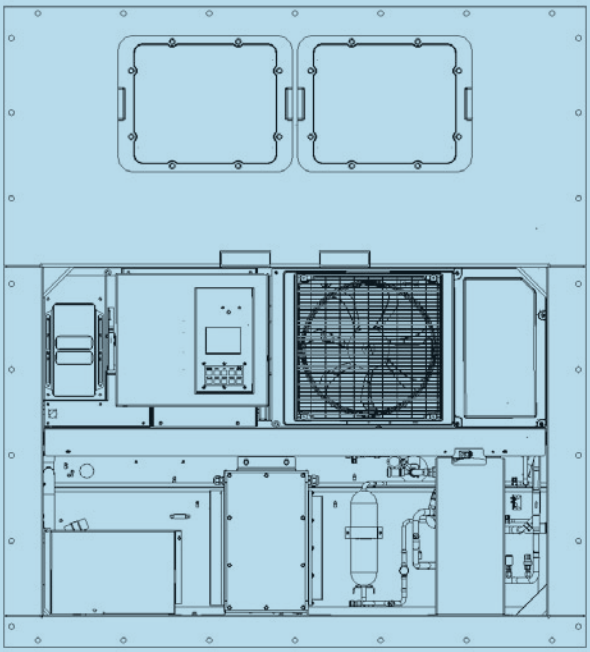
DAIKIN

DAIKIN INVERTER CONTAINER REFRIGERATION UNIT

Service Manual



LX10F10A or later

DAIKIN INDUSTRIES,LTD.

TR 11-07A

Make sure to read these instructions before operation.
This manual provides the minimum information required to operate the container refrigeration unit LX10F including the part names of each operating section, how to turn the power on and how to change the temperature setting, as well as the functions of the product and maintenance work, etc.

In addition, refer to the following document have been issued.
· Parts list
· Operation manual for personal computer software

Contents

SAFETY PRECAUTIONS

Always observe the following points before operating or inspecting a unit

⚠ DANGER

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

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

To inspect inside the inverter box, ensure to follow the instructions below.

1) Ensure to leave the unit at least 10 minutes after turning off the circuit breaker before opening the cover of the inverter box.

*This is because it takes time for the charge accumulated in the capacitor on the inverter board to be released.

2) Open the inverter box cover and ensure that the voltage between the terminal P2 and N on the inverter board is lowered to DC50V or below before starting inspection.

⚠ 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.

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

HFC IS USED FOR THIS PRODUCT AS A REFRIGERANT.

(1) Emission of fluorocarbons into the atmosphere without permission is prohibited.
(2) Recovery of fluorocarbons is mandatory when scrapping and servicing this product.
(3) The kind of fluorocarbon and its amount are stated in the manufacturer's label.

⚠ CAUTION

Wash the refrigeration unit with fresh water at PTI.

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

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

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

Be sure to only charge the unit with refrigerant R134a.

Use only Daikin specified refrigerant oil (IDEMITSU, Daphne Hermetic Oil FVC68D).

Open the oil can, just before charging the oil. Do not leave the can open for a long time to avoid moisture entry.
Using any refrigerant oil which has absorbed moisture may cause problems with the unit.

Do not release refrigerant R134a into atmosphere. Use recovery machine according to present legislation.

Important information regarding the refrigerant

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

Refrigerant type : R134a
GWP (1) value : 1430

(1) GWP=global warming potential

Chapter 1 Unit Specifications

1.1 Main Specifications

Item		Main Specifications
Mode Switch	Chilled mode	+30.0℃ ～ -9.9℃ (+86.0F ～ -14.1F)
	Frozen mode	-10.0℃ ～ -30.0℃ (+14.0F ～ -22.0F)
Condenser cooling system		Air cooling dedicated type
Controller		DECOSⅤ
Power source		Three phase 50Hz : 380/400/415V、60Hz : 440/460V Voltage fluctuation rate should be within ±10%.
Inverter compressor		Hermetically sealed scroll type (MAX. motor output : 8.1 kW)
Evaporator		Cross-fin coil type
Air cooling condenser		Cross-fin coil type
Evaporator fan		Propeller fan
Evaporator fan motor		Squirrel-cage three phase induction motor (Motor output: 400W/60W), dual speed, 2P/4P
Condenser fan		Propeller fan
Condenser fan motor		Squirrel-cage three phase induction motor (Motor output: 670W/120W), dual speed, 4P/6P
Defrosting system		Hot-gas defrosting system
Refrigerant control		Electronic expansion valve
Capacity control		By inverter compressor and hot-gas defrost control
Refrigerant (charged quantity)		R134a (For refrigerant charging amount, refer to the name plate, unit performance)
Refrigerant oil (charged quantity)		IDEMITSU, Daphne hermetic oil FVC68D (1.9 L)
Weight		For detail, refer to the name plate, unit performance

●The resistance of solenoid coil

Component name	Coil Resistance
Compressor motor	0.52Ω (20℃), 0.63Ω(75℃)
Condenser fan motor	High speed: 30.6Ω±5% (20℃) / Low speed: 21.6Ω±5% (20℃)
Evaporator fan motor	High speed: 17.2Ω±5% (20℃) / Low speed: 11.4Ω±5% (20℃)
Solenoid valve LSV, ESV, HSV, RSV	15.2 Ω±10% (20℃)
Modulation valve EEV, EMV, DMV	46±3Ω/phase（20℃）

1.2 Set Point and Protection Device

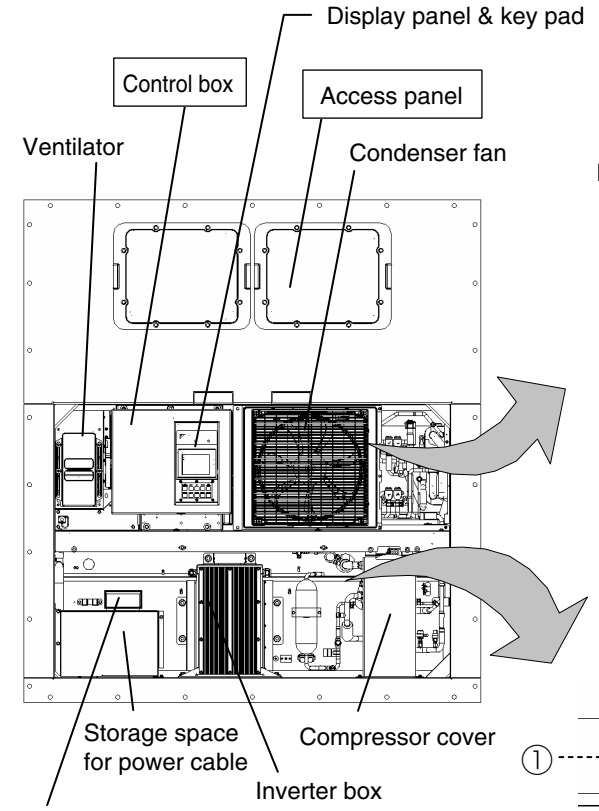
Component Name		Detector Symbol	Setting Value	Alarm
High pressure switch		HPS	OFF≧2400kPa（24.47kg/cm²） ON≦1900kPa（19.37kg/cm²）	E101 F101
Pressure control valve		PCV	Open≧2450kPa（25.0kg/cm²）	—
Fusible plug		—	95～100℃（203～212℉）	—
Built-in thermal protector for condenser fan motor		Q1M	OFF≧135℃±5℃（275℉±41℉） ON≦86℃±15℃（187℉±59℉）	—
Built-in thermal protector for evaporator fan motor		—	OFF≧145℃±5℃（293℉±41℉） ON≦94℃±15℃（201℉±59℉）	—
Circuit breaker (with earth leakage breaker)		CB	30A	—
Inverter circuit	Fin temperature (IPM protection)	VOT	ON＞90℃	E52C
	Instantaneous overcurrent	NIDC	ON 51Ap±10%	E52E F52E
	Electronic thermal 1 (Compressor overcurrent protection 1)		ON＞22.5A, OFF≦0.3A	E523
	Electronic thermal 2 (Compressor overcurrent protection 2)		ON＞30A, OFF≦1A	E524
	Lightning detection	VDC	ON≧125r/s (actual r/s - designated r/s)	E526
	Power-supply voltage imbalance		ON≧DC35V (Ripple voltage)	E531
	Undervoltage		ON≦DC290V	E532
	Overvoltage		ON≧DC790V	

●Fuse and Protection Circuit

Board	Fuse	Type	Protection Circuit	Alarm
I/O board（EC2）	F1U	F10A 250V fast-acting type	I/O board control power（DC13.5V, 5V, 3.3V）	—
	F2U		PCC1, PCC2, CFH, CFL, EFH, EFL HSV, RSV, LSV, ESV	F703 F707 E115 E117
	F3U		Spare	—
PT/CT board（EC7）	F11U	8A 600V	PT/CT board control power	—
Noise filter board（EC9）	F5U	12.5A 300A	Surge absorber 1 (Lightning protection)	—
	F6U		Surge absorber 2 (Lightning protection)	—
	F7U		Surge absorber 3 (Lightning protection)	—
	F8U	8A 600V	Inverter control circuit	—
I/O board（EC2）	TH1	2.5A 72V Automatic reset	RM (Remote Monitoring) circuit	—
	TH2		TransFresh circuit	—

1.3 Construction

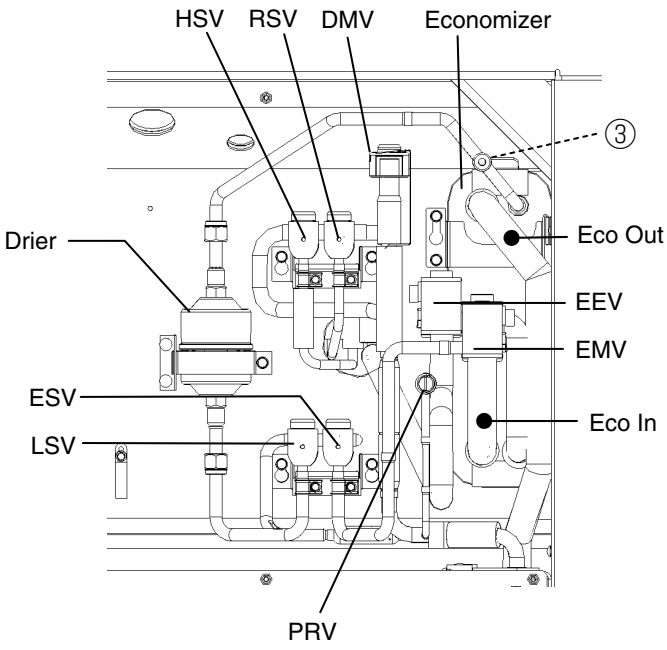
1.3.1 Outside View



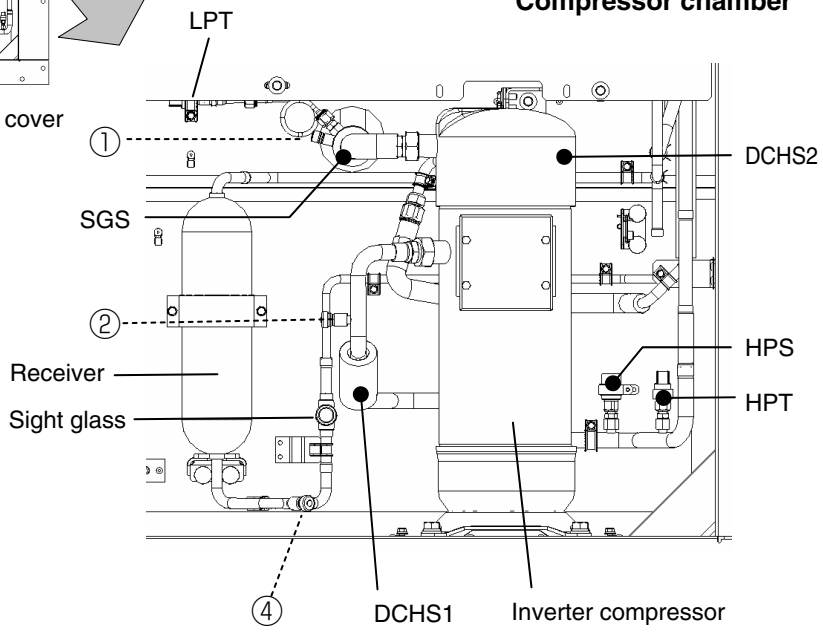
Model name plate

Contents on unit name plate
Model name
MFG number
MFG Year & Month
R134a charge amount [kg]
Unit weight [kg]

Valve chamber



Compressor chamber

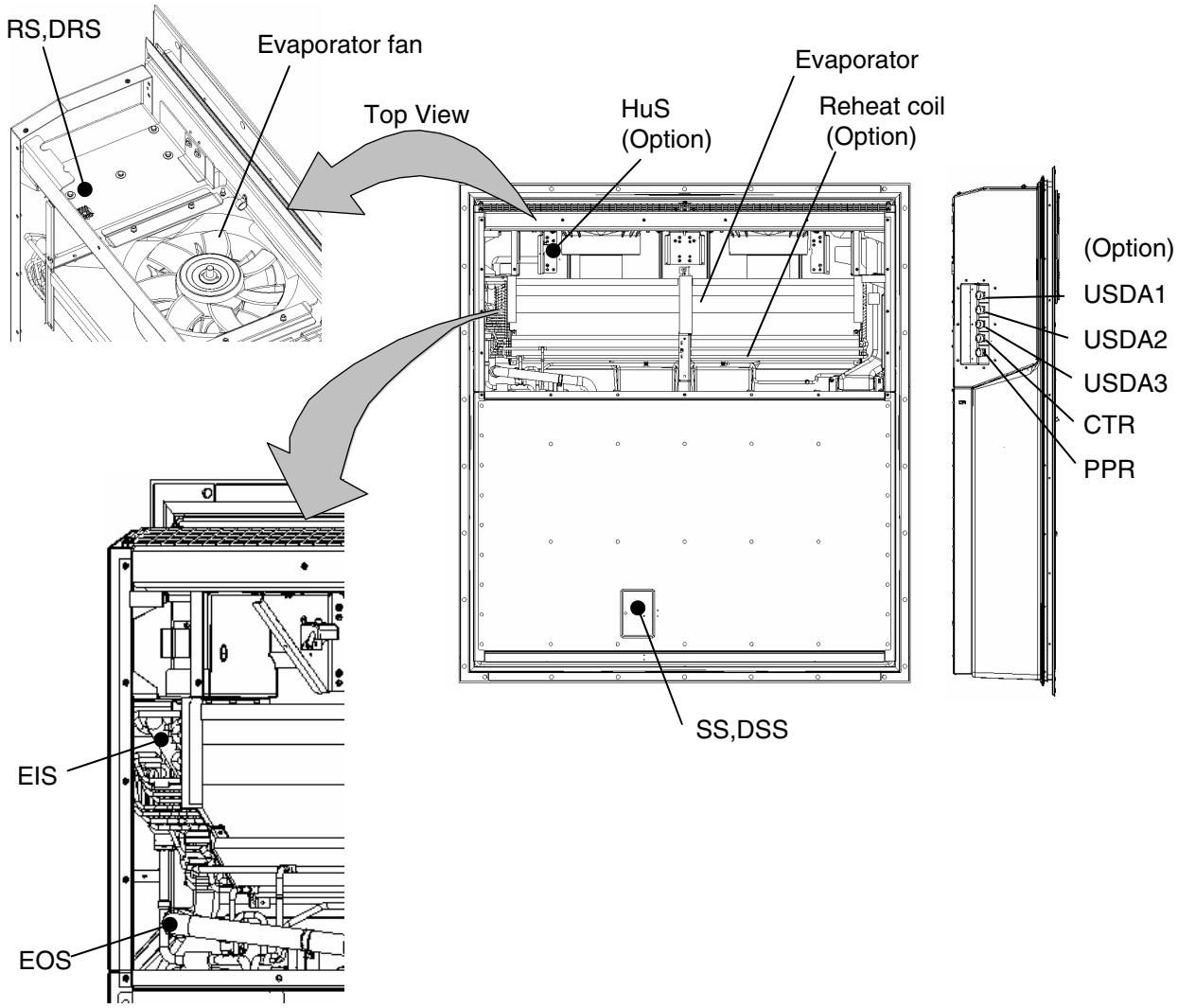


【Sensor】
AMBS : Ambient Temperature Sensor
DCHS1 : Discharge Gas Temperature Sensor 1
DCHS2 : Discharge Gas Temperature Sensor 2
Eco In : Economizer Inlet Temperature Sensor
Eco Out : Economizer Outlet Temperature Sensor
HPS : High Pressure Switch
HPT : High Pressure Transducer
LPT : Low Pressure Transducer
SGS : Compressor Suction Gas Temperature Sensor

【Valve】
DMV : Discharge Modulation Valve
EEV : Electronic Expansion Valve
EMV : Economizer Modulation Valve
ESV : Economizer Solenoid Valve
HSV : Hot Gas Solenoid Valve
LSV : Liquid Solenoid Valve
RSV : Reheat Solenoid Valve
PRV : Pressure Relief Valve

【Service port】
①Low Pressure (Gas line)
②High Pressure (Gas line)
③High Pressure (Liquid line)
④High Pressure (Liquid line)

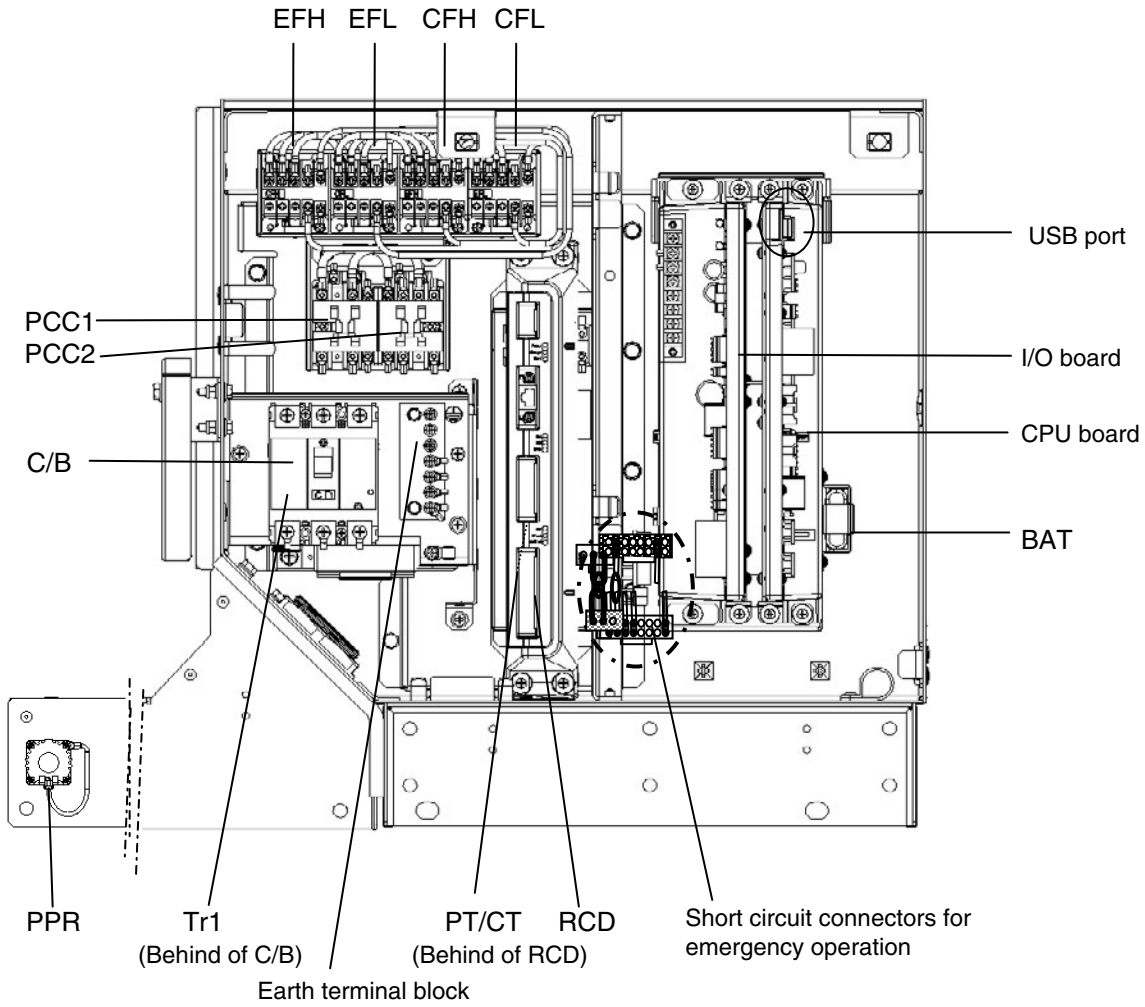
1.3.2 Inside View

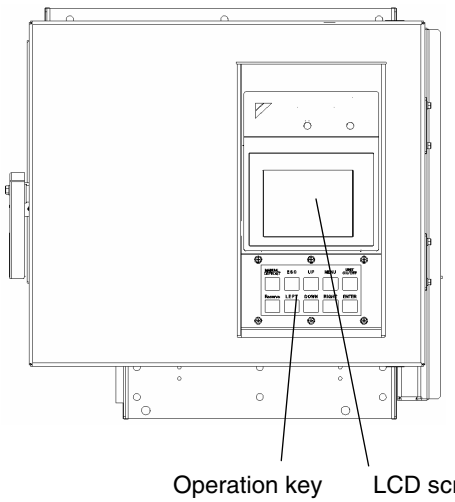


【Sensor】

CTR ：Cargo Temperature Sensor Receptacle (Option)
DRS ：Return Air Temperature Sensor for Data Recorder (Option)
DSS ：Supply Air Temperature Sensor for Data Recorder
EIS ：Evaporator Inlet Temperature Sensor
EOS ：Evaporator Outlet Temperature Sensor
HuS ：Humidity and Temperature Sensor (Option)
PPR ：PC Port Receptacle（Option）
RS ：Return Air Temperature Sensor
SS ：Supply Air Temperature Sensor
USDA1：USDA Sensor 1 Receptacle（Option）
USDA2：USDA Sensor 2 Receptacle（Option）
USDA3：USDA Sensor 3 Receptacle（Option）

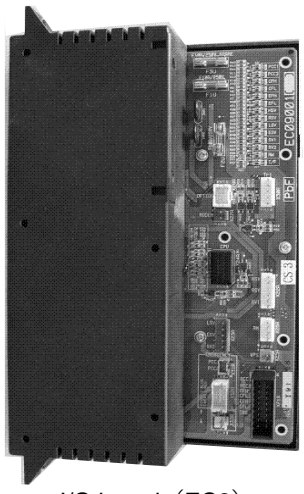
1.3.3 Control Box



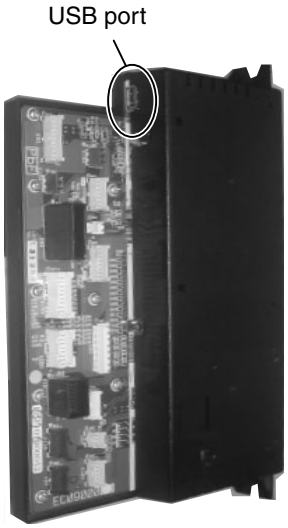


BAT	: Wake-up Battery (Rechargeable Battery)
C/B	: Circuit Breaker
CFH	: Magnetic Contactor, CFM high speed
CFL	: Magnetic Contactor, CFM low speed
EFH	: Magnetic Contactor, EFM high speed
EFL	: Magnetic Contactor, EFM low speed
PCC1	: Phase Correction Contactor 1
PCC2	: Phase Correction Contactor 2
PPR	: PC Port Receptacle
PT/CT	: PT/CT Board
RCD	: Modem (Option)
RM	: Remote Monitoring Receptacle (Option)
Tr1	: Transformer for Operating Circuit

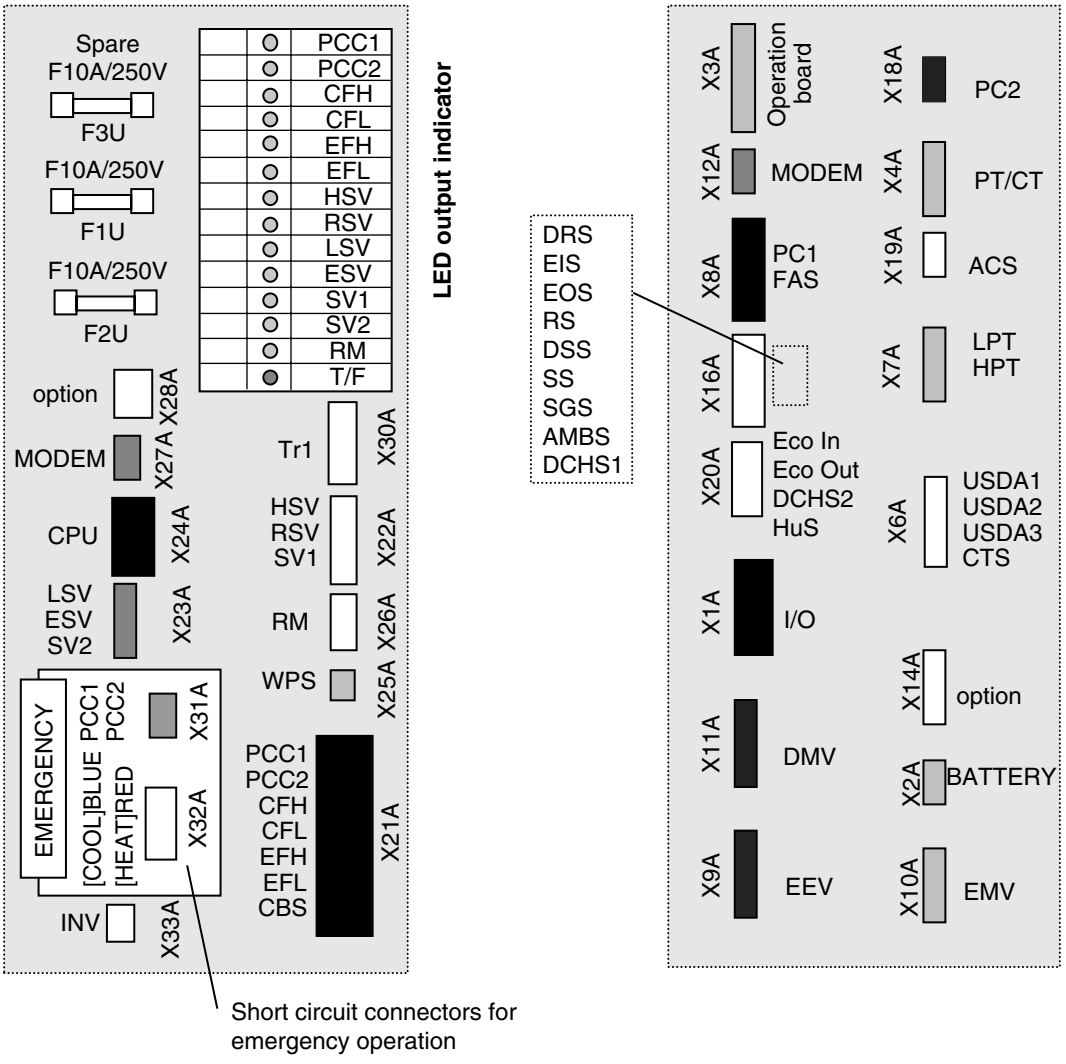
1.3.4 CPU Board and I/O Board



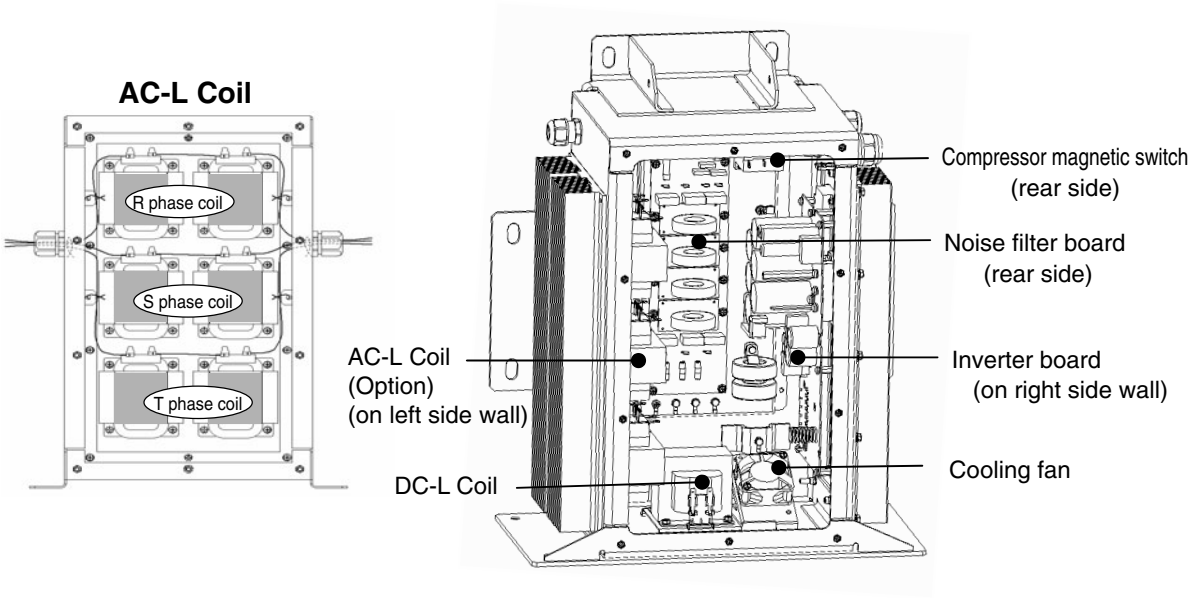
I/O board（EC2）

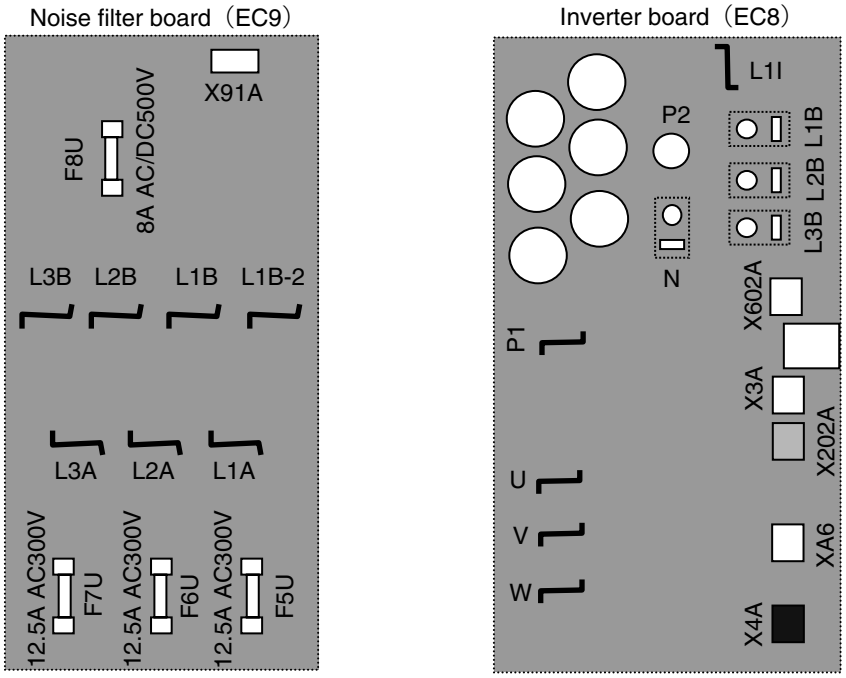


CPU board（EC1）



1.3.5 Inverter Box





Note: Inverter box internal wiring is put on cover of box.

1.3.6 Valves and Functions

EEV: Electronic Expansion Valve

EEV controls super heat at the evaporator outlet and controls the refrigerant supply quantity to the evaporator by means of temperature sensors installed at the evaporator outlet and inlet.

DMV: Discharge Modulation Valve

DMV is usually used at fully-open. However, while in defrosting operation, the opening is adjusted to conduct release control.

EMV: Economizer Modulation Valve

EMV controls the refrigerant supply quantity to the economizer while in pull-down operation by adjusting EMV opening by means of the temperature sensors mounted at the economizer outlet and inlet. The EMV is also used for the discharge pipe temperature control and charging control during defrost and heating operation.

ESV: Economizer Solenoid Valve

ESV is opened and closed in conjunction with the EMV.

LSV: Liquid Solenoid Valve

LSV is opened while in compressor operation. It is closed while in defrost and heating operation and automatic pump-down.

HSV: Hot gas Solenoid Valve

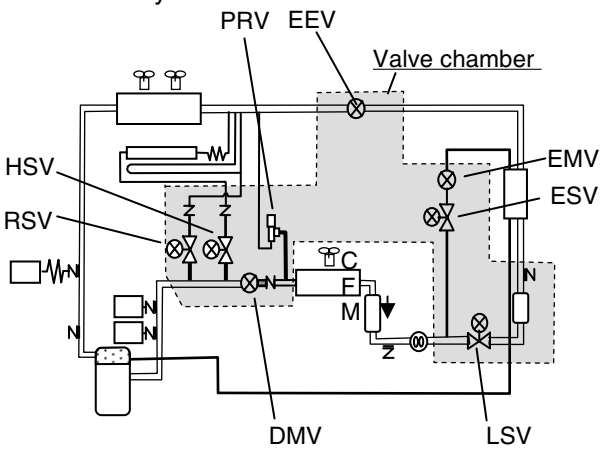
HSV is opened while in defrost and heating operation to supply hot-gas from the compressor to the evaporator and drain pan. It is also opened to equalize the pressure to protect compressor in case of large pressure difference of high and low pressure while in compressor start up.

RSV: Reheat Solenoid Valve

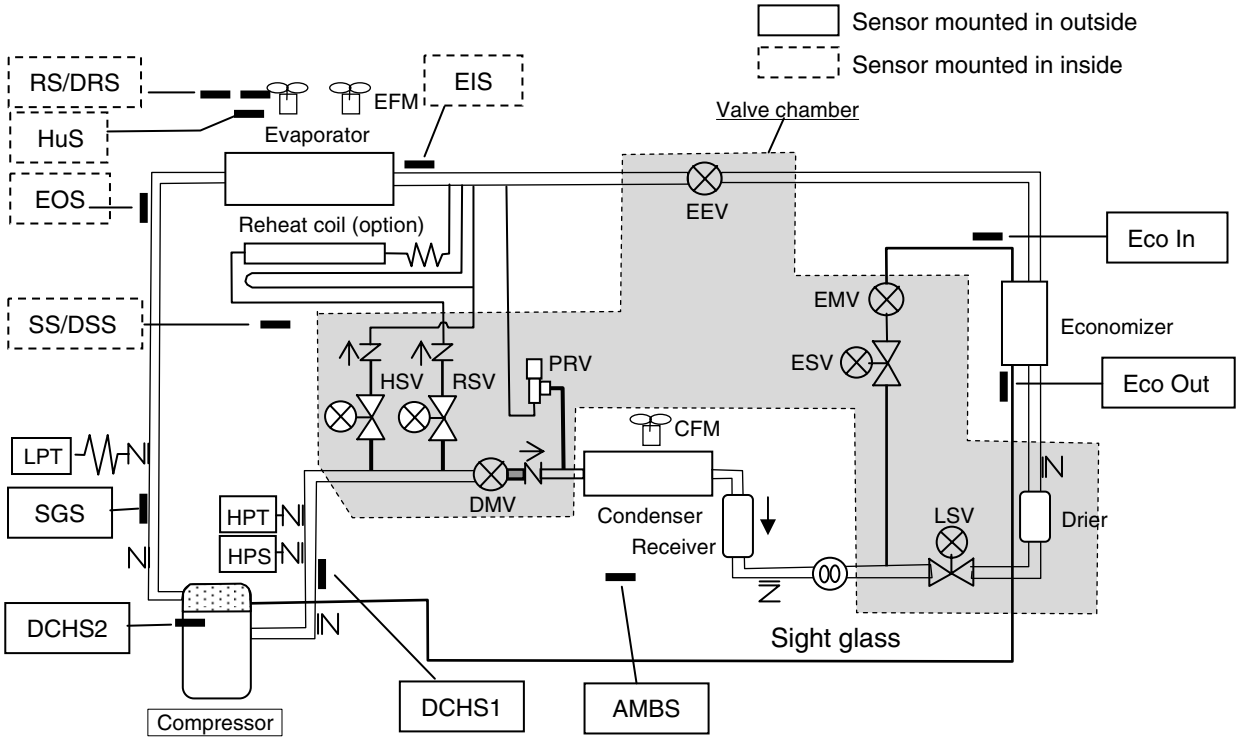
RSV is opened while dehumidification control operation to supply hot-gas from the compressor to the reheat coil.

PRV: Pressure Relief Valve

PRV is mechanical type pressure regulating valve. It releases the refrigerant to the low pressure side when the pressure rises abnormally.



1.3.7 Sensor Location



1.3.8 Printed Circuit Board

●CPU Board（EC1）

Controller described in this manual means CPU board. CPU board equips micro-computer and controls unit with operation software installed.
All information required for the control is input to the CPU board.

① Sensor information (temperature, humidity, pressure) and power information (voltage, phase sequence, current) are input.
② Configuration items (factory set) in accordance with requirement for individual user's order are input.
③ For example Unit ON/OFF, SP change, etc are inputted by key operation.

In responding to these inputs, CPU board outputs commands to each part to operate unit with accuracy.

① to modulation valves, solenoid valves and magnetic contactors
② to inverter board
③ to LCD display

Operation data is stored for 2 years（Logging interval 60 minutes). The data can be down-loaded with USB memory or PC installed DCCS software.

When commercial power OFF, some of setting work and data confirmation can be available by wake-up battery power (Rechargeable battery). Data download and software upload are possible. (Refer battery mode in paragraph 2.3)

Use Daikin spare parts for CPU board replacement. After replacement, configuration items are transmitted from operation board. Set controller time in accordance with setting request displayed on LCD. Install the latest operation software down-loaded from web site.

●I/O Board（EC2）

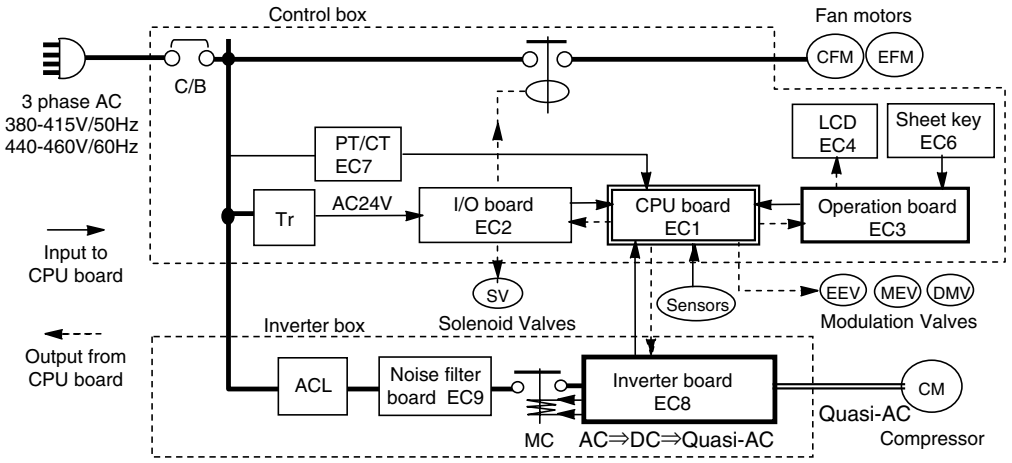
I/O board converts AC24V power from control transformer Tr1 to DC13V/DC5V and relays it to CPU board.
I/O board energizes magnetic contactors for fan motor EFM, CFM and phase correction contactor PCC1 or 2 by receiving order from CPU board. At the same time, LED lamps wired in parallel with them are energized and lighted ON. That is convenience with service work.

●Operation Board（EC3）

Operation board receives input from keyboard and transmits it to LCD board and CPU board. On the other hand it transmits signals from CPU board to LCD board.
If communication between operation board and CPU board is failed, operation board judges to display "Communication Interrupted" on LCD and CPU board logs alarm E903.
Configuration items factory set to CPU board have been copied to operation board. When CPU board is replaced, these items is transmitted to CPU board.

●Inverter Board（EC8）

Inverter board changes frequency of power source and controls compressor speed. Inverter board receives command of revolution number from CPU board. The operating condition during inverter control (compressor overload, power supply condition and actual frequency etc.) are transmitted to CPU board. The judging of operation continuing and stopping is conducted by CPU board.
Frequency change is made of frequent switching control with diode bridge circuit and results high temperature. Cooling fan circulates air inside inverter box and cooling fin constructed outside the box.



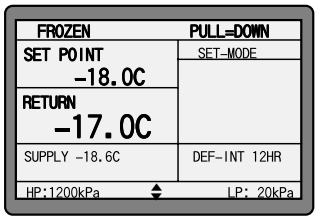
1.4 Operation Mode and Control

1.4.1 Frozen Mode

●Set Point and Control Temperature Sensor

Unit operates in frozen mode between Set Point -10.0℃ ～ -30.0℃ . The temperature control in frozen mode is controlled by the return air temperature sensor (RS).

●Display



FROZEN is displayed on the upper left and PULL-DOWN, or COOLING OFF is displayed on the upper right of the screen. RETURN temperature (RS) is displayed under SET POINT.

●＜Pull-down operation＞

Compressor runs at full capacity during pull-down operation. ESV opens to activate economizer circuit, then pull-down capacity is increased by sub-cooling the liquid refrigerant entering EEV.
EFM runs at high speed but it runs low speed when RS drops to -5.0℃ .

＜Modulated Cooling＞

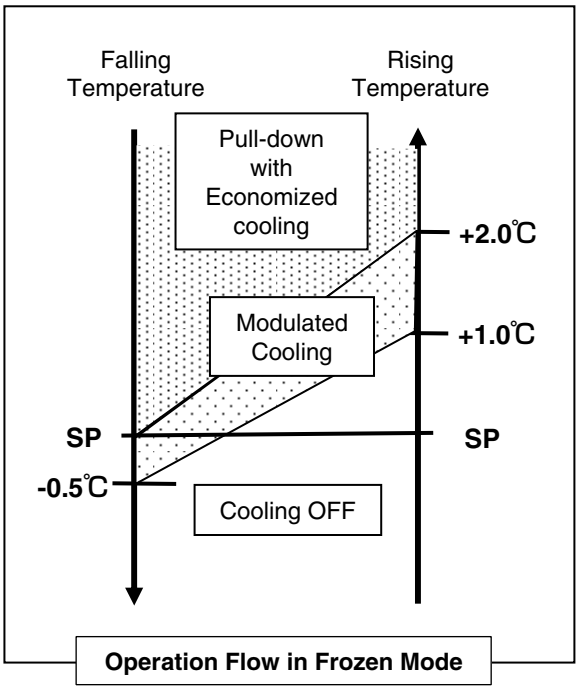
When RS drops to ≦SP, unit will enter to the modulating cooling. Compressor speed is modulated in response to temperature difference between RS and SP.

＜Cooling OFF＞

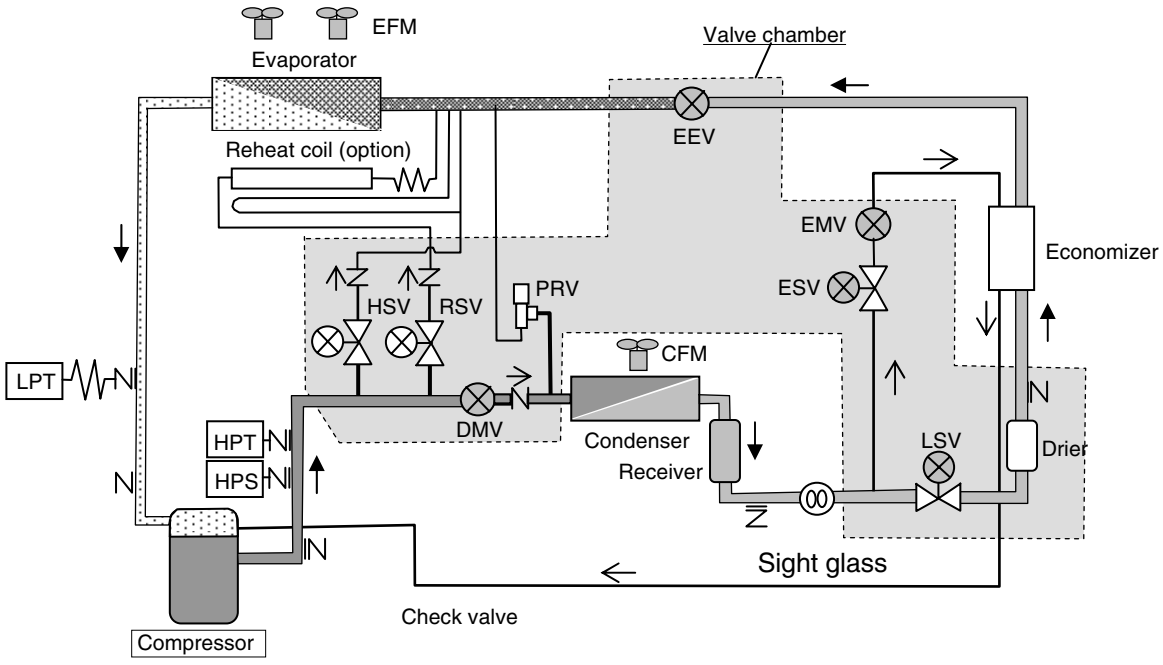
When RS still drops to ≦SP-0.5℃ , unit will enter to Cooling OFF. Compressor stops and EFM continues to run at low speed. If temperature rises to ≧SP+1.0℃ , the unit will return to the modulated cooling.

●Condenser Fan Motor, CFM

CFM will run with high, low or OFF in response to high pressure (HPT). (High Pressure Control)



Operation Flow in Frozen Mode



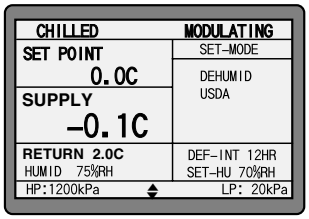
1.4.2 Chilled Mode

●Set Point and Control Temperature Sensor

Unit operates in chilled mode between Set Point +30.0℃ ～ -9.9℃ controlled by the supply air temperature sensor (SS).

●Display

CHILLED is displayed on the upper left and PULL-DOWN, MODULATING, Cooling OFF or HEATING is displayed on the upper right of the screen. SUPPLY temperature (SS) is displayed under SET POINT.



●＜Pull-down operation＞

Compressor runs at full capacity, ESV opens and economizer is activated, which is the same as frozen mode. EFM runs with high speed.

＜Modulated Cooling＞

When SS drops to ≦SP, unit will enter to the modulated cooling. Compressor speed is modulated in response to temperature difference between SS and SP.

＜Cooling OFF＞

When SS drops to ≦SP-0.3℃ (※), unit will enter to the Cooling OFF and compressor stops. If SS temperature rises to ≧SP+0.5℃ (※), the unit will return to the modulated cooling.

EFM runs with high or low speed in response to SS.

(※: Control value varies depending on operating condition.)

＜Heating＞

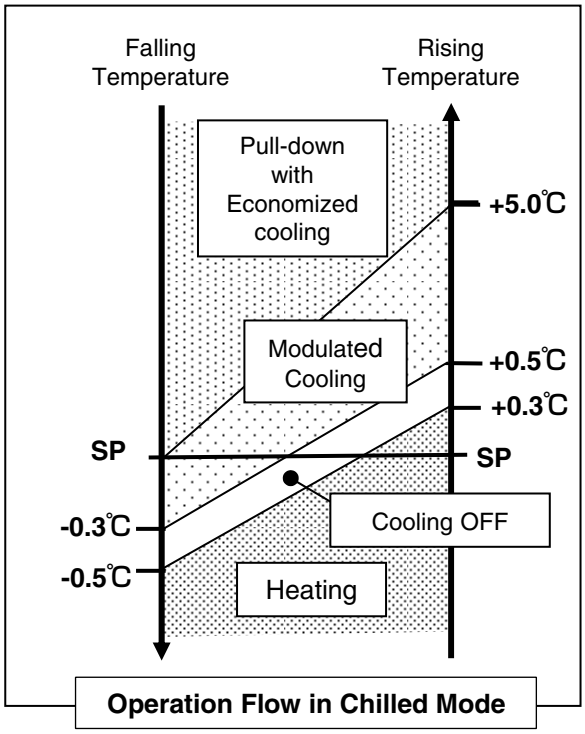
When SS is ≦ SP-0.5℃ (※), unit will be in heating operation. A hot gas is adopted for the heat source, which is same as defrost mode. The operation is same as defrost mode except EFM runs with high speed.

●Evaporator Fan Motor, EFM

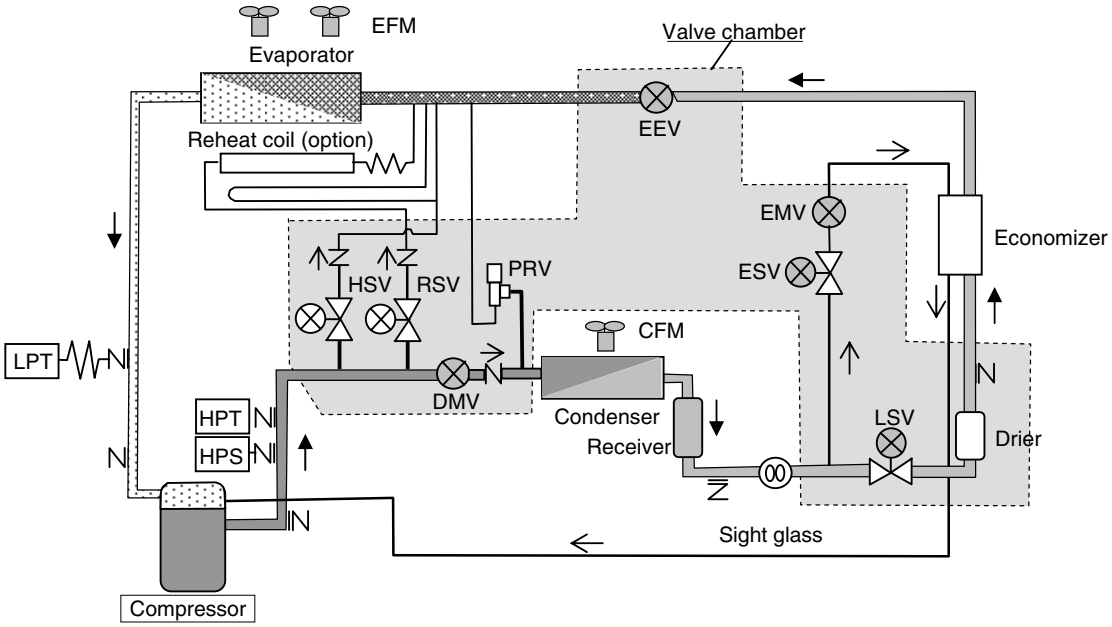
EFM runs at High or Low speed in modulated cooling mode as mentioned above. EFM runs always high speed only or low speed only depending on user's requirement.

●Condenser Fan Motor, CFM

CFM will run with high, low or OFF in response to high pressure (HPT). (High Pressure Control)



Operation Flow in Chilled Mode



1.4.3 Dehumidification Mode (Option)

The dehumidification operation lowers humidity using the reheater that heats the air cooled by the evaporator.
Heat source of the reheater, like the defrosting operation, uses high temperature refrigerant (hot gas) discharged from the compressor.
This control is optional, and available for only the unit equipped with a reheat coil.
The unit equipped with a reheat coil is set to "ON" at factory referring to ＊12 Configuration Setting in paragraph 2.3.

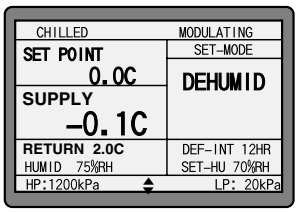
●Setting for dehumidification operation

To execute dehumidification operation, selecting the dehumidification operation set to "ON", "ON-A", or "Bulb" is necessary.

ON: When dehumidification operation is executed
ON-A：When dehumidification operation is executed for the unit without humidity sensor
Bulb: When dehumidification operation is executed in the Bulb mode
OFF: When dehumidification operation is not executed

●Display

After completion of setting, "DEHUMID" is indicated on right.

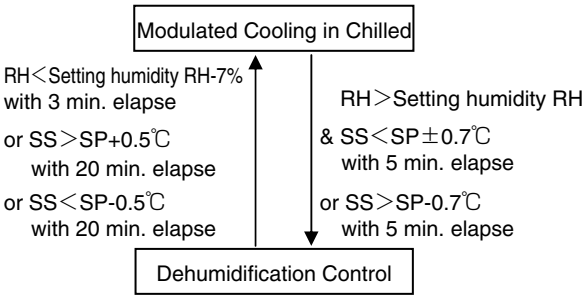


●Dehumidification Operation

Dehumidification operation starts when the following conditions are met during modulated cooling in the chilled mode.

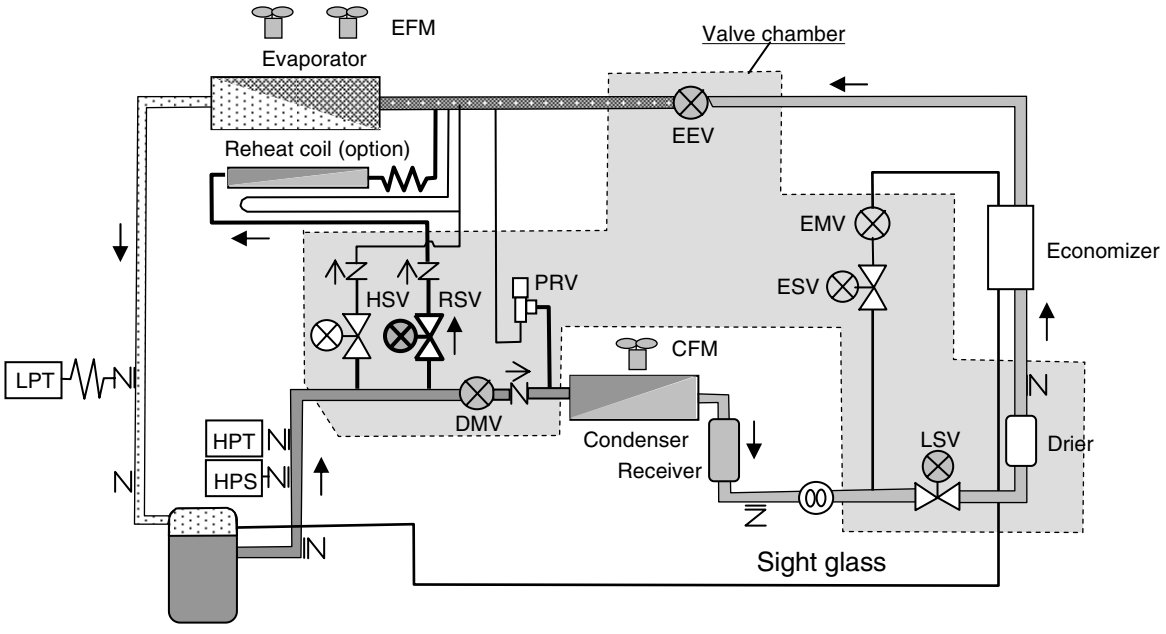
RH＞Setting humidity RH
& SS＜SP±0.7℃ with 5 min. elapse
or SS＞SP-0.7℃ with 5 min. elapse

When dehumidification operation starts, it supplies hot gas to the reheater. EFM runs at high speed.



●Cancellation of Dehumidification operation

1) Set dehumidification operation to "OFF"
2) 48 hours elapse after power OFF
3) F-PTI completed
4) Chilled PTI completed
5) Frozen PTI completed



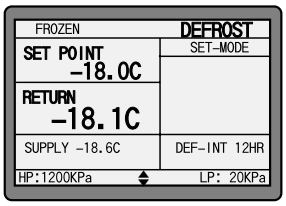
1.4.4 Defrost Mode

●Hot-Gas Defrost System

A hot gas system is adopted for the heat source; I.e. the high temperature and high pressure refrigerant discharged from the compressor is supplied to the evaporator and drain pan for defrosting. Since the ice built on the evaporator is directly and evenly heated up from the inside, defrosting can be efficiently performed.

●Display

"DEFROST" is displayed on the upper right of the screen.



●Defrost operation

The pump-down operation is executed by closing EEV and opening DMV first.

Then the defrost operation will start by closing DMV and opening HSV and hot gas is supplied to the evaporator and drain pan. During defrosting, the compressor speed is modulated in order to maintain the optimum hot gas temperature. (High Pressure Constant Control). The release control (DMV open, CFM ON) or charge control (ESV ON, EMV open) is executed for compressor protection. After termination of defrosting, normal temperature control operation will start without running EFM for the first 3 minute by delay timer.

●In-Range masking

The control temperature temporarily becomes out-rage during defrosting, but the IN RANGE LED is kept ON.

This will avoid misunderstanding that there will be a problem if the IN RANGE LED is turned OFF.

●Defrost Initiation

Pull-down	Short timer	6Hr (12Hr when RS<-15℃)
	Automatic detecting	When supply air temperature does not drop 0.2℃ per 1 hr in frozen mode.
In-Range	Defrost interval setting	"AUTO"
		Defrost interval setting "3, 6, 9, 12 or 24" Hr
	Out-range timer	Executed by 30 min. timer after the control temperature rises out of in-range.
Manual Defrost		Executed by MDS key.

●Defrost Initiation Conditions

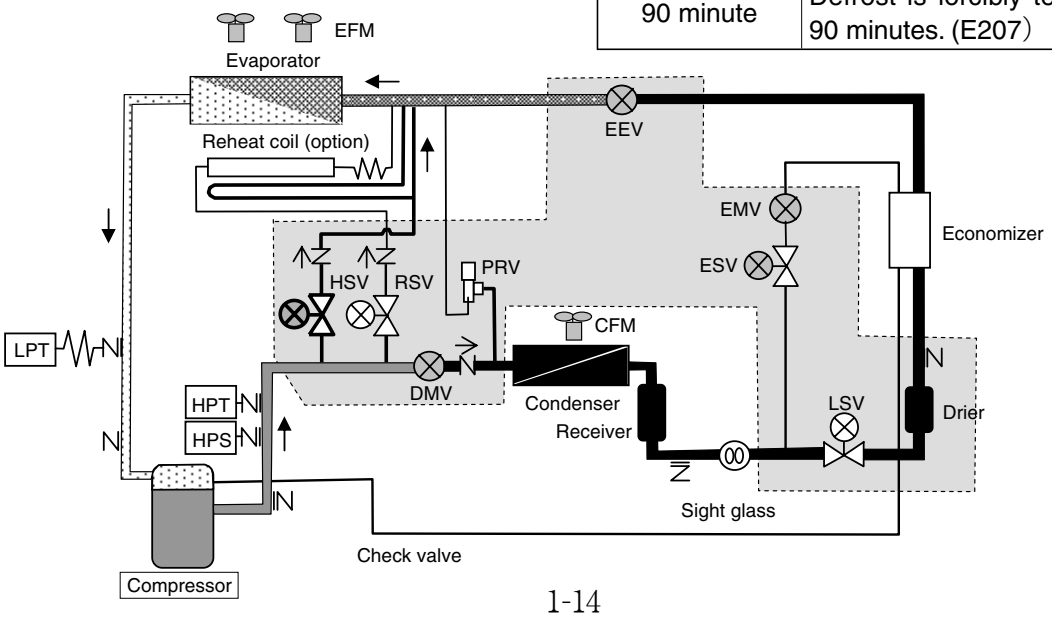
Timer Count-down	Initiation Conditions
Defrost interval (Frozen) Short timer Out-range timer Manual defrost (MDS key)	EOS≦20.0℃
Defrost interval (Chilled)	EOS≦20.0℃ & EIS<5.0 ℃

If the initiation conditions are not met when timer counts down, the defrosting will not be initiated.

If "AUTO" is selected, defrosting will be executed automatically in accordance with the accumulation of ice on the evaporator coil.

●Defrost Termination Conditions

Defrosting Time	Termination Conditions
＜45 minute	EOS≧20℃ & (RS≧5℃ or RS≧5℃ with 10 min. elapse if RS<-20℃ at defrost initiation)
≧ 45 minute	EOS≧30℃ & (RS≧15℃ or RS≧5℃ with 10 min. elapse if RS<-20℃ at defrost initiation)
90 minute	Defrost is forcibly terminated at 90 minutes. (E207)



1.4.5 Compressor, Fan Motor, Valve Function

●Frozen Mode

Component Name			Pull-down	Modulated Control	Cooling Off
Motor	Compressor	CM※7,8	Max.130r/s	20～130r/s	OFF
	Evaporator fan motor	EFM	H（L ※1）	L	L
	Condenser fan motor	CFM	H/L/OFF ※2	H/L/OFF ※2	OFF
Solenoid Valve	Liquid solenoid valve	LSV	ON	ON	OFF
	Economizer solenoid valve	ESV	ON	ON	OFF
	Hot gas solenoid valve	HSV	OFF	OFF	OFF
	Reheat solenoid valve	RSV	OFF	OFF	OFF
Modulation Valve	Electronic expansion valve	EEV※8	2～100%	2～100%	0%
	Economizer modulation valve	EMV※8	2～100%	2～100%	0%
	Discharge modulation valve	DMV※8	100%	100%	100%

------ Notes -----

※1 EFM operates at RS≦-5.0℃

※2 High pressure control

※3 EFM operates H only or L only depend on user requirement

EEV fully open: 420 pls
EMV fully open: 300 pls
DMV fully open: 760 pls

●Chilled Mode

Component Name		Pull-down	Modulated Control	Cooling Off	Heating
Motor	CM※7, 8	Max.130r/s	20～130r/s	OFF	20～95r/s
	EFM	H	H/L ※3	H/L	H/OFF
	CFM	H/L/OFF ※2	H/L/OFF ※2	OFF	OFF（L/H ※5）
Solenoid Valve	LSV	ON	ON	OFF	OFF（ON/OFF ※4）
	ESV	ON	ON/OFF	OFF	OFF（ON ※4）
	HSV	OFF	OFF	OFF	ON（ON/OFF ※4,5）
	RSV	OFF	OFF	OFF	OFF
Modulation Valve	EEV※8	2～100%	2～100%	0%	0%（0～36% ※4）
	EMV※8	2～100%	2～100%	0%	0%（24～24% ※4）
	DMV※8	100%	100%	100%	0%（0～100% ※4）（13～100% ※5）

●Dehumidification mode

Dehumidification
20～95r/s
H
H（L/OFF ※6）
ON
OFF
OFF
ON
2～100%
0%
20～100%

●Defrost Mode

Component Name		Pumpdown	Defrost
Motor	CM※7, 8	Max.50r/s	20～95r/s
	EFM	H/L/OFF ※2	OFF
	CFM	H	OFF（L/H ※5）
Solenoid Valve	LSV	ON	OFF（ON/OFF ※4）
	ESV	OFF	OFF（ON ※4）
	HSV	OFF	ON（ON/OFF ※4,5）
	RSV	OFF	OFF（ON/OFF ※4,5）
Modulation Valve	EEV※8	0%	0%（0～36% ※4）
	EMV※8	0%	0%（0～24% ※4）
	DMV※8	100%	0%（0～100% ※4）（13～100% ※5）

------ Notes -----

※4 Charging control

※5 Release control

※6 CFM may become L/OFF in some case to increase dehumidification capacity.

※7 Compressor may reduce its revolution prior to take protection control when the protection control activated in some reason.

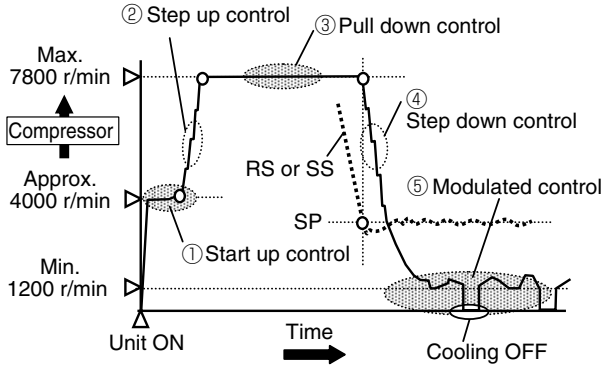
※8 Compressor revolution（r/s）and EEV, EMV, DMV opening（pls）are displayed in panel.（Refer to ※3 Sensor information in paragraph 2.3.）

1.4.6 Common Control

●Compressor running control

Compressor changes speed Min.1200 r/min to Max. 7800 r/min with inverter control.

＊Compressor's revolution will be displayed "rps" in screen.



①Start up control

After unit switch ON, unit goes to modulation valve Initial opening control first and compressor start up control. Start up control is to protect compressor from heavy wet compression when unit stops for long time under low ambient temperature. It is controlled with three steps: (1) pump down operation, (2) operation not in wet conditions 1, (3) operation not in wet conditions 2. Although it normally completes in several minutes, sometimes it takes almost 20 minutes if totalizing the time of guard timer at each step. The compressor runs at medium rotating speed (3800～5700r/min).

②Step up control

After completion of start-up control, the rotation speed will increase to the maximum speed of the pull down operation by having a few steps. It takes approximately two minutes.

③Pull-down control

It runs at the maximum rotating speed (7800 r/min) during pull down. When some cause makes the protection control activated, the rotating speed may decrease, giving a high priority on the protection control.

④Step down control

When the control temperature RS (frozen) or SS (chilled) reaches the setpoint temperature SP, the rotating speed of the compressor will be slowed down gradually. It takes two to three minutes.

⑤Modulated control

When the control temperature RS or SS reaches SP, the modulated control starts, and the compressor controls rotation speed in response to temperature difference between RS (or SS) and SP. (at the speed of as low as 1200 r/min)

The compressor stops when the load becomes light.

●Modulation valve initial operation

Turning the unit switch into ON triggers initial operation of the modulation valves EEV, EMV, and DMV.

EEV and EMV are fully opened (420pls) then fully closed (0pls). DMV is fully opened (760pls), then fully closed (0pls) and fully opened (760pls) again. The change of valve opening can be checked on the LCD screen. Operate keys immediately when the operation screen is displayed. It can be used for the function check of modulation valve coils when in service. (Refer to ※3 Sensor information in paragraph 2.3.)

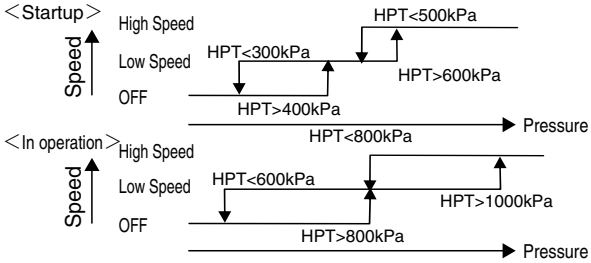
●Compressor protection control

When an operating status phenomenon is detected, rotation speed of the compressor will gradually slow down to protect the compressor. It will resume to normal operation when the operation status returns to normal. Three examples follow.

1. Suppression control of high-pressure increase starts at HPT≧2110kPa.
2. Suppression control of low-pressure decrease starts at LPT≦-50kPa.
3. Suppression control of discharged-gas-temperature increase starts at DCHS ≧117℃ .

●High pressure control

When ambient temperature is low, the high pressure will decrease. Accordingly, the low pressure will decrease too. In order to prevent this situation, optimum pressure is maintained by switching the condenser fan between OFF⇔Low speed⇔High speed based on the high pressure value.



＊ The control values described above may vary depending on operation status.

＊ CFM stops for ten seconds when switching from high speed to low speed.

●Pump down control

Pump down with EEV closed before defrosting initiation, before heating operation, or during the start-up control of the compressor. Collect refrigerant into the receiver, and terminate the pumping-down when the low pressure becomes -40kPa (or EOS-LP(T)>30℃).

●Automatic pump down

Automatic pump down is executed by pumping down with the LSV closed before replacement of dryer or collecting refrigerant. Terminate pump down when low pressure becomes -27kPa. Then open HSV to raise the pressure on the low pressure side slightly higher than atmospheric pressure so that replacing the dryer afterwards can be done easily. (Refer to paragraph 4.2.)

1.5 User Specifications

1.5.1 ASC, Automatic Setpoint Change (Option)

●ASC operation

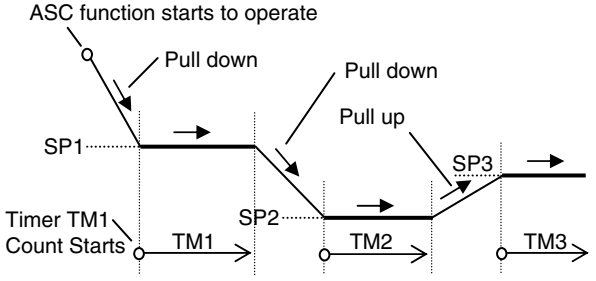
This function works only in the chilled mode. It is necessary to automatically change the set temperature over time for some types of cargoes. ASC function can specify the set temperature and its duration according to the plan.

●Setting for ASC operation

1. The first set temperature SP1 and its duration TM1
2. The second set temperature SP2 and its duration TM2
3. Since, up to 9 patterns are available for setting temperature (i.e.up to SP9). There is no duration limit by the timer for the last set temperature.

＊ For some types of cargoes, dehumidification control settings can be configured as well.

＊ The temperature inside is raised gradually (0.5℃ /Hr) to prevent rapid temperature rise during the pull up operation.



●Access to ASC operation

Access to ※2-5 ASC settings for ASC operation in paragraph 2.3.

●Display

During ASC operation "ASC" is displayed in the SET-MODE area.

Press ▶ or ◀ key to check the ASC status during operation display. The example below that among five sets of temperature settings, the third set is in operation remaining 15 hours to go.

CHILLED	MODULATION
SET POINT 2.0 ℃	SET-MODE
SUPPLY 2.1℃	DEHUMID ASC
RETURN 4.1C HUMID 75%RH	DEF-INT 12HR SET-HU 70%RH
HP:1200kPa ◀▲▼▶	LP: 20kPa

Operation screen

Automatic Setpoint Change				
No.	SP(C)	SHU(%)	Hr	REMAIN
1	-10.0	--	100	0
2	0.0	80	10	0
3	10.0	80	20	15
4	15.0	80	50	
5	20.0	80	LAST	
		◀▲▼▶		

ASC screen

●Cancellation of ASC operation

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

1.5.2 Cold Treatment Transport (Option)

Units equipped with USDA connection port can perform cold treatment transport in conformity with USDA. Regarding cold treatment transport, note the followings.

●Setting of USDA sensors
4：4 USDA sensors connected
3：3 USDA sensors connected
AUTO：Automatically recognizes the number of USDA sensors (Note 1)
OFF：No USDA sensor connected

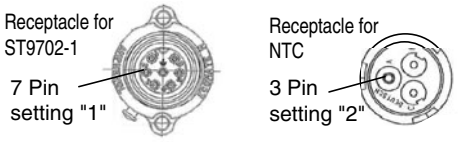
Note 1. USDA sensor can record the temperature ranging from –30.0℃ to +40℃ .
It does not meet the USDA standards.
Refer to paragraph 2.3 ※2-4 USDA setting

●USDA sensor calibration

USDA sensor must be calibrated for each transportation. Connect the PC with installed DCCS software and operate according to procedure. For detail, refer to operation manual for personal computer software.

Checking USDA sensor type setting

USDA sensor type includes "ST9702-1" type and "NTC" type.
If a hugely different calibration value is obtained at calibration, it is possible that USDA sensor type is incorrect.
Check with the drawings below since the connectors vary depending on the sensors.



Access to setting confirmation：※4 configuration settings information in paragraph 2.3.
Access to setting change：※12 configuration set in paragraph 2.3.

●USDA report

Temperature record data during cold treatment transport can be prepared in the format in conformity with USDA standards which is downloadable from the PC that installed DCCS software. For detail, refer to operation manual for personal computer software.

●Checking residual voltage of the rechargeable battery

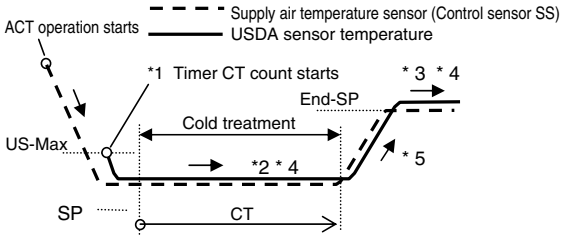
Temperature data must be recorded for at least 72 hours after the power is turned off. Check the residual voltage of the wake-up battery (Rechargeable battery) connected to controller prior to transport.
The residual voltage can be checked in the battery mode (※15 Data information in paragraph 2.3) or during operation (※3 Sensor information in paragraph 2.3).

1.5.3 ACT, Automatic Cold Treatment (Option)

●ACT operation

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

To activate ACT, the following 4 items must be set.
1. Cold treatment period CT (day)
2. Maximum pulp temperature US-Max (℃)
3. Set temperature during cold treatment SP (℃)
4. Set temperature after cold treatment is completed End-SP (℃)



*1 When all USDA sensor temperature has fallen to equal to or below US-Max, CT-day starts to count.
*2 When the temperature exceeds US-Max during cold treatment, which results in data logged, CT counting is cancelled. When the temperature falls to equal or below US-Max again, counting starts to recount cold treatment days (CT day).
*3 After cold treatment is completed, the operation starts at End-SP setting temperature.
*4 SP and End-SP can be changed during ACT operation (CT day and US-Max can not be changed)
*5 The temperature is raised gradually (0.1℃ per hour) to prevent rapid temperature rise.)

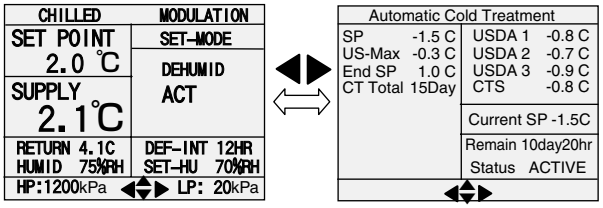
●Access to ACT operation

Access to ※2-6 ACT setting in paragraph 2.3.

●Display during ACT operation

"ACT" is displayed in the SET-MODE area.

Press ▶ or ◀ key to check the ASC status during operation display.



Operation screen　　ACT screen

●Cancellation of ACT operation

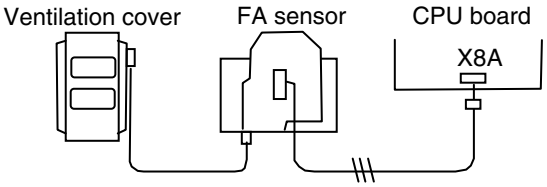
1. Cancellation of ACT operation
   1) When ACT is set to "OFF"
   2) When F-PTI is completed
   3) When Chilled PTI is completed
   4) When Frozen PTI is completed
2. Power off (unit off) during ACT operation and operations when restarting

Stop time	ACT operation when restarting
Less than 1 hour	ACT continues
1 hour or more to less than 48 hours	CT counting is reset and ACT restarts
48 hours or more to less than 72 hours	ACT continues with End-SP.
72 hours or more	ACT cancelled

1.5.4 Ventilator Volume Detection (FA Sensor) (Option)

Sometimes FA (Fresh Air) is taken in with the ventilator opened in the chilled mode. The FA volume can be displayed on the LCD screen or recorded as log with the FA sensor. When the ventilator is opened in the frozen mode, the alarm E807 is displayed.

The wire reel mechanism and position meter are installed inside of the FA sensor. The wire is connected to the ventilator outlet cover so that the movement of the cover opening and closing is converted into the variation of voltage to send to the controller.



Either "Ventilator with insect screen" or "Ventilator without insect screen" is set for the unit installed with FA sensor at factory referring to ※12 configuration set in paragraph 2.3.

●Setting of ventilation volume (FA volume)

Conduct the setting of ventilation volume after the completion of the FA sensor calibration. FA sensor characteristic differs between the ventilator opening and closing. To display accurate FA volume, make sure to follow the procedure of manual. Refer to ※ 18 FA sensor calibration in paragraph 4.1.

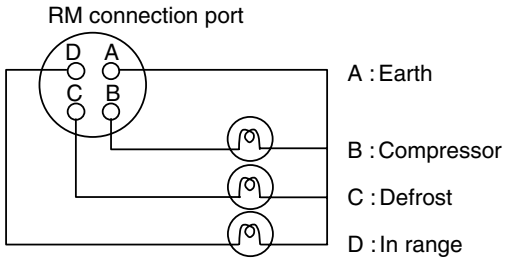
●Event log recording

FA volume (m3/h) is recorded as event log at the following timings.

1. At FA setting, at FA change
2. 0:00 am (Once a day)
3. When the unit starts to run

1.5.5 Remote Monitoring Receptacle (Option)

Installing the connection port for remote monitoring enables remote monitoring of operating conditions for compressor, defrost and in range.



1.5.6 Battery Mode

When the unit is not connected to the power source, following work and data check can be done with battery mode function.
In this case, the power source is wake-up battery (Rechargeable battery) connected to the controller.

●Setting functions

Unit ON/OFF	Defrost interval
Temperature setting	Humidity setting

●Display function

Return air temperature display (RS)
Supply air temperature display (SS)
High pressure (HPT)
Low pressure (LPT)
USDA 1, USDA 2, USDA 3 temperature
CTS temperature
Ventilation volume (FA)
Remaining battery voltage
PTI record (Latest 5 times PTI operation day)
Software version

●Alarm Record

Display alarm generated for maximum 180 days.

●Trip Chart

Indicate trip chart in a graphic display for maximum 90 days.

●USB Menu

Data download or upload is possible by connecting USB.

1.5.7 Information Interchange with Personal Computer

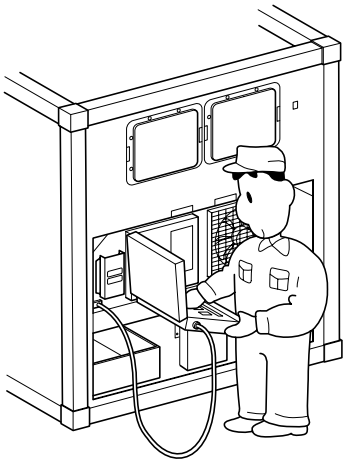
The electronic controller has an internal memory function to record the set point temperature, refrigeration temperature, operation mode, occurrence alarm and the report of automatic PTI during transportation in addition to the normal operation control.

Data download

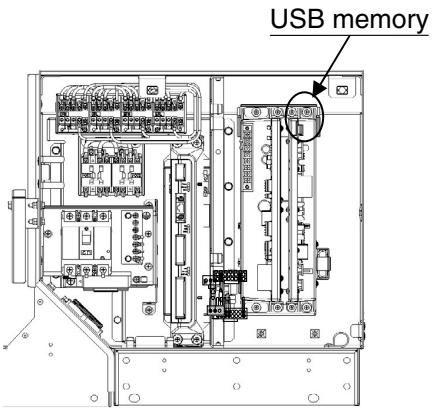
Data records can be downloaded by connecting a PC to the communication port. To download the FULL TRIP data which contains most large data, connect a USB memory to the connection port on the controller.

Software upload

The software in the controller can be updated by uploading software using a PC or USB memory.
The use of a PC also enables the container number, cargo description, destination and other information to be sent to and memorized in the controller.



PC connected to the communication port



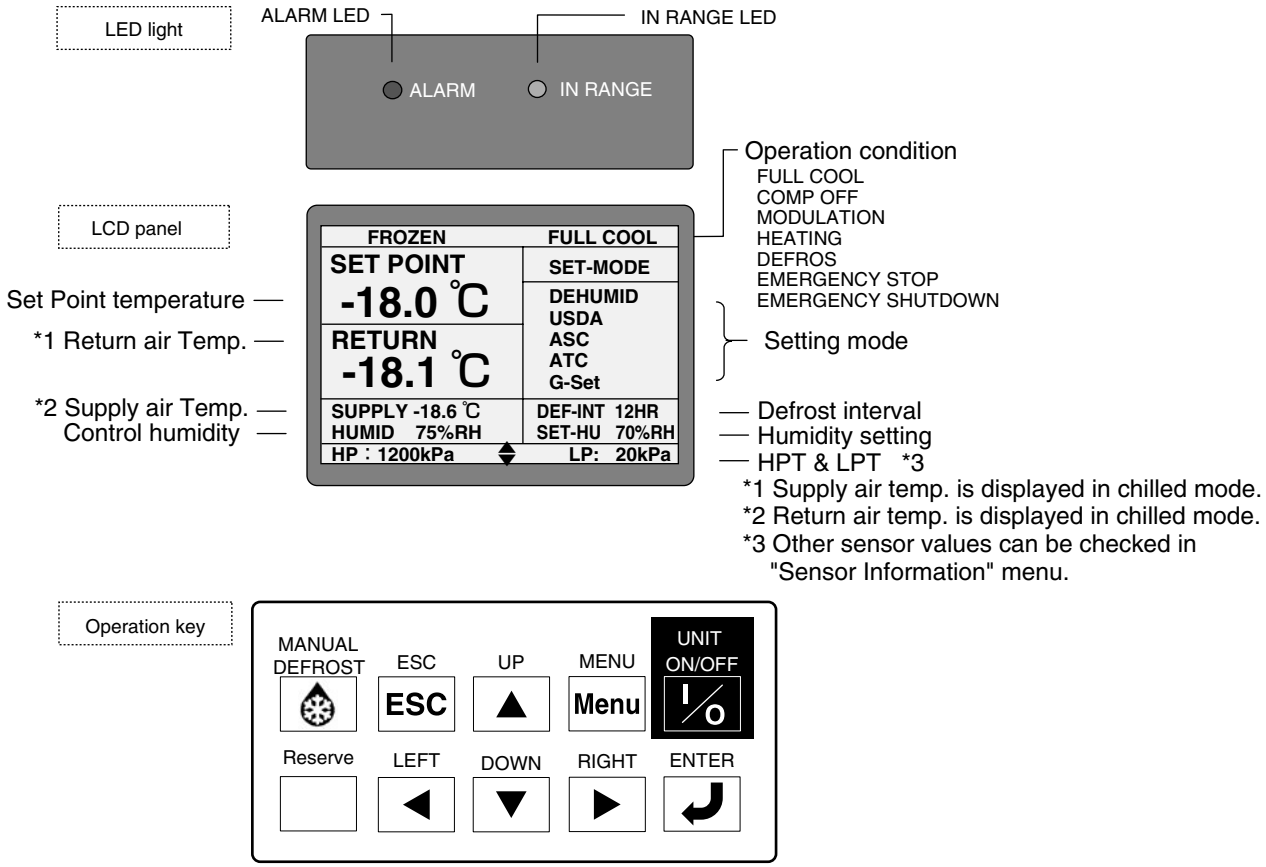
USB memory connected to the controller

Description			PC connection	USB memory connection
Download	Trip report	FULL TRIP	✓	✓ All data are downloaded in a lump.
		LAST ONE TRIP	✓	
		TRIP BY DATE	✓	
		TRIP BY TRIP	✓	
	PTI report		✓	
	USDA report		✓	
	Monitoring report		✓	✓
Upload	Software upload		✓	✓
	Container No. etc. upload		✓	

Note 1. Download the file with authentication into a USB memory from the web site.
2. See ※14-1 and ※14-2 menu in paragraph 2.3 for the procedure of downloading and uploading by connecting a USB memory.
3. When you see the downloading data from USB flash memory by PC, install the DCCS software (ver. 9 series) in advance.
4. Refer to the "Operation manual for personal computer software" for the procedure for downloading and uploading via a PC.

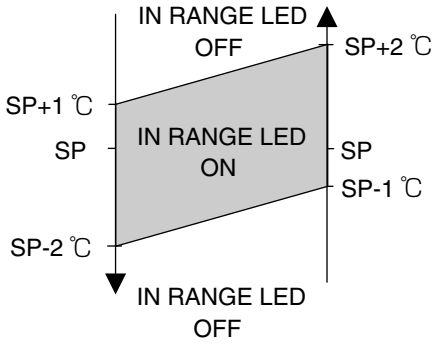
Chapter 2 Controller

2.1 Operation Panel



●IN RANGE LED

Lights when the control temperature is in range.



●ALARM LED

ALARM LED blinks in case of F alarms or E807 and E304.

●Function of operation key

UNIT ON/OFF

To start or to stop the unit operation. 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.

UP DOWN

1. Scroll up or down to select an item
2. Determine the setting item

RIGHT LEFT

1. Scroll right or left to select an item
2. Move to next or previous screen

MENU

1. To move to Battery Mode display when no power is supplied
2. To move to Initialize Menu display after unit ON/OFF key "ON"
3. To move to Menu display while the unit is in operation

ENTER

1. To determine the setting contents

ESC

1. To cancel the setting value or return to former display

MANUAL DEFROST

1. To carry out manual defrost operation

2.2 Controller Functions List

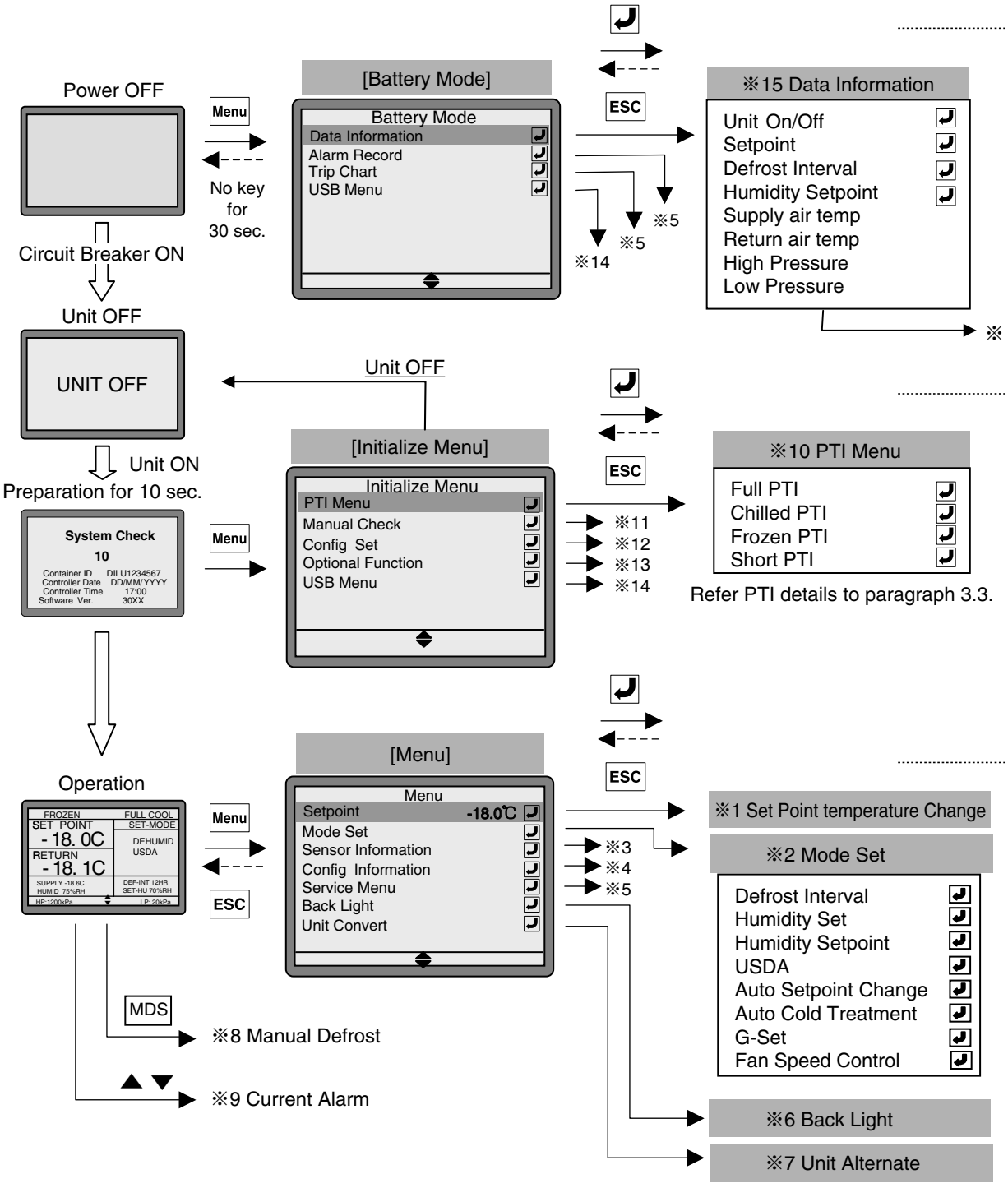
The controller installed in this unit has following functions. Access to the pertinent item in following pages for detail.

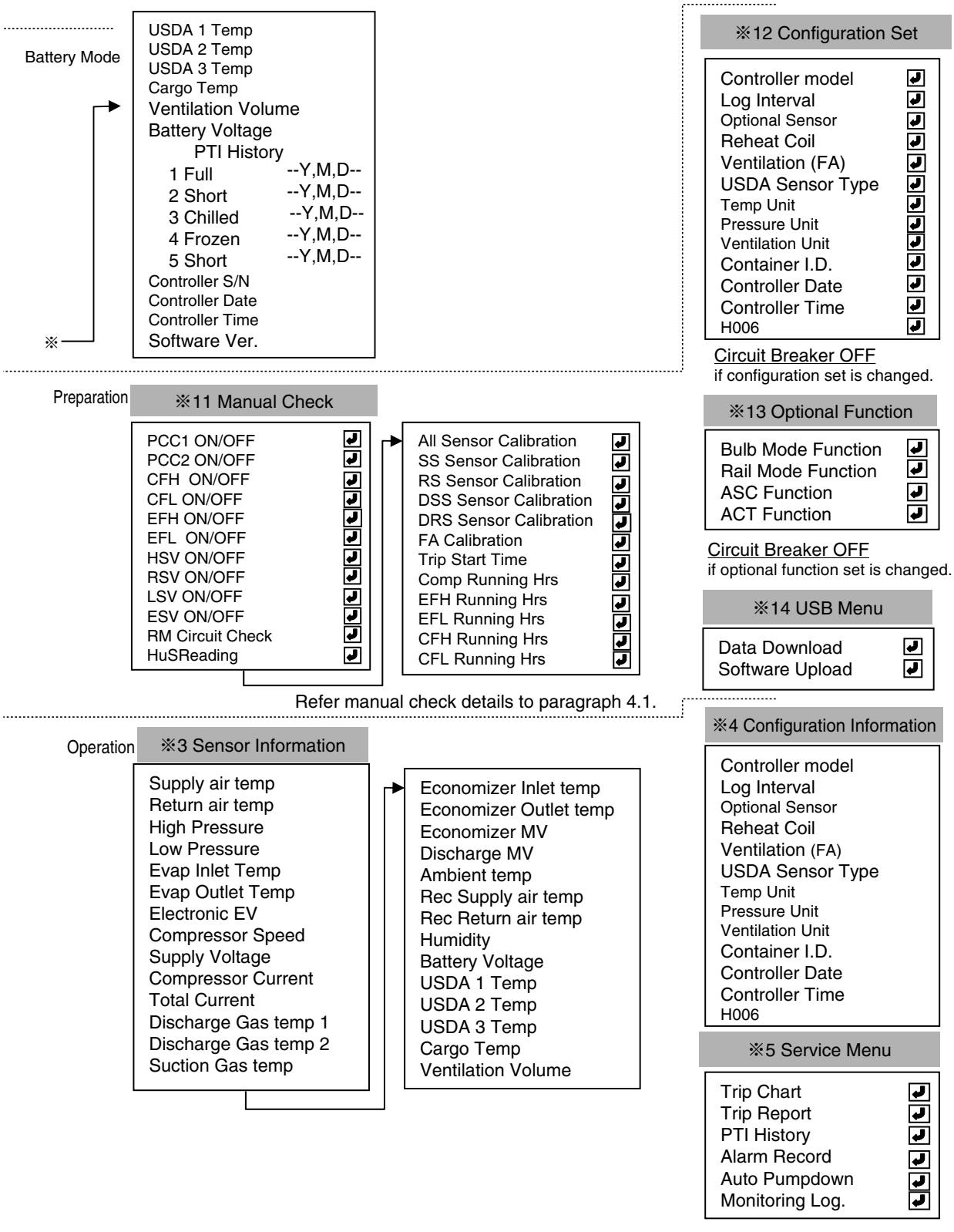
Items	Function			Paragraph No.
Setting	Temperature SP, Humidity SP			2.3 ※1, 2-2, 2-3
	Defrost Interval		AUTO or 3, 6, 9, 12 or 24Hr	2.3 ※2-1
	ASC (Automatic Set-point Change)			2.3 ※2-5
	USDA			2.3 ※2-4, 1.5.2
	ACT (Auto Cold Treatment)			2.3 ※2-6, 1.5.3
	Fan Speed Control			2.3 ※2-8
	G-Set (Power limit setting for Gen set operation)			2.3 ※2-7
PTI	Short PTI, Chilled PTI, Frozen PTI, Full PTI			3.3
Service	Manual Check	ON/OFF check	PCC1, PCC2, CFH, CFL, EFH, EFL with motor current display HSV, RSV, LSV, ESV	4.1 ※1～※10
			RM Circuit Check	4.1 ※11
		HuS Reading		4.1 ※12
		Sensor Calibration (Option)	SS, DSS, RS, DRS, FA	4.1 ※13～※18
		Trip Start Time and reset		4.1 ※19
		Running hours and reset	CM, EFH, EFL, CFH, CFL	4.1 ※20～※24
	Sensor Information	(Air) SS, DSS, RS, DRS, Hus, AMBS (Cargo) USDA1, 2, 3, CTS (Ref.) EIS, EOS, DCHS1 & 2, SGS, Eco-In, Eco-Out (Ventilation) FA (Pressure) HPT, LPT (Power) Battery Voltage, Supply Voltage, Total & Comp. Current		2.3 ※3
	Service Menu	Trip Chart, Trip Report, PTI History, Alarm Record		2.3 ※5
		Automatic Pump-down		2.3 ※5-5
		Monitoring Data logging		2.3 ※5-6
	LCD Back Light ON/OFF			2.3 ※6
	Unit Convert			2.3 ※7
	Manual Defrost			2.3 ※8
	Current Alarm Display			2.3 ※9
Data Download, Software Upload using USB				2.3 ※14
Battery Mode	Data Information	Setting	Unit ON/OFF SP, Humidity SP, Defrost Interval	2.3 ※15
		Sensor Information	SS, RS, USDA1, 2, 3, CTS, FA, HPT, LPT Battery Voltage	2.3 ※15
		PTI History, Software Version		2.3 ※15
	Alarm Record, Trip Chart			2.3 ※15
	Data Download, Software Upload using USB memory			2.3 ※14

2.3 Operation Procedure

Using the operation keys on the operation panel, the following settings and sensor information, etc. are displayed.

※1 Set Point temperature Change
※2 Mode Set
※3 Sensor Information
※4 Configuration Information
※5 Service Menu
※6 Back Light
※7 Unit Alternate
※8 Manual Defrost
※9 Current Alarm
※10 PTI Menu
※11 Manual Check
※12 Configuration Set
※13 Optional Function
※14 USB Menu
※15 Data Information

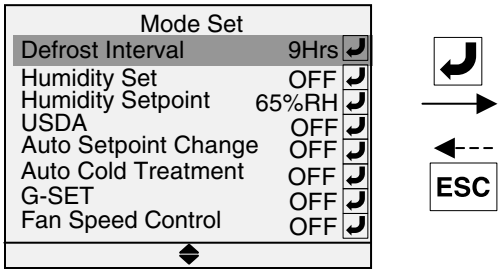



Battery Mode
※
USDA 1 Temp
USDA 2 Temp
USDA 3 Temp
Cargo Temp
Ventilation Volume
Battery Voltage
PTI History
1 Full --Y,M,D--
2 Short --Y,M,D--
3 Chilled --Y,M,D--
4 Frozen --Y,M,D--
5 Short --Y,M,D--
Controller S/N
Controller Date
Controller Time
Software Ver.
※12 Configuration Set
Controller model
Log Interval
Optional Sensor
Reheat Coil
Ventilation (FA)
USDA Sensor Type
Temp Unit
Pressure Unit
Ventilation Unit
Container I.D.
Controller Date
Controller Time
H006
Circuit Breaker OFF
if configuration set is changed.
Preparation
※11 Manual Check
PCC1 ON/OFF
PCC2 ON/OFF
CFH ON/OFF
CFL ON/OFF
EFH ON/OFF
EFL ON/OFF
HSV ON/OFF
RSV ON/OFF
LSV ON/OFF
ESV ON/OFF
RM Circuit Check
HuSReading
All Sensor Calibration
SS Sensor Calibration
RS Sensor Calibration
DSS Sensor Calibration
DRS Sensor Calibration
FA Calibration
Trip Start Time
Comp Running Hrs
EFH Running Hrs
EFL Running Hrs
CFH Running Hrs
CFL Running Hrs
※13 Optional Function
Bulb Mode Function
Rail Mode Function
ASC Function
ACT Function
Circuit Breaker OFF
if optional function set is changed.
※14 USB Menu
Data Download
Software Upload
Refer manual check details to paragraph 4.1.
Operation
※3 Sensor Information
Supply air temp
Return air temp
High Pressure
Low Pressure
Evap Inlet Temp
Evap Outlet Temp
Electronic EV
Compressor Speed
Supply Voltage
Compressor Current
Total Current
Discharge Gas temp 1
Discharge Gas temp 2
Suction Gas temp
Economizer Inlet temp
Economizer Outlet temp
Economizer MV
Discharge MV
Ambient temp
Rec Supply air temp
Rec Return air temp
Humidity
Battery Voltage
USDA 1 Temp
USDA 2 Temp
USDA 3 Temp
Cargo Temp
Ventilation Volume
※4 Configuration Information
Controller model
Log Interval
Optional Sensor
Reheat Coil
Ventilation (FA)
USDA Sensor Type
Temp Unit
Pressure Unit
Ventilation Unit
Container I.D.
Controller Date
Controller Time
H006
※5 Service Menu
Trip Chart
Trip Report
PTI History
Alarm Record
Auto Pumpdown
Monitoring Log.

※1 Set Point temperature Change

1. Press [▼] [▲] key to change Set Point temperature. Press [↵] key to determine.
   Set Temp. Range : -30.0℃ to +30.0℃ .

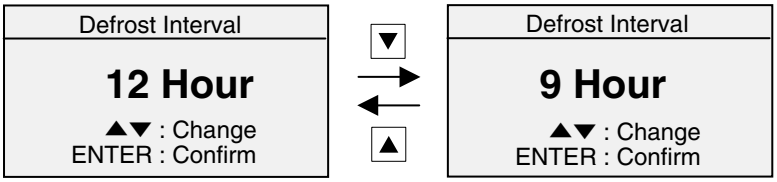
※2 Mode Set



※2-1 Defrost Interval Set
※2-2 Humidity Set
When Reheat Coil is set to "OFF" in ※12 Configuration Set, this function will not work.
※2-3 Humidity Set
※2-4 USDA Set
※2-5 Automatic set point change
When ASC function is set to "OFF" in ※13 Optional Function, this function will not work.
※2-6 Automatic Cold Treatment Set (Option)
When ACT function is set to "OFF" in ※13 Optional Function and USDA is "OFF" in ※2-4 USDA setting, this function will not work.
※2-7 G-SET Set
※2-8 Fan Speed Control

※2-1 Defrost Interval Set

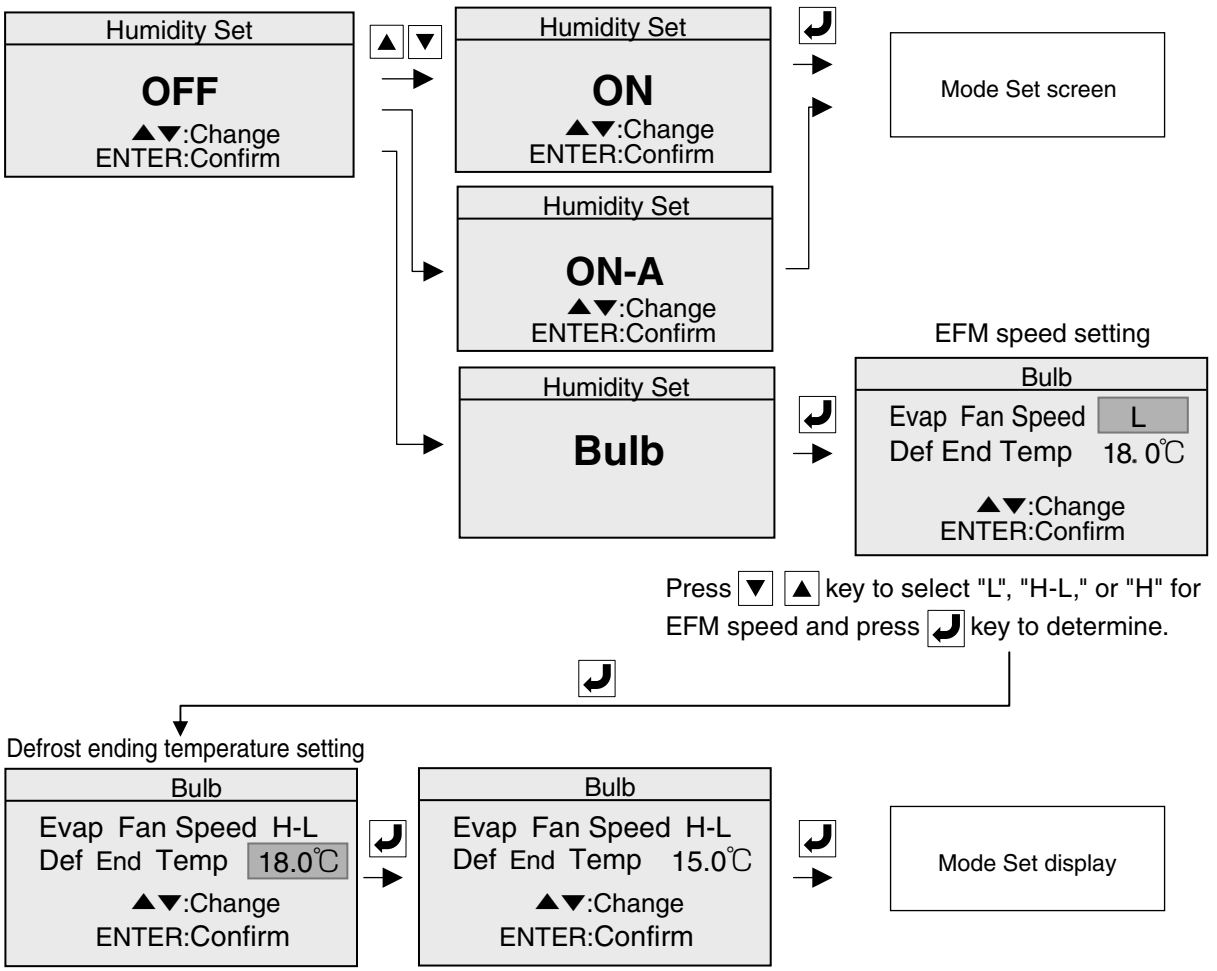
1. Press [▼] [▲] key to select defrost interval and press [↵] key to determine.
   Time setting: 3, 6, 9, 12, 24 Hr
   Auto setting: AUTO (Defrosting will executed automatically in accordance with the state of frost formation occurred on the evaporator coil.)



※2-2 Dehumidification Operation Set

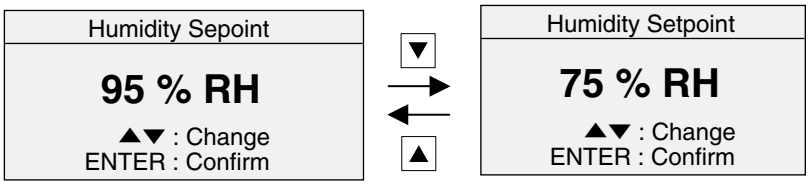
1. Press [▼] [▲] key to select "ON", "ON-A", "Bulb" or "OFF" and press [↵] key to determine.
   ON: Dehumidification operation is conducted. (For unit equipped with humidity sensor)
   ON-A : Dehumidification operation is conducted. (For unit not equipped with humidity sensor)
   Bulb: When dehumidifying (the Bulb mode is set to "ON" in ※13 Optional Function)
   OFF: When dehumidification operation is not conducted

Note: Either "ON" or "ON-A" is displayed depend on unit.



※2-3 Humidity Set

1. Press ▼ ▲ key to select Humidity Setting and press key to determine.
   Humidity Setting：50～95%RH

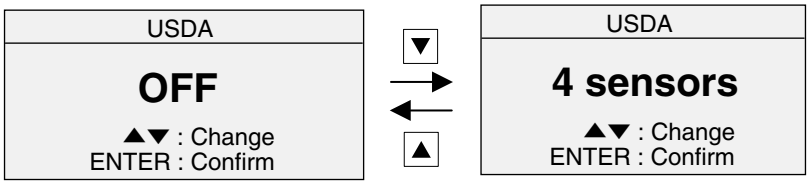


※2-4 USDA Set

1. Press ▼ ▲ key to select number of sensors and press key to determine.

4 sensors	：4 USDA sensors connected
3 sensors	：3 USDA sensors connected
AUTO	：Automatically recognize the number of USDA sensors connected (Note 1)
OFF	：No USDA sensor connected

Note 1: To measure the temperature inside or cargo temperature for the purposes other than cold treatment transport, USDA sensor can record the temperature ranging from –30.0 ℃ to +40 ℃ . Do not use it for cold transport treatment because it does not meet the USDA standards.



※2-5 ASC, Automatic set point change (Option)

This function can change the set temperature automatically over time (for details, refer to paragraph 1.5.1).

1. Press ▼ or ▲ key to select "ON" or "OFF".
   ON : Executing the automatic set point change
   OFF : Not executing the automatic set point change
2. Select "ON" and press ↵ key to determine, then the previous setting screen appears (Fig. 1).

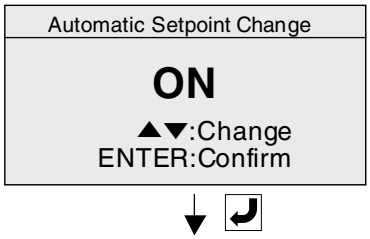


Fig. 1 (Previous setting screen)

1) The temperature can be set up to 9 times.
2) Range of the setting temperature SP: -30.0 ℃ to ＋30.0 ℃
3) DHU setting: "ON" when a dehumidification operation is executed, "OFF" when a dehumidification operation is not executed.
4) Range of the setting humidity SHU: 50% to 95% RH when DHU setting is "OFF" , "--" appears.
5) Range of operating time: Last, 1 to 999 Hr
   Select "Last" for the last operation so that it will be a continuous operation.

3. ASP Setting Procedure: See the case example below.

No	SP℃	DHU	SHU (%)	Hr
1	15.0	ON	80	48
2	10.0	ON	75	72
3	0.0	OFF	--	240
4	10.0	ON	75	LAST

3-1. Set SP, DHU, SHU or Hr for the first settings in the following ways.
   1) Press ▼ ▲ key to change setting to "15.0 ℃ ", the first SP, and press ↵ key to determine. (Fig. 2)
   2) Press ▶ key to move next setting item, SHU, and press ↵ key, then press ▼ ▲ key to change setting to "80%", the first SHU, and press ↵ key to determine. (Fig. 3)
   3) Press ▶ key to move next setting item, Hr, and press ↵ key, then press ▼ ▲ key to change setting to "48", the first operating Hr, and press ↵ key to determine. (Fig. 3)

3-2. Similarly, set the second and the third settings for SP, DHU, SHU or Hr (Figs. 4 and 5).

3-3. To set the fourth setting, select "LAST" for operation time and press ↵ key (Fig. 6).

3-4. Press ▼ key to move to "START", and press ↵ key. The next screen (Fig.7) will be appeared. (Fig. 6 ⇒ Fig. 7)

3-5. Press ↵ key to start an ASC operation (Fig 7).

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	21.0	ON	81	901
2	22.0	ON	82	902
3	23.0	ON	83	903
4	24.0	ON	84	904
5	25.0	ON	85	905
6	26.0	ON	86	906
7	27.0	ON	87	907
8	28.0	ON	88	908
9	29.0	ON	89	START ↵

▲▼◀▶ :Select Enter :Chg Set

Fig. 2 ↵ First time

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	15.0	ON	81	901
2	22.0	ON	82	902
3	23.0	ON	83	903

Fig. 3 ↵

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	15.0	ON	80	48
2	22.0	ON	82	902
3	23.0	ON	83	903

Fig. 4 ↵ Second time

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	15.0	ON	80	48
2	10.0	ON	82	902
3	23.0	ON	83	903

Fig. 5 ↵ Third time

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	15.0	ON	80	48
2	10.0	ON	75	72
3	0.0	OFF	--	240

Fig. 6 ↵ Fourth time

Auto Setpoint Change

No	SP ℃	DHU	SHU(%)	Hr
1	15.0	ON	80	48
2	10.0	ON	75	72
3	0.0	OFF	--	240
4	10.0	ON	75	LAST
5				
:				
9				START ↵

Fig. 7 ↵

Auto Setpoint Change

Press
Enter to Start
ESC to Cancel

※2-6 ACT, Automatic Cold Treatment

When cold treatment is completed during USDA transport, this ACT function switches the temperature to the preset temperature automatically. (See paragraph 1.5.3 for the detail.)

1. Press ▼ or ▲ key to select either "ON" or "OFF".
   ON：To enable automatic change of setting temperature
   OFF：To disable automatic change of setting temperature
2. When selecting "ON" and determining by pressing ↵ key, the previous setting screen appears (Fig. 1).

   The following four settings are required.
   1. USDA CT days (1 to 99 days)
   2. USDA Max. Temperature (-4.9 to 30.0 ℃)
   3. USDA Setpoint SP (-4.9 to 30.0 ℃)
   4. Final-SP (-4.9 to 30.0 ℃) after USDA CT

3. ACT setting procedure: See the case example below.

CT	：10 days
USDA Max.	：1.0 ℃
Setpoint	：0.0℃
Final-SP	：3.0℃

3-1. Set CT to 10 days.
Press ▼ ▲ key to change the previous CT to "10" days, the first SP, and press ↵ key to determine. (Fig. 2)

3-2. Press ▶ key to move to next setting item USDA Max, then press ↵ key, scroll with ▼ ▲ keys until USDA Max turns to "1.0" ℃ and press ↵ key to determine. (Fig. 3)

3-3. Similarly, set Setpoint to "0.0" ℃ and Final-SP to "3.0" ℃. (Fig. 3)

4. Finally, press ↵ key to start ACT operation. (Fig. 4)

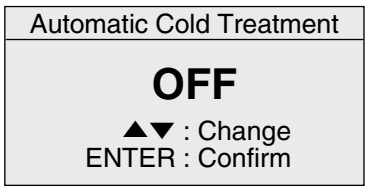


Fig. 1 Previous setting screen

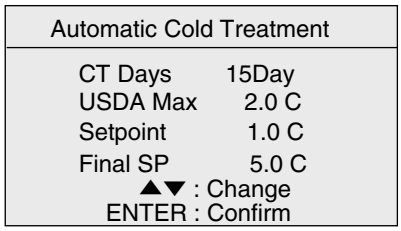


Fig. 2

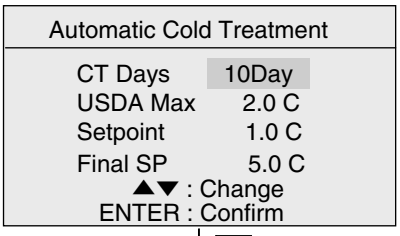


Fig. 3

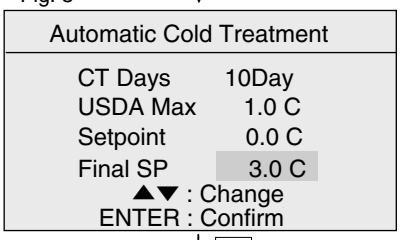
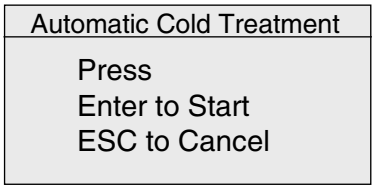
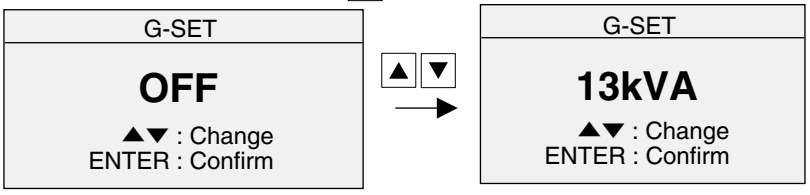


Fig. 4



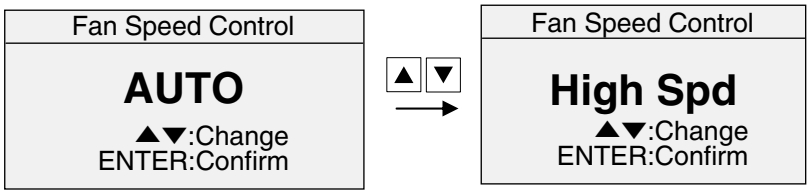
※2-7 G-set set

1. Press ▼ ▲ key to select total power consumption and press ↵ key to determine.
   OFF", "11", "12", "13", "14" or "15" kVA



※2-8 Fan Speed Control

1. Press ▼ ▲ key to select "OFF" or "ON", and press ↵ key to determine.



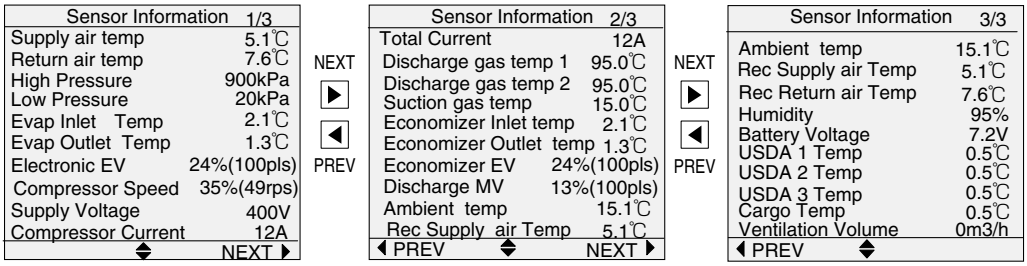
AUTO ：During chilled operation, the evaporator fan runs at high speed/low speed.

High Spd ：During chilled operation, the evaporator fan runs at high speed.

※3 Sensor Information

The current values in each sensor incorporated in this function unit are displayed.

1. Press [◀] [▶] key for page change.
   Press [▼] [▲] key to scroll.
2. Press [ESC] key for 1 second to return to Menu screen or press [ESC] key for 3 seconds to return to operation screen.



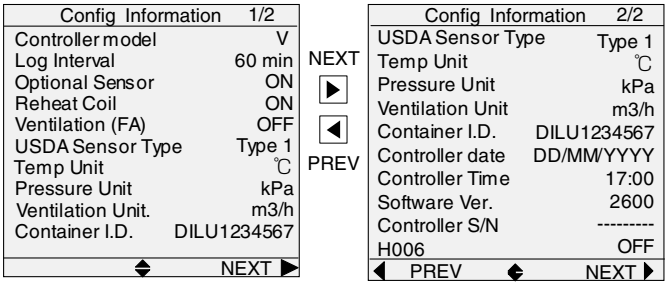
Notes 1. "ERROR" is displayed in the case of sensor failure.

2. If Humidity Set is "OFF" or "ON-A", Humidity "NA" is displayed.
3. If USDA is set "OFF", USDA 1, 2, 3 or Cargo Temp "NA" is displayed.
4. If USDA is set "AUTO", USDA 1, 2, 3 or Cargo Temp "NA" is displayed even if USDA sensor is failed.
5. If Ventilation (FA) is set "OFF", Ventilation Volume "NA" is displayed.

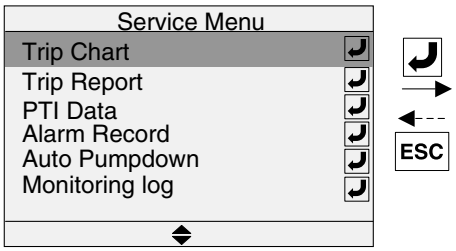
※4 Configuration Information

This function confirms the settings configured in ※12 Configuration Set.

1. Press [◀] [▶] key for page change.
   Press [▼] [▲] key to scroll.
2. Press [ESC] key for 1 second to return to Menu screen or press [ESC] key for 3 seconds to return to operation screen.



※5 Service Menu

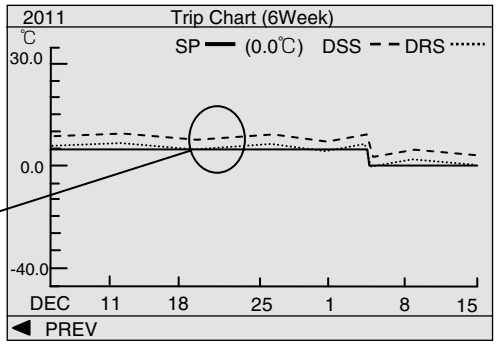


※5-1 Trip Chart
※5-2 Trip Report
※5-3 PTI History
※5-4 Alarm Record
※5-5 Automatic Pumpdown
※5-6 Monitoring Log (Start, Stop)

※5-1 Trip Chart

The Trip Chart displays the trip data for up to 90 days starting from the present in a graphic form. (Fig. 1)
Temperature range is 35 ℃ to -40 ℃ , Date span is 6 Week.
Press ◀ key to scroll for the past data.

Fig. 1 Initial screen



Zoom in example
(See below.)

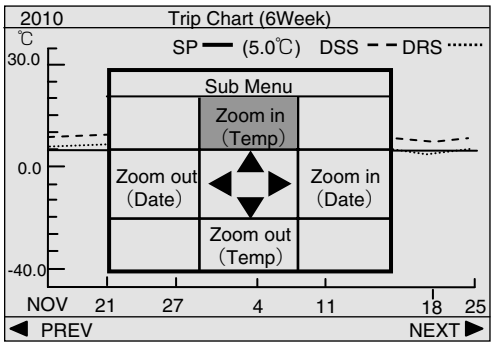
Zoom in/Zoom out function

Press MENU key, then Zoom in/Zoom out screen appears. (Fig.2)
＜Horizontal axis: Number of days＞
(Default) Zooming in or out from 6 weeks to 10 days, 5 days, 2.5 days, 1 day or vice versa (by ▶ ◀ keys).

＜Vertical axis: Temperature＞
(Default) Zooming in or out from 75 ℃ (35 to -40 ℃) to 30 ℃ , 20 ℃ , 10 ℃ , 4 ℃ or vice versa (by ▲ ▼ keys).

Menu

Fig. 2

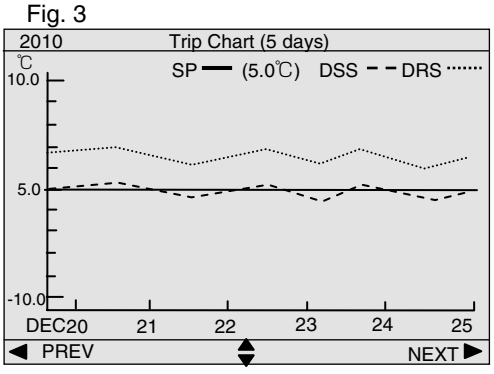


Zoom in or out for date ▶ ◀ ▲ ▼ Zoom in or out for Temperature

Zoom in example

Fig. 3 shows an example of zooming in the circled area in the Fig. 1. (Date span: 5 Day, Temperature range: 20 ℃)
The procedure follows.

Fig. 3



1. Scroll the span until the 25DEC, the day before the circled portion, appears at the right end on the screen by pressing ◀ key.
2. Press MENU key to show the Zoom in/Zoom out screen.
3. Zoom in the Date span from 6 Week into 5 Day.

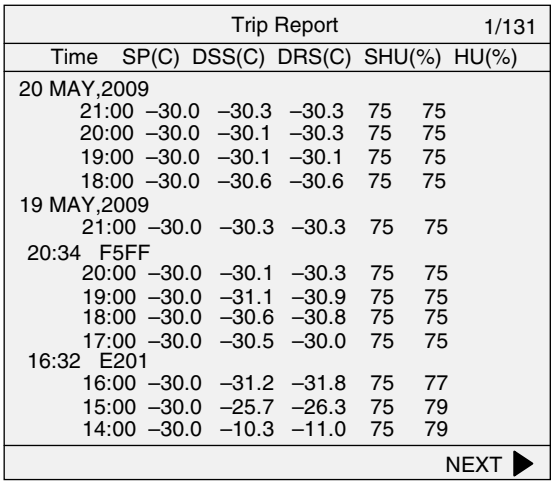
3-1. Press ▶ key to zoom in the Day span from 6 Week into 10 Day and press ↵ key.

3-2. Press MENU key again to show the Zoom in/ Zoom out screen, then zoom in from 10 Day to 5 Day using ▶ key, then press ↵ key.

4. Zoom in the temperature range from 35 to -40℃ to 10℃ .
Similar to the Date span, press MENU, ▲ , ↵ key in the following order: 35 to 40 ℃ ⇒ 30 ℃ ⇒20 ℃⇒10 ℃ .

※5-2 Trip Report

The Trip report shows the trip data for up to 12 weeks starting from the present.
Logging interval is the value that is set in the configuration set.
To be displayed as an event when an alarm occurs.

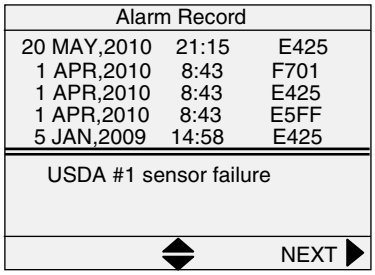


※5-3 PTI History

Shows up to five sets of the latest successful PTI History in the past.

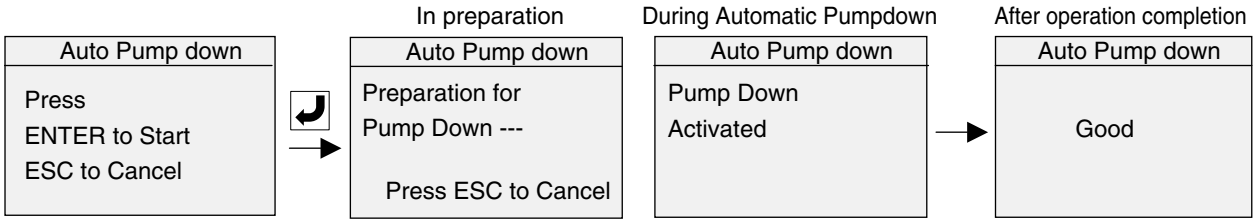
※5-4 Alarm Record

Display the alarm generated at the present and in the past maximum 12 weeks.



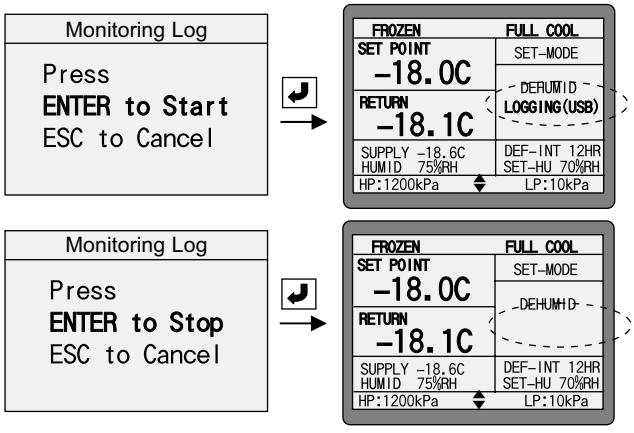
※ 5-5 Automatic Pumpdown

1. Press [↵] key to start Automatic Pumpdown.
   "Preparation for ···" is displayed if it is started soon after I/O switch ON since start-up control is activated.
   ＊"Pump Down Activated" is displayed during Automatic Pumpdown operation
2. After the operation is completed, "GOOD" is displayed. Alarm E202 (Automatic pumpdown failure) is displayed when the automatic pumpdown is failed. Turn I/O switch OFF to complete pumpdown.



※ 5-6 Monitoring Log

1. Insert USB memory. (CPU board)
2. Press [↵] key to start Monitoring Log. During Monitoring Log, "LOGGING (USB)" is displayed on the operation screen.
3. To complete the Monitoring Log, access to operation screen ⇒ Service menu ⇒ Monitoring Log and execute "Enter to Stop".



Caution !!
Disconnect USB memory after confirmation of "LOGGING (USB)" display off.

※6 Back Light (Adjustment of LCD screen brightness)

Selection of Back Light function

ON ：Back light function available
AUTO：Back light function available. (The back light is turned off in the absence of key operation for 5 minutes.)
OFF ：Back light off

1. Press ▼ ▲ keys to select "ON", "AUTO", or "OFF" and press ↵ key to determine (Fig. 1).
   ※When selecting "ON" or "AUTO", the next screen, Brightness adjustment, is displayed (Fig. 2).
   ※When selecting "OFF", the screen returns to the Menu screen by pressing ↵ key and the back light is turned off.

Brightness Adjustment

2. Adjust brightness by using ▼ ▲ keys and determine the selection by pressing ↵ key. (Fig. 3) Brightness：1, 2, 3, 4, 5, 6, 7 (Max)
3. Returns to the Menu screen by using ↵ key.

Fig. 1

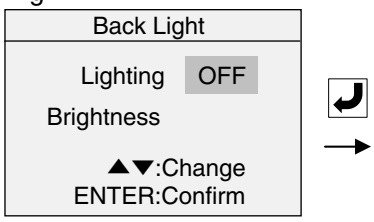


Fig. 2

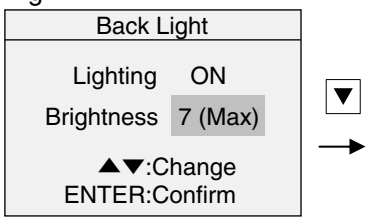
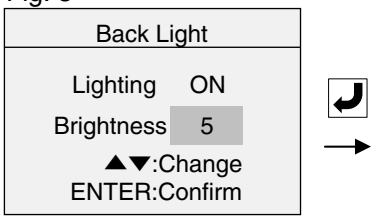


Fig. 3



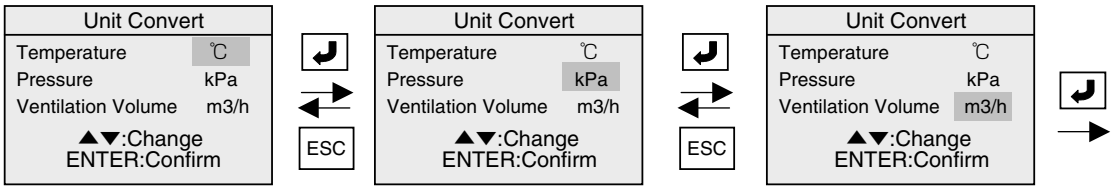
Note: The back light function will not be activated in the battery mode.

※7 Unit Alternate

1. Temperature Alternate
Press ▼ ▲ key to select "℃ " or "°F" and press ↵ to determine.

2. Pressure alternate
Press ▼ ▲ key to select "kPa", "PSI" or "Bar" and press ↵ to determine.

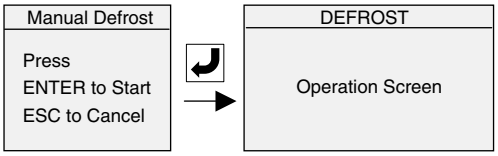
3. Ventilation Volume Alternate
Press ▼ ▲ key to select "m3/h" or "CFM" and press ↵ to determine.



※8 Manual Defrost

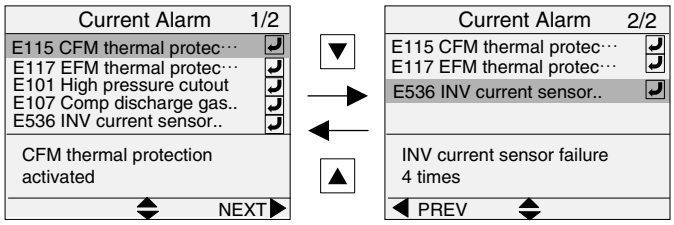
1. Press MDS key to activate manual defrosting.
   ＊"DEFROST" is displayed on the top of Operation display during Manual Defrost operation.

During Manual Defrost operation



※9 Current Alarm

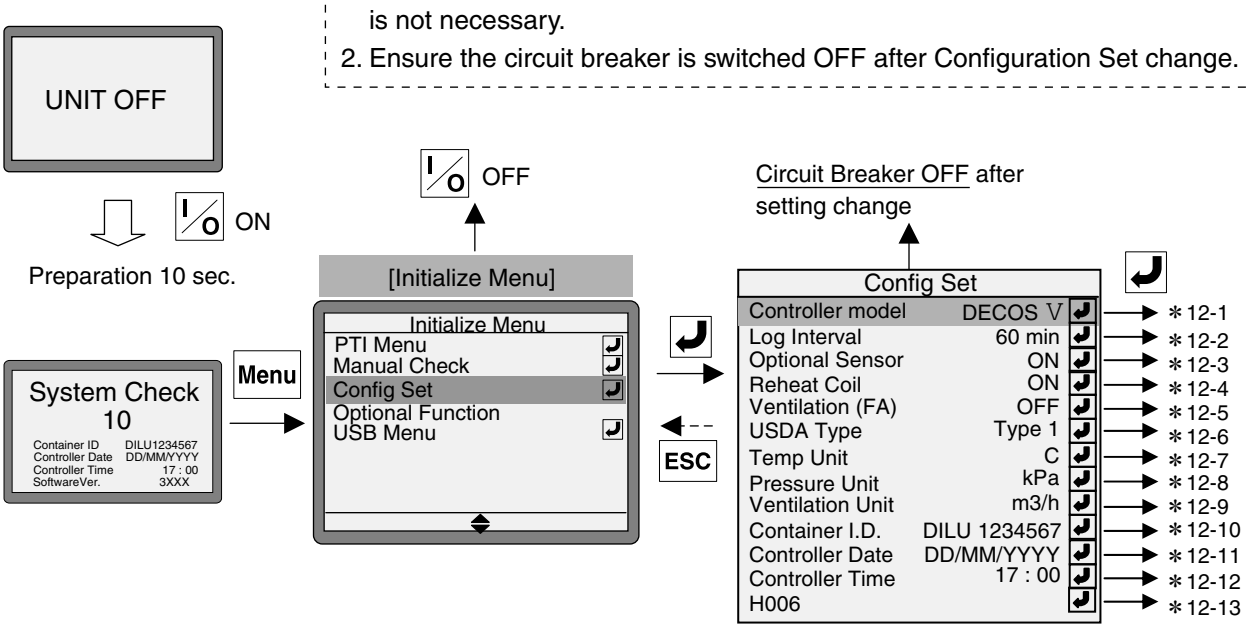
1. Press ▼ ▲ keys to display current alarm.
   ＊When there are many current alarms, they will be displayed on more than one page.
   ＊"No ALARM" is displayed when there is no current alarm.



※12 Configuration Set

Caution !!

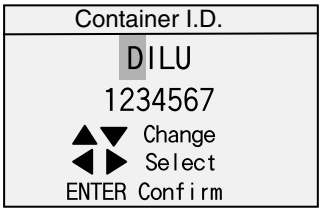
1. Optional function setting is done at factory. Normally, setting change at site is not necessary.
2. Ensure the circuit breaker is switched OFF after Configuration Set change.



	Title display	Setting ▼ ▲ Charge ⇒ ↵ Enter
※12-1 Controller model	Controller model	DECOS Ⅴ
※12-2 Log Interval	Log Interval	15, 30, 60, or 120 minutes
※12-3 Optional Sensor	Optional Sensor	ON : DRS sensor fitted OFF : DRS sensor not fitted
※12-4 Reheat Coil	Reheat Coil	ON : Reheat coil fitted OFF : DRS Reheat coil not fitted
※12-5 Ventilation (FA)	Ventilation (FA)	LOW-FLY : With FA sensor (Ventilator with insect screen) LOW : With FA sensor (Ventilator without insect screen) OFF : Without FA sensor
※12-6 USDA Sensor Type	USDA Sensor Type	Type 1 : ST9702-1 type USDA sensor Type 2 : NTC type USDA sensor
※12-7 Temp Unit	Temp Unit	℃ (Centigrade) or °F (Fahrenheit)
※12-8 Pressure Unit	Pressure Unit	kPa , psi or bar
※12-9 Ventilation Unit	Ventilation Unit	m3/h or CFM
※12-10 Container I.D.	Container I.D.	Mentioned in following page.
※12-11 Controller Date	Controller Date	
※12-12 Controller Time	Controller Time	
※12-13 H006	H006	H006 function: Detect the time which temperature difference between SS and DSS becomes 2℃ or over OFF: Without H006 function 1: Time which temperature difference becomes 2℃ or over is more than 1 hour 2: Time which temperature difference becomes 2℃ or over is more than 2 hour 3: Time which temperature difference becomes 2℃ or over is more than 3 hour 4: Time which temperature difference becomes 2℃ or over is more than 4 hour 5: Time which temperature difference becomes 2℃ or over is more than 5 hour 10: Time which temperature difference becomes 2℃ or over is more than 10 hour

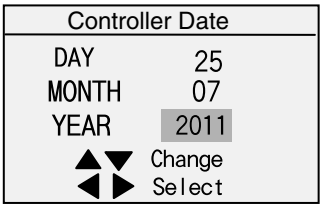
※12-10 Container I.D.

1. Press ▼ ▲ key to change the 1st alphabet.
2. Press ▶ key to move to the 2nd alphabet and press ▼ ▲ key to change 2nd alphabet.
3. Change the next alphabets and 7 numerals with same procedure.
   Press ↵ key to determine container I.D.



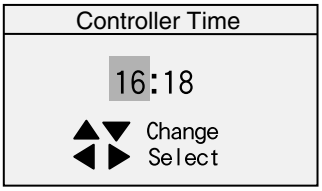
※12-8 Controller Date

1. Press ▼ ▲ key to change YEAR and press ↵ key to determine.
2. Press ▼ ▲ key to change MONTH and press ↵ key to determine.
3. Press ▼ ▲ key to change DAY and press ↵ key to determine.



※12-9 Controller Time

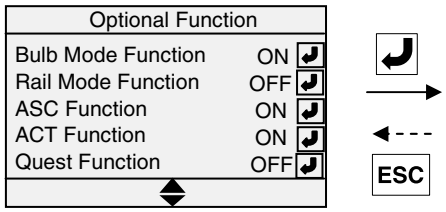
1. Press ▼ ▲ key to change TIME and press ↵ key to determine.
2. Press ▼ ▲ key to change MINUTE and press ↵ key to determine.



※13 Optional Function Mode

Notice !!

1. Optional function setting is done at factory. Normally, setting change at site is not necessary.
2. Ensure the circuit breaker is switched OFF after Configuration Set change.

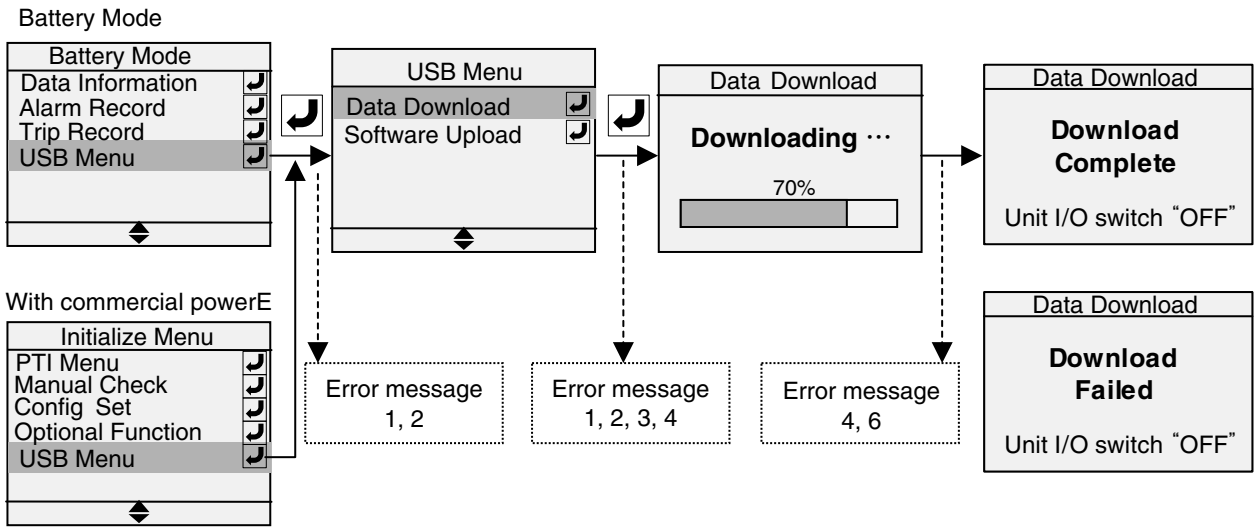


※13-1 Bulb mode function
※13-2 Rail mode function
※13-3 AST, Automatic change function of set temperature (for details, refer to paragraph 1.5.1)
※13-4 ACT, Automatic cold treatment function (for details, refer to paragraph 1.5.3)

	Title display	Setting ▼ ▲ Charge ⇒ ↵ Enter
※13-1 Bulb Mode Function	Bulb Mode Function	ON: With bulb mode function OFF: Without bulb mode function
※13-2 Rail Mode Function	Rail Mode Function	ON: With rail mode function OFF: Without rail mode function
※13-3 ASC Function	ASC Function	ON: With ASC function OFF: Without ASC function
※13-4 ACT Function	ACT Function	ON: With ACT function OFF: Without ACT function

※14 USB Menu

※14-1 Data Download



1. Insert the USB memory that contains an authentication file.
   Download the authentication file from the Daikin's web site.
2. Press ▼ key to select "Data Download" in "USB Menu" and press ↵ key to determine.
3. After completion of downloading,
   Pull out a USB flash memory (in the battery mode).
   Make Circuit Breaker to OFF or Unit I/O switch to OFF
   (when a commercial power source is used).

Error message 1

Data Download
No USB Memory Found !! Insert or Press ESC to Return

＊USB Memory not inserted

Error message 2

Data Download
Unsupported **USB Memory !!** Press ESC to Return

＊Unsupported USB Memory

Error message 3

Data Download
Wrong **USB** Press ESC to Return

＊The USB memory has no authentication file.

Error message 4

Data Download
USB Memory Full Need more than 1MByte Press ESC to Return

＊USB Memory insufficient capacity. 1MB or more is required.

Error message 5

Data Download
Too many Files !! **Move Files to** **Another Folder** Press ESC to Return

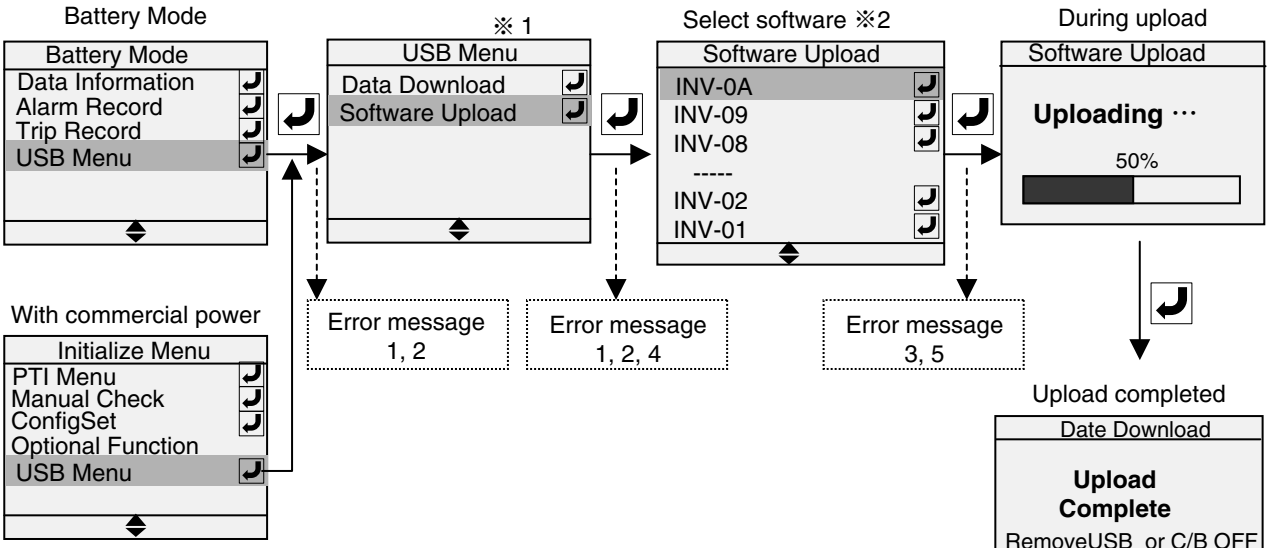
＊Too many files. For multiple download of same container ID on the same date, overwriting symbol A to Z.

Error message 6

Data Download
Download **Failed** Press ESC to Return

＊Download failed

※14-2 Software Upload



1. Insert USB memory (CPU board)
2. Press ▼ key to select "Software Upload" in "USB Menu" and press ↵ key to determine.
3. Press ▼ key to select "Software" in "Software Upload" and press ↵ key to determine.
4. After finishing uploading,
   Pull out a USB flash memory (in the battery mode).
   Set the Circuit Breaker to "OFF"
   (when a commercial power source is used).

Date Download

Upload Failed

RemoveUSB
(or C/B OFF).

Error message 1

Software Upload

No USB Memory Found !!
Insert or
Press
ESC to Return

＊USB Memory not inserted

Error message 2

Software Upload

Unsupported USB Memory !!

Press
ESC to Return

＊Unsupported USB Memory

Error message 3

Software Upload

No Upload Software !!

Press
ESC to Return

＊No program files inside USB memory

Error message 4

Software Upload

Upload Software Incorrect !!

Press
ESC to Return

＊Incorrect program files inside USB memory

Error message 5

Software Upload

USB Memory Read Failed !!
Erasing ···

50%

(Deleting failed data)
＊Upload failure from USB memory

Error message 6

Software Upload

USB Memory Read Failed !!

Press
ESC to Return

(Deleting failed data completed)
(USB⇒External Flash)

Error message 7

Software Upload

Upload Timeout

＊Upload timeout
(External Flash⇒Internal Flash)

Error message 8

Software Upload

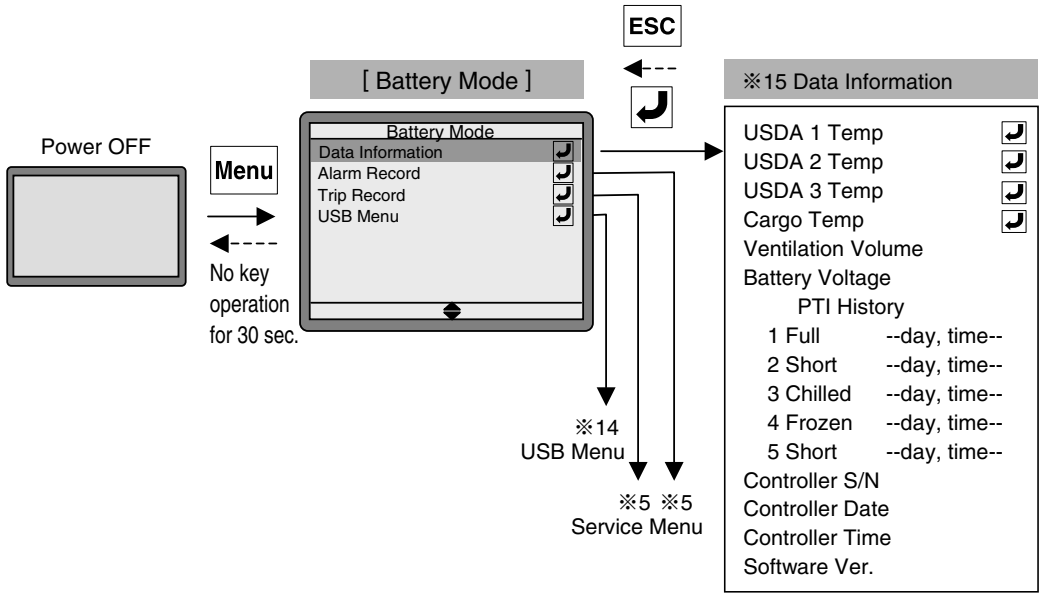
Upload Failed

＊Upload failed
(USB⇒External Flash)

※15 Data Information

Data Information is available in battery mode when no commercial power is supplied.
Press ↵ key to go to the setting change display for the following four items:

1. Unit ON/OFF OFF⇔ON
2. Temperature Setpoint
3. Defrost Interval Set
4. Humidity Setpoint



2.4 Wake-up Battery (Rechargeable Battery)

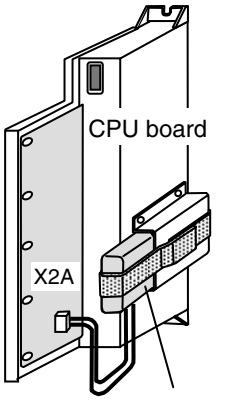
The power supply for battery mode function is depending on wake-up battery (Rechargeable type) fitted on side of controller.
Battery life is approximately 2 years. The remaining voltage at normal time can be checked by battery mode or during operation (*3 Sensor Information in paragraph 2.3). The guide is as follows.

●The residual voltage
7.6V or more: The battery has been charged.
7.5V or less: Recharge battery.
Recharging time is more than 14 hours.
Recharging is possible during operation or stopping (C/B ON) too.

●The residual voltage after completion of recharging
7.6V or more: The battery has been charged.
7.5V or less: The battery may have deteriorated. It is recommendable to replace the battery.
7.1V or less: The battery has deteriorated. The battery must be replaced.

Caution !!
In the event of using the battery for 2 years or more, USDA data logging etc., may not be executed even if LCD screen indicates that the residual voltage is more than 7.6V or more.

●Replacement of battery
Battery is fixed on the side of CPU board by Velcro tape. (Refer to the right fig.)
1. Remove the mounting bolts upper or lower side of CPU board and pull out to front side.
2. Disconnect the connecting cable to CPU board from connector. (X2A)
3. Remove the Velcro tape and dismount the battery together with lead wire.



Notice !!

This battery is NiCd battery.

●Please send the used battery to our certified stores or satellite parts center.
Please send the battery replaced in EU member nation to the following address.

DAIKIN REFRIGERATION OFFICEF
Fascinatio Boulevard 562, Cappele
A/D Ijssel 2909 VA, The Netherlands
Tel. +31-(0)10-286-2096
Fax. +31-(0)10-286-2096

2.5 Alarm Code

●Alarm grouping F---：Alarm that stops the unit
E---：Alarm that restarts the unit or continues the backup operation
T---：Alarm during PTI (Refer to paragraph 3.3.2.)
F5---：Alarm that stops the unit related to inverter
E5---：Alarm that restarts the unit related to inverter

Alarm grade	Alarm	Controller action at the generating of alarm
A	F --- F5 --	Uncontrollable state makes the unit to stop. The problem requires inspection/repair. Wait for the environment of supplied power to recover.
B	E --- E5 --	The unit stops, but resumes the operation when the conditions return to be met. ＊E ---：Restart after waiting for three minutes, then retry nine times. Then retry after waiting for four hours. ＊E5 --：Restart after waiting for three minutes, then retry infinitely. (Some jump to F5--- after four or five times of retry.)
C	E ---	Unit continues operation by back-up operation.
D	E ---	Alarm display only. Unit continues operation.

Alarm LED and Alarm Code Display

Alarm	Alarm LED (Red)	Alarm code display
F Alarm	Blinking	Press ▲ or ▼ key to display alarm code.
E Alarm	OFF (E807, E304 are blinking)	

●F Alarm

Diagnosis	Alarm code	Alarm content	Controller action
001	F101	HPS activates within 30 sec. after starting operation	UNIT stops
002	F109	LPT remains at -72kPa or less within 2 sec. after starting operation	UNIT stops
003	F301	Temperature setting requirement	UNIT stops
004	F401	Multiple sensor (SS, DSS, RS) failure in chilled mode	UNIT stops
004	F405	Multiple sensor (HPT, DCHS1, DCHS2) failure	UNIT stops
004	F407	Multiple sensor (HPT and LPT) failure	UNIT stops
004	F409	Multiple sensor (LPT, DCHS1, DCHS2) failure	UNIT stops
005	F701	Abnormal power voltage is detected within 2 sec. after power ON (C/B ON) (≧530V or ≦300V) One of R, S or T phase missing after power on. (C/B ON)	UNIT stops
006	F703	Abnormal power phase	UNIT stops
007	F705	One of R, S on T phase missing	UNIT stops
008	F707	Fuse F2U blown (I/O board)	UNIT stops
009	F809	E809 is generated 2 times (shortage of refrigerant)	UNIT stops

●E Alarm

Diagnosis	Alarm code	Alarm content	Controller action
001	E101	HPS activates during operation	Restart after 3 min.
101	E105	Compressor over current at startup (>51A)	Restart after 3 min.
011	E107	DCHS1 or DCHS2 becomes 130 ℃ or more for 10 minutes or 145 ℃ or more.	Restart after 3 min.
002	E109	LPT remains at -70kPa or lower during operation	Restart after 3 min.
010	E115	Condenser fan motor internal thermostat activated	Restart after 3 min.
011	E201	Pumpdown is not completed in rated time.	Alarm display only
013	E202	Automatic pumpdown failure	Alarm display only
014	E203	Overcooling Protection	Restart after 3 min.
014	E207	Defrost is not completed in 90 min.	Alarm display only
003	E303	Humidity setting requirement (during dehumidification operation)	Alarm display only
015	E304	Reheat Coil Setting Error	Alarm display only
003	E305	Defrost interval setting requirement	Alarm display only
003	E307	Calendar setting requirement	Alarm display only
003	E311	Trip start setting requirement	Alarm display only
016	E401	Supply air temperature sensor (SS) failure	Backup operation
016	E402	Data recorder supply air temperature sensor (DSS) failure	Backup operation
016	E403	Return air temperature sensor (RS) failure	Backup operation
016	E404	Data recorder return air temperature sensor (DRS) failure	Backup operation
017	E405	Discharge gas temperature sensor (DCHS1) failure	Backup operation
018	E406	Suction gas temperature sensor (SGS) failure	Backup operation
018	E407	Evaporator inlet temperature sensor (EIS) failure	Backup operation
018	E409	Evaporator outlet temperature sensor (EOS) failure	Backup operation
018	E411	Ambient temperature sensor (AMBS) failure	Alarm display only
019	E413	Low pressure transducer (LPT) failure	Backup operation
019	E415	High pressure transducer (HPT) failure	Backup operation
020	E417	Power voltage sensor (PT) failure	Alarm display only
021	E419	Current sensor (CT) failure	Alarm display only
022	E425	USDA #1 sensor failure	Alarm display only
022	E427	USDA #2 sensor failure	Alarm display only
022	E429	USDA #3 sensor failure	Alarm display only
023	E431	Humidity sensor (HuS) failure	Alarm display only
022	E433	Cargo temperature sensor (CTS) failure	Alarm display only
018	E435	Economizer inlet temperature sensor (ECIS) failure	Backup operation
018	E437	Economizer outlet temperature sensor (ECOS) failure	Backup operation
017	E439	Discharge gas temperature sensor (DCHS2) failure	Backup operation
024	E607	Sheet key fault (Status of the key being kept pressed lasted at least one minute.)	Alarm display only
005	E701	Abnormal power voltage is detected during operation. (≧530V or ≦300V) One of R, S or T phase missing during operation	Restart after 3 min.
025	E707	Instantaneous power shut down during operation	Restart after 3 min.
026	E801	Back-up battery failure	Alarm display only
027	E805	Ventilator opening FA sensor failure	Alarm display only
028	E807	Ventilator FA opens during frozen operation	Alarm display only
009	E809	Refrigerant shortage	Restart after 3 min.
029	E903	Communication error between CPU board and operation board	Alarm display only

●Inverter F Alarm

Diagnosis	Alarm code	Alarm content	Controller action
101	F528	E528 is generated 5 times. (Compressor does not operate at startup)	UNIT stops
102	F52E	E52E is generated 4 times. (Instantaneous over current >51A±10% at startup.)	UNIT stops
102	F52F	E52F is generated 4 times. (Compressor current sensor failure at startup.)	UNIT stops
103	F536	E536 is generated 4 times. (Detect offset failure of current sensor at startup)	UNIT stops
103	F538	Inverter board failure(Microcomputer I/O port logic judgment failure at power ON)	UNIT stops
103	F53A	Inverter board failure (Compressor type setting failure when power is on.)	UNIT stops
103	F53B	Inverter board failure (EEPROM fault when power is on.)	UNIT stops
103	F53C	E53C is generated 4 times. (Capacitor charging failure in main circuit at startup)	UNIT stops
101	F53D	E53D is generated 4 times. (Compressor lock at startup)	UNIT stops

●Inverter E Alarm

Diagnosis	Alarm code	Alarm content	Controller action
101	E523	Compressor over current (>22.5A) is detected during operation.	Restart after 3 min.
101	E524	Compressor over current (>50A) is detected during operation.	Restart after 3 min.
101	E525	Actual frequency much lower than command frequency due to compressor over load	Restart after 3 min.
104	E526	Actual frequency much higher than command frequency due to lightning or other external factors	Restart after 3 min.
101	E528	Compressor does not operate after startup.	Restart after 3 min.
105	E52C	Fin temperature higher than 90 ℃	Restart after 3 min.
102	E52D	Fin thermister abnormal (> 175 ℃ or < -45 ℃ is detected.)	Restart after 3 min.
102	E52E	Large instantaneous over current at startup (> 51A)	Restart after 3 min.
102	E52F	Compressor current sensor failure at startup	Restart after 3 min.
106	E531	Ripple voltage exceeds 35V due to poor power supply environment.	Restart after 3 min.
107	E532	DC voltage is below 290V or over 790V or voltage sensor is below 50V.	Restart after 3 min.
108	E533	DC voltage is below 200V or over 740V at startup. One of R, S or T phase missing at starting	Restart after 3 min.
103	E536	Current sensor offset fault at startup	Restart after 3 min.
103	E53C	Capacitor charge failure at startup	Restart after 3 min.
101	E53D	Compressor lock at startup	Restart after 3 min.
109	E542	Cooling fan lock during operation	Alarm display only
110	E5FF	Communication fault between CPU board and INV board	Restart after 3 min.

2.6 Alarm Diagnosis

<table>
<tr><th>001</th><th colspan="2">F101・E101</th></tr>
<tr><td>Alarm Generating Logic</td><td colspan="2">F101 HPS activates within 30 seconds after compressor startup.（HPS　OFF≧2400kPa, ON≦1900kPa ）
E101 HPS activates during operation.（HPS　OFF≧2400kPa、ON≦1900kPa ）</td></tr>
<tr><td>Possible Causes</td><td colspan="2">＊HPS or HPS circuit failure
＊Blocking or short circuiting of air passage for air cooled condenser, CFM reverse rotation, ambient temperature is over 50℃ (allowable limit).
＊DMV failure (Coil failure, Valve not opening, valve clogging)
＊Clogging of compressor discharge line ---Check valve, strainer front of check valve)
＊Mixing of non-condensable gas (water, air, etc.)
＊Refrigerant overcharging
＊Controller (CPU board) or inverter board failure</td></tr>
<tr><td rowspan="6">Trouble Shooting</td><td>1. Check the HPS working value by watching HPT value on the LCD screen (Lower left).</td><td>1. If HPS activates at lower than HPT2400kPa, it is HPS fault.</td></tr>
<tr><td>2. Check if there is blocking or short circuiting of air passage for air cooled condenser, CFM reverse rotation or stop.</td><td>2. Repair if there is a problem.</td></tr>
<tr><td>3. DMV check
3.1 Disconnect the connector X11A (CPU board), then check the resistance of DMV coil.
3.2 Touch for the coil vibration corresponding to opening change (pls) in initial opening operation of DMV. (Refer to initial opening operation in paragraph 1.4.5.)
3.3 Fully open the valve using emergency magnet. (Refer to paragraph 4.9.4.) Then operate the unit without mounting coil.</td><td>3.1 Resistance of each coil: 46±3Ω
3.2 In case that the coil does not vibrate corresponding to opening change, check the coil or the controller.
3.3 If the alarm is still detected, there is no valve body clogging and it is normal.</td></tr>
<tr><td>5. Check for entering of non-condensable gas. Check for entering of non-condensable gas referring to paragraph 4.4.</td><td rowspan="3">If there is abnormality, recover refrigerant and charge the specified amount of refrigerant.</td></tr>
<tr><td>4. Check compressor discharge line Check for clogging of check valve, strainer (front of check valve)</td></tr>
<tr><td>6. Refrigerant overcharging</td></tr>
<tr><td rowspan="2">Controller Action</td><td colspan="2">F101　Unit stop</td></tr>
<tr><td colspan="2">E101　Restart after 3 minutes standby×9 times retry
Retry after 4 hours standby</td></tr>
</table>

002	F109・E107・E109	
Alarm Logic	F109 LPT remains at -72kPa or lower within 2 seconds after compressor startup. E109 LPT remains at -70kPa or lower for 2 seconds during operation. E107 DCHS1or DCHS2 becomes 130℃ or more for 10 minutes or 145℃ or more.	
Possible Causes	1. Refrigerant shortage 2. Liquid line----LSV failure, clogging of filter, strainer or drier. 3. EEV failure (Coil failure, valve not opening, valve clogging)	
Trouble Shooting	1. Check for refrigerant shortage Charge refrigerant R134a 0.5kg additionally two times. Then, check if the low pressure changes (increases) during operation.	1. It is refrigerant shortage if there is change of low pressure increasing. Stop refrigerant additional charging and recover refrigerant in system. Check refrigerant leakages and then charge specified amount of refrigerant.
	2-1. LSV check 1) Check the LSV coil resistance 2) Energize LSV coil and listen the sliding sound ("CLICK") of valve body refering to LSV ON/OFF check（Refer Manual check in paragraph 4.1）	1) Coil resistance within 15.2±1.5Ω 2) If there is no sliding sound ("CLICK") of valve body, it is faulty valve body. (Valve body is not moving.)
	2-2. Liquid line checki Check if there is a clogging in filter (in front of LSV), drier, strainer (in front of EEV). If there is a clogging, the leaving side temperature of drier, filter or strainer is low.	2-2. If there is a clogging, replace that parts. Then, charge specified amount of refrigerant.
	3. EEV check 3.1 Disconnect the connector X9A (CPU board), then check the resistance of EEV coil. 3.2 Touch for the EEV coil vibration corresponding to opening change (pls) in initial opening operation of EEV.(Refer to paragraph 1.4.6 for initial opening operation.) 3.3 Fully open the valve body using emergency magnet. (Refer to paragraph 4.9.2.) Then operate the unit without mounting coil.	3.1 Resistance between each coil: 46±3Ω 3.2 In case that the coil does not vibrate corresponding to opening change, check the coil or the controller. 3.3 If the alarm is still detected, the valve body is not working. It is valve body malfunction.
Controller Action	F109 Unit stop	
	E109 Restart after 3 minutes standby×9 times retry Retry after 4 hours standby	

003	F301・E303・E305・E307・E311
Alarm Logic and Possible Causes	① All alarms --- After both CPU board (EC1) and operation board (EC3) are replaced together, the initial setup is not executed. ② E307, E311--- After CPU board (EC1) is replaced, the configuration set is not executed.
	④ E307, E311---Power is not supplied to S-RAM (CPU board) during power off due to Lithium battery (CPU board) fault. (E801 is also generated)
Trouble Shooting	Execute configuration settings of both ① and ②. 〈F301 Temperature setting requirement〉 --- Set temperature, following ＊1 Set Point Change in paragraph 2.3 (Set Point temperature Change). 〈E303 Humidity setting requirement〉 --- Set humidity, following ＊2-3 Humidity Setpoint in paragraph 2.3. 〈E305 Defrost Interval setting requirement〉 --- Set defrost interval, following ＊2-1 Defrost Interval in paragraph 2.3. 〈E307 Calendar setting request〉 --- Set ＊12-11 Controller date (year/month/day) and ＊12-12 Controller time (time), referring ＊12 Configuration Set in paragraph 2.3. 〈E311 Trip start setting requirement〉 --- Set *20 Trip Start Time to "0" (press ENTER key for three seconds.), referring Manual Check in paragraph 4.1.
	④ E307, E311 〈interim measures〉 ○Execute 〈Calendar setting〉 and 〈Trip start setting〉 as mentioned above. As a result, the unit works properly. But, the timer in the logging data starts from the initial date (e.g. 2011/01/01). 〈permanent measures〉 ○ If E801 is also detected, replace CPU board (Lithium battery installed).
Controller Action	F301 Unit stop
	E303 Alarm display only. E305 Alarm display only. E307 Alarm display only. E311 Alarm display only.

004	F401・F405・F407・F409
Alarm Logic and Possible Causes	F401 Multiple sensor (SS,DSS,RS) failure in chilled mode F405 Multiple sensor (HPT,DCHS1,DCHS2) failure F407 Multiple sensor (HPT,LPT) failure F409 Multiple sensor (LPT,DCHS1,DCHS2) failure
Trouble Shooting	The unit cannot perform backup operation and cannot be controlled. Replace each abnormal sensor.
Controller Action	F401, F405, F407, F409 Unit stop

005	F701・E701	
Alarm Logic	F701 ①Abnormal power voltage is detected within 2 seconds after power on. (≧530V or ≦300V) ②One of R, S or T phase missing after power on (S phase is missing in case F701 is generated also.) E701 ③Abnormal power voltage is detected during operation. (≧530V or ≦300V) ④One of R, S or T phase missing during operation (S phase is missing in case F701 is generated also.)	
Possible Causes	Power voltage remains more than upper limit (≧530V) or lower than lower limit (≦300V). One of R,S,T phase missing	
Trouble Shooting	①、③ Power check 1. Check if the actual power supply remains in allowable range (300V～530V).	1. Supply power voltage within allowable range Electrical parts may have damages.
	②、④ Check R,S,T phase missing 2.1 Check if there is missing phase in the primary side (Power side) of circuit breaker 2.2 Check if there is broken wire (open) in the secondary side of circuit breaker ＊Between C/B～X63A (PT/CT board) ＊Between C/B～ Tr1～X30A (I/O board)	2.1 Repair or replace if there is a problem in power plug or cable Provide specified power supply if there is missing phase in power supply 2.2 Repair if there is broken wire (open) in the secondary side of circuit breaker
Controller Action	F701 Unit stop	
	E701 Restart after 3 minutes standby×9 times retry Retry after 4 hours standby	

006	F703
Alarm Logic	The wave form of power phase is abnormal, therefore phase is not detected correctly.
Possible Causes	Abnormal wave form of power phase
Trouble Shooting	Check power supply equipment or facility and provide power supply with correct phase wave form
Controller Action	F703 Unit stop

007	F705	
Alarm Logic	One of R, S, T phase missing (S phase is missing in case F701 is generated also.)	
Possible Causes	1. Phase missing in power supply 2. Broken wire (open) in power plug or power cable 3. Wire disconnection in unit	
Trouble Shooting	1. Check if there is phase missing in power from power supply equipment side	1. Provide correct power supply if there is power phase missing
	2. Check if there is Broken wire (open) in power plug or power cable (the primary side of circuit breaker)	2. Repair if there is a problem in power plug or cable
	3. Check if there is broken wire (open) in the secondary side of circuit breaker ＊Between C/B～X63A (PT/CT board) ＊Between C/B～ Tr1～X30A (I/O board)	3. Repair if there is broken wire (open) in the secondary side of circuit breaker
Controller Action	F705 Unit stop	

008	F707
Alarm Logic	＊Fuse F2U (I/O board) is brown due to over current (10A/250V) in protection circuit (Generates E115 also if F707 is generated by controller control)
Possible Causes	＊Coil of magnet contactor or solenoid valve is burned-out in protection circuit or short circuited ＊The cable in protection circuit is short circuited
Trouble Shooting	1. Check if the coil of following magnet contactor or solenoid valve or their circuit is burnd-out or short circuited Magnet contactor：PCC1,PCC2, CFH,CFL,EFH,EFL Solenoid valve：HSV,RSV,LSV,ESV Built in thermostat in CFM：Q1M ＜Coil resistance＞ ＊Solenoid valve：15.2±1.5Ω (20℃)
Controller Action	F707 Unit stop

009	F809・E809
Alarm Logic	F809 E809 is generated twice (Refrigerant shortage) E809 Refrigerant shortage EEV opening ≧400pls×5 minutes continues during modulated cooling in chilled mode (in inrange control) or RS≦0℃ in frozen mode
Possible Causes	＊Liquid line is clogging ＊EEV fault ＊Refrigerant shortage The causes of **009** seems to be the same as **002** and **011** . Among them, it may be insufficient refrigerant.
Trouble Shooting	1. LSV check 2. Liquid line check 3. EEV check Refer to **002** for the troubleshooting. 4. Check refrigerant shortage If there is no problem in above items, it seems to be refrigerant shortage. Conduct refrigerant recovery and charge specified amount of refrigerant after checking location of refrigerant leakages.
Controller Action	F809 Unit stop E809 Restart after 3 minutes standby×9 times retry Retry after 4 hours standby

010	E115
Alarm Logic	＊CFM internal thermostat activated (OFF≧135℃±5℃) ＊E115 is also generated due to F707 (fuse F2U brown) (by controller control)
Possible Causes	＊CFM motor load large ＊Short circuited in motor internal coil
Trouble Shooting	1. Whether CFM motor generates heat? Whether motor shaft rotates smoothly by hand? Check whether it's locked. 2. Check whether motor coil resistance is normal. High speed 30.6 Ω±5% (20℃) / Low speed 21.6 Ω±5% (20℃)
Controller Action	E115 Restart after 3 minutes standby×9 times retry Retry after 4 hours standby

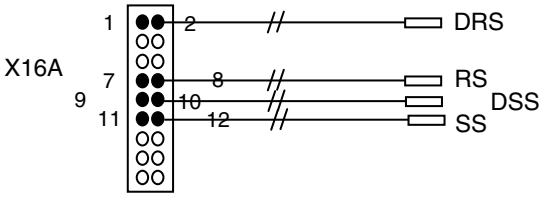
011	E201
Alarm Logic	E201 Pumpdown is not completed in rated time 〈Pump down prior to defrost (EEV close) 〉 Repeated three times without dropping to LPT<-40kPa or EOS-LP(T)>30℃ within 300 seconds. 〈Auto pump down (LSV close) 〉 It does not drop to LPT<-27kP within 210 seconds.
Possible Causes	〈Low-pressure does not decrease even when auto pump-down operation starts〉 1. EEV malfunction (Valve cannot be closed. Dusts caught in.)----- in case of pump down prior to defrost LSV malfunction (Valve cannot be closed. Dusts caught in.)----- in case of auto pump-down 2. Faulty compression of compressor
Trouble Shooting	① Check EEV or LSV (Refer to Diagnosis **002** .) ② In case that EEV or LSV is normal. 〈In case of pump-down operation before defrosting operation start〉 Connect manifold gauge, start manual defrost operation, and check whether the LPT at pump-down completion is <-40kPa within 300 seconds with the low-pressure gauge. 〈In case of auto pump-down operation (Refer to paragraph 4.2) 〉 Check whether the LPT at pump-down completion is <-40kPa with the low pressure gauge. ＊If the read reaches to completion pressure, it is normal. Wait and see. ＊If the read does not reach to completion pressure, suction capacity of the compressor may be insufficient.
Controller Action	E201 Alarm display only

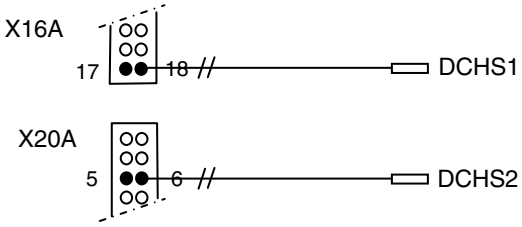
012	E202
Alarm Logic	Automatic pumpdown failure HPT≧2300kPa or DCHS≧120℃ during automatic pump-down. ＊This alarm is a reminder before replacing drier after auto pump-down completion.
Possible Causes	Refrigerant overcharged. (All refrigerant can not accumulated in condenser and receiver by pump down.)
Trouble Shooting	Collect refrigerant from service port ③ until the pressure between LSV and EEV becomes 0kPa - 350kPa. (The circuit between LSV and EEV is closed.) Then, replace drier. (Refer to paragraph 4.2)
Controller Action	E202　Alarm display only

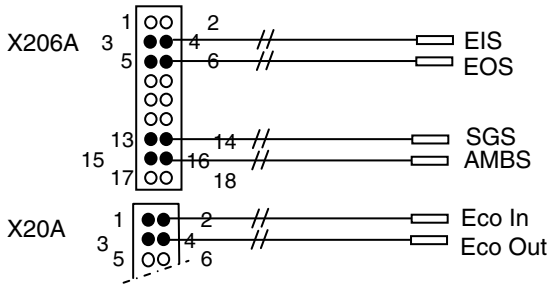
013	E203
Alarm Logic	Overcooling in chilled mode SS≦SP−3.0℃ & 5 minutes elapsed (prevention of over cooling) during modulated control.
Possible Causes	Cooling load changes rapidly. (load small)
Trouble Shooting	Check for the cause of sudden reduction of the load. ＊Example 1: Set the ventilation outlet from OPEN to CLOSE. ＊Example 2: The door is opened at the low ambient temperature(<SP).
Controller Action	E203　Restart after 3 minutes standby

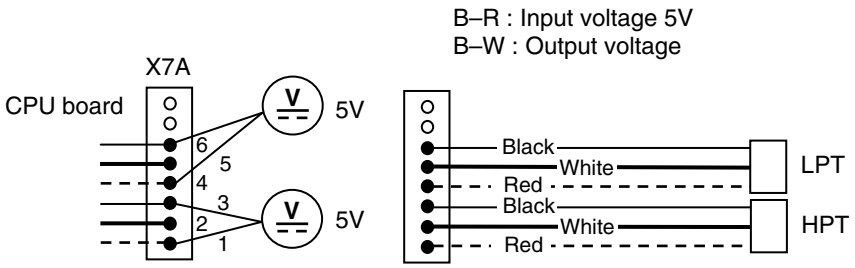
014	E207
Alarm Logic	Defrost can not be completed within 90 minutes. (The condition EOS≧10℃ was not satisfied five defrosting times continuously during 90-minute counting).
Possible Causes	＊Excessive frost on the evaporator coil. Frost partially remains. ＊Setting time of defrosting interval is too long. ＊Temperature of hot-gas for defrosting is low. Insufficient hot-gas circulation.
Trouble Shooting	1. Defrost remaining frost by manual defrosting. Also, check whether defrost completion condition (EOS≧30℃ & RS ≧15℃) are reached within 90 minutes on the LCD screen (※3 Sensor Information in paragraph 2.3). ＊If the read reaches to completion condition, it is normal. Wait and see. ＊If the read does not reach to completion condition, there may be low hot-gas temperature, insufficient hot-gas circulation, and so forth.
Controller Action	E207 Alarm display only

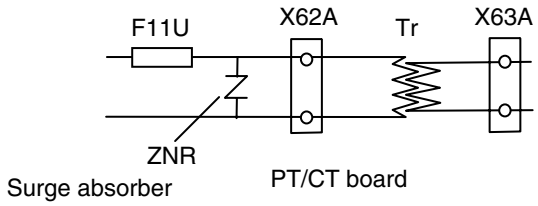
015	E304
Alarm Logic	Setting error of reheat coil
Possible Causes	Setting error in Configuration Set (＊12 Configuration Set in paragraph 2.3) ＊Reheat Coil is set to "OFF" for the unit with dehumidification control (reheat coil installed).
Trouble Shooting	For the unit with dehumidification control (reheat coil installed), change the Reheat Coil setting from "OFF" to "ON" in the configuration setting (＊12 Configuration Set in paragraph 2.3).
Controller Action	E304 Alarm display only (Alarm LED is blinking.)

016	**E401**（SS）・**E402**（DSS）・**E403**（RS）・**E404**（DRS）	
Alarm Logic	≦-40℃ (54kΩ) with 3 minute elapse or ≧100℃ (0.22 kΩ) with 3 minute elapse Note: The alarm is activated when sensor or the circuit is nearly disconnected (open) or short-circuited (close).	
Possible Causes	＊Faulty contact of connector X16A（CPU board） ＊Temperature sensor failure ＊Controller（CPU board）failure	
Trouble Shooting	1. Check if the connector X16A is inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Disconnect X16A, then check the resistance of sensor 	2. The sensor is normal if the resistance value and temperature match to sensor characteristic table. (Refer to sensor characteristic table in paragraph 5.2.) Check the controller (CPU board).
Controller Action	E401 SS malfunction ⇒ 1st backup at DSS ⇒ 2nd backup at RS-2℃ E402 DSS malfunction ⇒ backup at SS E403 RS malfunction ⇒ 1st backup at DRS ⇒ 2nd backup at SS+5℃ E404 DRS malfunction ⇒backup at RS	

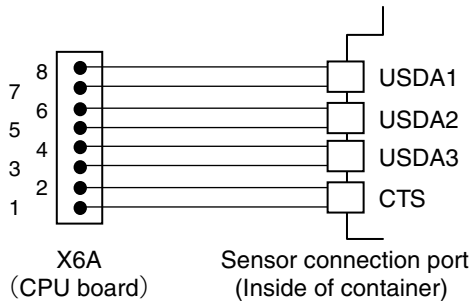
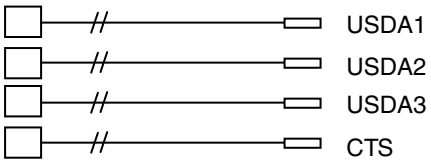
017	**E405**（DCHS1）・**E439**（DCHS2）	
Alarm Logic	≦3℃ (687 kΩ) with 3 minute elapse (when AMBS ≧-5℃) ≦-20℃ (687 kΩ) with 3 minute elapse (when AMBS <-25℃) or ≧187℃ (1320 kΩ) with 3 minute elapse Note 1: The activation temperature varies proportionally between ≦3℃ and ≦-20℃ when AMBS is ≧-10℃, ≧-15℃ or ≧-20℃ . 2: The alarm is activated when sensor or the circuit is nearly disconnected (open) or short-circuited (close).	
Possible Causes	＊Faulty contact of connector X16A, X20A (CPU board) ＊Temperature sensor fault ＊Controller (CPU board) fault	
Trouble Shooting	1. Check if the connector X16A and X20A are inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Disconnect the connectors X16A and X20A, then check the resistance of sensor 	2. The sensor is normal if the resistance value and temperature match to sensor characteristic table. (Refer to sensor characteristic table in paragraph 5.2.) Check the controller (CPU board).
Controller Action	E405 Alarm display only E439 Alarm display only	

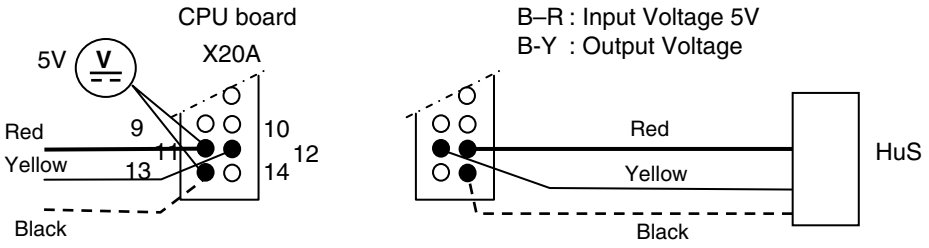
018	**E406**（SGS）・**E407**（EIS）・**E409**（EOS） **E411**（AMBS）・**E435**（Eco In）・**E437**（Eco Out）	
Alarm Logic	≦-57℃ (100 kΩ) with 3 minute elapse or ≧100℃ (0.221 kΩ) with 3 minute elapse Note: The alarm is activated when sensor or the circuit is nearly disconnected (open) or short-circuited (close).	
Possible Causes	＊Faulty contact of connector X16A and X20A (CPU board) ＊Temperature sensor failure ＊Controller failure	
Trouble Shooting	1. Check if the connector X16A and X20A are inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Disconnect the connectors X16A and X20A, then check the resistance of sensor  	2. The sensor is normal if the resistance value and temperature agree with sensor characteristic table. (Refer to sensor characteristic table in paragraph 5.2.) Check the controller (CPU board).
Controller Action	E406 Backup operation E407 Backup operation E409 Backup operation E411 Alarm display only E435 Backup operation E437 Backup operation	

019	**E413**（LPT）・**E415**（HPT）	
Alarm Logic	〈E413〉 ≦-110 kPa with 3 minutes elapse or ≧1420 kPa with 3 minutes elapse 〈E415〉 ≦-340 kPa with 3 minutes elapse or ≧4260 kPa with 3 minutes elapse	
Possible Causes	1. Faulty contact of connector X7A (CPU board) 2. Pressure transducer failure 3. Controller failure	
Trouble Shooting	1. Check if the connector X7A (CPU board) is inserted securely.	1. If alarm is still generated, proceed to next step.
	1-1. Connect the gauge manifold and compare the pressure in high pressure gauge and HPT value in LCD display (left below). 1-2.Connect the gauge manifold and compare the pressure in low pressure gauge and LPT value in LCD display (right below).	1-1. If the pressure difference of high pressure is within 50kPa, HPT is normal. 1-2. If the pressure difference of low pressure is within 10kPa, LPT is normal.
	3. Disconnect the connector X7A and check if there is input 5V from controller LPT：Connector X7A pin No.4-6（Red-Black） HPT：Connector X7A pin No.1-3（Red-Black）	3. If there is no input 5V, then check the controller If there is input 5V, then check the transducer.
		
Controller Action	E413 Backup operation E415 Backup operation	

020	E417	
Alarm Logic	Power voltage sensor PT failure (PT control circuit in PT/CT board remains ≦DC20V or ≧ DC654V)	
Possible Causes	1. Disconnection between connector X61A (PT/CT board)～ X4A (CPU board) 2. Fuse F11U brown (in PT/CT board) 3. Voltage sensor PT error (in PT/CT board)	
Trouble Shooting	1. Check if the connector X61A (PT/CT board) and X4A (CPU board) are inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Check if there is short circuit in secondary side of fuse F11U (ZNR, Tr primary side).  	2. If there is no short circuit, replace fuse. If there is short circuit, replace PT/CT board.
	3. Voltage sensor PT failure	3. Replace PT/CT board.
Controller Action	E417　Alarm display only	

021	E419	
Alarm Logic	Current sensor CT failure	
Possible Causes	＊Disconnection between connector X61A (PT/CT board)～ X4A (CPU board) ＊Voltage sensor CT failure（in PT/CT board）	
Trouble Shooting	1. Check if the connector X61A (PT/CT board) and X4A (CPU board) are inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Current sensor CT failure	2. Replace PT/CT board.
Controller Action	E419　Alarm display only	

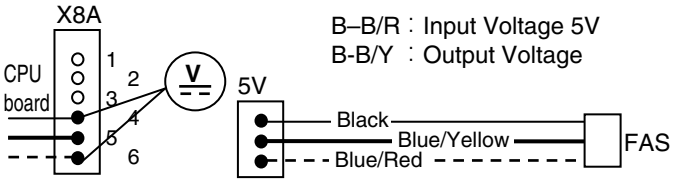
022	**E425**（USDA1）・**E427**（USDA2） **E429**（USDA3）・**E433**（CTS）	
Alarm Logic	〈＊13 Configuration set in paragraph 2.3 for USDA "1"〉 ≦-60℃ (AkΩ) or ≧85℃ (BkΩ) 〈＊13 Configuration set in paragraph 2.3 for USDA "2"〉 ≦-39℃ (320kΩ) or ≧96℃ (0.79kΩ) Note: The alarm is activated when sensor or the circuit is nearly disconnected (open) or short-circuited (close).	
Possible Causes	1. Setting error 2. Faulty cable or faulty connection port between controller and USDA sensor connection port 3. Faulty sensor ＊Faulty controller	
Trouble Shooting	1-1. If USDA is set to "3" or "4" in ＊2 mode setting of paragraph 2.3, check whether all of three or four sensors are connected.	1-1. Make sure that no alarm is detected after connecting all of three or four sensors.
	1-2. Check whether USDA is set to "3" or "4" for the unit that is not equipped with USDA connection port(optional).	1-2. If USDA is set to "3" or "4", set it to "OFF".
	2. Check whether cable or connection port between X6A and USDA connection port is broken (open) or short-circuited (short).  	2. Repair or replace if there is disconnection or short circuit.
	3. Check the resistance value for each sensor of USDA and CTS sensor each  	3. It is correct if the resistance and temperature is match to sensor characteristic. (Refer to USDA sensor characteristic in paragraph 5.2.)
	Caution: Regarding USDA sensor, type "1" and "2" have different characteristics. Identify the type by referring ＊4 Configuration Information in paragraph 2.3 (configuration setting information).	
Controller Action	E425 Alarm display only E427 Alarm display only E429 Alarm display only E433 Alarm display only	

023	E431	
Alarm Logic	Humidity sensor (HuS) failure (Detect RH>120% or RH<20%)	
Possible Causes	＊Humidity sensor (HuS) failure ＊Contact failure of connector X20A (CPU board) ＊Controller failure	
Trouble Shooting	1. Check if the connector X7A (CPU board) is inserted securely.	1. If alarm is still generated, proceed to next step.
	2. Disconnect X20A and check if there is input 5V from controller, then check the controller.	2. If there is no input 5V, then check the controller If there is input 5V, then replace the HuS sensor.
		
Controller Action	E431 Alarm display only	

024	E607
Alarm Logic	＊Sheet key failure (Status of the key being kept pressed lasted at least one minute)
Possible Causes	＊Sheet key (EC6) failure ＊Faulty cable or connection between Sheet key (EC6) ～Relay board (EC5) ～Operation board (EC3)
Trouble Shooting	1. Disconnect cable connectors of sheet key, relay board, and operation board, and check their pins visually, then securely insert the sockets. 2. If the alarm is still detected, replace the sheet key.
Controller Action	E607 Alarm display only

025	E707
Alarm Logic	There is instantaneous power failure during operation.
Possible Causes	Power supply failure
Trouble Shooting	Provide correct power supply. Unit stops once and restarts after 3 minutes standby. (Retry 9 times) Continue operation if correct power supply is provided in that time.
Controller Action	E707 Restart after 3 minutes standby×9 times retry Retry after 4 hours standby

026	E801
Alarm Logic	Battery failure on CPU board (E307 and E311 are also generated.)
Possible Causes	Batteries are dead due to salt water/moisture.
Trouble Shooting	〈Interim measures〉 The unit works normally with commercial power. But the time recording to the logging data is reset and the recording starts from initial date (e.g. 2011/01/01). 〈Permanent measures〉 Replace CPU board (Lithium battery installed).
Controller Action	E801 Alarm display only

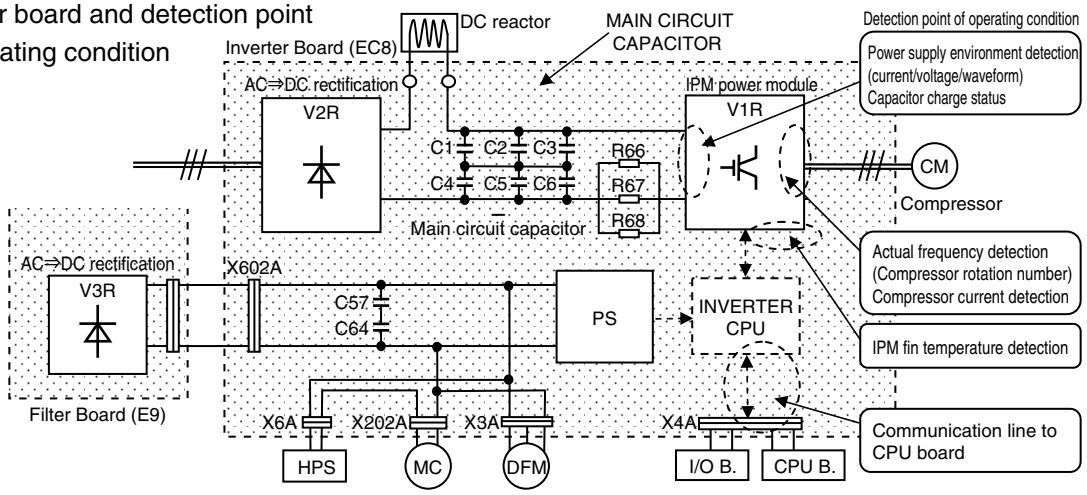
027	E805	
Alarm Logic	Ventilation FA sensor failure	
Possible Causes	1. Setting error 2. Installation failure of FA sensor　＊FA sensor failure 3. Controller (CPU board) failure	
Trouble Shooting	1-1. Check FA sensor setting LOW-FLY: With FA sensor (Ventilator with insect screen) LOW: With FA sensor (Ventilator without insect screen) OFF: Without FA sensor ＊Confirmation of setting: 2.3 *4 Configuration Setting Information	1-1. Correct if setting is wrong. Setting correction：※12 Configuration Setting in paragraph 2.3.
	1-2. Check if FA setting made "LOW-FLY" or "LOW" for unit without FA sensor（Option).	1-2. Set to "OFF" if FA setting made "LOW-FLY" or "LOW".
	2. Disconnect connector X8A, and check if there is input 5V from controller. FAS：X8A No.4-6（Red-Black）  	2. If there is no input 5V, then check the controller. If there is input 5V, then proceed to next step.
	3. Make sure that the FA wire is properly attached to the ventilator outlet. Operate the ventilator outlet lever to fully open and fully close. If an alarm is detected, replace the FA sensor.	
Controller Action	E805　Alarm display only	

028	E807
Alarm Logic	Ventilator is open during frozen operation.
Possible Causes	Frozen operation starts under condition of ventilator remains open.
Trouble Shooting	Close ventilator fully during frozen operation.
Controller Action	E807　Alarm display only

029	**Communication Interrupted**（E903）
Alarm Logic	Communication error between CPU board and operation board
Possible Causes	1. Cable failure or connection error between operation board (EC3) and CPU board (EC1) 2. Operation board failure (communication part to CPU board) 3. CPU board failure (communication part to operation board)
Trouble Shooting	1. Check if the connector of cable between operation board（EC3) and CPU board（EC1） is inserted securely. 2. If there is no connection error between both boards, it seems to be operation board or CPU board error.
Controller Action	Communication Interrupted（E903） Alarm display only （"Communication Interrupted" is displayed on LCD and the E903 event log is recorded.)

Inverter Alarm Diagnosis

Inverter board and detection point of operating condition



101	F528・F53D E105・E523・E524・E525・E528・E53D	
Alarm Logic & Possible Causes	Alarm Logic	Possible Causes
	E105 : Compressor current is large at starting（≧DC51A）	①Over-current due to compressor overload ③Inverter board failure（Current detection part）
	E523：Compressor overload during operation（≧DC22.5A） E524：Compressor overload during operation（≧DC30A）	①Over-current due to compressor overload ③Inverter board failure（Current detection part）
	F525：The revolution of compressor is down (detection of stepping out) because actual frequency is low against command frequency to compressor	①Revolution down due to compressor overload ③Inverter board failure (Frequency detection part)
	F528：E528 is generated 5 times. E528：Compressor is not started	②Compressor is lock at starting. ③Inverter board failure (detection part of revolution wave form)
	F53D：E528 is generated 4 times. E53D：Compressor does not operate during operation.	②Compressor is lock at starting ③Inverter board failure (detection part of lock)
Trouble Shooting	①Compressor overload ②Compressor lock Remove possible cause (listed below) of overload or starting error of the compressor. High differential pressure of startup/liquid compression/excessive oil/excessive refrigerant/ compressor coil burning/compressor shaft burning ②If compressor failure is not found, the inverter board failure may be possible cause. Replace the inverter board.	
Controller Action	F528・F53D E105・E523・E524・E525 E528・E53D	Unit stop Restart after 3 minutes standby (Permanent retry) Restart after 3 minutes standby (Retry 5 times, F528, F53D is generated at 4 times.)

102	F52E・F52F E52D・E52E・E52F	
Alarm Logic & Possible Causes	Alarm Logic	Possible Causes
	E52D：Fin temperature sensor failure	Inverter board failure（Fin temperature sensor） （Fin temperature≧175℃ or -45≦℃）
	F52E：E52E is generated 4 times. E52E：Instantaneous over current failure	Inverter board failure（IPM part） IPM：Intelligent Power Module
	F52F：E52F is generated 4 times. E52F：Compressor current sensor failure	Inverter board failure（Current detection part）
Trouble Shooting	Replacing of inverter board	
Controller Action	F52E, F52F　Unit stop E52D　Restart after 3 minutes standby (Permanent retry） E52E, E52F　Restart after 3 minutes standby (F52E, F52F is generated at 4 times retry.）	

103	F536・F538・F53C E536　　E53C	
Alarm Logic & Possible Causes	Alarm Logic	Possible Causes
	F536：E536 is generated 4 times. E536：Detect offset error of current sensor at starting	Inverter board failure (Current sensor)
	F538：Power module failure	Inverter board failure (IGBT) IGBT：Insulated gate Bipolar Transistor
	F53C：E53C is generated 4 times. E53C：Charging error of main circuit capacitor at starting	Inverter board failure （Capacitor short-circuited）
Trouble Shooting	Replacing of inverter board	
Controller Action	F536, F538, F53C　Unit stop E536　Restart after 3 minutes standby (F536 at 4 times retry） E53C　Restart after 3 minutes standby (F53C at 4 times retry）	

104	E526
Alarm Logic & Possible Causes	Condition of command frequency＜actual frequency remains temporarily（5 seconds）
	①Lightning surge sometimes shifts the detected rotating speed significantly, leading to abnormal stop of the unit due to over current. ②Inverter board failure (Frequency detection part)
Trouble Shooting	①Regardless alarm is generated, restart after 3 minutes standby (Permanent retry） Operation continues if the external factor like lightening is improved. ②If there is no external factor, it seems to be inverter board failure. Replace inverter board.
Controller Action	E526　Restart after 3 minutes standby (Permanent retry）

105	E52C
Alarm Logic	Cooling fin is over-heated (≧90℃ with 260 sec elapse or ≧93℃ with 5 sec elapse)
Possible Causes	①Ambient temperature is high (>50℃) ②Inverter board fault (Fin temperature detection part)
Trouble Shooting	①External operating temperature of the unit is up to 50 ℃ . Check external environment for short circuit of supply air from air cooled condenser coil. Resume the operation once the environment is improved. ②If there is no external factor, it seems to be inverter board fault. Replace inverter board.
	E52C Restart after 3 minutes standby (Permanent retry)

106	E531
Alarm Logic	Voltage between phases are unbalanced due to the deterioration of the power supply environment.
Possible Causes	Deterioration of power supply environment
Trouble Shooting	Regardless alarm is generated, restart after 3 minutes standby. (Permanent retry) Operation continues if the external factor like lightening is improved.
	E531 Restart after 3 minutes standby (Permanent retry)

107	E532
Alarm Logic	Voltage in inverter becomes ≧DC790V or ≦290V due to power supply voltage≧AC 530V or over, or ≦AC300V.
Possible Causes	①Power supply voltage is over upper limit (≧535V), or under lower limit (≦300V). ②Inverter board failure (Voltage detection part)
Trouble Shooting	①Check if the actual power voltage is within allowable range (300V～535V) . ＊Provide the power supply within allowable range if it is out of allowable range. Restart after 3 minutes standby. (Permanent retry) Operation continues if the power supply condition is improved. ②If the power voltage is within allowable range, it seems to be inverter board fault. Replace inverter board.
Controller Action	E532 Restart after 3 minutes standby (Permanent retry)

108	E533	
Alarm Logic	①Power supply remains in ≧530V or ≦300V. ②One of phase is missing in power supply to inverter.	
Possible Causes	①Power voltage remains more than upper limit (≧530V) or lower than lower limit (≦300V). ②Check if there is broken wire (open) or phase missing in the power supply to inverter (secondary side of circuit breaker).	
Trouble Shooting	①Power supply check Check if the power supply voltage is within allowable range（300V～530V). ②Check if there is broken wire (open) in the secondary side of circuit breaker. ＊Between C/B ～ X205A（inverter board）	①Provide the power supply voltage within allowable range. Electrical parts may have damages. ②Repair if there is broken wire in the secondary side of circuit breaker. ＊Between C/B ～ X205A（inverter board）
Controller Action	E533　Restart after 3 minutes standby (Permanent retry）	

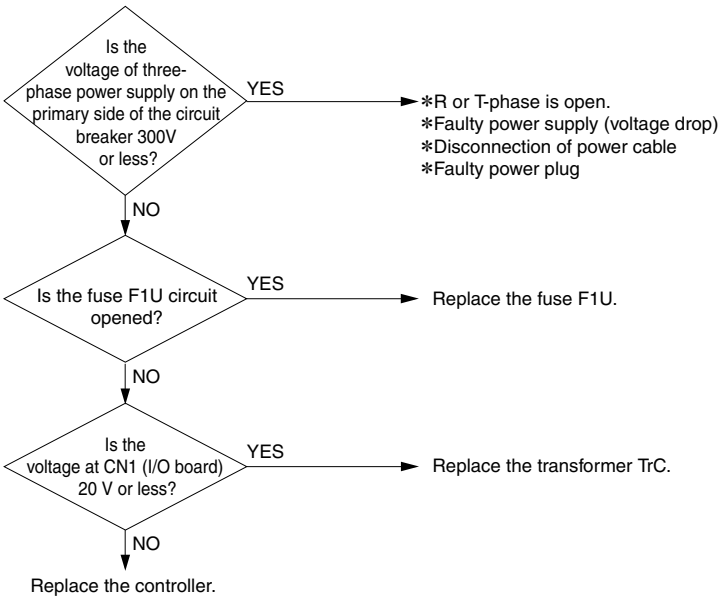
109	E542
Alarm Logic	Fan motor for cooling is faulty
Possible Causes	①Fan motor for cooling is lock or faulty cable connection ②Inverter failure (detection part of motor lock）
Trouble Shooting	①Check if fan motor for cooling is lock or faulty cable connection (disconnection or short circuit) ②If there is no fault in motor and cable, it seems to be inverter board failure. Replace inverter board.
Controller Action	E532　Alarm display only

110	Communication Interrupted（E5FF）
Alarm Logic	E5FF: Communication error between CPU board and inverter board during operation
Possible Causes	①Cable fault or connection error between inverter board and CPU board ②Inverter board failure (Communication part to CPU board) ③CPU board failure (Communication part to inverter board)
Trouble Shooting	①Disconnect the connector of cable between CPU board（connector X19A）and inverter board（connector X4A）and check pins visually. Insert socket securely after checking of cable disconnection or short circuit. ②If there is no connection error between both boards, it seems to be inverter board or CPU board failure.
Controller Action	Communication Interrupted（E5FF）　　Restart after 3 minutes standby (permanent retry） ("Communication Interrupted" is indicated on LCD and the E903 event log is recorded.)

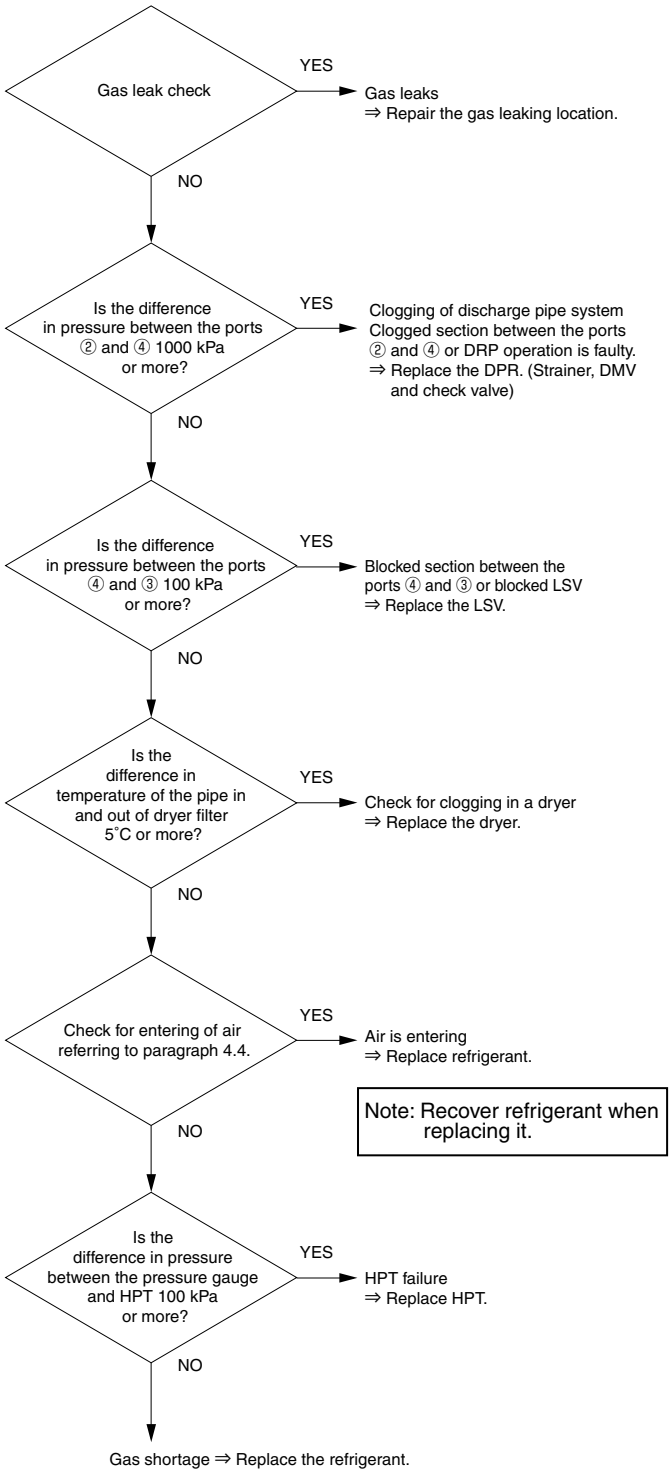
2.7 General Diagnosis

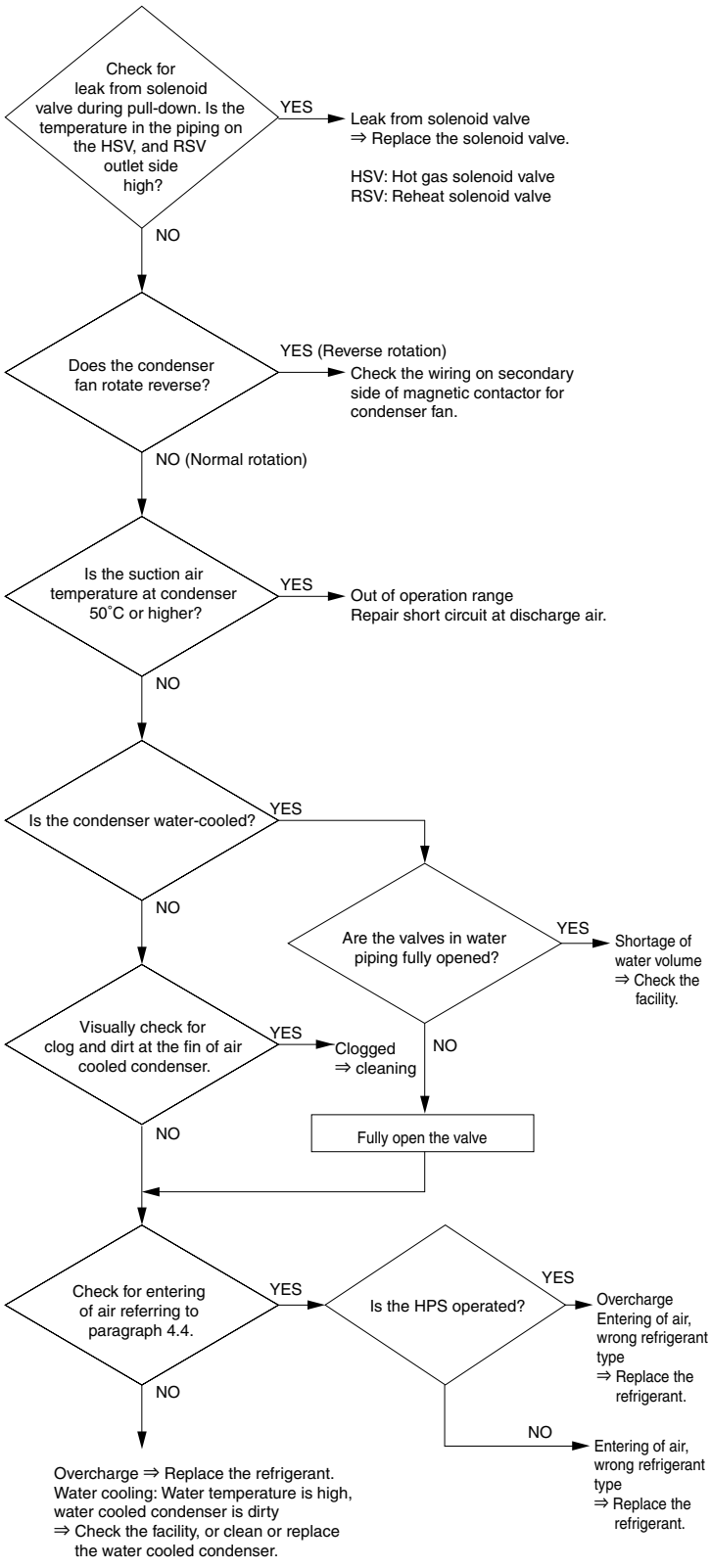
If the unit does not work properly, refer to the following table to find causes of trouble and provide appropriate measures.

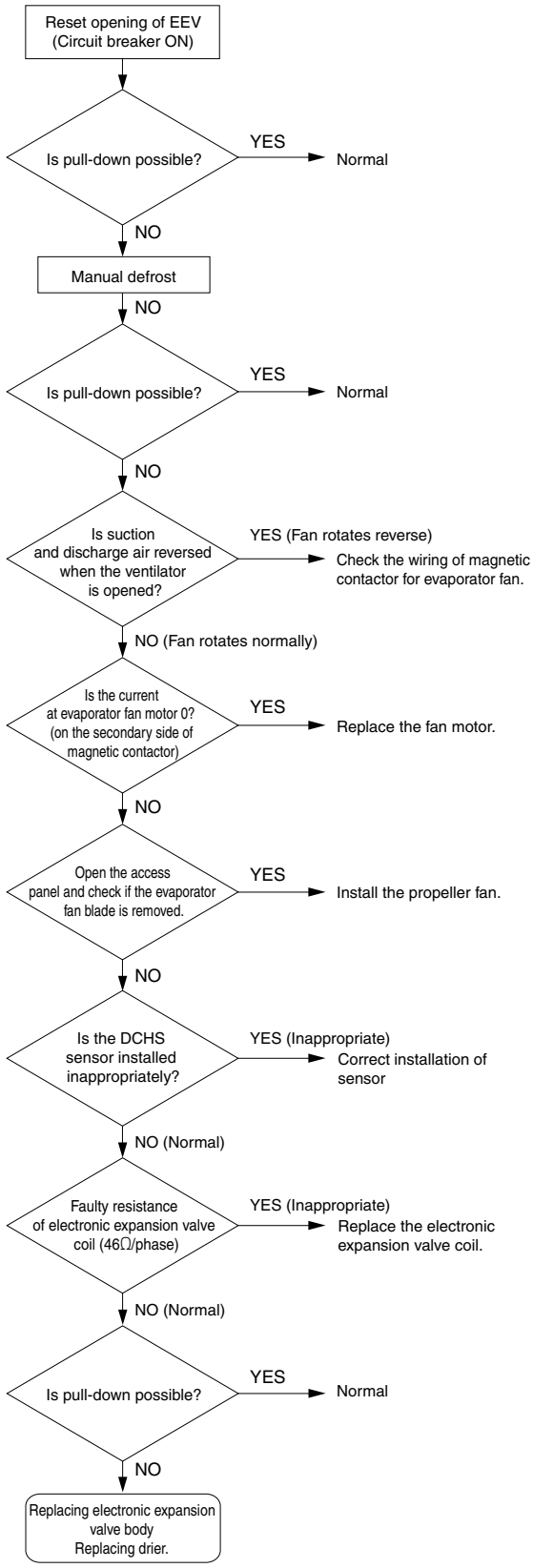
Symptom		Cause	Checkpoint	Remedy
Ⅰ Unit does not operate	A. Neither evaporator fan, condenser fan nor compressor runs.	Faulty power supply	Voltage on primary side of circuit breaker It should be within the voltage range shown in paragraph 1-1.	Check the power supply Check the power supply plug Check for disconnection of cable
		Failure in running of condenser fan	Ensure that the condenser fan is stopped while high pressure is under control. Does the condenser fan operate low speed at over 800kPa and high speed at over 1000kPa?)	It is normal if it operates low speed at over 800kPa and high speed at over 1000kPa.
			Mega test check on secondary side of magnetic contactor (Evaporator fan motor, condenser fan motor, compressor)	Replace faulty device.
		Controller	Unit switch ON/OFF check	Turn the switch ON.
			Alarm presence (F code)	See the instructions for alarm code of controller in paragraph 2.5.
		Secondary side of power supply transformer	Check for disconnection of F2U (fuse) Check for malfunction in object models shown in paragraph 1.2.	Replace the Fu. Replace faulty device.
			Check for disconnection on secondary side of transformer (Tr) Check if there is 24V between No.3 and 4 pins of connector X30A (I/O board).	Replace the transformer.
	B. Evaporator fan runs, but condenser fan and compressor do not run.	Not malfunction (thermostat-OFF status)	Display of controller (Presence of ALARM display)	See the alarm code when ALARM is issued
	C. Evaporator fan and compressor run, but condenser fan does not run.	Not malfunction (under high pressure control)	Check of operation of HPT (E101) by controller display	Refer to paragraph 2.6. Depend on alarm diagnosis No.001
		External factor	Visual check for foreign matters caught in and deformation (including relevant parts such as controllers)	Remove foreign matters
	D. Condenser fan and compressor run, but evaporator fan does not run.	Faulty electrical system of evaporator fan · CTP activation · Motor burnt out (disconnection) · Disconnected coil of magnetic contactor	· Motor coil resistance · Ensure that the magnetic contactor is turned ON · Voltage on secondary side of magnetic contactor (three-phase)	· Replace the fan motor · Replace the magnetic contactor
		External factor	Visual check for foreign matters caught in and deformation (including relevant parts such as controllers)	Remove foreign matters.
	E. Compressor runs, but evaporator fan and condenser fan do not run.	Not malfunction (defrost)	Is "DEFROST" indicated on LCD panel?	

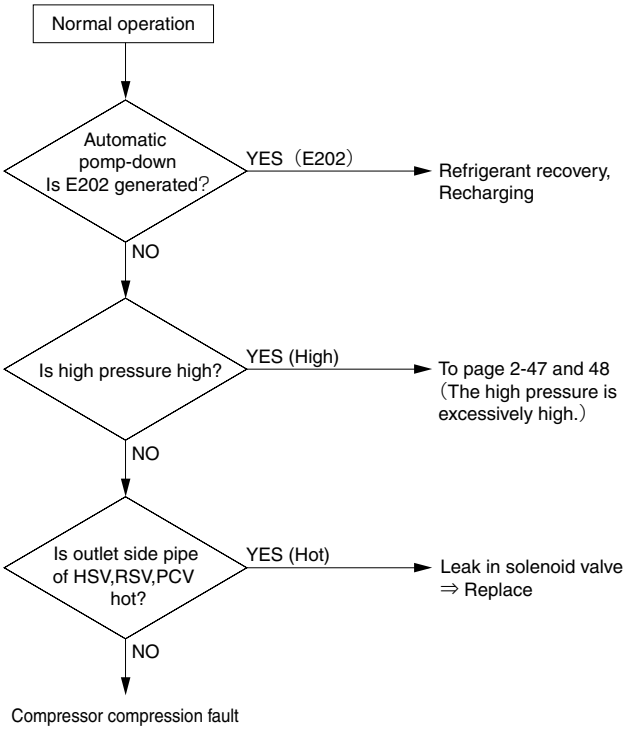
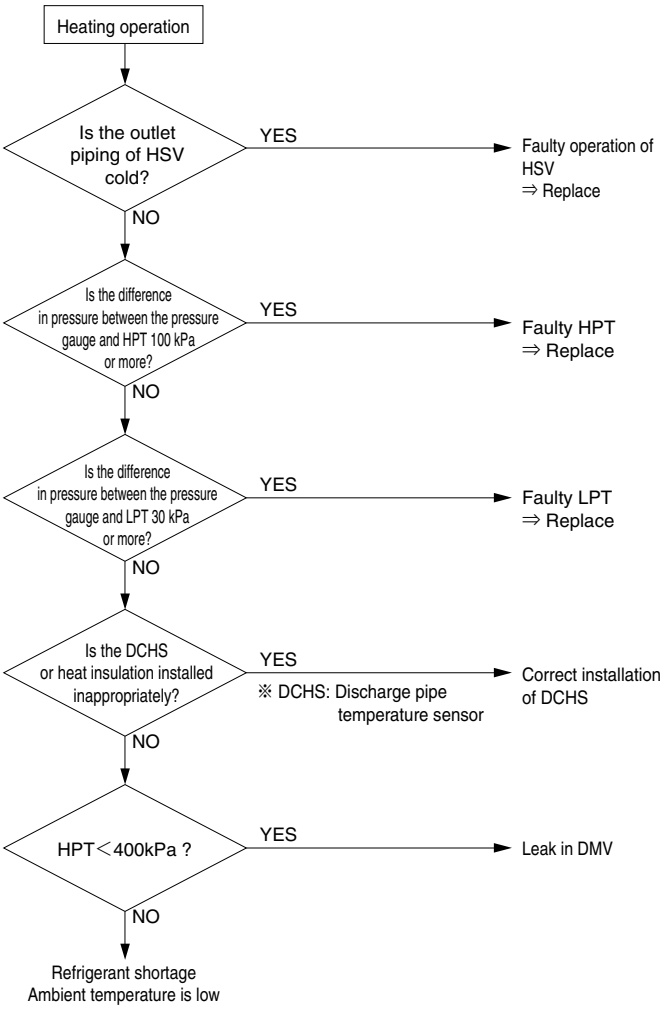
	Symptom	Cause	Checkpoint	Remedy
Ⅰ Unit does not operate	Power supply of the controller cannot be turned on.	· R or T-phase is open. · Faulty power supply (voltage drop) · Disconnection of power cable · Faulty power plug · Disconnection of fuse F1U (I/O board) circuit Faulty transformer		
Ⅱ Unit operates but soon stops.	A. Unit operates but soon stops (full stop).	Refer to the Alarm code list.	———	———
	B. Evaporator fan runs, but condenser fan and compressor stop soon.	Cooling OFF (normal)	———	———
	C. Compressor runs, but condenser fan and evaporator fan stop.	Defrost (normal)	———	———

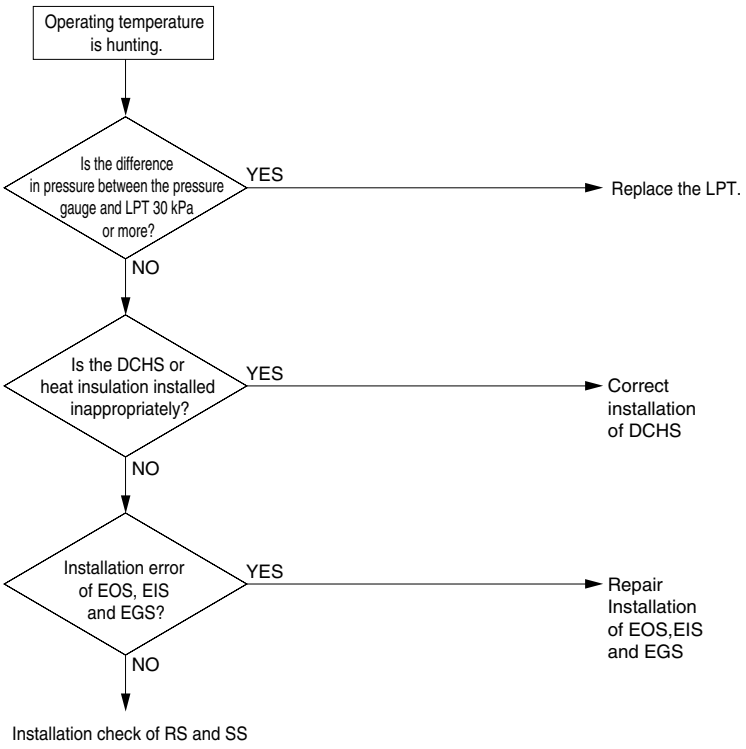
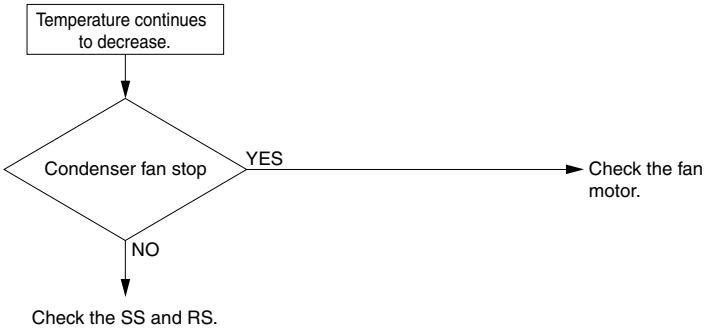
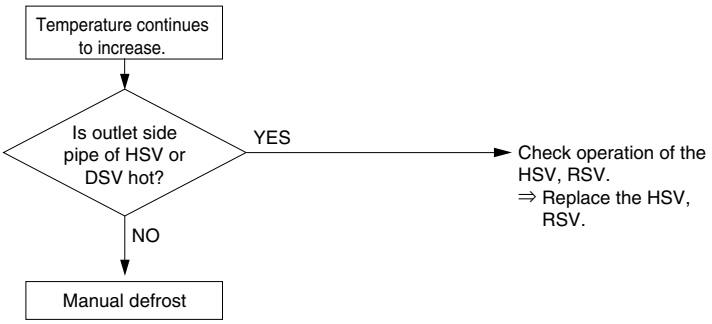
Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop.			
Sight glass flashes when the RS is 0℃ or less during frozen operation.	Refrigerant shortage Blocked pipe (parts) (including solenoid valves) Entering of air in refrigerant system		
The high pressure is excessively high.	Clogging of discharge pipe system (Compressor to condenser)		
The low pressure is excessively low.	Faulty liquid solenoid valve LSV		
	Blocked dryer		
The low pressure is excessively high.	Entering of air		
Frosted compressor body or suction pipe	Faulty high pressure transducer HPT		

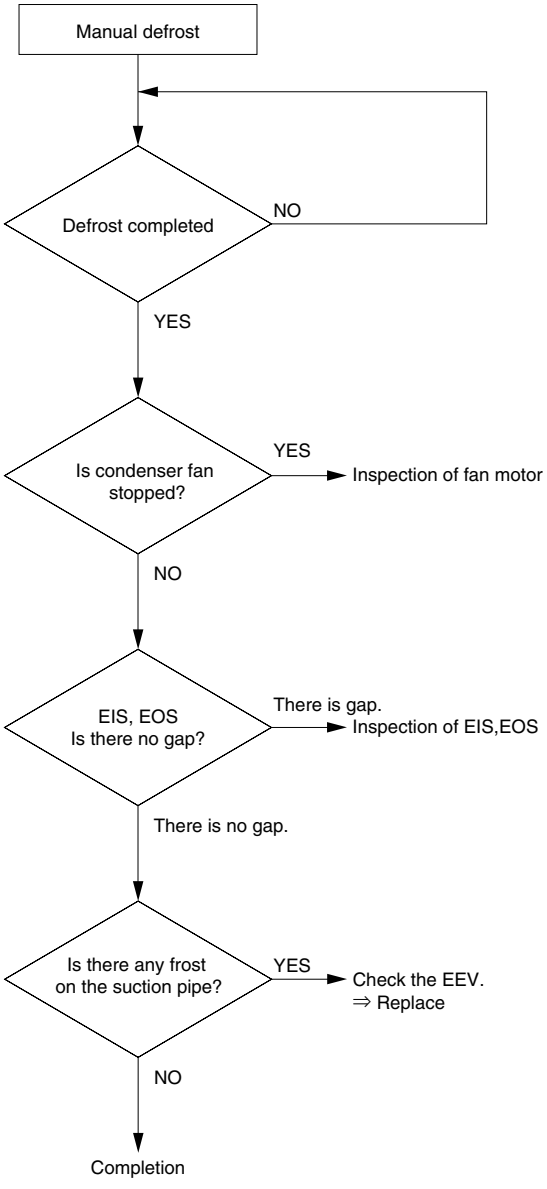


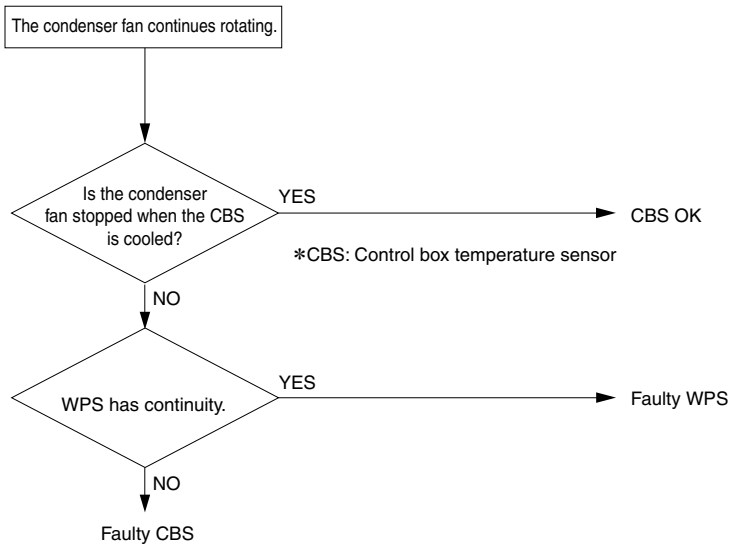
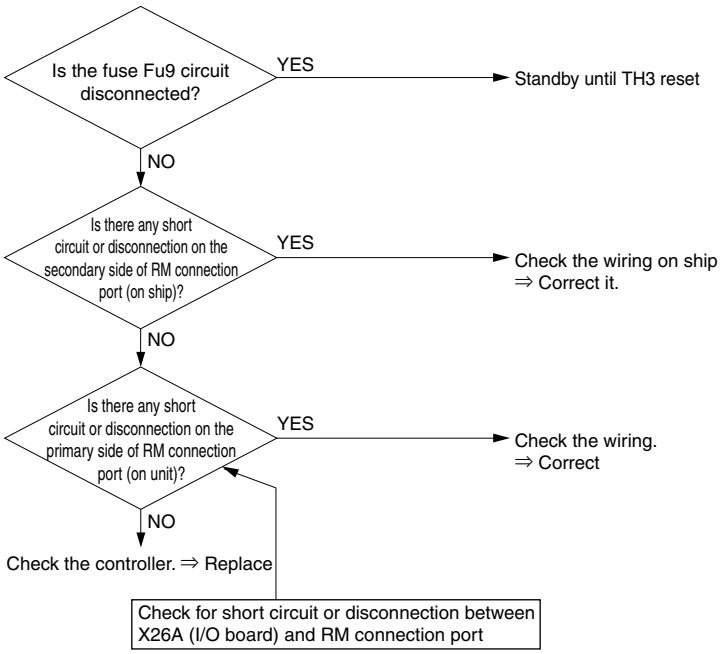
Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop. The high pressure is excessively high.	Solenoid valve internal leak Reverse rotation of condenser fan Ambient temperature is high. Short circuit Is the condenser water-cooled? Low water volume Water temperature is high. Clogged fin of air cooled condenser Entering air Overcharge Wrong refrigerant type		

Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop.	The low pressure is excessively low.	Faulty opening of electronic expansion valve (EEV) Low air volume (frosted evaporator) Low air volume (reverse rotation of evaporator fan) Low air volume (stop of evaporator fan) Low air volume (drop of propeller fan) Displacement of discharge pipe temperature sensor DCHS (detection of wet operation). Faulty electronic expansion valve coil Entering of water in refrigerant system Water choke	

	Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop.	The low pressure is excessively low.	Refrigerant overcharge. Solenoid valve internal leak HSV,RSV and PCV		
Ⅳ Inside temperature does not rise (during heating operation).	The high pressure is excessively low. The discharge gas temperature is low. The low pressure is excessively high.	Faulty operation of solenoid valve (HSV) Faulty operation of high pressure transducer HPT (Charging is impossible.) Faulty operation of low pressure transducer LPT (Charging is impossible.) Pressure leak to condenser due to leak from DMV		

Symptom	Cause	Checkpoint	Remedy
V Control is unstable (during chilled in range control operation). The control temperature is unstable.	Faulty low pressure transducer LPT Faulty discharge pipe temperature sensor DCHS Pipe temperature sensor fault (EOS,EIS,EGS) Air temperature sensor fault (RS,SS)		
Temperature continues to decrease.	Stop of evaporator fan		
Temperature continues to increase.	· Solenoid valve HSV or RSV remains open (dusts caught in) Excessive frost on the evaporator		

	Symptom	Cause	Checkpoint	Remedy
Ⅵ Abnormal noise or vibration	Abnormal noise	Malfunction of compressor inside	Auditory check	Replace
		Fan motor of evaporator, condenser · Worn bearing	Auditory check	Replace the parts.
		Contact with fan guide	Auditory check Visual check	Replace the faulty parts.
	Abnormal vibration	Compressor Fan motor · Loosen bolt	Auditory check Visual check	Tighten bolts.
		Piping · Removed or loosen cramp	Auditory check Visual check	Correct the cramp.
Ⅶ Abnormal frosting on compressor	Abnormal frosting on compressor and suction pipe	Condenser fan stop Check of superheat accuracy Faulty operation of electronic expansion valve (EEV)		

	Symptom	Cause	Checkpoint	Remedy
Ⅷ The air cooled condenser fan continues rotating.	The air cooling evaporator fan continues rotating.	Temperature in the control box is high. Water pressure switch WPS is short-circuited.		
Ⅸ Others	The remote monitoring RM is not output.	Disconnection of TH3 Short-circuit of RM circuit Faulty controller Short-circuit of RM circuit on ship		

Chapter 3 PTI & Periodic Inspection

3.1 Pre-Trip Inspection

Perform a pre-trip inspection of each component and take remedial actions if necessary so that the unit will operate normally. The following is the items necessary for a pre-trip inspection, but those surrounded with a frame can receive an automatic PTI.

(1) Appearance inspection of unit

① Physical damage
② Casing insulation through penetration
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
- Cable glands ----- Control box

⑧ Conditions of control box cover packing (water-proof)
⑨ Magnetic contactor contact point for burning out

(2) Inspection before unit operation

① Refrigerant leakage inspection

② Power voltage inspection (Automatic PTI range)

(3) Operation inspection of safety device and control equipment

① Safety device
② Control equipment

HPS	·····Measurement of the actuating pressure by stopping the condenser fan motor
Solenoid valve	·····Inspection of operation (open and close) and leakage
EFM	·····Speed switchover and rotating direction
EEV, EMV, DMV	·····Inspection of operation (open and close) and leakage

(4) Operation in each mode

① Pull-down → 0℃	Pull-down time, voltage and current
② Chilled control 0℃ Electronic temperature recorder calibration	Return, supply air temperature differential, voltage and current
③ Defrosting	Defrosting time
④ Pull-down → -18℃	Pull-down time, evaporator fan motor speed switchover
⑤ Frozen control -18℃ Electronic temperature recorder calibration	(Difference of temperature, direction of rotation)
⑥ Dehumidification operation and humidity sensor inspection	ON/OFF, voltage and current
	Remaining frost inspection

(5) PTI report preparation

●Consumables

①Rechargeable battery: 2 years
②Humidity sensor: Inspect every year. Replace when appropriate.
③Refrigerant: Inspect at the time of PTI. Replace if an abnormality (malfunction caused by moisture entering, etc.) is detected.
④Power plug: Inspect during PTI. Replace if an abnormality is detected.
⑤Power cable: Inspect during PTI. Replace if an abnormality is detected.

3.2 Manual Inspection

Some items subject to a manual inspection are listed below.

	No.	Inspection item	Inspection content	PTI
General structure	1	Inspection for physical damage		✓
	2	Loose mounting bolts	1) Casing frame	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
			5) Control box	✓
			6) Access panel	✓
	3	Condition of panels, hinges and lock		✓
	4	Drain pan and drain hose cleaning		✓
	5	Control box inspection	Cover packing inspection and replacement	✓
	6	Sealing condition of holes through casing frame	Air leakage and clearance	✓
Refrigerant system	1	Gas leakage		✓
	2	Refrigerant	Inspection of moisture in the refrigerant, and refrigerant charged amount	✓
	3	Inspection of service port cap	Confirmation of attachment	✓
	4	Liquid solenoid valve LSV	Check of installation for solenoid valve coil	✓
		Hot gas solenoid valve HSV		✓
		Economizer solenoid valve ESV		✓
		Reheater solenoid valve coil RSV		✓
	5	Electronic expansion valve EEV	Check of installation for motorized valve coil	✓
		Economizer modulation valve EMV		✓
		Discharge modulation valve DMV		✓
	6	Functional inspection and replacement of sight glass		✓
	7	Condition of fasteners on the refrigerant pipes and gauge pipes		✓
	8	Condenser coil cleaning	Water-cleaning	✓

	No.	Inspection item	Inspection content	PTI
Electrical system	1	Damage of power cable and plug		✓
	2	Inspection of condition of internal wiring		✓
	3	Terminal looseness inspection and retightening if necessary	1) Magnetic switch	✓
			2) Electronic controller terminal board	✓
			3) Terminal board	✓
	4	Condition of monitoring receptacle cap		✓
	5	Condition of personal computer receptacle cap		✓
	6	Fuse conditions	Burned out or not	✓
	7	Inspection of magnetic switch contact	Contact point inspection	✓
	8	Electric insulation check	1) Power cable and plug	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
	9	Starting procedure inspection		✓
	10	Temperature sensor	1) Installation condition of sensor	✓
			2) Indication error inspection and replacement	✓
	11	PT/CT (voltage and current) indication error inspection		✓
	12	Pressure sensor indication error inspection		✓
	13	Electronic controller	Check of wake-up battery	✓
	14	Evaporator fan motor	1) Speed switchover	✓
			2) Rotation direction	✓
	15	Condenser fan motor	Rotating direction	✓
	16	Evaporator fan	Deformation and damage inspection	✓
	17	Condenser fan	Deformation and damage inspection	✓
Others	1	Check for abnormal noise and vibration during operation		✓
	2	Temperature control function	1) 0℃ operation	✓
			2) –18℃ operation	✓
	3	Defrosting function		✓
	4	Unit water-cleaning		✓

3.3 Automatic PTI

● Automatic PTI enable condition

43 ℃ ≧ Ambient temperature ≧ -10.0 ℃

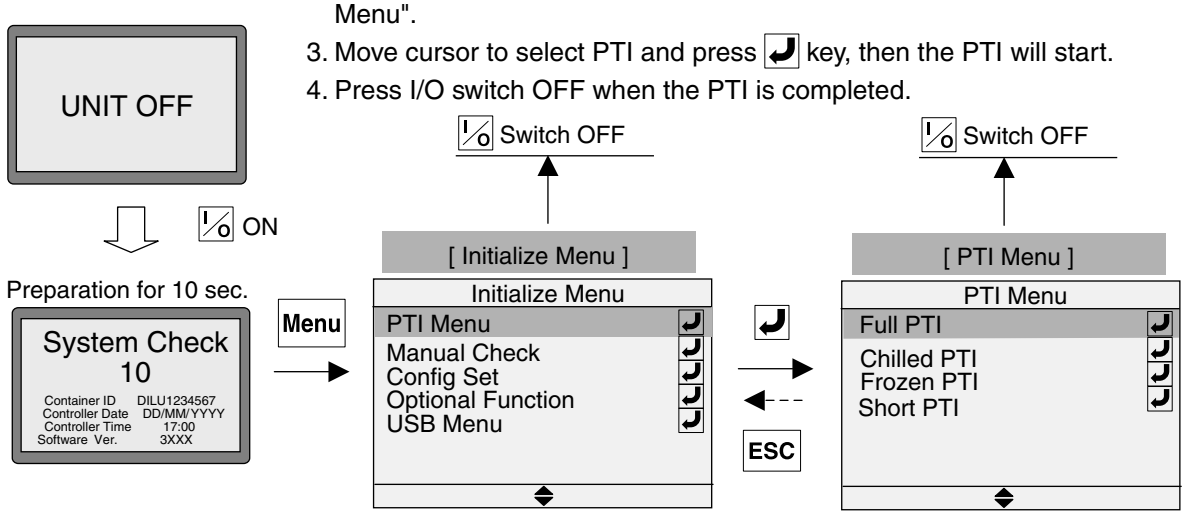
Ambient temperature above 43 ℃ or below -10.0 ℃ may result in PTI failure.

● Four options for automatic PTI are available, Short PTI, Full PTI, Chilled PTI and Frozen PTI.

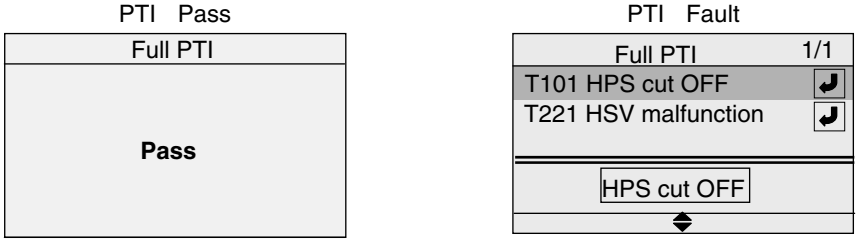
PTI	Content
Short PTI	Performed in order to find parts abnormalities. PTI continues even if abnormalities are found during PTI. But it terminates as soon as the compressor failure or the evaporator fan lock is detected.
Full PTI	Short PTI, Chilled PTI and Frozen PTI are performed. It terminates as soon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

●Access

1. Press MENU key at preparation display after I/O switch ON, and go to "Initialize Menu".
2. Select "PTI Menu" and press ↵ key in the "Initial Menu", and go to "PTI Menu".
3. Move cursor to select PTI and press ↵ key, then the PTI will start.
4. Press I/O switch OFF when the PTI is completed.



※ "Pass" for completion of PTI operation for failure is displayed



3.3.1 Automatic PTI Step No. and Contents

During PTI operation, Step No, contents, and select PTI (Short, Full, Chilled or Frozen) will be displayed.

Step No.	Contents	Short PTI	Full PTI	Chilled PTI	Frozen PTI
P00	Basic data record	✓	✓	✓	✓
P02	Alarm check on all sensors	✓	✓	✓	✓
P03	EFM check	✓	✓	✓	✓
P04	RS & SS accuracy check	✓	✓	✓	✓
P06	HPT & LPT accuracy check	✓	✓	✓	✓
P08	INV check	✓	✓	✓	✓
P10	ESV & EMV check	✓	✓	✓	✓
P12	LSV check	✓	✓	✓	✓
P14	HSV check	✓	✓	✓	✓
P16	RSV check	✓	✓	✓	✓
P18	DMV check	✓	✓	✓	✓
P20	HPS check	✓	✓	✓	✓
P22	Pump down check	✓	✓	✓	✓
P24	HSV, RSV & ESV check	✓	✓	✓	✓
P50	Pull-down check		✓	✓	✓
P60	0℃ control		✓	✓	
P70	Defrost operation check		✓	✓	✓
P80	Pull-down speed check		✓		✓
P90	-18℃ control		✓		✓

3.3.2 Automatic PTI Alarm

Alarm code T＊＊＊ is displayed for Automatic PTI.

Step No.	Contents	Alarm code	Conclusion	Possible cause	Check method
P00	Basic data check	No alarm	No conclusion		
P02	Alarm check on all sensors	Same as normal operation	Same as normal operation	Same as normal operation	Same as normal operation
P03	EFM check	T031	EFM operation current is large at high and low speed.	Faulty motor coil	Check motor coil
		T032	EFM operation current is small at high and low speed. (Broken wire?)	Faulty operation of magnetic contactors EFM wiring fault	Check of magnetic contactors operation Check wiring
P04	RS, SS check	T041	The temperature difference of SS and DSS is large.	SS Failure	Compare the SS with the DSS on the control panel.
			The temperature difference of RS and DRS is large.	RS Failure	Compare the RS with the DRS on the control panel.
P06	HPT, LPT check	T061	The pressure difference of HPT and LPT is large.	HPT Failure	Compare the high-pressure value between HPT and manifold gauge.
				LPT Failure	Compare the low-pressure value between LPT and manifold gauge.
P08	INV check	T081	The frequency does not match to command frequency.		
		T082	No pressure difference between high and low pressure.		

P10	EMV, ESV check	T101	EMV or ESV failure	EMV coil failure	Check EMV coil and wiring.
				EMV valve body failure	Check EMV outlet pipe temperature.
				ESV wiring failure	Check ESV coil and wiring.
				ESV coil burning out	Check clicking sound from ESV.
		T102	EMV failure	EMV coil failure	Check EMV coil and wiring.
				EMV valve body failure	Check EMV outlet pipe temperature.
		T103	ESV failure	ESV wiring failure	Check ESV coil and wiring.
				ESV coil burning out	Check clicking sound from ESV.
P12	LSV check	T121	LSV does not operate.	LSV coil failure	Check LSV coil and wiring.
				LSV valve body failure	Check LSV outlet pipe temperature.
P14	HSV check	T141	HSV does not open.	HSV coil failure	Check HSV coil and wiring
				HSV valve body failure	Check HSV outlet pipe temperature.
P16	RSV check	T161	RSV does not open.	RSV coil failure	Check RSV coil and wiring.
				RSV valve body failure	Check RSV outlet pipe temperature.
P18	DMV check	T181	DMV does not operate.	DMV wiring failure	Check DMV coil and wiring.
				DMV coil burning out	Check clicking sound from DMV.
P20	HPS check	T201	OFF value abnormal	①HPS failure ②HPT failure ③Gas leakage from gauge manifold	①Check HPT. ②Compare to gauge manifold. ③Remove gauge manifold.
		T202	Does not reset		
		T203	HPS: High pressure does not rise. HPS does not operate.		
		T204	HPS: High pressure does not drop.		
P22	Pump down check	T221	Pump down time is too long.	EEV failure	Check EEV coil, wiring, valve body.
				Leakage through HSV	Check HSV outlet pipe temperature.
				Leakage through RSV	Check RSV outlet pipe temperature.
				Leakage through ESV	Check ESV outlet pipe temperature.
P24	HSV, RSV ESV check	T241	Solenoid valve leakage	Leakage through HSV	Check HSV outlet pipe temperature.
				Leakage through RSV	Check RSV outlet pipe temperature.
				Leakage through ESV	Check ESV outlet pipe temperature.

P50	Pull-down check	T501	Ambient temperature is out of condition. (Unit is normal.)	Ambient temperature is below -10℃ and above 43℃	Check ambient temperature
		T502	Pull-down time is too long.		
P60	0℃ control	No alarm	No judgment		
P70	Defrost check	T701	Defrost initiation conditions out of range	EOS failure	Check EOS.
				Leakage of HSV solenoid valve	Check HSV outlet pipe temperature.
		T702	Defrost time is too long.	EOS failure	Check EOS.
P80	Pull-down check	T801	Pull-down time is too long.		
P90	-18℃ control	No alarm			

3.4 Periodic Inspection

Always to operate the unit normally, conduct periodic inspections of each part in addition to pre-operation ones and make adjustments or repairs where necessary. The following table shows an example of the inspection plan.

	No.	Inspection item	Inspection content	2nd year	4th year	8th year
General structure	1	Inspection for physical damage		✓	✓	✓
	2	Loose mounting bolts		✓	✓	✓
	3	Condition of panels, hinge and lock		✓	✓	✓
	4	Control box inspection	1) Cover packing inspection and replacement	✓	✓	✓
			2) Loose cable gland	✓	✓	✓
			3) Internal cleaning	✓	✓	✓
	5	Sealing condition of holes through casing frame	Air leakage and clearance	✓	✓	✓
	6	Packing inspection and replacement	Ventilator cover packing	✓	✓	✓
	7	Painted area recondition	1) Compressor	✓	✓	✓
			2) Receiver	✓	✓	✓
			3) Solenoid valve (coil cap)	✓	✓	✓
			4) Unit		✓	✓
	8	Repainting	1) Compressor			✓
			2) Receiver			✓
			3) Condenser fan motor			✓
			4) Condenser fan			✓
Refrigerant system	1	Refrigerant leakage		✓	✓	✓
	2	Compressor	Water entering to compressor terminal	✓	✓	✓
	3	Inspection and replacement of sight glass				✓
	4	Condition of fasteners on the refrigerant pipes and gauge pipes		✓	✓	✓
	5	Condition of thermal insulation of refrigerant pipe		✓	✓	✓
	6	Evaporator coil cleaning (by water)		✓	✓	✓
	7	Condenser coil cleaning	1) Water-cleaning	✓	✓	✓
			2) Steam-cleaning (after pumping down the refrigerant)	✓	✓	✓

	No.	Inspection item	Inspection content	2nd year	4th year	8th year
Electrical system	1	Damage of power cable and plug		✓	✓	✓
	2	Inspection of condition of internal wiring		✓	✓	✓
	3	Terminal looseness inspection and retightening if necessary	1) Magnetic switch	✓	✓	✓
			2) Terminal block	✓	✓	✓
	4	Condition of monitoring receptacle cap		✓	✓	✓
	5	Condition of personal computer receptacle cap		✓	✓	✓
	6	Fuse conditions	Burned out or not	✓	✓	✓
	7	Magnetic switch contact point inspection and replacement	1) Contact point inspection	✓	✓	✓
			2) Replace the contact on compressor contactor.			✓
			3) Replace the contact on evaporator fan motor			✓
			4) Replace the contact on condenser fan motor			✓
	8	Electric insulation check	1) Power cable and plug	✓	✓	✓
			2) Compressor	✓	✓	✓
			3) Evaporator fan motor	✓	✓	✓
			4) Condenser fan motor	✓	✓	✓
	9	Thermo sensor	1) Installation condition of sensors	✓	✓	✓
			2) Inspection of sensor and sensor lead for damage	✓	✓	✓
			3) Indication error inspection and replacement	✓	✓	✓
	10	Temperature sensor	Inspect every year.	✓	✓	✓
	11	PT/CT (voltage and current) indication error inspection		✓	✓	✓
	12	Pressure sensor indication error inspection		✓	✓	✓
	13	Condenser fan motor	Inspection of bearing		✓	✓
	14	Evaporator fan	Deformation and damage inspection	✓	✓	✓
	15	Condenser fan	Deformation and damage inspection	✓	✓	✓

Chapter 4 Service

Pre-Cautions for Service Work

1. Note Safety PRECAUTIONS, WARNING and CAUTION described in page 3.
2. Confirm model name and refrigerant charge amount stamped on model name plate mounted on the left wall in compressor chamber.
3. Do not overcharge refrigerant.
   Judge refrigerant flow amount if it's Normal or Shortage during RS≦0℃ in frozen mode by watching sight glass. Refer to paragraph 4.5.
4. Use correctly 4 service ports (Refer to paragraph 4.5)
   ① : for low pressure check
   ② : for high pressure check
   ①, ④ : for refrigerant recovery, vacuum & dehydration
   ④ : for liquid refrigerant charging
   ① : for gaseous refrigerant charging.
5. **Do not release R134a into atmosphere.**
   Use recover machine according to present legislation.

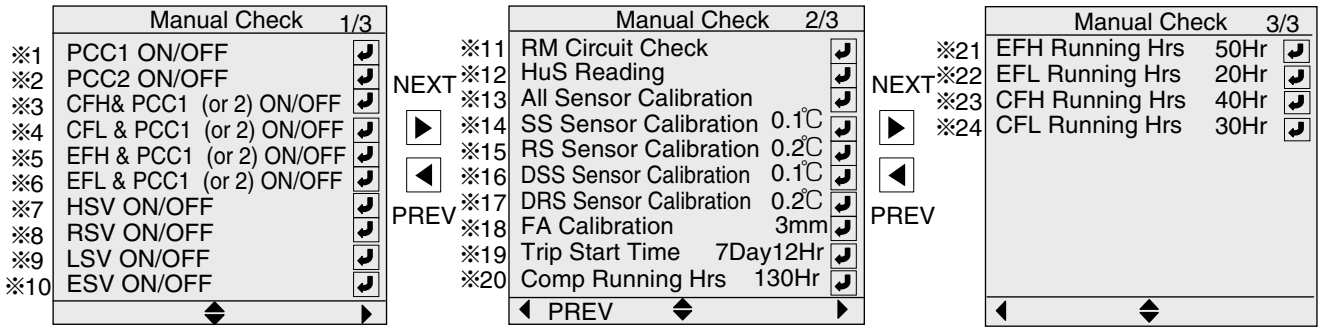
4.1 Manual Check

Manual Check allows the function check of each component and the function.

＜**Access**＞

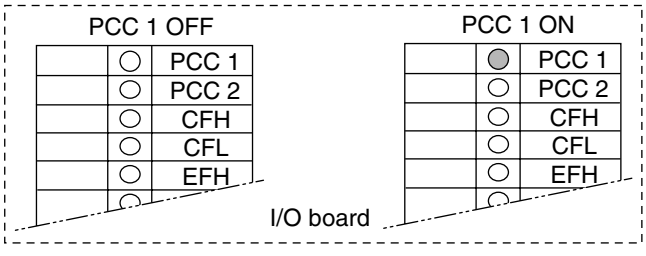
1. Press MENU key at preparation display after I/O switch ON, and go to "Initialize Menu".
2. Select "Manual Check" in Initialize Menu and press ↵ key, and go to "Manual Check" consist of 3 screens.
3. Press I/O switch to OFF when the "Manual Check" is completed.

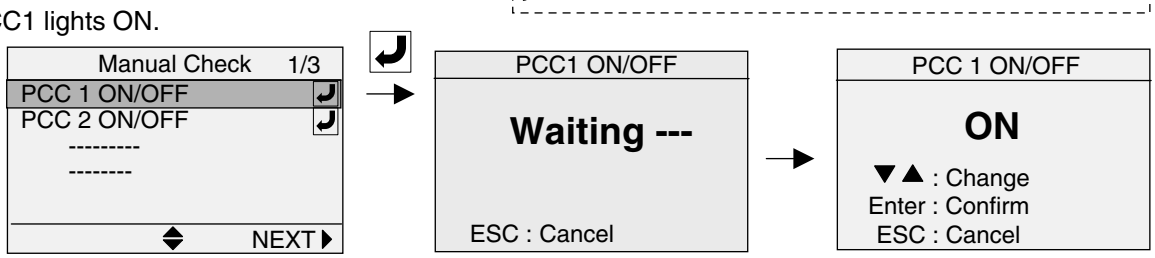
Manual Check Function	
ON/OFF Check	PCC,CFH,CFL,EFH,EFL,CM HSV,RSV,LSV,ESV
	RM Circuit Check
HuS Sensor Reading	HuS
Sensor Calibration	SS,DSS,RS,DRS,FA (option)
Trip Start Time and Reset	
Running Hours and Reset	CM,EFH,EFL,CFH,CFL



※1 PCC1 ON/OFF Check

1. Press ▼ ▲ key to select PCC1 ON/OFF and press ↵ key to determine.
   When the difference between high and low pressure is large (300kPa or more), pressure equalizing is executed so that "Waiting ---" is displayed.
2. Press ▼ ▲ key to select PCC1 ON and press ↵ key to determine. Then magnetic contactor for PCC1 is energized and LED for PCC1 lights ON.



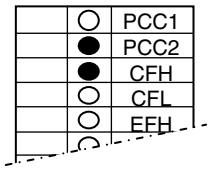


Follow the same procedure for other magnetic contactor or solenoid valve ON/OFF check.

※2 PCC2 ON/OFF Check
※3 CFH & PCC1 (or 2) ON/OFF Check
※4 CFL & PCC1 (or 2) ON/OFF Check
※5 EFH & PCC1 (or 2) ON/OFF Check
※6 EFL & PCC1 (or 2) ON/OFF Check
※7 HSV ON/OFF Check
※8 RSV ON/OFF Check
※9 LSV ON/OFF Check
※10 ESV ON/OFF Check

During checking, the corresponded magnetic contactor or solenoid valve is energized and LED (I/O board) lights ON (green).

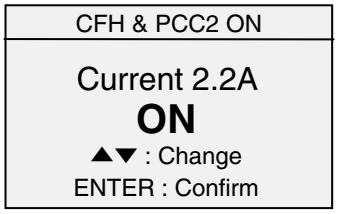
CFH &PCC2 ON



I/O board

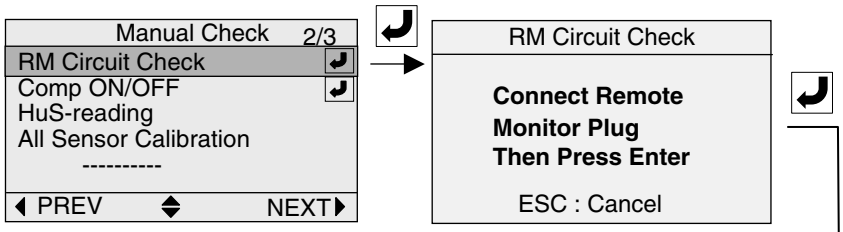
During checking ※3～※6, the corresponded fan operation current will be displayed.

CFH &PCC2 ON

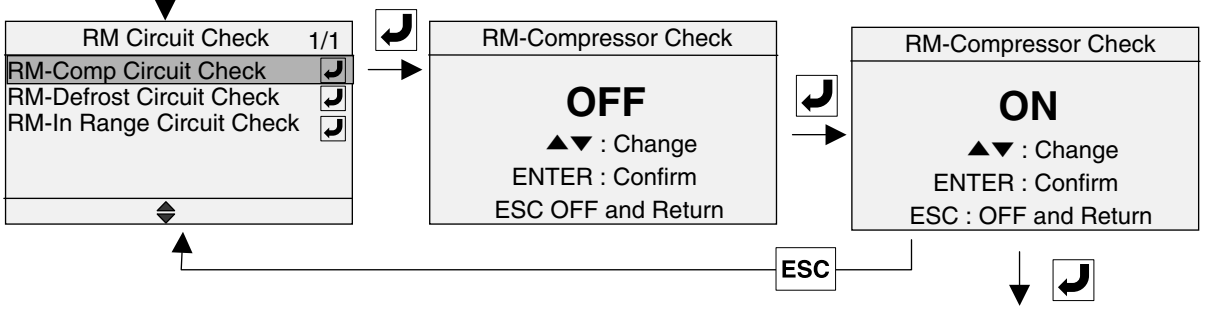


※11 RM (Remote Monitoring) Circuit Check (Option)

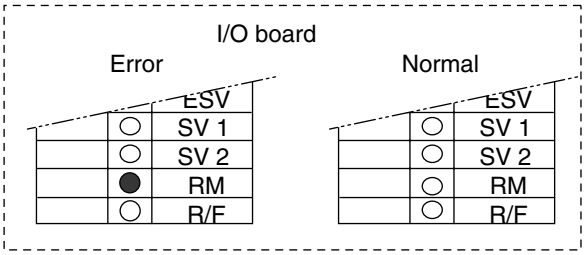
1. Press ▼ ▲ key to select "RM-Circuit Check" and press ↵ key to determine.
2. Connect Remote Monitoring plug.



※11-1 RM-Compressor Circuit Check



1. Press ▼ ▲ key to select RM-Compressor Check and press ↵ key to determine.
2. Press ▼ ▲ key to select ON and press ↵ key to determine. RM I/O Board LED "ON" for fail or "OFF" for pass.
3. It is error when LED (Red) for RM lights ON. (RM circuit for compressor is shorted.)
   It is normal when the LED lights OFF.

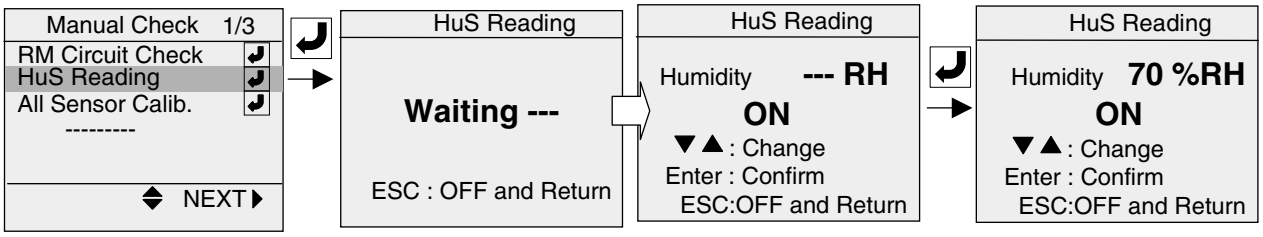


Follow the same procedure for RM-Defrost Circuit and RM-In Range Circuit checks.

※11-2 RM-Defrost Circuit Check
※11-3 RM-In Range Circuit Check

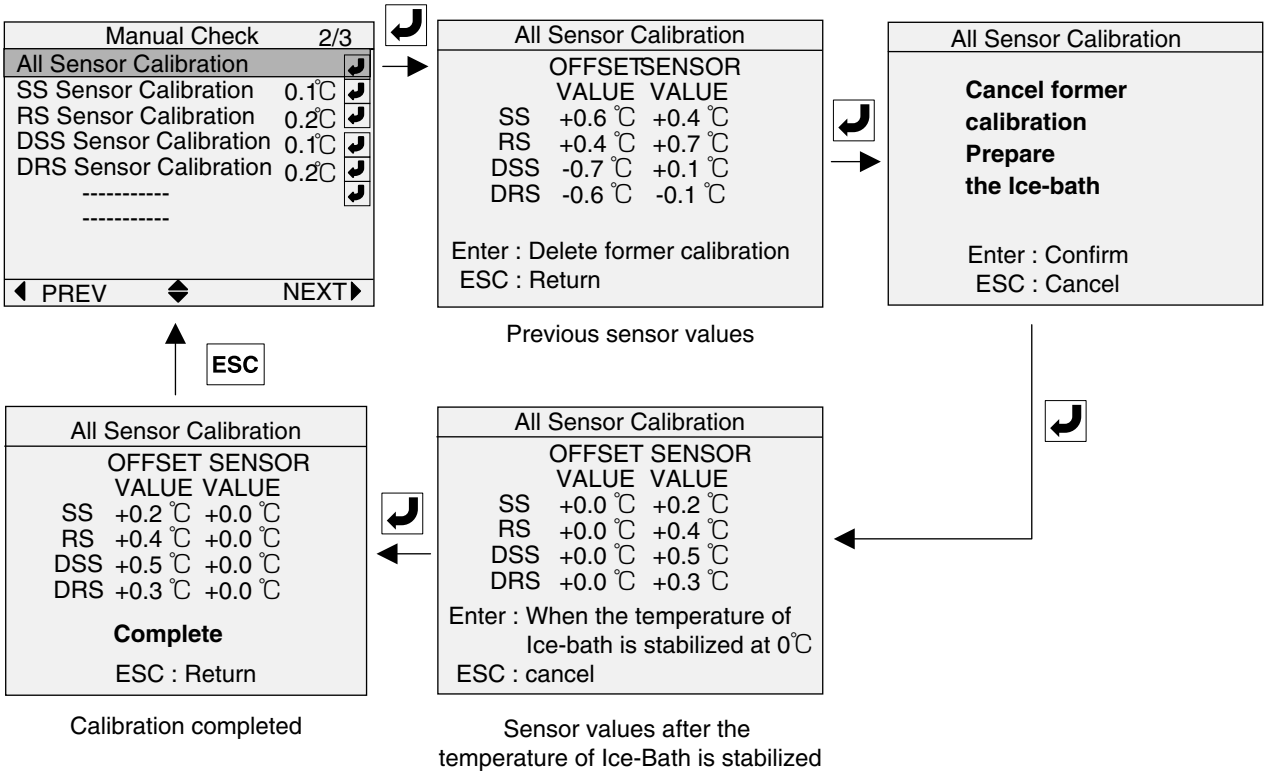
※12 Humidity Sensor Reading (Option)

1. Press [▼] [▲] keys to select HuS-Reading and press [↵] key to determine .
   Then EFM runs with high speed and humidity is displayed.
   When the difference between high pressure and low pressure is large (300kPa or more), unit enters to pressure equalizing so that "Waiting---" is displayed.



※13 All Sensor Calibration (Option)

Go to All Sensor Calibration in Manual Check for SS, RS, DSS and DRS.

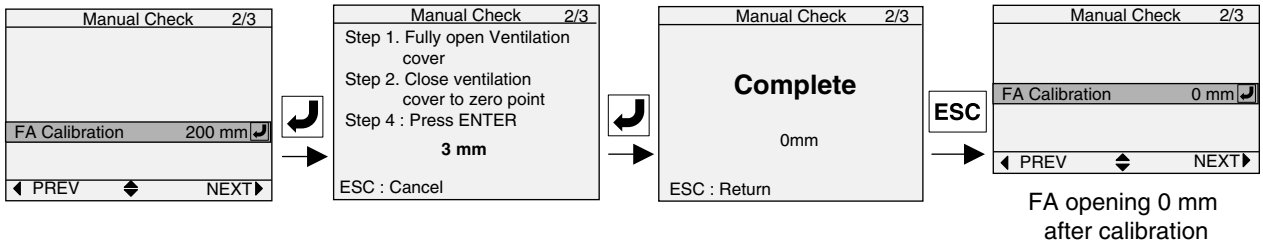


Follow the same procedure for individual sensor calibration.

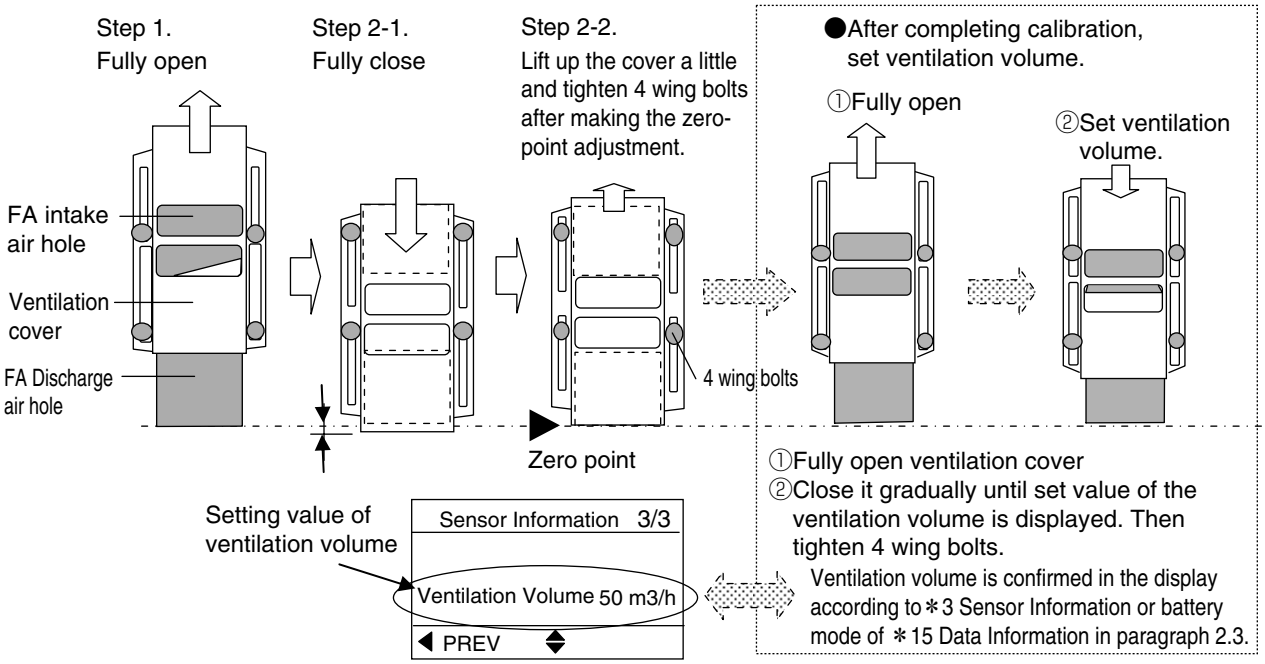
※14 SS Sensor Calibration (Option)
※15 RS Sensor Calibration (Option)
※16 DSS Sensor Calibration (Option)
※17 DRS Sensor Calibration (Option)

※18 FA Calibration (Option)

Go to FA Calibration in Manual Check first, then set ventilation volume.

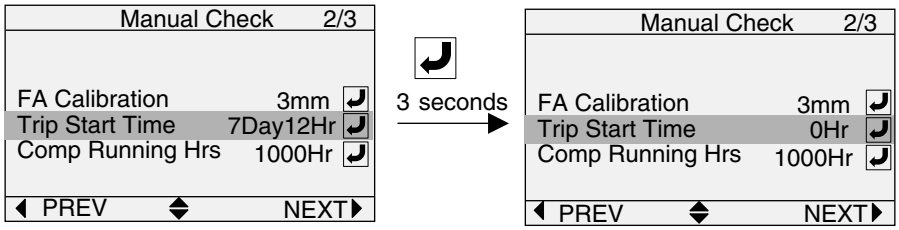


FA opening 0 mm after calibration



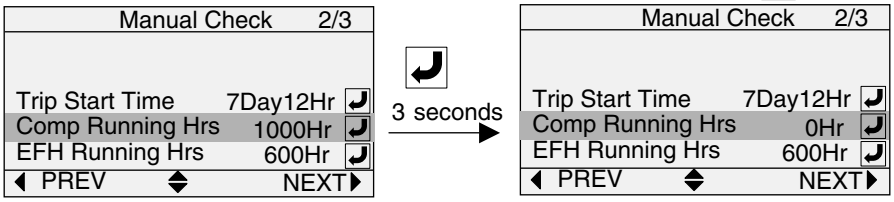
※19 Trip Start Time

Go to Trip Start reset by pressing ↵ key for 3 seconds.



※20 Comp. Running Hrs

1. Current Compressor Running Hrs is 1000 Hr as example below.
2. When compressor is replaced, it's recommended to reset 0 Hr by pressing ↵ key for 3 seconds.



Follow the same procedure for EFH, EFL, CFH and CFL running hrs.

※21 EFH Running Hrs

※22 EFL Running Hrs

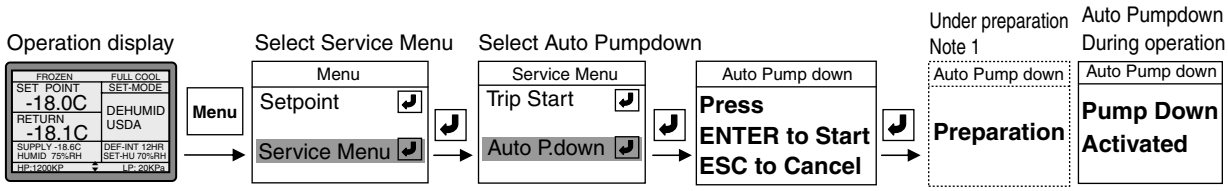
※23 CFH Running Hrs

※24 CFL Running Hrs

4.2 Automatic Pumpdown

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 closed stop valve.

●Access to Automatic Pumpdown

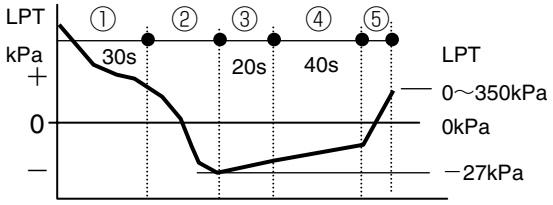


Note ;

1. When PTI starts soon after pressing I/O switch ON, "Preparation" is displayed due to actuation of start control. (Refer to startup control in paragraph 1.4.6)
2. "GOOD" is displayed after completion of automatic pump down. Then press I/O switch OFF for the termination.

●Automatic Pumpdown Operation

Automatic Pump Down operation consists of 5 steps as below. It is normally terminated for a several minutes but more longer under low ambient temperature (≦0℃).



①In the case of HPT≦700kPa, unit operates normally for 30 seconds.

②Pump Down Operation
Unit conducts pump down operation with closing LSV and compressor will stop when LPT drops to ≦-27kPa.

③Leakage Check
Keep unit stopping for 20 seconds and check if LPT does not rise.
Repeat ② and ③ 9 times when ambient temperature<0℃ or RS<0℃ .

④Pressure Equalizing
Keep EFM and CFM stopping for 40 seconds, then if LPT<0kPa, open HSV and increase LPT until LPT≧0～350kPa.

⑤Termination
Close HSV when LPT becomes 0～350kPa, then close EEV. "GOOD" is displayed and automatic pumpdown will be terminated.

CAUTION !!
If unit stops at step ① or ② above and triggers alarm E202, overcharged refrigerant may be caused.
In this case, recover the refrigerant from service port ③ until the pressure drops 0 to 350 kPa. (Closed circuit between LSV and EEV)
Replace drier after that.

●Use of Automatic Pumpdown

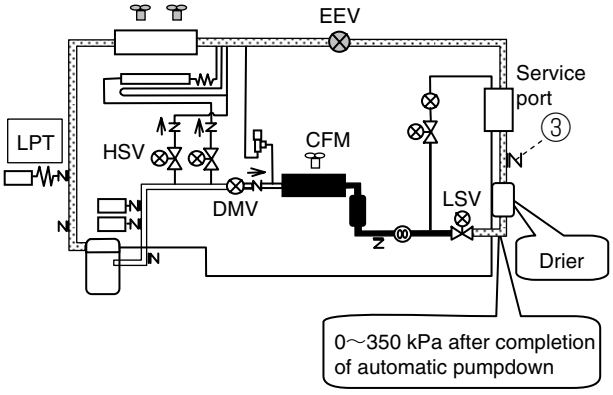
1. Replacement of drier

Replace drier after automatic pump down is completed. The pressure in the pipe in and out of the drier is slightly higher than the atmospheric pressure. Thus, although no ambient air will enter into the piping, replace drier quickly in a short period.

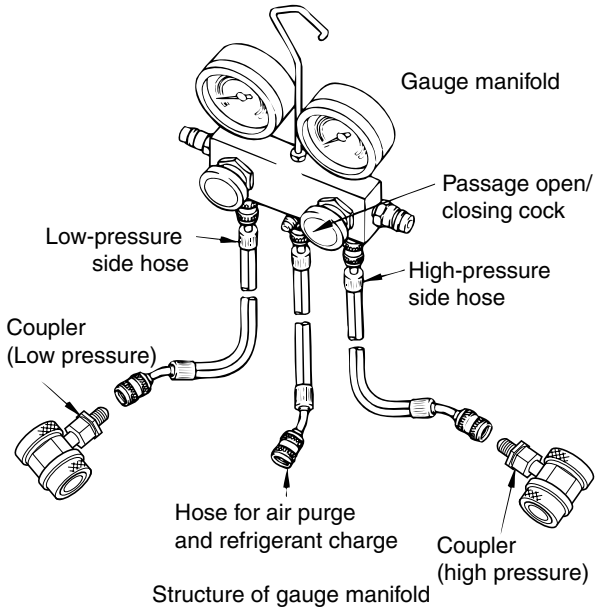
CAUTION !!
Ambient air may enter into piping if it is opened for long time after removing drier. In this case vacuum and dehydrate the piping after replacement of drier.

2. Checking the entering of non-condensable gas

After completion of automatic pumpdown, operate CFM and stabilize the pressure in condenser, then check the entering of non-condensable gas. (Refer to paragraph 4.4.)



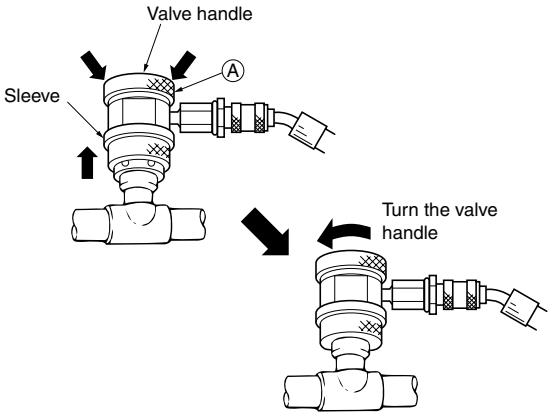
4.3 Connecting and Removing Gauge Manifold



Structure of gauge manifold

(1) Connecting gauge manifold

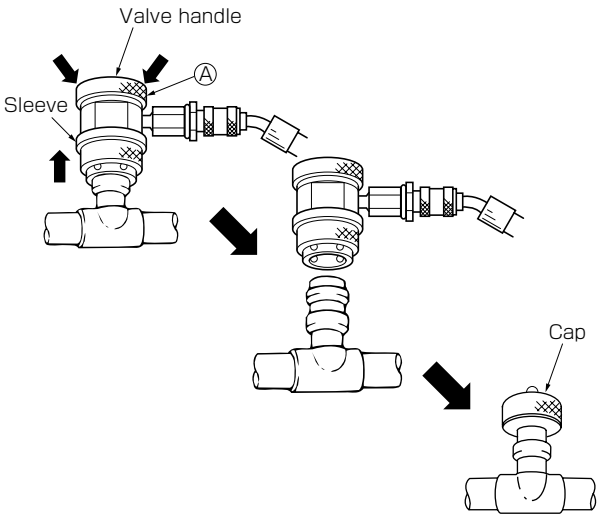
Turn the valve handle of coupler counterclockwise (the push pin is pulled up). Slide the sleeve upward, and press it against the service port. Then, securely push the valve handle (section A) until a click sound is heard. After the coupler is inserted into the service port, release the sleeve. The coupler is fixed so that it will hot detach from the service port. Next, turn the valve handle clockwise. Lower the push pin, and open the check valve at the service port.



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

(2) Removal of gauge manifold

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

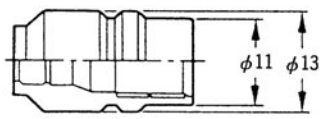
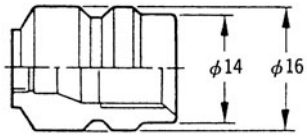


⚠ CAUTION

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

⚠ CAUTION

1. Use the pressure indicating function of the controller to check the working pressure as much as possible.
2. Use exclusive tools such as gauge manifold, charge hose and charging cylinder for R134a.
3. The service ports equipped on unit are exclusively provided for R134a.

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

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

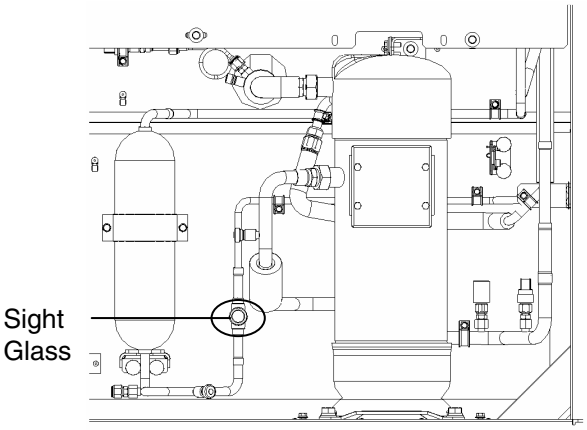
4.4 Checking Non-Condensable Gas

If the air or other non-condensable gases are present in the refrigerant system, they will gather in the condenser and the pressure inside the condenser will rise significantly.
In this case, recover all refrigerant and charge the specified charge amount of refrigerant.
Confirm whether the air or other non-condensable gas is present with following procedure.

(1) Collect refrigerant to condenser coil and receiver by operating automatic pumpdown.
(2) Operate condenser fan using CFM ON/OFF function in manual check and wait until the air inlet and outlet temperature of condenser becomes equal.
(3) Connect gauge manifold (High pressure gauge) to port ④.
Non-condensable gas are present if the corresponding saturation temperature of gauge pressure is higher than the temperature of the outdoor air.

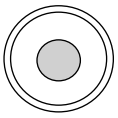
4.5 Sight Glass

Sight glass permits checking of the moisture content in the refrigerant and refrigerant flow rate.



(1) Moisture indicator

Recover all refrigerant and recharge new refrigerant if the sight glass indicates yellow as excessive moisture may be contained in the system.



Color	Judgment
Green	Dry
Yellow	Wet

(2) Judgment for refrigerant flow rate, Normal or Shortage?

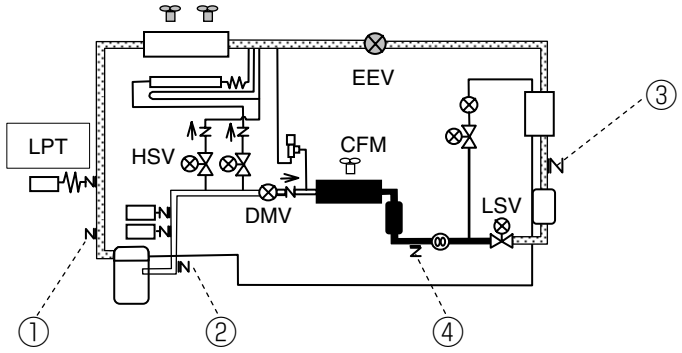
Judge refrigerant flow rate when frozen mode only under 0 ℃ .
Normal if full is indicated at RS < 0 ℃ .
Shortage if flashing is indicated at RS < 0 ℃ .

Frozen Operation		Judgment
RS＜0℃	Full	Normal
RS＜0℃	Flashing	Shortage

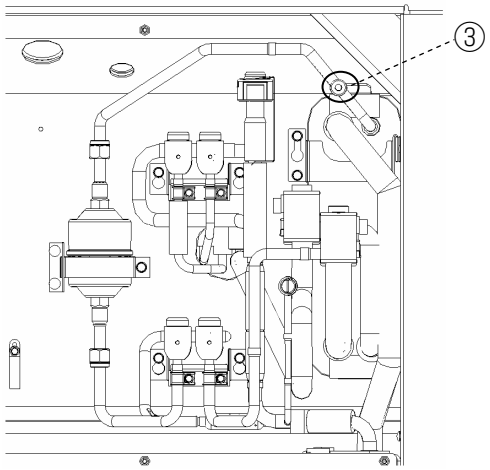
⚠ CAUTION

Do not judge shortage if flashing is indicated at RS > 0℃ frozen and at any range of chilled mode.
As flashing here does not mean gas shortage, do not charge with additional refrigerant.
It is possibly caused by overcharging.

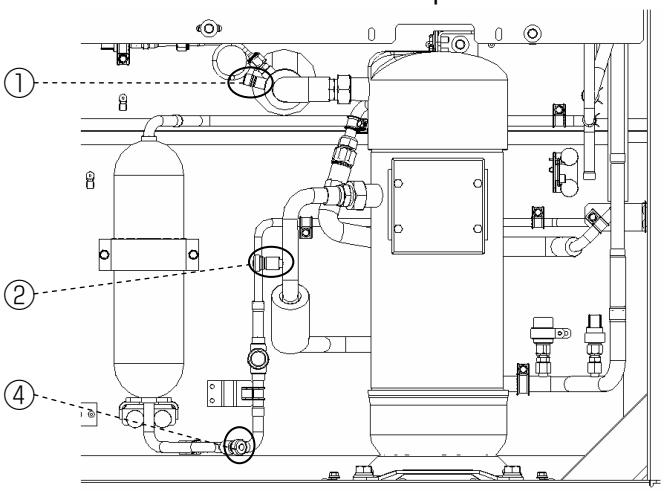
4.6 Refrigerant Recovery and Charge



Valve chamber



Compressor chamber

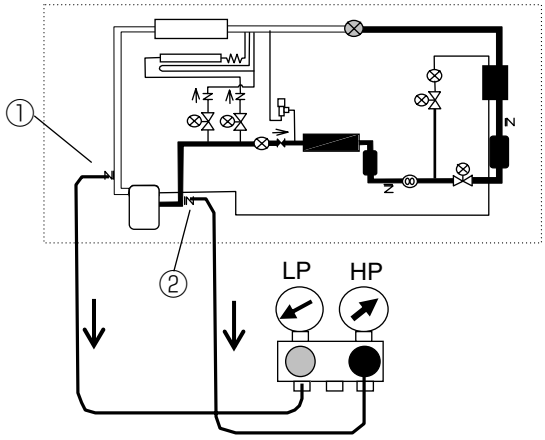


Work		Service port	Notes
Operation Pressure cheek	High pressure	②	
	Low pressure	①	
Refrigerant recovery		① & ④	Recover all refrigerant from ports ④ and ①.
Vacuum and dehydration		① & ④	Vacuum and dehydrate from ports ④ and ①.after recovering.
R134a Refrigerant charge (Refer to note 1 of specified charge amount of refrigerant.)	(1) Liquid charge	④	Charge liquid refrigerant from port ④ after vacuum and dehydration. All specified charge amount of refrigerant can not be charged.
	(2) Gaseous charge	①	By operating unit, charge gaseous refrigerant from port ① for the rest of specified charge amount of refrigerant. Charging liquid refrigerant from port ① causes malfunction of the compressor.

Note 1. Confirm specified charge amount of refrigeration stamped on model name plate.
The model name plate is mounted on the wall of compressor chamber (behind of cable box).

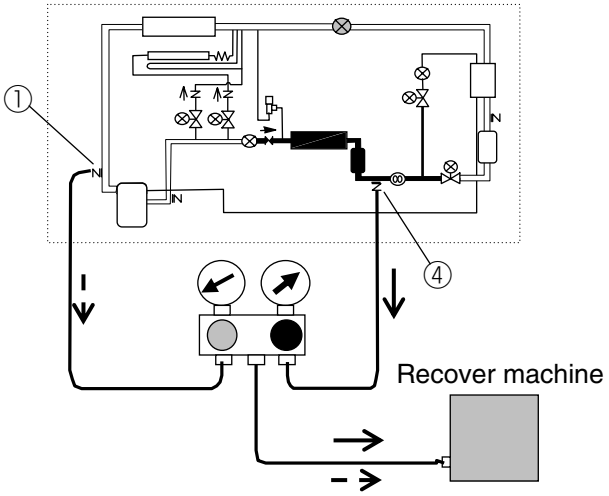
4.6.1 Operation Pressure Check

Use port ② for high pressure check and ① for low pressure check.



4.6.2 Refrigerant Recovery

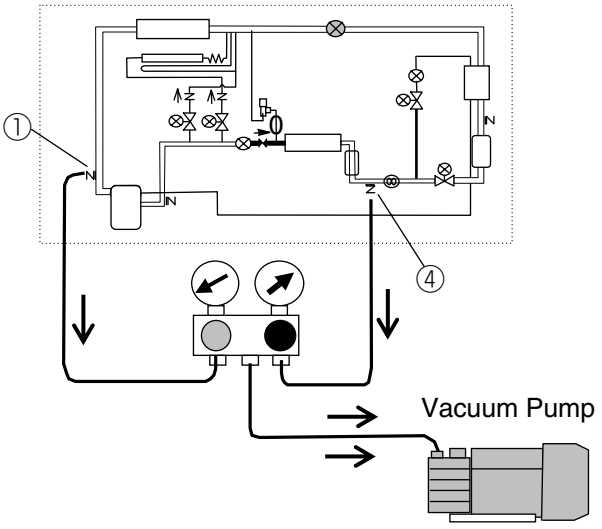
1.Recover refrigerant completely from ports ④ and ①.



4.6.3 Vacuum and Dehydration

Evacuation and Dehydration inside refrigerant system is very important procedure before charging refrigerant. If possible, heat up the system from outside to accelerate the evaporation of moisture if ambient temperature is lower than 15 ℃ . (Refer to "NOTE" below.)

1. Replace dryer if repairing for gas leakage is done or moisture inserting is found.
2. Connect vacuum pump to service ports ① and ④ and operate the vacuum pump for 1 hour or longer after reaching to -100kPa. It is recommended that the vacuum operation is switched ON overnight after work.
3. Shut off the pump and check to see if the vacuum holds for 5 minutes as it is. The vacuum and dehydration is completed if vacuum is holding.



●If moisture is existing in the system, proceed to following steps.

1) Connect R134a cylinder to gauge manifold and purge air inside the hoses. Open both valves of high and low pressure gauges and charge gaseous R134a and raise system pressure to roughly 20kPa by monitoring with the compound gauge. Hold this state for 15 minutes as it is.
2) Connect recovery machine and recover the refrigerant.
3) Operate vacuum pump and evacuate unit until the vacuum -100kPa. Shut off the vacuum pump. and check to see if the vacuum holds for 5 minutes as it is.
4) Repeat 1),2),3) again and vacuum is still held, vacuum and dehydration is completed.

   Reference: If moisture exists inside system, lubrication oil for vacuum pump will become muddy and whitish. Refer this for judgment of moisture existence.

●If the vacuum is still not held, there might be gas leakage somewhere in the system. Check and repair it.

NOTE

Moisture evaporates at 100 ℃ under atmospheric pressure. The evaporating temperature drops to lower under lower pressure. For example, according to below table, moisture evaporates at 11.7 ℃ under vacuum -100kPa. If 11.7 ℃ or lower, the moisture will not evaporate and ice might form before moisture removal is complete. If the system is heated up from outside under such low ambient temperature, the ice forming might be prevented and moisture evaporation is accelerated.

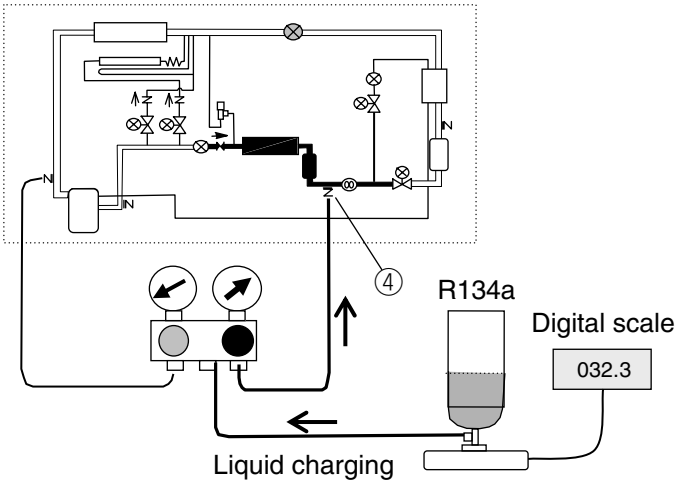
-----Water, Evaporating Temperature------

Evaporating Temperature ℃	Vacuum pressure kPa
100	0 (Atmospheric)
40	－ 93.6
30	－ 96.5
20.6	－ 98.9
11.7	－100
7.2	－100.2
0	－100.6

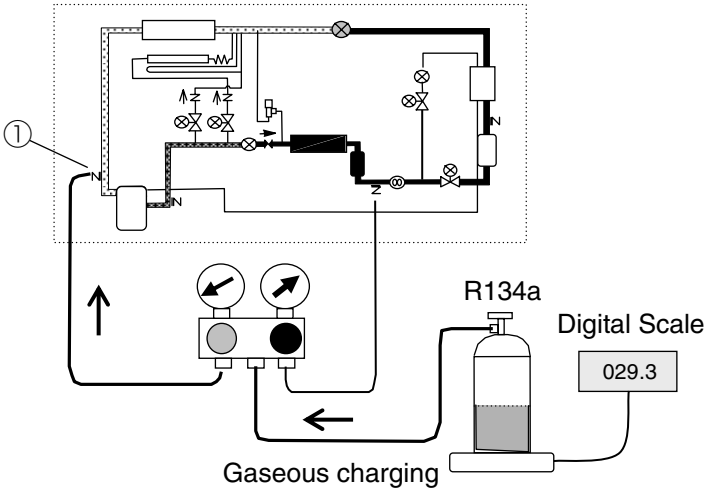
4.6.4 Refrigerant Charge

Charge specified amount of refrigerant after vacuuming and dehydration. Confirm the specified charge amount of refrigeration stamped on model name plate.

1. Place R134a cylinder on digital scale and connect hose to manifold gauge and purge air inside the hose. Record weight of R134a cylinder.
2. Charge liquid refrigerant from port ④.
   (All specified charge amount of refrigeration can not be charged.)



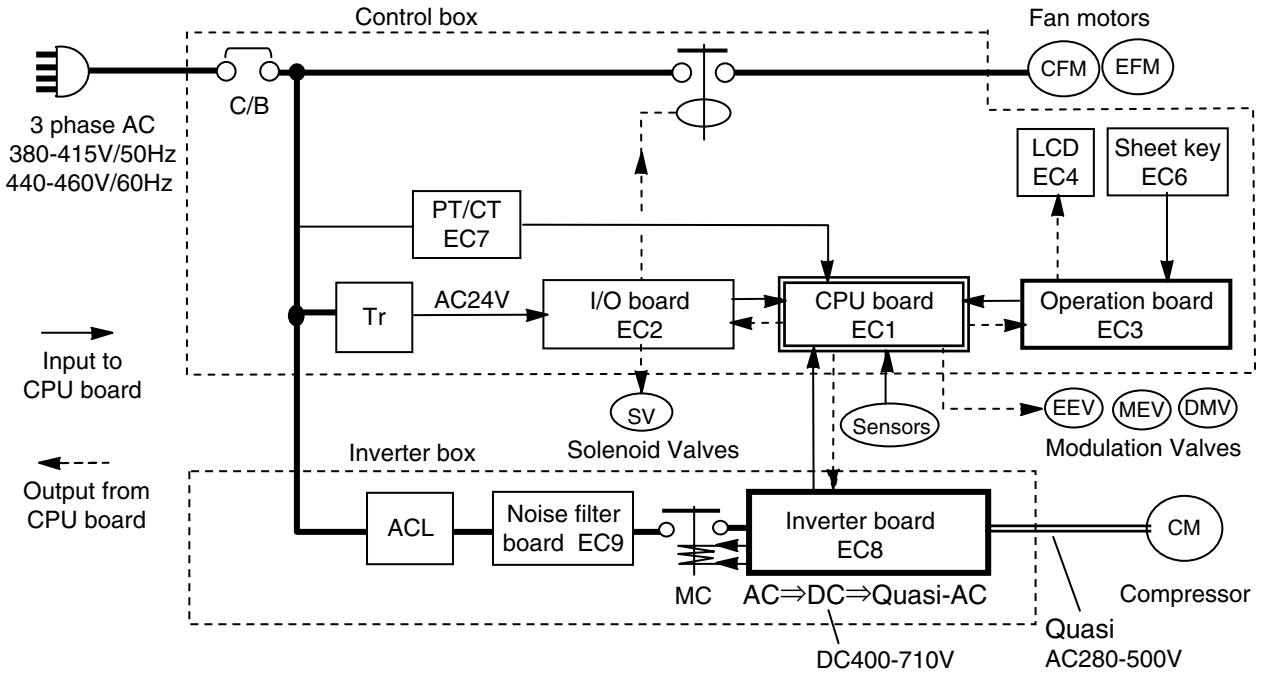
3. By operating unit, charge gaseous refrigerant from port ① for the rest of specified charge amount of refrigerant.
   Close cock of R134a cylinder after completion of charging.



⚠ CAUTION

Do not charging liquid refrigerant from port ①. That causes malfunction of the compressor.

4.7 Electrical Circuit and Servicing Precautions

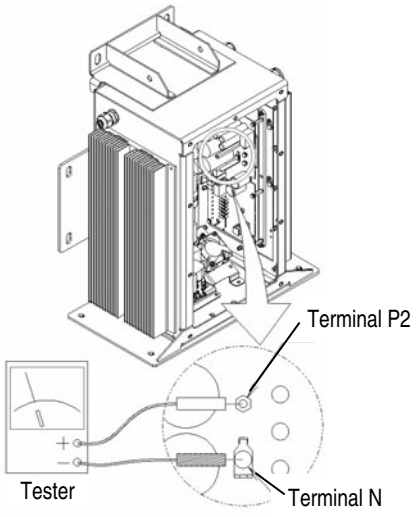


Servicing precautions

1. Power circuit
   Before inspecting the primary side of circuit breaker, be sure to turn off the power for facility side.
※Even after turning off the circuit breaker, supply voltage is still applied.

2. Before inspecting the secondary side of circuit breaker, be sure to turn off the circuit breaker.

3. Inverter circuit
   To inspect inside the inverter BOX, ensure to follow the instructions below.
①Ensure to leave the unit at least 10 minutes after turning off the circuit breaker before opening the cover of the inverter box.
※This is because it takes time for the charge accumulated in the capacitor on the inverter board to be released after turning off the circuit breaker.
②Open the inverter box cover and, ensure that the voltage between the terminal P2 and N on the inverter board is lowered to DC50V or below before starting inspection.



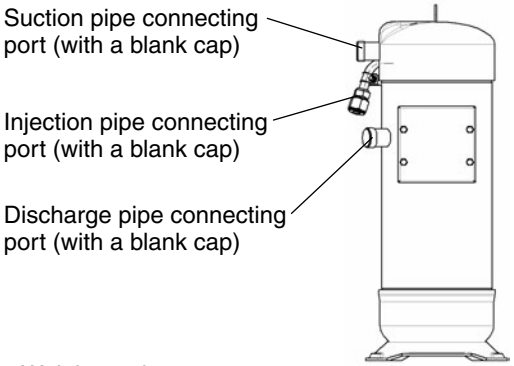
4.8 Parts Replacement

4.8.1 Compressor

●Preparation for installing a new compressor

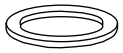
1. Check the replacement compressor and accessories.

Fig. 1 Replacement compressor

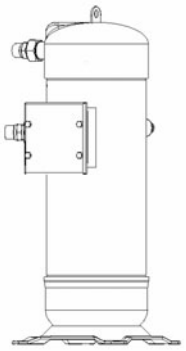


∗Weight 45kg
∗Refrigerant oil DAPHNE FVC68D charged.
∗Dry nitrogen gas charged.

＜Accessories ＞

Packing for suction/ discharge pipe connecting ports		2 pcs.

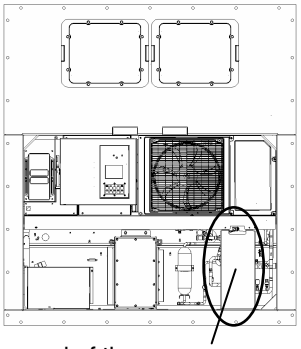
2. Remove the blank caps from the discharge, suction and injection pipe connecting ports.



●Compressor removal

1. Remove the compressor cover (Fig. 2).
2. Disconnect the compressor cable from the terminal box.
3. Disconnect three connecting pipes (Discharge, suction and injection pipes)
   Note 1. When removing pipes, use two wrenches so as not to damage the pipes (Figs. 3 & 4).
   Note 2. After disconnecting the discharge and suction pipes, also remove the packing (Fig. 3).
4. Remove the one bolt that holds the compressor top and the four bolts that hold the compressor legs.
5. Pull compressor out to front, turn the body approximately 20° clockwise and remove DCHS2 sensor mounted on right side. (Fig. 5)
   Hitch a screw driver to the hook of spring plate to pull out the sensor.

Fig.2



Removal of the compressor cover

Fig.3

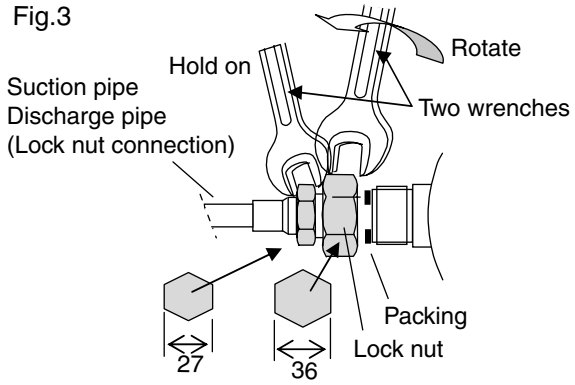
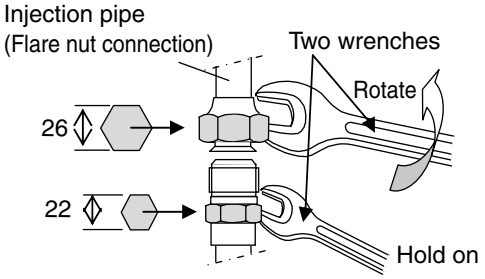
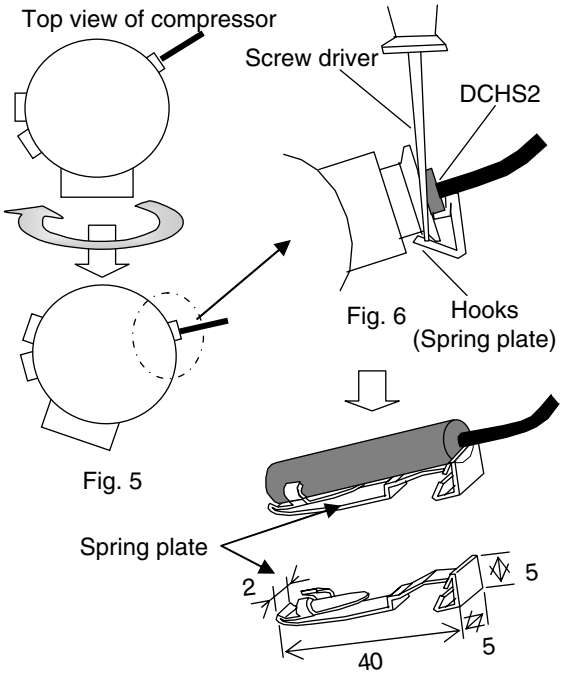


Fig.4





●Compressor installation

1. Temporarily placing the compressor
   Temporarily tighten the four bolts at the compressor legs and the one bolt at the compressor top.

2. Connecting three pipes
   (Discharge, suction and injection pipes)
   2-1. Place the provided packing on the discharge and suction pipe connecting ports of the compressor.
   2-2. After temporarily tightening lock nuts and flare nuts for three pipes, finally tightening them one by one to connect the pipes.
   Use two wrenches for the final tightening of flare nuts so as not to damage the pipes (figs. 3 & 4).
   2-3. Tightening torque for lock nut and flare nut is based on following.
   Discharge pipe: 122N · m (1200kgf.m)
   Suction pipe: 122N · m (1200kgf.m)
   Injection pipe: 54.9N · m (538kgf.m)

4. Fixing the compressor
   After connecting the pipes, finally tighten the four bolts to secure the compressor legs and the one bolt to secure the compressor top to fix the compressor.

5. Installing DCHS2 sensor
   Insert an assembled item consisting of the DCHS2 sensor and the spring plate until the hook clicks (Fig. 7).

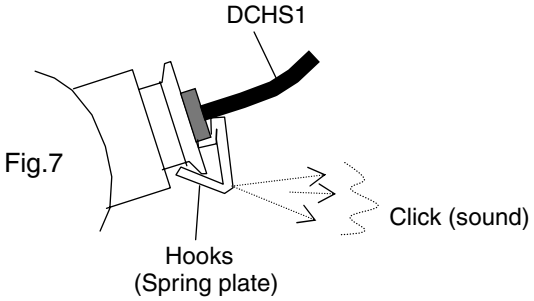


Fig.7

6. Connecting the compressor cables
   Correctly connect the compressor cables as per the Terminal Wiring Procedure attached to the compressor.

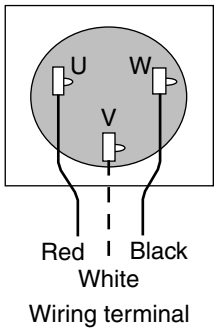


Fig. 8

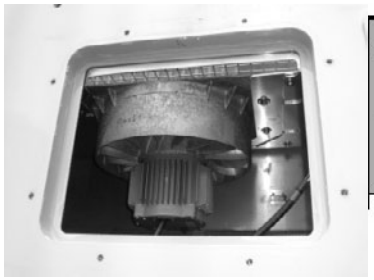
⚠ Caution

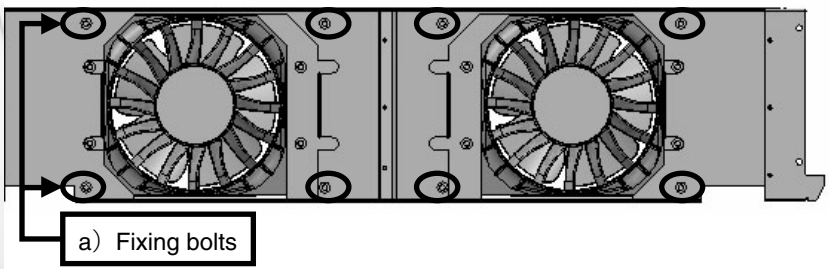
Wrong wiring will reverse the compressor and result in compressor damage.

4.8.2 Evaporator Fan and Fan Motor Removing

（1）Removing

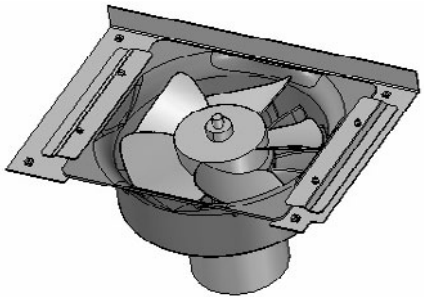
a）Remove access panel and disconnect 4 pcs. fixing bolts (M6) from fan mounting plate.



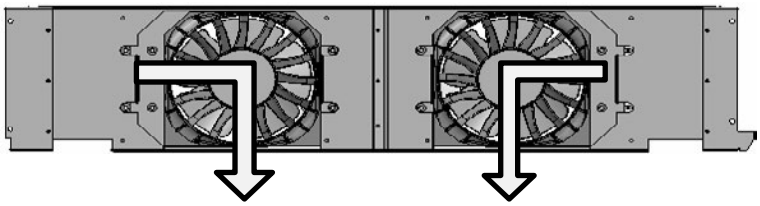


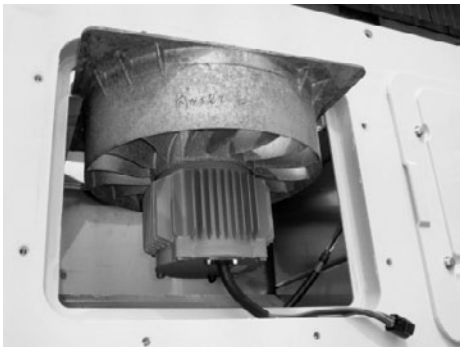
b）Loosen 4 pcs bolts (M8) from fan blade fixing metal.

c）Disconnect power supply connector on fan motor.

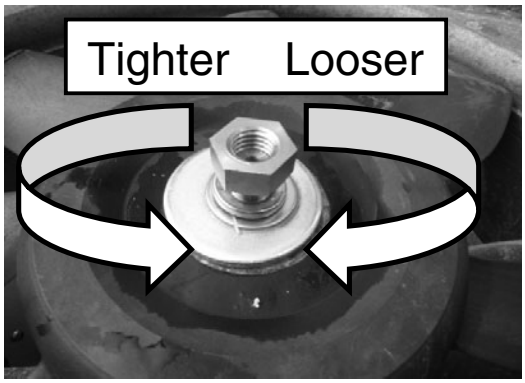


d）Slide fan mounting plate following arrow direction and remove fan assembly toward front side.





e）Remove fan mounting plate and replace fan motor.
(The screw of fan fixing nut (M14) is reverse direction.)



（2）Installation

f）Re-stall fan in a reverse way of removing.

4.8.3 Inverter Board

●Precautions when replacing inverter board

1) Wait 10 minutes or more after turning off the circuit breaker and then open the inverter box cover.
2) Before starting the work, open the inverter box cover and check that the voltage between terminals P2 and N on the inverter board is 50VDC or less.

●Removing the inverter board (Fig. 1)

1. Remove the front cover (10 mounting bolts).
2. Remove all cables connected to the inverter board (installed on the right side inside the box).
3. Remove the right cover (12 mounting bolts).

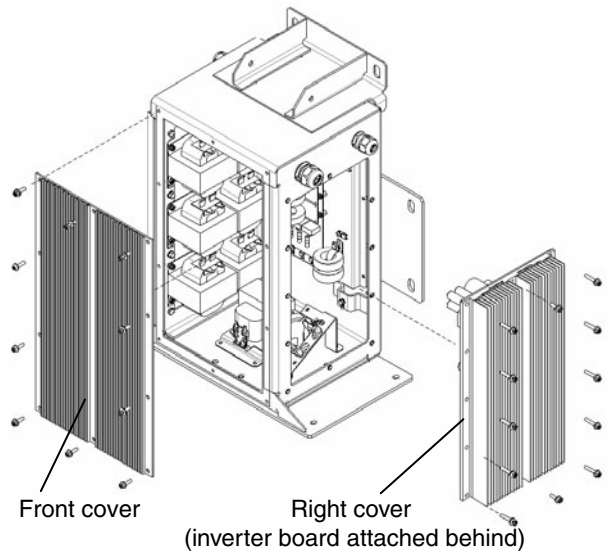


Fig.1 Inverter box

●Mounting the inverter board

The inverter board and the right cover are combined. (Fig. 2)

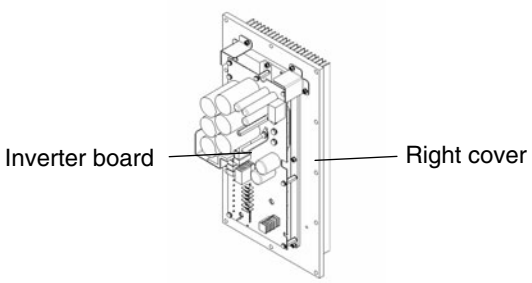
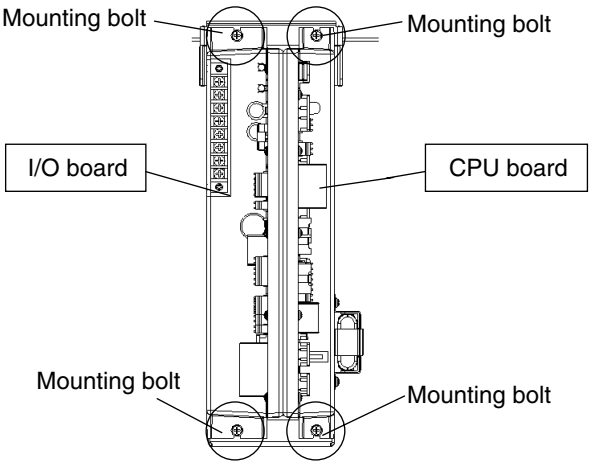


Fig.2 Inverter board

1. Reinstall the inverter board and reconnect the cables in reverse order (3⇒2⇒1).
2. Mounting the right and front covers.
   Use the attached new seal washers. Tighten the bolts temporally while checking that the packing is not deformed and then tighten them fully one by one evenly (to prevent water from entering). Tightening torque (M5) : 431±65 cN・m

4.8.4 CPU Board



●Replacement procedure

1. Removing CPU board
   1) Disconnect the cable that connects to CPU board from the connector.
   2) Remove the mounting bolts on the top and bottom of CPU board and pull the board forward.
   3) Remove the provided rechargeable battery (including the lead).

2. Mounting CPU board
   Reverse the above procedure to mount the rechargeable battery, connect the cable and mount CPU board using two bolts.

3. Uploading the latest software
   After mounting CPU board, upload the latest software.
   ＊Download the latest software from the Daikin's web site or request it at Daikin Service Office near you.

4. Necessity of configuration setting
   Case 1. When using CPU board from Daikin spare part, configuration setting is not required. The configuration setting is not conducted for spare part CPU board but the configuration setting values are automatically transmitted from operation board (EC3) when power is ON.

   Case 2. When occasionally using CPU board of the adjacent reefer, configuration setting is required. In this case "Configuration Set screen" is displayed when power is supplied as shown ※12 Configuration Set in paragraph 2.3. Configuration Set values varies by model. Refer to "Configuration Setting Table" issued separately.

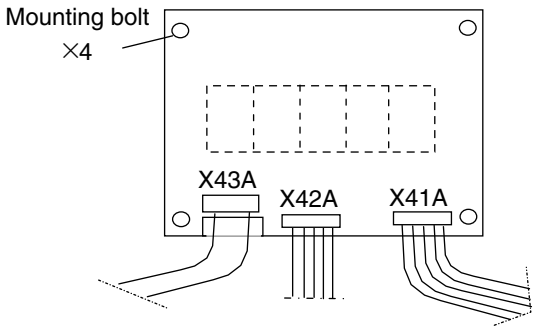
4.8.5 I/O Board

●Replacement procedure

1. Removing I/O board
   1) Remove the cable that connects to I/O board from the connector.
   2) Remove the mounting bolts on the top and bottom of I/O board and pull the board forward.

2. Mounting I/O board
   Reverse the above procedure to install I/O board using two bolts and connect the cable.

4.8.6 Operation Board



●Replacement procedure

1. Removing operation board

1) Remove the three cables that connect to operation board from the connector.
2) Remove the four mounting bolts.

2. Mounting operation board
   Reverse the above procedure to mount operation board using the four bolts and connect the cable.

3. Necessity for configuration setting
   Case 1: When using operation board from Daikin spare parts, configuration setting is not required.
   Configuration setting for operation board from spare parts is not made but that memorized on CPU board is automatically sent to LED board when power is supplied.

   Case 2: When occasionally using operation board of the adjacent reefer occasionally, configuration setting is required.
   In this case, ※12 Configuration Set in paragraph 2.3 is displayed when power is supplied.
   Configuration set points varies by model. Please refer to "Initial Setting Table" issued separately.

4.8.7 PT/CT Board

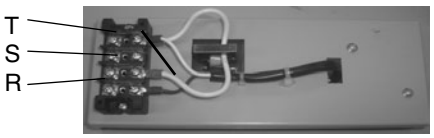
This printed circuit board incorporates the two functions as a measuring instrument and protective device and serves as an interface between the main circuit (high voltage) and controller.

●Function

Function	Description
Voltage and phase sequence detection	Voltage and phase sequence detection between R phase and S phase is executed by transferring the voltage waveform to the controller.
Current detection	Total running current of EFM and CFM are detected.

●Replacement procedure

①Loosen the four mounting bolts.
②After replacing the main body, mount the connector by following the original procedure.
③After checking the connections thoroughly, carry out test operation to confirm that no abnormality is present.



4.8.8 High Pressure Switch (HPS)

Type	ACB-LB156
Setting value	OFF 2400kPa（24.47kg/cm²） ON 1900kPa（19.37kg/cm²）

●Replacement method

1. Remove cable from inverter box.
2. Remove HPS from joint with check valve.
   ※Loosen flare nuts A and B using double wrenches. (Fig. 1)
   ※Do not lose push-stick inside the joint. (Fig. 2)
3. Installing of HPS
   ※Tighten flare nuts A and B using double wrenches. (Fig. 1)
4. Check if no gas leakage after completion of work.

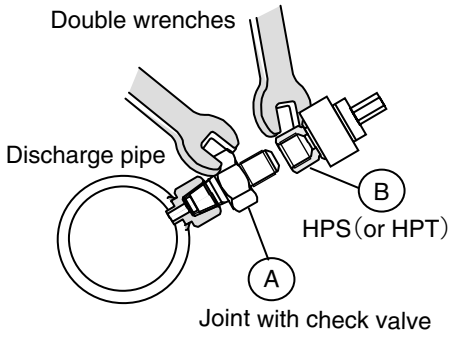


Fig. 1 Use double wrenches when removing and installing.

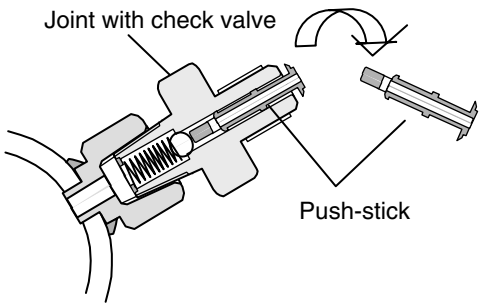


Fig. 2 Do not loss push-stick.

4.8.9 High Pressure Transducer (HPT)

Type	NSK-BD010F-070

●Removal of HPT

1. Remove HPT cable from control box.
2. Remove heat shrink tube and HPT from joint with check valve.
   ※Loosen flare nuts A and B using double wrenches. (Fig. 1)
   ※Do not lose push pin inside the joint with check valve. (Fig. 2)

●Installing of HPT

1. Insert heat shrink tube into HPT body.
2. Connect HPT to joint with check valve.
   ※Tighten flare nuts A and B using double wrenches. (Fig. 1)
3. Conduct gas leakage test and check to make sure no gas leakage after installing of HPT.
4. Set one end of heat shrink tube to joint seat with check valve (Fig. 3) and then
   ① Shrink the tube by heating up using drier. (Fig. 3)
   ② Apply silicon sealant to both ends inside of the tube. (Fig. 3)
   ③ Band both ends of the tube. (Fig. 3)
   ④ Bend HPT cable and band the cable to HPT body. (Fig. 4)

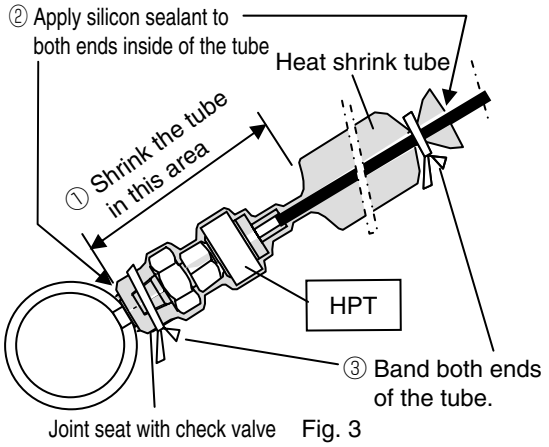


Fig. 3

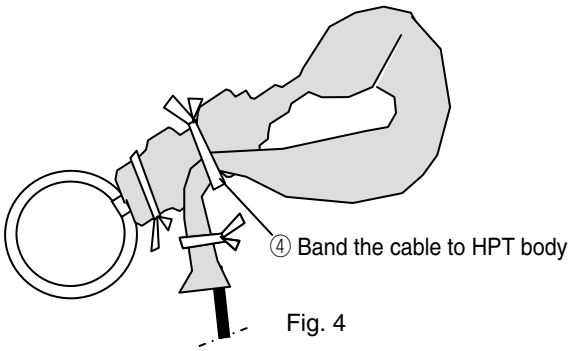


Fig. 4

4.8.10 Low Pressure Transducer (LPT)

Type	NSK-BD030F-070

●Removal of LPT

1. Remove LPT cable from control box.
2. Remove heat shrink tube and LPT connection tube from joint with check valve.

※Loosen flare nuts using double wrenches.（Fig. 5）

※Do not lose push-stick inside the joint with check valve. (Fig. 2)

●Installation of LPT

1. Insert heat shrink tube into LPT connection tube.
2. Connect LPT connection tube to joint with check valve.

※Tighten flare nuts using double wrenches. (Fig. 5)

3. Connect LPT to the other end of LPT connection tube.

※Tighten flare nuts using double wrenches. (Fig. 5)

4. Purge air inside LPT connection tube by loosening the flare nut of LPT and tighten the flare nut again.
5. Check to make sure there is no gas leakage.

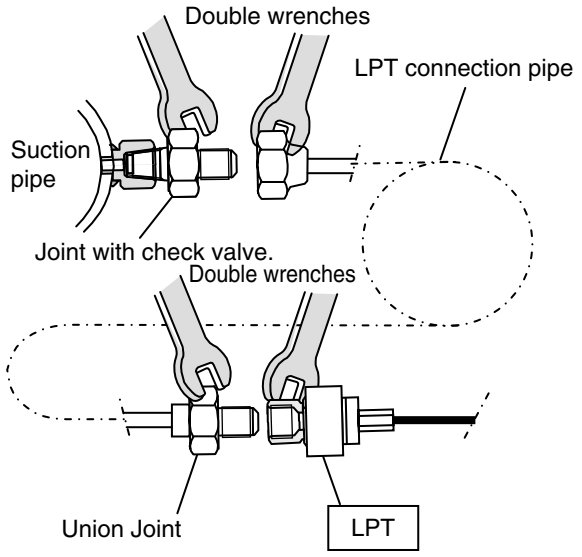
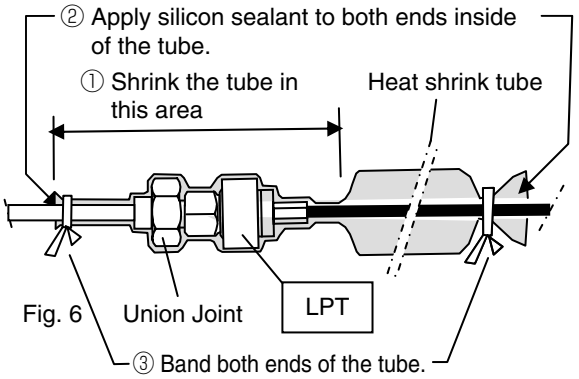
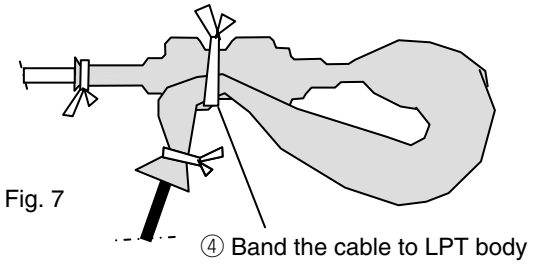


Fig. 5 Use double wrenches for loosening and tightening flare nuts

6. Set one end of heat shrink tube to left side of union joint. (Fig. 6) and then ① Shrink the tube by heating up using drier.
   ② Apply silicon sealant to both ends of the tube.
   ③ Band both ends of the tube. (Fig. 6)



10. ④ Bend LPT cable and band the cable to LPT body.（Fig. 7）



4.8.11 Electronic Expansion Valve (EEV), Economizer Modulation Valve (EMV), Discharge Modulation Valve (DMV)

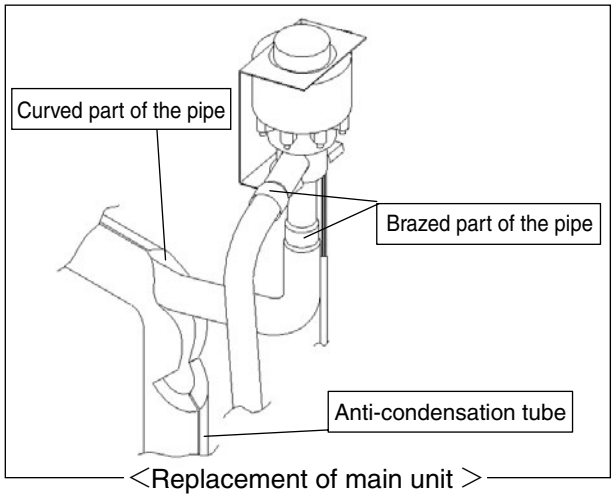
Name	Type	
Electronic Expansion Valve EEV	Coil	HCM-MD12DM-2 Socket (Red)
	Body	HCM-BD35DM-2 Valve size: 3.5mm
Economizer Modulation Valve EMV	Coil	HCM-MD12DM-3 Socket (White)
	Body	HCM-BD24DM-1 Valve size: 2.4mm
Discharge Modulation Valve DMV	Coil	HDM-MD120DM-4
	Body	HCM-BD120DM-2

(1) Replacing the coil

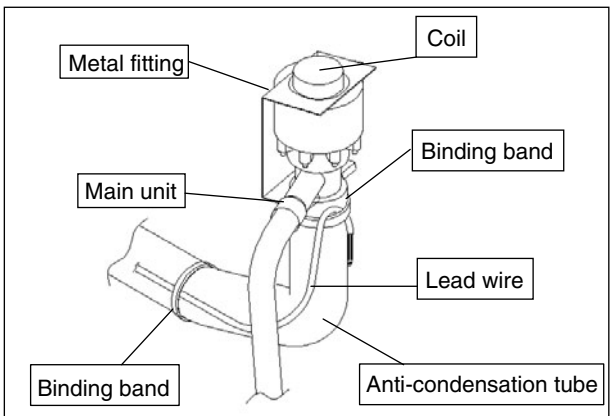
①Remove the binding band fixing the coil lead wire.
②Disconnect the connector of the coil.
③Remove the metal fitting and the coil.
④Replace the old coil with a new one.
⑤Attach the coil and the metal fitting.
⑥Mount the connector of the coil.
⑦Fix the coil lead wire with a binding band.

(2) Replacing the body

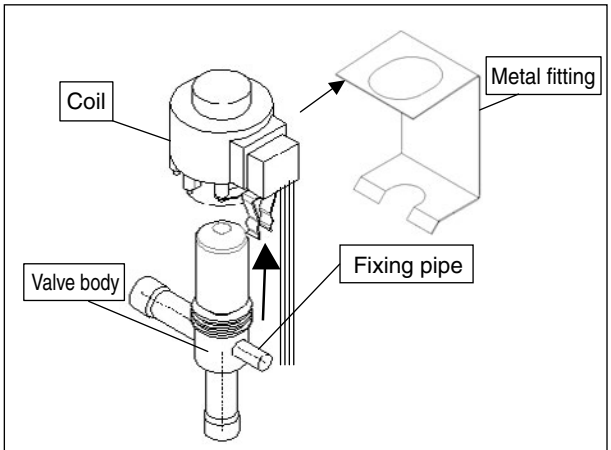
①Remove the binding band fixing the coil lead wire.
②Detach the anti-condensation tube until the curved part of the pipe.
③Remove the metal fitting and the coil.
④Remove the brazed part of the pipe.
⑤Insert the new valve body in the pipe.
→Braze the new valve body while cooling it with a wet cloth.
Maximum body temperature: 120℃ (248˚F) or less
⑥Mount the coil and the metal fitting.
⑦Mount the anti-condensation tube.
⑧Fix the coil lead wire with a binding band.



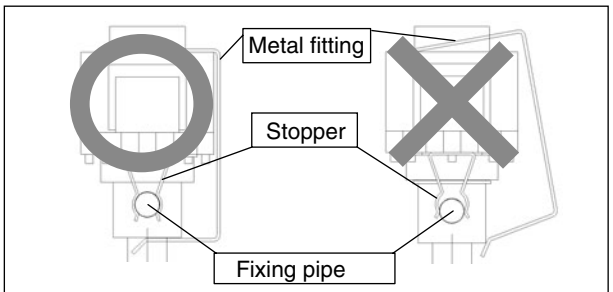
＜Replacement of main unit ＞



＜Part names＞



＜Replacement of the coil＞



＊ It clicks when installed.
＜Confirmation of metal fitting installation＞

Attention (When installing the coil and the metal fitting)

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

4.8.12 Solenoid Valve

4 Solenoid Valves using in this unit use a common coil and body.

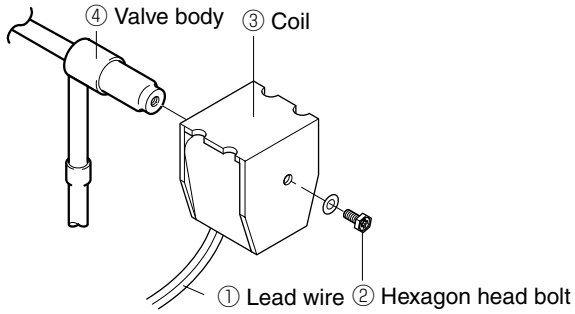
Name	Symbol	Body	Coil
Liquid solenoid Valve	LSV	VPV-803DQ	NEV-M0AB518C
Economizer solenoid Valve	ESV		
Hot gas solenoid Valve	HSV		
Reheat coil solenoid Valve	RSV		

(1) Replacing the coil

①Remove the lead wire connector from the inside of the control box, and cut and recover the binding band which fastens the lead wire.

②Remove the hexagonal head bolt on the top of the coil to pull the coil out.

③Replace the coil with a new one and restore the hexagonal head bolt, the binding band and connector on the original position.
When reassembling the coil, the tightening torque should be 1.2 N · m (12.2 kg · cm).



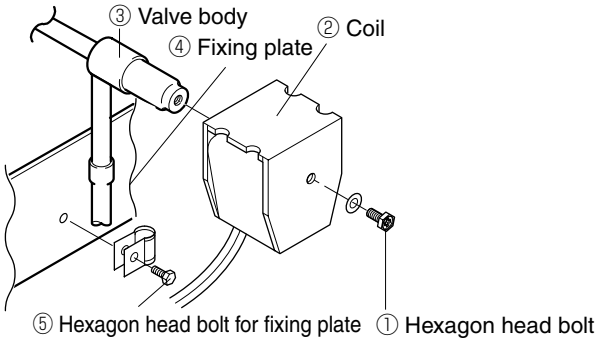
(2) Replacing the valve body

①Remove the hexagonal head bolt on the top of the coil to pull the coil out.

②Remove 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.

③Insert the new valve body into the pipe and conduct brazing while keeping the temperature of the valve body below 120℃ (248˚F) by cooling.

④Install the coil and restore the hexagonal head bolt of the fixing plate and the connector into their original position.



4.8.13 Drier

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

(1) Replacement procedure

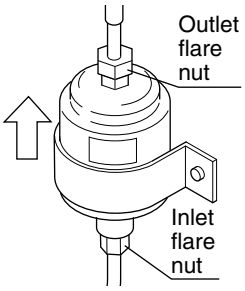
①Conduct the automatic pumpdown to collect the refrigerant in the liquid receiver.
Refer to paragraph 4.2 for the automatic pumpdown.

②Then, quickly replace the drier with a new one after loosening the flare nuts on the inlet and outlet side of the drier.

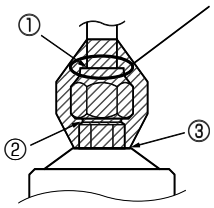
③After completing of the replacement of the drier, be sure to conduct refrigerant leakage test to confirm that no refrigerant leakage is occurring.

④Check on the green color of the sight glass after system operation has started.

⑤Apply silicon sealant to the drier body including the flare nuts on the inlet and outlet sides.



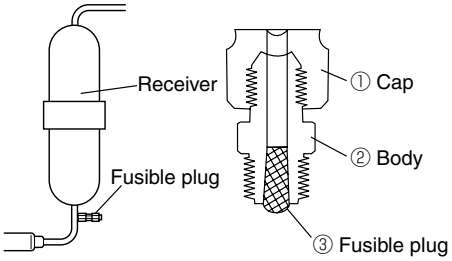
Fully apply silicon sealant to the drier body including the flare nuts on the inlet and outlet sides.



When put under low temperature and pressure by some operation conditions, ① and ② might have the threads damaged by frozen dew drops.

③ may become rusty as a result of coating peel-off at work using a spanner.

4.8.14 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℃ to 100℃).
For replacement, ①-③ shall be replaced.

4.8.15 Check Valve

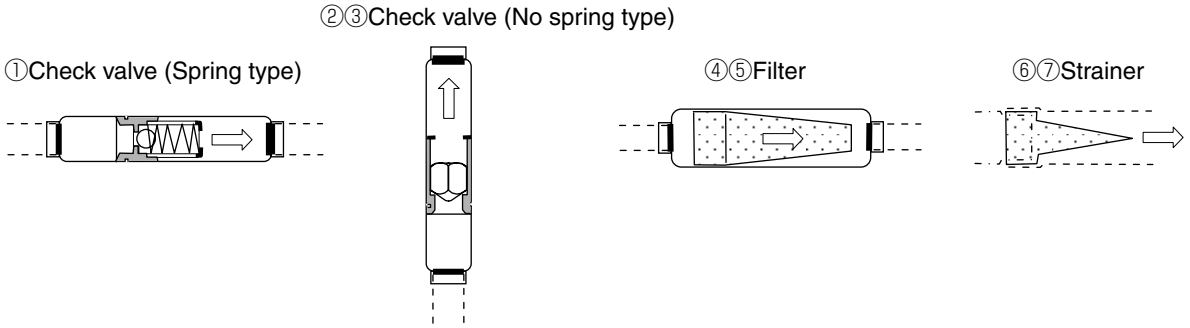
●Replacement method

1. Refer location of check valves to below picture.
2. Do not make any mistake about the installation direction (arrow direction) of the check valve
3. Conduct brazing while cool the center part of valve with a wet cloth to keep the temperature of the valve body below 120℃ (248˚F).
4. Check if there is no gas leakage after completion of brazing.

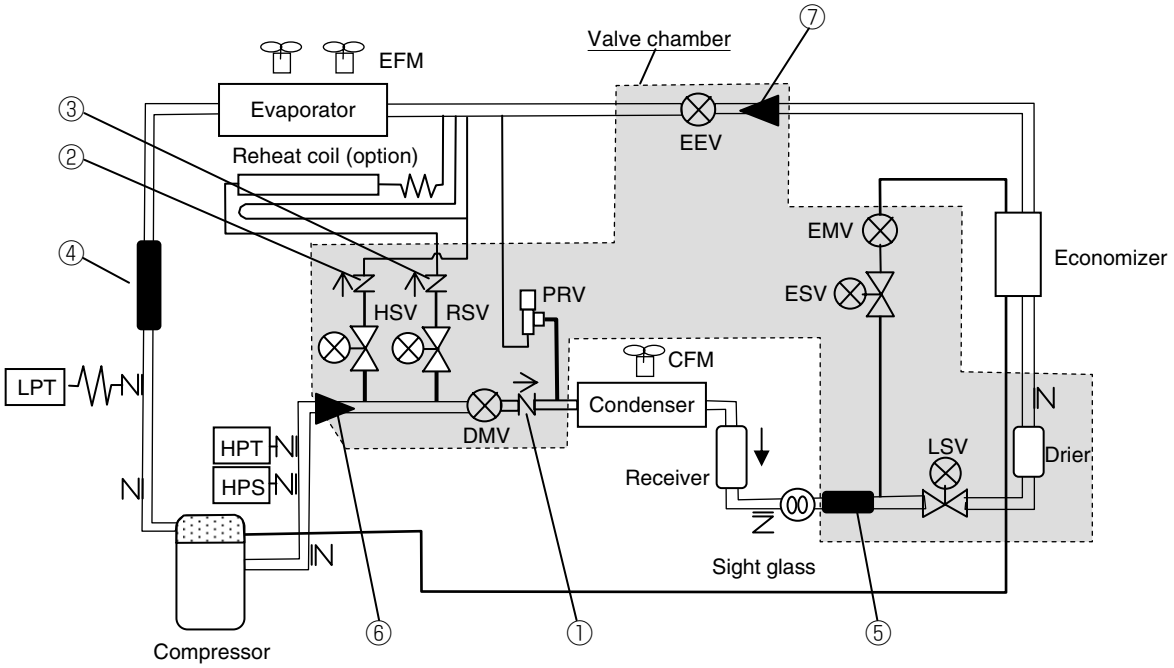
4.8.16 Filter and Strainer

●Replacement method

1. Refer location of check valves to below picture.
2. Install the new check valve in the direction which an arrow shows.
3. Check if there is no gas leakage after completion of brazing.



Name	No.	Size	Application
Check valve	①	5/8" , φ15.9	DMV outlet
	②③	3/8" , φ9.5	HSV, RSV outlet
Filter	④	1-1/4" , 31.8φ	Compressor inlet
	⑤	1/2" , 12.7φ	LSV, ESV inlet
Strainer	⑥	5/8" , 15.9φ	DMV, HSV, RSV inlet
	⑦	1/2" , 12.7φ	EEV inlet



4.9 Emergency Operation at Controller Malfunction

● On-site work

Following on-site work are required for emergency operation in the case of controller malfunction.

(1) Wiring change of controller

Change wiring to operate compressor, EFM and CFM forcibly.
Refer the details to paragraph 4.9.1.
Preparation parts: Shot circuit connector (fitted inside of controller)

(2) Fix the opening of EEV, EMV and DMV

Refer the details to paragraph 4.9.2 to 4.9.4.
Preparation parts: Emergency magnet (Parts No. 1896110)

Note: Fixing of opening for EEV, EMV or DMV is applicable for emergency use when controller is normal and EEV, EMV or DMV coil is malfunction.

●Operation condition at emergency operation

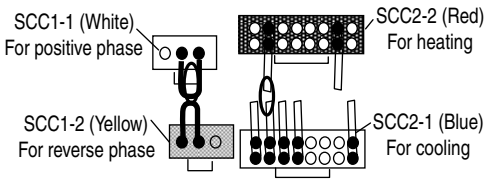
Temperature can not be controlled. Turn the circuit breaker ON or OFF to maintain the target temperature.

Operation Mode	Operation Condition
Cooling operation in frozen mode	Compressor: Continuous running with fixed speed. EFM : Low Speed CFM : High Speed EEV, EMV, DMV: Fixed opening LSV : Open
Heating operation	EFM : High Speed

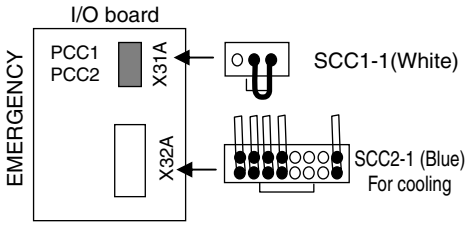
4.9.1 Wiring Change of Controller

Preparation

①Turn circuit breaker OFF.
②Disconnect power connector X24A（Black） located on I/O board. (To de-energized to CPU board.)
Refer location of X24A to I/O board in paragraph 1.3.4.
③Remove short-circuit connectors fitted inside controller box. (Right figure)

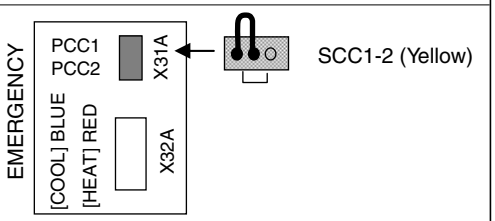


④ Connect SCC1-1（White）to X31A located on I/O board and SCC2-1（Blue）to X32A for <Cooling>.



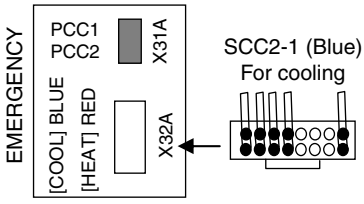
Confirmation of reversed phase in power supply

⑤Turn circuit breaker ON.
If the power supply is in reversed phase, condenser fan turns reverse.
⑥In the case of reversed phase, turn circuit breaker OFF and replace SCC1-1 (White) to SCC1-2 (Yellow).

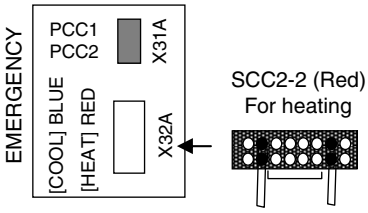


Forcible operation of Compressor, EFM and CFM

＜Cooling Operation＞
Keep ＜cooling operation＞ as it is.



＜Heating Operation＞
1. Turn circuit breaker OFF.
2. Replace SCC2-1 (Blue) to SCC2-2（Red） for <Heating>.
3. Turn circuit breaker ON.



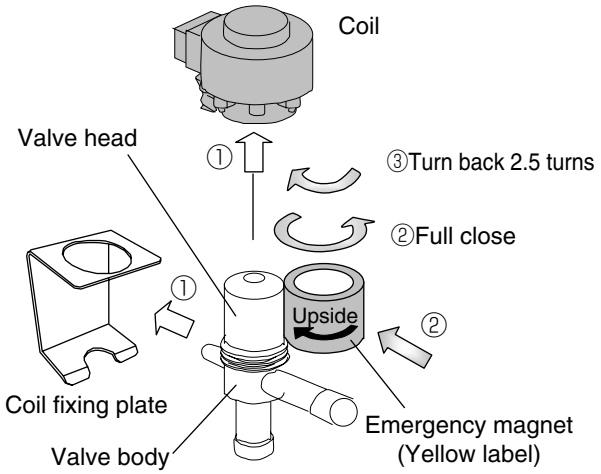
Caution

Recheck power supply phase when you operate again after the power is turned OFF.

4.9.2 Fixing of EEV Opening

For the emergency operation when controller or EEV coil is malfunctioned, EEV opening is fixed using emergency magnet.
The fixing of opening is procedure with fully close first and turn back 2.5 turns using emergency magnet. (Approx. 20% opening)
Emergency magnet: Parts No.1896110.

①Disconnect connector X9A（Brown）on CPU board. (To de-energized to EEV coil)
Refer the location of X9A to CPU board, in paragraph 1.3.4.
②Remove coil fixing plate and EEV coil.
③Bring the emergency magnet into contact with valve head, turn the magnet counterclockwise to close fully. There is a small click sound when the valve is fully closed.
(Approximate 7 turns from full open to full close.)
④Then turn back 2.5 turns clockwise.
⑤Install coil and coil fixing plate.



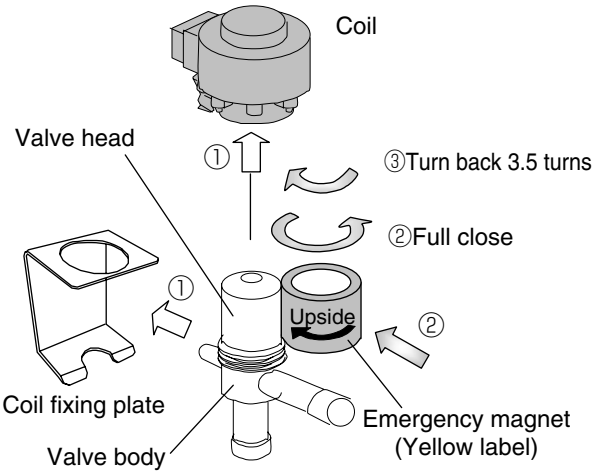
Recommendation !!
To shorten the pull-down operation time, it is recommended EEV opening to wider slightly. However, keep watching the operation, and close the valve opening if there is a frost around suction pipe due to the wet operation or the degree of super-heat becomes small.

ATTENTION !!
Make sure to reconnect connector X9A (Brown) to the socket on CPU board when the operation returns to normal.

4.9.3 Fixing of EMV Opening

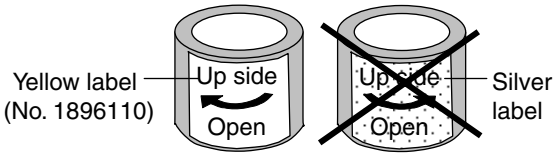
For the emergency operation when controller or EMV coil is malfunctioned, fix EMV opening using emergency magnet.
The fixing of opening is procedure with fully close once and turn back 3.5 turns using emergency magnet.(Approx. 40% opening)
Emergency magnet : Parts No.1896110.

①Disconnect connector X10A（White）on CPU board.（To de-energized EMV coil)
Refer the location of X10A to CPU board, in paragraph 1.3.4.
②Remove coil fixing plate and EMV coil.
③Bring the emergency magnet into contact with valve head, turn the magnet counterclockwise to close fully. There is a small click sound when the valve is fully closed.
(Approximate 7 turns from full open to full close.)
④Then turn back 3.5 turns clockwise.
⑤Install coil and coil fixing plate.



ATTENTION !!
Make sure to reconnect connector X10A (White) to the socket on CPU board when the operation returns to normal.

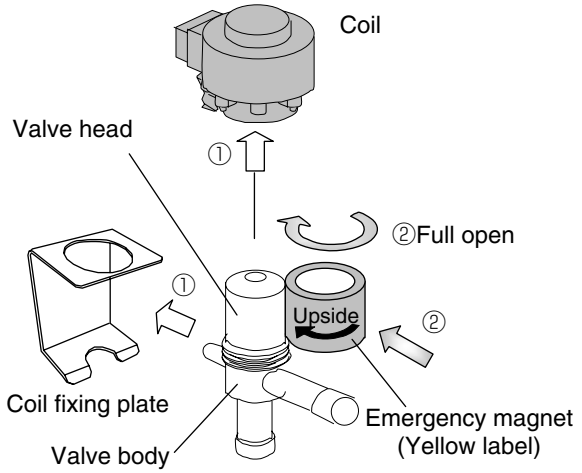
ATTENTION !!
Use emergency magnet with yellow label.



4.9.4 Fixing of DMV Opening

For the emergency operation when controller or DMV coil is malfunctioned, fix DMV opening fully using emergency magnet.
Preparation : Emergency magnet Parts No.1896110.

①Disconnect connector X11A（Blue）on CPU board.（To de-energized to DMV coil)
Refer the location of X11A to CPU board, in paragraph 1.3.4.
②Remove coil fixing plate and DMV coil.
③Bring the emergency magnet into contact with valve head, turn the magnet clockwise to open fully. There is a small click sound when the valve is fully opened.
(Approximate 10 turns from full close to full open.)
④Install coil and coil fixing plate.



ATTENTION !!
Make sure to reconnect connector X11A (Blue) to the socket on CPU board when the operation returns to normal.

Chapter 5 APPENDIX

5.1 Standard Tightening Torque for Bolt and Flare Nut

Type	Size	Tightening Torque			Example of Application
		N · m	kgf · m	lbf · ft	
Bolt	M4	1.6	16	1.2	Small parts
	M5	3.0	30	2.3	Solenoid valve Inverter box cover
	M6	5.2	51	3.8	Slide plate for EFM stator Condenser fan grille Solenoid valve chamber cover
	M8	12.3	121	9.1	Fixing plate of evaporator fan stator Condenser fan motor Control box door Access panel
	M10	25.2	247	18.6	
	M12	42.7	418	31.5	Compressor leg
	M14 Reverse threaded	67.8	664	50.0	Tip of evaporator fan shaft
Flare nut	ϕ6.4, 1/4"	15.7	154	11.6	Low-pressure port
	ϕ9.5, 3/8"	36.3	356	26.8	
	ϕ12.7, 1/2"	54.9	538	40.5	Drier, Compressor injection port
Compressor connector	(ϕ19.1 , 3/4")	122	1200	90	Compressor suction and discharge

5.2 Temperature Sensor Characteristics

●SS/RS/DSS/DRS/EIS/EOS/Eco In/Eco Out/SGS/AMBS

Temperature (℃)	Temperature (℉)	Resistance (kΩ)	Temperature (℃)	Temperature (℉)	Resistance (kΩ)
−40	−40	53.54	+1	+33	6.557
−39	−38	50.52	+2	+35	6.270
−38	−36	47.69	+3	+37	5.997
−37	−34	45.04	+4	+39	5.737
−36	−32	42.55	+5	+41	5.490
−35	−31	40.21	+6	+42	5.255
−34	−29	38.01	+7	+44	5.031
−33	−27	35.95	+8	+46	4.818
−32	−25	34.01	+9	+48	4.616
−31	−23	32.19	+10	+50	4.423
−30	−22	30.47	+11	+51	4.239
−29	−20	28.86	+12	+53	4.064
−28	−18	27.34	+13	+55	3.897
−27	−16	25.91	+14	+57	3.737
−26	−14	24.57	+15	+59	3.586
−25	−13	23.30	+16	+60	3.441
−24	−11	22.10	+17	+62	3.303
−23	−9	20.98	+18	+64	3.171
−22	−7	19.91	+19	+66	3.045
−21	−5	18.91	+20	+68	2.925
−20	−4	17.96	+21	+69	2.810
−19	−2	17.07	+22	+71	2.700
−18	−0	16.23	+23	+73	2.596
−17	+1	15.43	+24	+75	2.496
−16	+3	14.68	+25	+77	2.400
−15	+5	13.96	+26	+78	2.308
−14	+6	13.29	+27	+80	2.221
−13	+8	12.65	+28	+82	2.137
−12	+10	12.05	+29	+84	2.057
−11	+12	11.48	+30	+86	1.980
−10	+14	10.94	+31	+87	1.907
−9	+15	10.43	+32	+89	1.837
−8	+17	9.940	+33	+91	1.769
−7	+19	9.480	+34	+93	1.705
−6	+21	9.044	+35	+95	1.643
−5	+23	8.631	+36	+97	1.584
−4	+24	8.239	+37	+98	1.527
−3	+26	7.867	+38	+100	1.473
−2	+28	7.514	+39	+102	1.421
−1	+30	7.178	+40	+104	1.371
−0	+32	6.860	+41	+105	1.323
			+42	+107	1.277
			+43	+109	1.232
			+44	+111	1.190
			+45	+113	1.149
			+46	+114	1.110
			+47	+116	1.072
			+48	+118	1.036
			+49	+120	1.002
			+50	+122	0.9682

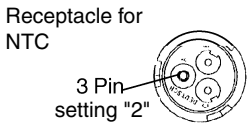
AD95A138C

●DCHS Sensor Characteristics DCHS1/DCHS2

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

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

Set sensor type "2" in ※12 Configuration Set in paragraph 2.3 for NTC type USDA sensor.

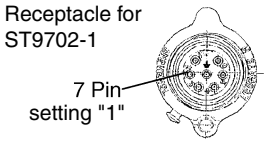


Temperature (℃)	Temperature (℉)	Resistance (kΩ)	Temperature (℃)	Temperature (℉)	Resistance (kΩ)
−20	−4	97.391	10	50	19.893
−19	−2	91.883	11	52	18.964
−18	0	86.721	12	54	18.083
−17	1	81.882	13	55	17.249
−16	3	77.343	14	57	16.457
−15	5	73.034	15	59	15.709
−14	7	69.087	16	61	14.995
−13	9	65.333	17	63	14.320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

3P156427A

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

Set sensor type "1" in ※12 Configuration Set in paragraph 2.3 for ST9702-1 type USDA sensor.



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

AD970217A

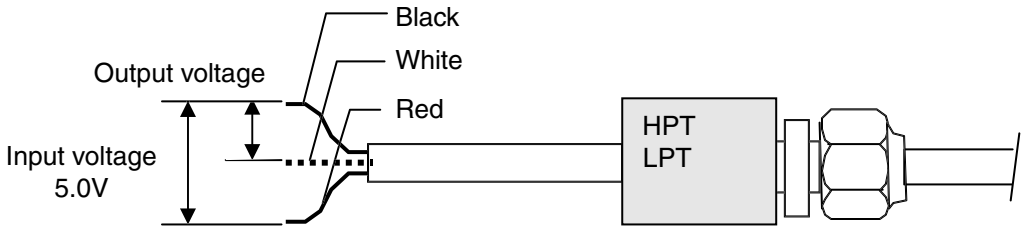
5.3 Pressure Transducer Characteristics

● HPT

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

● LPT

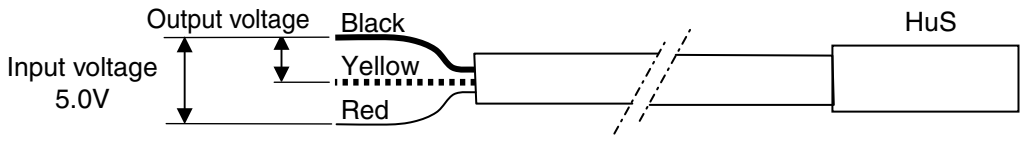
Pressure (kPa·G)	Output (V)	Pressure (kPa·G)	Output (V)
−500	−1.03	300	1.42
−400	−0.72	400	1.72
−300	−0.42	500	2.03
−200	−0.11	600	2.34
−100	0.19	700	2.64
0	0.50	800	2.95
100	0.81	900	3.25
200	1.11	1000	3.56



5.4 Humidity Sensor Characteristics, HuS (Option)

Relative Humidity - Out-put Voltage

Relative Humidity[%]	Out-put Voltage[V]±7%
0	0
10	0.1
20	0.2
30	0.3
40	0.4
50	0.5
60	0.6
70	0.7
80	0.8
90	0.9
100	1.0



AD070082B, 3P204826H

5.5 HFC134a Characteristics

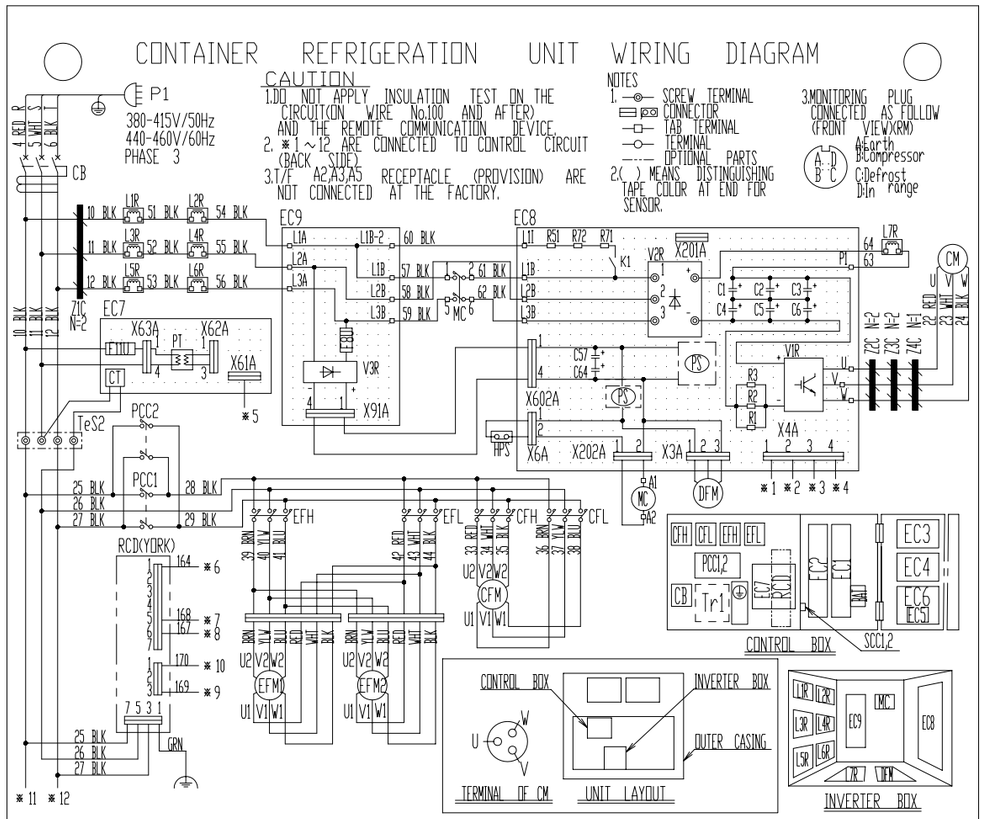
Temperature		Vapor pressure			Temperature		Vapor pressure		
℃	℉	kPa	kg/cm²·G	PSIG	℃	℉	kPa	kg/cm²·G	PSIG
−40	−40	−49	−0.50	−7.1	20	68	470	4.79	68.1
−39	−38.7	−46	−0.47	−6.6	21	69.8	488	4.97	70.7
−38	−36.4	−44	−0.44	−6.3	22	71.6	507	5.16	73.5
−37	−34.6	−41	−0.41	−5.9	23	73.4	525	5.35	76.1
−36	−32.8	−37	−0.38	−5.3	24	75.2	544	5.55	78.8
−35	−31	−34	−0.34	−4.9	25	77	564	5.75	81.7
−34	−29.2	−31	−0.31	−4.4	26	78.8	584	5.95	84.6
−33	−27.4	−27	−0.27	−3.9	27	80.6	604	6.16	87.5
−32	−25.6	−24	−0.24	−3.4	28	82.4	625	6.37	90.6
−31	−23.8	−20	−0.20	−2.9	29	84.2	647	6.59	93.8
−30	−22	−16	−0.16	−2.3	30	86	668	6.81	96.8
−29	−20.2	−12	−0.12	−1.7	31	87.8	691	7.04	100.1
−28	−18.4	−8	−0.07	−1.1	32	89.6	713	7.27	103.3
−27	−16.6	−3	−0.03	−0.4	33	91.4	737	7.51	106.8
−26	−14.8	1	0.01	0.1	34	93.2	760	7.75	110.2
−25	−13	6	0.06	0.8	35	95	785	8.00	113.8
−24	−11.2	11	0.11	1.5	36	96.8	810	8.25	117.4
−23	−9.4	16	0.16	2.3	37	98.6	835	8.51	121.0
−22	−7.6	21	0.21	3.0	38	100.4	861	8.77	124.8
−21	−5.8	27	0.27	3.9	39	102.2	887	9.04	128.6
−20	−4	32	0.33	4.6	40	104	914	9.31	132.5
−19	−2.2	38	0.39	5.5	41	105.8	941	9.59	136.4
−18	−0.4	44	0.45	6.3	42	107.6	969	9.88	140.5
−17	1.4	51	0.51	7.3	43	109.4	998	10.17	144.7
−16	3.2	57	0.58	8.2	44	111.2	1027	10.47	148.9
−15	5	64	0.64	9.2	45	113	1057	10.77	153.2
−14	6.8	71	0.71	10.2	46	114.8	1087	11.08	157.6
−13	8.6	78	0.79	11.3	47	116.6	1118	11.39	162.1
−12	10.4	85	0.86	12.3	48	118.4	1149	11.72	166.6
−11	12.2	93	0.94	13.4	49	120.2	1182	12.04	171.3
−10	14	100	1.02	14.5	50	122	1214	12.38	176.0
−9	15.8	108	1.10	15.6	51	123.8	1248	12.72	180.9
−8	17.6	117	1.18	16.9	52	125.6	1281	13.06	185.7
−7	19.4	125	1.27	18.1	53	127.4	1316	13.42	190.8
−6	21.2	134	1.36	19.4	54	129.2	1351	13.77	195.8
−5	23	143	1.45	20.7	55	131	1387	14.14	201.1
−4	24.8	152	1.55	22.0	56	132.8	1424	14.51	206.4
−3	26.6	162	1.65	23.4	57	134.6	1461	14.89	211.8
−2	28.4	172	1.75	24.9	58	136.4	1499	15.28	217.3
−1	30.2	182	1.85	26.3	59	138.2	1538	15.67	223.0
0	32	192	1.96	27.8	60	140	1577	16.07	228.6
1	33.8	203	2.07	29.4	61	141.8	1617	16.48	234.4
2	35.6	214	2.18	31.0	62	143.6	1658	16.90	240.4
3	37.4	225	2.29	32.6	63	145.4	1699	17.32	246.3
4	39.2	237	2.41	34.3	64	147.2	1741	17.75	252.4
5	41	249	2.53	36.1	65	149	1784	18.19	258.6
6	42.8	261	2.66	37.8	66	150.8	1828	18.63	265.0
7	44.6	274	2.79	39.7	67	152.6	1872	19.09	271.4
8	46.4	287	2.92	41.6	68	154.4	1918	19.55	278.1
9	48.2	300	3.06	43.5	69	156.2	1964	20.02	284.7
10	50	314	3.20	45.5	70	158	2010	20.50	291.4
11	51.8	328	3.34	47.5	71	159.8	2058	20.98	298.4
12	53.6	342	3.48	49.5	72	161.6	2107	21.48	305.5
13	55.4	357	3.63	51.7	73	163.4	2156	21.98	312.6
14	57.2	372	3.79	53.9	74	165.2	2206	22.49	319.8
15	59	387	3.95	56.1	75	167	2257	23.01	327.2
16	60.8	403	4.11	58.4	76	168.8	2309	23.54	334.8
17	62.6	419	4.27	60.7	77	170.6	2362	24.08	342.4
18	64.4	436	4.44	63.2	78	172.4	2415	24.62	350.1
19	66.2	453	4.62	65.6	79	174.2	2470	25.18	358.1
					80	176	2525	25.74	366.1

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

1kPa = 0.145PSIG

5.6 Sequence

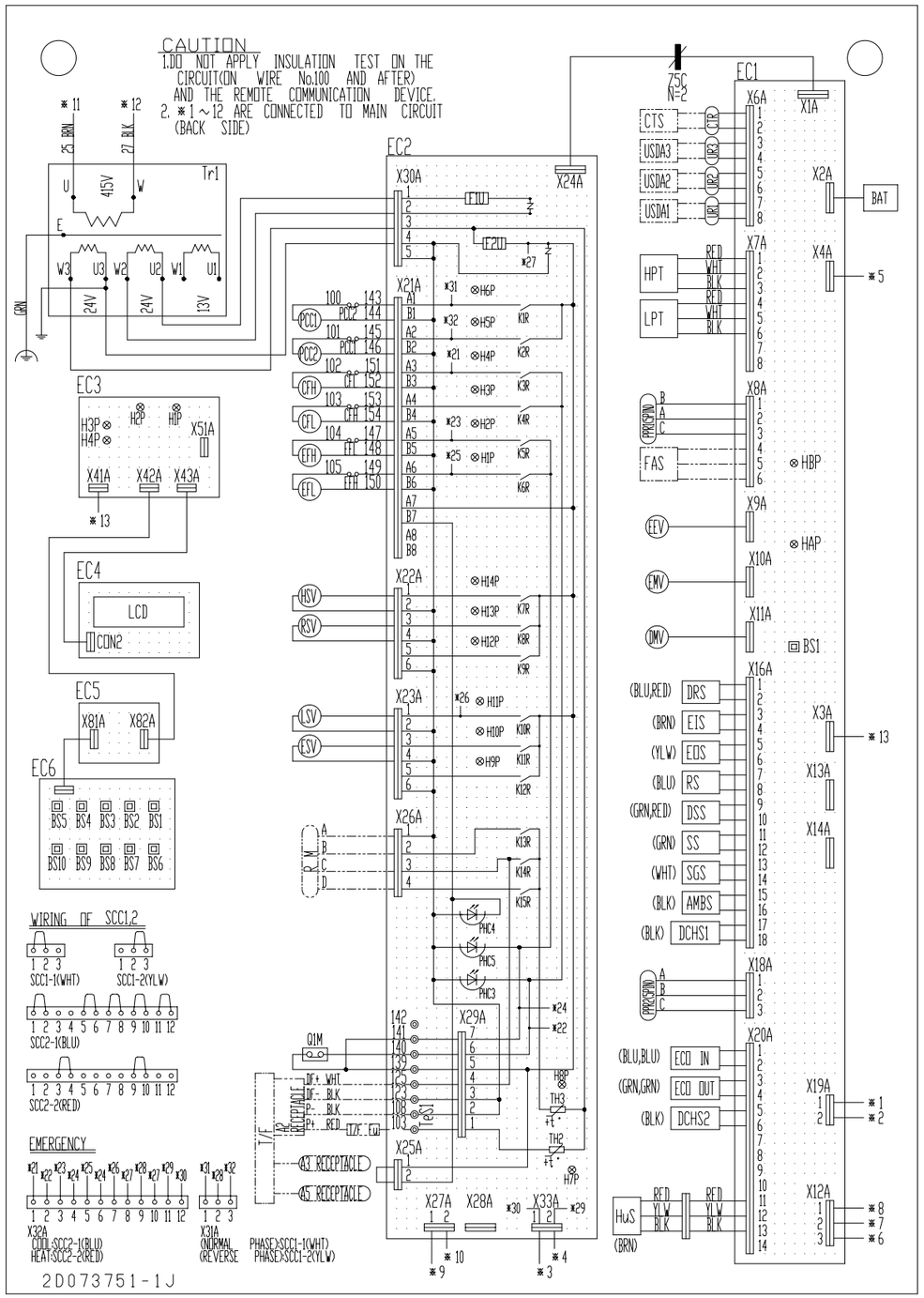
FRONT SIDE



AMBS	AMBIENT TEMP.SENSOR	EFM1,2	EVAPORATOR FAN MOTOR	PT	POTENTIAL TRANSFORMER
BAT	BATTERY	ETS	EVAPORATOR INLET SENSOR	QIM	THERMAL PROTECTOR FOR MOTOR(CFM)
BS1	BUTTON SWITCH(EC1)	EMV	ECONOMIZER MODULATION VALVE	R1～3, 51,71,72	REGISTER
BS1-10	BUTTON SWITCH(EC6)	EOS	EVAPORATOR OUTLET SENSOR		
C1～6, 57,64	CAPACITOR	ESV	ECONOMIZER SOLENOID VALVE	RS	RETURN AIR SENSOR
		F1U,2U	FUSE(250V,10A,FXEC2)	RSV	REHEAT COIL SOLENOID VALVE
CB	EARTH LEAKAGE CIRCUIT BREAKER(30A,100mA)	F3U	FUSE(250V,10A,FXEC2)(SPARE)	SCC1-1,2	SHORT CIRCUIT CONNECTOR 1
CFH	HIGH SPEED CONDENSER FAN CONTACTOR	F8U	FUSE(600V,8A,FXEC9)	SCC2-1,2	SHORT CIRCUIT CONNECTOR 2
CFL	LOW SPEED CONDENSER FAN CONTACTOR	F11U	FUSE(600V,8A)(EC7)	SGS	SUCTION GAS SENSOR
CFM	CONDENSER FAN MOTOR	H1P	SERVICE MONITOR(ALARM)(EC3)	SS	SUPPLY AIR SENSOR
CM	COMPRESSOR MOTOR	H1P-H14P	SERVICE MONITOR(EC2)	TH2,3	PTC THERMISTOR
CT	CURRENT TRANSFORMER	H2P	SERVICE MONITOR(IN RANGE)(EC3)	Tr1	TRANSFORMER(CONTROL)
CTR	CARGO TEMP. RECEPTACLE	H3P	SERVICE MONITOR-GREEN(EC3)	UR1-3	USDA RECEPTACLE
DCHS1	COMPRESSOR DISCHARGE SENSOR (DISCHARGE PIPE)	H4P	SERVICE MONITOR-RED(EC3)	V1R	IGBT POWER MODULE
DCHS2	COMPRESSOR DISCHARGE SENSOR (COMPRESSOR)	HAP	SERVICE MONITOR-GREEN(EC1)	V2R,V3R	DIODE BRIDGE
DFM	DC FAN MOTOR	HBP	SERVICE MONITOR-RED(EC1)	ZIC～ZSC	FERRITE CORE
DMV	DISCHARGE MODULATION VALVE	HPS	HIGH PRESSURE SWITCH		
DRS	DATA RECORDER RETURN AIR SENSOR	HPT	HIGH PRESSURE TRANSDUCER		
DSS	DATA RECORDER SUPPLY AIR SENSOR	HSV	HOT GAS SOLENOID VALVE		
EC1	CPU BOARD	HuS	HUMIDITY SENSOR		OPTIONAL SPECIFICATION
EC2	I/O BOARD	K1	RELAY(EC8)	CTS	CARGO TEMP. SENSOR 1
EC3	OPERATION BOARD	K1R-K15R	RELAY(EC2)	FAS	FRESH AIR SENSOR(VENTILATION VOLUME) 2
EC4	LCD BOARD	L1R-L6R	AC REACTOR	RCD	REMOTE COMMUNICATION DEVICE(YORK) 3
EC5	CONNECTOR BOARD	L7R	DC REACTOR	RM	REMOTE MONITORING RECEPTACLE 4
EC6	SHEET KEY	LCD	LIQUID CRYSTAL DISPLAY	T/F A2,3	TRANS FRESH,A2 ･3 RECEPTACLE(PROVISION) 5
EC7	PT/CT BOARD	LPT	LOW PRESSURE TRANSDUCER	T/F A5	TRANS FRESH,A5 RECEPTACLE 6
EC8	INVERTER CONTROL BOARD	LSV	LIQUID SOLENOID VALVE		TRANS FRESH,FUSE ASSY IN LINE FUSE
EC9	INVERTER NOISE FILTER BOARD	MC	MAGNET CONTACTOR	T/F Fu	(3AG, 250V, 2A, Slo-Blo) 7
ECO IN	ECONOMIZER HEAT EXCHANGE INLET SENSOR	P1	POWER PLUG	USDA1-3	USDA SENSOR 8
ECO OUT	ECONOMIZER HEAT EXCHANGE OUTLET SENSOR	PCC1,2	PHASE CORRECTION CONTACTOR		↑
EEV	ELECTRONIC EXPANSION VALVE	PHC	PHOTO COUPLER		OPTIONAL ITEM NO.
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR	PPRT,2	PC.PORT RECEPTACLE	EACH MODEL TO EQUIP FOLLOWING OPTIONS.	
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR	PS	SWITCHING POWER SUPPLY	・LX10F : NONE	

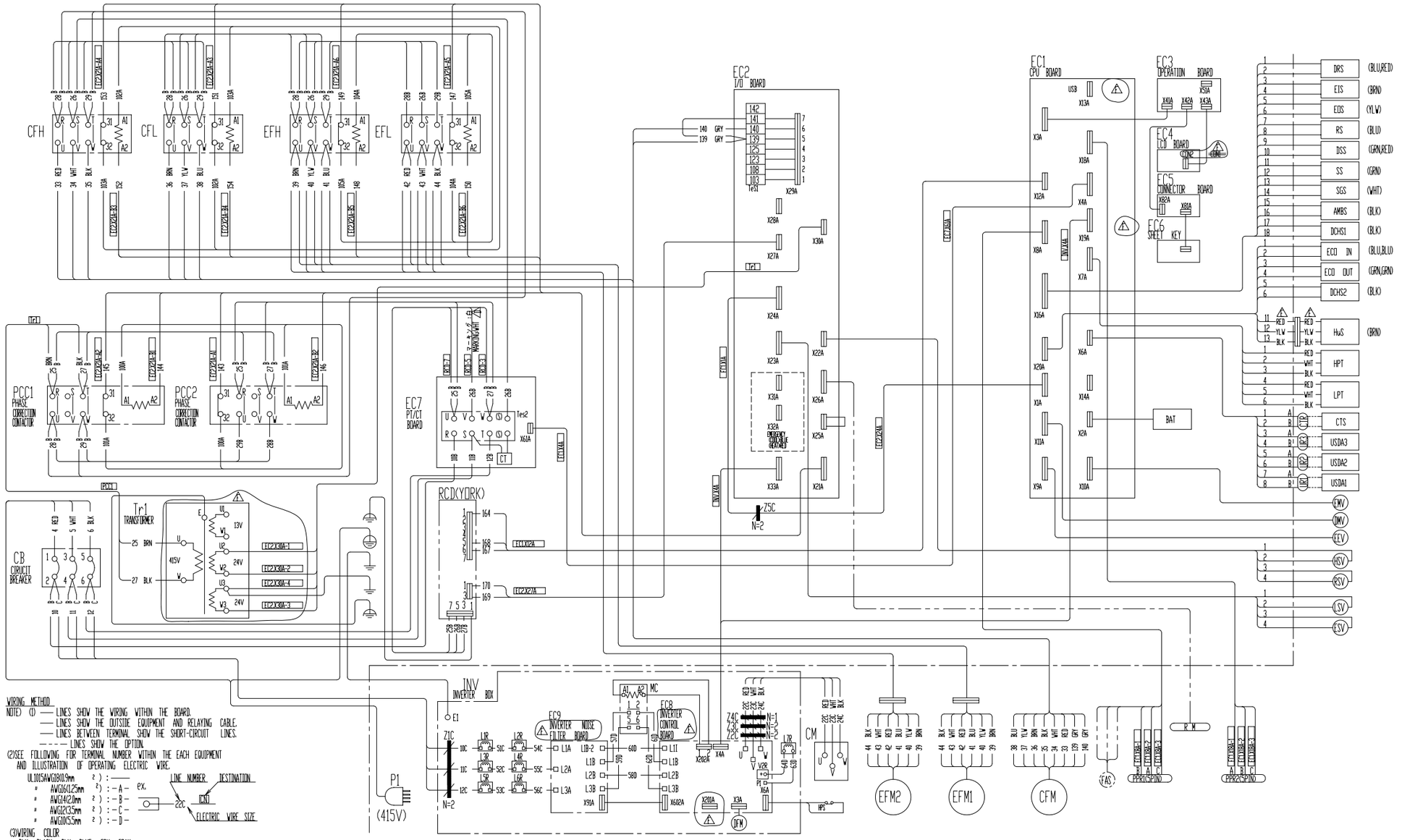
2D073751-1J LX10F

BACK SIDE



5-9

Stereoscopic wiring diagram



WIRING METHOD

NOTE) (1) —— LINES SHOW THE WIRING WITHIN THE BOARD.
—— LINES SHOW THE OUTSIDE EQUIPMENT AND RELAYING CABLE.
—— LINES BETWEEN TERMINAL SHOW THE SHORT-CIRCUIT LINES.
– – – – LINES SHOW THE OPTION.

(2)SEE FOLLOWING FOR TERMINAL NUMBER WITHIN THE EACH EQUIPMENT AND ILLUSTRATION OF OPERATING ELECTRIC WIRE.

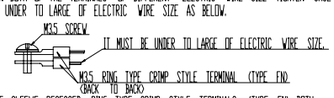
UL1015AWG18(0.9mm²) : —
" AWG16(1.25mm²) : —A—
" AWG14(2.0mm²) : —B—
" AWG12(3.5mm²) : —C—
" AWG10(5.5mm²) : —D—

ex. 22C — LINE NUMBER, DESTINATION, CONT, ELECTRIC WIRE SIZE

(3)WIRING COLOR
BLK : BLACK . BLU : BLUE . GRY : GRAY
BRN : BROWN . RED : RED . YLW : YELLOW
WHT : WHITE . GRN : GREEN

(4)SEE TABLE FOR SEQUENCE FIGURE IN THIS DRAWING.

(5)UNLESS OTHERWISE SPECIFIED AT INSTRUCTION FOR C.BOX ASSY, IN THE RING TYPE CRIMP STYLE TERMINALS BOTH TIGHTEN CASE MUST AS BELOW. THEN, IN BOTH OF THE TERMINALS OF DIFFERENT ELECTRIC WIRE SIZE TIGHTEN CASE MUST BE UNDER TO LARGE OF ELECTRIC WIRE SIZE AS BELOW.



(6)THE M3.5 SLEEVE RECESSED RING TYPE CRIMP STYLE TERMINALS (TYPE FN) BOTH TIGHTEN POINTS OR THE M3.5 SLEEVE RECESSED RING TYPE CRIMP STYLE TERMINALS (TYPE FN) AND THE M4 SLEEVE RECESSED RING TYPE CRIMP STYLE TERMINALS (TYPE FN) BOTH TIGHTEN POINTS, THEY MUST BE TIGHTENING TORQUE 11.2 ~ 13.8kgf · cm(1.1 ~ 1.3N · m).

(7)WIRING MUST NOT CONTACT TO COIL OF Tr1.

(8)HIGH VOLTAGE WIRING AND LOW VOLTAGE WIRING DIVORCE IN 25mm AND OVER.

(9)IF INTERNAL WIRING IS NOT SPECIFIED, SEE GAH00-Z.

(10)THE COLOR WITHIN ( ) SHOWS THE DISTINCTION COLOR.

· PARTS LIST OF OUTSIDE EQUIPMENT

REF. NO.	NAME	DEVICE SPEC	APPLIANCES NO.	REF. NO.	NAME	DEVICE SPEC	APPLIANCES NO.	REF. NO.	NAME	DEVICE SPEC	APPLIANCES NO.
1	AMBIENT TEMP.SENSOR		AMBS	14	EVAPORATOR INLET SENSOR		EIS	27	RETURN AIR SENSOR		RS
2	CONDENSER FAN MOTOR		CFM	15	ECONOMIZER MODULATION VALVE		EMV	28	REHEAT COIL SOLENOID VALVE		RSV
3	COMPRESSOR MOTOR		CM	16	EVAPORATOR OUTLET SENSOR		EOS	29	SUCTION GAS SENSOR		SGS
4	CARGO TEMP. RECEPTACLE		CTR	17	ECONOMIZER SOLENOID VALVE		ESV	30	SUPPLY AIR SENSOR		SS
5	COMPRESSOR DISCHARGE SENSOR (DISCHARGE PIPE)		DCHS1	18	HIGH PRESSURE SWITCH		HPS	31	USDA RECEPTACLE		UR1-3
6	COMPRESSOR DISCHARGE SENSOR (COMPRESSOR)		DCHS2	19	HIGH PRESSURE TRANSDUCER		HPT	32			
7	DISCHARGE MODULATION VALVE		DMV	20	HOT GAS SOLENOID VALVE		HSV	33			
8	DATA RECORDER RETURN AIR SENSOR		DRS	21	HUMIDITY SENSOR		HuS	34	CARGO TEMP. SENSOR	OPTION PARTS	CTS
9	DATA RECORDER SUPPLY AIR SENSOR		DSS	22	INVERTER BOX		INV	35	FLASH AIR SENSOR	OPTION PARTS	FAS
10	ECONOMIZER HEAT EXCHANGE INLET SENSOR		ECI IN	23	LOW PRESSURE TRANSDUCER		LPT	36	REMOTE MONITORING RECEPTACLE	OPTION PARTS	RM
11	ECONOMIZER HEAT EXCHANGE OUTLET SENSOR		ECI OUT	24	LIQUID SOLENOID VALVE		LSV	37	USDA SENSOR	OPTION PARTS	USDA1-3
12	ELECTRONIC EXPANSION VALVE (MAIN)		EEV	25	POWER PLUG		P1	38			
13	EVAPORATOR FAN MOTOR		EFM1,2	26	PC.PORT RECEPTACLE		PPR1,2	39			

Revision A Correction of spelling 2012.9.28

DAIKIN INDUSTRIES,LTD.

Head Office. Umeda Center Bldg., 4-12, Nakazaki-Nishi 2-chome, Kita-ku, Osaka, 530-8323 Japan.
Tel: 06-6373-4338
Fax: 06-6373-7297
Tokyo Office. JR Shinagawa East Bldg., 11F 18-1, Konan 2-chome, Minato-ku Tokyo, 108-0075 Japan.
Tel: 03-6716-0420
Fax: 03-6716-0230

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