

DAIKIN



DAIKIN

Marine type

Container Refrigeration Unit

Service Manual

DAIKIN CONTAINER

LXE10E-A



DAIKIN INDUSTRIES, LTD.

TR 01-09A

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 LXE10E-A. It covers all of the unit's functions from basics such as the names for each mode of operation, 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:

- 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.

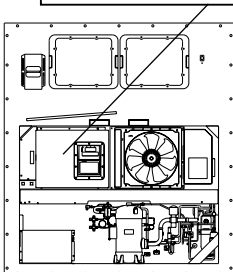
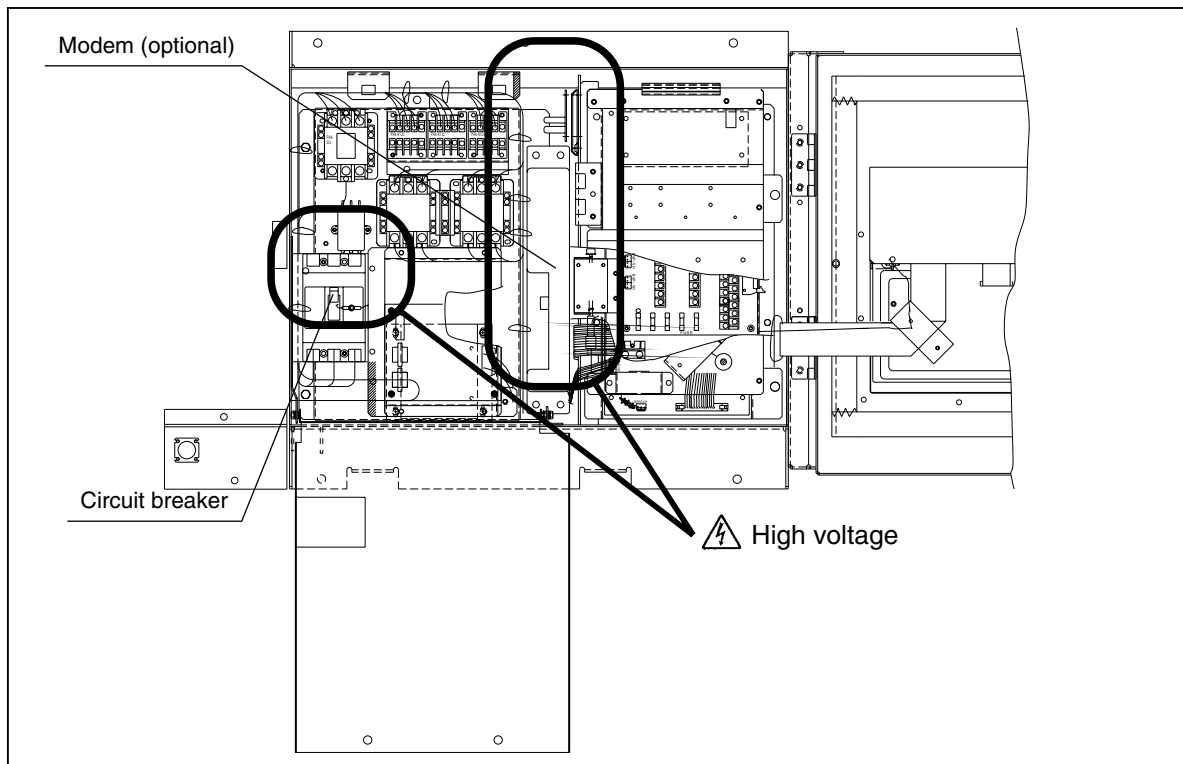
DANGER

Always turn off the main power supply to the facility before disconnecting the power plug.



Always turn off the main power supply to 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

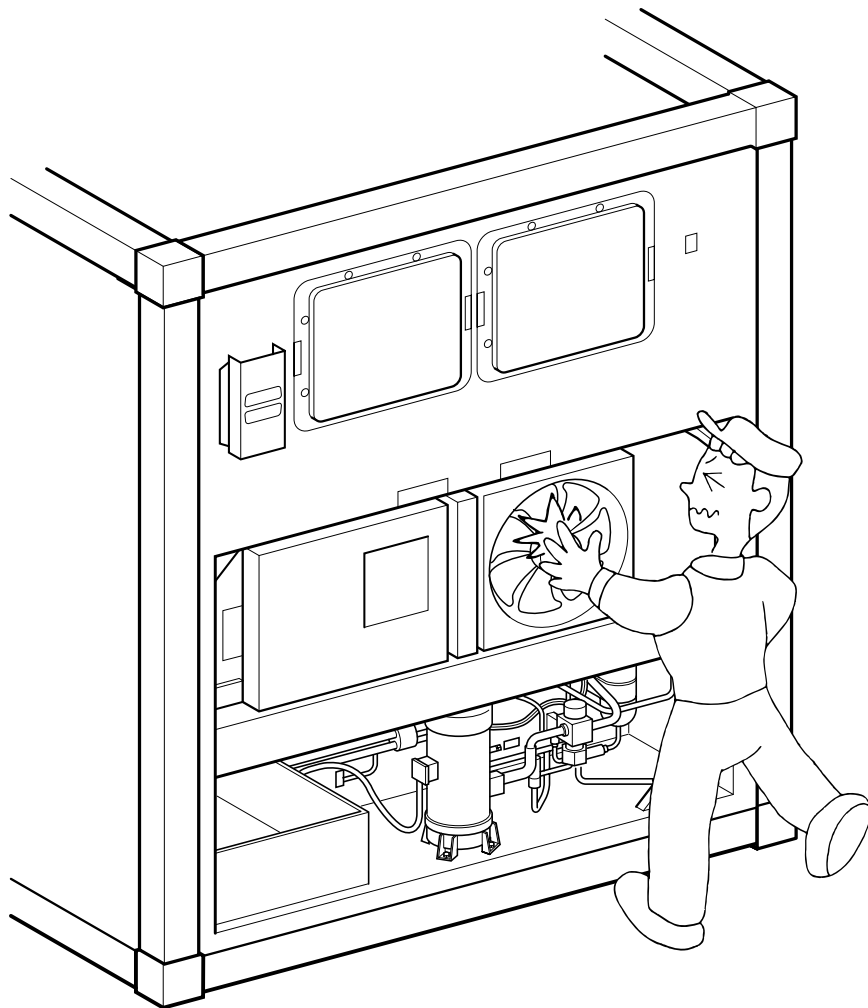


Do not touch the condenser fan while power to the unit is ON.

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.

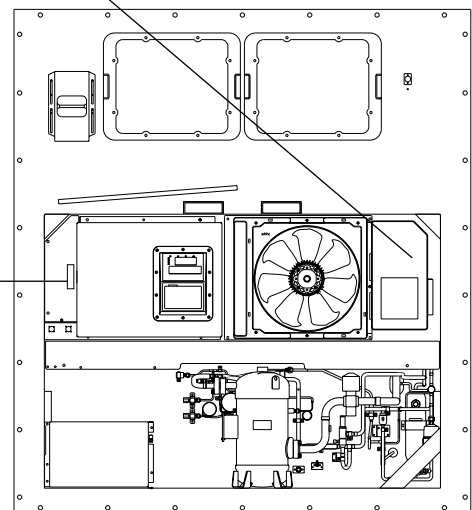
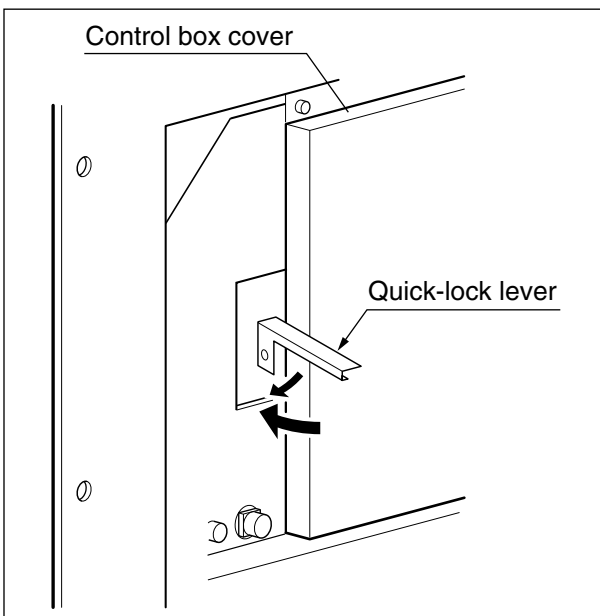
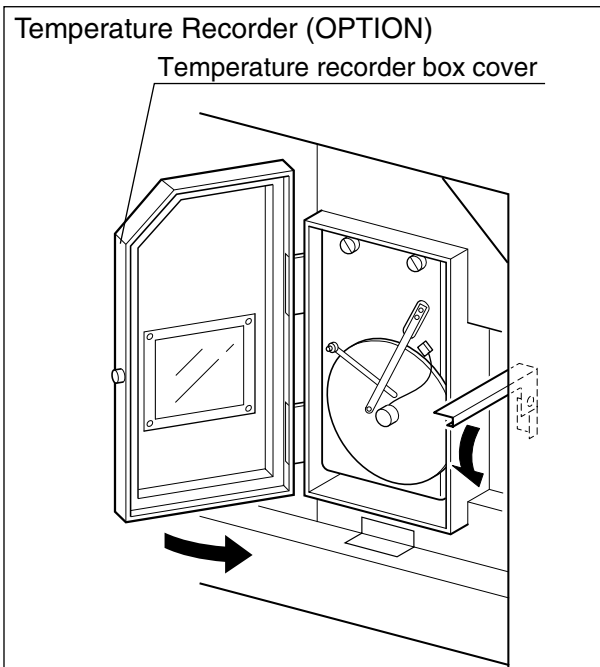




CAUTION

Before starting the unit, run the generator.

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

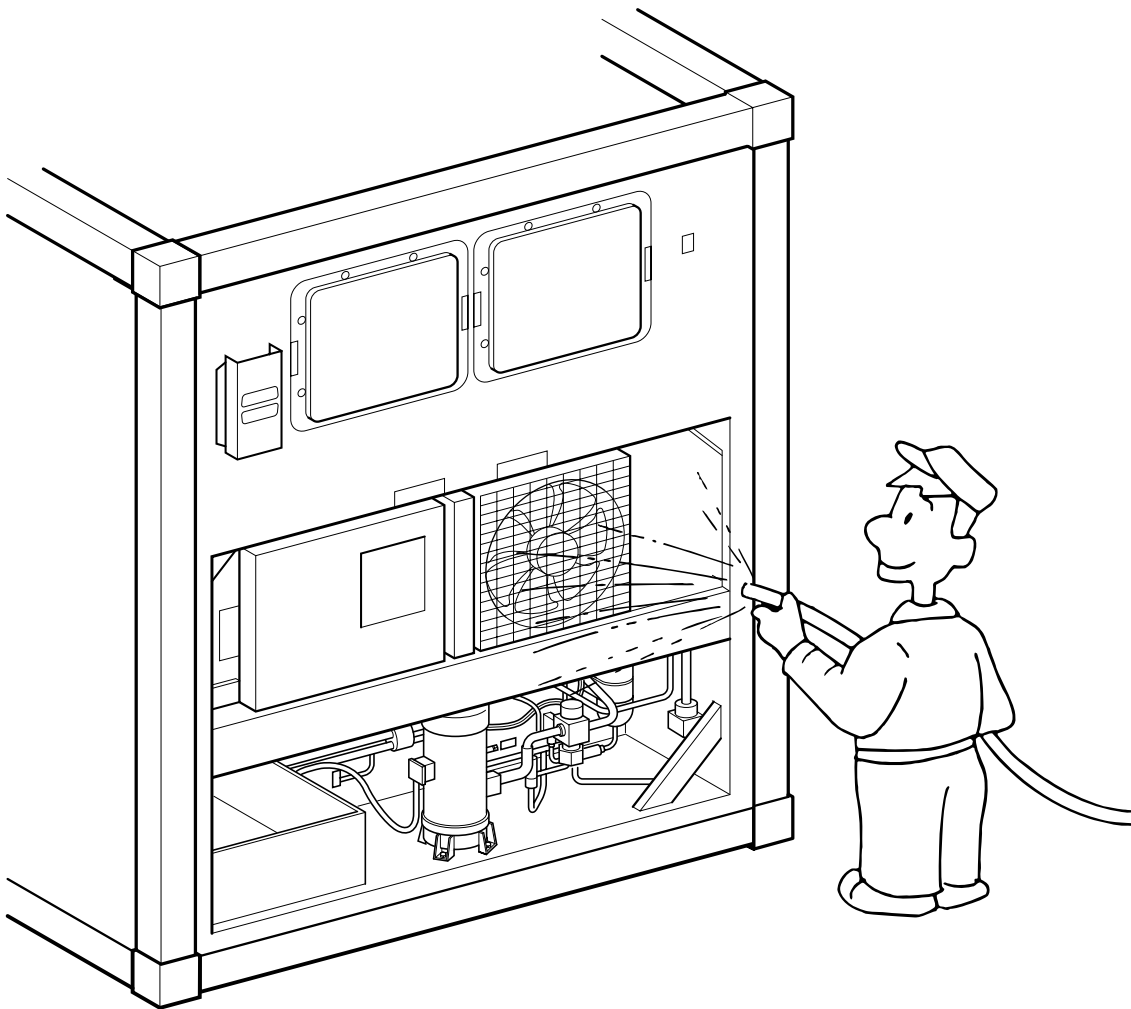




CAUTION

Wash the refrigeration unit with fresh water at PTI.

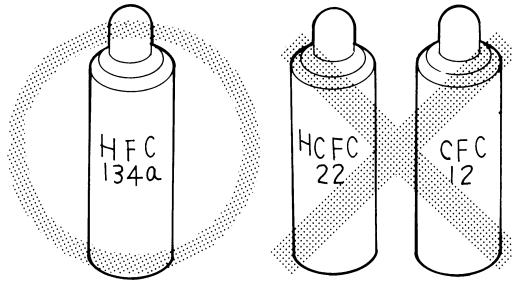
Carefully flush the air-cooled condenser with fresh water to remove the salt that sticks to it.



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.



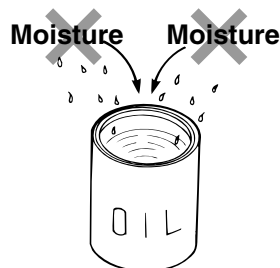
Use only Daikin specified oil (IDEMITSU, Daphne Hermetic Oil FVC46D) when replacing the refrigerant oil.
If any other refrigerating machine oil not specified is charged, it may cause problems with the unit.



DAPHNE
HERMETIC OIL
FVC46D

SUNISO
3GS-DI

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 section 4.1.2)
The charging hose and gauge port are not interchangeable with those of previous models using other refrigerants.

**CLASS 1 SPECIFIED PRODUCT BY
THE HYDROFLUORIC REFRIGERANT RECOVERY LAW**

HFC IS USED FOR THIS PRODUCT AS A REFRIGERANT.

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

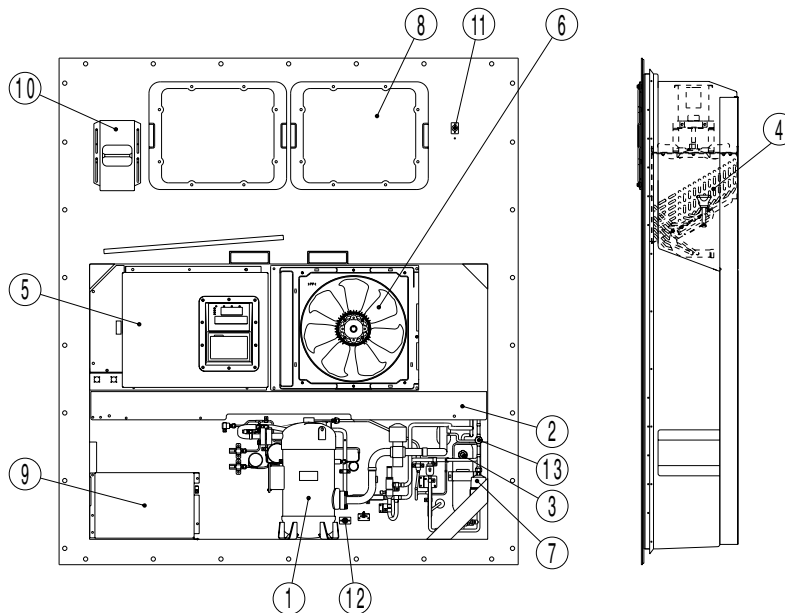
1. Introduction

1.1 OPERATION RANGE

Use the units within the following range.

| Item | Operation range |
|---------------------------|---|
| Ambient temperature range | -30°C to +50°C (-22°F to + 122°F) |
| Inside temperature range | -30°C to +25°C (-22°F to + 77°F) |
| Voltage | 50Hz: 380V/400V/415V, 60Hz: 440V/460V Voltage fluctuation rate should be within ±10% |
| Vibration and shock | 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 Sampling port (Return) (Use this port to measure the) (inside return air temperature.) |
| ⑤ Control box (Outside: switch, manual defrost switch, monitoring) (receptacle) (Inside: circuit breaker) | ⑫ Gas sampling port Sampling port (Supply) (This is used to measure the) (inside supply air temperature) (and inside CO ₂ concentration.) |
| ⑥ Condenser fan | ⑬ Liquid moisture indicator |
| ⑦ Drier | |

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.

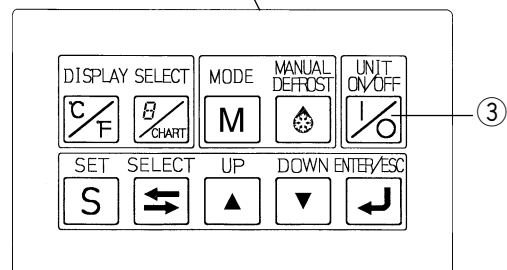
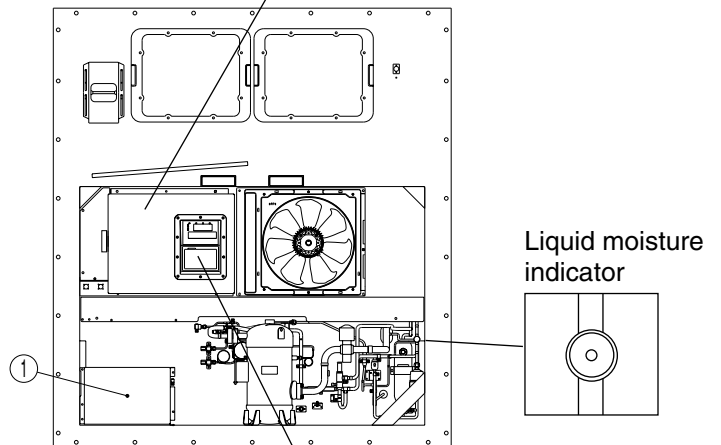
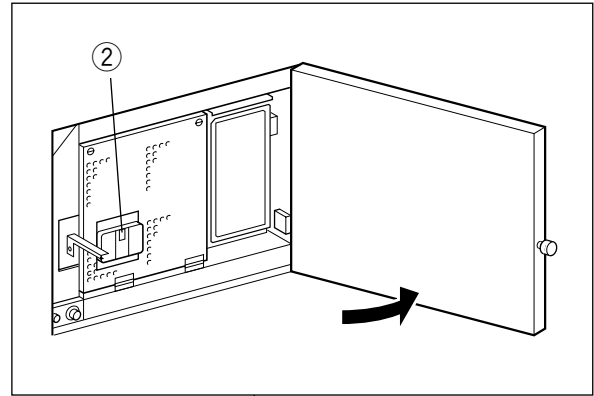
(2) Turn on the main power switch of the power source facility (outside the unit)

(3) Turn on the circuit breaker ②.

(4) Close the control box cover fully.

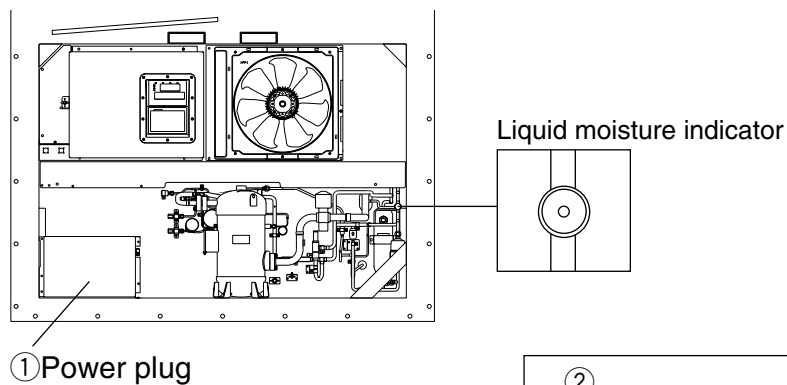
If it is poorly closed, it will allow water entry. Check the contact around the packing, and firmly close the cover. (Refer to the "⚠ CAUTION " on page 5.)

(5) Press the UNIT ON/OFF key ③.



1.3.2 Checking during operation

| Checking items(precautions) | Method of check |
|---|--|
| 1. Check the compressor, fan, pipes, etc. for abnormal noise and vibration. | Visual and auditory |
| 2. Check the refrigerant for shortage. | Visual During the chilled mode, the bubbles always appear in the moisture indicator. Do not charge the refrigerant excessively. Overcharging can damage the compressor. |
| 3. Check the refrigerant for moisture inclusion. | Visual The moisture indicator colour; Green: normal Yellow: abnormal. |
| 4. Check operating conditions with the pilot lamps. | Visual |



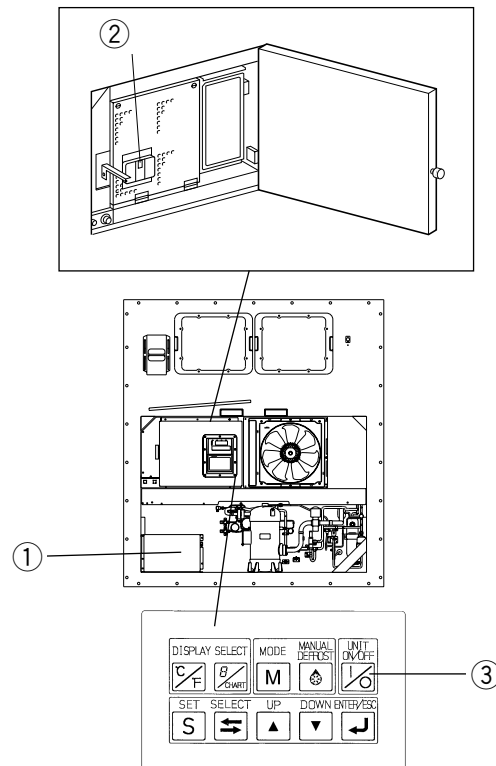
1.3.3 Procedure after operation

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

(2) Close the control box cover tightly.

(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.



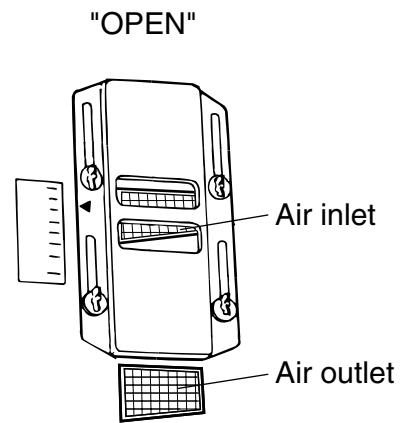
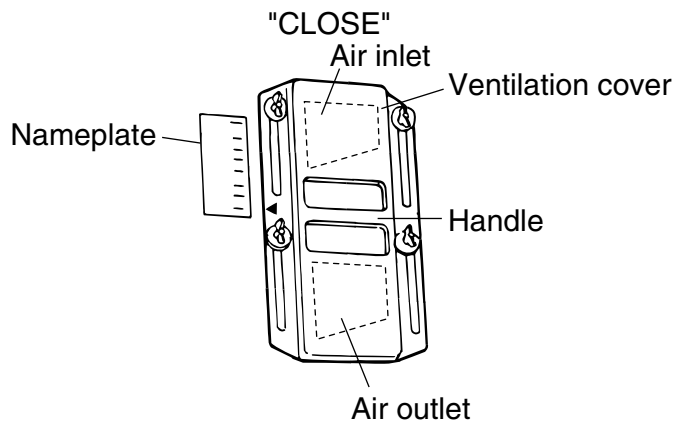
CAUTION

Keep the ventilation closed during transportation of the frozen cargo.

When ventilation is not required set the handle to "CLOSE".

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

※Set the arrow mark of the ventilation at the graduation on the scale to adjust the ventilation as desired according to the cargo.



2. General description

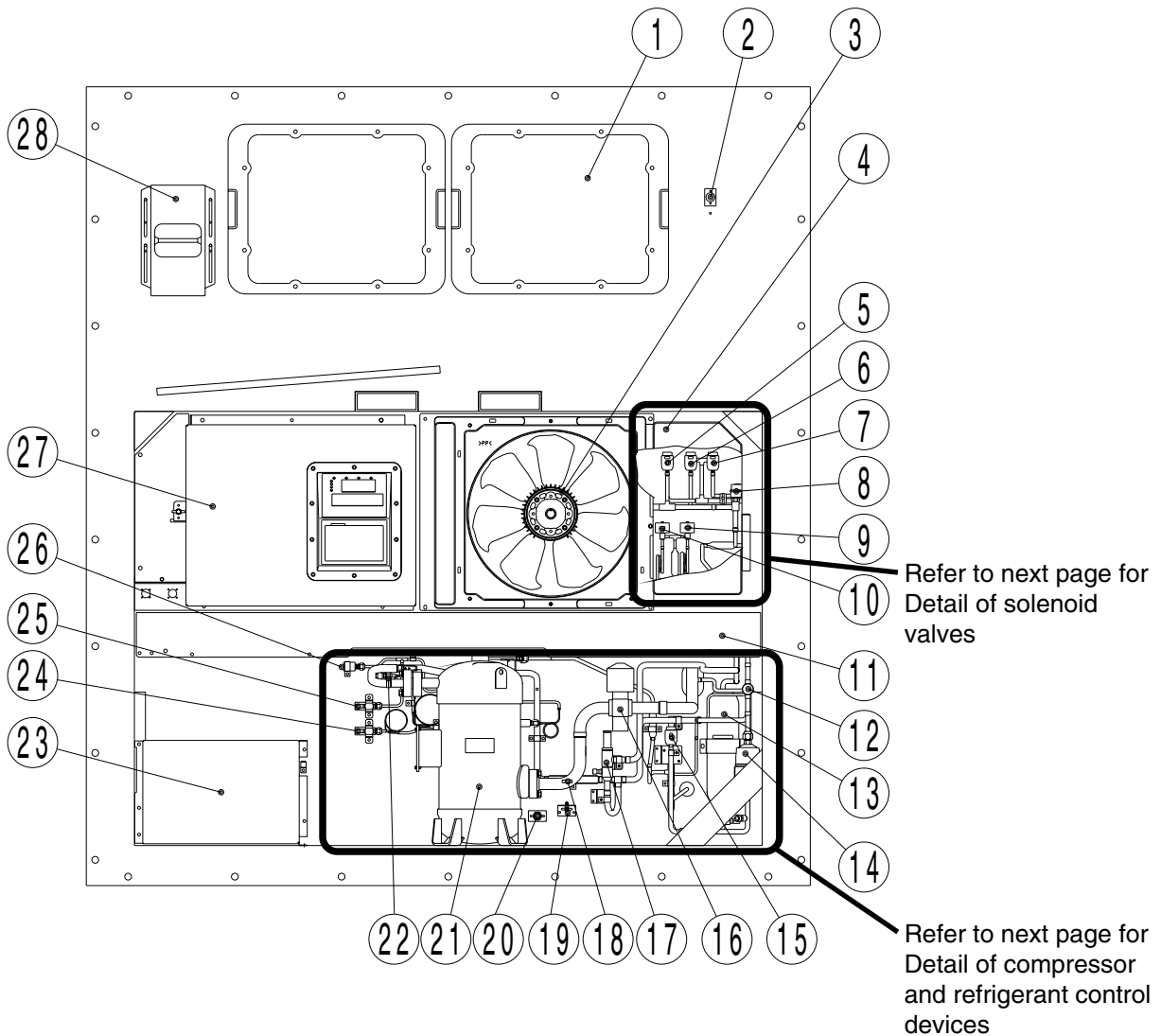
2.1 Main specifications

| Item | Model | LXE10E |
|---------------------------------------|-------------|--|
| Condenser cooling system | | Air cooled type |
| Controller | | DECOS III C |
| Power supply | | AC 3-phase 380V/400V/415V 50Hz, 440V/460V 60Hz |
| Compressor | | 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 (10A, 5A) |
| Refrigerant (charged amount) | | R134a : 4.6 (kg) |
| Refrigerant oil (charged amount) | | IDEMITSU, Daphne hermetic oil FVC 46D : 2.2(ℓ) |
| Weight | | Note; Refer to each model's specification for detail weight of each model. |

2.2 Names of components

2.2.1 Outside

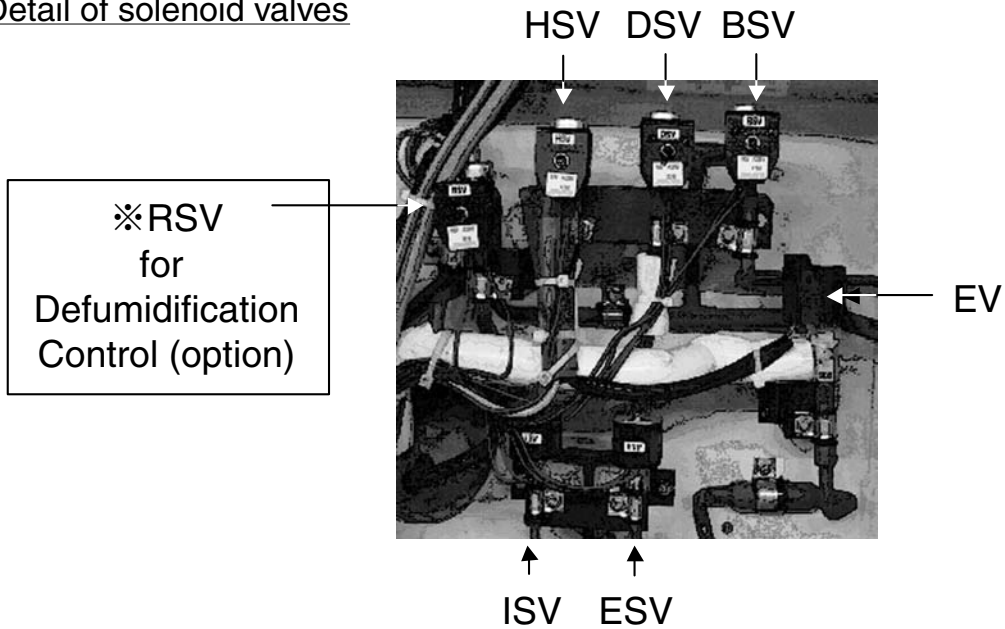
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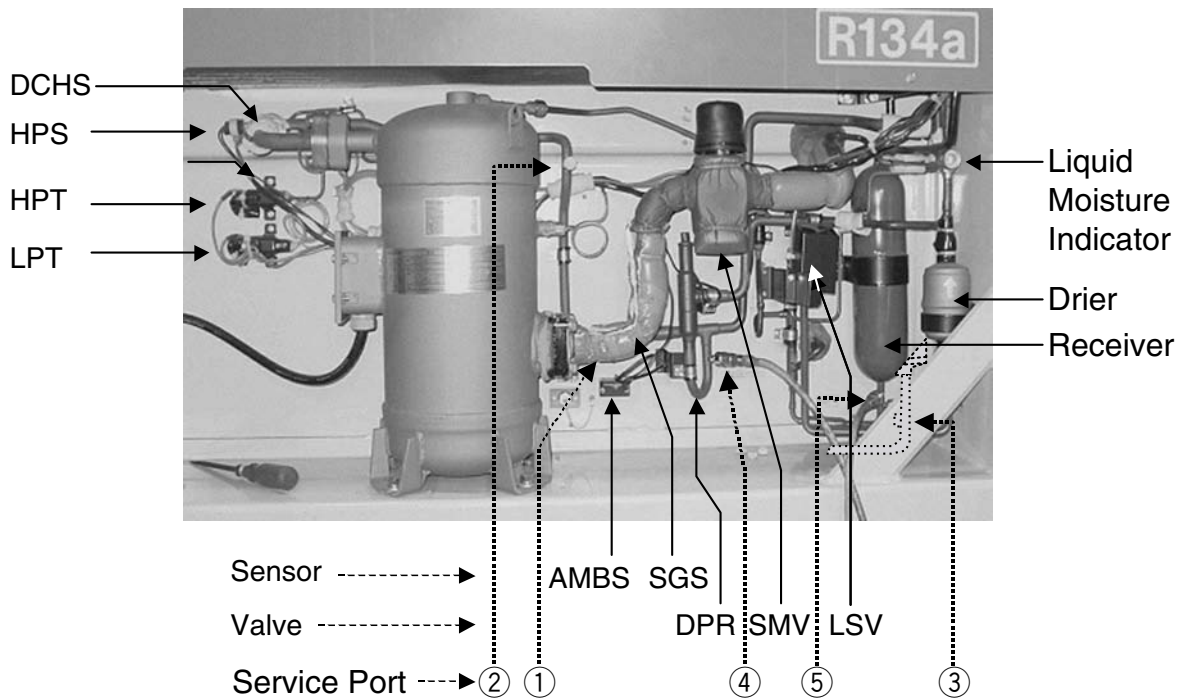
- | | |
|--|--|
| ① Access panel | ⑩ Injection solenoid valve (ISV) |
| ② Thermometer check port (Return air) | ⑪ Air-cooled condenser |
| ③ Condenser fan motor (CFM) | ⑫ Liquid/moisture indicator |
| ④ Temperature recorder box | ⑬ Liquid receiver |
| ⑤ Hot-gas solenoid valve (HSV) | ⑭ Dryer |
| ⑥ Defrost solenoid valve (DSV) | ⑮ Liquid solenoid valve (LSV) |
| ⑦ Discharge gas by-pass solenoid valve (BSV) | ⑯ Suction modulating valve (SMV) |
| ⑧ Electronic expansion valve (EV) | ⑰ Discharge pressure regulating valve (DPR) |
| ⑨ Economizer solenoid valve (ESV) | ⑱ Compressor suction pipe temperature sensor (SGS) |
| | ⑲ Ambient temperature sensor (AMBS) |
| | ⑳ Thermometer check port (Supply air) |
| | ㉑ Compressor (MC) |
| | 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



· Detail of compressor and refrigerant control devices

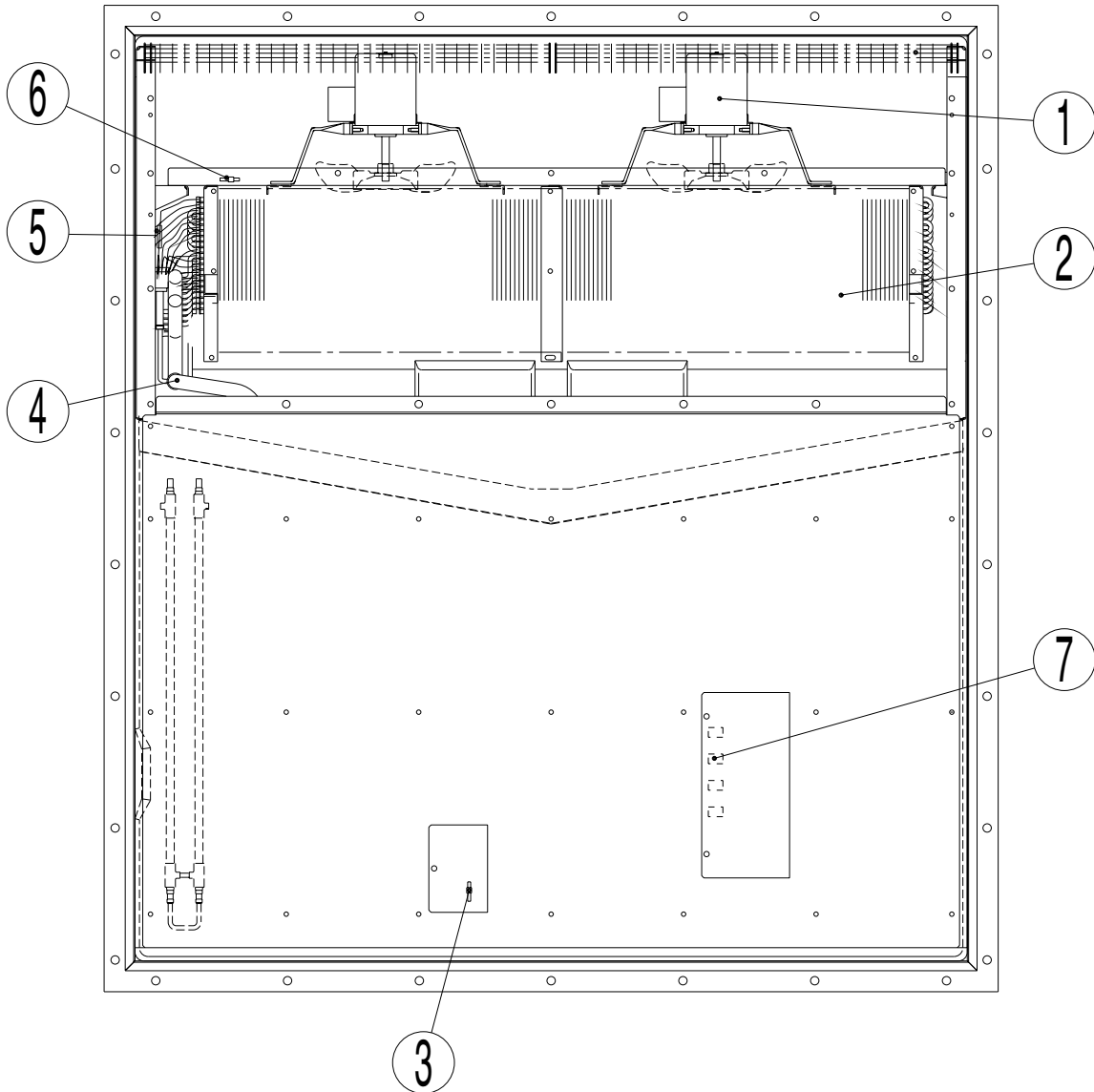


- [Valve]
- BSV :Bypass Solenoid Valve
 - DSV :Defrost Solenoid Valve
 - DPR :Discharge Pressure Regulator Valve
 - EV :Electronic Expantion Valve
 - ESV :Economizer Solenoid Valve
 - ISV :Injection Solenoid Valve
 - LSV :Liquid Solenoid Valve
 - RSV :Reheater Solenoid Valve (Option)
for dehumidification control
 - SMV :Suction Modulation Valve

- [Sensor]
- AMBS:Ambient Air Temperature Sensor
 - DCHS:Discharge Gas Temperature Sensor
 - HPS :High Pressure Switch
 - HPT :High Pressure Tranceducer
 - LPT :Low Pressure Tranceducer
 - SGS :Suction Pipe Temperature Sensor

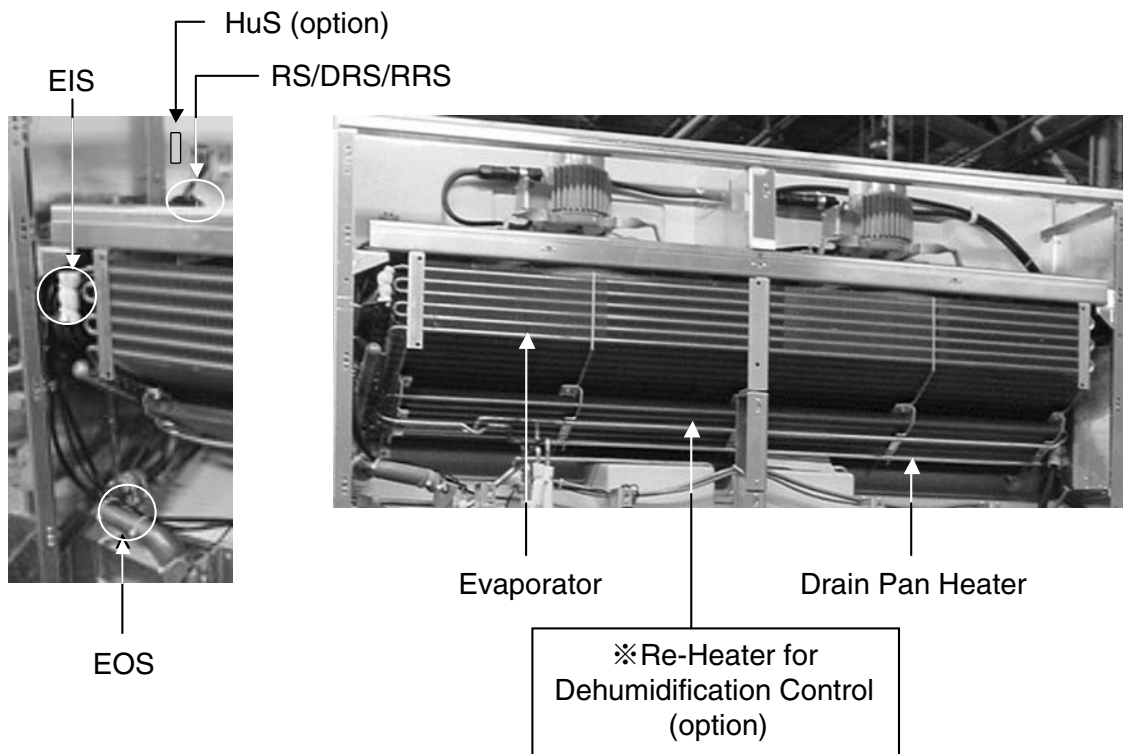
2.2.2 Inside

●LXE10E



- ① Evaporator fan motor (EFM)
- ② Evaporator
- ③ Supply air temperature sensor (SS)
Data recorder supply air temperature sensor (DSS)
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, optional)
Recorder return air temperature sensor (DRS, optional)
- ⑦ USDA receptacle (optional)

· Inside Detail

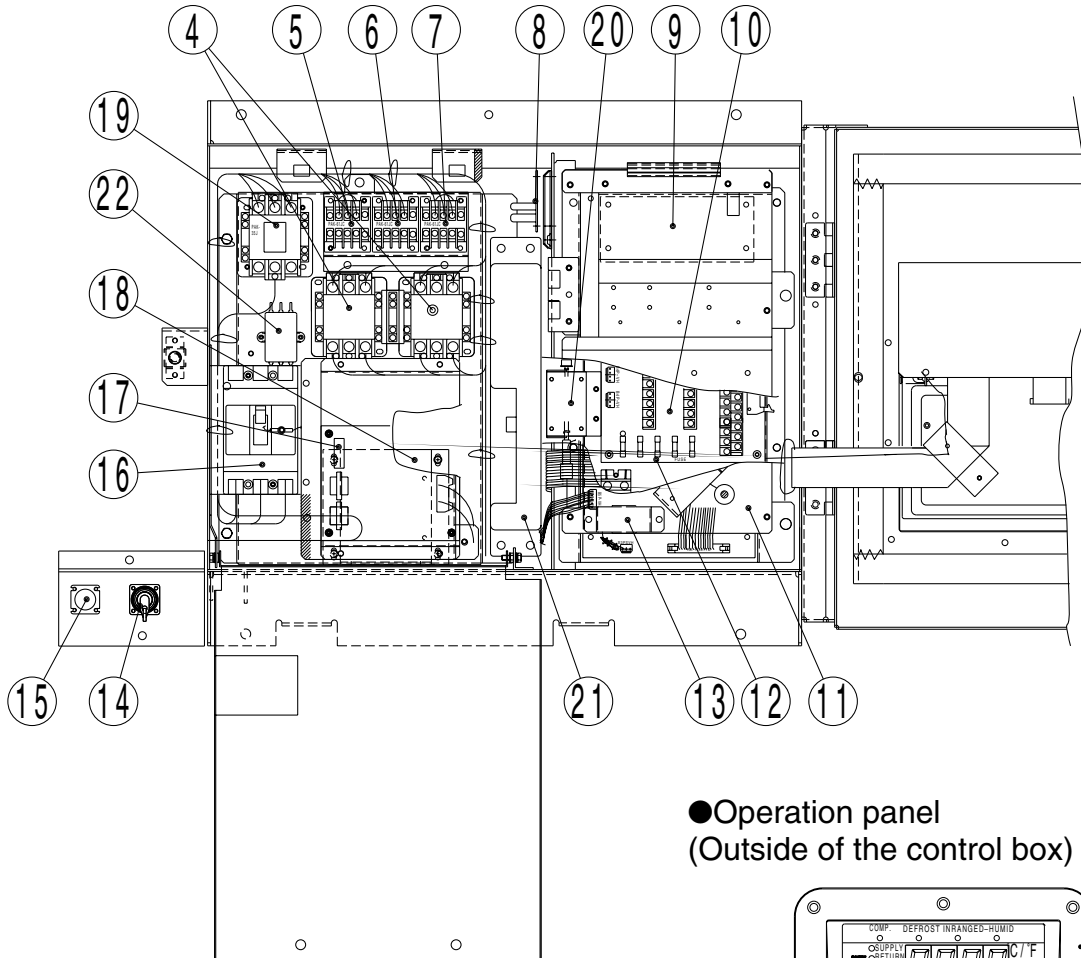


[Sensor]

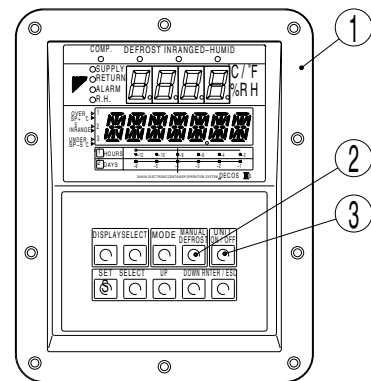
- DRS:Return Air Temperature Sensor for Datacorder
- DSS:Supply Air Temperature Sensor for Datacorder
- EIS :Evaporator Inlet Pipe Temperature Sensor
- EOS:Evaporator Outlet Pipe Temperature Sensor
- HuS :Humidity Sensor (Option)
- RS :Return Air Temperature Sensor
- RRS:Return Air Temperature Sensor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

2.2.3 Control box

● Inside of the control box

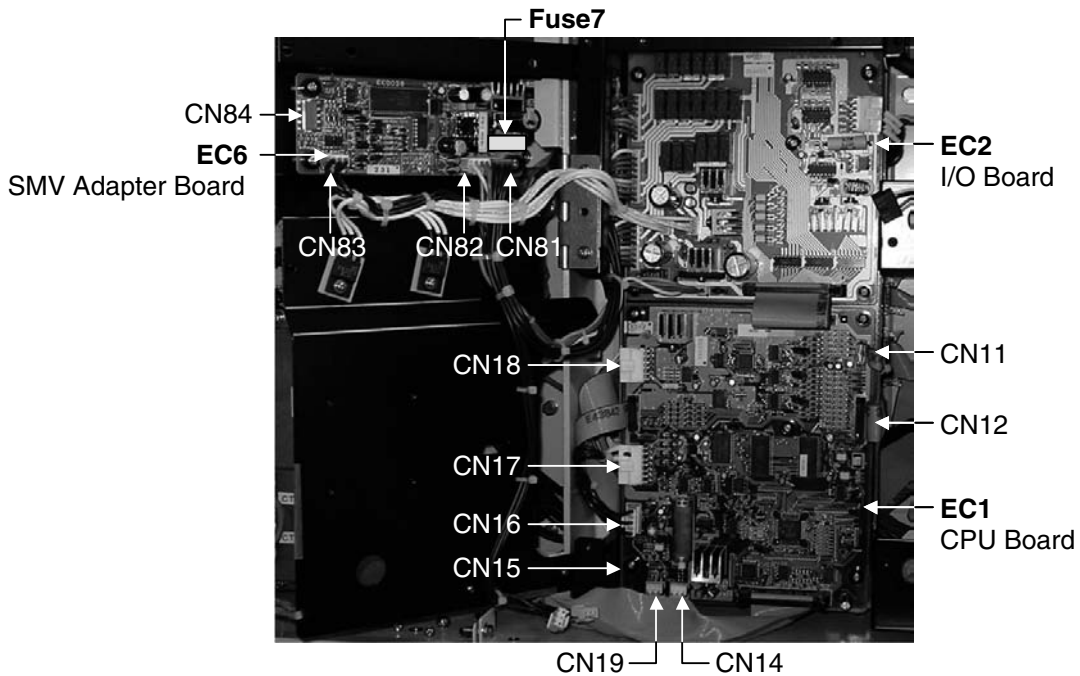
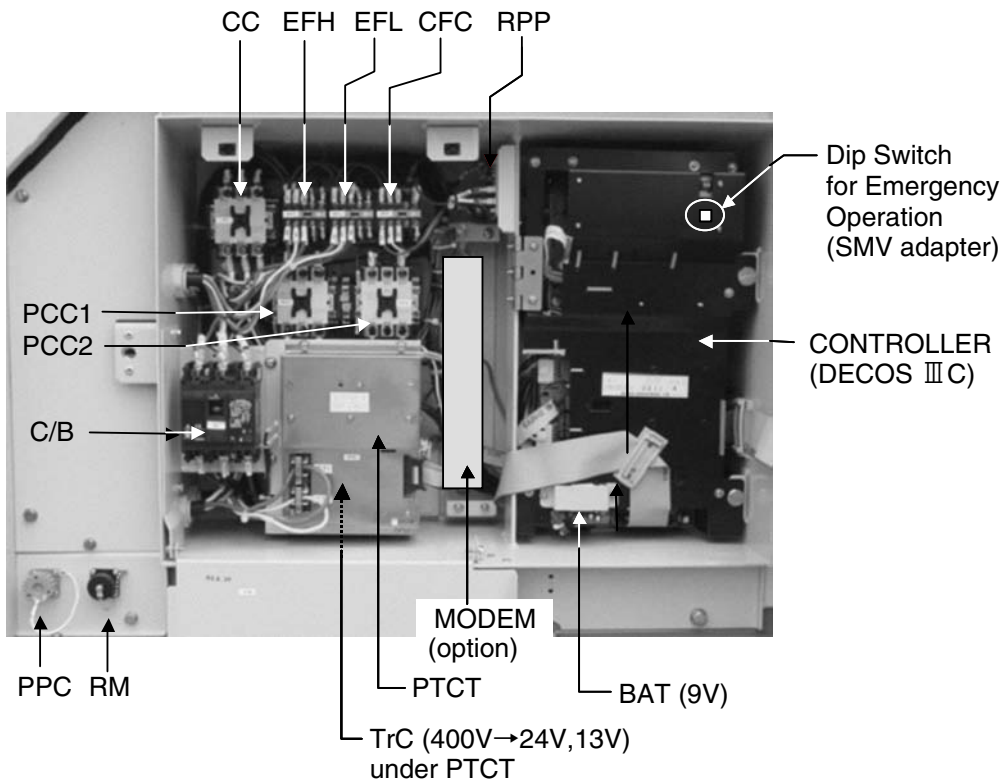


● Operation panel (Outside of the control box)



- | | |
|--|---|
| ① Controller operation panel (EC3, 4) | ⑫ Fuse (Fu1-6) |
| ② MANUAL DEFROST key | ⑬ Battery (BAT) |
| ③ UNIT ON/OFF key | ⑭ Remote monitoring receptacle (RM) |
| ④ Phase correction contactor (PCC1,2) | ⑮ Personal computer receptacle |
| ⑤ Magnetic contactor for high speed evaporator fan (EFH) | ⑯ Circuit breaker (CB) |
| ⑥ Magnetic contactor for low speed evaporator fan (EFL) | ⑰ PT/CT board |
| ⑦ Magnetic contactor condenser fan (CFC) | ⑱ Transformer (TrC), control circuit |
| ⑧ Reverse phase protection device (RPP) | ⑲ Magnetic contactor for compressor (CC) |
| ⑨ Adopter PCB (EC6) | ⑳ P.C.B for humidity sensor (HUS, optional) |
| ⑩ Terminal block board (TB1) | ㉑ Modem (RCD, optional) |
| ⑪ Controller CPU / IO board (EC1, 2) | ㉒ Noise filter (NF, optional) |

· Control box Inside detail



[Control Box]

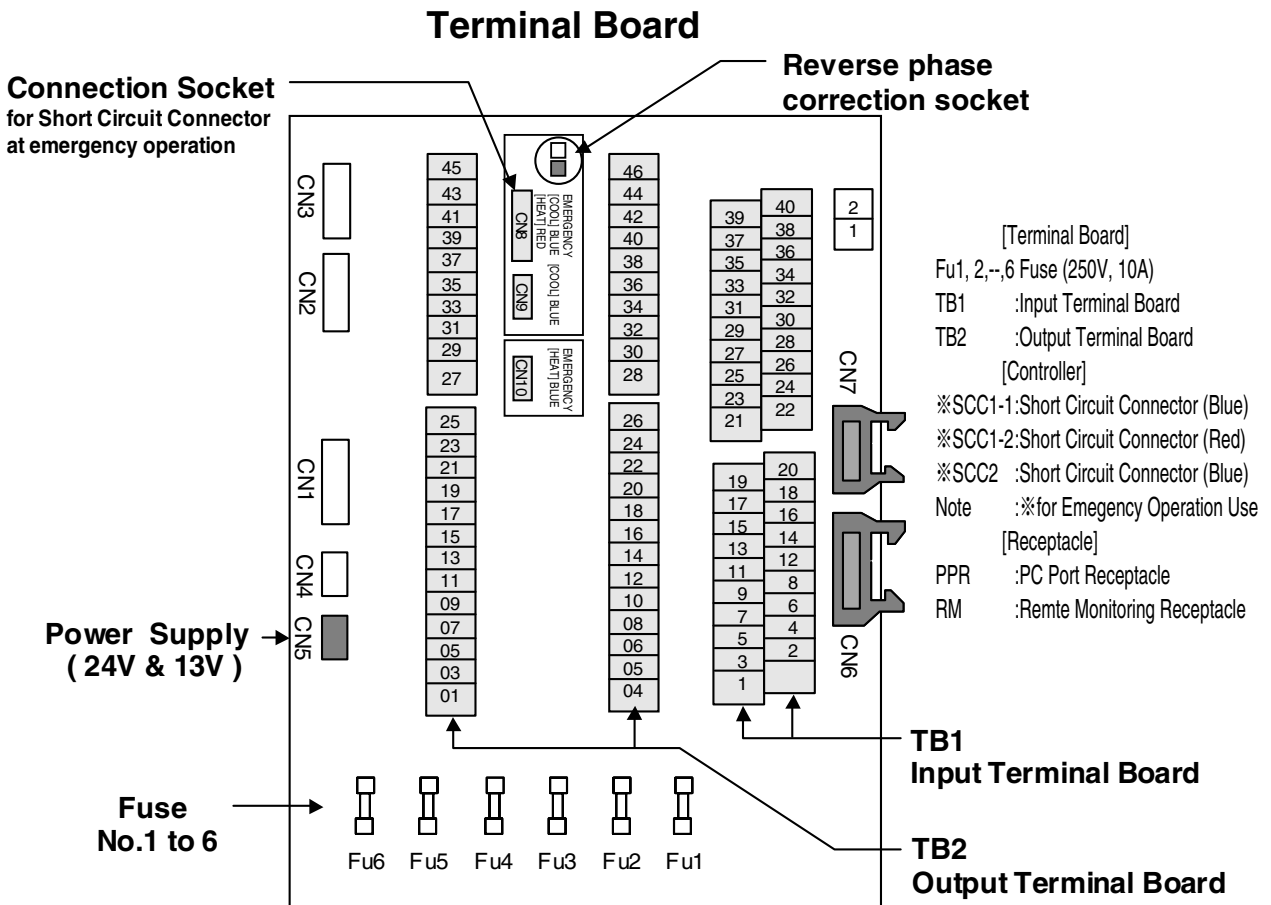
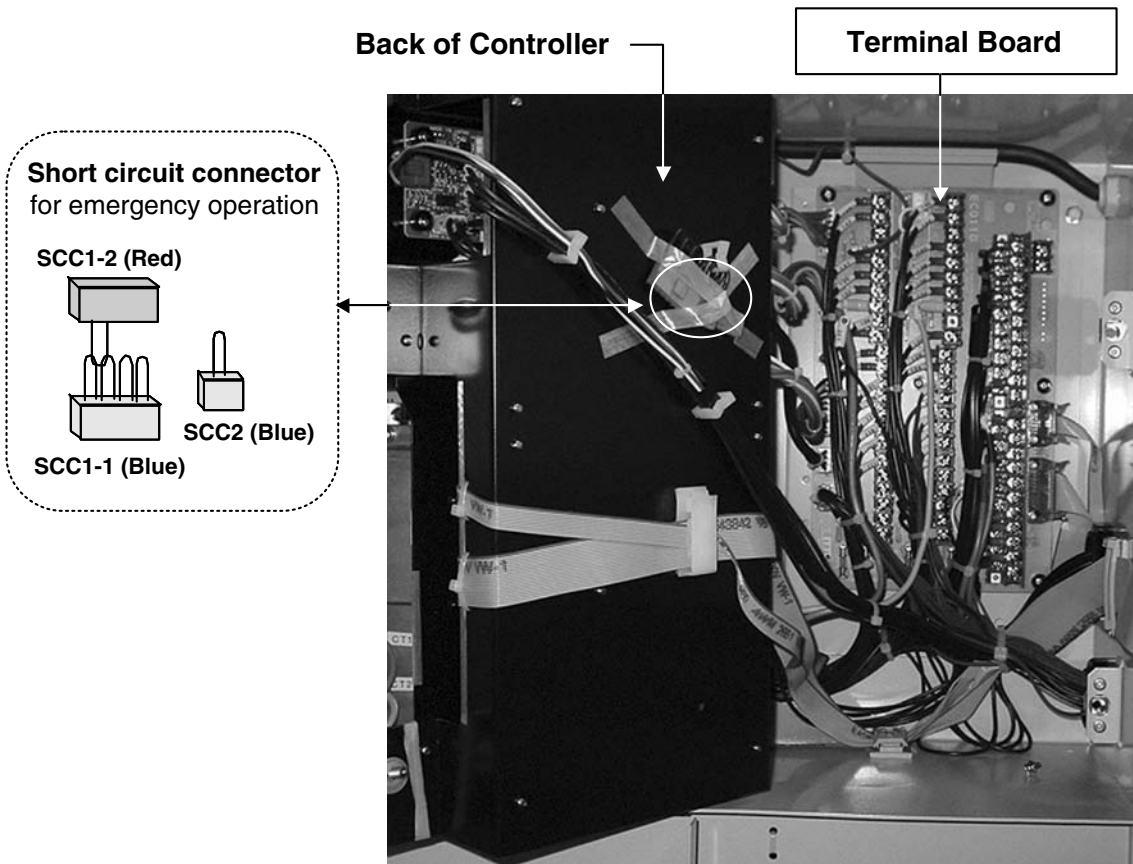
- BAT :Back-up Battery (9V)
- CC :Magnetic Contactor, Compressor
- CFC :Magnetic Contactor, Condensor Fan Motor
- C/B :Circuit Breaker
- EFH :Magnetic Contactor, Evaporator Fan Motor, High Speed
- EFL :Magnetic Contactor, Evaporator Fan Motor, Low Speed

- PCC1:Phase Correction Contactor 1
- PCC2:Phase Correction Contactor 2
- PTCT:PTCT Board
- RPP :Reverse Phase Protector
- TrC :Transformer

[Controller]

- EC1 :CPU Board
- EC2 :I/O Board
- EC6 :SMV Adapter Board

· Detail of terminal Board & Short circuit Connector



2.3 Set point of functional parts and protection devices

| | Device name | | Actuation | Set point | Detection method | Symbol |
|--|--|--|--|--|---|----------------|
| Pressure switch | High-pressure switch | | OFF ON | 2400kPa (24.47kg/cm ²) 1900kPa (19.37kg/cm ²) | High-pressure switch | HPS |
| | Mode selection | Chilled mode | ON | +25.0°C to -2.9°C (+77.0°F to +26.8°F) | Set point temperature | EC |
| Partial frozen mode | | -3.0°C to -10.0°C (+26.6°F to +14.0°F) | | | | |
| Frozen mode | | -10.1°C to -30.0°C (+13.8°F to -22.0°F) | | | | |
| Delay timer | Fan | Change-over for Hi/Lo | ON | 10 seconds | | |
| | | After defrosting | | 60 seconds | | |
| | Compressor | At starting | | 3 seconds | | |
| Defrosting timer | Initiation | Short | ON | 4 hours ※1 | | |
| | | Long | | 3, 6, 9, 12, 24 and 99 hours(※2) | | |
| | Back-up | | OFF | 90 minutes | | |
| | In-range masking | | | 90 minutes ※3 | | |
| | Out-range guard | | ON | 30 minutes | | |
| Defrosting termination set point ※6 | | | OFF Reset | 30°C (86°F) 15°C (59°F) ※4 | Evaporator outlet temperature sensor Return air temperature sensor | EOS RS, DRS |
| High-pressure control for Condenser fan (※Frozen only) | | | OFF ON | 800kPa (8.2kg/cm ²) ※7 1000kPa (10.2kg/cm ²) | High-pressure transducer | HPT |
| Discharge gas temperature protection set point | Pull down LPT>50kpa LPT≤50kpa | OFF Reset | 135°C (275°F) After 3 minutes elapsed | Discharge gas temperature sensor | DCHS | |
| | | OFF Reset | 128°C (262°F) After 3 minutes elapsed | | | |
| Overcurrent protection set point (Cutout) | | | OFF Reset | 26.0A After 3 minutes elapsed | PT/CT board | CT2 |
| Current control | | | Control | 50Hz : 16.1A 60Hz : 17.4A | PT/CT board | CT1 |
| High pressure control | | | Control | 2300 to 2350 kPa (23.5 to 24.0 kg/cm ²) | High pressure sensor | HPT |
| Current | Circuit breaker | | OFF | 30A | | CB |
| | Fuse | | OFF | 5A, 10A ※5 | | Fu |
| Motor | Evaporator fan motor thermal protector | | OFF | 132°C (270°F) | | |
| | Condenser fan motor thermal protector | | OFF | 135°C (275°F) | | MTP |
| | Compressor motor thermal protector | | OFF | 140°C (284°F) | | CTP |
| - | Fusible plug | | - | 95~100°C | | |

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

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

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

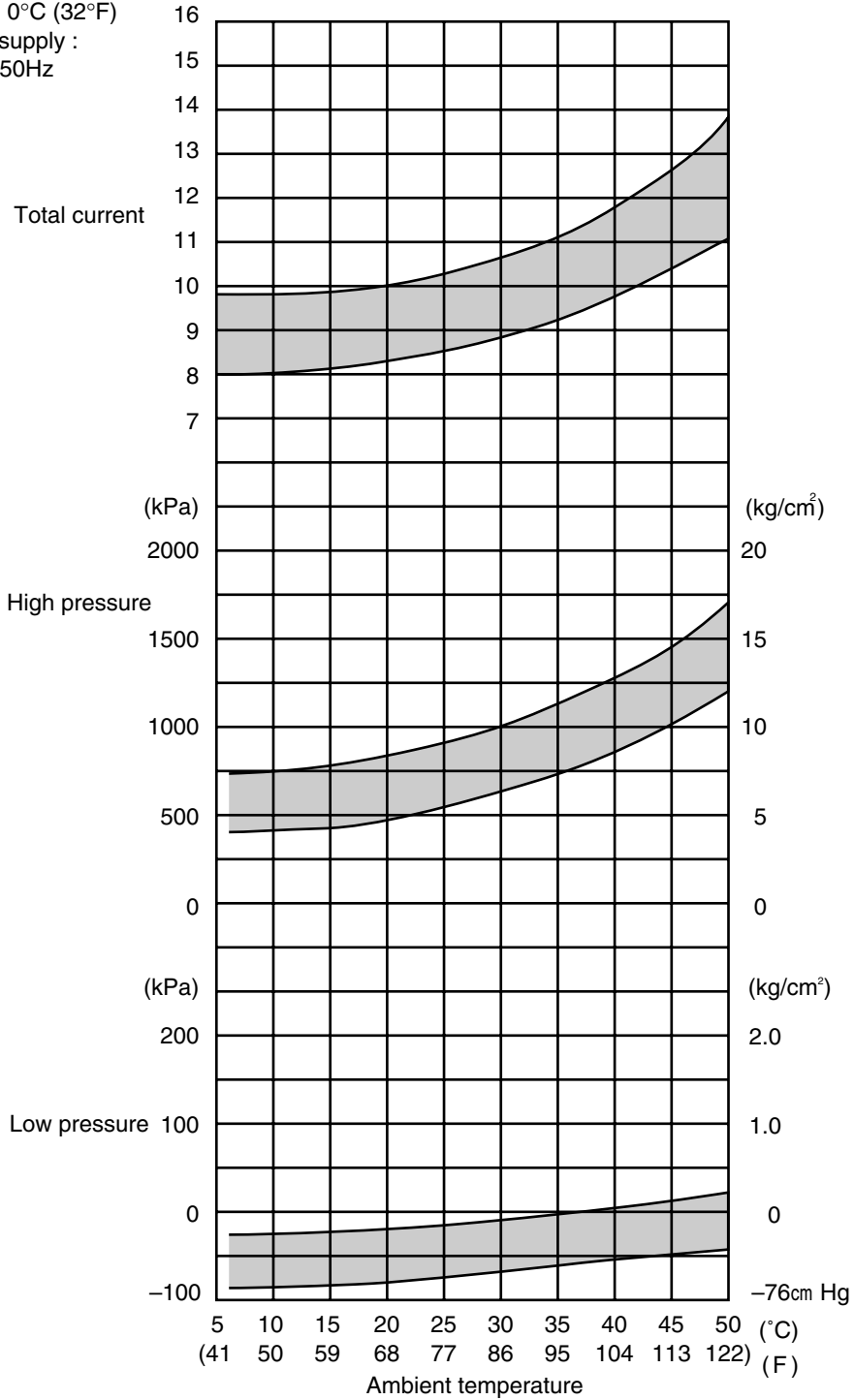
(※4) If defrost is initiated when inside temperature is out range area. (= In-range LED is not light), this condition is added to finish defrost. Refer to "Defrosting termination" in 2.5.3.

(※5) Refer to "Fuse Protection table" in 7.11.

(※6) When dehumidification is ON in dehumidification mode, the setting figure may change between 900~2100kPa automatically (Refer to "High Pressure Control" Page 2-24)

2.4 Operating pressure and running current

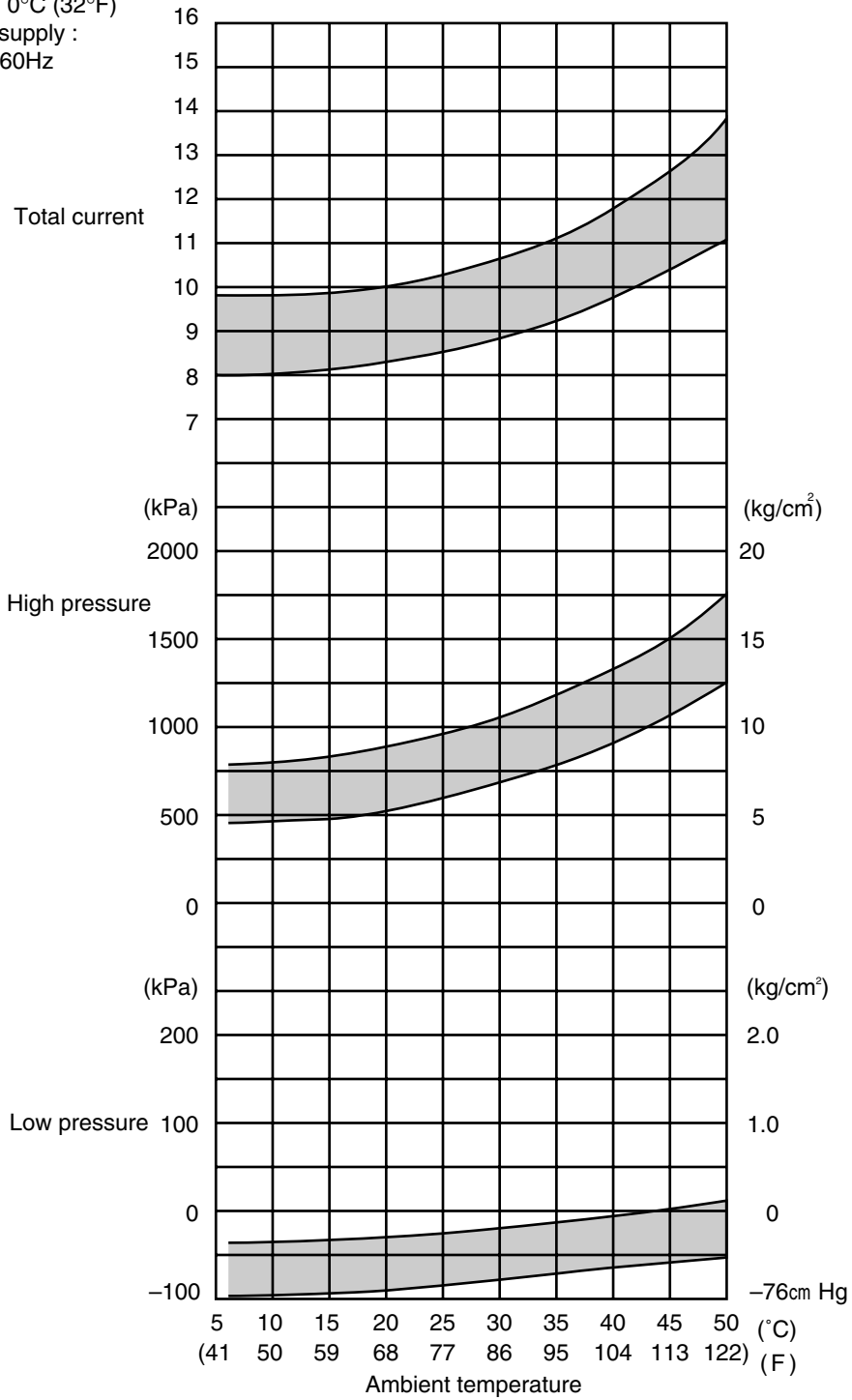
- Chilled mode
 Inside : 0°C (32°F)
 Power supply :
 415V / 50Hz



- 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 |

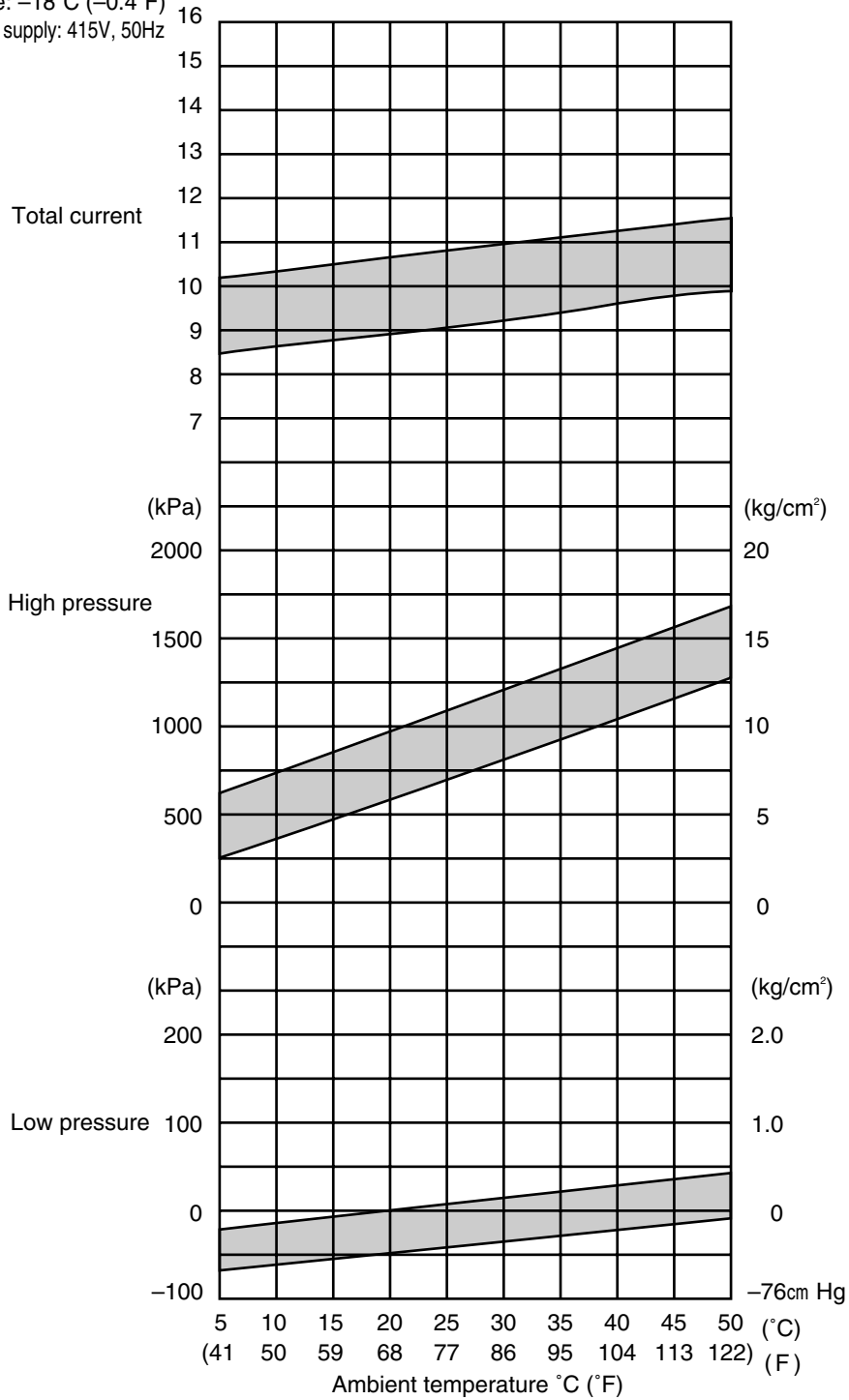
●Chilled mode
 Inside : 0°C (32°F)
 Power supply :
 400V / 60Hz



●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 |

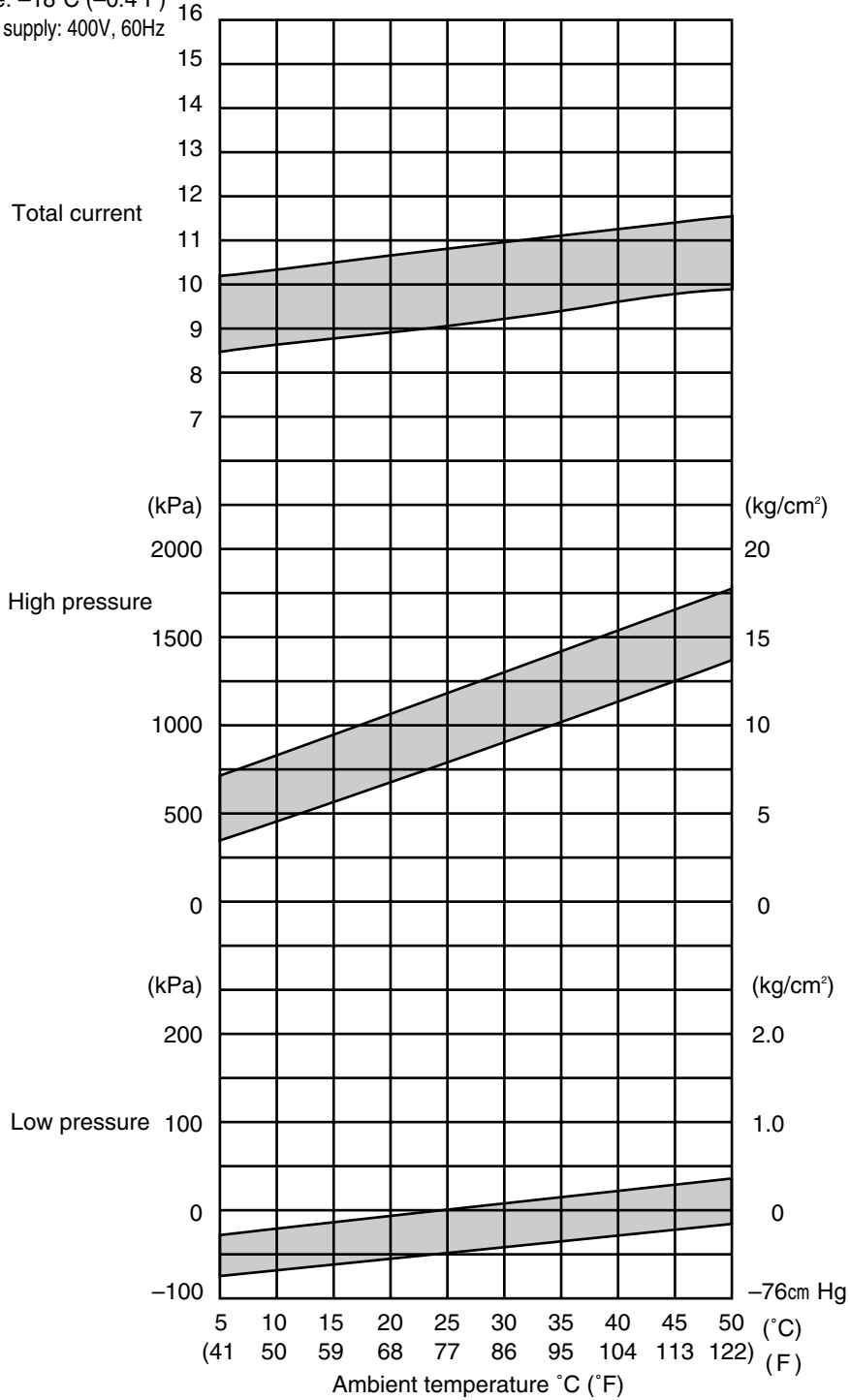
●Frozen mode
 Inside: -18°C (-0.4°F)
 Power supply: 415V, 50Hz



●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.

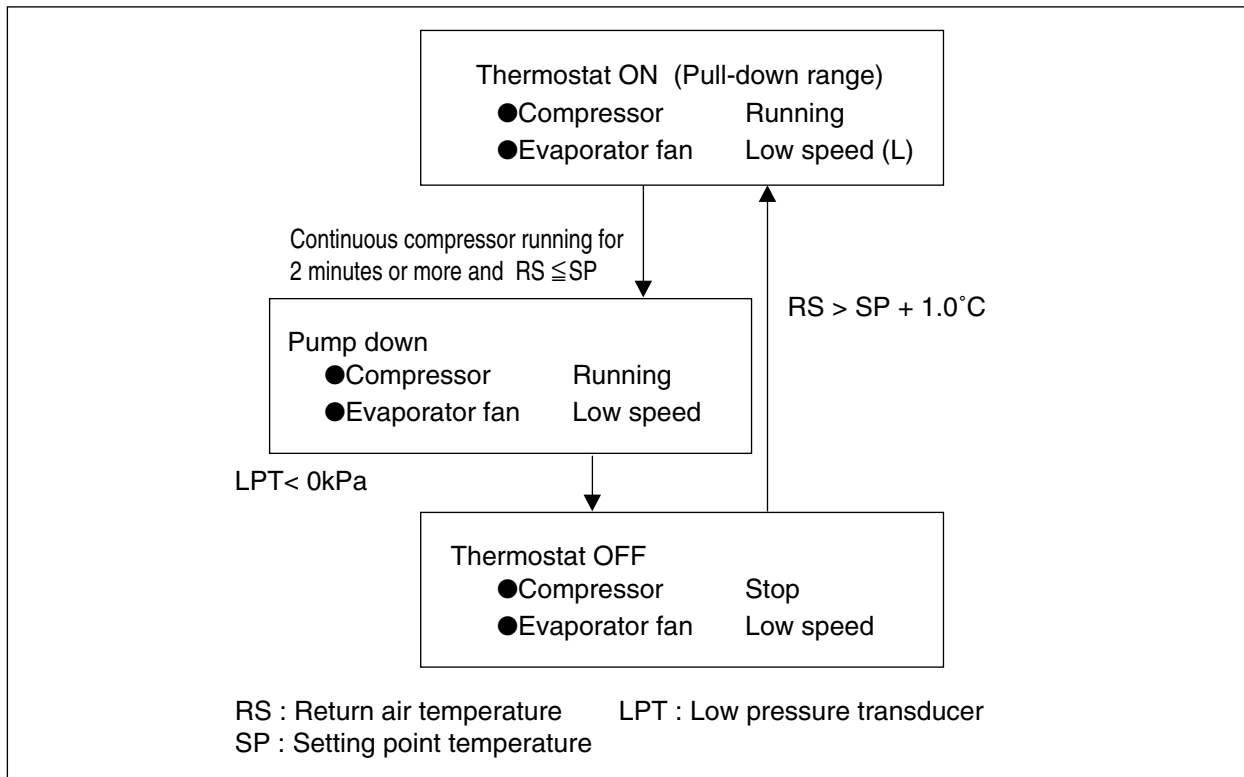
The relationship between the operation mode and setting temperature is as follows.

| Operation mode | Setting temperature | Control sensor | Operation description |
|---------------------|--|-------------------------------|---|
| Frozen mode | -10.1°C to -30.0°C (+13.8°F to -22.0°F) | Return air temperature sensor | Compressor ON/OFF control |
| Partial frozen mode | -3.0°C to -10.0°C (+26.6°F to +14°F) | Return air temperature sensor | Capacity control operation with suction modulating valve and hot-gas bypass control |
| Chilled mode | +25.0°C to -2.9°C (+77°F to +26.8°F) | Supply air temperature sensor | Capacity control operation with suction modulating valve and hot-gas bypass control |
| Defrosting mode | — | — | Hot-gas defrosting with refrigerant metering control |

※For details, refer to section 2.5.1 to 2.5.4

2.5.1 Frozen mode

Control state transition and common control



Operation of magnetic contactor and solenoid valve

| Component name | | Thermostat ON | Pump down | 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 | ON / OFF※1 |
| Solenoid valve | Liquid solenoid valve | LSV | ON | OFF |
| | Economizer solenoid valve | ESV | ON(OFF※3) | ON(OFF※3) |
| | Injection solenoid valve | ISV | OFF(ON※2) | OFF(ON※2) |
| | Hot-gas solenoid valve | HSV | OFF | OFF |
| | Defrost solenoid valve | DSV | OFF | OFF |
| | Discharge gas by-pass solenoid valve | BSV | OFF | OFF |
| Suction modulating valve | SMV | 100% | | |
| Electronic expansion valve | EV | 10 to 100% | | |

Note) ※1: High pressure control

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

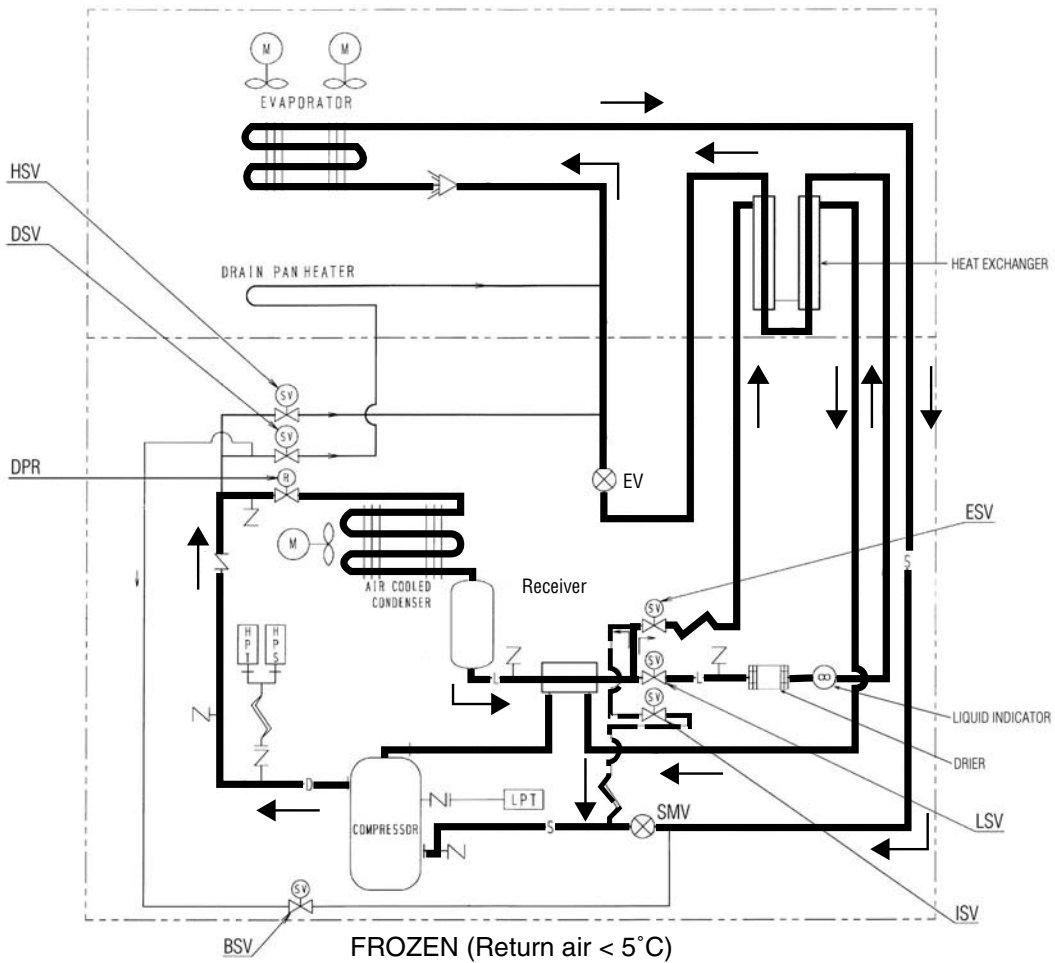
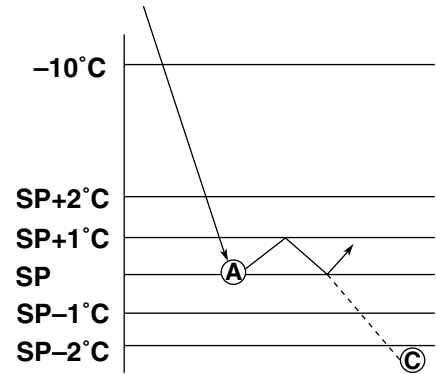
※3: Economizer control (Refer to Page 2-26)

(1) Set point temperature and control sensor

When the set point temperature (referred to as SP hereafter) is $-10.1^{\circ}\text{C}(+13.8^{\circ}\text{F})$ or lower, the compressor is operated ON and OFF, in response to return air temperature.

(2) Control

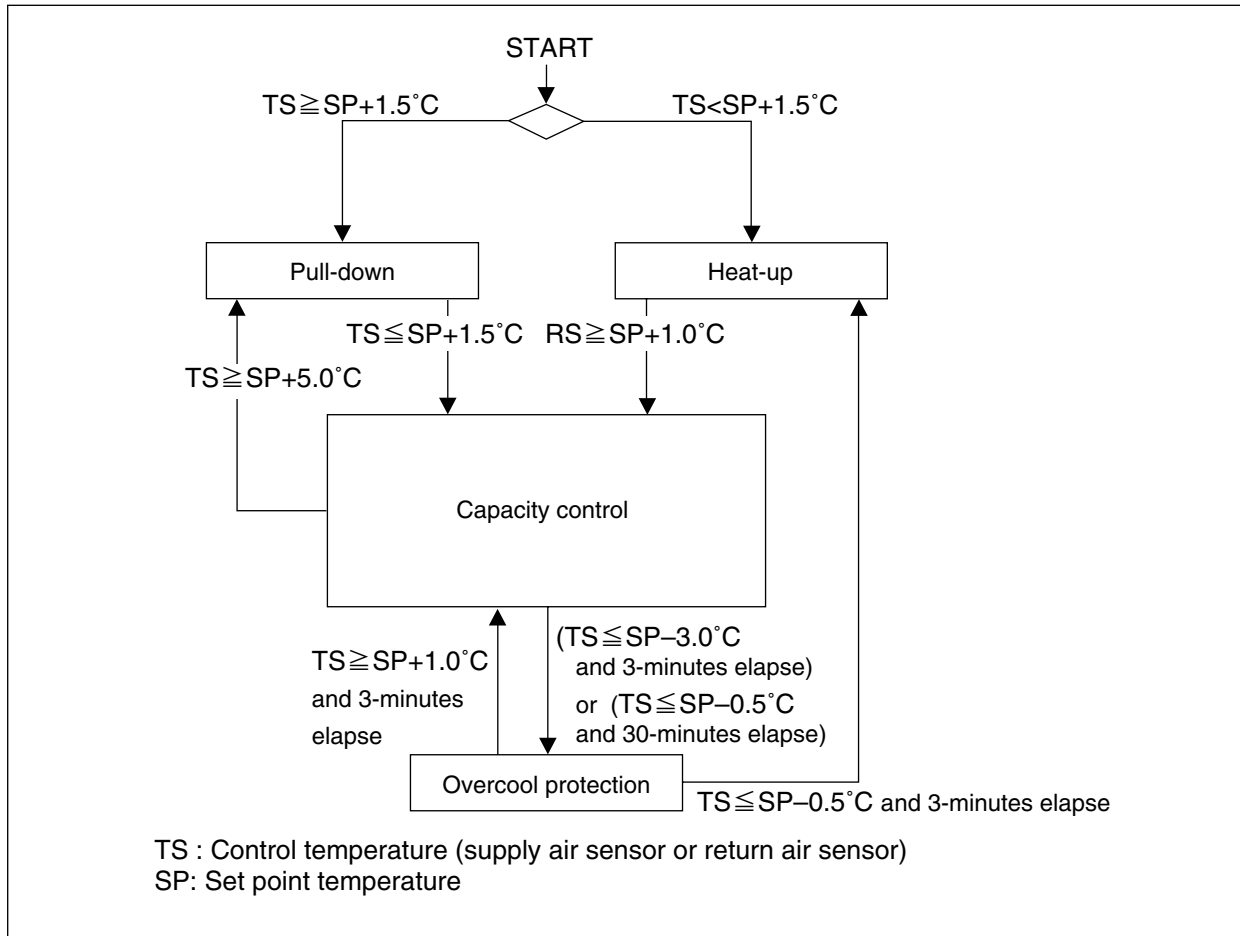
- ① When the control temperature reaches SP (point A), the compressor and condenser fan are turned off after the liquid solenoid valve has been de-energized and the pump down operation has been completed.
- ② When the control temperature exceeds $\text{SP}+1.0^{\circ}\text{C}$, the compressor, liquid 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: Elec. Exp. 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 and partial frozen mode

Control state transition and common control



Operation of magnetic conductor 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 / OFF※4 | ON / OFF※1 | OFF |
| Solenoid valve | Liquid solenoid valve | LSV | ON | ON | OFF | OFF |
| | Economizer solenoid valve | ESV | OFF | OFF | OFF | OFF |
| | Injection solenoid valve | ISV | ON / OFF※2 | ON / OFF※4 | ON / OFF※3 | OFF |
| | Hot-gas solenoid valve | HSV | OFF | ON / OFF※4 | ON | OFF |
| | Defrost solenoid valve | DSV | OFF | ON / OFF※4 | ON | OFF |
| | Discharge gas by-pass solenoid valve | BSV | OFF | ON / OFF※4 | OFF | OFF |
| Suction, modulating valve | | SMV | 100% | 3 to 100% | 100% | 100% |
| Electronic expansion valve | | EV | 10 to 100% | 10 to 100% | 0% | 50% |

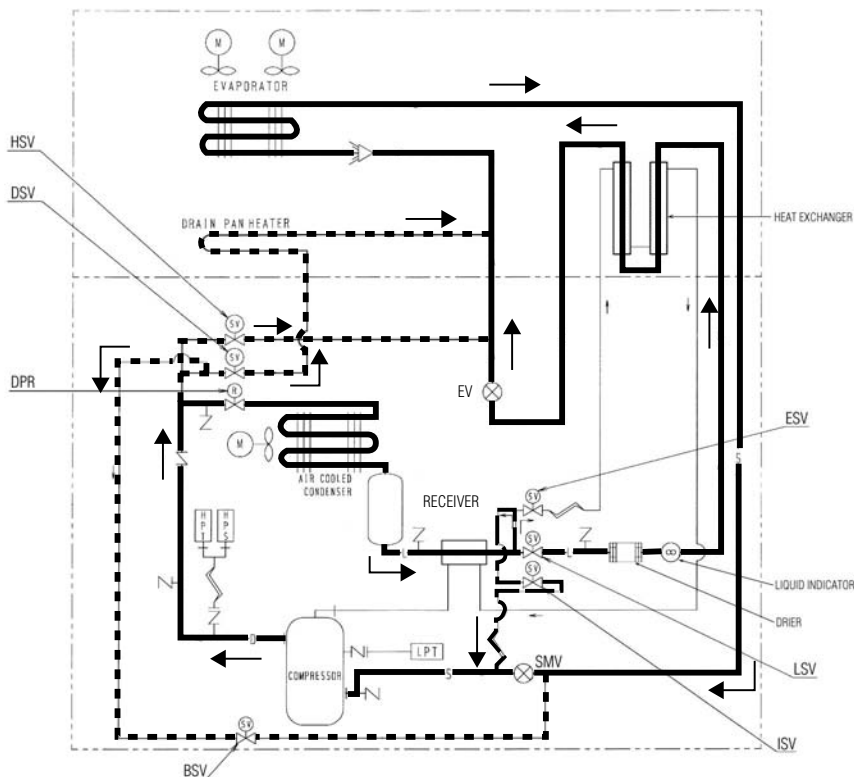
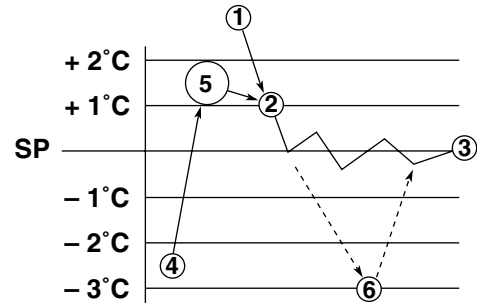
Note) ※1: High pressure control ※2: Discharge gas temperature control
 ※3: Charge control ※4: Capacity control and hot gas by-pass

(1) Set point temperature and control sensor

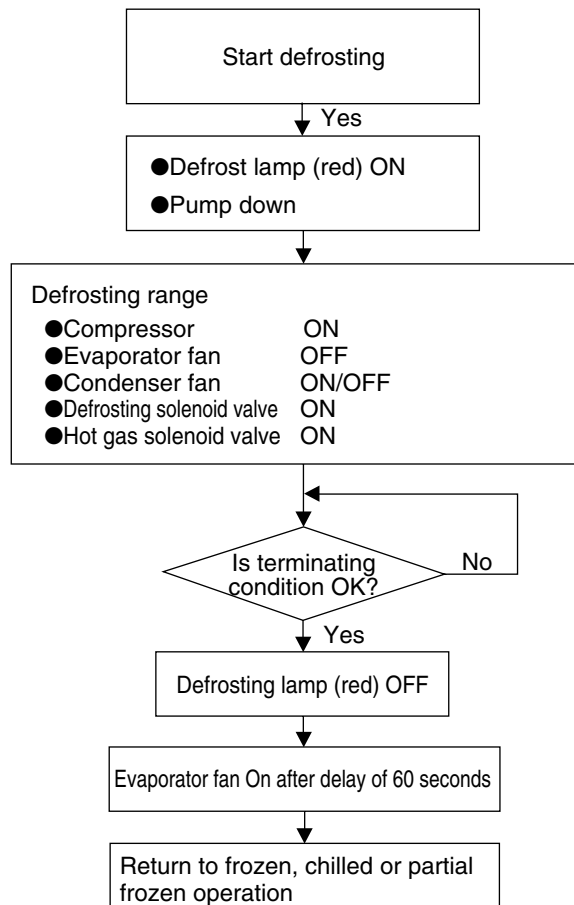
- Chilled operation
When the set point temperature is -2.9°C ($+26.8^{\circ}\text{F}$) or higher, the suction modulating valve (SMV) is controlled sensing the supply air temperature in order to adjust the cooling capacity.
- Partial frozen operation
When the set point temperature is -3.0 to -10.0°C ($+26.6$ to $+14.0^{\circ}\text{F}$), the suction modulating valve is controlled sensing the return air temperature in order to adjust the refrigerating capacity.
- Operation mode switching
Operation mode is automatically switched according to the set point of the electronic controller. Chilled and partial frozen operations are controlled in the same manner except the sensor for the temperature control.

(2) Control

- (a) Pull-down operation
Pull-down operation is carried out with fully opened suction modulating valve when the control temperature is higher than the set point temperature for 1.5°C or more (point ①).
- (b) Capacity control operation
When the control temperature reaches the point ②, the in-range lamp is turned on. At the same time, the suction modulating valve is activated to conduct the capacity control operation. The control temperature 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 is lower than [set point temperature $+1.5^{\circ}\text{C}$] (point ④), the heat-up operation using hot gas is conducted in order to raise the return air temperature to the [set temperature $+1.5^{\circ}\text{C}$] (point ⑤).
- (d) Overcool protection operation
Although the unit's operation is in a stable state, if the control temperature lowers below set point temp -3°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 | ON/OFF※3 | OFF | |
| | Evaporator fan. Low speed | EFL | | | |
| | Condenser fan | CF | ON/OFF※1 | ON/OFF※1 | |
| Solenoid valve | Liquid solenoid valve | LSV | OFF | OFF | |
| | Economizer solenoid valve | ESV | ON/OFF※4 | OFF | |
| | Injection solenoid valve | ISV | OFF (ON※5) | ON/OFF※2 | |
| | 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 | OFF(ON※6) | |
| Suction modulating valve | | | SMV | 100% | 100% |
| Electronic expansion valve | | | EV | 10 to 100% | 5% |

Note) ※1: Pressure control

※2: Charging control

※3: Frozen mode ... EFL ON, Chilled mode ... EFH ON

※4: Economizer control

※5: Discharge gas temperature control

※6: 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.

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

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

| Type of timer | Defrosting interval set | Function |
|-----------------|--|---|
| Long timer | 3, 6, 9, 12, 24 and 99 ^{※1} hours are selectable. | Regardless of the control temperature, defrosting is initiated according to the selected interval. |
| Short timer | 4 hours ^{※2} | Defrosting is initiated every 4 hours until the control temperature comes within the in-range after pull-down. When the temperature is in-range, defrosting timer will change into the selected long timer. |
| 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. Refer to "(3) On-demand defrost"

※2. 6 hours when the control temperature is -20°C or below.

② Starting 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.

③ Initiation by frost detection

If the suction 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

When "99" in long timer is selected, defrosting is activated upon the condition of frost on evaporator coil. This function is only for Frozen setting (SP < -10.1 deg C). and starting with 12 hours. (If this function is selected for chilled setting, defrost initiates every 6 hours automatically.)

Procedure:

Step 1: After defrost, the controller records compressor running time for 1st 1 hour. (T1)

Step 2: When 12 hours passed after defrost, controller records compressor running time for last 1 hour (T2). And the controller check whether the below condition is satisfied.

$$T2 > T1 \times 1.15$$

Step 3: If the above condition is satisfied, defrost is activated.

If above condition is not satisfied, defrost is postponed another one hour.

After counting up 13 hours, then repeat "Step 2".

Defrost will be postponed every one hour until the above condition (Step 2) is satisfied. (Max. 24 hours)

(4) Defrosting termination

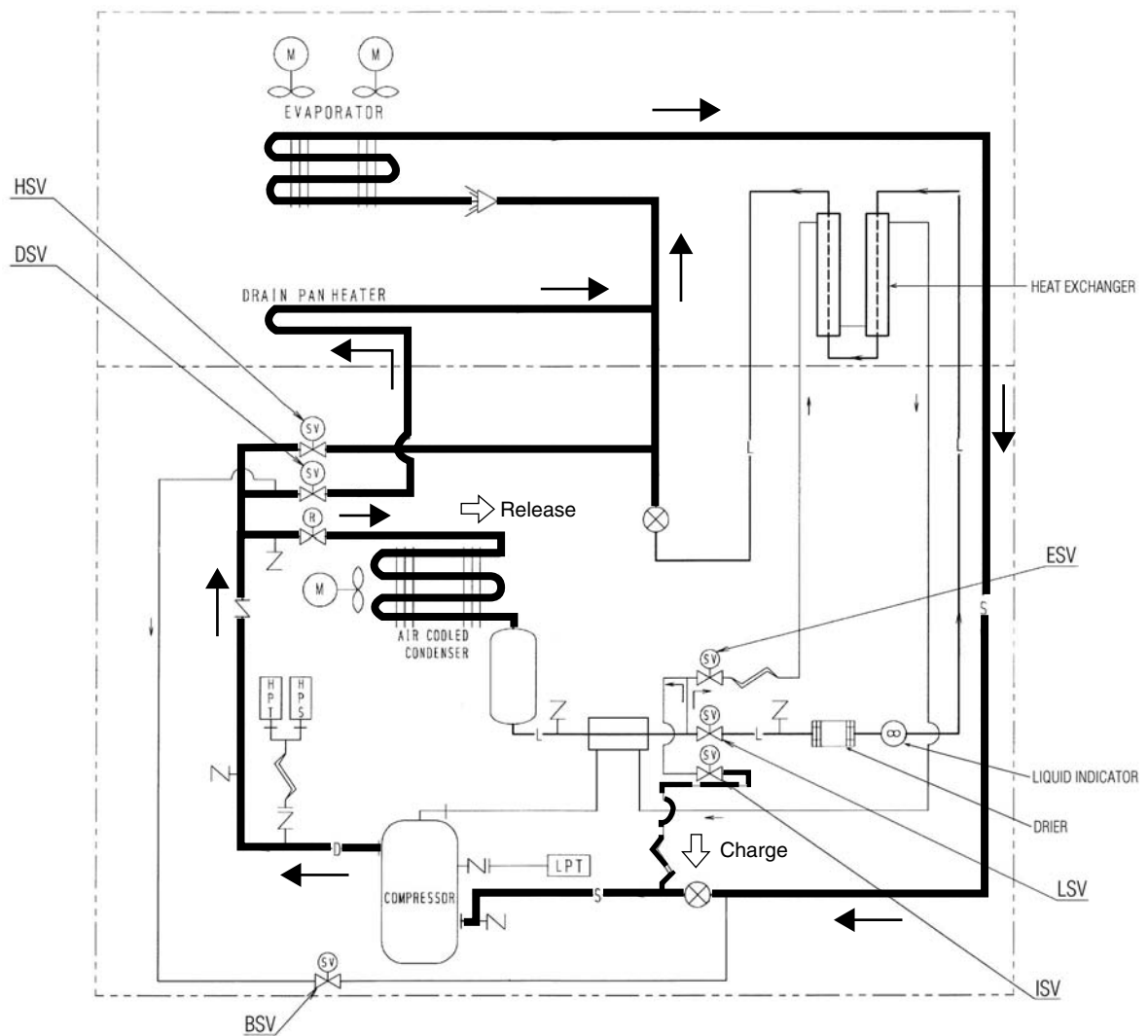
Defrosting will be terminated when any one of the following three conditions is satisfied.

① The below figure is satisfied during defrost.

| Status before defrost | Termination |
|-----------------------|--|
| INRANGE | $EOS \geq 30.0^{\circ}\text{C}$ |
| OUTRANGE | $EOS \geq 30.0^{\circ}\text{C} + RS/DRS \geq 15^{\circ}\text{C}$ |

② 90 minutes have elapsed.

③ Any one of protective devices is activated.



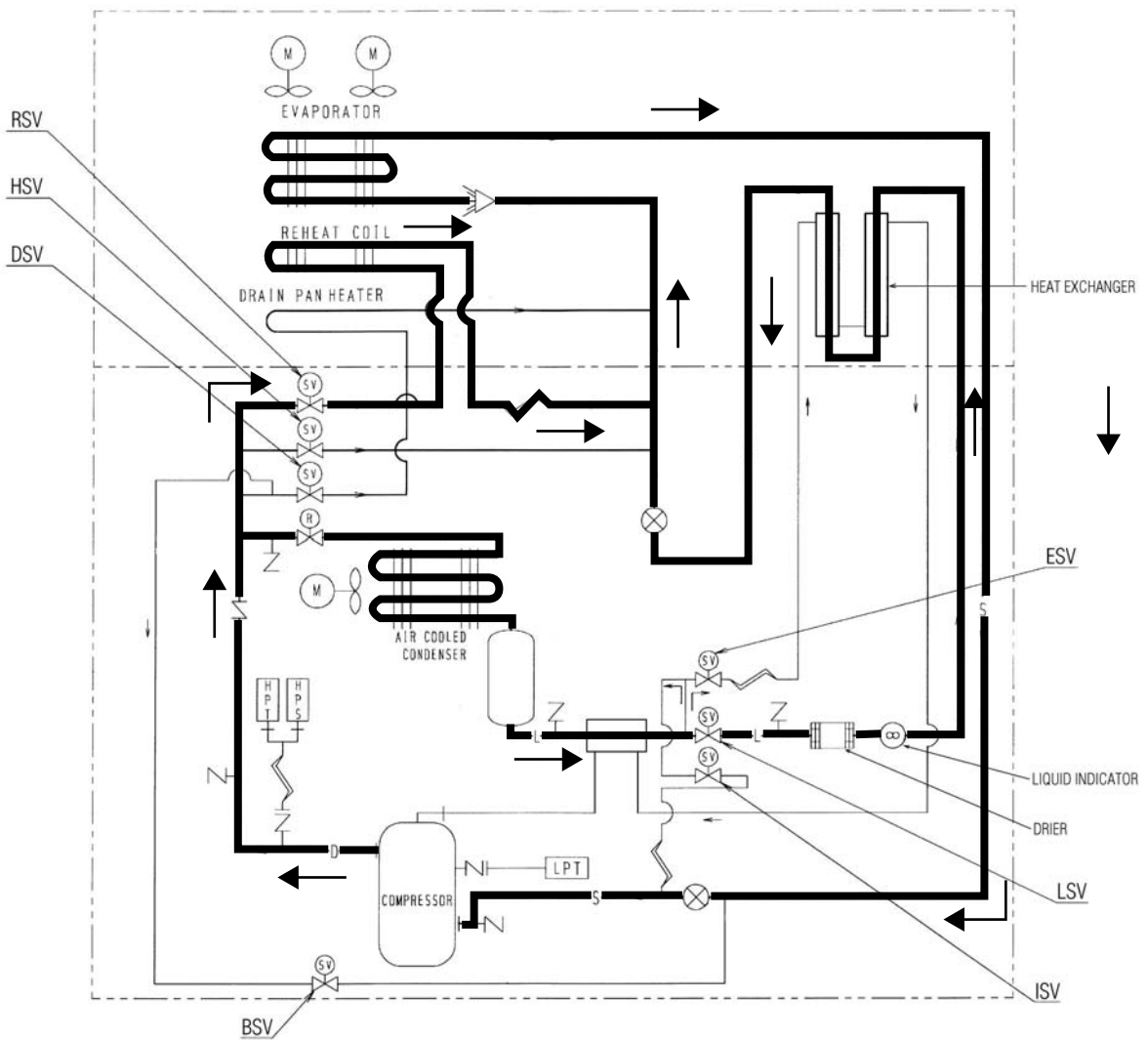
(5) Dehumidification ※If reheat coil and humidity sensor (Optional) is equipped:

The unit have dehumidification control by a reheat coil, which is 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 pressurized refrigerant to reheat coil. The "DEHUMID" LED lamp will light up.

The following setting can be made:

- 1) Non bumidification control
- 2) Humidification control (OPTION)
Dehumidification range: 30%RH–95%RH



2.5.4 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 | Partial frozen | 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"> At the start of the operation with low ambient temperature, an oil temperature raising control is executed. When a protection device activates at the operation start, a high pressure/current control is executed. | ○ | ○ | ○ | |
| 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 | These functions control the heating capacity for defrosting and heating operation. | | ○ | ○ | ○ |
| 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 | Dehumidification (optional) | The unit can execute dehumidification by reheat coil and humidity sensor. | | ○ | | |

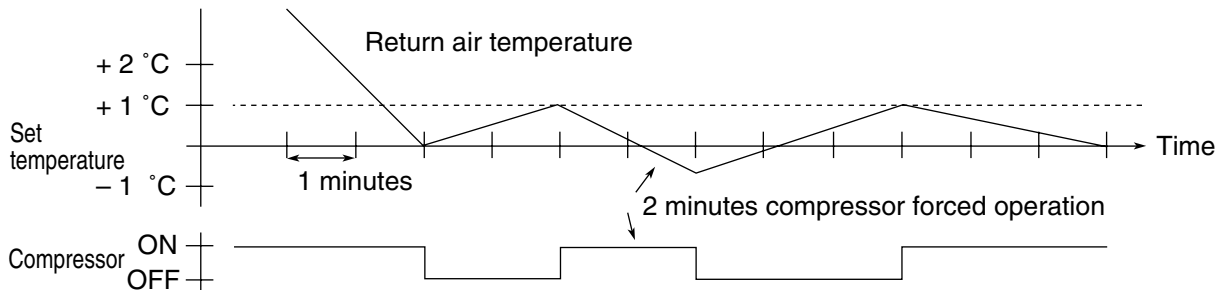
Common control

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 and starts to suppress high pressure and starting current.

- Temperature control of refrigerant oil

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

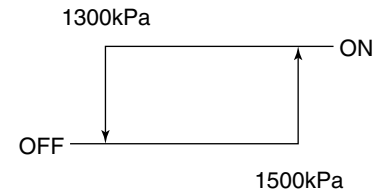
On starting the unit, by-pass discharge gas to suction side of the compressor by opening the solenoid valve (BSV) to raise the oil temperature rapidly ensuring a stable feed of oil.

In order to control the oil temperature of refrigerating machine 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 delay time of 10 sec. is provided to switch the high speed to low speed and vice versa.

Chilled mode : High speed
 Partial frozen 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.

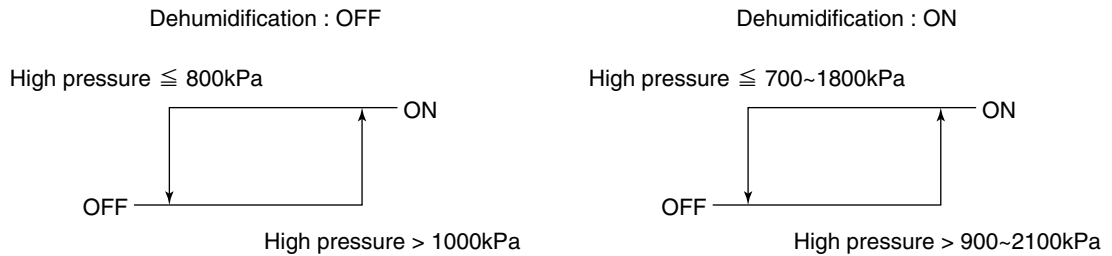
E : High-pressure control

- 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
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.

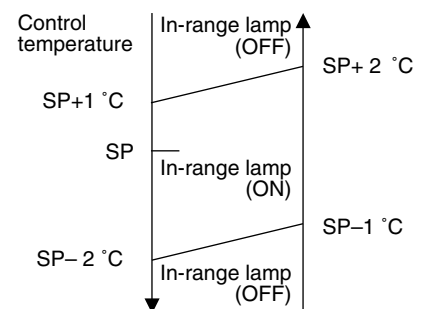
Discharge gas temperature (DCHS) set value

| | Frozen, chilled (pull-down) | | Chilled, capacity control |
|----------------|-----------------------------|----------|---------------------------|
| | RS ≤ 0°C | RS > 0°C | |
| ISV ON | 120°C | 128°C | 113°C |
| ISV OFF | 103°C | 118°C | 108°C |

- Defrosting / Heat-up operation
Control the injection ON/OFF with charge control. For details, see the section of "charge control" on page 2-25.

G : In-range control

In order to observe at a glance whether the refrigeration unit properly controls the inside temperature or not, the orange lamp on the display panel will light up when the control temperature is near the set point temperature (SP).



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

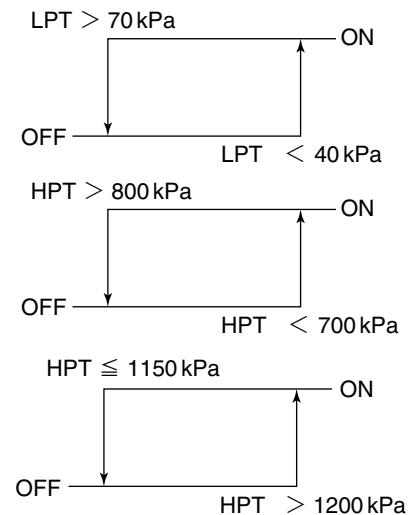
Charge control or release control is executed to maintain the heating capacity optimum in defrosting and heating operation.

- 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

Before the thermostat turns OFF and at the start of defrosting, close liquid solenoid valve (LSV) to conduct pump down operation and recover refrigerant in the receiver. When the low pressure reaches 0kPa or lower, the pump down is terminated.

L : Economizer control

The economizer circuit for which the intermittent injection to scroll compressor and the refrigerant heat exchanger are combined, is adopted in the unit.

The economizer circuit enables the liquid refrigerant to have wide range of subcooling resulting in a significant increase of cooling capacity.

- Economizer solenoid valve (ESV) control

Frozen mode: ON with return air temperature (RS) of 5°C or lower

Chilled & partial frozen mode: ON with return air temperature (RS) of 5°C or lower during pull-down operation

During capacity control, the control does not turn ON.

3. ELECTRONIC CONTROLLER

3.1 Function table

●DECOS III c (Daikin Electronic Controller Operation System)

(Note) [PC]: Functions using personal computer

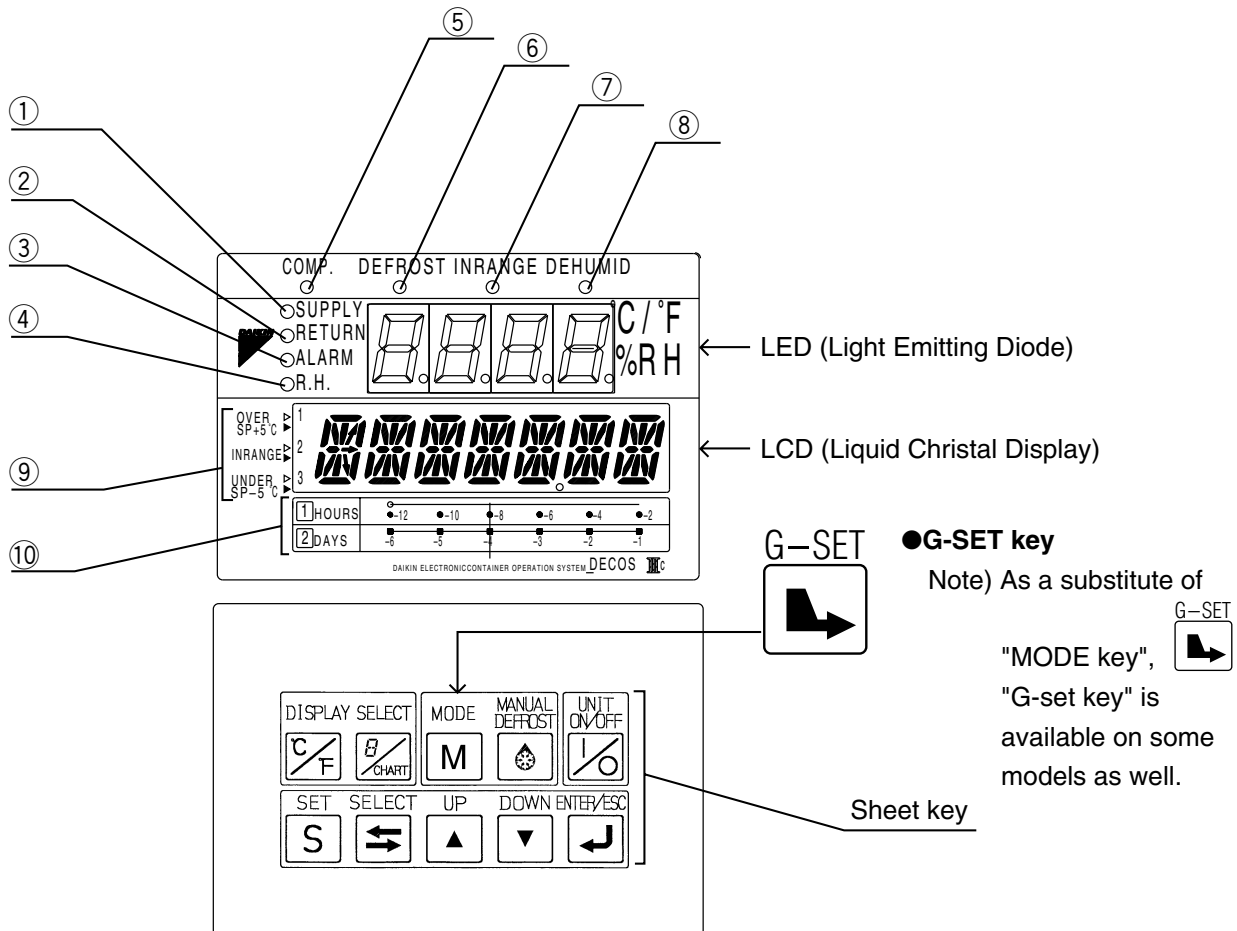
| No. | Function division | Function | DECOS III c |
|-----|--------------------------------------|--|---|
| 1 | Control function | <ul style="list-style-type: none"> • Temperature control • Defrosting control • Humidity control | <ul style="list-style-type: none"> ✓ ✓ Optional |
| 2 | Initial setting | <ul style="list-style-type: none"> • With/without optional equipment (USDA, humidity) and horse power selection • Chartless function setting | <ul style="list-style-type: none"> ✓ ✓ |
| 3 | Setting | <ul style="list-style-type: none"> • Temperature • Defrosting interval • Humidity • [PC] --- Header information set of data logger | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ |
| 4 | Indication (Display panel) | <ul style="list-style-type: none"> • Operating mode (compressor running, defrosting, in-range temperature, dehumidifying) • Alarm • Return air temperature/set point temperature • Supply air temperature/set point temperature • Defrosting interval • Inside humidity/set point humidity • Ambient temperature • High pressure • Low pressure • Power supply voltage • Total operating current • Compressor operating current • Evaporator inlet temperature • Evaporator outlet temperature • Discharge gas temperature • Compressor suction gas temperature • Suction modulating valve opening • Electronic expansion valve opening • Return air temperature (during PTI only) • Supply air temperature (during PTI only) • Pulp temperature (USDA #1, #2, #3) • Cargo temperature | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ Optional ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ Optional Optional |
| 5 | Self-diagnosis and automatic back-up | <ul style="list-style-type: none"> • Sensor <ul style="list-style-type: none"> Return air temperature sensor Supply air temperature sensor Ambient temperature sensor High pressure sensor Low pressure sensor Voltage sensor Current sensor Evaporator inlet temperature sensor Evaporator outlet temperature sensor Discharge gas temperature sensor Compressor suction gas temperature sensor Humidity sensor Pulp temperature sensor Cargo temperature sensor Data recorder sensor • High pressure switch • Solenoid valve/hot gas modulating valve (leakage check) • Long defrosting • Over-voltage | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ Optional Optional Optional Optional ✓ ✓ ✓ ✓ |

| No. | Function division | Function | DECOS III c |
|-----|--------------------------------------|---|---|
| 5 | Self-diagnosis and automatic back-up | <ul style="list-style-type: none"> • Open-phase running • Over current running • CPU and peripheral device (electronic controller) | <ul style="list-style-type: none"> ✓ ✓ ✓ |
| 6 | Manual inspection | <ul style="list-style-type: none"> • Compressor running hour indication • Evaporator fan individual operation (high speed) • Evaporator fan individual operation (low speed) • Condenser fan individual operation • Indication of elapsed time since trip start/time resetting • Evaporator fan run-hour indication • Condenser fan run-hour indication • Controller software version indication • [PC] --- Pulp temperature sensor/cargo temperature sensor calibration • [PC] --- Header information set of data logger • [PC] --- All sensor data indication • [PC] --- Controller built-in relay output display/MV output (opening rate) indication/EV output (opening rate) indication | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ Optional ✓ ✓ ✓ |
| 7 | Automatic PTI | <ul style="list-style-type: none"> • Automatic PTI (SHORT) = Operation check of components • Automatic PTI (FULL) | <ul style="list-style-type: none"> ✓ ✓ |
| 8 | Data logging | <ul style="list-style-type: none"> • Compressor total running hour • Evaporator fan motor total running hour • Condenser fan motor total running hour • Trip data • Pulp temperature data • Cargo temperature data • Alarm logging data • Automatic PTI data • Event data | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ Optional Optional ✓ ✓ ✓ |
| 9 | Data retrieving (Data output) | <ul style="list-style-type: none"> • [PC] --- Alarm data • [PC] --- Trip data • [PC] --- Automatic PTI data • [PC] --- Pulp temperature data • [PC] --- Cargo temperature data • [PC] --- Event data | <ul style="list-style-type: none"> ✓ ✓ ✓ Optional Optional ✓ |
| 10 | Communication | <ul style="list-style-type: none"> • Remote monitoring • Remote control | <ul style="list-style-type: none"> Optional Optional |
| 11 | Power back-up | <ul style="list-style-type: none"> ※Even while the power is off, the following works are possible. • Setting, Temperature setting Humidity setting Defrosting interval setting [PC] --- Container ID data setting • Saving the logger data record • Data retrieving (down loading) | <ul style="list-style-type: none"> Optional ✓ ✓ ✓ ✓ ✓ |
| 12 | Chartless | <ul style="list-style-type: none"> • Alarm indication function (H code) • Operation history indication function (D code) • Pull-down time indication function (P code) • Temperature logging data indication on LCD in simple graphic chart | <ul style="list-style-type: none"> ✓ ✓ ✓ ✓ |
| 13 | G-SET mode | <ul style="list-style-type: none"> ※To be used when power supply capacity is small. • Energy saving operation | <ul style="list-style-type: none"> ✓ |
| 14 | Data scroll | <ul style="list-style-type: none"> • Temperature log scroll indication function • Alarm log indication function | <ul style="list-style-type: none"> ✓ ✓ |
| 15 | Data input | <ul style="list-style-type: none"> ※The following works are possible using the indication panel • Container ID (No.) entering • Controller time setting | <ul style="list-style-type: none"> ✓ ✓ |
| 16 | Automatic Pump down | <ul style="list-style-type: none"> • Refelgerant is collected into the receiver and condensor coil. | <ul style="list-style-type: none"> ✓ |

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.)
- ② RETURN LED (Lights when "return air temperature" is indicated.)
- ③ ALARM LED (Lights when alarm is generated.)
- ④ R.H.LED (Lights when "relative humidity" is indicated.)
- ⑤ COMP.LED (Lights when the compressor is running.)
- ⑥ DEFROST LED (Lights when the unit is under the defrosting operation.)

- ⑦ IN RANGE LED (Lights when the control temperature is in range.)
- ⑧ DE-HUMID.LED (Lights when the controller is the dehumidification control optional.)
- ⑨ Temperature base (Used for the graphic chart indication on the LCD.)
- ⑩ Time base (Used for the graphic chart indication on the LCD.)

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.

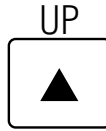
When the power supply is OFF:

- 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.



●G-SET key

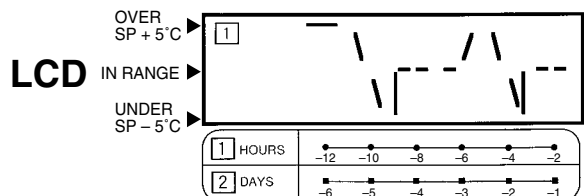
To carry out the following control

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




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.

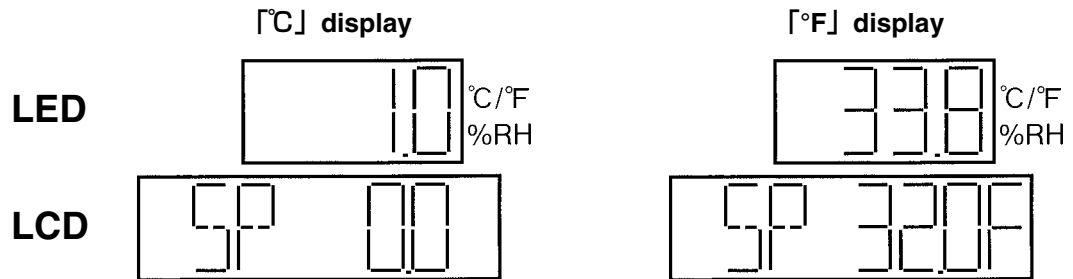







① Indicate the temperature data required to be converted into "°F" on the LED or the LCD.

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.

※ Once defrosting operation starts, the operation mode is not changeable until the defrosting operation completes. If this key is pressed during the defrosting operation, it is ineffective.

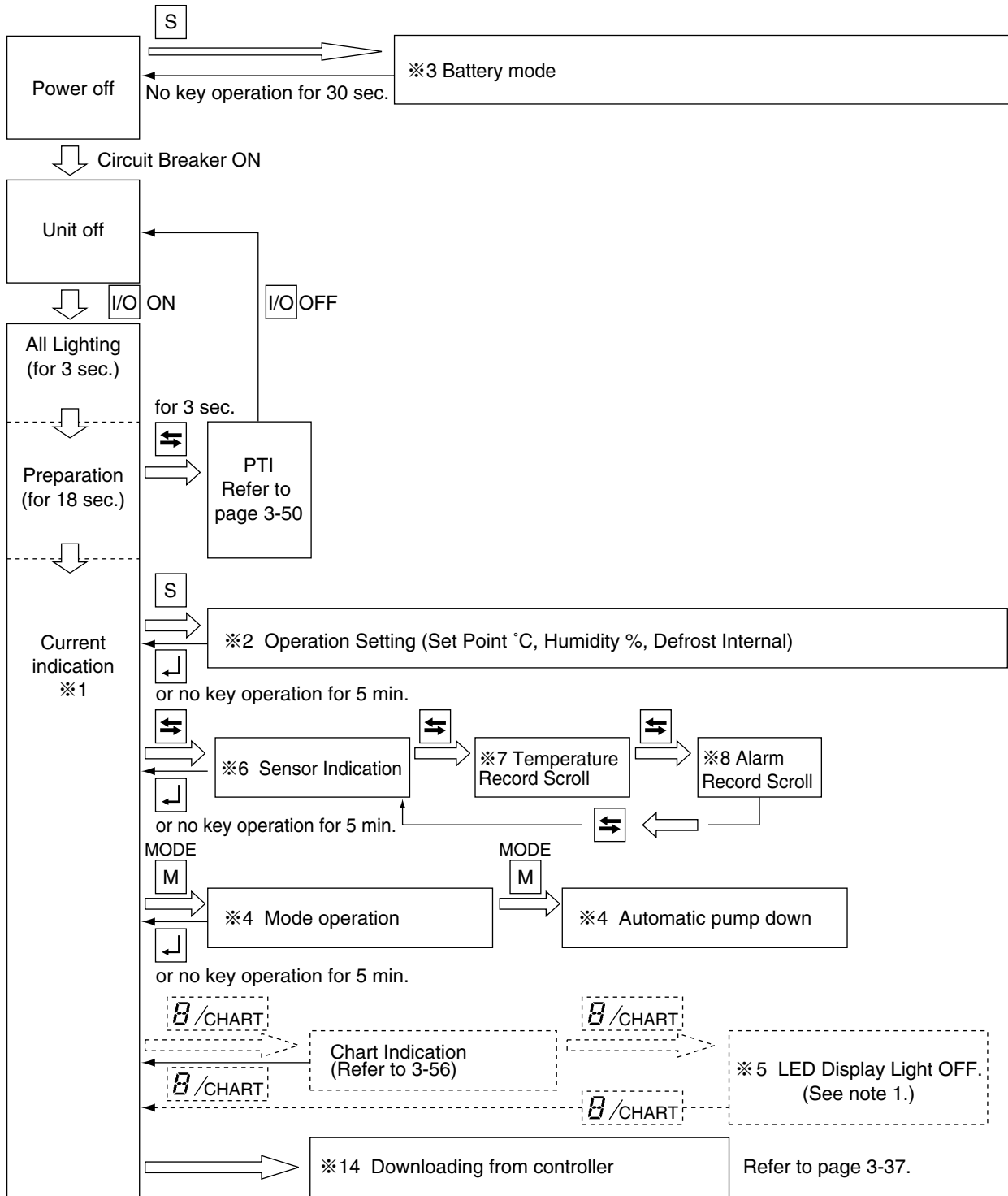
※ Defrosting will not start when the evaporator outlet temperature is 20°C or higher or the inlet temperature is 5°C or higher.

3.2.2 Operation mode and control

| Operation mode | Setting temperature | | |
|---------------------|--|---|--|
| | Chilled mode | Partial frozen mode | Frozen mode |
| Operation procedure | Set the set point temperature at +25 to -2.9°C (+77 to +26.8°F). | Set the set point temperature at -3.0 to -10.0°C (+26.6 to +14°F). | Set the set point temperature at -10.1 to -30.0°C (+13.8 to -22°F). |
| Function | Chilled mode operation is initiated. Inside temperature is controlled proportionally in modulation by the supply air temperature sensor. | Partial frozen mode operation is initiated. Inside temperature is controlled through modulation by the return air temperature sensor. | Frozen mode operation is initiated. Inside temperature is controlled by cycling ON/OFF of compressor by the return air temperature sensor. |
| | Evaporator fans run at high speed | | Evaporator fans run at low speed |

3.3 Operation procedure

3.3.1 Operation procedure flow chart



I/O : Unit On / Off key **S** : S key **↔** : Select key **↵** : Enter key **8/CHART** : 8 / Chart key
M : MODE key

Note 1. ※5 activates when the "dISP" in ※11 is set to "ON" in controller initial setting in 3-28.

Check on settings and operation conditions

| | | |
|--|--|--------|
| ※1. Current indication mode (indication of operation conditions) | | |
| Indicates the unit operation conditions. | <ul style="list-style-type: none"> ●Supply air temperature (SS) ●Return air temperature (RS) ●Defrost interval ●Alarm ●Setting point humidity and humidity (OPTION) | P 3-9 |
| ※2. Operation setting mode | | |
| Settings for cargo transportation | <ul style="list-style-type: none"> ●Temperature settings ●Defrost interval settings ●Humidity settings (optional) | P 3-10 |
| ※3. Battery mode (settings for operation conditions by using the battery) | | |
| Setting can be executed when commercial power supply is not available. | <ul style="list-style-type: none"> ●Temperature settings ●Humidity settings ●Defrost interval settings ●Unit ON/OFF setting | P 3-11 |
| ※4. Mode operation | | |
| <ul style="list-style-type: none"> ●The maximum power consumption can be set. ●The pump down can be executed automatically. ●Dehumidification mode can be set. (option) | | P 3-12 |
| ※5. LED display off mode | | |
| LED display section on the controller can be turned off. | <ul style="list-style-type: none"> ●LED lights off | P 3-14 |

Indication of detailed data alarm and PTI

| | | |
|-----------------------------------|---|--------|
| ※6. Sensor indication mode | <p>Each sensor value can be indicated.</p> <ul style="list-style-type: none"> ●High pressure (HPT) ●Low pressure (LPT) ●Total current (CT1) ●Compressor current (CT2) ●Voltage (PT1) ●Ambient temperature (AMBS) ●Evaporator inlet temperature (EIS) ●Evaporator outlet temperature (EOS) <ul style="list-style-type: none"> ●Discharge gas temperature (DCHS) ●Suction gas temperature (SGS) ●Modulating valve opening ●Electronic expansion valve opening ●Supply air temperature (SS) ●Return air temperature (RS) <div style="border: 1px solid black; padding: 2px;"> <ul style="list-style-type: none"> ●Pulp temperature (USDA #1, #2, #3) ●Cargo temperature (CTS) ●Data recorder supply air temperature (DSS) ●Data recorder return air temperature (DRS) <p>[optional]</p> </div> | P 3-15 |
|-----------------------------------|---|--------|

| | | |
|---|--|--------|
| ※7. Temperature record scroll function | <p>Temperature record of the control sensor can be indicated in the order (scroll indication) from the latest data.</p> <ul style="list-style-type: none"> ●Chilled mode: Supply air temperature ●Partial frozen mode: Return air temperature ●Frozen mode: Return air temperature (up to 7 days) | P 3-18 |
|---|--|--------|

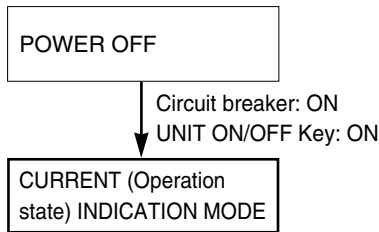
| | | |
|---|--|--------|
| ※8. Alarm record scroll function | <p>Alarm record can be indicated in order (scroll indication) from the latest data.</p> <ul style="list-style-type: none"> ●Alarm indication (up to 7 days) | P 3-21 |
|---|--|--------|

| | | |
|---------------------------------------|---|--------|
| ※9. PTI record scroll function | <p>Last 3 PTI results can be displayed.</p> | P 3-23 |
|---------------------------------------|---|--------|

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 | Supply air temperature | Set point temperature |
| | RETURN | Return air temperature | Set point temperature |
| | Chilled mode: SUPPLY | Chilled mode: SUPPLY air temperature | Current defrosting interval setting |
| | Partial frozen mode: RETURN | Partial frozen mode: RETURN air temperature | |
| | Frozen mode: RETURN | Frozen mode: RETURN air temperature | |
| 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) | R.H. | Value of humidity sensor | Set point humidity |

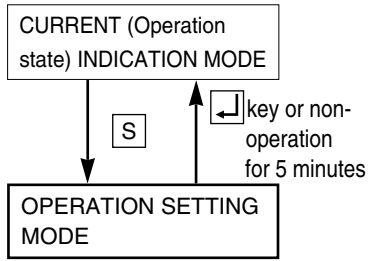
Note 1) ●Each pressing of the down key, scrolls through the detected alarm codes in sequence when two or more alarm codes are displayed.
After indicating the last alarm, display goes to the next item.
The numerator of the LCD display stands for the current alarm, while the denominator stands for the number of alarm codes existing.

●To erase the d code or H code alarm, depress the key for 3 seconds while the code is displayed.

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.



To change to the OPERATION SETTING MODE, press the [S] key while the unit is in the CURRENT INDICATION MODE.

In the OPERATION SETTING MODE, Control temperature, Control humidity (optional) and Defrosting interval 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 <small>Note 2)</small> | Current setting temperature | "SET-SPC" or "SET-SPF" | Change the value using the [△] key or [▽] key. Press the [↓] key to determine the setting. Setting temperature range; –30 to 30°C. |
| CONTROL HUMIDITY SETTING <small>(optional Note 1)</small> | Current setting humidity | "SET-SHU" | Change the value using the [△] key or [▽] key. Press the [↓] 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 [△] key or [▽] key. Press the [↓] key to determine the setting. "On demand defrosting" is conducted when "99h" has been selected. (See page 2-20.) |

Note 1) ● This indication appears only when the humidity control is set, otherwise this is skipped and the next item is shown.

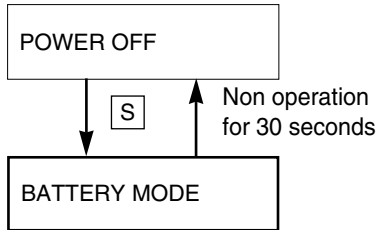
Note 2) ● In case temperature is set in °C setting temperature can be set at interval of 0.1 °C.

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.

| Item | LED display | LCD display | Setting method |
|------------------------------------|-------------|-------------------------|--|
| POWER OFF | - | - | - |
| RETURN AIR TEMPERATURE DISPLAY | (Light off) | RS※※※.※C Note 1) | - |
| SUPPLY AIR TEMPERATURE DISPLAY | (Light off) | SS※※※.※C Note 1) | - |
| CONTROL TEMPERATURE DISPLAY | (Light off) | SP※※※.※C | - |
| CONTROL TEMPERATURE SETTING | (Light off) | "SP C" | Change the value using the △ key or ▽ key. Press the ↵ key to determine the setting. Setting temperature range; -30 to +30°C. |
| CONTROL HUMIDITY SETTING(optional) | (Light off) | "SHU " | Change the value using the △ key or ▽ key. Press the ↵ key to determine the setting. Setting humidity range: 60 to 95%RH |
| DEFROST INTERVAL SETTING | (Light off) | "dEF H" | Select a defrost interval 99h, 24h,12h,9h,6h or 3h using the △ key or ▽ key. Press the ↵ key to determine the setting. "On demand defrosting" is conducted when "99h" has been selected. (See page 2-20.) |
| UNIT ON/OFF SETTING | (Light off) | "UNIT ON" or "UNIT OFF" | Change the value using the △ key or ▽ key. Press the ↵ key to determine the setting. |


Note 1). The inside sensor temperature is indicated on the section of ※※※.※.

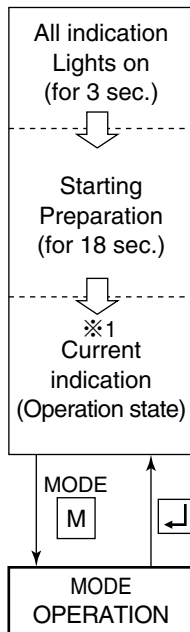


CAUTION

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**  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 4.1.3)

3. LED display Light-OFF (OPTION)

All LED (includes LED lamp) can be switched off.

In order to execute this function, initial setting (Refer to initial setting in 3.8.2) shall be required to change "on" position in advance.

4. Dehumidification mode setting

Dehumidification mode can be executed in this mode (M. Dehumidification mode control in 2.5.4).

When "Dehumidification" is set to "on", it is possible to change the following set from default.

① Inside humidity : 95% (Default) ~30% RH

| Setting item | LED panel | LCD panel | Setting method |
|--|--------------------------------------|-----------|--|
| <pre> graph TD A[Current indication mode] -- "MODE M" --> B[G-set operation Note 1)] B -- "MODE M" --> C[Automatic pump down operation] C -- "(MODE) M" --> D[Dehumidification] D -- "(OFF) MODE M" --> A D -- "(ON) MODE M" --> E[Humidity set] E -- "MODE M" --> A </pre> | — | — | — |
| | OFF, 11, 12, 13, 14, 15 unit: kVA | G-SET | Select the energy saving set point by using or , and press the key to determine the setting. |
| | ON, OFF | P down | Select "ON" by using key and , and press the key to determine the setting. |
| | ON/OFF | dHu | Select desired setting by or , then press key. |
| | 95% RH~30% RH | SET-SHU | Select desired setting by key or , then press key to determine. |

Note 1) If the power supply is turned off in the G-set mode, the mode is cancelled 30 minutes from when power was lost.

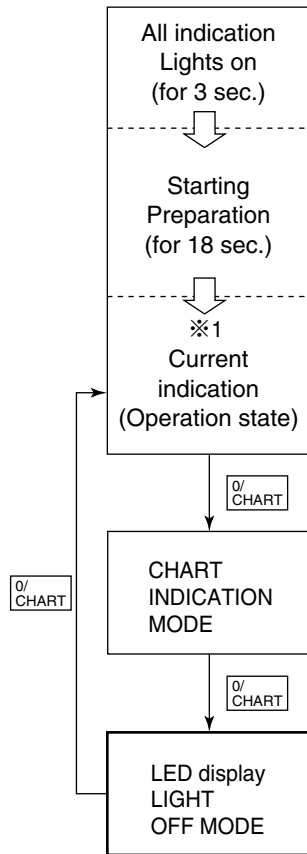
5. LED display LIGHT-OFF MODE


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 3-27.


<Operation procedure>



Push the  key twice during current indication mode to switch to the panel (LED) lighting off mode.
(When pushing the key once, the mode changes to chart indication mode.)

When the panel (LED) lighting off mode activates, the LED lighting is turned off and the LCD reads "dISPOFF".

※ Cancellation of panel (LED) lighting off mode.

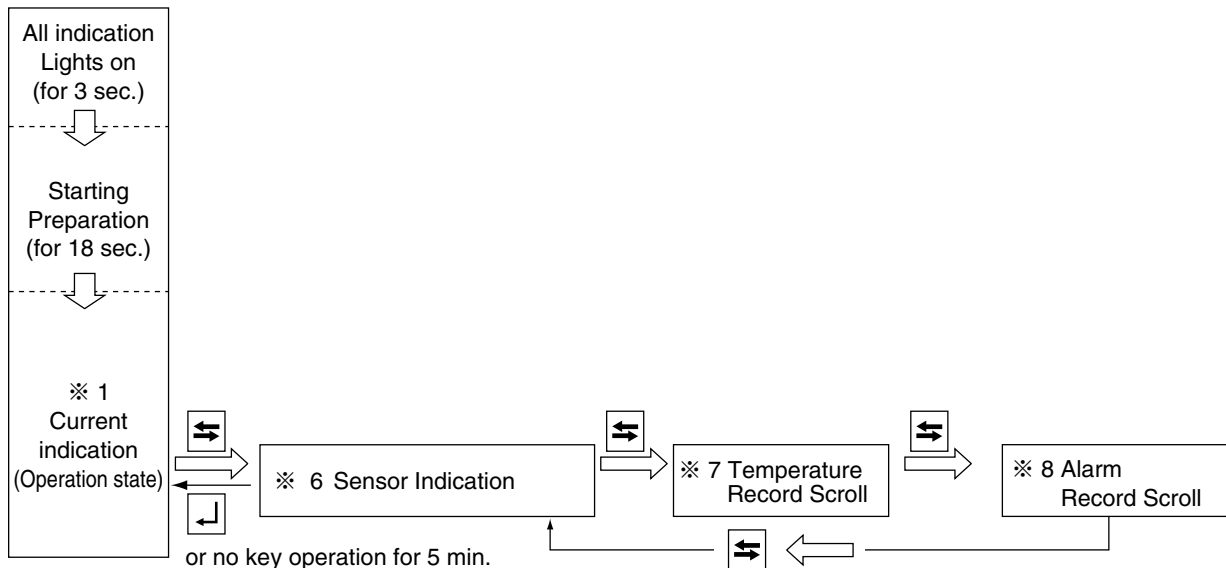
When the  key is pushed again, it returns to current indication mode and LED turns ON.

6. SENSOR INDICATION MODE



Each sensor value, the modulating valve (MV) opening, and the electronic expansion valve (EV) opening can be checked. The following items are displayed:

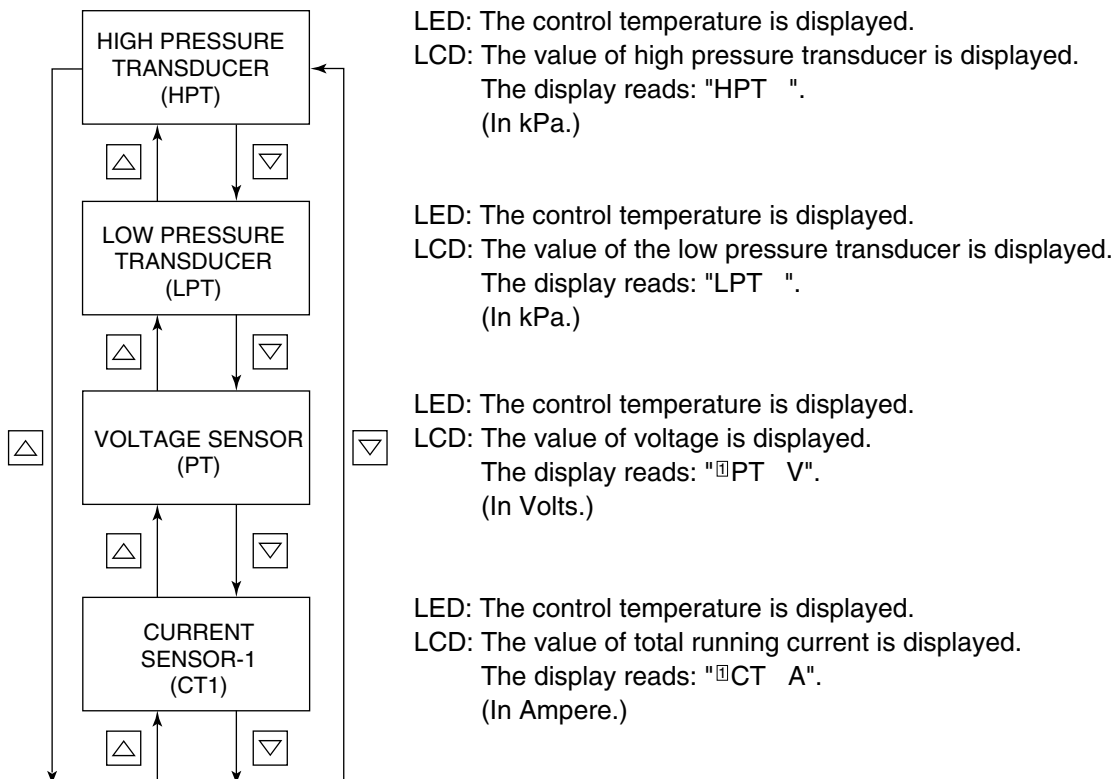
High pressure (HPT), low pressure (LPT), voltage (PT1), total current (CT1), compressor current (CT2), ambient temperature (AMBS), evaporator inlet temperature (EIS), evaporator outlet temperature (EOS), discharge gas temperature (DCHS), suction gas temperature (SGS), suction modulating valve opening,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

<Mode selection procedure>

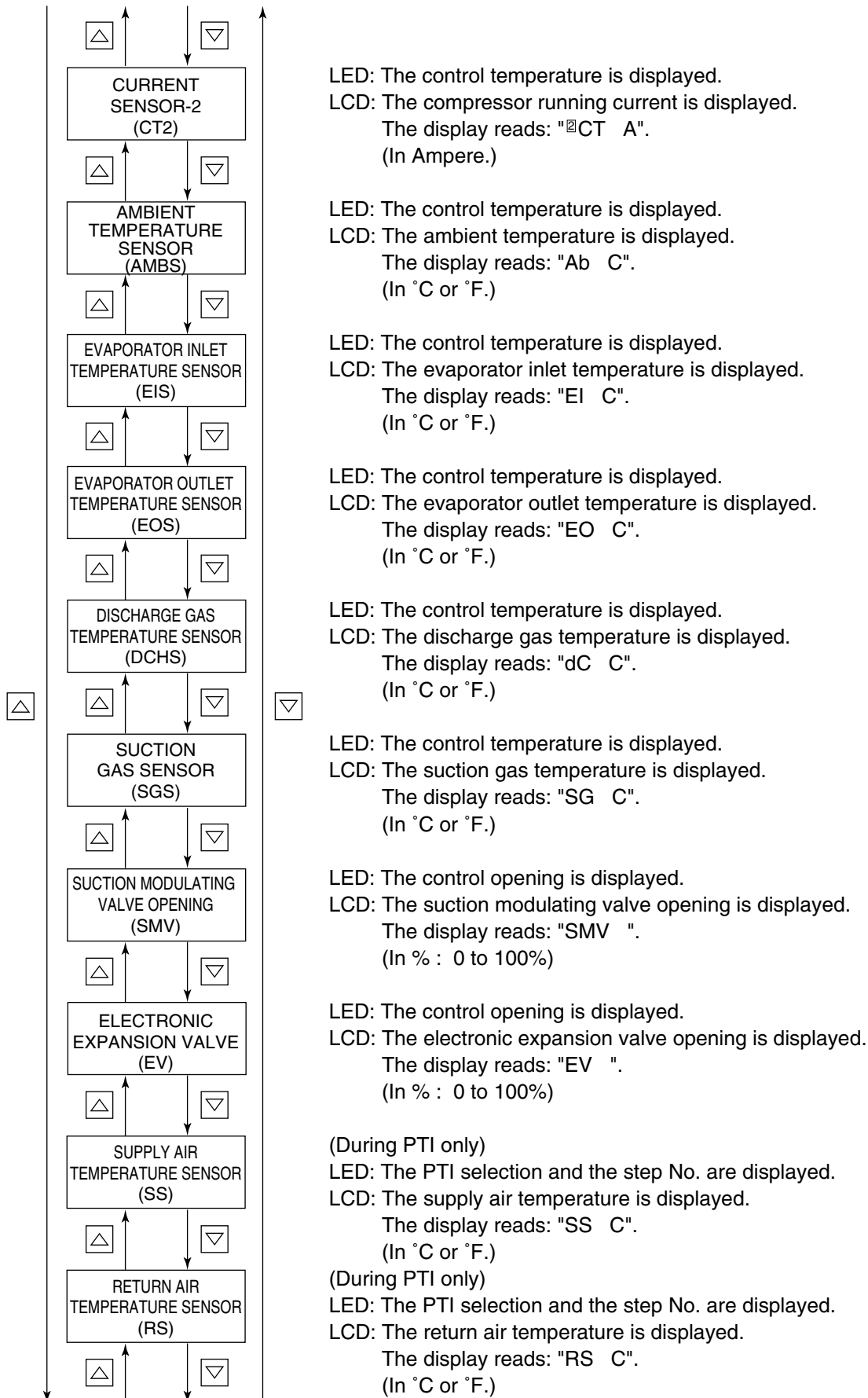


<Operation procedure>

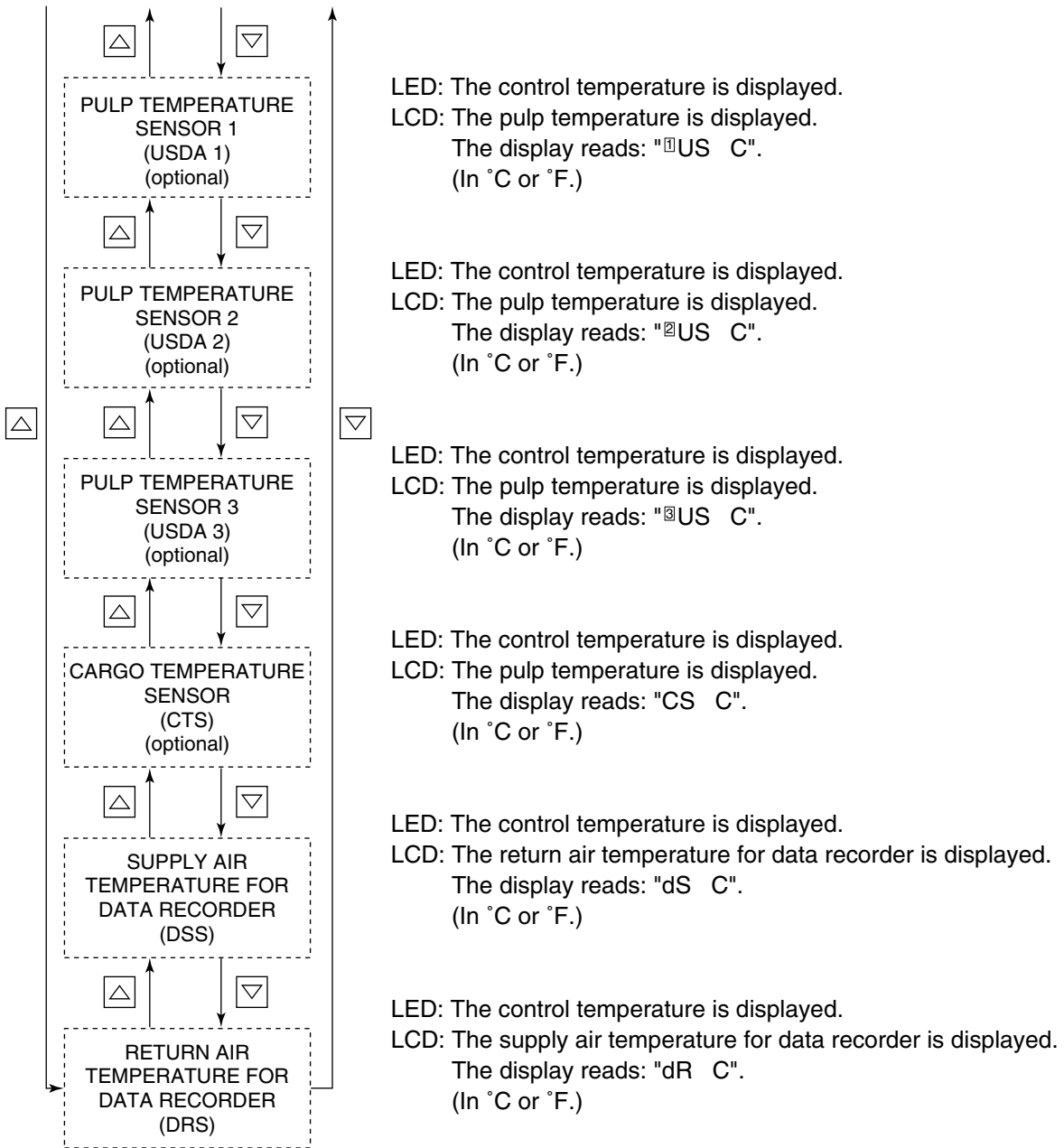
Whenever the  or  key is pressed, the display changes.



6. SENSOR INDICATION MODE (continued)



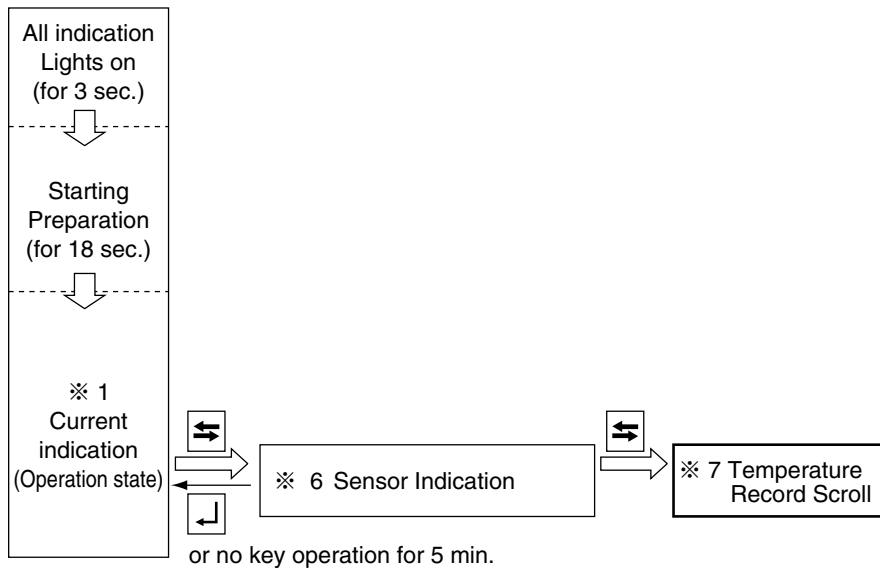
6. SENSOR INDICATION MODE (continued)



7. TEMPERATURE RECORD SCROLL MODE

The control sensor value record is shown in sequence (scroll) starting with the latest data. The latest control temperatures for a maximum of 7 days are displayed.

<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 partial frozen mode and frozen mode, the return air temperature is the controlled temperature, and in the chilled mode, the supply air temperature is the control temperature.)

To pause the scrolling action, press the or key. To continue to the next temperature record manually, press the or key during the holding of indication, or to resume the automatically scroll function, do not press any key for 10 seconds. To see data beginning with start again, press and hold the key for 3 seconds.

To restore the current indication mode, press the key.

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






To go to the operation setting mode, press the key.


Temperature record scroll function

The control sensor value record for the last 7 days is displayed in sequence (scroll) beginning with the latest one and ending with oldest one, so that easy inspection of the previous operation data is enabled on board.

<Operation procedure>

The LED indicates the control temperature, and the LCD displays the data or time and the non-control temperature in turn. (In the partial frozen and frozen modes, return air temperature is the controlled temperature, and in the chilled mode, supply air temperature is the controlled temperature.)

To pause the scrolling action, press the  or  key. To advance to the next temperature record, press the  or  key again. If arrow key is not pressed for 10 seconds, the continuous scrolling action is resumed. To see data from the beginning, press and hold the  key for 3 seconds.

To restore the current indication mode screen, press the  key.

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

If the successive (scroll) screen is currently displayed, the current indication mode screen is resumed when 5 minutes elapses after indication ends.

To return to the operation setting mode, press the  key.



CAUTION

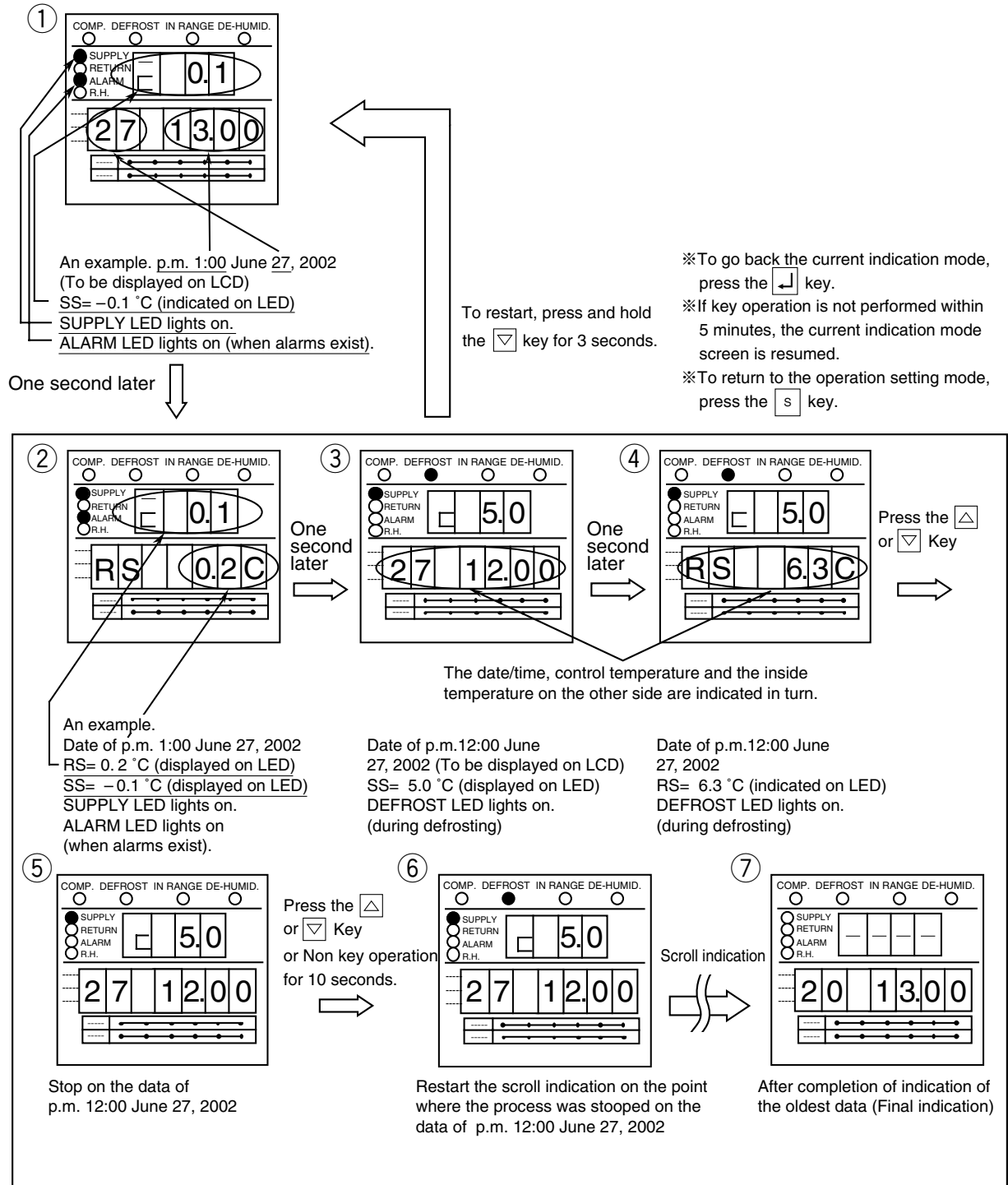
The displayed temperature is not the current instantaneous value but an average taken in a specific logging interval.

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 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, 2002, 14:00.

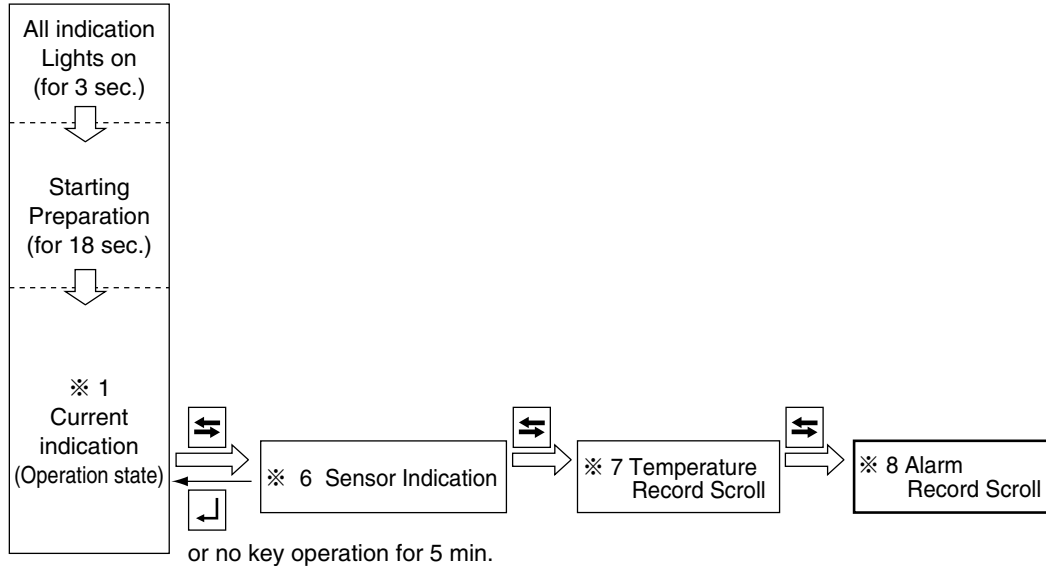


Note: "□" on the leftmost of the LED shows that the indication is of the temperature record scroll indication mode.

8. ALARM RECORD SCROLL MODE

The alarm record is shown in sequence (scroll) starting with the latest data. The latest alarms for a maximum of 7 days are displayed.

<Mode selection procedure>



<Operation procedure>

The LED indicates the alarm codes and the LCD displays date and time.

To pause the scrolling action, press the or key. To continue to the next alarm record, press the or key during the holding of indication, or to resume the automatically scroll function, do not press any key for 10 seconds. To see data beginning with start again, press and hold the key for 3 seconds.

To restore the current indication mode, press the key.

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

To go to the operation setting mode, press the key.

Alarm record scroll function

The alarms detected over the last 7 days are displayed on the controller which scrolls through them at the rate of one sec/alarm.

< Operation procedure >

The LED indicates alarm codes, and the LCD displays date and time.

To pause the scrolling action, press the or key. To advance to the next alarm code detected, press the or key again. If arrow key is not pressed for 10 seconds, then the continuous scrolling action is resumed. To see data from the beginning, press and hold the key for 3 seconds.

To return to the current indication mode screen, press the key.

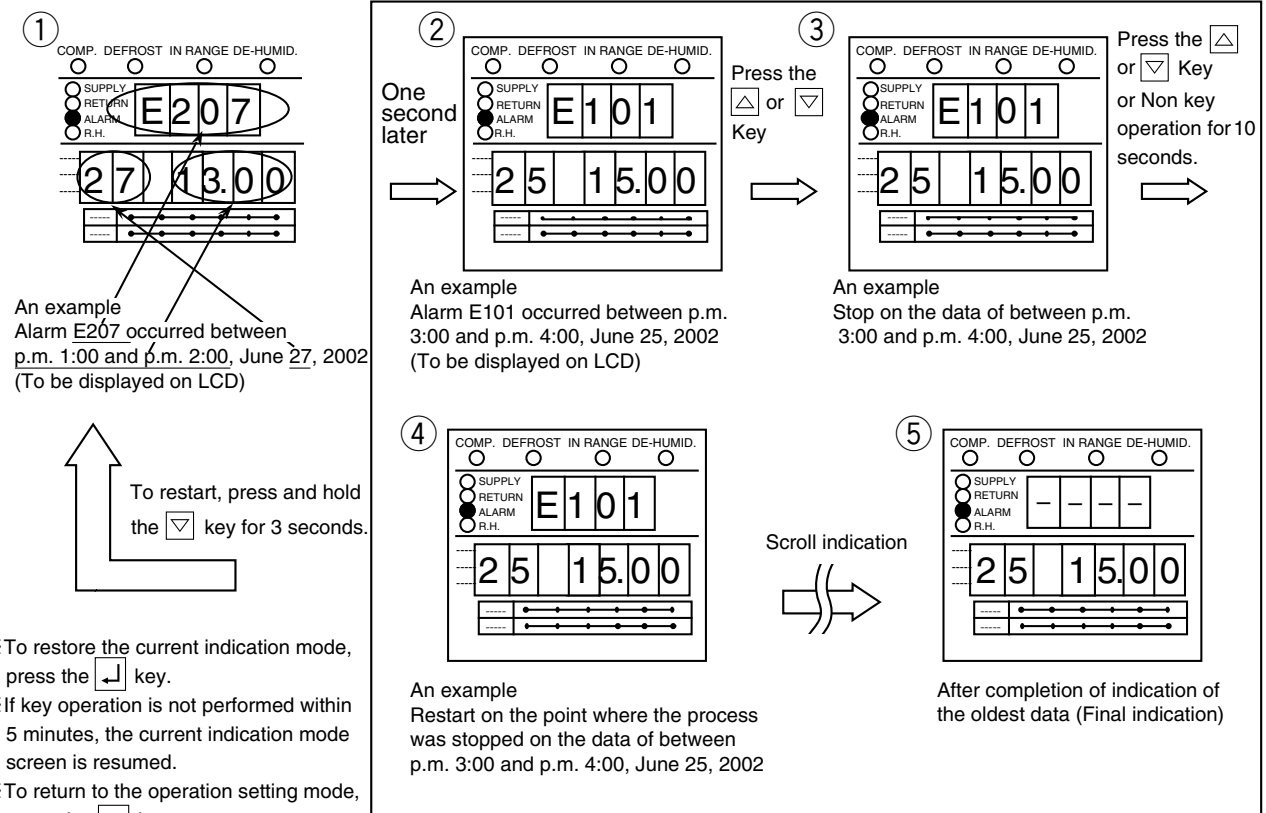
If key operation is not performed for 5 minutes, the current indication mode screen is resumed.

If the successive (scroll) screen is currently displayed, the current indication mode screen is resumed when 5 minutes elapses after the indication ends.

To return to the operation setting mode, press the key.

● Example of ALARM RECORD SCROLL INDICATION MODE

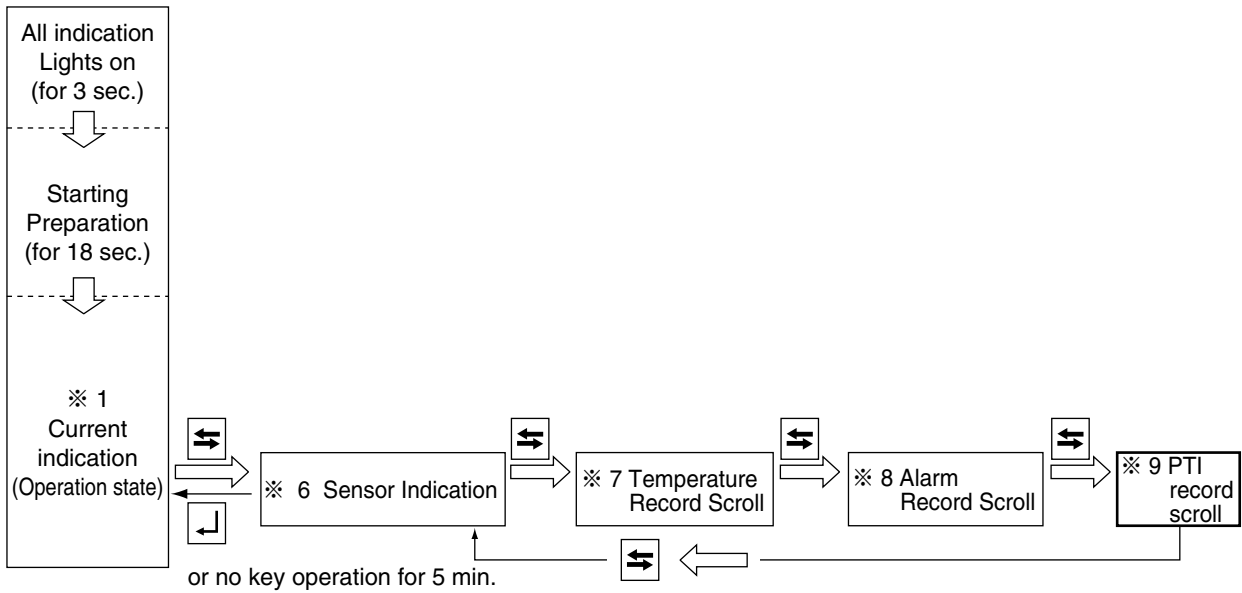
※ It is assumed that the current date and time are June 27, 2002, 14:00.



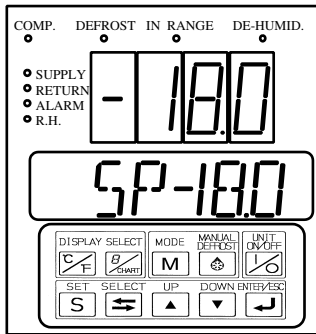
9. PTI RECORD SCROLL MODE

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

<Mode selection procedure>



PTI record scroll function



- ① When "normal" display is on LED/LCD, press
- ② Last PTI data is displayed as left
- ③ Latest 3 data can be displayed by or key

LED : E000 (PTI was good status.)

E001 (Alarm was detected in the PTI)

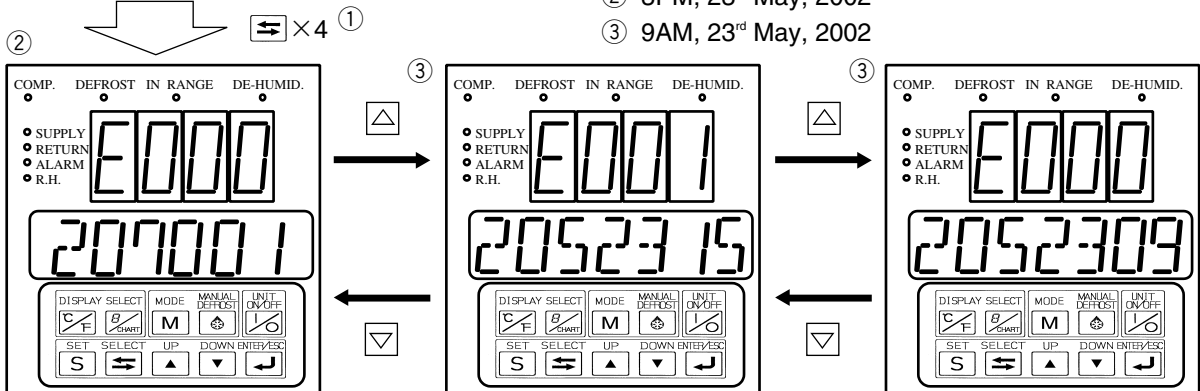
LCD : Date (Y/MM/DD/TT)

From Now to Past

(Ex. ① 1AM, 4th July, 2002

② 3PM, 23rd May, 2002

③ 9AM, 23rd May, 2002



3.3.3 Setting flow chart

This configuration setting flow shall be utilized, when

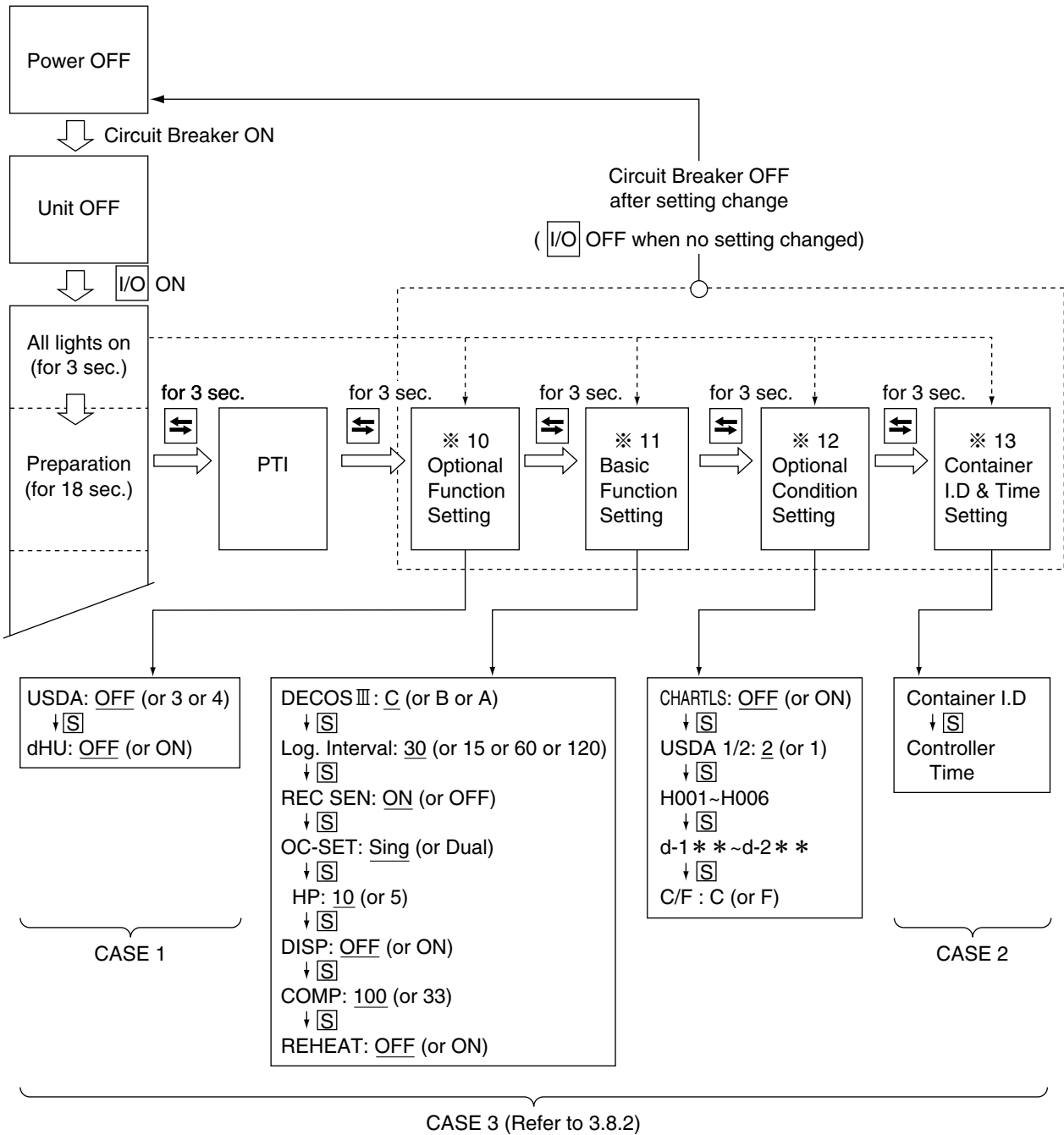
CASE 1) USDA transportation setting is required (※10 Optional Function Setting)

CASE 2) Container ID shall to be subjected to change from another container for emergency use.
(※13 Container ID & Time Setting)

CASE 3) Controller is replaced to new one. (All setting in ※10-13 shall be set.)

NOTE 1 : All initial settings are pre-setted, when the unit is delivered.

2 : In case to complete the setting change, CIRCUIT BREAKER shall be turned off



Controller initial setting

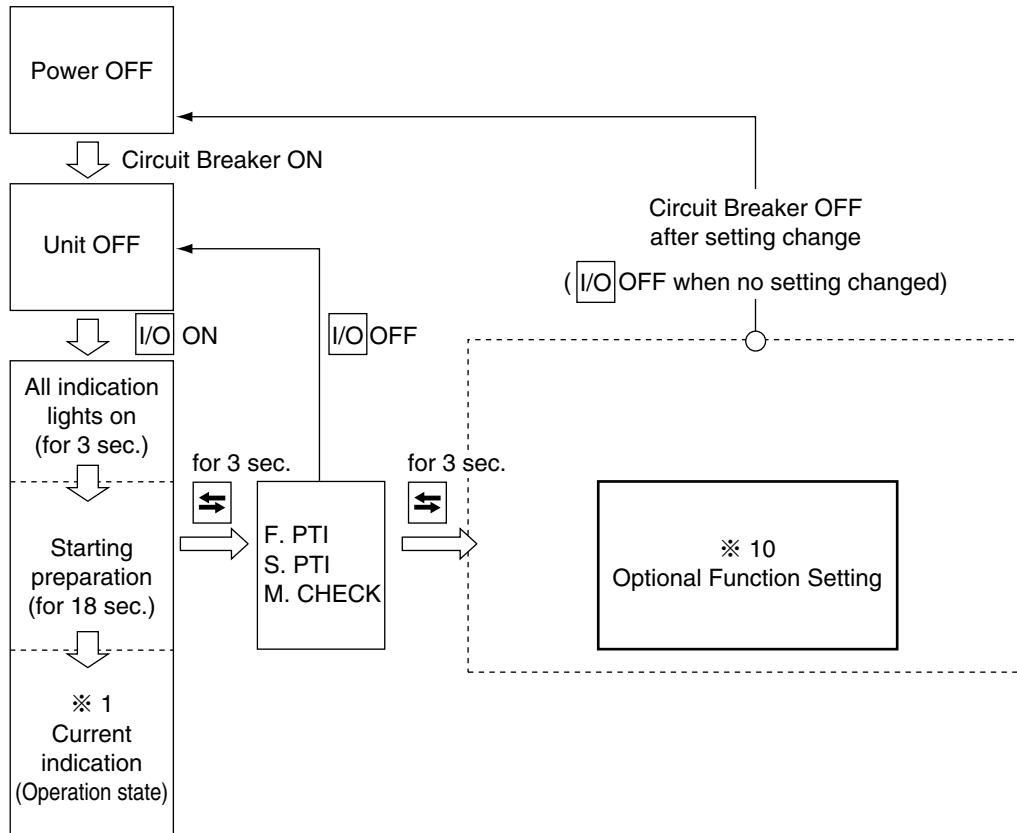
| | | |
|---|---|--------|
| ※10. Optional function mode | | |
| ●USDA sensor setting | | P 3-26 |
| ●Dehumidification control on/off setting | | |
| ※11. Basic function setting mode | | |
| ●Controller type | ●Logging interval | P 3-27 |
| ●Compressor unload | ●Data recorder sensor on/off | P 3-28 |
| ●Reheat coil | ●Power supply | |
| | ●Compressor horse power | |
| | ●Indication (LED section) light off function on/off | |
| ※12. Optional condition setting mode | | |
| ●Chartless function setting | ●H001 | ●d1-- |
| ●Type of USDA sensor | ●H002 | ●d2-- |
| ●°C/°F set | ●H003 | ●d3-- |
| | ●H004 | ●d-1- |
| | ●H005 | ●d-2- |
| | ●H006 | |
| ※13. Input data mode | | |
| ●Container I.D. (No.) | | P 3-31 |
| ●Controller time | | P 3-32 |

Personal computer and controller

| | | |
|--|--|--------|
| ※14. Controller software download mode | | |
| Data logged in a personal computer and controller is exchangeable. For the details, refer to the "Operation manual for personal computer software". | | P 3-32 |

10. OPTIONAL FUNCTION SETTING MODE

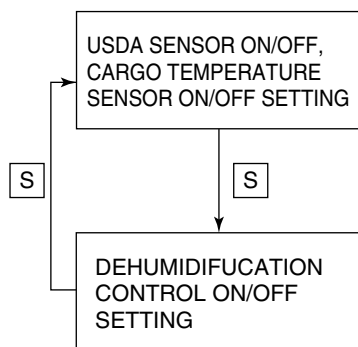
<Key operation to enter/exit>



<Key operation in this mode>

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

Turn the power breaker OFF after the setting.



To set the USDA ON/OFF and CARGO TEMPERATURE SENSOR ON/OFF: Select "OFF (not in use)", "3 (3 USDA probes are in use)", or "4 (3 USDA probes and 1 cargo temperature sensor are in use)" on the LED while the LCD displays "USdA".

Whenever the **[△]** or **[▽]** key is pressed, the indication of "OFF" or "3" or "4" is changed.

Press the **[↵]** key to determine the setting.

Note: When two USDA probes are connected, the setting will be determined automatically to "3" (3 USDA probes are in use).

To set the DEHUMIDIFICATION CONTROL:

Select "ON" (conducting dehumidifying with humidity sensor) or "OFF" (conducting no dehumidifying) on the LED while the LCD indicates "dHU".

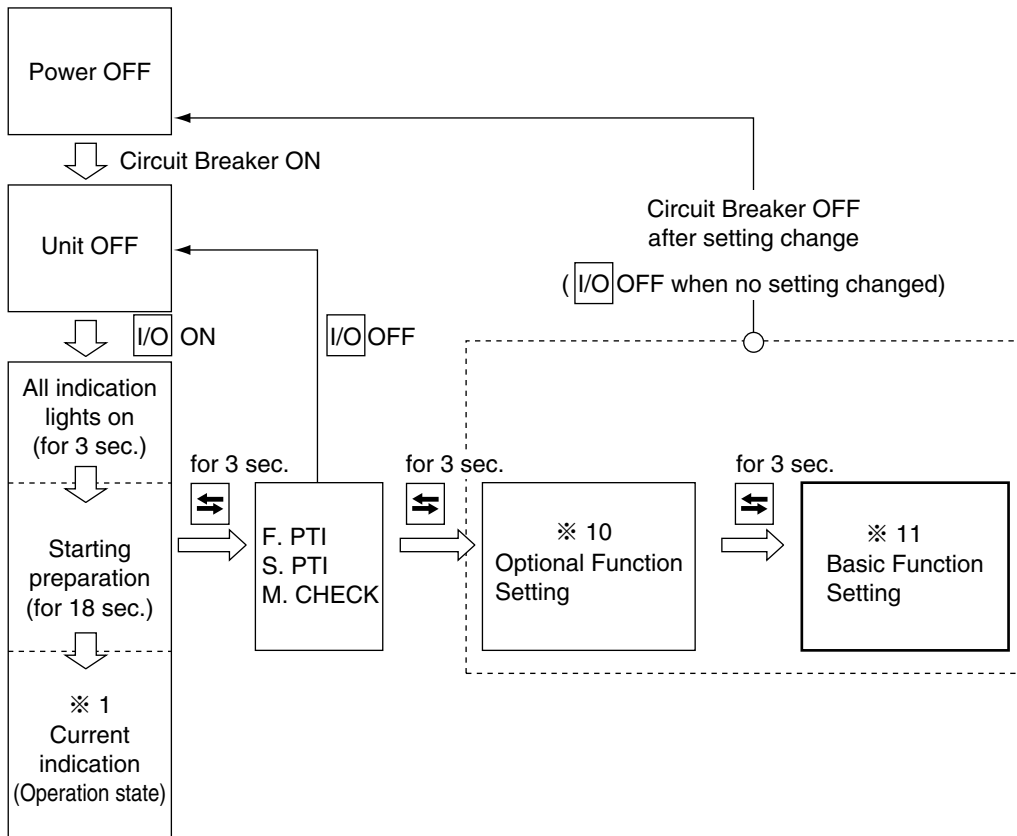
Whenever the **[△]** or **[▽]** key is pressed, the indication of "ON" or "OFF" is changed.

Press the **[↵]** key to determine the setting.

Note : This setting can be changed by **[M]** key. (Refer to 3-12)

11. BASIC FUNCTION SETTING MODE

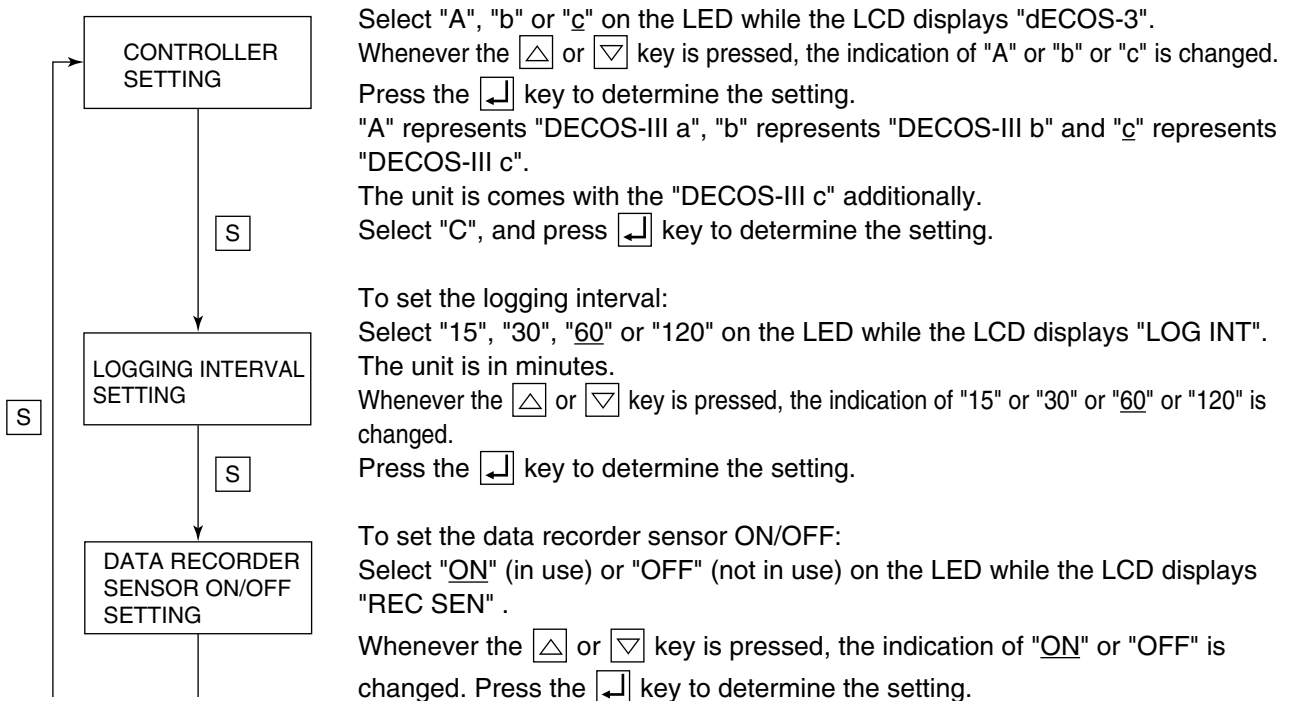
<Key operation to enter/exit>

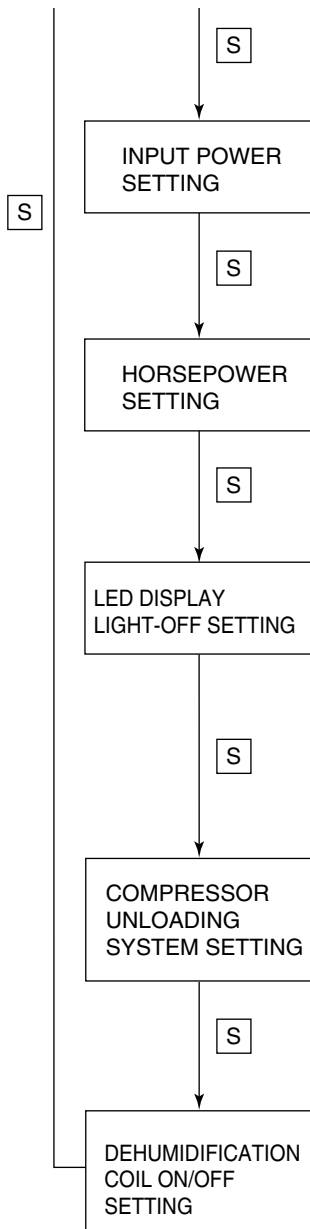


<Key operation in this mode>

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

Turn the power breaker OFF after the setting.





To set the power input:

Select "Sing" or "dUAL" on the LED when the LCD displays "OC-SET" .

Whenever the or key is pressed, the indication of "Sing" or "dUAL" is changed. Press the key to determine the setting.

For the unit, select "Sing", and press key to determine the setting.

To set the horse power setting:

Select "5" or "10" on the LED when the LCD displays "HP" (Horse power).

Whenever the or key is pressed, the indication of "5" or "10" is changed. Press the key to determine the setting.

To set the "panel (LED) lighting off" function ON/OFF:

Select "ON" (provided) or "OFF" (not provided) on the LED when the LCD displays "disp" .

Whenever the or key is pressed, the indication of "ON" or "OFF" is changed. Press the key to determine the setting.

Note: When the 0/CHART key is pressed twice when the "panel (LED) lighting off" function is ON, the lights on the LED panel are turned off.

To set the compressor unloading system:

Select "33 (provided)" or "100 (not provided)" on the LED when the LCD displays "COMP".

Whenever the or key is pressed, the indication of "33" or "100" is changed.

Note: This "33" setting is applicable for LXE10D type only.

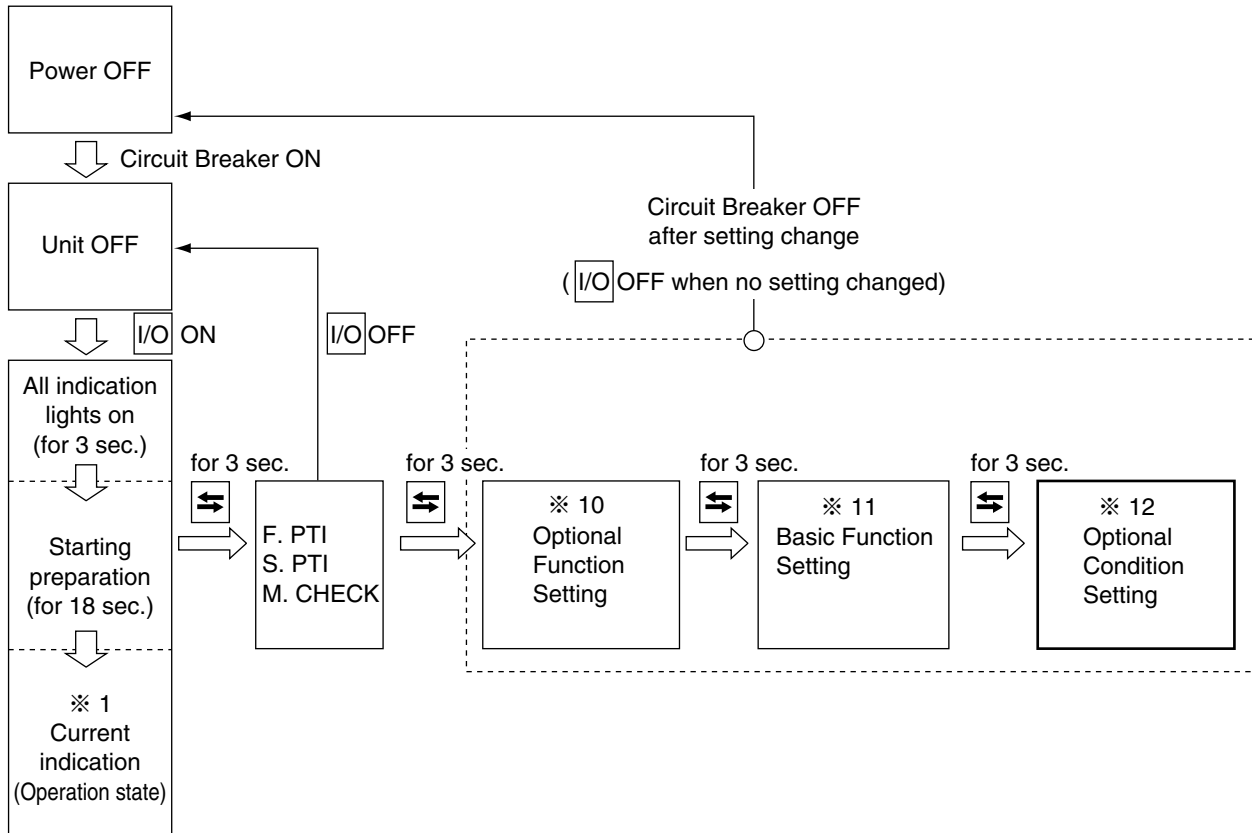
To set the dehumidification coil ON/OFF:

Select "ON (provided)" or "OFF (not provided)" on the LED when the LCD displays "REHEAT".

Whenever the or key is pressed, the indication of "ON" or "OFF" is changed. Press the key to determine the setting

12. OPTIONAL CONDITION SETTING MODE

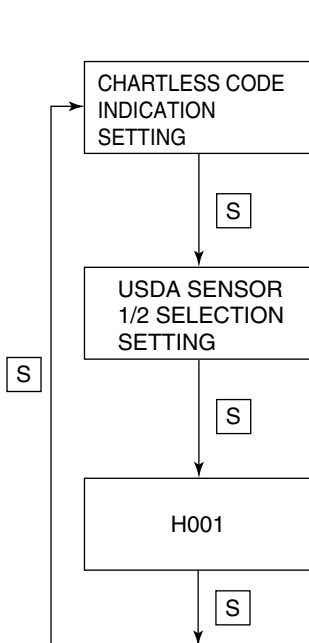
<Key operation to enter/exit>



<Key operation in this mode>

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

Turn the power breaker OFF after the setting.



To set the chartless code (D code /H code):

Select "ON" (indication of D/H code) or "OFF" (no indication of D/H code) on the LED when the LCD displays "CHARTLS".

Whenever the **[△]** or **[▽]** key is pressed, the indication of "ON" or "OFF" is changed.

Press the **[↵]** key to determine the setting.

To set the USDA sensor selection:

Select "1" or "2" on the LED when the LCD displays "USdA1/2".

Whenever the **[△]** or **[▽]** key is pressed, the indication of "1" or "2" is changed.

Press the **[↵]** key to determine the setting.

(see mode detail→5-9)

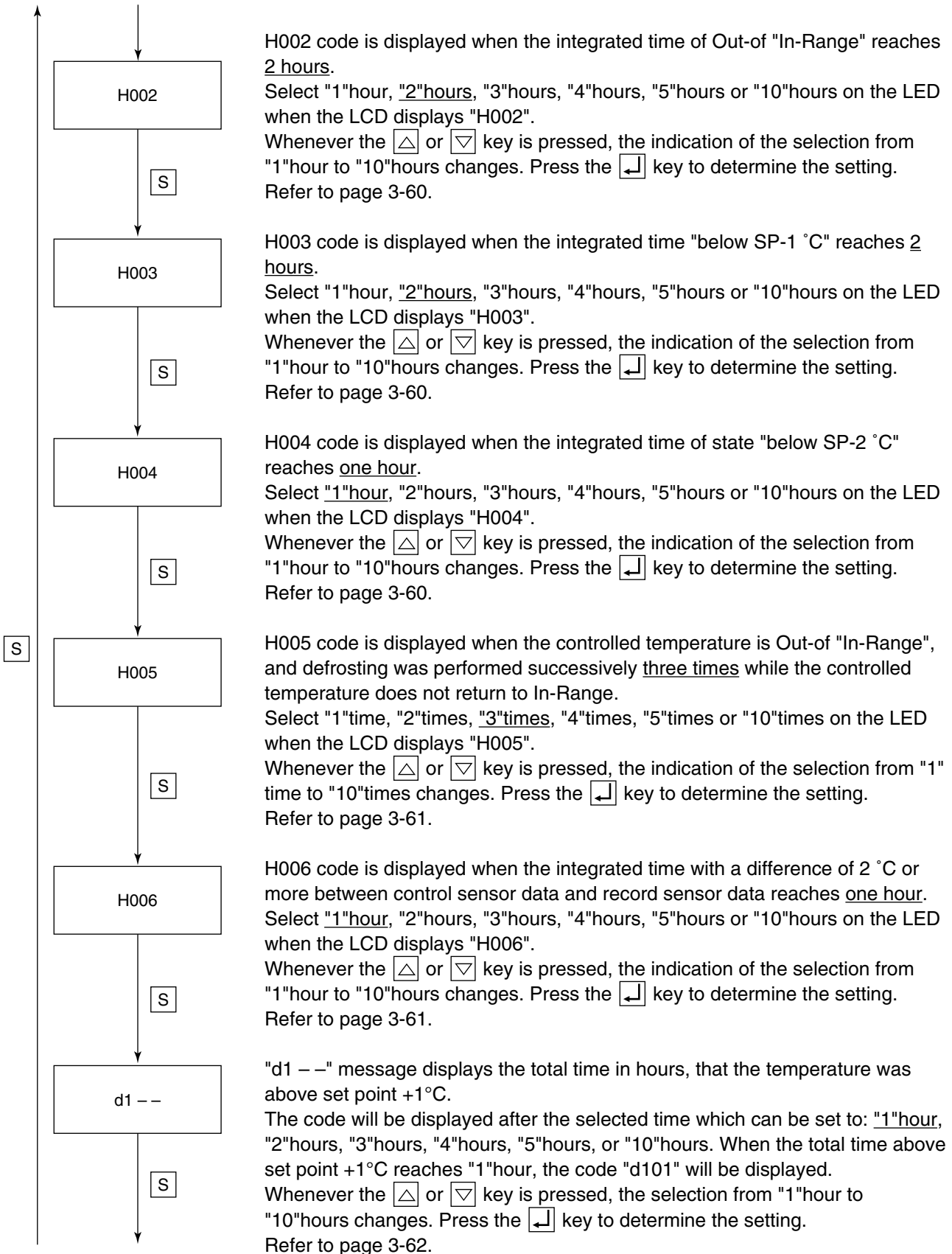
H001 code is displayed when the control temperature does not lower by 3 °C or more for every 4 hours in pull-down operation.

Select "1" °C, "2" °C, "3" °C, "4" °C, "5" °C or "10" °C on the LED when the LCD displays "H001".

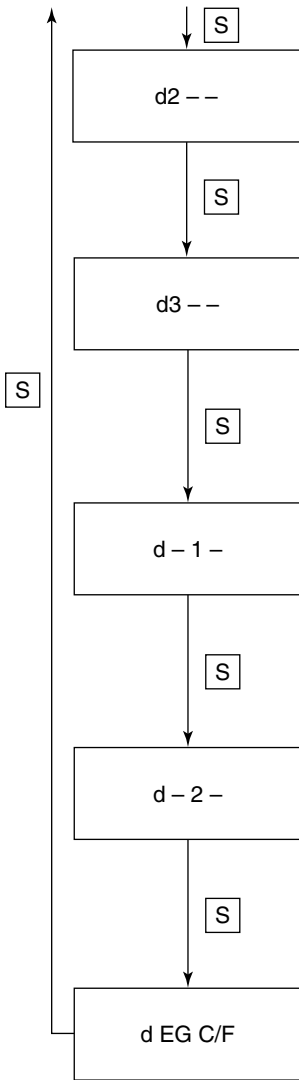
Whenever the **[△]** or **[▽]** key is pressed, the indication of the selection from "1" °C to "10" °C changes. Press the **[↵]** key to determine the setting.

Refer to page 3-60.

12. OPTIONAL CONDITION SETTING MODE (continued)



12. OPTIONAL CONDITION SETTING MODE (continued)



"d2 --" message displays the total time in hours, that the temperature was above set point +2°C. The code will be displayed after the selected time which can be set to: "1"hour, "2"hours, "3"hours, "4"hours, "5"hours, or "10"hours. When the total time above set point +2°C reaches "1"hour, the code "d101" will be displayed.

Whenever the \triangle or ∇ key is pressed, the selection from "1"hour to "10"hours changes. Press the \leftarrow key to determine the setting.

Refer to page 3-62.

"d3 --" message displays the total time in hours, that the temperature was above set point +3°C. The code will be displayed after the selected time which can be set to: "1"hour, "2"hours, "3"hours, "4"hours, "5"hours, or "10"hours. When the total time above set point +3°C reaches "1"hour, the code "d101" will be displayed.

Whenever the \triangle or ∇ key is pressed, the selection from "1"hour to "10"hours changes. Press the \leftarrow key to determine the setting.

Refer to page 3-62.

"d - 1 -" message displays the total time in hours, that the temperature was below set point -1°C. The code will be displayed after the selected time which can be set to: "1"hour, "2"hours, "3"hours, "4"hours, "5"hours, or "10"hours. When the total time below set point -1°C reaches "1"hour, the code "d101" will be displayed.

Whenever the \triangle or ∇ key is pressed, the selection from "1"hour to "10"hours changes. Press the \leftarrow key to determine the setting.

Refer to page 3-62.

"d - 2 -" message displays the total time in hours, that the temperature was below set point -2°C. The code will be displayed after the selected time which can be set to: "1"hour, "2"hours, "3"hours, "4"hours, "5"hours, or "10"hours. When the total time below set point -2°C reaches "1"hour, the code "d101" will be displayed.

Whenever the \triangle or ∇ key is pressed, the selection from "1"hour to "10"hours changes. Press the \leftarrow key to determine the setting.

Refer to page 3-62.

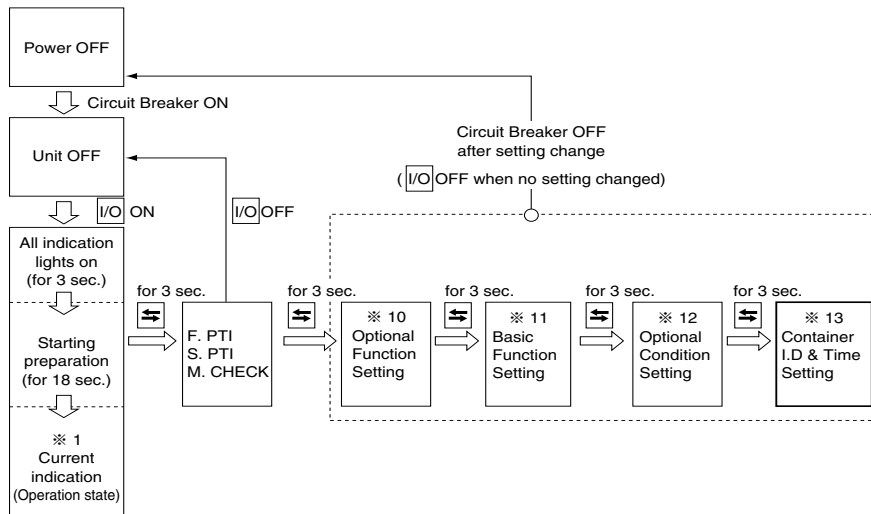
With dEG C/F mode, can be selected.

Select "C" or "F" on the LED when the LCD displays "d EG C/F".

Whenever the \triangle or ∇ key is pressed, the indication of the selection "C" or "F" changes. Press the \leftarrow key to determine the selection. "C" stands for °C/kPa while "F" for °F/PSI.

13. INPUT DATA MODE

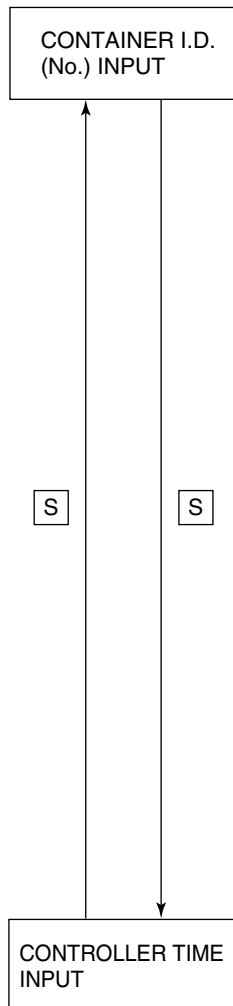
<Key operation to enter/exit>



<Key operation in this mode>

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

Turn OFF the power breaker to confirm the setting.



To input the container I.D. (No.):

Press the **[↵]** key when the LCD displays "SET I.d", then display "i.d.-C" (name of shipping company input with alphabetical character) or "i.d.-n" (number input with numerical character) on the LED by using **[↑]** or **[↓]** key.

To input the shipping company name (alphabet):

Press the **[↵]** key when the LED displays "i.d.-C", then the leftmost digit on LCD flashes. Select the alphabet to be input using the **[↑]** or **[↓]** key, and press the **[↵]** key, then the flashing digit shifts to the right.

Carry on the same procedure until the 4 letters are input, then press the **[↵]** key to determine the input. Once determined, the input letters will flash.

To input the numbers (numeral):

Press the **[↵]** key when the LED displays "i.d.-n", then the leftmost digit on LCD flashes. Select the number to be input by using the **[↑]** or **[↓]** key, and press the **[↵]** key, then the flashing digit shifts to the right.

Carry on the same procedure until the 7 numbers are input, then press the **[↵]** key to determine the input. Once determined, the input numbers will flash.

To set the control time:

Press the **[↵]** key when the LCD displays "SET TIME", then the LCD displays "YEAR" and the LED shows the year currently set in the controller. Change the setting year by using the **[↑]** or **[↓]** key, then press the **[↵]** key to determine the setting.

Then, the LCD displays "MONTH" and the LED displays the month currently set in the controller. Change the setting month by using the **[↑]** or **[↓]** key, then press the key to determine the setting.

Set day, time and minute by the same procedure.

Enter the day, hour or minute when "DAY", "HOUR" or "MINUTE" is displayed on LCD respectively.

If the power circuit breaker (CB) is not turned off, the new setting will not be recognized.

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 3-11.

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 | HPS activated within 30 seconds after operation start or protection device activated 5 times at start-up operation or Fuse 1 brown (Refer Page 7-7). | Unit stops | |
| | F109 | Low- pressure drops to-85kPa or lower within 2 seconds after operation start. | Unit stops | |
| | F111 | HPS does not activate when it reaches to the set value. | Unit stops | |
| | F301 | Temperature setting required (SRAM failure) | 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 | Suction modulating valve (SMV) does not fully close contrary to the designation or initial setting of the controller is wrong. | Unit stops | |
| | F701 | Abnormal high voltage (over 600V) | Unit stops | |
| | F705 | S phase became open phase | Unit stops | |
| F803 | Abnormalities, which make it impossible to continue operation Note2. | Unit stops | | |
| Display alone or restartable alarm | Protection device activation | 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 | DCHS became abnormal high temperature during operation. In the event the refrigerant circulation rate is low, the unit will stand by for three minutes to restart then. | Restart after 3-minute |
| | | E109 | Low pressure drops to-90kPa or lower for 2 seconds or longer successively during normal operation. | If this error occurs two times, F803 error will be detected to stop the unit. Restart after 3-minute |
| | Control error | E201 | Pump down is not completed within 90 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-minutes |
| | | E207 | Defrosting is not completed within 90 minutes | Only alarm display |
| | Printed-circuit board failure | E303 | Humidity setting required (SRAM failure) | Only alarm display |
| | | E305 | Defrost timer setting required (SRAM failure) | Only alarm display |
| | | E307 | Calendar setting required (SRAM failure) | Only alarm display |
| | | E311 | Trip-start setting required (SRAM failure) | Only alarm display |
| | | E315 | PT/CT board failure | Restart after 3-minutes |
| | Sensor alarm | 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-minutes | |
| 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 | | |
| Electronic functional part alarm | E603 | Suction modulating valve (SMV) malfunction or driver malfunction | Back-up operation | |
| | E607 | MDS (sheet key) malfunction | Only alarm display | |
| Power supply alarm | E707 | Momentary power failure | Restart after 3-minutes | |
| Other alarm | E801 | Backup battery replacement date exceeded | 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 the event error E101, E103, E107, or E109 occurs 10 times, the system will go to 4-hour standby mode.
- 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.

3.4.2 Back-up operation at sensor malfunction

PF : Partial Frozen

| Sensor malfunction | | Mode | Back-up content |
|--------------------|--------------------------------------|----------------------------|---|
| SS | Supply air temperature sensor | Chilled | The same control is executed by using DSS (optional). In case of DSS malfunction, [RS-2.0°C] is used for control. When DSS and RS are faulty, the unit should be stopped. |
| | | PF Frozen Defrost | No influence (continuous operation) |
| RS | Return air temperature sensor | Chilled Defrost | No influence (continuous operation) |
| | | PF | The same control is executed by using DRS (optional). In case of DRS malfunction, [SS+2.0°C] is used for control. When DRS and SS are faulty, the unit should be stopped. |
| | | DEFROST- ING | The same control is executed by using DRS (optional). |
| AMBS | Ambient temperature sensor | All modes | Continuous operation |
| DCHS | Discharge gas temperature sensor | Chilled | Continuous operation |
| | | PF Frozen Defrosting | Continuous operation |
| EIS | Evaporator inlet temperature sensor | Chilled, PF | Continuous operation |
| | | Frozen | See the next page |
| | | Defrosting | No influence (continuous operation) |
| EOS | Evaporator outlet temperature sensor | Chilled, PF | Continuous operation |
| | | 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, PF | Continuous operation |
| | | Frozen | See the next page |
| | | Defrosting | No influence (continuous operation) |
| HPT | High pressure transducer | Chilled PF, Frozen | Continuous operation |
| | | Defrosting | Refrigerant charge:No influence Refrigerant release:LPT is used for releasing. |
| LPT | Low pressure transducer | Chilled PF, Frozen | Continuous operation |
| | | Defrosting | Refrigerant charge:HPT is used for charging Pump down:Pump down operation is not conducted |
| HPS | High pressure switch | All modes | Continuous operation |
| WPS | Pressure switch for water | All modes | Continuous operation |
| CTP | Compressor thermal protector | All modes | Continuous operation |

●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 Battery

3.5.1 Specifications

DECOS IIIc controller can use two types of batteries; DRY or Rechargeable (Optional). It is not possible to exchange the type of battery afterwards.

The battery is positioned on CPU & I/O box in controller box.

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

Rechargeable: DAIKIN original rechargeable battery

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 (Standard) | ○ | ○ | — |
| Rechargeable (Optional) | ○ | ○ | ○ |

○ : Available — : Not available

1) Display wake up (Refer to chapter 3.3.2) page 3-11.

Setting/Display the following items on the LCD display.

<Display>

Temperature on the return air sensor

Temperature on the supply air sensor

<Setting change>

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

2) USDA data log

USDA sensors data log every 1 hour

Note) When the Alkaline battery is equipped, it must be replaced for a new every PTI, when USDA is used.

3) Trip data log

Trip data; Setting point, Supply air, Return air, Humidity and time is logged every 1 hour after power off until battery run out. (Min. 3 days)

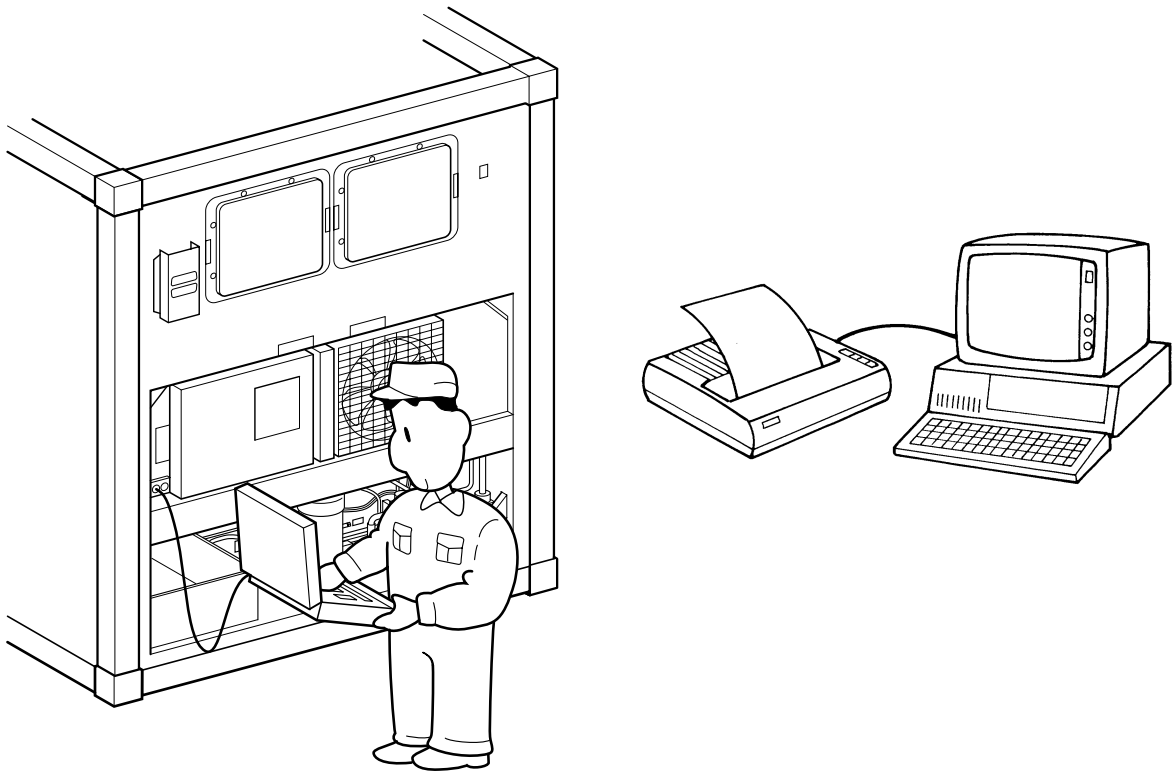
3.6 Information interchange with personal computer

The electronic controller DECOS IIIc 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 3.9.2.3)

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

| | Data name | Logging data |
|---|---------------------|---|
| 1 | ID data | <ul style="list-style-type: none"> ● Container No. ● Departure port ● Set point temperature ● Set point ventilation flow rate ● Set point humidity ● Comment ● Loading date ● Load ● Transit place ● Final destination ● Navigation No. |
| 2 | Trip data | <ul style="list-style-type: none"> ● Operation mode ● Supply air temperature (SS) ● Return air temperature (RS) ● Inside humidity (optional) ● Ambient temperature (AMBS) ● Set point temperature ● Set point humidity (optional) ● Data recorder sensor temperature (DSS/DRS) (optional) |
| 3 | Alarm | <ul style="list-style-type: none"> ● Alarm output date/time ● Alarm code |
| 4 | PTI | <ul style="list-style-type: none"> ● SHORT PTI ● FULL PTI |
| 5 | USDA (optional) | <ul style="list-style-type: none"> ● Pulp sensor temperature (USDA #1 to #3) ● Date/time ● Logging interval is 1 hour. |
| 6 | Event | <ul style="list-style-type: none"> ● Power ON/OFF ● H code ● D code ● Unit ON/OFF ● Date/time ● G-SET ON/OFF |
| 7 | USDA+CTS (optional) | <ul style="list-style-type: none"> ● Pulp sensor temperature (USDA #1 to #3) and cargo sensor temperature ● Date/time |

Logged data can be retrieved with the aid of personal computer software. Refer to the Operation Manual for Personal Computer Software for detail.

3.6.2 SOFTWARE CONFIGURATION

| | MAIN MENU | SUB MENU | Explanation of functions | Remarks |
|---|---|---|---|--|
| FIELD JOB | LOGGER DATA DOWNLOAD | TRIP DATA | Data recorded in the logger is read from the controller onto the personal computer (disk or hard disk). (This operation is called the download). | No information appears on the screen at this time. |
| | | USDA DATA | | |
| | | 4-PULP SENSORS DATA | | |
| | | PTI DATA | | |
| | | ALL DATA AFTER TRIP-START | | |
| | CONTAINER I.D. /HEADER | SET CONTAINER I.D. /HEADER -From DISK | The logger header (set point temperature, cargo name, destination and other information) is changed. ● Data previously saved on disk is transmitted to the controller. | Disk →Controller |
| | | CHANGE CONTAINER I.D. -From Keyboard | The container No. (container ID) set in the controller is changed. | Input from keyboard |
| | | CHANGE CONTAINER HEADER -From Keyboard | The logger header is changed. | Input from keyboard |
| | | CHANGE CALENDAR | The internal clock on the controller is changed. ● The controller clock is based on GMT (Greenwich Mean Time) | Conversion from personal computer built-in clock |
| | MAINTENANCE & REPAIR | DISPLAY CURRENT OPERATING DATA | Controller sensor values, operation of internal relay and opening rates of SMV and EV are displayed on the screen. | Record on disk is enabled. |
| | | DISPLAY CURRENT ALARM | Detected alarms are displayed. | |
| | | DISPLAY ALARM LOG | Information of alarm recorded in the logger is displayed. | Record on disk is enabled. |
| | | DISPLAY TEMPERATURE CHART | Fluctuation of control temperature which has been recorded in the logger is displayed in a graphic chart. | |
| | | REPLACE BATTERY | The back-up battery replacement day is set and displayed. | Setting can be also made on the control panel. |
| | USDA (3-PULP SENSORS) COLD -TREATMENT | CALIBRATION USDA SENSORS | The pulp sensor (USDA sensor) to be used for low temperature transportation is calibrated. | The ice bath is used. |
| | | DISPLAY TEMPERATURE CHART | Fluctuation of the pulp sensor (USDA sensor) temperature which has been recorded in the logger is displayed in a graphic chart. Summary report of trip data is indicated. | |
| 4-PULP SENSORS COLD -TREATMENT | CALIBRATION 4-PULP SENSORS | The pulp sensor (USDA sensor) to be used for low temperature transportation is calibrated. | The ice bath is used. | |
| | DISPLAY TEMPERATURE CHART | Fluctuation of the pulp sensor (USDA sensor) temperature which has been recorded in the logger is displayed in a graphic chart. Summary report of trip data is indicated. | | |

| | MAIN MENU | SUB MENU | Explanation of functions | Remarks |
|-----------------------------|--|---|---|---------|
| OFFICE JOB | MAKE REPORT | TRIP REPORT | Reports are made based on record data read from the logger. | |
| | | USDA REPORT | | |
| | | 4-PULP SENSOR REPORT | | |
| | | PTI REPORT | | |
| | | ALARM REPORT | | |
| | | MONITOR REPORT | | |
| | EVENT REPORT | | | |
| MAKE CONTAINER I.D. /HEADER | SET CONTAINER I.D. /HEADER into DISK | Disk data to change LOGGER HEADER of controller is created. | | |
| CONFIG SET | <ul style="list-style-type: none"> • CHART MARK • CRT MODEL • SET TIME ZONE • G.M.T-LOCAL TIME | <ul style="list-style-type: none"> • SELECT JOB • TRIP REPORT | Environment using personal computer software is set. | |

3.7 Inspection procedure for the electronic controller

DECOS IIIc enables the internal data of the controller CPU (RAM data) to be displayed on the monitor of a personal computer by connecting the two with a communication cable. This makes it possible to preform an easy inspection of the controller and diagnose any defect.

(1) Inspection of sensors

The inspection is carried out by comparing the sensor readings on the controller display with the display on the personal computer. In case the sensor reading is abnormal, the sensor should be replaced with a new one, but **be sure to check the sensor for damage as well as the internal harness and its connectors before replacing.** (Refer to Appendix for the sensor characteristics.) Page 7-3 and 7-4.

(2) Inspection of the internal relays of the electronic controller

The inspection is carried out by checking the display on the personal computer and the internal relay output (24VAC) on the terminals of terminal board, utilizing the electric tester or test lamp. In case the internal relay malfunctions, the power I/O board should be replaced with a new one, but **be sure to check the internal harness and its connectors for damage before replacing.**

(3) Inspection of the Suction modulation valve

Suction modulation valve is driven by the PCB adapter. If the Suction modulation valve does not function (i.e. if there is no clicking sound, ever though the control display shows the valve opening and closing), then the PCB adapter should be replaced, but be sure to check the internal harness and its connectors for damage before replacing.

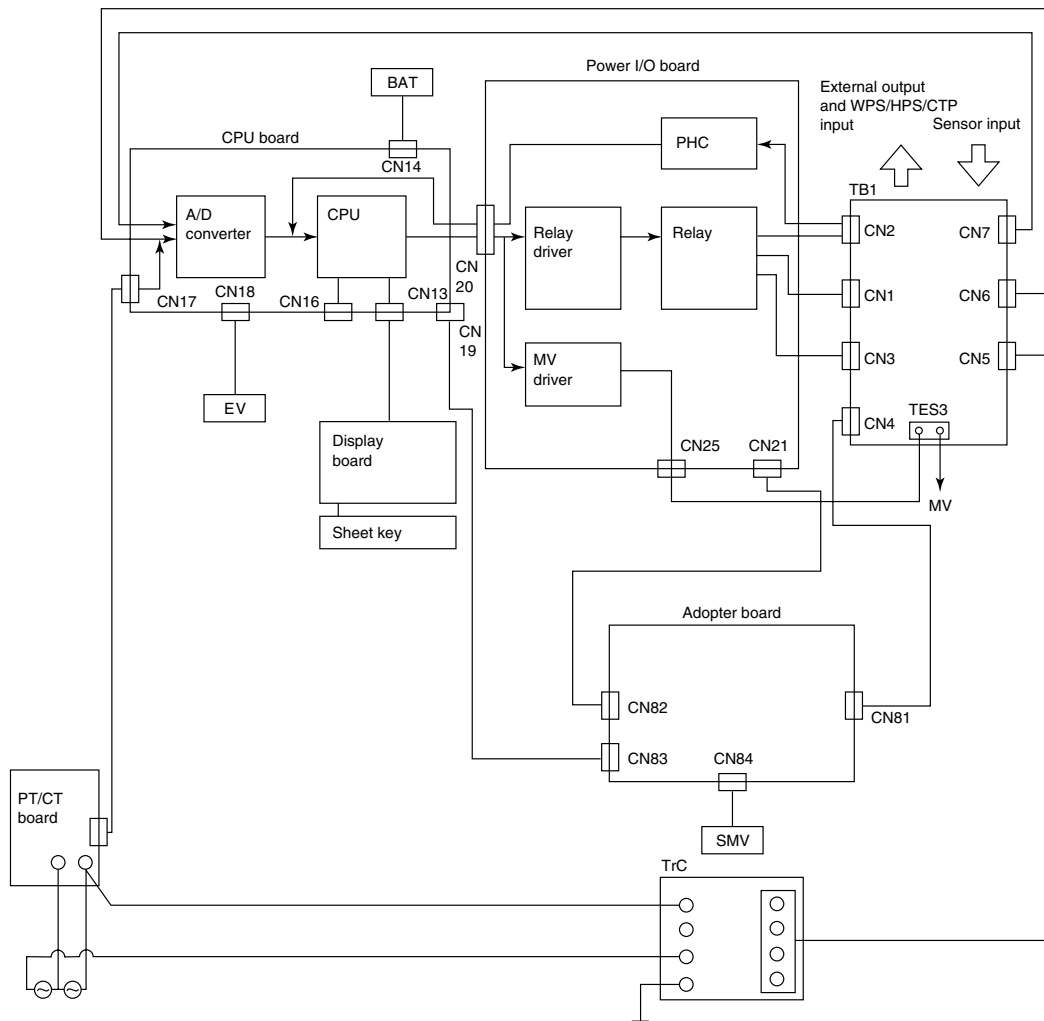
(4) Inspection of the electronic expansion valve

If the electronic expansion valve does not operate (no clicking sound) when the valve opening is changed on the controller indication, the electronic expansion valve should be replaced. However, **check on damage of internal harness and poor contact of connector before the replacement.**

(5) Inspection of the cpu board

If the green light on the cpu board is flashing, then the cpu board is working normally.

●Basic internal wiring diagram of electronic controller



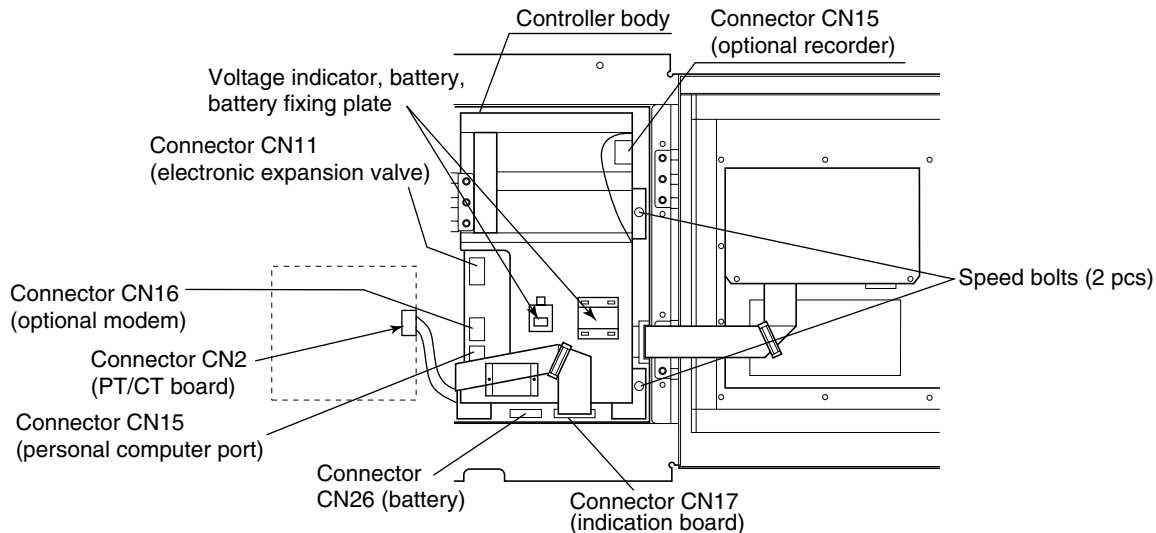
3.8 Controller replacement and the initial setting

3.8.1 Controller replacement

<Replacement procedure for the controller>

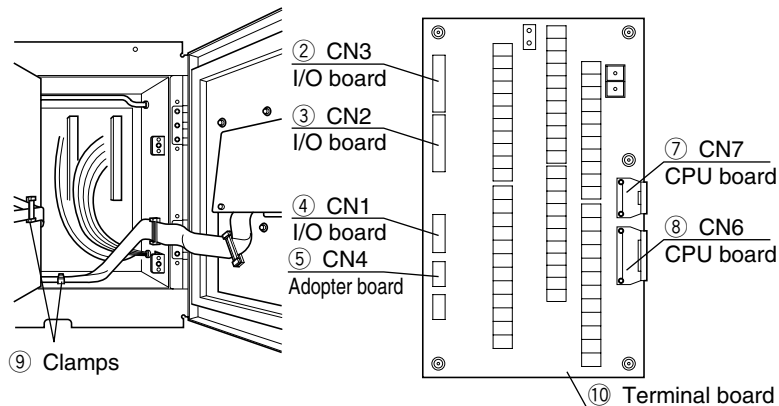
- (1) Remove speed bolts (2 pcs) on the controller body, then remove the connector.

Be sure to keep voltage indicator, the battery and the battery fixing plate for reinstallation.



- (2) Open the controller body, then disconnect the connectors ② through ⑧ on the terminal board mounting plate ⑩.

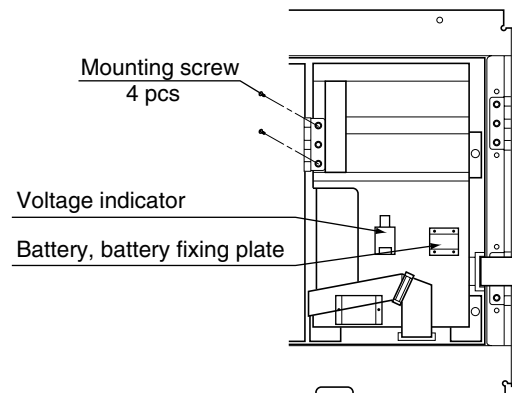
- (3) Disengage clamps ⑨ fixing the harness.



- (4) Remove screws (2 pcs) fixing the controller, and replace the controller with a new one.

- (5) In the reverse procedure, set the connector, the terminal speed bolts and the mounting screws into the original setup.

Install the battery and the voltage indicator removed from the previous controller before replacement by using the battery fixing plate.

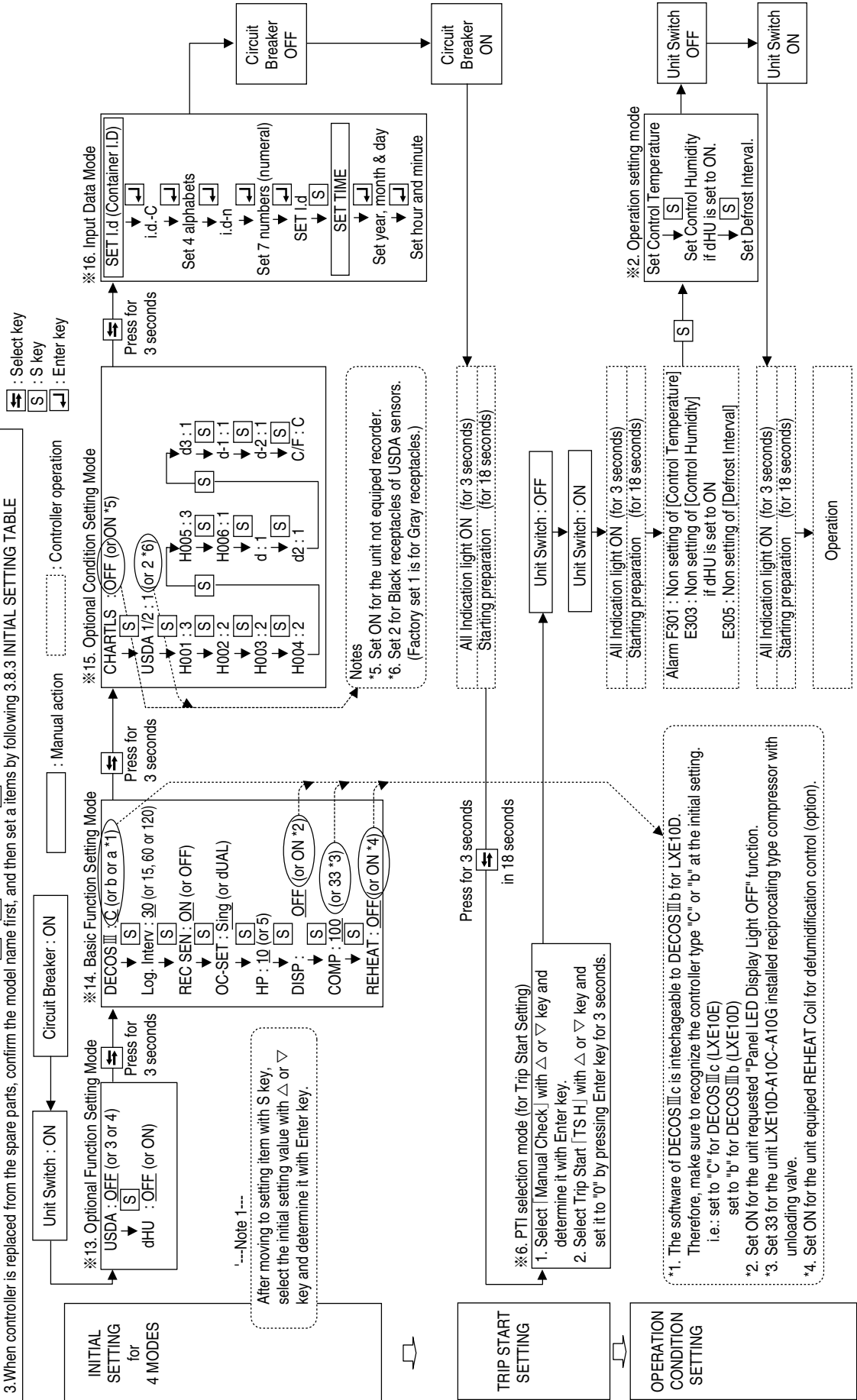


CAUTION Make sure that the connector is firmly connected.

3.8.2 INITIAL SETTING & OPERATION PROCEDURE

Key operation

- Underlined figures show the value of the most usual setting case. Actually all the setting have been set following 3.8.3 INITIAL SETTING TABLE at factory.
- When the setting change is required, select the desired setting using Δ or ∇ key and press \rightarrow key to confirm, and then turn circuit breaker off.
- When controller is replaced from the spare parts, confirm the model name first, and then set a items by following 3.8.3 INITIAL SETTING TABLE



3.8.3 INITIAL SETTING TABLE INTO SPARE CONTROLLER

| MODEL NAME Note 1 | ※7. Optional function setting mode | | | | | | | | | | ※8. Basic function mode | | | | | | | | | | ※9. Optional Condition setting mode | | | | | | | | | | ※10. Input Data | |
|----------------------|------------------------------------|--------------------------|------------------|----------------------|-------------|------------|--------------------|----------------------|---------------------|---------------------------|-------------------------|--------|------|------|------|------|------|--------|------|------|-------------------------------------|------------------|----------------|---------------------|----------|--|--|--|--|--|-----------------|--|
| | UsdA | dHu | LOG INT | REC SEN | OC-SET | HP | dISP | COMP | REHEAT | CHARTLS | USdA1/2 | H001 | H002 | H003 | H004 | H005 | H006 | D1-- | D2-- | D3-- | D-1- | D-2- | C/F | SET Id | SET TIME | | | | | | | |
| LXE10E | UsdA sensor | Dehumidification control | Logging interval | Data recorder sensor | Input power | Hose power | Panel lighting OFF | Comp./Unload setting | Reheat coil setting | D/H code alarm indication | USdA sensor type | H code | | | | | | D code | | | | Temp. indication | Container I.D. | Controller set time | | | | | | | | |
| -A2 | OFF | OFF | 30 | ON | Single | 10 | OFF | 100 | ON | ON | 2 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A4 | OFF | OFF | 30 | ON | Single | 10 | OFF | 100 | OFF | ON | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A5 | OFF | OFF | 30 | ON | Single | 10 | OFF | 100 | OFF | OFF | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A5A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A6R | OFF | OFF | 30 | ON | Single | 10 | ON | 100 | OFF | OFF | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A11 | OFF | OFF | 60 | ON | Single | 10 | OFF | 100 | OFF | OFF | 2 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A9 | OFF | OFF | 30 | ON | Single | 10 | ON | 100 | OFF | OFF | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A9R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A14 | OFF | OFF | 60 | ON | Single | 10 | OFF | 100 | ON | ON | 2 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -A16 | OFF | OFF | 30 | ON | Single | 10 | OFF | 100 | OFF | ON | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A17 | OFF | OFF | 30 | ON | Single | 10 | OFF | 100 | OFF | OFF | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| -A18 | OFF | OFF | 60 | ON | Single | 10 | OFF | 100 | ON | OFF | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | * | GMT | | | | | | | |
| Spare controller | blank | blank | blank | blank | blank | blank | blank | blank | blank | ON | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | C | blank | 01/1/1 | | | | | | | |

Notes 1. Confirm MODEL NAME mentioned in the name plate mounted on the reefer unit.

- It is possible to input Container I.D. and Controller Time with both the panel operation and the personal computer installed DCCS's software.
- When inputting the container I.D. by the panel operation, take care not to enter any of the following pairs of alphabet and numeral(i-1),(O-0),(S-5).
- If you don't input container I.D., it is impossible to download the logger data with the personal computer.
- If you don't input the controller set time, it starts from 2001.1.1, 0:00.

3.9 PTI (Pre-Trip Inspection) AND PERIODIC INSPECTION

The controller (DECOS III c) 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 cooling capacity inspection are executed. The cooling capacity check is executed only if any abnormal components are not found with S.PTI. If any abnormality is found during the cooling 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.)

3.9.1 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 nd year | 4 th year | 8 th year | |
|--------------------|---|---|--|-----------------------|-----------------------|-----------------------|-----------------------|
| General structure | 1 | Inspection for physical damage | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | 2 | Loose mounting bolts | 1) Casing frame | <input type="radio"/> | | | |
| | | | 2) Compressor | <input type="radio"/> | | | |
| | | | 3) Condenser fan motor | <input type="radio"/> | | | |
| | | | 4) Evaporator fan motor | <input type="radio"/> | | | |
| | | | 5) Control box | <input type="radio"/> | | | |
| | | | 6) Temperature recorder box | <input type="radio"/> | | | |
| | | | 7) Access panel | <input type="radio"/> | | | |
| | | | 8) Others | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 3 | Conditions of panel, hinge and lock | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | 4 | Drain pan and drain hose cleaning | <input type="radio"/> | | | | |
| | 5 | Control box inspection | 1) Cover packing inspection and replacement | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | | | 2) Loose cable gland | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | | | 3) Internal cleaning | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 6 | Temperature recorder box inspection | 1) Cover packing inspection and replacement | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | | | 2) Internal cleaning | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 7 | Sealing condition of holes through casing frame | 1) Air leakage and clearance | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| 8 | Packing inspection and replacement | 1) Ventilator cover packing | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | | 2) Unit sealing packing | | | | <input type="radio"/> | |
| 9 | Painted area recondition | 1) Compressor | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | | 2) Water-cooled condenser/liquid receiver | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | | 3) Solenoid valve (coil cap) | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | | 4) Casing frame | | | <input type="radio"/> | <input type="radio"/> | |
| 10 | Repainting | 1) Compressor | | | | <input type="radio"/> | |
| | | 2) Water-cooled condenser/liquid receiver | | | | <input type="radio"/> | |
| | | 3) Condenser fan motor | | | | <input type="radio"/> | |
| | | 4) Condenser fan | | | | <input type="radio"/> | |
| Refrigerant system | 1 | Gas leakage | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| | 2 | Refrigerant | 1) Inspection of moisture in the refrigerant, and refrigerant charged amount | <input type="radio"/> | | | |
| | | | 2) Replacement of refrigerant | | | <input type="radio"/> | <input type="radio"/> |
| | 3 | Inspection of high pressure switch operational pressure | <input type="radio"/> | | | | |
| | 4 | Operation and leakage of solenoid valve | 1) Liquid solenoid valve | <input type="radio"/> | | | |
| | | | 2) Economizer solenoid valve | <input type="radio"/> | | | |
| | | | 3) Injection solenoid valve | <input type="radio"/> | | | |
| | | | 4) Hot gas solenoid valve | <input type="radio"/> | | | |
| | | | 5) Defrosting solenoid valve | <input type="radio"/> | | | |
| | | | 6) Discharge gas by-pass solenoid valve | <input type="radio"/> | | | |
| 5 | Operation and leakage of suction modulating valve | <input type="radio"/> | | | | | |
| 6 | Operation and leakage of electronic expansion valve | <input type="radio"/> | | | | | |
| 7 | Compressor | Water entering to compressor terminal | | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |

| | No. | Inspection item | Inspection content | PTI | 2 nd year | 4 th year | 8 th 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 | 1) 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 | 1) Indication error inspection and replacement | ○ | | | | |
| | | 2) Replacement | | ○ | ○ | ○ | |
| 12 | PT/CT (voltage and current) indication error inspection | | | ○ | ○ | ○ | |
| 13 | Pressure sensor indication error inspection and replacement | | | ○ | ○ | ○ | |

| | No. | Inspection item | Inspection content | PTI | 2 nd year | 4 th year | 8 th year |
|-------------------|---------------------|---|--|-----|----------------------|----------------------|----------------------|
| Electrical system | 14 | Temperature recorder inspection | 1) Calibration | ○ | | | |
| | | | 2) Sensor error inspection and replacement | | ○ | ○ | ○ |
| | | | 3) Chart drive inspection | ○ | | | |
| | | | 4) Recording operation inspection | ○ | | | |
| | | | 5) Loose terminal | | ○ | ○ | ○ |
| | | | 6) Chart drive dry battery inspection, and replacement | ○ | | | |
| | | | 7) Check and replacement of pen lifting battery | | | | ○ |
| | 15 | Electronic controller | 1) Check and replacement of wake-up battery | ○ | | | |
| | | | 2) LCD panel replacement | | | ○ | ○ |
| | 16 | Evaporator fan motor | 1) Speed switchover | ○ | | | |
| | | | 2) Revolution direction | ○ | | | |
| | | | 3) Motor replacement | | | | ○ |
| | 17 | Condenser fan motor | 1) Rotating direction | ○ | | | |
| | | | 2) Motor replacement | | | | ○ |
| 18 | Evaporator fan | 1) Deformation and damage inspection | ○ | | ○ | ○ | |
| 19 | Condenser fan | 1) 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.

3.9.2 Automatic PTI (Pre-Trip Inspection)

- The automatic PTI function is provided so as to ensure correct inspection and to shorten inspection time.

(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) Starting inspection and operation inspection of safety device and control equipment

- ① Starting
 - Inspection whether the starting procedure is proper or not
 - Inspection for abnormal noise and abnormal vibration
 - Moisture in the refrigerant ----- This is reinspected at the end of PTI.
 - Rotating direction of fan motor.
- ② Safety device
 - HPS ----- Measurement of the actuating pressure by stopping the condenser fan motor.
- ③ 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 |
| ⑤ Frozen control | -18°C | Electronic temperature recorder calibration | (Temperature differential and rotating direction) ON/OFF, voltage and current |

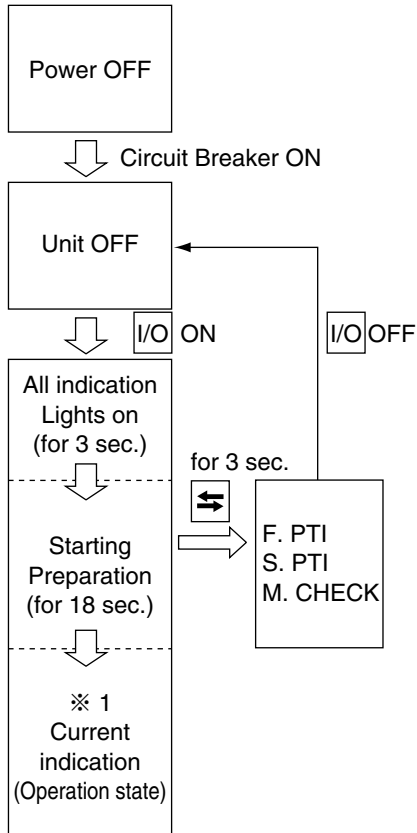
Remained frost inspection

(5) PTI report preparation

3.9.2.1 PTI SELECTION MODE

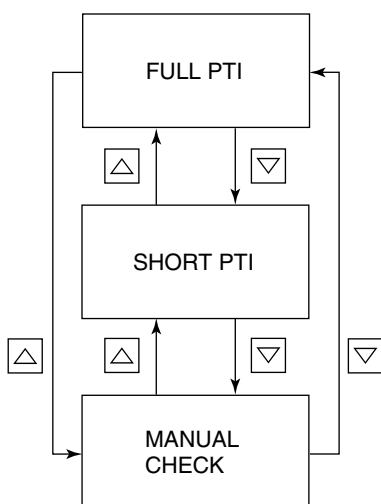
The test mode of FULL (F.PTI), SHORT PTI (S.PTI), and MANUAL CHECK (M.CHECK) can be selected.

<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 the following pages.

● 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 result may be abnormal. |
| 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 condition. |
| M. CHECK | ○ | ○ | |

3.9.2.2 Short PTI (S.PTI)

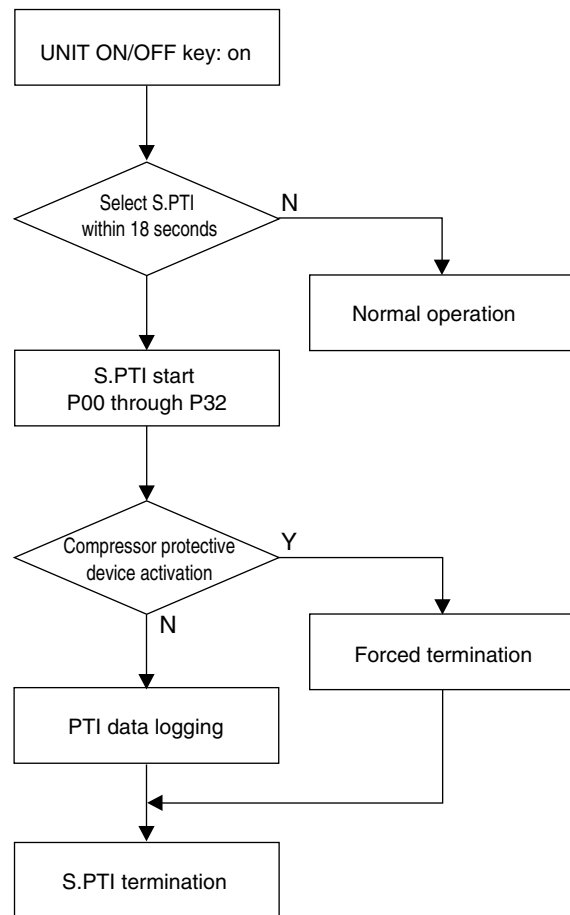
● Step display and content

| 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 3-way solenoid valve (HSV) and reheat coil solenoid valve (RSV) opening or closing check |

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

● S.PTI Flow chart operation



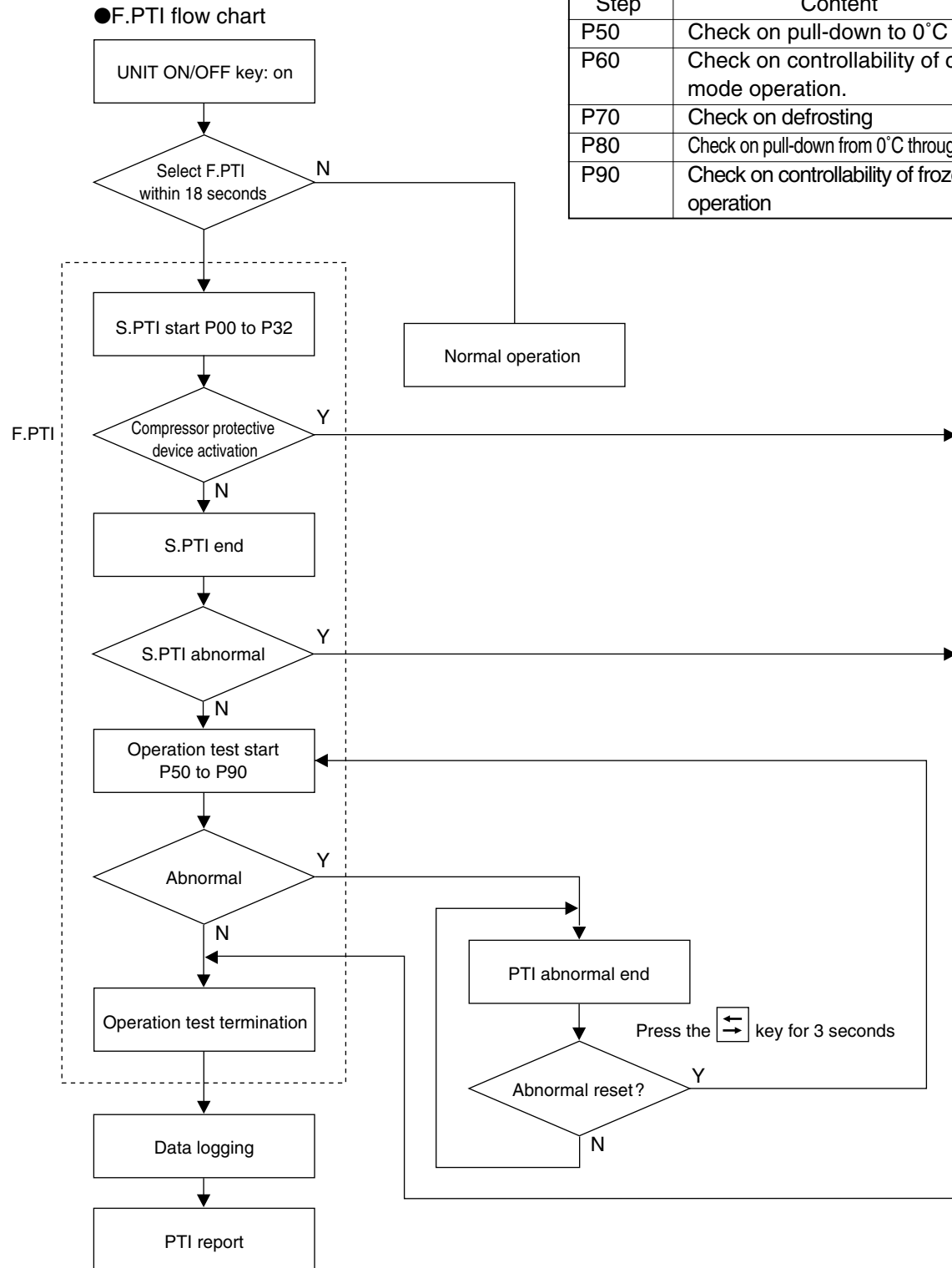
3.9.2.3 Full PTI (F.PTI)

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 |



3.9.2.4 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 control | J502 | Long pull-down time | | | |
| P60 | 0°C control | 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 chapter 6.3 for more information.

3.9.2.5 Manual check (M.CHECK)

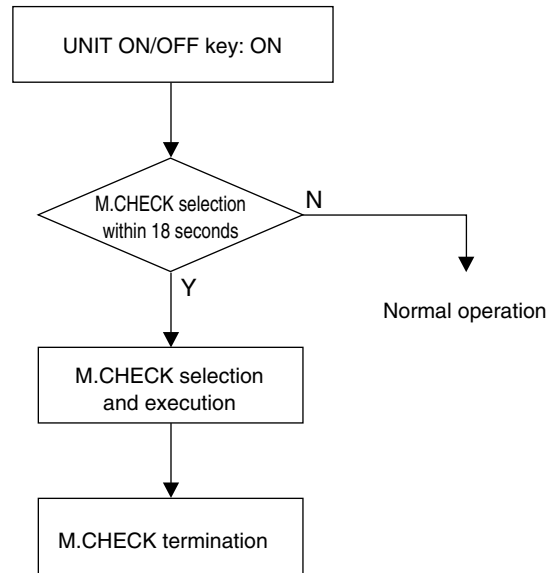
Since the components are operated individually differing from S.PTI and F.PTI, the steps can be respectively selected and executed. However, any error occurring during execution of M.CHECK will not be included.

Turn the UNIT ON/OFF key off to terminate the M.CHECK.

● Step indication and contents

| Step (indicated on the LCD) | Indication content (indicated on the LED) |
|--------------------------------|--|
| CC ×10H | Compressor integrated run-hour |
| EFH A | Running current value of evaporator fan motor high-speed running |
| EFL A | Running current value of evaporator fan motor low-speed running |
| CF A | Running current value of condenser fan motor running |
| TS H | Elapsed time after trip start |
| EF1 × 10H | Evaporator fan motor 1 run- hour |
| EF2 × 10H | Evaporator fan motor 2 run- hour |
| CF × 10H | Condenser fan run- hour |
| SOFTVER | Controller software version |

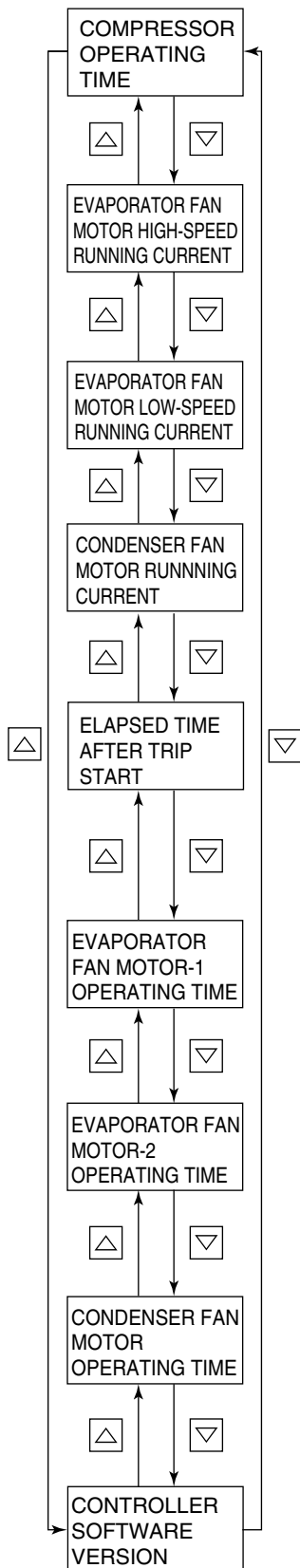
● M.CHECK flow chart



MANUAL CHECK SELECTION MODE

The LED displays the values of following items:

Compressor operating time, Evaporator fan motor high-speed running current, Evaporator fan motor low-speed running current, Condenser fan motor running current, Battery life, Horse power, Elapsed time after trip start, Evaporator fan motor running time, Condenser fan motor running time, and Controller software version.



To display the compressor operating time:

Press the key when the LCD shows "CC ×10H".

The operating time is [the value shown on the LED] ×10 hours.

Pushing the key for 3 seconds sets compressor operating time to 0 (hour).

To display the current value of the evaporator fan motor high-speed:

Press the key when the LCD shows "EFH A", then the LED displays the current value. (Unit: Ampere)

To display the current value of the evaporator fan motor low-speed:

Press the key when the LCD shows "EFL A", then the LED displays the current value. (Unit: Ampere)

To display the current value of the condenser fan motor running current:

Press the key when the LCD shows "CF A", then the LED displays the current value. (Unit: Ampere)

To display the elapsed time after trip start:

Press the key when the LCD shows "TS H", then the LED displays the elapsed time. (Unit: Hours).

When the key is pressed and hold for 3 seconds while the elapsed time is displayed the TRIP START is set, and the elapsed time display is reset to "0" (hour).

To display the evaporator fan motor-1 operating time:

Press the key when the LCD shows "EF1 ×10H".

The operating time is [the value displayed on the LED] ×10 hours.

When the key is pressed and hold for 3 seconds while the evaporator fan motor-1 operating time is displayed, the evaporator fan motor-1 operating time is reset to "0" (hour).

("EF1" stands for the right hand side fan motor looking from the inside of the container.)

To display the evaporator fan motor-2 operating time:

Press the key when the LCD shows "EF2 ×10H".

The operating time is [the value displayed on the LED] ×10 hours.

If the key is pressed and hold for 3 seconds while the evaporator fan motor-2 operating time is displayed, the evaporator fan motor-2 operating time is reset to "0" (hour).

"EF2" stands for the left hand side fan motor looking from the inside of the container.

To display the condenser fan motor operating time:

Press the key when the LCD shows "CF ×10H".

The operating time is [the value displayed on the LED] ×10 hours.

If the key is pressed and hold for 3 seconds while the condenser fan motor operating time is displayed, the condenser fan motor operating time is reset to "0" (hour).

To display the controller software version:

Press the key when the LCD shows "SOFTVER".

The value on the LED is the software version.

3.10 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.

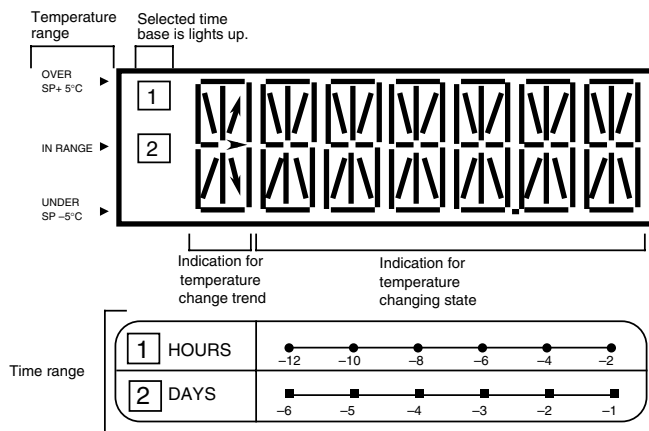
- Chart Indication Function
- Pull Down Time Indication Function
- Chartless Code display Function

3.10.1 Chart indication function

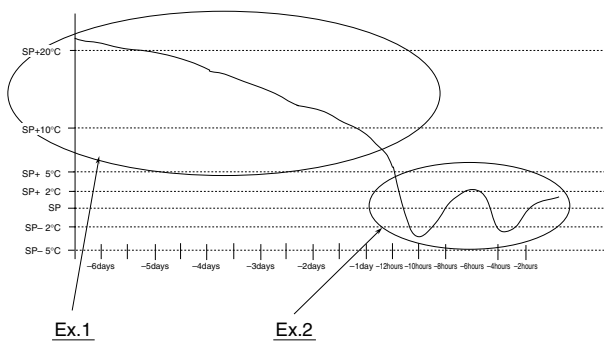
The temperature record data is indicated in a graphic chart on the LCD panel in the chart indication mode.

- 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

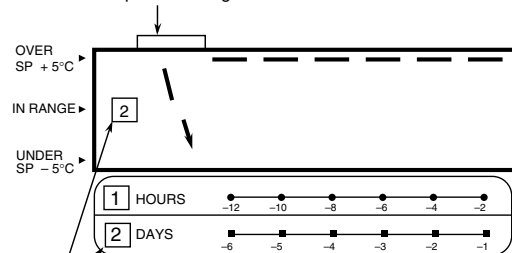


● Example of chart indication



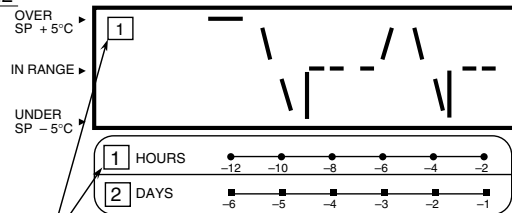
Ex.1

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))


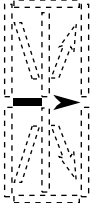

Ex.2



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

●Displaying temperature change trend:

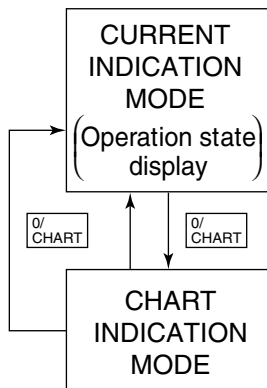
- The temperature change trend is shown in the leftmost LCD.
- However, this display is shown only when all segments are in the same temperature range.

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

※ According to setting point of H001, trend indication changes.

Refer to page 3-30 optional condition setting mode for the H001 setting procedure.

< Operation procedure >



To shift to the chart indication mode, press the $\boxed{\text{CHART}}$ 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 $\boxed{\Delta}$ or $\boxed{\nabla}$ key.

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

3.10.2 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.

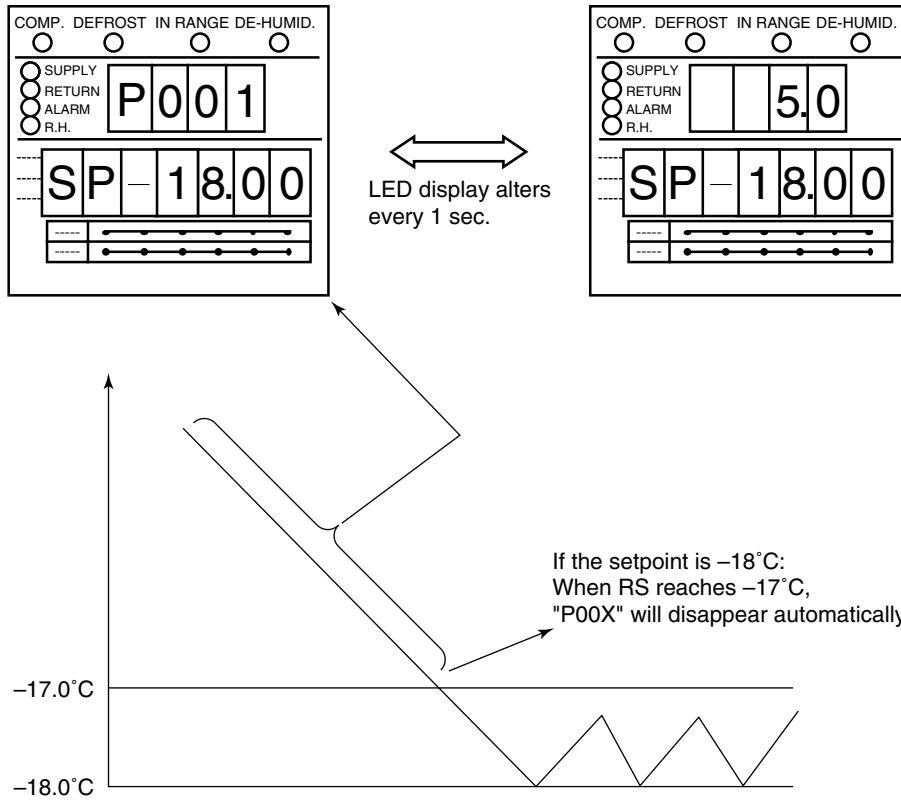


Figure1

3.10.3 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 conditions setting" on the page 3-30.


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

3.10.3.1 List of chartless code

C: chilled mode, F: Frozen mode, PF: Partial 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, PF | 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, PF | 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, PF | 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, PF | 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, PF | 7 |
| | d2XX | When the total time above set point +2°C reaches <u>1 hour</u> , the code "d201" will be displayed. | C, F, PF | 7 |
| | d1XX | When the total time above set point +1°C reaches <u>1 hour</u> , the code "d101" will be displayed. | C, F, PF | 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, PF | 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, PF | 7 |
| | PXXX | XXX: When the total pull-down time reaches one hour, an indication XXX=001 appears. | C, F, PF | 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.

3.10.3.2 H-code

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

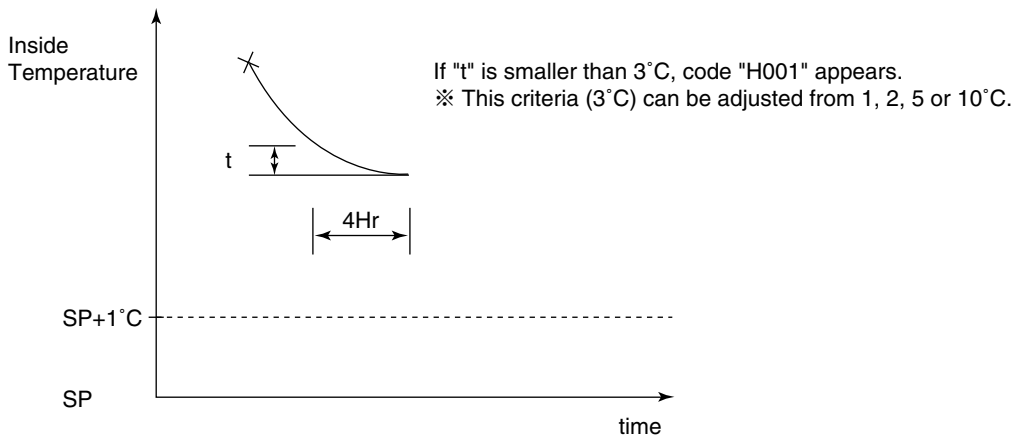


Figure2

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

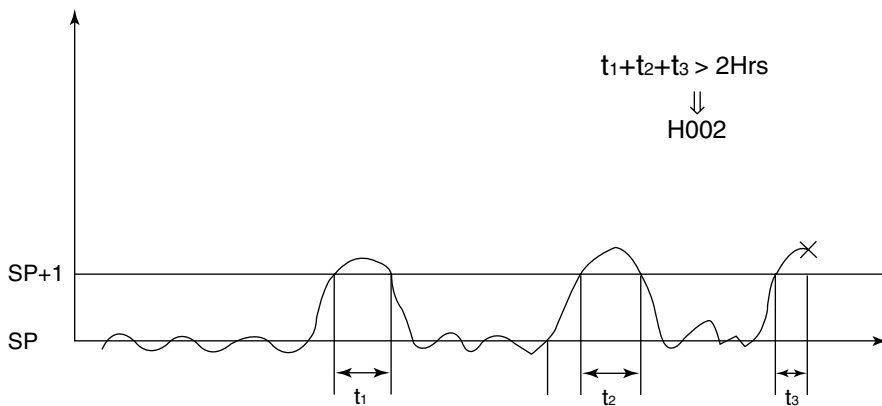


Figure3

H003 =The alarm will be displayed when the total time below setpoint -1°C reaches 2 hours.

H004 =The alarm will be displayed when the total time below setpoint -2°C reaches 2 hours.

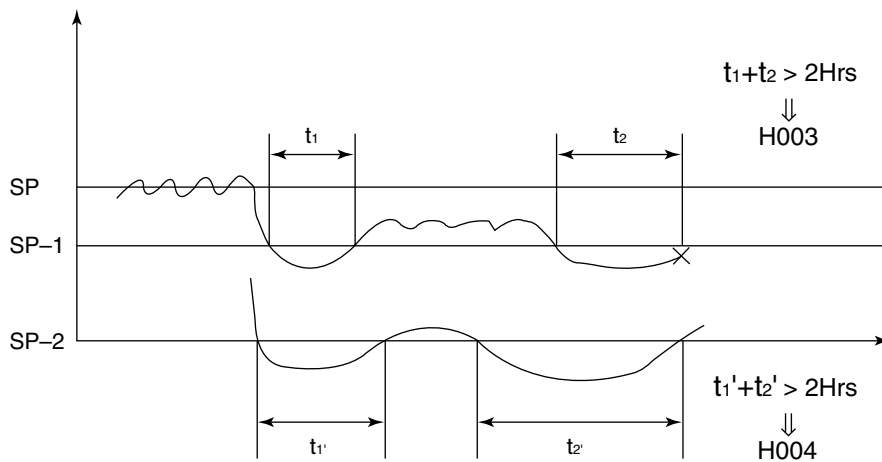


Figure4

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.

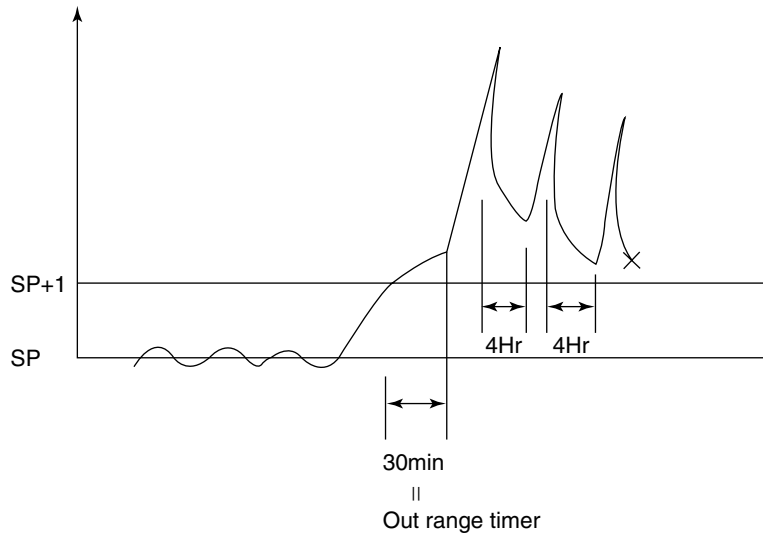
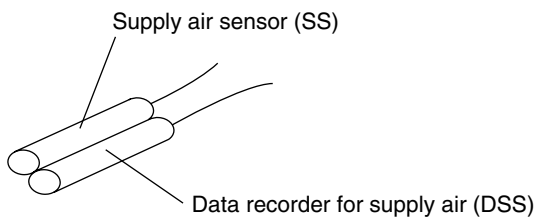


Figure5

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



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

Figure6

3.10.3.3 d-code:

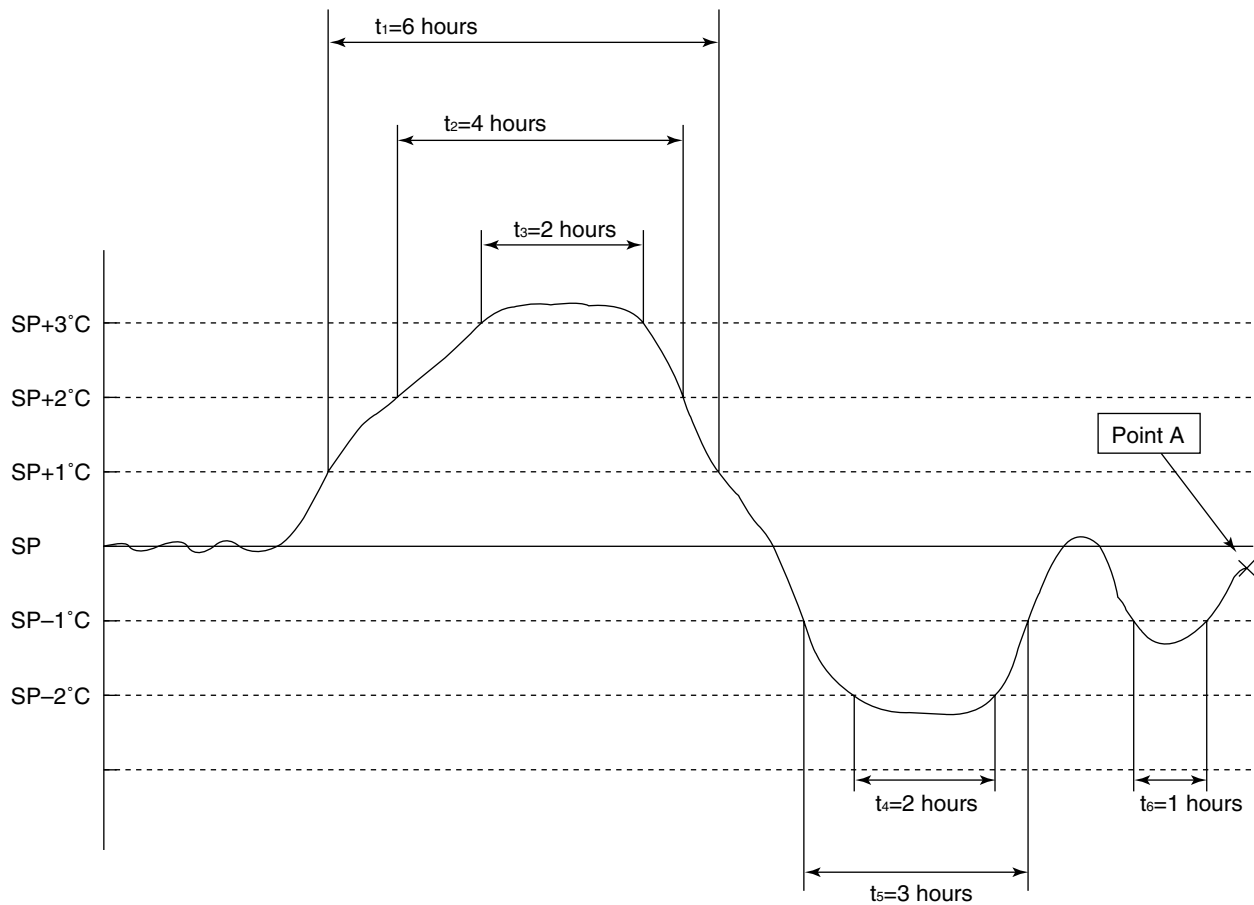
The d-code shows the current operation state of the unit.

Example d101:

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

Example d-21:

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



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

- d106 (above setpoint $+1^{\circ}\text{C}$ for 6 hours)
- d204 (above setpoint $+2^{\circ}\text{C}$ for 9 hours)
- d302 (above setpoint $+3^{\circ}\text{C}$ for 2 hours)
- d-22 (below setpoint -2°C for 2 hours)
- d-13 (below setpoint -1°C for 3 hours)
- d-11 (below setpoint -1°C for 1 hour)

Figure7

3.11 Communication modem

DECOS III c controller has function to transmit operation data through power line, if slave modem (Optional) is provided in control box. (Refer to Control box in 2.2.3)

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

(*1) According to the relationship among slave modem, Master modem and controller, items which can monitor and/or 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

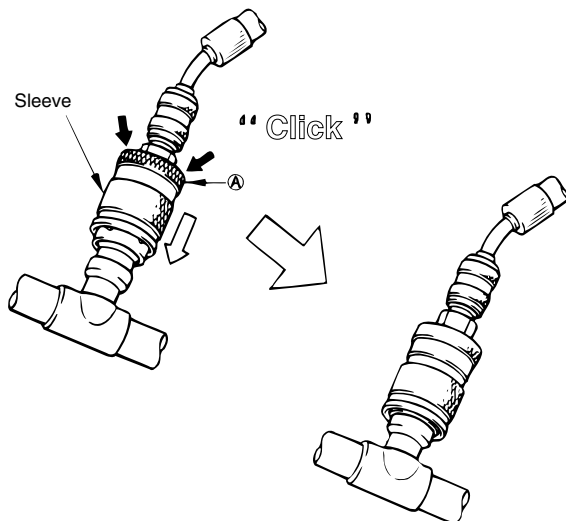
4.1.1 Collection of refrigerant

- 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

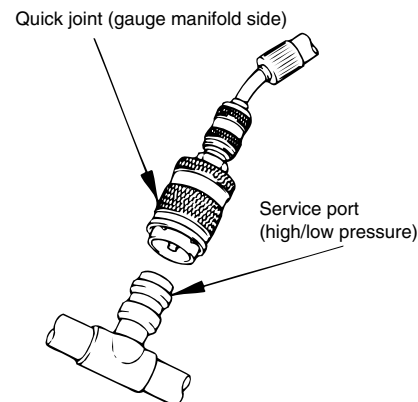
(1) Attaching the gauge manifold

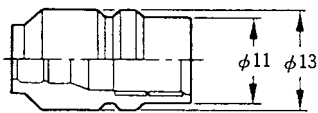
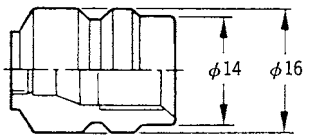
Place the quick joint against the service port



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.
The service port of quick joint type is provided to make improved handling.
- ※ Quick joint system

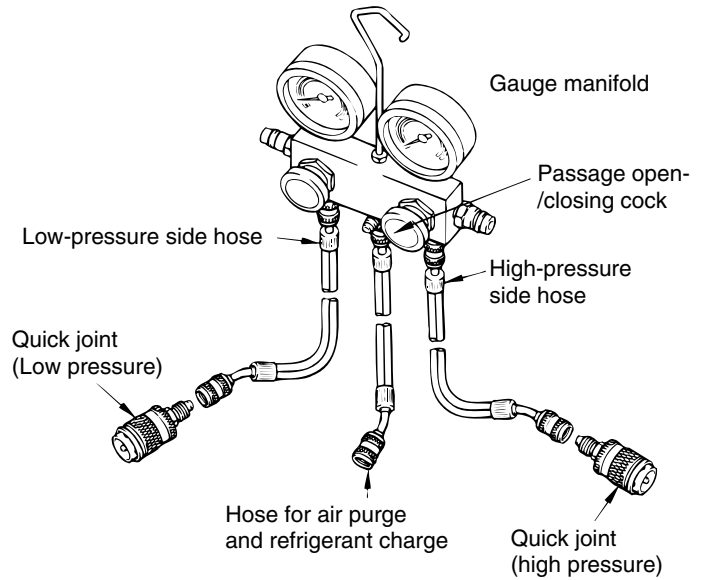


| | HFC134a (SAE quick joints) |
|--------------------|--|
| Low pressure side |  |
| High pressure side |  |

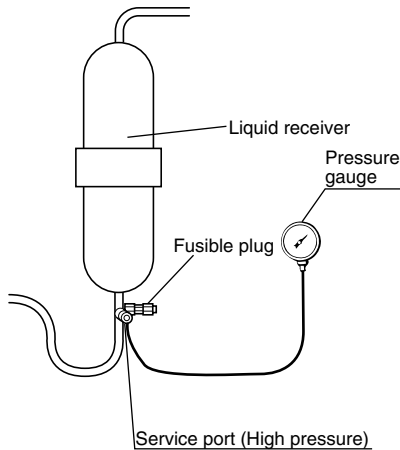
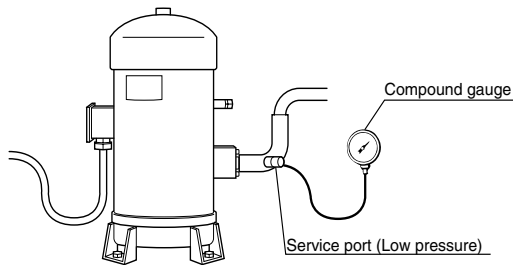
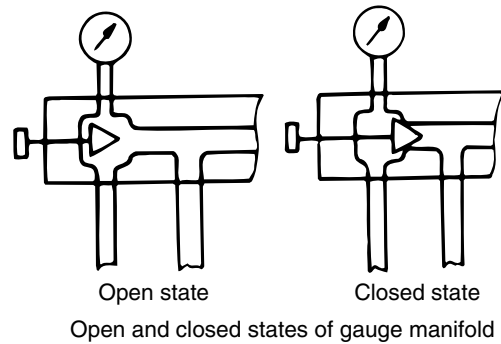
Be sure to use the gauge manifold with the quick joints shown above.

●Caution on the service work

- ① Be sure not to bend the refrigerant pipe when pushing the quick joint during connection work.
- ② If the installation fails due to movement of the sleeve, try it again after returning the sleeve to the original position.
- ③ The remaining pressure in the charge hose may cause installation failure. In this case, try it again after relieving the pressure in the hose.

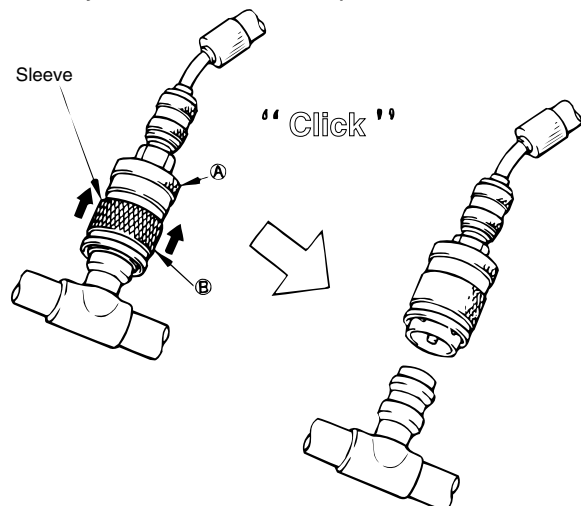


Structure of gauge manifold



(2) Removal of gauge manifold

Holding the quick joint at A, pull the section B (sleeve) upward and remove the quick joint from the service port.



CAUTION

Be sure to attach the cap to the service port after the removal of the 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) Controller operation

- ① Press **M** key (or **G-SET** key) twice during operation, and go to Automatic Pump Down Mode.

| | |
|--------|-----|
| OFF | LED |
| P DOWN | LCD |

- ② Select "ON" by using **△** or **▽** key, and press **↵** key to start the Automatic Pump Down.

| |
|--------|
| ON |
| P DOWN |

- *No displayed in LED during Automatic Pump operation

| |
|--------|
| |
| P DOWN |

- *When Automatic Pump is completed, "GOOD" is displayed. and the unit stops.

| |
|--------|
| GOOD |
| P DOWN |

- ③ Turn the UNIT ON/OFF switch off.

○ Controller display

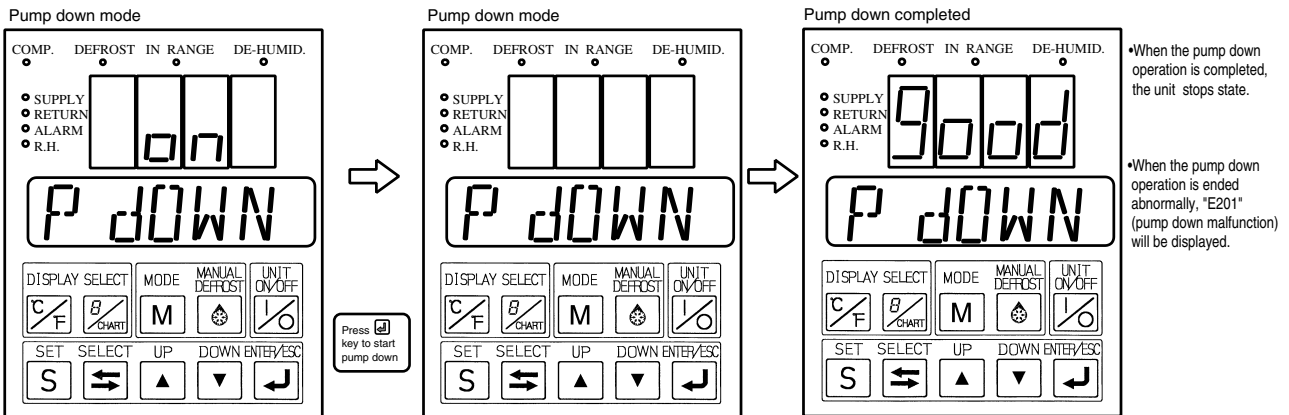


Fig. 2

After the automatic pump down operation, conduct the following jobs.

- ① Replacement of drier

As soon as the automatic pump down operation is complete, replace the drier in order to prevent air from entering the drier inlet/outlet piping. (Refer to 4.2.6 for detail.)
- ② Recovery of refrigerant

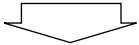
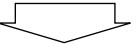
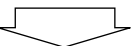

Conduct the automatic pump down operation in advance and, then, recover the refrigerant. (Refer to 4.1.4 (2), (3) for more detail.)
- ③ Refrigerant charge

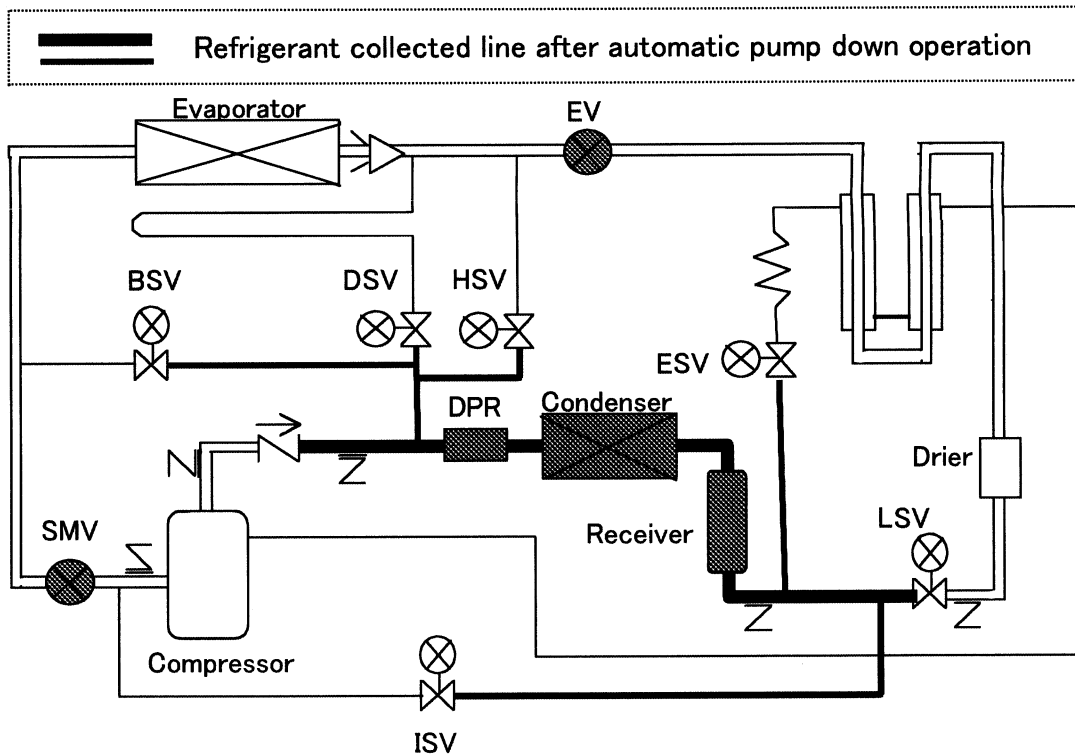
Operate Automatic pump down when the specific refrigerant amount can not be charged due to the pressure balance. (Refer to 4.1.4 (4) for more detail.)

(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.

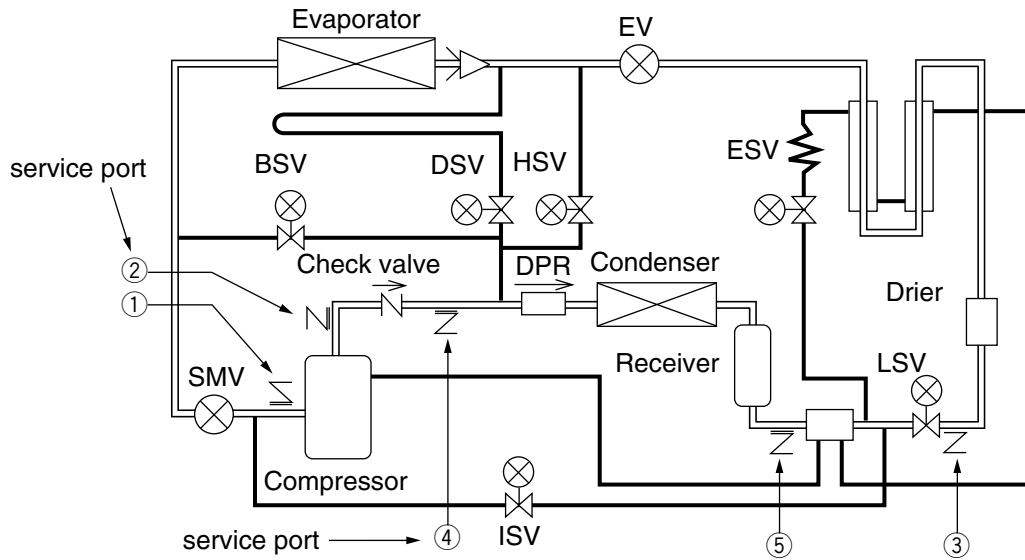
When "Good" is displayed, service works such as replacing the dryer, etc. can be conducted without any other operation.

| | ① | ② | ③ | ④ | ⑤ |
|------------|--|---|-----|---|---|
| | [Preparation] Turn on Automatic pump down.  Normal operation for 1 minute | [Pump down-Twice] ②→③→②→③ Pump down start  Compressor stop at LP ≤ -55kPa | | Increase pressure to 0~300kPa in low pressure side. | [Termination] EV full close  Termination  GOOD |
| Compressor | ON | ON | OFF | OFF | OFF |
| LSV | ON | | | | |
| EV | ON | ON | ON | ON | ON (full close) |
| SMV | ON | ON | ON | ON | ON |
| ESV | | ON→OFF | | | |
| DSV | | | | | |
| HSV | | | | ON (1st) | |
| BSV | | | | | |
| ISV | | | | ON (2nd) | |



4.1.4 Refrigerant Recovery and Charge

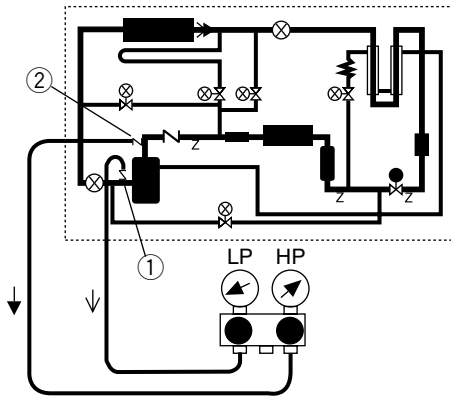
Schematic diagram



| Service work | | Service port | Remarks |
|---|--------------------------|--|--|
| Pressure Check | High pressure | ② | |
| | Low pressure | ① | |
| Refrigerant recovery and charge (R134a: 4.6Kgf) | [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 4.2 kgf, 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. | |

(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 air or other non-condensable gas exists in the refrigerant circuit, it is accumulated in the condenser, which raises pressure in the condenser abnormally high and reduces the heat transfer ratio of the condenser surface resulting in a decrease of the refrigerating capacity. It is, therefore, very important to remove non-condensable gas.

If the discharge pressure is abnormally high and does not return to the normal pressure, inspect if air or any other non-condensable gas exists by the following procedure.

●Conduct automatic pump down operation (see page 4-3) and stop the unit after collecting the refrigerant into the liquid receiver.

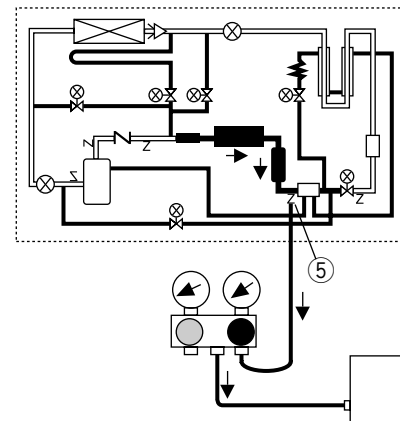
Run the condenser fan by using the condenser fan check (see page 3-55) in the manual check functions, and wait until the condenser cooling air inlet/outlet temperatures become equal. If there is any difference between the saturated pressure corresponding to cooling air temperature and condensing pressure, then non-condensable gas exists. In this case, recover non-condensable gas as stated below.

- ①Conduct automatic pump down
- ②Then collect the gas from the service port ② on the compressor discharge side.

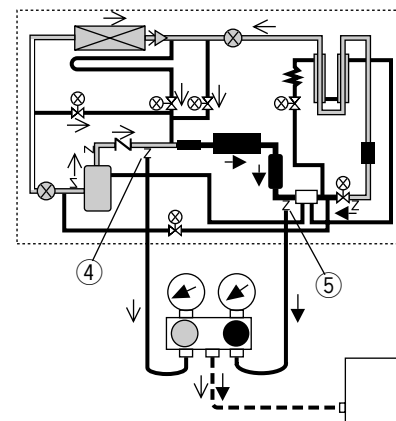
- ③Reading the pressure gauge, collect the non-condensable gas repeatedly until condensing pressure equals saturated pressure.

(3) Refrigerant Recovery

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



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



(4) Vacuum-dehydrating, and refrigerant / charging

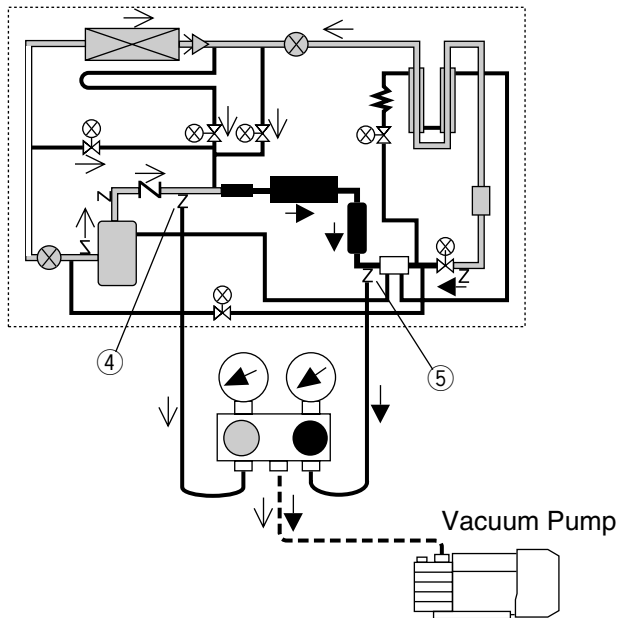
If all the refrigerant has leaked out and air is intermixed in the refrigeration circuit, remove the cause of trouble and carry out vacuum-dehydrating. Then charge the specified amount of refrigerant.

[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, 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.



(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.)

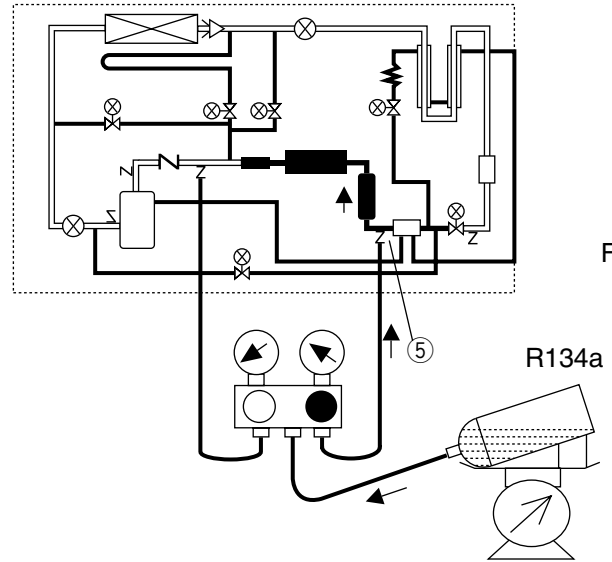


Figure 1

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.

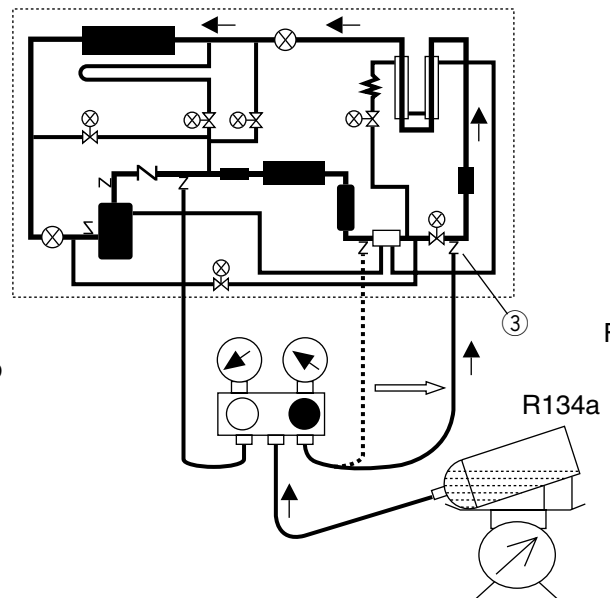


Figure 2

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.
(※ The compressor stops twice during the Auto. P. D. operation. It is possible to end either at 1st stop or at 2nd stop.)

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.



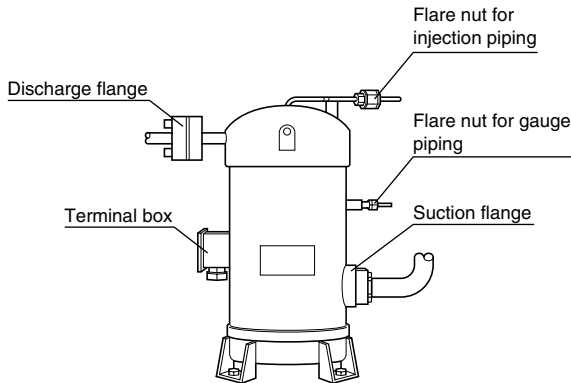
CAUTION

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.

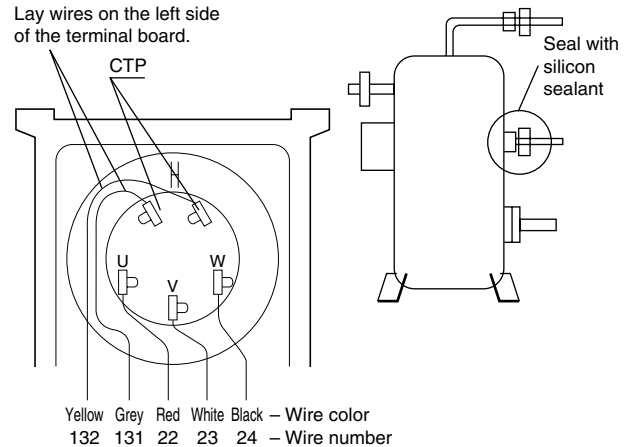


(1) Removal of compressor

- ① Collect the refrigerant from the quick joints on discharge pressure regulating valve inlet and liquid receiver outlet.
Refer to the section "4.1. Maintenance service" on page 4-1 for refrigerant collecting method.
- ② Switch off the power.
- ③ Open the terminal box cover to disconnect the wires.
- ④ Remove the bolts for suction flange and discharge flange.
- ⑤ Remove the flare nut for the intermittent injection and gauge piping.
- ⑥ Remove the compressor mounting bolts.

(2) Installation of compressor

- ① Fix the compressor base with bolts
Tightening torque: $42.7\text{N} \cdot \text{m}$ ($435\text{kgf} \cdot \text{cm}$)
- ② Apply new gaskets to the suction and discharge flange and fix them with bolts
Tightening torque for the suction flange: $25.2\text{N} \cdot \text{m}$ ($257\text{kgf} \cdot \text{cm}$)
Tightening torque for the discharge flange: $25.2\text{N} \cdot \text{m}$ ($257\text{kgf} \cdot \text{cm}$)
- ③ Tighten the flare nut for intermittent injection and gauge piping.
Tightening torque : $\phi 6.4$: $15.7\text{N} \cdot \text{m}$ ($160\text{kgf} \cdot \text{cm}$)
 $\phi 9.5$: $36.3\text{N} \cdot \text{m}$ ($370\text{kgf} \cdot \text{cm}$)
- ④ Connect wires to the terminals and put the cover on.
Pay the utmost attention to the wiring of the compressor. Incorrect wiring may run the compressor in wrong direction and may cause burn out
- ⑤ Apply a silicon sealant on the flare nut section of gauge piping.



CAUTION

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

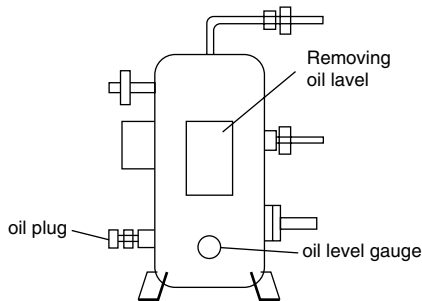


CAUTION





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

(3) Removal of excess refrigerant oil after compressor replacement

The oil plug, oil level gauge and "Removing oil level" are fitted on the spare parts compressor.



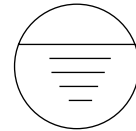
○ When the compressor is replaced to spare parts compressor, remove the excess refrigerant oil in the following procedure.

1. Connect manifold to the discharge and suction ports.
2. Operate the unit for about 5 minutes.
3. Stop the unit.
4. Conduct oil return operation by using the short PTI function of controller.
 - (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. Then, conduct "P06", "P08" steps displayed on the LED.

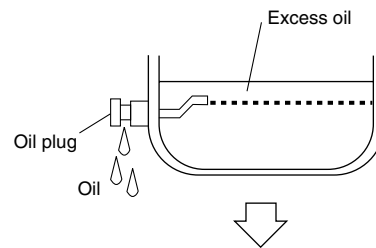
P06/HPS check:
When the high pressure rises, the circulation amount increases to return the refrigerant oil to the compressor.

P08/Pump down check:
Evaporates the refrigerant contained in the compressor oil.
 - (4) When "P10" is displayed on the LED, stop the unit.

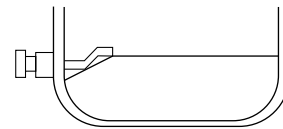
5. If the oil level can be seen on the oil level gauge, conduct the step 4 oil return operation again.



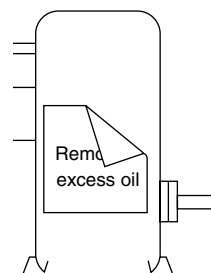
6. Bypass gas from high pressure side to low pressure side of gauge manifold, adjust the low pressure to 0kPa or more.
7. Loosen the oil drain plug and remove the excess oil.



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



9. 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

4.2.2 Fan and fan motor

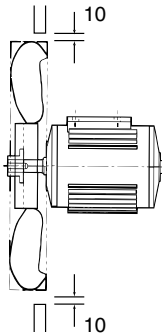
(1) Specification

| | | 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 6203WNC | Shielded ball bearing with rubber seal 620400NC-X |

(2) Installation structure

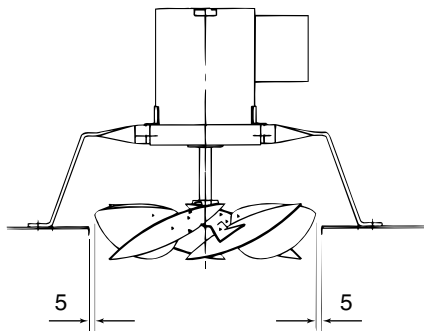
a. Condenser fan and fan motor

Condenser fan and fan motor



b. Evaporator fan and fan motor

Evaporator fan and fan motor



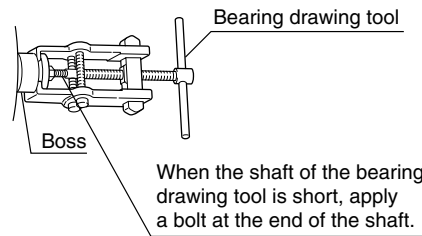
(3) Replacement procedure

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.



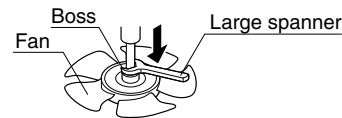
2) Condenser fan motor

- 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

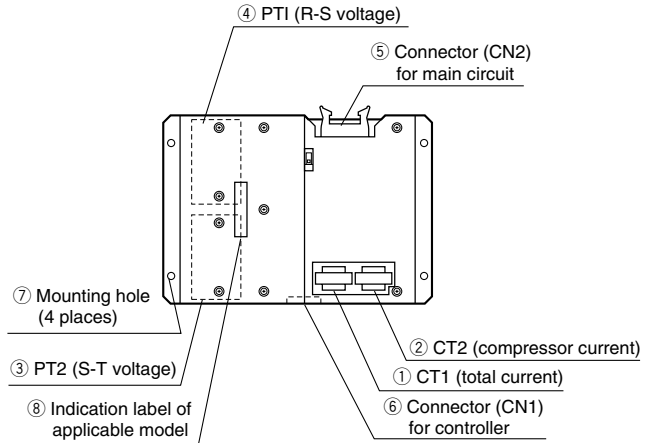
Apply the locking agent on the screws of the fan to prevent from loosening. Otherwise, fan may drop from the motor.

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.

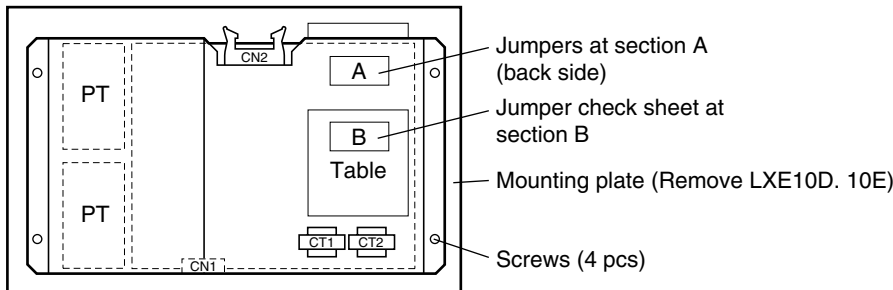
(1) Function

| 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

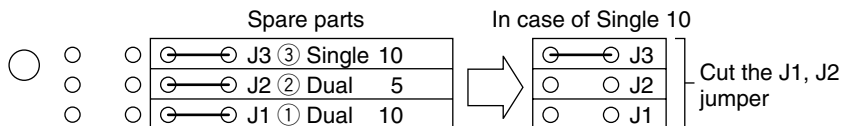
Before installing the PT/CT board (spare parts), cut jumpers and remove the mounting plate for the over current setting.



(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 | | | Check |
|------|-----------|--------|-----|-----|-------|
| | | J1 | J2 | J3 | |
| 1 | Dual 10 | ⊖—⊕ | ○ | ○ | |
| 2 | Dual 5 | ○ | ⊖—⊕ | ○ | |
| 3 | Single 10 | ○ | ○ | ⊖—⊕ | ✓ |

(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.

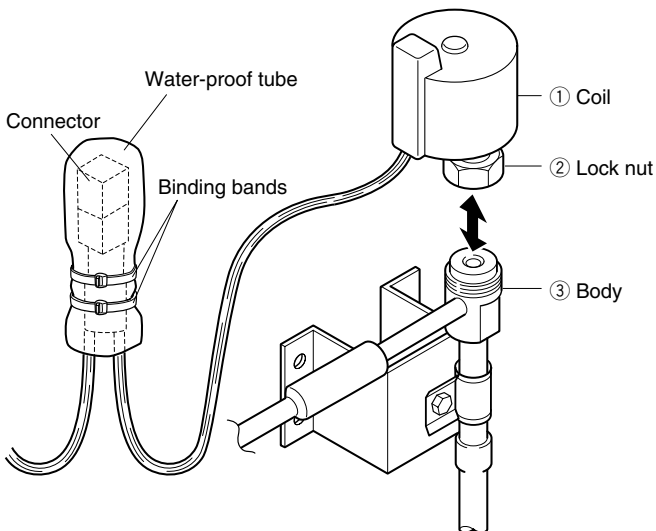
4.2.4 Electronic expansion valve

- Model Coil : EBM-MD12DM-1
Body : EDM-B804DM-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.

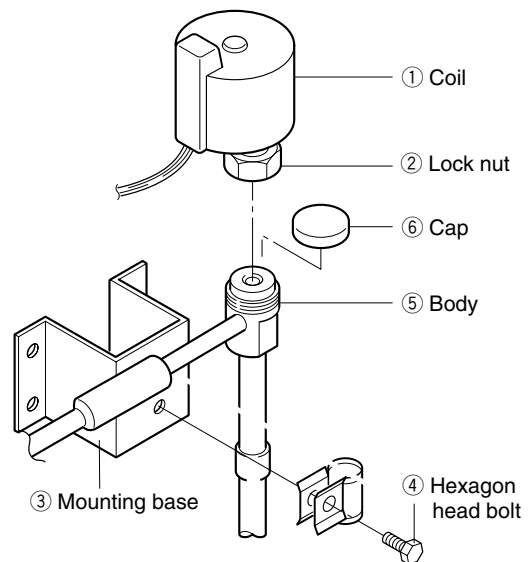
(1) Replacing the coil

- ① Cut the binding bands which fasten the water-proof tube and the lead wires.
- ② Disconnect the lead wire connector from the water-proof tube.
- ③ Loosen the lock nut, then remove the coil from the body.
- ④ Install a new coil. The tightening torque for installation is 6.9 to 16.7 N · m (70 to 170kgf · cm).
- ⑤ Restore the binding bands and the lead wire connector into the original state.
- ⑥ After replacing, carry out refrigerant leakage check, and make sure that there are no leaks.

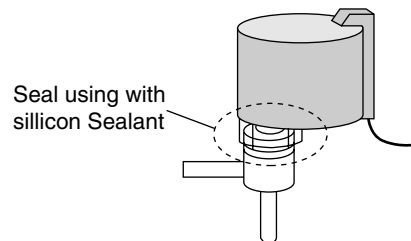


(2) Replacing the body

- ① Loosen the lock nut, then remove the coil.
- ② Remove the hexagonal head bolts, and cut the pipe on the body, then remove remaining pipes from brazing parts.
- ③ Connect a new body to the pipes. Be sure to conduct brazing work while cooling the body below 120°C (248°F) by using wet cloths.
- ④ Fix the body to the mounting base.
- ⑤ Remove the cap, and mount the coil with the tightening torque of 6.9 to 16.7 N · m (70 to 170kgf · cm).
- ⑥ After replacing, carry out refrigerant leakage check, and make sure that there are no leaks.



- ⑦ Apply a silicon sealant to the lock nut section.



4.2.5 Suction modulation valve

The flow rate of suction gas is controlled between 3 to 100% by a stepping motor in order to conduct capacity control operation.

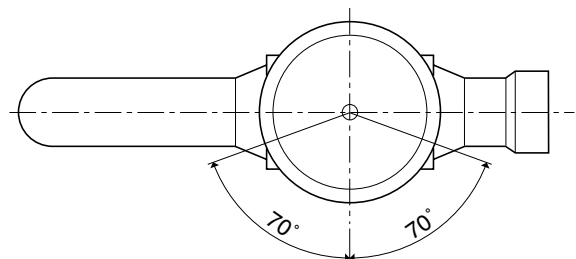
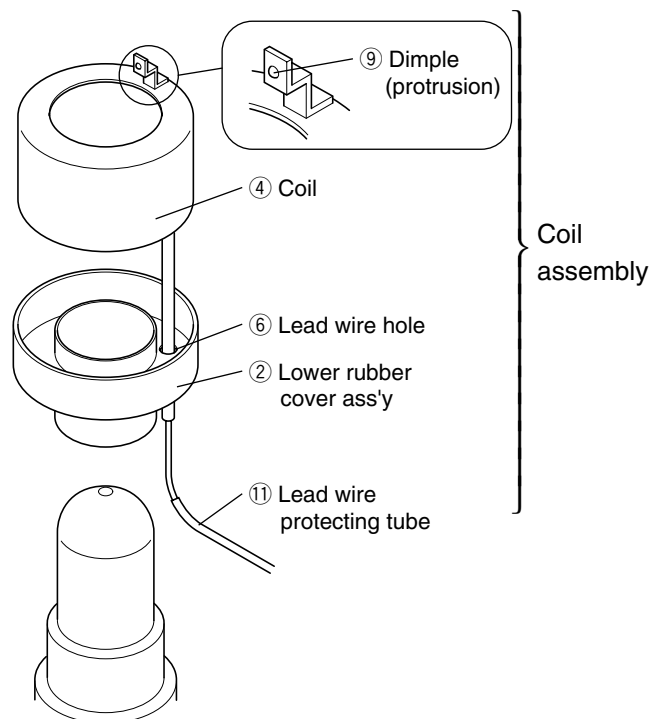
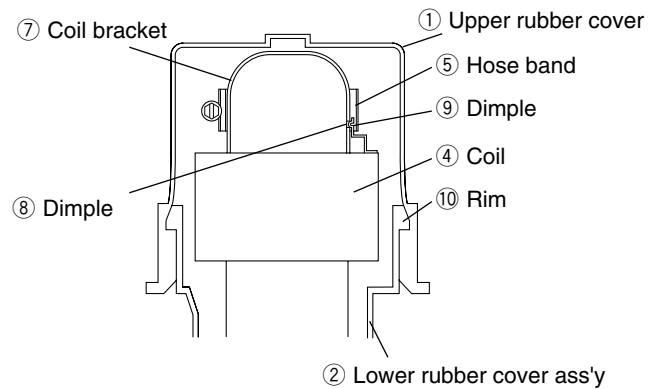
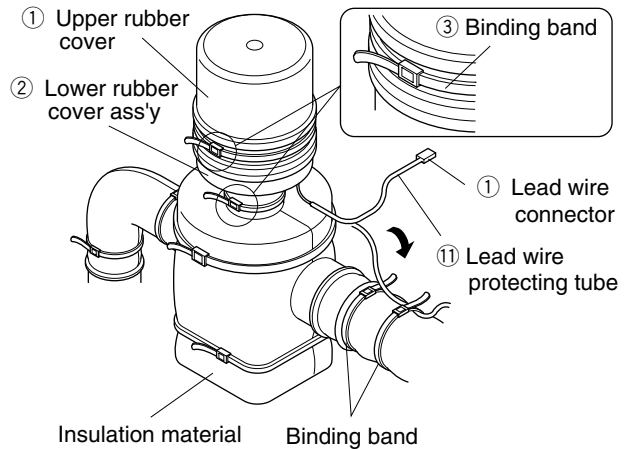
1. Replacing the coil

● Coil removing procedure

- (1) Disconnect the SMV lead wire connector ① from the inside of control box.
- (2) Cut the binding band ③ at the upper rubber cover ① and lower rubber cover ②, then remove the rubber cover ①.
- (3) Remove the hose band ⑤ located above the coil ④ with screw driver.
- (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 1) Engage the dimple ⑧ of coil bracket ⑦ with the dimple ⑨ of coil ④, and adjust the angle.
 - Since the angle adjustment is important for control of suction modulating value, carry out the adjusting accurately.
 - Note 2) Set the hose band ⑤ with screw driver
 - Note 3) torque is $1 \pm 0.05 \text{ N} \cdot \text{m}$ ($10.2 \pm 0.5 \text{ kgf} \cdot \text{cm}$).
 - Be careful not to set the band at an angle.
- (2) Replace the upper rubber cover ①
 - Note) Set the engaging section of upper cover to fit with the rim of lower rubber cover ⑩.
- (3) Place the binding band ③ to fit the upper and lower covers
 - Note 1) Fastening is 100 to 140 N (10.2 to 14.3 kgf).
 - Note 2) Set the buckle of lower binding band within the range of $\pm 70^\circ$ on the left side and right side of the centre line at the front of valve.
 - Note 3) Fix the lead wire carefully so that water does not enter into its protecting tube ⑪. (Fix lead wire with binding band.)
- (4) Connect the connector of lead wire ① to the inside of control box.

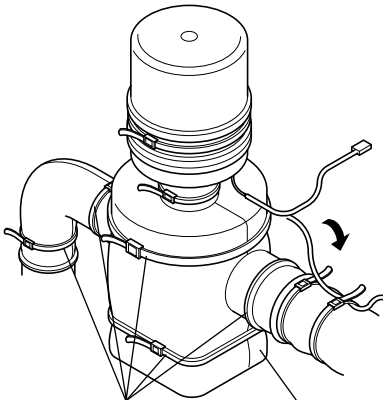


2. Replacement of body

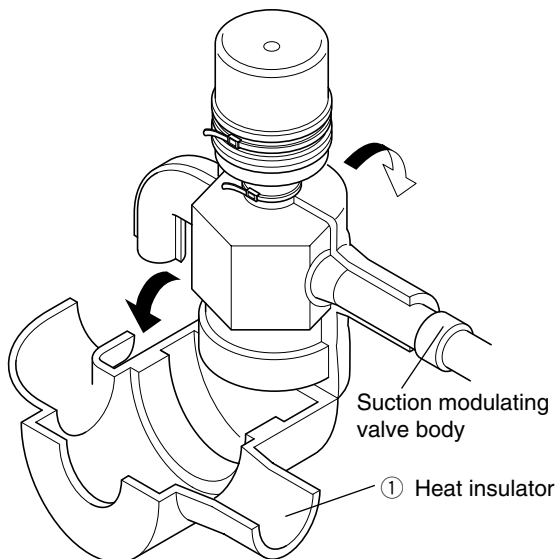
- (1) Remove the coil. Refer to the section 1. "Replacing the coil" for removing procedure.
- (2) Remove the heat insulator ① for the SMV after cut the binding band ②.
- (3) Heat up the brazed joint on the piping of SMV body to disconnect the pipe at brazed section.
- (4) Assemble piping of the SMV body, 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 value 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 bandling band ②.
- (6) Install the coil. Refer to the section 1. "Replacing the coil" for removing procedure.



② Bandling band ① Heat insulator



Suction modulating valve body

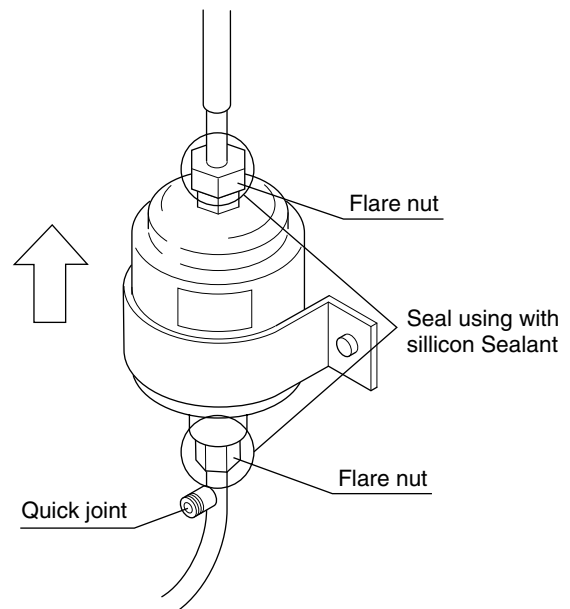
① Heat insulator

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 or if it is blocked. When installing the new drier, follow the directions given on the label and do not make any mistake about the flow 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 When the flare nuts are loosened, if no sound of gas refrigerant leakage is detected at the flare nut section, then air mixing into the refrigerant is suspected. In this case, conduct vacuum-dehydrating from the quick joint located at the inlet side of drier.
- ④ After completing of the replacement of the drier, be sure to conduct refrigerant leakage test to confirm that no refrigerant leakage is occurring.
- ⑤ Check on the green colour of the liquid / moisture indicator after system operation has started.
- ⑥ Adhere some anti-corrosion tape to the flare nut section. Apply a silicon sealant to the lock nut section.

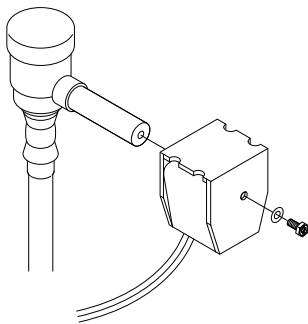


4.2.7 Solenoid valve

Two kinds of solenoid valves are employed for the unit.

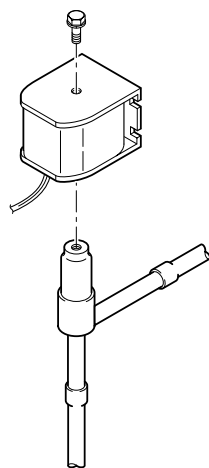
Coil is common and replacement procedure is also almost the same for all types of valves.

| Valve name | Symbol | Valve type | Type of coil |
|---------------------------------------|--------|------------|--------------|
| Economizer Solenoid valve. | ESV | NEV-202DXF | NEV-MOAB507C |
| Injection Solenoid valve. | ISV | | |
| Discharge gas by-pass Solenoid valve. | BSV | | |
| Liquid Solenoid valve. | LSV | NEV-803DXF | |
| Defrosting Solenoid valve. | DSV | | |
| Hot gas Solenoid valve. | HSV | | |
| Reheat Solenoid valve. | RSV | | |



NEV-803DXF

Fig. 1



NEV-202DXF

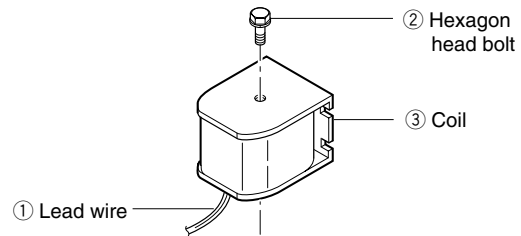
Fig. 2

(1) Replacing the coil

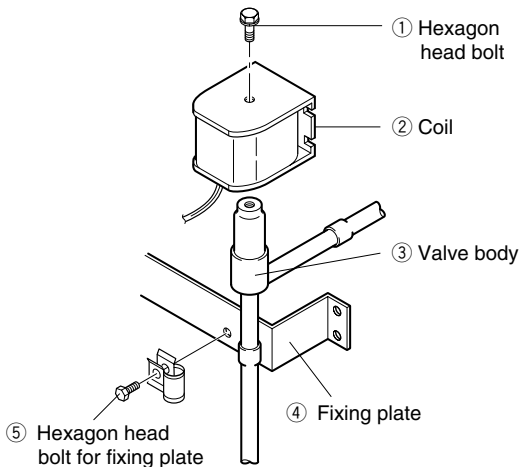
- ① Remove the lead wire connector from the inside of the control box, and cut and recover the binding band which fastens the lead wire.
- ② Remove the hexagonal head bolt on the top of the coil to pull the coil out.
- ③ Replace the coil with a new one and restore the hexagonal head bolt, the binding band and connector on the original position.
When reassembling the coil, the tightening torque should be 2.9 N·m (30 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 Valve body

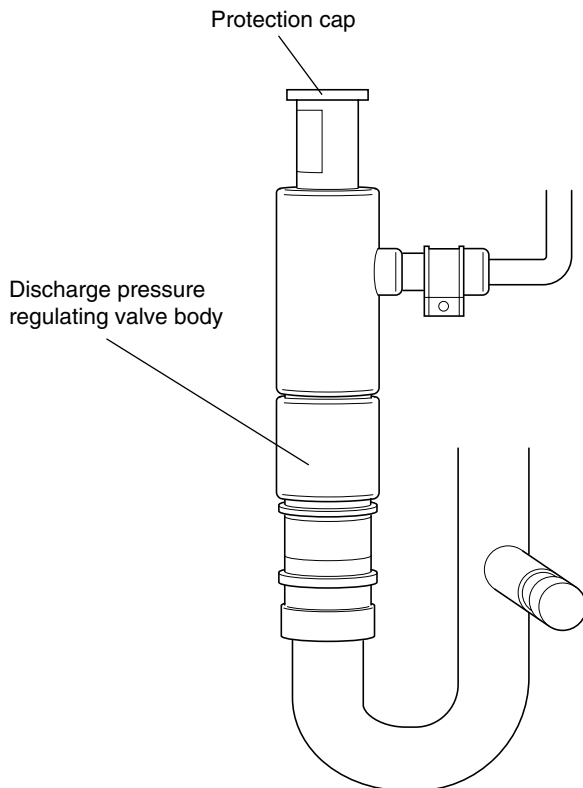


4.2.8 Discharge pressure regulating valve

- 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/cm²).
- 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.

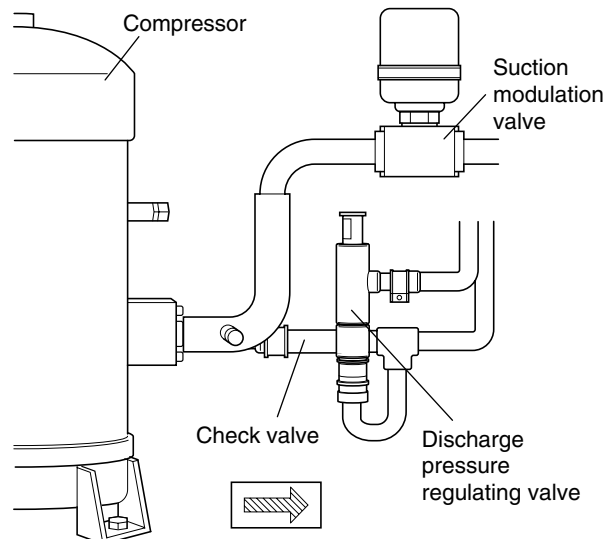


4.2.9 Check valve

- 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.



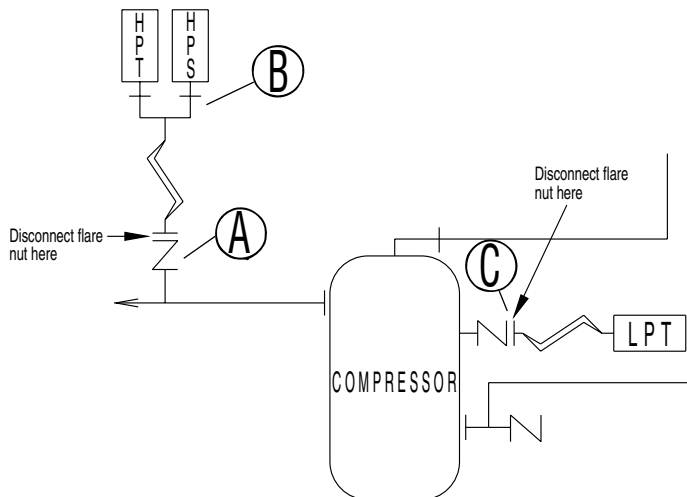
4.2.10 High-pressure switch (HPS)

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

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.



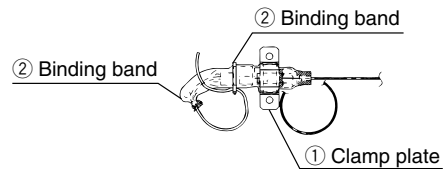
4.2.11 Low pressure transducer (LPT)

- Model SPCL02
- Colour indication: Low pressure transducer: Blue
Low pressure transducer: cable: White

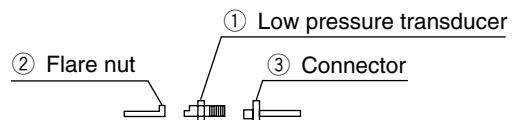
The LPT is located in the refrigerant circuit. The operating low pressure value is displayed on the controller indication panel.

(1) Replacing the transducer

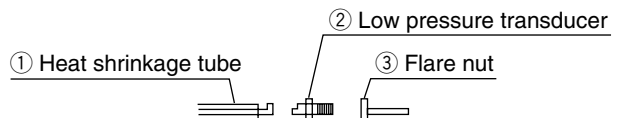
- ① Disconnect the lead wire from the control box.
- ② In order to prevent refrigerant from flowing out, disconnect the low-pressure transducer piping from the gauge joint (with check valve) **(C)** on the compressor side.
- ③ Remove two screws on the clamp plate fixing low pressure transducer in place,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



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



- ⑤ Insert the pressure transducer cable through the heat shrinkage tube, and connect the cable to the new low pressure transducer. If paint on the low pressure transducer is peeled off, apply clear lacquer.

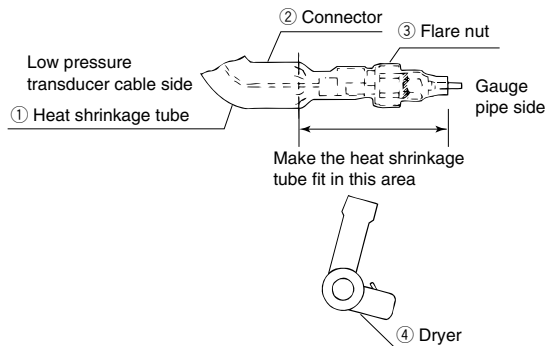


CAUTION

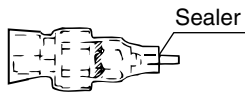
Do not expose the low pressure transducer to hot air of a dryer for excess time.

Otherwise, the transducer may be damaged.

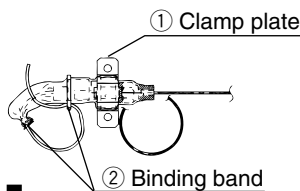
- ⑥ Apply the heat shrinkage tube in the following position, then shrink it with hot air of a dryer.



- 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 SPCH01
- Colour indication: High pressure transducer: Red
High pressure transducer: cable: Red

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

(1) Replacement procedure

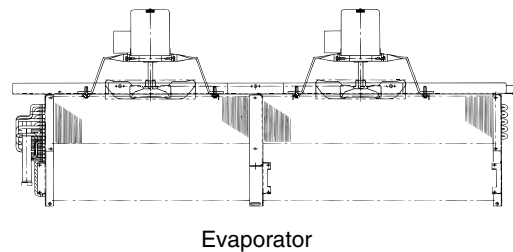
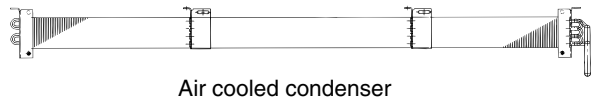
The replacement procedure is the same as that for the low pressure transducer.

Make sure that the fixing position and the cable connection is correct.

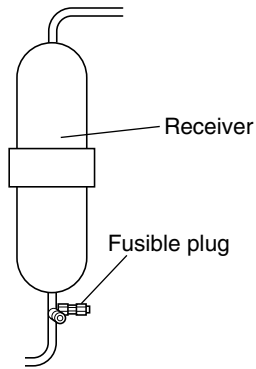
4.2.13 Air-cooled condenser and evaporator

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



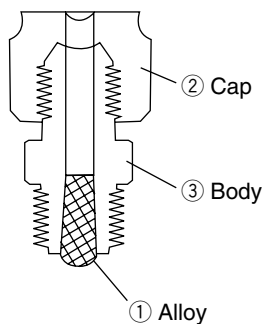
● Replacement of fusible plug

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

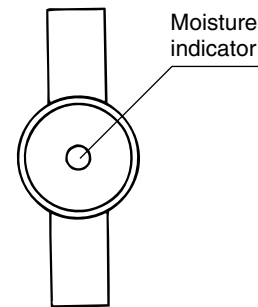
This indicator permits checking of the flow of refrigerant and moisture content in the refrigerant.

(1) Moisture entering

The indicator indicates the moisture content by the colour at the centre of the window.

Check this indicator while the unit is operating.

| Color | Conclusion |
|--------|------------------------|
| Green | Dry |
| Yellow | Wet (moisture entered) |



Note) 1. The indicator may appear yellow if it has been exposed to gaseous refrigerant for a long time.

2. The colour of the indicator must be checked after operation of a few hours.

3. The indicator is influenced by the temperature of the liquid refrigerant. At low temperatures, a long time is required for the indicator to change color.

4. To shorten the indication changing time, raise the temperature of the liquid refrigerant. (Block the air discharge grille of the condenser fan to increase the working pressure in order to raise the temperature.)

(2) Flow of refrigerant

When the moisture indicator is sealed with the liquid, bubbles will disappear on the moisture indicator.

- If a lot of bubbles are observed during pull-down and frozen operation, a refrigerant shortage can be suspected.
- Several bubbles may be generated soon after the operation start and chilled operation. However, it is not a refrigerant shortage.

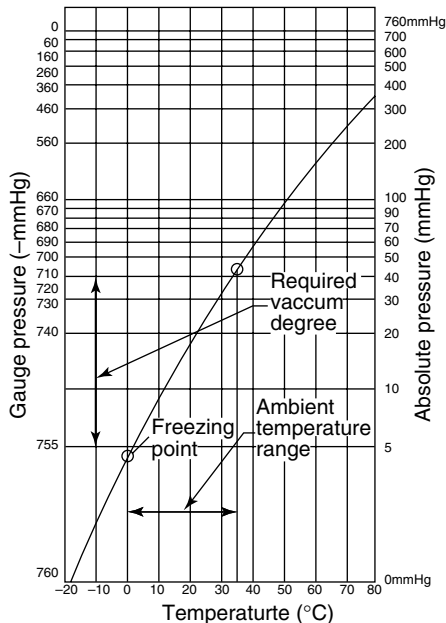
4.2.16 Evacuation and dehydrating

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]

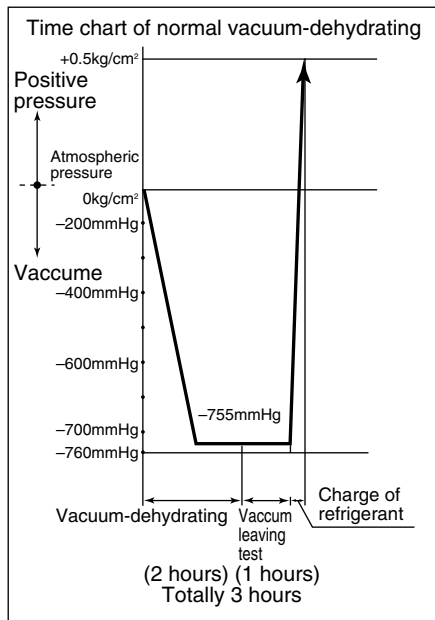
① Vacuum-dehydrating(first time)

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.

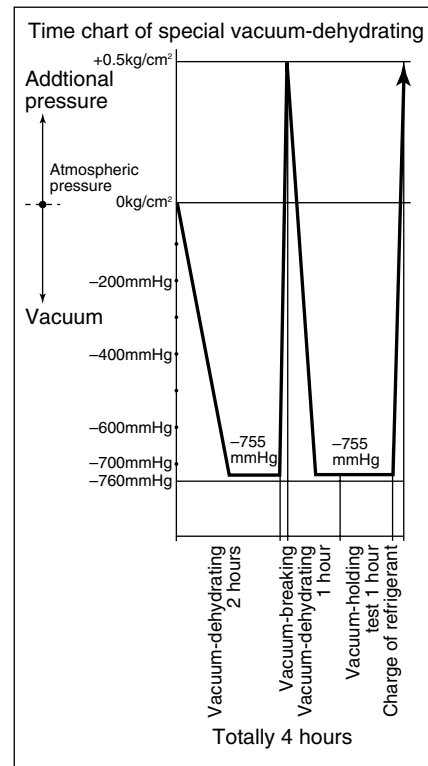
- ② Vacuum holding test
Hold the system at a pressure of -755mmHg or lower for 1 hour or longer, and confirm that the vacuum reading does not rise on the vacuum gauge. If it rises, moisture or leakage may exist in the system. However, take care not to leak air from the gauge manifold. If air enters, it is recommended to use the copper tube directly instead of gauge manifold.
- ③ Charging of refrigerant
After the 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 0.5kg/cm^2 from the service port on suction pipe. Since nitrogen gas breaks the vacuum, the effect of the vacuum-dehydrating is enhanced. However, if there is 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 -755mmHg or lower.)
If pressure of -755mmHg 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.)



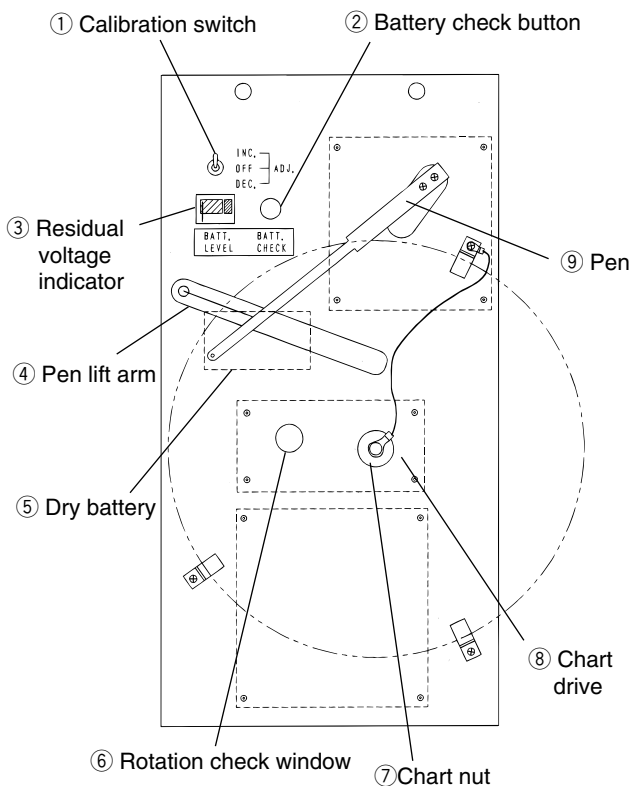
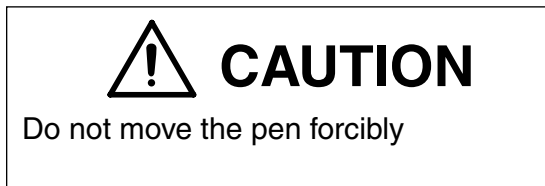
($1\text{mmHg}=0.0013\text{kg/cm}^2=0.133\text{Kpa}$)

5. OPTIONAL DEVICES

The following optional devices are available for some models.

5.1 Electronic temperature recorder

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.

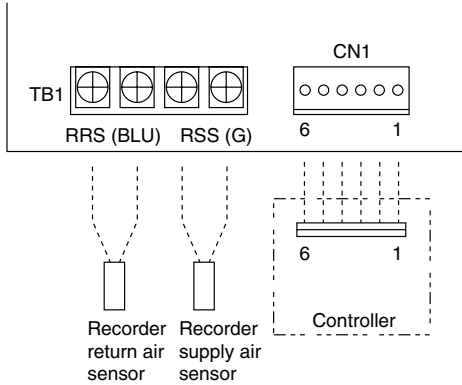
| Recording temperature range | Accuracy °C | | |
|-----------------------------|-------------|--------|-------|
| | Recorder | Sensor | Total |
| 25°C to 10°C | ±1.0 | ±1.0 | ±2.0 |
| 10°C to -15°C | ±0.5 | ±0.3 | ±0.8 |
| -15°C to -29.9°C | ±1.0 | ±1.0 | ±2.0 |

(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.

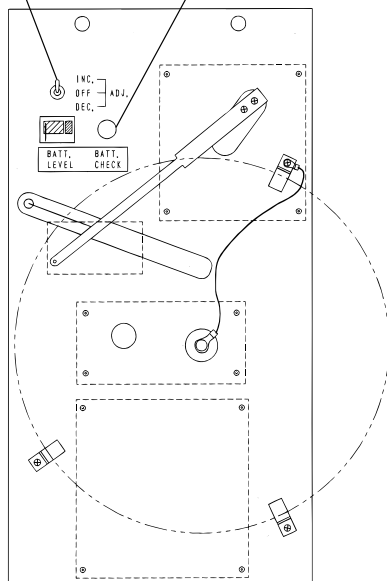
1) Switching function for recording sensors

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)

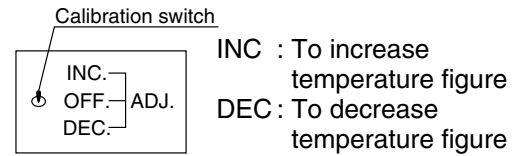
| Set temperature (°C) | Recording sensor |
|----------------------|-------------------|
| -30.0 to -3.0 | Return air sensor |
| -2.9 to 25.0 | Supply air sensor |

① Calibration switch

② Battery check button



2) Calibration function



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.

Notes: 1. The pen is adjusted to suit to the PSD-217C (REV.A) recording chart paper or its equivalent.

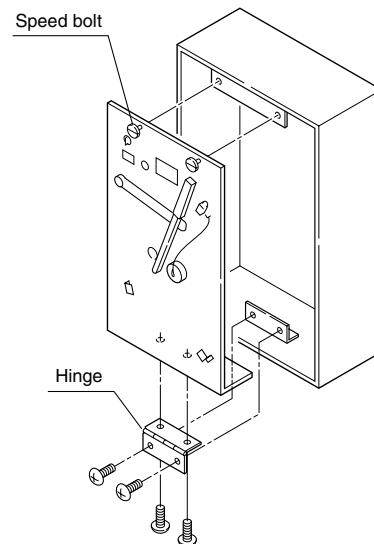
Do not use the recording charts other than ones mentioned above.

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.

(4) 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.

5.2 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 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 | T3107003 | 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 ; Initial setting mode at page 3-30.
Quantity of receptacles should be set
- 2) Type of USDA sensor
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

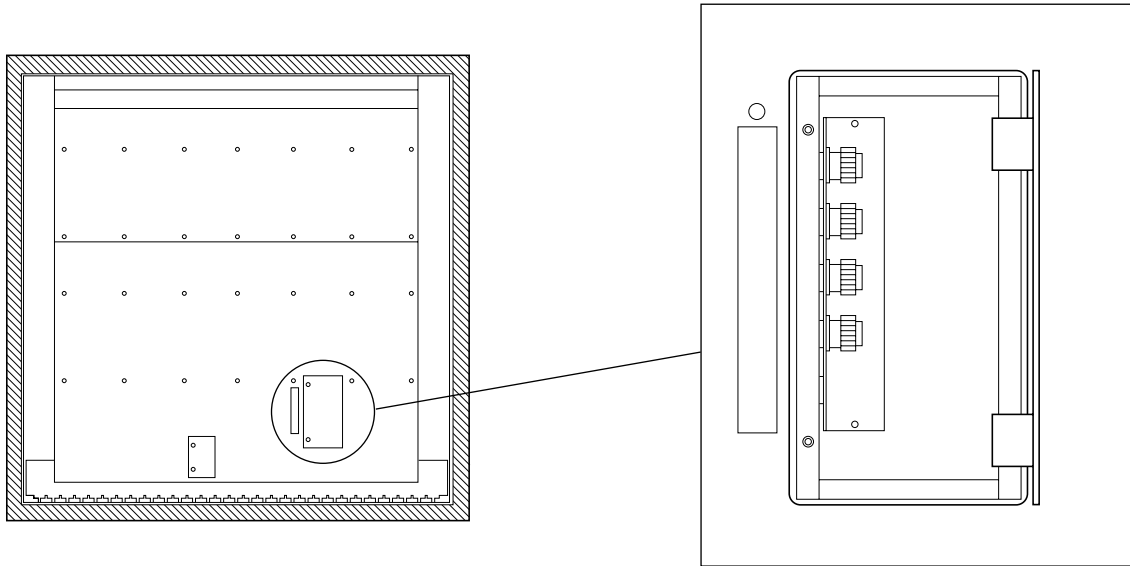
Cargo and refrigeration unit shall be required pre-cooling before cargo loading. As to position of USDA sensors and operation, please refer to the guidance of USDA.

5.2.5 USDA report

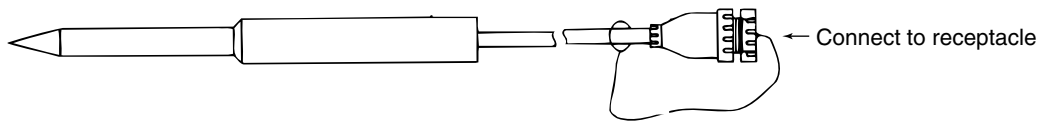
Free supply downloading software enables you to make document easily, which USDA local officer requires. In detail, please refer to "Operation manual for Daikin Container Communication Software".

●An example of installation of USDA receptacle inside

●USDA receptacle



●USDA sensor

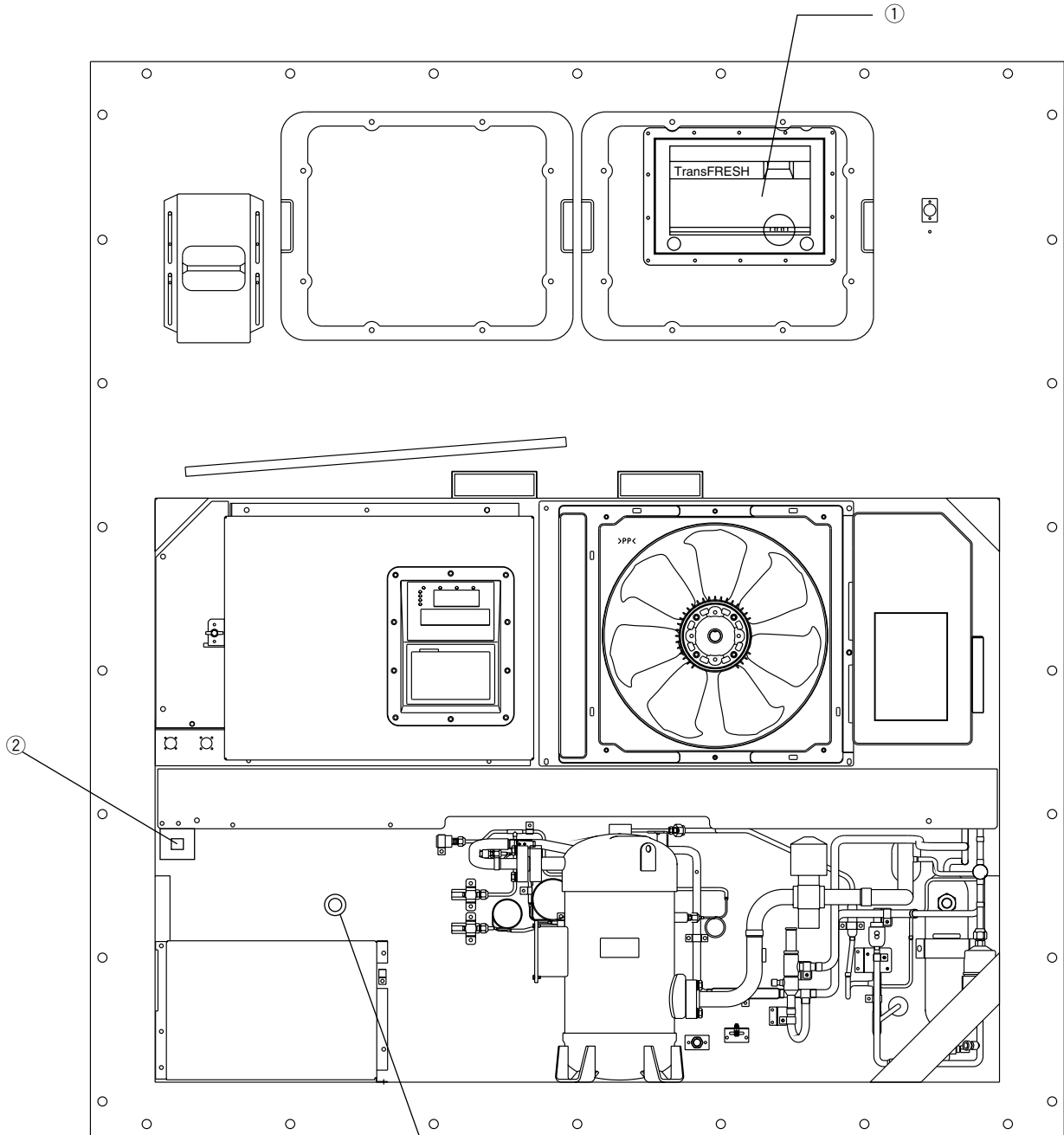


5.3 TransFRESH

Attachment for the TransFRESH CA devices are provided to control the internal atmosphere (quantity of O₂ and CO₂).

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.

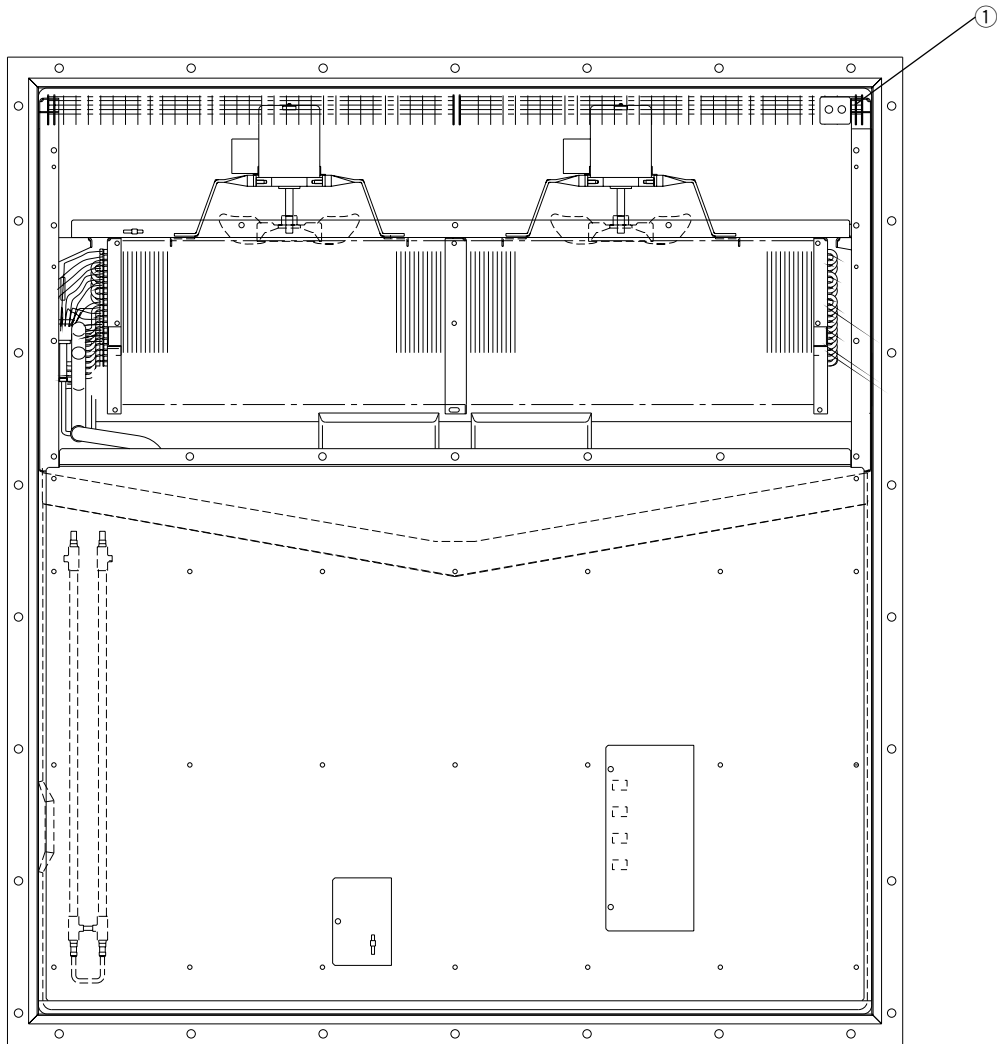


① TransFRESH SECURITY ENCLOSURE

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

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.

| State | Malfunction occurrence | Abnormal point | Possible cause |
|--|--|---|---|
| I unit does not operate | A. Neither evaporator fan, condenser fan nor compressor ran. | ① No trouble with unit | Power failure |
| | | | Equipment power supply: OFF |
| | | | Disconnection of power plug |
| | | | Poor contact of power plug |
| | | ② Circuit breaker | Circuit breaker: OFF |
| | | | Solenoid valve coil burned out or short circuit |
| | | | Contacting coil burned out or short circuit |
| | | ③ UNIT ON/OFF key | OFF or malfunction |
| | | | ④ Controller |
| | | Fuse (10A) burned out | |
| Open phase (R or T) | | | |
| ⑤ Power transformer | Shut down due to alarm generation | | |
| | Wire breakage or open phase | | |
| B. Evaporator fan rotates, but condenser fan and compressor do not rotate. | No trouble with unit | ON/OFF control with frozen mode (Inside temperature is lower than SP.) | |
| C. Condenser fan rotates, but evaporator fan and compressor do not rotate. | Activation of electronic overcurrent protection device, PT/CT board. | Overcurrent due to overload operation, etc. | |
| D. Compressor rotates, but evaporator fan and condenser fan do not rotate. | Fan motor, actuation of protection thermostat | Fan locked by foreign material | |
| | | Not-closing of protection thermostat contact point | |
| E. Compressor buzzes, but it does not operate. | ① Compressor | Open phase | |
| | | Lock | |
| | | Low supply voltage | |
| | | Motor coil burned out or short circuit | |
| | ② Power transformer | Power transformer malfunction | |
| II Unit operates but soon stops | A. Unit starts but soon stops | ① Activation of HPS within 30 seconds after compressor starting | High-pressure switch malfunction |
| | | ② Abnormal low pressure drop within 2 seconds after compressor starting | Liquid solenoid valve: closed |
| | | | Electronic expansion valve: closed |
| | | ③ Activation of electronic overcurrent protection devices, PT/CT board | Overcurrent due to overload operation, etc. |
| | ④ Activation of compressor thermal protector | Overcurrent due to overload operation, etc. | |
| B. Evaporator fan rotates, but condenser fan and compressor do not rotate. | ① No trouble with unit | In ON-OFF control operation with frozen mode | |
| C. Condenser fan rotates, but evaporator fan and compressor do not rotate. | ① Activation of high-pressure switch (Air cooled condenser type) | Refrigerant overcharge | |
| | | Air entering in the refrigerant system | |
| | | Insufficient air flow rate in the air cooled condenser | |
| | | ○ Condenser finned coil blocked | |
| | | ○ Air passage blocked by foreign material | |
| | | ○ Broken blade of condenser fan | |
| ○ Condenser fan motor rotation failure | | | |
| ○ Activation of condenser fan motor thermal protector | | | |

| State | Malfunction occurrence | Abnormal point | Possible cause |
|--|--|--|---|
| II Unit operates but soon stops | C. Condenser fan rotates, but evaporator fan and compressor do not rotate. | ① Activation of high-pressure switch (Water cooled condenser type) | <input type="radio"/> Short circuit of condenser fan motor |
| | | | <input type="radio"/> Wrong installation of condenser fan |
| | | | <input type="radio"/> Reverse rotation of condenser fan |
| | | | Insufficient cooling water flow rate |
| | | | <input type="radio"/> Water-cooled condenser blocked with scale |
| | | ② Electronic overcurrent protection device, PT/CT board actuation | Overcurrent due to overload operation, etc. |
| | | ③ Abnormal low pressure drop | Electronic expansion valve: poor contact of connector |
| | | | Electronic expansion valve: incorrect opening |
| | | | Electronic expansion valve: blocked |
| | | | Suction modulating valve: blocked |
| | | | Dryer: blocked |
| | | ④ Abnormal discharge gas temperature | Hot gas solenoid valve: coil wire broken |
| | | | Injection solenoid valve: closed |
| Injection capillary tube: blocked | | | |
| High pressure increasing due to overload | | | |
| III Inside temperature does not drop. | A. Suction pressure is high | ① Poor compression of compressor | Abrasion of scroll slide section |
| | | ② Hot gas solenoid valve | Valve leakage |
| | | ③ Defrosting solenoid valve | Valve leakage |
| | | ④ Discharge gas by-pass solenoid valve | Valve leakage |
| | | ⑤ Electronic expansion valve | Electronic expansion valve malfunction |
| | | | Poor contact of connector |
| | ⑥ Injection solenoid valve | Valve leakage | |
| | B. Suction pressure is excessively low | ① Liquid solenoid valve (Not opened) | Solenoid valve coil malfunction |
| | | ② Shortage of refrigerant charge | Refrigerant leakage |
| | | ③ Drier | Drier blocked with contamination |
| | | ④ Suction modulating valve | Coil wire breakage |
| | | | Disconnection of connector |
| | | ⑤ Electronic expansion valve | Valve blocked with moisture |
| Valve blocked with contamination | | | |
| Breakage of coil lead wire or disconnection of connector | | | |
| Lead wire breakage or miss-mounting of evaporator inlet or outlet sensor | | | |
| ⑥ Evaporator | | Electronic expansion valve malfunction | |
| | Abnormal frosting | | |
| | Insufficient air flow rate in the evaporator | | |
| | <input type="radio"/> Air passage blocked by foreign material | | |
| | <input type="radio"/> Evaporator fan motor malfunction | | |
| | <input type="radio"/> Evaporator fan damage or fall out | | |
| <input type="radio"/> Air short circuit around the evaporator | | | |
| <input type="radio"/> Reverse rotation of evaporator fan motor | | | |
| C. Economizer circuit does not function | Economizer solenoid valve | Solenoid valve coil malfunction | |
| | | Valve blocked with contamination | |
| D. Defrosting is not initiated. | ① Manual defrost key | Poor contact of connector | |
| | | ② Evaporator outlet sensor | Incorrect installation of sensor |
| | | ③ Defrosting solenoid valve | Valve blocked with contamination |
| | | | Valve coil malfunction |
| ④ No trouble with unit | Defrost interval is set to 99 H (Demand/defrost setting) | | |

| State | Malfunction occurrence | Abnormal point | Possible cause | |
|--|--|--|---|--|
| III Inside temperature does not drop. | E. Defrosting is operated frequently. | ① No trouble with the unit | Excessive amount of moisture in cargo | |
| | | ② Defrosting solenoid valve | Leakage | |
| | | ③ Defrost timer | Short setting timer | |
| | F. Refrigeration unit is normal | ① Container | High cargo temperature Poor thermal insulation or air leakage | |
| IV Inside temperature does not rise (in the heating mode) | A. Discharge pressure is low. | ① Poor compression of compressor | Abrasion of scroll slide section | |
| | | ② Hot gas solenoid valve | Valve leakage | |
| | | ③ Defrosting solenoid valve | Valve leakage | |
| | | ④ Injection solenoid valve | Valve blocked with contamination | |
| | B. Discharge pressure is high | ① Evaporator fan | Damages on fan blade | |
| | | | Rotation failure of fan motor | |
| Actuation of fan motor thermal protector | | | | |
| V Control is unstable | A. Hunting | ① Suction modulating valve | Valve blocked with contamination | |
| | | ② Electronic expansion valve | Valve blocked with contamination | |
| | B. Temperature continues dropping. | ① Suction modulating valve | Valve blocked with contamination | |
| | | | Magnetic coil malfunction | |
| | | | Wire breakage | |
| | C. Temperature continues rising. | ① Suction modulating valve | Valve blocked with contamination | |
| | | | ② Electronic expansion valve | Valve blocked with contamination |
| | | | ③ Evaporator | Insufficient evaporator air flow rate (Refer to III-B-⑥.) |
| | | | ④ Drier | Drier blocked with contamination |
| | | | ⑤ Shortage of refrigerant charging amount | Refrigerant leakage |
| VI Abnormal noise or abnormal vibration. | A. Abnormal noise is generated | ① Compressor | Worn-out of bearing | |
| | | | Abrasion of scroll slide section | |
| | | | Loose-tightened bolt | |
| | | ② Evaporator fan | Loose fan motor set bolt | |
| | | | Deformation of fan motor set leg or loose-tightened bolt | |
| | | | Bending of fan motor shaft | |
| | | | Worn-out of fan motor bearing | |
| | | | Deformation of fan guide | |
| | | | Contact between fan and fan guide | |
| | | ③ Condenser fan | Loose-tightened fan motor set bolt | |
| | | | Bending of fan motor shaft | |
| | | | Worn-out of fan motor bearing | |
| | | | Deformation of fan guide | |
| | Deformation of condenser front panel | | | |
| B. Abnormal vibration generates | ① Compressor | Loose-tightened set bolt | | |
| | ② Piping | Loose-tightened or missing of clamp bolt | | |
| VII Abnormal frosting on compressor | Frosting area is less than one third of compressor surface. | It is normal, since the unit is controlled to make superheat degree small by electronic expansion valve. | | |
| | Frosting area is more than one third of compressor surface. | Suction gas temperature sensor | Defective contact of sensing section Deviation from specified sensor characteristics | |
| | | Discharge gas temperature sensor | Defective contact of sensing section Deviation from specified sensor characteristics | |
| | | Evaporator inlet sensor | In back-up operation due to faulty sensor | |
| | | Evaporator outlet sensor | In back-up operation due to faulty sensor | |
| VIII Water-cooled operation is impossible | Although water coupling are connected, condenser fan continues rotating. | ① No actuation of water pressure switch | Insufficient cooling water flow rate Water pressure switch malfunction | |
| | | ② No trouble with the unit | To prevent temperature in the control box from rising,the condenser fan rotates at the ambient temperature of 30°C or higher. | |

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 | | |
|---|--|--|--|--|
| F101 | The high-pressure switch (HPS) activates within 30 seconds after the compressor start or the protection devices activates five times at unit start-up. | Discharge pressure regulation valve is defective. | | |
| | | Check valve is blocked. | | |
| | | Lead wire of the high-pressure switch is broken. | | |
| | | High-pressure switch contact is defective. | | |
| | | High-pressure switch is defective. | | |
| | | Condenser fan motor is in abnormal stop. | | |
| | | Printed-circuit board malfunction. | | |
| F109 | Low pressure lowers abnormally within 2 seconds after compressor started. | Liquid solenoid valve coil is broken. | | |
| | | Low-pressure transducer (LPT) value is abnormal. | CPU board is faulty. The low-pressure transducer is faulty. | |
| F111 | High-pressure switch (HPS) does not activate at set value. | High-pressure switch lead wire is broken. High-pressure transducer lead wire is broken. | | |
| F301 | Temperature setting request | Set point temperature is not set. | | |
| | | Failure of SRAM (on CPU board) | | |
| F401 F403 | In the chilled or partial frozen mode, the supply air sensor (SS) and return air sensor (RS) is defective. | Short circuit or breakage of both sensor lead wires | | |
| | | Wrong wiring connection on both sensors | | |
| | | Both sensors defective | | |
| | | CPU board malfunction | | |
| F603 | The suction modulating valve does not fully close although it is set to be full-close. | Suction modulating valve coil is broken. Suction modulating valve malfunctions. | | |
| F701 | Abnormal power voltage Note) 1. | | | |
| F705 | S phase is open phase | The voltage selector is in poor contact. | | |
| | | The circuit breaker is in poor contact. | | |
| | | Power plug is in poor contact. | | |
| | | Power cable is broken | | |
| | | Open phase of power supply | | |
| F803 | Any following malfunction codes are counted 10 times E101 · E103 · E107 E109 · E203 · E707 | Refer to the possible cause of the left mentioned malfunction codes. | | |
| E101 | High-pressure switch (HPS) activated during operation. | Refrigerant is overcharged | | |
| | | Wrong refrigerant is charged. (i.e. HCFC22) | | |
| | | Air entered in the refrigerant system | | |
| | | Insufficient air flow rate | Fins are blocked | |
| | | | Air passage is blocked by some foreign materials | |
| | | | Short circuit of condenser cooling air | |
| | | | Wrong installation of condenser fan | |
| | | | Condenser fan rotates reverse. | |
| | | | Condenser fan breakage. | |
| | | | Condenser fan fell out. | |
| | | Ambient temperature is abnormally high | | |
| | | Condenser fan motor running is abnormal | Motor stops due to thermal protector actuation. | Blocked finned coil. |
| | | | | Air passage is blocked by some foreign materials |
| | | | | Wiring lead breakage |
| | | Water-cooled condenser capacity is decreased | Motor does not run | Wrong wiring |
| | | | Shortage of cooling-water | |
| | | | | Cooling-water temperature high. |
| | | Blocked with scale | | |
| HPS malfunction | | | | |
| Wiring lead breakage | | | | |
| Poor connection with terminal block board | | | | |
| Wrong wiring of high pressure switch | | | | |
| CPU board malfunction | | | | |
| Power I/O board malfunction | | | | |
| E103 | Electronic overcurrent protection device (electronic OC) actuates. | Compressor lock | | |
| | | CPU board malfunction | | |
| | | Power I/O board malfunction | | |
| | | PT/CT board malfunction | | |

Note1: If S phase is open, F701 may occur. When F701 and F705 are displayed together, inspect the S phase for opening.

| Alarm code | Content | Possible cause | | | |
|--|---|---|---|--|----------------------|
| E103 | Compressor thermal protector (CTP) activates. | Shortage of refrigerant amount | Refrigerant leakage | | |
| | | | Injection solenoid valve is not opened. | Wiring lead breakage | |
| | | | | Defective wiring | |
| | | | | Coil burned out | |
| | | | | Coil fell out | |
| | | Injection capillary is blocked | | | |
| | Compressor thermal protector (CTP) malfunction | | | | |
| | Compressor lock | | | | |
| E105 | Micro-computerized overcurrent protection device (Micro-computerized OC) activates. | Compressor lock | | | |
| | | Excessive refrigerant supply during defrosting and metering heating | Injection solenoid valve is not closed due to foreign materials caught. | | |
| | | The current sensor (CT2) value is abnormal. | CPU board malfunction | | |
| | | | Current sensor malfunction | | |
| E107 | Discharge gas temperature sensor (DCHS) becomes abnormally high during operation. | Injection solenoid valve operates improperly. | Valve is blocked with contamination | | |
| | | | Wire lead breakage | | |
| | | | Wrong wiring | | |
| | | | Coil burned out | | |
| | | | Coil fell out | | |
| | | Injection capillary is blocked | | | |
| | | High pressure is abnormally high. | Overcharge of refrigerant | | |
| | | Compressor burnt | | | |
| | | Refrigerant shortage | | | |
| | | Drier is blocked | | | |
| | | Excessive frost on the evaporator | | | |
| | | Discharge gas temperature sensor value is abnormal | CPU board malfunction | | |
| | | | Sensor failure | | |
| Evaporator outlet sensor failure during defrosting | | | | | |
| E109 | Low pressure continues to lower abnormally for 2 seconds or longer. | Insufficient refrigerant amount | Shortage of refrigerant amount | | |
| | | | Refrigerant leakage | | |
| | | Liquid solenoid valve is not opened. | Valve blocked with contamination | | |
| | | | Wiring lead breakage | | |
| | | | Wrong wiring | | |
| | | | Coil burned out | | |
| | | | Coil fell out | | |
| | | Electronic expansion valve does not activate. | Valve blocked with moisture | | |
| | | | Valve blocked with contamination | | |
| | | | Coil wiring lead breakage or connector disconnection | | |
| | | | Evaporator inlet or outlet sensor wiring breakage or wrong installation | | |
| | | | Electronic expansion valve malfunction | | |
| | | Drier is blocked | | | |
| | | Excessive frost on evaporator | Evaporator fan insufficient air circulation | Air passage is blocked by foreign material | |
| | | | | Evaporator fan breakage | |
| | | | | Air-short circuit around evaporator | |
| | | | | Reverse rotation of evaporator fan | |
| | | | Fan motor does not run | Evaporator fan fell out | |
| | | | | Wrong wiring | |
| | | | | Fan motor thermal protector actuates. | Wiring lead breakage |
| | | | | | Wrong wiring |
| | | Air leaks on the access panel. | Air passage is blocked by foreign materials | | |
| | | | Ventilator is open. | | |
| Low-pressure transducer value is abnormal | CPU board malfunction | | | | |
| | Sensor malfunction | | | | |
| E201 | Pump-down does not end within 60 seconds. | Liquid solenoid valve does not close. | Valve blocked with contamination | | |
| | | | Lead wire breakage | | |
| | | | Wrong wiring | | |
| | | | Coil burned out | | |
| | | | Coil fell out | | |
| | | Compressor valve breakage | | | |
| | | Abrasion of compressor scroll | | | |
| | | Injection solenoid valve does not close. | Valve blocked with contamination | | |
| | | | Lead wire breakage | | |

| Alarm code | Content | Possible cause | |
|--|---|--|---|
| E201 | Pump-down does not end within 60 seconds. | Injection solenoid valve does not close. | Wrong wiring |
| | | | Coil burned out |
| | | | Coil fell out |
| | | Leakage of hot gas solenoid valve | Valve blocked with contamination |
| | | Defrosting solenoid valve | Valve blocked with contamination |
| Discharge gas by-pass solenoid valve | Valve blocked with contamination | | |
| E203 | Overcool protection function actuate (control sensor \leq SP- 3.0) in the chilled or partial frozen mode for 3 minutes or longer. | Suction modulating valve does not operate. | Lead wire breakage |
| | | | Wrong wiring |
| | | | Coil burned out |
| | | | Adopter PCB is defective |
| | | | Valve blocked with contamination |
| | | Insufficient evaporator fan air flow rate (Only for partial frozen mode) | Air passage is blocked by foreign materials |
| | | | Evaporator fan damaged |
| | | | Air short circuit around evaporator |
| | | Evaporator fan motor thermal protector activates | Evaporator fan interferes with guide |
| | | | Air passage is blocked by foreign material |
| E207 | Defrosting time is 90 minutes long | Evaporator outlet sensor gets off from the evaporator outlet tube. | |
| | | Insulation pipe cover of evaporator outlet sensor is improperly installed. | |
| | | Evaporator outlet sensor is defective. | |
| | | Defrosting solenoid valve does not open | Lead wire breakage |
| | | | Coil burned out |
| | | | Valve blocked with contamination |
| | | Hot gas solenoid valve does not open. | Lead wire breakage |
| | | | Coil burned out |
| | | | Valve blocked with contamination |
| | | Injection solenoid valve does not open | Lead wire breakage |
| | | | Wrong wiring |
| | | | Coil burned out |
| | | | Coil fell out |
| High-pressure transducer or low-pressure transducer malfunction. | | | |
| Evaporator outlet sensor value is abnormal | Printed-circuit board malfunction | | |
| | Sensor malfunction | | |
| Excessive frosting | | | |
| E303 | Humidity setting request | CPU board (SRAM) malfunction | Resetting |
| E305 | Defrosting interval setting request | | |
| E307 | Calendar setting request | | |
| E311 | Trip start setting request | | |
| E401 | Supply air temperature sensor (SS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | Sensor value is abnormal | Printed-circuit board malfunction |
| E402 | Data recorder supply air temperature sensor (DSS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | Sensor value is abnormal | Printed-circuit board malfunction |
| E403 | Return air temperature sensor (RS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | CPU board malfunction | |
| E404 | Data recorder return air temperature sensor (DRS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | CPU board malfunction | |
| E405 | Discharge temperature sensor (DCHS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | CPU board malfunction | |
| E406 | Suction gas sensor (SGS) malfunction | Line breakage | |
| | | Short circuit | |
| | | Wrong wiring | |
| | | CPU board malfunction | |

| Alarm code | Content | Possible cause |
|-----------------------|---|--|
| E407 | Evaporator inlet sensor (EIS) malfunction | Line breakage |
| | | Short circuit |
| | | Wrong wiring |
| | | CPU board malfunction |
| E409 | Evaporator outlet sensor (EOS) malfunction | Line breakage |
| | | Short circuit |
| | | Wrong wiring |
| | | CPU board malfunction |
| E411 | Ambient sensor (AMBS) malfunction | Line breakage |
| | | Short circuit |
| | | Wrong wiring |
| | | CPU board malfunction |
| E413 | Low pressure transducer (LPT) malfunction | Line breakage |
| | | Short circuit |
| | | Wrong wiring |
| | | CPU board malfunction |
| E415 | High pressure transducer (HPT) malfunction | Line breakage |
| | | Short circuit |
| | | Wrong wiring |
| | | CPU board malfunction |
| E417 | Voltage sensor (PT1) malfunction | Sensor malfunction |
| | | CPU board malfunction |
| E419 | Voltage sensor (PT2) malfunction | Sensor malfunction |
| | | CPU board malfunction |
| E421 | Current sensor (CT1) malfunction | Sensor malfunction |
| | | CPU board malfunction |
| E423 | Current sensor (CT2) malfunction | Sensor malfunction |
| | | CPU board malfunction |
| E425 E427 E429 | Pulp temperature sensor (USDA1 to 3) malfunction | Wrong wiring in the USDA receptacle. |
| | | Line breakage in the USDA receptacle. |
| | | Short circuit in the USDA receptacle. |
| | | Junction cable breakage |
| | | Junction cable poor contact |
| | | Wrong wiring in the control box |
| | | Short circuit in the control box |
| | | Pulp temperature sensor malfunction |
| CPU board malfunction | | |
| E431 | Humidity sensor (HuS) malfunction | Lead wire breakage |
| | | Wrong wiring |
| | | Humidity sensor malfunction |
| | | CPU board malfunction |
| E603 | Line breakage of suction modulating valve (SMV) or drive circuit malfunction or wrong setting of controller | Lead wire breakage |
| | | Wrong wiring |
| | | CPU board malfunction |
| | | Wrong setting of initial setting of controller (DECOS a, b, c) |
| E607 | Abnormal contact point of manual defrost key (sheet key) | Switch malfunction |
| | | Short circuit |
| | | CPU board malfunction |
| E707 | Momentally power failure | Commercial power supply stops for 40 to 300msec. |

LXE10E

Malfunction and Alarm
when the socket is disconnected or loosened.

| Location | Socket No. | Malfunction or Alarm when the socket is disconnected or loosened. | Applicable to LXE10D |
|----------------------------|------------------|---|-------------------------|
| SMV Board (EC6) | CN81 (White) | No Alarm.....No power supply to Controller | — |
| | CN82 (Red) | No Alarm.....No power supply to Controller | — |
| | CN83 (Yellow) | F803 | — |
| | CN84 (Blue) | F603 | — |
| PT/CT Board (EC6) | CN1 | F705 | Yes |
| | CN2 | F705 E315 E417 E421 E423 | Yes |
| I/O Board (EC2) | CN26 | No Alarm.....No power supply to recorder | Yes |
| CPU Board (CN1) | CN13 | No Alarm.....No power supply to Controller | Yes |
| | CN15 | No Alarm.....No communication to cpmputer for data down loading | Yes |
| | CN16 | No Alarm.....No power supply to MODEM | Yes |
| | CN18 | No Alarm.....No "signal" power supply to EV | Yes |
| Terminal Board (TB1) | CN1 | E109 → F109 (F803) | Yes |
| | CN2 | F101 | Yes |
| | CN3 | No Alarm.....No power to PCC (No operation) | Yes |
| | CN4 | No Alarm.....No power supply to Controller | Yes |
| Terminal Board (TB1) | CN6 | F803, E401, E403, E409, E411, E413, E415 ("E" displayed in SS, RS temperature indication for E401, E403) | Yes |
| | CN7 | F406 E407 E402 E404 ("E" displayed in DRS, DSS, EIS, SGS temperature indication) | Yes |

| Location | Fuse No. | Malfunction or Alarm when the fuse is broken. | Applicable to LXE10D |
|----------------------------|----------|--|-------------------------|
| Terminal Board (TB1) | Fu1 | F101 | Yes |
| | Fu2 | BSV | — |
| | Fu3 | E109 → F109 (F803).....No power to LSV (LSV close) | Yes |
| | Fu4 | F603, E315, E417, E421, E423 | Yes |
| | Fu5 | No Alarm.....No power supply to Controller | Yes |
| | Fu6 | No Alarm.....No power supply to Monitoring Cirt | — |

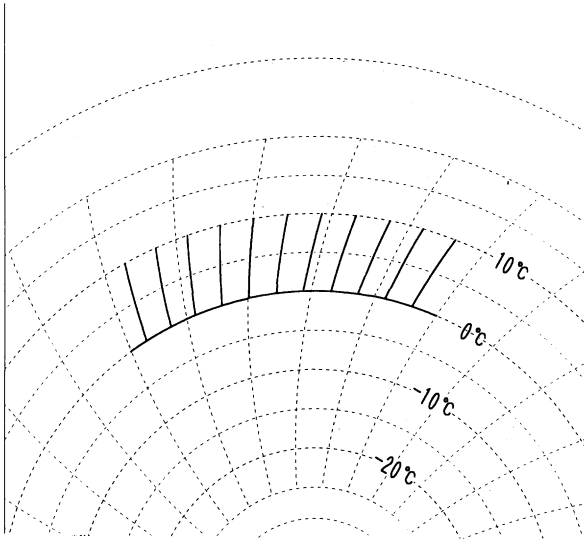
6.3 Troubleshooting for automatic PTI (J-code)

| 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 (ISV) | 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. |

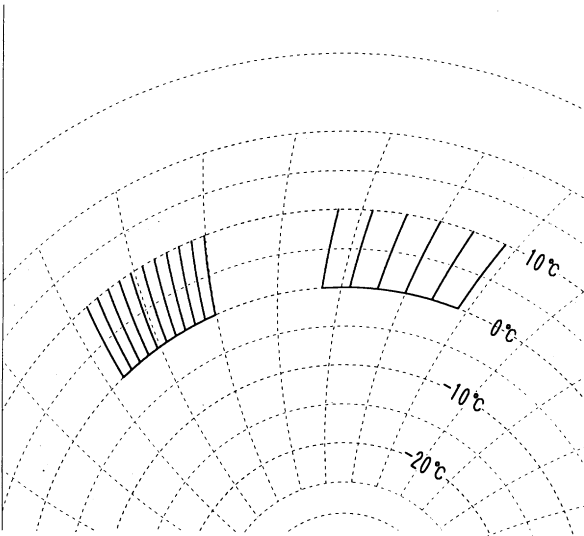
| Step | Content | Alarm code | Conclusion | Possible cause | Check method |
|------|---|---------------|---|---|---|
| P22 | Check on discharge gas by-pass solenoid valve (BSV) | J221 | BSV does not open. | BSV coil malfunction | Check on BSV coil, wiring and terminals. |
| | | | | BSV malfunction | 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 | SMV function check (Open SMV to 3%) | J281 | (LPT : decrease 20Kpa) | SMV coil failure SMV malfunction | Refer 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. |
| | | | | HSV malfunction | Check on outlet piping temperature of HSV |
| 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 Page 6-1~6-9)

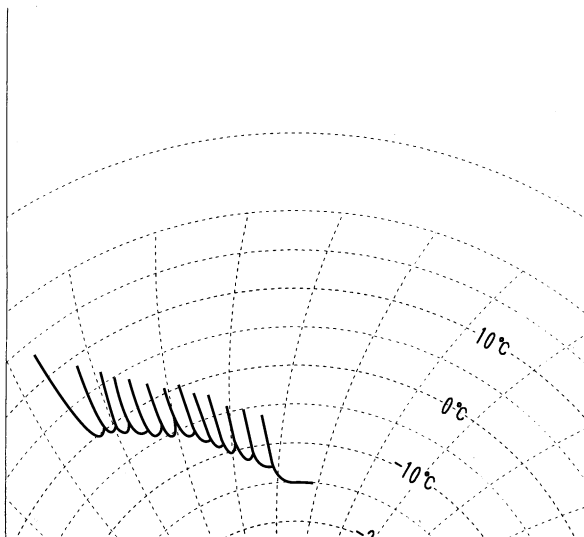
6.4 Diagnosis based on the recording chart



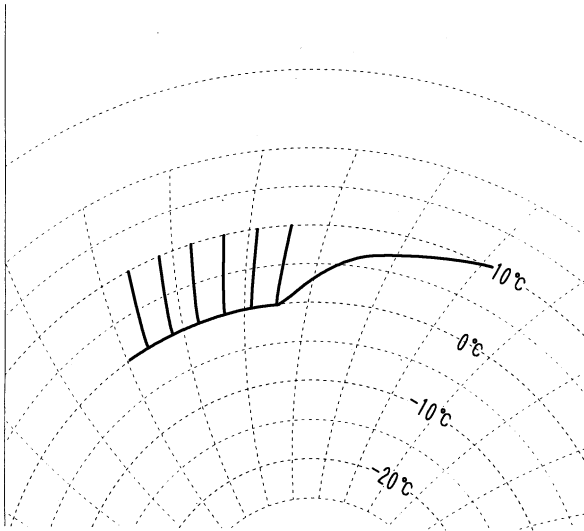
| | |
|---|--|
| Set temperature | 0°C |
| Occurrence read out from the recording chart | Defrosting is periodically executed by the timer |
| Abnormal content and abnormal point | Normal |



| | |
|---|--|
| 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. |



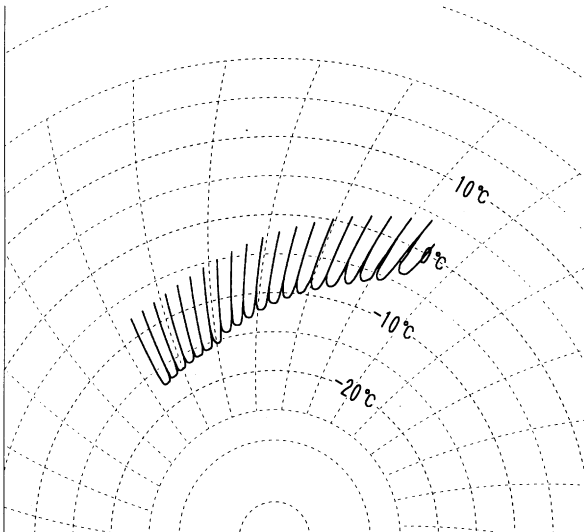
Set temperature 0°C

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

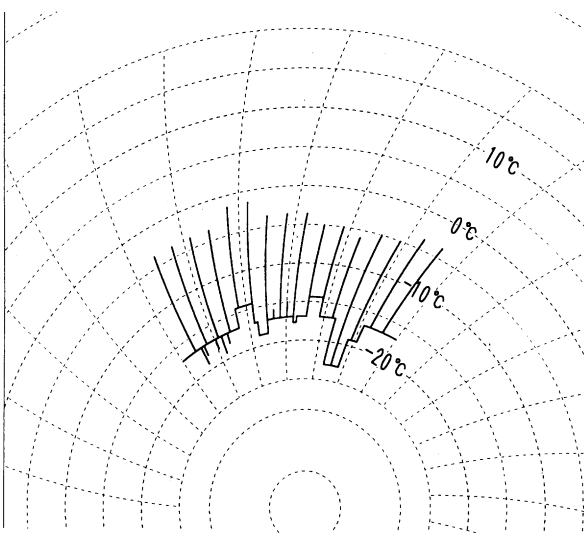
Occurrence read out from the recording chart

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.



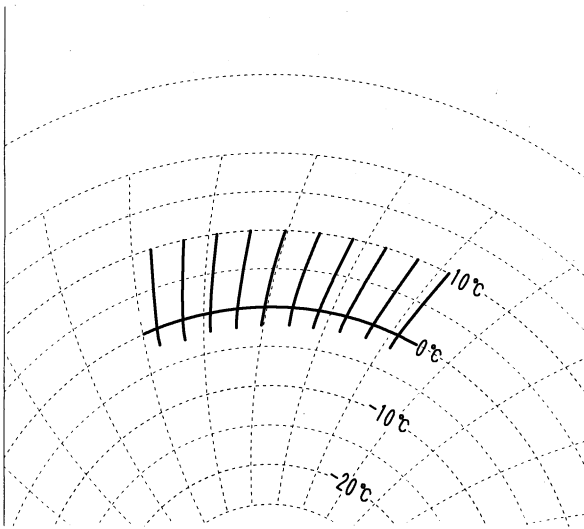
Set temperature - 18°C

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.



Set point temperature **0°C**

Occurrence read out from the recording chart

When defrosting, the inside temperature temporarily drops.

Abnormal content and abnormal point

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.

Emergency Operation is available only at Frozen Operation Mode. (SP= -10.1°C~-30°C)

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

- Short circuit connector --- Stored on the back of CPU/IO board case in the control box.
- Electronic expansion valve emergency cap --- (parts no. 1080263)
- Suction modulating valve emergency magnet --- (parts no. 1270530)

(2) On-site work

The on-site work is requested as follows 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.

* Connect the short circuit connector stored on the back of controller.

* For the details, refer to the section 6.5.2 "Short Circuit Operation"

② Electronic Expansion Valve opening adjustment for 1/4 opening.

* Use Emergency Cap for the for 1/4 opening.

* For the details, refer to the section 6.5.3 "Opening Adjustment"

③ Suction Modulation Valve opening adjustment for full opening.

* Use Emergency Magnet for full the opening.

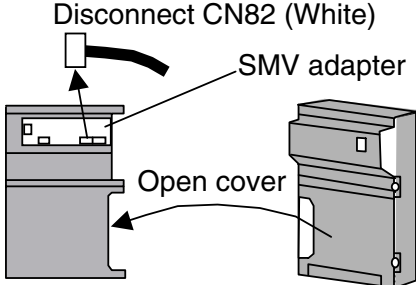
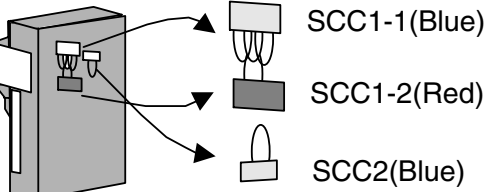
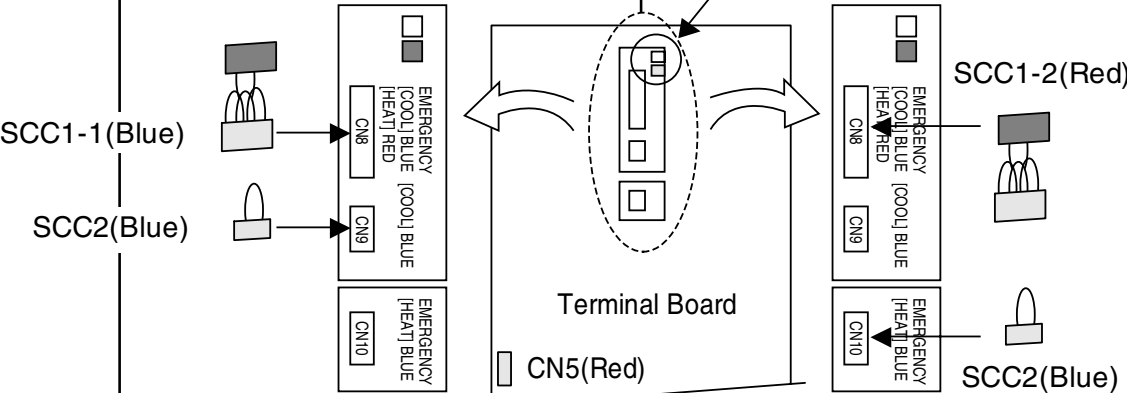
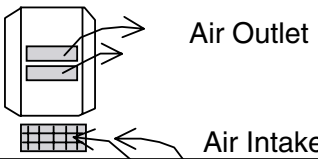
* For the details, refer to the section 6.5.4 "Opening Adjustment"

(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 |
|--|--|---|
| For cutting off the power to CPU board | ① Turn the circuit breaker OFF. ② Disconnect the power supply connector CN82(White) on SMV adapter board. | Disconnect CN82 (White)  |
| For making the forced running of COMP., CFM and EFM. | ③ Remove Short Circuit Connector SCC1-1(Blue), SCC1-2(Red) and SCC2(Blue) stored on back of controller. |  |
| | ④ Connect Short Circuit Connector SCC1-1(Blue) to CN8 and SCC2 (Blue) to CN9 on terminal board. | ④ Connect Short Circuit Connector SCC1-2(Red) to CN8 and SCC2 (Blue) to CN10 on terminal board. |
| | CN-C1 & CN-C2 : Reverse phase correction socket (Refer to next step ⑥) | |
| |  | |
| For checking reverse phase power | ⑤ Turn the circuit breaker ON. If the power is in reverse phase, COMP. can not be run and CFM runs reversely. | ⑤ Turn the circuit breaker ON. If the power is in reverse phase, EFM runs reversely with high speed. Then fresh air is sucked to Outlet Hole and discharged from Inlet Hole at the ventilator.  |
| For correcting reverse phase power | ⑥ If it is in reverse phase, turn the circuit breaker OFF and replace the reverse phase correction socket to opposite side. ("Lower socket CN-C1 to Upper CN-C2" or "Upper CN-C2 to Lower CN-C1") | |

6.5.3 Opening adjustment of electronic expansion valve

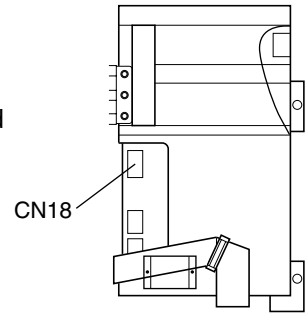
In case of the controller malfunction or faulty electronic expansion valve coil, electronic expansion valve can be operated with fixed valve opening by using emergency cap.

Caution

If the electronic expansion valve is energized while the coil is removed from valve body, the coil driver with which the valve needle is pushed protrude excessively. In this state, when the valve is restored from emergency operation, the needle may be caught with the driver resulting the valve fully closed. Therefore, be sure not to energize the coil before emergency operation.

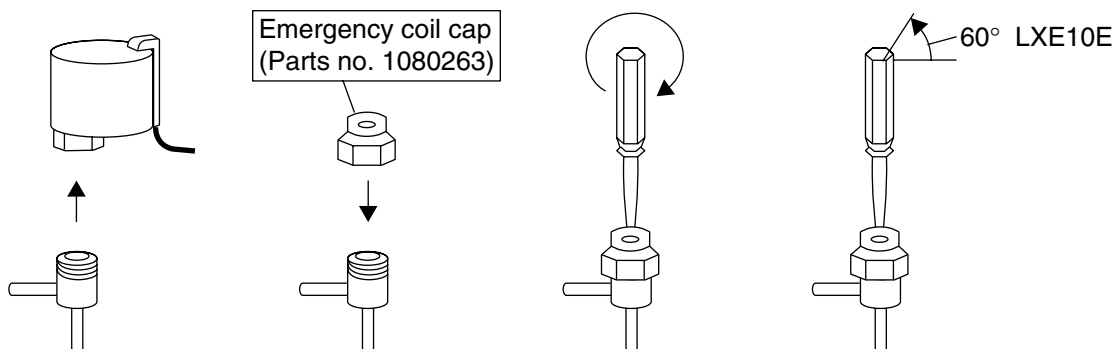
[Disenergizing of coil]

- When controller malfunction
Disconnect the red power supply connector (red : CN5) on the terminal board when removing of controller short circuit connector (SCC1-1 or SCC1-2) to disenergize the electronic expansion valve.(described in the section 10.5.2)
- When only electronic expansion valve is conducted emergency operation.
Disconnect CN18 on the controller CPU board to disenergize the electronic expansion valve.



- ① Remove the coil.
- ② Set the emergency cap on the electronic expansion valve body.
- ③ Fully close the electronic expansion valve by turning the minus recessed screw of emergency cap clockwise with miniature driver.
(Tightening torque: approx. 1 kgf · cm The torque is required to tighten the valve softly until the driver stops turning)
- ④ Then slightly open the electronic expansion valve by turning the minus recessed screw of emergency cap counter clockwise for 60°
- ⑤ Apply a loose-free adhesive on the screw.

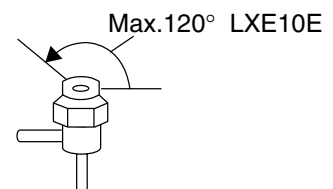
- ① Remove the coil. ② Set the emergency coil cap. ③ Fully close. ④ Slightly open.



Recommendation

*EV opening adjustment during pull-down operation

To shorten the operation hours, it is recommended that the opening be adjusted up to max. 50%. However if the frost is observed around the comp. body or the super heat is insufficient due to wet operation, close slightly the opening.

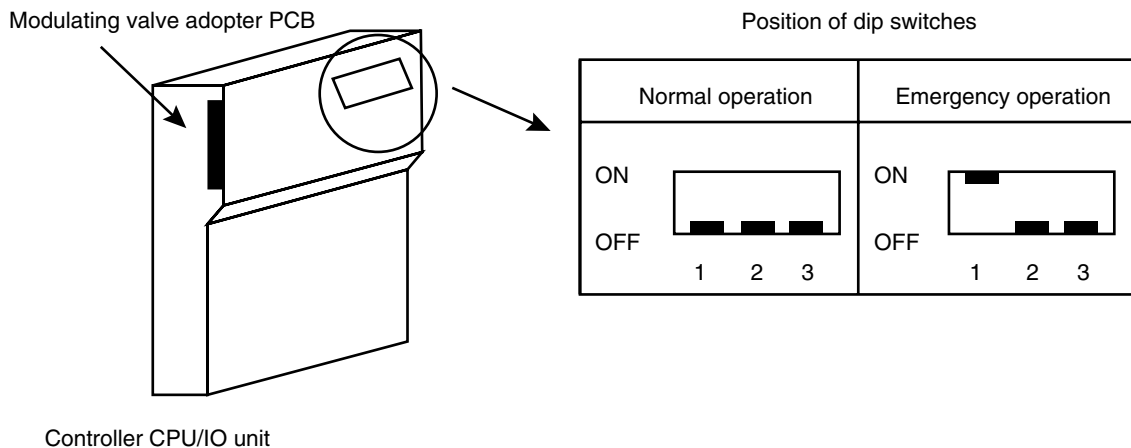


6.5.4 Opening adjustment of suction modulation valve:

In case of emergency, there are two ways to open the suction modulating valve manually. It is important to follow these steps in this sequence. Use step 1 first. If this is not working, then use step 2.

Step 1. Fully open the valve by using the dip switch on the adopter PCB.

In case of controller malfunction while the suction modulating valve and adopter PCB are normal, turn the No. 1 dip switch ON to open the valve automatically. At the same time the dip switch is switched, a clicking sound can be heard that the valve fully opens. If nothing will be heard, continue to step 2.

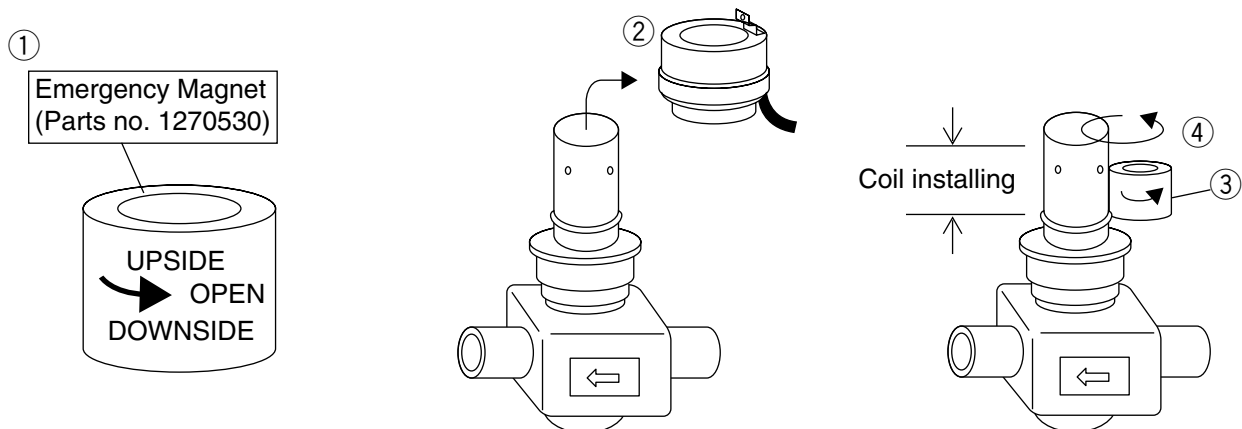


Step 2. Fully open the valve by using an emergency magnet.

If the method of step 1 was not working, use this step to open the valve.

In case of the suction modulating valve or adopter PCB malfunction, the valve can be opened by using an emergency magnet.

- ① Prepare Emergency Magnet
- ② Remove the coil of the modulating valve.
- ③ Contact the emergency magnet to the coil mounting section of the valve with the "UPSIDE" up. (the emergency magnet is attracted to the coil installing section by magnetic force of the inside driving magnet)
- ④ Rotate the emergency magnet counter clockwise to open the valve fully. (when the valve is fully opened, the inside driving magnet will be inactive and the emergency magnet can be removed)



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 3-27, 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 |
|------------------|---|--|
| E401 | SS Supply air temperature sensor (SS) for control malfunction | Chilled mode: Back-up operation with DSS Frozen mode: only malfunction code indication |
| E402 | DSS Data recorder supply air temperature sensor (DSS) malfunction | Only malfunction code indication |
| E401 E402 | Both SS and DSS malfunction | Chilled mode: Back-up operation with RS -2°C. Frozen mode: only malfunction code indication |
| E403 | RS Return air temperature sensor (RS) for control malfunction | Chilled mode: only malfunction code indication Frozen mode: Back-up operation with DRS |
| E404 | DRS Data recorder supply air temperature sensor (DRS) malfunction | Only malfunction code indication |
| E403 E404 | Both RS and DRS malfunction | Chilled mode: only malfunction code indication Frozen mode: Back-up operation with SS +5°C |
| H006 | Chilled mode: Temperature difference is 2 °C or more between SS and DSS or more than one hour. | Only malfunction code indication |
| | Frozen mode: Temperature difference is 2 °C or more between RS and DRS or more than one hour. | Only malfunction code indication |

6.6 Troubleshooting for automatic PTI (J-code)

| Step | Content | Alarm code | Judgment | 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 (Indoor fan stops) | J061 | Abnormal OFF point | (1) HPS malfunction (2) High pressure transducer (HPT) malfunction | (1) Check HPS (2) Compare to Gauge manifold |
| | | J062 | Not return | | |
| | | J064 | High pressure does not rise. (HPS does not operate within 5 minutes) | | |
| | | J065 | High pressure does not drop. (HPS does not reset within 5 minutes) | | |
| P08 | Pump down check (LSV : OFF) | J081 | Pump down requires too long time. (The pressure does not reach LPT < 0KPa in two minutes.) | Leakage from liquid solenoid valve due to dust pinched with the valve seat part. | |
| | | | | Leakage from hot gas by-pass solenoid valve due to dust pinched with the valve seat part. | Touch the outlet pipe of the solenoid valve. |
| | | | | Leakage from defrost solenoid valve due to dust pinched with the valve seat part. | Touch the outlet pipe of the solenoid valve. |
| | | | | Leakage from discharge gas by-pass solenoid valve due to dust pinched with the valve seat part. | Touch the outlet pipe of the solenoid valve. |
| | | | | Low pressure transducer (LPT) malfunction | Compare with pressure gauge |
| P10 | Solenoid valve check (Unit stops) | J101 | Excessive leakage of solenoid valve (LP increases above 200Kpa within 2 minutes) | Hot gas by-pass valve malfunction | Check hot gas by-pass valve |
| | | | | Injection valve malfunction | Check Injection valve |
| P12 | RS, SS accuracy check (Indoor fan stops) | J121 | Excessively large temperature difference between RS and DRS Excessively large temperature difference between SS and DSS (ΔT is within 1.2°C) | 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 (HSV : ON) | J141 | Excessively large pressure difference between HPT and LPT (ΔP is within 100Kpa) | 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 (Hi should be higher speed than Lo.) | Evaporator fan and motor malfunction. Magnetic contactor (EFH/L) and wiring malfunction. | Check Evaporator fan and motor. Check magnetic contactor (EFH/L) and wiring. |

| Step | Content | Alarm code | Judgement | Possible cause | Check method |
|------|---|---------------|---|---|---|
| P20 | Check on economizer solenoid valve (ESV) (ESV : ON) | J201 | ESV does not open. (HPT > 20Kpa) | ESV coil malfunction | Check on ESV coil, wiring and terminals. |
| | | | | ESV malfunction | Check on capillary tube temperature on ESV outlet. |
| P22 | Check on discharge gas by-pass solenoid valve (BSV) (BSV : ON) | J221 | BSV does not open. (LPT : increase 10Kpa) | 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) (DSV : ON) | J241 | DSV does not open. (HPT : decrease 40Kpa) | 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 | SMV function check (Open SMV to 3%) | J281 | (LPT : decrease 20Kpa) | SMV coil failure SMV malfunction | Refer 4.2.5. Check appearance (Replace coil bracket) |
| P29 | Electronic expansion valve check (Open EV to 5%) | J291 | Pump down time is too long. (It should be LP < -55Kpa within 2 minutes) | Electronic expansion valve wiring malfunction (Coil mounting failure) | Check knocking sound of the coil Disconnect and connect the connector of the coil Refer to 4.2.4 mounting |
| | | | | Electronic expansion valve coil burn out. | Check on knocking sound of coil. |
| P30 | ISV check (ISV : ON) | J301 | ISV does not open. (SGS drops 3°C) | ISV coil malfunction | Check on ISV coil, wiring and terminals. |
| | | | | ISV malfunction | Check on capillary tube temperature on ISV outlet. |
| P32 | HSV check (HSV : ON) | J321 | HSV does not open. (HPT decrease 40Kpa) | HSV coil malfunction | Check on HSV coil, wiring and terminals. |
| | | | | HSV malfunction | Check on outlet piping temperature of HSV |
| 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. (SS temperature should drop to 1°C within 2 hours) | 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. (It should be EOS > 30°C within 90 minutes) | Wrong installation of EOS. | Check the installation of EOS. |
| | | | | EOS malfunction. | Check EOS. |
| P80 | Pull-down cooling capacity | J801 | Pull down time is too long. (It should be RS < -18°C within 3 hours.) | 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 Page 6-1~6-9)

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 | 3.0 | 31 | 2.2 |
| | 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 |

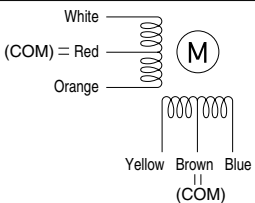
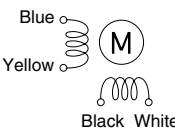
Note: Tolerance of tightening torque is within $\pm 10\%$.

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 Ω | Remarks |
|--------|-------------------------------------|---|---|
| CM | Compressor motor coil | 1.780 Ω (@75°C) | |
| CFM | Condenser fan motor coil | 57.2 Ω | |
| EFM | Evaporator fan motor coil | 19.4 Ω | |
| LSV | Liquid solenoid valve coil | 15.2 \pm 1.1 Ω (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 | | |
| EV | Electronic expansion valve coil | White - Red : 150 Ω Orange - Red : 150 Ω Yellow - Brown : 150 Ω Blue - Brown : 150 Ω |  |
| SMV | Suction modulation valve coil | Blue - Yellow : 113 Ω Black - White : 113 Ω |  |

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

7.4 HFC134a, temperature - vapor pressure characteristics table

| Temperature °C | Vapor pressure | | Temperature °C | Vapor pressure | |
|-------------------|----------------|------------------------|-------------------|----------------|------------------------|
| | kPa | kg/cm ² · G | | kPa | kg/cm ² · G |
| -40.0 | -49 | -0.5015 | 20.0 | 470 | 4.7977 |
| -39.0 | -46 | -0.4734 | 21.0 | 488 | 4.9795 |
| -38.0 | -44 | -0.4440 | 22.0 | 507 | 5.1656 |
| -37.0 | -41 | -0.4135 | 23.0 | 525 | 5.3560 |
| -36.0 | -37 | -0.3817 | 24.0 | 544 | 5.5508 |
| -35.0 | -34 | -0.3486 | 25.0 | 564 | 5.7500 |
| -34.0 | -31 | -0.3141 | 26.0 | 584 | 5.9538 |
| -33.0 | -27 | -0.2783 | 27.0 | 604 | 6.1621 |
| -32.0 | -24 | -0.2410 | 28.0 | 625 | 6.3751 |
| -31.0 | -20 | -0.2023 | 29.0 | 647 | 6.5929 |
| -30.0 | -16 | -0.1621 | 30.0 | 668 | 6.8154 |
| -29.0 | -12 | -0.1204 | 31.0 | 691 | 7.0428 |
| -28.0 | -8 | -0.0771 | 32.0 | 713 | 7.2751 |
| -27.0 | -3 | -0.0322 | 33.0 | 737 | 7.5124 |
| -26.0 | 1 | 0.0144 | 34.0 | 760 | 7.7548 |
| -25.0 | 6 | 0.0627 | 35.0 | 785 | 8.0023 |
| -24.0 | 11 | 0.1128 | 36.0 | 810 | 8.2551 |
| -23.0 | 16 | 0.1646 | 37.0 | 835 | 8.5131 |
| -22.0 | 21 | 0.2183 | 38.0 | 861 | 8.7765 |
| -21.0 | 27 | 0.2739 | 39.0 | 887 | 9.0453 |
| -20.0 | 32 | 0.3314 | 40.0 | 914 | 9.3196 |
| -19.0 | 38 | 0.3908 | 41.0 | 941 | 9.5994 |
| -18.0 | 44 | 0.4523 | 42.0 | 969 | 9.8849 |
| -17.0 | 51 | 0.5159 | 43.0 | 998 | 10.1762 |
| -16.0 | 57 | 0.5816 | 44.0 | 1027 | 10.4732 |
| -15.0 | 64 | 0.6494 | 45.0 | 1057 | 10.7761 |
| -14.0 | 71 | 0.7195 | 46.0 | 1087 | 11.0850 |
| -13.0 | 78 | 0.7918 | 47.0 | 1118 | 11.3999 |
| -12.0 | 85 | 0.8664 | 48.0 | 1149 | 11.7209 |
| -11.0 | 93 | 0.9434 | 49.0 | 1182 | 12.0481 |
| -10.0 | 100 | 1.0229 | 50.0 | 1214 | 12.3815 |
| -9.0 | 108 | 1.1048 | 51.0 | 1248 | 12.7213 |
| -8.0 | 117 | 1.1892 | 52.0 | 1281 | 13.0676 |
| -7.0 | 125 | 1.2761 | 53.0 | 1316 | 13.4203 |
| -6.0 | 134 | 1.3657 | 54.0 | 1351 | 13.7797 |
| -5.0 | 143 | 1.4580 | 55.0 | 1387 | 14.1457 |
| -4.0 | 152 | 1.5530 | 56.0 | 1424 | 14.5185 |
| -3.0 | 162 | 1.6508 | 57.0 | 1461 | 14.8982 |
| -2.0 | 172 | 1.7514 | 58.0 | 1499 | 15.2848 |
| -1.0 | 182 | 1.8549 | 59.0 | 1538 | 15.6785 |
| 0.0 | 192 | 1.9613 | 60.0 | 1577 | 16.0793 |
| 1.0 | 203 | 2.0708 | 61.0 | 1617 | 16.4873 |
| 2.0 | 214 | 2.1833 | 62.0 | 1658 | 16.9027 |
| 3.0 | 225 | 2.2989 | 63.0 | 1699 | 17.3254 |
| 4.0 | 237 | 2.4177 | 64.0 | 1741 | 17.7557 |
| 5.0 | 249 | 2.5398 | 65.0 | 1784 | 18.1936 |
| 6.0 | 261 | 2.6651 | 66.0 | 1828 | 18.6391 |
| 7.0 | 274 | 2.7937 | 67.0 | 1872 | 19.0925 |
| 8.0 | 287 | 2.9258 | 68.0 | 1918 | 19.5539 |
| 9.0 | 300 | 3.0613 | 69.0 | 1964 | 20.0232 |
| 10.0 | 314 | 3.2004 | 70.0 | 2010 | 20.5007 |
| 11.0 | 328 | 3.3430 | 71.0 | 2058 | 20.9864 |
| 12.0 | 342 | 3.4892 | 72.0 | 2107 | 21.4805 |
| 13.0 | 357 | 3.6392 | 73.0 | 2156 | 21.9831 |
| 14.0 | 372 | 3.7929 | 74.0 | 2206 | 22.4943 |
| 15.0 | 387 | 3.9505 | 75.0 | 2257 | 23.0142 |
| 16.0 | 403 | 4.1119 | 76.0 | 2309 | 23.5430 |
| 17.0 | 419 | 4.2773 | 77.0 | 2362 | 24.0807 |
| 18.0 | 436 | 4.4467 | 78.0 | 2415 | 24.6276 |
| 19.0 | 453 | 4.6201 | 79.0 | 2470 | 25.1837 |
| | | | 80.0 | 2525 | 25.7492 |

Conversion rate : 1kg · f/cm² · G=98.0665kPa

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

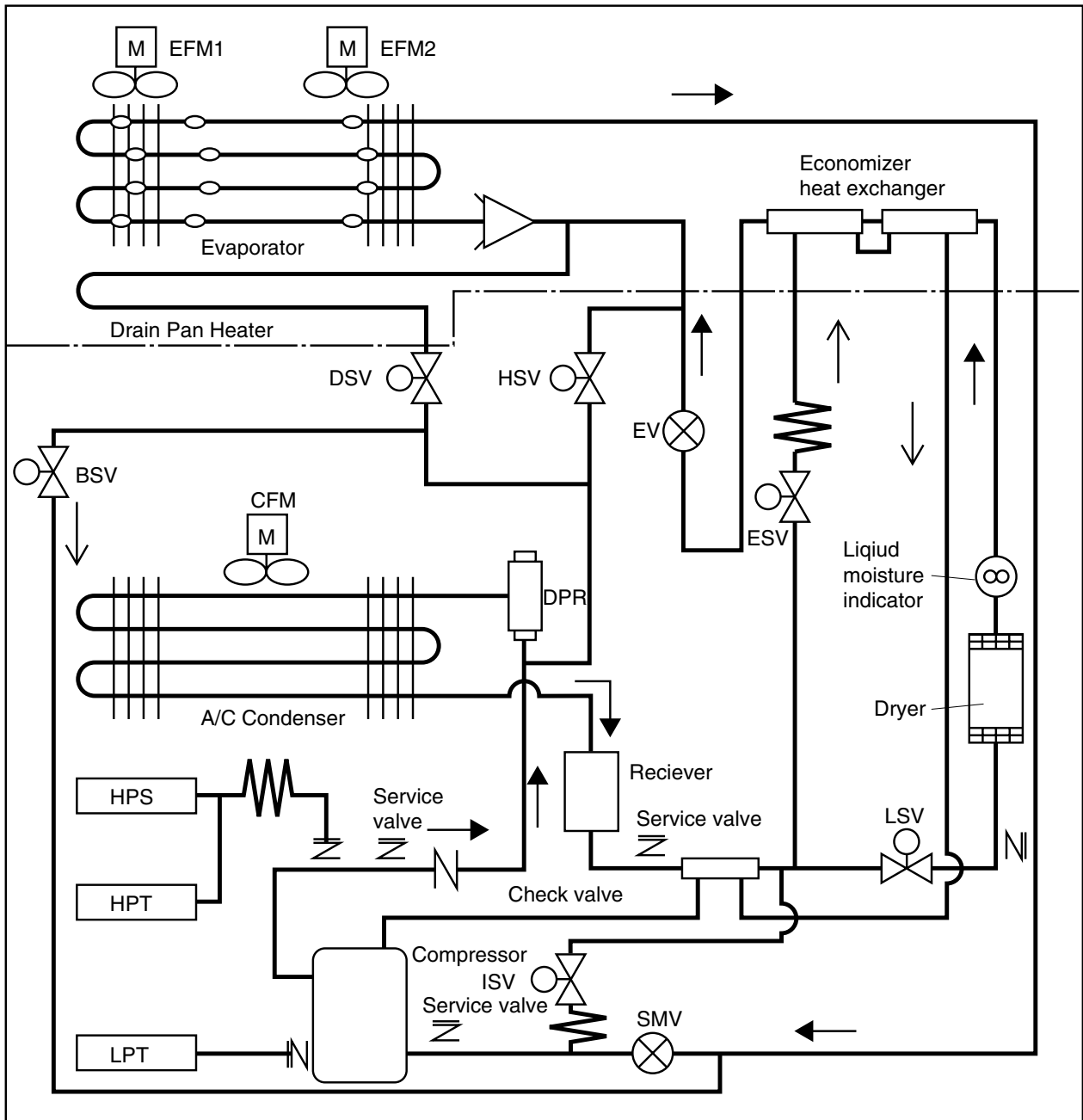
| Pressure (kPa · G) | Out put (V) | Pressure (kPa · G) | Out put (V) |
|--------------------|-------------|--------------------|-------------|
| 0 | 0.50 | 1100 | 1.62 |
| 100 | 0.60 | 1200 | 1.72 |
| 200 | 0.70 | 1300 | 1.83 |
| 300 | 0.81 | 1400 | 1.93 |
| 400 | 0.91 | 1500 | 2.03 |
| 500 | 1.01 | 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



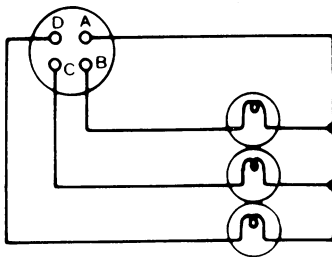
- | | | |
|-------------------------------|---|----------------------------------|
| EV:Elec.Exp.Valve | SMV:Suction Modulation Valve | DPR:Discharge pressure regulator |
| LSV:Liquid Solenoid Valve | HSV:Hot Gas Solenoid Valve | |
| DSV:Defrost Solenoid Valve | ISV:Injection Solenoid Valve | |
| ESV:Economizer Solenoid Valve | BSV:Discharge Gas Bypass Solenoid Valve | |

7.10 Pilot lamps and monitoring circuit

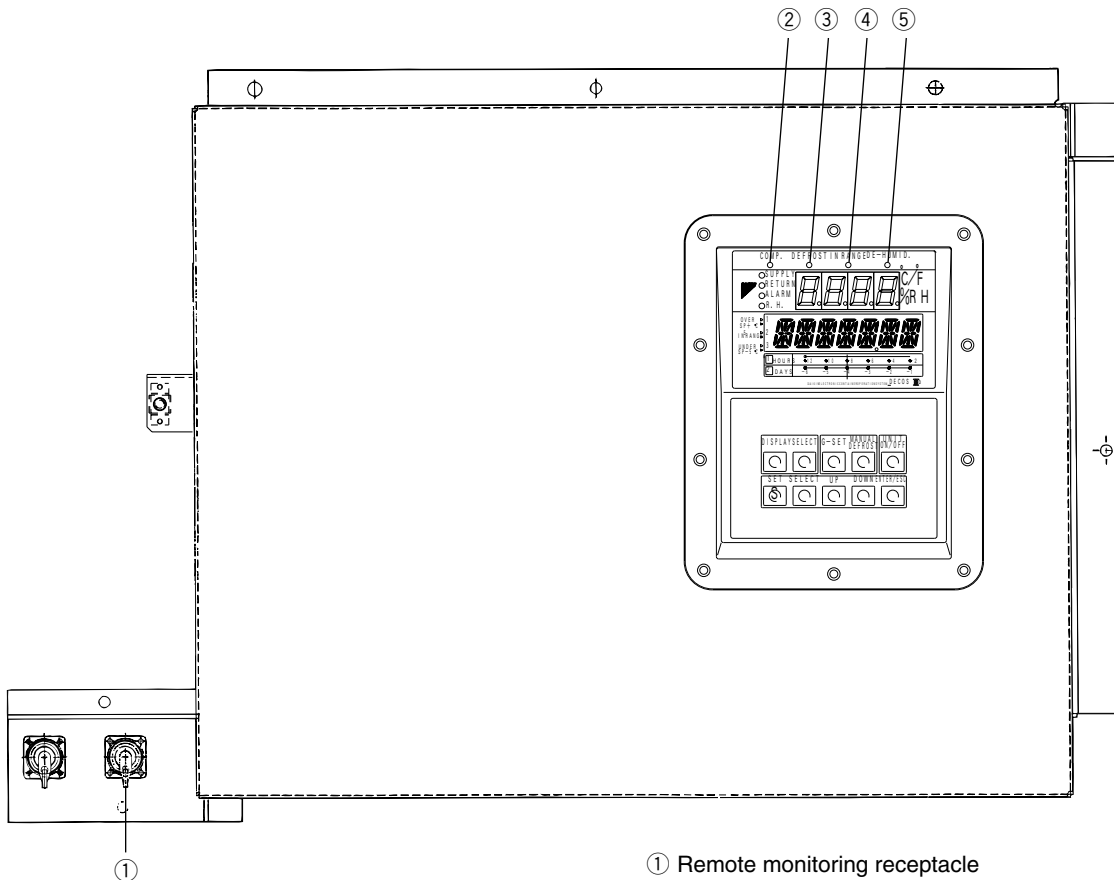
Four pilot lamps which indicate operating mode are mounted on the controller in the control box.

| 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. | Red | The unit is set to the dehumidification control operation. (optional) |

The remote monitoring receptacle for the pilot lamp is also equipped. The connections are as shown below.



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



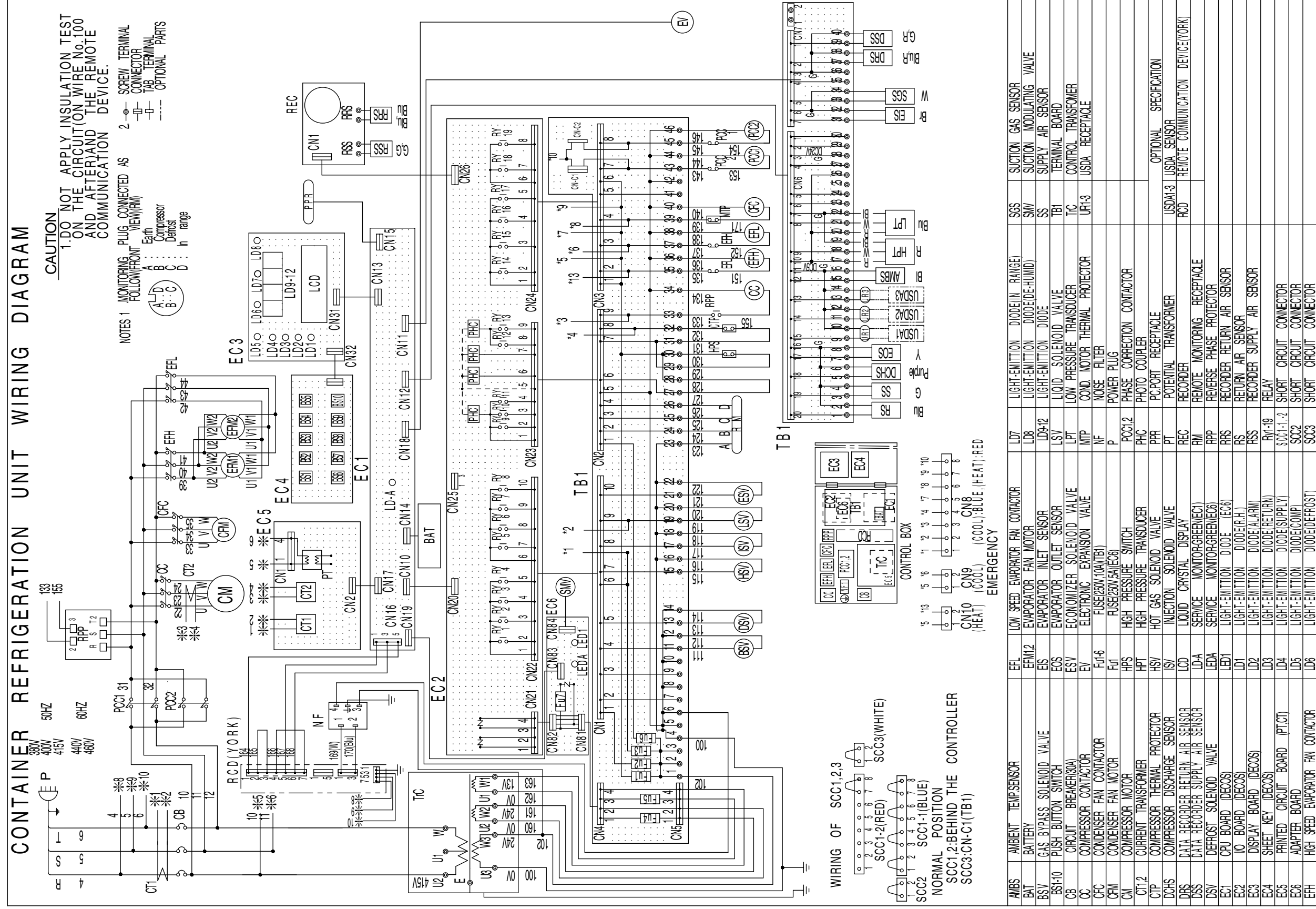
- ① Remote monitoring receptacle
- ② COMP. (green)
- ③ DEFROST (red)
- ④ IN RANGE (orange)
- ⑤ DE-HUMID. (yellow)

7.11 Fuse protection table

| | Protection of: | Wiring diagram: |
|--------------------|---|--|
| Fuse 1 (250V, 10A) | <ul style="list-style-type: none"> • High pressure switch (HPS) • Compressor contactor (CC) • Evaporator fan contactor high speed (EFH) • Evaporator fan contactor low speed (EFL) • Condensor fan contactor (CFC) • Compressor terminal protector (CTP) • Phase correction contactor (PCC1, PCC2) | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 2 (250V, 10A) | <ul style="list-style-type: none"> • Gas bypass solenoid valve (BSV) • Defrost solenoid valve (DSV) | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 3 (250V, 10A) | <ul style="list-style-type: none"> • Hot gas solenoid valve (HSV) • Liquid solenoid valve (LSV) • Injection solenoid valve (ISV) • Economizer solenoid valve (ESV) | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 4 (250V, 10A) | <ul style="list-style-type: none"> • Electronic expansion valve (EV) • PT and CT board | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 5 (250V, 10A) | <ul style="list-style-type: none"> • Recorder • LED indication • LCD display | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 6 (250V, 10A) | <ul style="list-style-type: none"> • Remote monitoring receptacle (RM) | Drawing 7.12 at TB1 print board page 7-9 |
| Fuse 7 (250V, 5A) | <ul style="list-style-type: none"> • Suction modulating valve (SMV) | Drawing 7.12 at EC6 print board page 7-9 |

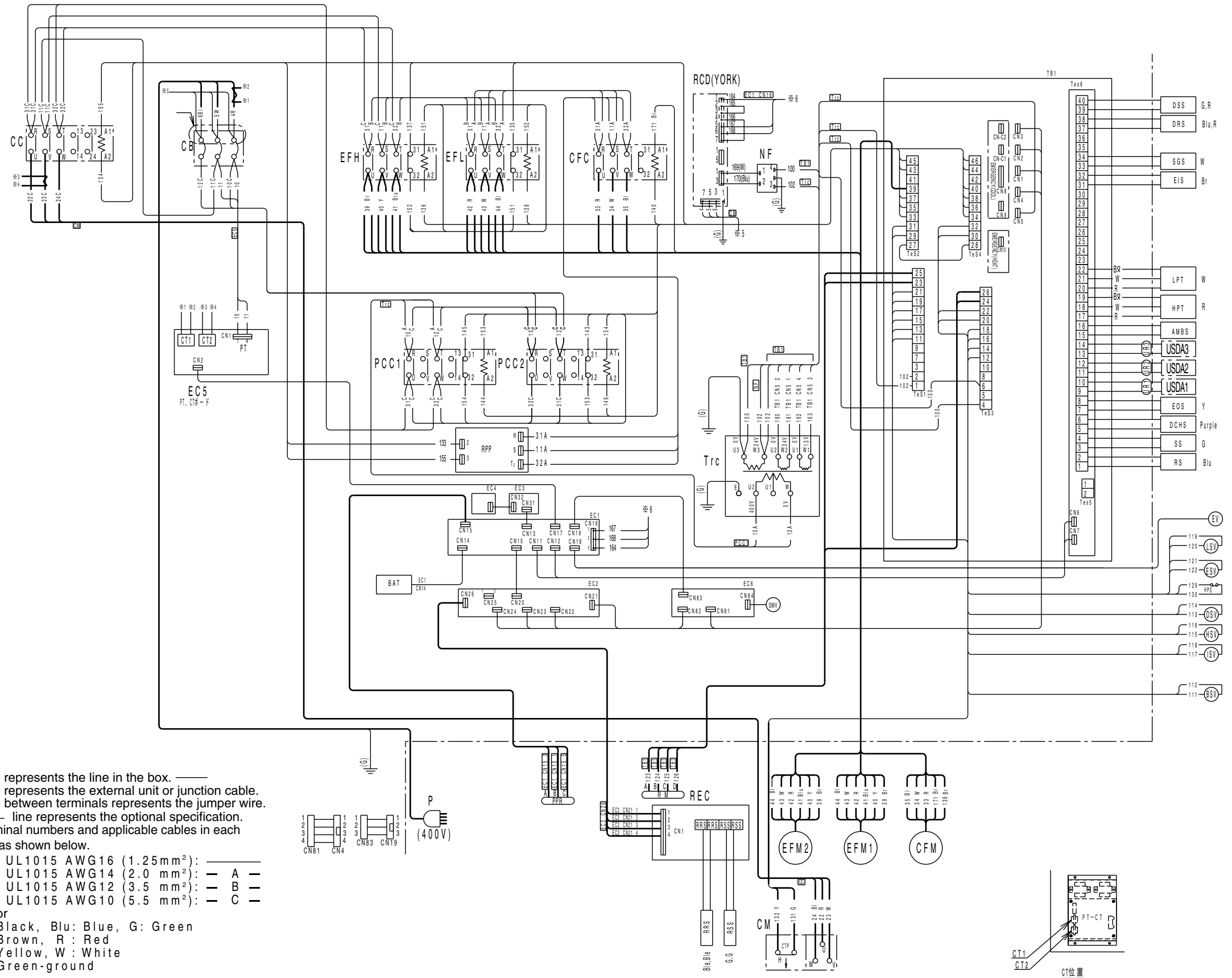
7.12 Schematic wiring diagram

●LXE10E



7.13 Stereoscopic wiring diagram

●LXE10E



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