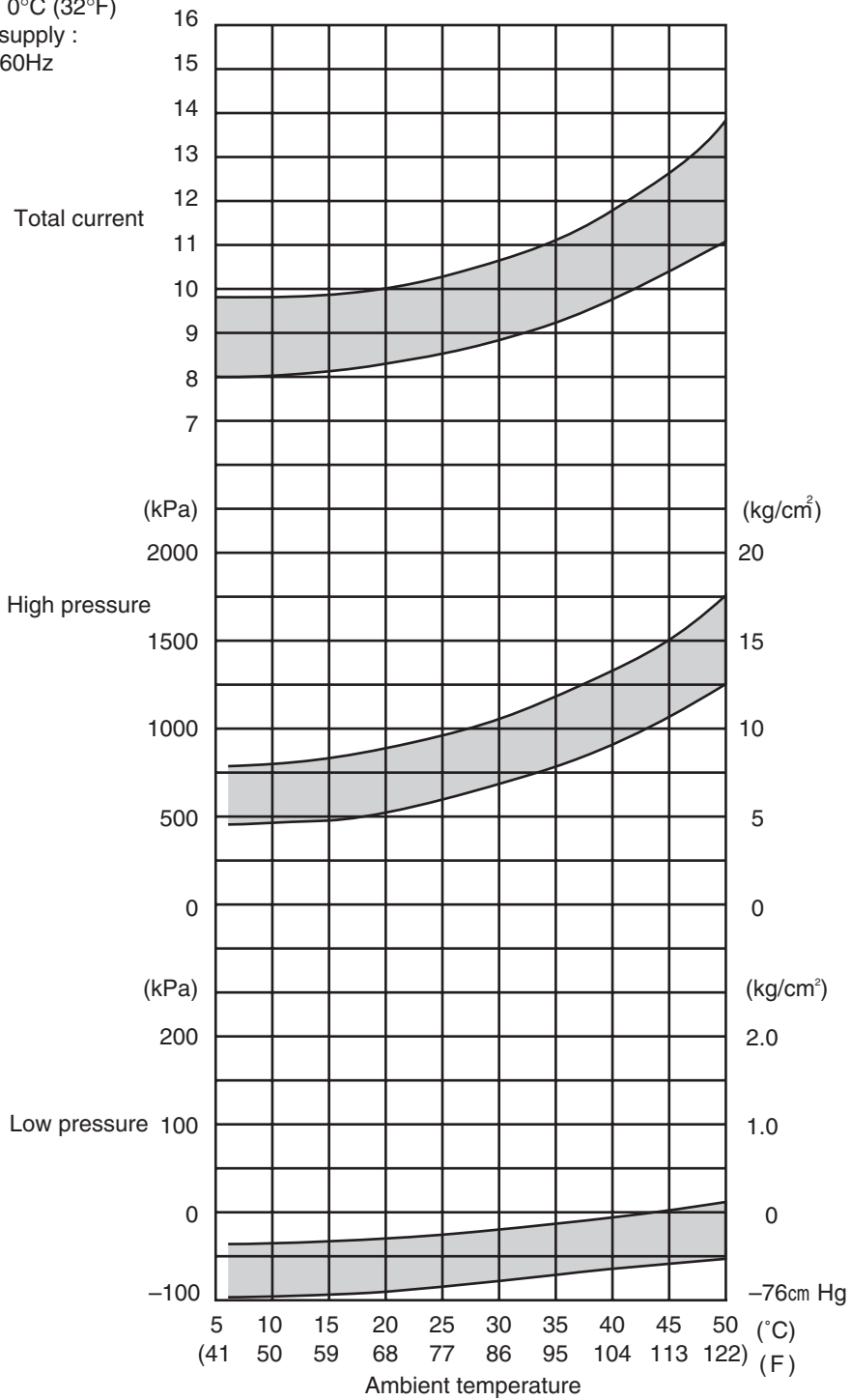
- Chilled mode  
 Inside : 0°C (32°F)  
 Power supply :  
 415V / 50Hz



- Fan motor current

Item	Amperage
Condenser fan motor running current	1.4 (415VAC)
Evaporator fan motor running current (2 motors)	3.2 (415VAC) Hi speed

●Chilled mode  
 Inside : 0°C (32°F)  
 Power supply :  
 400V / 60Hz

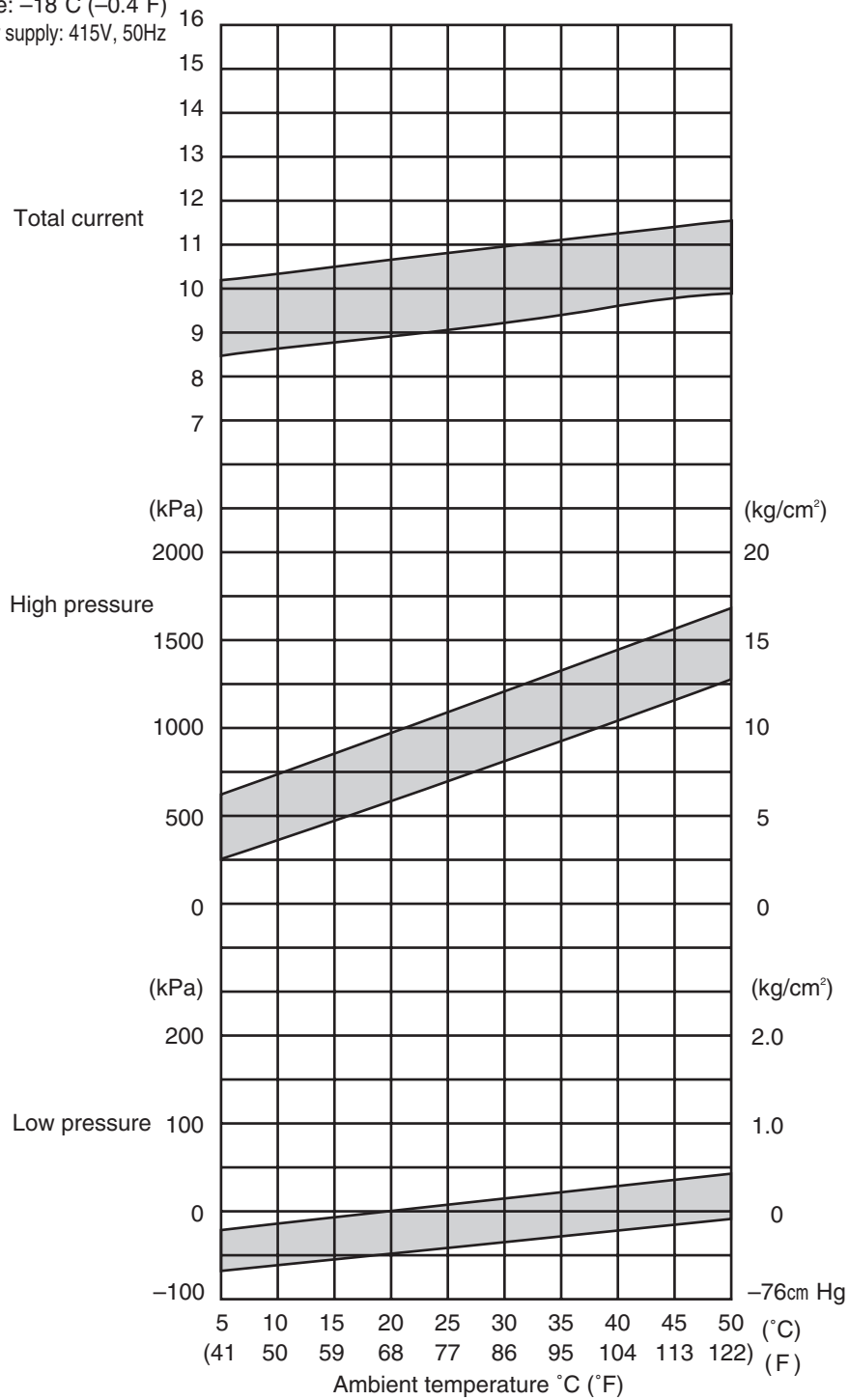


●Fan motor current

Item	Amperage
Condenser fan motor running current	1.4 (400VAC)
Evaporator fan motor running current (2 motors)	3.2 (400VAC) Hi speed

●Frozen mode

Inside: -18°C (-0.4°F)  
Power supply: 415V, 50Hz

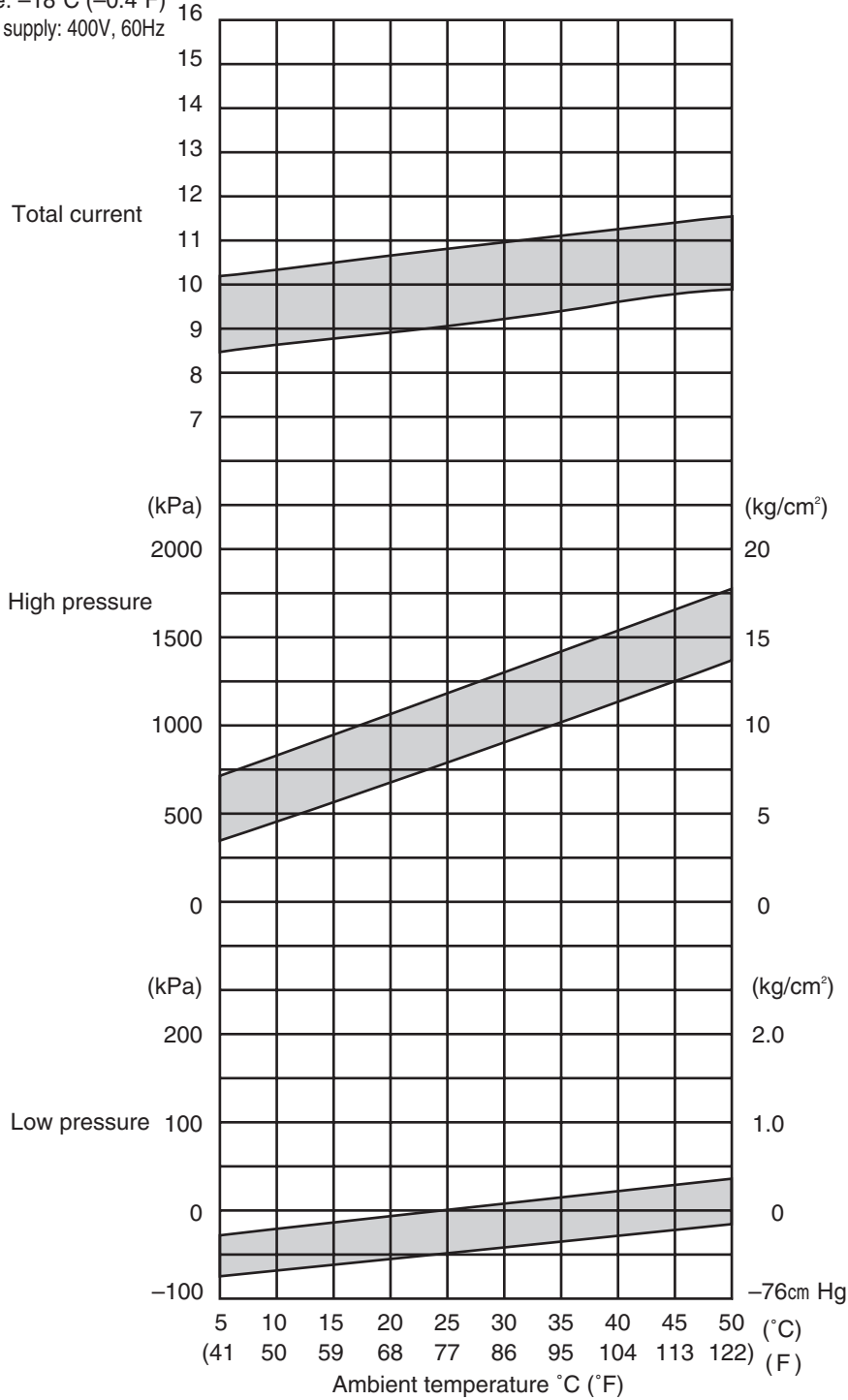


●Fan motor current

Item	Amperage
Condenser fan motor running current	1.4 (415VAC)
Evaporator fan motor running current (2 motors)	0.9 (415VAC) Low speed

●Frozen mode

Inside: -18°C (-0.4°F)  
Power supply: 400V, 60Hz



●Fan motor current

Item	Amperage
Condenser fan motor running current	1.4 (400VAC)
Evaporator fan motor running current (2 motors)	0.9 (400VAC) Low speed

## 2.5 Operation modes and control

There are two main types of operation modes: the cargo cooling control mode and the unit inspection mode.

The cargo cooling control mode is explained in this section.

※For the unit inspection mode, refer to section 3.9.

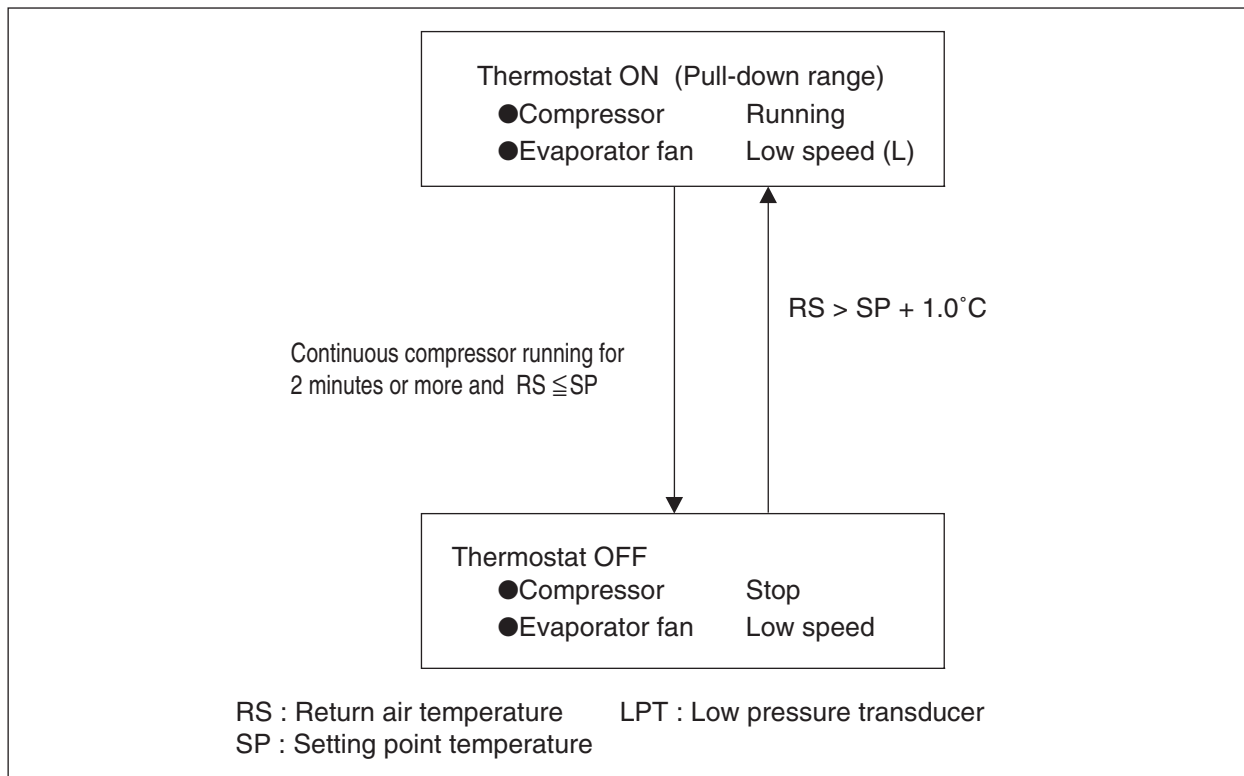
The relationship between the operation mode and setting temperature is as follows.

※For details, refer to clause 2.5.1 to 2.5.4

Mode selection	Operation mode	Setting temperature	Control sensor	Inside fan	Operation description
Mode selection	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
	Defrosting mode	-	-	OFF	Hot-gas defrosting with refrigerant quantity control

### 2.5.1 Frozen mode

Control state transition and common control



Operation of magnetic contactor and solenoid valve

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

Note) ※1: High pressure control (Refer to Page 2-26)

※2: Injection control (Refer to Page 2-27)

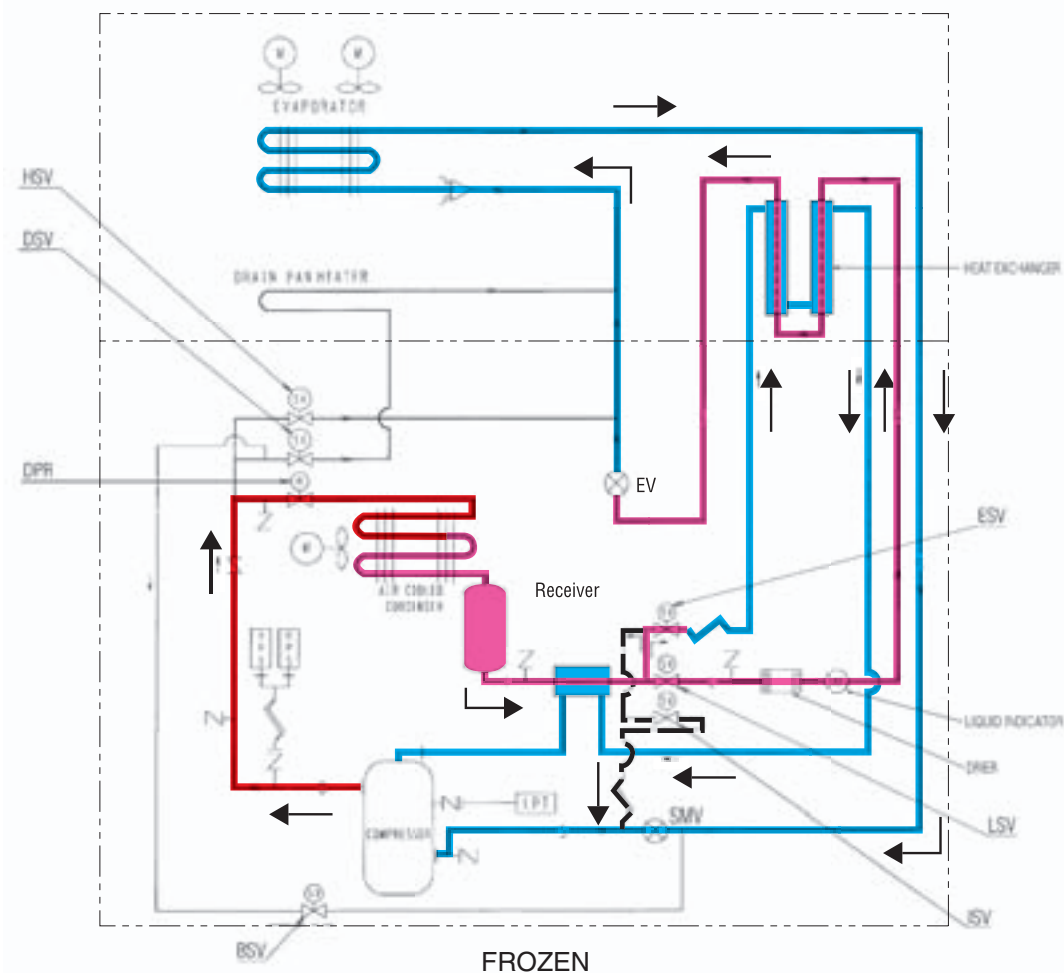
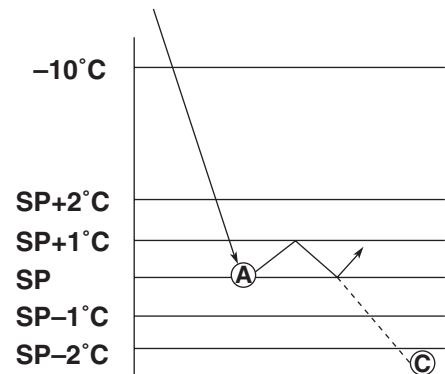
※3: RSV : OFF  $RS \leq 20^{\circ}\text{C}$ , RSV : ON  $RS \geq 25^{\circ}\text{C}$

**(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 operated 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 once it is turned on. Even if the control temperature becomes 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)

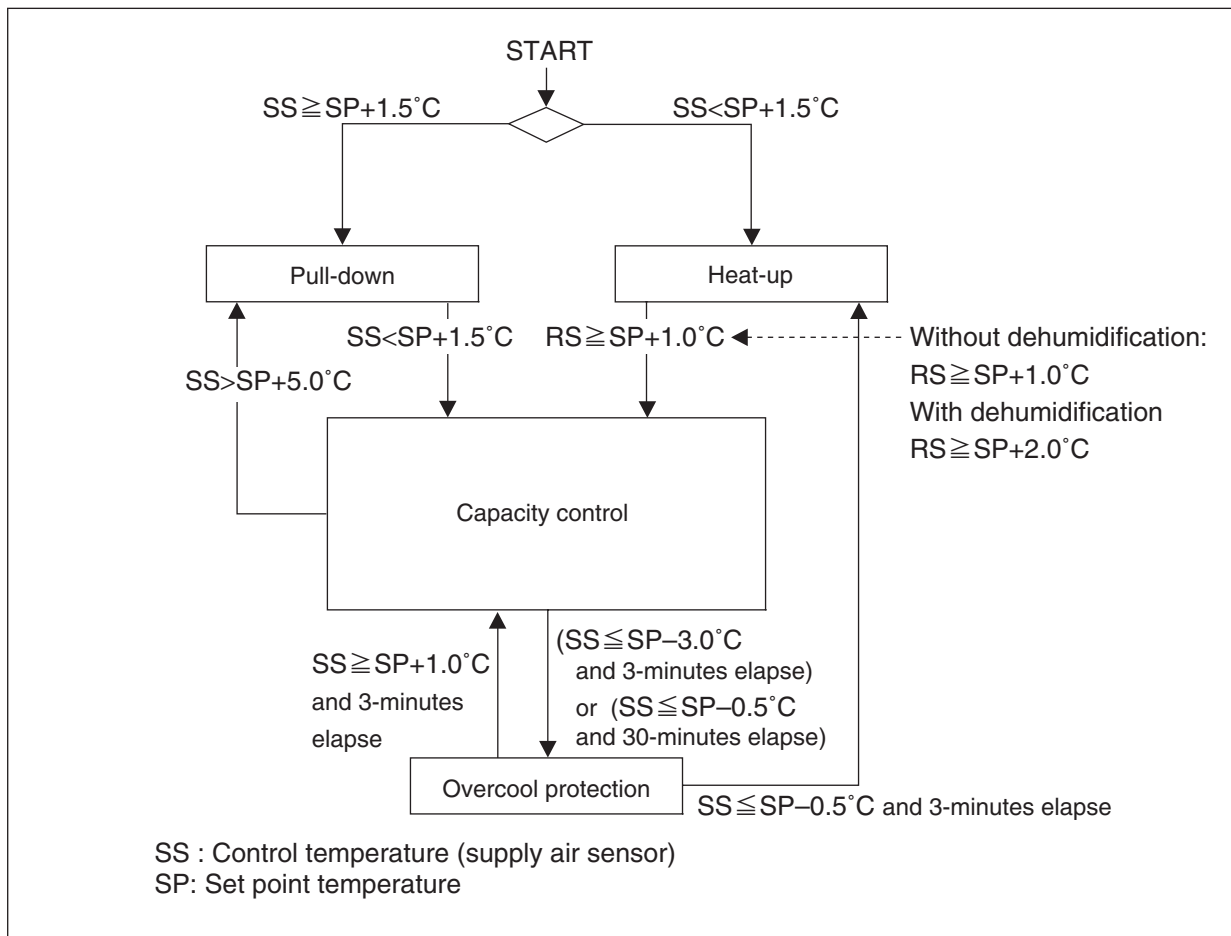


- |                                  |  |
|----------------------------------|--|
| EV :Electronic Expansion Valve   | HSV:Hot Gas Solenoid Valve               |
| LSV :Liquid Solenoid Valve       | ISV :Injection Solenoid Valve            |
| DSV:Defrost Solenoid Valve       | BSV :Discharge gas Bypass Solenoid Valve |
| ESV:Economizer Solenoid Valve    | LPT :Low Pressure Transducer             |
| DPR:Discharge pressure regulator | HPT:High Pressure Transducer             |
| SMV:Suction Modulation Valve     | HPS:High Pressure Switch                 |



## 2.5.2 Chilled mode

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	
	Evaporator fan. High speed	EFH	ON	ON	ON	
	Evaporator fan. Low speed	EFL	OFF	OFF	OFF	
	Condenser fan	CF	ON / OFF※1	ON	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
	Defrost solenoid valve	DSV	OFF	ON / OFF※5	ON	OFF
	Discharge gas by-pass solenoid valve	BSV	OFF	ON / OFF※5	OFF	OFF
	Reheat solenoid valve	RSV	ON / OFF※6	OFF	OFF	OFF
Suction modulating valve	SMV	100%	3 to 100%	100%	100%	
Electronic expansion valve	EV	21~420pls (5~100%)	48~420pls (11~100%)	0pls (0%)	189pls (45%)	

Note) ※1: High pressure control    ※4: Release control  
 ※2: Injection control            ※5: Capacity control and hot gas by-pass  
 ※3: Charge control                ※6: RSV : OFF RS  $\leq$  20°C, RSV : ON RS  $\geq$  25°C

**(1) Set point temperature and control sensor**

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

**(2) Control**

(a) Pull-down operation

Pull-down operation is carried out with fully opened suction modulating valve when the control temperature (SS) is higher than the set point temperature for  $1.5^{\circ}\text{C}$  or more (point ①).

(b) Capacity control operation

When the control temperature (SS) reaches the point ② (set point temperature  $+1.5^{\circ}\text{C}$ ), the suction modulation valve is activated to conduct the capacity control operation.

The control temperature (SS) converges to the set point temperature (point ③) while repeats temperature increasing and decreasing.

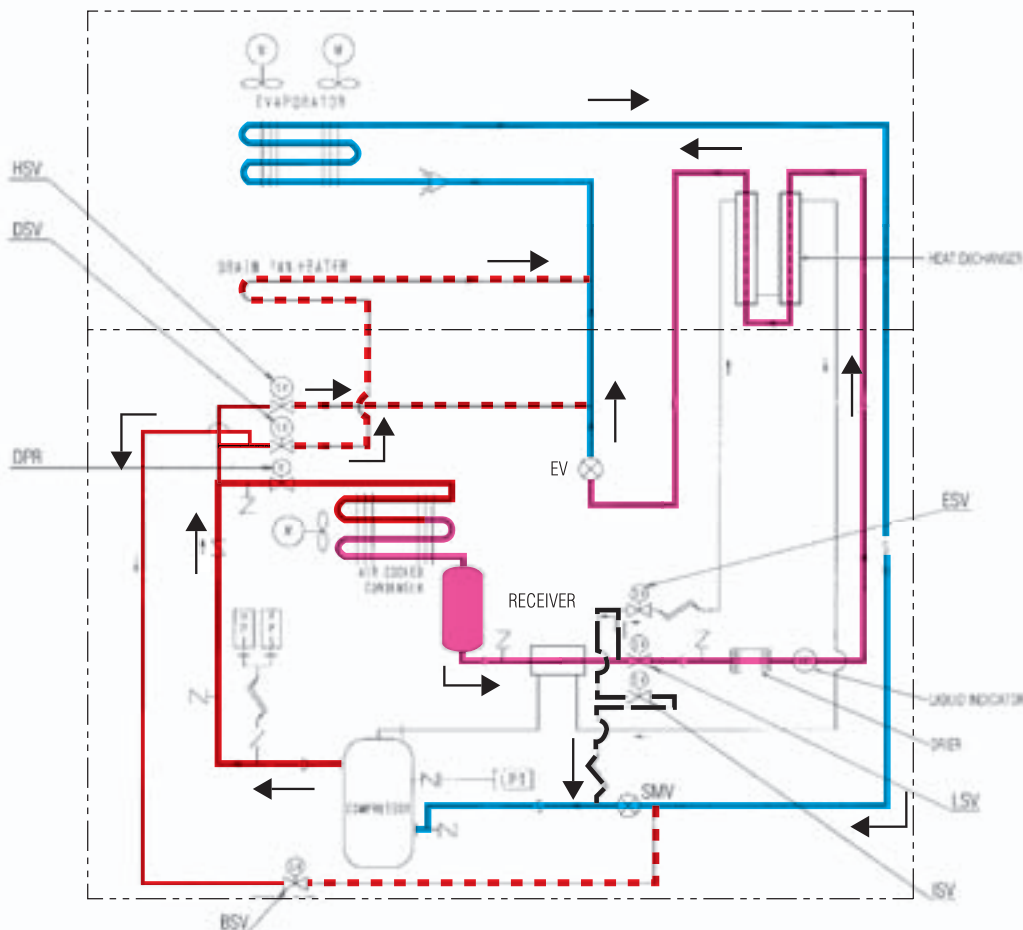
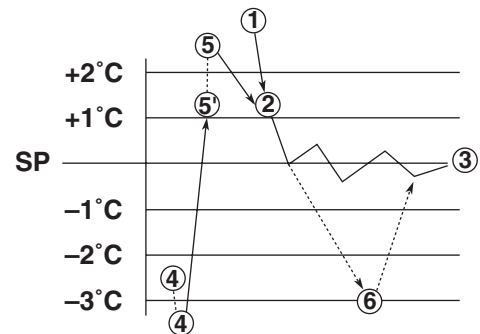
During capacity control, hot gas by-pass (HSV, DSV, BSV) and liquid injection (ISV) are conducted in order to maintain the optimum operation condition of refrigerant system.

(c) Heat-up operation

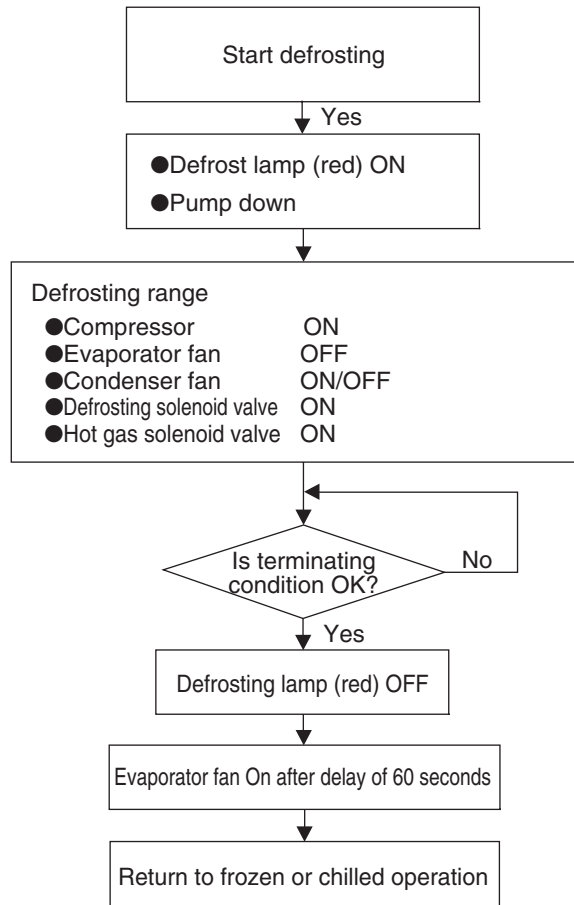
When the control temperature (SS) is lower than the set point temperature for  $1.5^{\circ}\text{C}$  or more (point ④), heat-up operation using hot gas is conducted in order to raise the equivalent return air temperature (RS) (point ④) to the set point temperature  $+1.5^{\circ}\text{C}$  or more (point ⑤). Then the equivalent control temperature (SS) (point ⑤) is controlled to reach to the point ②.

(d) Overcool protection operation

Although the unit's operation is in a stable state, if the control temperature lowers below set point temp  $-3^{\circ}\text{C}$  (point ⑥), the compressor stops and only the evaporator fan continues to operate.



### 2.5.3 Defrosting mode



Operation of magnetic contactor and solenoid valve

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

Note) ※1: Charging control  
 ※2: Release control  
 ※3: RSV:ON EOS>15°C

## Defrosting operation

### (1) Defrosting system

A hot-gas defrost system is adopted in the units; i.e. the 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 effectively.

### (2) Defrosting initiation

Defrosting is initiated by the timer or the manual defrost key.

①Initiation by timer (Timer is set at the electronic controller, refer to clause 3.3.2 for its operating method.)

Type of timer	Defrosting interval set	Function
Long timer	3, 6, 9, 12, 24 hours and 99 <sup>※2</sup> are selectable.	Defrosting is initiated according to the set interval. <sup>※1</sup>
Short timer	4 hours <sup>※3</sup>	Defrosting is initiated every 4 hours until the control temperature comes within the in-range after pull-down.
Out-range timer	30 minutes	After the control temperature comes within in-range once, defrosting will be started 30 minutes later if the control temperature rises out of the in-range.

※1. However, defrosting is not initiated when frosting on the evaporator can not be detected.

- Evaporator inlet temperature : 5°C or higher
- Evaporator outlet temperature : 20°C or higher

※2. On-demand defrost selection (12 hours for Frozen mode and 6 hours automatic for Chilled mode)

※3. 6 hours when the control temperature is -20°C or below.

②Starting by MANUAL DEFROST key (on the operation panel sheet key)

Press the MANUAL DEFROST key, then press the ENTER/ESC key while indicate "ON" on the LED display. The manual defrosting operation starts.

③Initiation by frost detection

If the return air temperature does not drop at the speed of 0.2°C/1hr during frozen pull-down operation, defrosting will be initiated because it is judged that frost is formed on the evaporator. However, if the suction temperature is -20°C or lower, defrosting will not be initiated. (activated)

### (3) On demand defrost

If "99" is set with the long timer, the on-demand defrosting is carried out.

The on-demand defrosting is done through the frozen operation, and the defrosting interval is internally set to 12 hours. However, the freezing operation continues if the evaporator does not have a heavy frost when 12 hours have been counted.

("If chilled operation is selected when "99" is set, the defrosting interval will be automatically set to "6" hours.)

Step 1: After defrost termination, the operation time per hour of the compressor (T1) is recorded.

Step 2: The measurement of the operation time per hour of the compressor is continued, and the time (T2) is recorded.

Step 3: If  $T2 > T1 \times 1.15$ , the defrosting operation is initiated.

If  $T2 \leq T1 \times 1.15$  when 12 hours have been counted, the freezing operation is continued.

**(4) Defrosting termination**

Defrosting will be terminated when any one of the following three conditions is satisfied.

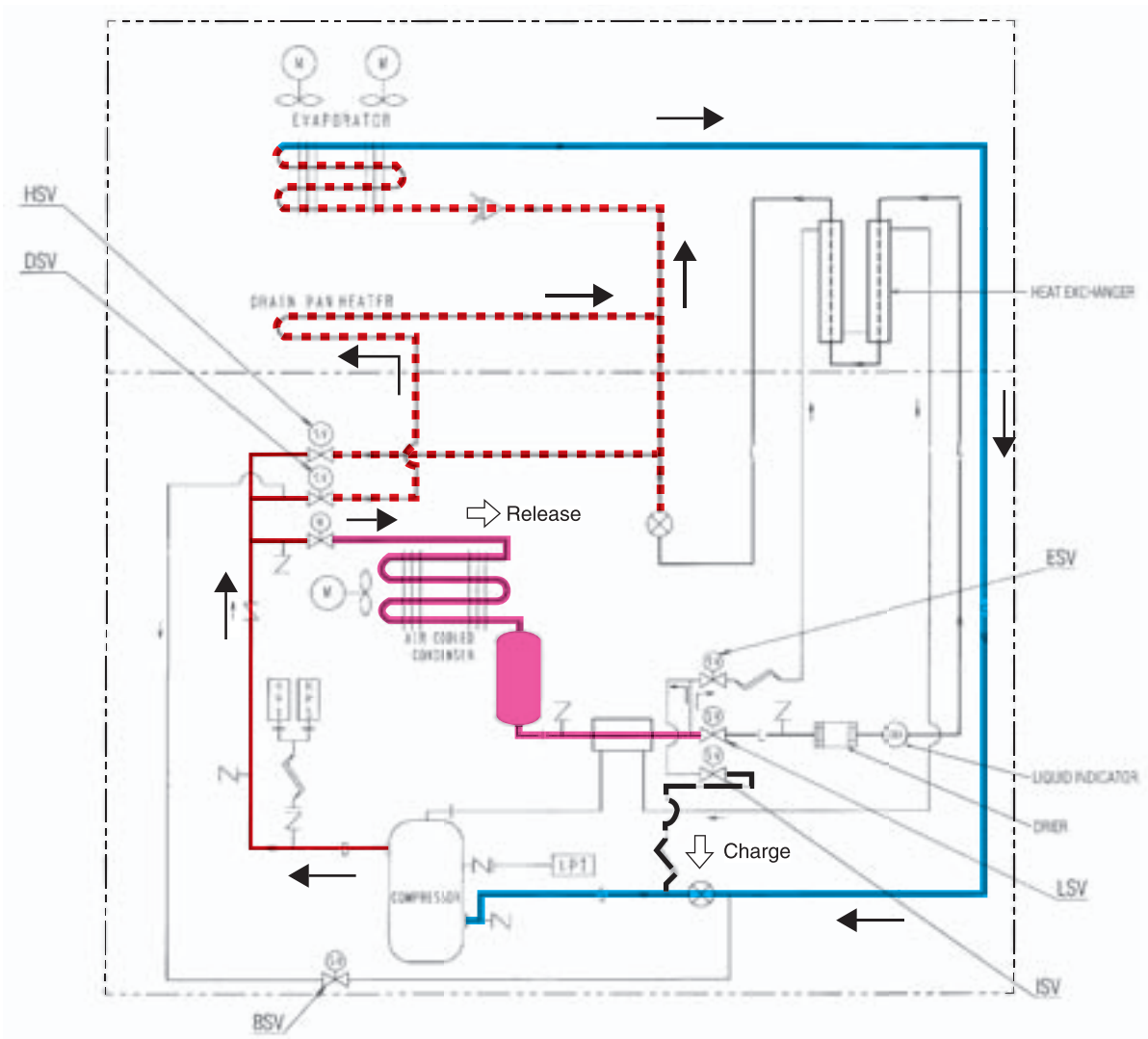
① The below figure is satisfied during defrost.

Operation mode	Status before defrost	Termination
Frozen mode	INRANGE	$EOS \geq 30.0^{\circ}\text{C}$
	Out of RANGE	$EOS \geq 30.0^{\circ}\text{C} \& RS \geq 15^{\circ}\text{C} \& DRS \geq 15^{\circ}\text{C}$
Chilled mode	INRANGE	
	Out of RANGE	

※ Only out of range conditions in case of chilled operation

② When the backup timer has counted up 90 minutes

③ Any one of protective devices is activated.



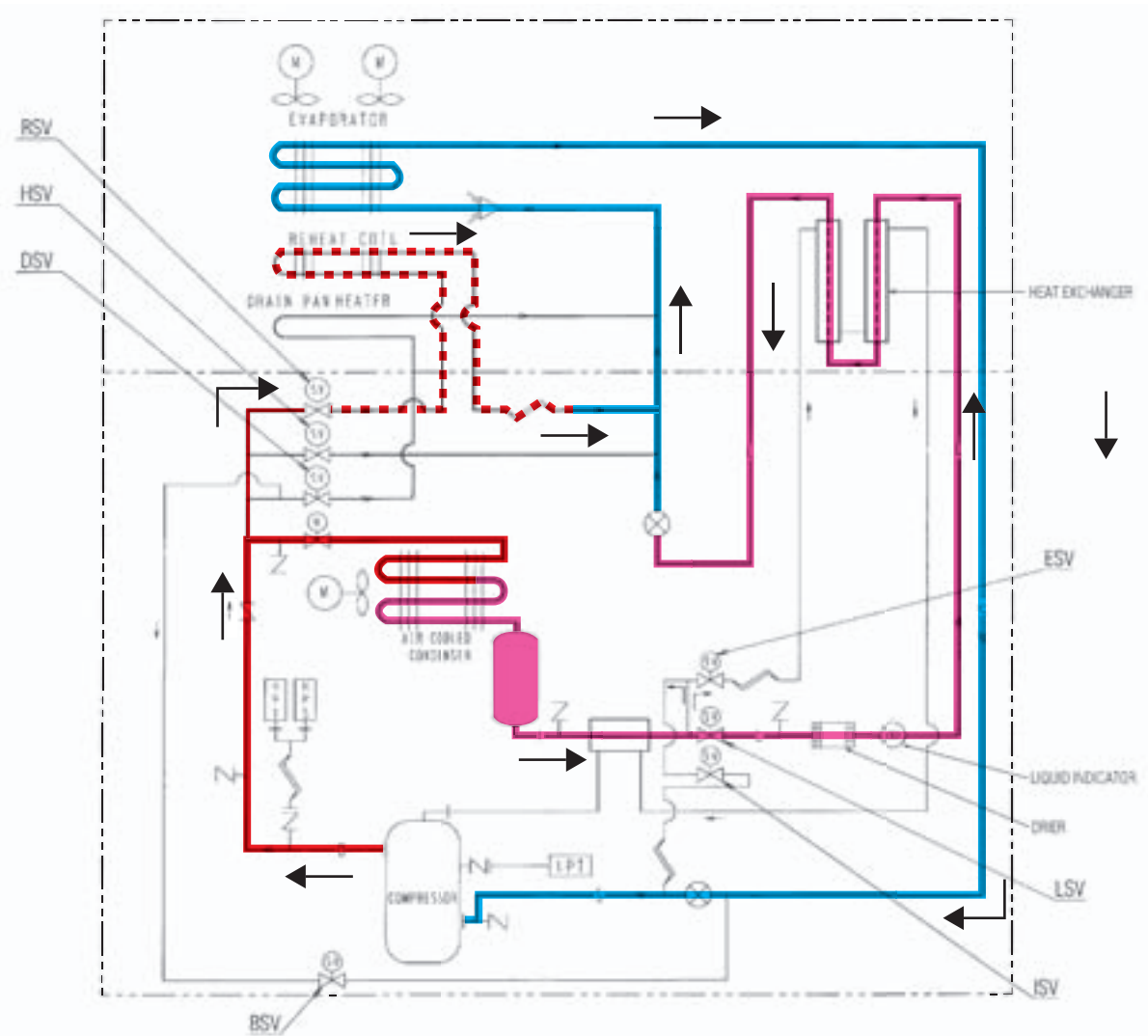
### 2.5.4 Dehumidification (Optional)

The unit have dehumidification control by a reheat coil, which is fitted under the evaporator coil. To execute dehumidification, controller setting is required. (Refer to Page 3-12)

In dehumidification, the Reheat Solenoid Valve (RSV) opens to give high temperature and high pressurized refrigerant to reheat coil. The "DEHUMID" LED lamp will light up.

The following setting can be made:

- 1) Non humidification control
- 2) Humidification control (optional)  
Dehumidification range: 60%RH–95%RH



### 2.5.5 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 the inside temperature.	○			
B	Starting control	<ul style="list-style-type: none"> <li>At the start of the operation with low ambient temperature, an oil temperature raising control is executed.</li> <li>When a protection device activates at the operation start, a high pressure/current control is executed.</li> </ul>	○	○	○	
C	Evaporator fan speed control	The evaporator fan is switched to the high or low speed according to the set point temperature.	○	○	○	
D	Superheat control	In order to keep the superheat of the evaporator optimum, the opening of the electronic expansion valve is controlled.	○			
E	High-pressure control	In order to keep the high pressure optimum, the opening of the electronic expansion valve is controlled.	○	○	○	
F	Injection	In order to prevent the 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 $SP \pm 2^{\circ}C$ , the in-range lamp is turned on.	○	○	○	
H	In-range masking control	After defrosting initiation, the in-range lamp is kept on for 90 minutes.	○	○	○	○
I	Capacity control	The circulating flow rate of refrigerant is proportionally controlled with suction modulating valve to keep the control temperature variation within $\pm 0.5^{\circ}C$ .		○	○	
J	Charging and releasing control	The heating capacity of defrosting and heating operation are controlled.		○	○	○
K	Pump down control	The liquid refrigerant is collected into the liquid receiver (water cooled condenser).	○	○	○	○
L	Economizer control	The economizer circuit is controlled to enhance cooling capacity.	○	○	○	
M	Reheat coil control	The reheat solenoid valve (RSV) is controlled to carry out dehumidification.			○	

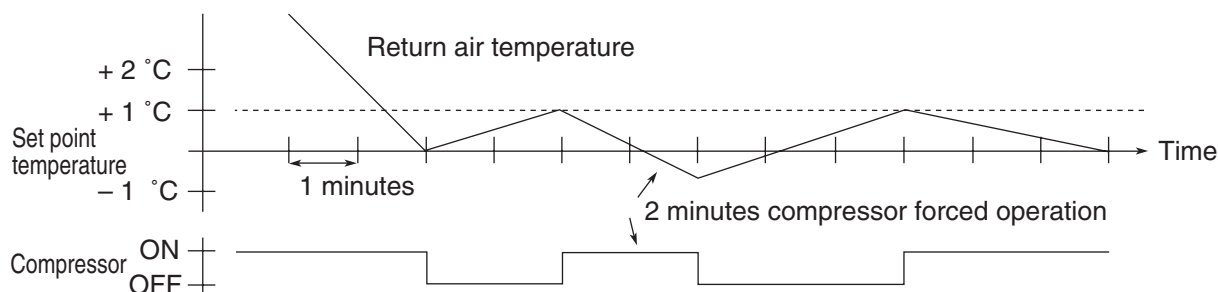
## Common control

### 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.

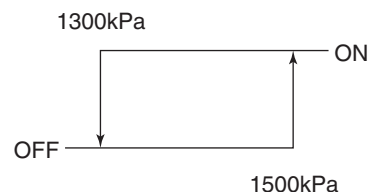
On starting the unit, by-pass discharge gas to suction side of the compressor by opening the solenoid valve (BSV) to raise the oil temperature rapidly ensuring a stable feed of oil.

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  
Frozen mode : Low speed

### D : Superheat control

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

### E : High-pressure control

- By electronic expansion valve

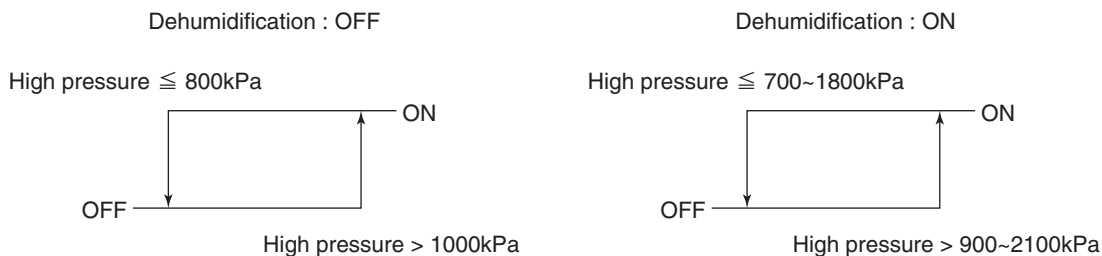
When the ambient temperature is high during the air-cooled operation, the condensing pressure (high pressure) will increase, and the high pressure switch may be activated.

In order to prevent this situation, the 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, the condenser pressure (high pressure) will decrease. Accordingly, the low pressure will decrease. In order to prevent this situation, when the high pressure becomes set point or lower, the condenser fan stops to prevent the high pressure from excess dropping. When the high pressure becomes set point or higher afterwards the operation will be restarted. This control varies upon dehumidification setting.



## F : Injection control

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

- During normal compressor operation

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

The control is conducted properly by using detected discharge gas temperature and inside temperature.

Discharge gas temperature (DCHS) set value

	Frozen, chilled (pull-down)			Chilled, capacity control
	AMBS<40°C		AMBS>40°C	
	RS≤0°C	RS>0°C		
ISV_ON	DCHS>120°C	DCHS>125°C	Turned ON/OFF depending on AMBS and RS	DCHS>113°C
ISV_OFF	DCHS<110°C	DCHS<118°C		DCHS<108°C

- Defrosting / Heat-up operation

Control the injection ON/OFF with charge control. For details, see the section of "charge control" on page 2-29.

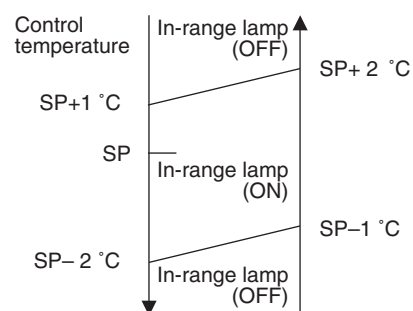
## G : In-range control

When the control temperature is close to the setting value (SP), the in-range lamp on the display panel is lit to clearly indicate whether the inside temperature is controlling normally.

## H : In-range masking control

If the inside temperature is within the in-range when defrosting is started, the in-range lamp will be kept turned on forcibly for certain period as below regardless of the inside temperature thereafter.

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



Setpoint ≥ -20.0°C	90 minutes
Setpoint ≤ -20.1°C	120 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

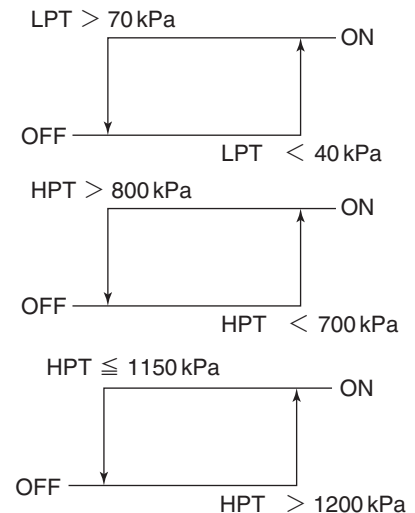
Charge control or release control is executed to maintain the heating capacity optimum in defrosting and heating operation.

### • Charge control

- ① The suction pressure (LPT) is detected and the injection solenoid valve (ISV) is turned on, then, liquid refrigerant is charged into the suction pipe.
- ② The discharge pressure (HPT) is detected and the injection solenoid valve (ISV) is turned on, then the liquid refrigerant is charged into the suction piping.

### • 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 stop

When starting the defrosting operation or before starting the heating operation, close the liquid solenoid valve (LSV), carry out the pump-down operation and collect refrigerant into the receiver. The pump-down operation is stopped when the low pressure becomes 0kPa or less.

## L : Economizer control

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

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

### 3. ELECTRONIC CONTROLLER

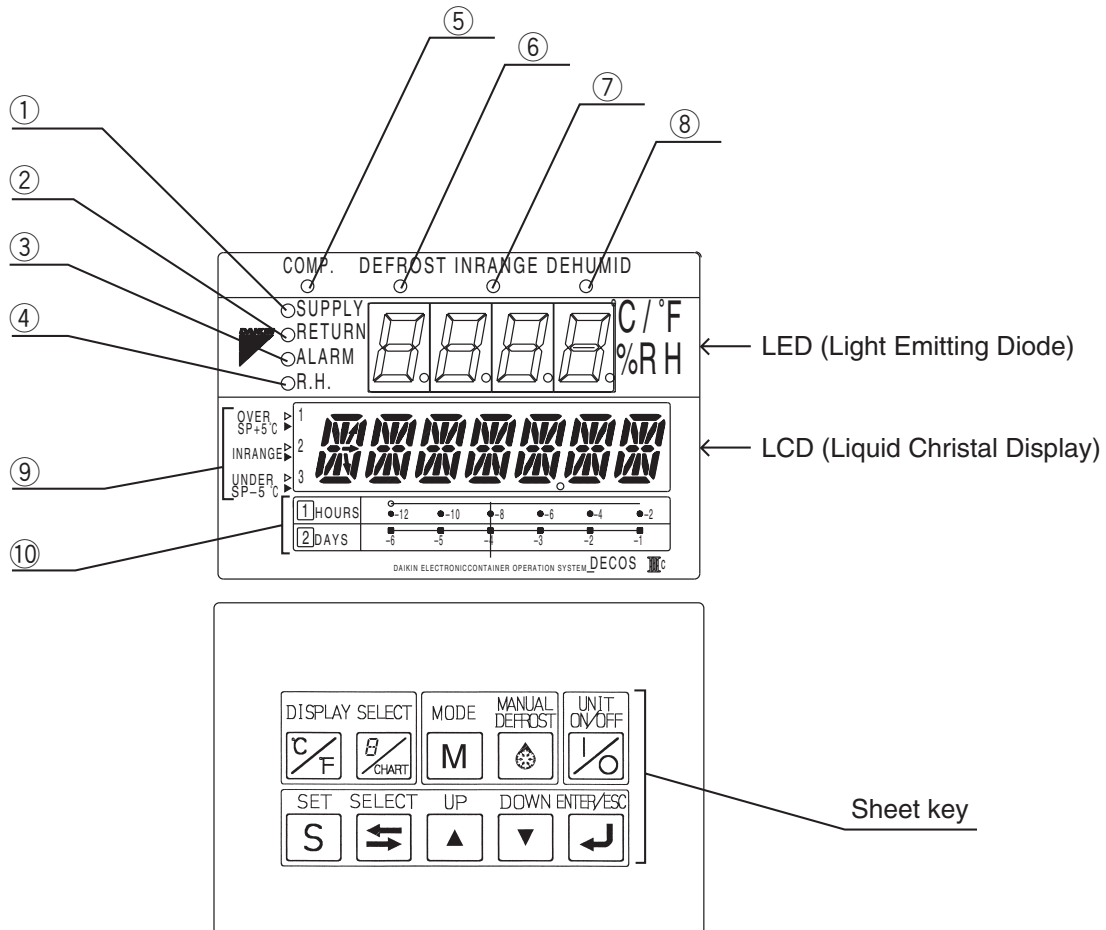
#### 3.1 Functions of DECOS III d and DECOS III e

Items changed	Decos III e	Decos III d
Initial setting at the time of replacement	Not required	Required (Input using the panel)
Download time of trip data (If the whole memory capacity of the TRIP data and EVENT data is used)	Approx. 6 minutes	Approx. 17 minutes
Memory capacity of trip data (If the log interval is 60 minutes)	For 2 years or more	For 1.5 years or more
Remaining battery voltage indication	The voltage is indicated regardless of the types of batteries: rechargeable or dry cell.	Not available
Controller serial number	A serial number is available for each controller. The serial number is indicated if the report is created with DCCS.	Not available

## 3.2 Basic operation of electronic controller

### 3.2.1 Control panel

Name and function of each components



- |   |  |
|---|--|
| 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.  
The controller has a memory function.  
If the power supply is cut off suddenly while the unit is on, and the power supply is then turned on again, the unit automatically starts the operation without pressing this key again. If the power supply is cut off while the unit is off, the unit does not start the operation unless this 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 key

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



### ●DOWN key

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



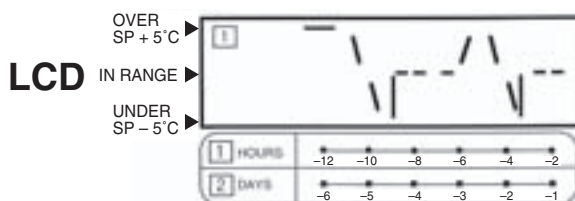
### ●ENTER/ESCAPE key

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




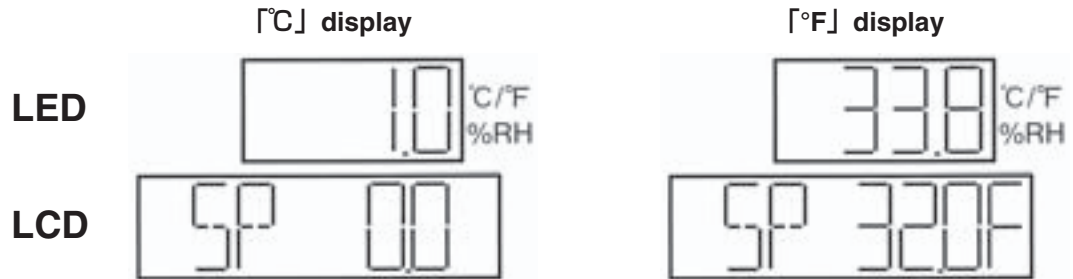
### CHART key (DISPLAY SELECT key)





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.





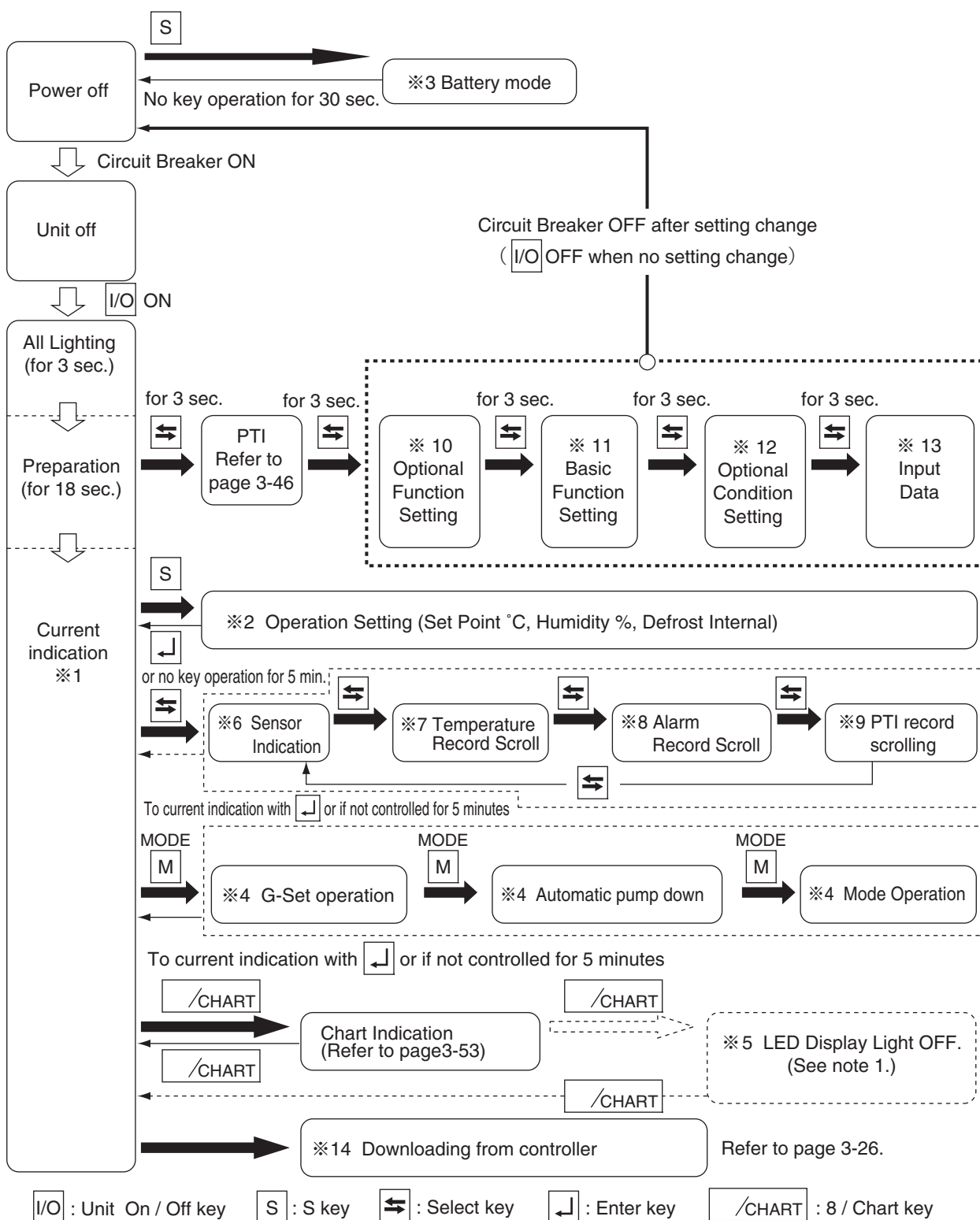
- ① Indicate the temperature data required to be converted into "°F" on the LED or the LCD.
  - ② Press the  key, then the temperature data displayed in "°C" is converted into "°F" for one minute.
- ※ If any other key is pressed during the "°F" indication, the display switches to "°C".



- 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.
- ※ The defrosting operation is not started when the temperature of the evaporator outlet tube (EOS) is 20°C or higher and that of the evaporator inlet tube (EIS) is 5°C or more.
- ※ If the dehumidification function is available (the reheater coil is turned ON), the defrosting operation may be started even when the evaporator temperature is 5°C or more.

### 3.3 Operation procedure

#### 3.3.1 Operation procedure flow chart



Note 1. ※5 activates when the "DISP" in ※11 is set to "ON" in controller initial setting in page 3-22.

<b>※1. Current indication mode (indication of operation conditions)</b>		
Indicates the unit operation conditions.	<ul style="list-style-type: none"> <li>●Supply air temperature (SS)</li> <li>●Return air temperature (RS)</li> <li>●Defrost interval</li> <li>●Alarm</li> <li>●Setting point humidity and humidity (optional)</li> </ul>	Page 3-8
<b>※2. Operation setting mode</b>		
Settings for cargo transportation	<ul style="list-style-type: none"> <li>●Temperature settings</li> <li>●Defrost interval settings</li> <li>●Humidity settings (optional)</li> </ul>	Page 3-9
<b>※3. Battery mode (settings for operation conditions by using the battery)</b>		
Setting can be executed when commercial power supply is not available.	<ul style="list-style-type: none"> <li>●Temperature settings</li> <li>●Humidity settings</li> <li>●Defrost interval settings</li> <li>●Unit ON/OFF setting</li> </ul>	Page 3-10
<b>※4. Mode operation</b>		
<ul style="list-style-type: none"> <li>① G-Set operation : The maximum power consumption can be set in case of operation by generation.</li> <li>② Automatic pump down : The pump down can be executed automatically.</li> <li>③ Mode Operation : Dehumidification mode can be set. (optional)</li> </ul>	Page 3-11	
<b>※5. LED display off mode</b>		
LED display section on the controller can be turned off.	<ul style="list-style-type: none"> <li>●LED lights off</li> </ul>	Page 3-12
<b>※6. Sensor indication mode</b>		
Each sensor value can be indicated.	<ul style="list-style-type: none"> <li>●Discharge gas temperature (DCHS)</li> <li>●Suction gas temperature (SGS)</li> <li>●Modulating valve opening</li> <li>●Electronic expansion valve opening</li> <li>●Supply air temperature (SS)</li> <li>●Return air temperature (RS)</li> <li>●Pulp temperature (USDA #1, #2, #3)</li> <li>●Cargo temperature (CTS)</li> <li>●Data recorder supply air temperature (DSS)</li> <li>●Data recorder return air temperature (DRS)</li> <li>[optional]</li> </ul>	Page 3-13
<ul style="list-style-type: none"> <li>●High pressure (HPT)</li> <li>●Low pressure (LPT)</li> <li>●Total current (CT1)</li> <li>●Compressor current (CT2)</li> <li>●Voltage (PT1)</li> <li>●Ambient temperature (AMBS)</li> <li>●Evaporator inlet temperature (EIS)</li> <li>●Evaporator outlet temperature (EOS)</li> </ul>		
<b>※7. Temperature record scroll function</b>		
Temperature record of the control sensor can be indicated in the order (scroll indication) from the latest data.	<ul style="list-style-type: none"> <li>●Chilled mode: Supply air temperature</li> <li>●Frozen mode: Return air temperature (up to 7 days)</li> </ul>	Page 3-16



<b>※8. Alarm record scroll function</b>		
Alarm record can be indicated in order (scroll indication) from the latest data.	●Alarm indication (up to 7 days)	Page 3-18

<b>※9. PTI record scroll function</b>		Page 3-19
Last 3 PTI results can be displayed.		

<b>※10. Optional function mode</b>		Page 3-20
Set the optional functions if the controller is replaced.	●USDA sensor available/not available setting ●Dehumidification control on/off setting	

<b>※11. Basic function setting mode</b>		
Set the 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 3-21 Page 3-22
●Controller type ●Compressor unload ●Reheat coil		

<b>※12. Optional condition setting mode</b>		
●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 3-23 Page 3-24

<b>※13. Input data mode</b>		Page 3-25 Page 3-26
Set the container ID and the controller time.	●Container I.D. (No.) ●Controller time	

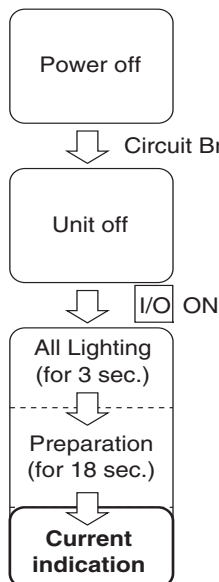
## Personal computer and controller

<b>※14. Controller software download mode</b>		Page 3-26
Data logged in a personal computer and controller is exchangeable. For the details, refer to the "Operation manual for personal computer software".		

### 3.3.2 Mode operation procedure

#### 1. CURRENT (Operation state) INDICATION MODE

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



Turn on the circuit breaker and the UNIT ON/OFF key after turning the power supply on, then the display panel switches to the 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.

Select an item using the or key. The value of the selected item is indicated on the LED lamp, LED display and LCD display.

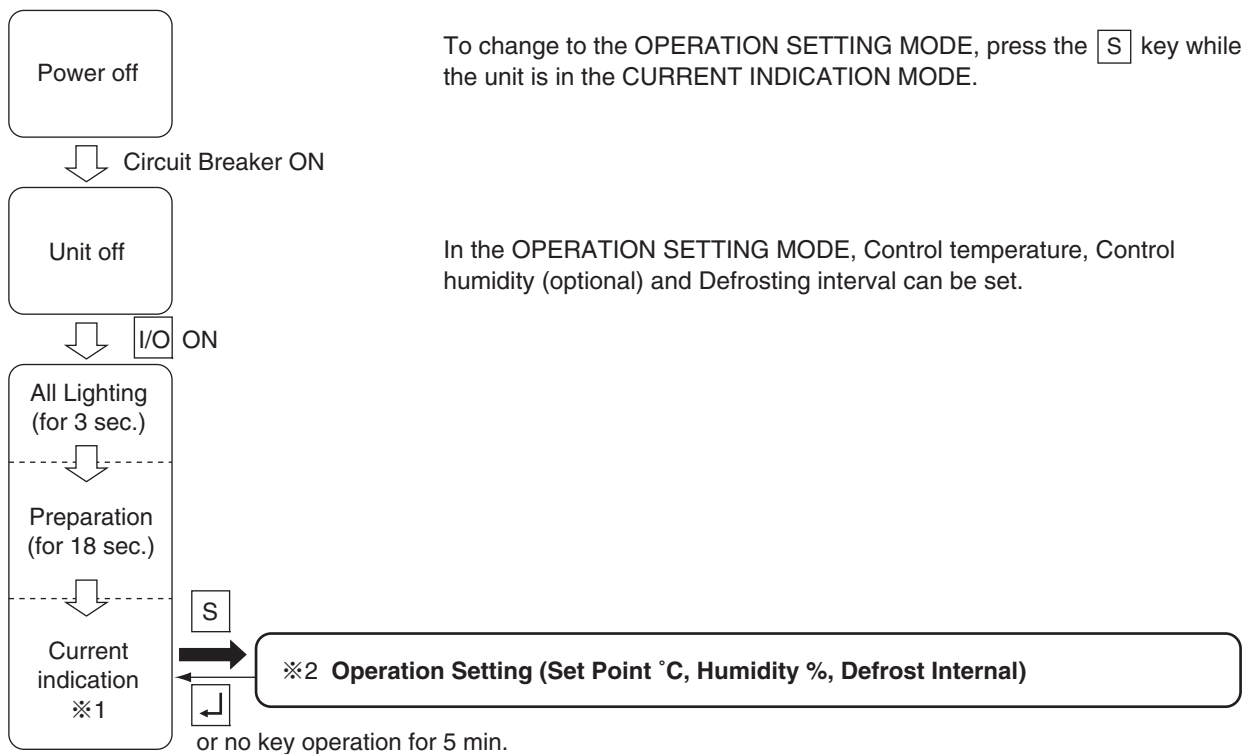
Indication item	LED lamp to be lit on	LED display	LCD display
 SUPPLY AIR TEMPERATURE (SS)	SUPPLY	Supply air temperature	Set point temperature
 RETURN AIR TEMPERATURE (RS)	RETURN	Return air temperature	Set point temperature
 DEFROSTING INTERVAL (Def)	Chilled mode: SUPPLY Frozen mode: RETURN	Chilled mode: SUPPLY air temperature Frozen mode: RETURN air temperature	Current defrosting interval setting
 ALARM (Note 1)	ALARM	All the detected alarms codes or ("Good" if there is no detected alarm)	The 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 the detected alarm codes in sequence when two or more alarm codes are displayed. After indicating the last alarm, display goes to the next item. The numerator of the LCD display stands for the current alarm, while the denominator stands for the number of alarm codes existing.

Note 2) ● The value of the humidity sensor is displayed only when the "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. The value of the selected item is indicated on the LED and LCD display.

Item	LED display	LED display	Setting method
CURRENT INDICATION MODE	-	-	-
CONTROL TEMPERATURE SETTING	Current setting temperature Note 2)	"SET-SPC" or "SET-SPF"	Change the value using the <b>△</b> key or <b>▽</b> key. Press the <b>↵</b> key to determine the setting. Setting temperature range; -30 to 30°C.
CONTROL HUMIDITY SETTING (optional Note 1)	Current setting humidity	"SET-SHU"	Change the value using the <b>△</b> key or <b>▽</b> key. Press the <b>↵</b> key to determine the setting. Setting humidity range: 60 to 95%RH
DEFROST INTERVAL SETTING	Current defrosting interval	"SET-dEF"	Select a defrost interval 99h, 24h, 12h, 9h, 6h, or 3h using <b>△</b> key or <b>▽</b> key. Press the <b>↵</b> key to determine the setting. "On demand defrosting" is conducted when "99h" has been selected. (See page 2-23.)

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

Note 2) ●In case temperature is set in °C setting temperature can be set at interval of 0.1 °C.

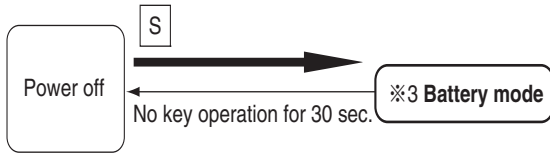
In case temperature is set in °F, setting temperature should be the value converted into °F based on °C and rounded off the two decimal places.

### 3. BATTERY MODE

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

- Indication of inside supply air temperature (SS) and return air temperature (RS)
- Setting for control temperature, control humidity and defrost interval

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



In the BATTERY MODE, return air temperature/supply air temperature can be indicated. 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 off.

Indications or setting items	LED screen	LCD screen	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	—
Battery (BAT)	(Unlit)	bAT V	—
Software version (SOFT)	(Unlit)	VER	—
Control temperature setting (SP)	(Unlit)	SP C	Change the setting temperature using the <b>[▲]</b> key and <b>[▼]</b> key and determine the value using the <b>[↵]</b> key. Temperature setting range: -30 to +30°C
Control humidity setting (RH) (Optional)	(Unlit)	SHU	Change the setting humidity using the <b>[▲]</b> key and <b>[▼]</b> key and determine the value using the <b>[↵]</b> key. Humidity setting range: 60 to 95%RH
Defrosting (Def) interval setting	(Unlit)	dEF H	Select a defrosting interval from among 99, 24h, 12h, 9h, 6h and 3h and determine the value using the <b>[↵]</b> key. 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" using the <b>[▲]</b> key and <b>[▼]</b> key and determine the value using the <b>[↵]</b> key.



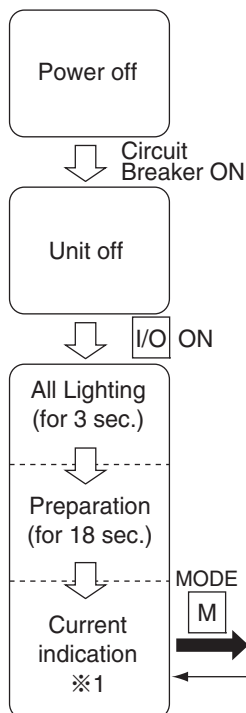
## CAUTION

If no indication on the LCD panel is displayed by operating the key, it is supposed the wake-up battery is dead. Replace the battery.

**4. MODE OPERATION**

Press the **MODE** **M** key in current indication mode to go to MODE operation.

In mode operation, the following settings/operations are available.



1. Generator setting

Total power consumption can be reduced to desired Max setting for the specific generators set or power facilities.

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 clause 4.1.3)

3. Dehumidification mode setting

Dehumidification mode can be executed in this mode (Refer to Dehumidification mode control in clause 2.5.4).

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

① Inside humidity : 95%~60% RH

To current indication with **MODE** **M** or if not controlled for 5 minutes

Setting item	LED panel	LCD panel	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 <b>△</b> or <b>▽</b> key, and press the <b>↵</b> key to determine the setting.
Automatic pump down operation	ON, OFF	P down	Select "ON" by using <b>△</b> key and <b>▽</b> key, and press the <b>↵</b> key to determine the setting.
Dehumidification	ON/OFF	dHu	Select desired setting by <b>△</b> or <b>▽</b> key, then press <b>↵</b> key.
Humidity set	95% RH~65%RH	SET-SHU	Select desired setting by <b>△</b> key or <b>▽</b> key, then press <b>↵</b> key to determine.

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

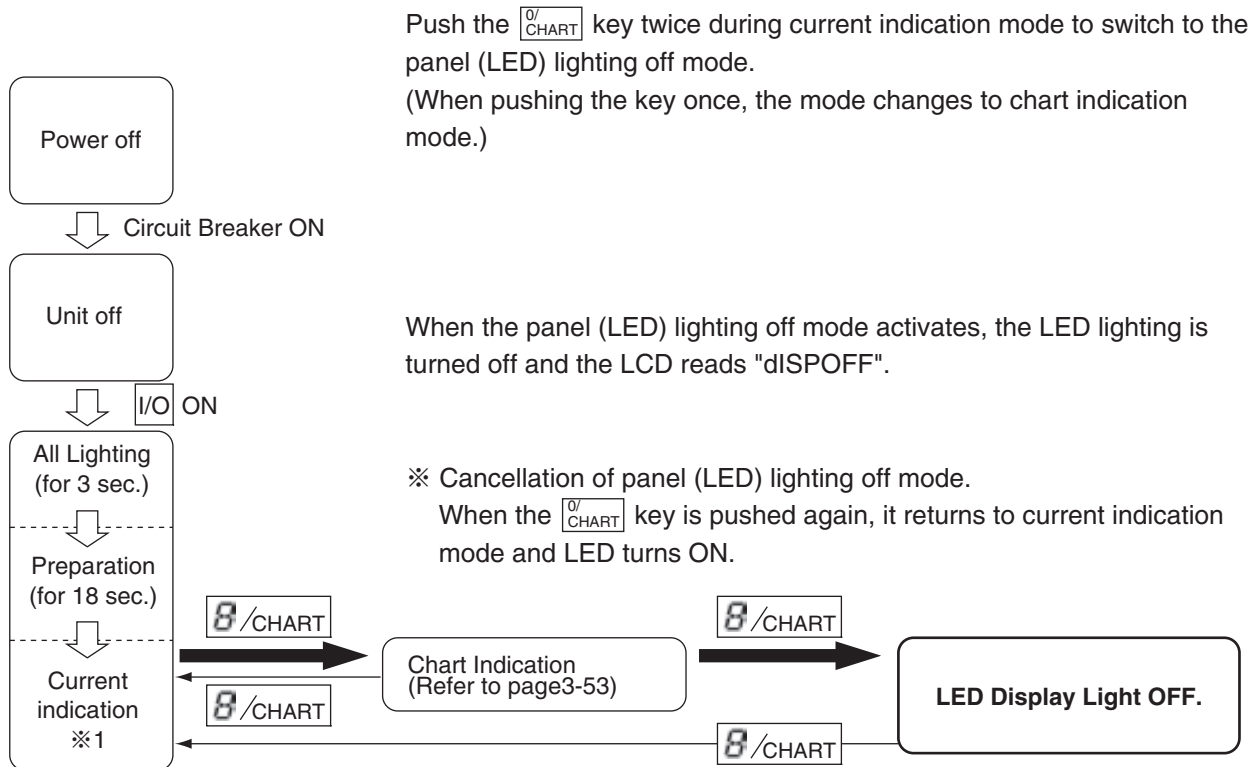
### 5. LED display LIGHT-OFF MODE

The controller LED display is turned off with 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 setting mode" to ON. Refer to page 3-21.

#### <Operation procedure>

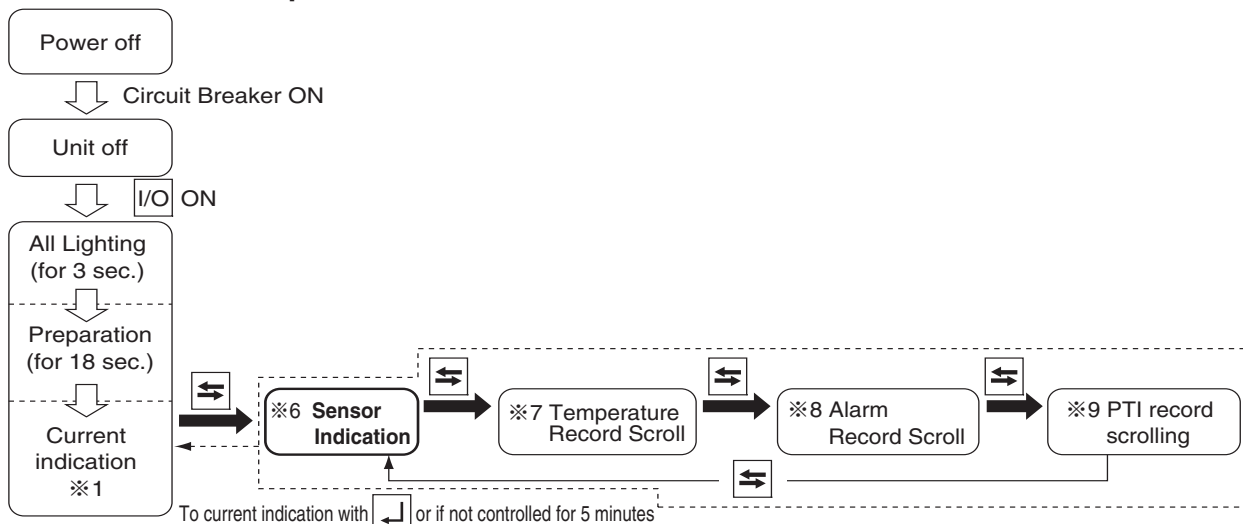


## 6. SENSOR INDICATION MODE

Each sensor value and the opening of the suction modulating valve (SMV) and the electronic expansion valve (EV) can be checked. The following items are shown.

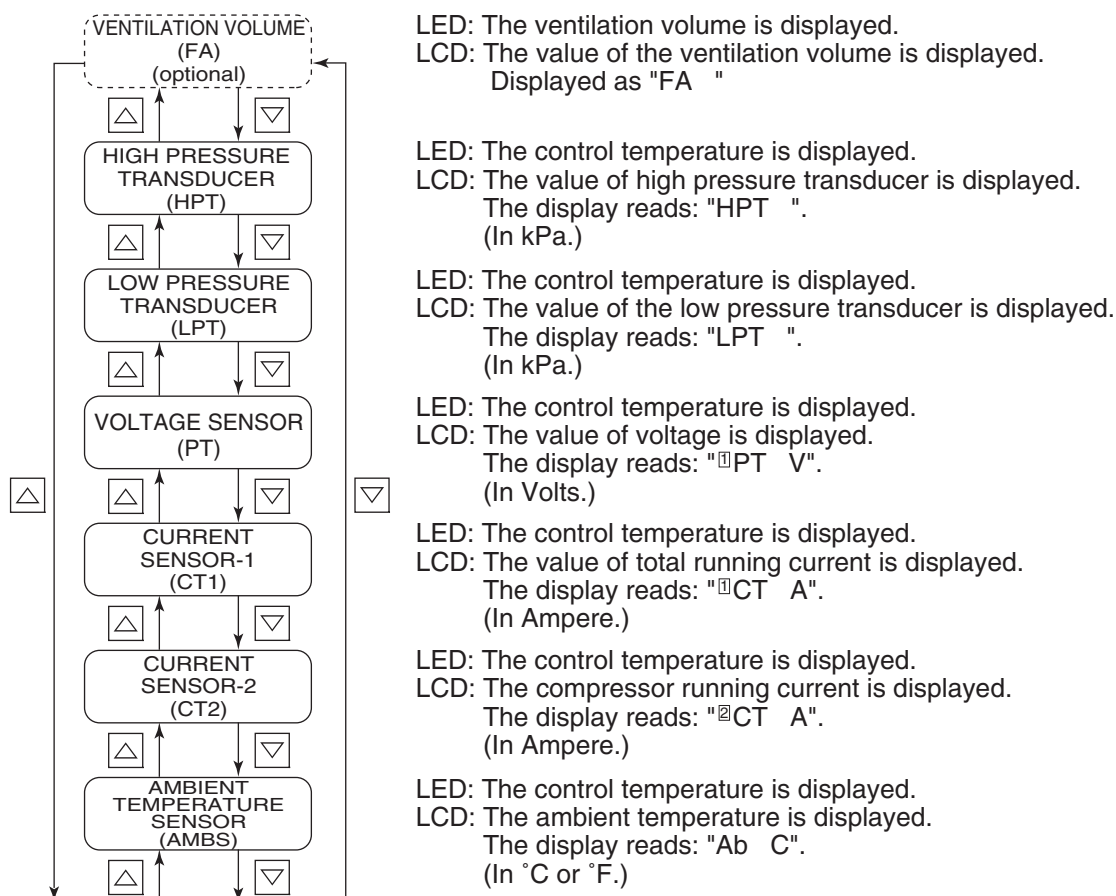
High pressure (HPT), low pressure (LPT), voltage (PT1), total current (CT1), compressor current (CT2), ambient temperature (AMBS), evaporator inlet temperature (EIS), evaporator outlet temperature (EOS), discharge gas temperature (DCHS), suction gas temperature (SGS), suction modulating valve opening, 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).

### <Mode selection procedure>


























### <Operation procedure>

Whenever the or key is pressed, the display changes.

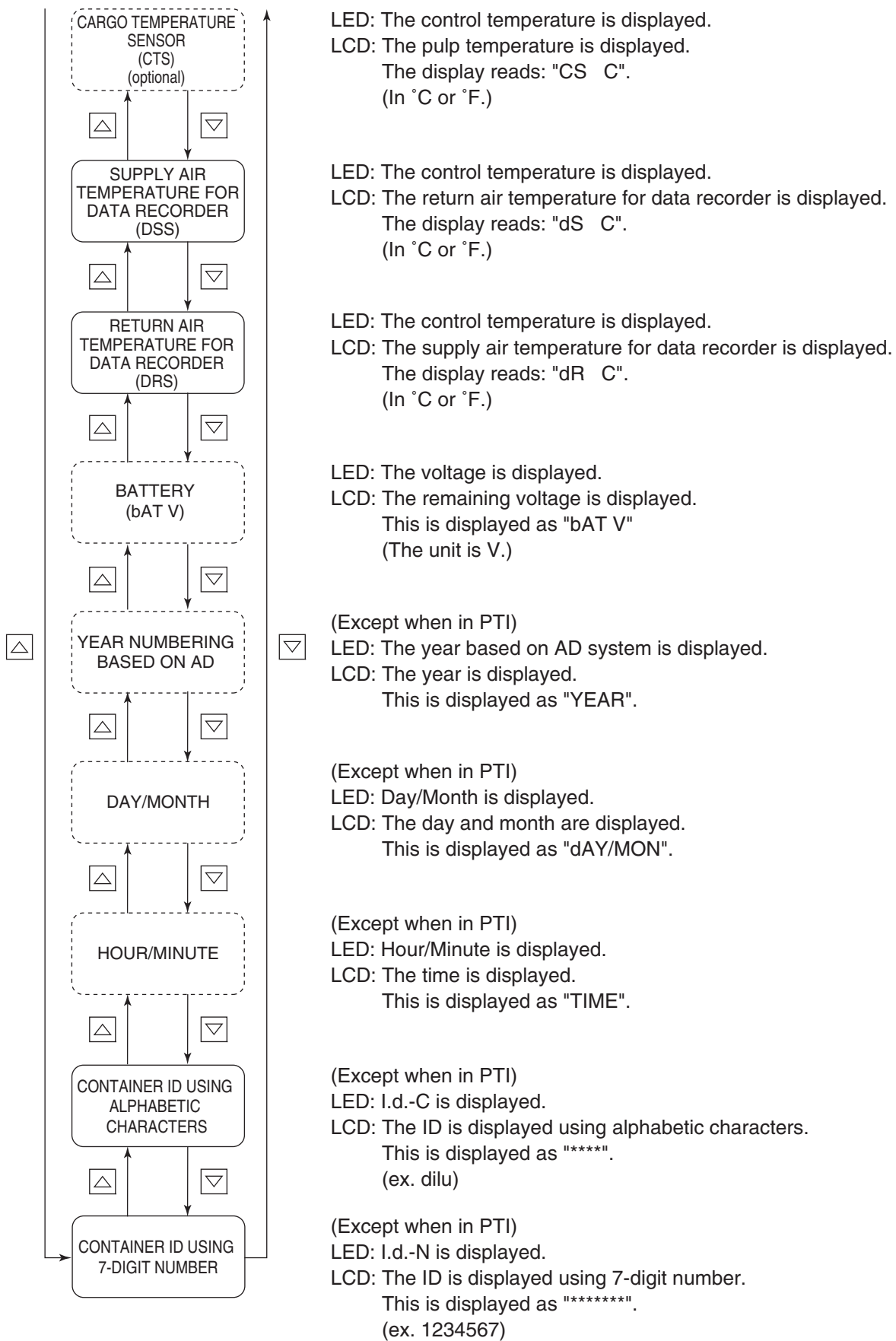


**6. SENSOR INDICATION MODE** (Continued from the previous page)

 <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">EVAPORATOR INLET TEMPERATURE SENSOR (EIS)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">EVAPORATOR OUTLET TEMPERATURE SENSOR (EOS)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">DISCHARGE GAS TEMPERATURE SENSOR (DCHS)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">SUCTION GAS SENSOR (SGS)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">SUCTION MODULATING VALVE OPENING (SMV)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">ELECTRONIC EXPANSION VALVE OPENING (EV)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">SUPPLY AIR TEMPERATURE SENSOR (SS)</div> <div style="text-align: center;">   </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">RETURN AIR TEMPERATURE SENSOR (RS)</div> <div style="text-align: center;">   </div> <div style="border: 1px dashed black; padding: 5px; margin-bottom: 5px;">PULP TEMPERATURE SENSOR 1 (USDA 1) (optional)</div> <div style="text-align: center;">   </div> <div style="border: 1px dashed black; padding: 5px; margin-bottom: 5px;">PULP TEMPERATURE SENSOR 2 (USDA 2) (optional)</div> <div style="text-align: center;">   </div> <div style="border: 1px dashed black; padding: 5px; margin-bottom: 5px;">PULP TEMPERATURE SENSOR 3 (USDA 3) (optional)</div> <div style="text-align: center;">   </div>	<p>LED: The control temperature is displayed. LCD: The evaporator inlet temperature is displayed. The display reads: "EI C". (In °C or °F.)</p> <p>LED: The control temperature is displayed. LCD: The evaporator outlet temperature is displayed. The display reads: "EO C". (In °C or °F.)</p> <p>LED: The control temperature is displayed. LCD: The discharge gas temperature is displayed. The display reads: "dC C". (In °C or °F.)</p> <p>LED: The control temperature is displayed. LCD: The suction gas temperature is displayed. The display reads: "SG C". (In °C or °F.)</p> <p>LED: The control opening is displayed. LCD: The suction modulating valve opening is displayed. The display reads: "SMV %". (In % : 0 to 100%)</p> <p>LED: The control opening is displayed. LCD: The electronic expansion valve opening is displayed. The display reads: "EV %". (In % : 0 to 100%)</p> <p>(During PTI only) 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> <p>(During PTI only) 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> <p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "①US C". (In °C or °F.)</p> <p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "②US C". (In °C or °F.)</p> <p>LED: The control temperature is displayed. LCD: The pulp temperature is displayed. The display reads: "③US C". (In °C or °F.)</p>
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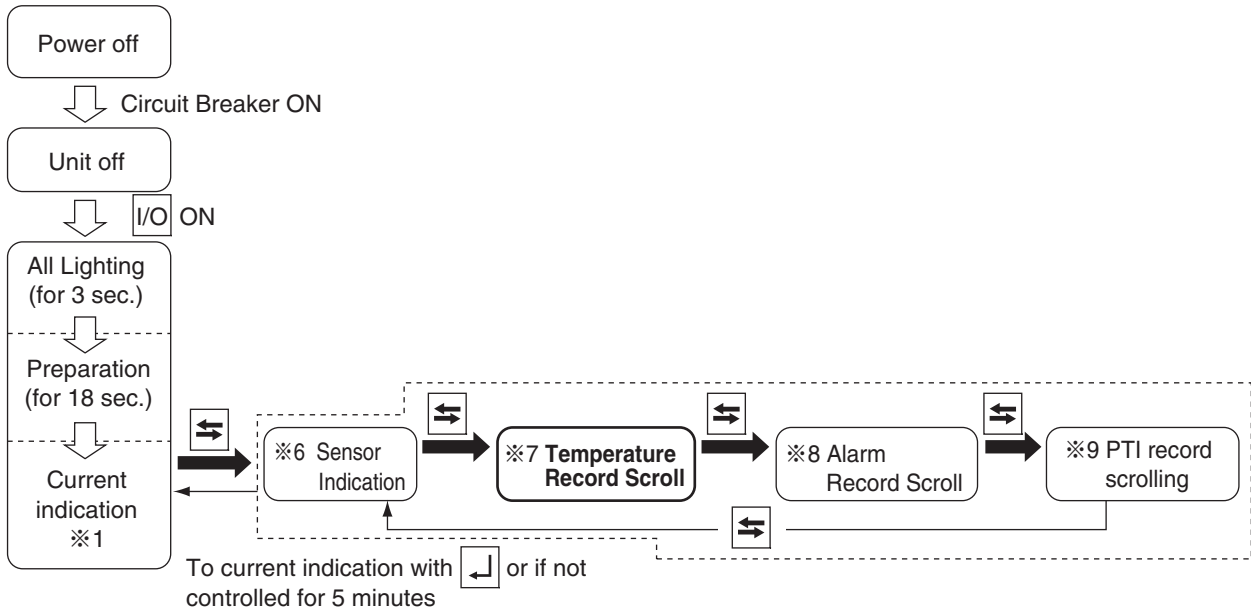
**6. SENSOR INDICATION MODE** (Continued from the previous page)



## 7. TEMPERATURE RECORD SCROLL MODE

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

### <Mode selection procedure>



### <Operation procedure>

The LED indicates the control temperature, and the LCD displays the data/time and the data record temperature in turn. (In the frozen mode, the return air temperature is the controlled temperature, and in the chilled mode, the 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 operation is done for 10 seconds.

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

To restore the current indication mode, press the key.

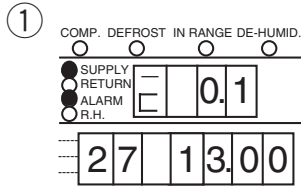
If key operation is not performed within 5 minutes, the current indication mode is resumed.

● Example of TEMPERATURE RECORD SCROLL INDICATION MODE

※ It is assumed that the control temperature is the supply air temperature (SS) and the logging interval is 1 hour, and the current date and time are 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.

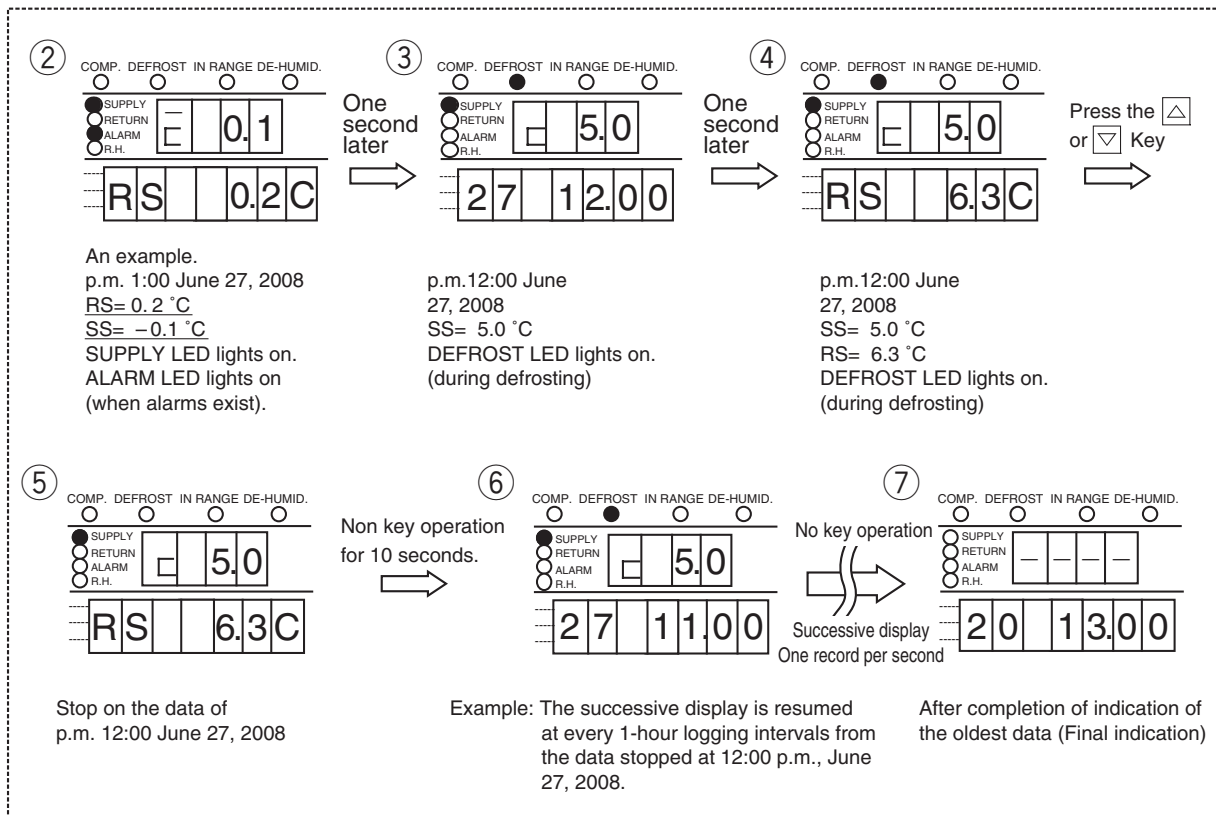


Example:  
Operation data at 1:00 pm, June 27, 2008  
SS= -0.1 °C  
SUPPLY LED lights on.  
ALARM LED lights on (when alarms exist).

One second later

To restart, press and hold the key for 3 seconds.

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

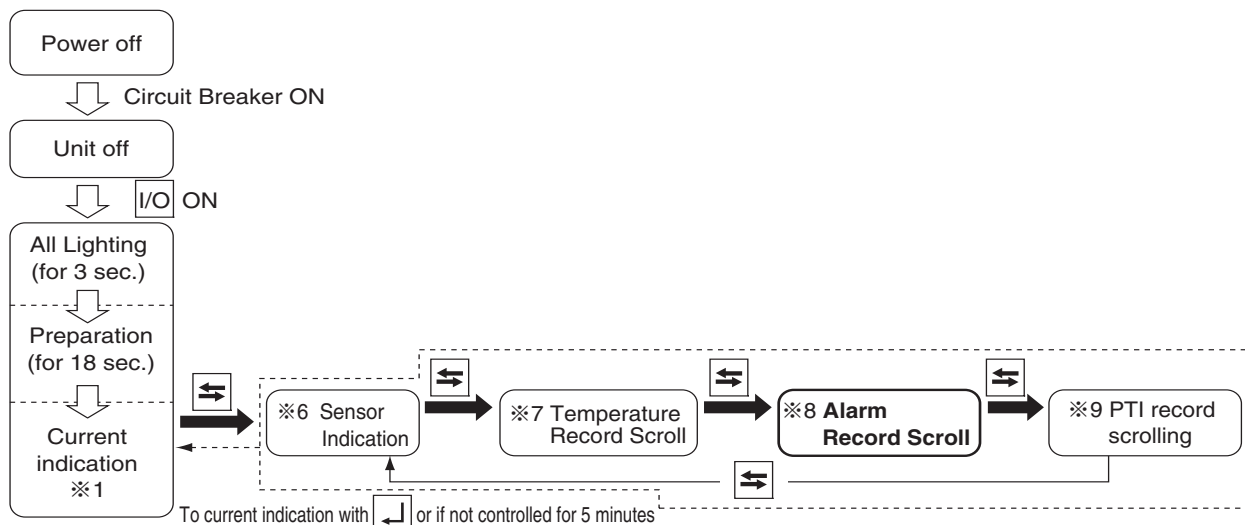


Note: "□" on the leftmost of the LED shows that the indication is of the temperature record scroll indication mode.

## 8. ALARM RECORD SCROLL MODE

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

### <Mode selection procedure>



### <Operation procedure>

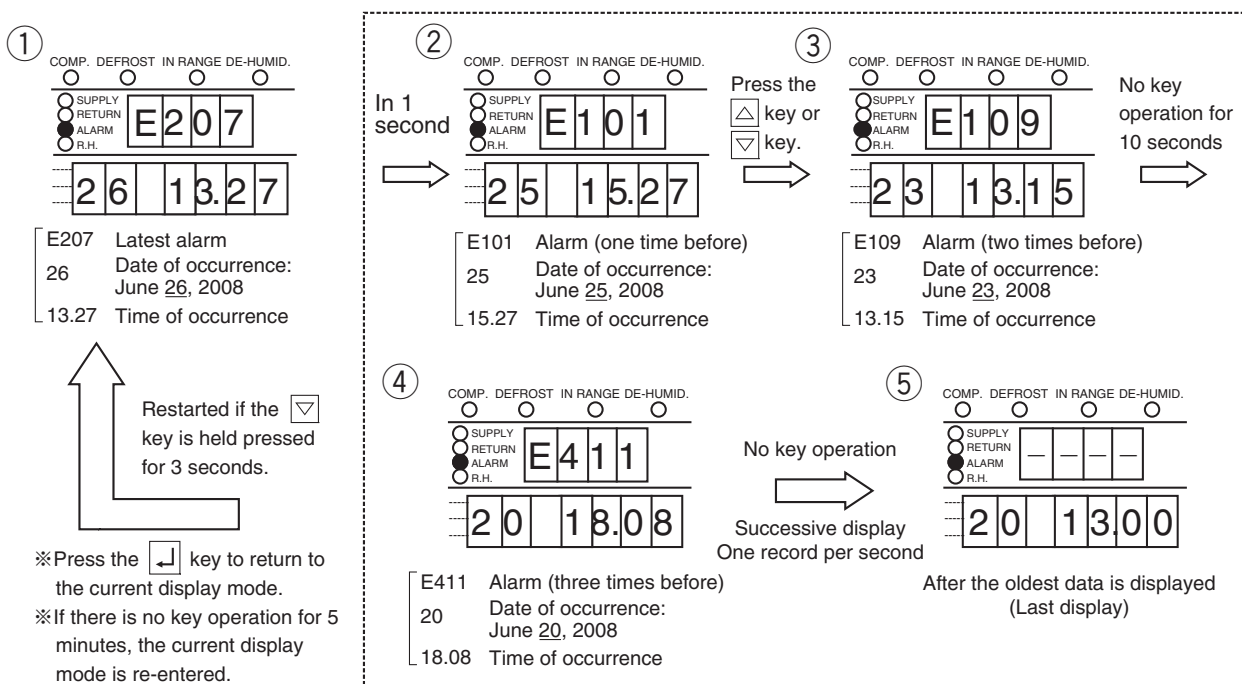
The alarm codes are displayed in the LED, and the alarm occurrence time and date are displayed in the LCD.

Press the key or key to pause the successive display of records. After the pause, the successive (scrolling) display will be resumed if no key operation is done for 10 seconds.  
Keep the key pressed for 3 seconds to view the data again from the beginning.

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

### ● Example of alarm record scroll mode display

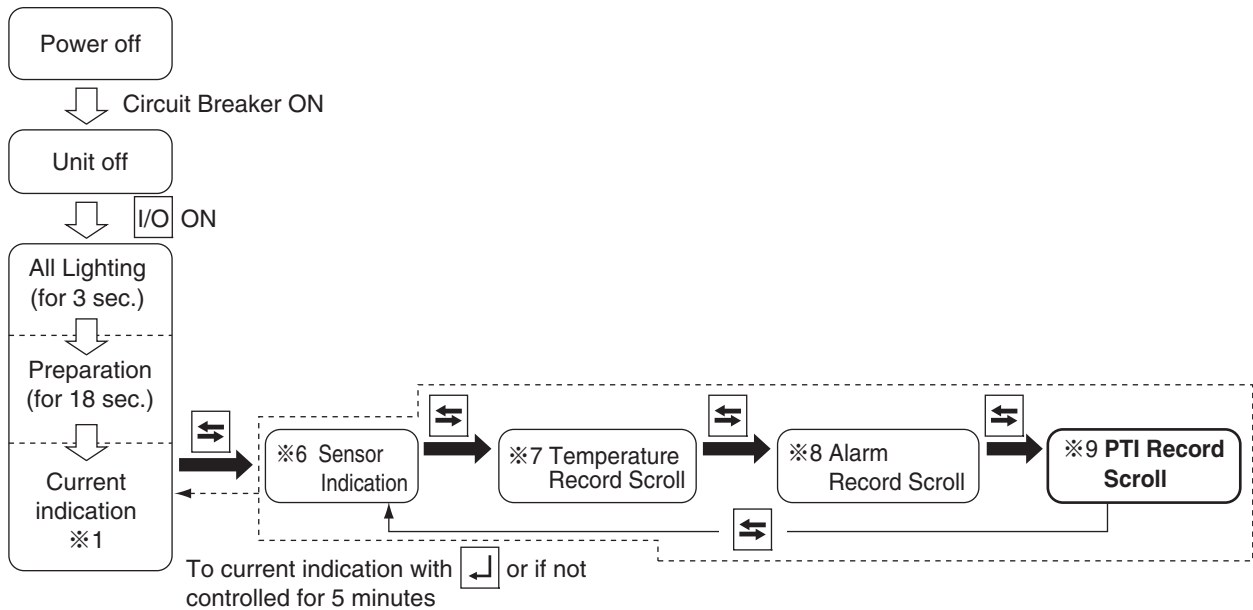
※The example below is based on the presumption that the current time is around 14:00, June 27, 2008.



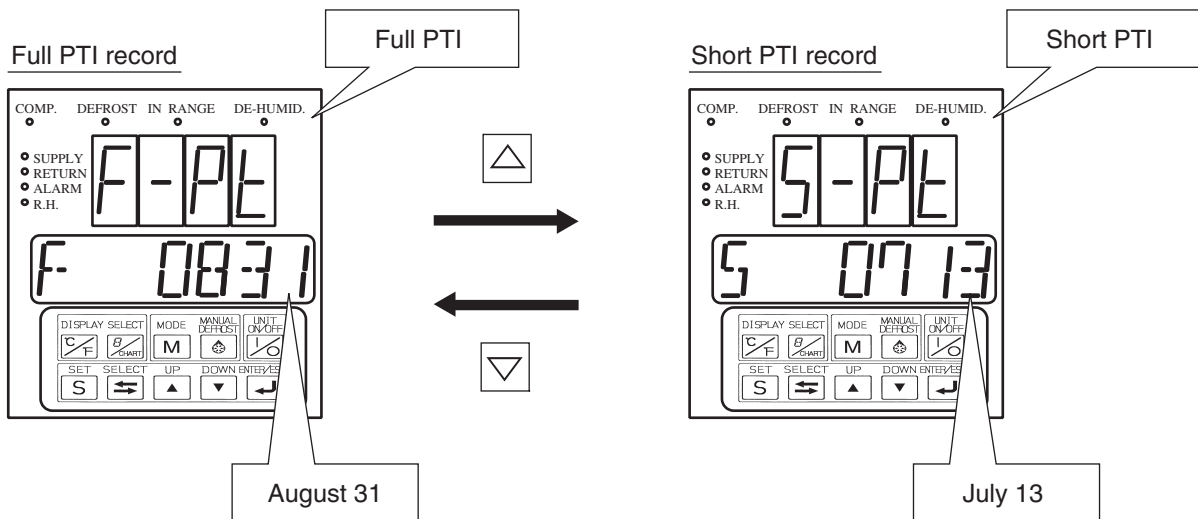
**9. PTI RECORD SCROLL MODE**

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

**<Mode selection procedure>**



The controller shows the "Time and Date" and "FULL PTI or SHORT PTI" as below.



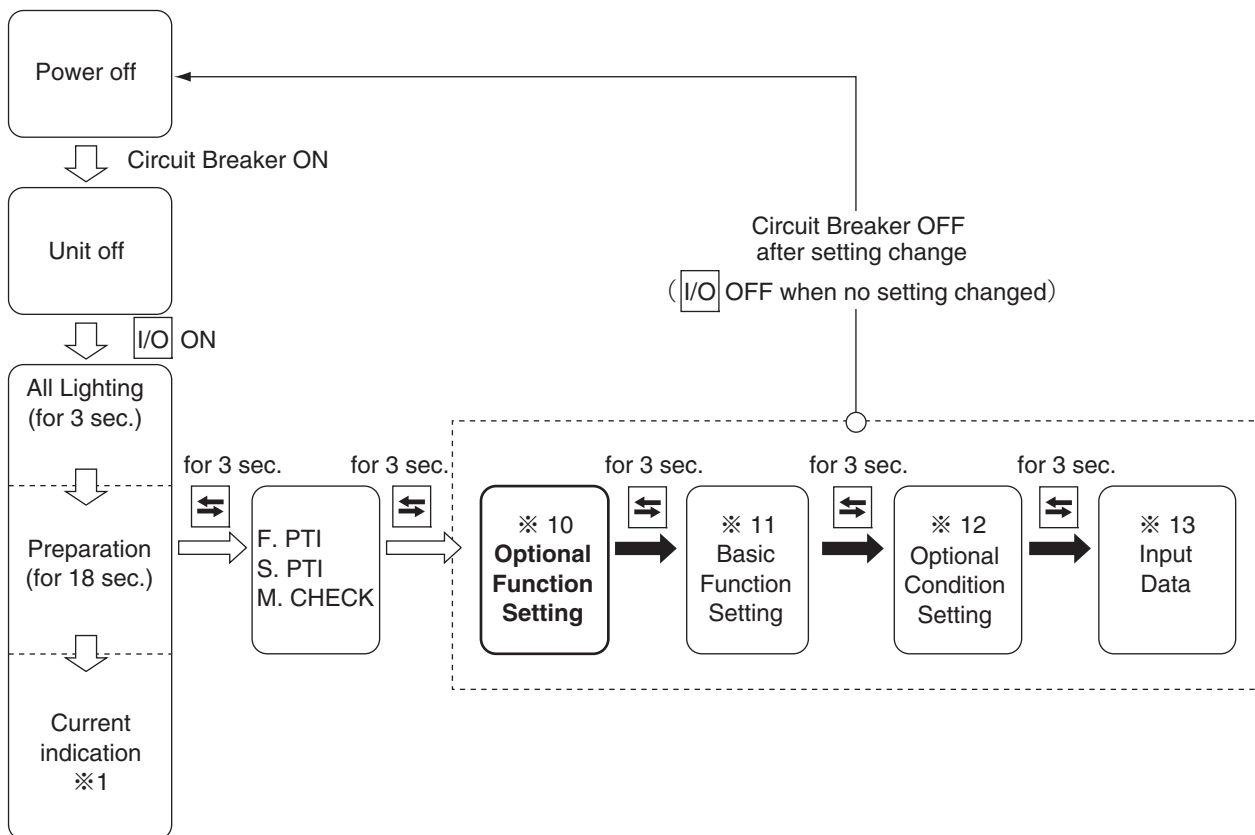
If no PTI data is present, the LCD is displayed as below.  
(Common for scroll mode and battery mode)

F-PTI : F-    - - - - -

S-PTI : S    - - - - -

**10. OPTIONAL FUNCTION SETTING MODE**

<Key operation to enter/exit>



<Key operation in this mode>

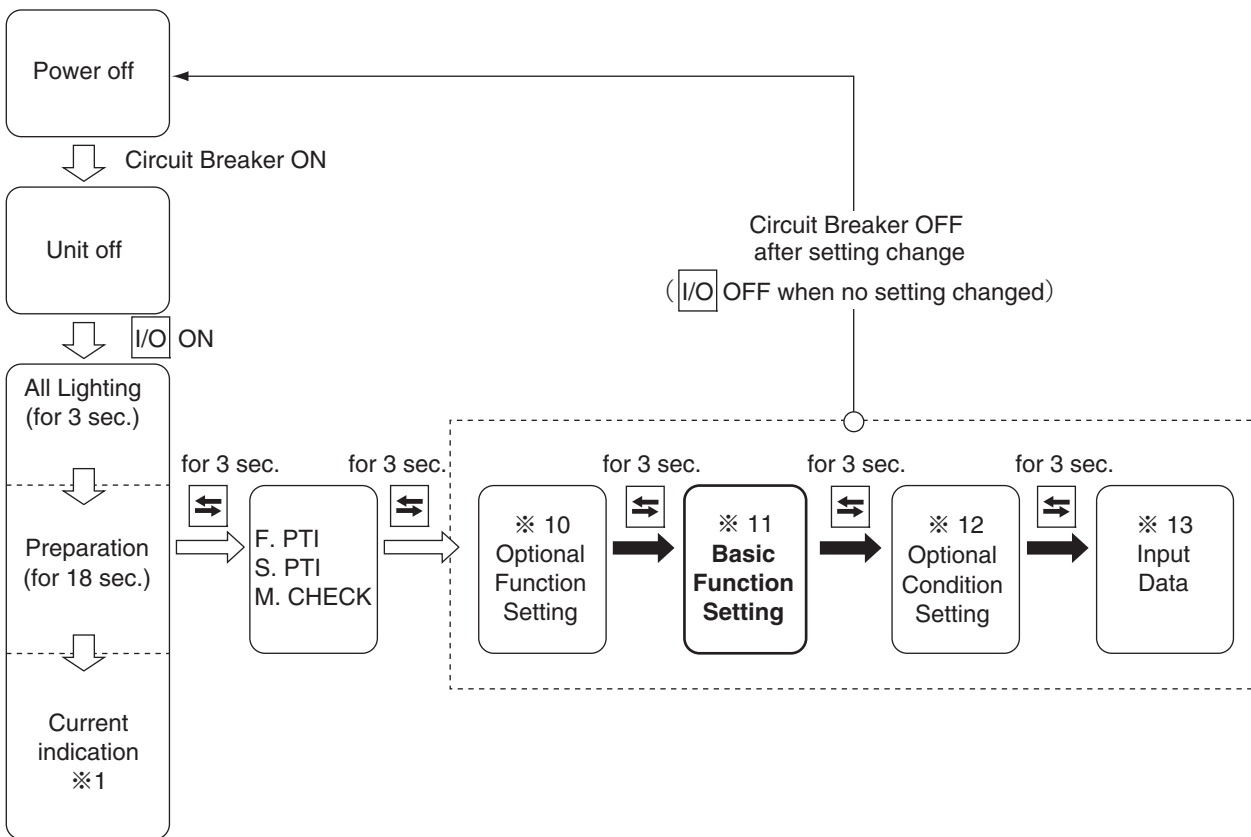
Whenever the **[S]** key is pressed, the display changes.

For the determination of setting, turn the power breaker OFF after the setting.

Indications or setting items	LED screen	LCD screen	Setting method
<div style="border: 1px solid black; padding: 5px; width: fit-content;">                     USDA sensor available/ not available Cargo humidity sensor available/not available                 </div> <div style="border: 1px dashed black; padding: 5px; width: fit-content; margin-left: 20px;">                     Dehumidification operation ON/OFF                 </div>	OFF: USDA sensor not available 3 : 3 USDA sensors 4 : 3 USDA sensors and 1 cargo temperature sensor Au : The numbers of USDA sensors and cargo sensors are automatically detected and set.	USdA	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection. Note: "3" is set automatically if 2 USDA sensors are connected.
	ON : If the dehumidification sensor is provided and the dehumidification function is available ON-A: If the dehumidification sensor is not provided but the dehumidification function is available OFF : If the dehumidification function is not available Note : Either "ON" or "ON-A" is displayed depending on the model.	dHU	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection. Note: The dehumidification can be turned ON and OFF during the mode operation described in 3.3.4.

**11. BASIC FUNCTION SETTING MODE**

**<Key operation to enter/exit>**



**<Key operation in this mode>**

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

For the determination of setting, turn the power breaker OFF after the setting.

Indications or setting items	LED screen	LCD screen	Setting method
	A: If used as DECOS-III a b: If used as DECOS-III b c: If used as DECOS-III c d: If used as DECOS-III d e: If used as DECOS-III e	dECOS-3	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection.
	15, 30, 60 and 120 (The unit is minute)	LOG INT	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection.
	ON : Data recorder sensor available OFF: Data recorder sensor not available	REC SEN	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection.
	Sing : In case of normal power supply dUAL: If the DUAL power supply (Optional) is available	OC-SET	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection.
	5 : If the compressor corresponds to 5 horsepower (Only some units of Decos III a) 10: If the compressor corresponds to 10 horsepower	HP	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> key to determine the selection.

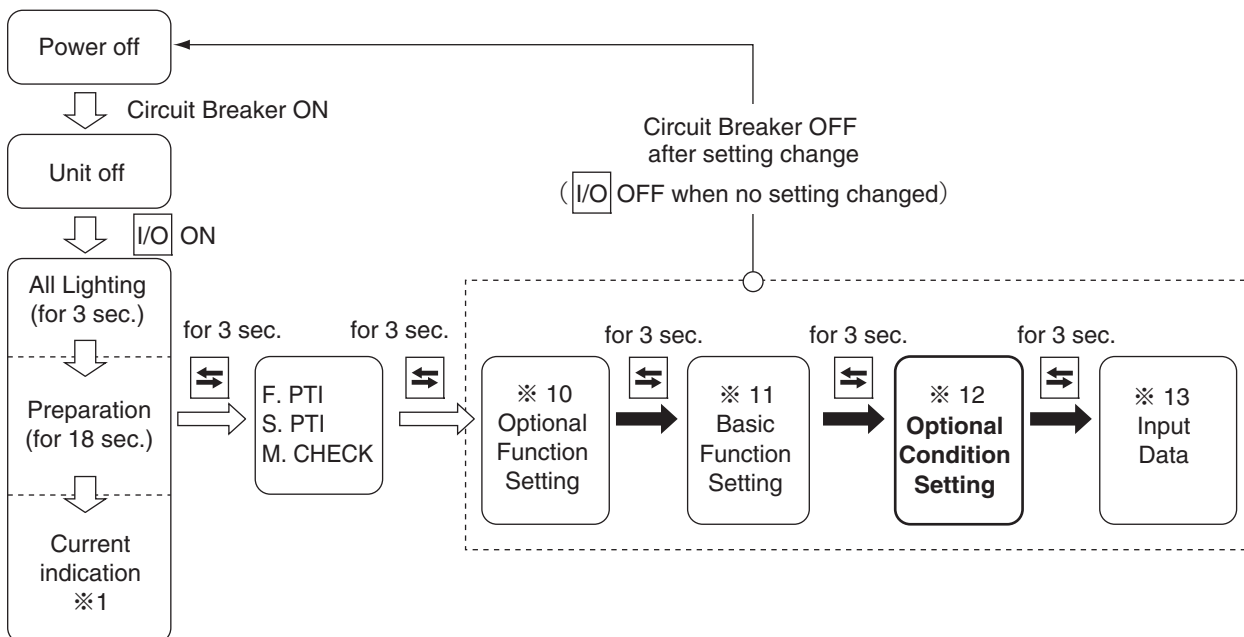
## 11. BASIC FUNCTION SETTING MODE (Continued from the previous page)

<p style="text-align: center;">S</p> <p style="text-align: center;">Setting LED indicator lamp turning-off function available or not available</p>	<p>ON : Turning-off function available OFF: Turning-off function not available</p>	<p>diSP</p>	<p>Make selection using the <input type="checkbox"/> key and <input type="checkbox"/> key. Press the <input type="checkbox"/> key to determine the selection.</p> <p>Note: If turned "ON", the LED display becomes unlit by pressing the <input type="checkbox"/> key twice.</p>
<p style="text-align: center;">S</p> <p style="text-align: center;">Compressor unloader system setting</p>	<p>33 : Unloader system available 100: Unloader system not available</p>	<p>COMP</p>	<p>Make selection using the <input type="checkbox"/> key and <input type="checkbox"/> key. Press the <input type="checkbox"/> key to determine the selection.</p> <p>Note: "33" is applicable only for LXE10D.</p>
<p style="text-align: center;">S</p> <p style="text-align: center;">Setting of dehumidification coil available or not available</p>	<p>ON : Dehumidification coil available OFF: Dehumidification coil not available</p>	<p>REHEAT</p>	<p>Make selection using the <input type="checkbox"/> key and <input type="checkbox"/> key. Press the <input type="checkbox"/> key to determine the selection.</p>
<p style="text-align: center;">S</p> <p style="text-align: center;">Detection of ventilation amount (FA log) function setting</p>	<p>OFF: Detection function not available H : Detection function available at the upper ventilator L : Detection function available at the lower ventilator</p>	<p>FA SEN</p>	<p>Make selection using the <input type="checkbox"/> key and <input type="checkbox"/> key. Press the <input type="checkbox"/> key to determine the selection.</p>



## 12. OPTIONAL CONDITION SETTING MODE

### <Key operation to enter/exit>



### <Key operation in this mode>

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

For the determination of setting, turn the power breaker OFF after the setting.

Indications or setting items	LED screen	LCD screen	Setting method
Temperature & pressure display unit setting	C: Temperature unit = °C, Pressure unit = kPa, F: Temperature unit = °F, Pressure unit = PSI	dEG C/F	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↵]</b> key to determine the selection.
Chartless code (H code & D code) Display setting	ON : H code and D code are displayed. OFF: H code and D code are not displayed.	CHARTLS	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↵]</b> key to determine the selection. Note: Refer to section 3.10.3 for details about H & D codes.
USDA sensor type setting	1: ST9702-1 sensor 2: NTC type probe sensor	USDA1/2	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↵]</b> key to determine the selection. Note: For details, refer to section 5.2.
H001 code generation temperature setting	The temperature at which the H001 code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is °C.)	H001	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↵]</b> key to determine the selection. Note: Refer to section 3.9.3.2.
H002 code generation time setting	The time at which the H002 code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour)	H002	Make selection using the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↵]</b> key to determine the selection. Note: Refer to section 3.9.3.2.

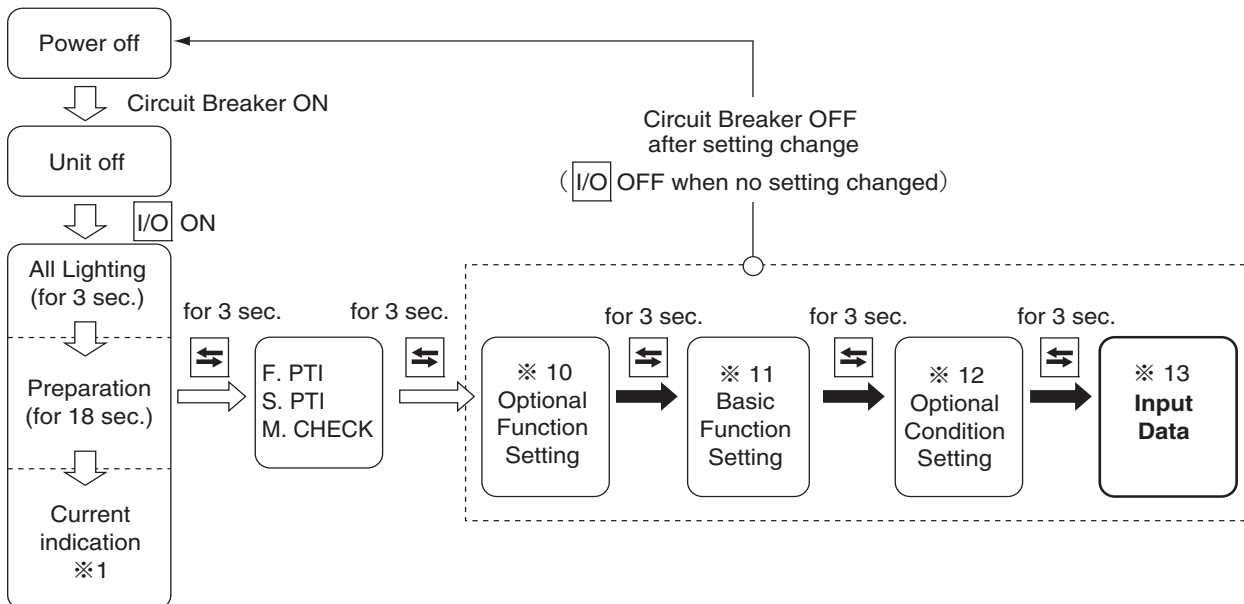
**12. OPTIONAL CONDITION SETTING MODE** (Continued from the previous page)

S	↓ S	H003 code generation time setting	The time at which the H003 code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	H003	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.2.
	↓ S	H004 code generation time setting	The temperature at which the H004 code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is °C.)	H004	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.2.
	↓ S	H005 code generation count setting	The number of times of defrosting operations which generate the H005 is set. 1, 2, 3, 4, 5, 10 (The unit is number of times.)	H005	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.2.
	↓ S	H006 code generation time setting	The time at which the H006 code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is number of times.)	H006	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.2.
	↓ S	d1-- code generation time setting	The time at which the d1- code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	d1--	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.3.
	↓ S	d2-- code generation time setting	The time at which the d2- code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	d2--	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.3.
	↓ S	d3-- code generation time setting	The time at which the d3- code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	d3--	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.3.
	↓ S	d-1- code generation time setting	The time at which the d-1- code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	d-1-	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.3.
	↓ S	d-2- code generation time setting	The time at which the d-2- code is generated is set. 1, 2, 3, 4, 5, 10 (The unit is hour.)	d-2-	Make selection using the  key and  key. Press the  key to determine the selection. Note: Refer to section 3.9.3.3.

## 13. INPUT DATA MODE

Each of the following item data can be input.  
 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.

For the determination of setting, turn OFF the power breaker to confirm the setting.

Indications or setting items	LED screen	LCD screen	Setting method
		SET I.d	Press the <b>[↓]</b> 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)	Make selection by pressing the <b>[△]</b> key and <b>[▽]</b> key. Press the <b>[↓]</b> 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.	Change the blinking character using the <b>[△]</b> key and <b>[▽]</b> key. If the <b>[↓]</b> key is pressed, the blinking character moves to the right. If the <b>[↓]</b> key is pressed while the rightmost character is lit, the input is determined 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	Change the blinking number using the <b>[△]</b> key and <b>[▽]</b> key. If the <b>[↓]</b> key is pressed, the blinking number moves to the right. If the <b>[↓]</b> key is pressed while the rightmost number is lit, the input is determined. Note: If the number is incorrect, the input is not determined and the screen in which the shipping company name is input appears.

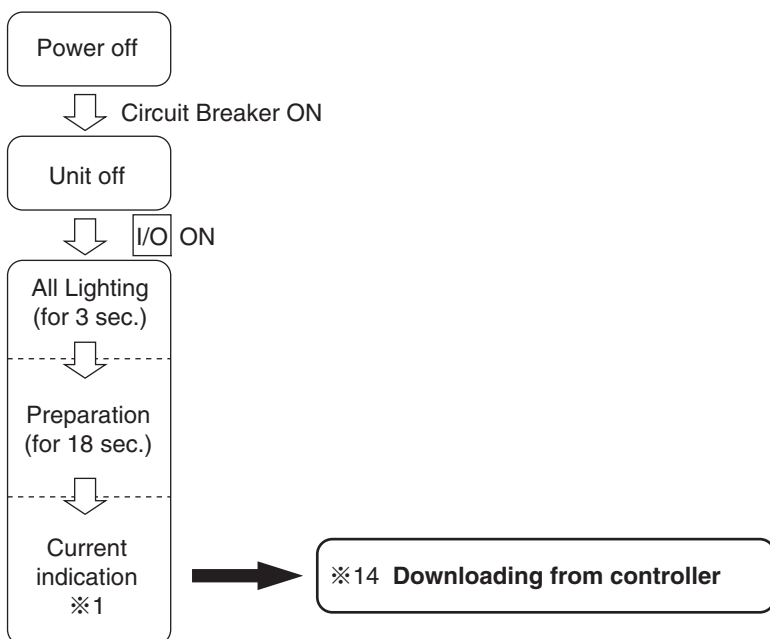
**13. INPUT DATA MODE** (Continued from the previous page)

	—	SET TIME	Press the  key to go to the subsequent "Year" setting screen.
	20XX (The A.D. year currently set)	YEAR	The value can be increased or decreased by using the  key and  key. Press the  key to determine the selection and go to the subsequent "Month" setting screen.
	XX (The month currently set)	MONTH	The value can be increased or decreased by using the  key and  key. Press the  key to determine the selection and go to the subsequent "Day" setting screen.
	XX (The day currently set)	dAY	Make the setting in the same manner as described above. Determine the selection to go to the subsequent "Hour" setting screen.
	XX (The hour currently set)	HOUR	Make the setting in the same manner as described above. Determine the selection to go to the subsequent "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 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 3-10.

**<Key operation to enter/exit>**



## 3.4 Alarm display and back-up function

### 3.4.1 Alarm list

Alarm grouping	Alarm code	Alarm content	Action with alarm
Permanent stop	F101	After powered on, if HPS starts to operate before the compressor starts. Or the compressor fails to start 5 times.	Unit stops
	F109	If the low pressure becomes -90kPa or lower within 2 seconds after the compressor started.	Unit stops
	F111	Error in communication between the CPU and the I/O board	Unit stops
	F301	Temperature setting request (Error in the CPU board)	Unit stops
	F401	Return/Supply air sensor malfunction (at chilled mode)	Unit stops
	F403	Return/Supply air sensor malfunction (at partial frozen mode)	Unit stops
	F603	If the initial settings of the controller are wrong, or if the suction modulating valve (SMV) does not close even when instructed to close.	Unit stops
	F701	Error in power supply voltage (530V or more, 300V or less)	Unit stops
	F705	S phase became open phase	Unit stops
F803	If any of the following conditions are applicable 1) E107 is generated twice due to EV opening error. 2) Errors are identified in the 2 evaporator fans. (Refer to E205.) 3) The contacts of magnetic switch for the compressor is welded. 4) 2 of the HPT sensor, LPT sensor and DCHS sensor are abnormal.	Unit stops	
Display alone or restorable alarm	E101	High-pressure switch activated during normal operation.	Restart after 3-minute
	E103	CTP or electronic OC activated during normal operation.	Restart after 3-minute
	E105	Micro processor OC activated during normal operation.	Restart after 3-minute
	E107	The DCHS is excessively hot during operation. The EV opening error continues 5 minutes. F803 is displayed when E107 due to EV opening error is generated twice.	Restart after 3-minute
	E109	Low pressure drops to -90KPa or lower for 2 seconds or longer successively during normal operation. Low pressure is higher than 400KPa for 5 minutes or longer successively.	Restart after 3-minute
	E201	Pump down is not completed within 120 seconds.	Only alarm display
	E203	Overcool protection activates in the chilled or partial frozen mode. (Control temperature $\leq$ SP-3°C or for 3 minutes)	Restart after 3-minute
	E205	Abnormal lock current at the evaporator fan motor is detected (E205 is displayed if a fan motor is faulty, and F803 is displayed if two fan motors are faulty)	Only alarm display
	E207	Defrosting is not completed within 90 minutes (120 minutes if the inside temperature is -20°C or lower)	Only alarm display
	E303	Humidity setting required (CPU board malfunction)	Only alarm display
	E305	Defrost timer setting required (CPU board malfunction)	Only alarm display
	E307	Calendar setting required (CPU board malfunction)	Only alarm display
	E311	Trip-start time setting required (CPU board malfunction)	Only alarm display
	E315	PT/CT board malfunction	Restart after 3-minute
	E401	Supply air temperature sensor (SS) malfunction	Back-up operation
	E402	Data recorder supply air temperature sensor (DSS) malfunction	Back-up operation
	E403	Return air temperature sensor (RS) malfunction	Back-up operation
	E404	Data recorder return air temperature sensor (DRS) malfunction	Back-up operation
	E405	Discharge air temperature sensor (DCHS) malfunction	Only alarm display
	E406	Suction gas temperature sensor (SGS) malfunction	Back-up operation
	E407	Evaporator inlet temperature sensor (EIS) malfunction	Back-up operation
	E409	Evaporator outlet sensor (EOS) malfunction	Back-up operation
	E411	Ambient sensor (AMBS) malfunction	Only alarm display
	E413	Low pressure transducer (LPT) malfunction	Back-up operation
	E415	High pressure transducer (HPT) malfunction	Back-up operation
	E417	Voltage sensor (PT1) malfunction	Only alarm display
	E421	Current sensor (CT1) malfunction	Only alarm display
	E423	Current sensor (CT2) malfunction	Restart after 3-minute
	E425	Pulp temperature sensor (USDA1) malfunction	Only alarm display
	E427	Pulp temperature sensor (USDA2) malfunction	Only alarm display
	E429	Pulp temperature sensor (USDA3) malfunction	Only alarm display
	E431	Humidity sensor (HuS) malfunction	Only alarm display
	E433	Cargo temperature sensor (CTS) or box temperature sensor (CBS) malfunction	Only alarm display
E603	· EV connection malfunction · SMV (MV) operation malfunction	Back-up operation	
E607	MDS (sheet key) malfunction	Only alarm display	
E707	Shutdown due to an instantaneous voltage error	Restart after 3-minute	
E801	Exhausted battery for the CPU board	Only alarm display	
E805	FA sensor malfunction	Only alarm display	
E807	The ventilator open during the frozen operation	Only alarm display	

Note 1) The alarm LED does not blink when E code alarm is generated.

To check if any alarm generates, use alarm indication function in the section "1. Current indication mode" of "3.3.2 Mode operation procedure."

- In case of sensor malfunction, the judgment for sensor malfunction does not perform for 3 minutes before the pressure or temperature reaches to the specified value.
- The unit enters the standby mode for 4 hours if E101, E103, E105, E107 (DCHS abnormally high), E109, E315, E707 are generated 9 times.

### 3.4.2 Back-up operation at sensor malfunction

Sensor malfunction		Mode	Back-up content
SS	Supply air temperature sensor	Chilled	The same control is executed by using DSS. In case of DSS malfunction, [RS-2.0°C] is used for control. When DSS and RS are faulty, the unit should be stopped.
		Frozen Defrost	Error indication only (Operation continued)
RS	Return air temperature sensor	Chilled Defrost	Error indication only (Operation continued)
		DEFROST-ING	The same control is executed by using DRS.
AMBS	Ambient temperature sensor	All modes	Error indication only (Operation continued)
DCHS	Discharge gas temperature sensor	Chilled	Error indication only (Operation continued)
		Frozen Defrosting	Error indication only (Operation continued)
EIS	Evaporator inlet temperature sensor	Chilled	Error indication only (Operation continued)
		Frozen	See the next page
		Defrosting	Error indication only (Operation continued)
EOS	Evaporator outlet temperature sensor	Chilled	Error indication only (Operation continued)
		Frozen	See the next page
		Defrosting	Defrosting start-up: Always permissible Defrosting termination: The 90 minute timer count-up or when EIS>90°C or RS>set point
SGS	Suction gas temperature sensor	Chilled	Error indication only (Operation continued)
		Frozen	See the next page
		Defrosting	Error indication only (Operation continued)
HPT	High pressure transducer	Chilled Frozen	Error indication only (Operation continued)
		Defrosting	Refrigerant charge: Error indication only (Operation continued) Refrigerant release: LPT is used for releasing.
LPT	Low pressure transducer	Chilled Frozen	Error indication only (Operation continued)
		Defrosting	Refrigerant charge: HPT is used for charging Pump down: Pump down operation is not conducted (Operation continued)

●Back-up for temperature sensors (EIS, EOS, SGS) at frozen mode (superheat control)

No.	Evaporator inlet sensor EIS	Evaporator outlet sensor EOS	Compressor suction gas sensor SGS	Back-up 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

### 3.5 Back Up Battery

#### 3.5.1 Specifications

DECOS III e controller can use two types of batteries; DRY or Rechargeable (Optional).

The battery is attached to the lower part of the controller.

DRY Battery: 9V block battery. (This can be purchased locally.)

Rechargeable battery: Daikin genuine product (Part NO. 1890491)

#### 3.5.2 Function

This battery is used without main power supply for the following functions.

	1) Display wake up	2) USDA data log	3) Trip data log
DRY Battery (Purchased locally)	○	○	—
Rechargeable (Optional)	○	○	○

○ : Available    — : Not available

1) Display wake up (Refer to clause 3.3.2) page 3-8.

Setting/Display of the following items are possible on the LCD display.

<Display>

Temperature on the return air sensor

Temperature on the supply air sensor

USDA1, USDA2, USDA3 (CTS)

<Setting change>

Inside temperature, defrosting interval, dehumidifying set (Optional), Unit ON/OFF

2) USDA data log

USDA sensors data log every 1 hour

3) Trip data log

Trip data log every 1 hour.

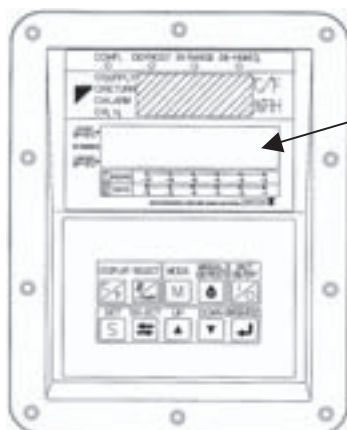
#### 3.5.3 Battery check

1) Life span of rechargeable battery

The life of span of the rechargeable battery is approximately 2 years. If the battery is used for 2 year or more, the USDA data or trip data may not be logged even when the LCD screen indicates a remaining voltage of 7.6V or more.

2) Battery check (Refer to section 3.3.2) P.3-10

3) Some voltage is remaining in the dry cell battery. However, it is recommended that the dry cell battery be replaced for each voyage.



LCD screen  
Remaining voltage display



Check the remaining voltage on the LCD in the battery mode after turning OFF the sensor display mode or the breaker.

In case the unit is connected to the commercial power supply

- When the battery is being recharged, the voltage is indicated 0.5 to 1.5V higher because of the power supply.  
(While the battery is being recharged, the characters indicated on the LCD screen blink. Similarly, when the dry cell battery is used, the characters will blink on the LCD screen. But the battery is not being recharged.)
- When no battery is recharged, the voltage is indicated about 1.0V higher because the load is small.

7.6V or more: The battery is being recharged.

Less than 7.6V: Turn ON the commercial power supply to recharge the battery for 14 hours and recheck the battery voltage. Follow the instructions shown below depending on the result.

7.6V or more: The battery recharge is complete.

Less than 7.6V: The battery may have deteriorated. It is recommendable to replace the battery.

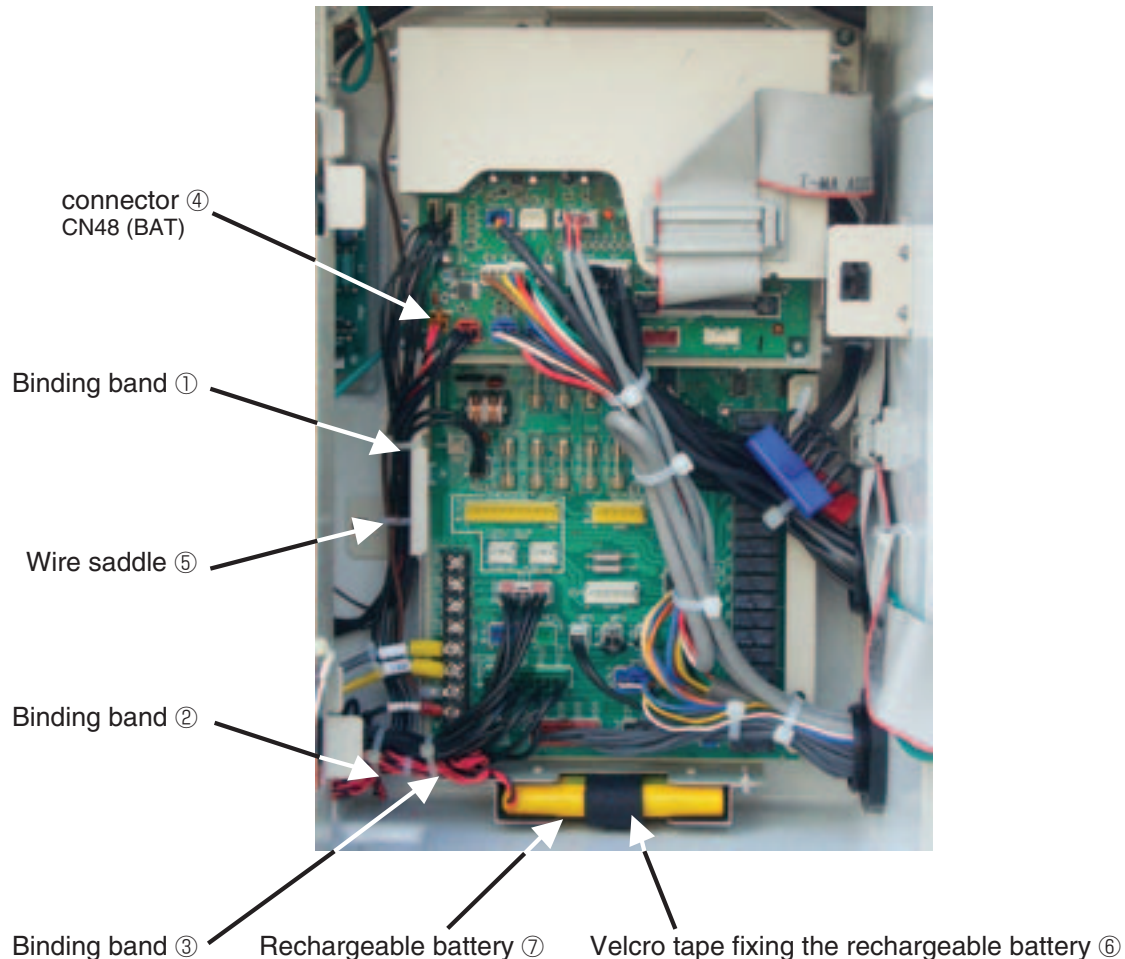
Less than 7.2V: The battery has deteriorated. The battery must be replaced.

(The voltage values are indicated based on the standard temperature at 20°C. The lower the temperature becomes, the lower the voltage is.)

### 3.5.4 Battery replacement (Rechargeable battery)

<How to replace the rechargeable battery>

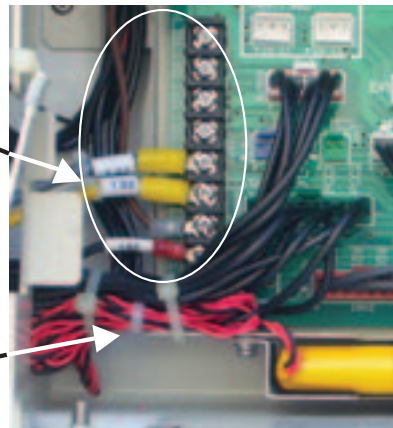
- Always turn off the main power supply to the facility before carrying out the following procedures.
- (1) Remove the controller and the binding bands ① ~ ③ fastening the harnesses and the harness of the rechargeable battery.
  - (2) Disconnect connector ④ from the CPU board.
  - (3) Remove the harness of the rechargeable battery from wire saddle ⑤.
  - (4) Remove Velcro tape ⑥ and rechargeable battery ⑦.



- (5) Replace the rechargeable battery with a new one. (Ensure that the battery of the specified type is used.)
- (6) Fix rechargeable battery ⑦ with Velcro tape ⑥ used for fixing the battery.
- (7) Securely attach the connector to connector ④ on the CPU board. (Refer to Note 1.)
- (8) Fix the harness of rechargeable battery ⑦ and other harnesses to the controller unit with binding band ①. (Refer to Note 1.)
- (9) Pass the harness of rechargeable battery ⑦ through wire saddle ⑤. (Refer to Note 1.)
- (10) Bind the harness of rechargeable battery ⑦ and other harnesses with binding band ②. (Refer to Note 2.)
- (11) Fix the harness of rechargeable battery ⑦ and other harnesses to the controller unit with binding band ③. (Refer to Note 2.)

Note 1:  
Pass the harness of the rechargeable battery behind the harnesses connected to the round solderless terminal block.

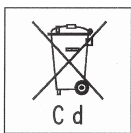
Note 2:  
Bind the redundant portion of the harness of the rechargeable battery.



## Attention

- Remove the exhausted battery and ensure that it is collected and disposed of safely. Refer to next page for detail.  
→ A NiCd battery is used.
- The battery has to be removed before disposing of the unit.

**FOR RECHARGABLE BATTERIES:**



Batteries supplied with the refrigeration unit are marked with this symbol  
This means that the batteries shall not be mixed with unsorted Household waste.  
If a chemical symbol is printed beneath the symbol, this chemical symbol means that the

battery contains a heavy metal above a certain concentration. Possible chemical symbols are  
· Cd: lead (>0,002%)

Waste batteries must be treated at a specialized treatment facility for re-use. By ensuring waste batteries are disposed off correctly, you will help to prevent potential negative consequences for the environment and human health.

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 Refer Service and Engineering Office  
Fascination Boulevard 562 2909 VA Capelle aan den IJssel The Netherlands  
TEL: 31-10-286-2090  
FAX: 31-10-286-2099

**FOR DRY BATTERIES:**



Batteries supplied with the refrigeration unit are marked with this symbol  
This means that the batteries shall not be mixed with unsorted Household waste.  
Waste batteries must be treated at a specialized treatment facility for re-use.

By ensuring waste batteries are disposed off correctly, you will help to prevent potential negative consequences for the environment and human health.

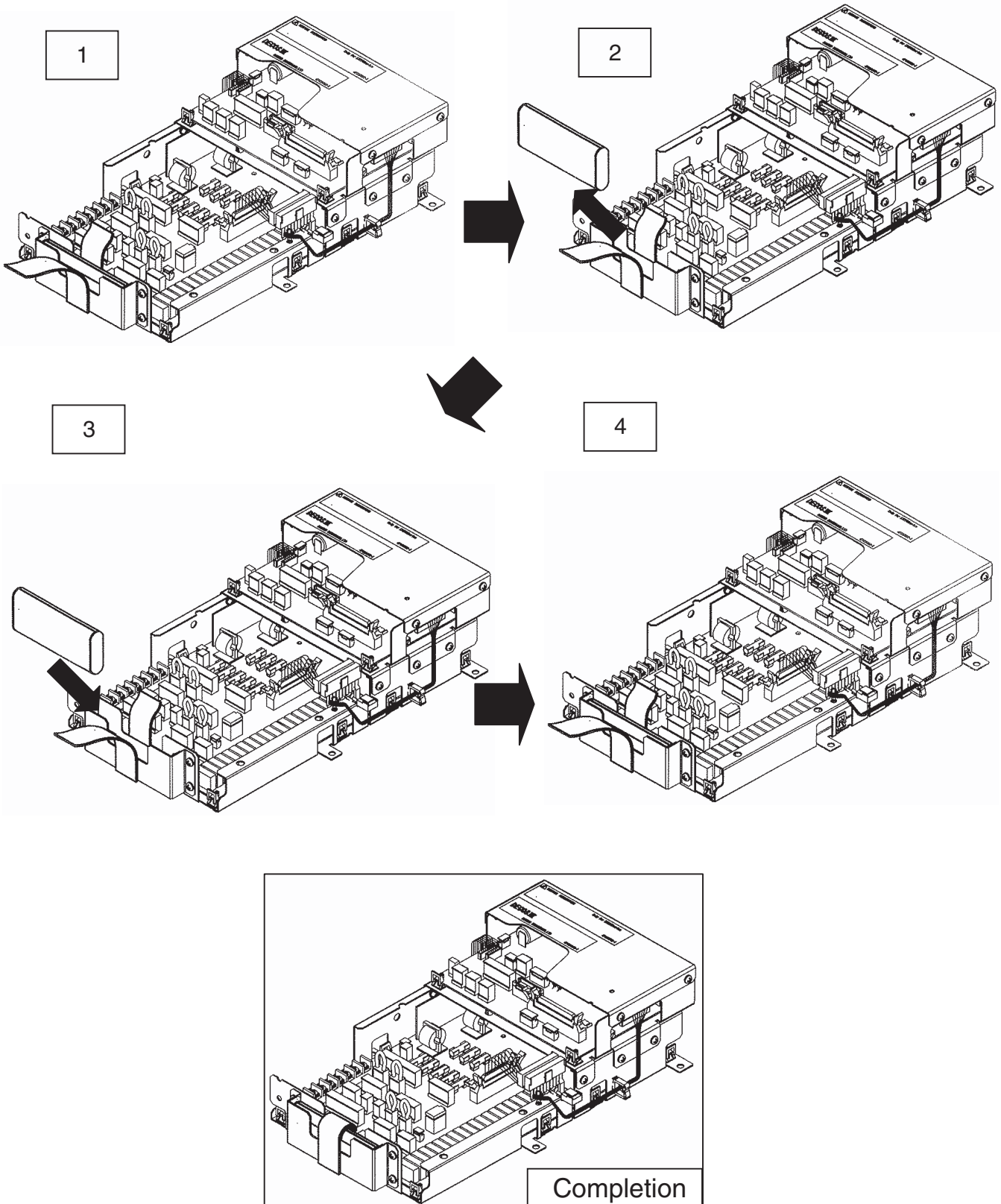
In addition, the used batteries, please send to our certified stores or the satellite parts centers as follows,

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

Daikin Refer Service and Engineering Office  
Fascination Boulevard 562 2909 VA Capelle aan den IJssel The Netherlands  
TEL: 31-10-286-2090  
FAX: 31-10-286-2099

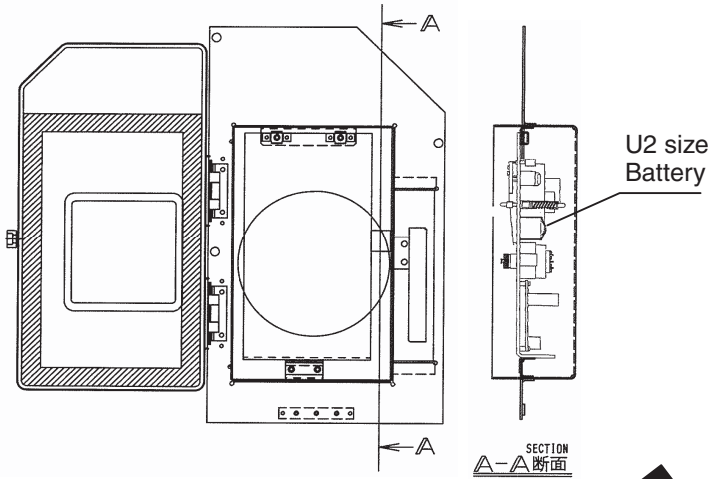
EXCHANGE METHOD OF RECHARGEABLE BATTERIES:

1. Peel the magic tape.
2. Take out the rechargeable battery from holder.
3. Insert the rechargeable battery to holder.
4. Fix the rechargeable battery with magic tape.

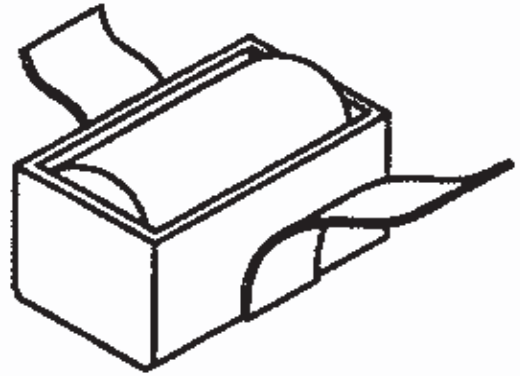


EXCHANGE METHOD OF U2 SIZE BATTERIES:

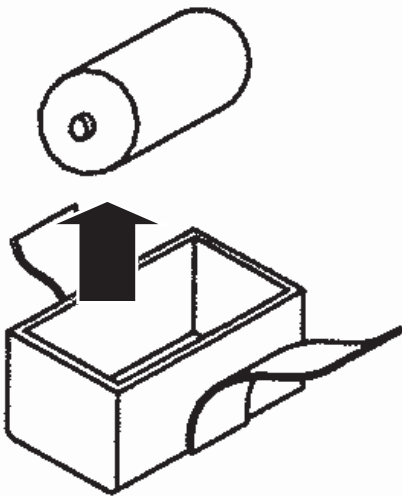
1. Peel the magic tape.
2. Take out the U2 size battery from holder.
3. Insert the U2 size battery to holder.
4. Fix the U2 size battery with magic tape.



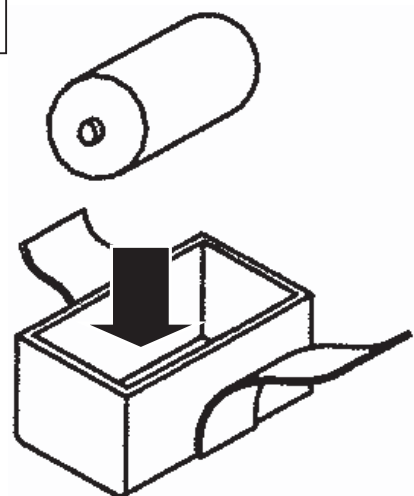
1



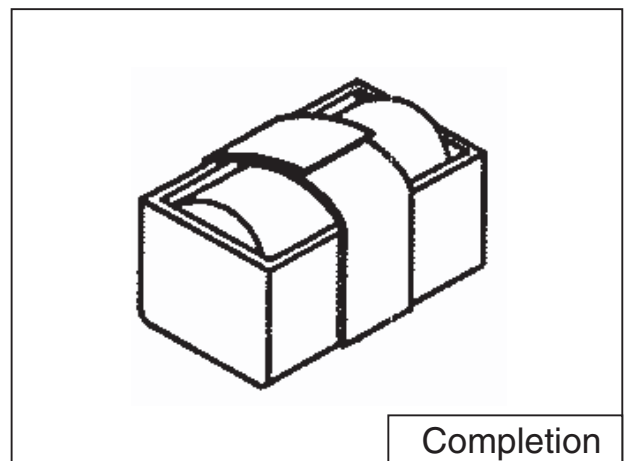
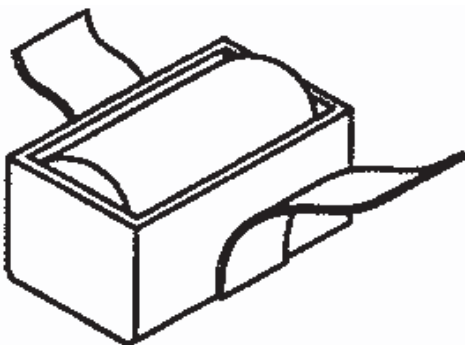
2



3



4



### 3.6 Information interchange with personal computer

The electronic controller DECOS IIIe 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.

Also 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 are useful to analyze any problems that occurred during transportation and to prepare various kinds of reports.

Moreover, 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.

#### 3.6.1 Data logging

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

There are seven kinds of logging data.

As to Tripdata, its logging interval can select from 15, 30, 60 (default) and 120 minutes.

※When F. PTI is executed, the logging interval become default (Refer to clause 3.8.2.3)

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

	Type	Logging data
1	ID data	<ul style="list-style-type: none"> <li>● Setting temperature</li> <li>● Setting ventilation amount</li> <li>● Setting humidity</li> </ul>
2	Trip data	<ul style="list-style-type: none"> <li>● Operation date (year, month, day)</li> <li>● Operation time</li> <li>● Setting temperature</li> <li>● Supply air temperature for data recorder</li> <li>● Discharge air temperature for data recorder</li> <li>● Supply air temperature</li> <li>● Discharge air temperature</li> <li>● Outside air temperature</li> <li>● Setting humidity (Optional)</li> <li>● Humidity (Optional)</li> <li>● Operation mode</li> </ul>
3	USDA (Optional)	<ul style="list-style-type: none"> <li>● Pulp temperature sensor USDA #1 to #3</li> <li>● Year/month/day/time</li> <li>● Logging interval of 1 hour</li> </ul>
4	USDA+CTS (Optional)	<ul style="list-style-type: none"> <li>● Pulp temperature sensor USDA #1 to #3</li> <li>● Cargo temperature sensor CTS</li> <li>● Year/month/day/time</li> <li>● Logging interval of 1 hour</li> </ul>
5	Event	<ul style="list-style-type: none"> <li>● Power ON/OFF</li> <li>● Unit ON/OFF</li> <li>● Setting temperature change</li> <li>● Setting humidity change</li> <li>● Defrosting interval setting change</li> <li>● Defrosting IN/OUT</li> <li>● PTI startup and result</li> <li>● Battery mode startup</li> </ul>
6	Alarm	<ul style="list-style-type: none"> <li>● Alarm occurrence date (year/month/day)</li> <li>● Alarm code</li> </ul>
7	PTI	<ul style="list-style-type: none"> <li>● SHORT PTI</li> <li>● FULL PTI</li> </ul>
8	Software version	<ul style="list-style-type: none"> <li>● Version of the software installed in the controller</li> </ul>
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.

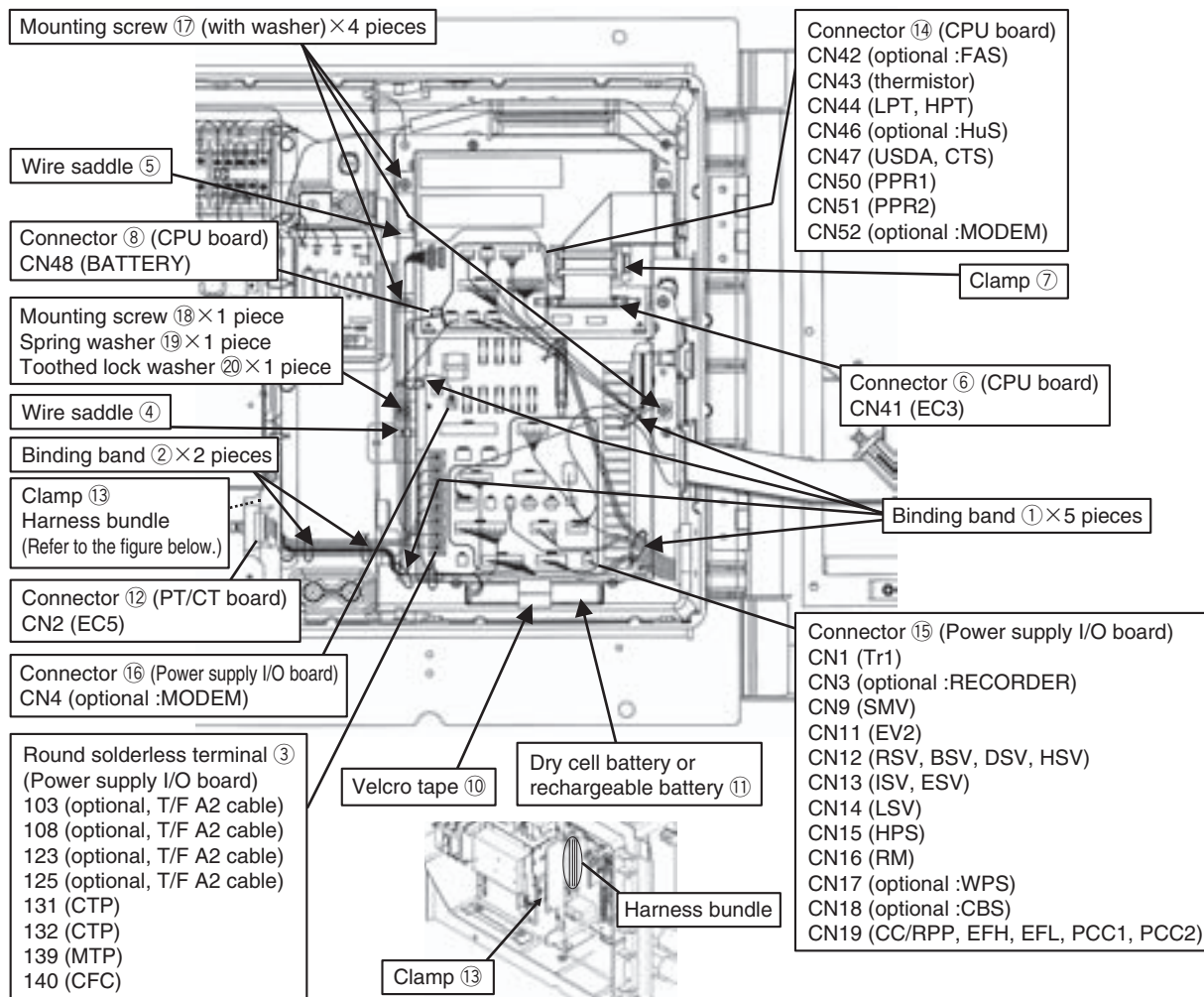
## 3.7 Controller replacement and software upgrade

### 3.7.1 Controller replacement

#### <Replacement procedure for the controller>

- Always turn off the main power supply to the facility before carrying out the following procedures.

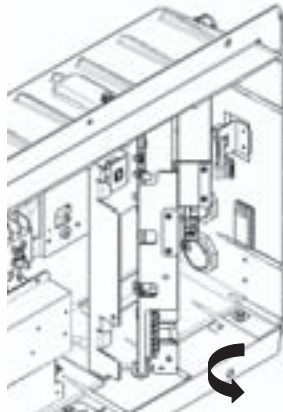
- (1) Remove binding band ① fixing each harness to the controller unit.  
Remove binding band ② binding harnesses.  
→Take care not to damage the harnesses.
- (2) Disconnect round solderless terminal ③ from the power supply I/O board.  
Disconnect the harness of terminal No.139 from wire saddles ④ and ⑤.
- (3) Disconnect connector ⑥ from the CPU board and the harness from clamp ⑦, respectively.
- (4) Disconnect connector ⑧ from the CPU board and the harness from wire saddle ④, respectively.
- (5) Remove the Velcro tape ⑩ and remove dry cell battery or rechargeable battery ⑪.  
→Properly store the removed battery for reuse.
- (6) Disconnect connector ⑫ of the PT/CT board and the harness from clamp ⑬, respectively.  
Pull out connector ⑫ from the inner side of the harness, and disconnect the harness from wire saddle ④.
- (7) Disconnect connectors ⑭ to ⑯ from the CPU board and power supply I/O board.  
→It is not necessary to disconnect the short-circuit connector or empty connector.
- (8) Remove mounting screw (with washer) ⑰, mounting screw ⑱, spring washer ⑲ and toothed lock washer ⑳ of the controller.  
→Properly store the removed screws and washers for reuse.



(9) Replace the old controller with the new one.

Tilt the controller unit to take it out from or insert it into the control box. (Refer to the figure below.)

→Prevent the corner of the controller from damaging the harness or other parts.



(10) Fix the new controller with mounting screw (with washer) ⑰, mounting screw ⑱, spring washer ⑲ and toothed lock washer ⑳.

→Ensure that the mounting screw, spring washer and toothed lock washer are installed in correct places.

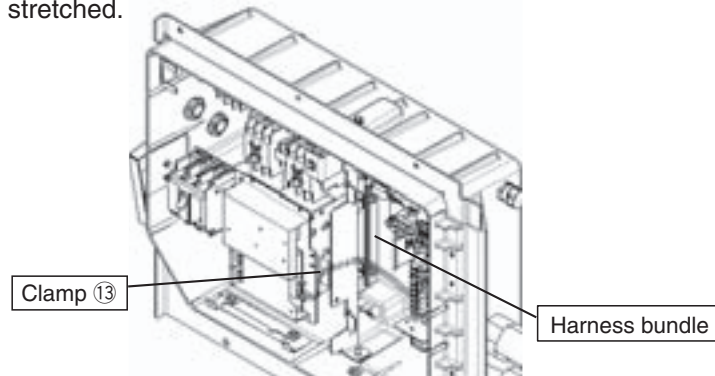
→Tighten the screws securely and completely.

(11) Insert connectors ⑭ to ⑯ into the CPU board and power supply I/O board.

(12) Fix the harness of connector ⑫ to wire saddle ④ and pass it behind the harness bundle. (Refer to the figure below.)

Insert connector ⑫ into the PT/CT board, and fix the harness to clamp ⑬.

→ When fixing the harness to the clamp, ensure that the sheet metal is not touched with the harness being stretched.



(13) Fix dry cell battery or rechargeable battery ⑪ with Velcro tape ⑩.

(14) Fix the harness of connector ⑧ to wire saddle ④, and insert connector ⑧.

(15) Insert connector ⑥ into the CPU board, and fix the harness to clamp ⑦.

→ When fixing the harness to the clamp, ensure that the sheet metal is not touched with the harness being stretched.

### Attention (When inserting each connector)

●Do not directly touch the CPU board and power supply I/O board.

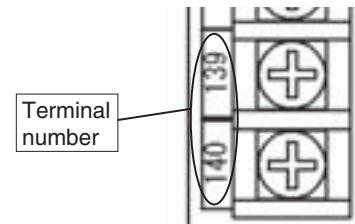
●Do not apply excessive load to the CPU board and power supply I/O board.

●Insert the connector securely by confirming its shape, direction, number of pins and color.

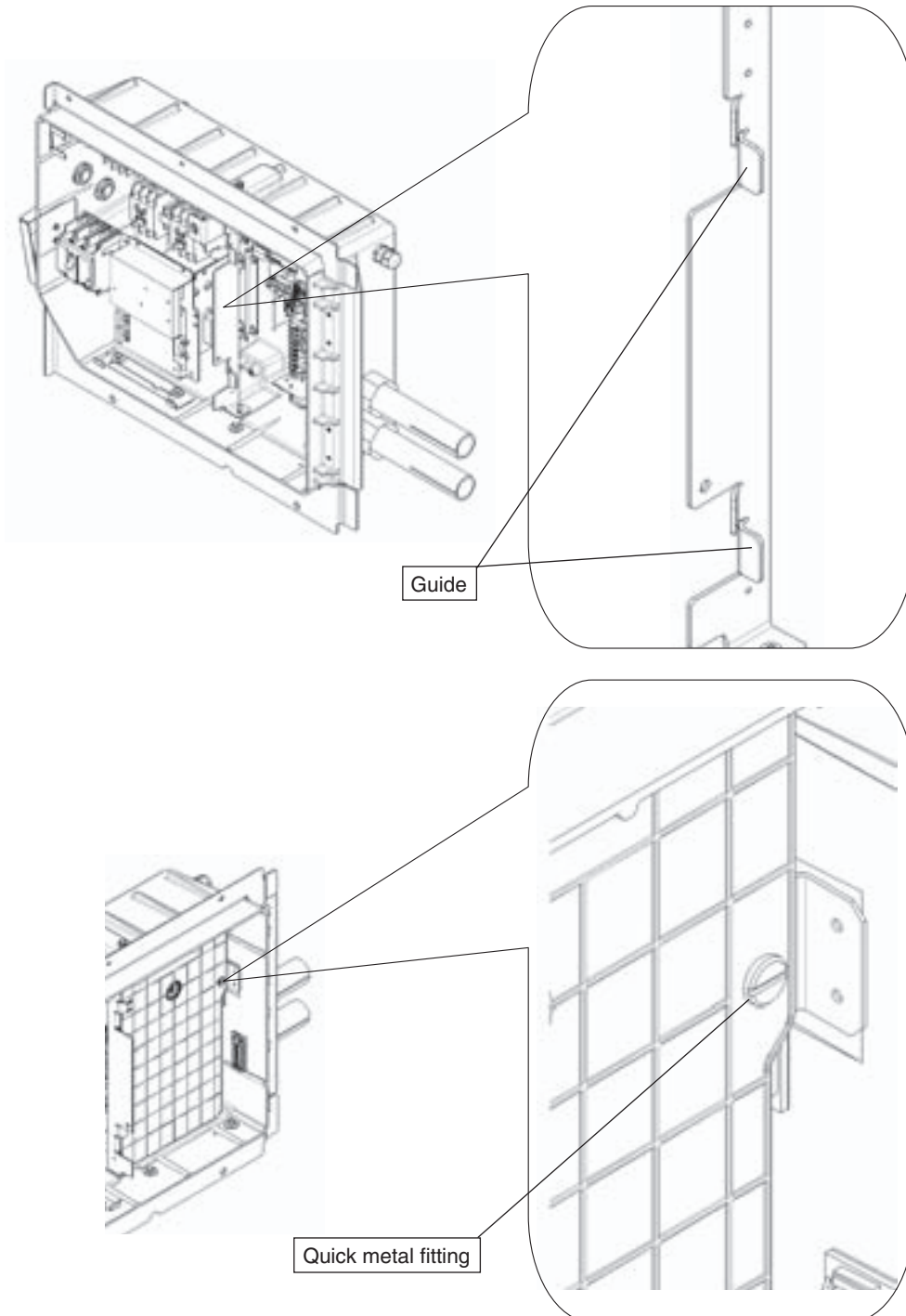
→Otherwise, the connection may not function normally, proper connection may not be established, the board may be broken, or the connector may be lost during the transportation.



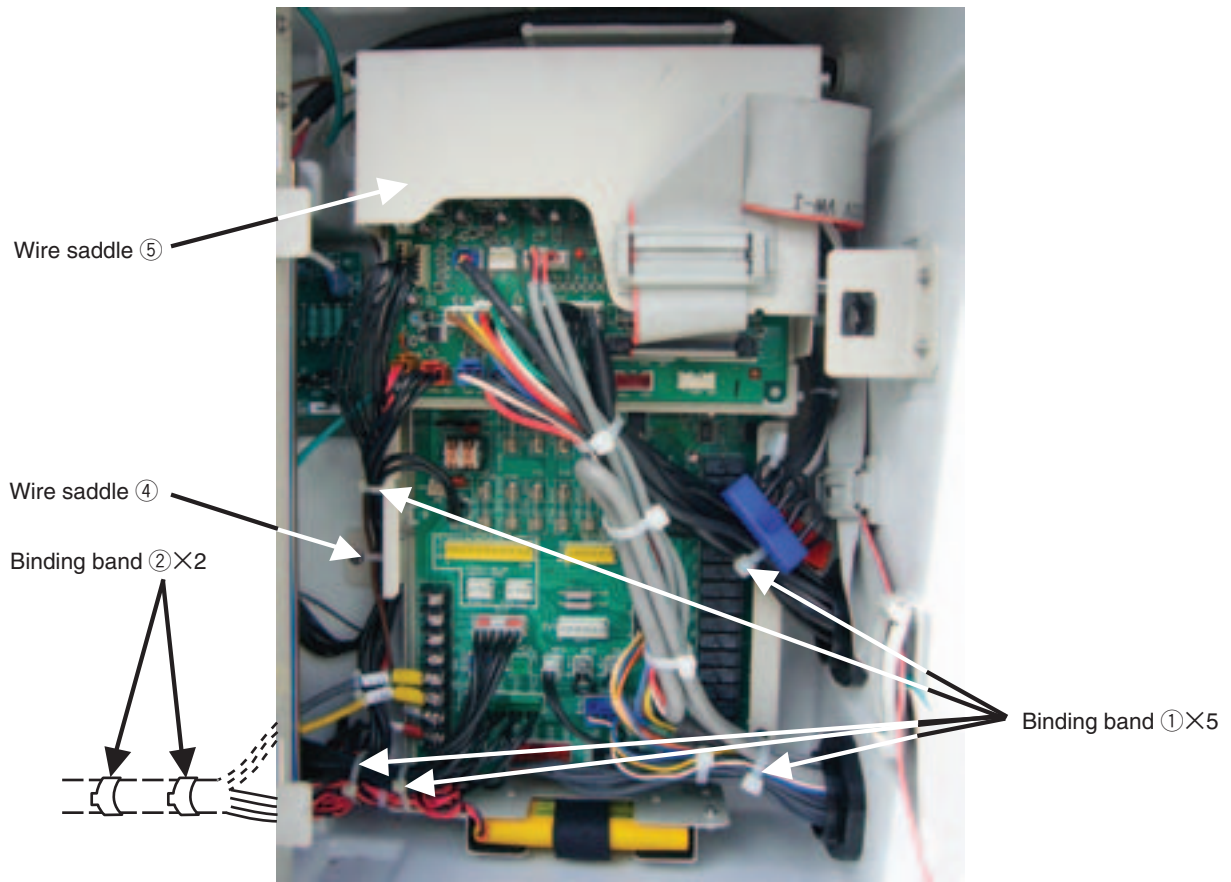
- (16) Attach the round solderless terminal to the power supply I/O board.  
→ Attach the terminal by checking the terminal number of the mark tube and the terminal number of silk print indicated on the power supply I/O board. (Refer to the figure below.)  
→ Tighten the screws securely and completely.  
Fix the harness of terminal number 139 to wire saddles ④ and ⑤.



- (17) Bind the harnesses with binding band ②.  
Fix each harness to the controller unit with binding band ①.
- (18) Mount the controller cover. (Refer to figure below.)  
Place the cover on the front side of the cover guide.  
Fix the cover by tightening the quick metal fitting with a quarter turn to the right.



<Wiring completed after replacement>



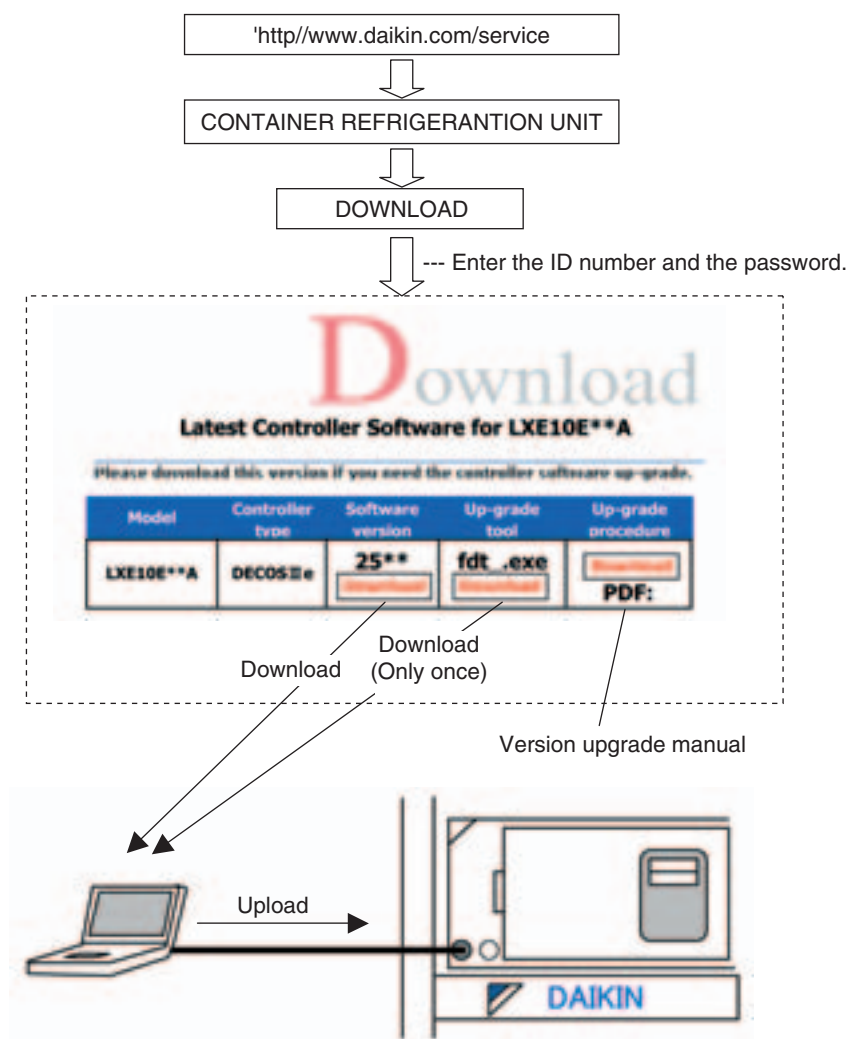
## 3.7.2 INSTALLATION OF SOFTWARE OF LATEST VERSION (VERSION UPGRADE)

### ● Items required

1. Personal computer (with Windows 2000 or Windows XP installed)
2. Communication cable
3. Tool for software version upgrade (fdt\_4\_00\_2.exe)
4. Software for controller DECOS III e (25\*\*.mot)

After the replacement with the spare parts controller, the software needs to be upgraded. Download the software of the latest version and the tool for version upgrade (only once) from the 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.

### 3.8 PTI (Pre-Trip Inspection) AND PERIODIC INSPECTION

The controller (DECOS III e) has the automatic PTI function, which consists of three process of SHORT PTI (referred to as S.PTI hereafter), FULL PTI (referred to as F.PTI hereafter) and MANUAL CHECK (referred to as M.CHECK hereafter)

Mode	Operation description
S.PTI	The components are inspected for abnormalities. Even if any abnormal components are found, all processes are executed.
F.PTI	S.PTI + unit capacity inspection are executed. The capacity check is executed only if any abnormal components are not found with S.PTI. If any abnormality is found during the capacity inspection, F.PTI is terminated.
M.CHECK	The functional parts and the operation data can be inspected.

The abnormalities which occur during automatic PTI will be displayed on the controller when the automatic PTI is terminated.

- Refer to section 3.4 for the alarm code checking procedure.
- Refer to section 6.2 for the alarm code contents.

When automatic PTI is terminated, the result of the PTI can be output as a report with using a personal computer. (Refer to the Operation Manual for Personal Computer Software.)

### 3.8.1 Inspection item

The periodic inspection and adjustment of components (if required) is recommended to ensure continued successful operation.

The following table shows an example of the inspection plan.

	No.	Inspection item	Inspection content	PTI	2 <sup>nd</sup> year	4 <sup>th</sup> year	8 <sup>th</sup> year
General structure	1	Inspection for physical damage		○	○	○	○
	2	Loose mounting bolts	1) Casing frame	○			
			2) Compressor	○			
			3) Condenser fan motor	○			
			4) Evaporator fan motor	○			
			5) Control box	○			
			6) Temperature recorder box	○			
			7) Access panel	○			
			8) Others		○	○	○
	3	Conditions of panel, hinge and lock		○	○	○	○
	4	Drain pan and drain hose cleaning		○			
	5	Control box inspection	1) Cover packing inspection and replacement	○	○	○	○
			2) Loose cable gland		○	○	○
3) Internal cleaning				○	○	○	
6	Temperature recorder box inspection	1) Cover packing inspection and replacement	○	○	○	○	
		2) Internal cleaning		○	○	○	
7	Sealing condition of holes through casing frame	Air leakage and clearance	○	○	○	○	
8	Packing inspection and replacement	Ventilator cover packing		○	○	○	
9	Painted area recondition	1) Compressor		○	○	○	
		2) Water-cooled condenser/liquid receiver		○	○	○	
		3) Solenoid valve (coil cap)		○	○	○	
		4) Casing frame			○	○	
10	Repainting	1) Compressor				○	
		2) Water-cooled condenser/liquid receiver				○	
		3) Condenser fan motor				○	
		4) Condenser fan				○	
1	Gas leakage		○	○	○	○	
2	Refrigerant	Inspection of moisture in the refrigerant, and refrigerant charged amount	○				
Refrigerant system	3	Inspection of high pressure switch operational pressure		○			
	4	Operation and leakage of solenoid valve	1) Liquid solenoid valve	○			
			2) Economizer solenoid valve	○			
			3) Injection solenoid valve	○			
			4) Hot gas solenoid valve	○			
			5) Defrosting solenoid valve	○			
			6) Discharge gas by-pass solenoid valve	○			
5	Operation and leakage of suction modulating valve		○				
6	Operation and leakage of electronic expansion valve		○				
7	Compressor	Water entering to compressor terminal		○	○	○	

	No.	Inspection item	Inspection content	PTI	2 <sup>nd</sup> year	4 <sup>th</sup> year	8 <sup>th</sup> year
Refrigeration system	8	Dryer replacement			○	○	○
	9	Function inspection and replacement of liquid moisture indicator		○			○
	10	Conditions of fasteners on the refrigerant pipes and gauge pipes		○	○	○	○
	11	Condition of thermal insulation of refrigerant pipe			○	○	○
	12	Evaporator coil cleaning (BY water)			○	○	○
	13	Condenser coil cleaning	1) Water-cleaning	○	○	○	○
			2) Steam-cleaning (after pumping down the refrigerant)			○	○
14	Water-cooled condenser inspection	1) Water-leakage inspection		○	○	○	
		2) Operation of water pressure switch		○	○	○	
Electrical system	1	Damage of power cable and plug		○	○	○	○
	2	Inspection of conditions of internal wiring		○	○	○	○
	3	Terminal looseness inspection and retightening if necessary	1) Magnetic switch	○	○	○	○
			2) Electronic controller terminal block	○	○	○	○
			3) Terminal block	○	○	○	○
	4	Condition of monitoring receptacle cap		○	○	○	○
	5	Conditions of personal computer receptacle cap		○	○	○	○
	6	Fuse conditions	Burned out or not	○	○	○	○
	7	Magnetic switch contact point inspection and replacement	1) Contact point inspection	○	○	○	
			2) Replace the contact on compressor contactor				○
			3) Replace the contact on compressor fan motor				○
			4) Replace the contact on evaporator fan motor				○
	8	Electric insulation check	1) Power cable and plug	○	○	○	○
2) Compressor			○	○	○	○	
3) Condenser fan motor			○	○	○	○	
4) Evaporator fan motor			○	○	○	○	
9	Starting procedure inspection		○				
10	Thermosensor	1) Installation conditions of sensor	○	○	○	○	
		2) Inspection of sensor and sensor lead for damage		○	○	○	
		3) Indication error inspection and replacement	○	○	○	○	
11	Humidity sensor	Replacement		○	○	○	
12	PT/CT (voltage and current) indication error inspection		○	○	○	○	
13	Pressure sensor indication error inspection		○	○	○	○	

	No.	Inspection item	Inspection content	PTI	2 <sup>nd</sup> year	4 <sup>th</sup> year	8 <sup>th</sup> year
Electrical system	14	Temperature recorder inspection	1) Sensor error inspection	○	○	○	○
			2) Chart drive inspection	○			
			3) Recording operation inspection	○			
			4) Loose terminal		○	○	○
			5) Chart drive dry battery inspection	○			
			6) Check of pen lifting battery	○			
	15	Electronic controller	1) Check of wake-up battery	○			
			2) LCD panel replacement			○	○
	16	Evaporator fan motor	1) Speed switchover	○			
			2) Revolution direction	○			
17	Condenser fan motor	Rotating direction	○				
18	Evaporator fan	Deformation and damage inspection	○	○	○	○	
19	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	Defrosting function		○			
4	Unit water-cleaning		○				

※ The service life of the wake-up battery is approx. one year (Dry battery). For USDA transportation, replace the battery with a new Dry battery when PTI is performed.

### 3.8.2 Automatic PTI (Pre-Trip Inspection)

- The automatic PTI function is provided so as to ensure correct inspection and to shorten inspection time. (Refer to section 3.2 for operation of controller)

#### (1) Appearance inspection of unit

- ① Physical damage
- ② Casing insulation through hole area
- 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 sections
  - Bolts and nuts ----- Casing frame, compressor, fan motor control box and temperature recorder box
  - Cable glands ----- Control box
- ⑧ Conditions of control box cover packing (water-proof) and temperature recorder box cover packing (water-proof)
- ⑨ Magnetic contactor contact point for burning out.

#### (2) Inspection before unit operation

- ① Gas leakage inspection

② Power voltage inspection (Automatic PTI range)

#### (3) Operation inspection of safety device and control equipment

- ① Safety device
 

HPS	-----	Measurement of the actuating pressure by 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	-----	Inspection of 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   | Electronic temperature recorder calibration | 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 | Electronic temperature recorder calibration | ON/OFF, voltage and current   |

Remained frost inspection

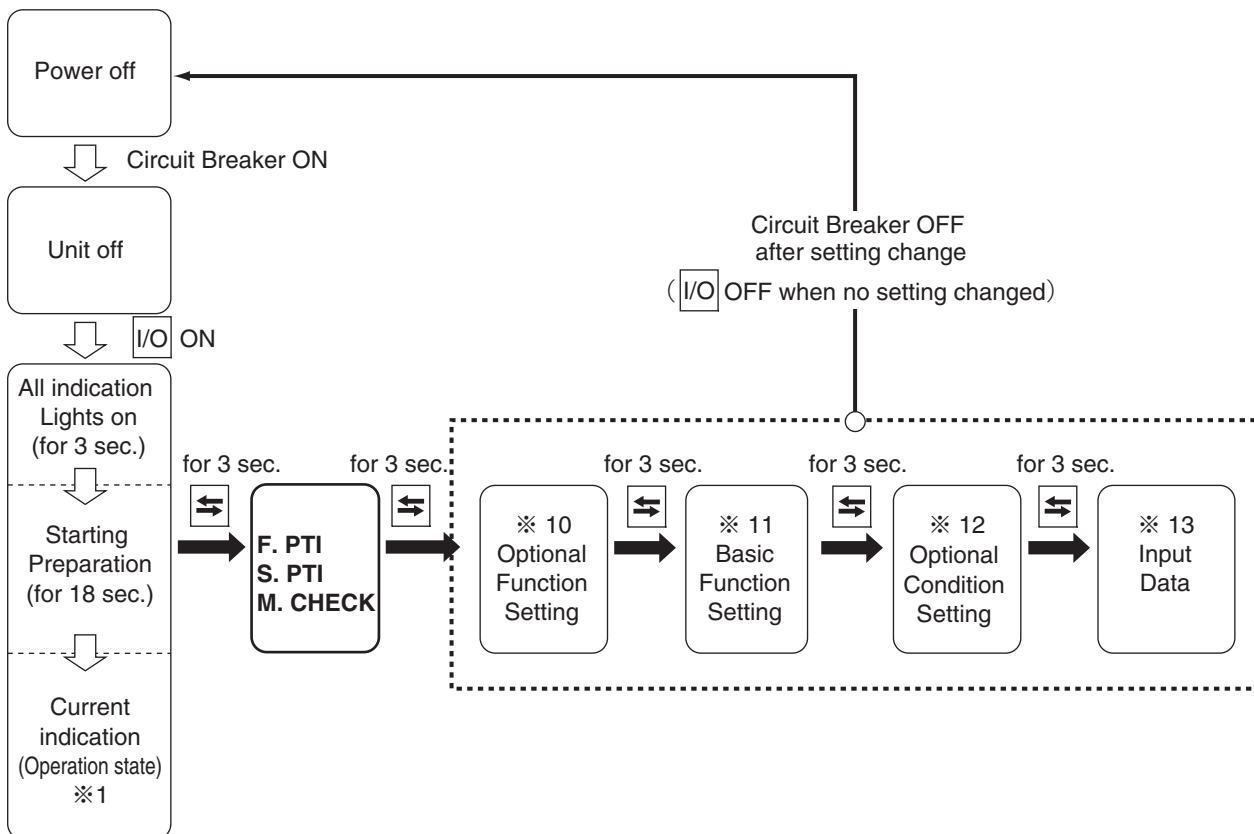
#### (5) PTI report preparation



### 3.8.2.1 PTI selection mode

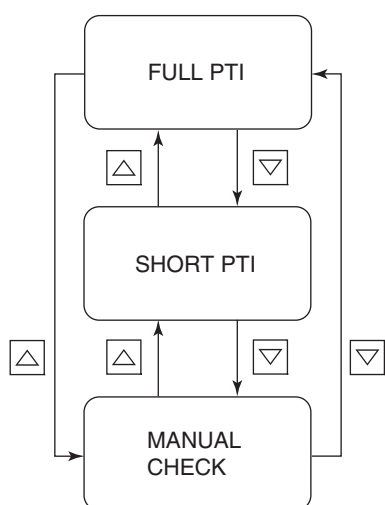
The test mode of FULL (F.PTI), SHORT PTI (S.PTI), and MANUAL CHECK (M.CHECK) can be selected.

#### <Mode selection procedure>



#### <Operation procedure>

Whenever the or key is pressed, the indication changes.



To start FULL PTI, press the key while "F.PTI" is display on the LCD.

To start SHORT PTI, press the key while "S.PTI" is display on the LCD.

●When the key is pressed while "M-CHECK" is displayed on the LCD, the manual check selection mode is set.

The detail of the manual check selection mode is described in page 3-48.

● Automatic PTI enable conditions

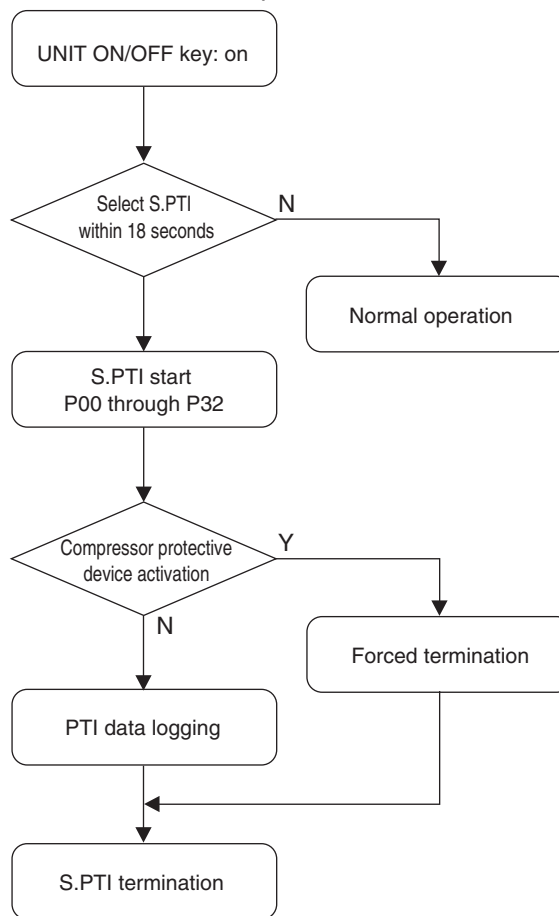
	Water cooled operation	Air cooled operation	Ambient temperature condition
S. PTI	×	○	-10°C < Ambient temperature ≤ 43°C When the ambient temperature is above 43°C or below -10°C, the correct judgment may not be possible.
F. PTI	×	○	-10°C ≤ Ambient temperature ≤ 43°C When the ambient temperature is above 43°C or below -10°C, the following alarm will be indicated. J501: Out of ambient temperature specified conditon.
M. CHECK	○	○	

3.8.2.2 Short PTI (S.PTI)

● Step display and content

Step	Content
P00	Basic data record (container No., date, time, compressor integrated run-hour, ambient temperature)
P02	Alarm check on all sensors
P04	Power conditions (voltage and frequency) check
P05	Compressor start 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) •Defrost solenoid valve (DSV) •Discharge gas by-pass (BSV) •Economizer solenoid valve (ESV)
P12	Supply and return air sensor (SS and RS) 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	Defrost solenoid valve (DSV) opening or closing check
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 Reheat coil solenoid valve (RSV -optional) opening or closing check

● S.PTI Flow chart operation



※1 If the ambient temp is -10°C or lower, the function check of the solenoid valve cannot be preformed correctly, short circuit the 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.

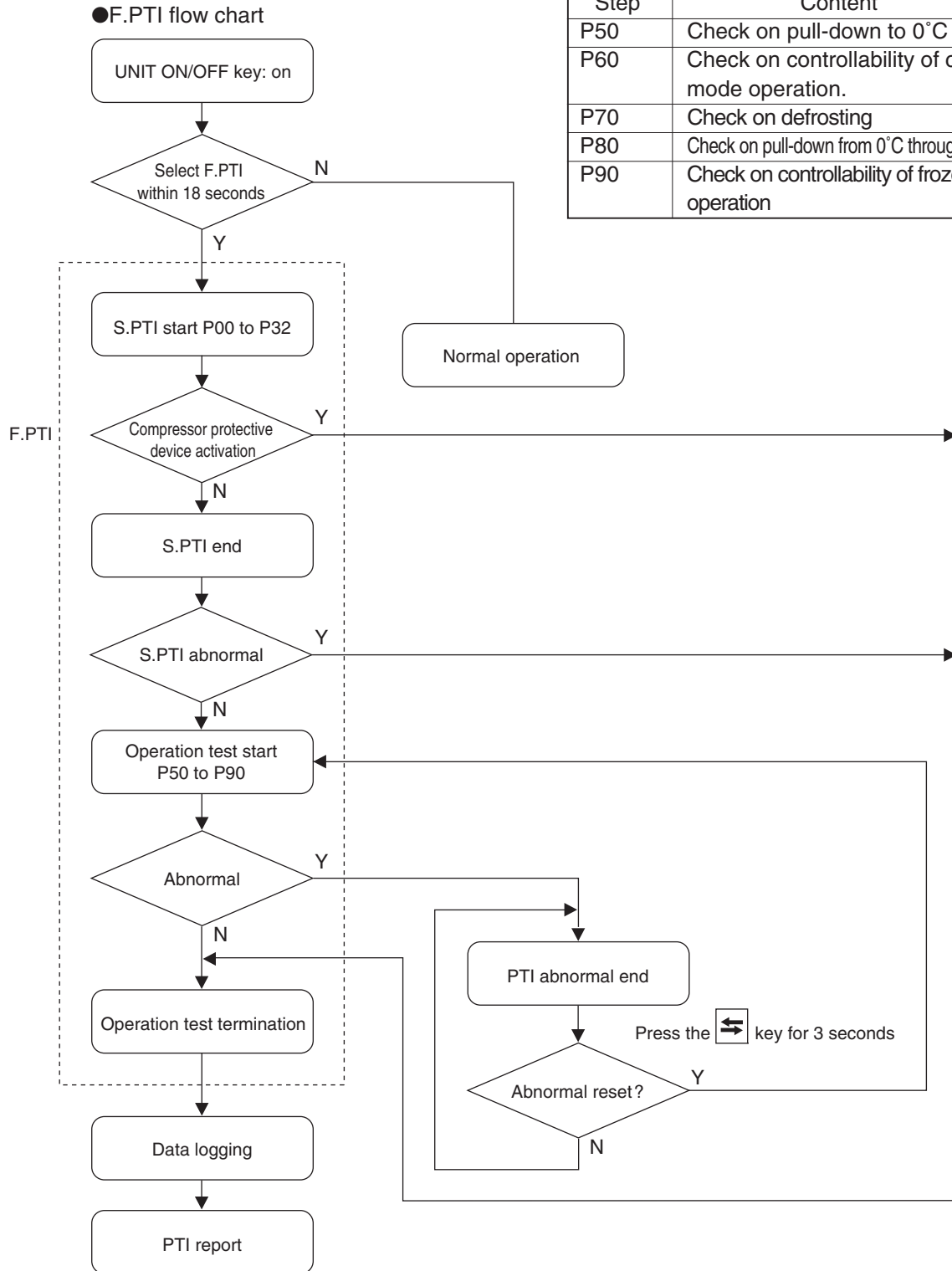
### 3.8.2.3 Full PTI (F.PTI)

F.PTI consists of S.PTI and operation tests.

●Step display and contents

(step P00 to P32 are as same as S.PTI)

Step	Content
P50	Check on pull-down to 0°C
P60	Check on controllability of chilled mode operation.
P70	Check on defrosting
P80	Check on pull-down from 0°C through -18°C
P90	Check on controllability of frozen mode operation



### 3.8.2.4 Alarm list during PTI (Pre-Trip Inspection)

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

The alarms at automatic PTI are indicated in J ※※※., being 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	S.PTI	F.PTI	Remarks
P00	Basic data	No indication	Check basic-data	↑	↑	
P02	All sensor	Same as normal operation	Check basic-data			
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			
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	Defrost solenoid valve	J241	Defrost solenoid valve malfunction			
P26	Operation	No indication	Judged with P28			
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			
	Reheat coil solenoid valve	J322	Reheat coil solenoid valve malfunction			
P50	Pull-down cooling capacity	J501	Out of ambient temperature conditions			↓
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 6.3 for more information.

### 3.8.2.5 Manual check (M.CHECK)

In M. CHECK, each functional 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 screen	LCD screen	Setting method and description
	—		Press the  key to display the number in the LED meaning the accumulated operation time of the compressor.
	Accumulated operation time of the compressor	CC × 10H	Operation time = Number in LED × 10 [hours] Keep the  key pressed for 3 seconds to reset the accumulated operation time to 0.
	—	EFH A	Press the  key to operate the evaporator fan at high speed, and the operation current of the fan is indicated in the LED.
	Evaporator fan operation current at high speed		The unit is A.
	—	EFL A	Press the  key to operate the evaporator fan at low speed, and the operation current of the fan is indicated in the LED.
	Evaporator fan operation current at low speed		The unit is A.
	—	CF A	Press the  key to operate the condenser fan, and the operation current of the fan is indicated in the LED.
Condenser fan operation current		The unit is A.	
—	TS H	Press the  key to show the time elapsed since starting the trip.	
Time elapsed since trip start		The unit is [hour]. Keep the  key pressed for 3 seconds to start the trip with the time elapsed reset to 0 [hour].	
—	EF1 × 10H	Press the  key to show the accumulated operation time of evaporator fan 1 in the LED.	
Evaporator fan 1 accumulated operation time		Operation time = Number in LED × 10 [hours] Keep the  key pressed for 3 seconds to reset the accumulated operation time to 0. Evaporator fan 1 is located on the right viewed from the inside.	

	—		Press the  key to display the accumulated operation time of evaporator fan 2 in the LED.
	Accumulated operation time of evaporation fan 2	EF2 × 10H	Operation time = Number in LED × 10 [hours] Keep the  key pressed for 3 seconds to reset the accumulated operation time to 0. Evaporator fan 2 is located on the left viewed from the inside.
	—		Press the  key to display the accumulated operation time of the condenser fan in the LED.
	Accumulated operation time of the condenser fan	CF × 10H	Operation time = Number in LED × 10 [hours] Keep the  key pressed for 3 seconds to reset the accumulated operation time to 0.
	—		Press the  key to display the software version in the LED.
	Software version	SOFTVER	

### 3.9 Chartless function

The controller provides the temperature recorder function.

In the case of recorder-equipped units, checking for the temperature on the chart recorder will provide ease of monitoring the state of tripping.

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

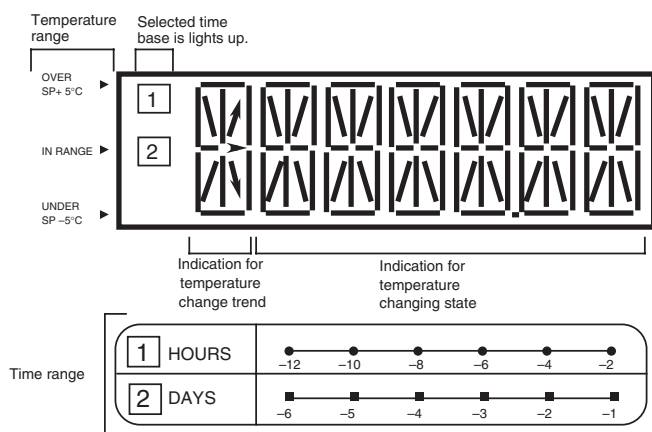
- Chart Indication Function
- Pull Down Time Indication Function
- Chartless Code display Function

#### 3.9.1 Chart indication function

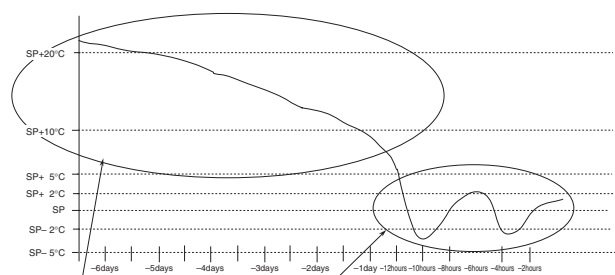
The temperature record data is indicated in a graphic chart on the LCD panel in the chart indication mode.

- 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) and one day for 6 days log (2 DAYS).
- The indication of the data during the defrosting is flickered, and the indication of the other chart data is lit on.

##### ● LCD panel



##### ● Example of chart indication

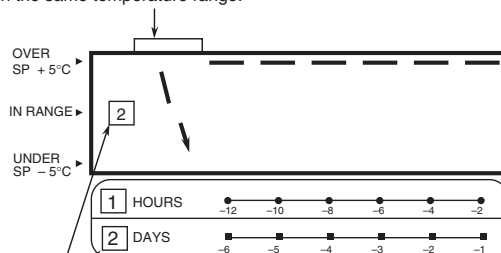


Ex.1

Ex.2

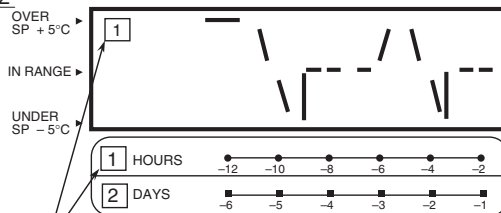
##### Ex.1

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:

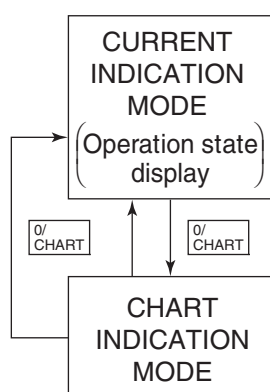
- The temperature change trend is shown in the leftmost LCD.
- However, this display is shown only when all segments are in the same temperature range.

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 the setting of H001.

For details about the setting of H001, refer to page 3-23, "OPTIONAL FUNCTION SETTING MODE."

< Operation procedure >



To shift to the chart indication mode, press the  $\frac{0}{\text{CHART}}$  key while the unit is in the current indication mode.

In the chart indication mode, the LCD displays a simple graphic chart. The ordinate at the left side of LCD screen for temperature base and the abscissa at the bottom of LCD for time base are indicated. The No. indicated at the time base is the same as the No. on the left most of the LCD, which indicates the simple graphic chart is of 12 hours log or 6 days log indication. Select the base to be uses using the  $\triangle$  or  $\nabla$  key.

When the  $\frac{0}{\text{CHART}}$  key is pressed, the unit goes back to the current indication mode.



### 3.9.2 P code (Pull down time indication)

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

P001: Lasts the pull-down for 1 hour.

P002: 2 houes passed since pull-down started.

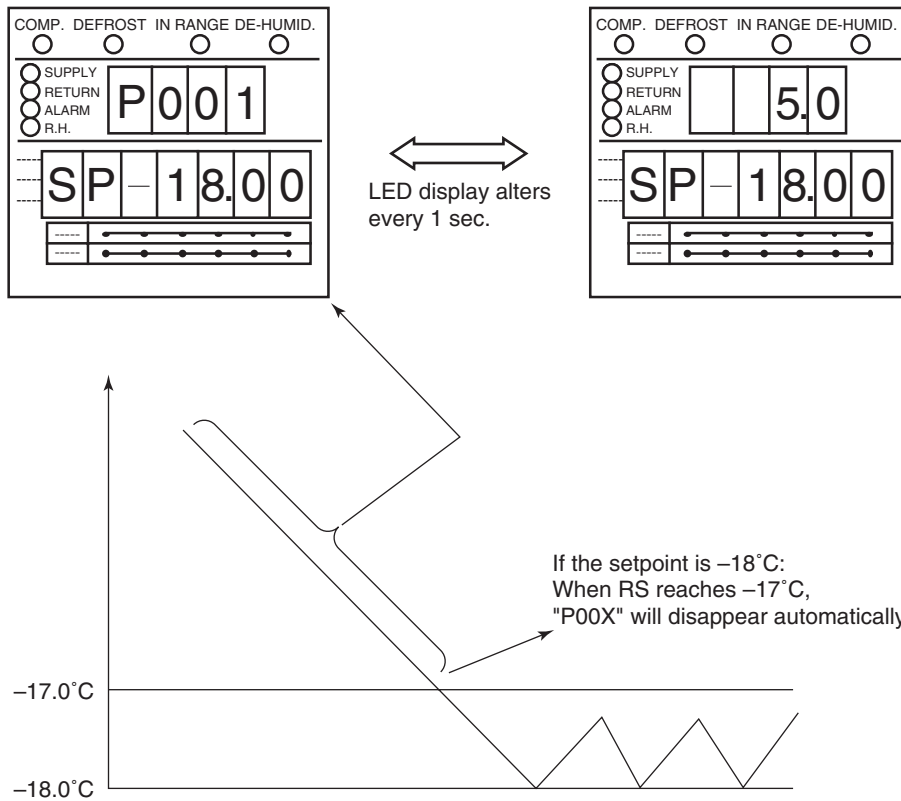


Figure1

### 3.9.3 Chartless code display function

The chartless code represents the coded inside air temperature.

Select "ON" of the chartless code setting to indicate the code on the LED.

For the chartless code setting, refer to the "OPTIONAL CONDITION SETTING MODE" on the page 3-23~3-24.


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

#### 3.9.3.1 List of chartless code

C: chilled mode, F: Frozen mode

	Code	Description	Operation mode	Figure
Abnormal temperature record	H001	The alarm is displayed when the control temperature does not decrease by <u>3°C</u> or more for 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 defrosting.)	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 the control air temperature is Out-of -In-Range and defrosting was performed successively <u>three times</u> while the control air temperature does not return to in-range.	C, F	5
	H006	The alarm is displayed when the integrated time of difference 2 °C or more between control sensor data and record sensor data reaches to <u>one hour</u> or more.	C, F	6
Operation history	d3XX	When the total time above set point +3°C reaches <u>1 hour</u> , the code "d301" will be displayed.	C, F	7
	d2XX	When the total time above set point +2°C reaches <u>1 hour</u> , the code "d201" will be displayed.	C, F	7
	d1XX	When the total time above set point +1°C reaches <u>1 hour</u> , the code "d101" will be displayed.	C, F	7
	d-1X	When the total time below set point -1°C reaches <u>1 hour</u> , the code "d-11" will be displayed.	C, F	7
	d-2X	When the total time below set point -2°C reaches <u>1 hour</u> , the code "d-21" will be displayed.	C, F	7
PXXX	XXX: When the total pull-down time reaches one hour, an indication XXX=001 appears.	C, F	1	

Note 1) The encircled setting can be changed.

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 turn off the power supply for 3 days.

### 3.9.3.2 H-code

**H001** =The alarm is displayed when the control temperature does not decrease by  $3^{\circ}\text{C}$  or more every 4 hours during pull-down operation.

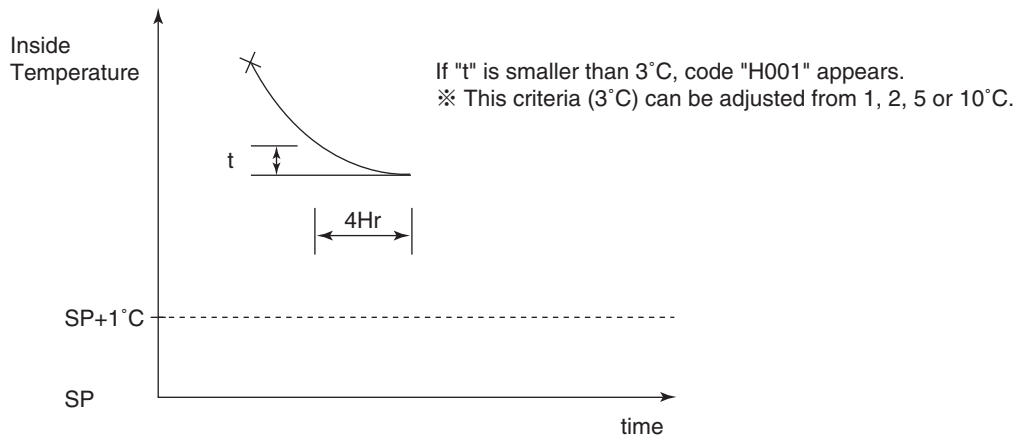


Figure2

**H002** =The alarm is displayed when the total time out of "in-range" reaches 2 hours. (Counting is not performed during defrosting).

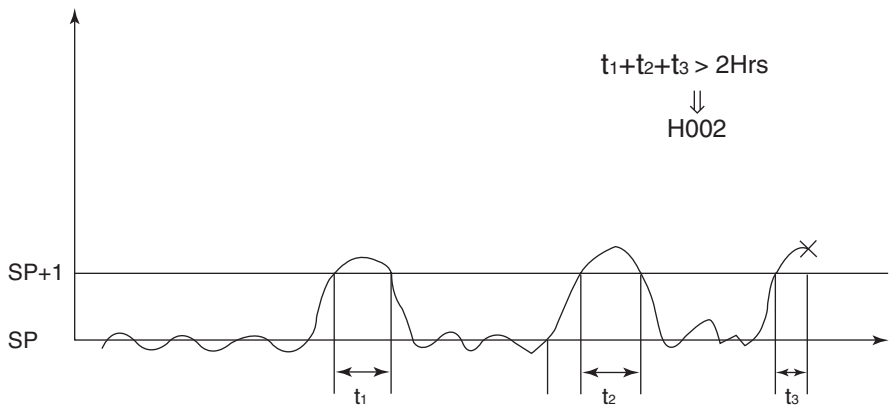


Figure3

**H003** =The alarm will be displayed when the total time below setpoint  $-1^{\circ}\text{C}$  reaches 2 hours.

**H004** =The alarm will be displayed when the total time below setpoint  $-2^{\circ}\text{C}$  reaches 2 hours.

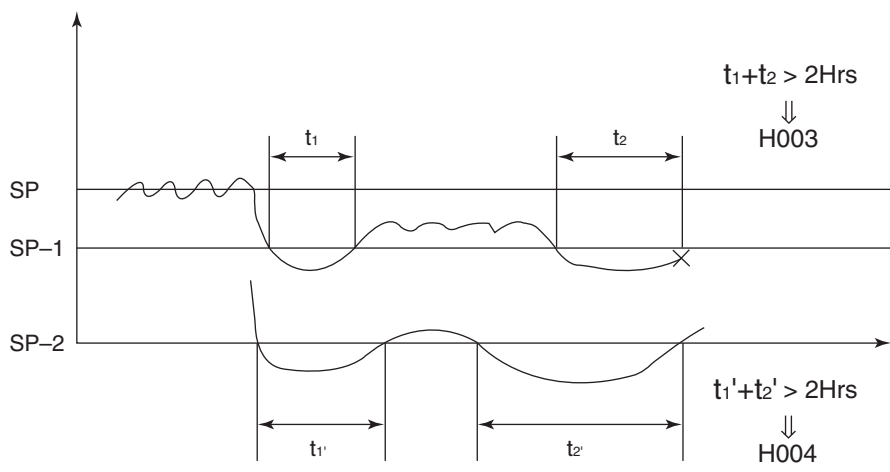


Figure4

**H005** =The alarm is displayed when the control air temperature is out of "in-range" and defrosting was performed three times while the control air temperature does not return to in-range.

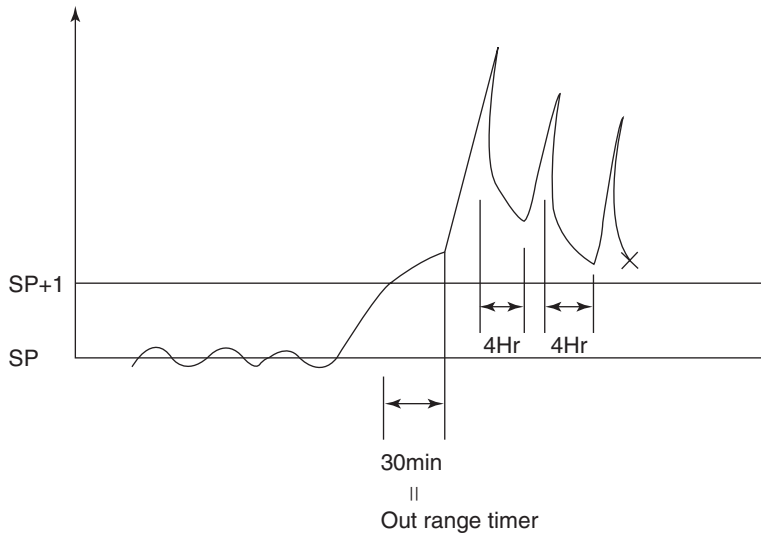
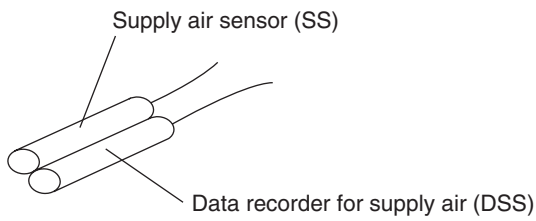


Figure5

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



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

Figure6

### 3.9.3.3 d-code:

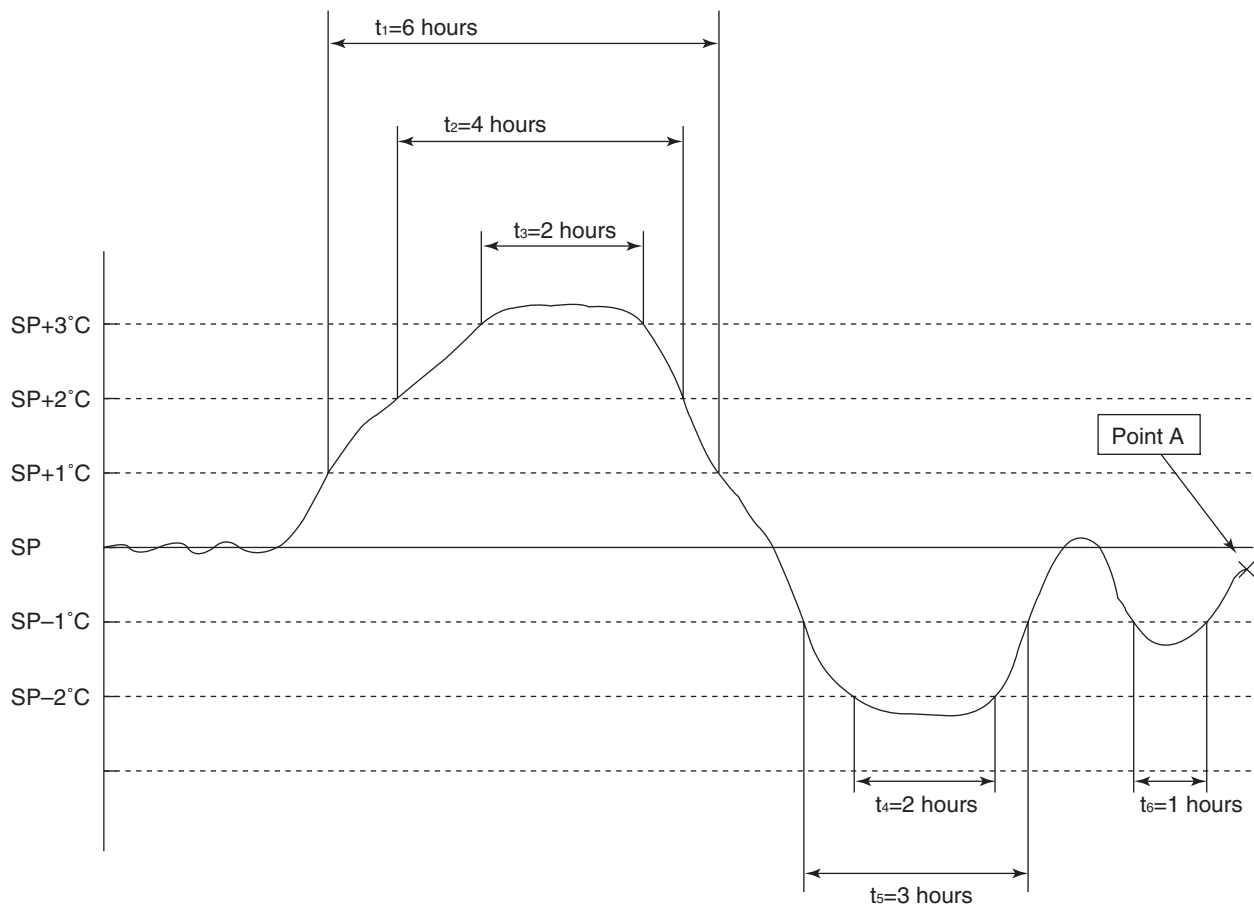
The d-code shows the current operation state of the unit.

#### 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  $-2^{\circ}\text{C}$  reaches 1 hour.  
The code "d-22" will then be displayed when the total time below set point  $-2^{\circ}\text{C}$  reaches 2 hours.



Example : If inside temperature was recorded above graph, controller shows the following "d code" when user check the code 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  $-2^{\circ}\text{C}$  for 2 hours)
- d-13 (below setpoint  $-1^{\circ}\text{C}$  for 3 hours)
- d-11 (below setpoint  $-1^{\circ}\text{C}$  for 1 hour)

Figure7

### 3.10 Communication modem

DECOS III e controller has function to transmit operation data through power line, if slave modem is provided in control box.

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

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

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

## 4. SERVICE AND MAINTENANCE

### 4.1 Maintenance service

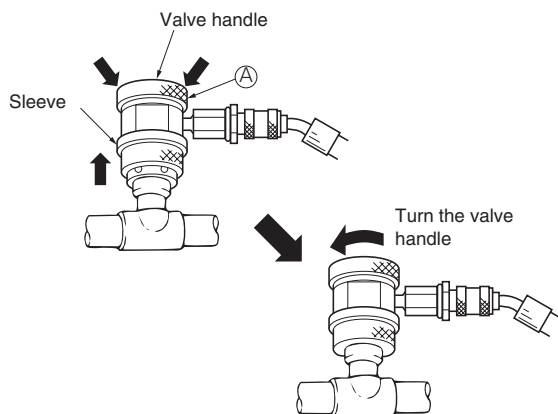
#### 4.1.1 Collection of refrigerant

- ① When release the 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 strictly all the environmental laws relating with to the country where the repair service is conducted.

#### 4.1.2 Gauge manifold

##### (1) Attaching the gauge manifold

Turn the valve handle of coupler counterclockwise (the push pin is pulled up). Slide the sleeve upward, and press it 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. The coupler is fixed so that it is not detached from the service port. Next, turn the valve handle clockwise. Lower the push pin, and open the check valve at the service port.

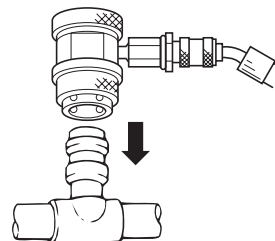


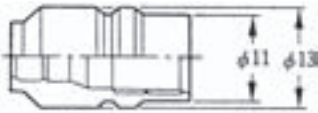
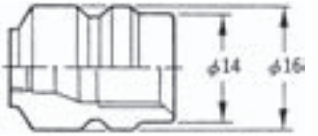
Note: Do not fully turn the valve handle clockwise. Otherwise, the push pin may be broken.

## CAUTION

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 of the pressure gauge, gauge manifold, charge hose and charging cylinder which have 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 port of quick joint type is provided to make improved handling.

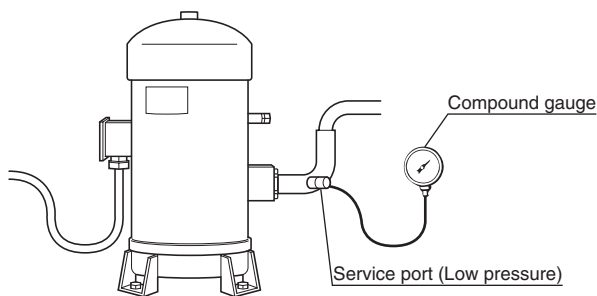
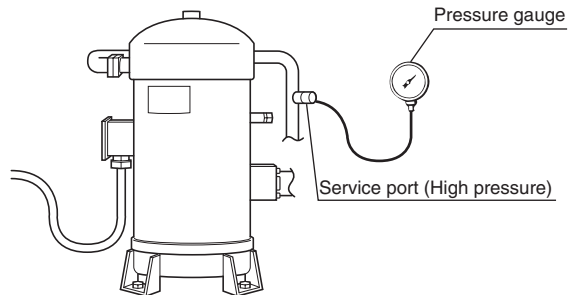
※ Quick joint system



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

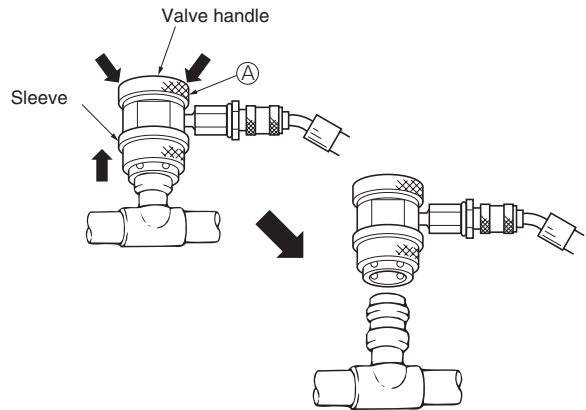
Be sure to use the gauge manifold with the quick joints shown above.

- Location of service ports on high pressure and low pressure sides  
Service ports on high pressure and low pressure sides are located as shown below.



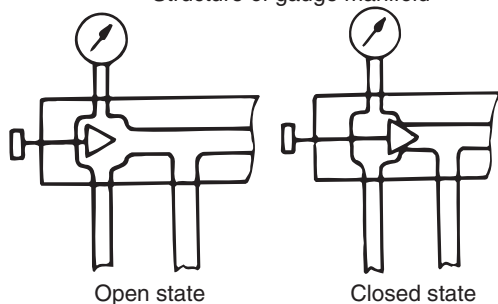
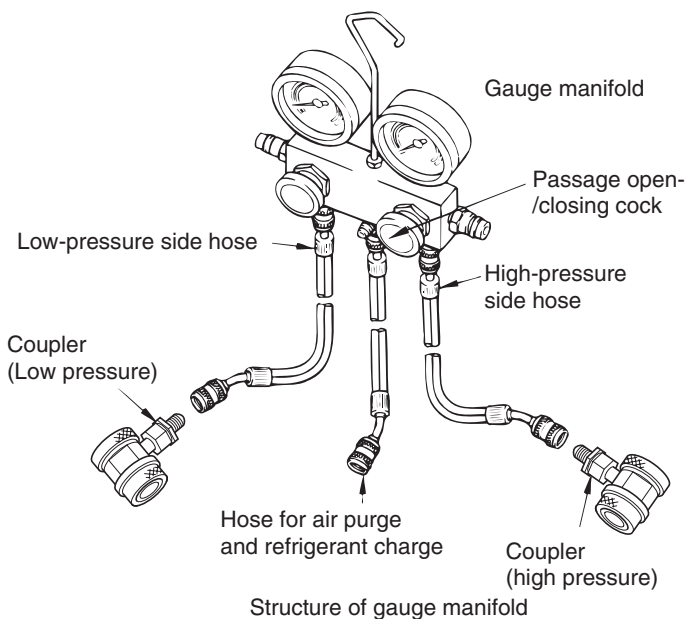
**(2) Removal of gauge manifold**

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



**CAUTION**

Be sure to attach the cap to the service port after the removal of the manifold.



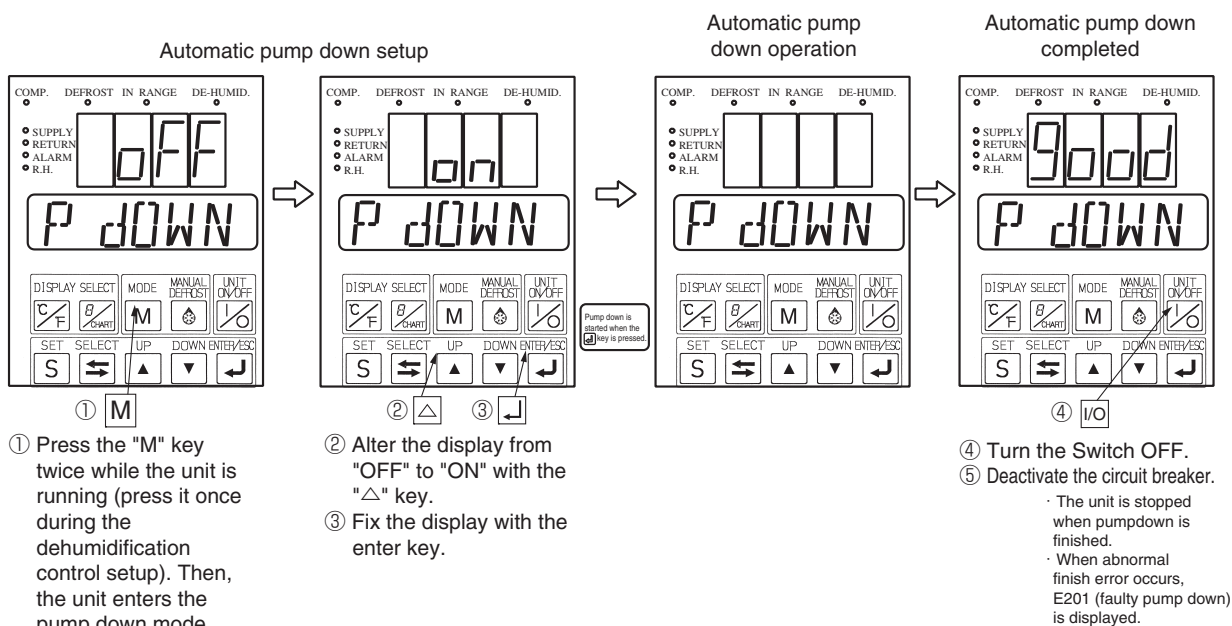
Open and closed states of gauge manifold



### 4.1.3 Automatic pump down

An automatic pump down system is applied to the unit to prevent the unit from extra decrease of low pressure due to pump down operation or burning of scroll compressor due to a close stop valve.

#### (1) Access to automatic pump down operation mode



#### (2) Use of automatic pumpdown

##### [1] Replacement of dryer

※ After the automatic pumpdown operation is completed, pressure in the pipe in and out of the dryer is slightly higher than the atmospheric pressure.

Thus, although no ambient air will not be entered in the piping, even when the dryer is replaced, replace it quickly in a short period. (For details, see clause 4.2.6)

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

##### [2] Recovering refrigerant

※ Before recovering refrigerant, execute the automatic pump down operation.

(As for the details, see (2) of clause 4.1.4)

##### [3] Charging refrigerant (third step)

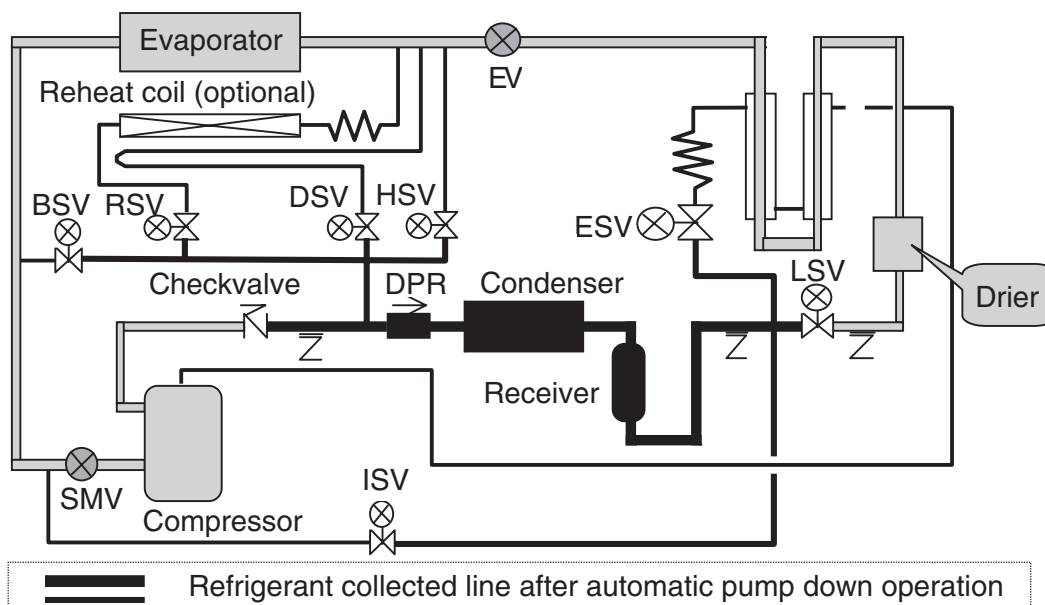
※ If the ambient temperature is low, and the refrigerant cannot be charged to the specified amount because of pressure balance, execute the automatic pump down operation. (As for the details, see (3) of clause 4.1.4)

**(2) Automatic pump down operation**

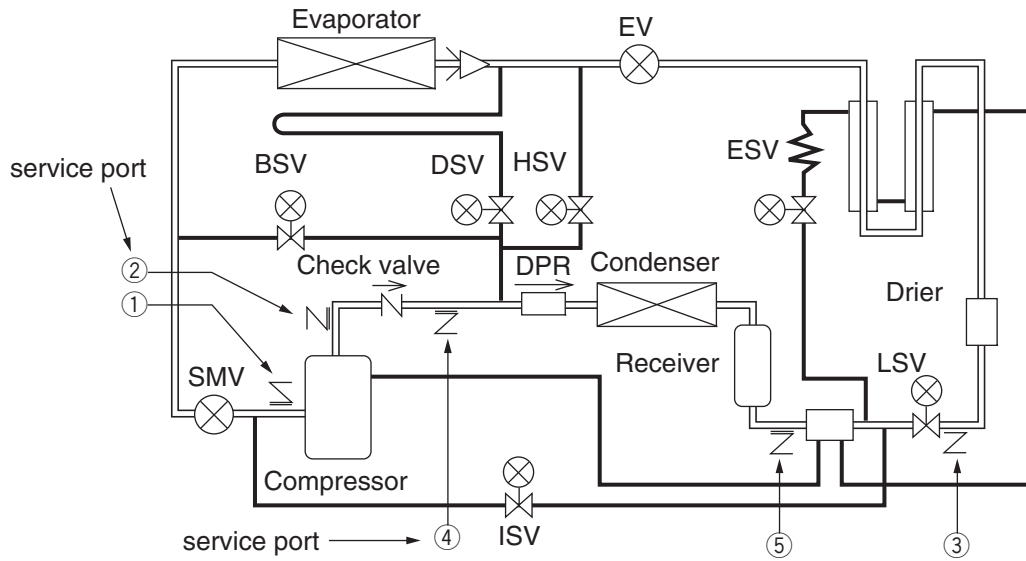
Once the automatic pump down is started, all of the service works from refrigerant collection into the receiver, to the equalizing in suction piping system, can be executed automatically. When "Good" is displayed, service works such as replacing the dryer, etc. can be conducted without any other operation.

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 $LP \leq -55kPa$		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	
DSV						
BSV						
RSV						
SMV	100%	100%	100%	100%	100%	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 (three 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.



### 4.1.4 Refrigerant Recovery and Charge

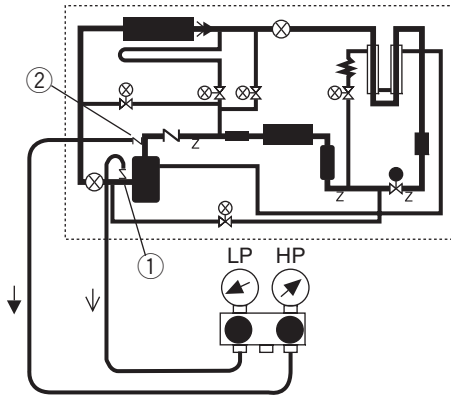


Service work		Service port	Remarks
Pressure Check	High pressure	②	
	Low pressure	①	
Refrigerant recovery and charge (R134a: 5.2kg)	[1] Refrigerant Recovery	⑤	Recover refrigerant from port ⑤ after operating Automatic Pump-Down first.
		④ & ⑤	Recover completely the refrigerant left in the unit port ④ & ⑤.
	[2] Vacuum & Dehydration	④ & ⑤	After recovering, vacuum from port ④ & ⑤. *The connection at port ④ is same size at ① for low pressure.
	[3] Liquid charging	⑤→③※	After vacuuming, charge liquid refrigerant from ⑤ first and them from ③.
③※		If not reached to the specified amount 5.2 kg, go to next below. 1. Operate Automatic Pump-Down first and stop it using ON/OFF switch after the compressor stops during the Auto pump down operation. 2. Charge liquid refrigerant from port ③.	

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

### (1) Operation Pressure Check

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



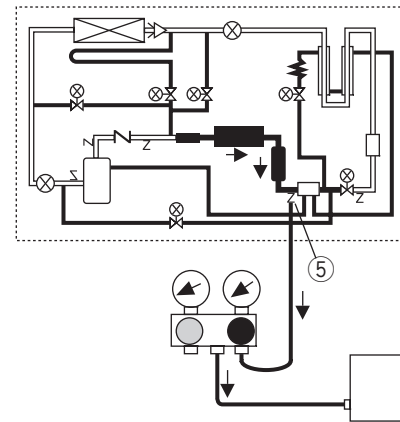
### (2) Recovery non-condensable gas

If the 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. Therefore, it is very important to eliminate the non-condensable gases. If the discharge pressure is abnormally high and the pressure is not normalized, check whether the air or other non-condensable gases are present by following the procedure below.

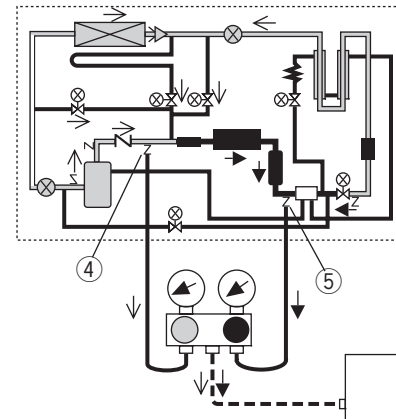
- After carrying out the automatic pump-down operation to collect the coolant in the liquid receiver, stop the unit once. Operate the condenser fan in accordance with the condenser fan check procedure included in the manual check procedure, and wait until the cooling air inlet and outlet temperatures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

### (3) Refrigerant Recovery

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



- ③ Recover completely refrigerant left in the unit from ports ④ & ⑤.



### (4) Vacuum-dehydrating, and refrigerant / charging

If all the refrigerant has leaked out and air is intermixed in the refrigeration circuit, remove the cause of trouble and carry out vacuum-dehydrating. Then charge the specified amount of refrigerant.

[Required tools]

1. Refrigerant cylinder (content of 20kg) equipped with joint for HFC134a
2. Gauge manifold with quick joints
3. Weighing scale (up to 50kg)
4. Vacuum pump

**(a) Vacuum dehydrating**

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

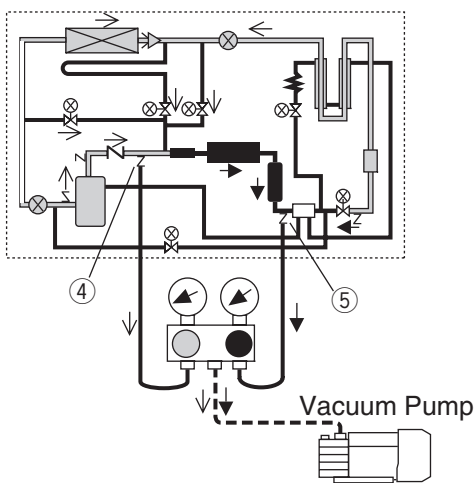


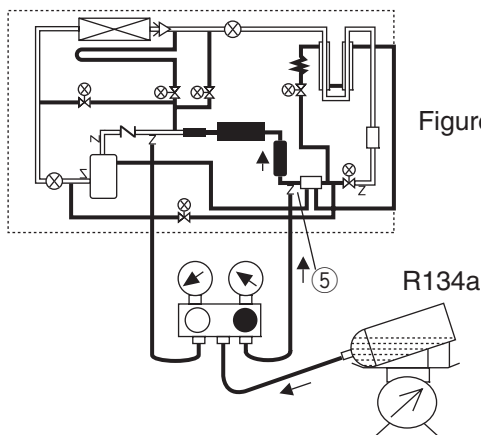
Figure 1

**(b) Cylinder weight recording**

Place a refrigerant cylinder on the weighing scale, and record the weight of the cylinder.

**(c) Charging of liquid refrigerant**

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



2. Replace the manifold gauge hose to port ③ and add the liquid refrigerant. Then if it reached to the specified amount close the cock of the refrigerant cylinder.

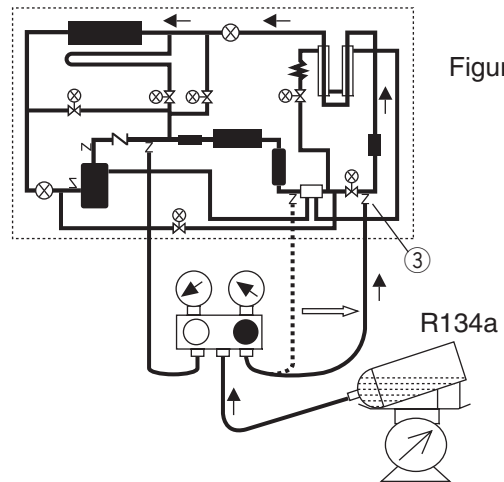


Figure 2

If it is not reached to the specified amount due to the pressure valance, close the cock of the ref. cylinder and go to next 3 & 4.

3. Operate Automatic Pump Down first.

When the compressor stops during the operation, end the Auto. P. D. operation using Unit ON/OFF switch.

4. Open the cock of the ref. cylinder and add the liquid refrigerant from port ③. Then if it reached to the specified amount close the cock of the ref. cylinder.

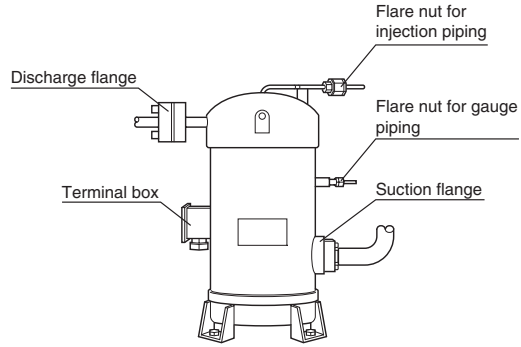
**⚠ CAUTION**

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

## 4.2 Main components and maintenance

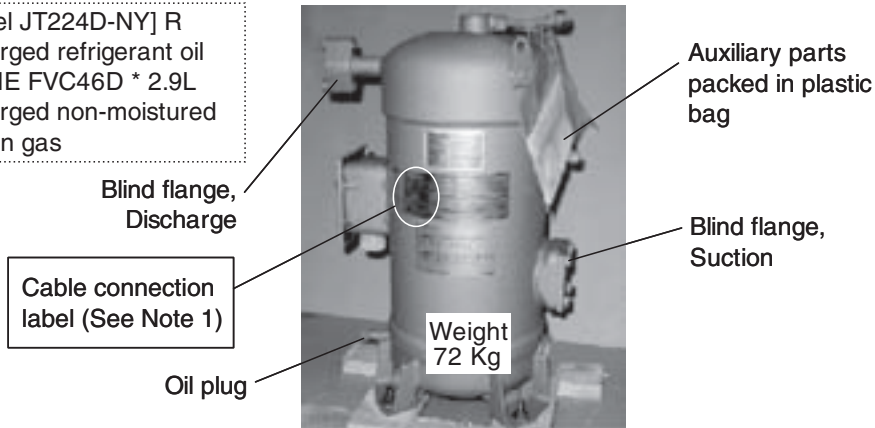
### 4.2.1 Scroll compressor

The compressor is of a hermetic scroll type with the built-in motor so that there are less places where refrigerant may leak. No refrigerant oil is required when the unit is new because it has been charged before delivery.



#### (1) Preperation of spare parts compressor

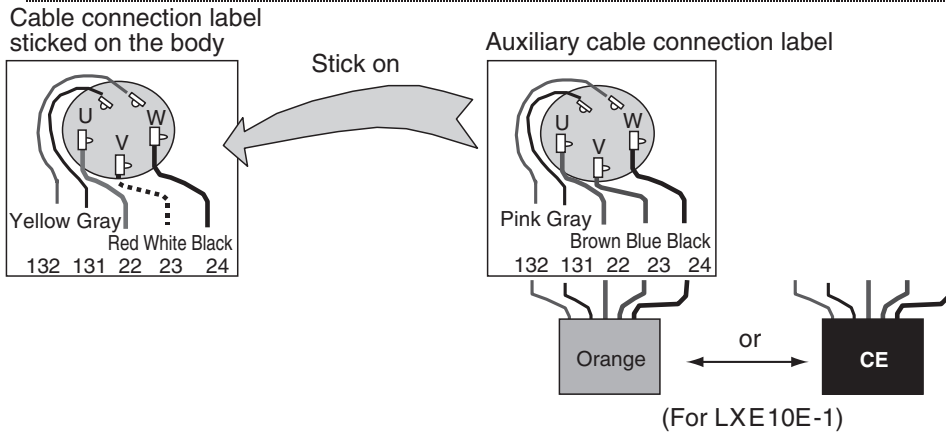
[Model JT224D-NY] R  
 \* Precharged refrigerant oil DEPHNE FVC46D \* 2.9L  
 \* Precharged non-moistured nitrogen gas



[Auxiliary parts]

Instruction card	Gasket, Suction	Gasket, Discharge	Packing 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.



Note 2. Don't drop the precharged refrigerant oil out after removing the blind flanges.

## 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 the refrigerant from service port ④ on discharge line and ⑤ at receiver/water cooled condenser outlet.  
(Refer to the clause 4.1.4 Refrigerant Recovery and charge)
2. Close the discharge and suction side stop valves on the compressor.

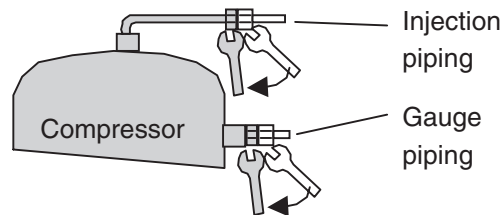
### Disconnect cables and mounting bolts

3. Switch off the power.
4. Open the terminal box cover and disconnect the cables.
5. Remove the mounting bolts.

### Disconnect pipings

6. Remove the flare nuts for the injection piping on the compressor head and gauge piping on the body.

Attention !  
Use double wrenches when the flare nuts are removed.



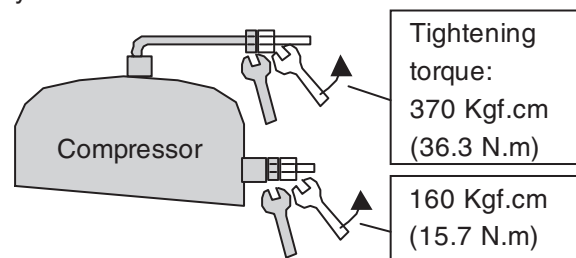
7. Remove the insulation tape fixed on suction flange and discharge flange.
8. Remove the bolts for suction and discharge flange.

## (3) Installation of compressor

### Connect pipings and fix mounting bolts

1. Before connecting pipings, insert and screw in the mounting bolts slightly.
2. Tighten the flare nuts for the injection piping and gauge piping on the body.

Attention !  
Use double wrenches when the flare nuts are tightened.



3. Fix the suction and discharge flanges using with the auxiliary gaskets and the bolts.
4. Tighten the mounting bolts.

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

435 Kgf.cm (42.7 N.m)

## Connect cables

5. Connect the cables to the terminals.

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

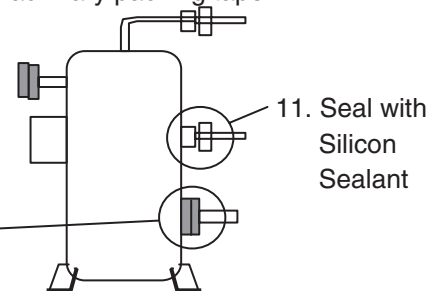
## Charge refrigerant

6. Open the discharge and suction side stop valves.
7. Vacuum and dehydrate from service port ④ and ⑤.
8. Then charge the refrigerant from service port ⑤ and ③.  
(Refer to the clause 4.1.4 Refrigerant Recovery and charge)
9. Check gas leakage especially at sunction/discharge  
flanges and flare nuts for injection piping/gauge piping.

10. Fix the auxiliary insulation tape and fix the auxiliary packing tape  
using clamp band to the sunction  
flanges.

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

10. Fix the auxiliary  
insulation tape



## CAUTION

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



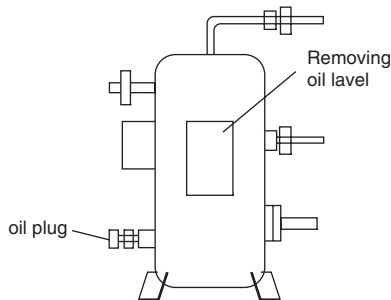
## CAUTION

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



#### (4) Removal of excess refrigerant oil after compressor replacement

The oil plug and "Removing oil label" are fitted on the spare parts compressor.







○ When the compressor is replaced to spare parts compressor, remove the excess refrigerant oil in the following procedure.

1. First check again whether the discharge/suction side stop valves are opened and the cable connection at terminal is correct.

**Preparation** 2. Connect manifold to the discharge and suction ports.

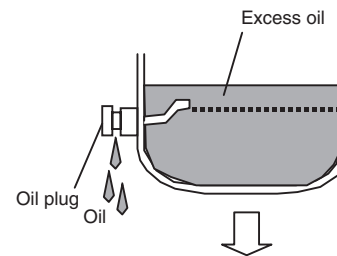
3. Operate the unit for about 5 minutes. Stop the unit.

**Return the oil to the compressor** 4. Operate the S-PTI (Short PTI) and stop at step of "P10".

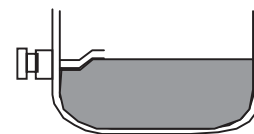
- (1) Set the ON/OFF switch to ON.
- (2) Push and hold the  key for 3 seconds to enter PTI selection mode.
- (3) Selecting the "S-PTI" mode using the   key and pushing the  key activates the short PTI.
- (4) When "P10" is displayed on the LED, stop the unit.

5. Bypass gas from high pressure side to low pressure side of gauge manifold, adjust the low pressure to 0kPa or more.

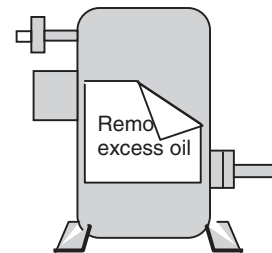
6. Loosen the oil drain plug and remove the excess oil.



7. Close the oil plug when no more oil comes out.



8. Take off "Removing oil level" sticker on compressor body.



REMOVING EXCESS COMPRESSOR OIL IS NOT COMPLETED.

REMOVE EXCESS COMPRESSOR OIL. THEN TAKE OFF THIS LABEL

<Function of step P06 & P08 before P10>

Operate the steps of "P06" and "P08" which are displayed on the LCD.

P06/HPS check:

When the high pressure rises, the circulation rate of refrigerant increases and the oil is expected to return to the compressor.

P08/Pump down check:

The refrigerant contained in the compressor oil is evaporated and separated from the oil.

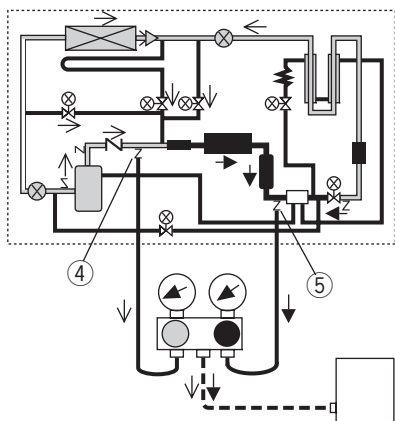
**(5) Procedure for oil replacement of Daikin scroll compressor (with oil gauge)**

If the refrigerator oil is contaminated due to seizure of the compressor's motor etc., replace the oil by following the procedure shown below.

**1. Collecting oil**

- 1) Operate the compressor for about 10 minutes with pull-down.
- 2) Stop the unit and collect all the refrigerant.

Collect completely the refrigerant gas remaining in the unit through ports ④ and ⑤.

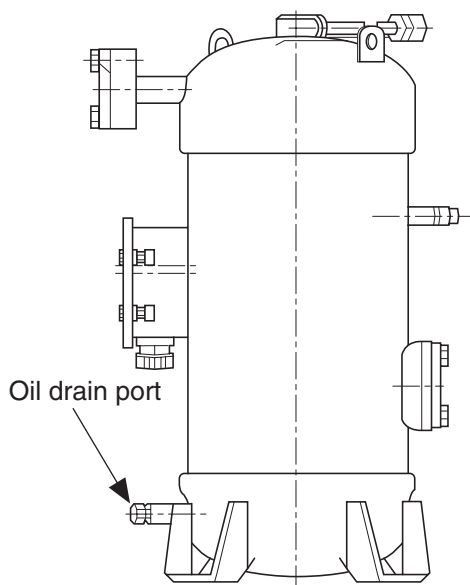


- 3) Drain the contaminated oil after checking that the pressure inside the compressor is 0kPa.

A: Remove the compressor, and tilt it to drain and collect the contaminated oil from the suction flange.

B: When using an oil collector  
Remove the oil gauge and insert the tube of the oil collector into the oil gauge opening to collect the contaminated oil inside the compressor.

Note: Use an oil pan to prevent the oil from escaping when the oil gauge is removed.



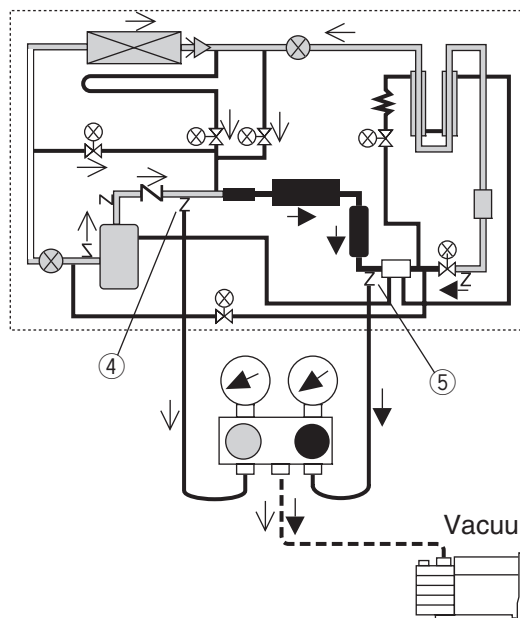
**2. Filling new oil**

- A: ① Fill 2.0L of new oil through the suction flange with the compressor removed.  
② Attach the compressor to the unit.  
(Replace the discharge and suction flange gaskets with new ones.)

Tightening torques:	
Compressor mount base	: 42.7N.m
Suction/discharge flange	: 25.2N.m
φ 9.5 flare nut	: 36.3N.m
φ 6.4 flare nut	: 15.7N.m

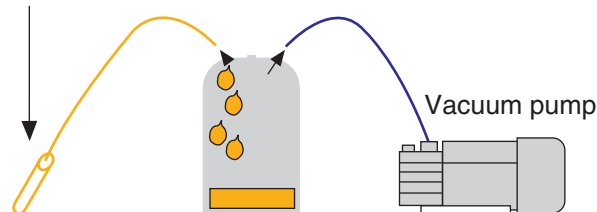
B: If an oil collector is used

- ① Attach a new oil gauge  
(Tightening torque: 26.4 to 32.3N.m)
- ② Use a vacuum pump to let 2L of the new oil to be sucked through the oil drain port of the compressor, and tighten the cap of the oil drain port with torque wrench. (15.7N.m)



Oil collector

(Clean it. Get rid of impurities, contaminants and moisture.)



3. Vacuum in the refrigerant system

- 1) Connect the vacuum pump to the connection port as shown in the figure on previous page.
- 2) Vacuum up to 75.5cmHg or more.

4. Filling a specified amount of refrigerant.

- 1) Connect the gauge manifold as shown in the diagram below and fill a specified amount of refrigerant.  
(Refrigerant: R-134a LXE10E-A: 4.6kg.  
LXE10E-1: 5.4kg)

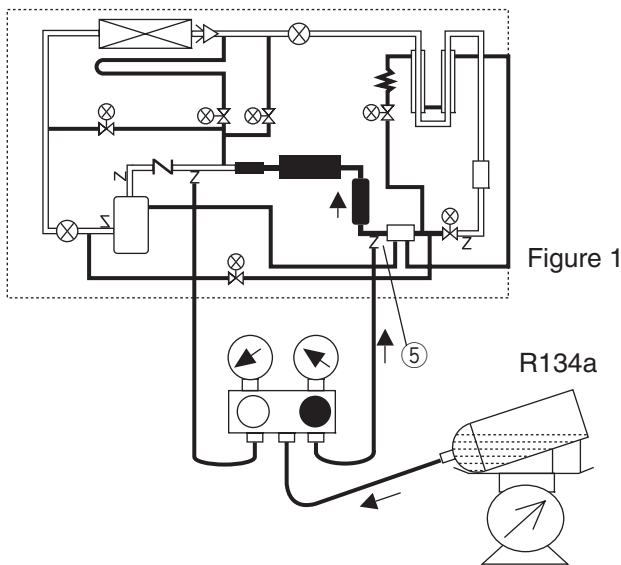


Figure 1

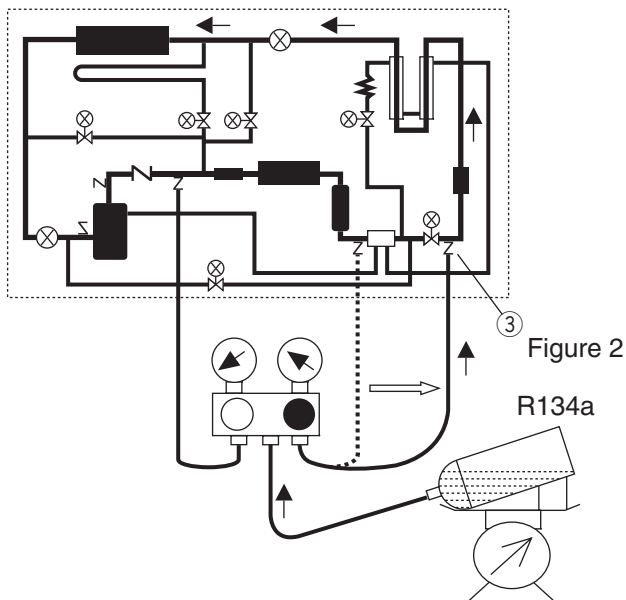


Figure 2

5. Flushing operation and oil contamination

- 1) Set the unit to SP-20, and carry out the pull-down operation for about 30 minutes.
- 2) Check the oil contamination.
- 3) Repeat steps 1 to 7 if the oil is still dirty.

6. Adjustment of oil quantity

Refer to "(4) Removal of excess refrigerant oil after compressor replacement on page 4-11.

7. Replacement of dryer filter

- 1) Carry out the automatic pump down.
- 2) Replace the dryer filter.  
(Tightening torque: LXE10E-A: 54.9N.m,  
LXE10E-1: 28.0N.m)

8. Checking refrigerant gas leaks

9. Securely apply touch-up and silicon sealant to each part.

[Reference]

Compressor oil gauge part number : 1520444

Discharge flange packing : 0132192

Suction flange packing : 0395032

Compressor oil (FVC-46D) part number:

1. 1L can : 99S0843
2. 1L can \*24 pieces : 99S0030
3. 4L can \*6 pieces : 99S0815
4. 18L can \*1 piece : 9990188

## 4.2.2 Fan and fan motor

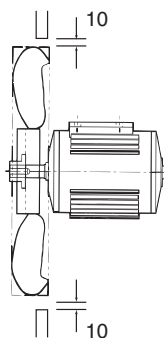
### (1) Specification

		Evaporator	Condenser
Fan	Model	Propeller fan	
	Size	440mm	300mm
Motor	Model	3-phase squirrel-cage induction motor	
	Output (60Hz) (Number of poles)	700/90W (2P/4P)	670W (4P)
	Bearing	Shielded ball bearing with rubber seal 6203VVNX9	Shielded ball bearing with rubber seal Counter-shaft side: 6204UUNC-X Shaft side: 6205UU

### (2) Installation structure

#### a. Condenser fan and fan motor

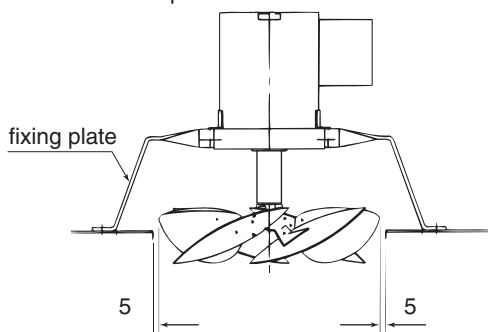
Condenser fan and fan motor



#### b. Evaporator fan and fan motor

When installing the fan, keep contact with the root of the shaft of the fan installing section.

Evaporator fan and motor



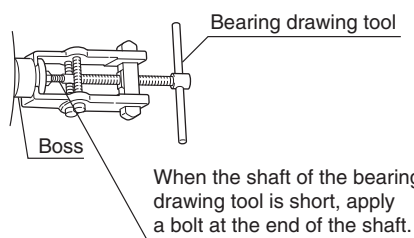
### (3) Replacement procedure

#### 1) Condenser fan

Remove the fan grille and the fan guide, and loosen the two hexagonal sets of screws on the boss of the fan, then pull the fan forward out.

※If the boss is stuck to the motor shaft, use the bearing drawing tool on the market to pull out the fan.

● How to use bearing drawing tool on the market.



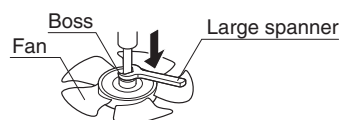
#### 2) Condenser fan motor

- ① Remove the condenser fan.
- ② Disconnect the fan motor cable from the magnetic switch in the control box.
- ③ Remove the fan motor mounting bolts, and replace the motor.
- ④ Install the fan and connect the cable.
- ⑤ After replacement, confirm that the fan is not in contact with the fan guide. (For checking, rotate the fan by hand.)

#### 3) Evaporator fan

Loosen the two sets of screws on the boss portion of the fan, and pull the fan downward out.

※ If the boss is stuck to the motor shaft, use a large spanner as shown below.



#### 4) Evaporator fan motor

- ① After removing the fan at item 3), disconnect the fool proof wire connection.
- ② Remove the motor mounting bolts. (Do not remove the motor mounting base.)
- ③ After replacing the motor, connect the wiring with fool proof wire connection.
- ④ Install the fan.
- ⑤ After replacement, make sure that the fan is not in contact with the fan guide. (To check, rotate the fan by hand.)



## CAUTION

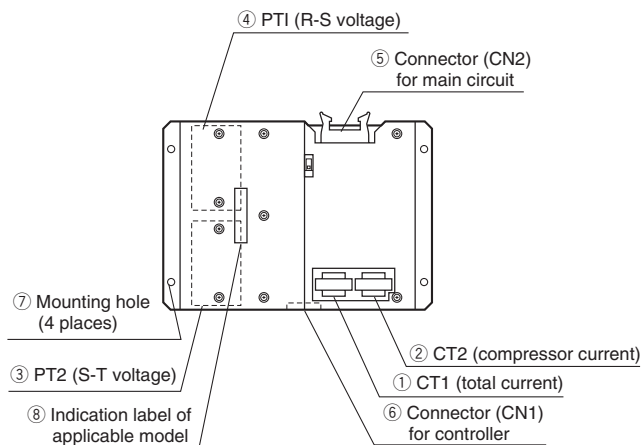
Apply the locking agent on the screws of the fan to prevent from loosening. Otherwise, fan may drop from the motor.

### 4.2.3 PT and CT board (EC9756)

Two function of the measuring device and protector are integrated on this printed-circuit board. This board works as an interface between the main circuit (high voltage) and the controller.

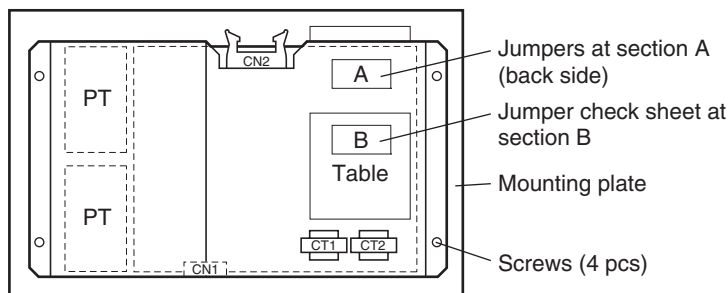
#### (1) Function

Name	Content
Current measurement (CT1, CT2)	AC 0 to 50A (50/60Hz)
Voltage measurement (PT1, PT2)	AC 150 to 600V (50/60Hz)
Compressor overcurrent protection	Unit with 400V only : 26.0A Unit with 200V and 400V: 15.0A
Phase sequence detection	The phase sequence is detected by sending the voltage waveform to the controller.



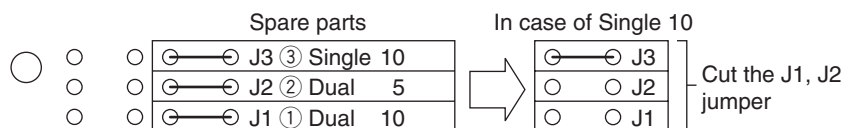
#### (2) Pre-assembly work

Before installing the PT/CT board (spare parts), cut jumpers and remove the mounting plate for the over current setting.



#### (2-1) Overcurrent setting

Cut jumpers at section A according to the following chart in order to make the over current setting.  
Example: over current setting for 10Hp single power



#### (2-2) Indication of check marks

After cutting jumpers, indicate check marks on the table B.

CASE	Type	Jumper			CASE	Check
		J1	J2	J3		
1	Dual 10	⊖—⊕	○ ○	○ ○	1	
2	Dual 5	○ ○	⊖—⊕	○ ○	2	
3	Single 10	○ ○	○ ○	⊖—⊕	3	✓

Example of check mark indication

(2-3) Removal of mounting plate

Check the following table to see if the mounting plate should be removed. If the mounting plate must be removed, remove the four screws and dismount the mounting plate.

**Over current setting and removal of mounting plate**

Model	Spare parts	LXE5C	LXE10C	LXE10D	LXE10D LXE10E
Type	——	Dual 5HP	Dual 10HP		Single 10HP
Over current setting value	——	8.5A	15A		26A
Jumpers	J3	⊖—⊖	○ ○	○ ○	⊖—⊖
	J2	⊖—⊖	⊖—⊖	○ ○	○ ○
	J1	⊖—⊖	○ ○	⊖—⊖	○ ○
Mounting plate	Provided	Not to be removed	Not to be removed	To be removed	To be removed

○ ○ : Cut jumper

⊖—⊖ : Do not cut jumper

(3) Replacement procedure



## CAUTION

Be sure that the main power is disconnected.

- ① Disconnect the wires routed via CT1 and CT2 from the terminals.  
※At this time, take care to prevent CT1 and CT2 from being damaged.
- ② Disconnect the connector (CN1) for the controller and the connector (CN2) for the main circuit.
- ③ Remove four mounting nuts.
- ④ After replacing the PT and CT board, connect the lead wired in reverse order of the above removal procedure.
- ⑤ After checking the wiring once, test-run the system to verify that no trouble is found.

#### 4.2.4 Electronic expansion valve

- Model Coil : HCM-MD12DM-1
- Body : HCM-BD35DM-1

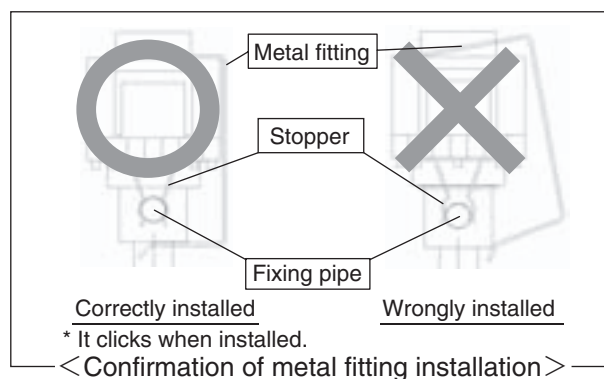
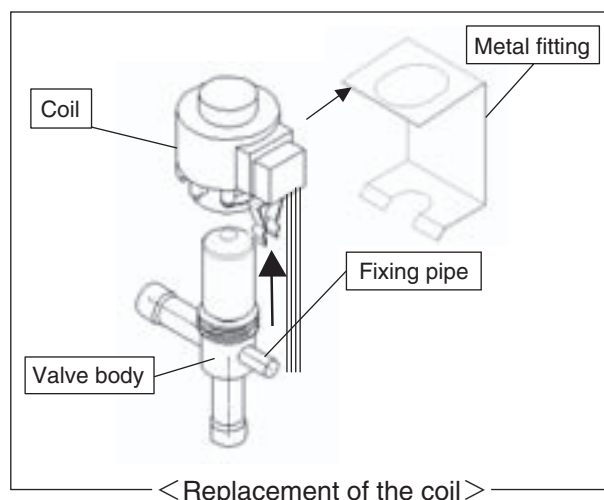
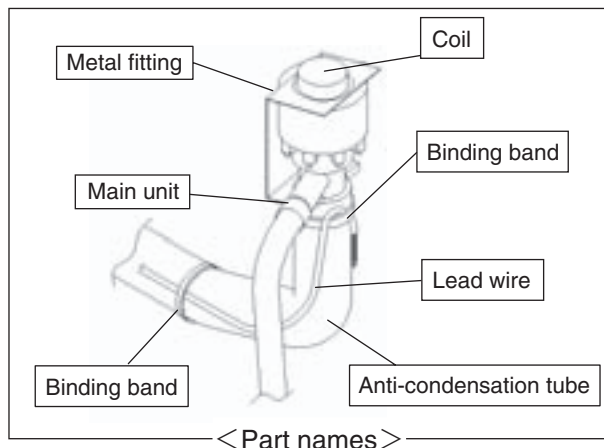
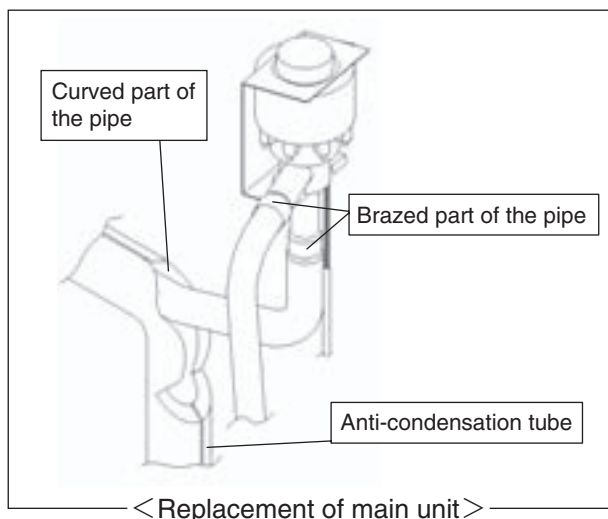
This unit adopts an electronic expansion valve. The electronic expansion valve controls the optimum refrigerant flow rate automatically, using the temperature sensor at the evaporator inlet and outlet pipes. In case of emergency including controller malfunctions, refer to the chapter of troubleshooting, section 6.5, Emergency operation.

##### (1) Replacing the coil

- ① Remove the binding band fixing the coil lead wire.
- ② Disconnect the connector of the coil.
- ③ Remove the metal fitting and the coil.
- ④ Replace the old coil with a new one.
- ⑤ Attach the coil and the metal fitting.
- ⑥ Mount the connector of the coil.
- ⑦ Fix the coil lead wire with a binding band.

##### (2) Replacing the body

- ① Remove the binding band fixing the coil lead wire.
- ② Detach the anti-condensation tube until the curved part of the pipe.
- ③ Remove the metal fitting and the coil.
- ④ Remove the brazed part of the pipe.
- ⑤ Insert the new valve body in the pipe.
  - Braze the new valve body while cooling it with a wet cloth.
- ⑥ Mount the coil and the metal fitting.
- ⑦ Mount the anti-condensation tube.
- ⑧ Fix the coil lead wire with a binding band.



#### 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 fitting damage or pinch the lead wire.
  - 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 conduct capacity control operation.

#### 1. Replacing the coil

##### ● Coil removing procedure

- (1) Disconnect the SMV lead wire connector ① from the inside of control box.
  - ① from the inside of control box.
- (2) Cut the binding band 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 of coil

- (1) Mount the 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) Fix the coil ④ and coil bracket ⑦ with the tie wrap ⑤ so that the coil ④ and the position of the dimple of coil bracket ⑦ should not be displaced.

Note) Ensure that the tie wrap is not tilted.

- (3) Arrange the lead wires as shown in the Fig. A and Fig. D and fix them with the binding band so that the slack of lead wires should be prevented.

- (4) Replace the upper rubber cover ①.

Note) Set the engaging section of upper cover to fit with the rim of lower rubber cover ⑩.

- (5) Place the binding band ③ to fit the upper and lower covers

Note) Fix the lead wire carefully so that water does not enter into its protecting tube ⑪.

(Fix lead wire with binding band.)

- (6) Connect the connector of lead wire ① to the inside of control box.

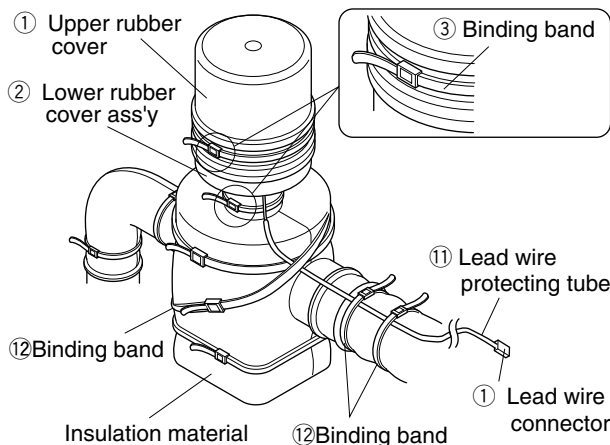


Fig. A

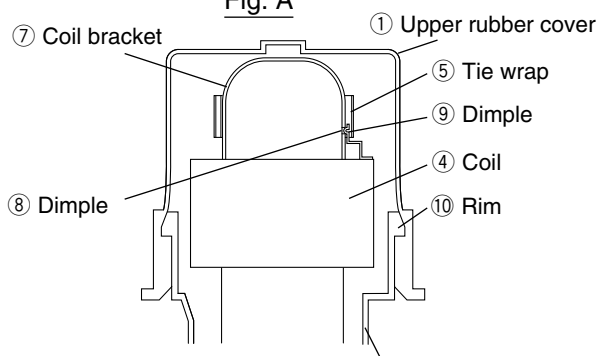


Fig. B

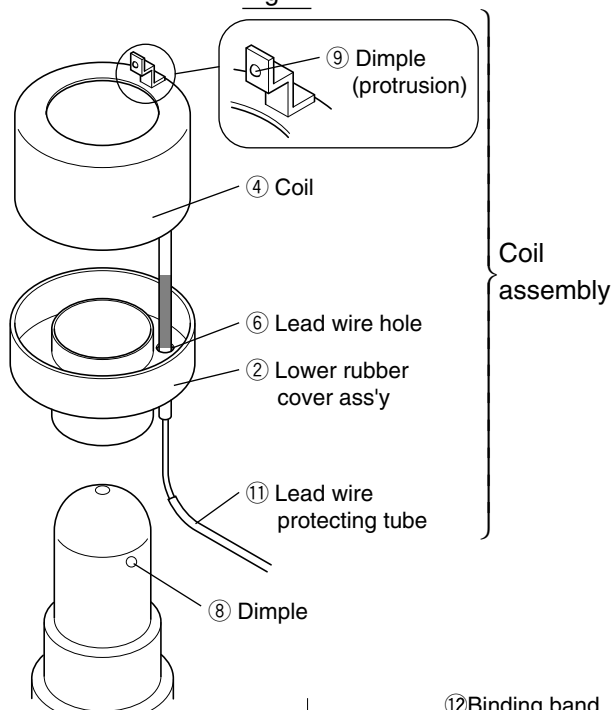


Fig. C

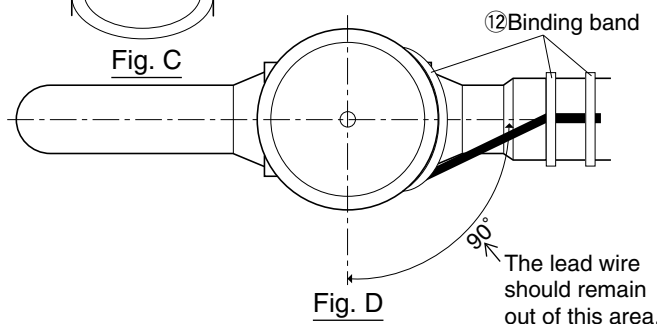
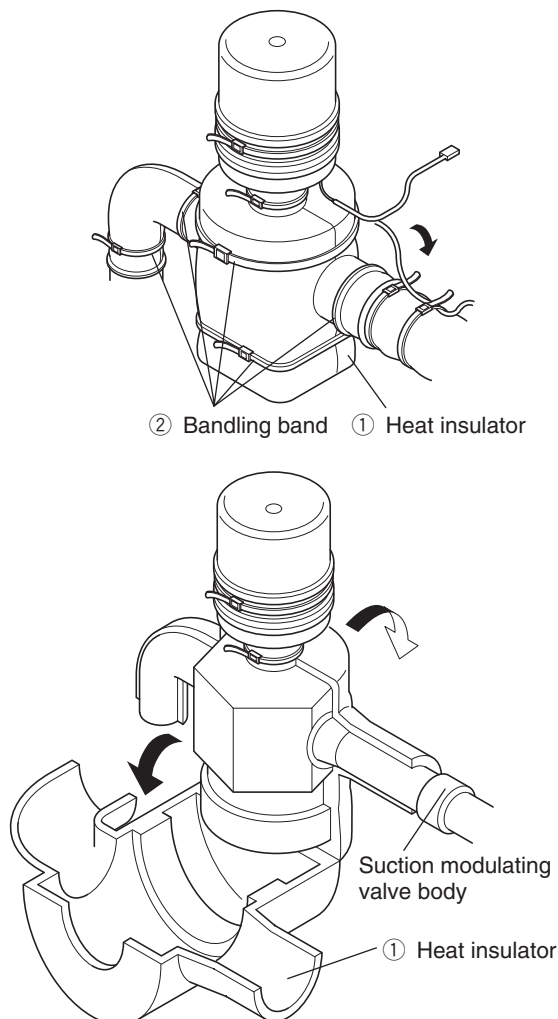


Fig. D



## 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 cut the binding band ②.
- (3) Heat up the brazed joint on the piping of SMV body to disconnect the pipe at brazed section.
- (4) Assemble piping of the SMV body, and conduct brazing while keeping the temperature of lower body of SMV below 120°C (248°F) by covering the body with wet cloth.  
Note) When brazing, to keep the temperature of body, including valve body, coil, lead wire, etc. below 120°C by supplying water.  
In this work, be sure to prevent water from entering into the lead wire protection tube.
- (5) Install the heat insulator ① and fasten it with banding band ②.
- (6) Install the coil. Refer to the section 1. "Replacing the coil" for removing procedure on the previous page.

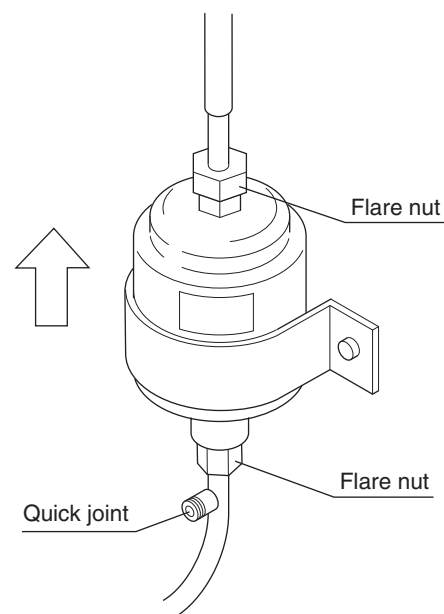


## 4.2.6 Drier

The drier automatically absorbs moisture in the refrigerant while it is circulated. It also commonly works as a filter to remove dust in the refrigerant. Replace the drier if it does not absorb moisture, is blocked, or if the system has been opened to the atmosphere. When installing the new drier, follow the arrow and do not make any mistake about the installation direction of the drier

### (1) Replacement procedure

- ① Conduct **the automatic pump down** to collect the refrigerant in the liquid receiver. Refer to page 4-3 and 4-4 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 completing of the replacement of the drier, be sure to conduct refrigerant leakage test to confirm that no refrigerant leakage is occurring.
- ④ Check on the green colour of the liquid / moisture indicator after system operation has started.
- ⑤ Apply a silicon sealant to the flare nut section.  
Adhere some anti-corrosion tape.

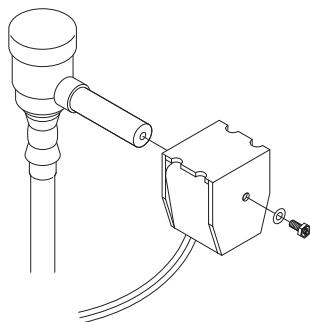


### 4.2.7 Solenoid valve

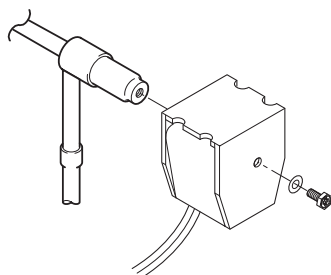
Two kinds of solenoid valves are employed for the unit.

Coil is common 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		
Defrosting Solenoid valve.	DSV		
Hot gas Solenoid valve.	HSV		
Reheat Solenoid valve. (optional)	RSV		



VPV-803DQ  
Fig. 1



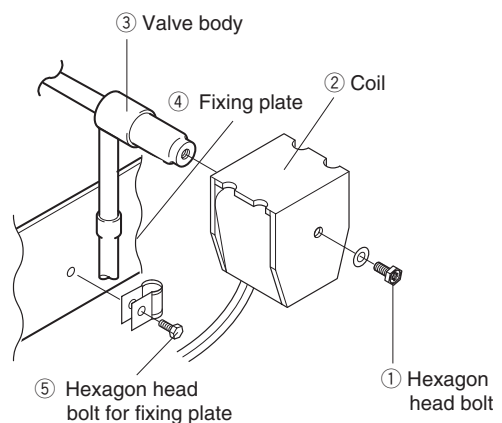
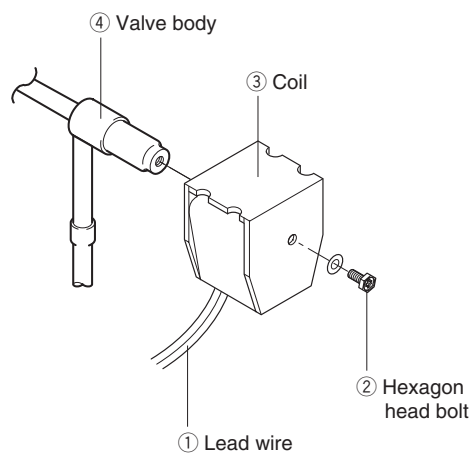
NEV-202DXF  
Fig. 2

#### (1) Replacing the coil

- ① Remove the lead wire connector from the inside of the control box, and cut and recover the binding band which fastens the lead wire.
- ② Remove the hexagonal head bolt on the top of the coil to pull the coil out.
- ③ Replace the coil with a new one and restore the hexagonal head bolt, the binding band and connector on the original position.  
When reassembling the coil, the tightening torque should be 1.2 N·m (12.2 kg·cm).

#### (2) Replacement of valve body

- ① Remove the hexagonal head bolt on the top of the coil to pull the coil out.
- ② Remove the hexagonal head bolt of the fixing plate, and cut the two pipes at the side of the valve body.  
Disconnect the remaining pipes at the brazed joint sections.
- ③ Insert the new valve body into the pipe and conduct brazing while keeping the temperature of the valve body below 120 °C (248 °F) by cooling.
- ④ Install the coil and restore the hexagonal head bolt of the fixing plate and the connector into their original position.

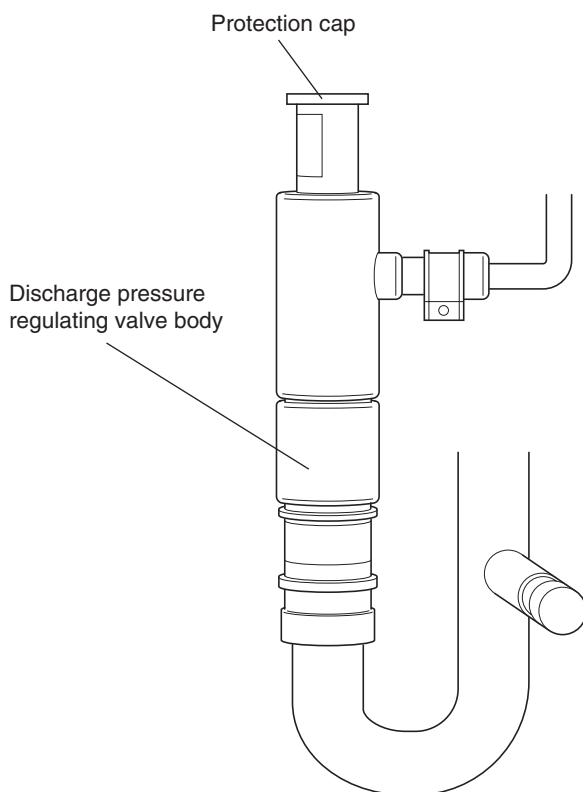


#### 4.2.8 Discharge pressure regulating valve

- Model KVR15

##### (1) Replacing the valve

- 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/cm<sup>2</sup>).
- ② When brazing, it is required to cool the valve body in order to keep the temperature of valve body below 140 °C by covering the body with wet cloth or the like.
- ③ After brazing work, set 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 After replacement, carry out refrigerant leakage check, and make sure there are no leaks.

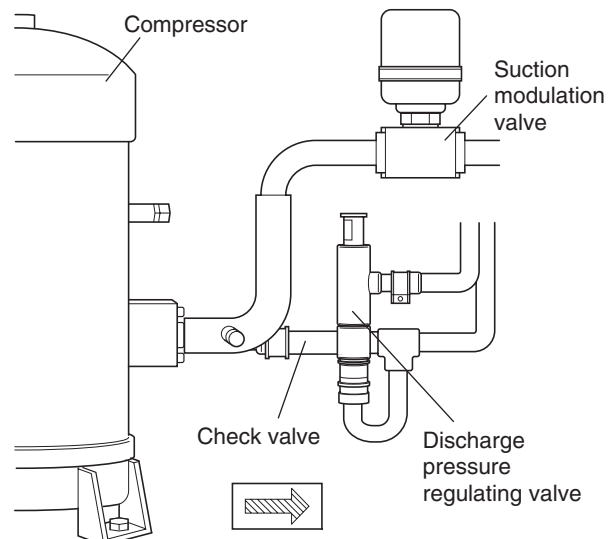


#### 4.2.9 Check valve

- Model LCV(B)5

##### (1) Replacement procedure

- ① Remove the pipe clamp which fixes the check valve, then heat up the valve to disconnect the brazed joint.
- ② Install the new check valve taking care to install it in the correct direction, which is the same direction as the arrow shown in the label.
- ③ Conduct brazing while cool the center part of valve with a wet cloth to keep the temperature of the valve body below 120 °C (248° F)
- ④ After replacing the valve, carry out refrigerant leakage check, and make sure that there are no leaks.



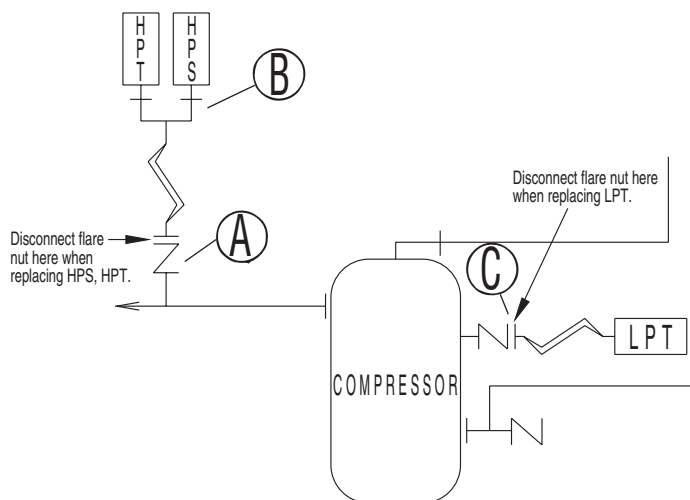
#### 4.2.10 High-pressure switch (HPS)

- Model ACB-KB15
- Set point OFF : 2400kPa (24.47kg/cm<sup>2</sup>)  
ON : 1900kPa (19.37kg/cm<sup>2</sup>)

When the refrigeration pressure of the unit rises abnormally, the compressor stops for safety. The HPS will be activated when the pressure exceeds the set point, as a result of trouble with the condenser fan.

##### (1) Replacement procedure

- ① Disconnect the lead wire from the control box.
- ② In order to prevent refrigerant from flowing out, disconnect the high-pressure gauge piping from the gauge joint (with check valve) **(A)** on the compressor side.
- ③ Remove the flare nut **(B)** and mounting screws of HPS on the casing at the left side of the compressor.
- ④ Replace the HPS. After tightening the flare nut **(B)**, tighten the flare nut **(A)**.
- ⑤ After tightening **(A)**, slightly loosen the flare nut **(B)**, remove air, and retighten **(B)**.
- ⑥ After replacing, carry out the refrigerant leakage check, and make sure that there are no leaks.



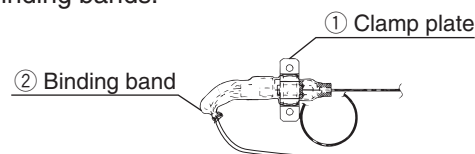
#### 4.2.11 Low pressure transducer (LPT)

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

The LPT is located in the refrigerant circuit. The operating low pressure value is displayed on the controller indication panel.

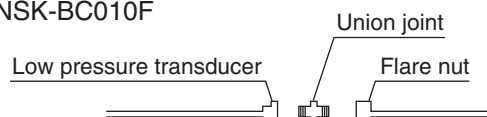
##### (1) Replacing the transducer

- ① Disconnect the lead wire from the control box.
- ② In order to prevent refrigerant from flowing out, disconnect the low-pressure transducer piping from the gauge joint (with check valve) **(C)** on the compressor side.
- ③ Remove two screws on the clamp plate fixing low pressure transducer in place, and cut the binding bands.

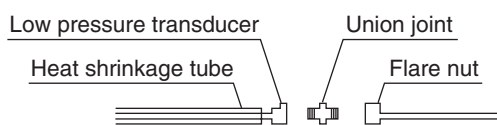


- ④ Remove the heat shrinkage tube, and disconnect the connector from the low pressure transducer.

● NSK-BC010F



- ⑤ Insert the pressure transducer cable through the heat shrinkage tube, 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.

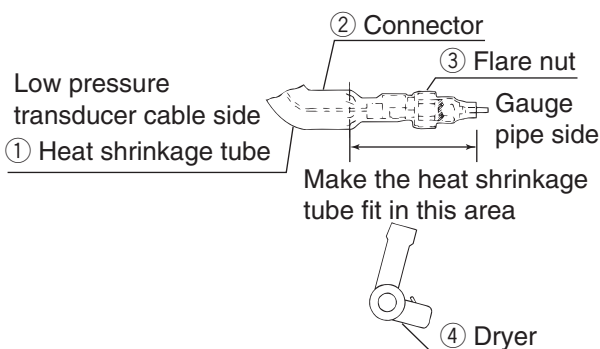


## CAUTION

**Do not expose the low pressure transducer to hot air of a dryer for excess time.**

Otherwise, the transducer may be damaged.

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

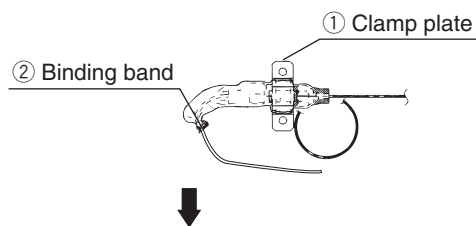


- ⑦ Apply sealer between the heat shrinkage tube and the flare nut. (Sealer :KE4898)



- ⑧ Fix the low pressure transducer with the clamp plate, and fix the cable with the binding band.

Fix the shrinkage tube end of the cable side downward for prevention of water entering into the tube.



Fix the tube directing the end downward

#### 4.2.12 High pressure transducer (HPT)

Model	NSK	
Transducer type	NSK-BC030F	
Identification color	Transducer	Red & Brown body
	Connector	Nothing

The HPT is located in the refrigerant circuit. The operating high pressure value is displayed on the controller indication panel.

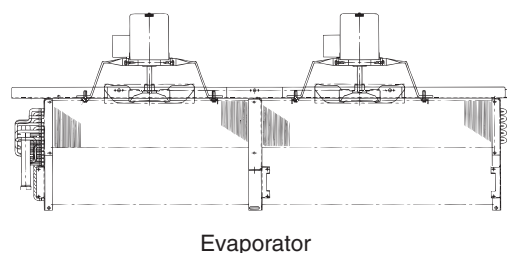
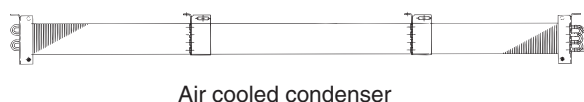
##### (1) Replacement procedure

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

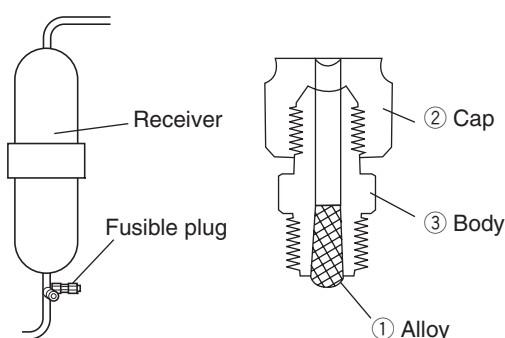
#### 4.2.13 Air-cooled condenser and evaporator

This finned coil is compact and has uniform heat exchanging performance and high heat exchanging efficiency due to the adoption of corrugated fins.

- Washing of air-cooled condenser  
Carefully flush the air-cooled condenser with fresh water after trip, although this type of condenser employs thick fins and electrodeposition coating for high corrosion resistance.
- For the maintenance of the air-cooled condenser, remove the fan grille, fan guide and temperature recorder box. For the maintenance of the evaporator, remove the rear panel of the evaporator.



#### 4.2.14 Fusible plug

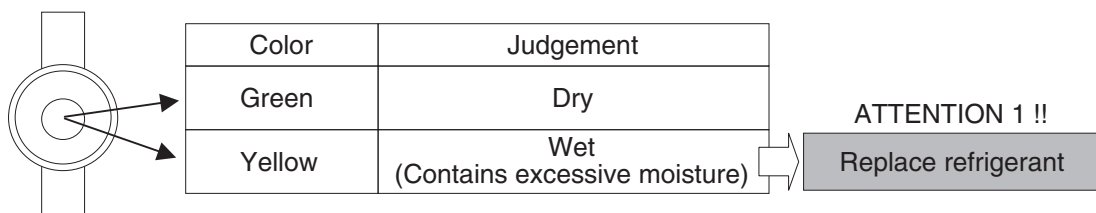


- Replacement of fusible plug  
If pressure rises abnormally in the refrigeration circuit, the fusible plug is automatically activated, so, thoroughly check the possible causes if the fusible plug melts. If the fusible plug is activated, the fusible alloy ① melts and refrigerant blow out (Melting point: 95°C ~100°C). For replacement, ①-③ shall be replaced.

### 4.2.15 Liquid / Moisture indicator

Liquid/Moisture Indicator permits checking of the refrigerant flow rate and moisture content in the refrigerant.

#### (1) Moisture indicator



#### (2) Judgement for refrigerant flow rate (normal, shortage or overcharge) (for unit with 5.2 kg refrigerant)

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 deg. C.
	RS < approx 0°C Flashing	Shortage	Refrigerant charge is short if the indicator shows flashing of refrigerant when RS is under approx 0 deg.C.
	RS > approx 0°C Flashing	Normal in most cases	Refrigerant charge is normal with flashing in the indicator in most cases, when RS is above approx 0 deg. C.
Chilled operation	Flashing	Normal in most cases	Refrigerant charge is normal with flashing in the indicator in most cases, during chilled operation with capacity control.

**ATTENTION 2 !!**  
As flashing here does not mean gas shortage, do not charge with additional refrigerant.  
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 of the compressor.

(Specified amount of refrigerant: R134a 5.2Kg/LXE10E100 or later)

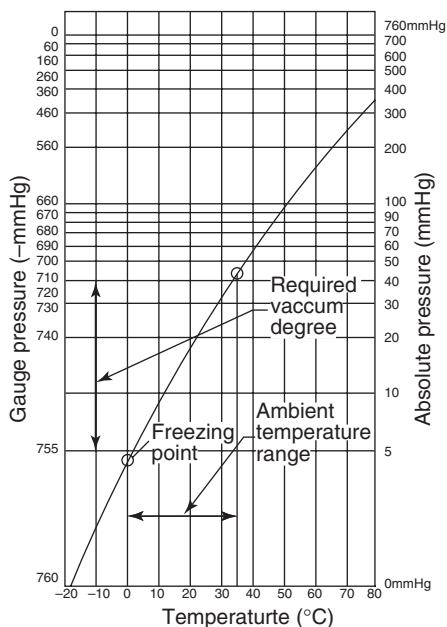
### 4.2.16 Evacuation and dehydrating

After repairing the refrigerant system, vacuum-dehydrate the system before charging the refrigerant.

Vacuum-dehydrating is the process to make the circuit dry by purging the moisture (liquid) in the circuit to outside in state of vapor (gas) using the vacuum pump.

As the pressure lowers below normal atmosphere (760mmHg), the boiling point of water rapidly 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), vacuum-dehydrating will be impossible unless the vacuum degree is lower than -752mmHg. For vacuum-dehydrating, it is important to select and maintain the vacuum pump.



#### (1) Vacuum pump selection

Select a vacuum pump considering the following two points.

- 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 vacuum-dehydrating work, be sure to confirm that the pump achieves the vacuum degree of -755mmHg or lower by using the vacuum 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
Oilless 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.

With the pump of an oil rotary type, it is important to replace the oil and check the achievability every 1 to 2 months.

#### (2) Vacuum-dehydrating method

There are two method of vacuum-dehydrating of normal vacuum-dehydrating and special vacuum-dehydrating. In general, the normal vacuum-dehydrating is applied. If any moisture is enters the circuit, apply the special vacuum-dehydrating method.

[normal vacuum-dehydrating]

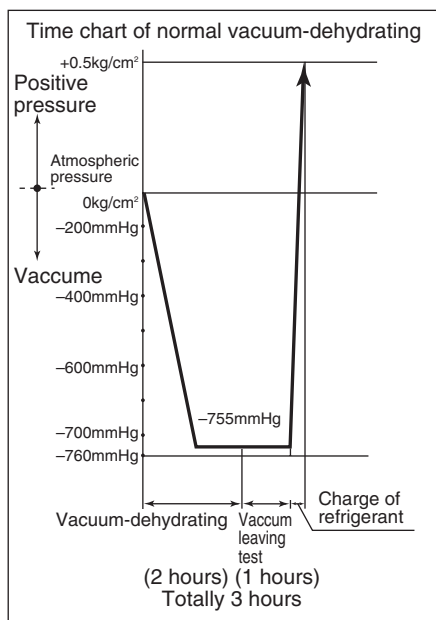
##### ① Vacuum-dehydrating(first time)

Connect the gauge manifold to the service ports of the liquid line and the outlet of discharge pressure regulator. Run the vacuum pump for 2 hours or longer. (The achievable vacuum degree must be -755 mmHg or lower)

If a pressure of -755mmHg or lower can not be achieved even after pump operation of 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 operation of 3 hours or more, check for leakage.

Note: Evacuate the system from the service ports ④ of both liquid and outlet of the check valve ⑤, because the system is blocked on the way since the liquid solenoid valve is provided on the way of the system.

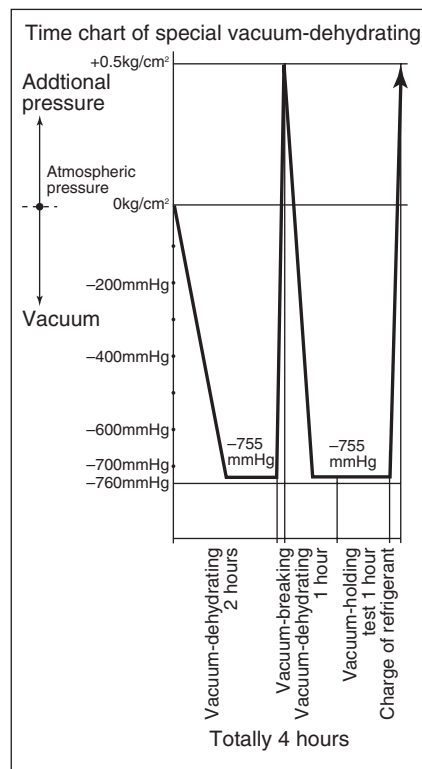
- ② Vacuum holding test  
Hold the system at a pressure of  $-755\text{mmHg}$  or lower for 1 hour or longer, and confirm that the vacuum reading does not rise on the vacuum gauge. If it rises, moisture or leakage may exist in the system. However, take care not to leak air from the gauge manifold. If air enters, it is recommended to use the copper tube directly instead of gauge manifold.
- ③ Charging of refrigerant  
After the vacuum-holding test, make the circuit vacuum 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 vacuum-dehydrating]  
This method is that the vacuum-breaking process with nitrogen gas is integrated one time or more in the same way as the normal vacuum-dehydrating process.

- ① Vacuum-dehydrating (first time) ..... 2 hours
- ② Vacuum-breaking (first time)  
Nitrogen gas is pressurized to  $0.5\text{kg/cm}^2$  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 much moisture, it can not be removed by this method. Therefore, do not allow water entry or produce water during the refrigerant piping work.
- ③ Vacuum-dehydrating (second time)  
Run the vacuum pump one hour or longer. (The achievable vacuum must be  $-755\text{mmHg}$  or lower.)  
If pressure of  $-755\text{mmHg}$  or lower can not be achieved even after vacuuming of 2 hours, repeat step ② vacuum-breaking and ③ vacuum-dehydrating.
- ④ Vacuum holding test ..... 1 hour } Same as normal vacuum-dehydrating
- ⑤ Additional charge of refrigerant }

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



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



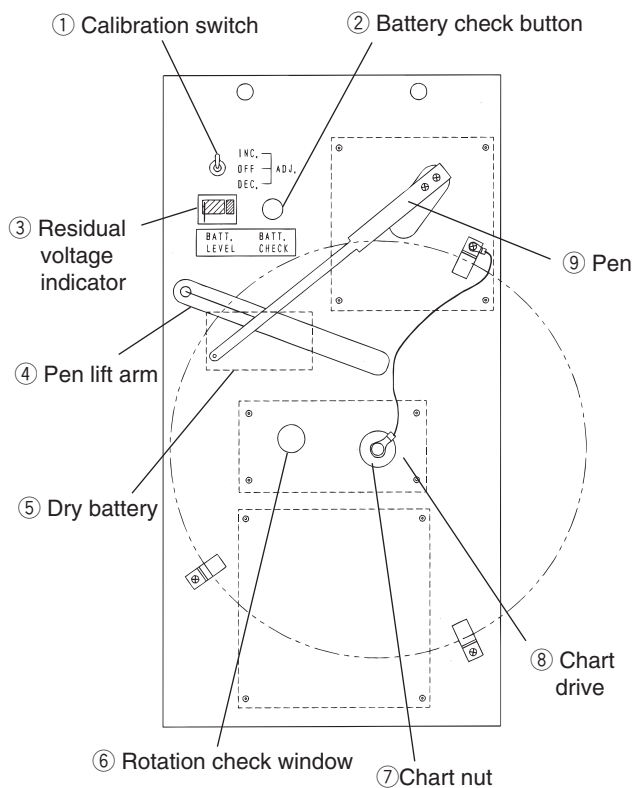
## 5. OPTIONAL DEVICES

The following optional devices are available for some models. As for other options, see Chapter 8 in the SUPPLEMENTARY MANUAL.

### 5.1 Electronic temperature recorder

#### 5.1.1 Standard type

This recorder automatically records the control temperature (either return air temperature or supply air temperature) with the chilled/partial frozen and frozen switching signals from the controller. The faulty sensor detection function and calibration function are integrated for maintenance and inspection.



#### (1) Specifications

- Model DER9601A
- Power supply AC13V 50/60Hz
- Recording temperature range  $-30.0$  to  $+25.0$  °C ( $-22$  to  $+77$  °F)
- Chart paper Round type 8-inch pressure-sensitive paper [PARTLOW PSD-217C (REV.A) or equivalent] (31days/rev.)
- Battery

Use	Type	Specification	Standard
Chart drive	R14P (SUM-2)	DC1.5 V U2 (C size) type	JISC8501 IEC60086
Recording pen goes to upper end of the chart	6LR61	DC9V	JISC8511 IEC60086

#### Battery life

Approx. 1 year (Check with the residual voltage indicator)

- Residual voltage indicator (optional)  
Green zone : Operable  
Silver zone : Usable for 7 days  
Red zone : Replace battery
- Recording pen driving system  
Pulse motor drive
- Sensor (Thermistor)

Model	Use
ST9503-4	RSS: For supply air temperature recording
ST9503-2	RRS: For return air temperature recording

#### Note : Recording accuracy

The accuracy of the recorder and the sensor are shown in the following table.

The adjustment with calibration is applicable only on the recorder.

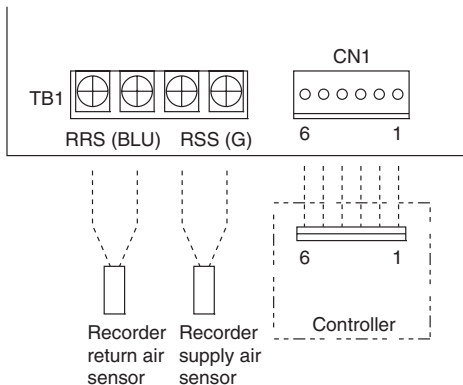
Recording temperature range	Accuracy °C		
	Recorder	Sensor	Total
$25^{\circ}\text{C}$ to $10^{\circ}\text{C}$	$\pm 1.0$	$\pm 1.0$	$\pm 2.0$
$10^{\circ}\text{C}$ to $-15^{\circ}\text{C}$	$\pm 0.5$	$\pm 0.3$	$\pm 0.8$
$-15^{\circ}\text{C}$ to $-29.9^{\circ}\text{C}$	$\pm 1.0$	$\pm 1.0$	$\pm 2.0$

**(2) Devices and schematic wiring diagram**

1) Devices

Device	Location
Temperature recorder board	In the temperature recorder box
Recorder return air sensor (RRS)	Evaporator suction area
Recorder supply air sensor (RSS)	Evaporator discharge area

2) Schematic wiring diagram



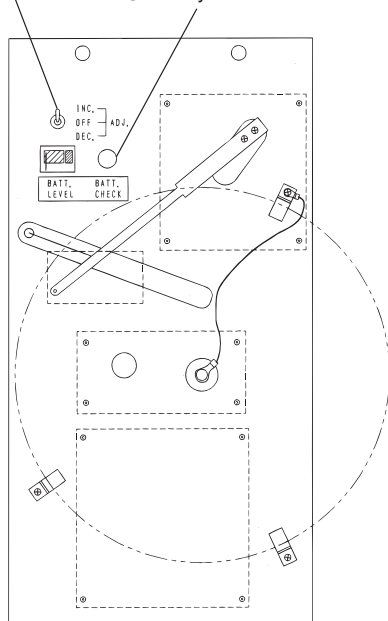
**(3) Checking (Calibration) of the indicated value on the recorder (optional)**

This recorder can be checked for its switching function for recording sensors and temperature indication function regardless of inside temperature, and can be adjusted.

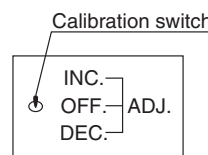
- 1) Switching function for recording sensors  
By operating the set temperature on the controller, the temperature recorder automatically switches the recording sensors, return air sensor (for frozen and partial frozen modes) and supply air sensor (for chilled mode)

① Calibration switch

② Battery check button



2) Calibration function



INC : To increase temperature figure  
DEC : To decrease temperature figure

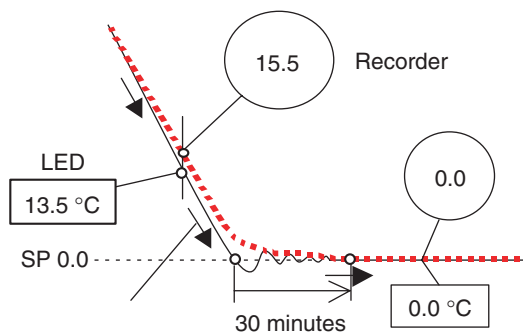
- Notes: 1. The pen is adjusted to suit to the PSD-217C (REV.A) recording chart paper or its equivalent. Do not use the recording charts other than ones mentioned above.  
2. Do not change the position of pen during transportation.  
3. When the power is supplied, the pen vibrates momentarily and will return to its original position due to the recording characteristics, but this is not a sign of trouble.

**CAUTION**

During the indoor temperature is stable, recording temperature is adjustable by changing the pen position using the calibration switch. Do not move the temperature recording pen manually.

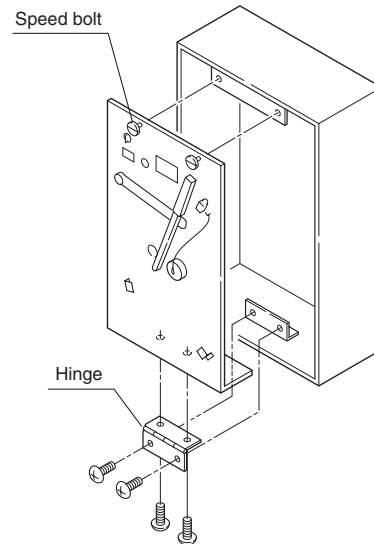
**(4) Characteristics of the recorder**

During the pull-down operation and for 30 minutes after the setting temperature is reached, the recorder calculates the accumulated average temperature every 7.5 minutes. As the temperature is displayed at the pen tip with a certain delay, the actual temperature will be higher than the temperature displayed in the LED. Therefore, the adjustment of the temperature displayed at the pen tip should be done after a lapse of 30 minutes since the setting temperature is reached.



### (5) Replacement of temperature recorder

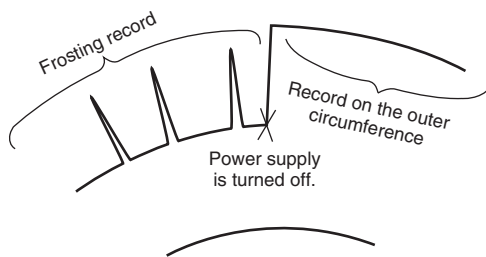
- ① Turn off the circuit breaker.
- ② Remove the wiring connector and sensors from the back of the temperature recorder.
- ③ Remove the hinge on the bottom and the speed bolts on the top.
- ④ Replace the temperature recorder board.
- ⑤ After replacement, be sure to check the wiring and operation.



### 5.1.2 Rechargeable battery type

#### ● Temperature record with power supply turned off

When the power supply is turned off, the pen will move to the outer circumference of recording sheet simultaneously.



#### ● Rechargeable battery

The rechargeable battery is equipped on the electronic temperature recorder.

(Application of rechargeable battery)

- ① Drive of chart
- ② Pen swings up when the main power is turned off (+25°C is recorded.)

(Specifications of rechargeable battery)

- Charge type nickel cadmium battery (7.2V, 600mA)
- Model:6N-600AA-2

(Replacement reference)

- As reference, 2 to 4 years have elapsed.
- Replace the battery if the pen does not swing up to +25°C when the breaker is turned off.
- Confirm the life of rechargeable battery and make sure the internal gear rotating properly through the rotation check window when the battery was replaced.

## 5.2 USDA transportation

If USDA receptacles and sensors (Optional) are provided to the unit, the unit can take USDA transportation. (Refer to arrangement of main component in clause 2.2.2.)

### 5.2.1 Type of USDA sensor/receptacle

Two types of sensors can be installed, according to the type of receptacles.

User should confirm the type of receptacles and select proper sensor in below table.

According to the model, the quantity of receptacle is different. (3 or 4)

Type	Receptacle	Sensor
1	C016 30G006 20012	ST9702-1
2	HD10-3-96P	NTC type probe

\*3 receptacles : USDA 1, USDA 2, USDA 3

4 receptacles : USDA 1, USDA 2, USDA 3, CTS (Cargo temperature sensor)

### 5.2.2 Initial setting

User should confirm initial setting of controller as below.

- 1) USDA transportation: Optional function setting mode described in page 3-20  
Quantity of receptacles should be set
- 2) USDA sensor type: Optional condition function setting mode described in page 3-23  
Type of USDA sensor should be set.

### 5.2.3 USDA sensor calibration

USDA requires sensor calibration every transportation and report each offset figure. Free-supply downloading software enable to assist this. Please refer to "Operation manual for Daikin Container Communication Software".

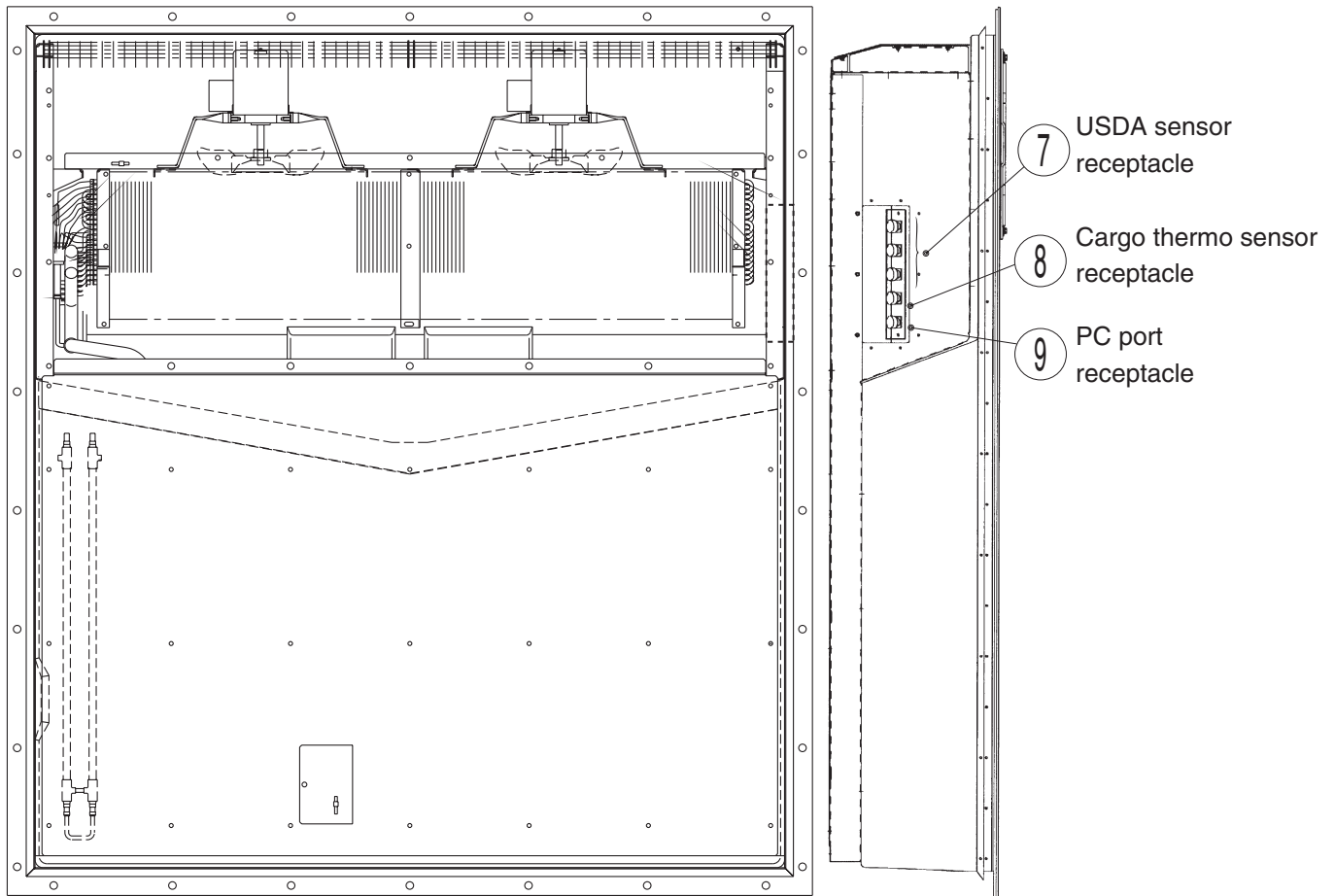
### 5.2.4 USDA transportation requirement

Cargo and refrigeration unit shall be required pre-cooling before cargo loading. As to position of USDA sensors and operation, please refer to the guidance of USDA.

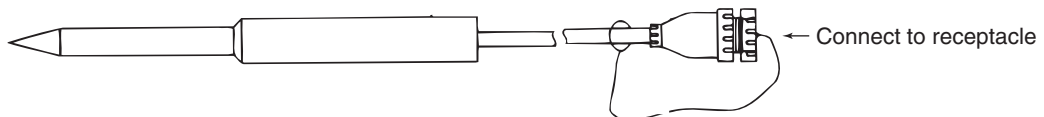
### 5.2.5 USDA report required by USDA local officer

Free supply downloading software enables you to make document easily, which USDA local officer requires. In detail, please refer to "Operation manual for Daikin Container Communication Software".

●An example of installation of USDA receptacle inside



●USDA sensor

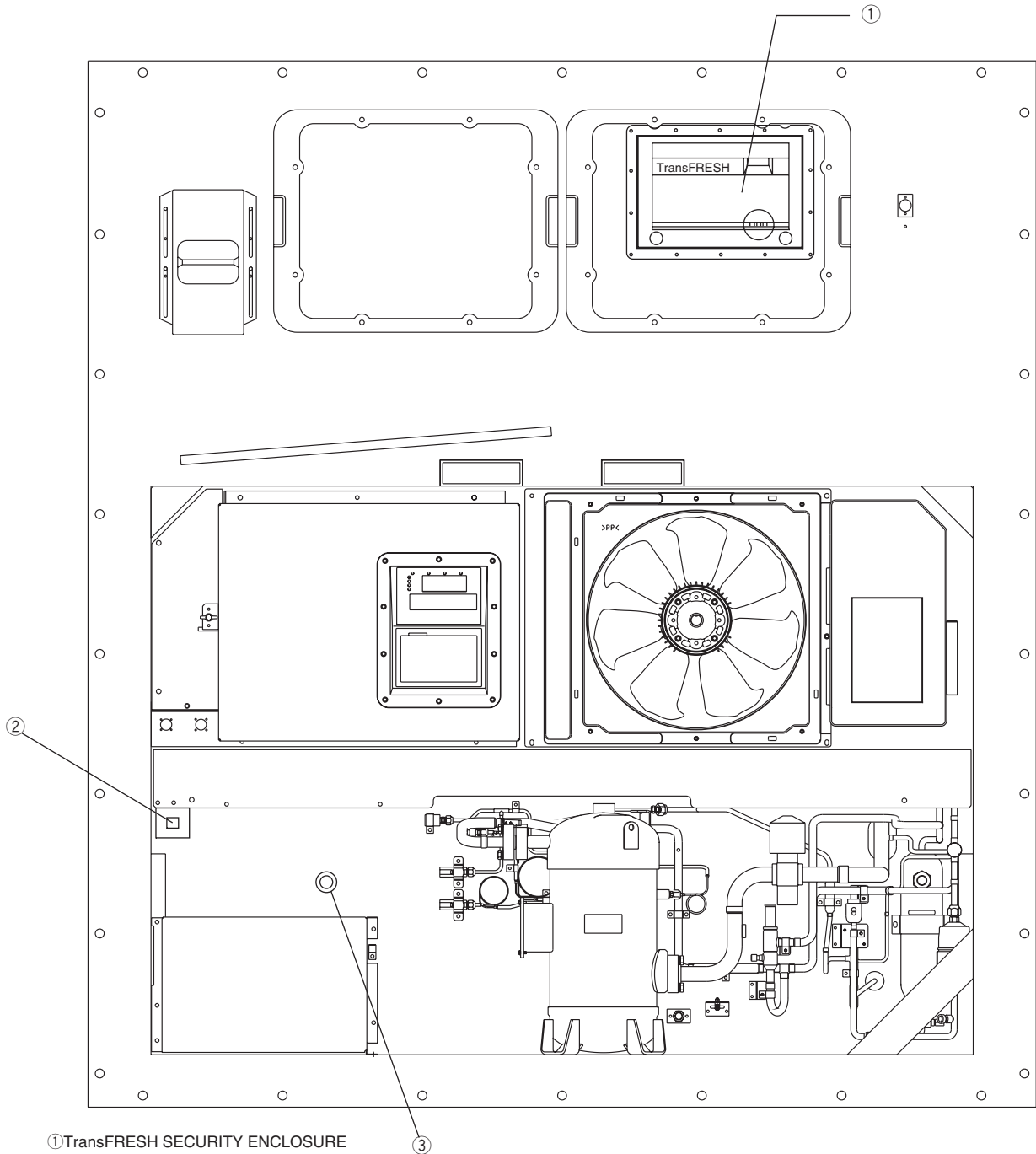


### 5.3 TransFRESH

Attachment for the TransFRESH CA devices are provided to control the internal atmosphere (quantity of O<sub>2</sub> and CO<sub>2</sub>).

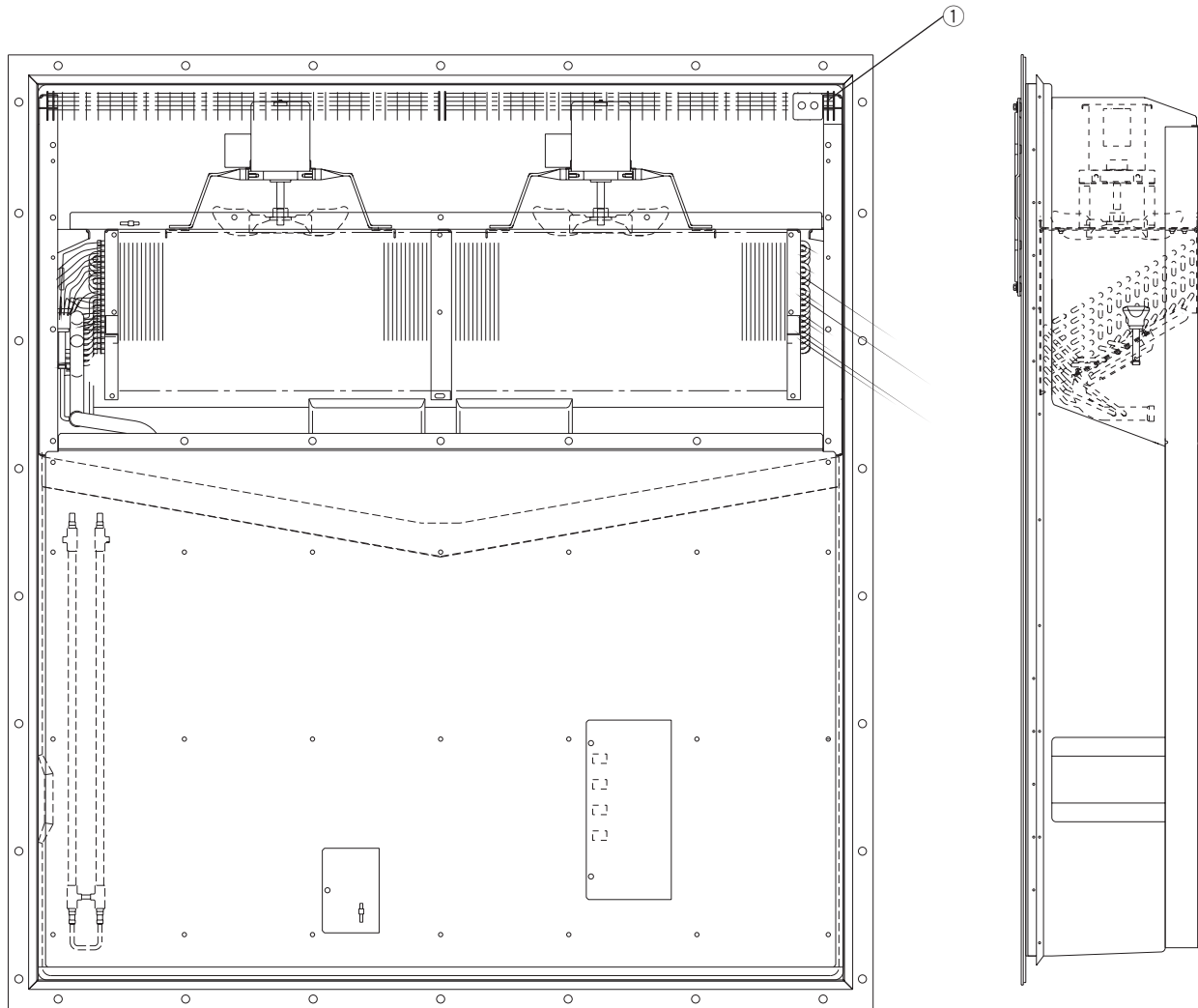
Use the CA devices according to the Operation Manual supplied by TransFRESH. The controller and sensor included in the CA devices are installed by the TransFRESH's agents before each transportation.

- An example of installation of CA devices, outside.



- ① TransFRESH SECURITY ENCLOSURE
- ② TransFRESH COMMUNICATION BRACKET
- ③ TransFRESH Single purge port

●An example of installation of CA devices, inside



① TransFRESH ASS'Y A4&A5 CABLES W/MOUNTING BOX

## 5.4 PARTIAL FROZEN MODE

Some types of devices have the partial frozen mode as part of operation modes.

### 5.4.1 OPERATION MODES AND SETTING TEMPERATURES

Mode name	Setting temperature	Control sensor	Inside fan	Description about operation
Chilled mode	+30.0°C to -3.0°C (+86.0°F to +26.6°F)	Supply air temperature sensor	High speed	Capacity control operation using the suction modulating valve and the hot gas bypass
Partial frozen mode	-3.1°C to -10.0°C (+26.4°F to -14.0°F)	Suction air temperature sensor	High speed	Capacity control operation using the suction modulating valve and the hot gas bypass
Frozen mode	-10.1°C to -30.0°C (+13.8°F to -22.0°F)	Suction air temperature sensor	Low speed	Turning ON/OFF the compressor

### 5.4.2 PARTIAL FROZEN OPERATION CONTROL

The suction air temperature sensor (RS) serves as control sensor. The sensors other than the control sensor carry out the controls in the same manner as in the case of chilled operation. The differences other than controls are as follows:

- In the partial frozen mode, the dehumidification function (Optional) cannot be set.
- In the partial frozen mode, the "RETURN" LED lamp is lit and the suction air temperature is displayed in the LED.
- During the partial frozen operation, the backup operations are carried out as shown below if any failure occurs in the sensor.

Abnormal sensor		Backup operation
SS	Supply air temperature sensor	Only abnormal indication (Operation continued)
RS	Suction air temperature sensor	The same control is carried out with DRS Control at SS+2.0°C with DRS failure Shutdown in case of an failure in DRS and SS
AMBS	Ambient air temperature sensor	Only abnormal indication (Operation continued)
DCHS	Discharge gas temperature sensor	Only abnormal indication (Operation continued)
EIS	Evaporator inlet temperature sensor	Only abnormal indication (Operation continued)
EOS	Evaporator outlet temperature sensor	Only abnormal indication (Operation continued)
SGS	Suction gas temperature sensor	Only abnormal indication (Operation continued)
HPT	High pressure sensor	Only abnormal indication (Operation continued)
LPT	Low pressure sensor	Only abnormal indication (Operation continued)



## 6. TROUBLESHOOTING

### 6.1 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. Neither evaporator fan, condenser fan nor compressor runs.	Faulty power supply	Voltage on primary side of circuit breaker It should be within the voltage range shown in page 1-1.	Check the power supply Check the power supply plug Check for disconnection of cable
		Failure in running of condenser fan	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.)	The unit is normal if the condenser fan is stopped while the HPT is 1000 kPa or more
			Megger check on secondary side of magnetic contactor (Evaporator fan motor, condenser fan motor, compressor)	Replace faulty device
		Controller	Unit switch ON/OFF check	Turn the switch ON
			Alarm presence (F code)	See the instructions for alarm code of electronic controller in section 6.2
		Secondary side of power supply transformer	Check for disconnection of Fu1 (fuse) Check for malfunction in object models shown in section 7.11	Replace the Fu Replace faulty device
	Check for disconnection on secondary side of transformer (Tr) Connector type terminal board: Check of 24V between lead wires 101 and 104		Replace the transformer	
	B. Evaporator fan runs, but condenser fan and compressor do not run.	Not malfunction (thermo-OFF status)	Display of controller (ALARM display)	See the alarm code when ALARM is issued
	C. Evaporator fan and compressor run, but condenser fan does not run.	Not malfunction (high pressure control)	Check of operation of HPT (E101) by controller display	See section 6.2
		External factor	Visual check for foreign matters caught in and deformation (including relevant parts such as controllers)	Remove foreign matters
D. Condenser fan and compressor run, but evaporator fan does not run.	Faulty electrical system of evaporator fan · CTP activation · Motor seizure (disconnection) · Disconnected coil of magnetic contactor	Controller display E205 (Faulty 1 unit of EFM) E803 (Faulty 2 units of EFM) ↓ · 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	
		External factor	Visual check for foreign matters caught in and deformation (including relevant parts such as controllers)	Remove foreign matters
E. Compressor runs, but evaporator fan and condenser fan do not run.	Not malfunction (defrost)	Check the lighting status of LED (red) of DEF on control panel		

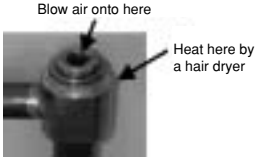
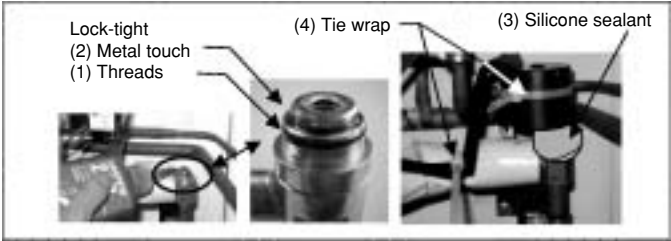
	Symptom	Cause	Checkpoint	Remedy
I Unit does not operate	F. Evaporator fan and condenser fan run, but compressor does not run (throbs)	<ul style="list-style-type: none"> <li>· Faulty power supply of compressor system</li> <li>· Burnt-out of compressor motor (disconnection)</li> <li>· Faulty connection of terminal board of compressor (disconnection, entering of water)</li> </ul> <p>Disconnection of magnetic contactor coil</p> <p>Faulty controller (Ry) Faulty RPP (reverse phase protector)</p>	<p style="text-align: center;">* 1. Connector type terminal board CN19 (10pin)</p> <p style="text-align: center;">* Refer to Schematic wiring diagram</p>	<p>Check for disconnection of compressor motor coil Check the terminals Check the voltage</p> <p>Faulty coil of magnetic contactor for compressor</p> <p>Faulty RPP operation</p> <p>Normal phase?</p> <p>YES (Normal phase) Replace RPP</p> <p>NO (Reverse phase) Check the controller and compressor</p> <p>Faulty controller Ry</p>
		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 operate	Disconnection of fuse Fu1 circuit  Faulty controller Faulty PT/CT board	<pre> graph TD     Q1{Is the fuse Fu1 circuit disconnected?} -- YES --&gt; R1[Replace the fuse Fu1]     Q1 -- NO --&gt; R2[Replace the controller or PT/CT board]             </pre>	
	Power supply of the controller cannot be turned on	<ul style="list-style-type: none"> <li>· R or T-phase is open</li> <li>· Faulty power supply (voltage drop)</li> <li>· Disconnection of power cable</li> </ul> Faulty power plug Disconnection of fuse Fu6 circuit  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?} -- YES --&gt; R3["* R or T-phase is open * Faulty power supply (voltage drop) * Disconnection of power cable * Faulty power plug"]     Q2 -- NO --&gt; Q3{Is the fuse Fu6 circuit disconnected?}     Q3 -- YES --&gt; R4[Replace the fuse Fu6]     Q3 -- NO --&gt; Q4{Is the voltage at CN1 of TB1 20 V or less?}     Q4 -- YES --&gt; R5[Replace the transformer TrC]     Q4 -- NO --&gt; R6[Replace the controller]             </pre>	
II	Unit operates but soon stops			
	A. Unit operates but soon stops (full stop)	Refer the Alarm list (page 3-27)	_____	_____
	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  The low pressure is excessively high  Frosted compressor body or suction pipe	Refrigerant shortage Blocked pipe (parts) (including solenoid valves) Trap of air in refrigerant system  Faulty discharge pressure control valve DPR  Faulty liquid solenoid valve LSV  Blocked dryer  Entering of air  Faulty high pressure transducer HPT	Gas leak check YES → Gas leaks ⇒ Repair the gas leaking portion NO →	
		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 →	
		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 →	
		Is the difference in temperature of the pipe in front of and that back of dryer filter 5°C or more? YES → Check for clog in a dryer ⇒ Replace the dryer NO →	
		Check for entering of air referring to clause 4.1.4 (2) YES → Air is entering ⇒ Replace refrigerant NO →	Note: Recover refrigerant when replacing it
		Is the difference in pressure between the pressure gauge and HPT 100 kPa or more? 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 from solenoid valve during pull-down. Is the temperature in the piping on the BSV, HSV, and DSV outlet side high? YES → Leak from solenoid valve ⇒ Replace the solenoid valve NO →	BSV: Discharged gas bypass solenoid valve HSV: Hot gas solenoid valve DSV: Defrost solenoid valve
	Reverse rotation of condenser fan	Does the condenser fan rotate reverse? YES(Reverse rotation) → Check the wiring on secondary side of solenoid contactor for condenser fan NO(Normal rotation) →	
	· Ambient temperature is high · Short circuit	Is the discharge air temperature at condenser 50°C or higher? YES → Out of operation range Restore short circuit at discharge air NO →	
	· Is the condenser water-cooled? · Low water level · Water temperature is high	Is the condenser water-cooled? YES → Is the water piping valve fully open? YES → Shortage of water volume ⇒ Check the facility NO → Visually check for clog and dirt at the fin of air cooled condenser YES → Clogged ⇒ cleaning NO → Fully open the valve	
	Clogged heat exchanger of condenser	Visually check for clog and dirt at the fin of air cooled condenser YES → Clogged ⇒ cleaning NO → Fully open the valve	
	· Entering air · Overcharge · Wrong refrigerant type	Check for entering of air referring to clause 4.1.4 (2) YES → Is the HPS operated? YES → Overcharge Entering of air, wrong refrigerant type ⇒ Replace the refrigerant NO → Trap of air, wrong refrigerant type ⇒ Replace the refrigerant NO → Check for leak from the solenoid valve S-PTI alarm J101? (P10) YES → Faulty compressor ⇒ Replace the compressor NO →	
	Compressor internal leak	Check for leak from 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	· Faulty opening of electronic expansion valve (EV) · Faulty opening of suction modulating valve (SMV)	· Low air volume (frosted evaporator)	
		· Low air volume (reverse rotation of evaporator fan)		
		· Low air volume (stop of evaporator fan)		
		· Low air volume (drop of propeller fan)		
		Displacement of discharge pipe temperature sensor DCHS (detection of humidity)		
		Faulty electronic expansion valve coil		
		Entering of water in refrigerant system Water choke		
			Continue to next page	

	Symptom	Cause	Checkpoint	Remedy
IV Inside temperature does not drop	The low pressure is excessively low		<p>Continue from previous page</p> <p>Remove the electronic expansion valve coil</p> <p>Blow air into the electronic expansion valve and heat the valve by a dryer</p>  <p>NO</p> <p>Is pull-down possible?</p> <p>YES → Restore the electronic expansion valve (see the pictures below)</p> <ol style="list-style-type: none"> <li>(1) Apply Lock-tight sealant to the threads</li> <li>(2) Apply Lock-tight sealant to the metal touch section</li> <li>(3) Apply silicone sealant to the flare nut</li> <li>(4) Fix the cable at two positions</li> </ol> <p>NO</p> <p>Replace the valve Replace the dryer</p> 	
	The low pressure is excessively high	Solenoid valve internal leak(BSV, DSV, HSV)  Solenoid valve internal leak(ISV)  Faulty compression by compressor	<p>Normal operation</p> <p>Is HSV, DSV, BSV outlet pipe hot?</p> <p>YES (Hot) → Leak from solenoid valve ⇒ Replace</p> <p>*HSV: Hot gas solenoid valve *DSV: Defrost solenoid valve *BSV: Discharge gas bypass solenoid valve</p> <p>NO (Cold)</p> <p>Is the ISV outlet pipe hot?</p> <p>YES (Hot) → Leak from solenoid valve ⇒ Replace</p> <p>*ISV: Injection solenoid valve</p> <p>NO (Cold)</p> <p>Circuit breaker OFF→ON</p> <p>Is pull-down possible?</p> <p>YES → Finish</p> <p>NO → Replace the compressor</p>	

	Symptom	Cause	Checkpoint	Remedy
IV Inside temperature does not rise (during heating operation)	The high pressure is excessively low The discharge gas temperature is low The low pressure is excessively high	Faulty operation of valve (HSV or DSV)	Heating operation ↓ Is the outlet piping of HSV, DSV cold? YES → Faulty operation of HSV, DSV ⇒ Replace NO ↓	
		Faulty operation of high pressure transducer HPT (charging is impossible)	↓ Is the difference in pressure between the pressure gauge and HPT 100 kPa or more? YES → Faulty HPT ⇒ Replace NO ↓	
		Faulty operation of low pressure transducer LPT (charging is impossible)	↓ Is the difference in pressure between the pressure gauge and LPT 30 kPa or more? YES → Faulty LPT ⇒ Replace NO ↓	
		Displacement of HPT, DCHS (Stop of evaporator fan)	↓ Is the DCHS or heat insulator installed inappropriately? YES → Correct installation of DCHS NO ↓	※ DCHS: Discharge pipe temperature sensor
		Stop of evaporator fan	↓ Is the magnetic contactor (high speed) for evaporator fan motor turned OFF? YES → Faulty DCHS temperature detection ⇒ Replace NO ↓	
		Reduced heating air volume (stop or drop of evaporator fan)	↓ Is the evaporator fan motor stopped? YES → Faulty motor ⇒ Replace NO ↓	
		Pressure leak to condenser due to leak from discharge pressure control valve (DPR) Leak from ISV ⇒ Charge control is unavailable	↓ 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)	The control temperature is unstable	Faulty low pressure transducer LPT  Faulty discharge pipe temperature sensor DCHS  Faulty opening of suction modulating valve SMV  Faulty contact of solenoid valve (BSV)	<pre>                     graph TD                         Start[Operating temperature is hunting] --&gt; D1{Is the difference in pressure between the pressure gauge and LPT 30 kPa or more?}                         D1 -- YES --&gt; R1[Replace the LPT]                         D1 -- NO --&gt; D2{Is the DCHS or heat insulator installed inappropriately?}                         D2 -- YES --&gt; R2[Correct installation of DCHS]                         D2 -- NO --&gt; D3{The SMV opening is fixed to approx. 24%}                         D3 -- YES --&gt; R3[Reset the opening of SMV (Circuit breaker ON)]                         D3 -- NO --&gt; R4[Check the BSV connector or lead wire]                     </pre> <p style="text-align: right;">※ BSV: Discharge gas bypass solenoid valve</p>	

	Symptom	Cause	Checkpoint	Remedy
V	Control is unstable (during chilled proportional control operation)	Temperature continues to decrease		
		Disconnection of fuse (Fu2) circuit  Faulty operation of defrost solenoid valve DSV  Stop of evaporator fan  Faulty operation of suction modulating valve SMV		
V	Temperature continues to increase	Excessive frost on evaporator		
		Opened discharge gas bypass solenoid valve BSV (dusts caught in)  Excessive frost on evaporator	Manual defrost ※ As for the manual defrost, refer to page 2-22.	
VI	Abnormal noise or vibration	Malfuction of compressor inside	Auditory check	Replace
		Fan motor of evaporator, condenser · Worn bearing	Auditory check	Replace the unit
		· Interference with fan guide	Auditory check Visual check	Replace the faulty parts
	Abnormal vibration	Compressor, fan motor · Loosen bolt	Auditory check Visual check	Tighten bolts
Piping · Removed or loosen cramp		Auditory check Visual check	Correct the cramp	



	Symptom	Cause	Checkpoint	Remedy
<p>VII</p> <p>Abnormal frosting on compressor</p>	<p>The air cooling evaporator fan continues rotating</p>	<p>Water pressure switch WPS will not operate</p> <ul style="list-style-type: none"> <li>· Water pressure is low</li> <li>· Water temperature is excessively high</li> <li>· Water flow rate is low</li> </ul> <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> <pre> graph TD     Start[The condenser fan continues rotating] --&gt; D1{The high pressure is excessively high}     D1 -- YES --&gt; R1[Check the water pressure, water temperature, and water volume]     D1 -- NO --&gt; D2{Is the condenser fan stopped when the CBS is cooled?}     D2 -- YES --&gt; R2[CBS OK]     D2 -- NO --&gt; D3{WPS has continuity}     D3 -- YES --&gt; R3[Faulty WPS]     D3 -- NO --&gt; R4[Faulty CBS]                     </pre> <p>*CBS: Control box temperature sensor</p>	
<p>IX</p> <p>Others</p>	<p>The remote monitoring RM is not output.</p>	<p>Disconnection of Fu9</p> <p>Short-circuit of RM circuit</p> <ul style="list-style-type: none"> <li>· Faulty controller</li> <li>· Short-circ of RM circuit on ship</li> </ul>	<pre> graph TD     D1{Is the fuse Fu9 circuit disconnected?}     D1 -- YES --&gt; R1[Replace the Fu9]     D1 -- NO --&gt; D2{Is there any short circuit or disconnection on the secondary side of RM junction port (on ship)?}     D2 -- YES --&gt; R2[Check the wiring on ship =&gt;Correct it]     D2 -- NO --&gt; D3{Is there any short circuit or disconnection on the primary side of RM connection port (on unit)?}     D3 -- YES --&gt; R3[Check the wiring =&gt;Correct]     D3 -- NO --&gt; R4[Check the controller=&gt;Replace]                     </pre> <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>	

## 6.2 Alarm codes on electronic controller

If any alarm occurs, search its cause and repair it referring to the following table.

Be sure to check the connectors in the electronic controller as the poor contact of them may cause the controller alarm codes.

Alarm code	Content	Possible cause/checkpoint
F101	The high-pressure switch (HPS) contact is open	HPS circuit check · Broken lead wire · Faulty contact · Blown fuse Fu1
	If HPS is activated before the compressor starts to operate when the power is turned on. Or, if the compressor fails to start to operate 5 times during the starting control.	Condenser fan motor operation check Discharge piping refrigerant circuit check · Discharge stop valve · Discharge filter · Discharge check valve · Discharge pressure regulating valve
	The fuse Fu1 is blown	Fuse Fu1 circuit check
	Faulty controller	Faulty controller
F109	LPT becomes lower than -90KPA within 2 seconds after the compressor starts to operate.	Refrigerant circuit check · Suction stop valve · SMV (Suction modulating valve) · EV (Electronic expansion valve) · LSV (Liquid solenoid valve) · Dryer · Clogged EV, LSV inlet filter
		Low pressure transducer LPT circuit check · Fu3, LPT fault, broken lead wire, short circuit
		Shortage of refrigerant
		Faulty controller
F111	A communication error in the CPU and I/O board	Controller fault · CPU board fault (EC1) · I/O board fault (EC2)
F301	Temperature setting request	Set temperature has not been set up yet (Set up the temperature when the controller is replaced)
		Faulty controller (CPU board fault)
F401 F403	Supply air temperature sensor SS fault Return air temperature sensor RS fault	Faulty SS and RS · Broken or short-circuited lead wire · Faulty wiring (disconnection of connector) · Faulty sensor
		Faulty sensor (faulty CPU PCB)
F603	If the suction modulating valve (SMV) does not fully close even when instructed so.	Faulty SMV body · Broken coil
		Faulty driving circuit · Disconnection of connector · Blown Fu7, 4 · Faulty PCB for suction modulating valve (EC6)
	Wrong controller model setting	Decos III "c" or "d" for LXE10E Decos III "b" for LXE10D
F701	Power supply voltage error If 270V<PT1<300V or PT1<530V within 2 seconds after the power is turned on. Subsequently, if PT1<300V or PT1>530V continuously for 15 seconds. If the phase sequence (positive and negative) is unknown.	Abnormal power supply voltage · 530V or higher, 300V or lower
		Faulty voltage detection · Faulty PT of PC/CT board (other than disconnection and short-circuit) · Faulty contact of connector · S phase is open phase
F705	S phase is open phase	Abnormal power supply voltage · S phase is open phase · Faulty contact of power supply facility
		Faulty power supply equipment · Faulty contact of power plug · Faulty contact of power cable · Faulty PT/CT board (EC5)
F803	If any of the following conditions is applicable 1) E107 is generated twice due to EV opening error. 2) Considered that both of the 2 evaporator fans are stopped 3) Improper welding of the magnetic switch of the compressor 4) Failures are present in any 2 of the HPT sensor, LPT sensor and DCHS sensor	Find the cause of the alarm for each of the issued alarm codes
E101	High-pressure switch (HPS) activates during operation	Troubleshooting → The inside temperature does not drop. → Refer to the item "The high pressure is excessively high."

Alarm code	Content	Possible cause/checkpoint
E103 (Electronic type OC)	Operating current of the compressor is high	Single phase operation due to faulty contact · Magnetic contactor for compressor · Compressor cable · Compressor terminal
		Malfunctioned equipment · Compressor lock · Actuation of thermal protector CTP for compressor · Faulty PT/CT board (EC5) · Faulty controller (CPU, I/O board)
		Wrong initial setup of PT/CT board (jumper wire) (Single or Dual power supply, 10HP or 5HP)
E105 (Micro-computer type OC)	Operating current of the compressor is high	Single phase operation due to incomplete contact · Magnetic contactor for compressor · Compressor cable · Compressor terminal
		Malfunctioned equipment · Compressor lock · Faulty CT of PT/CT board · Abnormal controller (CPU board)
		Wrong initial setting of controller (Single or Dual power supply, 10HP or 5HP)
E107	· The discharge gas temperature is excessively high · The EV opening error continues 5 minutes.	Clogged refrigerant system · Dryer · Filter
		Shortage of refrigerant
		Malfunctioned equipment · Faulty operation of ISV · Clogged capillary at ESV outlet
E109	Low pressure becomes abnormal during operation.	Refer to the "Unit operates but soon stops" and "Low pressure is excessively low" in "6. Troubleshooting"
		Malfunctioned equipment · Faulty low pressure transducer LPT · Faulty controller (CPU board) · Blown fuse Fu3
E201	Pumpdown is not completed within 120 seconds	The solenoid valve cannot be closed (dusts caught in) · LSV (liquid solenoid valve) · HSV (hot gas solenoid valve) · DSV (defrost solenoid valve) · BSV (discharge gas bypass solenoid valve)
		Faulty operation of compressor
		Malfunctioned equipment · Controller · Low pressure transducer LPT
E203	Overcooling prevention (control sensor<=SP-3.0) continues for three minutes or longer in the chilled or partial frozen mode	Refer to the "Control is unstable" and "Temperature continues to decrease" in "6. Troubleshooting"
E205	The inside fan motor stops	Faulty operation of evaporator fan motor · Motor lock · Burned-out motor coil · Operation of thermal protector CTP for compressor · Disconnection on the secondary side of magnetic contactor for evaporator fan
		Faulty evaporator fan propeller · Propeller ice lock · Foreign matters caught in propeller
E207	Defrost cannot be completed within 90 minutes	Malfunctioned equipment · Faulty sensor (EOS, RS, HPT, LPT, DCHS) · Faulty controller · Faulty operation of HSV, DSV, ISV · Faulty operation of discharge pressure regulating valve
		Abnormal refrigerant system · Shortage of refrigerant · Heavy frosting

Alarm	Content	Possible cause/checkpoint
E303 E305 E307 E311	Humidity setting request Defrost timer setting request Calendar setting request Trip start setting request	Equipment malfunctioned · Faulty controller Faulty operation · Wrong initial setting of controller
E315	A failure in the PT/CT board	Replacement of the PT/CT board requested · There is no input from the PT/CT board.
E401 E402 E403 E404 E405 E406 E407 E409 E411 E413 E415 E419 E425 E427 E429 E431 E433	Supply air temperature sensor (SS) fault Data recorder supply air temperature sensor (DSS) fault Return air temperature sensor (RS) fault Data recorder return air temperature sensor (DRS) fault Discharge pipe temperature sensor (DCHS) fault Suction gas temperature sensor (SGS) fault Evaporator inlet pipe temperature sensor (EIS) fault Evaporator outlet pipe temperature sensor (EOS) fault Ambient temperature sensor (AMBS) fault Low pressure transducer (LPT) fault High pressure transducer (HPT) fault Voltage sensor (PT2) fault Pulp temperature sensor (USDA1) fault Pulp temperature sensor (USDA2) fault Pulp temperature sensor (USDA3) fault Humidity sensor (Hus) fault Carge temperature sensor (STS) fault	System malfunction · Faulty sensor · Faulty controller · Broken or short-circuited lead wire · Wrong wiring · Disconnection of connector
E417 E421 E423	Voltage sensor (PT1) fault Current sensor (CT1) fault Current sensor (CT2) fault	Malfunctioned equipment · Faulty sensor · Faulty controller · Broken or short-circuited lead wire · Wrong wiring · Disconnection of connector
E603	· SMV (MV) operation malfunction · EV connection malfunction	SMV operation malfunction · Faulty controller · Faulty SMV coil · Faulty PCB for SMV · Broken wire of harness (disconnection of connector) EV connection malfunction · EV wire or harness disconnection · EV connector disconnection
E607	Faulty contact point of manual defrost key (sheet key)	Faulty short-circuit of switch Faulty short-circuit of CPU
E707	Instantaneous voltage failure shutdown	The power is not supplied for 40 to 300 mm sec.
E801	Exhausted battery of the CPU board	Replacement of the battery requested · Exhausted battery of the CPU board
E805	A failure in the FA sensor	If the FA setting is other than "OFF", the FA sensor is abnormal.
E807	Opened ventilator	The ventilator is opened during frozen operation

### 6.3 Troubleshooting for automatic PTI (J-code)

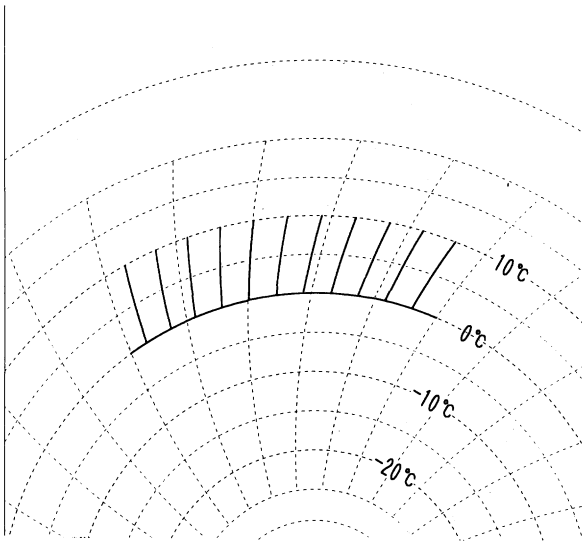
Step	Content	Alarm code	Conclusion	Possible cause	Check method
P00	Basic data record	No indication	No judgment		
P02	Alarm check on all sensor	Same as normal operation	Same as normal operation	Same as normal operation	Same as normal operation
P04	Power supply check	No indication	Same as normal operation	Same as normal operation	Same as normal operation
P05	Compressor start running check	J051	Same as normal operation	Same as normal operation	Same as normal operation
P06	HPS check	J061	Abnormal OFF point	(1) HPS malfunction (2) High pressure transducer (HPT) malfunction (3) Gas leak from Gauge manifold (No unit malfunction)	(1) Check HPS (2) Compare to Gauge manifold (3) Remove Gauge manifold.
		J062	Not return		
		J064	High pressure does not rise.		
		J065	High pressure does not drop.		
P08	Pump down check	J081	Pump down requires too long time.	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 defrosting 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	Excessive leakage of solenoid valve	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 the DSS on the controller panel.
				RS malfunction	Compare the RS with the DS on the controller panel.
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 controller panel).
				LPT malfunction	Compare the low pressure valve with the gauge manifold of LPT (on the controller panel)
P16	Evaporator fan Hi/Lo speed operation check	J161	Abnormal operation of evaporator fan speed	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 on economizer solenoid valve (ESV)	J201	ESV does not open.	ESV coil malfunction	Check on ESV coil, wiring and terminals.
				ESV malfunction	Check on capillary tube temperature on ESV outlet.



Step	Content	Alarm code	Conclusion	Possible cause	Check method
P22	Check on discharge gas by-pass solenoid valve (BSV)	J221	BSV does not open.	BSV coil malfunction	Check on BSV coil, wiring and terminals.
				BSV malfunction	Check on outlet piping temperature of BSV
P24	Check on defrosting solenoid valve (DSV)	J241	DSV does not open.	DSV coil failure	Check on DSV coil, wiring and terminals.
				DSV malfunction	Check on outlet piping temperature of DSV
P26	Standard Pull down operation	No indication			
P28	Check on suction modulating valve (SMV) (Open SMV to 3%)	J281	(LPT : decrease 20kPa)	SMV coil malfunction	Refer to section 4.2.5. Check appearance. (Replace coil bracket)
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 connector of the coil.
				Electronic expansion valve coil burn out.	Check on knocking sound of coil.
				Leakage of hot gas by-pass solenoid valve	Touch the outlet pipe of the solenoid valve.
				Leakage of defrosting 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.
P30	ISV opening or closing check	J301	ISV does not open.	ISV coil malfunction	Check on ISV coil, wiring and terminals.
				ISV malfunction	Check on capillary tube temperature on ISV outlet.
P32	HSV opening or closing check	J321	HSV does not open.	HSV coil malfunction	Check on HSV coil, wiring and terminals.
	RSV opening or closing check	J322	RSV does not open.	RSV coil malfunction	Check on outlet piping temperature of RSV
P50	Pull-down cooling capacity	J501	Out of ambient temperature condition	No unit malfunction 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 judgement		
P70	Defrosting operation check	J701	Out of starting condition. (EOS is 20°C or more.)	Wrong installation of EOS.	Check the installation of EOS.
				Leakage of hot gas solenoid valve	Touch the outlet pipe of the solenoid valve.
		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 6-1 to 6-17)

## 6.4 Diagnosis based on the recording chart



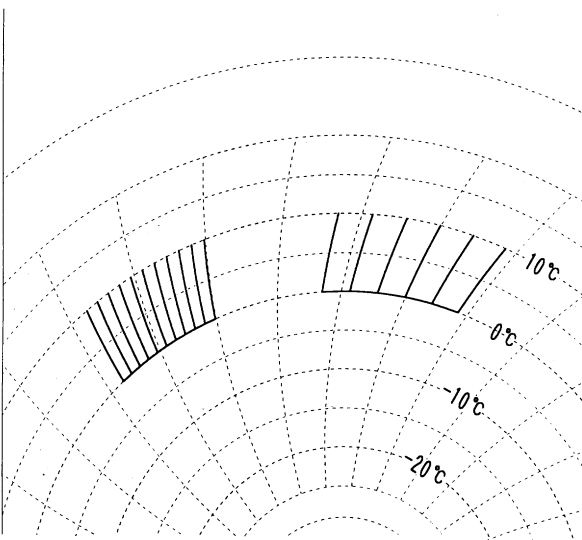
**Set temperature** 0°C

**Occurrence read out from the recording chart**

Defrosting is periodically executed by the timer

**Abnormal content and abnormal point**

Normal



**Set temperature**

0°C

**Occurrence read out from the recording chart**

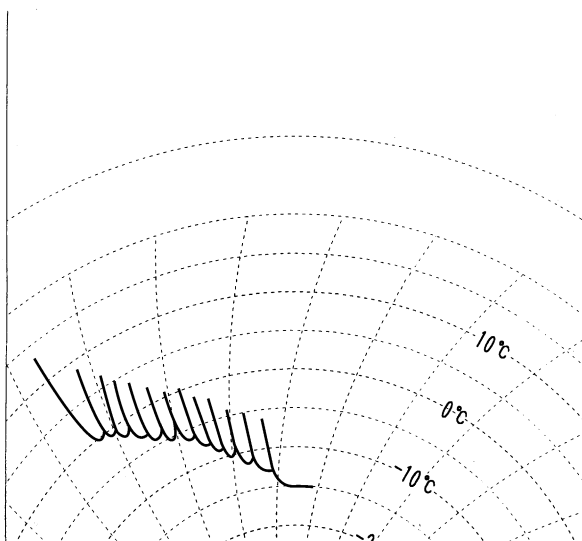
The recording paper is not properly fed because the chart nut which retains the recording chart is loose.

(left side)

**Abnormal content and abnormal point**

Tighten the chart nut, then it will return to normal.

(Right side)



**Set point temperature**

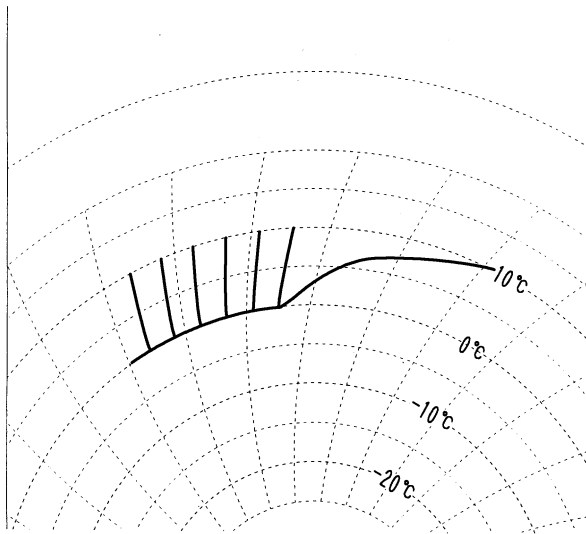
5°C

**Occurrence read out from the recording chart**

When the moisture in the cargo is excessive, the cooling capacity becomes insufficient during pull-down operation since frosting occurs excessively. Since the temperature rises before reaching the set point temperature, defrosting is repeated at outside of the in-range temperature.

**Abnormal content and abnormal point**

The operation is not abnormal. Until the amount of the frost on the evaporator is to be reduced, defrosting with the frost detection is repeated. In 2 to 3 days, defrosting interval will return to normal.



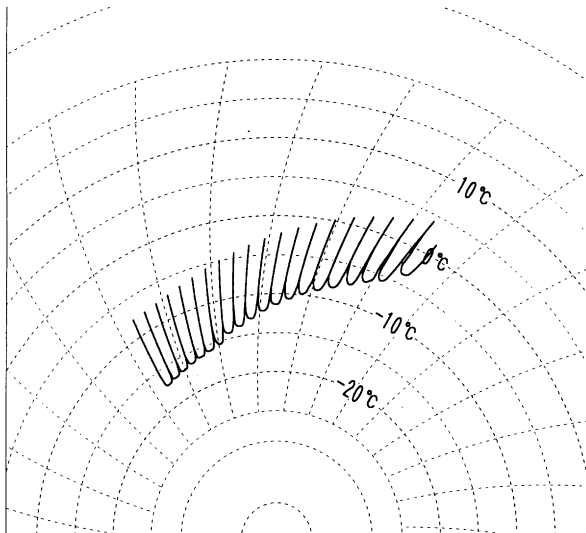
**Set temperature** 0°C

**Occurrence read out from the recording chart**

Though the temperature record is normal, the temperature rapidly rises.

**Abnormal content and abnormal point**

The compressor stops due to malfunction or the fusible safety plug is molten.



**Set point temperature** - 18°C

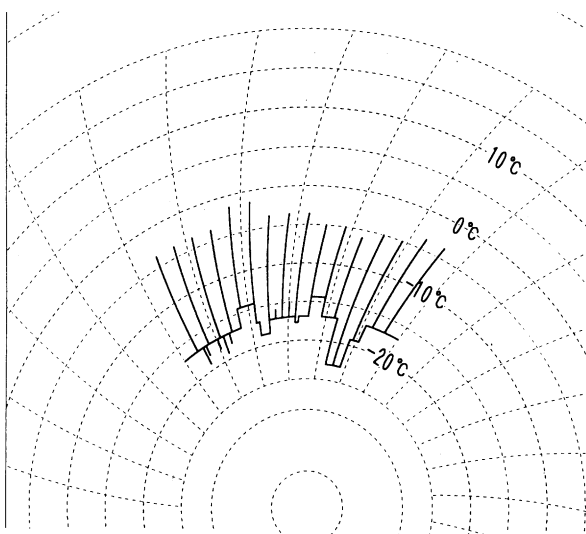
**Occurrence read out from the recording chart**

Though defrosting is periodically executed, the inside temperature gradually rises.

**Abnormal content and abnormal point**

Due to the insufficient cooling capacity, the inside temperature rises.

- Refrigerant amount is short due to leakage.
- Compressor valve is broken.
- Expansion valve or liquid solenoid valve are clogged.
- High pressure rises due to shortage of air flow rate of the condenser, etc.



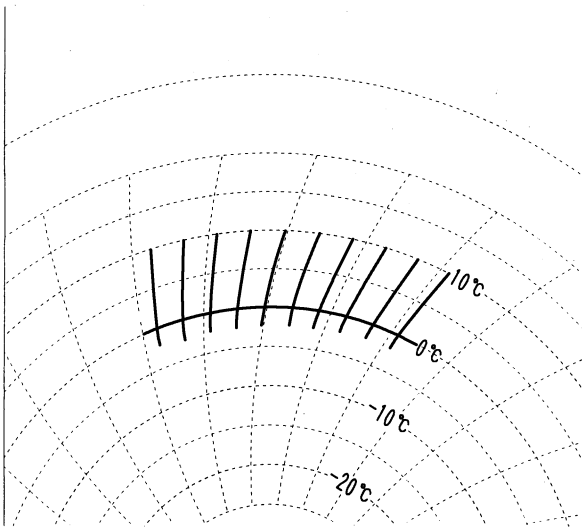
**Set temperature** - 18°C

**Occurrence read out from the recording chart**

The recorder temperature suddenly varies.

**Abnormal content and abnormal point**

The connector in the temperature recorder is in poor contact.



<b>Set point temperature</b>	<b>0°C</b>
<b>Occurrence read out from the recording chart</b> When defrosting, the inside temperature temporarily drops.	
<b>Abnormal content and abnormal point</b> Since the liquid solenoid valve is not closed, pump-down operation before defrost starts is not performed, and cooling operation continues with the evaporator fan stopped. The normal operation starts 2 min. after defrosting has been terminated forcibly, but the evaporator is still cold.	

## 6.5 Emergency operation

### 6.5.1 Emergency operation of controller

In case of the controller malfunction, emergency operation can be executed by using emergency operation kit.

#### (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 works 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 for making the forced running of Compressor, Condenser Fan and Evaporator Fans.
    - \* Install the short-circuit connector in front of the controller.
    - \* For the details, refer to the clause 6.5.2 "Short Circuit Operation"
- ② Opening adjustment of electronic expansion valve
  - \* The emergency magnet is used to adjust the opening.
  - \* For the details, refer to the clause 6.5.3 "Opening Adjustment"
- ③ Suction Modulation Valve opening adjustment for full opening.
  - \* Use Emergency Magnet for full the opening.
  - \* For details, refer to "Adjustment in fully open condition" in section 6.5.4.

#### (3) Operating condition at emergency

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

Mode	Available function of protection devices	Operating condition of unit
Cooling operation	RPP : Reverse phase protection device 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 with fixed opening. <input type="radio"/> Suction modulating valve operates with full opening.
Heat operation	—————	<input type="radio"/> Compressor stops. <input type="radio"/> Evaporator fan runs at high speed continuously. <input type="radio"/> Condenser fan stops.

### 6.5.2 Short circuit operation of controller

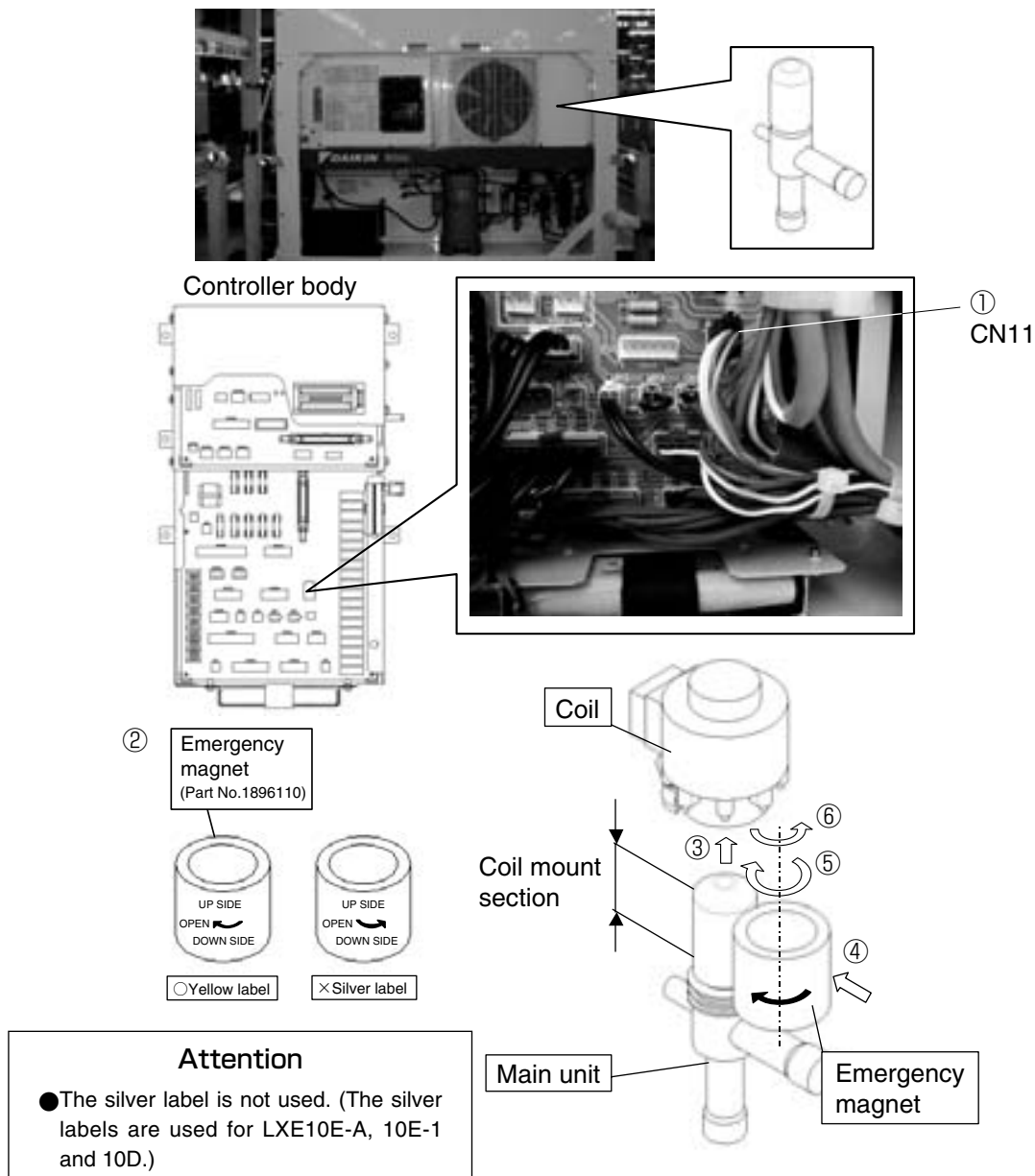
	Cooling operation	Heating operation
Power OFF	① Turn OFF the circuit breaker.	
Forcible operation of compressor and condenser fan	② Disconnect power supply connector CN1 (Red) located in front of the controller, and disconnect short-circuit connectors SCC1-1 (Blue), SCC1-2 (Red) and SCC3 (White).	
	<p>Labels: CN1 (Red), SCC1-2 (Red) – heating operation, SCC1-1 (Blue) – cooling operation, SCC3 (White) – the reverse phase correction socket</p>	
	③ Connect SCC3 (White) to CN-C1.	
	<p>Labels: CN-C1, CN-C2</p>	
	④ Connect short-circuit connector SCC1-1 (Blue) to CN8 of the power supply I/O board.	④ Connect short-circuit connector SCC1-2 (Red) to CN8 of the power supply I/O board.
	<p>Labels: CN8, CN-C1, CN-C2</p>	
Confirmation of power supply reversed phase	⑤ Turn ON the circuit breaker. If the power supply is in reversed phase, the compressor does not operate. And the condenser fan is rotated inversely.	⑤ Turn ON the circuit breaker. The evaporator fan operates in reverse at reversed phase and the fan runs at high speed. And fresh air is taken in through the ventilator outlet and discharged from the inlet.
		<p>Labels: Air suction, Air discharge, In case of positive phase, In case of reversed phase</p>
	⑥ In case of reversed phase, turn OFF the circuit breaker and connect SCC3 (White) from CN-C1 to CN-C2.	
	<p>Labels: CN8, CN-C1, CN-C2</p>	

### 6.5.3 Emergency operation of electronic expansion valve

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

- ① Disconnect the CN11 connector from the power supply I/O board of the controller to forcibly turn OFF the power supply to the electronic expansion valve.
- ② Prepare 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 the driving magnet located inside.)
- ⑤ Turn the emergency magnet in the OPEN direction (clockwise) in the same place.  
→ Ensure that the valve is fully open. (There is a small click sound.)
- ⑥ Turn 90° to 180° counterclockwise the emergency magnet in the same place.

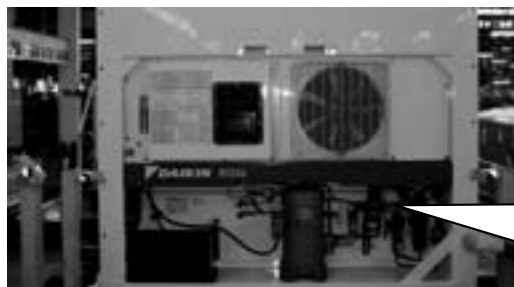
To shorten the operation time, it is recommended that the opening be adjusted. However, slightly close the opening if there is a frost around the compressor due to the operation in wet conditions or the degree of superheat is small.



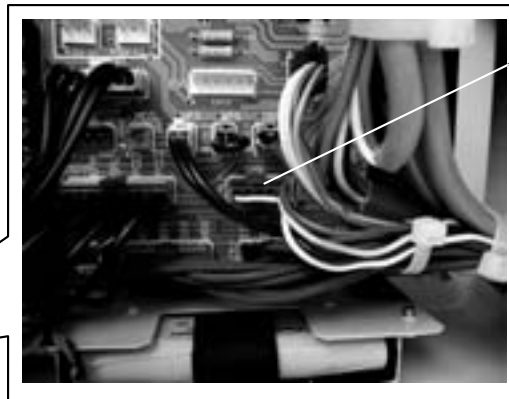
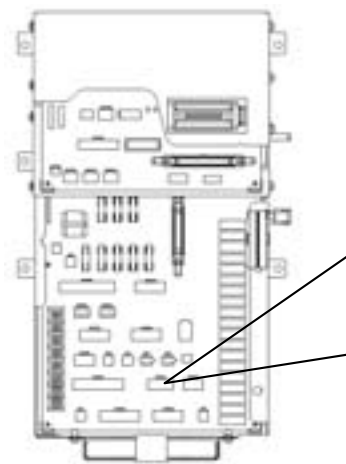
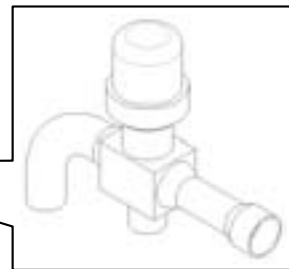
### 6.5.4 Emergency operation of suction modulation valve

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

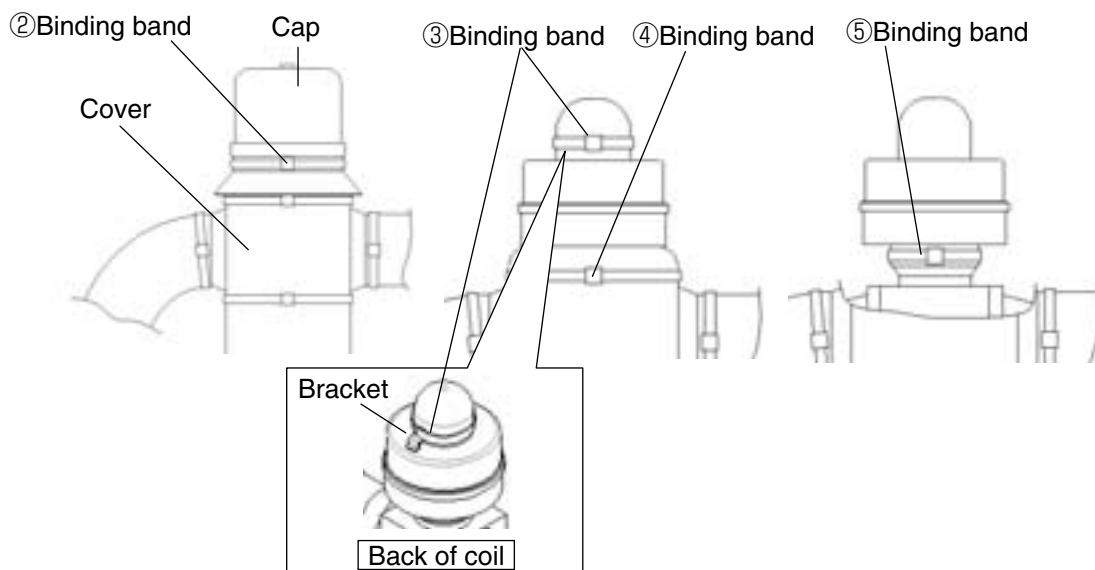
- ① Disconnect the CN9 connector from the power supply I/O board of the controller to forcibly turn OFF the power supply to the suction modulation valve.
- ② Remove the binding band of the suction modulation valve cap, and then remove the cap.
- ③ Remove the binding band from the upper section of the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



Controller body

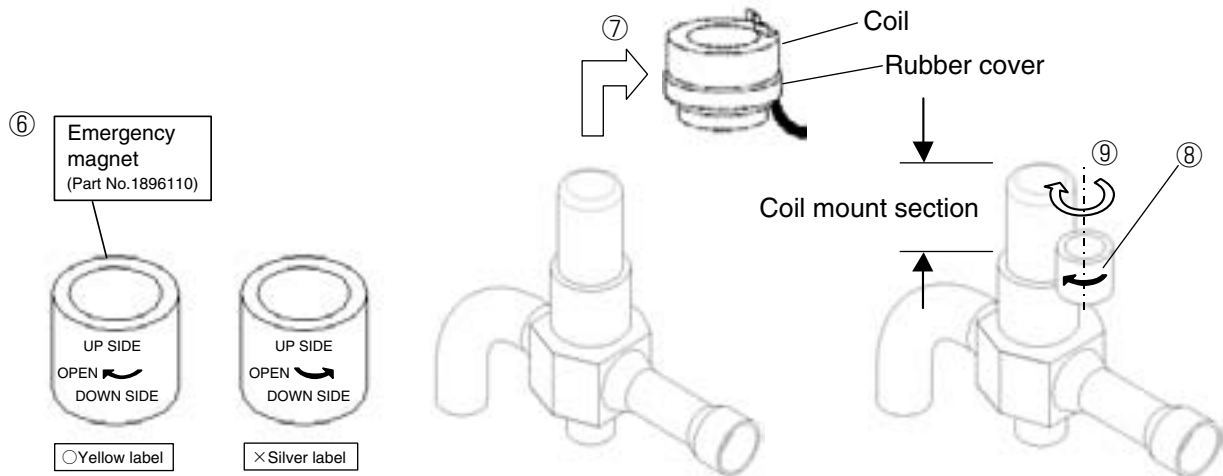


①  
CN9





- ⑥ Prepare the emergency magnet.
- ⑦ Remove the 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 click sound.)



**Attention**

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

### 6.5.5 Automatic Back up for supply / return air temperature sensors

When the unit is equipped with the data recorder sensors, the following emergency operations are available.

When the DRS and DSS are used for the emergency operation, DATA RECORDER SENSOR ON/OFF SETTING to be set OFF. (Refer to page 3-21, basic function setting mode.)

RS: Return air temperature sensor    DRS: Data recorder return air temperature sensor

RRS: Recorder return air temperature sensor

SS: Supply air temperature sensor    DSS: Data recorder supply air temperature sensor

RSS: Recorder supply air temperature sensor

Malfunction code	Abnormal point	Unit back-up operation	Check method	Emergency operations
E401	SS Supply air temperature sensor (SS) for control malfunction	Chilled mode: Back-up operation with DSS Frozen mode: only malfunction code indication	Check for looseness of the connector and crimp terminal.	Replace the SS and DSS.
E402	DSS Data recorder supply air temperature sensor (DSS) malfunction	Only malfunction code indication	Check for looseness of the connector and crimp terminal.	_____
E401 E402	Both SS and DSS malfunction	Chilled mode: Back-up operation with RS -2°C. Frozen mode: only malfunction code indication	Check for looseness of the connector and crimp terminal.	_____
E403	RS Return air temperature sensor (RS) for control malfunction	Chilled mode: only malfunction code indication Frozen mode: Back-up operation with DRS	Check for looseness of the connector and crimp terminal.	Replace the RS and DRS.
E404	DRS Data recorder supply air temperature sensor (DRS) malfunction	Only malfunction code indication	Check for looseness of the connector and crimp terminal.	_____
E403 E404	Both RS and DRS malfunction	Chilled mode: only malfunction code indication Frozen mode: Back-up operation with SS +5°C	Check for looseness of the connector and crimp terminal.	_____
H006	Chilled mode: Temperature difference is 2 °C or more between SS and DSS or more than one hour.	Only malfunction code indication	Compare with records by a recorder, and decide which sensor is faulty.	Replace the SS and DSS only when the SS is faulty.
	Frozen mode: Temperature difference is 2 °C or more between RS and DRS or more than one hour.	Only malfunction code indication	Compare with records by a recorder, and decide which sensor is faulty.	Replace the RS and DRS only when the RS is faulty.

## 7. APPENDIX

### 7.1 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	1.2	12.2	0.9
	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

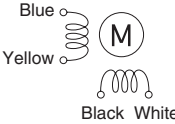
Note: Tolerance of tightening torque is within  $\pm 10\%$ .

### 7.2 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	Dryer	54.9	500	40.5

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

### 7.3 Resistance of motor coil and solenoid valve coil

Symbol	Parts name	Value of resistance $\Omega$	Remarks
CM	Compressor motor coil	1.780 $\Omega$ (@75°C)	
CFM	Condenser fan motor coil	57.2 $\Omega$	
EFM	Evaporator fan motor coil	19.4 $\Omega$	
LSV	Liquid solenoid valve coil	15.2 $\pm$ 1.1 $\Omega$ (common)	
HSV	Hot gas solenoid valve coil		
DSV	Defrosting 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		
SMV	Suction modulation valve coil	Blue - Yellow : 113 $\Omega$ Black - White : 113 $\Omega$	

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

## 7.4 HFC134a, temperature - vapor pressure characteristics table

Temperature		Vapor pressure			Temperature		Vapor pressure		
°C	°F	kPa	kg/cm <sup>2</sup> ·G	PSIG	°C	°F	kPa	kg/cm <sup>2</sup> ·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/cm<sup>2</sup> · G=98.0665kPa

1kPa = 0.145PSIG

**7.5 Temperature conversion table and temperature sensor  
(SS/RS/DSS/DRS/RSS/RRS/EIS/EOS/SGS/AMBS) characteristics table**

Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
+ 50	+ 122	0.985	+ 0	+ 32	6.860
+ 49	+ 120.2	1.018	- 1	+ 30.2	7.176
+ 48	+ 118.4	1.054	- 2	+ 28.4	7.508
+ 47	+ 116.6	1.090	- 3	+ 26.6	7.857
+ 46	+ 114.8	1.128	- 4	+ 24.8	8.226
+ 45	+ 113	1.167	- 5	+ 23	8.614
+ 44	+ 111.2	1.208	- 6	+ 21.2	9.023
+ 43	+ 109.4	1.251	- 7	+ 19.4	9.454
+ 42	+ 107.6	1.296	- 8	+ 17.6	9.909
+ 41	+ 105.8	1.342	- 9	+ 15.8	10.39
+ 40	+ 104	1.390	- 10	+ 14	10.89
+ 39	+ 102.2	1.441	- 11	+ 12.2	11.43
+ 38	+ 100.4	1.493	- 12	+ 10.4	11.99
+ 37	+ 98.6	1.548	- 13	+ 8.6	12.59
+ 36	+ 97	1.605	- 14	+ 6.8	13.22
+ 35	+ 95	1.665	- 15	+ 5	13.88
+ 34	+ 93.2	1.727	- 16	+ 3.2	14.59
+ 33	+ 91.4	1.791	- 17	+ 1.4	15.33
+ 32	+ 89.6	1.859	- 18	- 0.4	16.12
+ 31	+ 87.8	1.929	- 19	- 2.2	16.95
+ 30	+ 86	2.003	- 20	- 4	17.83
+ 29	+ 84.2	2.080	- 21	- 5.8	18.76
+ 28	+ 82.4	2.160	- 22	- 7.6	19.75
+ 27	+ 80.6	2.244	- 23	- 9.4	20.80
+ 26	+ 78.8	2.331	- 24	- 11.2	21.91
+ 25	+ 77	2.423	- 25	- 13	23.08
+ 24	+ 75.2	2.519	- 26	- 14.8	24.33
+ 23	+ 73.4	2.619	- 27	- 16.6	25.66
+ 22	+ 71.6	2.724	- 28	- 18.4	27.06
+ 21	+ 69.8	2.833	- 29	- 20.2	28.56
+ 20	+ 68	2.948	- 30	- 22	30.15
+ 19	+ 66.2	3.068	- 31	- 23.8	31.83
+ 18	+ 64.4	3.193	- 32	- 25.6	33.63
+ 17	+ 62.6	3.325	- 33	- 27.4	35.53
+ 16	+ 60.8	3.463	- 34	- 29.2	37.56
+ 15	+ 59	3.607	- 35	- 31.0	39.72
+ 14	+ 57.2	3.758	- 36	- 32.8	42.02
+ 13	+ 55.4	3.917	- 37	- 34.6	44.46
+ 12	+ 53.6	4.083	- 38	- 36.4	47.07
+ 11	+ 51.8	4.258	- 39	- 38.2	49.85
+ 10	+ 50	4.441	- 40	- 40	52.81
+ 9	+ 48.2	4.633			
+ 8	+ 46.4	4.834			
+ 7	+ 44.6	5.046			
+ 6	+ 42.8	5.268			
+ 5	+ 41	5.501			
+ 4	+ 39.2	5.747			
+ 3	+ 37.4	6.004			
+ 2	+ 35.6	6.275			
+ 1	+ 33.8	6.560			

## 7.6 Temperature conversion table and temperature sensor (DCHS) characteristics table

Temperature(°C)	Temperature(°F)	Resistance(kΩ)	Temperature(°C)	Temperature(°F)	Resistance(kΩ)
72	162	32.783	102	216	12.566
74	165	30.629	104	219	11.835
76	169	28.635	106	223	11.153
78	172	26.787	108	226	10.515
80	176	25.073	110	230	9.919
82	180	23.482	112	234	9.361
84	183	22.005	114	237	8.840
86	187	20.633	116	241	8.351
88	190	19.358	118	244	7.894
90	194	18.171	120	248	7.465
92	198	17.066	122	252	7.063
94	201	16.037	124	255	6.685
96	205	15.078	126	258	6.331
98	208	14.184	128	262	5.998
100	212	13.350	130	266	5.686

## 7.7 High pressure transducer characteristics table

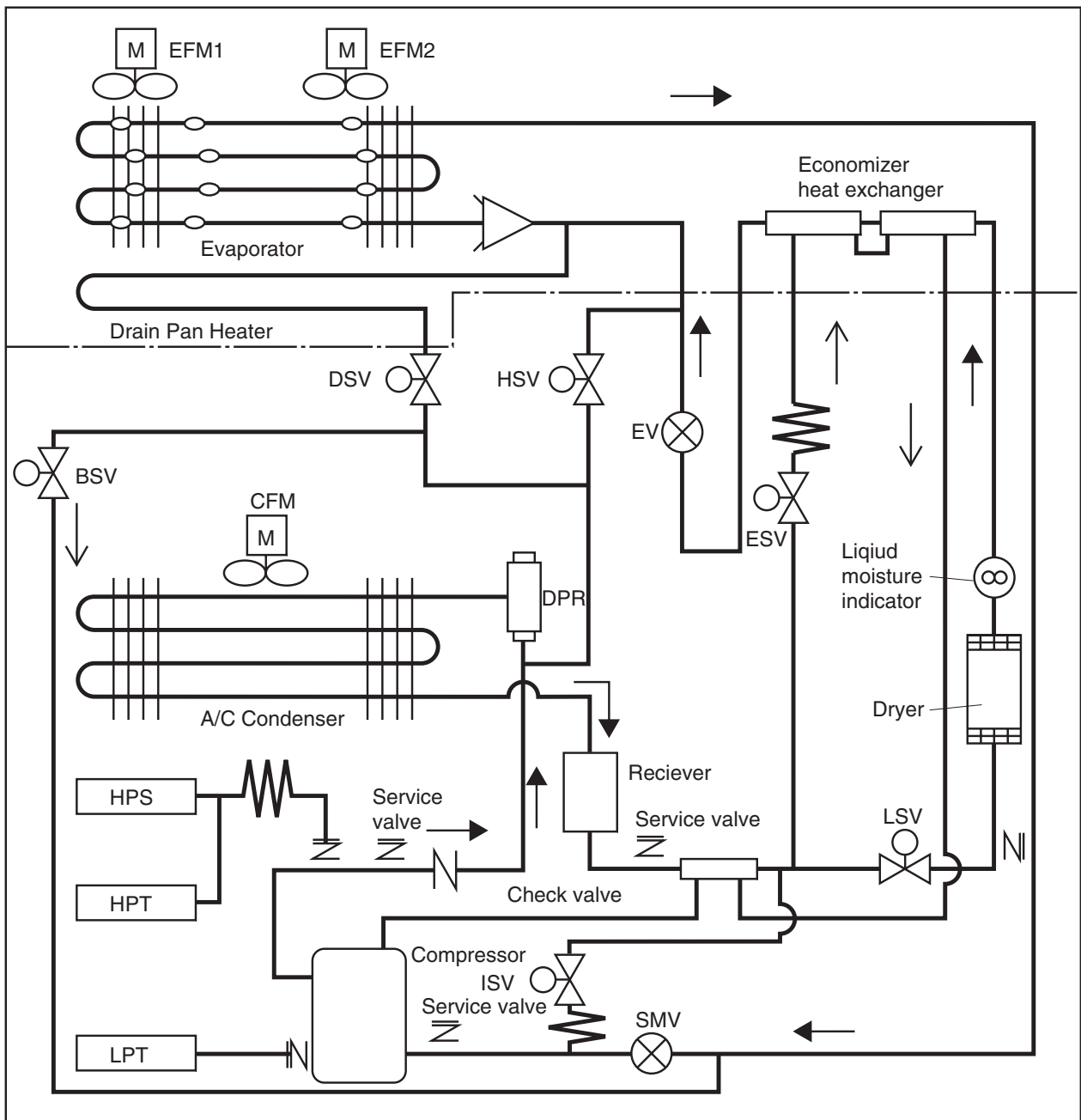
Pressure (kPa · G)	Out put (V)	Pressure (kPa · G)	Out put (V)
0	0.50	1100	1.62
100	0.60	1200	1.72
200	0.70	1300	1.83
300	0.81	1400	1.93
400	0.91	1500	2.03
500	1.01	1600	2.13
600	1.11	1700	2.23
700	1.21	1800	2.34
800	1.32	1900	2.44
900	1.42	2000	2.54
1000	1.52	2100	2.64

## 7.8 Low pressure transducer characteristics table

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

## 7.9 Piping diagram

●LXE10E



EV :Electronic Expansion Valve    SMV:Suction Modulation Valve    DPR:Discharge pressure regulator  
 LSV :Liquid Solenoid Valve    HSV:Hot Gas Solenoid Valve  
 DSV:Defrost Solenoid Valve    ISV :Injection Solenoid Valve  
 ESV:Economizer Solenoid Valve    BSV:Discharge Gas Bypass Solenoid Valve

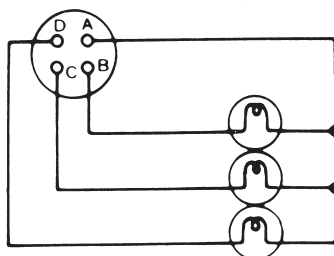
## 7.10 Electric wiring

### pilot lamps and monitoring circuit (option)

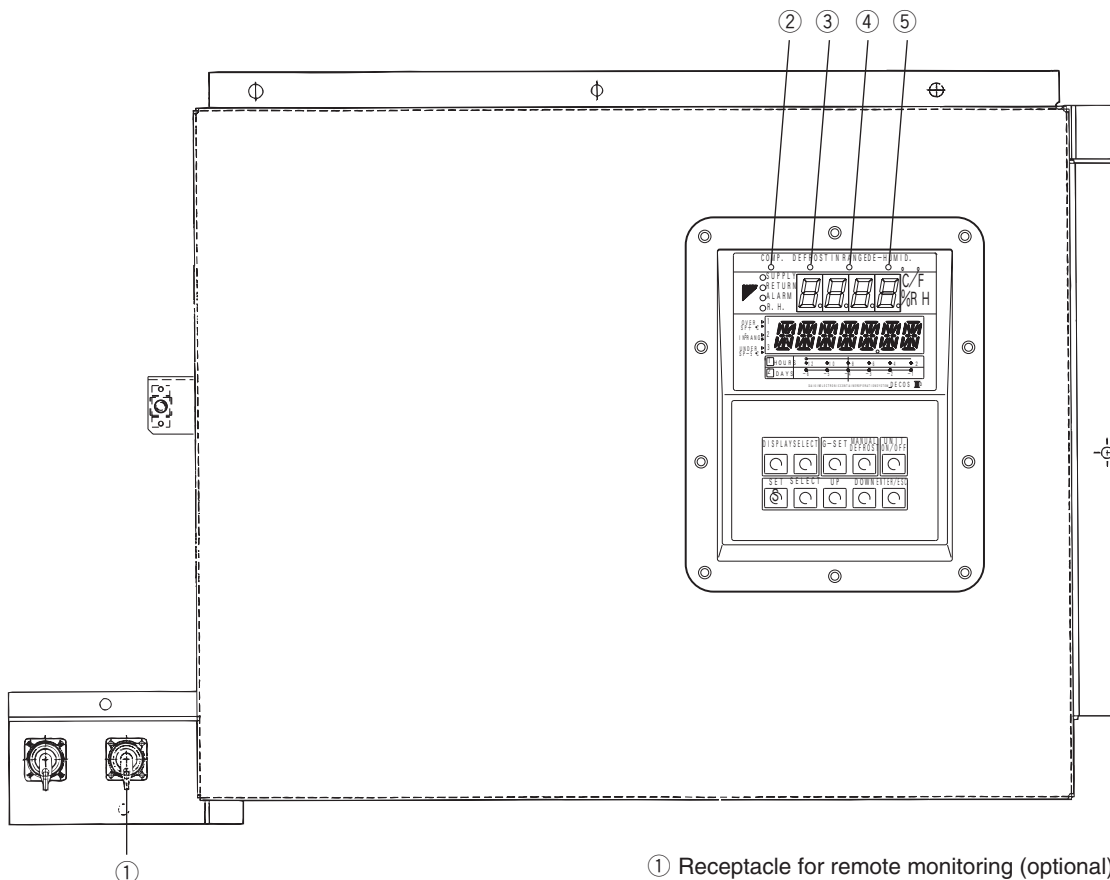
Four pilot lamps which indicate operating mode are mounted on the controller in the control box.

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 optionally attached. The connection is as shown below.



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



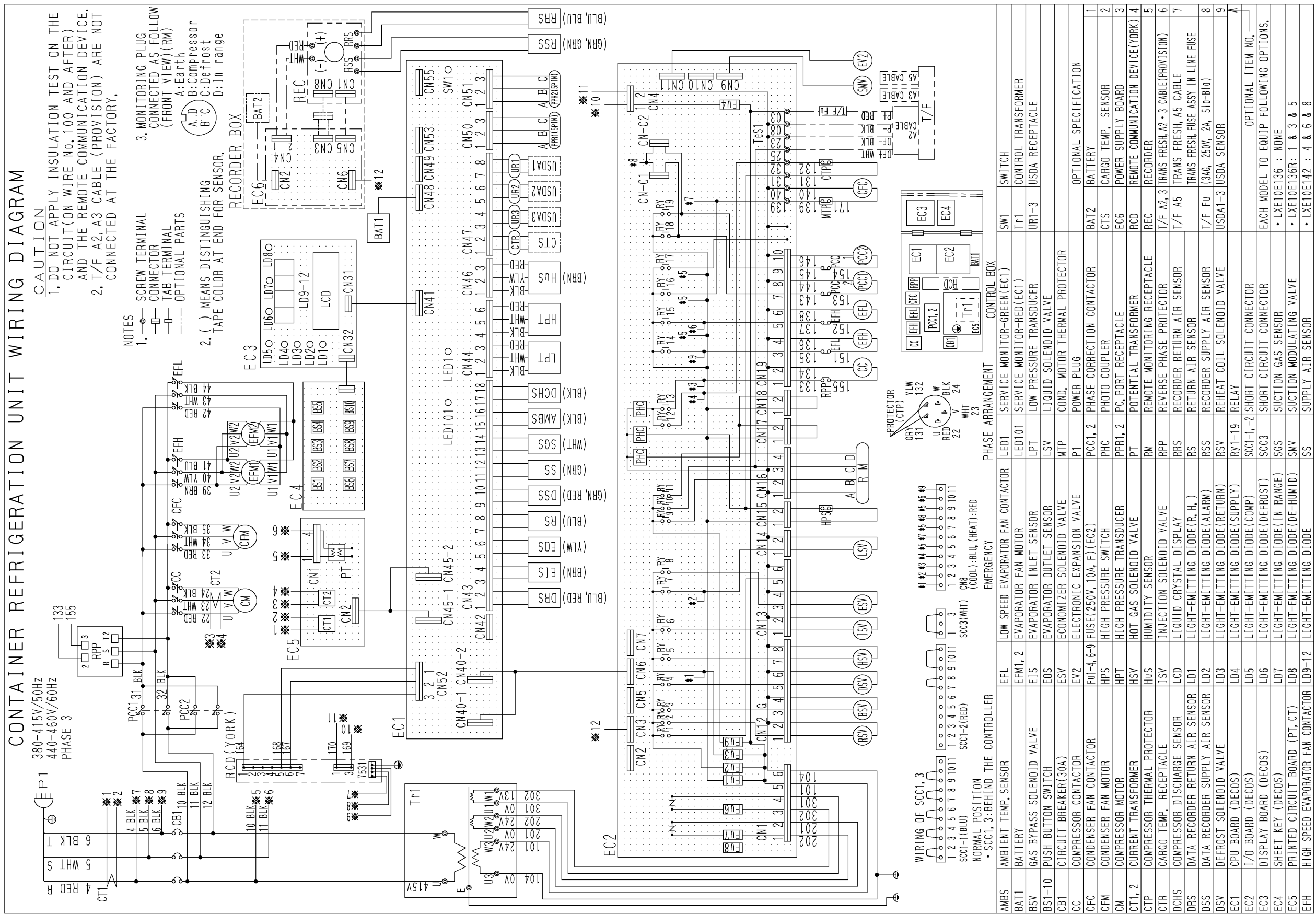
- ① Receptacle for remote monitoring (optional)
- ② COMP. (green)
- ③ DEFROST (red)
- ④ IN RANGE (orange)
- ⑤ DE-HUMID. (yellow)



## 7.11 Fuse protection table

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

7.12 Schematic wiring diagram (LXE10E136)





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**DAIKIN INDUSTRIES, LTD.**

Head Office. Umeda Center Bldg., 4-12, Nakazaki-Nishi 2-chome, Kita-ku, Osaka, 530-8323 Japan.

Tel: 06-6373-4338

Fax: 06-6373-7297

Tokyo Office. JR Shinagawa East Bldg., 11F 18-1, Konan 2-chome, Minato-ku Tokyo, 108-0075 Japan.

Tel: 03-6716-0420

Fax: 03-6716-0230