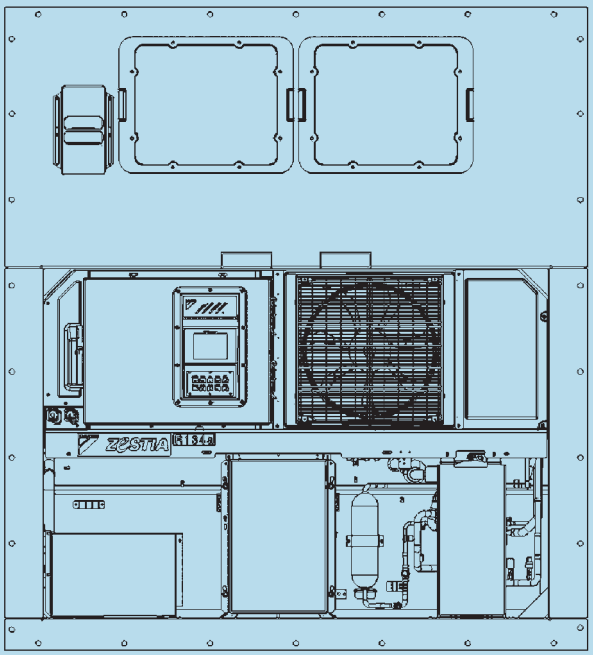
DAIKIN

DAIKIN INVERTER CONTAINER REFRIGERATION UNIT

Service Manual



LX10F11B3 or later
(DECOS Va)

DAIKIN INDUSTRIES,LTD.

TR 16-02

Make sure to read these instructions before operation.
This manual provides the minimum information required to operate the container refrigeration unit LX10F series or later 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

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 TP1 and TP2 on the inverter board is less than DC50V before starting inspection.

R134a should be used as refrigerant.

Be sure to prevent air from becoming mixed in with refrigerant, and never charge the equipment used for hydrostatic pressure tests with gas that contains air or O_2.
If any other refrigerant not specified is charged, or charging procedure is not correct, it may explosions may occur.

⚠ 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 and water-cooled operation : Condenser fan may start and stop automatically for the refrigerant high pressure control.

CLASS 1 PRODUCT SPECIFIED BY THE FLUOROCARBONS EMISSION CONTROL LAW

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.

The replacement of the electric wiring must be performed by the manufacturer, distributor, or a certified electrician.

⚠ 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.

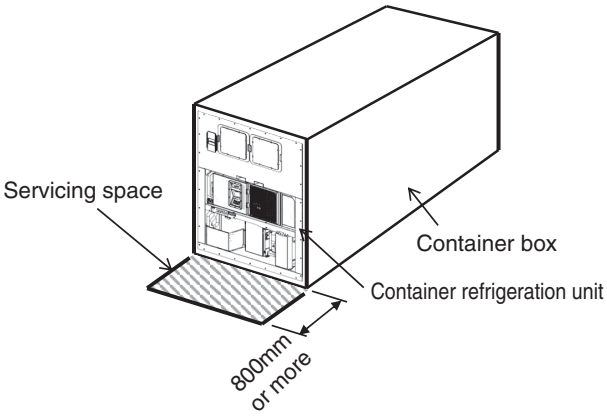
Securely close the control box cover.
Otherwise, it will allow water entry.

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

Open the oil bottle, just before charging the oil. Do not leave the bottle open for a long time to avoid moisture entry.
Using 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 regulation.

Ensure that there is sufficient servicing space when inspecting the front of the container refrigeration unit.



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

You may be required to perform periodic refrigerant leakage inspections. Contact Daikin for details.

Chapter 1 Unit Specifications

1.1 Operation Range and Main Specifications

1.1.1 Operation Range

Item	Operation Range
Ambient temperature range	+50℃～-30℃ (+122℉～-22℉)
Inside temperature range	+30℃～-30℃ (+86℉～-22℉)
Voltage	50Hz：380 / 400 / 415V 60Hz：440 / 460V Voltage fluctuation rate±10%
Vibration/impact	Horizontal direction: 5G, vertical direction: 2G

1.1.2 Main Specifications

Item		Main Specifications
Mode Switch	Chilled mode	+30.0℃ ～ -9.9℃ (+86.0℉ ～ +14.1℉)
	Frozen mode	-10.0℃ ～ -30.0℃ (+14.0℉ ～ -22.0℉)
Condenser cooling system		Air cooling type
Controller		DECOSVa
Inverter compressor		Hermetically sealed scroll type (Rated motor output 3.75kW, MAX. motor output 8.1kW)
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 control
Refrigerant		R134a (For refrigerant charging amount, refer to the name plate)
Refrigerant oil		IDEMITSU, Daphne hermetic oil FVC68D
Weight		For detail, refer to the name plate, unit performance

●The resistance of solenoid coil

Component name	Coil Resistance
Compressor motor	0.90Ω±7% (20℃)
Condenser fan motor	High speed: 30.6Ω±5% (20℃) / Low speed: 21.6Ω±5% (20℃)
Evaporator fan motor	High speed: 23.0Ω±10% (20℃) / Low speed: 89.2Ω±10% (20℃)
Solenoid valve LSV, ESV, HSV, RSV	15.2 Ω±10% (20℃)
Modulation valve EEV, EMV, DMV	46±3Ω/phase (20℃)

1.2 Protection Device and Setting Value

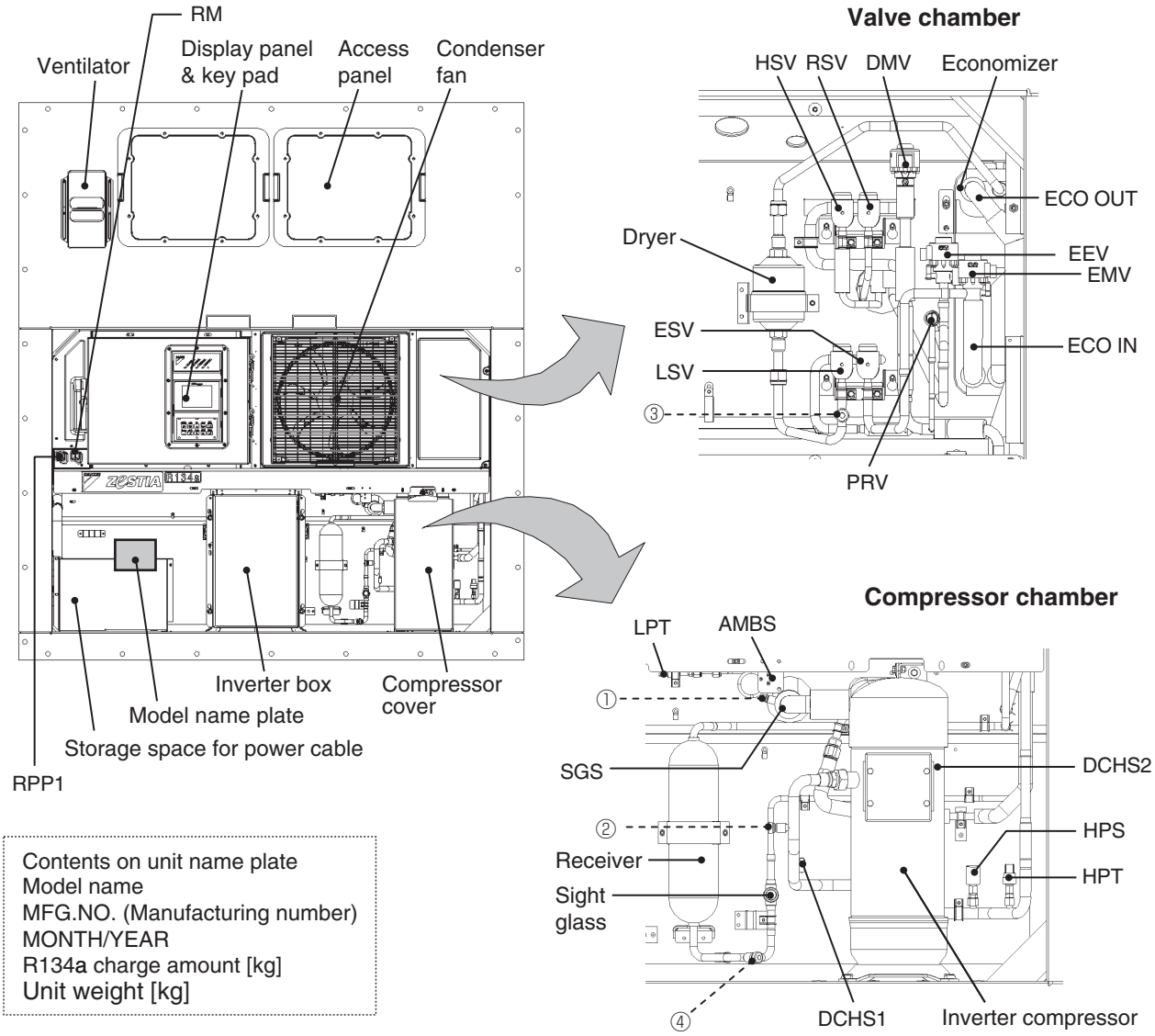
Component Name	Detector Symbol	Setting Value	Alarm
High pressure switch	HPS	OFF≧2400kPa（24.47kg/cm²） ON≦1900kPa（19.37kg/cm²）	E101 F101
Pressure relief valve	PRV	Open≧2450kPa（25.0kg/cm²）	—
Fusible plug	—	95～100℃（203～212℉）	—
Built-in thermal protector for condenser fan motor	Q1M	OFF≧135℃±5℃（275℉±41℉） ON≦86℃±15℃（187℉±59℉）	—
Built-in thermal protector for evaporator fan motor	—	OFF≧145℃±5℃（293℉±41℉） ON≦94℃±15℃（201℉±59℉）	—
Circuit breaker (ELCB)	CB	30A（100mA）	—

●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 surge protection) <Non-replaceable>	—
	F6U		Surge absorber 2 (lightning surge protection) <Non-replaceable>	—
	F7U		Surge absorber 3 (lightning surge protection) <Non-replaceable>	—
	F8U	8A 600V	Inverter control circuit <Non-replaceable>	—
I/O board（EC2）	TH3	2.5A 72V Automatic reset	RM (Remote Monitoring) circuit <Non-replaceable>	—
	TH2		TransFresh circuit <Non-replaceable>	—

1.3 Construction

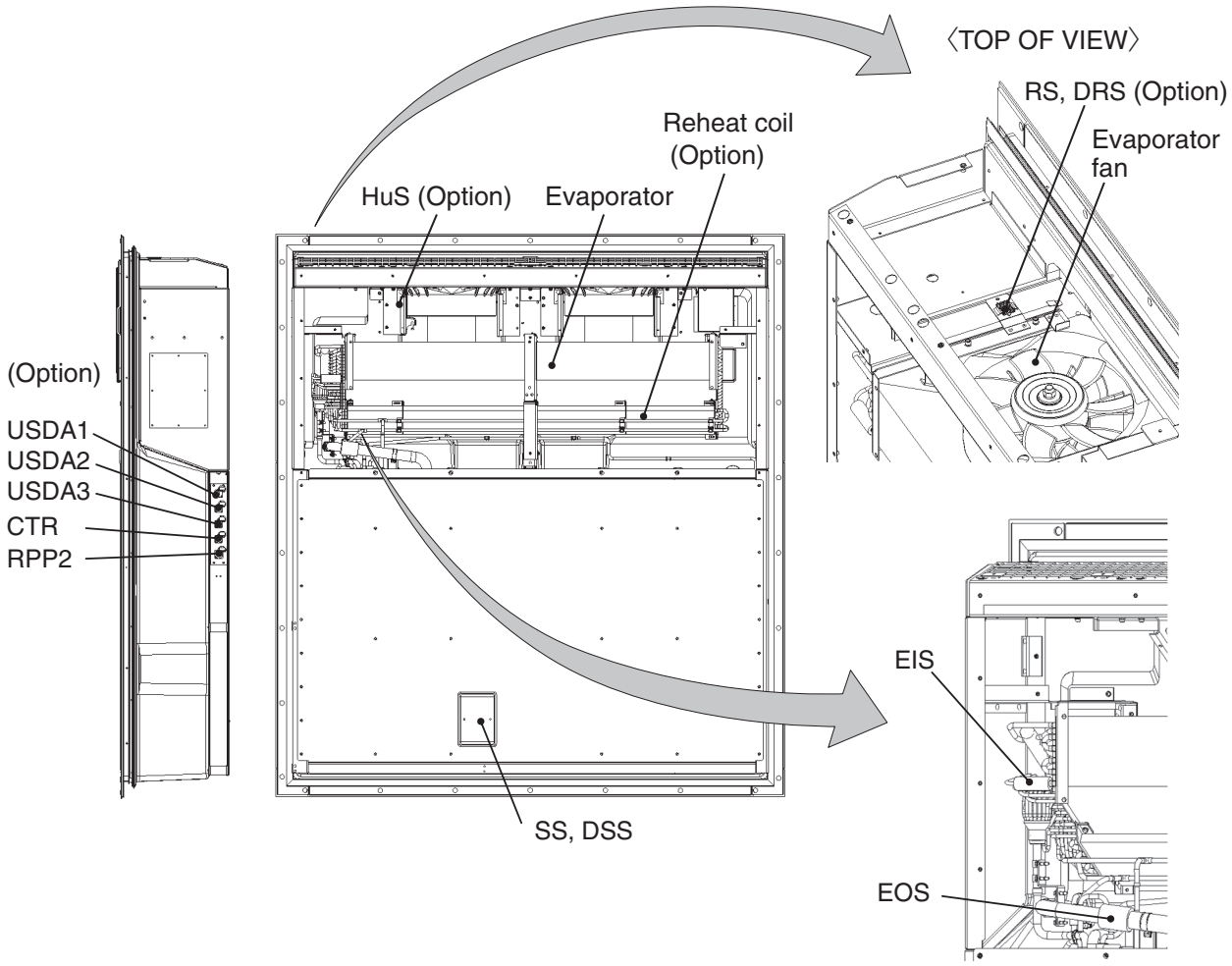
1.3.1 Outside View



Contents on unit name plate
Model name
MFG.NO. (Manufacturing number)
MONTH/YEAR
R134a charge amount [kg]
Unit weight [kg]

【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)
【Interface】
PPR1 : PC port receptacle
RM : Remote monitoring receptacle (Option)

1.3.2 Inside View



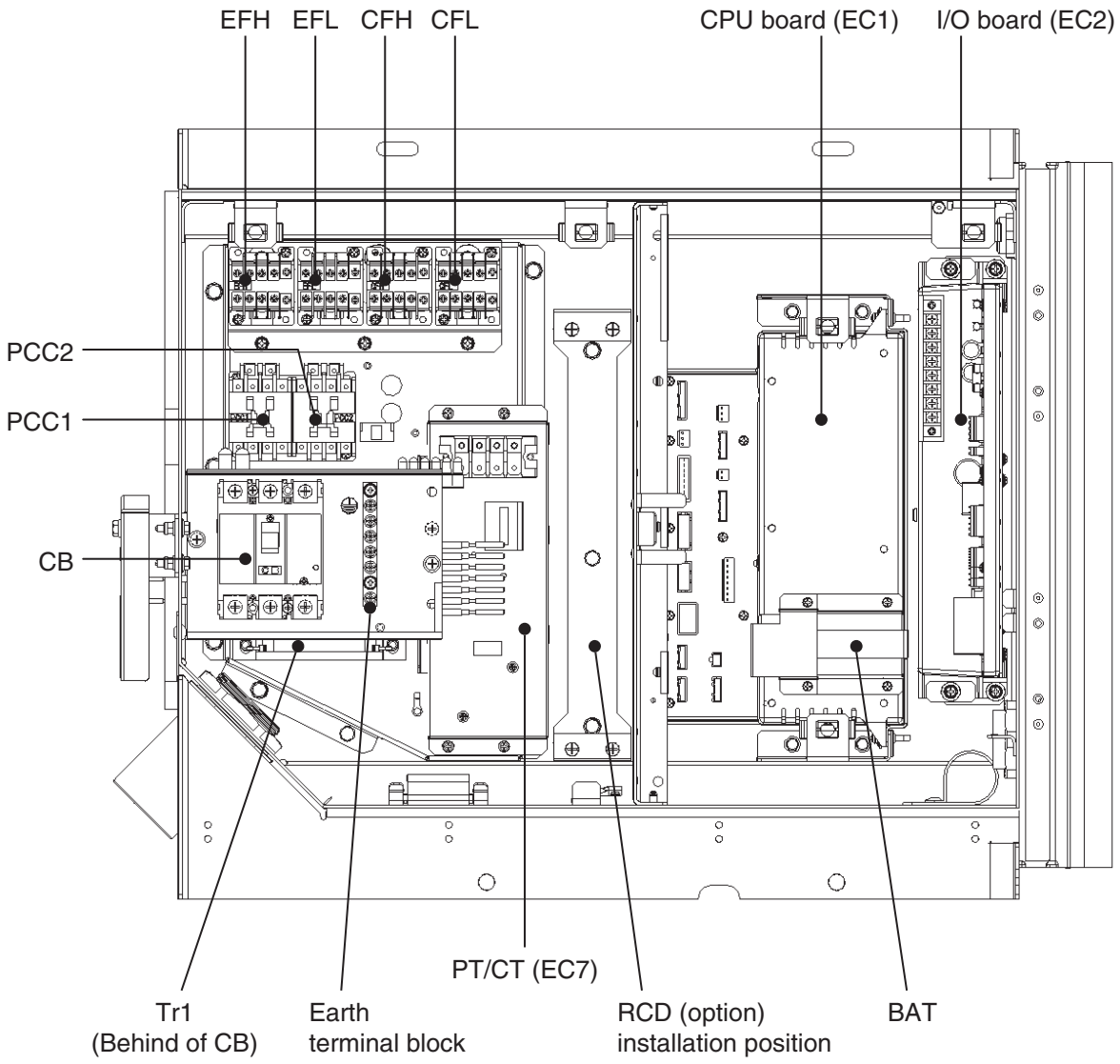
【Sensor】

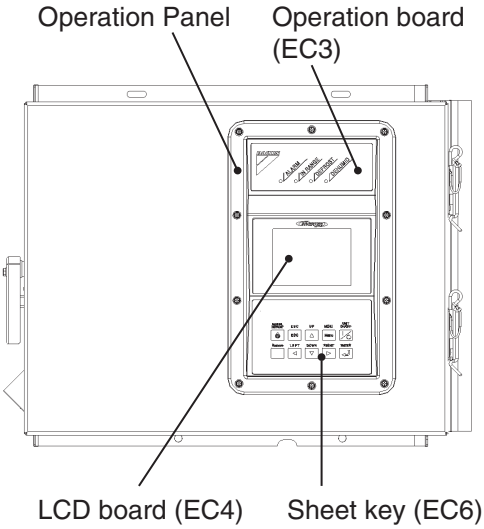
DRS : Return Air Temperature Sensor for Data Recorder (Option)
DSS : Supply Air Temperature Sensor for Data Recorder
EIS : Evaporator Inlet Temperature Sensor
EOS : Evaporator Outlet Temperature Sensor
HuS : Humidity Sensor (Option)
SS : Supply Air Temperature Sensor

【Interface】

CTR : Cargo Temperature Sensor Receptacle (Option)
RPP2 : PC Port Receptacle（Option）
USDA1 : USDA Sensor 1 Receptacle（Option）
USDA2 : USDA Sensor 2 Receptacle（Option）
USDA3 : USDA Sensor 3 Receptacle（Option）

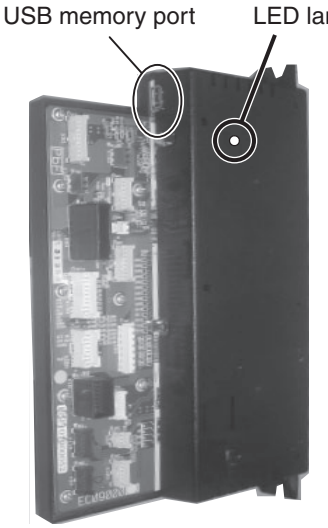
1.3.3 Control Box



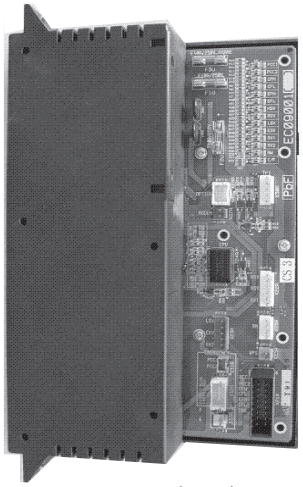


BAT	: Wake-up Battery (Rechargeable Battery)
CB	: Circuit Breaker (ELCB)
CFH	: Magnetic Contactor, CFM high speed
CFL	: Magnetic Contactor, CFM low speed
EFH	: Magnetic Contactor, EFM high speed
EFL	: Magnetic Contactor, EFM low speed
PCC1	: Phase Correction Contactor 1
PCC2	: Phase Correction Contactor 2
PT/CT	: PT/CT Board
RCD	: Modem (Option)
Tr1	: Transformer for Operating Circuit

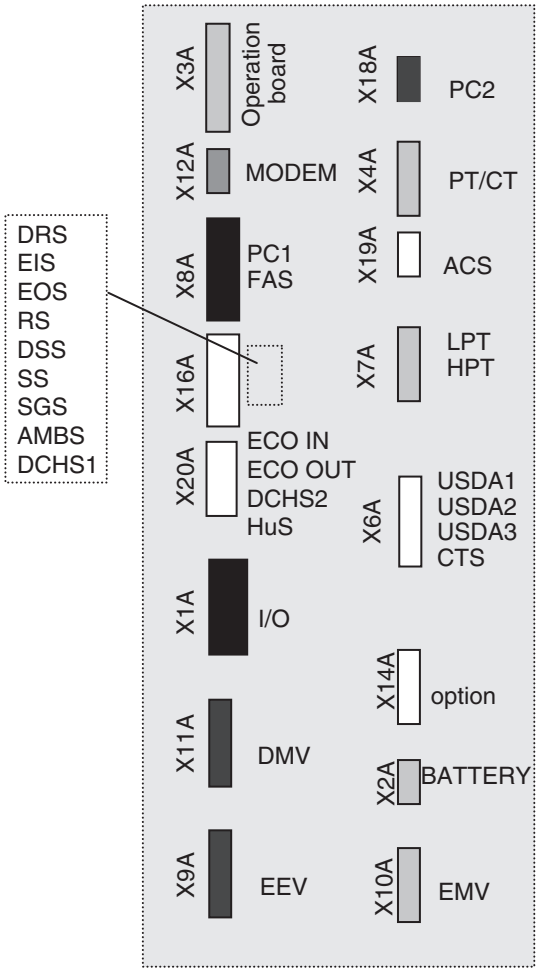
1.3.4 CPU Board and I/O Board

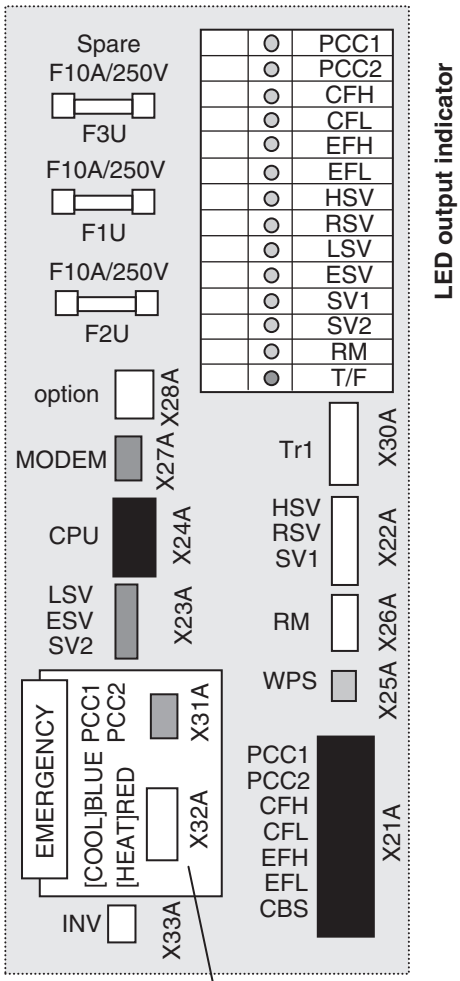


CPU board（EC1）



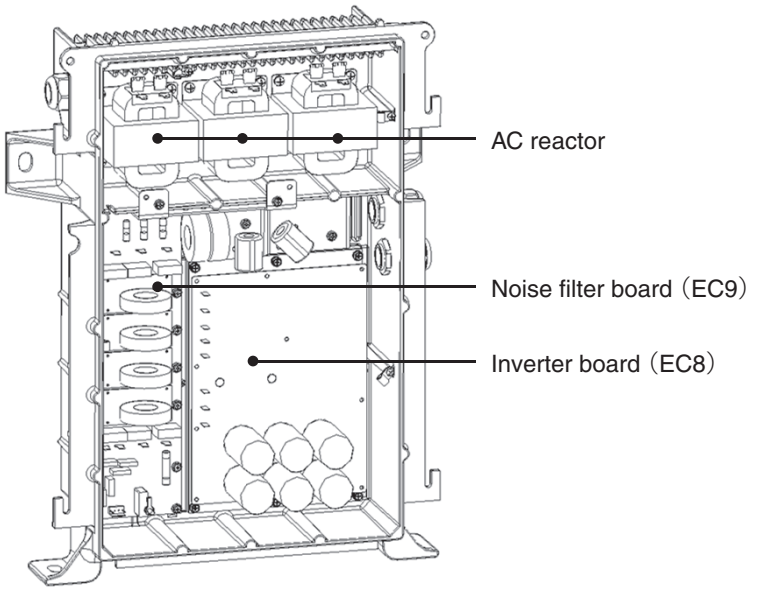
I/O board（EC2）



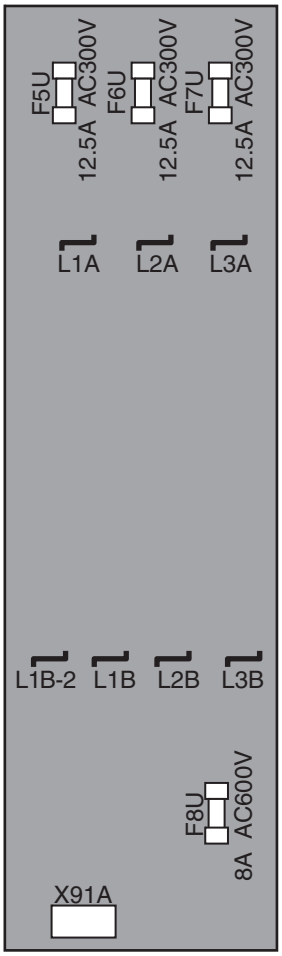


Short circuit connectors for emergency operation

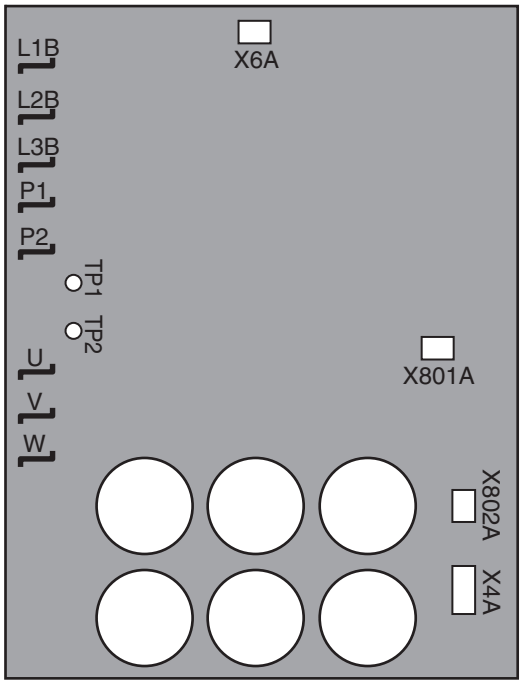
1.3.5 Inverter Box



Noise filter board（EC9）



Inverter board（EC8）



Note: Wiring diagram for the unit including inverter circuit is put on back side of the control box cover.

1.3.6 Valves and Functions

EEV: Electronic Expansion Valve

EEV controls super heat at the evaporator outlet and controls the refrigerant supply amount 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 and heating operation, the opening is adjusted as release control.

EMV: Economizer Modulation Valve

EMV controls the refrigerant supply amount 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. EMV is also used for the discharge pipe temperature control and charging control during defrost and heating operation.

ESV: Economizer Solenoid Valve

Opening of ESV is synchronized with 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

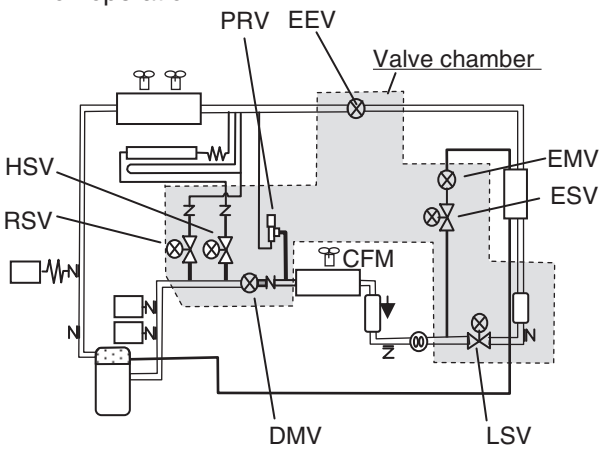
HSV is opened while in defrost and heating operation to supply hot-gas from the compressor to the evaporator and drain pan. It is also opened to equalize the pressure to protect compressor in case of large pressure difference of high and low pressure while in compressor start up.

RSV: Reheat Solenoid Valve

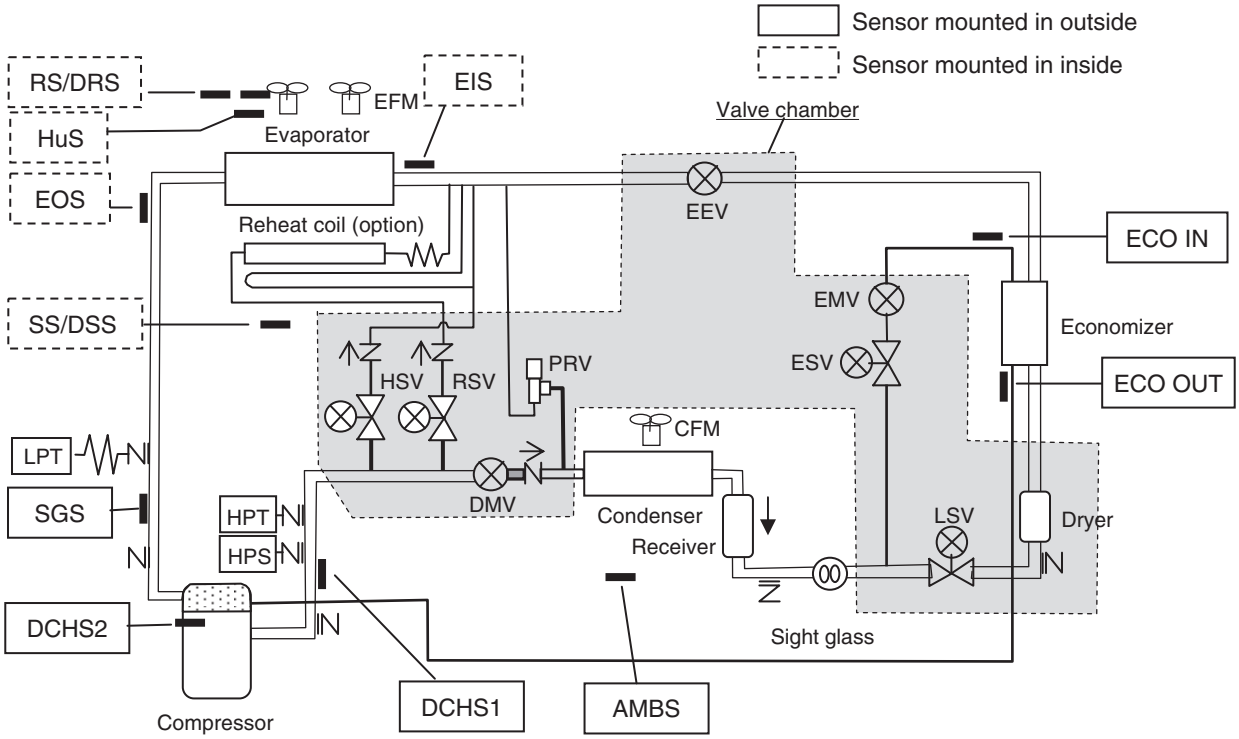
RSV is opened while dehumidification control operation to supply hot-gas from the compressor to the reheat coil.

PRV: Pressure Relief Valve

PRV is mechanical type pressure release valve. It releases the refrigerant to the low pressure side when the pressure rises abnormally during non operation.



1.3.7 Sensor Location



1.3.8 Printed Circuit Board

●CPU Board（EC1）

Controller described in this manual as 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 downloaded using a PC which has the DCCS software installed or with a USB memory.

When power OFF, some of setting work and data indication can be available by wake-up battery power (Rechargeable battery). Data download and software upload are also 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 downloaded from web site.

●I/O Board（EC2）

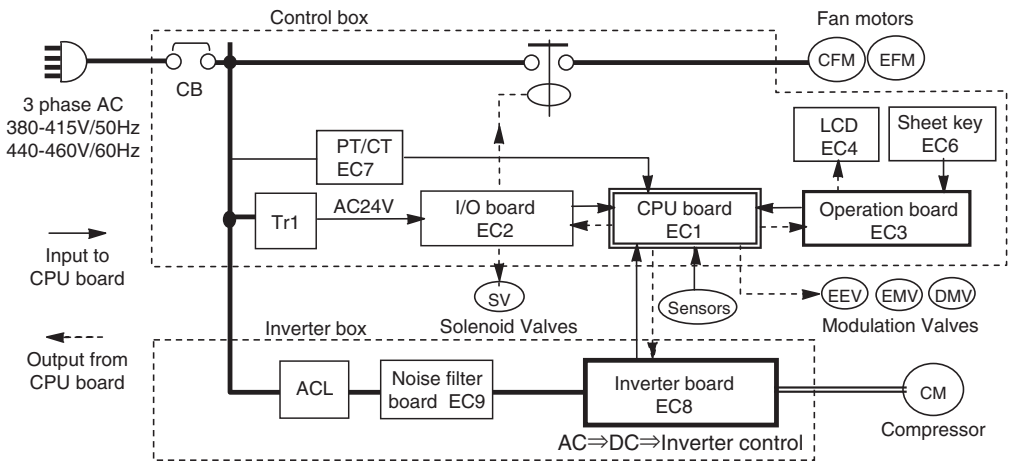
I/O board converts AC24V power from control transformer Tr1 to DC13V/DC5V and supply it to CPU board.
I/O board energizes magnetic contactors for fan motor EFM, CFM and phase correction contactor PCC1 or 2 by receiving order from CPU board. At the same time, LED lamps wired in parallel with them are 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 alarm E903 is shown on trip report.
Configuration items factory set to CPU board have been copied to operation board. When CPU board is replaced, these items are transmitted to CPU board.

●Inverter Board（EC8）

Inverter board changes frequency of power source and controls compressor speed. Inverter board receives command of rotation speed value from CPU board. The operating condition during inverter control (compressor overload, power supply condition and actual frequency etc.) are transmitted to CPU board. The judgment for operation continuing and stopping is conducted by CPU board. Output from inverter is made of frequent switching control by power module and results to creating high temperature. Radiator fin constructed outside inverter box.



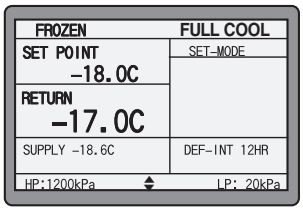
1.4 Operation Mode and Control

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 FULL COOL, or COOLING OFF is displayed on the upper right of the screen. RETURN temperature (RS) is displayed under SET POINT.

●Operation mode

FULL COOL＜Pull down＞

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℃ .

FULL COOL＜Modulation＞

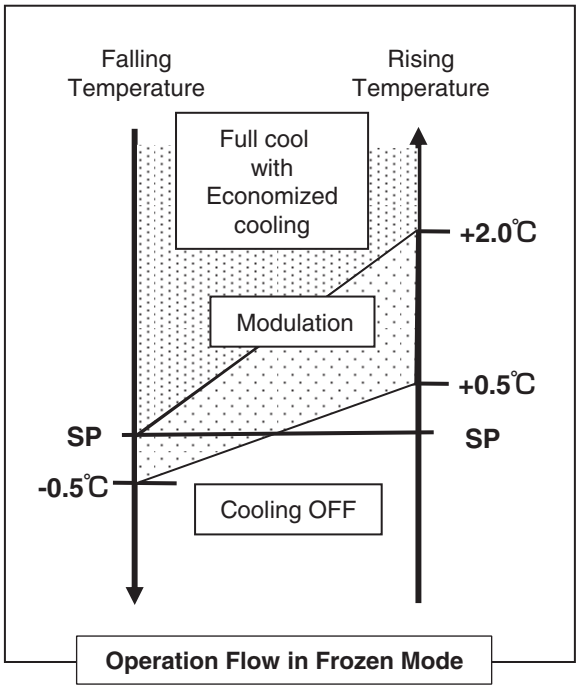
When RS drops to ≦SP, unit will enter to the modulating cooling. Compressor speed is modulated in response to temperature difference between RS and SP.

COOLING OFF

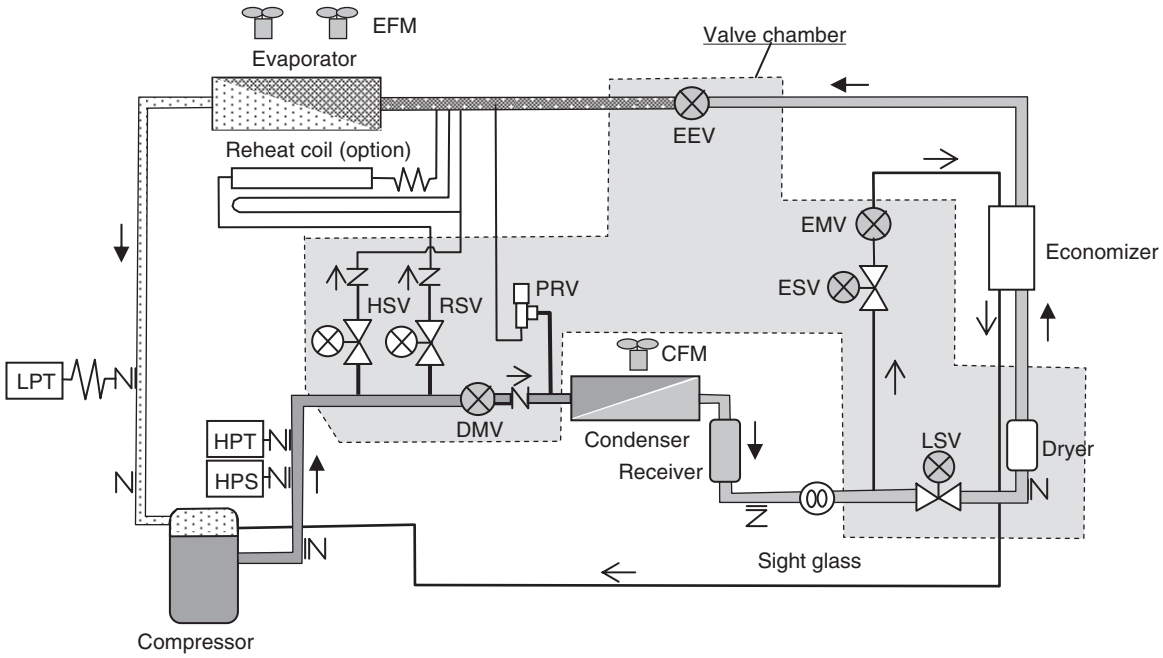
When RS still drops to ≦SP-0.5℃ , unit will enter to Cooling OFF. Compressor stops and EFM continues to run at low speed. If temperature rises to ≧SP+0.5℃ , the unit will return to the modulated cooling.

●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

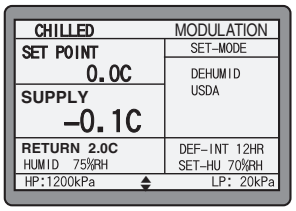


1.4.2 Chilled Mode

●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 FULL COOL, MODULATION, COOLING OFF or HEATING is displayed on the upper right of the screen. SUPPLY temperature (SS) is displayed under SET POINT.

●Operation mode

FULL COOL＜Pull down＞

Compressor runs at full capacity, ESV opens and economizer is activated. EFM runs with high speed.

MODULATION

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

COOLING OFF (HEATING 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 modulation.

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.

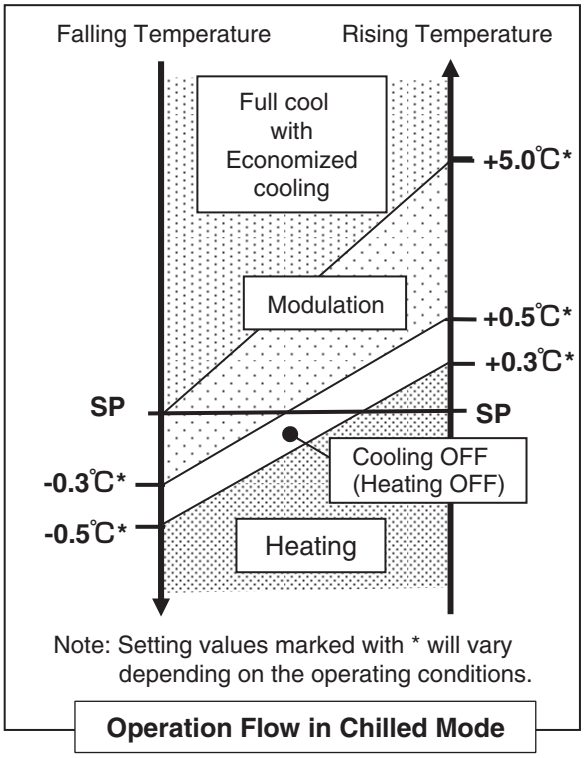
The operation is same as defrost mode except EFM runs with high speed.

●Evaporator Fan Motor, EFM

EFM runs at High or Low speed in Modulation as mentioned above.

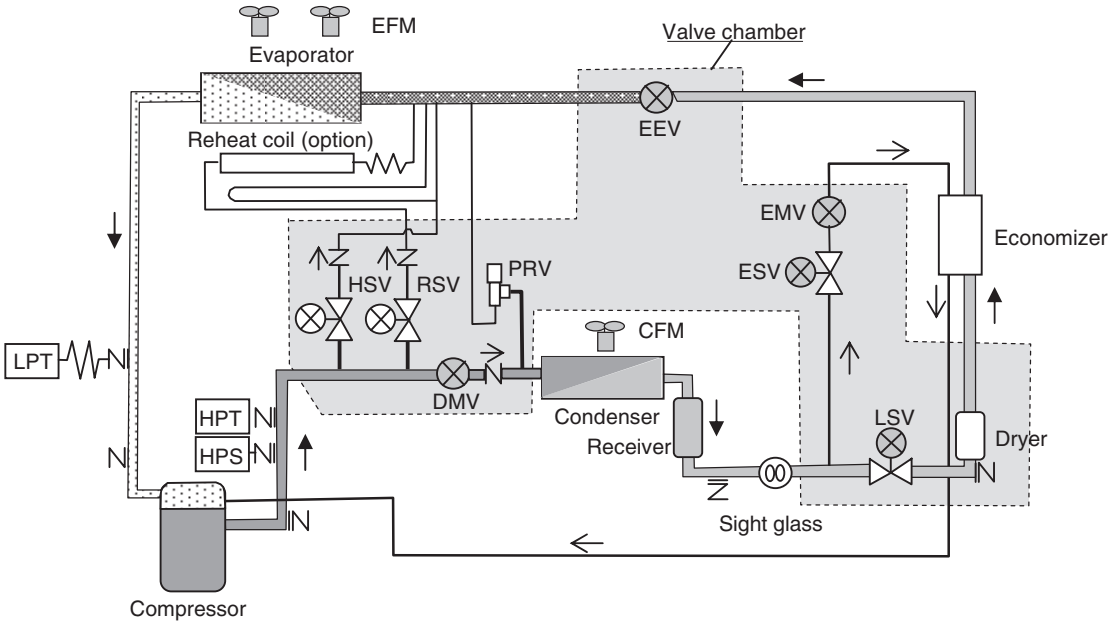
●Condenser Fan Motor, CFM

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



Note: Setting values marked with * will vary depending on the operating conditions.

Operation Flow in Chilled Mode



1.4.3 Dehumidification Mode (Option)

Dehumidification operation reduces the internal relative humidity using the reheat coil that heats up the air cooled by the evaporator.
Heat source of the reheat coil, 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.

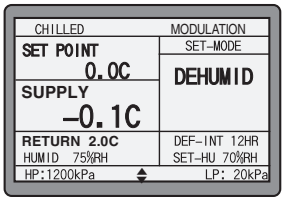
●Setting for dehumidification control

Select ON for "Dehumidification Set" on the Mode Set screen to enable dehumidification operation.

ON: When dehumidification operation is executed
OFF: When dehumidification operation is not executed

●Display

After the settings are complete, DEHUMID will appear at the right side of the screen.



●LED display

The DEHUMID indicator (yellow) lights.

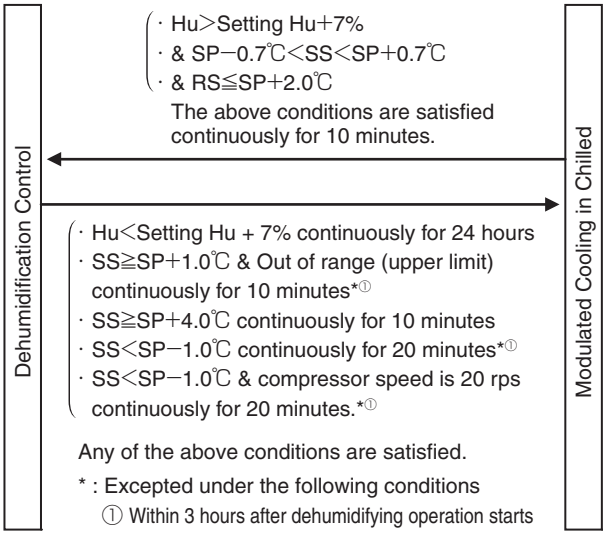
●Dehumidification Operation

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

Hu＞Setting Hu＋7%
& SP－0.7℃＜SS＜SP＋0.7℃
& RS≦SP＋2.0℃

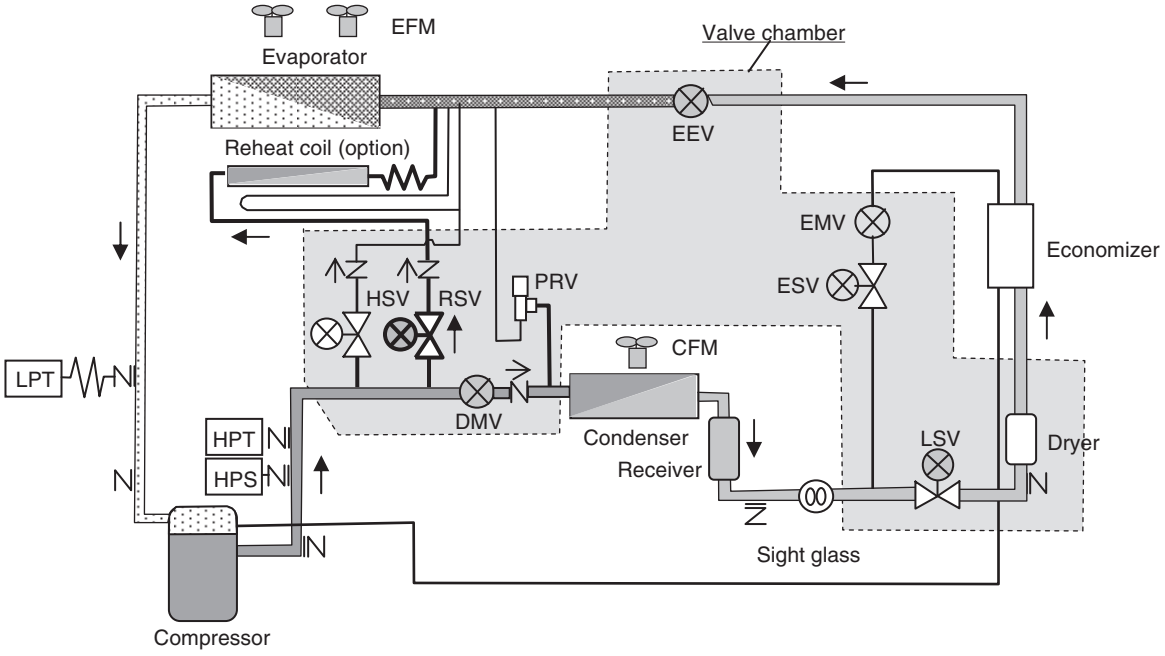
The above conditions are satisfied continuously for 10 minutes.

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



●Cancellation of Dehumidification operation

Select OFF for "Dehumidification Set" on the Mode Set screen to cancel dehumidification operation.



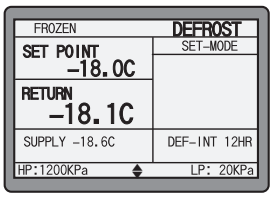
1.4.4 Defrost Mode

●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.



●LED display

The DEFROST indicator (orange) lights.

●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 adjusted in order to maintain the optimum hot gas temperature. (High Pressure Constant Control). Release control (DMV open, CFM ON) or charge control (ESV and, EMV open) may be carried out depending on the operating conditions. After termination of defrosting, normal temperature control operation will start. However, the delay timer will cause the evaporator fan to remain stopped for a maximum of 3 minutes.

●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 Manual defrost key.

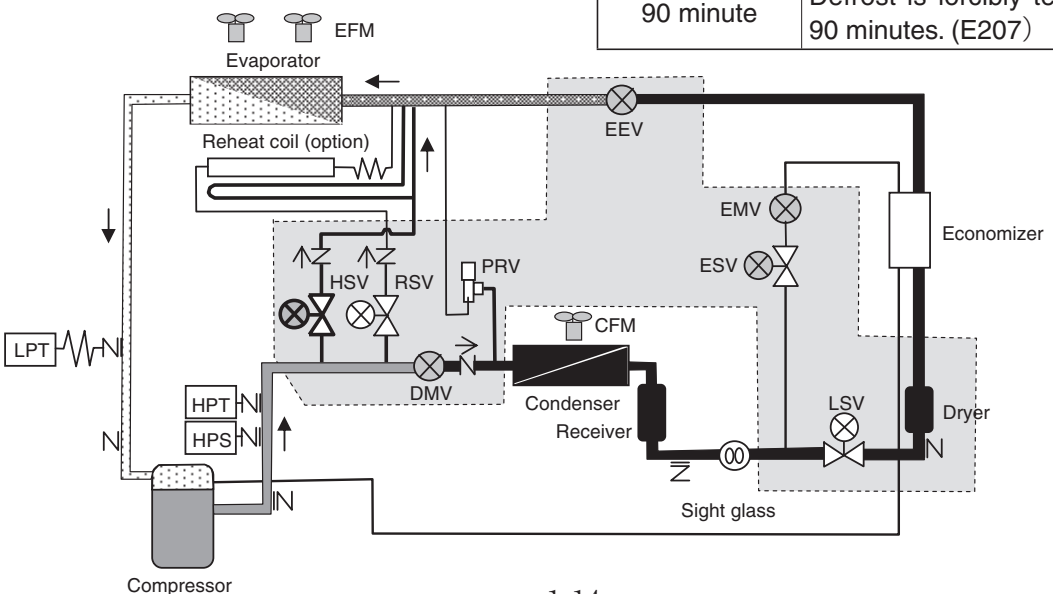
●Defrost Initiation Conditions

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

If the initiation conditions are not satisfied 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≧25℃ & (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			Full Cool	Modulation	Cooling OFF
Motor	Compressor	CM※7,8	Max.130 rps	20～130 rps	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 H/L change automatically

EEV fully open: 420 pls

EMV opening upper limit: 300 pls

(EMV fully open: 420 pls)

DMV fully open: 760 pls

●Chilled Mode

Component Name		Full Cool	Modulation	Cooling OFF	Heating
Motor	CM※7, 8	Max.130 rps	20～130 rps	OFF	20～95 rps
	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%（0～24% ※4）
	DMV※8	100%	100%	100%	0%（0～100% ※4）（13～100% ※5）

●Dehumidification mode

Dehumid.
20～95 rps
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.50 rps	20～95 rps
	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.

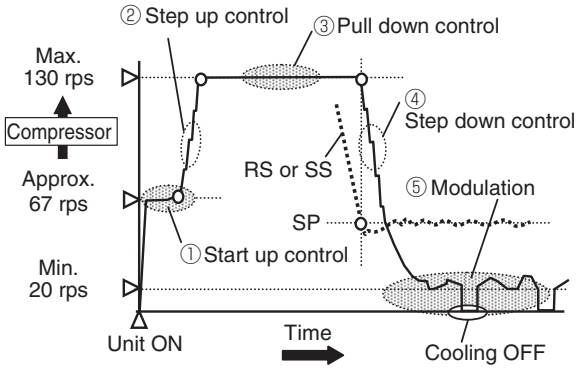
※7 Compressor may reduce its rotation speed prior to take protection control when the protection control activated in some reason.

※8 Compressor rotation speed（rps）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. 20 rps to Max. 130 rps with inverter control.



①Start up control

After unit switch ON, unit goes to calibration valves at first and compressor start up control. Start up control is to protect liquid back condition due to 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.

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 rotation speed (130 rps) during pull down. When some cause makes the protection control activated, the rotation 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 rotation speed of the compressor will be slowed down gradually. It takes two to three minutes.

⑤Modulation

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 20 rps)
The compressor stops at small heat load condition.

●Calibration valves

Turning the unit switch into ON triggers initial operation for calibrating 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. The operation of the modulation valve coils can be checked during maintenance. (Refer to ※3 Sensor information in paragraph 2.3.)

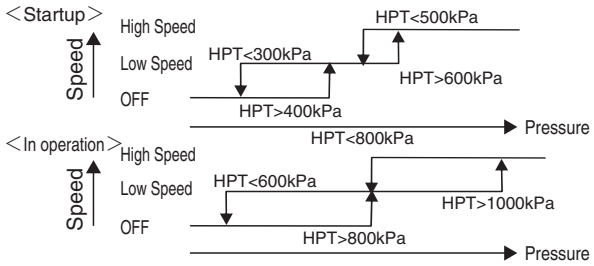
●Compressor protection control

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 pump 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. Automatic Pumpdown)

1.5 Optional Functions

1.5.1 ASC, Automatic Setpoint Change (Option)

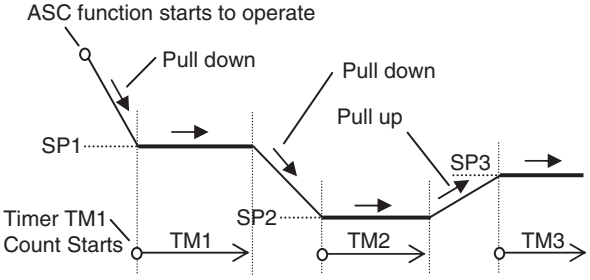
●ASC operation

It can be possible to improve quality for some types of cargo by automatically changing the set temperature over time.
ASC function can specify the set temperature and its duration automatically.

●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.

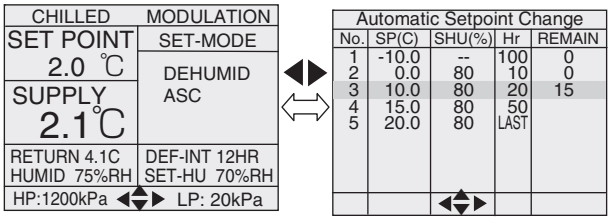


●Precautions when setting ASC operation

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.



Operation screen　　ASC screen

●Cancellation of ASC operation

1. Cancellation of ASC operation
   When configuring ASC to "OFF"
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

Units equipped with USDA receptacle 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 "NTC (Standard)" type and "ST9702-1" 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 receptacles vary depending on the sensors.

Access to setting confirmation：※4 Configuration Set Information in paragraph 2.3.
Access to setting change：※12 Configuration Set in paragraph 2.3.

●USDA report

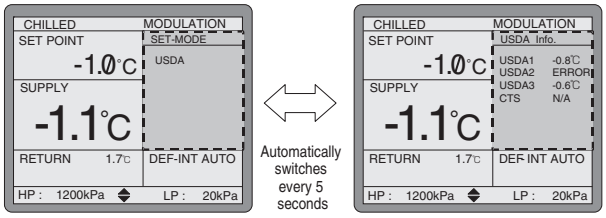
Temperature record data during cold treatment transport can be prepared in the format in conformity with USDA standards which is downloadable from the PC that installed DCCS software. For detail, refer to operation manual for personal computer software.

●Checking remaining voltage of the wake-up battery

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

●Indications during USDA operation

During USDA operation, the SET-MODE area will change to "USDA INFO" every 5 seconds, and the USDA sensor value will be displayed. (Diagram below)
Current supply / return air temperature and each USDA sensor values are shown on LCD display automatically without press any operation key.



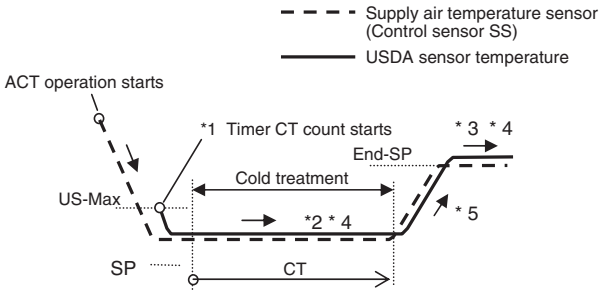
1.5.3 ACT, Automatic Cold Treatment

●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 dropped lower than 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 dropped lower than 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.)

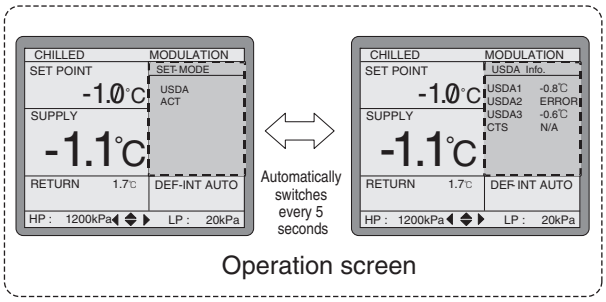
●Access to ACT operation

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

●Indications during ACT operation

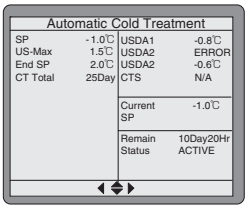
During USDA operation, "ACT" is displayed in the SET-MODE area.

The SET-MODE area will change to "USDA INFO" every 5 seconds, and the current USDA sensor value will be displayed. (Figure below)



Operation screen

When the ▶ or ◀ key is pressed, the ACT setting status and the current operating status can be checked.



ACT screen

●Cancellation of ACT operation

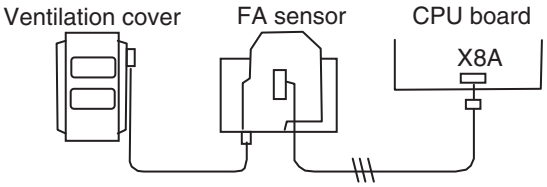
1. Cancellation of ACT operation
   1) When ACT is set to "OFF"
   2) When F-PTI is completed
   3) When Chilled PTI is completed
   4) When Frozen PTI is completed
2. Power off (unit off) during ACT operation and operations when restarting

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)

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, 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.

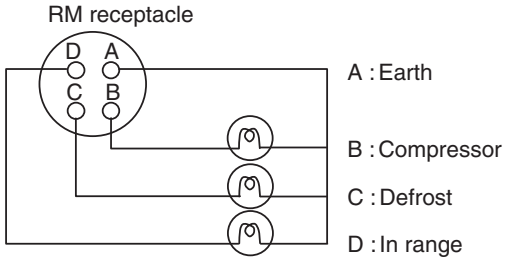
1. At FA setting, at FA change
2. 0:00 am (Once a day)
3. When the unit starts to run
4. When the controller is waked up by battery mode

1.5.5 Remote Monitoring Receptacle

Able to install receptacle for remote monitoring on front of the unit.

In case of connect remote monitoring cable, below operation conditions are transferred to main board.

1. Compressor running
2. Defrost
3. In-range



1.6 Battery Mode

When the unit is not connected to the power source, following work can be done with battery mode function.
If the wake-up battery is not sufficiently charged, the function may not operate.

●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 memory.

1.7 Information Interchange with Personal Computer

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

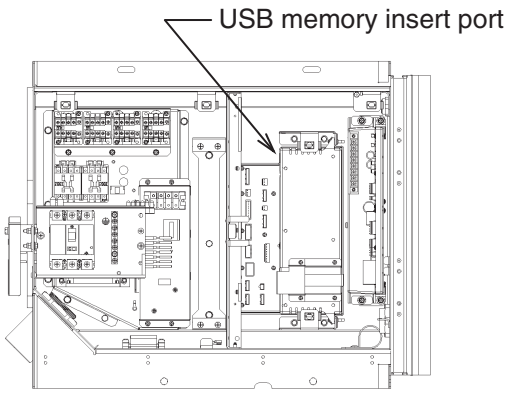
Data download

Data records can be downloaded by connecting a PC to the communication port. Furthermore, all of the recorded data inside the controller can be downloaded by inserting a USB memory into the connection port of 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



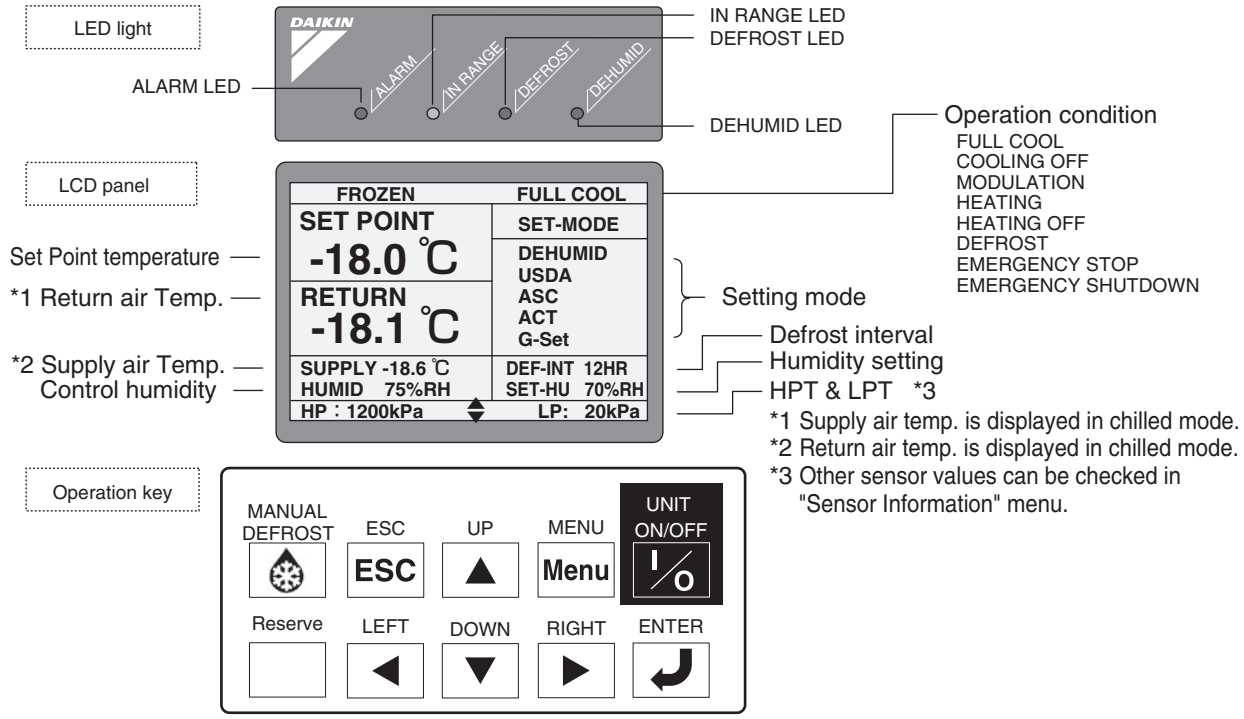
USB memory connected to the controller

Description			PC connection	USB memory connection
Download	Trip report	FULL TRIP	✓	✓ All data are downloaded.
		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 memory by PC, install the DCCS software (ver. 9 series) in advance.

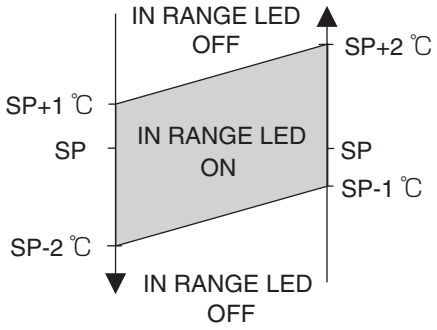
Chapter 2 Controller

2.1 Operation Panel



●ALARM LED (Red)
ALARM LED blinks in case of F alarms or E807 and E304.

●IN RANGE LED (Green)
Lights when the control temperature is in range.



●DEFROST LED (orange)
Lights when defrosting control is being carried out.

●DEHUMID LED (yellow)
Lights when dehumidifying is set to ON.

●Function of operation key

UNIT ON/OFF
To start or to stop the unit operation. If the power supply is cut off 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
- Scroll up or down to select an item
- Determine the setting item

RIGHT LEFT
- Scroll right or left to select an item
- Move to next or previous screen

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

ENTER
- To determine the setting contents

ESC
- Returns from the display contents to the previous screen.

MANUAL DEFROST
- To carry out manual defrost operation

2.2 Controller Functions List

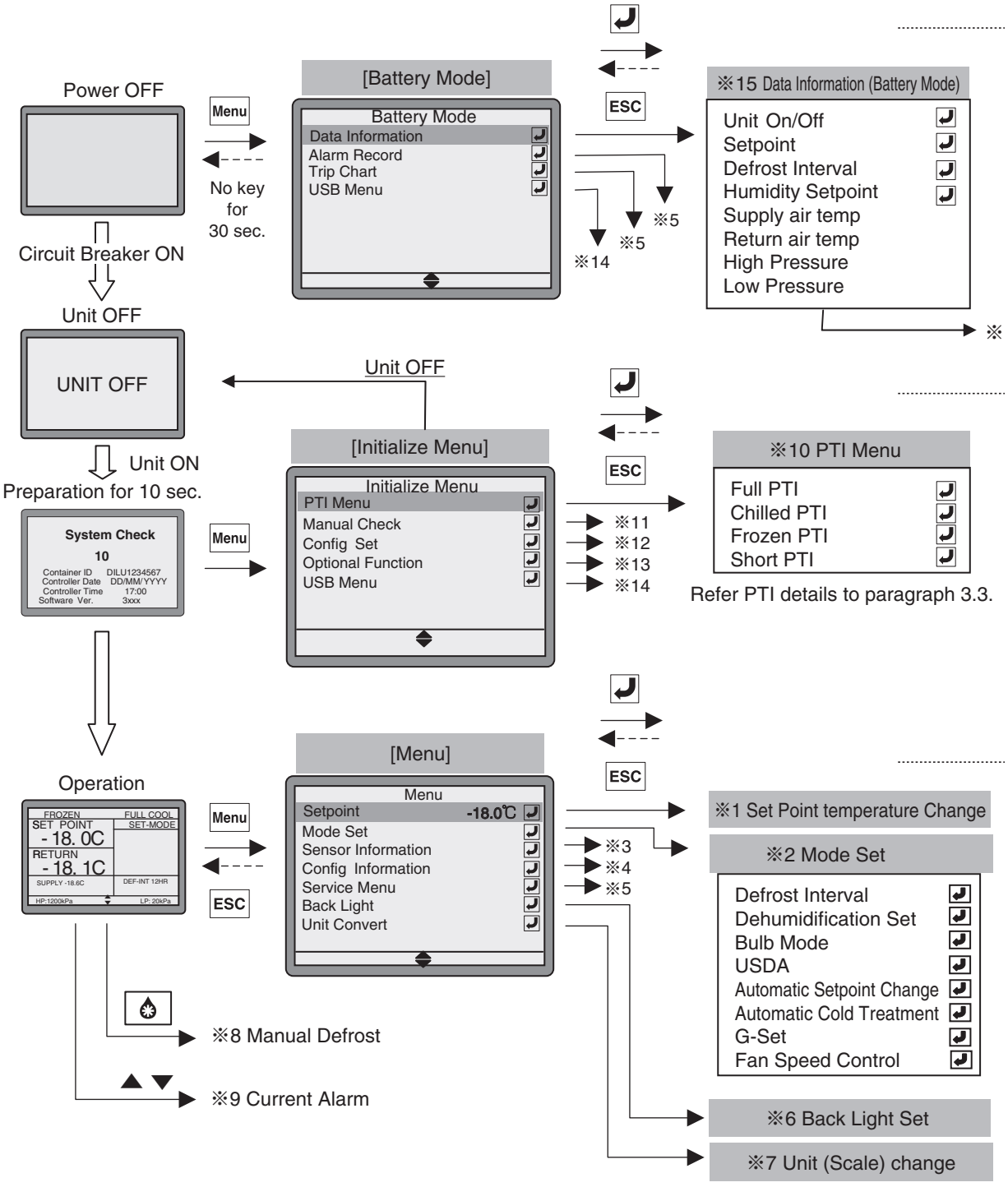
The controller installed in this unit has following functions. Access to the pertinent item in following pages for detail.

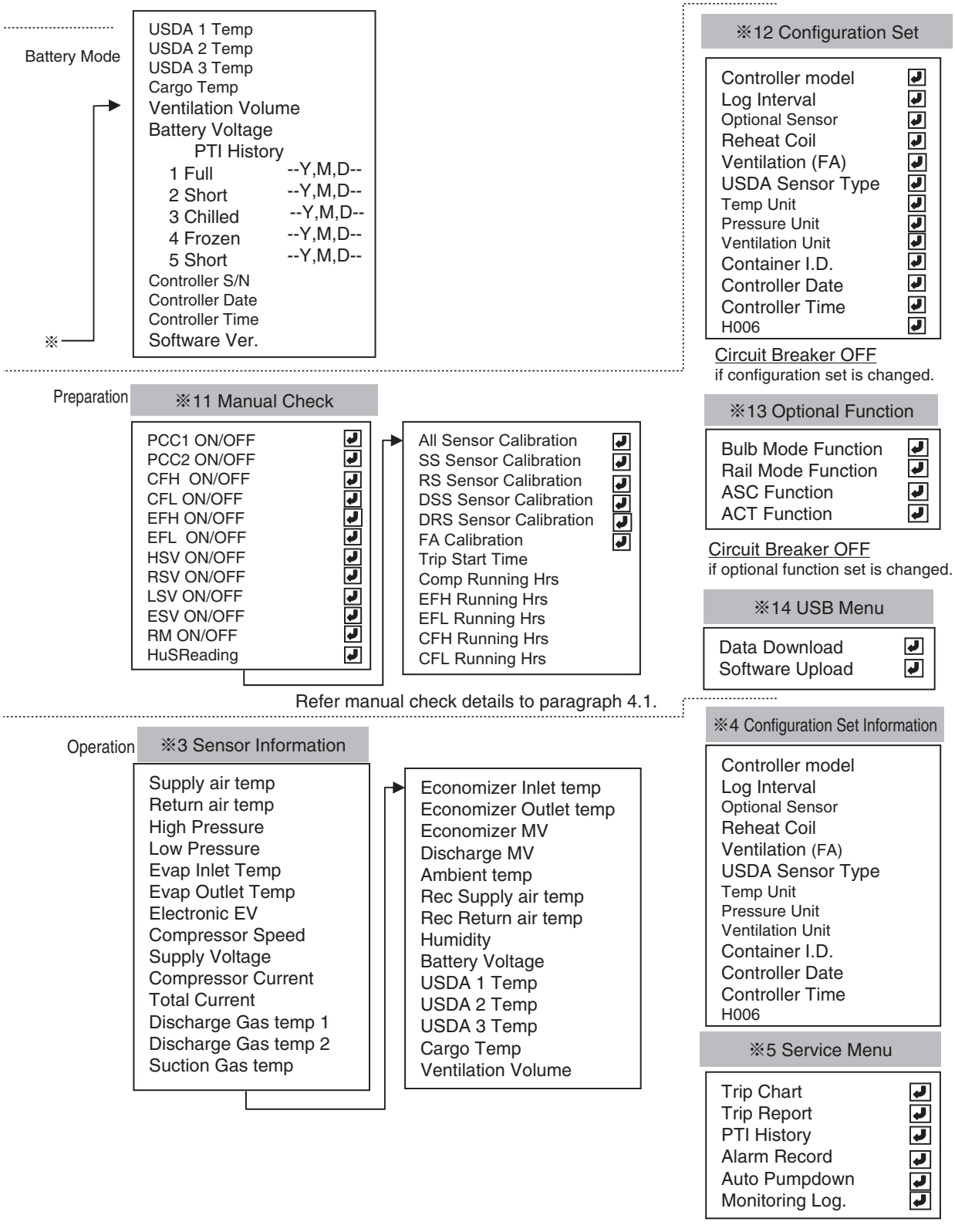
Items	Function			Paragraph No.
Setting	Temperature SP, Humidity SP, Bulb mode			2.3 ※1, 2-2, 2-3
	Defrost Interval		AUTO or 3, 6, 9, 12 or 24Hr	2.3 ※2-1
	ASC (Automatic Set-point Change)			2.3 ※2-5
	USDA			2.3 ※2-4, 1.5.2
	ACT (Automatic Cold Treatment)			2.3 ※2-6, 1.5.3
	Fan Speed Control			2.3 ※2-8
	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	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 setting			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 memory				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 Set
※7 Unit (Scale) Change
※8 Manual Defrost
※9 Current Alarm
※10 PTI Menu
※11 Manual Check
※12 Configuration Set
※13 Optional Function Set
※14 USB Menu
※15 Data Information (Battery Mode)

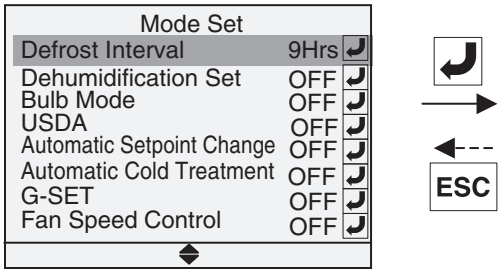




※1 Set Point temperature Change

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

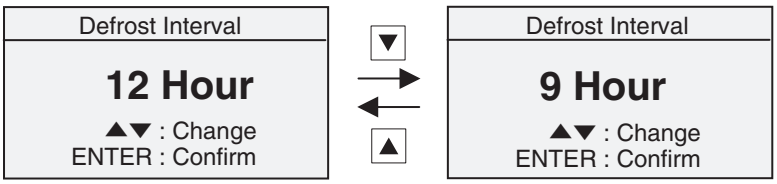
※2 Mode Set



※2-1 Defrost Interval Set
※2-2 Dehumidification Set
When Reheat Coil is set to "OFF" in ※12 Configuration Set, this function will not work.
※2-3 Bulb Mode Set
※13 You cannot select this function if Bulb Mode Function is set to "OFF" in the optional function settings. (N/A is displayed.)
※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

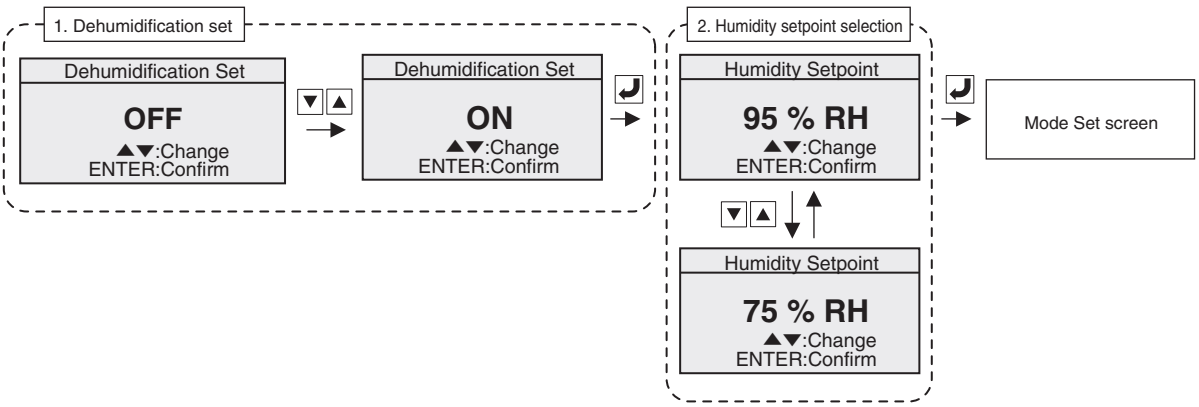
※2-1 Defrost Interval Set

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 Set

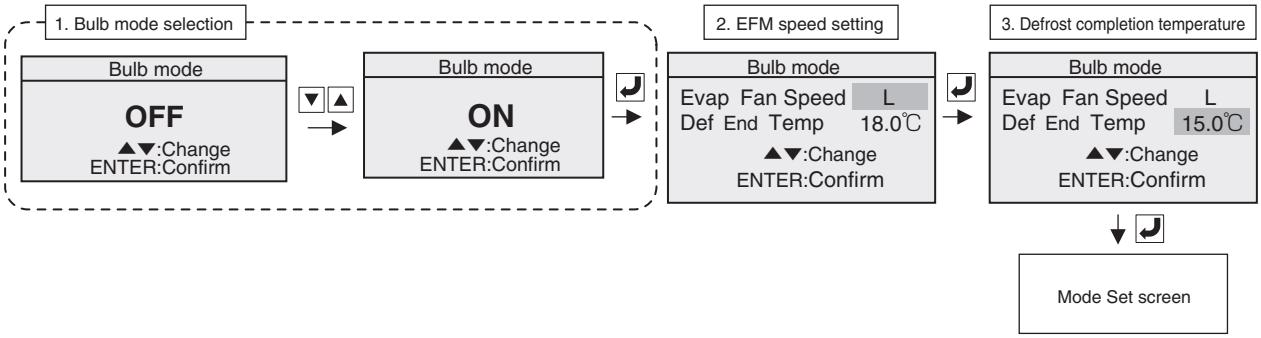
1. Press ▼ or ▲ key to select "ON" or "OFF" and press ↵ key to determine.
   ON : Dehumidification operation is conducted. (For unit equipped with humidity sensor)
   OFF : Dehumidification operation is not conducted.
2. After selecting "ON", press ▼ or ▲ key to select the humidity setpoint and press ↵ key to determine.
   Humidity selection range: 50 to 95%RH



※2-3 Bulb Mode Set

1. Press ▼ or ▲ key to select "ON" or "OFF" and press ↵ key to determine.
   ON : Bulb mode operation is conducted. (For unit equipped with humidity sensor)
   OFF : Bulb mode operation is not conducted.
2. After selecting "ON", press ▼ or ▲ key to select "L", "H-L", or "H" for the EFM speed and press ↵ key to determine.
3. Press ▼ or ▲ key to select the defrost completion temperature in the range of 4.0℃ to 18.0℃ and press ↵ key to determine.

※ If it is necessary to set the humidity, do so according to the procedure in 2-2 Dehumidification Set.

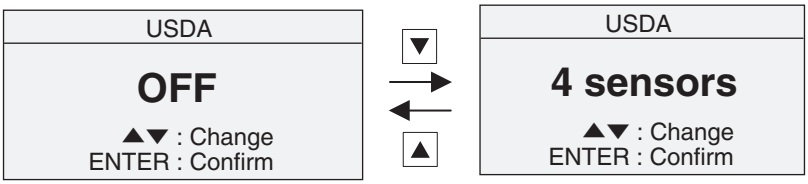


※2-4 USDA Set

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).

Step 1. Press ▼ or ▲ key to select "ON" or "OFF".
ON : To enable automatic set point change
OFF : To disable automatic set point change

Step 2. Select "ON" and press ↵ key to determine, then the previous setting screen appears (Fig. 1).

1) The temperature can be set up to 9 times.
2) Setting temperature range 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) Setting humidity range 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.

Step 3. ASC 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).

Automatic Setpoint Change

ON

▲▼:Change
ENTER:Confirm

↓ ↵

Fig. 1 (Previous setting screen)

Automatic 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

Automatic 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

Automatic 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

Automatic 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

Automatic 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

Automatic 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 ↵

Automatic 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.)

Step 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

Step 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

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

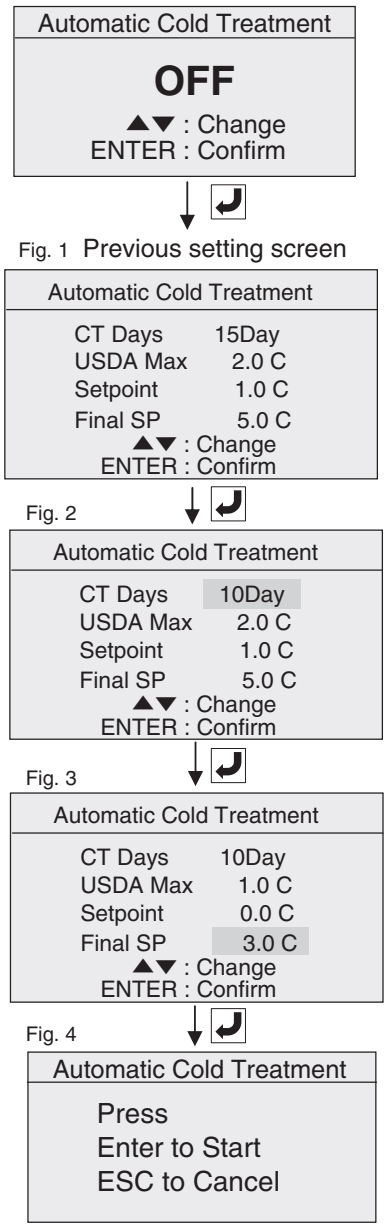
CT	: 10 days
USDA Max.	: 1.0 ℃
Setpoint	: 0.0℃
Final-SP	: 3.0℃

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)

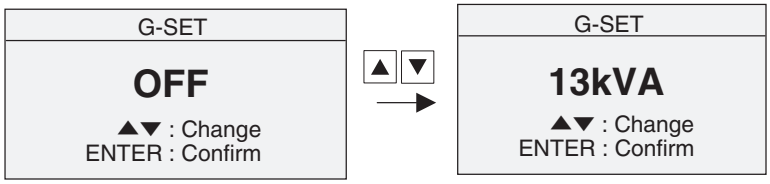
Step 4. Finally, press ↵ key to start ACT operation. (Fig. 4)



※2-7 G-set set

It is able to select power consumption limit of the unit in order to continuous operation as much as possible when power supply is not enough capacity.

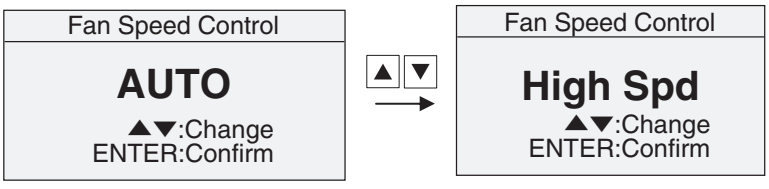
1. Press ▼ ▲ key to select total power consumption and press ↵ key to determine.
OFF", "11", "12", "13", "14" or "15" kVA



When a G-set setting has been made, the total power consumption will take priority, so that refrigeration performance may be insufficient under some conditions.

※2-8 Fan Speed Control

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

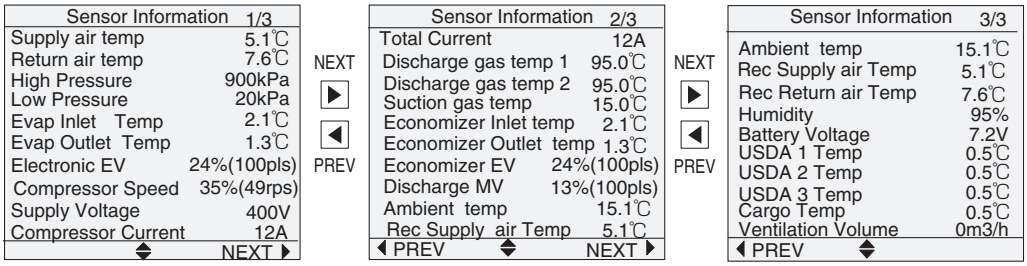


AUTO : During chilled operation, the evaporator fan runs at high speed/low speed.
High Spd : During chilled operation, the evaporator fan runs at high speed.

※3 Sensor Information

The current values in each sensor in the unit are displayed.

1. Press ◀ ▶ key for page change.
   Press ▼ ▲ key to scroll.
2. Press the ESC key for 1 second to return to the previous screen. (If you press the ESC key for 3 seconds, the display will return to the operation screen.)



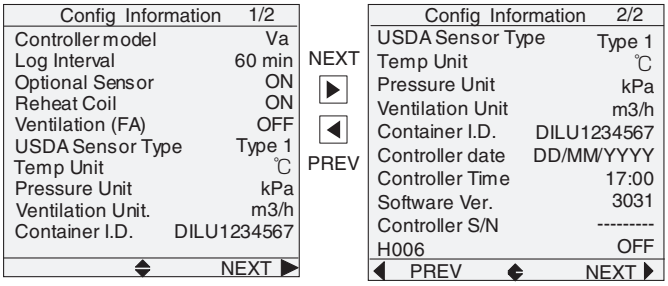
Notes 1. "ERROR" is displayed in the case of sensor failure.

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

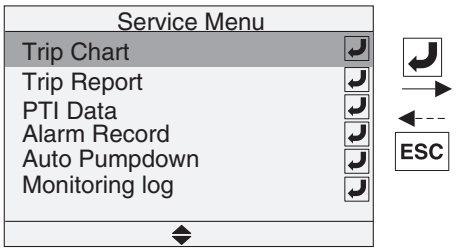
※4 Configuration Set Information

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

1. Press ◀ ▶ key for page change.
   Press ▼ ▲ key to scroll.
2. Press the ESC key for 1 second to return to the previous screen. (If you press the ESC key for 3 seconds, the display will return to the operation screen.)



※5 Service Menu

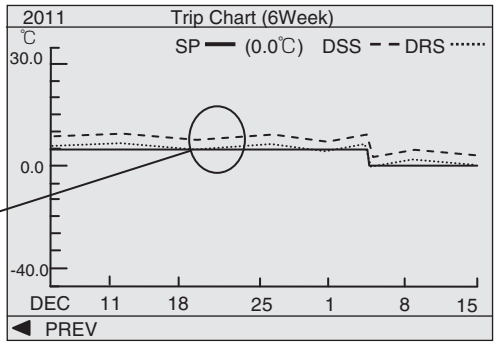


※5-1 Trip Chart
※5-2 Trip Report
※5-3 PTI History
※5-4 Alarm Record
※5-5 Automatic Pumpdown
※5-6 Monitoring Log (Start, Stop)

※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 42 days (6 weeks).
Press ◀ key to scroll for the past data.

Fig. 1 Initial screen



Zoom in example
(See below.)

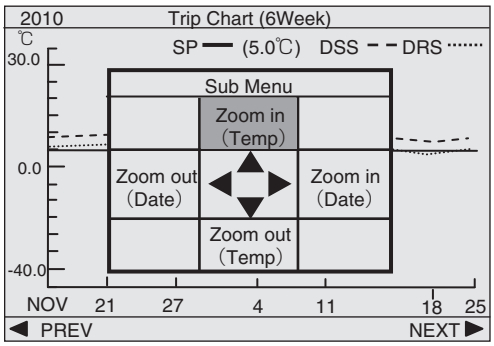
Zoom in/Zoom out function

Press MENU key, then Zoom in/Zoom out screen appears. (Fig.2)
＜Horizontal axis: Number of days＞
(Default) Zooming in or out from 42 days (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

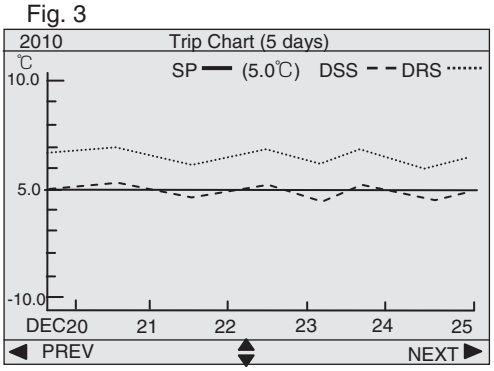


Zoom in or out for date ▶ ◀ ▲ ▼ Zoom in or out for Temperature

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



Step 1. Scroll the span until the DEC25, the day before the circled portion, appears at the right end on the screen by pressing ◀ key.
Step 2. Press MENU key to show the Zoom in/Zoom out screen.
Step 3. Zoom in the Date span from 6 Week into 5 Day.
Press ▶ key to zoom in the Day span from 6 Week into 10 Day and press ↵ key.
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.
Step 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 84 days (12 weeks) starting from the present.
The logging interval is the value that is selected in the configuration settings.
To be displayed as an event when an alarm occurs.

Trip Report 1/131

Time	SP(C)	DSS(C)	DRS(C)	SHU(%)	HU(%)
20 MAY,2009					
21:00	–30.0	–30.3	–30.3	75	75
20:00	–30.0	–30.1	–30.3	75	75
19:00	–30.0	–30.1	–30.1	75	75
18:00	–30.0	–30.6	–30.6	75	75
19 MAY,2009					
21:00	–30.0	–30.3	–30.3	75	75
20:34 F5FF					
20:00	–30.0	–30.1	–30.3	75	75
19:00	–30.0	–31.1	–30.9	75	75
18:00	–30.0	–30.6	–30.8	75	75
17:00	–30.0	–30.5	–30.0	75	75
16:32 E201					
16:00	–30.0	–31.2	–31.8	75	77
15:00	–30.0	–25.7	–26.3	75	79
14:00	–30.0	–10.3	–11.0	75	79

NEXT ▶

※5-3 PTI History

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

PTI History	
Full PTI	15 JAN,2011 23:45 3Hour Ago
Chilled PTI	21 DEC,2010 21:38 25Day 5Hour Ago
Short PTI	21 DEC,2010 19:05 25Day 8Hour Ago
Full PTI	15 NOV,2010 17:10 31Day 10Hour Ago
Short PTI	21 AUG,2010 15:05 120Day 8Hour Ago

※5-4 Alarm Record

Display the alarm generated at the present and in the past maximum 180 days.

Alarm Record

20 MAY,2010	21:15	E425
1 APR,2010	8:43	F701
1 APR,2010	8:43	E425
1 APR,2010	8:43	E5FF
5 JAN,2009	14:58	E425

USDA #1 sensor failure

▲▼ NEXT ▶

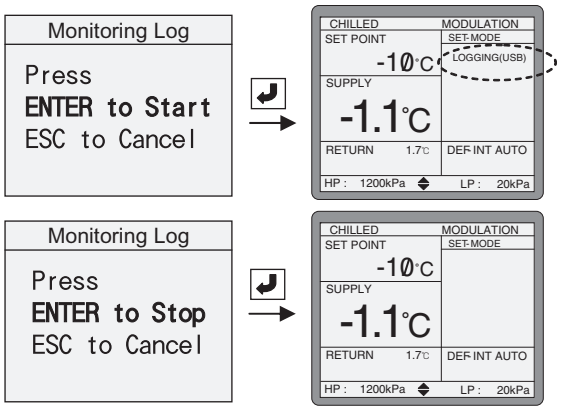
※ 5-5 Automatic Pumpdown

Step 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
Step 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.

	In preparation	During Automatic Pumpdown	After operation completion
Auto Pump down	Auto Pump down	Auto Pump down	Auto Pump down
Press ENTER to Start ESC to Cancel	Preparation for Pump Down --- Press ESC to Cancel	Pump Down Activated	Good

※ 5-6 Monitoring Log

This function stores data generated during operation such as temperature sensor values, pressure values and valve opening value onto USB memory.
By monitoring this data, it is possible to understand the status of the operation more accurately.
Step 1. Insert USB memory. (CPU board)
Step 2. Press [↵] key to start Monitoring Log. During Monitoring Log, "LOGGING (USB)" is displayed on the operation screen.
Step 3. To complete the Monitoring Log, access to operation screen ⇒ Service menu ⇒ Monitoring Log and execute "Enter to Stop".



Caution !!

1. Remove the USB memory after confirming that the "LOGGING (USB)" display has turned off.
   If the USB memory is removed while monitoring log is still in progress, the data files may become corrupted.
2. The data files are saved at intervals of one per hour.
3. The file size of a single data file is approximately 400 KB.

※6 Back Light Set (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

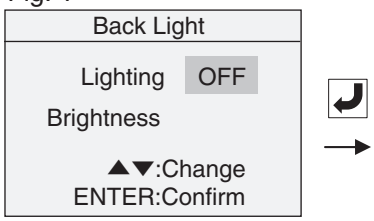


Fig. 2

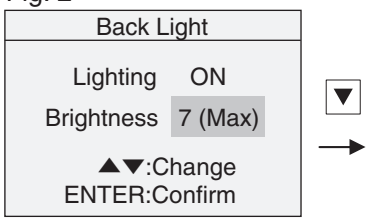
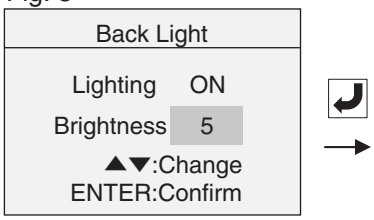


Fig. 3



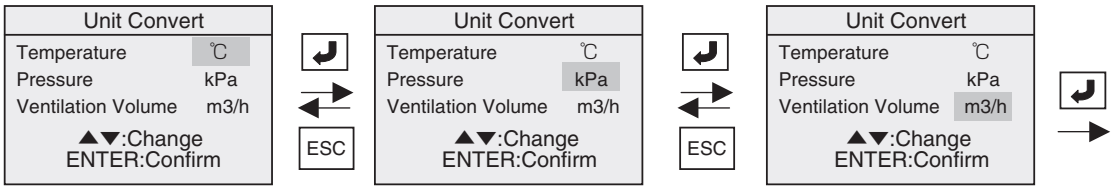
Note: The back light function will not be activated in the battery mode.

※7 Unit (Scale) Change

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

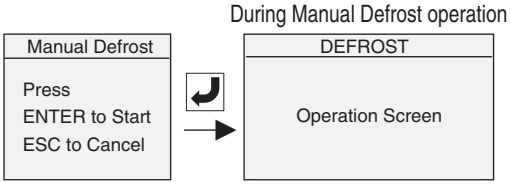
2. Pressure alternate
Press ▼ ▲ key to select "kPa", "PSI" or "Bar" and press ↵ to determine.

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



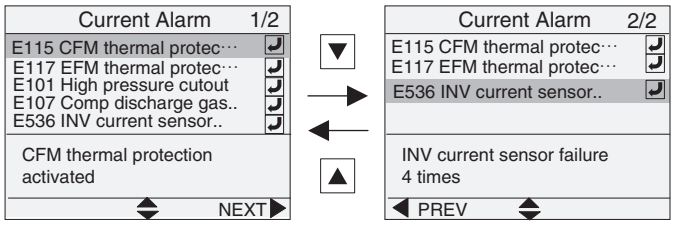
※8 Manual Defrost

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



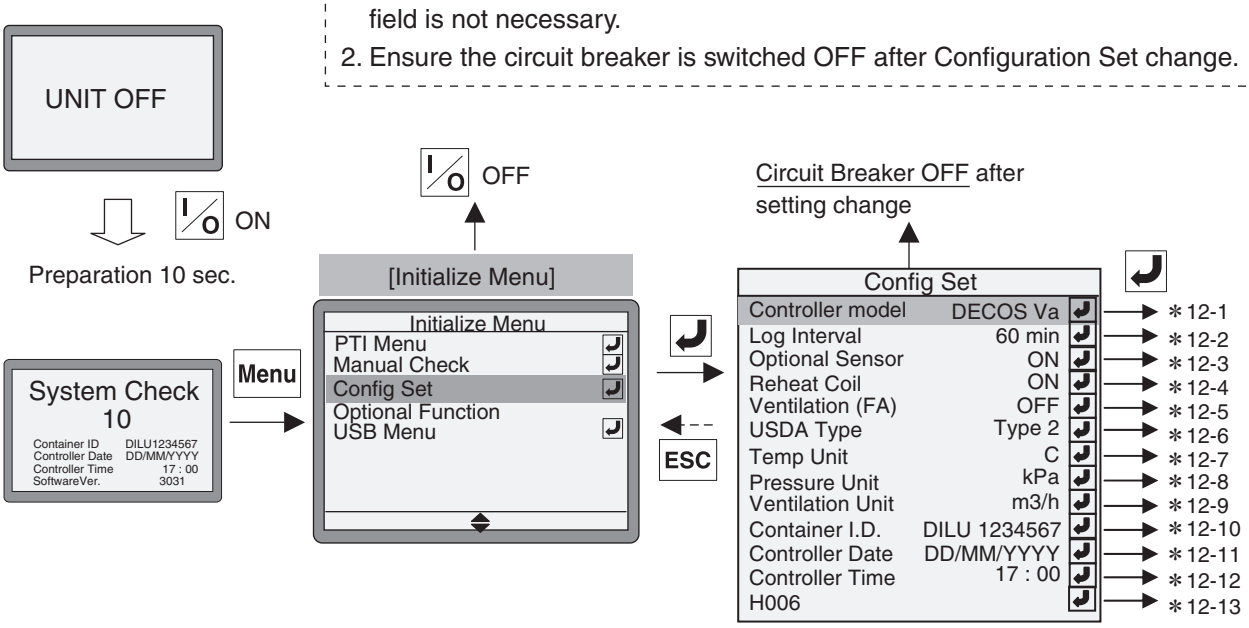
※9 Display Alarm

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

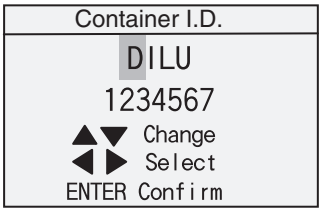
Caution !!
1. Optional function setting is done at factory. Normally, setting change at field is not necessary.
2. Ensure the circuit breaker is switched OFF after Configuration Set change.



	Title display	Setting ▼ ▲ Charge ⇒ ↵ Enter
※12-1 Controller model	Controller model	DECOS Va or V
※12-2 Log Interval	Log Interval	15, 30, 60, or 120 minutes
※12-3 Optional Sensor	Optional Sensor	ON : DRS sensor equipped OFF : DRS sensor not equipped
※12-4 Reheat Coil	Reheat Coil	ON : Reheat coil equipped OFF : Reheat coil not equipped
※12-5 Ventilation (FA)	Ventilation (FA)	HIGH-FLY : With FA sensor (Ventilator with insect screen) HIGH : With FA sensor (Ventilator without insect screen) OFF : Without FA sensor (Standard)
※12-6 USDA Sensor Type	USDA Sensor Type	Type 1 : ST9702-1 type USDA sensor Type 2 : NTC type USDA sensor (Standard)
※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

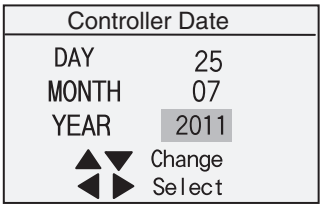
※12-10 Container I.D.

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



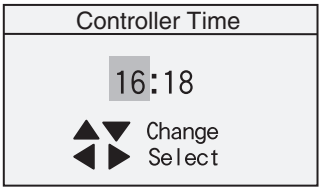
※12-8 Controller Date

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



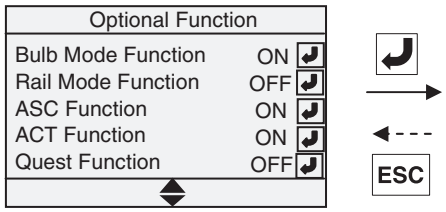
※12-9 Controller Time

Step 1. Press ▼ ▲ key to change TIME and press ↵ key to determine.
Step 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. (In some cases the function may not operate even after it has been set.)
2. Ensure the circuit breaker is switched OFF after Configuration Set change.

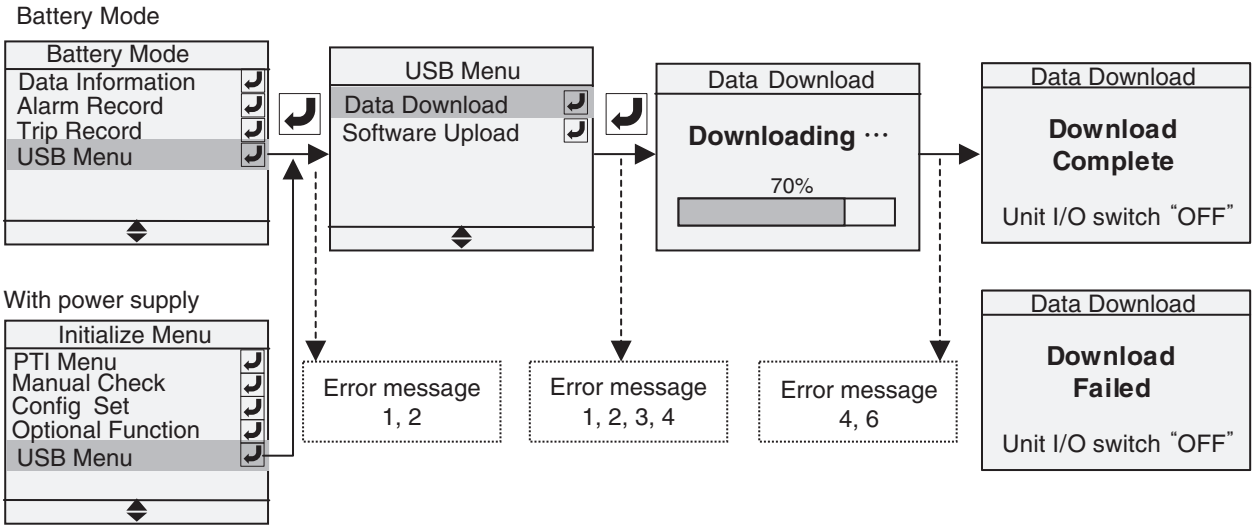


※13-1 Bulb mode function
(※13-2 Rail mode function)
※13-3 AST, Automatic change function of set temperature (for details, refer to paragraph 1.5.1)
※13-4 ACT, Automatic cold treatment function (for details, refer to paragraph 1.5.3)

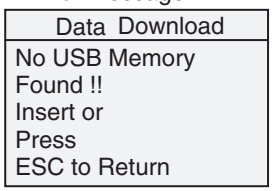
	Title display	Setting ▼ ▲ Change ⇒ ↵ Enter
※13-1 Bulb Mode Function	Bulb Mode Function	ON: With bulb mode function OFF: Without bulb mode function
※13-2 Rail Mode Function	Rail Mode Function	ON: With rail mode function OFF: Without rail mode function
※13-3 ASC Function	ASC Function	ON: With ASC function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

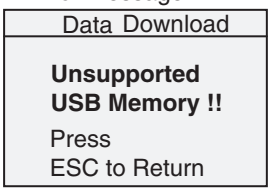


Error message 1



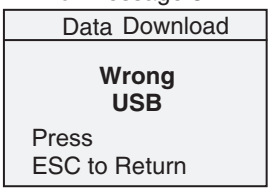
＊USB Memory not inserted

Error message 2



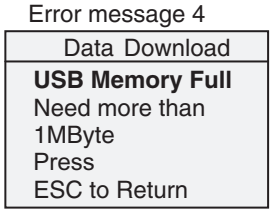
＊Unsupported USB Memory

Error message 3



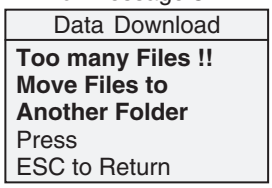
＊The USB memory has no authentication file.

Error message 4



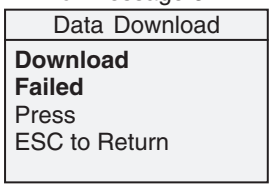
＊USB Memory insufficient capacity. 1MB or more is required.

Error message 5



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

Error message 6

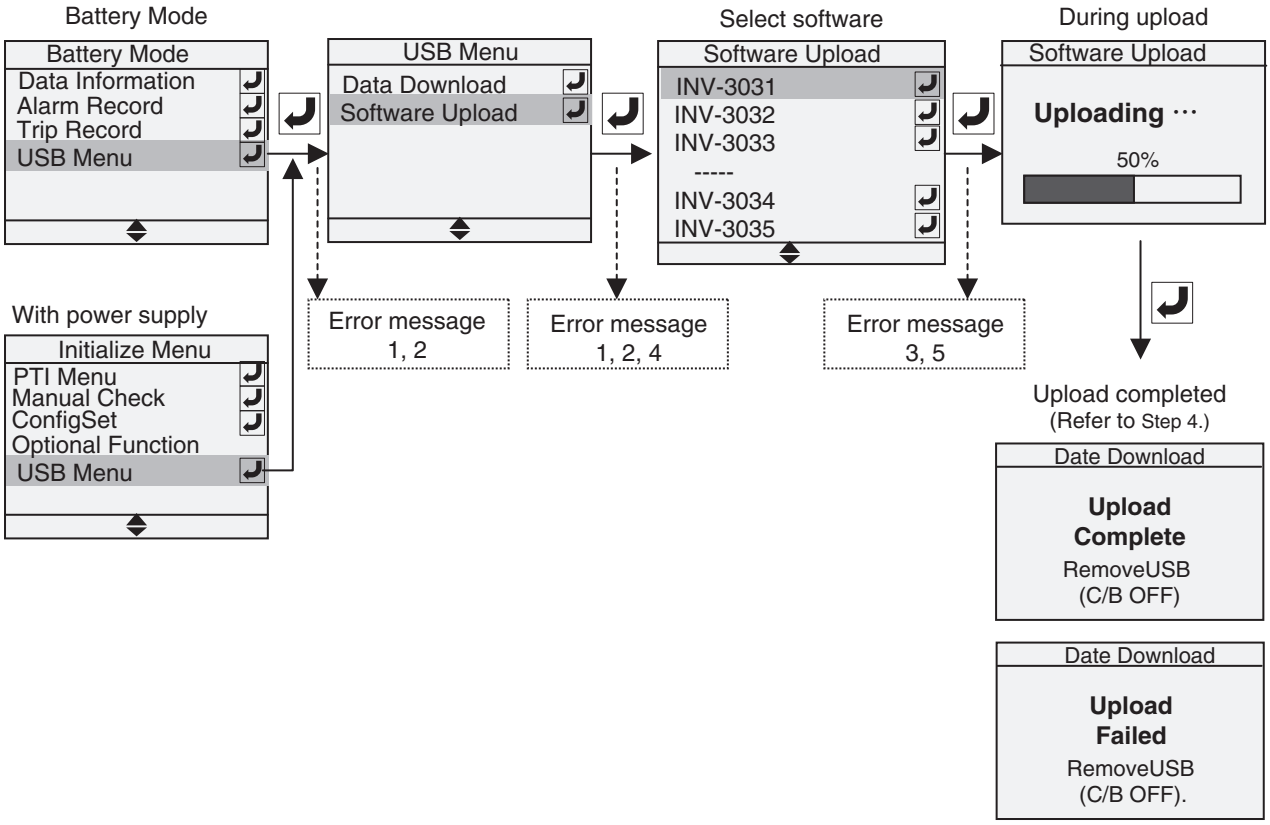


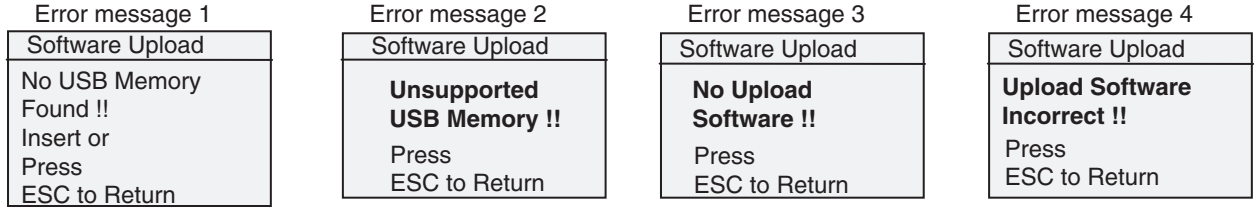
＊Download failed

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

(※1) : Save the authentication file directly onto the USB memory.

※14-2 Software Upload



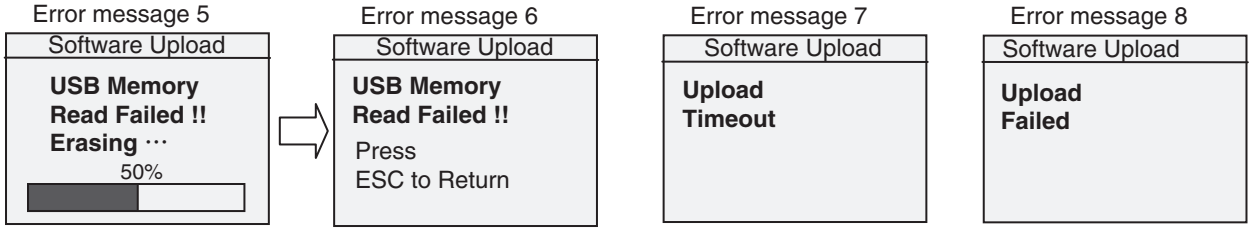


∗USB Memory not inserted

∗Unsupported USB Memory

∗No program files inside USB memory

∗Incorrect program files inside USB memory



(Deleting failed data)
∗Upload failure from USB memory

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

∗Upload timeout
(External Flash⇒Internal Flash)

∗Upload failed
(USB⇒External Flash)

Step 1. Insert USB memory (CPU board)

Step 2. Press ▼ key to select "Software Upload" in "USB Menu" and press ↵ key to determine.

Step 3. Press ▼ key to select "Software" in "Software Upload" and press ↵ key to determine.

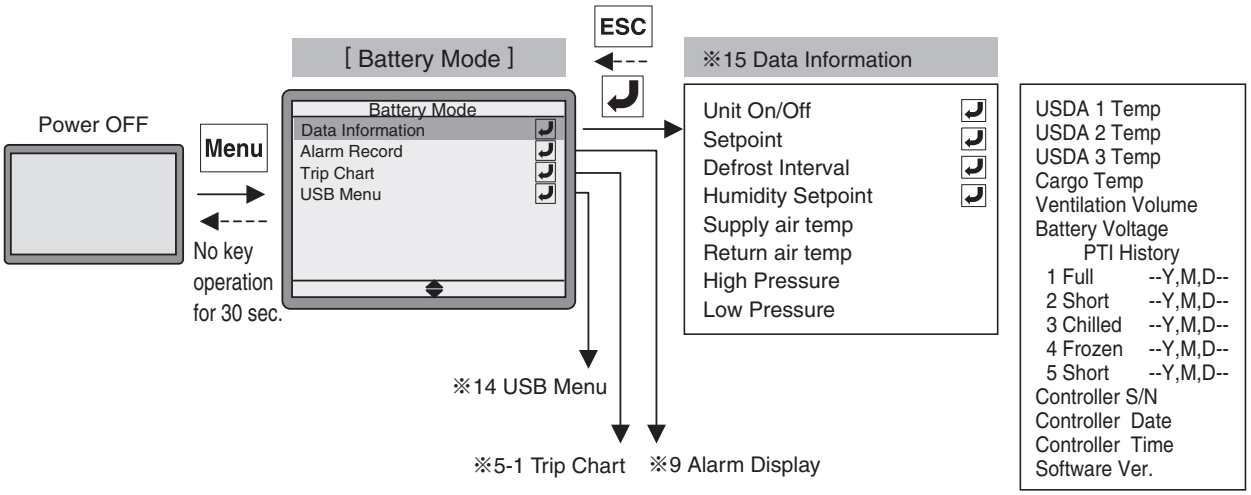
Step 4. After finishing uploading,Pull out a USB memory (in the battery mode).
Set the Circuit Breaker to "OFF" (when a commercial power source is used).

Note: After the USB memory has been inserted, it will take up to 30 seconds for the USB memory to be authenticated.

※15 Data Information (Battery Mode)

Data Information is available in battery mode when no power is supplied.
Furthermore, the following four items can be set :

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



2.4 Wake-up Battery (Rechargeable Battery)

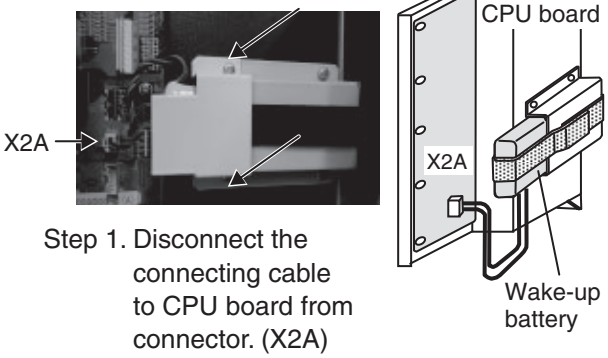
If power supply is not available, the above battery mode will supply power from the wake-up battery (rechargeable type) which is installed at CPU board. Battery life is approximately 2 years. The remaining voltage at normal time can be checked by battery mode or during operation (*3 Sensor Information in paragraph 2.3). The guide is as follows.

●The remaining voltage
DC7.6V or more: The battery has been charged.
DC7.5V or less: Recharge battery.
To recharge, power the unit for 14 hours or more. When power is being supplied, recharging will be carried out while the unit is operating and while it is stopped (CB on).

●The remaining voltage after completion of recharging
DC7.6V or more: The battery has been charged.
DC7.5V or less: The battery may have deteriorated. It is recommendable to replace the battery.
DC7.1V or less: The battery has deteriorated. The battery must be replaced.

Caution !!
In case of using the battery for 2 years or more, USDA data logging etc., may not be executed even if LCD screen indicates that the remaining voltage is more than DC7.6V or more.

●Replacement of battery
Battery is fixed on CPU board. (Refer to the right fig.)



Step 1. Disconnect the connecting cable to CPU board from connector. (X2A)
Step 2. Remove the mounting bolts of the battery cover.
Step 3. Remove the Velcro tape and dismount the battery together with lead wire.

Notice !!

Cd

This battery is Nickel-metal hydride 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 OFFICE
Fascinatio Boulevard 562, Cappele
A/D Ijssel 2909 VA, The Netherlands
Tel. +31-(0)10-286-2090
Fax. +31-(0)10-286-2099

2.5 Alarm Code

●Alarm grouping
F---：Alarm that unit stop
E---：Alarm that unit restart or backup operation
T---：Alarm during PTI (Refer to paragraph 3.3.2.)
F5---：Alarm that unit stop related to inverter
E5---：Alarm that unit restart related to inverter
Communication Interrupted: Communication error between CPU board (EC1) and operation board (EC3)

Alarm	Controller action at the generating of alarm
F ---	Critical shut down. (Requires inspection/repair)
E ---	The unit stops, but restarts 3 minutes after the condition returns to normal. If the same error occurs multiple times, the unit will switch to standby for 4 hours or stop.
	Unit continues operation by back-up operation.
	Alarm display only. Unit continues operation.

Alarm LED and Alarm Code Display

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

●F Alarm

Diagnosis	Alarm code	Alarm content	Controller action
001	F101	HPS activates within 30 seconds after compressor starts. (2400 kPa or more)	UNIT stops
030	F106	Abnormal compressor operation	UNIT stops
002	F109	LPT drops below -72kPa within 2 seconds after compressor starts	UNIT stops
003	F301	Temperature setting request	UNIT stops
004	F401	SS, DSS, RS and DRS all failed in chilled mode	UNIT stops
004	F405	HPT, DCHS1 and DCHS2 all failed	UNIT stops
004	F407	HPT and LPT both failed	UNIT stops
004	F409	LPT, DCHS1 and DCHS2 all failed	UNIT stops
005	F701	Abnormal power supply voltage detected	UNIT stops
006	F703	Unbalance power supply	UNIT stops
007	F705	Open power phase during operation	UNIT stops
008	F707	Fuse F2U is open (I/O board)	UNIT stops
009	F809	E809 (shortage of refrigerant) is generated twice	UNIT stops

●E Alarm

Diagnosis	Alarm code	Alarm content	Controller action
001	E101	HPS activates during operation	Restart after 3 min.
101	E105	Compressor operating current is too high (over DC 51A)	Restart after 3 min.
030	E106	Abnormal compressor operation	Restart after 3 min.
002	E107	DCHS1 or DCHS2 becomes 130 ℃ or more for 10 minutes or 145 ℃ or more.	Restart after 3 min.
002	E109	LPT drops below -70kPa during operation	Restart after 3 min.
010	E115	Condenser fan motor internal thermostat activated	Restart after 3 min.
011	E201	Pumpdown control is not completed within rated time	Alarm display only
012	E202	Automatic pumpdown failure	Alarm display only
013	E203	Overcooling prevention	Restart after 3 min.
014	E207	Defrost is not completed in 90 min.	Alarm display only
003	E303	Humidity setting request (during dehumidification operation)	Alarm display only
015	E304	Incorrect configuration set (Reheat coil)	Alarm display only
003	E305	Defrost interval setting request	Alarm display only
003	E307	Calendar setting request	Alarm display only
003	E311	Trip start setting request	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 (ECO IN) failure	Backup operation
018	E437	Economizer outlet temperature sensor (ECO OUT) failure	Backup operation
017	E439	Discharge gas temperature sensor (DCHS2) failure	Backup operation
031	E441	CPU board temperature sensor failure	Backup operation
024	E607	Sheet key failure	Alarm display only
005	E701	Abnormal power supply voltage detected	Restart after 3 min.
025	E707	Temporary power supply shut down during operation	Restart after 3 min.
026	E801	CPU onboard battery failure	Alarm display only
027	E805	FA sensor failure	Alarm display only
028	E807	Ventilator open warning: Ventilator is open during frozen operation	Alarm display only
009	E809	Refrigerant shortage	Restart after 3 min.
029	E903	A communication error between CPU board (EC1) and operation board (EC3)	Alarm display only

●Inverter F Alarm

Diagnosis	Alarm code	Alarm content	Controller action
101	F528	E528 (Compressor does not startup) is generated 5 times.	UNIT stops
102	F52E	E52E (Temporary compressor overcurrent) is generated 4 times.	UNIT stops
102	F52F	E52F (Compressor current sensor failure) is generated 4 times.	UNIT stops
103	F536	E536 (Current sensor offset error) is generated 4 times.	UNIT stops
103	F538	Inverter board failure (Microcomputer I/O port logic judgment failure when unit is on)	UNIT stops
104	F53A	Incorrect setting (Controller model)	UNIT stops
102	F53B	Inverter board failure (EEPROM fault when unit is on)	UNIT stops
103	F53C	E53C (Main circuit condenser recharging error) is generated 4 times.	UNIT stops
101	F53D	E53D (Compressor lock) is generated 4 times.	UNIT stops

●Inverter E Alarm

Diagnosis	Alarm code	Alarm content	Controller action
101	E523	Compressor over current (>16.1A) is detected during operation.	Restart after 3 min.
101	E524	Compressor over current (>19A) 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.
105	E526	Actual frequency much higher than command frequency due to external factors	Restart after 3 min.
101	E528	Compressor does not operate after startup.	Restart after 3 min.
106	E52C	Inverter board temperature higher than 99 ℃	Restart after 3 min.
102	E52D	Inverter board temperature abnormal (> 150 ℃ or < -45 ℃ is detected.)	Restart after 3 min.
102	E52E	Current is too high temporary during startup (over DC51A)	Restart after 3 min.
102	E52F	Compressor current sensor failure at startup	Restart after 3 min.
107	E531	Power supply voltage is unbalance	Restart after 3 min.
108	E532	Power supply voltage error (too high, too low at abnormally)	Restart after 3 min.
109	E533	Power supply voltage error (open phase)	Restart after 3 min.
103	E536	Current sensor offset fault when compressor starts	Restart after 3 min.
103	E53C	Main circuit charge failure when compressor starts	Restart after 3 min.
101	E53D	Compressor lock when compressor starts	Restart after 3 min.
110	E542	Cooling fan lock during operation (LX10F15A only)	Alarm display only
111	E5FF	A communication error between CPU board (EC1) and Inverter board (EC8)	Restart after 3 min.

2.6 Alarm Diagnosis

001	F101・E101	
Alarm Generating Logic	F101 HPS activates within 30 seconds after compressor start.（OFF≧2400kPa, ON≦1900kPa ） E101 HPS activates during operation.（OFF≧2400kPa、ON≦1900kPa ）	
Possible Causes	＊HPS or HPS circuit including connector X6 (inverter board) failure ＊Condenser air restriction / Short circuiting / CFM reverse rotation / Ambient temperature is over 50 degree C ＊DMV failure (Coil failure, Valve not opening, valve clogging) ＊Discharge line of compressor is restricted ---Check valve, strainer (after HPT) ＊Mixing of non-condensable gas (water, air, etc.) ＊Refrigerant overcharging ＊Controller (CPU board) or inverter board failure	
Trouble Shooting	Stpe 1. Check value of HPS activating while watching to HPT value on the LCD screen.	If HPS activates at lower than HPT2400kPa, replace HPS.
	Stpe 2. Check for blocking or short circuiting of air passage on air cooled condenser, CFM reverse rotation or stopped.	Repair as needed.
	Stpe 3. DMV check 3.1 Disconnect the connector X11A (CPU board), then check resistance of DMV coil. 3.2 Touch on coil vibration corresponding to opening change when calibrating DMV at startup. (Refer to Calibration valves in paragraph 1.4.6.) 3.3 Fully open valve using emergency magnet. (Refer to paragraph 4.9.4.) Then operate the unit without coil.	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 alarm is repeated, the valve body will not operate. Replace DMV body
	Step 4. Check compressor discharge line Check for clogging of check valve, strainer (front of check valve)	If there is abnormality, recover refrigerant and charge the specified amount of refrigerant.
	Stpe 5. Check for non condensable gas Refer to paragraph 4.4	
	Stpe 6. Refrigerant overcharging	
Controller Action	F101 Unit stop	
	E101 Restart after 3 minutes	

002	F109・E107・E109	
Alarm Logic	F109 LPT drops below -72 kPa within 2 seconds after compressor startup or E109 is generated 9 times E109 LPT drops below -70 kPa for 2 seconds during operation. E107 DCHS1or DCHS2 becomes 135℃ or more for 10 minutes or 145℃ or more.	
Possible Causes	1. LSV failure 2. EEV failure (Coil failure, valve not opening, valve clogging) 3. Liquid line----Clogging of filter, strainer or dryer. 4. Refrigerant shortage 5. LPT failure	
Trouble Shooting	Step 1. LSV check 1.1 Check LSV coil resistance 1.2 Energize LSV coil and listen the sliding sound ("CLICK") of valve body after selected LSV ON/OFF check（Refer to ※9 in paragraph 4.1 Manual Check.）	1.1 Coil resistance within 15.2±1.5Ω 1.2 If there is no sliding sound ("CLICK") of valve body, replace LSV body.
	Step 2. EEV check 2.1 Disconnect the connector X9A (CPU board), then check the resistance of EEV coil. 2.2 Touch on EEV coil vibration corresponding to opening change when calibrating EEV at startup. (Refer to paragraph 1.4.6 for calibration valves.) 2.3 Fully open the valve body using emergency magnet. (Refer to paragraph 4.9.2.) Then operate the unit without coil.	2.1 Resistance between each coil: 46±3Ω 2.2 In case that the coil does not vibrate corresponding to opening change, check the coil or the controller. 2.3 If the alarm is repeated, replace EEV body.
	Step 3. Liquid line check Check if there is a clogging in filter (front of LSV), dryer, strainer (front of EEV). If there is a clogging, the outlet side temperature of dryer, filter or strainer is low.	3. If there is a clogging, repair as needed. Then, charge specified amount of refrigerant.
	Step 4. Check for refrigerant shortage and/or gas leak Charge refrigerant R134a 0.5kg additionally two times. Then, check if the low pressure changes (increases) during operation.	4. 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.
	Step 5. Check LPT. (Refer to diagnosis No. **019**.)	
Controller Action	F109 Unit stop	
	E107 · E109 Restart after 3 minutes	

003	F301・E303・E305・E307・E311
Alarm Logic and Possible Causes	① 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.
	③ E307, E311---No power supply to S-RAM (CPU board) during power off due to CPU onboard battery (CPU board) failure. (E801 is also generated.)
Trouble Shooting	①, ② Set configuration setting 〈F301 Temperature setting request〉 --- Set temperature, following ＊1 Set Point Change in paragraph 2.3 (Set Point temperature Change). 〈E303 Humidity setting request〉 --- Set humidity, following ＊2-3 Humidity Setpoint in paragraph 2.3. 〈E305 Defrost Interval setting request〉 --- 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.
	③〈Permanent measures〉 ○ If E801 is also generated, replace CPU board. 〈Emergency measures〉 ○The unit will operate, However, controller time starts from incorrect time whenever power OFF/ON. therefore, trip data may not shown correctly.
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 SS, DSS, RS and DRS all failed during chilled mode, or X16A (CPU board) is disconnected. F405 Multiple sensor (HPT,DCHS1,DCHS2) all failure. F407 Multiple sensor (HPT,LPT) all failure. F409 Multiple sensor (LPT,DCHS1,DCHS2) all failure.
Trouble Shooting	The unit cannot perform backup operation and cannot be controlled. Replace each failed sensor. Refer to **016**, **017**, and **019**.
Controller Action	F401, F405, F407, F409 Unit stop

005	F701 · E701
Alarm Logic	The power supply voltage is ＞ AC565V or ＜ AC329V.
Possible Causes	The power supply voltage is high (＞ AC565V) or low (＜ AC329V).
Trouble Shooting	Check if the actual power supply within range (AC329V～AC565V).
Controller Action	F701 Unit stop
	E701 Restart after 3 minutes

006	F703
Alarm Logic	The waveform of power supply is abnormal, therefore phase is not detected correctly.
Possible Causes	Abnormal waveform of power supply
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 is open (F701 is also generated when S phase is open.)	
Possible Causes	1. Abnormal power supply (Open phase) 2. Broken wire (open) at power plug or power cable 3. Wire disconnection at unit	
Trouble Shooting	1. Check if there is open phase on power from power supply equipment side	1. Provide correct power supply if there is power phase is open
	2. Check if there is Broken wire (open) at power plug or power cable (the primary side of circuit breaker)	2. Repair if there is a problem at power plug or cable
	3. Check if there is broken wire (open) at the secondary side of circuit breaker ＊Between C/B～X63A (PT/CT board)	3. Repair as needed
Controller Action	F705 Unit stop	

008	F707
Alarm Logic	＊Fuse F2U (I/O board) is open. (E115 is also appeared when F707 is generated)
Possible Causes	＊Coil of magnet contactor or solenoid valve is burned-out. Short circuited or grounded. ＊Ciruit line for below device is short circuit.
Trouble Shooting	1. Replace Fuse F2U after check following circuit. 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 Chilled mode ＜Full Cool＞ EEV Opening≧400 pls, and RS is not drop 0.2℃ for 1 hour ＜Modulation＞ EEV Opening≧400 pls continuously for 5 minutes Frozen ＜RS≧0℃＞ EEV Opening≧400 pls, and RS is not drop 0.2℃ for 1 hour ＜RS＜0℃＞ EEV Opening≧400 pls continuously for 5 minutes
Possible Causes	＊Shortage of refrigerant ＊Liquid line (dryer) is clogging ＊EEV failure
Trouble Shooting	Step 1. LSV check Step 2. Liquid line check and dryer blockage check Step 3. EEV check Step 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

The causes of **009** seems to be the same as **002** and **011**. Among them, it may be insufficient refrigerant.

Refer to **002** for the troubleshooting.

010	E115
Alarm Logic	＊Condenser fan motor internal thermostat activated (OFF≧135℃±5℃) (When F707(Fuse F2U is open) is generated, E115 is also appeared)
Possible Causes	＊Condenser fan motor lock ＊Short circuit on the motor coil
Trouble Shooting	1. Whether condenser fan 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

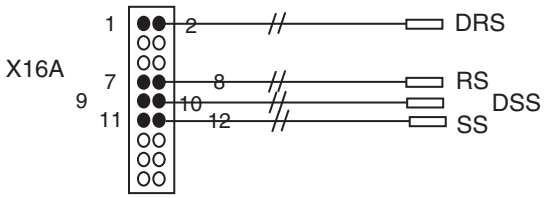
011	E201
Alarm Logic	E201 Pumpdown is not completed in fixed time 〈Pump down before defrost (EEV close)〉 LPT＜-40kPa or EOS-LP(T)＞30℃ not reached less than 3 times within 300 seconds. 〈Auto pump down (LSV close)〉 Does not drop to LPT＜-27kP within 210 seconds.
Possible Causes	1. EEV failure (Valve cannot close or clogged)----- in case of pump down before defrost LSV failure (Valve cannot close or clogged)----- in case of auto pump-down 2. LPT failure 3. Compressor failure
Trouble Shooting	Step 1. Check EEV or LSV (Refer to Diagnosis **002** .) Step 2. In case that EEV or LSV is normal. 2-1. Check LPT. (Refer to diagnosis No. **019**) Carry out automatic pumpdown and compare with gauge pressure. 2-2. If the Low pressure is not reached to completed pressure, the compressor may abnormal condition.
Controller Action	E201 Alarm display only

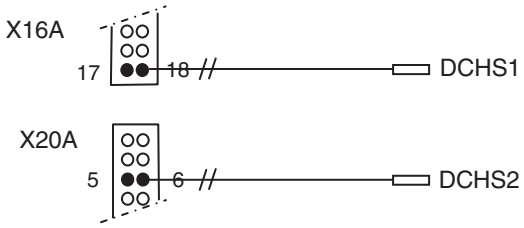
012	E202
Alarm Logic	Automatic pumpdown failure HPT≧2300kPa or DCHS1 or DCHS2≧120℃ during automatic pump-down.
Possible Causes	Refrigerant overcharged
Trouble Shooting	Recover refrigerant and charge with specified amount of refrigerant shown on unit name plate.
Controller Action	E202 Alarm display only

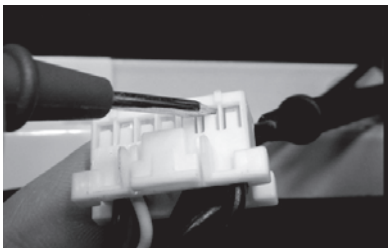
013	E203
Alarm Logic	SS≦SP-3.0℃ & 5 minutes elapsed during modulated control in chilled mode. (Over cooling prevention)
Possible Causes	Cooling load changes rapidly. (Small heat load)
Trouble Shooting	Check for the cause of sudden reduction of the heat load. ＊Example 1: Set the ventilation outlet from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

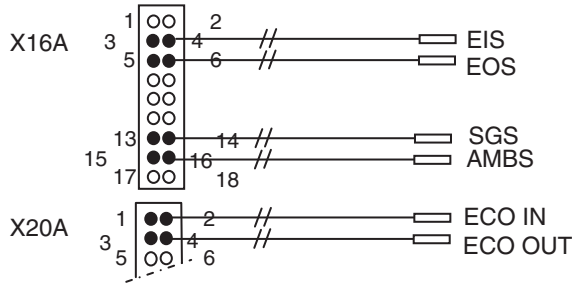
014	E207
Alarm Logic	Defrost can not be completed within 90 minutes. (The condition EOS≧10℃ was not satisfied five defrosting times continuously during 90 minute counting).
Possible Causes	＊Excessive frost on the evaporator coil. ＊Setting time of defrosting interval is too long.
Trouble Shooting	1. Remove rest frost by manual defrost. Also, check whether defrost completion condition (EOS≧25℃ & RS ≧15℃) are reached within 90 minutes on the LCD screen (※3 Sensor Information in paragraph 2.3). ＊In case of defrost is completed by above complete condition, consider as normal. Monitor unit operation. ＊In case of defrost does not complete due to not reach to complete condition, there may be low hot-gas temperature, insufficient hot-gas circulation.
Controller Action	E207 Alarm display only

015	E304
Alarm Logic	Incorrect configuration set (Reheat coil)
Possible Causes	Dehumidification operation is selected when reheat coil is set to "OFF" in Configuration Set.
Trouble Shooting	Change the Reheat Coil setting from "OFF" to "ON" on 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	Above sensor≦-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 disconnected (open) or short-circuited.
Possible Causes	＊Open contact of connector X16A（CPU board） ＊Temperature sensor failure ＊Controller（CPU board）failure
Trouble Shooting	Step 1. Check connector X16A and make sure it is properly installed. Step 2. Disconnect X16A, and check the resistance of sensor  If the resistance value matches the temperature sensor characteristic table (refer to 5.2 temperature sensor characteristics), the sensor is normal. Example of sensor resistance value measurement (Connector X16A) * Contact to the connector pins correctly.  Step 3. Check the controller (CPU board).
Controller Action	<Chilled mode> When E401 (SS failure), Backup by DSS When E401 (SS failure) and E402 (DSS failure), Backup by RS=SP+2℃ When E401 (SS failure), E402 (DSS failure) and E403 (RS failure), Backup by DRS=SP+2℃ <Frozen mode> When E403 (RS failure), Backup by DRS When E403 (RS failure) and E404 (DRS failure), Backup by SS=SP-5℃ When E403 (RS failure), E404 (DRS failure) and E401 (SS failure), Backup by DSS=SP-5℃ When All sensors are failure (RS, DRS, SS, DSS), the unit will operate as Full cool continuously

<table>
<tr><th>017</th><th>E405（DCHS1）・E439（DCHS2）</th></tr>
<tr><td>Alarm Logic</td><td>① DCHS1, 2≦-33℃ (687 kΩ) & 1 minute elapsed.
② DCHS2≦AMBS & compressor speed is 53 rps or more
③ DCHS1, 2≧187℃ (1320 kΩ) & 3 minutes elapsed.
Note 1: If the outside air temperature is -15℃ or lower, no judgment is made during startup control.
2: The alarm is activated when sensor or the circuit is disconnected (open) or short-circuited.</td></tr>
<tr><td>Possible Causes</td><td>＊Faulty contact of connector X16A, X20A (CPU board)
＊Temperature sensor failure
＊Controller (CPU board) failure</td></tr>
<tr><td>Trouble Shooting</td><td>Step 1. Check connector X16A / X20A and make sure it is properly installed.
Step 2. Disconnect X16 and X20A and check the sensor resistance values.
 

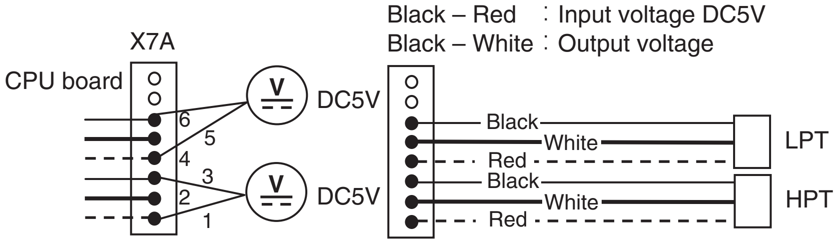
If the resistance value matches the temperature sensor characteristic table (refer to 5.2 temperature sensor characteristics), the sensor is normal.
Example of sensor resistance value measurement (Connector X20A)
* Contact to the connector pins correctly.
 
Step 3. Check that DCHS2 is correctly installed on the compressor.
Step 4. Check the controller (CPU board).</td></tr>
<tr><td></td><td>When E405 (DCHS1 failure), Backup by DCHS2
When E439 (DCHS2 failure), Backup by DCHS1</td></tr>
</table>

018	**E406** (SGS) • **E407** (EIS) • **E409** (EOS) **E411** (AMBS) • **E435** (ECO IN) • **E437** (ECO OUT)
Alarm Logic	Above sensor ≦-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 disconnected (open) or short-circuited.
Possible Causes	＊Faulty contact of connector X16A and X20A (CPU board) ＊Temperature sensor failure ＊Controller failure
Trouble Shooting	Step 1. Check connector X16A / X20A and make sure it is properly installed. Step 2. Disconnect the connectors X16A and X20A, then check the resistance of sensor  If the resistance value matches the temperature sensor characteristic table (refer to 5.2 temperature sensor characteristics), the sensor is normal. Step 3. Check the controller (CPU board). Example of sensor resistance value measurement (Connector X16A) * Contact to the connector pins correctly. 
Controller Action	When E406 (SGS failure), Backup by EOS When E407 (EIS failure), Backup by LPT When E409 (EOS failure), Backup by SGS When E411 (AMBS failure), Alarm display only When E435 (ECO IN failure), Backup with economizer system stop When E437 (ECO OUT failure), Backup with economizer system stop

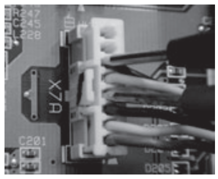
019 E413（LPT）• E415（HPT）

Alarm Logic	〈E413〉 LPT: ≦-110 kPa with 3 minutes elapse or ≧1420 kPa with 3 minutes elapse 〈E415〉 HPT: ≦-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	Step 1. Check connector X7A and make sure it is properly installed.
	Step 2-1. Connect manifold gauges and compare the value of pressure gauge and HPT value in LCD display. Replace HPT if the difference is greater than 50 kPa. Step 2-2.Connect manifold gauges and compare the value of pressure gauge and LPT value in LCD display. Replace LPT if the difference is greater than 10 kPa.
	Step 3. Turn on the circuit breaker and check if there is DC5V input from the controller.

Black – Red : Input voltage DC5V
Black – White : Output voltage



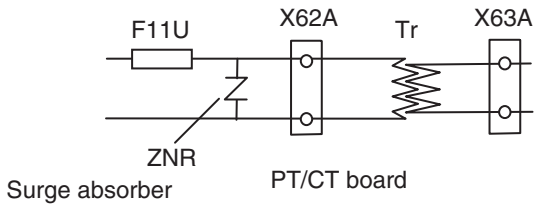
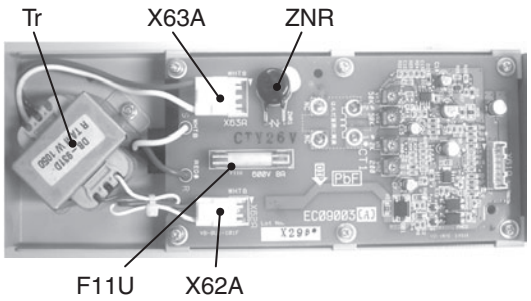
Example of voltage check
(Connector X7A)



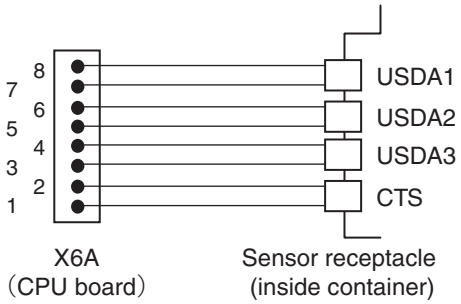
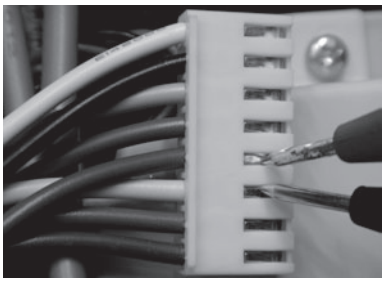
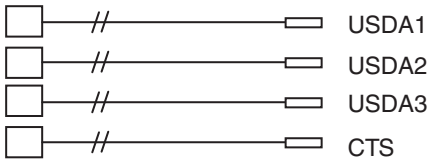
Sensor name	Pin No. (Connector X7A)		Voltage value
HPT	1	3	DC 5V
	2	3	Refer to“5.3 Pressure Sensor Characteristics”
LPT	4	6	DC 5V
	5	6	Refer to“5.3 Pressure Sensor Characteristics”

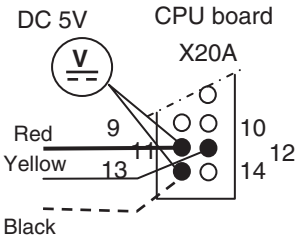
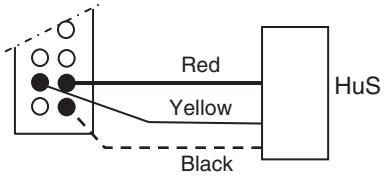
If input DC 5V is not present, check the controller.
If input DC 5V is present, replace the pressure transducer.

Controller Action	E413 Backup operation E415 Backup operation

020	E417
Alarm Logic	Power voltage sensor PT failure
Possible Causes	1. Open circuit between connector X61A (PT/CT board)～ X4A (CPU board) 2. Fuse F11U is open (on PT/CT board) 3. Voltage sensor PT failure (on PT/CT board)
Trouble Shooting	Step 1. Check connector X61A (PT/CT board) and X4A (CPU board). Make sure it is properly connected.
	Step 2. Check if there is short circuit in secondary side of fuse F11U (ZNR, primary side of Tr).   If shorted, replace the PT/CT board.
	Step 3. If repeat the alarm with no short circuit, replace the PT/CT board.
Controller Action	E417 Alarm display only

021	E419
Alarm Logic	Current sensor CT failure
Possible Causes	＊Open circuit between connector X61A (PT/CT board)～ X4A (CPU board) ＊Current sensor CT failure（in PT/CT board）
Trouble Shooting	Step 1. Check connector X61A(PT/CT board) / X4A(CPU board) and make sure it is properly installed.
	Step 2. Replace PT/CT board.
Controller Action	E419 Alarm display only

022	**E425**（USDA1）・**E427**（USDA2） **E429**（USDA3）・**E433**（CTS）
Alarm Logic	When USDA sensor type "2" is set on ※12 Configuration set in paragraph 2.3 USDA sensor / CTS ≦-39℃ (320kΩ) or ≧96℃ (0.79kΩ) Note: The alarm is activated when sensor or the circuit is disconnected (open) or short-circuited.
Possible Causes	1. Incorrect setting (Setting number of USDA sensor is not match) 2. Circuit <line> malfunction Connector disconnected / open wire / short circuit / USDA receptacle failure 3. USDA sensor failure * Controller failure
Trouble Shooting	Step 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.
	Step 2. Check whether cable or receptacle between X6A and USDA receptacle is open or short-circuited. After make jumper between pins A—B on USDA/CTS receptacle, check the continuity on socket X6A (CPU board).  Continuity check (Connector X6A）  Repair or replace if there is disconnection or short circuit.
	Step 3. Check the resistance value for each sensor of USDA and CTS sensor  Replace sensor, if does not matches the resistance and USDA sensor characteristic table. **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).
	Step 4. If the sensor is normal, replace the controller.
Controller Action	E425 Alarm display only E427 Alarm display only E429 Alarm display only E433 Alarm display only

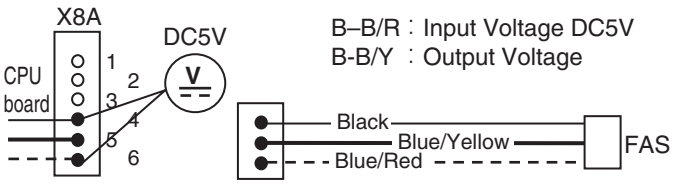
023	E431
Alarm Logic	Humidity sensor (HuS) failure (Detect RH>120% or RH<20%)
Possible Causes	＊Humidity sensor (HuS) deteriorated ＊Contact failure of connector X20A (CPU board) ＊Controller failure
Trouble Shooting	Step 1. Replace the humidity sensor. Step 2. Check connector X20A (CPU board) and connector on the Humidity sensor cable located below fan deck. Make sure it is properly connected. Step 3. Turn on the circuit breaker and check if there is DC5V input from the controller.   Example of voltage check (Connector X20A)  Step 4. Replace the CPU board.
Controller Action	E431 Alarm display only

Sensor name	Pin No. (Connector X20A)		Voltage value
Humidity sensor	11	13	DC 5V
	12	13	refer to “5.4 Humidity Sensor Characteristics”

024	E607
Alarm Logic	＊Sheet key failure
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 connector pins visually, and secure insert correctly. 2. Replace the sheet key if the alarm is repeated.
Controller Action	E607 Alarm display only

025	E707
Alarm Logic	The power supply shut down temporarily during operation or the power supply phase waveform was abnormal.
Possible Causes	Power supply failure or abnormal power supply phase waveform
Trouble Shooting	Check the power supply equipment and provide the correct power supply (power supply phase waveform). 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	In the case of a temporary power supply shut down) E707 Restart after 3 minutes of standby × 9 retries. Then, restart after 4 hours of standby. In the case of an abnormal power supply phase waveform) E707 is generated 2 times → F703 unit stop.

026	E801
Alarm Logic	CPU onboard battery failure (E307 and E311 are also generated.)
Possible Causes	CPU onboard battery is drained due to salt water or moisture
Trouble Shooting	〈Permanent measures〉 Replace CPU board (Lithium battery installed). 〈Emergency measures〉 The unit will operate. However, controller time starts from incorrect time whenever power OFF/ON. therefore, trip data may not shown correctly.
Controller Action	E801 Alarm display only

027	E805（FA sensor built in the unit only）	
Alarm Logic	FA sensor failure	
Possible Causes	1. Incorrect setting 2. FA wiring is installed incorrectly. FA sensor failure 3. Controller (CPU board) failure	
Trouble Shooting	1-1. Check FA sensor setting. HIGH-FLY: With FA sensor (Ventilator with insect screen) HIGH: With FA sensor (Ventilator without insect screen) OFF: Without FA sensor ＊Confirmation of setting: 2.3 ※4 Configuration Set Information	1-1. Change setting as correct：※12 Configuration Set in paragraph 2.3.
	1-2. Check if FA setting made "HIGH-FLY" or "HIGH" for unit without FA sensor.	1-2. Set to "OFF" if FA setting made "HIGH-FLY" or "HIGH".
	2. Turn on the circuit breaker and check if there is DC5V input from the controller. FAS：X8A No.4-6（Red-Black） 	2. If there is no input DC5V, then check the controller. If there is input DC5V, 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（FA sensor built in the unit only）
Alarm Logic	Ventilator is open during frozen operation.
Possible Causes	Ventilator is still open when the unit is in frozen mode
Trouble Shooting	Make sure to fully close ventilator in frozen operation If the ventilation volume is displayed regardless of the valve being fully closed, perform the FA Calibration under 4.1 Manual Check.
Controller Action	E807　Alarm display only

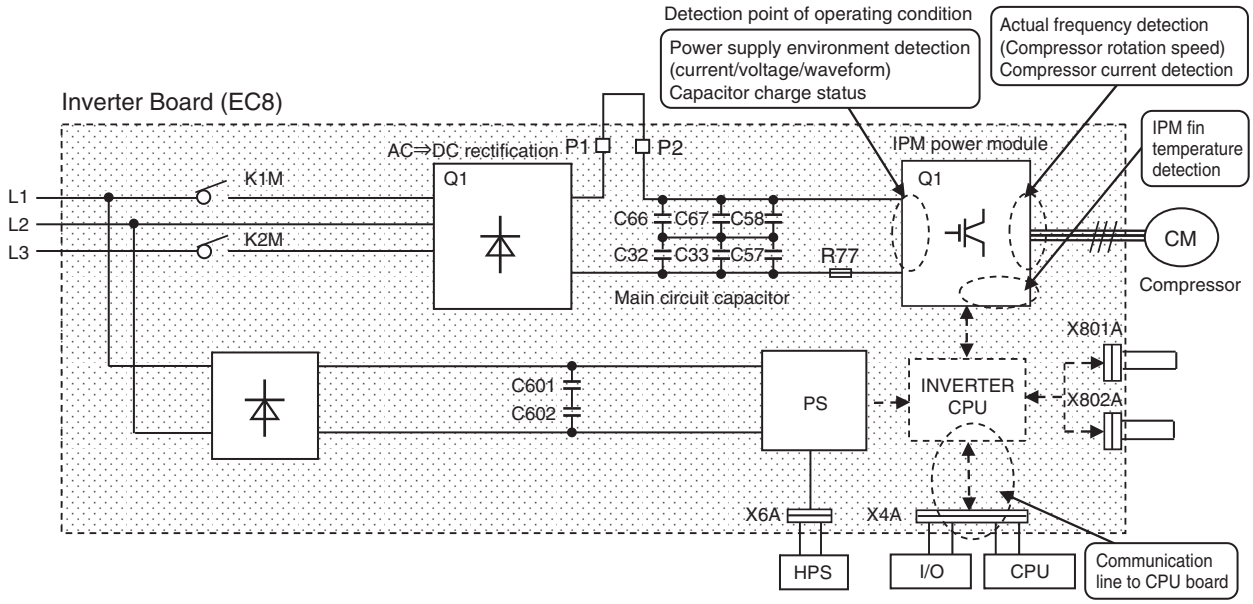
029	Communication Interrupted（E903）
Alarm Logic	A communication error between CPU board and operation board
Possible Causes	1. Open circuit between operation board (EC3) and CPU board (EC1) 2. Operation board failure 3. CPU board failure
Trouble Shooting	Step 1. Check if the connector of cable between operation board（EC3) and CPU board（EC1) is inserted securely. Step 2. If there is no connection error between both boards, it seems to be operation board or CPU board failure. Replace in order starting from the CPU board.
Controller Action	Communication Interrupted（E903） Alarm display only （"Communication Interrupted" is displayed on LCD and E903 is recorded on trip report.)

030	F106・E106
Alarm Logic	Abnormal compressor operation
Possible Causes	Wiring connection mistake between the compressor and the inverter board (EC8)
Trouble Shooting	Step 1. Check the colors of the wires connected to U, V, and W on the inverter board (EC8). (U - red, V - white, W - black) Step 2. Check the colors of the wires connected to U, V, and W in the compressor terminal box. (U - red, V - white, W - black) (Refer to paragraph 4.8.1 Parts Replacement, Compressor .) Step 3. After checking the wiring in the above steps, if an alarm occurs, replace the compressor.
Controller Action	F106 Unit stop. E106 Restart after 3 minutes of standby

031	E441
Alarm Logic	CPU board (EC1) temperature sensor failure
Possible Causes	The internal temperature sensor of the CPU board (EC1) is malfunctioning.
Trouble Shooting	Replace the CPU board (EC1).
Controller Action	E441 Backup operation

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 too high at starting (≧DC51A)	①Over-current due to compressor overload ②Compressor lock ③Inverter board failure (Current detection part)
	E523 : Compressor overload during operation (≧DC16.1A) E524 : Compressor overload during operation (≧DC19A)	①Over-current due to compressor overload ③Inverter board failure (Current detection part)
	E525 : Compressor speed is down (detection of stepping out) because actual frequency is low against command frequency to compressor	①Speed down due to compressor overload ③Inverter board failure (Frequency detection part)
	E528 : Compressor is not started F528 : E528 is generated 5 times.	②Compressor is lock at starting. ③Inverter board failure (detection part of wave form)
	E53D : Compressor does not operate during operation. F53D : E53D is generated 4 times.	②Compressor is lock during operation ③Inverter board failure (detection part of lock)
Trouble Shooting	Step 1. Check the compressor 1-1. Check insulation and resistance of the compressor motor. 1-2. Check sound of compressor at starting. Replace compressor if insulation, resistance is abnormal or noise is created at staring. Step 2. Replace Inverter board if compressor sound is normal or does not start.	
Controller Action	F528・F53D E105・E523・E524・E525 E528・E53D	Unit stop Restart after 3 minutes Restart after 3 minutes (Retry 5 times, F528, F53D is generated at 4 times.)

102	F52E・F52F・F53B E52D・E52E・E52F	
Alarm Logic & Possible Causes	Alarm Logic	Possible Causes
	E52D：Fin temperature sensor failure	Inverter board failure（Fin temperature sensor） （Fin temperature≧150℃ or -45≦℃）
	F52E：E52E is generated 4 times. E52E：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）
	F53B：EEPROM failure when unit is on	Inverter board failure (EEPROM part) EEPROM : Electrically Erasable Program ROM
Trouble Shooting	Replace Inverter board	
Controller Action	F52E, F52F, F53B　Unit stop E52D　Restart after 3 minutes E52E, E52F　Restart after 3 minutes (F52E, F52F is generated at 4 times retry.)	

103	F536・F53B・F53C E536　　E53C	
Alarm Logic & Possible Causes	Alarm Logic	Possible Causes
	E536：Detect offset error of current sensor at starting F536：E536 is generated 4 times.	Inverter board failure (Current sensor)
	F53B：Power module failure	Inverter board failure (IGBT) IGBT：Insulated gate Bipolar Transistor
	E53C：Charging failure of main circuit capacitor at starting F53C：E53C is generated 4 times.	Inverter board failure （Capacitor short-circuited）
Trouble Shooting	Replace Inverter board	
Controller Action	F536, F53B, F53C　Unit stop E536　Restart after 3 minutes (F536 at 4 times retry） E53C　Restart after 3 minutes (F53C at 4 times retry）	

104	F53A
Alarm Logic	Incorrect setting (Controller model)
Possible Causes	Does not match controller model setting and compressor model
Trouble Shooting	Check controller model setting according to Configuration Set (Item 2.3 *12). Model name　Compressor model　Controller model LX10F11B or later　JT80GSDNYR@S　DECOSVa LX10F15A　JT80GJDNYR@S　DECOSV
Controller Action	F53A　Unit stops

105	E526
Alarm Logic	Actual frequency is higher than command frequency from the controller continues for 5 seconds.
Possible Causes	Lightning surge sometimes shifts the detected rotation speed significantly, leading to abnormal stop of the unit due to over current.
Trouble Shooting	Operation continues if the external factor (such as lightning) is improved.
Controller Action	E526　Restart after 3 minutes

106	E52C
Alarm Logic	Inverter board temperature is over-heated (≧90℃ with 260 sec elapse or ≧99℃ with 5 sec elapse)
Possible Causes	①Ambient temperature is high (>50℃) ②Inverter board failure (fin temperature detection part) ③Inverter box is heat up due to less air circulation.
Trouble Shooting	①The unit can operate with an ambient temperature of up to 50℃ . Check for a short circuit at the discharge air of the air cooling condenser coil and also check the surrounding environment. Operation continues if the environment is improved. ②If no external factors are present, the inverter board may have failed. Replace the inverter board. ③Clean the fin on the rear of the inverter box and the base of the inverter box to ensure that the air can circulate.
	E52C Restart after 3 minutes

107	E531
Alarm Logic	Unbalanced power phase is supplied
Possible Causes	Abnormal power supply
Trouble Shooting	Regardless alarm is generated, restart after 3 minutes standby. Operation continues if the external factor is improved.
	E531 Restart after 3 minutes

108	E532
Alarm Logic	Voltage in inverter becomes ≧DC790V or ≦DC320V due to power supply voltage≧AC530V or ≦AC300V.
Possible Causes	①Power supply voltage is at high voltage (≧AC535V), or low voltage (≦AC300V). ②Inverter board failure (Voltage detection part)
Trouble Shooting	①Check if the actual power voltage is within range (300V～535V) . ＊Provide the power supply within range if it is out of range. Restart after 3 minutes standby. Operation continues if the power supply condition is improved. ②If the power voltage is within range, it seems to be inverter board failure. Replace inverter board.
Controller Action	E532 Restart after 3 minutes

109	E533	
Alarm Logic	①Power supply voltage ≧AC530V or ≦AC300V. ②One of phase is open at power supply to inverter.	
Possible Causes	①Power supply voltage is too high (≧ AC 530V) or too low (≦ AC 300V). ②Check if there is broken wire (open) or open phase at the power supply for inverter (secondary side of circuit breaker).	
Trouble Shooting	①Power supply check Check if the power supply voltage is within range（AC300V～AC530V). ②Check if there is a broken wire (open) between L1B, L2B and L3B (INV board) at the secondary side of the circuit breaker.	①Provide the power supply voltage within range. Electrical parts may have damages. ②Repaire as needed
Controller Action	E533　Restart after 3 minutes	

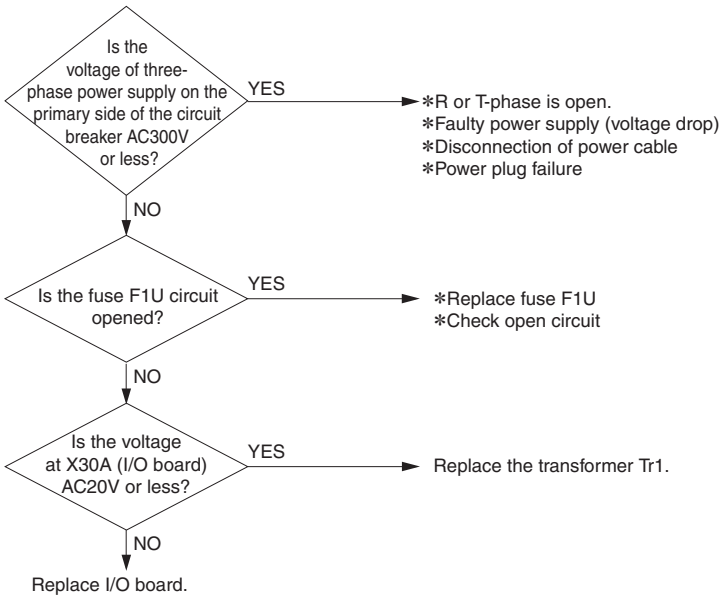
110	E542（LX10F15A only）
Alarm Logic	DC fan motor failure
Possible Causes	①Fan motor for cooling is lock or faulty cable connection ②Inverter failure
Trouble Shooting	①Check if fan motor for cooling is lock or faulty cable connection (open or short circuit) ②Replace Inverter board if DC fan motor and wiring of DC fan are no failure.
Controller Action	E532　Alarm display only

111	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) ④Noise filter board failure
Trouble Shooting	Step 1. Set the circuit breaker to ON (UNIT OFF), and then measure the voltage at the inverter board (terminals L1B, L2B and L3B). 1.1 If there is no power voltage, check the power supply line including the noise filter board. 1.2 If there is power voltage but the LED (green) on the inverter board is not flashing, replace the inverter board. Step 2. Disconnect the connectors between the CPU board (connector X19A) and the inverter board (connector X4A), and visually check the connector pins. After checking if any cables are open or short circuited, securely insert the sockets. Step 3. Replace the inverter board or CPU board.
Controller Action	Communication Interrupted（E5FF）　Restart after 3 minutes ("Communication Interrupted" is displayed on LCD and E903 is recorded on trip report.

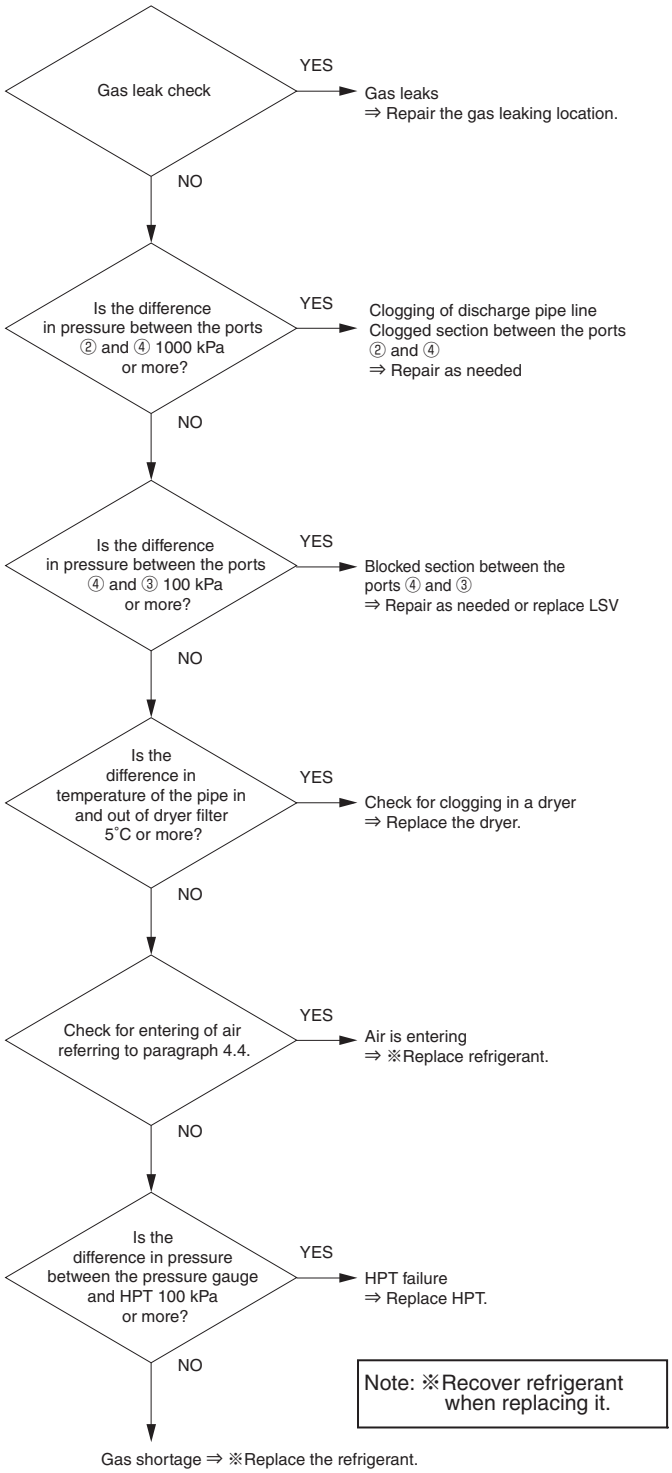
2.7 General Diagnosis

If the unit does not work properly, refer to the following table for diagnosis to repair procedure and repair action need.

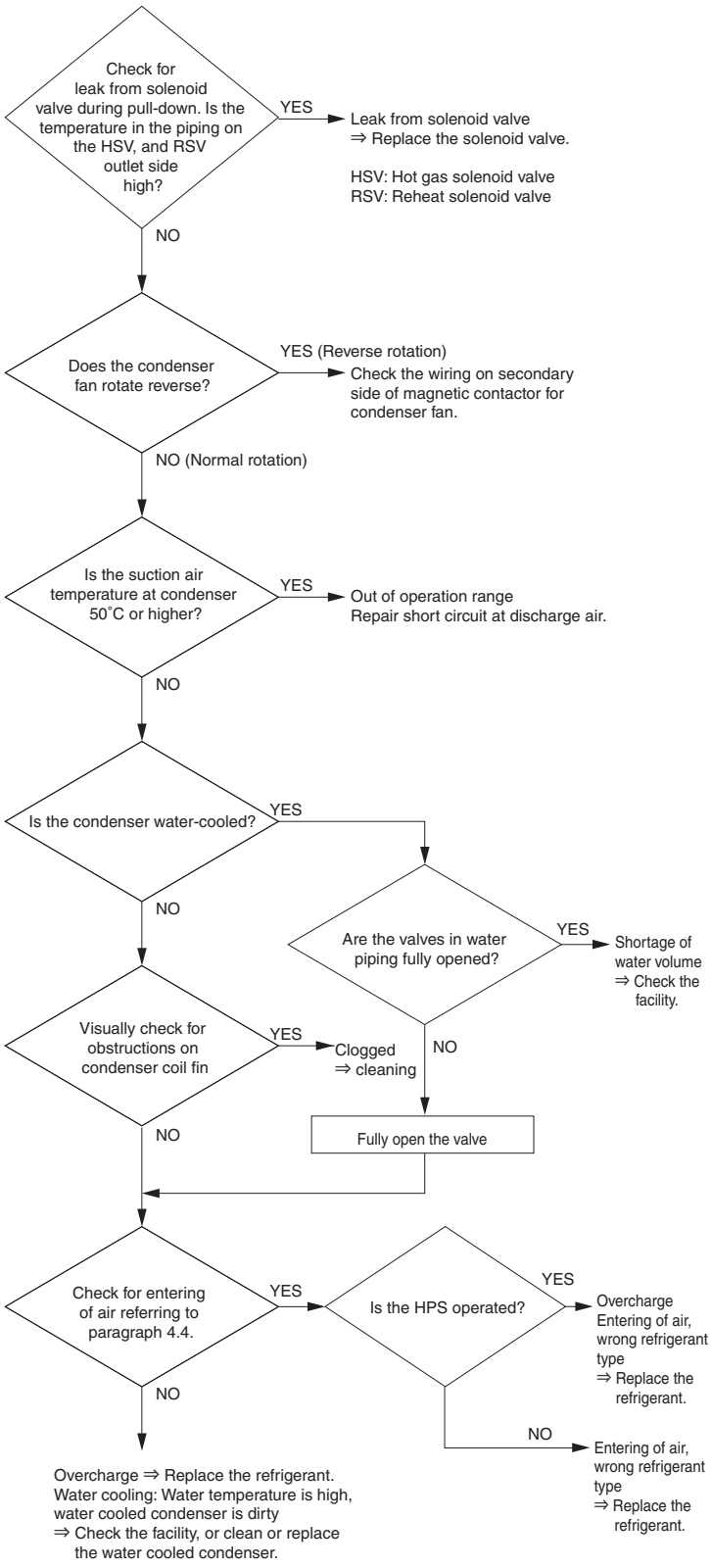
Symptom		Cause	Checkpoint	Remedy
I Unit does not operate	A. Compressor, Evaporator fan, Condenser fan dose not run.	Faulty power supply	Voltage on primary side of circuit breaker It should be within the voltage range shown in paragraph 1-1.	Check the power supply Check the power supply plug Check for disconnection of cable
		Device malfunction	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 components shown in paragraph 1.2.	Replace Fuse. Replace faulty device.
			Check for disconnection on secondary side of transformer (Tr) Check if there is AC24V 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.	Normal operation (Cooling OFF status)	Display of controller (ALARM display)	See the alarm code when ALARM is generated
	C. Evaporator fan and compressor run, but condenser fan does not run.	Normal operation <No action needed>	· Check of operation of HPT (E101) by controller display · Check if the condenser fan has stopped during high-pressure control. (Check that the condenser fan operates at low speed at over 800kPa and at high speed at over 1000kPa.)	· Refer to paragraph 2.6. Depend on alarm diagnosis **001** · Normal if it operates at low speed at over 800 kPa and at high speed at over 1000 kPa.
		External factor	Visual check debris and damage (including relevant parts such as controllers)	repair as needed
	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 debris and damage (including relevant parts such as controllers)	repair as needed
	E. Compressor runs, but evaporator fan and condenser fan do not run.	Normal operation <No action needed>	· Does "DEFROST" display on the LCD panel? · Is the Defrost LED (orange) illuminated?	

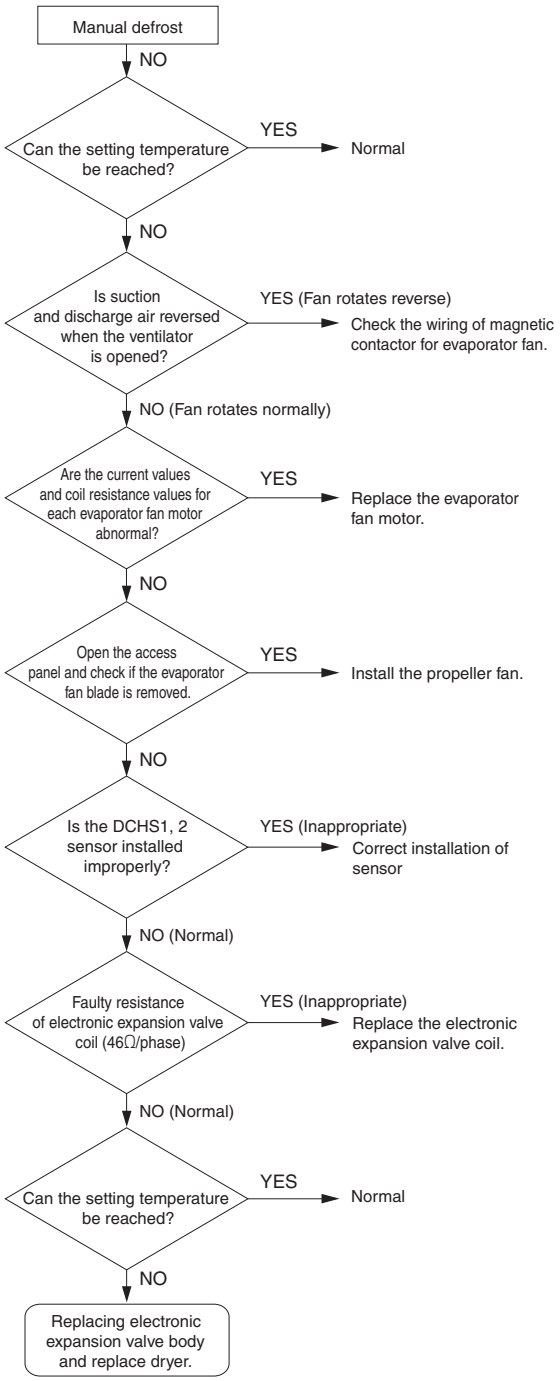
<table>
<tr><th colspan="2">Symptom</th><th>Cause</th><th>Checkpoint</th><th>Remedy</th></tr>
<tr><td rowspan="1">Ⅰ Unit does not operate</td><td>F. Controller does not turn on.</td><td>· R or T-phase is open.
· Faulty power supply (voltage drop)
· Disconnection of power cable
· Faulty power plug
· Disconnection of fuse F1U (I/O board) circuit
Faulty transformer</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="3">Ⅱ Unit operates but soon stops.</td><td>A. Unit operates but soon stops (full stop).</td><td>Refer to the Alarm code list.</td><td>———</td><td>———</td></tr>
<tr><td>B. Evaporator fan runs, but condenser fan and compressor stop soon.</td><td>Cooling OFF (normal)</td><td>———</td><td>———</td></tr>
<tr><td>C. Compressor runs, but condenser fan and evaporator fan stop.</td><td>Defrost (normal)</td><td>———</td><td>———</td></tr>
</table>

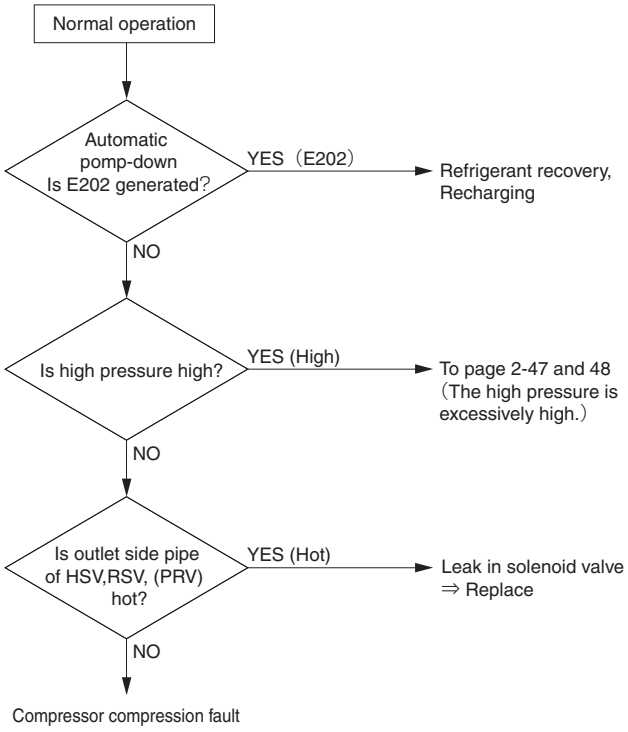
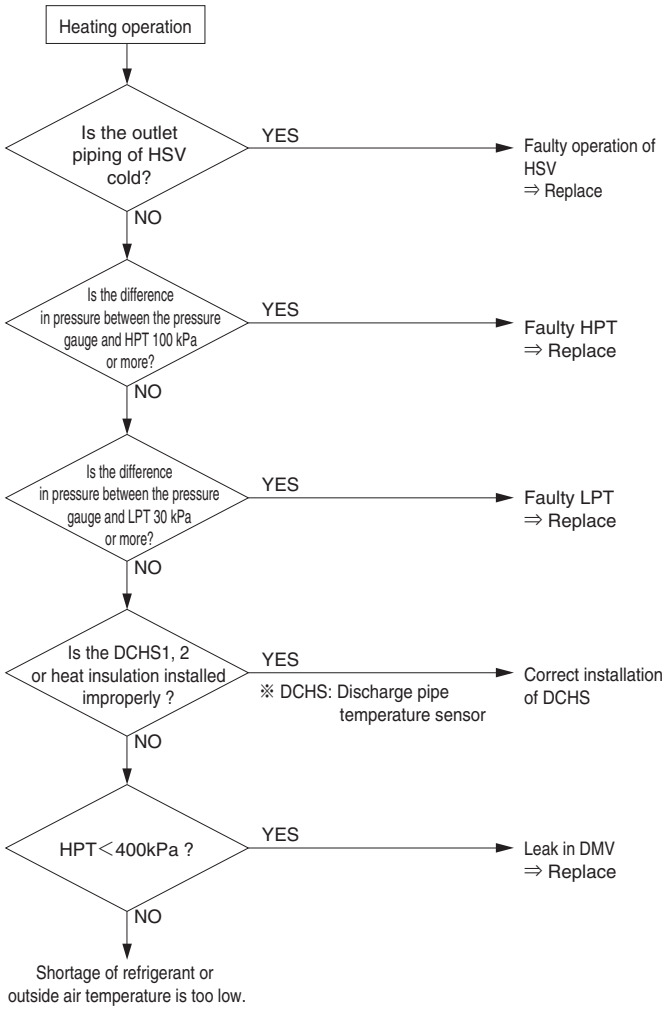
Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop.			
Sight glass flashes when the RS is 0℃ or less during frozen operation.	Refrigerant shortage System blockage (including solenoid valves) Entering of air in refrigerant system		
The high pressure is excessively high.	Clogging of discharge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

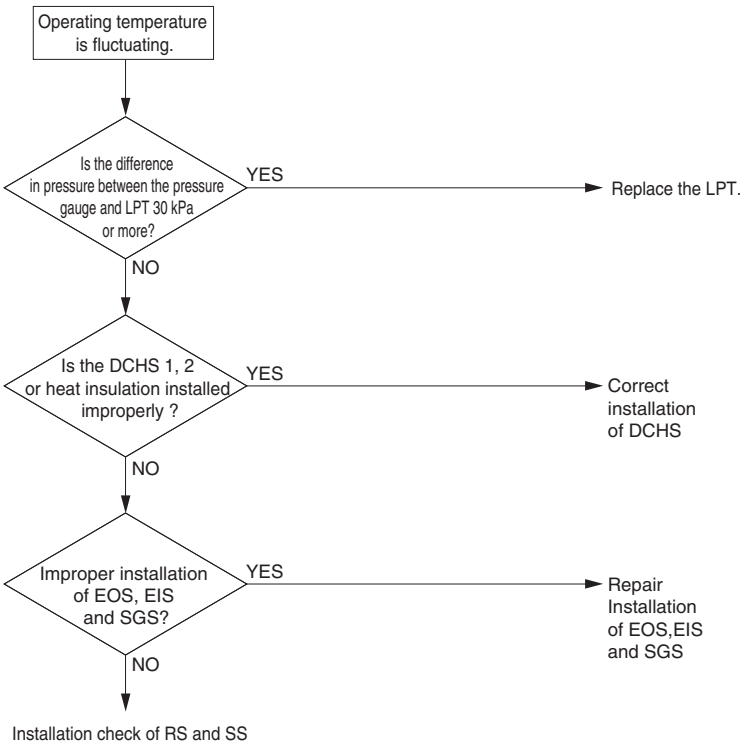
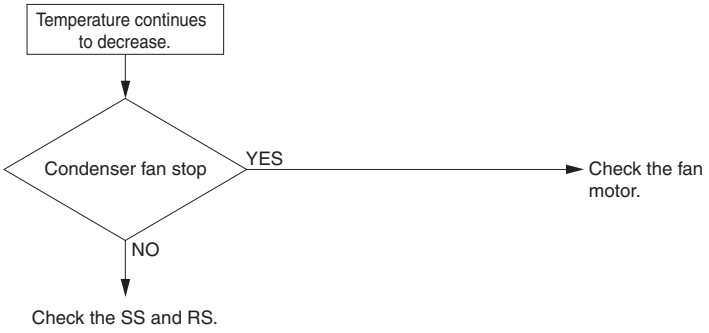
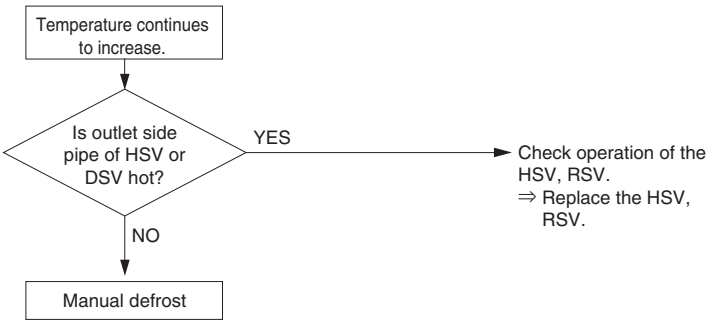


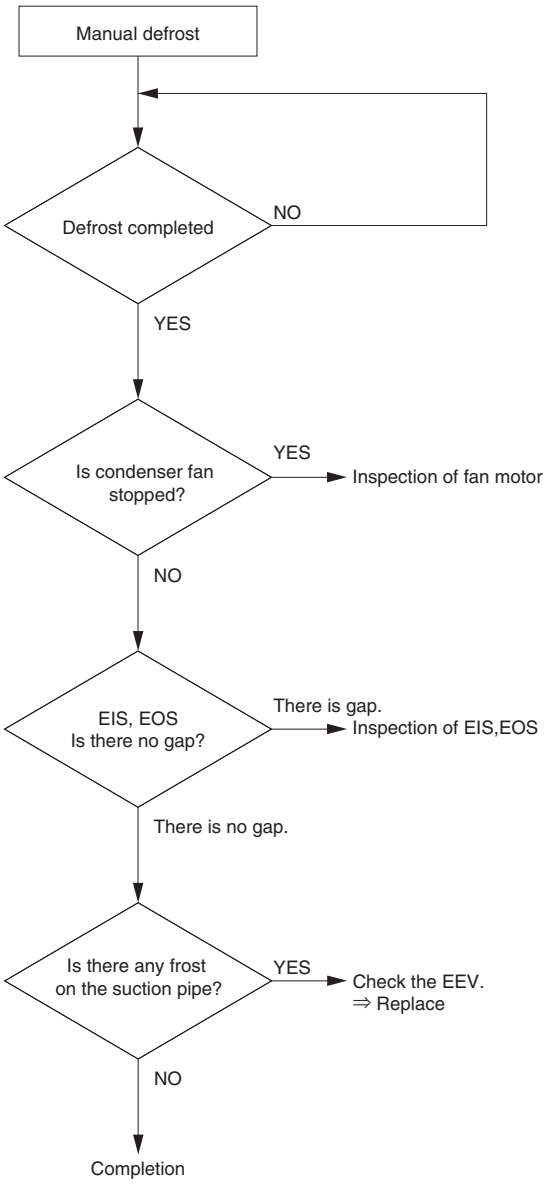
Note: ※Recover refrigerant when replacing it.

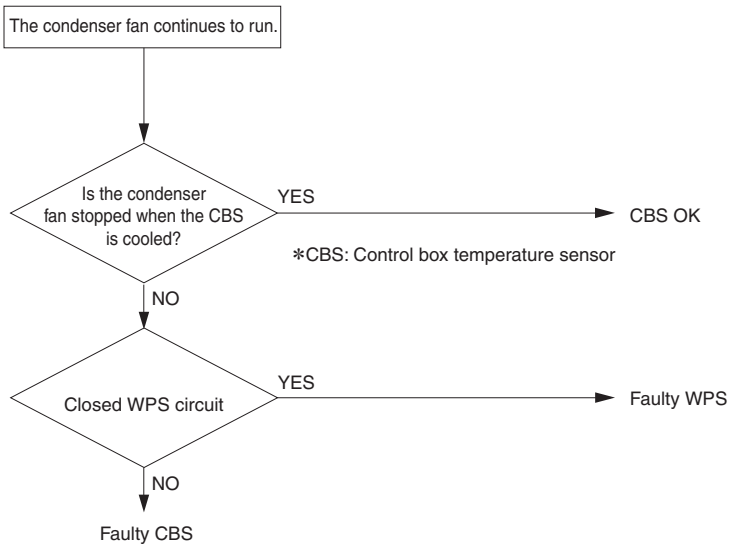
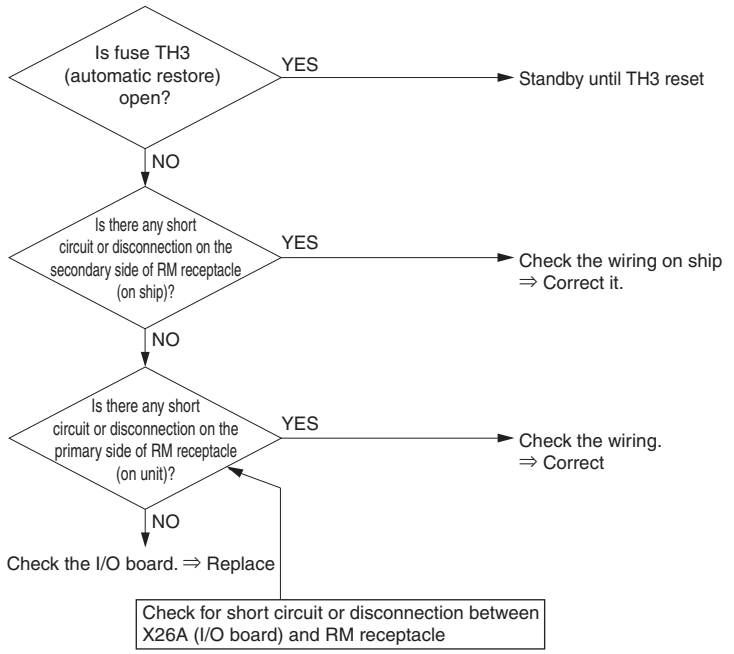
Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop. The high pressure is excessively high.	Solenoid valve internal leak Reverse rotation of condenser fan Ambient temperature is high. Short circuit Is the condenser water-cooled? Low water volume Water temperature is high. Clogged fin of 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.	Low air volume (frosted evaporator) Low air volume (reverse rotation of evaporator fan) Evaporator fan motor failure Low air volume (Fan blade removed) Improperly discharge pipe temperature sensor DCHS1,2 (detection of wet operation). Faulty electronic expansion valve coil Entering of water in refrigerant system		

	Symptom	Cause	Checkpoint	Remedy
Ⅲ Inside temperature does not drop.	The low pressure is too high.	Refrigerant overcharge. Solenoid valve internal leak HSV,RSV (PRV)		
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) HPT failure (pressure reading is not correct) LPT failure (pressure reading is not correct) DCHS1, 2 installation faulty 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 1, 2 Pipe temperature sensor fault (EOS,EIS,SGS) Air temperature sensor fault (RS,SS)		
Temperature continues to decrease.	Stop of evaporator fan		
Temperature continues to increase.	· Solenoid valve HSV or RSV internal leak Excessive frost on the evaporator		

	Symptom	Cause	Checkpoint	Remedy
Ⅵ Abnormal noise or vibration	Abnormal noise	Malfunction of compressor	Auditory check	Replace
		Evaporator and condenser fan motors · Worn bearings · Fan blades touching	Auditory check Auditory and visual check	Repair as needed.
	Abnormal vibration	Compressor Fan motor · Loosen bolt	Auditory check Visual check	Tighten bolts.
		Piping · Removed or loosen cramp	Auditory check Visual check	Fix 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 condenser fan continues to run.	The condenser fan continues to run.	Temperature in the control box is high. Water pressure switch WPS is short-circuited.		
Ⅸ Others	The remote monitoring (RM) has no 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. Pre trip inspection includes items are listed below.

(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 cramp
⑥ Condition of each sensor installation
⑦ Loose mounting sections
- Bolts and nuts ----- Casing frame, compressor, fan motor, control box, inverter box
- Cable glands ----- Control box

⑧ Conditions of control box cover packing (water-proof)
⑨ Magnetic contactor contact point
⑩ Condition of Inverter box cover packing (water-proof)

(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	·····Check for proper activation of switch when high pressure is raised 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	(Temperature difference and rotating direction) voltage and current
⑥ Dehumidification operation and humidity sensor inspection	Remaining frost inspection

(5) PTI report preparation

●Consumables

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

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) Unit frame	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
			5) Control box	✓
			6) Access panel	✓
			7) Inverter box	✓
	3	Condition of panels, hinges and lock		✓
	4	Drain pan and drain hose cleaning		✓
	5	Control box / Inverter box inspection	Cover packing inspection and replacement	✓
	6	Sealing condition of holes through Unit frame	Air leakage and clearance	✓
Refrigerant system	1	Refrigerant leakage		✓
	2	Refrigerant	Check for moisture in refrigerant and amount of refrigerant	✓
	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		✓
		Reheat 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 cramp on the refrigerant pipes and gauge pipes		✓
	8	Condenser coil cleaning	Clean with fresh water	✓

	No.	Inspection item	Inspection content	PTI
Electrical system	1	Damage of power cable and plug		✓
	2	Inspect condition of internal wiring		✓
	3	Inspect electrical connections and tighten as needed	1) Magnetic switch	✓
			2) Electrical contractors	✓
			3) Terminal block	✓
	4	Condition of monitoring receptacle cover		✓
	5	Condition of PC port cover		✓
	6	Fuse conditions	Open or short connection	✓
	7	Inspection of magnetic switch contact	Contact point inspection	✓
	8	Check electrical insulation	1) Power cable and plug	✓
			2) Compressor	✓
			3) Condenser fan motor	✓
			4) Evaporator fan motor	✓
	9	Starting procedure inspection		✓
	10	Temperature sensor	1) Installation condition of sensor	✓
			2) Alarm indication	✓
	11	PT/CT (voltage and current) Alarm indication		✓
	12	Pressure sensor Alarm indication		✓
	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	Defrost function		✓
	4	Clean unit with fresh water		✓

3.3 Automatic PTI

● Automatic PTI enable condition

43 ℃ ≧ Ambient temperature ≧ -10.0 ℃

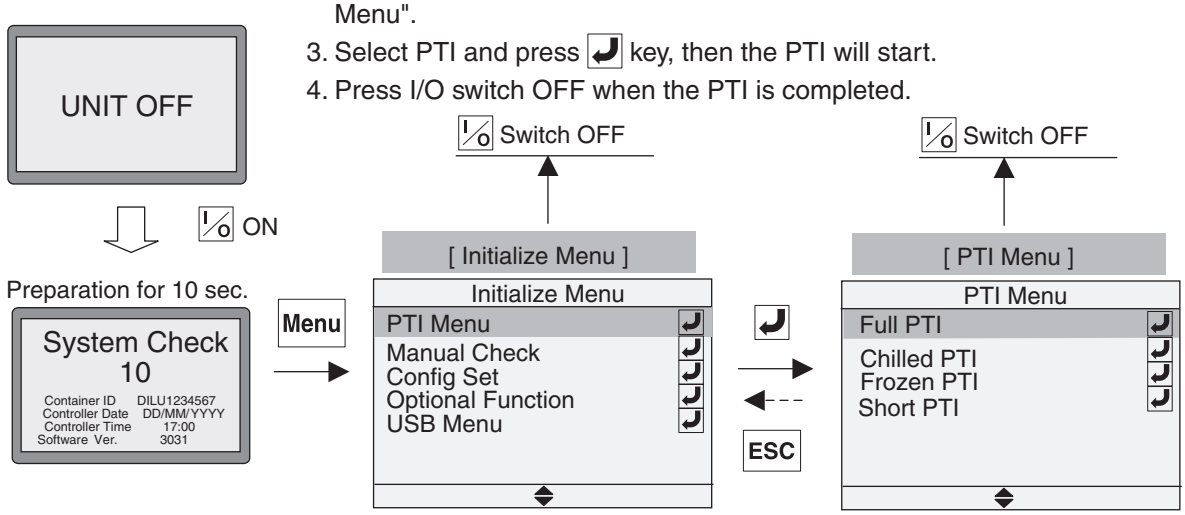
Ambient temperature above 43 ℃ or below -10.0 ℃ may result in PTI failure.

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

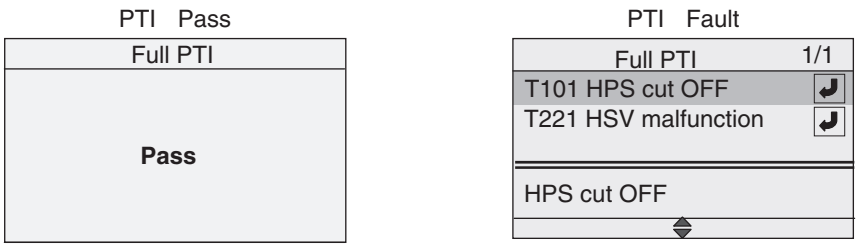
PTI	Content
Short PTI	Performed in order to find parts abnormalities. PTI continues even if abnormalities are found during PTI. PTI terminate if controller detects a compressor failure or evaporator fan is locked.
Full PTI	Short PTI, Chilled PTI and Frozen PTI are performed. It terminates as soon as abnormalities are found after the completion of Short PTI
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. 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	Controller data check	✓	✓	✓	✓
P02	Alarm check on all sensors	✓	✓	✓	✓
P03	PCC check / EFM check	✓	✓	✓	✓
P04	SS, RS 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	Valve leak check	✓	✓	✓	✓
P50	0℃ pull-down		✓	✓	✓
P60	0℃ control maintenance		✓	✓	
P70	Defrost test		✓	✓	✓
P80	-18℃ pull-down		✓		✓
P90	-18℃ control maintenance		✓		✓

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	Controller data	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
	PCC check	T033	Current is small.	PCC failure (broken wire)	Check PCC wiring and contact points.
		T034	A current is present.	PCC failure (welding)	Check PCC wiring and contact points.
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 wiring failure	Check EMV coil and wiring.
				EMV coil burning out	Check EMV outlet pipe temperature.
				ESV coil failure	Check ESV coil and wiring.
				ESV valve body failure	Check ESV outlet pipe temperature.
		T102	ESV failure	ESV wiring failure	Check ESV coil and wiring.
				ESV coil burning out	Check clicking sound from ESV.
		T103	EMV failure	EMV wiring failure	Check EMV coil and wiring.
				EMV coil burning out	Check EMV outlet pipe temperature.
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 is low.	①HPS failure ②HPT failure ③Gas leakage from manifold gauges	①Check HPT. ②Compare to manifold gauges. ③Remove manifold gauges.
		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	Valve leak check	T241	Solenoid valve internal 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.
				Leakage through EEV	Check EEV outlet pipe temperature.

P50	0℃ pull-down	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℃ maintenance	No alarm	No judgment		
P70	Defrost test	T701	Defrost initiation conditions out of range	EOS failure	Check EOS.
				HSV internal leakage	Check HSV outlet pipe temperature.
		T702	Defrost time is too long.	EOS failure	Check EOS.
P80	-18℃ pull-down	T801	Pull-down time is too long.		
P90	-18℃ maintenance	No alarm			

3.4 Periodic Inspection

Always to operate the unit normally, periodic inspections for each parts are required in order to confirm the unit condition and maintenance separately pre-trip inspection.
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 and Inverter box inspection	1) Cover packing inspection and replacement	✓	✓	✓
			2) Loose cable gland	✓	✓	✓
			3) Internal cleaning	✓	✓	✓
	5	Air leakage from unit casing	Air leakage and clearance	✓	✓	✓
	6	Seal inspection and replacement	Ventilator cover packing	✓	✓	✓
	7	Painted area recondition (Touch-up paint)	1) Compressor	✓	✓	✓
			2) Receiver	✓	✓	✓
			3) Solenoid valve (coil cover)	✓	✓	✓
			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 electrical terminal	✓	✓	✓
	3	Inspection and replacement of sight glass				✓
	4	Condition of cramp 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 retighten if necessary	1) Magnetic switch	✓	✓	✓
			2) Electronic connection	✓	✓	✓
	4	Condition of monitoring receptacle cover		✓	✓	✓
	5	Condition of PC port cover		✓	✓	✓
	6	Fuse conditions	Open or short connection	✓	✓	✓
	7	Magnetic switch contact point inspection and replacement	1) Contact point inspection	✓	✓	✓
			2) Replace the contact on evaporator fan motor			✓
			3) 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	Temperature sensor	1) Installation condition of sensors	✓	✓	✓
			2) Inspection of sensor and sensor cable for damage	✓	✓	✓
			3) Alarm indication	✓	✓	✓
	10	Humidity sensor	Inspect every year.	✓	✓	✓
	11	PT/CT (voltage and current) Alarm indication		✓	✓	✓
	12	Pressure sensor Alarm indication		✓	✓	✓
	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 indicated 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 regulation.

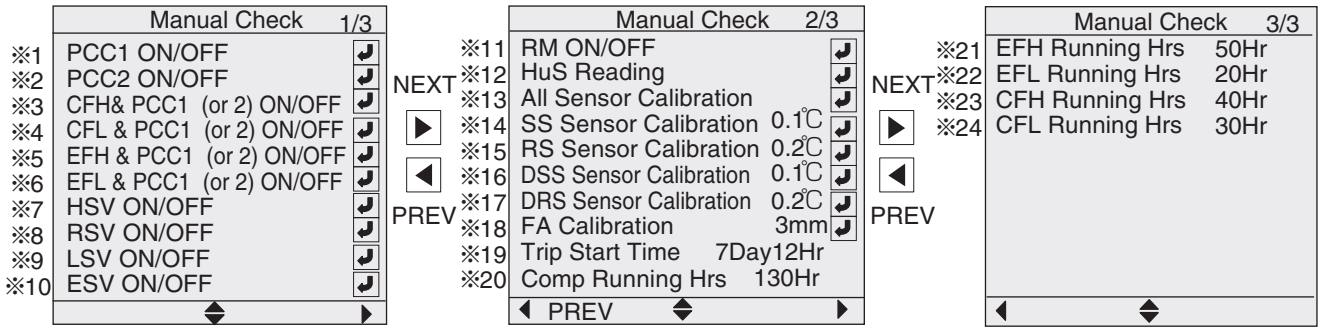
4.1 Manual Check

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

＜Access＞

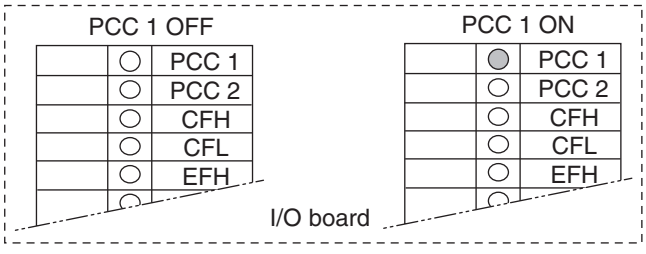
1. Press MENU key at preparation display after I/O switch ON, and go to "Initialize Menu".
2. Select "Manual Check" in Initialize Menu and press ↵ key, and go to "Manual Check" consist of 3 screens.
3. Press I/O switch to OFF when the "Manual Check" is completed.

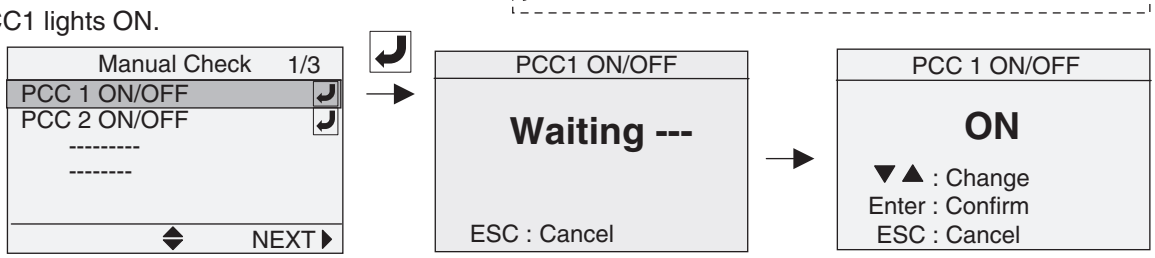
Manual Check Function	
ON/OFF Check	PCC,CFH,CFL,EFH,EFL,CM HSV,RSV,LSV,ESV
	RM (Circuit)
HuS Sensor Reading	HuS
Sensor Calibration	SS,DSS,RS,DRS,FA (option)
Trip Start Time and Reset	
Running Hours and Reset	CM,EFH,EFL,CFH,CFL



※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.



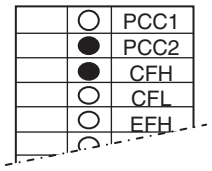


Follow the same procedure for other magnetic contactor or solenoid valve ON/OFF check.

※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).

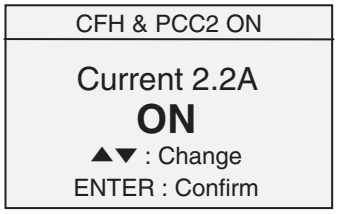
CFH &PCC2 ON



I/O board

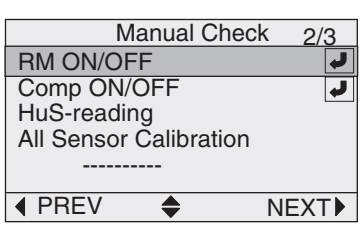
During checking ※3～※6, the corresponded fan operation current will be displayed.

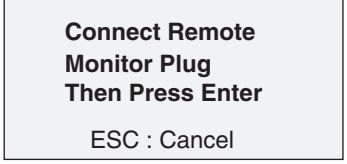
CFH &PCC2 ON



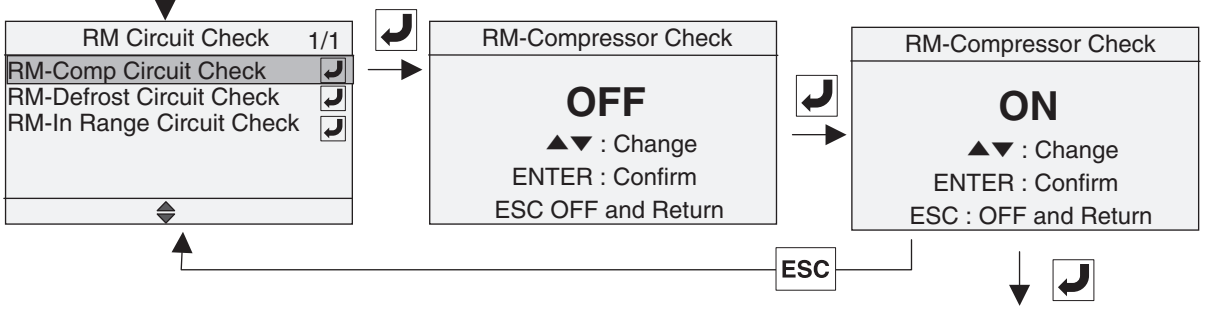
※11 RM (Remote Monitoring) Circuit Check (Option)

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

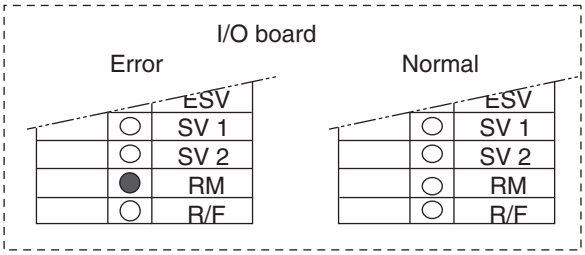




※11-1 RM-Compressor Circuit Check



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.

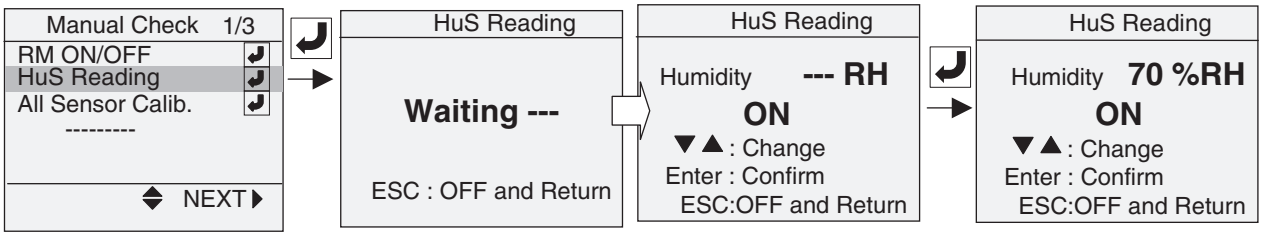


Follow the same procedure for RM-Defrost Circuit and RM-In Range Circuit checks.

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

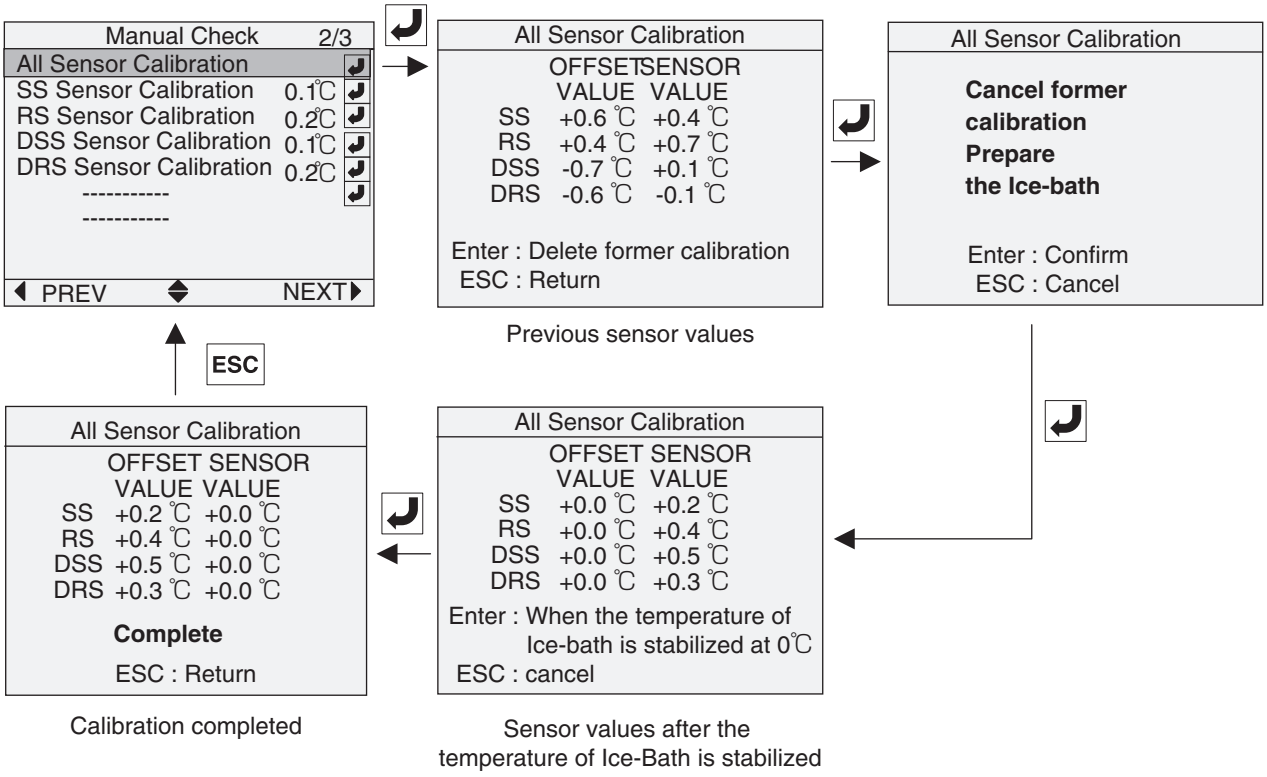
※12 Humidity Sensor Reading (Option)

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.

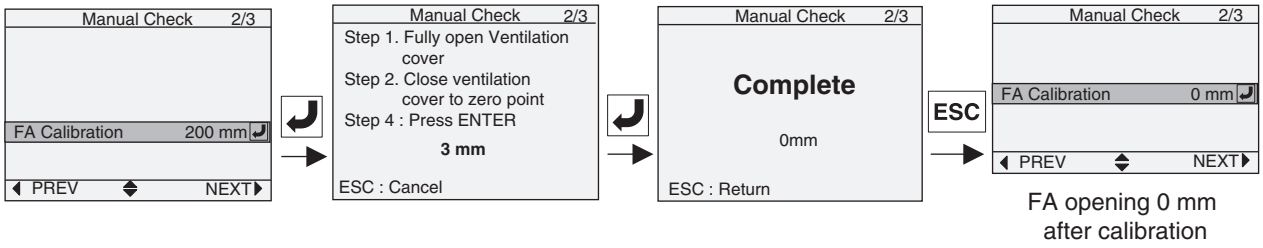


Follow the same procedure for individual sensor calibration.

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

※18 FA Calibration (Option)

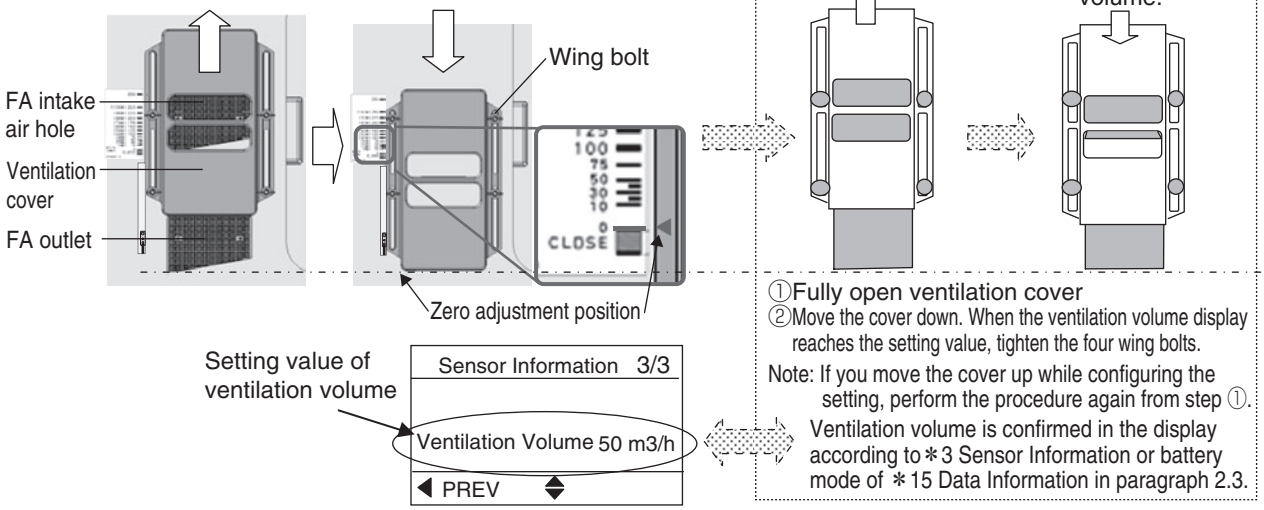
Go to FA Calibration in Manual Check first, then set ventilation volume.



FA opening 0 mm after calibration

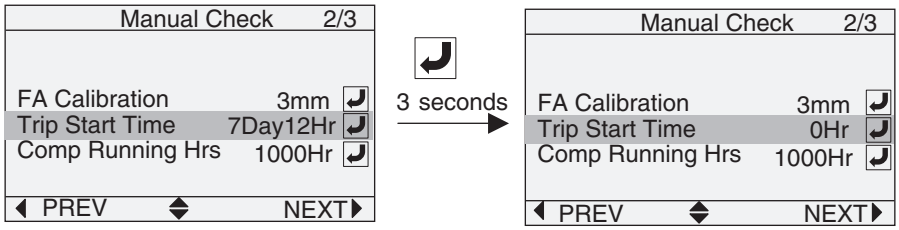
Step 1.
Fully open

Step 2.
While closing the cover, adjust to the zero position of the ventilation identification plate, and then tighten the four wing bolts.



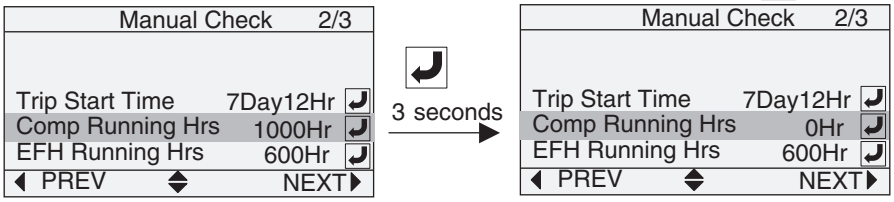
※19 Trip Start Time

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

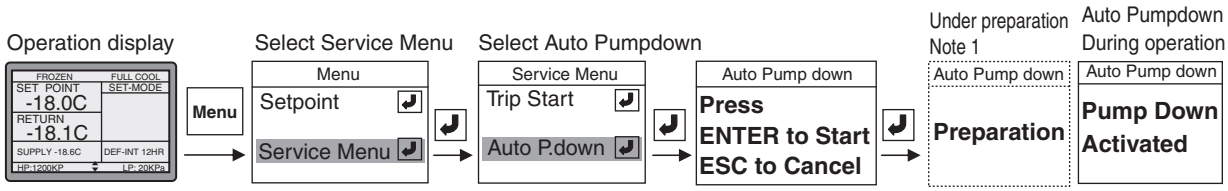
※23 CFH Running Hrs

※24 CFL Running Hrs

4.2 Automatic Pumpdown

An automatic pump down is performed to prevent damage to compressor due to extremely low suction pressure.

●Access to Automatic Pumpdown

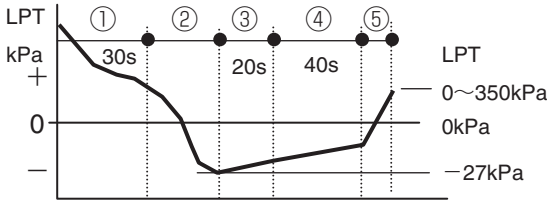


Note ;

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.

●Use of Automatic Pumpdown

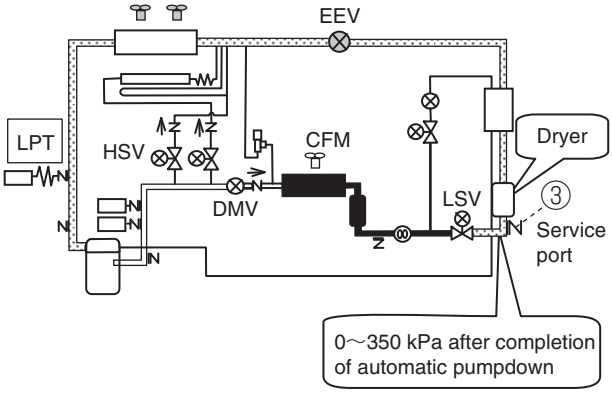
1. Replacement of Dryer

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

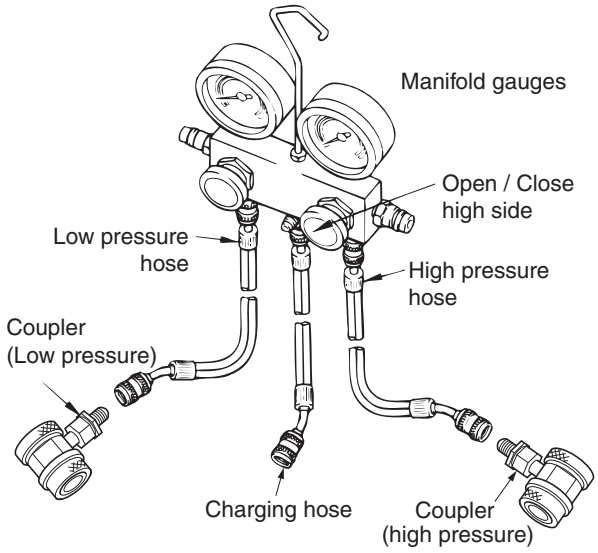
CAUTION !!
Ambient air may enter into piping if it is opened for long time after removing Dryer. In this case vacuum and dehydrate the piping after replacement of Dryer.

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.)



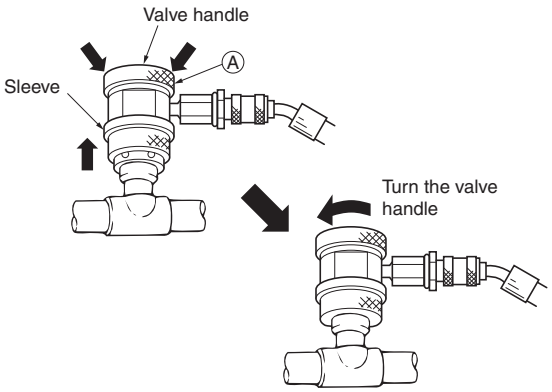
4.3 Connecting and Removing Manifold Gauges



Structure of manifold gauges

(1) Connecting manifold gauges

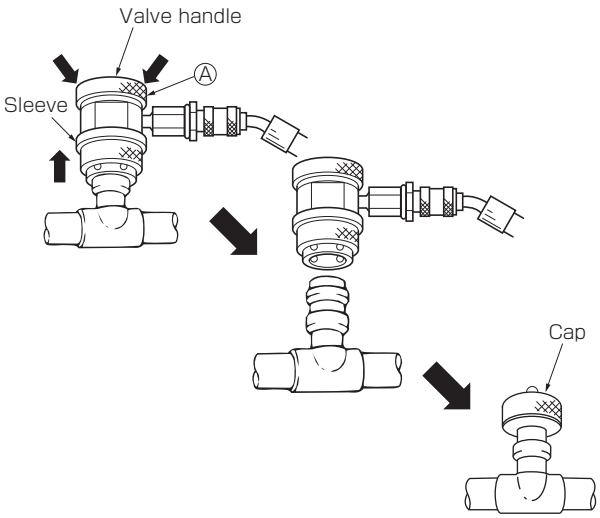
Turn the valve handle of coupler counterclockwise (the push pin is retracted). Slide the sleeve upward, and press it against the service port. Then, securely push the valve handle (section A) until a click sound is heard. After the coupler is inserted into the service port, release the sleeve. Next,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

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

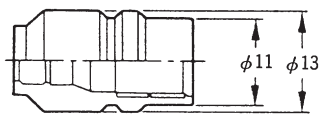
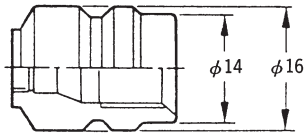


⚠ CAUTION

Be sure to 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 manifold gauges, charge hose and charging cylinder for R134a.
3. The service ports equipped on unit are exclusively provided for R134a.

	R134a (SAE quick joints)
Low pressure side	
High pressure side	

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

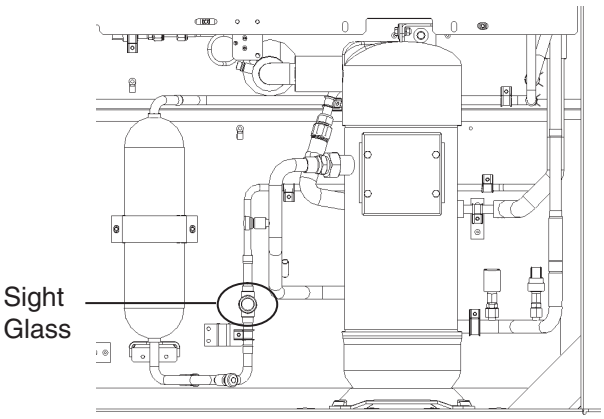
4.4 Checking Non-Condensable Gas

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 manifold gauges (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.

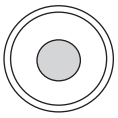
4.5 Sight Glass

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



(1) Moisture indication

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?

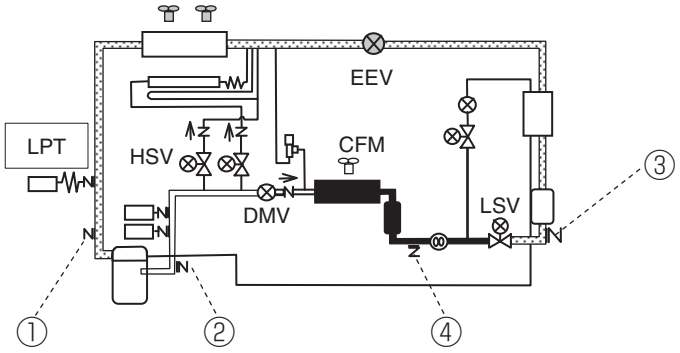
Judge refrigerant flow rate when frozen mode only under 0 ℃ .
Normal if full is indicated at RS < 0 ℃ .
Shortage if flashing is indicated at RS < 0 ℃ .

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

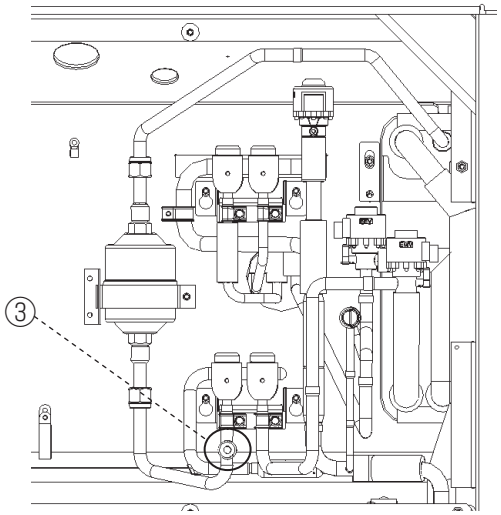
⚠ CAUTION

Do not judge shortage if flashing is indicated at RS > 0℃ frozen mode 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.

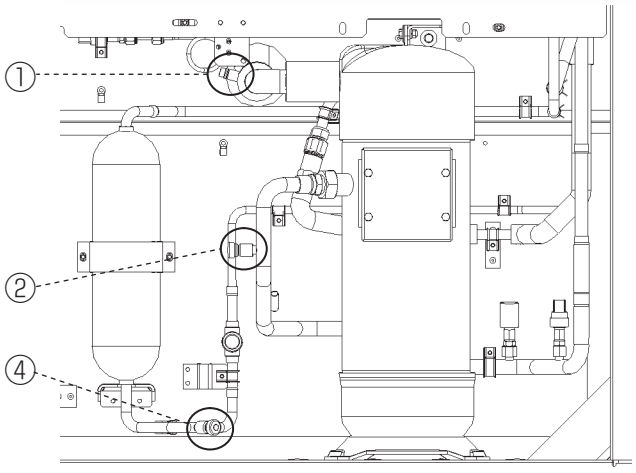
4.6 Refrigerant Recovery and Charge



Valve chamber



Compressor chamber

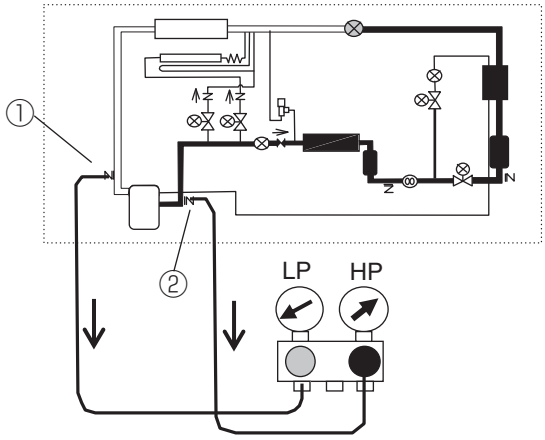


Work		Service port	Notes
Operation Pressure cheek	High pressure	②	
	Low pressure	①	
Refrigerant recovery		① & ④	Recover all refrigerant from ports ④ and ①.
Vacuum and dehydration		① & ④	Vacuum and dehydrate from ports ④ and ① after recovering.
R134a Refrigerant charge (Refer to note 1 of specified charge 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 indicated on model name plate.
The model name plate is mounted on the compressor chamber (behind of cable box).

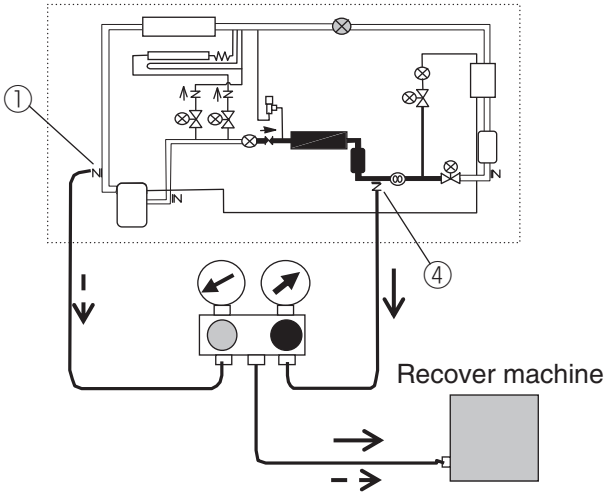
4.6.1 Operation Pressure Check

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



4.6.2 Refrigerant Recovery

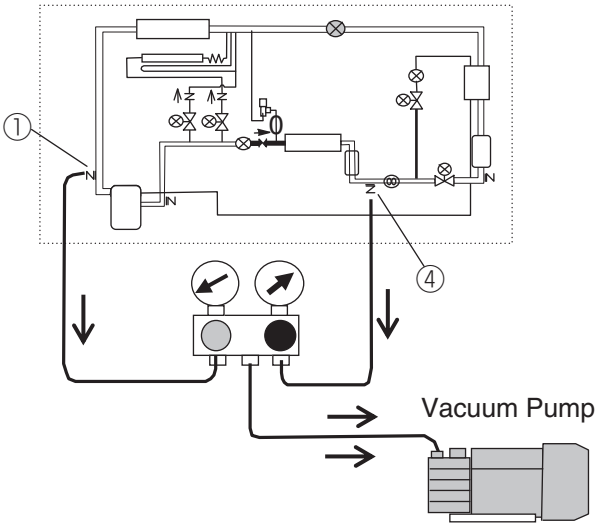
1.Recover refrigerant completely from ports ④ and ①.



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 manifold gauges 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.

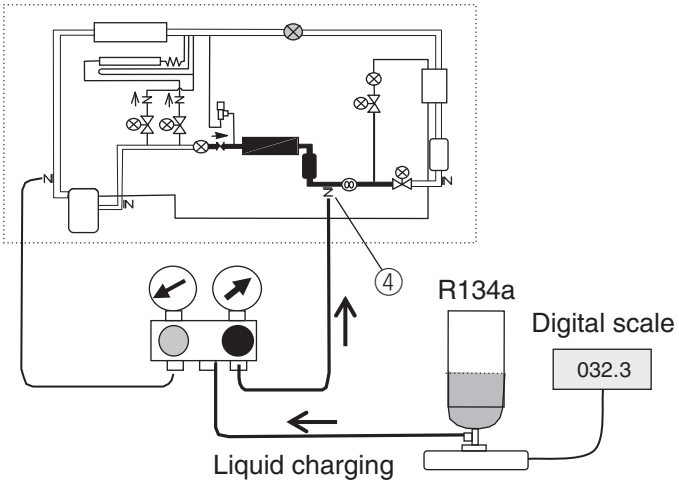
-----Water, Evaporating Temperature------

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

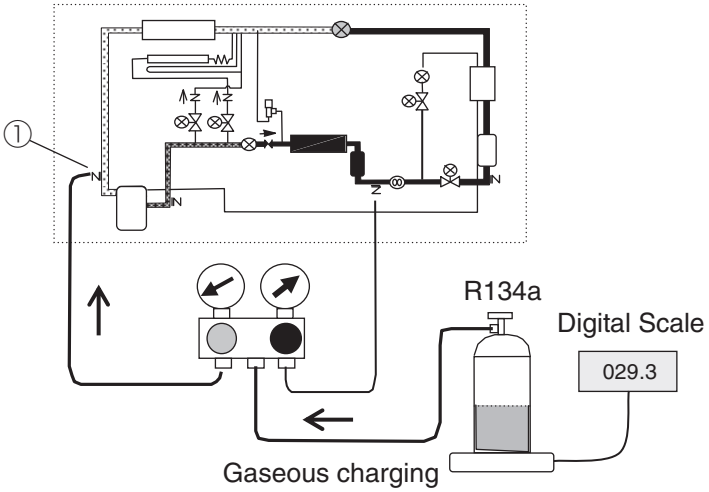
4.6.4 Refrigerant Charge

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

1. Place R134a cylinder on digital scale and connect hose to manifold gauges 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.)



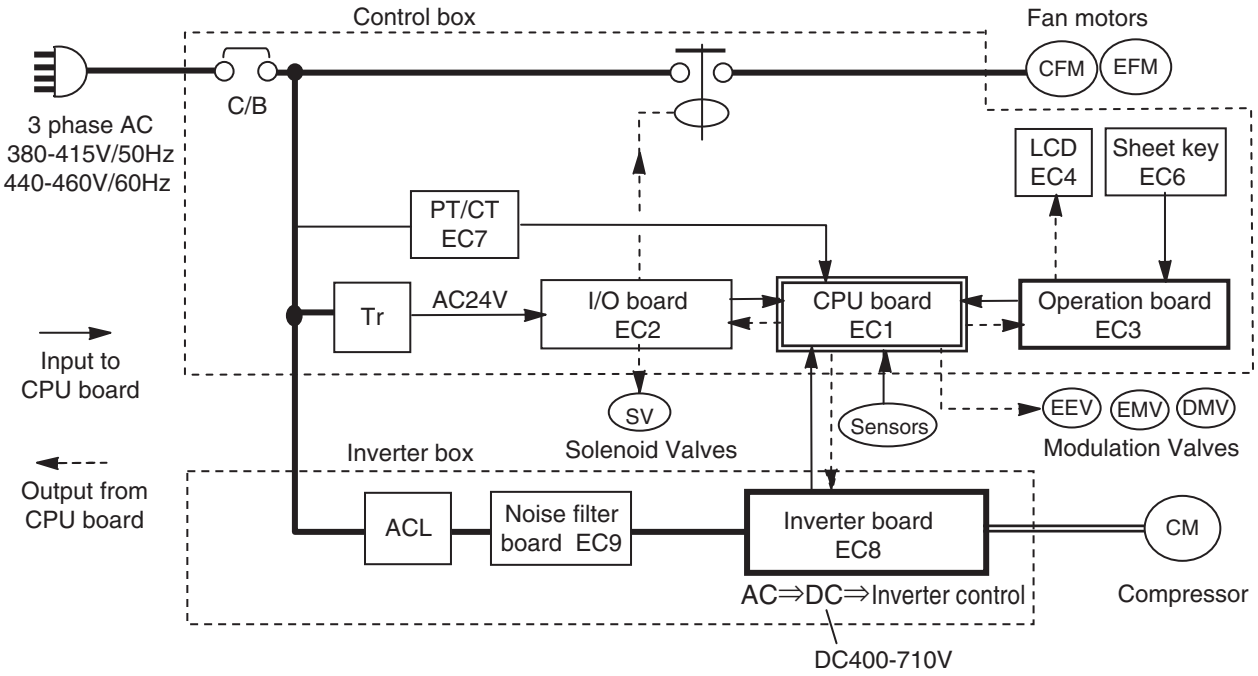
3. By operating unit, charge gaseous refrigerant from port ① for the rest of specified charge amount of refrigerant.
   Close cock of R134a cylinder after completion of charging.



⚠ CAUTION

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

4.7 Electrical Circuit and Servicing Precautions



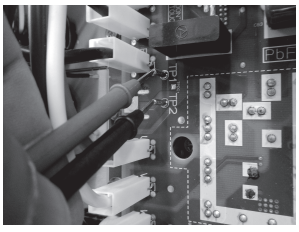
(When stopped) Max. 460×1.1×√2=713V
(When operated) Max. 460×1.3=598V

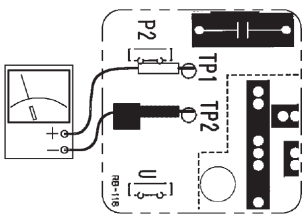
Servicing precautions

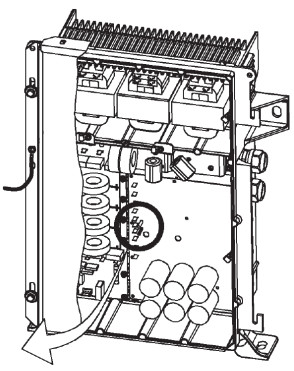
1. Power circuit
   Before inspecting the primary side of circuit breaker, be sure to turn off the power for facility side.
※Even after turning off the circuit breaker, supply voltage is still applied.

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

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 TP1 and TP2 on the inverter board is lowered to DC50V or below before starting inspection.







4.8 Parts Replacement

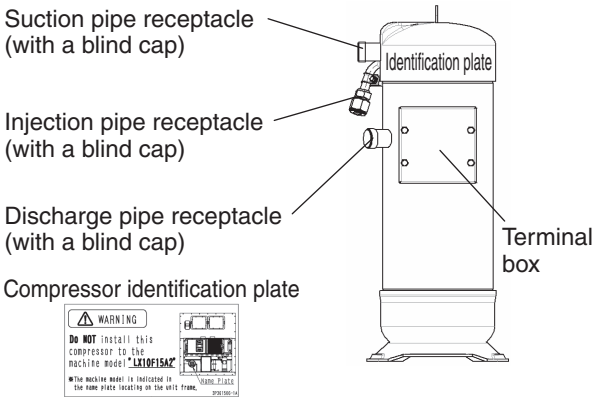
∗After replacing parts, check that the parts are able to operate correctly.

4.8.1 Compressor

●Preparation for installing a new compressor

1. Check the replacement compressor and accessories.
   Identification plate is affixed on the replacement compressor.Check the unit model according to the identification plate.

Fig. 1 Replacement compressor



∗Weight 40kg

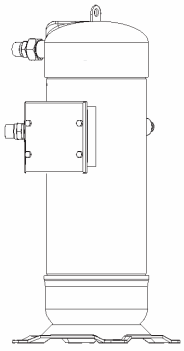
∗Refrigerant oil DAPHNE FVC68D charged.

∗Dry nitrogen gas charged.

＜Accessories＞

Packing for suction/ discharge pipe receptacles		2 pcs.

2. Remove the blind caps from the discharge, suction and injection pipe receptacles.



●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 base.

Fig.2

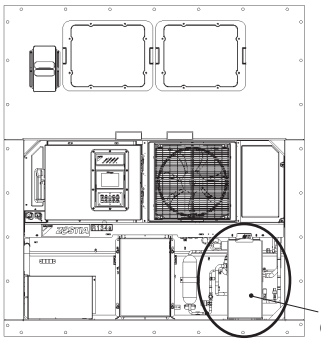


Fig.3

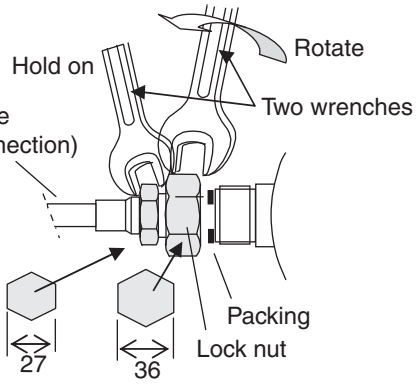
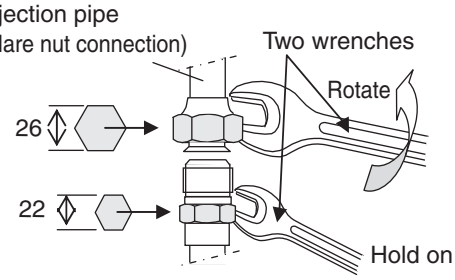


Fig.4



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 cramp of spring plate to pull out the sensor. (Fig. 6)

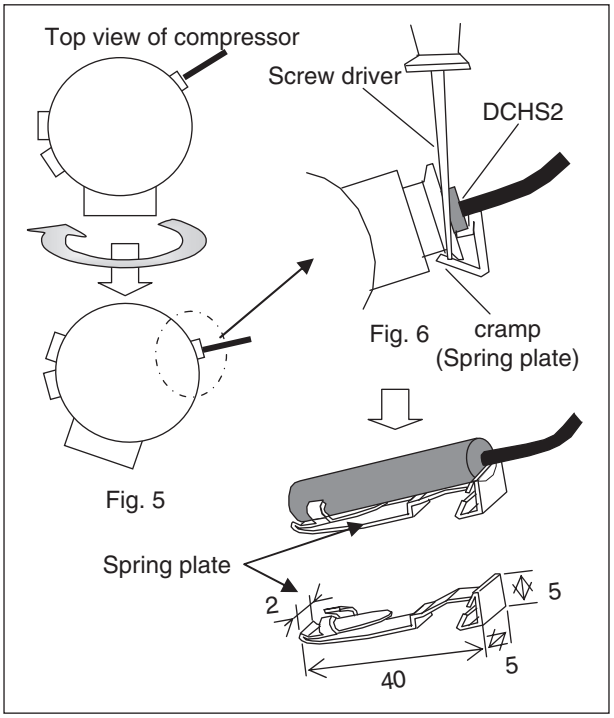


Fig. 5 Fig. 6

●Compressor installation

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

2. Connecting
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 (1244.1kgf·cm)
Suction pipe: 122N · m (1244.1kgf·cm)
Injection pipe: 54.9N · m (559.8kgf·cm)

2-4. Apply silicon to cover each lock nut after tightening.

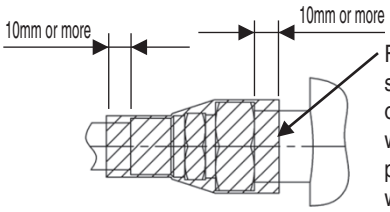


Fig. 7

4. Fixing the compressor
After connecting the pipes, finally tighten the four bolts to secure the compressor base 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 cramp sound (Fig. 8).

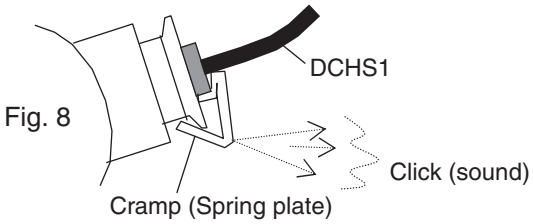


Fig. 8

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

⚠ Caution

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

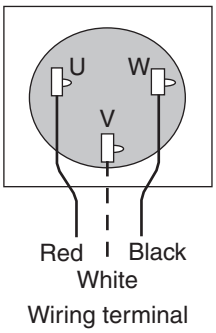
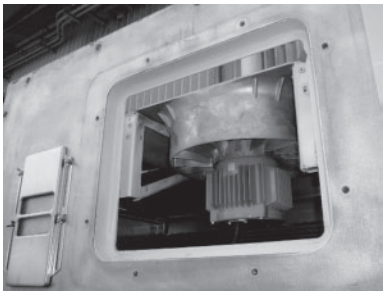


Fig. 9

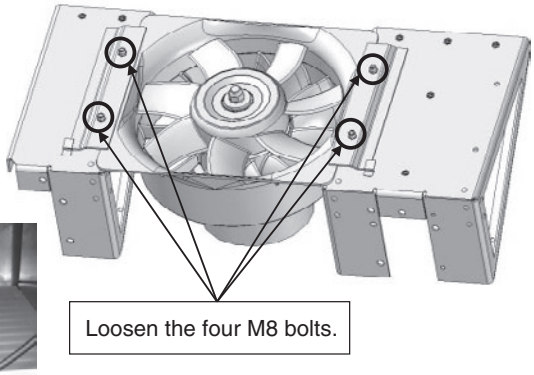
4.8.2 Replacing the evaporator fan motor

(1) Removing

a) Remove access panel.

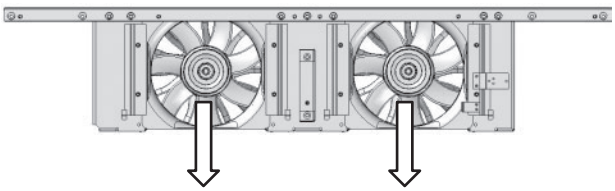


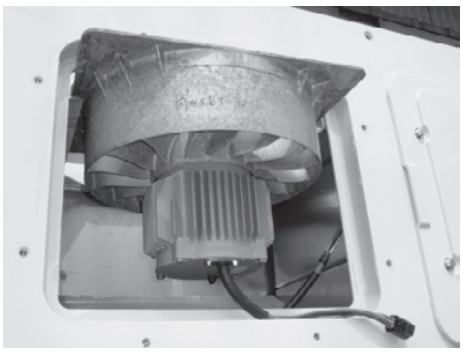
b) Loosen 4 pcs bolts (M8) from fan blade fixing metal.



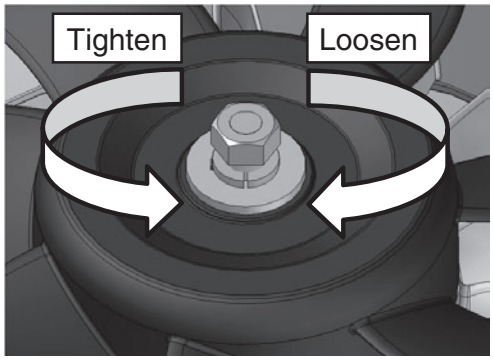
c) Disconnect power supply connector on fan motor.

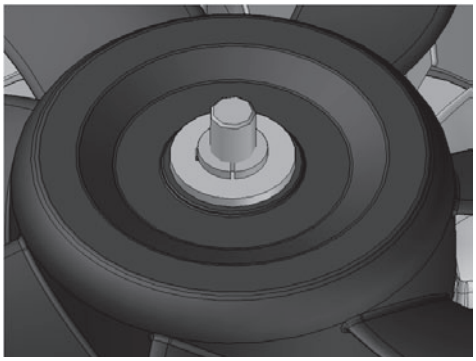
d) Pull the fan assembly straight out.





e) Remove fan diffuser 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.
(Securely connect the power supply connector for the fan motor.

4.8.3 Inverter Board (EC8)

●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 TP1 and TP2 on the inverter board is 50VDC or less. (Fig. 1)

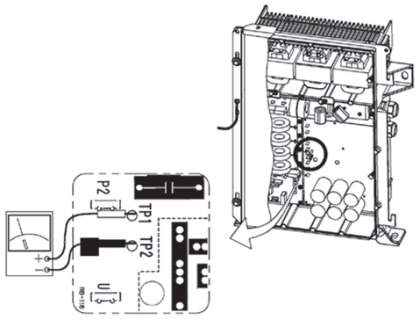


Fig.1 Layout of inverter boards TP1 and TP2

●Removing the inverter boards (Fig. 2)

1. Loosen the four nuts of the mounting bolts which are securing the front cover, and then remove the front cover.

2. Remove all cables connected to the inverter board after check the voltage at TP1 and TP2.

3. Remove the inverter board (6 mounting bolts).

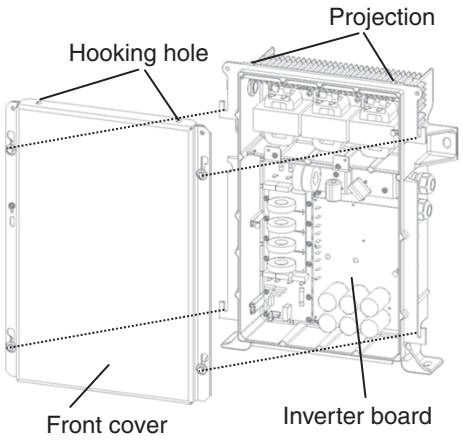


Fig.2 Inverter box

●Mounting the inverter board

The inverter board and the right cover are combined. (Fig. 3)

1. Peel off the protective film (transparent) from the heat transfer sheet which is attached to the back of the inverter board plate.
   ＊Be careful to avoid getting any foreign matter on the heat transfer sheet to prevent air bubbles from forming in the sheet.

2. Install the inverter board. Tightening order as ①⇒②⇒③⇒④⇒⑤⇒⑥. (Fig. 3)
   Bolt tightening torque (M5): 2.29 ± 0.34 N · m

3. Connect the cables to the inverter board.

4. Install the front cover.
   Insert the projection at the top of the box into hooking hole in the top of the front cover, and then tighten the four nuts onto the bolts.
   Bolt tightening torque (M6): 3.93 ± 0.58 N · m

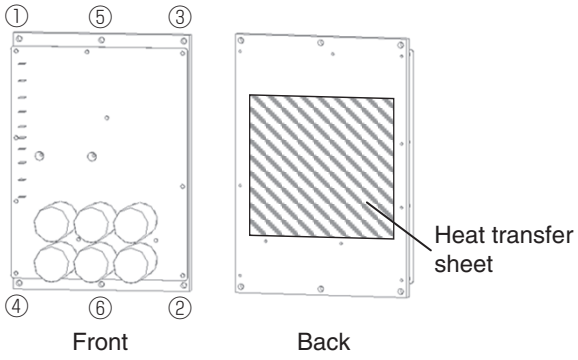
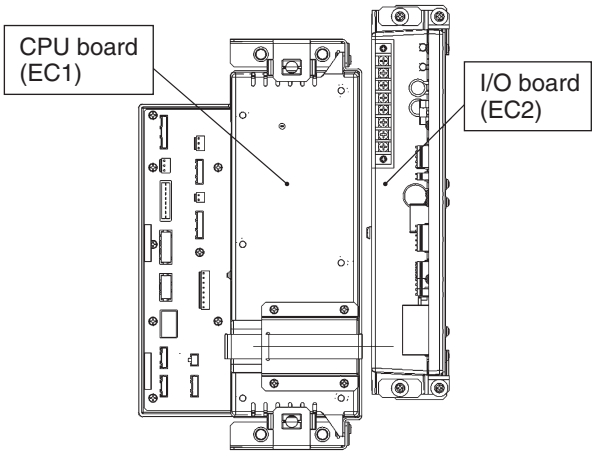


Fig.3 Inverter board

4.8.4 CPU Board (EC1)



●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) Disconnect wake-up battery connection.

2. Mounting CPU board
   Reverse the above procedure to mount the wake-up battery, connect the cable and mount CPU board using two bolts.
   Make sure all connector are connected correctly.

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.

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 selected on spare part CPU board but the configuration setting values are automatically transmitted from operation board (EC3) when power is ON.

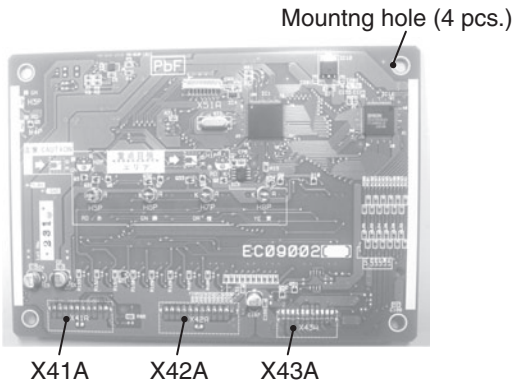
4.8.5 I/O Board (EC2)

●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.
   Make sure all connector are connected correctly.

4.8.6 Operation board (EC3)



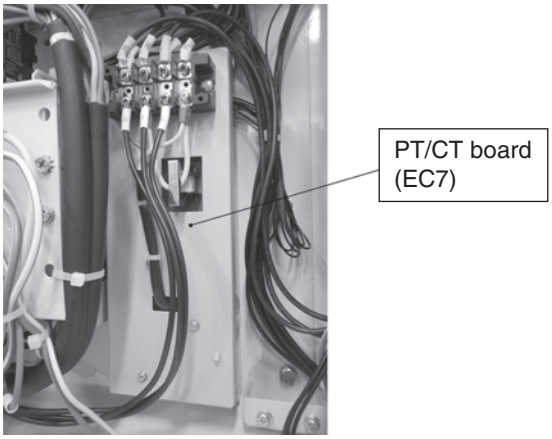
●Replacement procedure

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
   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 operation board when power is supplied.

4.8.7 PT/CT Board (EC7)



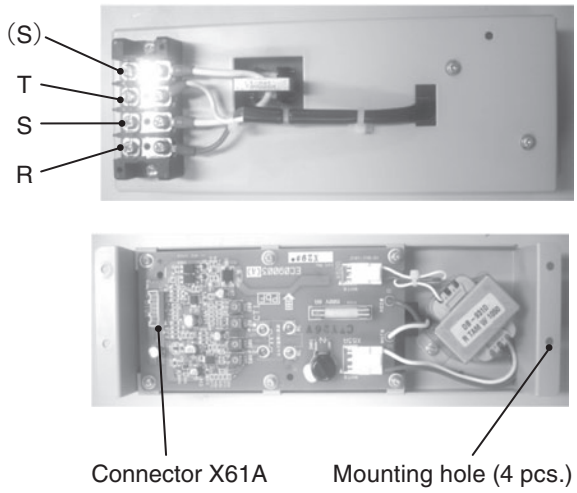
This printed circuit board has the two functions as a measuring instrument and protective device and provide as an interface between the main circuit (high voltage) and controller.

●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 P.T.I to confirm the operation.



4.8.8 High Pressure Switch (HPS)

Type	ACB-LB164
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 two wrenches. (Fig. 1)
   ※Do not lose push-stick inside the joint. (Fig. 2)
3. Installing of HPS
   ※Tighten flare nuts A and B using two wrenches. (Fig. 1)
4. Make sure no gas leakage after install HPS.

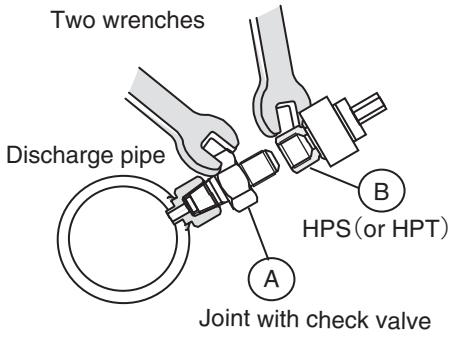


Fig. 1 Use two wrenches when removing and installing.

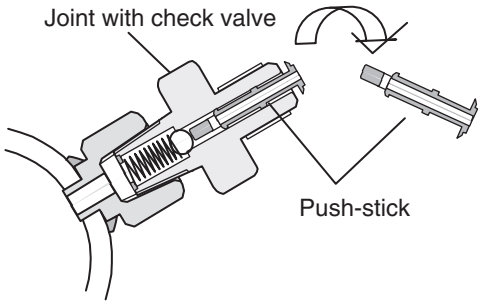


Fig. 2 Do not lose push-stick.

4.8.9 High Pressure Sensor (HPT)

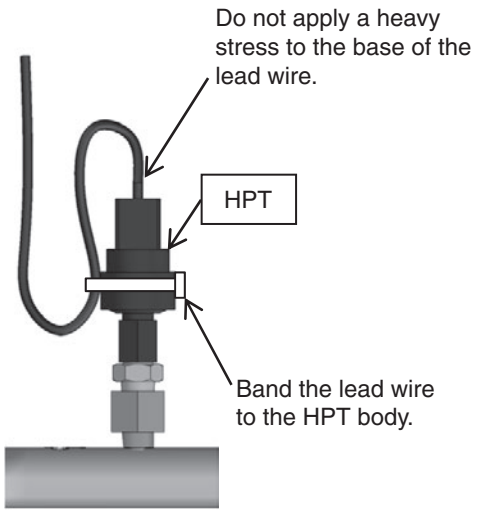
Type	NSK-BH030F-391

●Removal of HPT

1. Remove the lead wire from the control box.
2. Remove the HPT from the joint with check valve.
   ※Loosen flare nuts A and B using two wrenches.
   ※Do not lose the push pin inside the joint with check valve.

●Installation of HPT

1. Connect the HPT to the joint with check valve.
   ※Tighten flare nuts A and B using two wrenches.
2. Conduct a gas leakage test to check that no gas leaks after installing the HPT.
3. Bend the HPT lead wire as shown in Fig. 1, and then band the lead wire to the HPT body.



4.8.10 Low Pressure Sensor (LPT)

Type	NSK-BD010F-070

●Removal of LPT

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

※Loosen flare nuts using two wrenches.（Fig. 1）

※Do not lose push-stick inside the joint with check valve.

●Installation of LPT

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

※Tighten flare nuts using two wrenches. (Fig. 1)

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

※Tighten flare nuts using two wrenches. (Fig. 1)

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

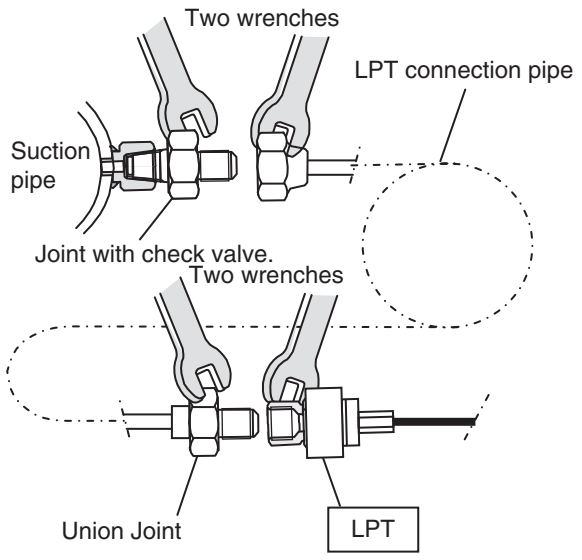
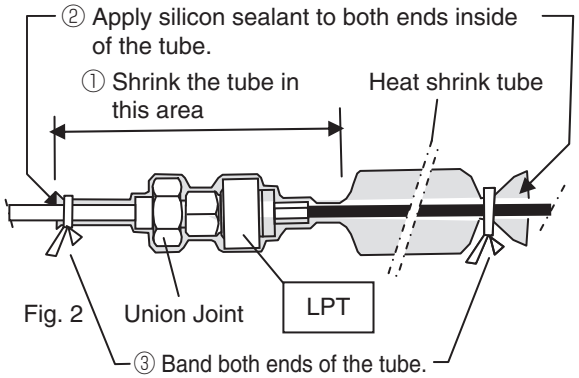
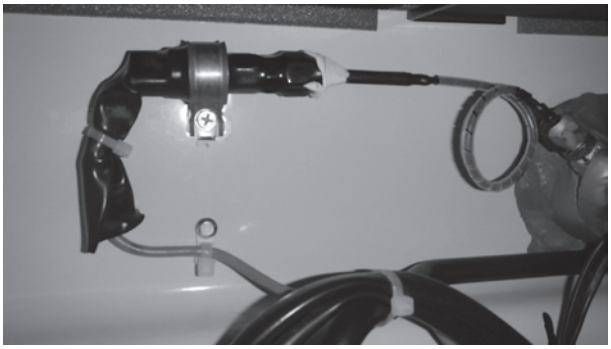


Fig. 1 Use two wrenches for loosening and tightening flare nuts

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



10. ④ Bend the LPT cable as shown in the photograph below, and secure it to the LPT body with the band.



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

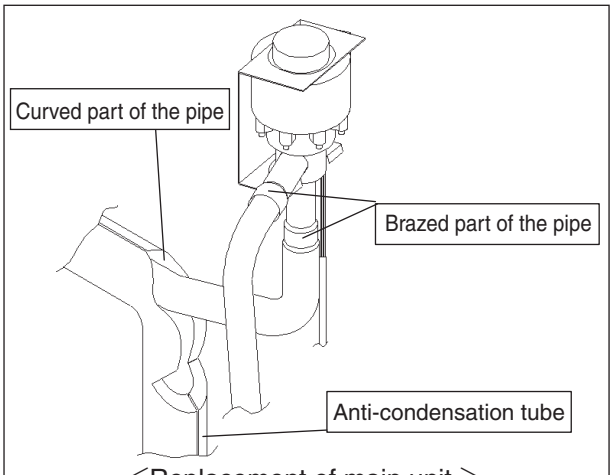
Name	Type	
Electronic Expansion Valve EEV	Coil	HCM-MD12DM-2 Socket (Red)
	Body	HCM-BD35DM-2 Valve size: 3.5mm
Economizer Modulation Valve EMV	Coil	HCM-MD12DM-3 Socket (White)
	Body	HCM-BD24DM-1 Valve size: 2.4mm
Discharge Modulation Valve DMV	Coil	HCM-MD12DM-4
	Body	HCM-BD120DM-2

(1) Replacing the coil

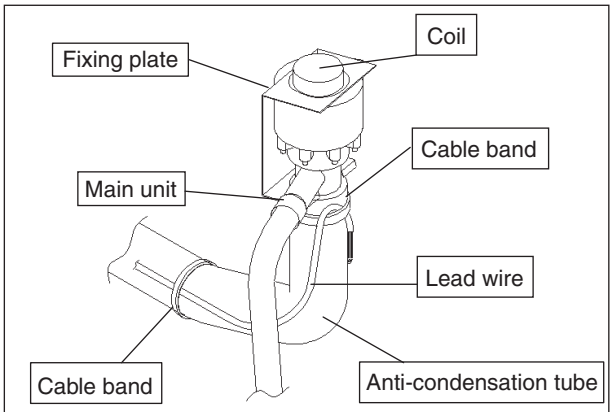
①Remove the cable band securing coil lead wire.
②Disconnect the connector on CPU board.
③Remove the fixing plate and the coil.
④Replace the old coil with a new one.
⑤Attach the coil and the fixing plate.
⑥Plug in coil connector on CPU board.
⑦Fix the coil lead wire with a cable band.

(2) Replacing the body

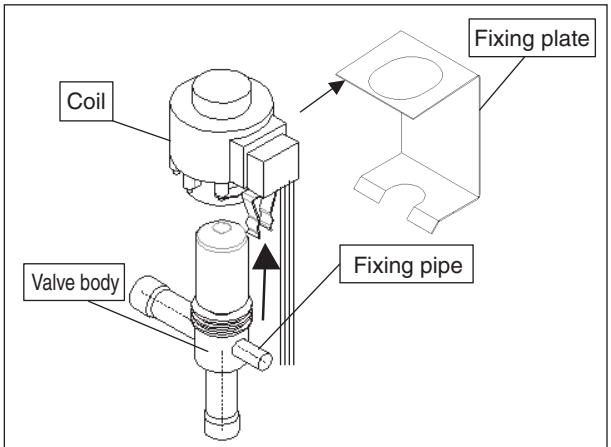
※Recover refrigerant at first and proceed following step.
①Remove the cable band fixing the coil lead wire.
②Detach the anti-condensation tube until the curved part of the pipe.
③Remove the fixing plate and the coil.
④Un-solder valve piping.
⑤Solder in the new valve body.
→Braze the new valve body while cooling it with a wet cloth.
Maximum body temperature: 120℃ (248˚F) or less
⑥Mount the coil and the fixing plate.
⑦Install the anti-condensation tube.
⑧Fix the coil lead wire with a cable band.



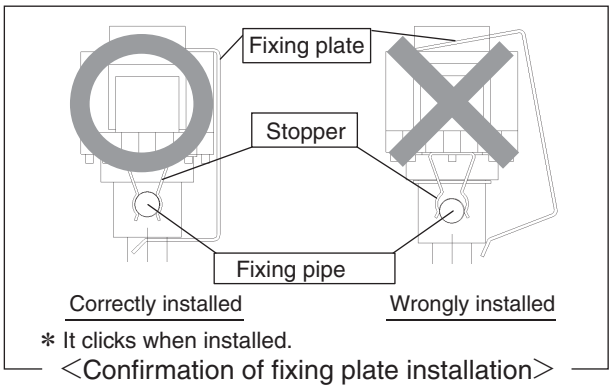
<Replacement of main unit >



<Part names>



<Replacement of the coil>



* It clicks when installed.
<Confirmation of fixing plate installation>

Attention (When installing the coil and the fixing plate)

●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 fixing plate 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.

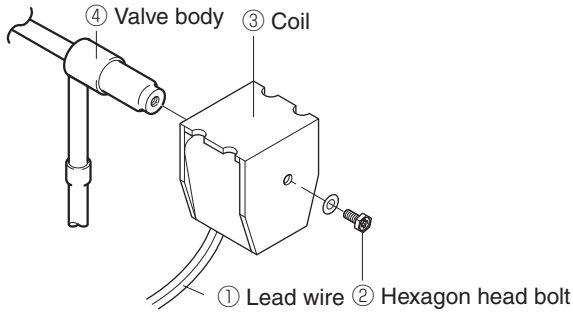
Name	Symbol	Body	Coil
Liquid solenoid Valve	LSV	VPV-803DQ	NEV-MOAB518C
Economizer solenoid Valve	ESV		
Hot gas solenoid Valve	HSV		
Reheat coil solenoid Valve	RSV		

(1) Replacing the coil

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

②Remove the hexagonal head bolt on the top of the coil and remove the coil.

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



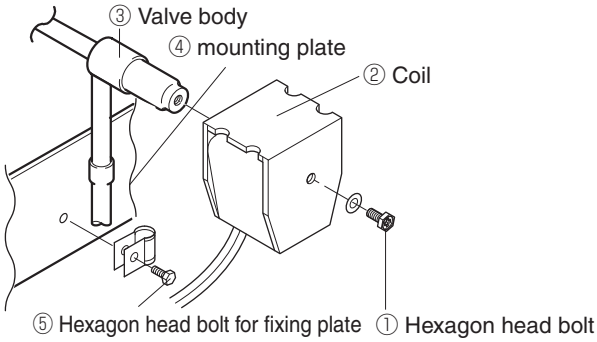
(2) Replacing the valve body

①Remove the hexagonal head bolt on the top of the coil remove the coil.

②Remove the hexagonal head bolt of the mounting plate, and cut the two pipes at the side of the valve body.
Disconnect the remaining pipes at the brazed joint sections.

③Solder in new valve body while keeping the temperature of the valve body below 120℃ (248˚F) by cooling.

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



4.8.13 Dryer

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

(1) Replacement procedure

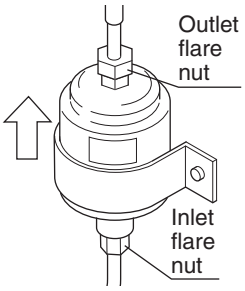
①Conduct the automatic pumpdown to collect the refrigerant in the liquid receiver.
Refer to paragraph 4.2 for the automatic pumpdown.

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

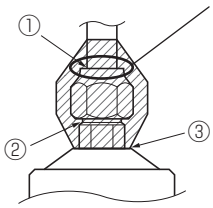
③After completing of the replacement of the dryer, be sure to conduct refrigerant leakage test to confirm that no refrigerant leakage is occurring.

④Check on the green color of the sight glass after system start up.

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



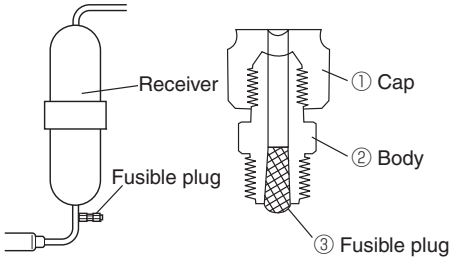
Fully apply silicon sealant to the dryer body including the flare nuts on the inlet and outlet sides.



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
Refrigerant system pressure rise abnormally fusible plug will release pressure.
If the fusible plug is activated, the fusible alloy ③ melts and refrigerant blow out (Melting point: 95℃ to 100℃).
For replacement, ①-③ shall be replaced.

4.8.15 Check Valve

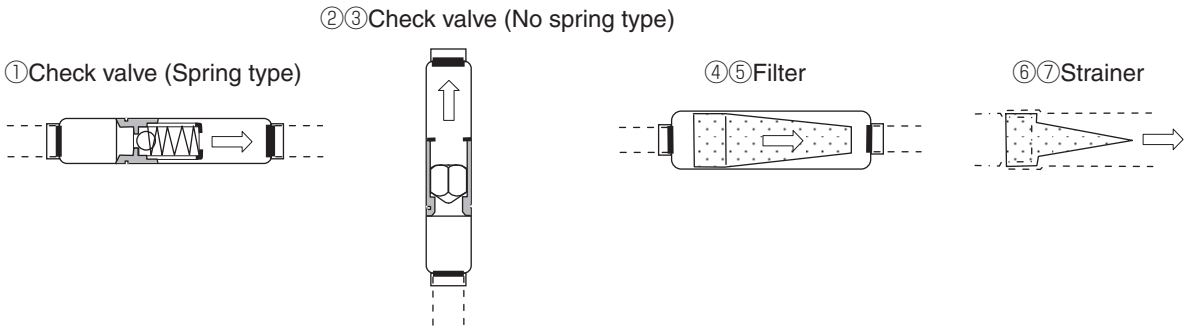
●Replacement method

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. While brazing, keep valve cool below 120℃ (248˚F) with wet cloth.
4. Check if there is no gas leakage after completion of brazing.

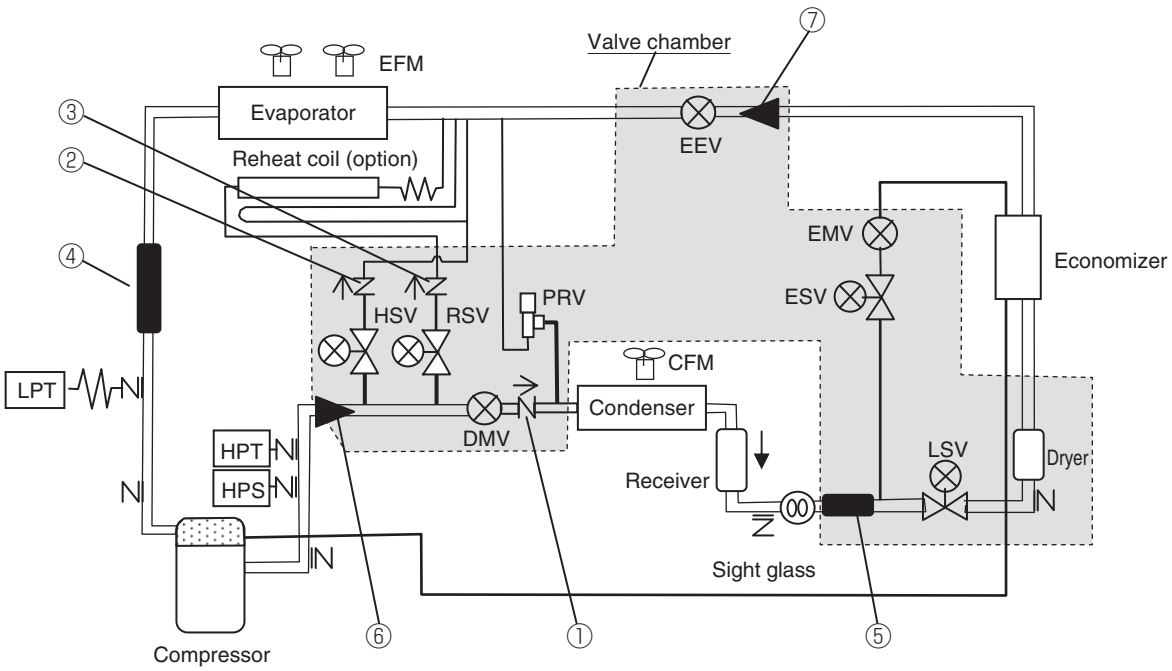
4.8.16 Filter and Strainer

●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

● **Manually change**

Following manually changing are required for emergency operation in the case of controller malfunction.

(1) Wiring change of controller

Change wiring to operate compressor, EFM and CFM.

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 manually.

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

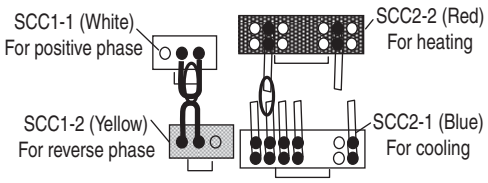
4.9.1 Wiring Change of Controller

Preparation

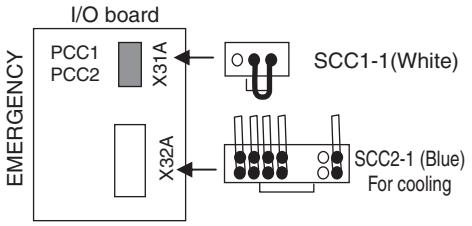
①Turn circuit breaker OFF.

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)



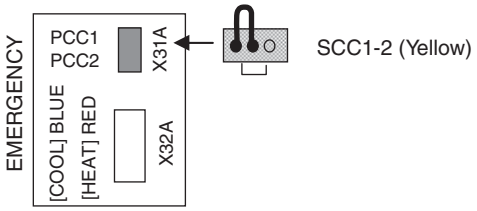
④ Connect SCC1-1（White）to X31A located on I/O board and SCC2-1（Blue）to X32A for <Cooling>.
Check the insertion direction of the connector.



Confirmation of power phase

⑤Turn circuit breaker ON.
If the power supply is in reversed phase, condenser fan turns reverse.

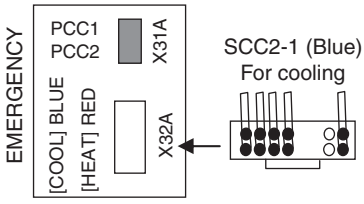
⑥In the case of reversed phase, turn circuit breaker OFF and replace SCC1-1 (White) to SCC1-2 (Yellow).



Forcible operation of Compressor, EFM and CFM

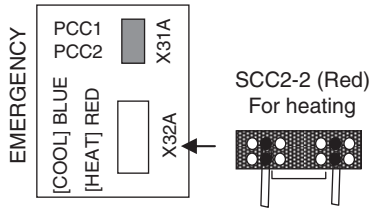
＜Cooling Operation＞

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.



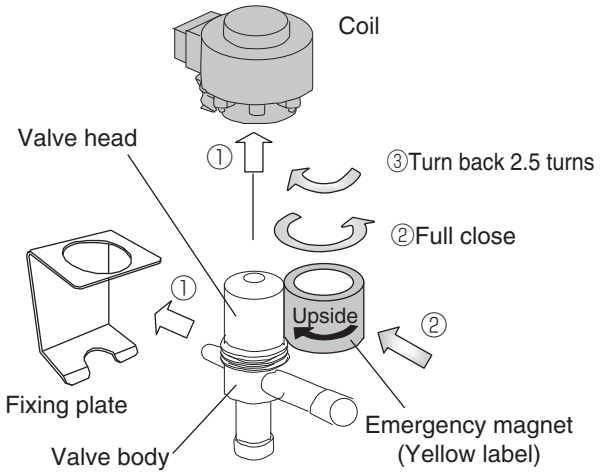
Caution

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 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 fixing plate.



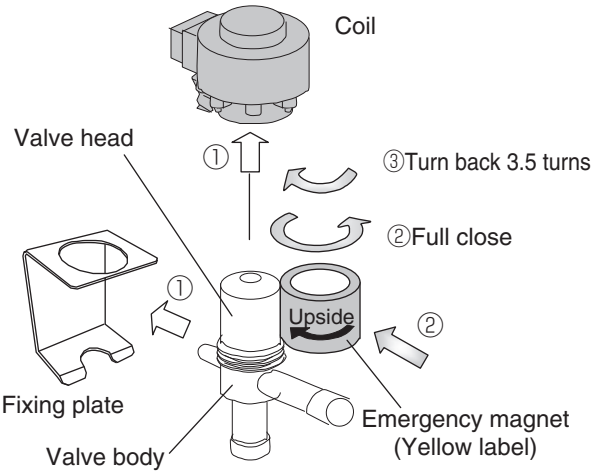
Recommendation !!
To quick pull-down, it is recommended EEV opening to wider slightly.
However, keep watching the operation, and close the valve opening if there is a frost around suction pipe due to the wet operation or the degree of super-heat becomes small.

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

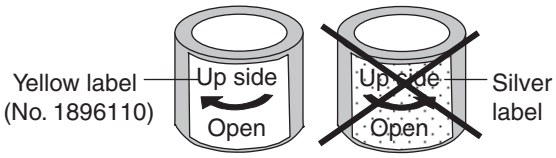
For the emergency operation when controller or EMV coil is malfunctioned, fix EMV opening using emergency magnet.
The fixing of opening is procedure with fully close once and turn back 3.5 turns using emergency magnet.(Approx. 40% opening)
Emergency magnet : Parts No.1896110.

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 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 fixing plate.



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

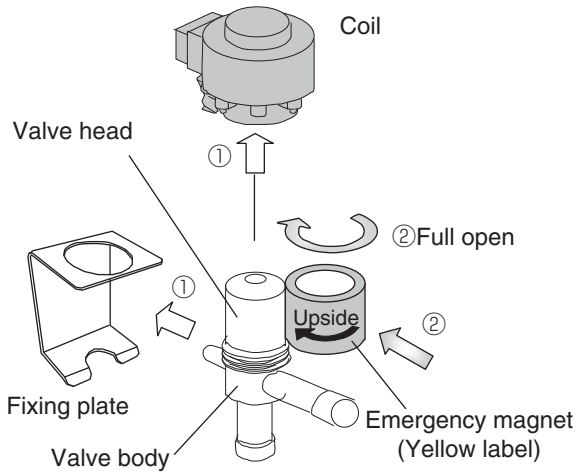
ATTENTION !!
Use emergency magnet with yellow label.



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 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 fixing plate.

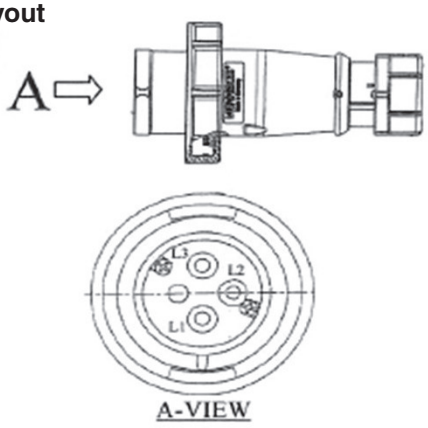


ATTENTION !!
Make sure to reconnect connector X11A (Blue) to the socket on CPU board when the operation returns to normal.

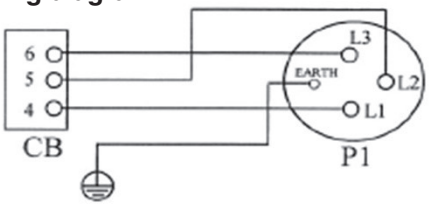
4.10 External Receptacle Wiring Diagrams

4.10.1 Power Plug (P1)

●Layout

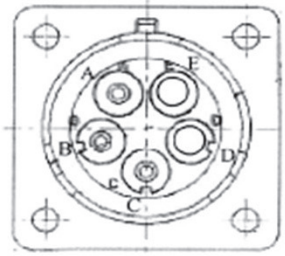


●Wiring diagram

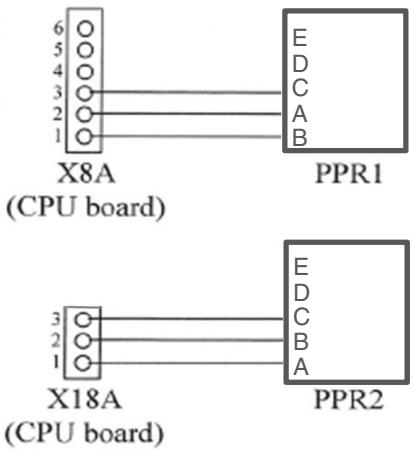


4.10.2 PC Port Receptacle (PPR1, 2)

●Layout (as seen from the front)



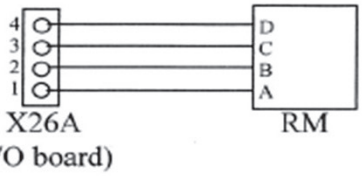
●Wiring diagram



4.10.3 Remote Monitoring Receptacle (RM; option)

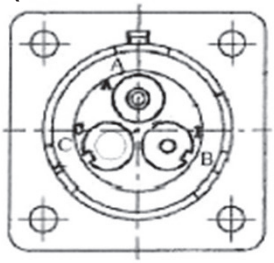
●Layout (as seen from the front)

●Wiring diagram

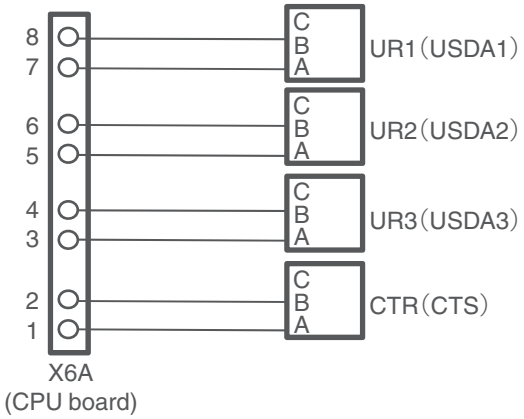


4.10.4 USDA Sensor 1 to 3 Receptacles (USDA 1 to 3; options) Cargo Temperature Sensor Receptacle (CTR; option)

●Layout (as seen from the front)



●Wiring diagram



Chapter 5 Air/Water-Cooled Type (Option)

5.1 Operation Range and Main Specifications

5.1.1 Operation Range

Use this unit within the following ranges.

Item		Operation Range
Ambient temperature range		+50℃～-30℃（+122℉～-22℉）
Inside temperature range		+30℃～-30℃（+86℉～-22℉）
Cooling water	Temperature	+36℃～+10℃（+96.8℉～+50℉）
	Water volume	23～30L/min
	Water pressure	196～490kPa（2～5kg/cm²）
Voltage		50Hz：380 / 400 / 415V 60Hz：440 / 460V Voltage fluctuation rate±10%
Vibration/impact		Horizontal direction: 5G, vertical direction: 2G

5.1.2 Main Specifications

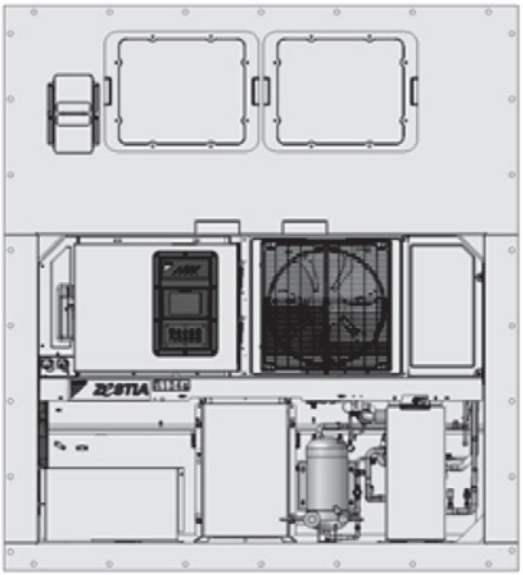
Item		Main Specifications
Mode Switch	Chilled mode	+30.0℃ ～ -9.9℃ (+86.0℉ ～ +14.1℉)
	Frozen mode	-10.0℃ ～ -30.0℃ (+14.0℉ ～ -22.0℉)
Condenser cooling system		Air/Water-Cooled Type
Controller		DECOSVa
Inverter compressor		Hermetically sealed scroll type (Rated motor output 3.75kW, MAX. motor output 8.1kW)
Evaporator		Cross-fin coil type
Air cooling condenser Water-cooled condenser		Cross-fin coil type Shell-and-tube 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 control
Refrigerant		R134a (For refrigerant charging amount, refer to the name plate)
Refrigerant oil		IDEMITSU, Daphne hermetic oil FVC68D
Weight		For detail, refer to the name plate, unit performance

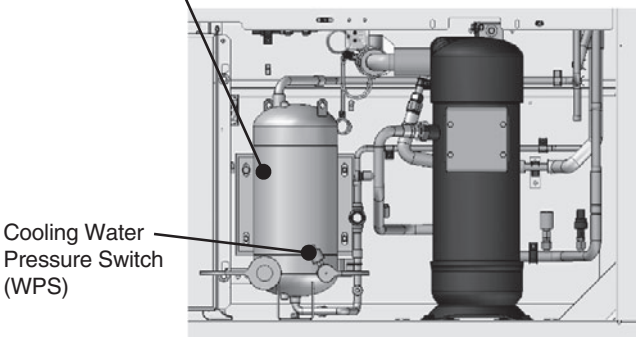
5.2 Protective Device and Setpoints

Component Name	Detector Symbol	Setting Value	Alarm
High pressure switch	HPS	OFF≧2400kPa（24.47kg/cm²） ON≦1900kPa（19.37kg/cm²）	E101 F101
Pressure relief valve	PRV	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 (ELCB)	CB	30A（100mA）	—
Cooling Water Pressure Switch	WPS	OFF≧98kPa（1.0kg/cm²） ON≦39kPa（0.4kg/cm²）	—

5.3 Construction

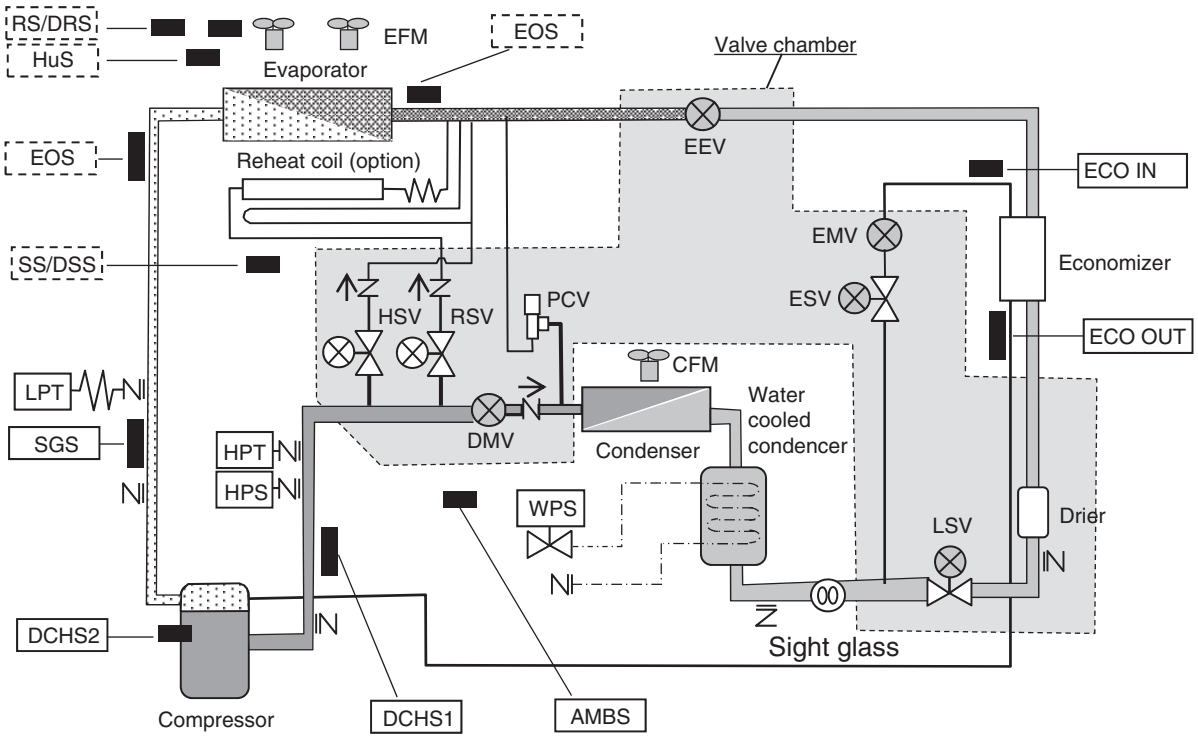
5.3.1 Outside View





The other parts are the same as the air-cooled type.

5.3.2 Piping System Diagram and Sensor Location



5.4 Operation

Follow the procedure shown below to operate the unit.

Cooling water pipe connections

For water-cooled operation, connect and pass water through a pipe.

[Note] Use fresh water for the cooling water.

●Connection procedure

1. Connect the inlet joint (①).
2. Connect the outlet joint (②).

●Removal procedure

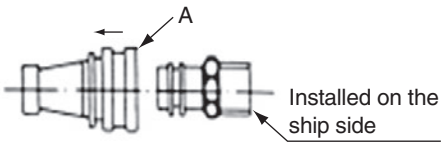
1. Remove the outlet joint (②).
2. Remove the inlet joint (①).

Connect the cooling water joints as shown below.

Connection procedure:

Insert the ship-side joint into the unit-side joint. Push them together until you feel them click.

Exercise caution regarding the splashing of cooling water when connecting and disconnecting the joints.

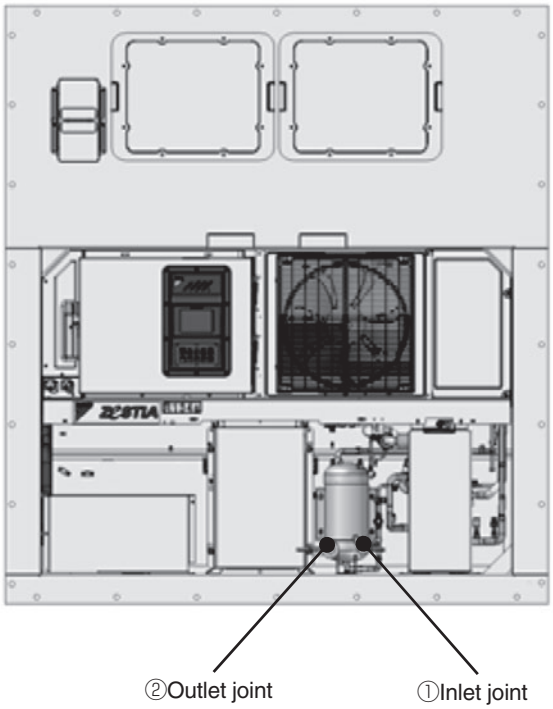


Cooling water outlet-side pipe connection procedure

Removal procedure:

While pressing the female-side joint (A) as indicated by the arrow in the above figure, pull the ship-side joint toward you.

(Note) During water-cooled operation, do not touch the condenser fan with your hands. (The condenser fan starts and stops to cooling the controller box and inverter box.)



5.5 Operation Mode and Control

5.5.1 Water-cooled Operation

The switch to water-cooled operation is performed automatically by cooling water pressure switch.

After connecting to the cooling water pipe, when cooling water flows to the water-cooled condenser, the contact of the cooling water pressure switch installed at the condenser inlet opens, the condenser fan stops, and water-cooled operation is performed.
If the water supply stops during water-cooled operation, the cooling operation is switched to air-cooling.

5.5.2 Condenser Fan Control during Water-cooled Operation

Generally, the condenser fan is stopped during water-cooled operation, but the condenser fan may operate to cool the control box and inverter box.

5.6 Parts Replacement

5.6.1 Cooling Water Pressure Switch (WPS)

●Type LCB-MB10

●Setpoint OFF 98kPa (1.0kg/cm²)
ON 39kPa (0.4kg/cm²)

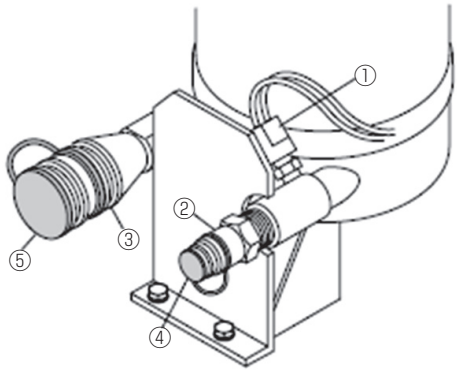
●This is used to switch between air-cooled operation and water-cooled operation. The cooling water flows, and when the inlet water pressure reaches the setpoint, the contact switches OFF, the condenser fan is stopped, and water-cooled operation is performed.

(1) Replacement procedure

①Remove the WPS lead wire from the controller terminal block.

②Stop the cooling water pump, check that no water pressure is being applied, and then remove the WPS.

③Replace the WPS, apply seal tape around the threads, and then tighten the screw.



①Cooling Water Pressure Switch (WPS)
②Cooling water inlet joint
③Cooling water outlet joint
④Inlet joint cap
⑤Outlet joint cap

Chapter 6 APPENDIX

6.1 Standard Tightening Torque for Bolt and Flare Nut

Type	Size	Tightening Torque			Example of Application
		N · m	kgf · cm	lbf · ft	
Bolt	M4	1.6	16.3	1.2	Small parts
	M5	3.0	30.6	2.2	Solenoid valve
	M6	5.2	53.0	3.8	Evaporator fan Stator slide plate Condenser fan grille Valve chamber cover
	M8	12.3	125.4	9.1	Evaporator fan Stator fixing plate Condenser fan motor Control box door Access panel
	M10	25.2	257.0	18.6	
	M12	42.7	435.4	31.5	Compressor Base
	M14 Reverse threaded	67.8	691.4	50.0	Evaporator fan shaft
Flare nut	ϕ6.4, 1/4"	15.7	169.1	11.6	Low-pressure port
	ϕ9.5, 3/8"	36.3	370.2	26.8	
	ϕ12.7, 1/2"	54.9	559.8	40.5	Dryer, Compressor injection port
Compressor connector	(ϕ19.1, 3/4")	122	1244.1	90.0	Compressor suction and discharge

6.2 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

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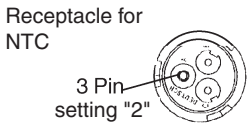
●DCHS Sensor Characteristics DCHS1/DCHS2

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

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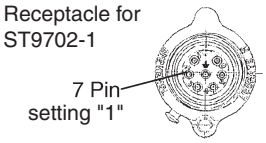
●ST9702-1 type USDA Sensor Characteristics, USDA1, USDA2, USDA3, CTS (Option)

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

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6.3 Pressure Sensor 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

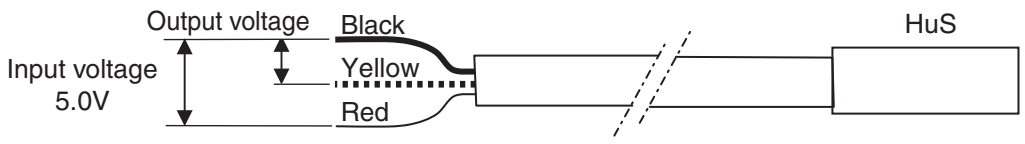
● LPT

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

6.4 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



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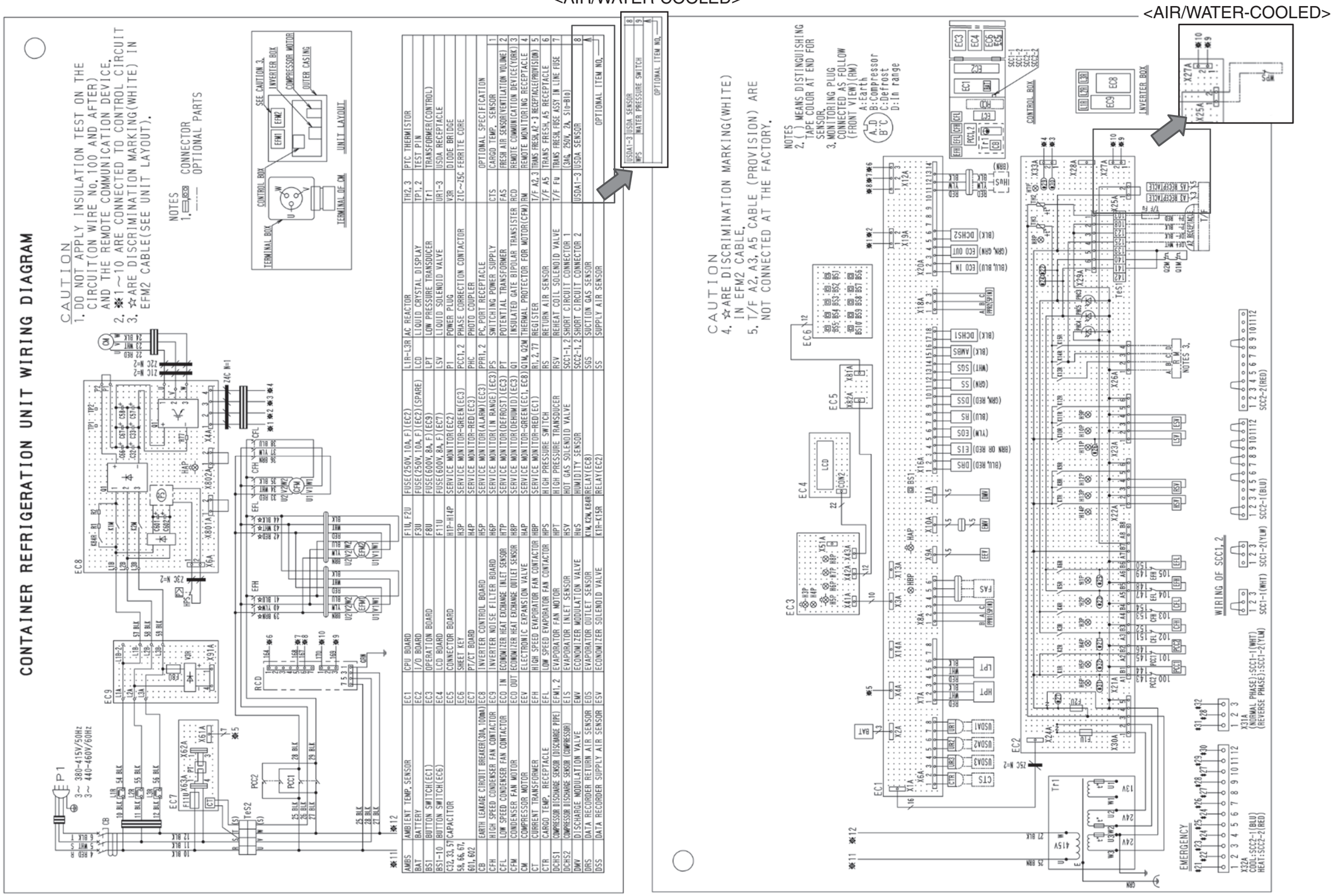
6.5 R134a Characteristics

Temperature		Vapor pressure			Temperature		Vapor pressure		
°C	°F	kPa	kg/cm²·G	PSIG	°C	°F	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

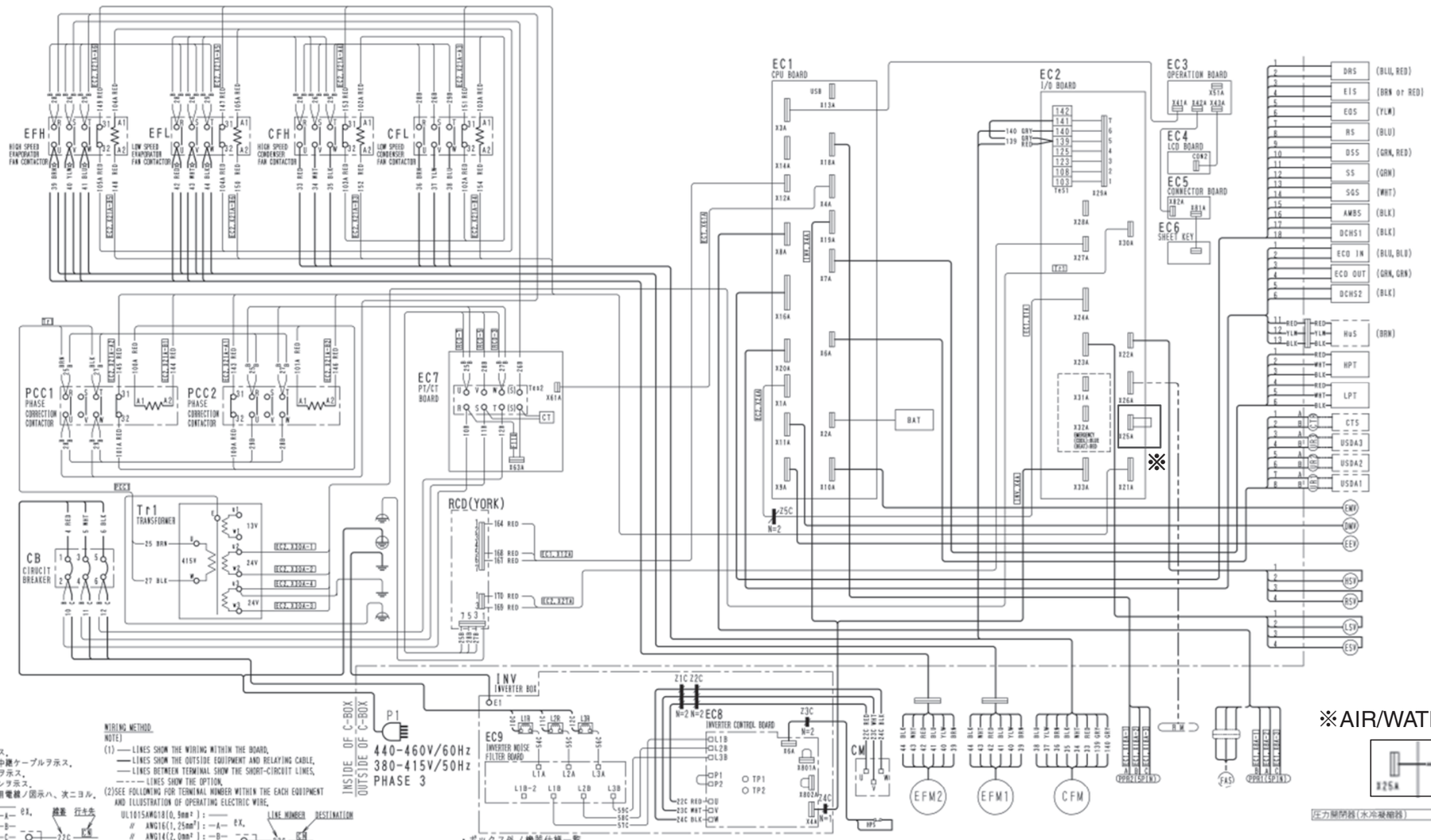
Conversion rate：1kgf/cm² · G=98.0665kPa

1kPa = 0.145PSIG

6.6 Sequence



Stereoscopic wiring diagram



配線要領

注)

(1)――線ハ、盤内配線ヲ示ス。
――線ハ外部機器及ビ、中継ケーブルヲ示ス。
端子間――線ハ、短絡線ヲ示ス。
- - - - 線ハ、オプションヲ示ス。

(2)各機器内ノ端子番号、使用電線ノ図示ハ、次ニヨル。

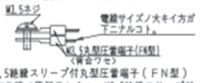
UL1015AWG18(0.9mm²)	――	0X,
〃 AWG16(1.25mm²)	―A―	
〃 AWG14(2.0mm²)	―B―	
〃 AWG12(3.5mm²)	―C―	22C
〃 AWG10(5.5mm²)	―D―	

線番 行キ先 IC6 電線サイズ

(3)配線色
BLK：黒色、BLU：青色、GRY：灰色
BRN：茶色、RED：赤色、YLW：黄色
WHT：白色、GRN：緑色

(4)本図ノ、シーケンス図ハ、表ニヨル。

(5)C，BOX組立要領ニ指示無キ箇所デ
丸端子2ケ共締メノ場合ハ下記ノ様ニスルコト。
又、電線サイズノ異ナル端子2ケヲ共締メノ場合ハ
下記ノ様ニ電線サイズノ大キイ方ヲ下ニスルコト。



(6)M3.5絶縁スリーブ付丸型圧着端子（ＦＮ型）
2本共締メ箇所モシクハ、M3.5絶縁スリーブ付
丸型圧着端子（ＦＮ型）トM4絶縁スリーブ付
丸型圧着端子（ＦＮ型）2本共締メ箇所ハ
トルク11、2～13、8kg・cmデ締メ付ケルコトトスル。
(1、1～1、3N・m)

(7)Tr1ノコイルニ配線ガ接触シナイヨウニスルコト。
(8)強電配線ト弱電配線ハ25mm以上分離スルコト。
(9)指示ナキ箇所ノ機内配線ハ0.6AWG10-2ニヨル。
(10)(　)内ノ色ハ識別色ヲ示ス。
(11)☆部ニオイテEFM2(屋外カラ見テ右ノ電動機)用
ケーブルノミ識別マーキング(白)有リ。

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.

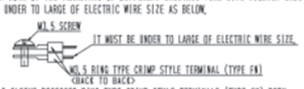
UL1015AWG18(0.9mm²)	——	
〃 AWG16(1.25mm²)	—A—	0X,
〃 AWG14(2.0mm²)	—B—	
〃 AWG12(3.5mm²)	—C—	22C
〃 AWG10(5.5mm²)	—D—	

LINE NUMBER DESTINATION IC6 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 11.2~13.0kgf・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 GAR018-2.

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

(11)☆ARE DISCRIMINATION MARKING(WHITE) IN EFM2 CABLE.

・ボックス外ノ機器仕様一覧

整理NO.	品名	機器仕様	器具番号	整理NO.	品名	機器仕様	器具番号	整理NO.	品名	機器仕様	器具番号
1	温度センサ(外気)		AMBS	14	温度センサ(熱交入口)		EIS	27	電磁弁(レヒートコイルバイパス)		RSV
2	電動機(庫外ファン)		CFM	15	電動弁(エコノマイザ)		EWV	28	温度センサ(サクションガス)		SGS
3	電動機(圧縮機)		CM	16	温度センサ(熱交出口)		EOS	29	温度センサ(吹出)		SS
4	レセプタクル(カーゴ温度)		CTR	17	電磁弁(エコノマイザ)		ESV	30	レセプタクル(USDA)		UR1-3
5	吐出管温度センサ(吐出管)		DCHS1	18	圧力開閉器(高圧)		HPS	31			
6	吐出管温度センサ(圧縮機)		DCHS2	19	圧力センサ(高圧)		HPT	32			
7	電動弁(吐出)		DMV	20	電磁弁(ホットガス)		HSV	33	湿度センサ	オプション部品	HuS
8	温度センサ(吸込データレコーダ)		DRS	21	インバータボックス		INV	34	温度センサ(カーゴ)	オプション部品	CTS
9	温度センサ(吹出データレコーダ)		DSS	22	圧力センサ(低圧)		LPT	35	センサ(換気口位置)	オプション部品	FAS
10	温度センサ(エコノマイザ入口)		ECO IN	23	電磁弁(液)		LSV	36	レセプタクル(リモートモニタリング)	オプション部品	RM
11	温度センサ(エコノマイザ出口)		ECO OUT	24	プラグ		P1	37	センサ(USDA)	オプション部品	USDA1-3
12	電子膨張弁(メイン)		EEV	25	レセプタクル(パソコンポート)		PPR1, 2	38			
13	電動機(庫内ファン)		EFM1, 2	26	温度センサ(吸込)		RS	39			

・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	TEMP.SENSOR(AMBIENT)		AMBS	14	TEMP.SENSOR(EVAPORATOR INLET)		EIS	27	SOLENOID VALVE(REHEAT COIL)		RSV
2	MOTOR(CONDENSER FAN)		CFM	15	MODULATION VALVE(ECONOMIZER)		EWV	28	TEMP.SENSOR(SUCTION GAS)		SGS
3	MOTOR(COMPRESSOR)		CM	16	TEMP.SENSOR(EVAPORATOR OUTLET)		EOS	29	TEMP.SENSOR(SUPPLY AIR)		SS
4	RECEPTACLE(CARGO TEMP.)		CTR	17	SOLENOID VALVE(ECONOMIZER)		ESV	30	RECEPTACLE(USDA)		UR1-3
5	COMPRESSOR DISCHARGE SENSOR (DISCHARGE PIPE)		DCHS1	18	PRESSURE SWITCH(HIGH)		HPS	31			
6	COMPRESSOR DISCHARGE SENSOR (COMPRESSOR)		DCHS2	19	PRESSURE TRANSDUCER(HIGH)		HPT	32			
7	MODULATION VALVE(DISCHARGE)		DMV	20	SOLENOID VALVE(HOT GAS)		HSV	33	HUMIDITY SENSOR	OPTION PARTS	HuS
8	TEMP.SENSOR(DATA RECORDER RETURN AIR)		DRS	21	INVERTER BOX		INV	34	TEMP. SENSOR(CARGO)	OPTION PARTS	CTS
9	TEMP.SENSOR(DATA RECORDER SUPPLY AIR)		DSS	22	PRESSURE TRANSDUCER(LOW)		LPT	35	SENSOR(FA VENTILATOR POSITION)	OPTION PARTS	FAS
10	TEMP.SENSOR(ECONOMIZER HEAT EXCHANGE INLET)		ECO IN	23	SOLENOID VALVE(LIQUID)		LSV	36	RECEPTACLE(REMOTE MONITORING)	OPTION PARTS	RM
11	TEMP.SENSOR(ECONOMIZER HEAT EXCHANGE OUTLET)		ECO OUT	24	POWER PLUG		P1	37	SENSOR(USDA)	OPTION PARTS	USDA1-3
12	ELECTRONIC EXPANSION VALVE (MAIN)		EEV	25	RECEPTACLE(PC PORT)		PPR1, 2	38			
13	MOTOR(EVAPORATOR FAN)		EFM1, 2	26	TEMP.SENSOR(RETURN AIR)		RS	39			

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TR16-02
(2016.01.00100)NK