



DAIKIN
Marine type
Container Refrigeration Unit

Service manual

Model

LXE10C
LXE10C-A
LXE10CA
LXE10CA-A
LXE5C
LXE5C-A

DAIKIN INDUSTRIES, LTD.

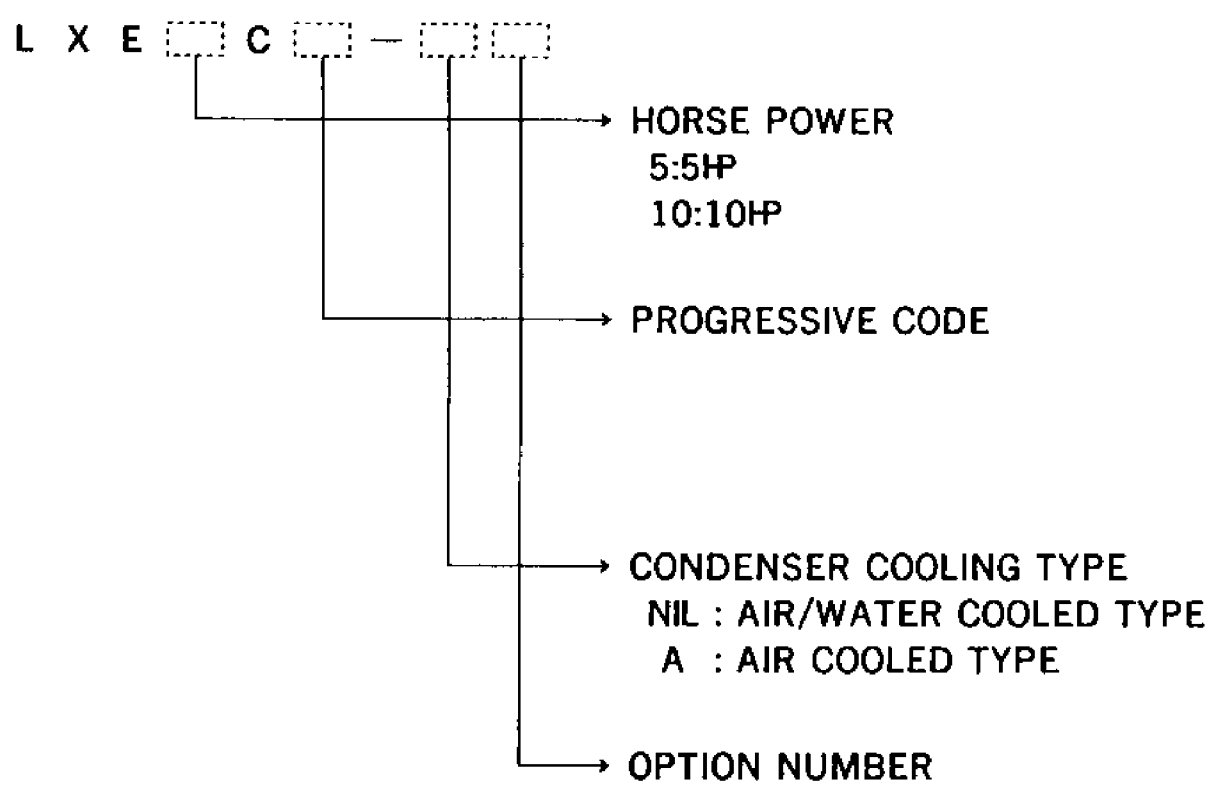
TR94-02B

This manual describes the features, functions, operation, and maintenance of the container refrigeration unit. In addition, the manuals listed below are also available.

- Parts list
- Operation manual of personal computer software
- Compressor dismantling and assembly manual

Please refer also to these manuals.

NOMENCLATURE



NOTE)1. "R" GIVEN AFTER OPTION NUMBER STANDS FOR "REVISE" AND IT IS GIVEN FOR THE UNIT WHICH IS SPECIALLY MODIFIED.

The combination of models and electronic controllers is as follows.

Model name	Controller
LXE5C-1	DECOSIII
LXE5C-XX	DECOSIIIa
LXE10C(-A)	DECOSIII
LXE10CA(-A)	DECOSIIIa

"XX" of model name indicates unit for 20 feet units excepting LXE5C-1.

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Safety Precautions

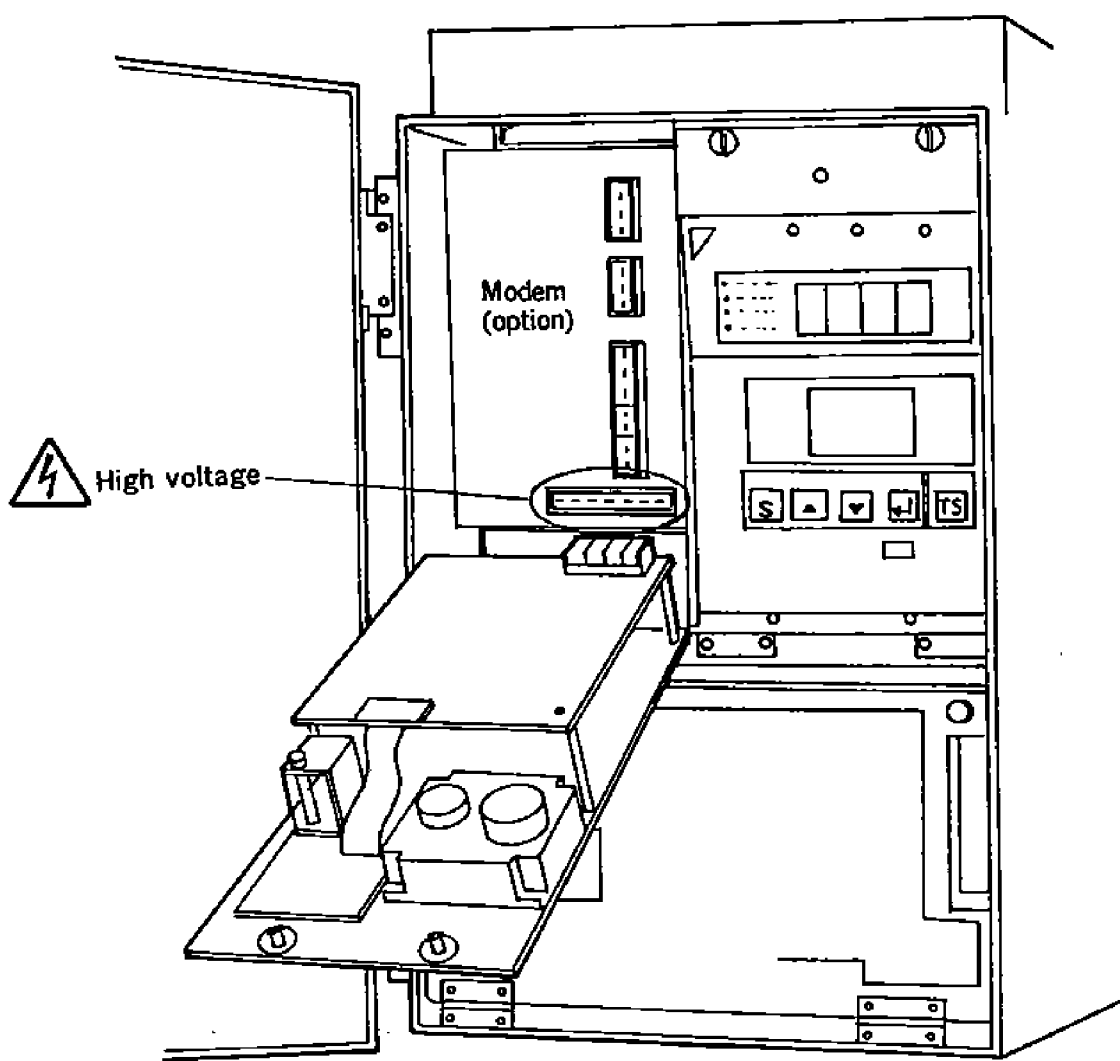
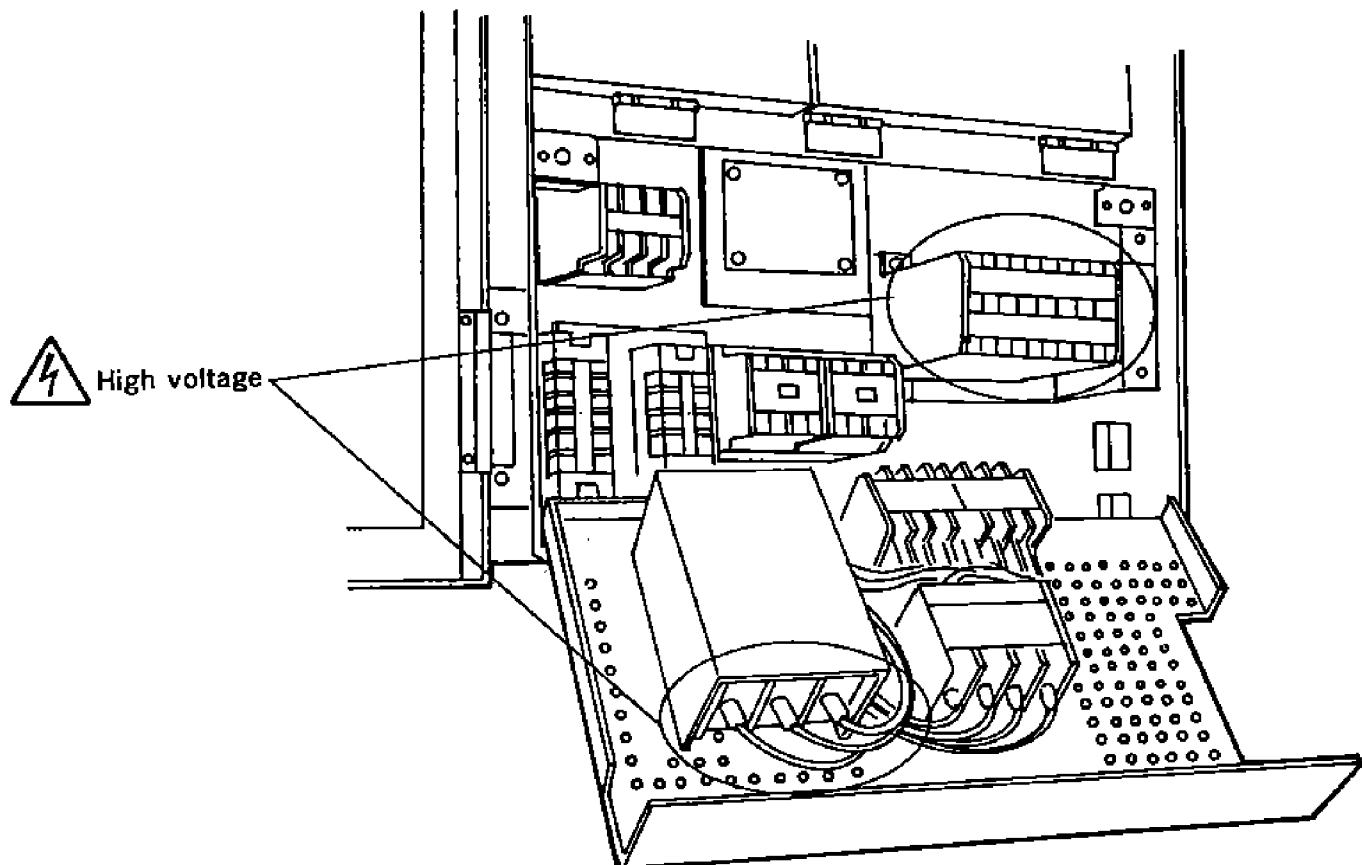
Before operating, inspecting or repairing, observe the following items.

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DANGER

Before disconnecting the power plug, be sure to turn off the power supply. 

Before inspecting the inside of the control box, be sure to turn off the main power supply.
※ Because the high voltage remains applied to the voltage selector, the circuit breaker and the optionally provided modem even though the circuit breaker in the control box is turned off. 



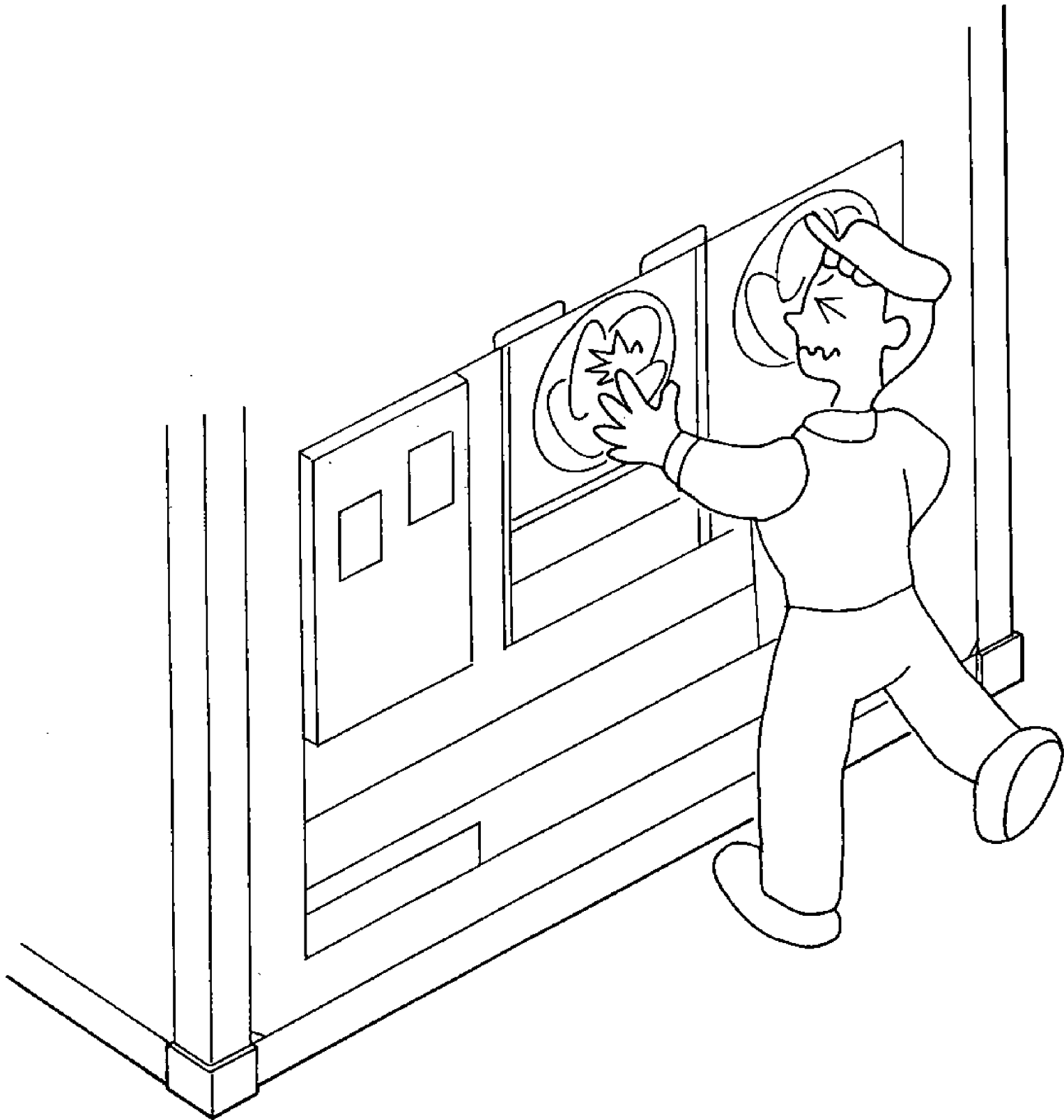
WARNING

Be sure not to touch the condenser fan(s) during electricity being applied.

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



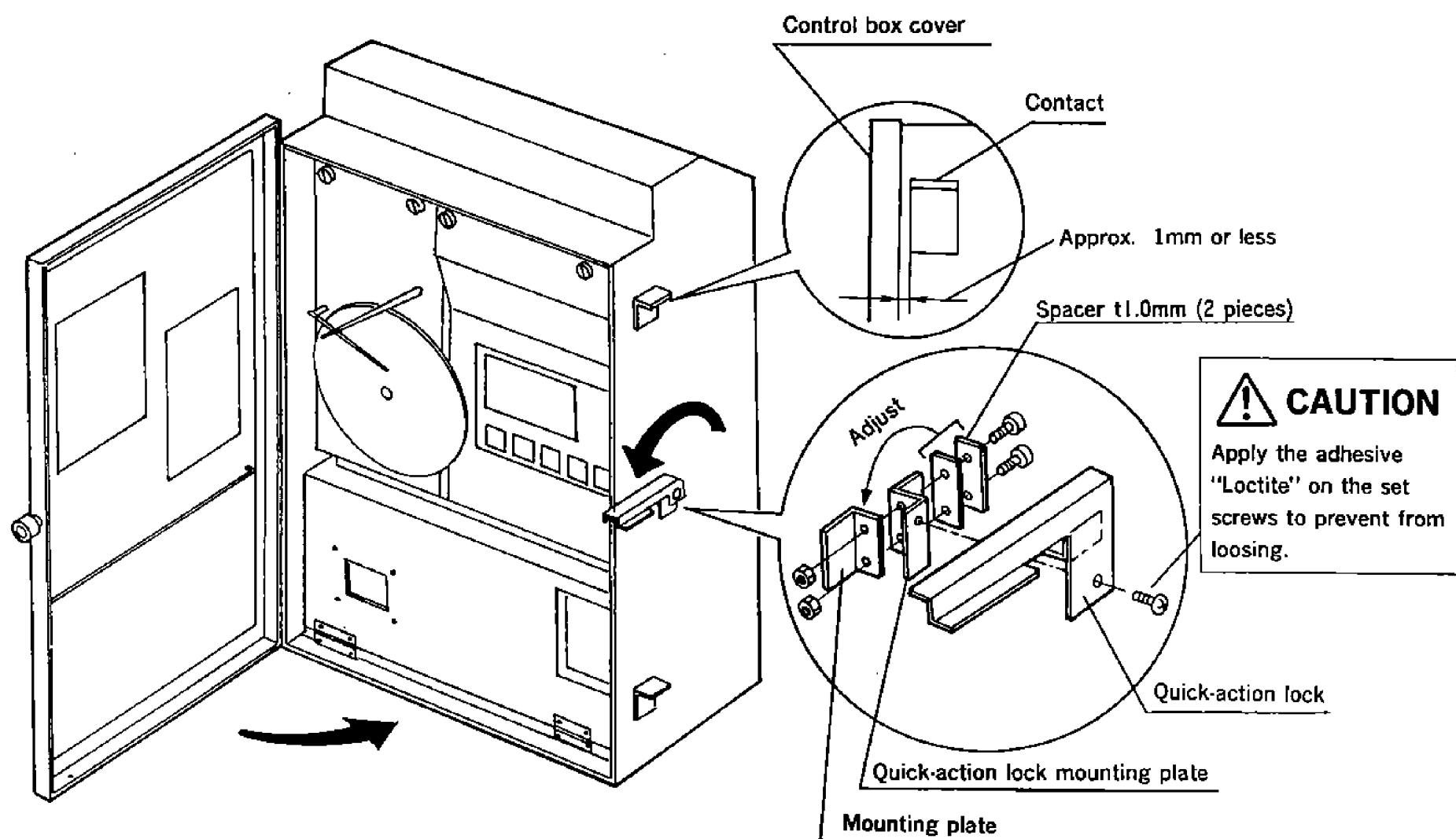
- Air cooled operation : Condenser fan may start/stop automatically for refrigerant high pressure control.
- Water cooled operation : Condenser fan may start/stop automatically for cooling of control box.



CAUTION

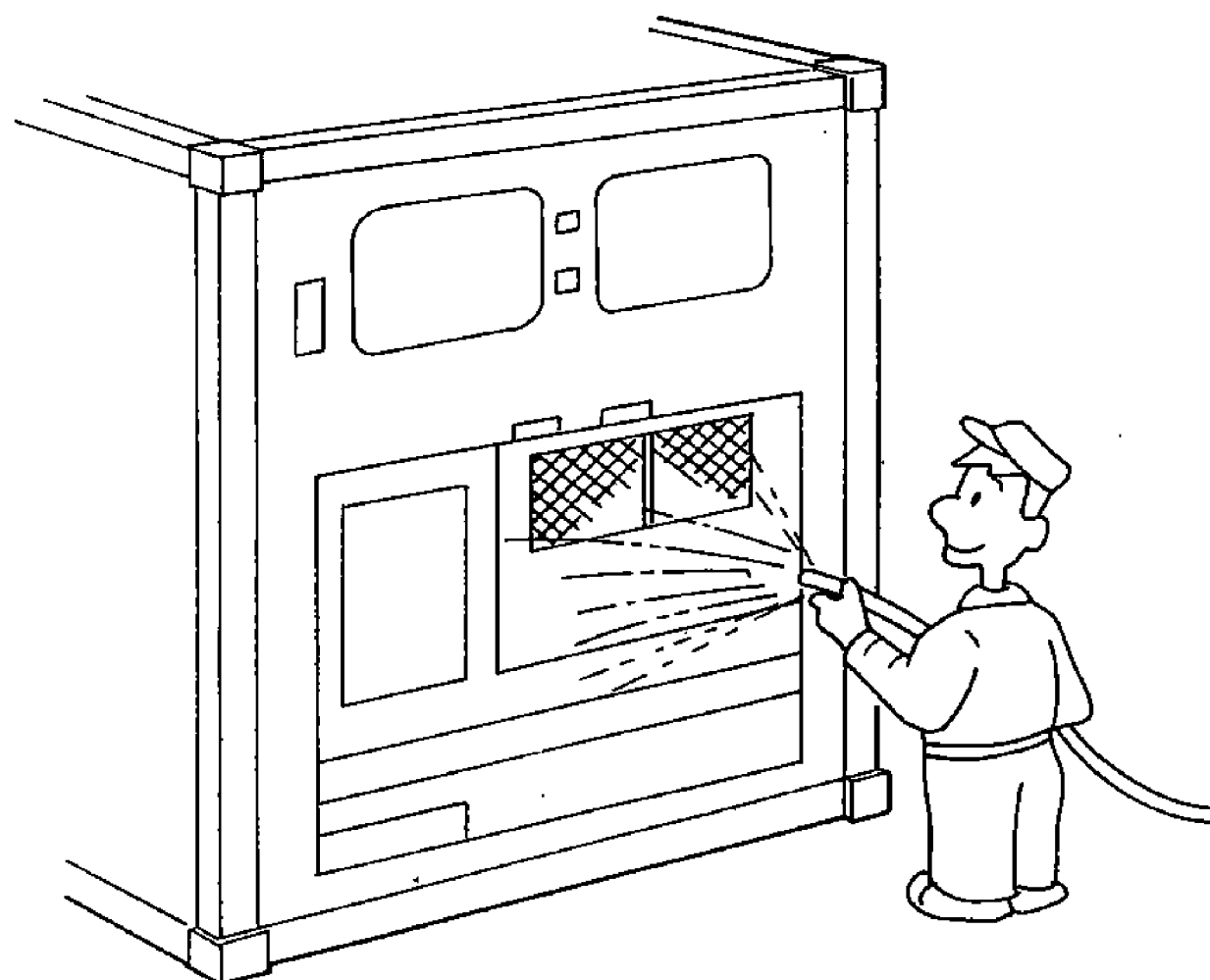
Before starting the unit, be sure to connect the power plug and run the generator.

Securely close the control box cover.
Otherwise, it will cause water ingress.



※Quick-action lock adjustment
If the clearance between the cover and contact is large, adjust the quick-action lock.
→Put the spacer between the quick-action lock mounting plate and the mounting plate (control box).

Be sure to wash the refrigeration unit with fresh water during PTI.
Carefully and specially water-wash the air cooled condenser since much salt sticks to it.

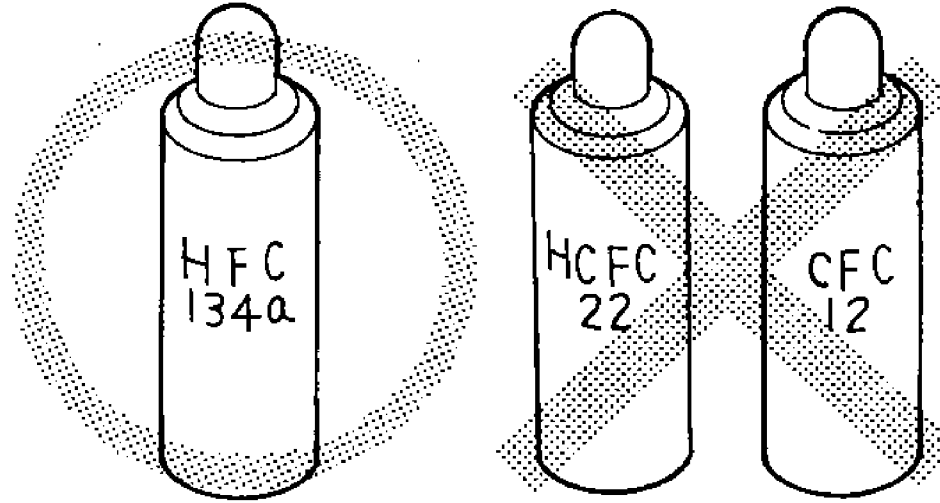


CAUTION

Refrigerant and refrigeration oil

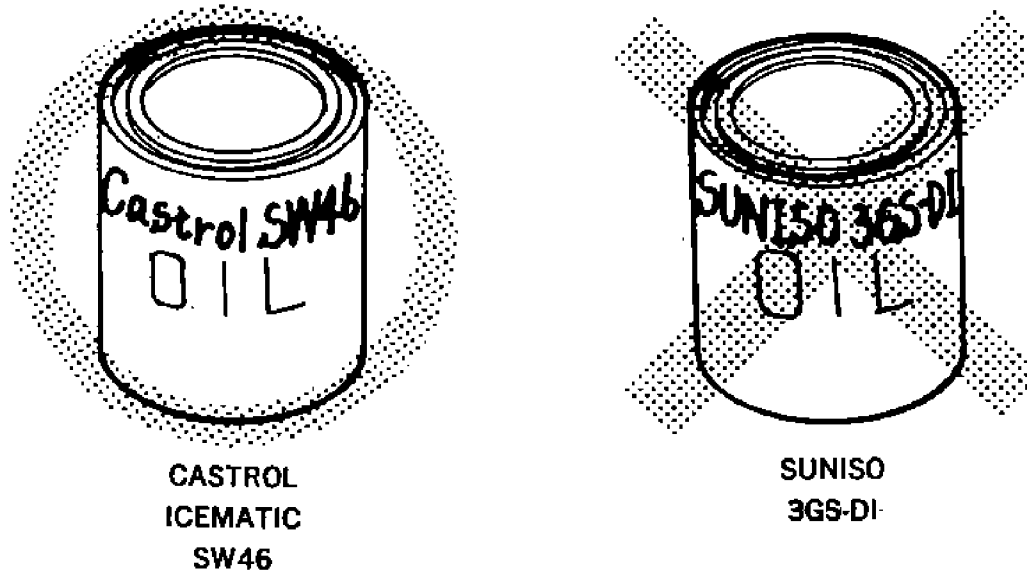
Never attempt to use any other refrigerant (CFC12, HCFC22, etc) except HFC134a on the refrigeration unit.

If any other refrigerant not specified is charged, it may cause the refrigeration unit to go wrong.



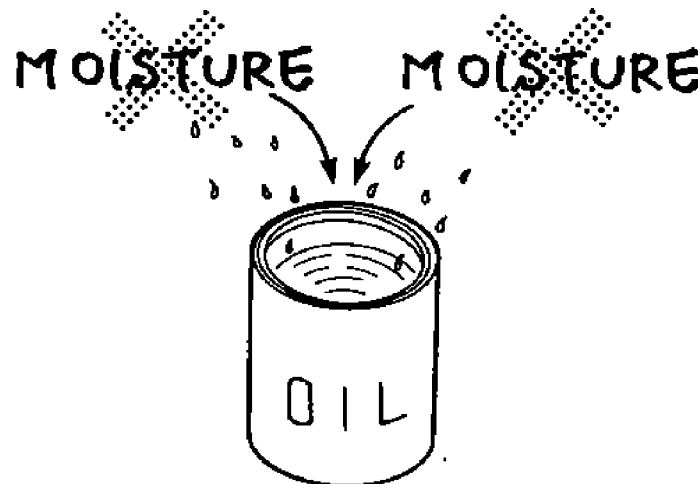
When replacing the refrigeration oil, be sure to use the specified oil (Castrol Icematic SW46).

If any other refrigeration oil not specified is charged, it may cause the refrigeration unit to go wrong.



Just before charging the oil, open the oil can, and use all the oil whose can is opened once. Don't leave the opened can as it is for a long time.

If any refrigeration oil which absorbs much moisture is used, it may cause the refrigeration unit to go wrong.



Be sure to use the exclusive tools for HFC134a. (gauge manifold, charging cylinder, etc) Don't use any tools for CFC12 or HCFC22.

Service ports with quick joints for exclusive use of HFC134a are provided in the refrigeration unit to avoid refrigerant and refrigeration oil of a different kind entering into the refrigeration circuit. (Refer to maintenance and repair 5.2)

The charging hose and service port are not interchangeable with that of previous model (s).

Chapter for Operation

Before operation, be sure to read through this chapter. This chapter describes the minimum knowledge which is necessary to operate the refrigeration unit. For example, this chapter introduces the names of the operational parts, the method to supply electric power, the method to change the set temperature, and other items.

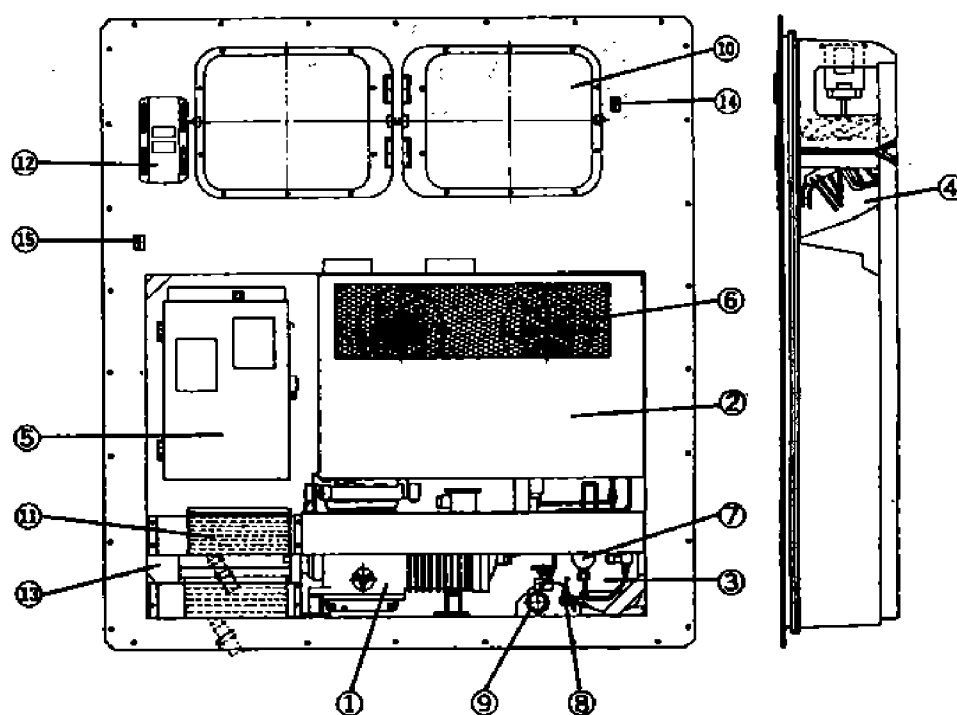
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1. Operation ranges

Use the units within the following ranges.

Item	Operation range	
Ambient temperature range	-30°C ~ +50°C (-22°F ~ +122°F)	
Cooling water (Air/water cooled type)	Quality of water	Fresh water
	Temperature	10°C ~ 36°C (50°F ~ 96.8°F)
	Water flow rate	26 ~ 40 l/min.
	Pressure	196 ~ 490 kPa (2 ~ 5 kg/cm ²)
Inside temperature range	DECOSIII	DECOSIIIa
	-25°C ~ +25°C (-13°F ~ +77°F)	-30°C ~ +25°C (-22°F ~ +77°F)
Voltage	200V class 200V	50Hz, 200V/220V/230V 60Hz
	400V class 380V/400V/415V	50Hz, 440V/460V 60Hz
Voltage fluctuation rate is within ±10%		
Vibration and shock	2G	

2. Names of components (LXE10CA is shown below)



- | | |
|--|--|
| ① Compressor | ⑧ Cooling-water inlet coupling |
| ② Air-cooled condenser | ⑨ Cooling-water outlet coupling |
| ③ Water-cooled condenser (Air/water-cooled type)
Receiver (Air-cooled type) | (For water-cooled operation, connect the water pipings to them.
Water-cooled operation will be automatically selected.) |
| ④ Evaporator | |
| ⑤ Control box | ⑩ Access panel |
| (Outside : Start switch, manual defrost switch,
voltage selector and monitoring receptacle
Inside : Circuit breaker) | ⑪ Storage space for power cable |
| | ⑥ Condenser fan |
| (Water-cooled operation : The left-side fan may be operated to
cool down the control box.) | ⑬ Power transformer |
| | ⑦ Dryer |
| | ⑮ Thermometer check point
(The thermometer is used to measure the internal supply air
temperature and internal CO ₂ concentration.) |

3. Operation

Operate the unit by the following procedure given below.

3.1 Preparation and operation

CAUTION

Confirm that supply power is turned off.
Confirm that the power plug ①, the circuit breaker ②, and the start switch ③ are off.
Otherwise, it will be dangerous during checking.

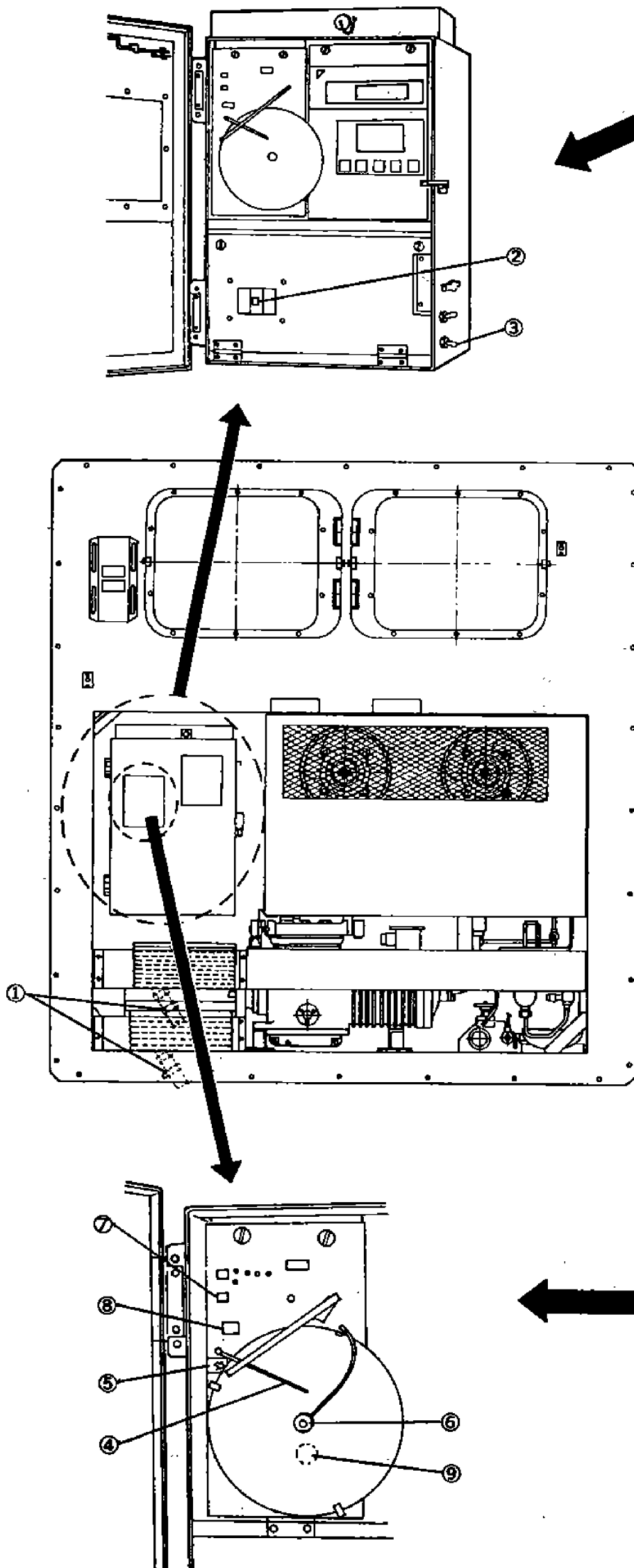
Confirm that the recording chart is driven.
(For LXE10CA(-A), the temperature recorder is optional.)

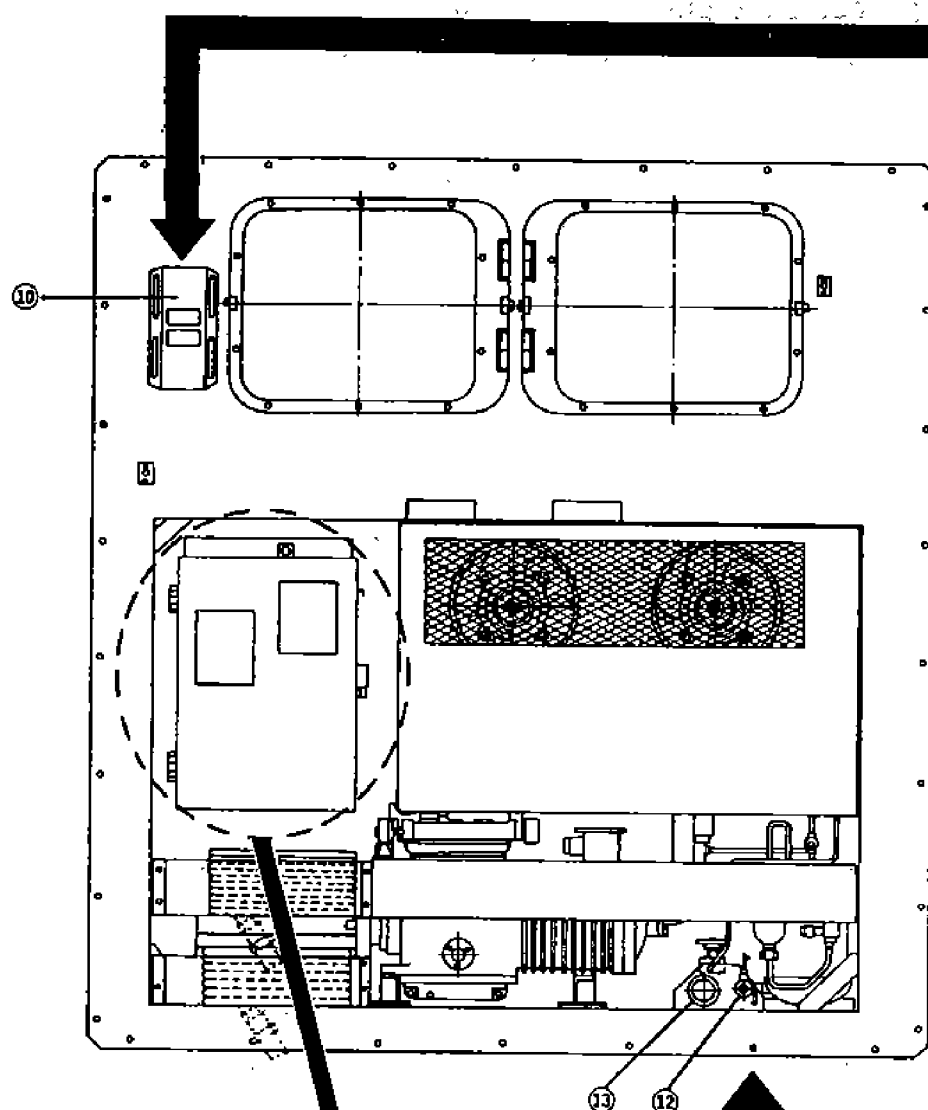
- **Check the life of the dry battery.**
Press the bush button ⑦, and confirm that the needle of the voltage-remaining indicator ⑧ remains in the blue zone. (The meter functions only when the push-button ⑦ is pressed down.)
- **Check the chart drive for running.**
After checking the life of the dry battery, check through the inspection window ⑨ that the inside flywheel is rotating.

Set up the recording chart.

- Raise the pen with the pen holder ④, loosen the chart nut ⑥, and set up a new recording chart.
- Align the date of the recording chart to the arrow of the present time ⑤.
- Firmly tighten up the chart nut ⑥, release the pen, and confirm that recording is possible.

(to be continued)





Operation of the ventilator.

Open or close the ventilator ⑩ according to the cargo. (Be sure to keep it closed during transportation of frozen cargo.)

Connect the cooling-water pipings in case of water cooled operation.

For water-cooled operation, connect the water pipings, and supply water through the pipings.
Note: Use fresh water as the cooling water.

● Connecting method

1. Connect the pipings to the inlet coupling ⑫.
2. Connect the pipings to the outlet coupling ⑬.

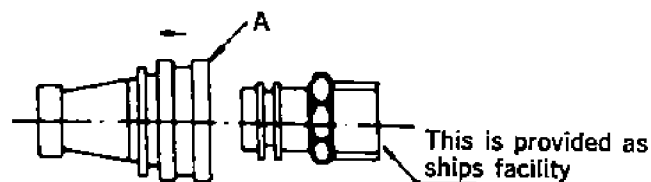
● Disconnecting method

1. Disconnect it from the outlet coupling ⑬.
2. Disconnect it from the inlet coupling ⑫.

Connect the cooling-water coupling as follows.

Connection : Insert the coupling of the ship into the coupling of the unit until "click" is felt by hand.

During connection or disconnection, take care to prevent water from splashing.

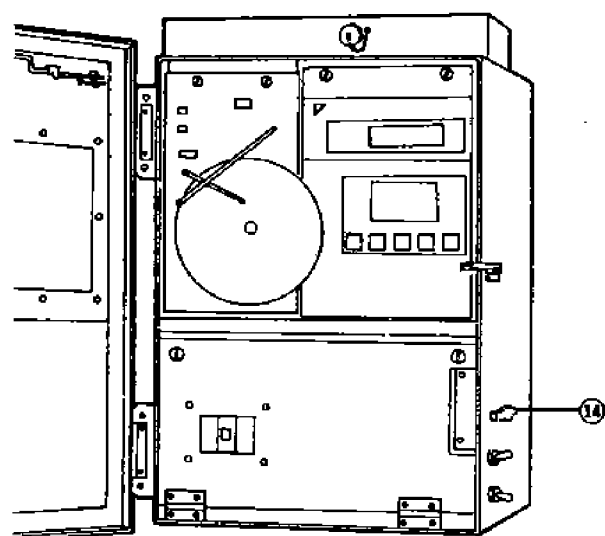


Pipe connecting method on the cooling-water outlet side

Pipe connecting method on the cooling-water outlet side

Disconnection: Keeping the "A" part of the female coupling pressed in the arrow direction as shown above, pull the water piping.

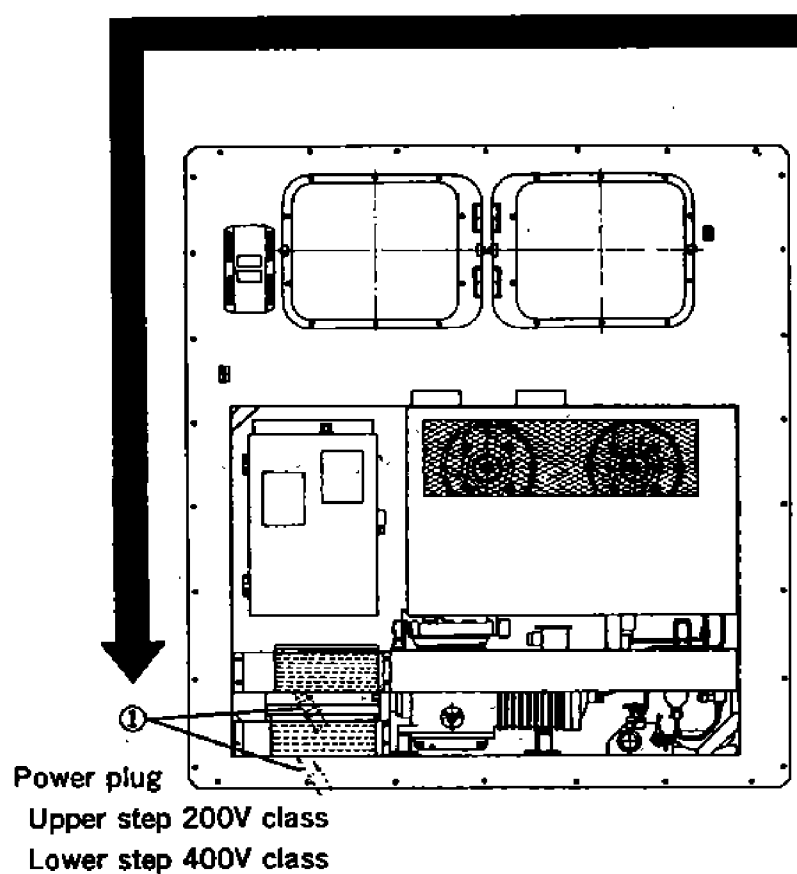
Note: During water-cooled operation, don't touch the condenser fan with hand. (In order to cool down the control box, the condenser fan may start and stop.)



Check that all refrigerant stop valves are opened. (Refer to "piping diagram".)

Set the lever of the voltage selector ⑭ according to the supply voltage.

(to be continued)



↓

Connect the power plug to the power supply. Insert the plug ① which suits to the power source voltage, and fasten the plug firmly.

↓

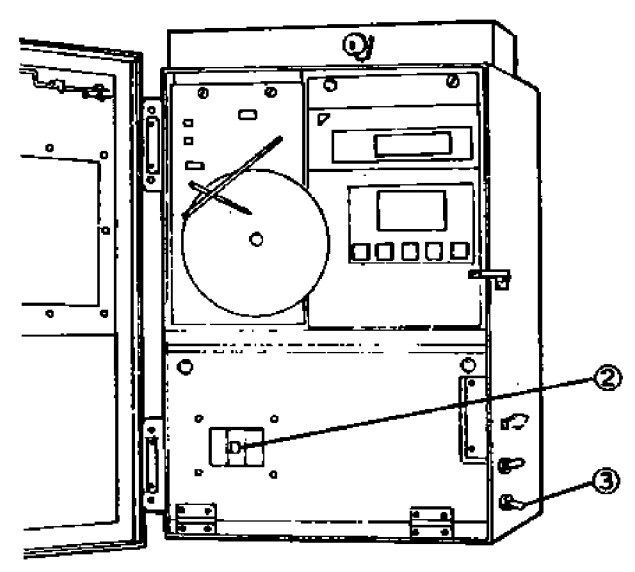
Turn on the power switch of the facility (outside the unit).


↓

Turn on the circuit breaker ② and start switch ③.

↓

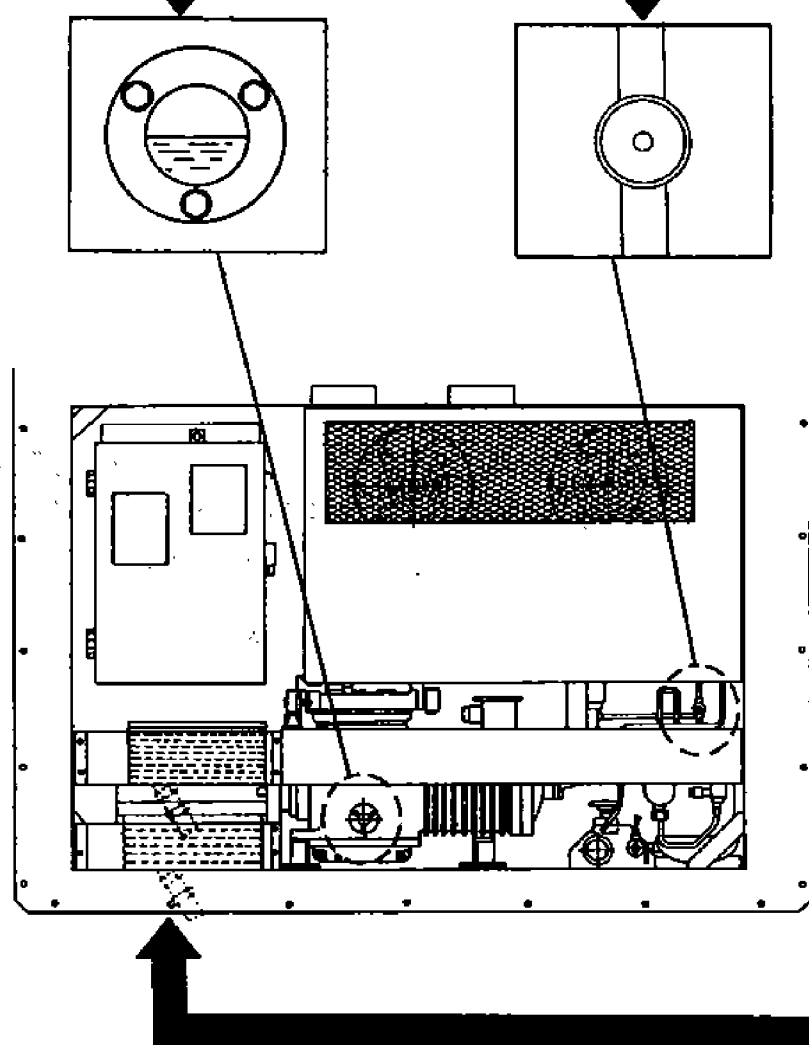
Close the control box cover. If it is poorly closed, it will cause water ingress. Check the contact around the packing, and firmly close the cover. (Refer to Item 2 in "Safety precautions".)



 **CAUTION** Don't apply voltage on the both 200V class power plug and, 400V class power plug at same time. (otherwise, it will fail the detection of reversible phase of power source.)

3.2 Checking during operation

Checking items (precautions)	Method of check
1. Check the compressor, fan, pipes, etc for abnormal noise and vibration.	Visual and auditory
2. Check the compressor oil for abnormal level and deterioration. (Though the oil level may temporarily drop at the start time, it will gradually rise.)	Visual Oil level should be approx. 1/4 to 3/4 of its full scale.
3. Check the refrigerant for shortage. (Though bubbles generate soon after start, it does not mean that the refrigerant is short.)	Visual Many bubbles in the moisture indicator mean refrigerant shortage.
4. Check the refrigerant for moisture inclusion. (If it has been exposed to gaseous refrigerant for a long time, the moisture indicator may turn to yellow, but this is no indication of abnormality.)	Visual The moisture indicator should normally appear green. Yellow color is a sign of abnormality.
5. Check if the temperature recorder operates according to the inside temperature.	Visual
6. Check operating conditions with the pilot lamps.	Visual

**3.3 Maintenance after operation**

Turn off the start switch, and turn off the circuit breaker.



Stow the power cable.
Direct the plug's opening downward to prevent collecting sea water or rain water.

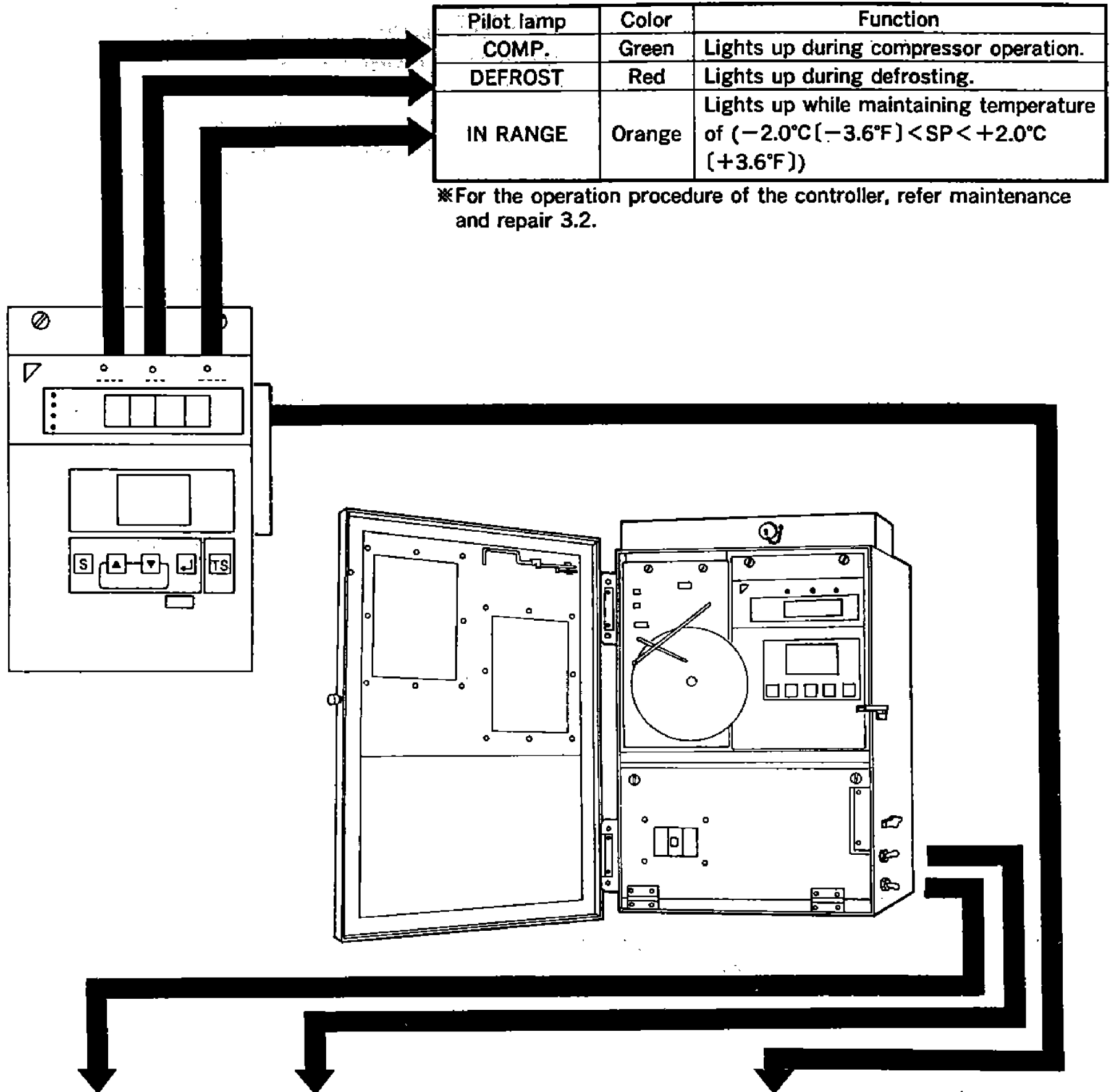


Close the control box cover.



After water-cooled operation, disconnect the water pipe.

3.4 Switches and pilot lamps




Pilot lamp	Color	Function
COMP.	Green	Lights up during compressor operation.
DEFROST	Red	Lights up during defrosting.
IN RANGE	Orange	Lights up while maintaining temperature of $(-2.0^{\circ}\text{C}[-3.6^{\circ}\text{F}] < \text{SP} < +2.0^{\circ}\text{C} [+3.6^{\circ}\text{F}])$

*For the operation procedure of the controller, refer maintenance and repair 3.2.

Switch	Start switch	Defrost				Temperature setting		
		Defrosting		Chilled	Partial frozen	Frozen		
Operation mode	——	Auto	Manual	Chilled	Partial frozen	Frozen		
Operation point	Turn on the switch.	Automatically controlled by timer. S:4Hr L:369,1224Hr	Turn on the switch.	Set the temperature at $+25.0^{\circ}\text{C}$ to -2.9°C ($+77$ to $+26.8^{\circ}\text{F}$).	Set the temperature at -3.0 to -10.0°C ($+26.6$ to $+14^{\circ}\text{F}$).	Set the temperature at -10.1 to -25.0°C ($+13.8$ to -13°F)DECOSIII -10.1 to -30.0°C ($+13.8$ to -22°F)DECOSIIIa		
Function	The unit is run and stopped.	Defrosting with hot gas is run. When defrosting is terminated, cooling operation will automatically start.		Chilled mode operation is run. Inside temperature is controlled in modulation by the supply sensor.	Partial frozen mode operation is run. Inside temperature is controlled in modulation by the return sensor.	Frozen mode operation is run. Inside temperature is controlled in cycling ON/OFF of compressor by the return sensor. Evaporator fan run at the low speed when controlled air temperature is under -10°C .		
				Evaporator fans run at the high speed.				

4. Basic operation procedure of electronic controller

(Refer maintenance and repair 3.2 for details.)

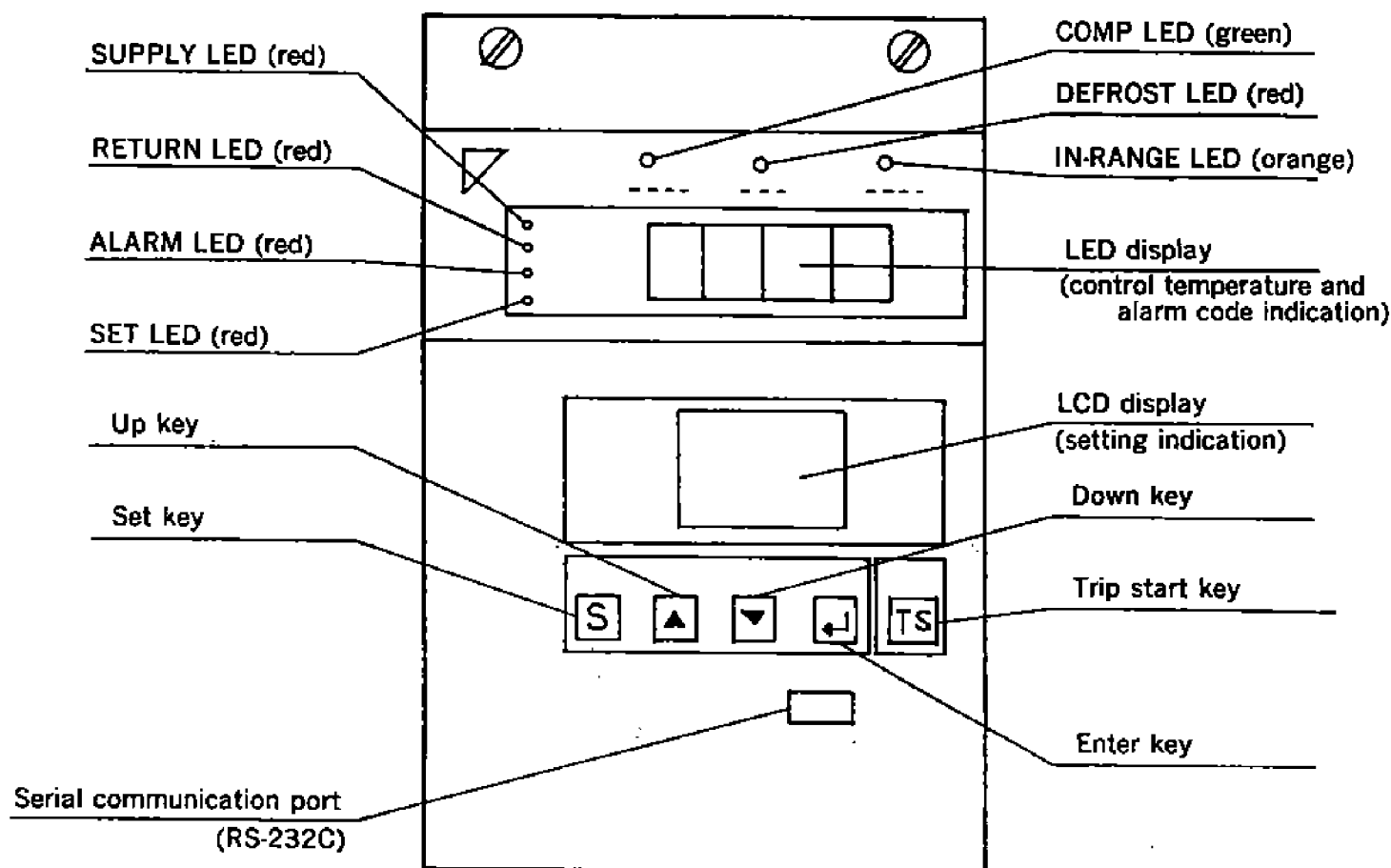


CAUTION The refrigeration unit starts after approx. 21 seconds from turning on of start switch. Because the controller carry out self-diagnosis.

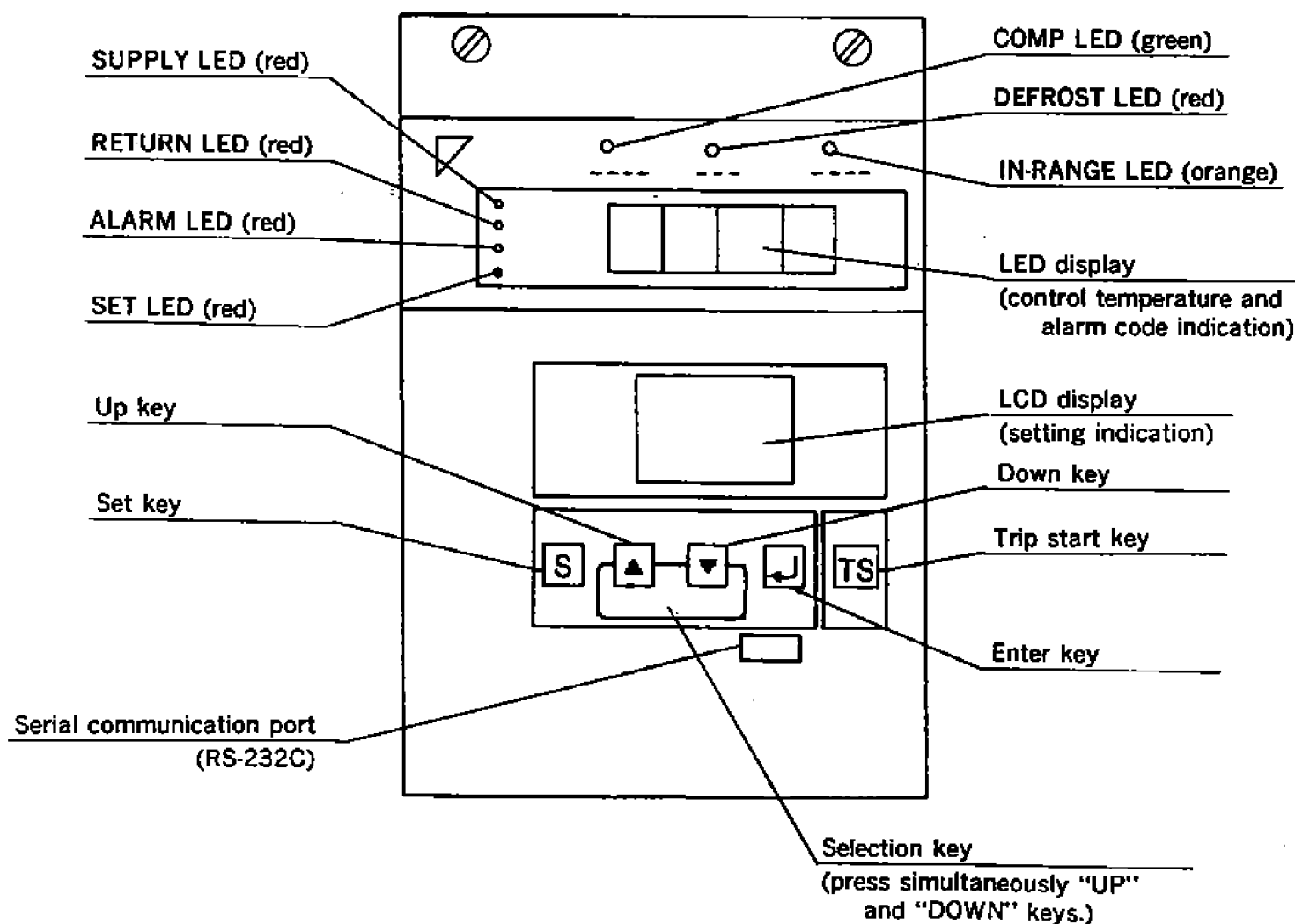
◇ Turn on the power, and the current display mode will be displayed after all indicators lighting up for 3 seconds.

4.1 Indication panel

●DECOSIII



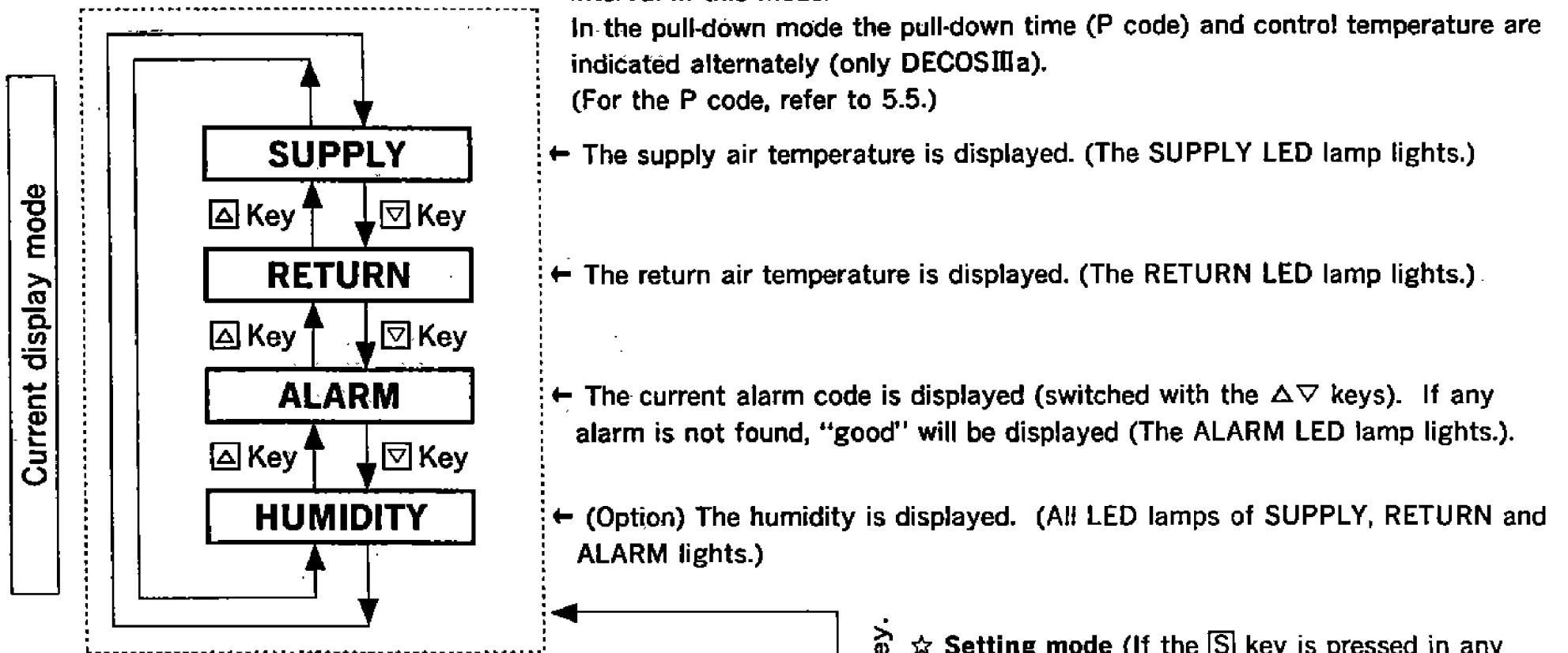
●DECOSIIIa



4.2 Panel operation (for DECOSIII/DECOSIIIa)

☆ **Current display mode** (Note: LCD displays the set temperature and defrosting interval in this mode.)

In the pull-down mode the pull-down time (P code) and control temperature are indicated alternately (only DECOSIIIa). (For the P code, refer to 5.5.)

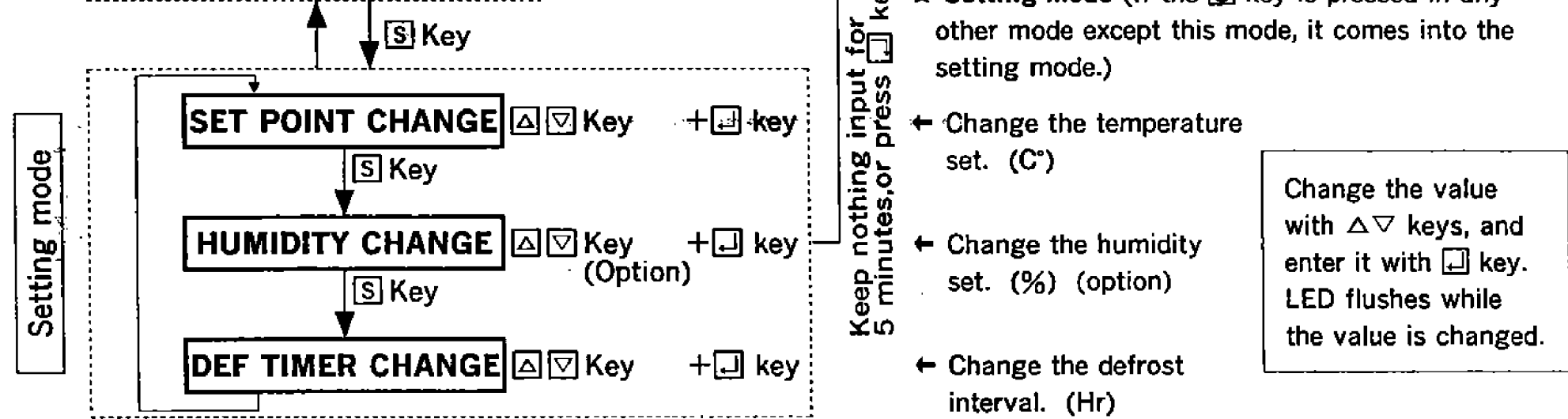


← The supply air temperature is displayed. (The SUPPLY LED lamp lights.)

← The return air temperature is displayed. (The RETURN LED lamp lights.)

← The current alarm code is displayed (switched with the Δ / ∇ keys). If any alarm is not found, "good" will be displayed (The ALARM LED lamp lights.).

← (Option) The humidity is displayed. (All LED lamps of SUPPLY, RETURN and ALARM lights.)



☆ **Setting mode** (If the \square key is pressed in any other mode except this mode, it comes into the setting mode.)

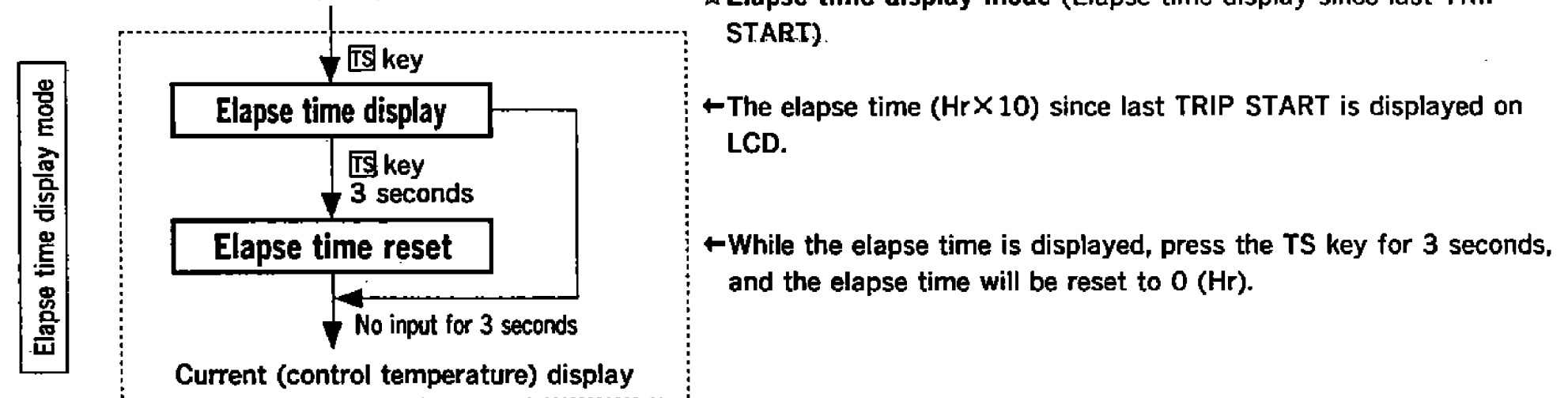
← Change the temperature set. (C°)

← Change the humidity set. (%) (option)

← Change the defrost interval. (Hr)

Change the value with Δ / ∇ keys, and enter it with \square key. LED flashes while the value is changed.

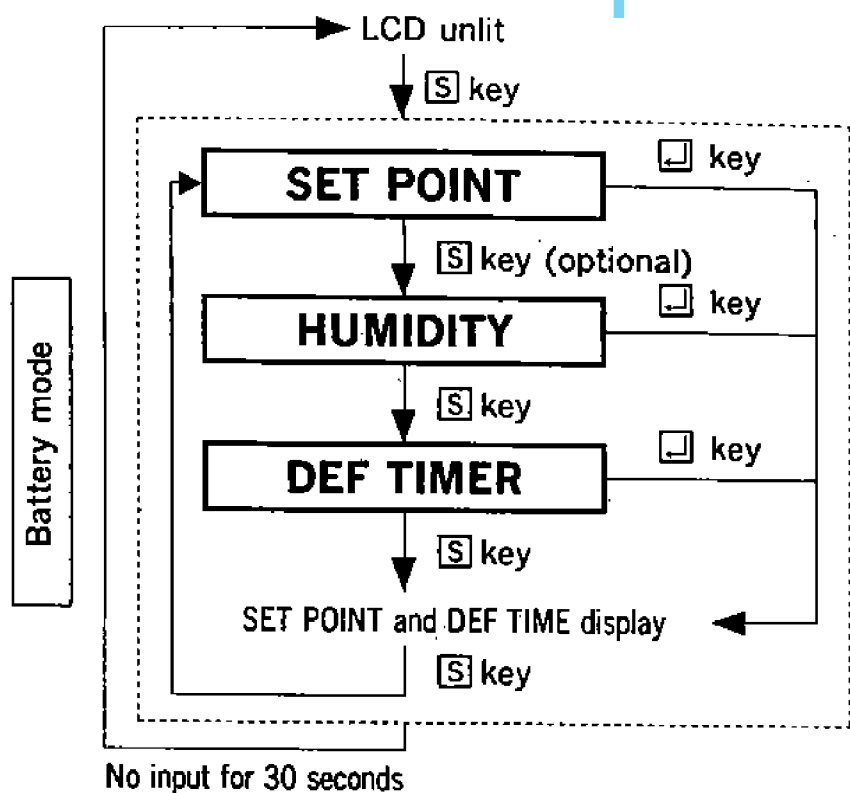
All states (except inspection mode)



☆ **Elapse time display mode** (Elapse time display since last TRIP START).

← The elapse time (Hr \times 10) since last TRIP START is displayed on LCD.

← While the elapse time is displayed, press the TS key for 3 seconds, and the elapse time will be reset to 0 (Hr).



☆Battery mode (Commercial power is shut off.)

◇It is possible to change the following set due to the power of backup battery even if no commercial power is connected.

- ←The set point of temperature is changed.
- ←The humidity set is changed (optional).
- ←The defrost interval is changed.

Change the setting with and keys, and enter it with key. During changing, LCD blinks.

CAUTION If the ambient temperature is -20°C or lower, the battery mode will sometimes not activate since the performance of the back-up battery drops. Since this is not a trouble, connect the commercial power supply for setting.

CAUTION Be sure to initialize after replacing the controller. (For the initializing method, refer to "Service", 6.3.2.)

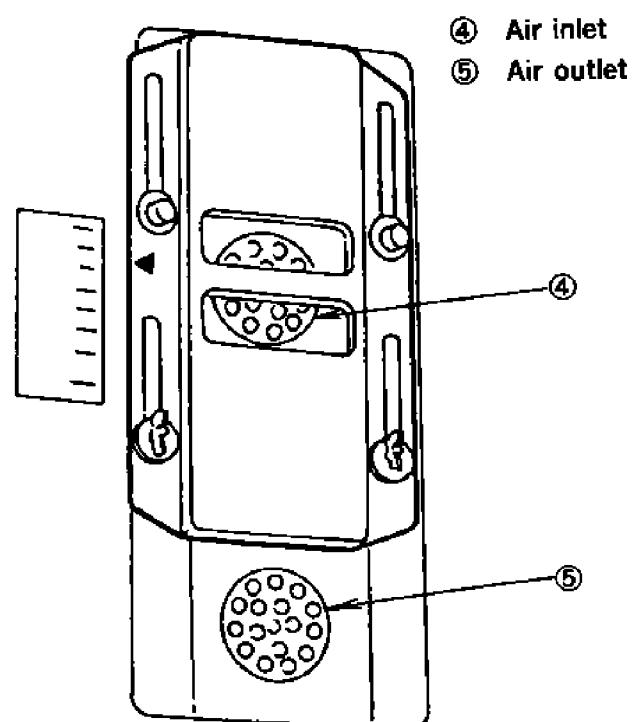
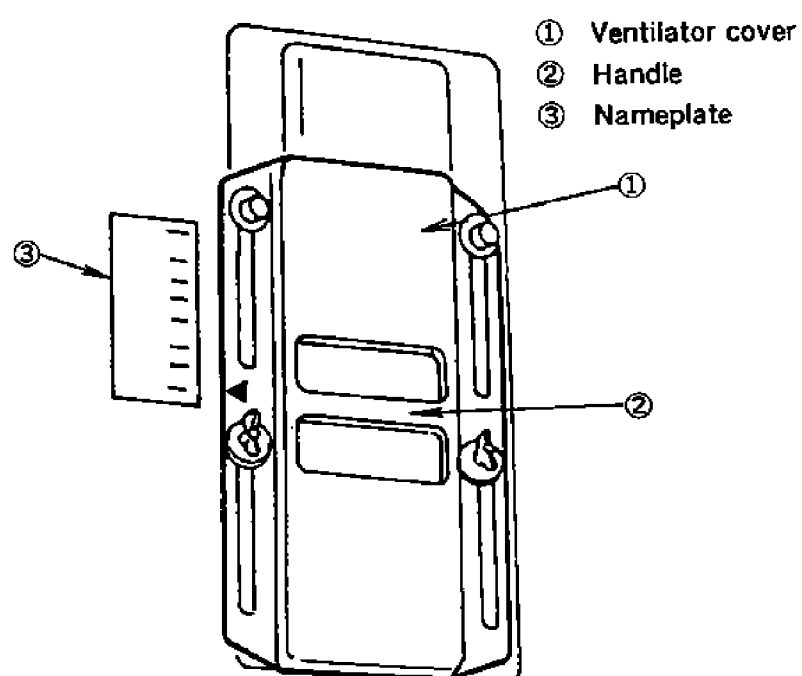
5. Ventilator

Handling method

- 1) Unnecessary ventilation (Frozen mode)
Set the handle to "CLOSE".

- 2) Necessary ventilation (chilled mode)
Slide the handle upward.

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



CAUTION

Be sure to keep the ventilator closed during transportation of the frozen cargo.

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Chapter for maintenance and repair

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1. Data of refrigeration unit

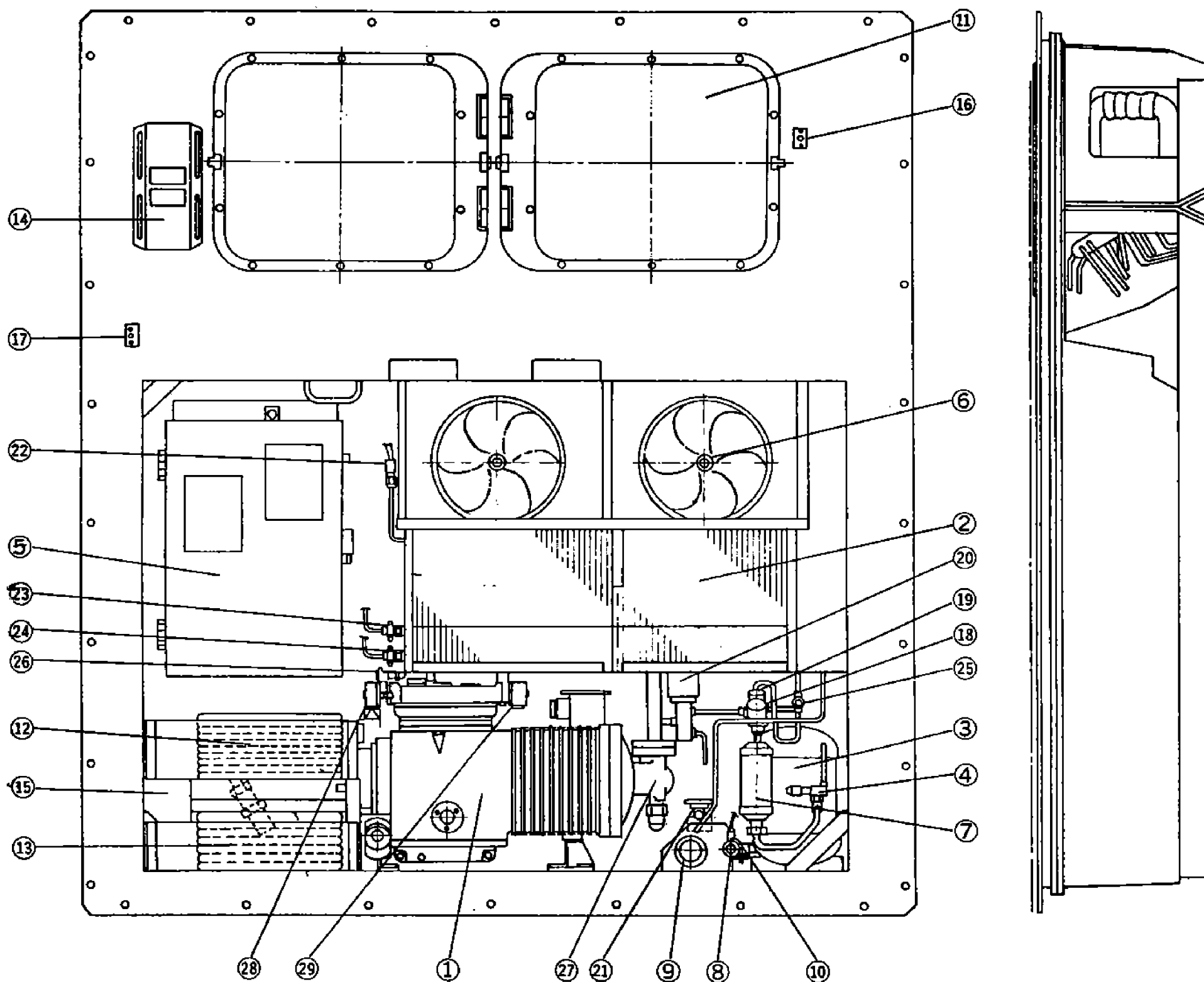
1.1 Main specifications

Item	Model	LXE10C LXE10CA	LXE10C-A LXE10CA-A	LXE5C	LXE5C-A
		Air-cooled type		Air-cooled type	
Condenser cooling system		Air/water-cooled type	Air-cooled type	Air/water-cooled type	Air-cooled type
Controller		LXE10C, LXE10C-A, LXE5C-1.....DECOSIII LXE10CA, LXE10CA-A, LXE5C-XX.....DECOSIIIa			
Power supply		AC 3-phase 200V 50Hz, 380V 400V 415V 50Hz 200V, 220V, 230V 60Hz, 440V 460V 60Hz (Dual voltage system with voltage selector)			
Compressor		Semi-hermetic type (Output: 5.5kW)		Semi-hermetic type (Output: 3.75kW)	
Evaporator		Cross-finned coil type			
Air-cooled condenser		Cross-finned coil type			
Water-cooled condenser		Shell and coil type	Receiver	Shell and coil type	Receiver
Fan		Propeller type directly driven by motor			
Fan motor		Three-phase squirrel-cage induction motor			
Defrosting	System	Hot-gas defrost system			
	Initiation	Timer or manual switch			
	Termination	Piping temperature of the evaporator outlet detected by a thermister.			
Refrigerant control		Thermostatic expansion valve			
Capacity control		Hot gas bypass control with modulating control valve Compressor cylinder unloader		Hot gas bypass control with modulating control valve	
Protective safe devices		Circuit breaker, PT/CT board (for over current protection). compressor thermal protector, fan-motor thermal protector, high-pressure switch, fusible safety plug, fuse (10A) × 5			
Refrigerant (charged amount)		R134a: 5.0(kg)/11.0(lbs)		R134a: 4.0(kg)/8.8(lbs)	
Refrigeration oil (charged amount)		CASTROL ICEMATIC SW46: 4.0(ℓ)		CASTROL ICEMATIC SW46: 2.3(ℓ)	
Unit weight		Approx. 650(kg)/1433(lbs)		Approx. 580(kg)/1278(lbs)	

1.2 Names of components

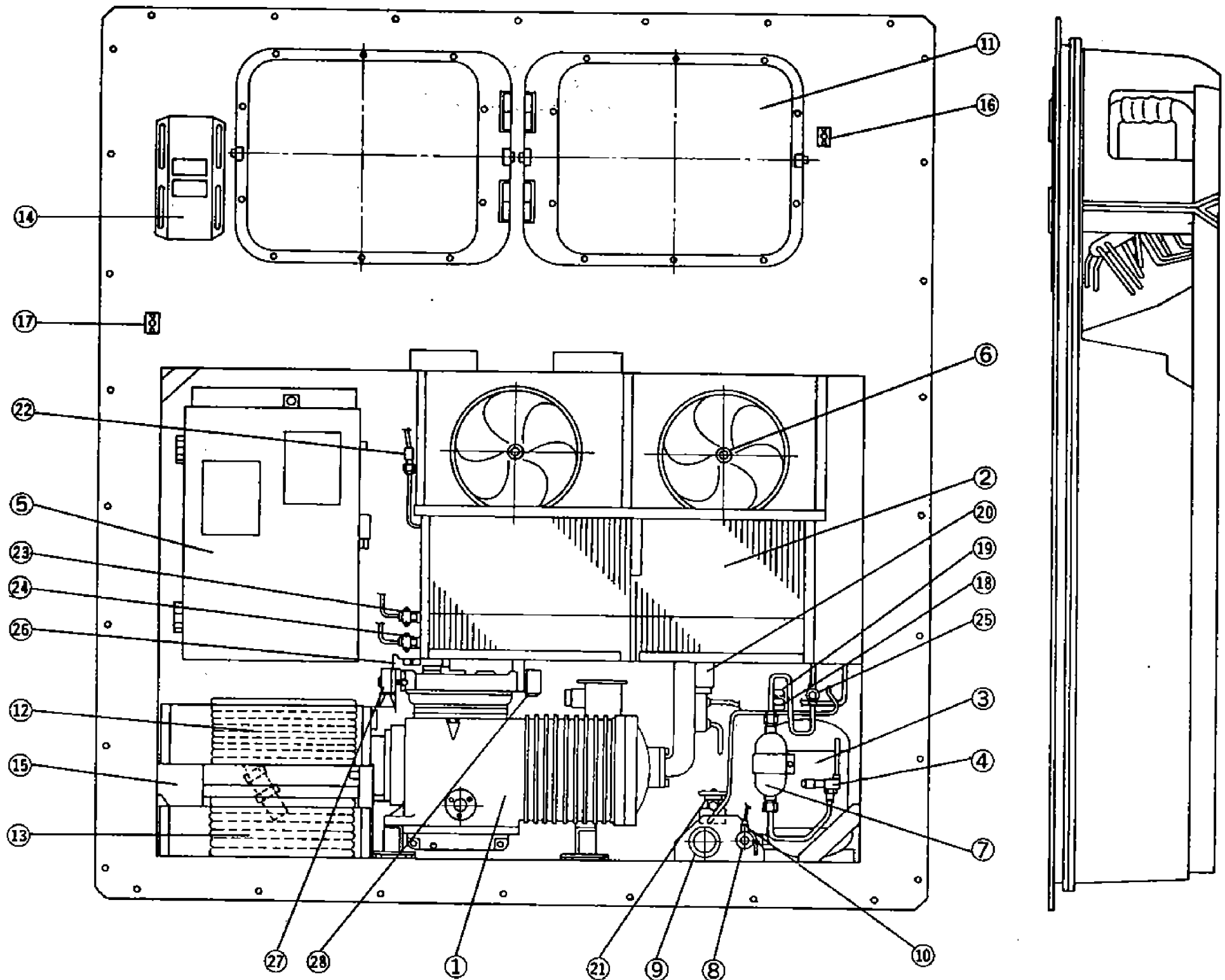
1.2.1 Outside (LXE10C/5C is shown below)

●LXE10C/5C



- | | | |
|--|--|--|
| ① Compressor | ⑩ Water pressure switch | ⑩ Water pressure switch |
| ② Air-cooled condenser | ⑪ Access panel | ⑪ Access panel |
| ③ Water-cooled condenser (air/water-cooled type)
Receiver (air-cooled type) | ⑫ Storage space for power cable (200V class) | ⑫ Storage space for power cable (200V class) |
| ④ Outlet stop valve, water-cooled condenser (receiver) | ⑬ Storage space for power cable (400V class) | ⑬ Storage space for power cable (400V class) |
| ⑤ Control box | ⑭ Ventilator | ⑭ Ventilator |
| ⑥ Condenser fan motor | ⑮ Power transformer | ⑮ Power transformer |
| ⑦ Dryer | ⑯ Unload solenoid valve 1 (USV1) | ⑯ Unload solenoid valve 1 (USV1) |
| ⑧ Cooling water inlet coupling | ⑰ Unload solenoid valve 2 (USV2) | ⑰ Unload solenoid valve 2 (USV2) |
| ⑨ Cooling water outlet coupling } Air/water-cooled type | | |
| ①⑥ Thermometer check point | | |
| ①⑦ Thermometer check point | | |
| ①⑧ Liquid solenoid valve (LSV) | | |
| ①⑨ Injection solenoid valve (ISV) | | |
| ②① Modulating control valve (MV) | | |
| ②② Expansion valve | | |
| ②③ High pressure switch (HPS) | | |
| ②④ High pressure sensor (HPT) | | |
| ②⑤ Low pressure sensor (LPT) | | |
| ②⑥ Liquid/moisture transducer | | |
| ②⑦ Delivery stop valve | | |
| ②⑧ Suction stop valve | | |
- Note: Unload solenoid valves ②⑧ and ②⑨ are not provided in LXE5C(-A).

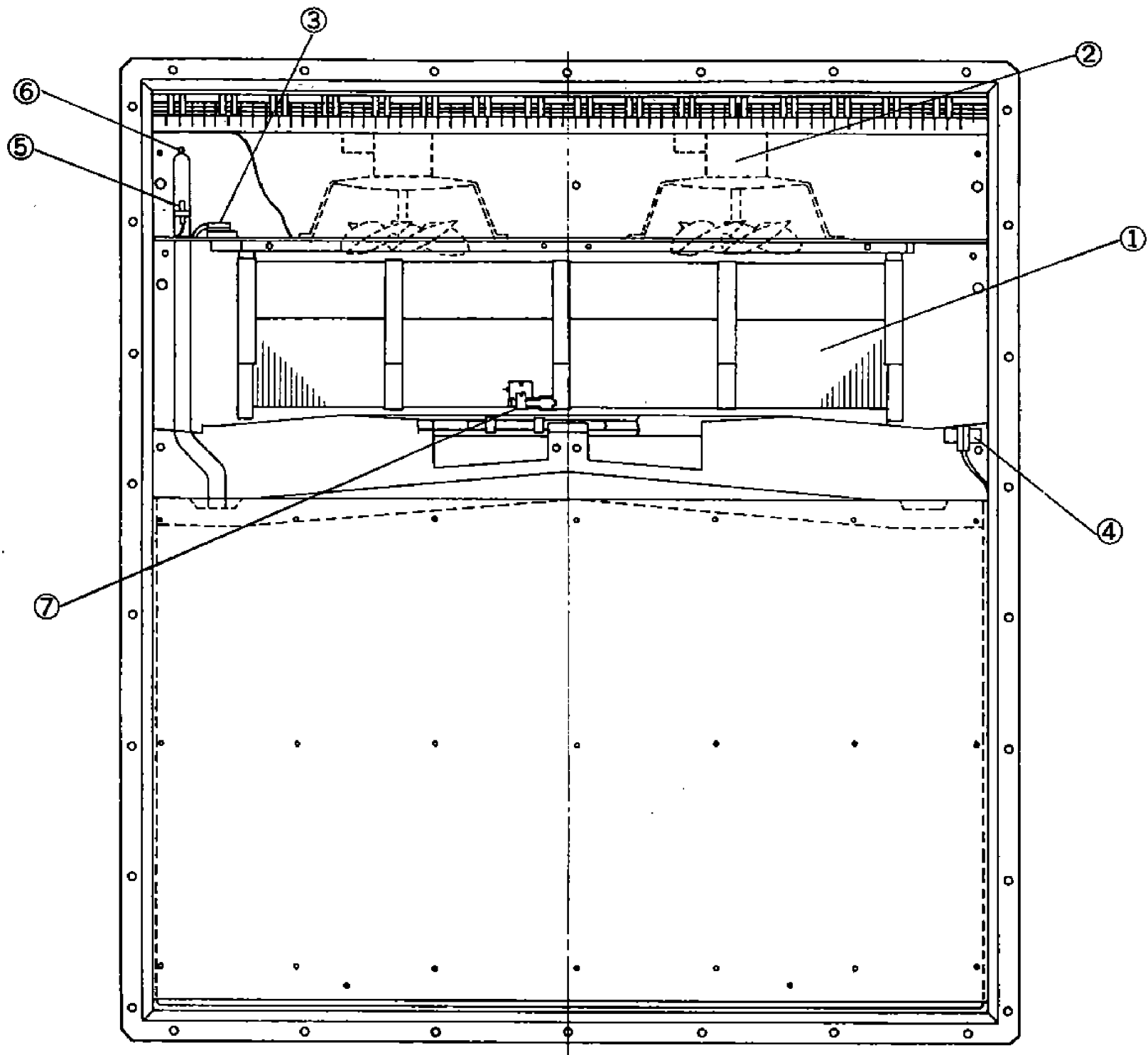
●LXE10CA



- | | |
|--|--|
| ① Compressor | ⑩ Water pressure switch |
| ② Air-cooled condenser | ⑪ Access panel |
| ③ Water-cooled condenser (air/water-cooled type)
Receiver (air-cooled type) | ⑫ Storage space for power cable (200V class) |
| ④ Outlet stop valve, water-cooled condenser (receiver) | ⑬ Storage space for power cable (400V class) |
| ⑤ Control box | ⑭ Ventilator |
| ⑥ Condenser fan motor | ⑮ Power transformer |
| ⑦ Dryer | ⑯ Thermometer check point |
| ⑧ Cooling water inlet coupling | ⑰ Thermometer check point |
| ⑨ Cooling water outlet coupling | ⑱ Liquid solenoid valve (LSV) |
| | ⑲ Injection solenoid valve (ISV) |
| | ⑳ Modulating control valve (MV) |
| | ㉑ Expansion valve |
| | ㉒ High pressure switch (HPS) |
| | ㉓ High pressure sensor (HPT) |
| | ㉔ Low pressure sensor (LPT) |
| | ㉕ Liquid/moisture transducer |
| | ㉖ Delivery stop valve |
| | ㉗ Unload solenoid valve 1 (USV1) |
| | ㉘ Unload solenoid valve 2 (USV2) |

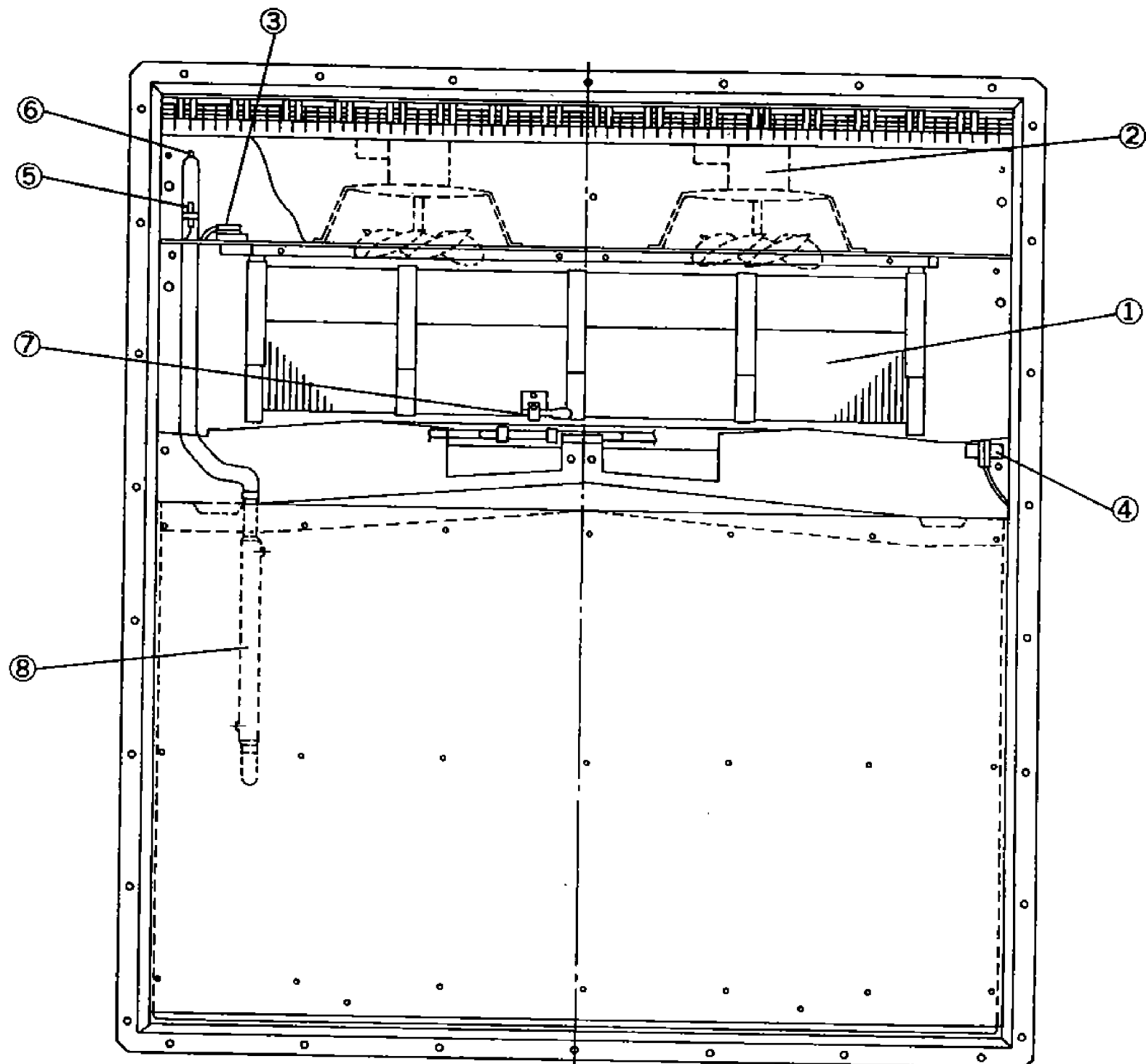
1.2.2 Inside

●LXE10C/5C



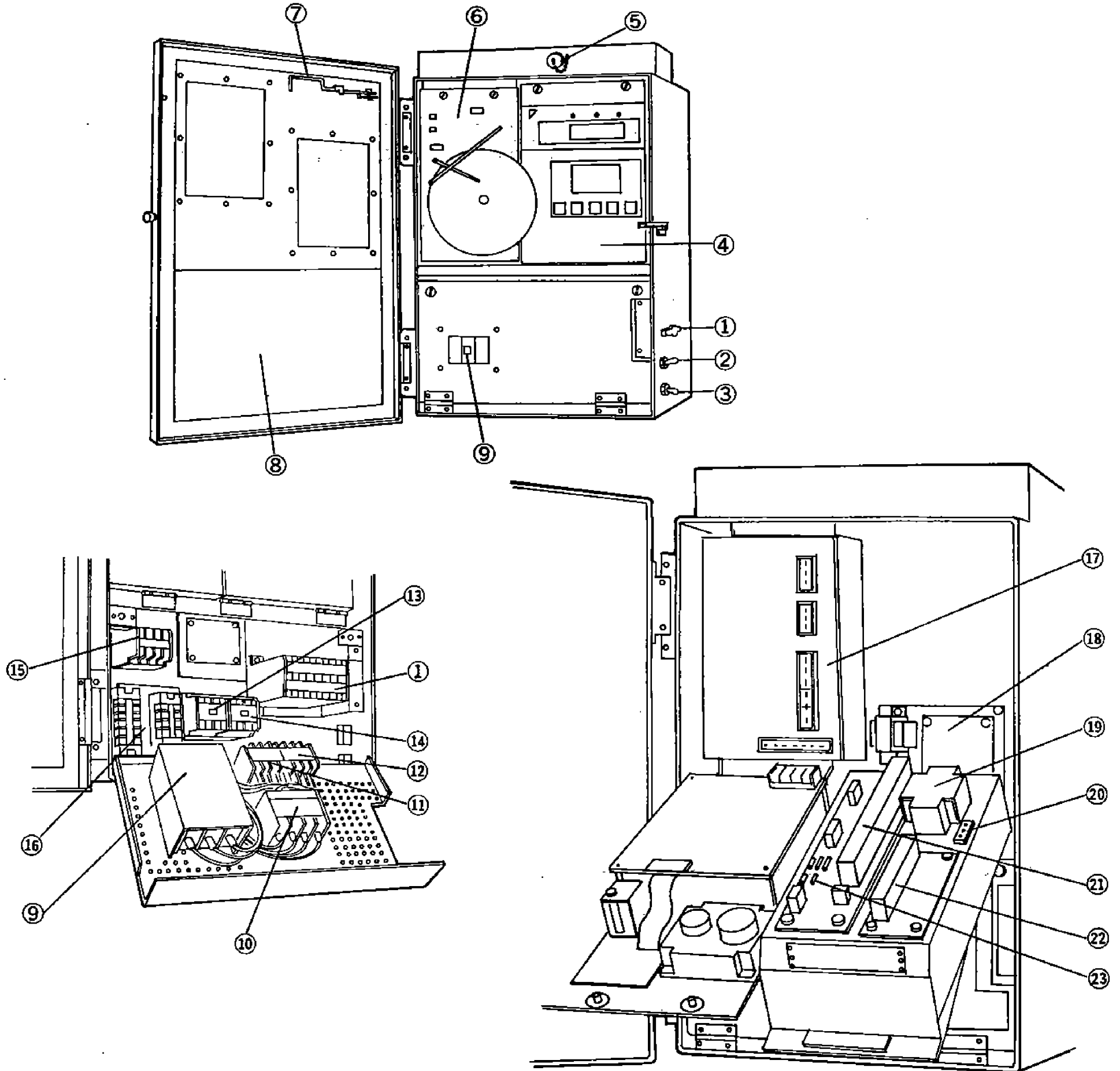
- ① Evaporator
- ② Evaporator fan motor
- ③ Return sensor, and return sensor for recorder (RS, RRS)
- ④ Supply sensor, and supply sensor for recorder (SS, RSS)
- ⑤ Evaporator outlet sensor
- ⑥ Feeler tube, expansion valve
- ⑦ Hot-gas solenoid valve (HSV)

●LXE10CA



- ① Evaporator
- ② Evaporator fan motor
- ③ Return sensor, and return sensor for recorder (RS, RRS)
- ④ Supply sensor, and supply sensor for recorder (SS, RSS)
- ⑤ Evaporator outlet sensor
- ⑥ Feeler tube, expansion valve
- ⑦ Hot-gas solenoid valve (HSV)
- ⑧ Liquefied gas heat exchanger

1.2.3 Control box



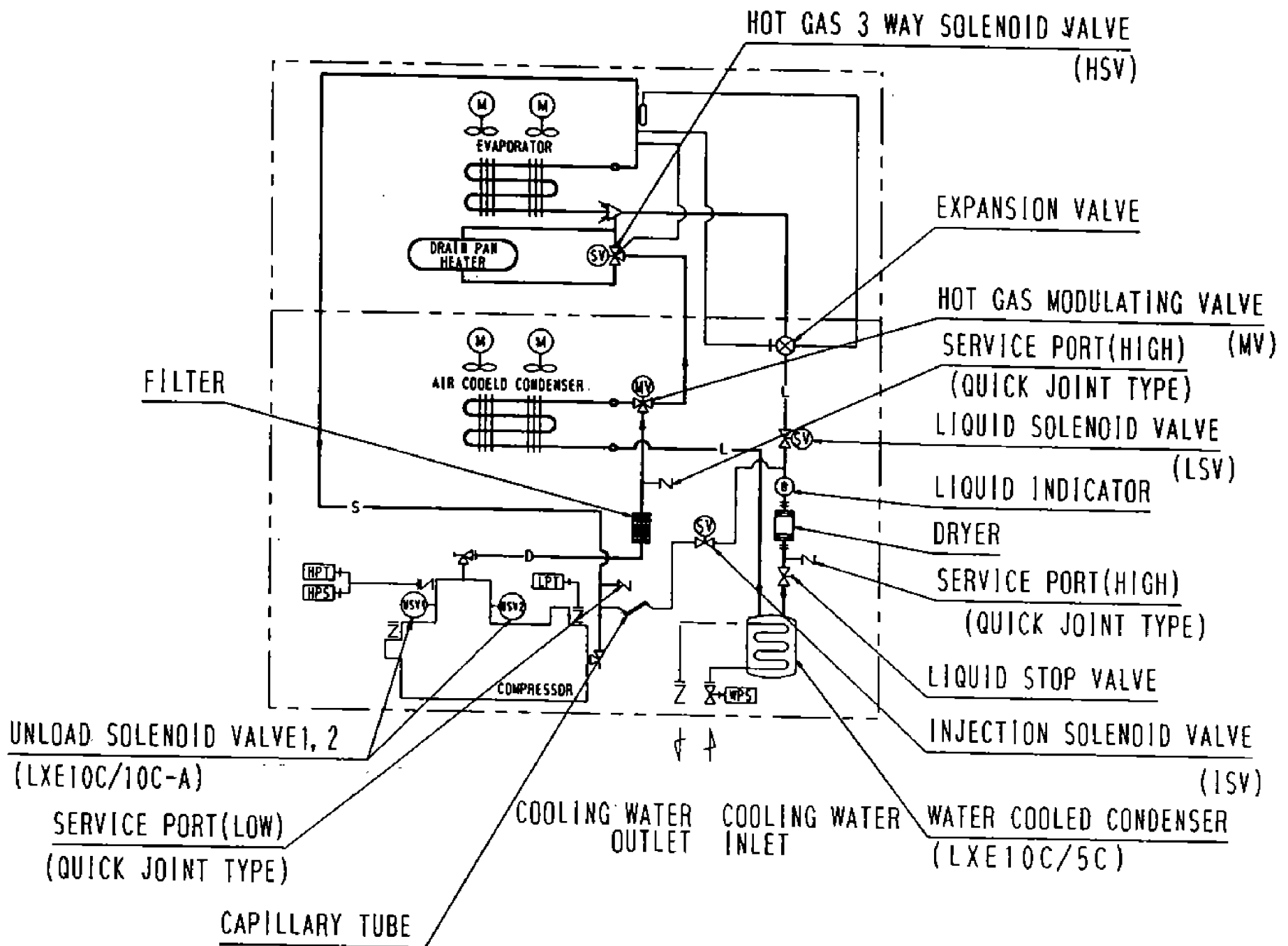
- ① Voltage selector (VS)
- ② Manual defrost switch (MDS)
- ③ Unit start switch (SSW)
- ④ Electronic controller
- ⑤ Remote monitoring receptacle (RM)
- ⑥ Electronic temperature recorder (Option)
- ⑦ Stopper
- ⑧ Chart pocket
- ⑨ Circuit breaker (CB)
- ⑩ Magnetic contactor (CC), compressor
- ⑪ Magnetic contactor (EFL), evaporator fan for low speed
- ⑫ Magnetic contactor (EFL), evaporator fan for high speed

- ⑬ Magnetic contactor (CFC1), condenser fan
- ⑭ Magnetic contactor (CFC2), condenser fan
- ⑮ Phase sequence contactor (PCC1, 2)
- ⑯ Transformer (TrC), control circuit
- ⑰ Modem (RCD) (Option)
- ⑱ PT/CT board
- ⑲ Controller backup battery (BAT)
- ⑳ Terminal block (2P), modulating control valve
- ㉑ Terminal block board (TB1)
- ㉒ Terminal block board (TB2)
- ㉓ Fuse 5x10A (Fu)

※The modem is optional.

1.3 Piping diagram

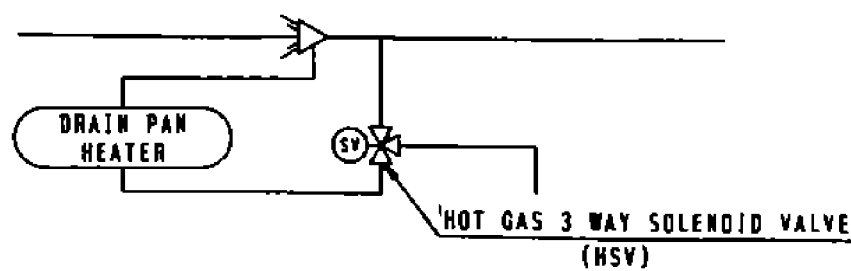
●LXE10C/LXE5C-1



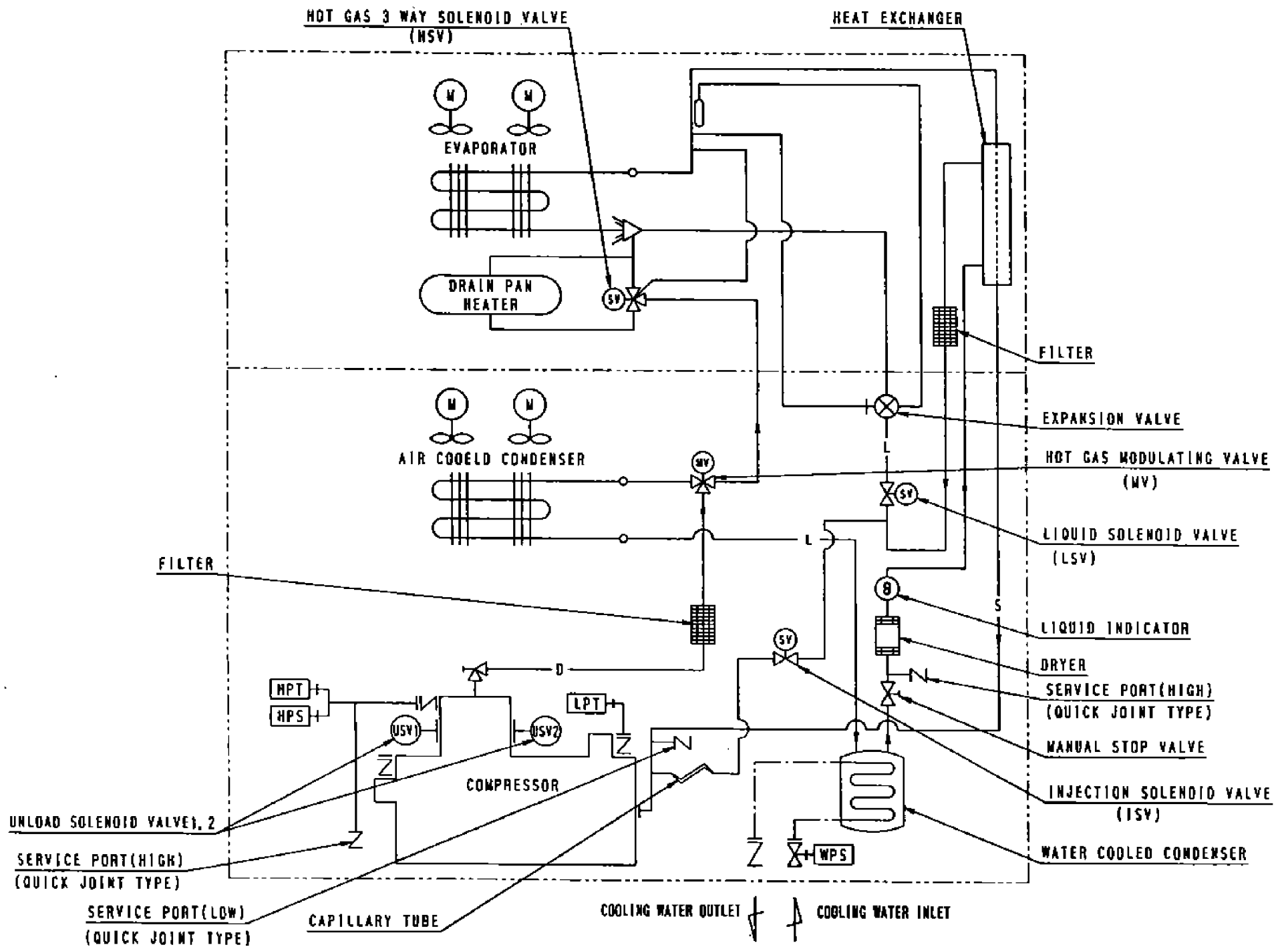
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
LPT	LOW PRESSURE TRANSDUCER
WPS	WATER PRESSURE SWITCH (LXE10C/5C)

—L—	LIQUID PIPE
—S—	SUCTION PIPE
—D—	DISCHARGE PIPE
—	WATER PIPE

A : In case of LXE5C



●LXE10CA



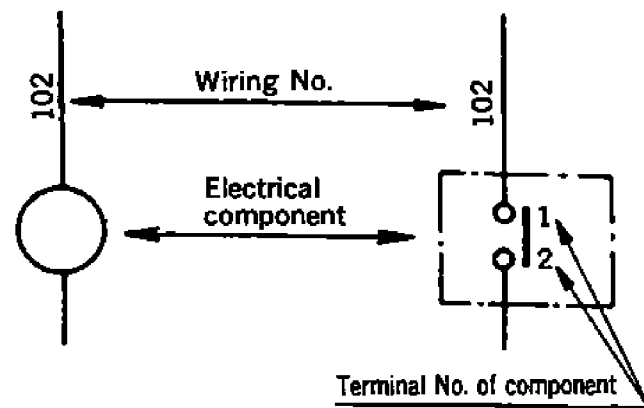
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
LPT	LOW PRESSURE TRANSDUCER
WPS	WATER PRESSURE SWITCH

— L —	LIQUID PIPE
— S —	SUCTION PIPE
— D —	DISCHARGE PIPE
— H —	FLANGE CONNECTION
— + —	FLARE CONNECTION
— — —	WATER PIPE

1.4 Electric wiring diagram

1.4.1 How to read wiring diagrams

(1) In the wiring diagram, marks and numbers have the meanings given right.



(2) **Wiring symbols**

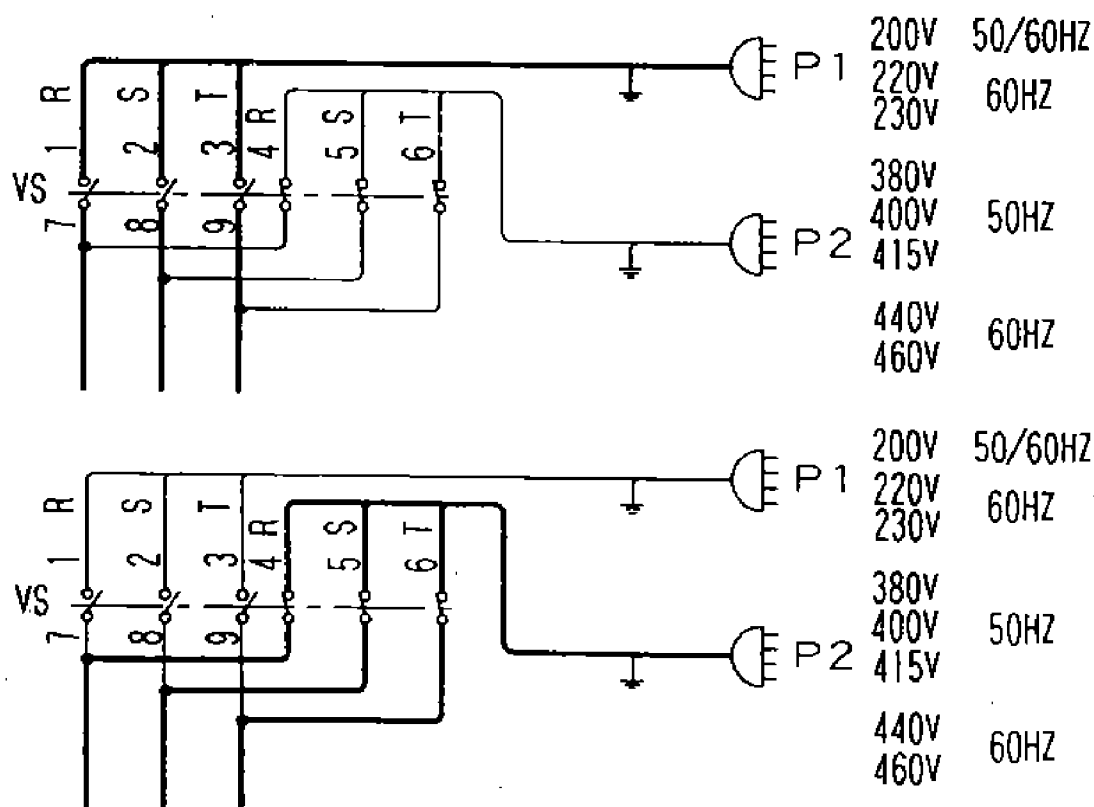
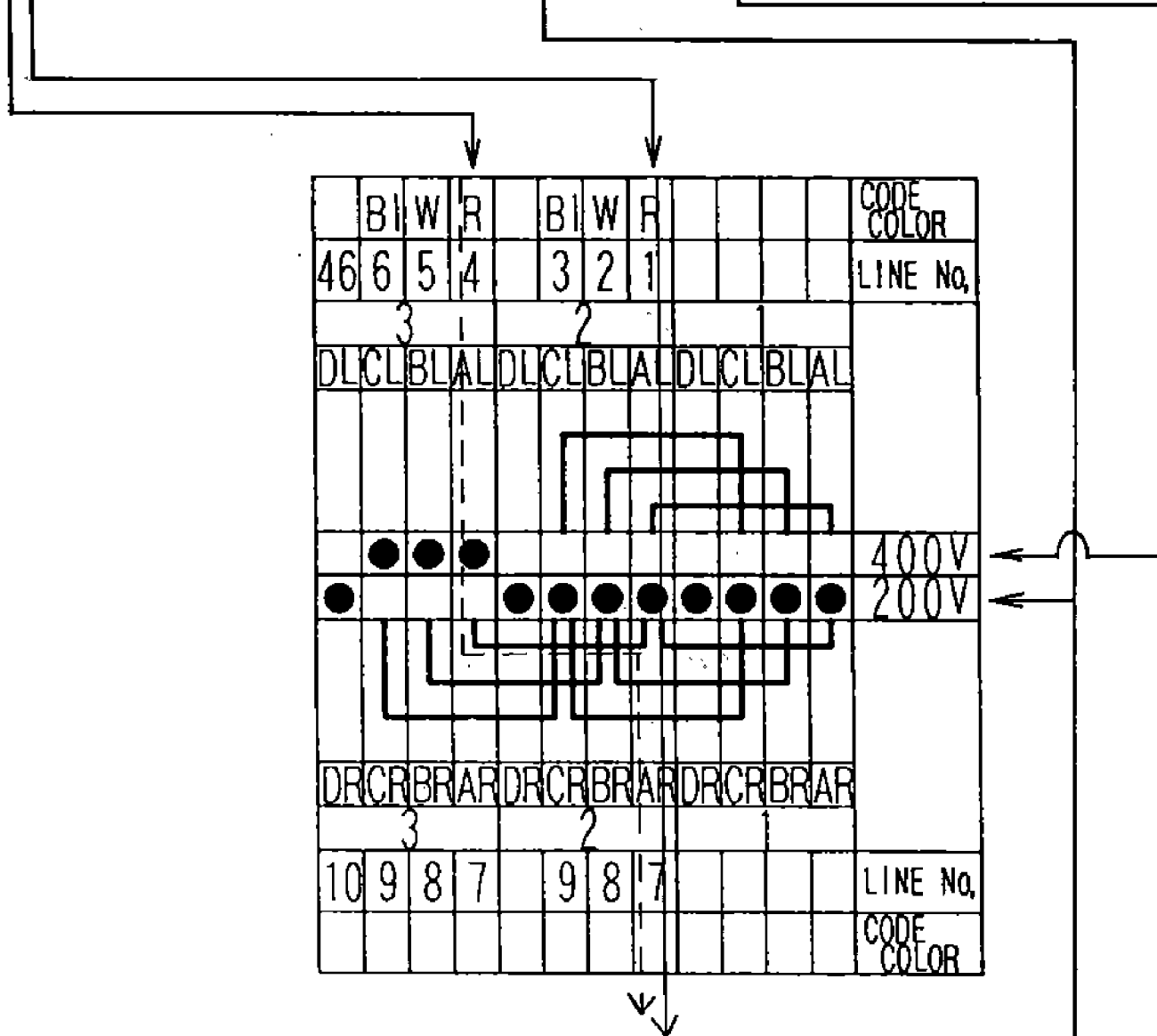
- a. The wiring symbols indicates the unenergized or stationary state in which electricity does not flow in the circuit.
- b. When a coil is energized (supplied with power), the associated contact changes its position.

Name of component	Brief description	DAIKIN symbol	American symbol
Coil	Magnetic contactor		
	Solenoid valve		
	Modulating valve		
Contacts of contactor	N. O. (Normal open)		
	N. C. (Normal close)		
Pressure switch	N. C. (Normal Close)		
Thermal switch			
Toggle switch	SSW (Start switch)		
	MDS (Manual defrest switch which return automatically)		
Voltage selector	Close on 200V class	Except SSW 	/
	Close on 400V class		

d. How to read the wiring diagram of the voltage selector.

In the chart, "●" denotes that the contact is closed.
 For example, the states between the terminal AL2 and AR2, and between AL3 and AR2.

	Selector lever position	
	200V class	400V class
Between AL2 and AR2	Closed	Open
Between AL3 and AR2	Open	Closed




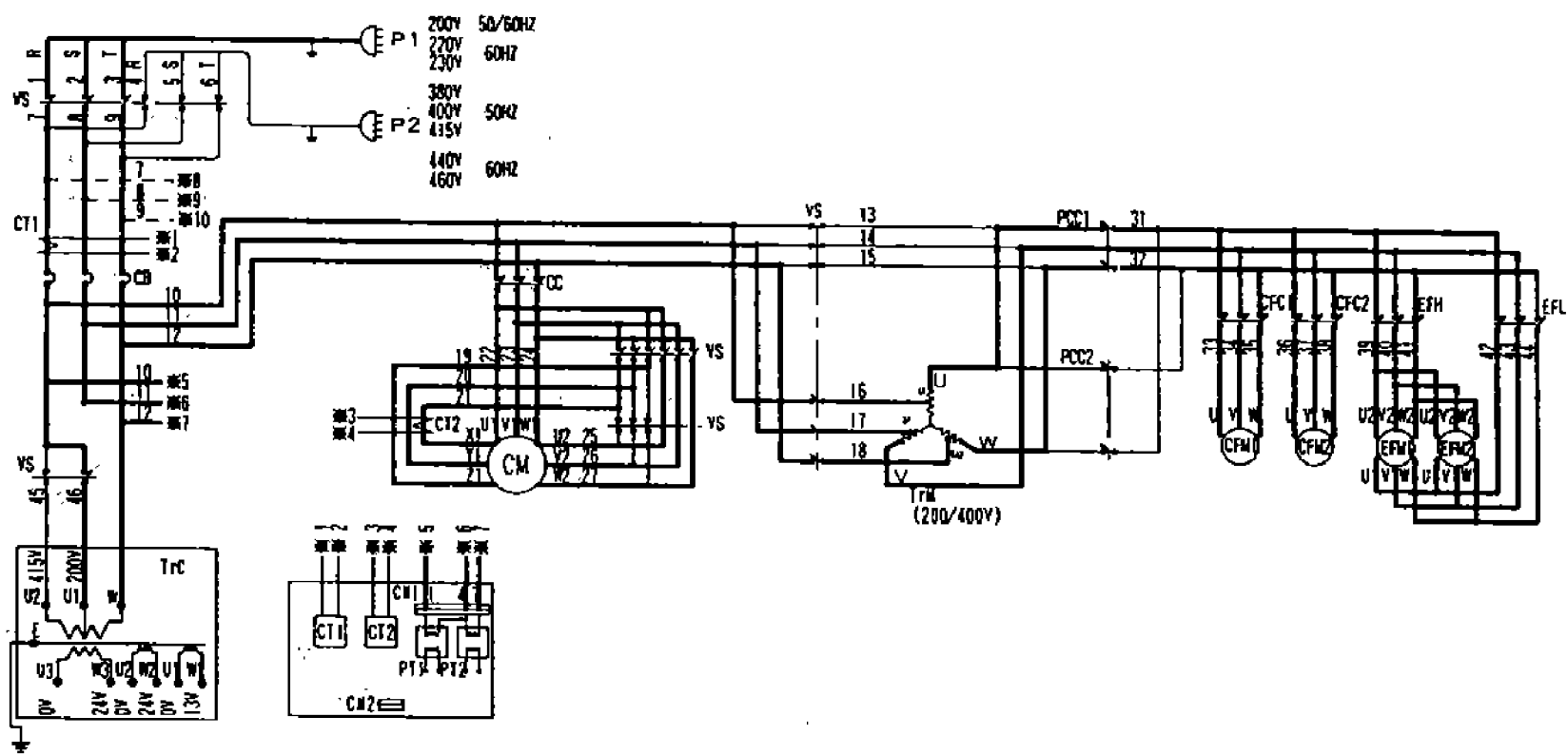
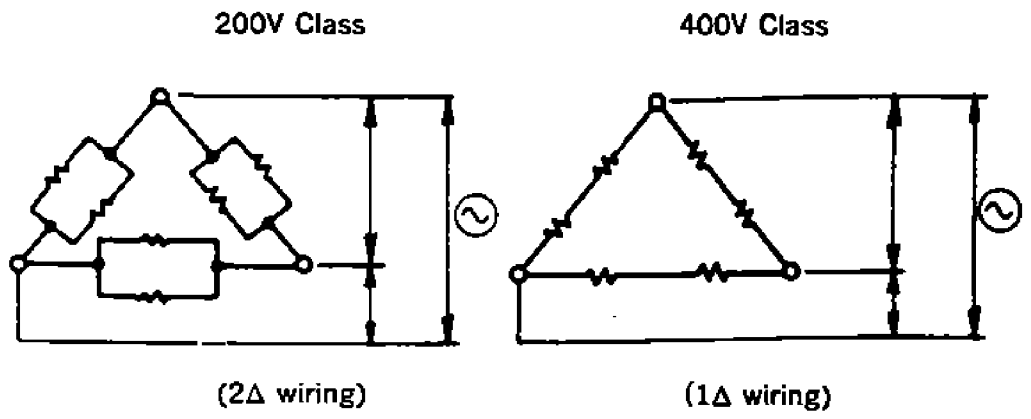
1.4.2 Voltage selection system (Change-over for 200V/400V class)

(1) The dual wound motor is adopted to the compressor and the transformer is adopted for the fan motors. Turn the lever of the voltage selector (multi-contact cam switch) manually in accordance with the power supply available in order to change the wiring of each motors and the transformer of control circuit. Thus, the systems are switched to be suitable for the power supply. The internal wiring of the dual wound motor in the compressor is as shown in the right.

(2) Circuit formation

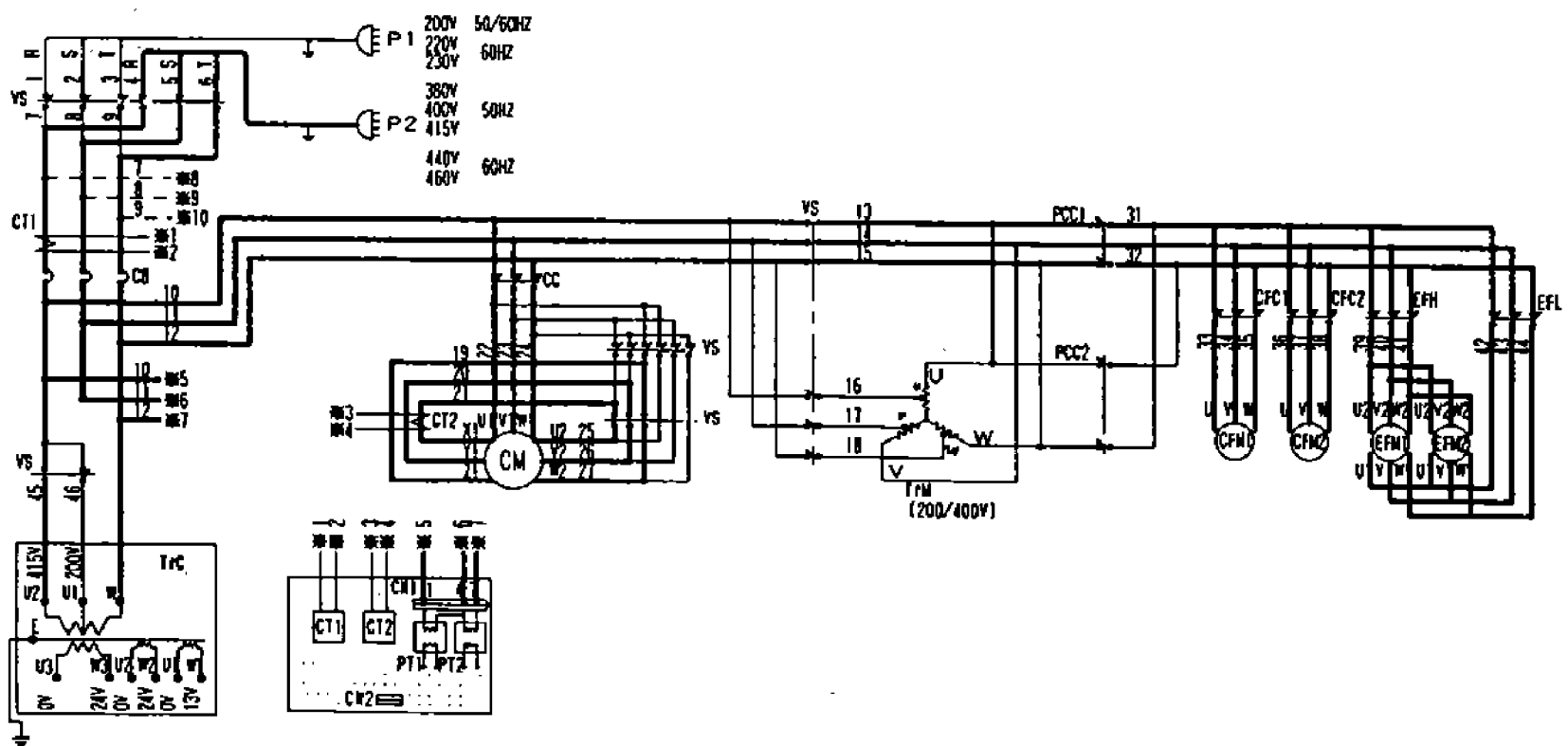
○200V class (Set the selector lever to "200V Class".)

The contacts (except SSW) shown by  become closed in the sequence diagram.



○400V class (Set the selector lever to "400V Class".)

The contacts shown by  become closed in the sequence diagram to formate the 400V class circuit.



(3) Phase selection

The reversible system is adopted to the compressor, and the proper-phase selection system is adopted to the fan motors.

○Compressor

Since the oil pump is a reversible trochoid type, the specified oil pressure can be obtained regardless of the turning direction of the built-in motor.

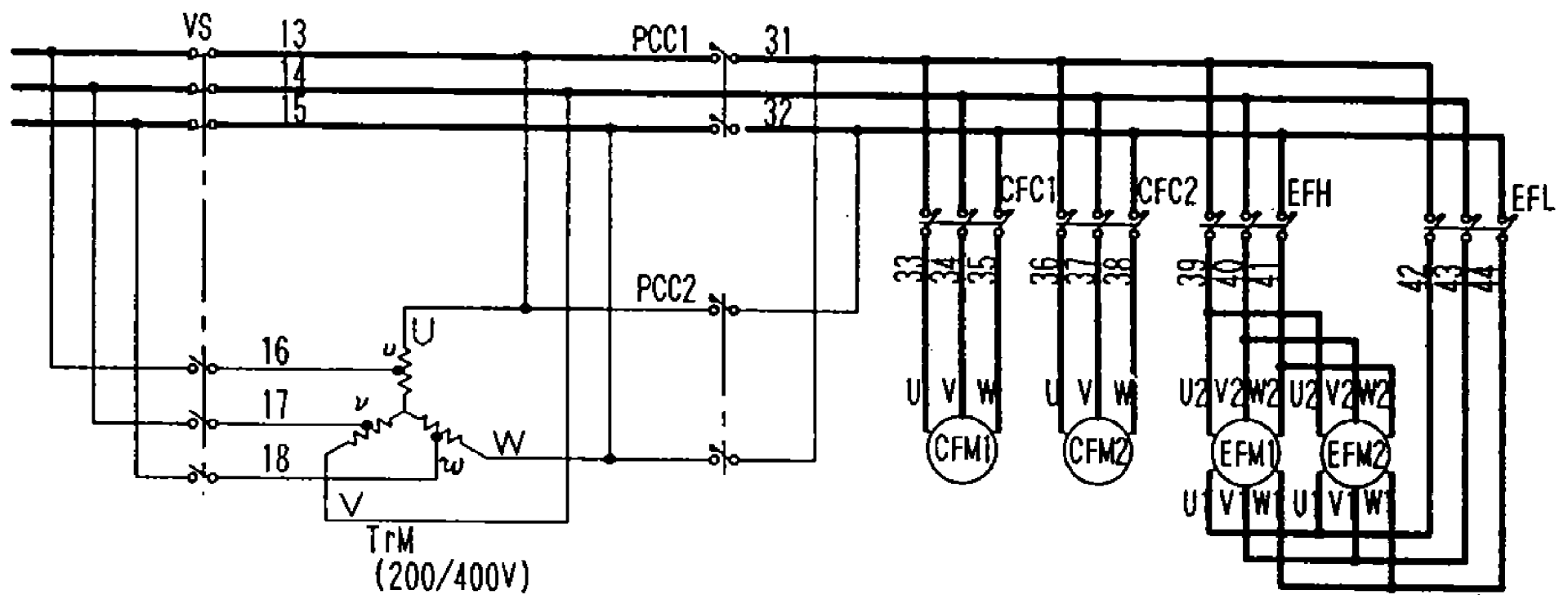
○Fan motor

When the phases are reversed, R phase and T phase will be automatically interchanged by the controller according to the instruction of the phase sequence detecting function.

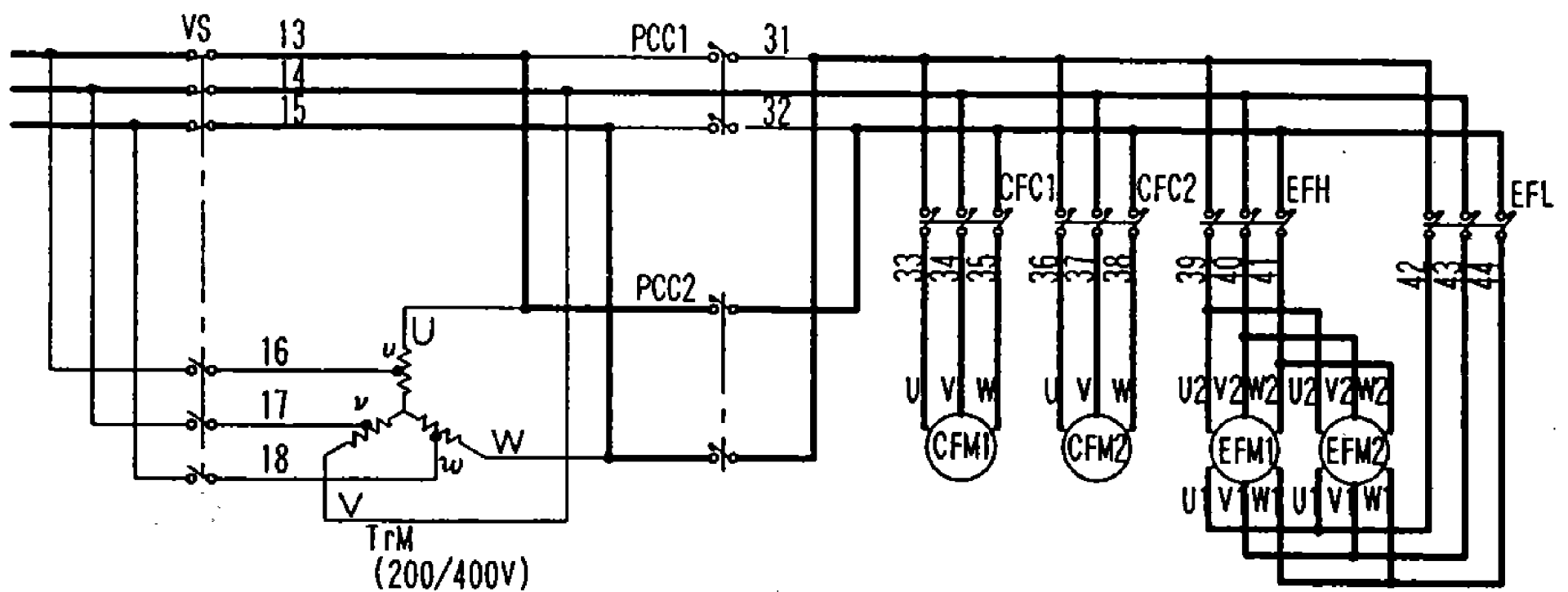
PT/CT board : Phase-sequence detecting function

PCC1, 2 : Magnetic contactors for phase change-over

●Proper phase



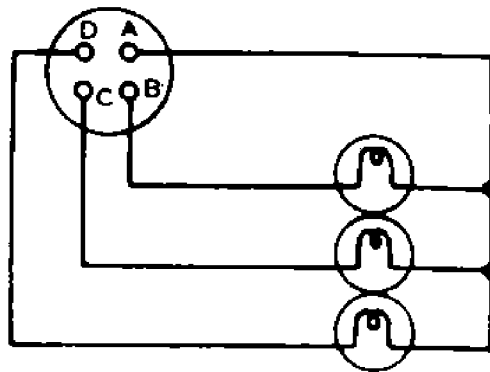
●Wrong phase



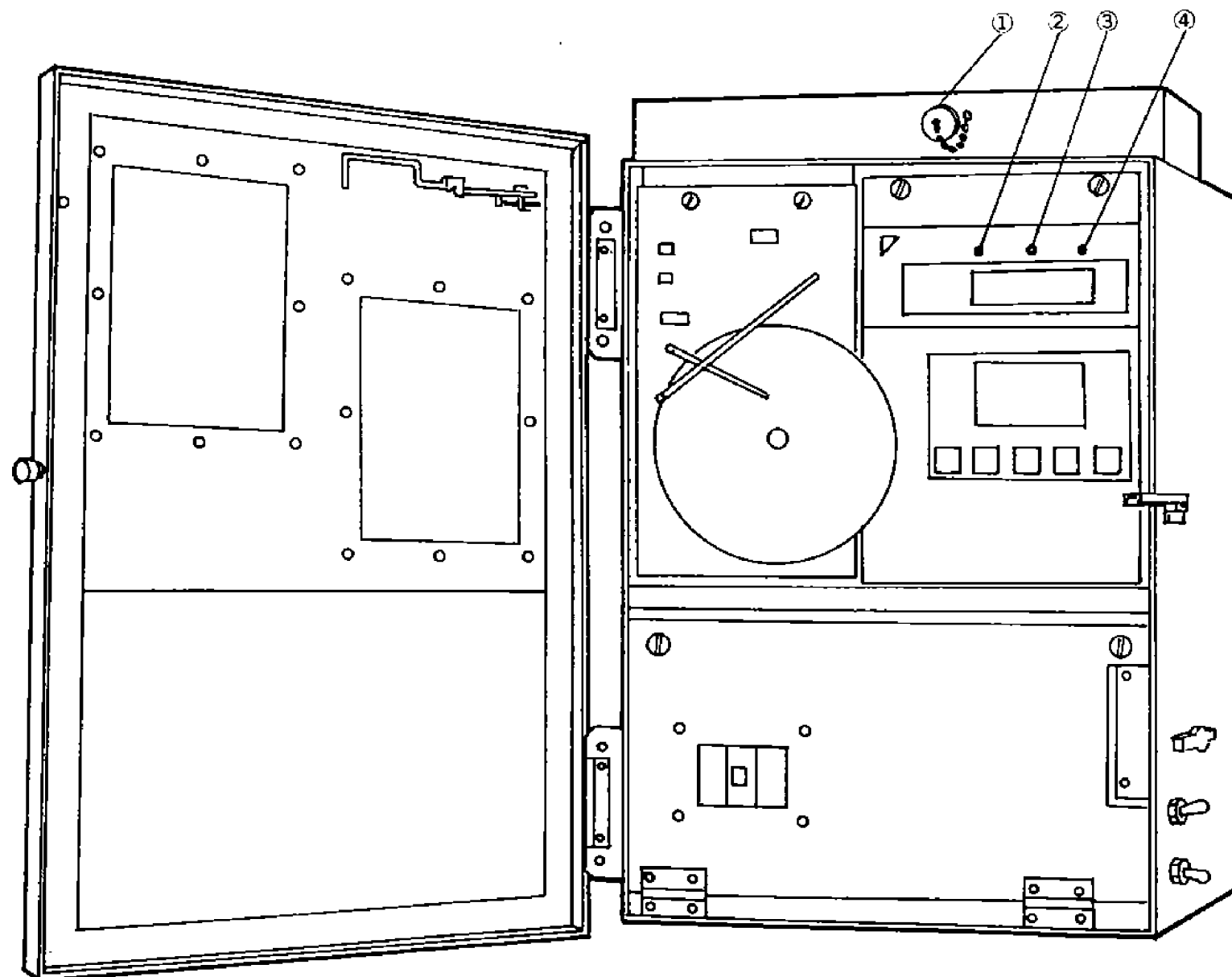
1.4.3 Pilot lamps and monitoring circuit

- (1) Three lamps which indicate operating mode are mounted on the controller in the control box.
- Green : indicates that the compressor is running (GL).
- Red : indicates defrost mode (RL).
- Orange : indicates that the inside temperature is within range (within $\pm 2^{\circ}\text{C}$ ($\pm 3.6^{\circ}\text{F}$) of the preset temperature. (OL)

The monitoring receptacle is also equipped. The connections are shown below.



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



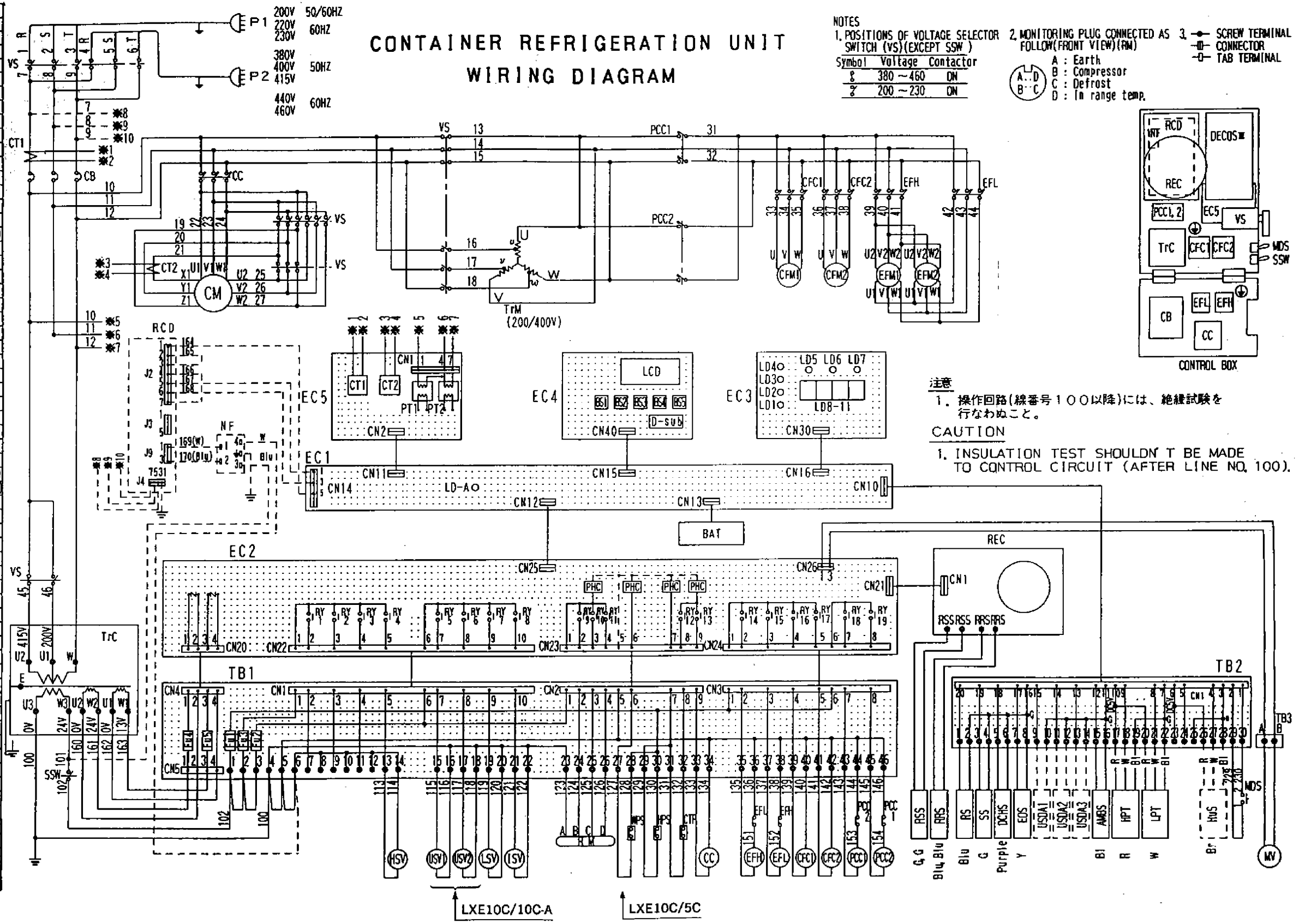
- ① Monitoring receptacle
 ② Red
 ③ Green
 ④ Orange

<https://daikin-p.ru>

1.4.4 Schematic wiring diagram

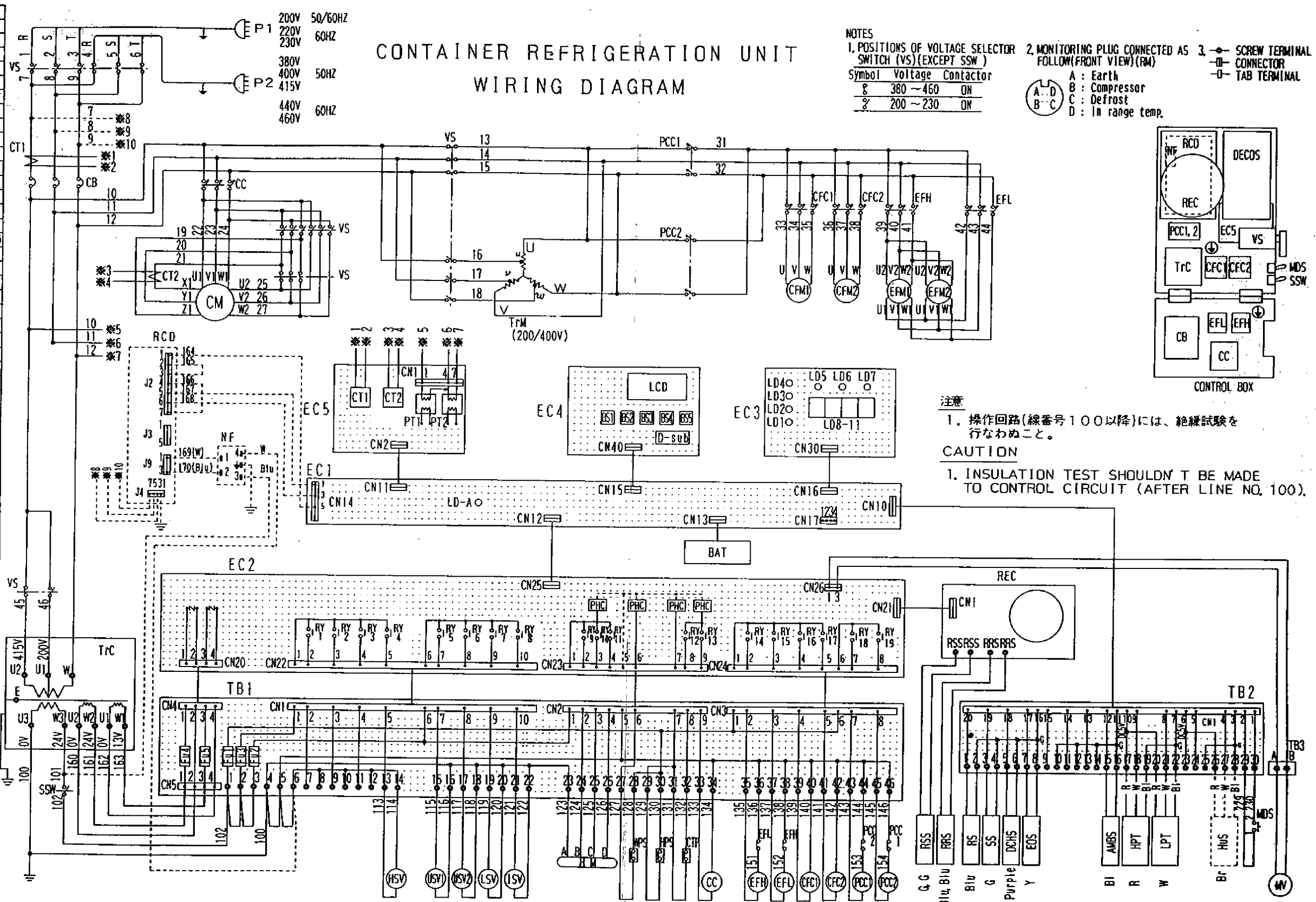
●LXE10C/5C

AMB5	AMBIENT TEMP. SENSOR
BAT	BATTERY
BS1-5	PUSH BUTTON SWITCH
CB	CIRCUIT BREAKER(50A)
CC	COMPRESSOR CONTACTOR
CFC1, 2	CONDENSER FAN CONTACTOR
CFM1, 2	CONDENSER FAN MOTOR
CM	COMPRESSOR MOTOR
CT1, 2	CURRENT TRANSFORMER
CTP	COMPRESSOR THERMAL PROTECTOR
DCHS	COMPRESSOR DISCHARGE SENSOR
D-sub	D-sub CONNECTOR(RS232C)
EC1	CPU BOARD (DECOS III)
EC2	I/O BOARD (DECOS III)
EC3	LED BOARD (DECOS III)
EC4	LCD BOARD (DECOS III)
EC5	PRINTED CIRCUIT BOARD (CT, PT)
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR
EFM1, 2	EVAPORATOR FAN MOTOR
EOS	EVAPORATOR OUTLET SENSOR
Fu1-5	FUSE(250V, 10A)
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
HSV	HOT GAS SOLENOID VALVE
ISV	INJECTION SOLENOID VALVE
LCD	LIQUID CRYSTAL DISPLAY
LD-A	SERVICE MONITOR-GREEN
LD1	LIGHT-EMITTING DIODE(SEF)
LD2	LIGHT-EMITTING DIODE(ALARM)
LD3	LIGHT-EMITTING DIODE(RETURN)
LD4	LIGHT-EMITTING DIODE(SUPPLY)
LD5	LIGHT-EMITTING DIODE(COMP)
LD6	LIGHT-EMITTING DIODE(DEFROST)
LD7	LIGHT-EMITTING DIODE(IN RANGE)
LD8-11	LIGHT-EMITTING DIODE
LPT	LOW PRESSURE TRANSDUCER
LSV	LIQUID SOLENOID VALVE
MDS	MANUAL DEFROST SWITCH
MV	MODULATING VALVE
PI, 2	POWER PLUG
PCC1, 2	PHASE CORRECTION CONTACTOR
PHC	PHOTO COUPLER
PT1, 2	POTENTIAL TRANSFORMER
REC	RECORDER
RM	REMOTE MONITORING RECEPTACLE
RSS	RECORDER RETURN AIR SENSOR
RS	RETURN AIR SENSOR
RSS	RECORDER SUPPLY AIR SENSOR
RY1-19	RELAY
SS	SUPPLY AIR SENSOR
SSW	START SWITCH
TB1-3	TERMINAL BOARD
TfC	CONTROL TRANSFORMER
TfM	MAIN TRANSFORMER
USV1, 2	UNLOAD SOLENOID VALVE
VS	VOLTAGE SELECTOR
WPS	WATER PRESSURE SWITCH
OPTIONAL SPECIFICATION	
HUS	HUMIDITY SENSOR
NF	NOISE FILTER
RCD	REMOTE COMMUNICATION DEVICE
USDA1-3	USDA SENSOR



●LXE10CA-1

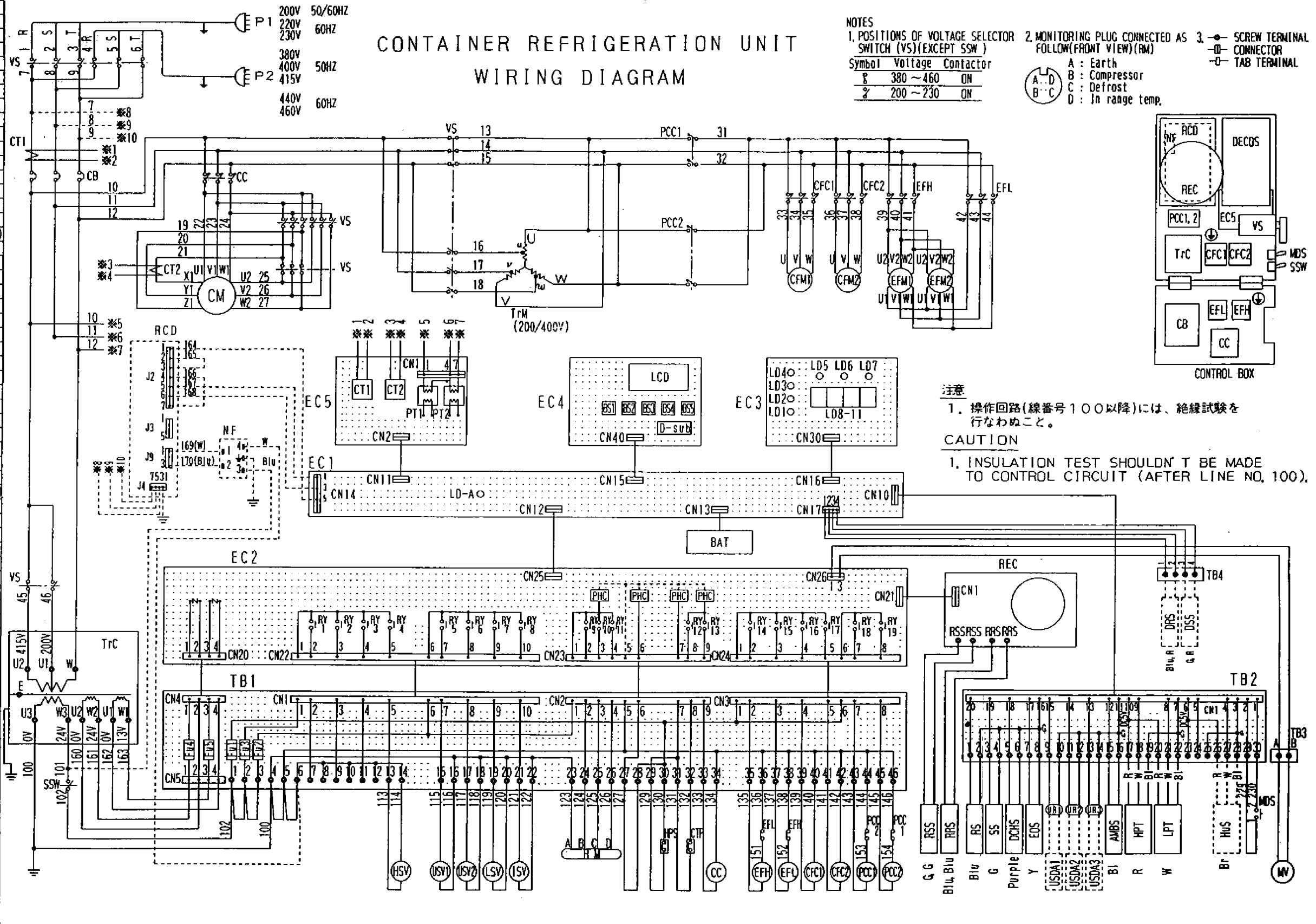
AMBS	AMBIENT TEMP. SENSOR
BAT	BATTERY
BS1-5	PUSH BUTTON SWITCH
CB	CIRCUIT BREAKER(50A)
CC	COMPRESSOR CONTACTOR
CFC1, 2	CONDENSER FAN CONTACTOR
CFM1, 2	CONDENSER FAN MOTOR
CM	COMPRESSOR MOTOR
CT1, 2	CURRENT TRANSFORMER
CTP	COMPRESSOR THERMAL PROTECTOR
DCHS	COMPRESSOR DISCHARGE SENSOR
D-sub	D-sub CONNECTOR(RS232C)
EC1	CPU BOARD (DECOS)
EC2	I/O BOARD (DECOS)
EC3	LED BOARD (DECOS)
EC4	LCD BOARD (DECOS)
EC5	PRINTED CIRCUIT BOARD (CT, PT)
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR
EFM1, 2	EVAPORATOR FAN MOTOR
EOS	EVAPORATOR OUTLET SENSOR
Fu1-5	FUSE(250V, 10A)
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
HSV	HOT GAS SOLENOID VALVE
ISV	INJECTION SOLENOID VALVE
LCD	LIQUID CRYSTAL DISPLAY
LD-A	SERVICE MONITOR-GREEN
LD1	LIGHT-EMISSION DIODE(SET)
LD2	LIGHT-EMISSION DIODE(ALARM)
LD3	LIGHT-EMISSION DIODE(RETURN)
LD4	LIGHT-EMISSION DIODE(SUPPLY)
LD5	LIGHT-EMISSION DIODE(COMP)
LD6	LIGHT-EMISSION DIODE(DEFROST)
LD7	LIGHT-EMISSION DIODE(IN RANGE)
LD8-11	LIGHT-EMISSION DIODE
LPT	LOW PRESSURE TRANSDUCER
LSV	LIQUID SOLENOID VALVE
MDS	MANUAL DEFROST SWITCH
MV	MODULATING VALVE
P1, 2	POWER PLUG
PCC1, 2	PHASE CORRECTION CONTACTOR
PHC	PHOTO COUPLER
PT1, 2	POTENTIAL TRANSFORMER
REC	RECORDER
RM	REMOTE MONITORING RECEPTACLE
RRS	RECORDER RETURN AIR SENSOR
RS	RETURN AIR SENSOR
RSS	RECORDER SUPPLY AIR SENSOR
RY1-19	RELAY
SS	SUPPLY AIR SENSOR
SSW	START SWITCH
TB1-3	TERMINAL BOARD
Trc	CONTROL TRANSFORMER
Tm	MAIN TRANSFORMER
USV1, 2	UNLOAD SOLENOID VALVE
VS	VOLTAGE SELECTOR
WPS	WATER PRESSURE SWITCH
OPTIONAL SPECIFICATION	
HUS	HUMIDITY SENSOR
NF	NOISE FILTER
RCD	REMOTE COMMUNICATION DEVICE



●LXE10CA-A1

AMBS	AMBIENT TEMP. SENSOR
BAT	BATTERY
BS1-5	PUSH BUTTON SWITCH
CB	CIRCUIT BREAKER(50A)
CC	COMPRESSOR CONTACTOR
CFC1, 2	CONDENSER FAN CONTACTOR
CFM1, 2	CONDENSER FAN MOTOR
CM	COMPRESSOR MOTOR
CT1, 2	CURRENT TRANSFORMER
CTP	COMPRESSOR THERMAL PROTECTOR
DCHS	COMPRESSOR DISCHARGE SENSOR
D-sub	D-sub CONNECTOR(RS232C)
EC1	CPU BOARD (DECOS)
EC2	I/O BOARD (DECOS)
EC3	LED BOARD (DECOS)
EC4	LCD BOARD (DECOS)
EC5	PRINTED CIRCUIT BOARD (CT, PT)
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR
EFM1, 2	EVAPORATOR FAN MOTOR
EOS	EVAPORATOR OUTLET SENSOR
Fu1-5	FUSE(250V, 10A)
HRS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
HSV	HOT GAS SOLENOID VALVE
ISV	INJECTION SOLENOID VALVE
LCD	LIQUID CRYSTAL DISPLAY
LD-A	SERVICE MONITOR-GREEN
LD1	LIGHT-EMITTING DIODE(SET)
LD2	LIGHT-EMITTING DIODE(ALARM)
LD3	LIGHT-EMITTING DIODE(RETURN)
LD4	LIGHT-EMITTING DIODE(SUPPLY)
LD5	LIGHT-EMITTING DIODE(COMP)
LD6	LIGHT-EMITTING DIODE(DEFFROST)
LD7	LIGHT-EMITTING DIODE(1M RANGE)
LD8-11	LIGHT-EMITTING DIODE
LPT	LOW PRESSURE TRANSDUCER
LSV	LIQUID SOLENOID VALVE
MDS	MANUAL DEFFROST SWITCH
MV	MODULATING VALVE
P1, 2	POWER PLUG
PCC1, 2	PHASE CORRECTION CONTACTOR
PHC	PHOTO COUPLER
PT1, 2	POTENTIAL TRANSFORMER
REC	RECORDER
RM	REMOTE MONITORING RECEPTACLE
RRS	RECORDER RETURN AIR SENSOR
RS	RETURN AIR SENSOR
RSS	RECORDER SUPPLY AIR SENSOR
RY1-19	RELAY
SS	SUPPLY AIR SENSOR
SSW	START SWITCH
TB1-4	TERMINAL BOARD
TrC	CONTROL TRANSFORMER
TrM	MAIN TRANSFORMER
UR1-3	USDA RECEPTACLE
USV1, 2	UNLOAD SOLENOID VALVE
VS	VOLTAGE SELECTOR
OPTIONAL SPECIFICATION	
DRS	DATA RECORDER RETURN AIR SENSOR
DSS	DATA RECORDER SUPPLY AIR SENSOR
HuS	HUMIDITY SENSOR
NF	NOISE FILTER
RCD	REMOTE COMMUNICATION DEVICE
USDA1-3	USDA SENSOR

CONTAINER REFRIGERATION UNIT WIRING DIAGRAM



NOTES

1. POSITIONS OF VOLTAGE SELECTOR SWITCH (VS)(EXCEPT SSW)
 2. MONITORING PLUG CONNECTED AS FOLLOW(FRONT VIEW)(RM)
 3. SCREW TERMINAL
-□- CONNECTOR
-○- TAB TERMINAL
- Symbol Voltage Contactor
- | | | |
|---|-----------|----|
| 8 | 380 ~ 460 | ON |
| 2 | 200 ~ 230 | ON |
- A : Earth
B : Compressor
C : Defrost
D : In range temp.

注意

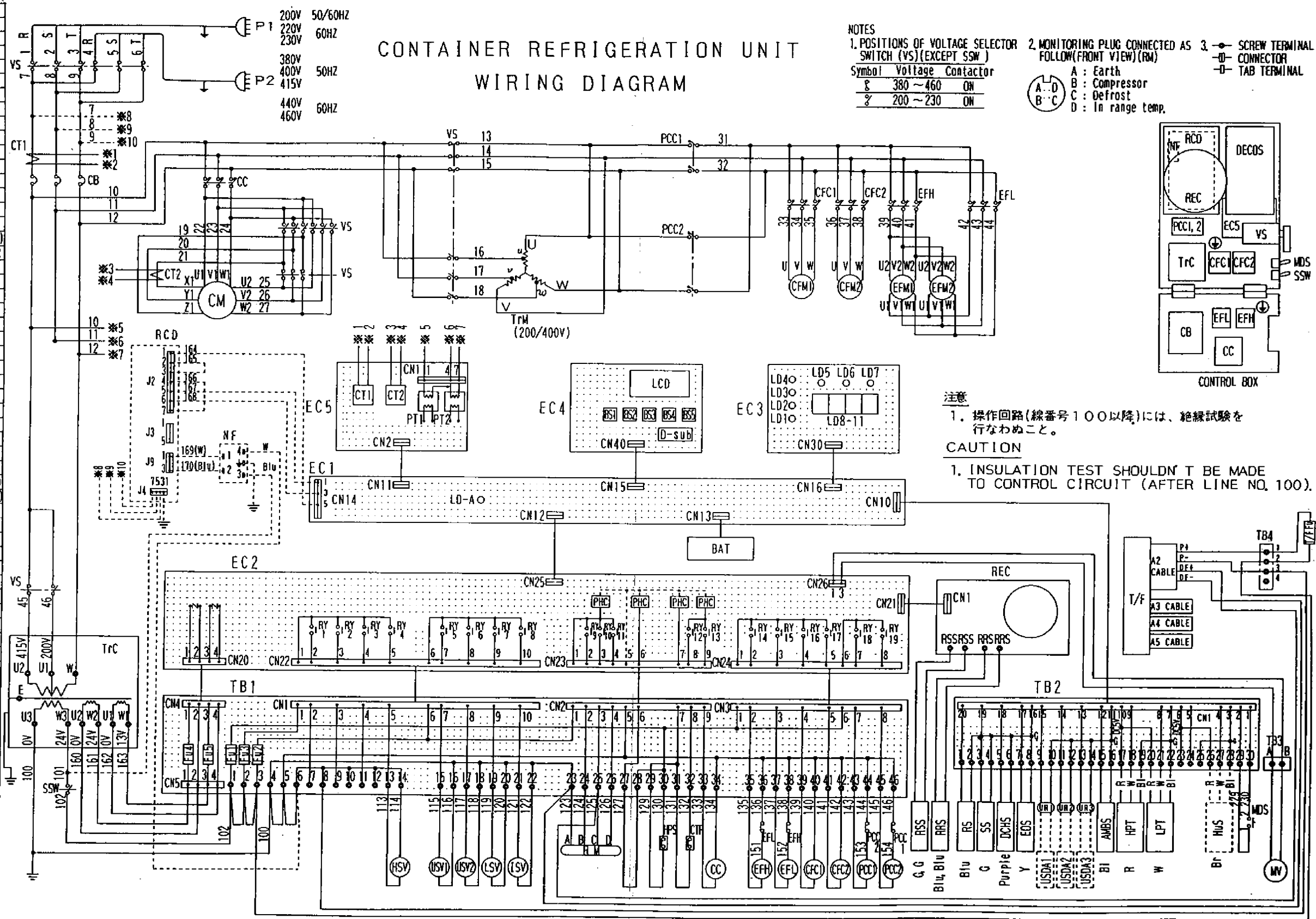
1. 操作回路(線番号100以降)には、絶縁試験を行なわぬこと。

CAUTION

1. INSULATION TEST SHOULD'N T BE MADE TO CONTROL CIRCUIT (AFTER LINE NO. 100).

●LXE10CA-A2

AMBS	AMBIENT TEMP. SENSOR
BAT	BATTERY
BS1-5	PUSH BUTTON SWITCH
CB	CIRCUIT BREAKER(50A)
CC	COMPRESSOR CONTACTOR
CFC1, 2	CONDENSER FAN CONTACTOR
CFM1, 2	CONDENSER FAN MOTOR
CM	COMPRESSOR MOTOR
CT1, 2	CURRENT TRANSFORMER
CTP	COMPRESSOR THERMAL PROTECTOR
DCHS	COMPRESSOR DISCHARGE SENSOR
D-sub	D-sub CONNECTOR(RS232C)
EC1	CPU BOARD (DECOS)
EC2	I/O BOARD (DECOS)
EC3	LED BOARD (DECOS)
EC4	LCD BOARD (DECOS)
EC5	PRINTED CIRCUIT BOARD (CT, PT)
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR
EFM1, 2	EVAPORATOR FAN MOTOR
EOS	EVAPORATOR OUTLET SENSOR
Fu1-5	FUSE(250V, 10A)
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
HSV	HOT GAS SOLENOID VALVE
ISV	INJECTION SOLENOID VALVE
LCD	LIQUID CRYSTAL DISPLAY
LD-A	SERVICE MONITOR-GREEN
LD1	LIGHT-EMITTION DIODE(SET)
LD2	LIGHT-EMITTION DIODE(ALARM)
LD3	LIGHT-EMITTION DIODE(RETURN)
LD4	LIGHT-EMITTION DIODE(SUPPLY)
LD5	LIGHT-EMITTION DIODE(COMP)
LD6	LIGHT-EMITTION DIODE(DEFROST)
LD7	LIGHT-EMITTION DIODE(IN RANGE)
LD8-11	LIGHT-EMITTION DIODE
LPT	LOW PRESSURE TRANSDUCER
LSV	LIQUID SOLENOID VALVE
MDS	MANUAL DEFROST SWITCH
MV	MODULATING VALVE
PI, 2	POWER PLUG
PCC1, 2	PHASE CORRECTION CONTACTOR
PHC	PHOTO COUPLER
PT1, 2	POTENTIAL TRANSFORMER
REC	RECORDER
RM	REMOTE MONITORING RECEPTACLE
RRS	RECORDER RETURN AIR SENSOR
RS	RETURN AIR SENSOR
RSS	RECORDER SUPPLY AIR SENSOR
RY1-19	RELAY
SS	SUPPLY AIR SENSOR
SSW	START SWITCH
TB1-4	TERMINAL BOARD
T/F A2	Trans FRESH, A2 CABLE
T/F Fu	Trans FRESH, FUSE ASSY IN LINE(250V, 2A)
TtC	CONTROL TRANSFORMER
Tm	MAIN TRANSFORMER
UR1-3	USDA RECEPTACLE
USV1, 2	UNLOAD SOLENOID VALVE
VS	VOLTAGE SELECTOR
OPTIONAL SPECIFICATION	
HuS	HUMIDITY SENSOR
NF	NOISE FILTER
RCD	REMOTE COMMUNICATION DEVICE
USDA1-3	USDA SENSOR



●LXE10CA-A3

AMBS	AMBIENT TEMP. SENSOR
BAT	BATTERY
BS1-5	PUSH BUTTON SWITCH
CB	CIRCUIT BREAKER(50A)
CC	COMPRESSOR CONTACTOR
CFC1, 2	CONDENSER FAN CONTACTOR
CFM1, 2	CONDENSER FAN MOTOR
CM	COMPRESSOR MOTOR
CT1, 2	CURRENT TRANSFORMER
CTP	COMPRESSOR THERMAL PROTECTOR
DCHS	COMPRESSOR DISCHARGE SENSOR
DRS	DATA RECORDER RETURN AIR SENSOR
DSS	DATA RECORDER SUPPLY AIR SENSOR
D-sub	D-sub CONNECTOR(RS232C)
EC1	CPU BOARD (DECOS)
EC2	I/O BOARD (DECOS)
EC3	LED BOARD (DECOS)
EC4	LCD BOARD (DECOS)
EC5	PRINTED CIRCUIT BOARD (CT, PT)
EFH	HIGH SPEED EVAPORATOR FAN CONTACTOR
EFL	LOW SPEED EVAPORATOR FAN CONTACTOR
EFM1, 2	EVAPORATOR FAN MOTOR
EOS	EVAPORATOR OUTLET SENSOR
Fu1-5	FUSE(250V, 10A)
HPS	HIGH PRESSURE SWITCH
HPT	HIGH PRESSURE TRANSDUCER
HSV	HOT GAS SOLENOID VALVE
ISV	INJECTION SOLENOID VALVE
LCD	LIQUID CRYSTAL DISPLAY
LD-A	SERVICE MONITOR-GREEN
LD1	LIGHT-EMITTING DIODE(SET)
LD2	LIGHT-EMITTING DIODE(ALARM)
LD3	LIGHT-EMITTING DIODE(RETURN)
LD4	LIGHT-EMITTING DIODE(SUPPLY)
LD5	LIGHT-EMITTING DIODE(COMP)
LD6	LIGHT-EMITTING DIODE(DEFROST)
LD7	LIGHT-EMITTING DIODE(IN RANGE)
LD8-11	LIGHT-EMITTING DIODE
LPT	LOW PRESSURE TRANSDUCER
LSV	LIQUID SOLENOID VALVE
MDS	MANUAL DEFROST SWITCH
MV	MODULATING VALVE
PI, 2	POWER PLUG
PCC1, 2	PHASE CORRECTION CONTACTOR
PHC	PHOTO COUPLER
PT1, 2	POTENTIAL TRANSFORMER
RM	REMOTE MONITORING RECEPTACLE
RS	RETURN AIR SENSOR
RY1-19	RELAY
SS	SUPPLY AIR SENSOR
SSW	START SWITCH
TB1-4	TERMINAL BOARD
TrC	CONTROL TRANSFORMER
TrM	MAIN TRANSFORMER
USV1, 2	UNLOAD SOLENOID VALVE
VS	VOLTAGE SELECTOR
OPTIONAL SPECIFICATION	
HuS	HUMIDITY SENSOR
NF	NOISE FILTER
RCD	REMOTE COMMUNICATION DEVICE

CONTAINER REFRIGERATION UNIT WIRING DIAGRAM

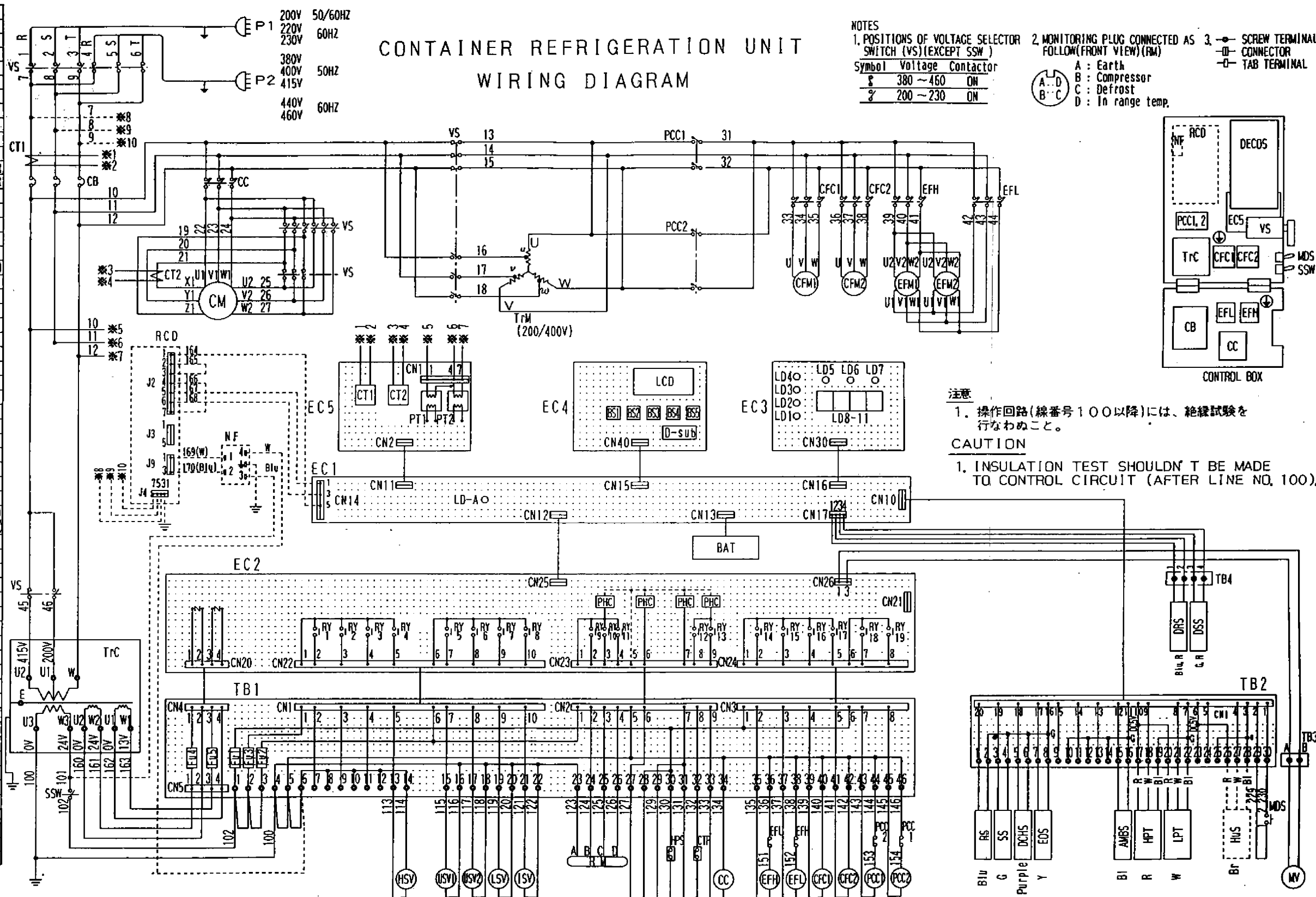
NOTES

1. POSITIONS OF VOLTAGE SELECTOR SWITCH (VS)(EXCEPT SSW)

Symbol	Voltage	Contact
⊗	380 ~ 460	ON
⊘	200 ~ 230	ON

2. MONITORING PLUG CONNECTED AS 3. FOLLOW(FRONT VIEW)(RM)

Symbol	Terminal
⊗	A : Earth
⊘	B : Compressor
⊙	C : Defrost
⊚	D : In range temp.



注意

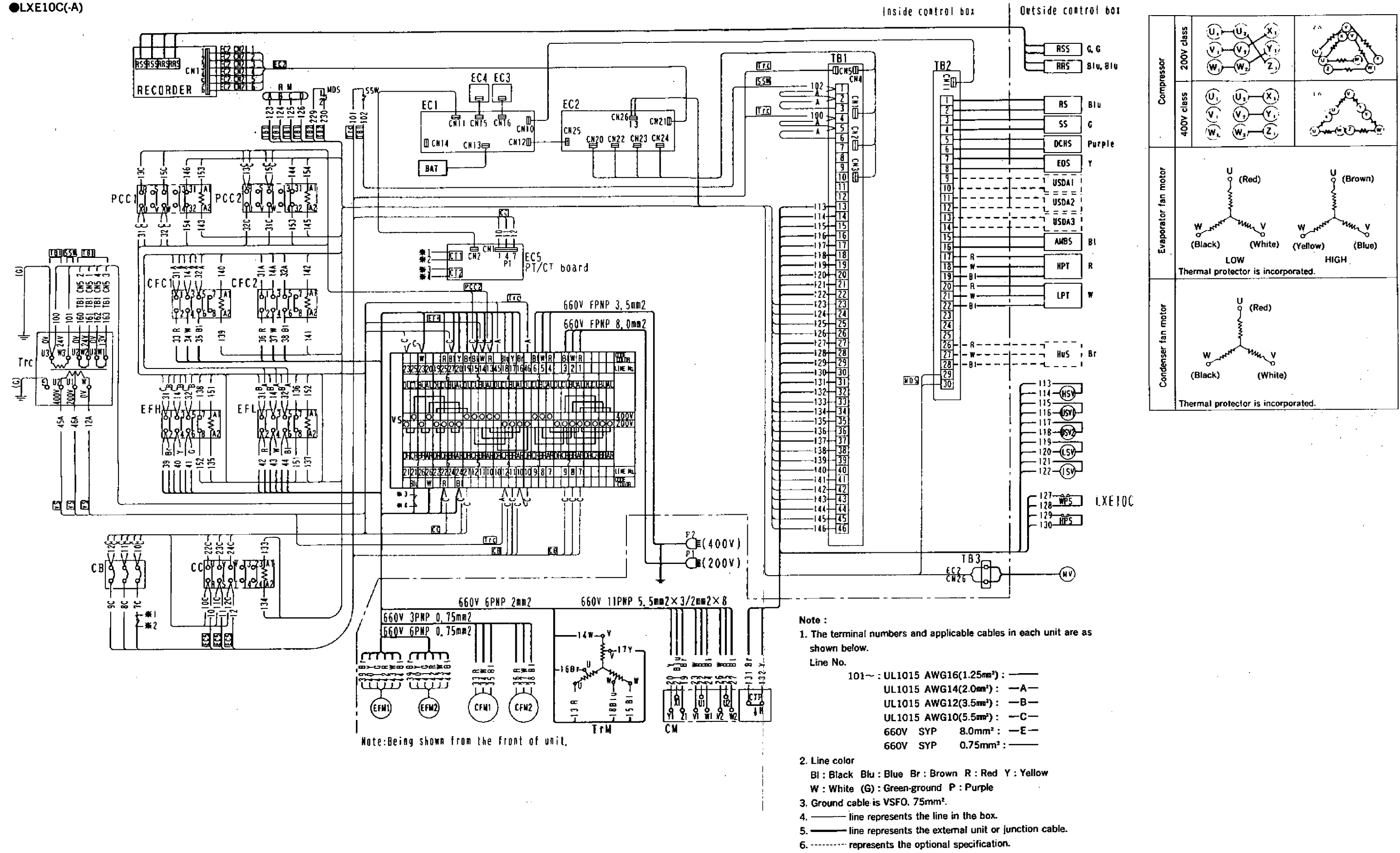
1. 操作回路(線番号100以降)には、絶縁試験を行なわぬこと。

CAUTION

1. INSULATION TEST SHOULDN'T BE MADE TO CONTROL CIRCUIT (AFTER LINE NO. 100).

1.4.5 Actual wiring diagram

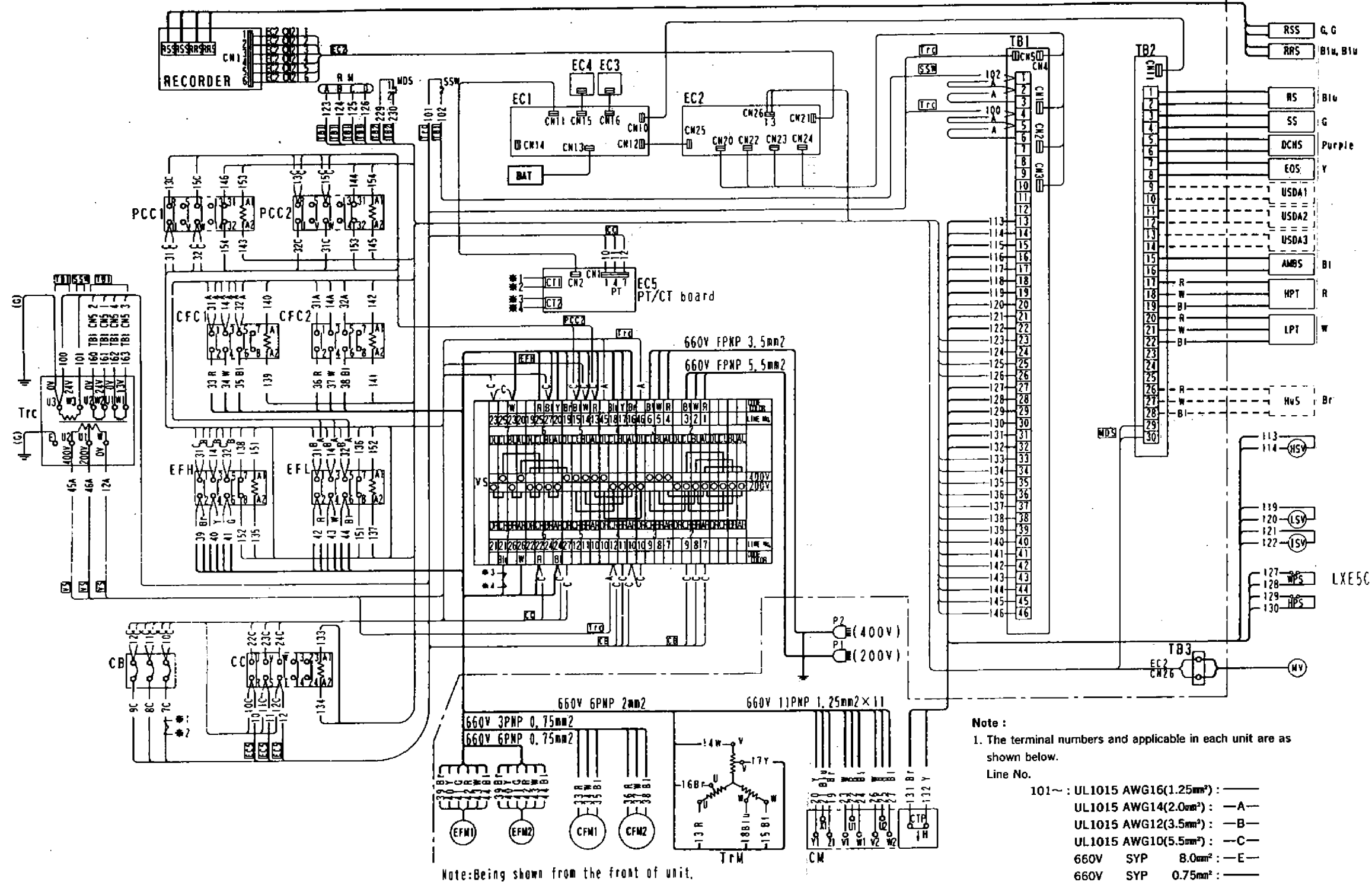
●LXE10C(-A)



●LXE5C(A)

Inside control box

Outside control box



Note: Being shown from the front of unit.

Note :

1. The terminal numbers and applicable in each unit are as shown below.

Line No.

- 101 ~ : UL1015 AWG16(1.25mm²) : —
- UL1015 AWG14(2.0mm²) : —A—
- UL1015 AWG12(3.5mm²) : —B—
- UL1015 AWG10(5.5mm²) : —C—
- 660V SYP 8.0mm² : —E—
- 660V SYP 0.75mm² : —

2. Line color

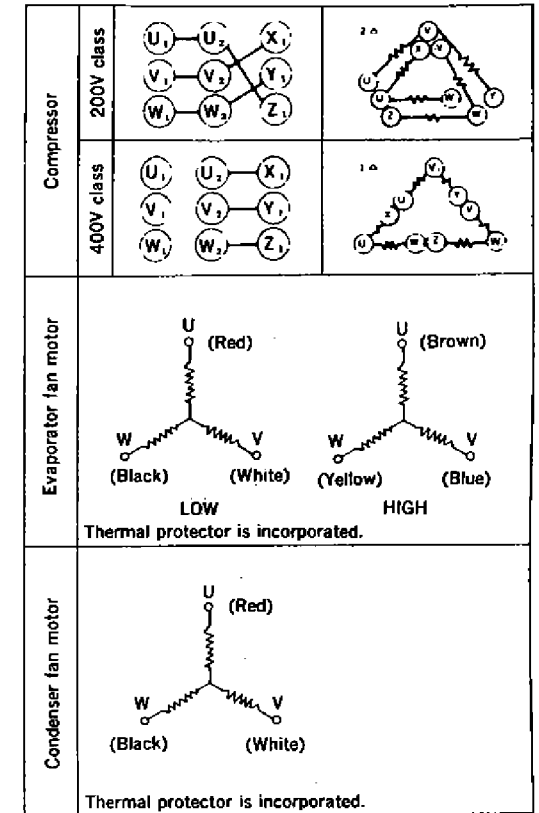
Bl : Black Blu : Blue Br : Brown R : Red Y : Yellow
W : White (G) : Green-ground P : Purple

3. Ground cable is VSFO. 75mm².

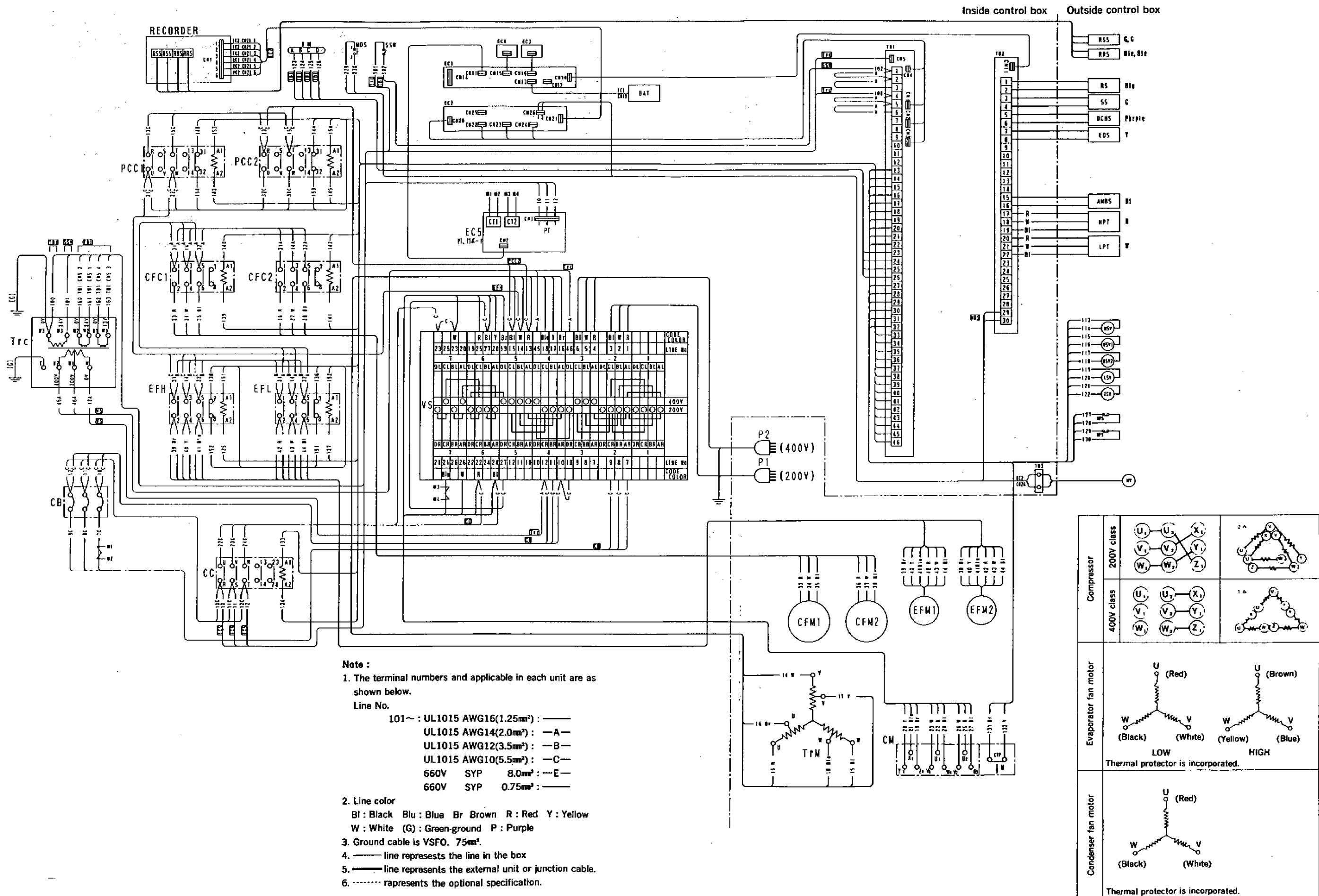
4. — line represents the line in the box

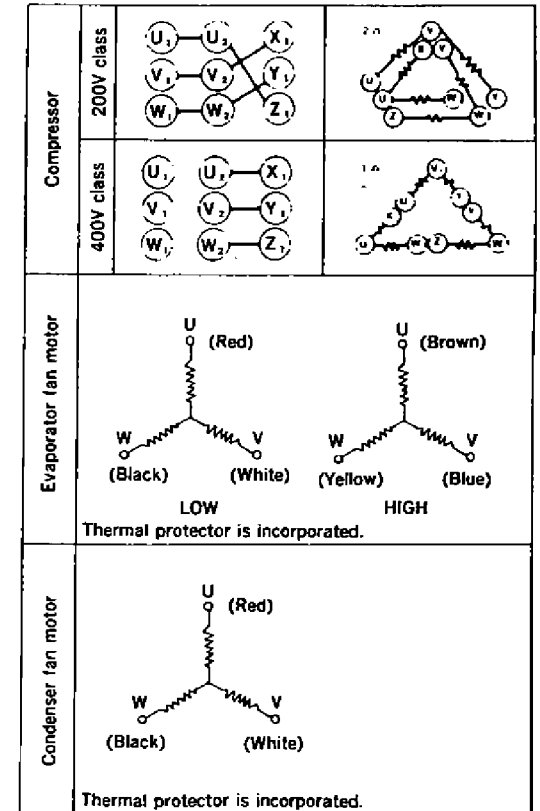
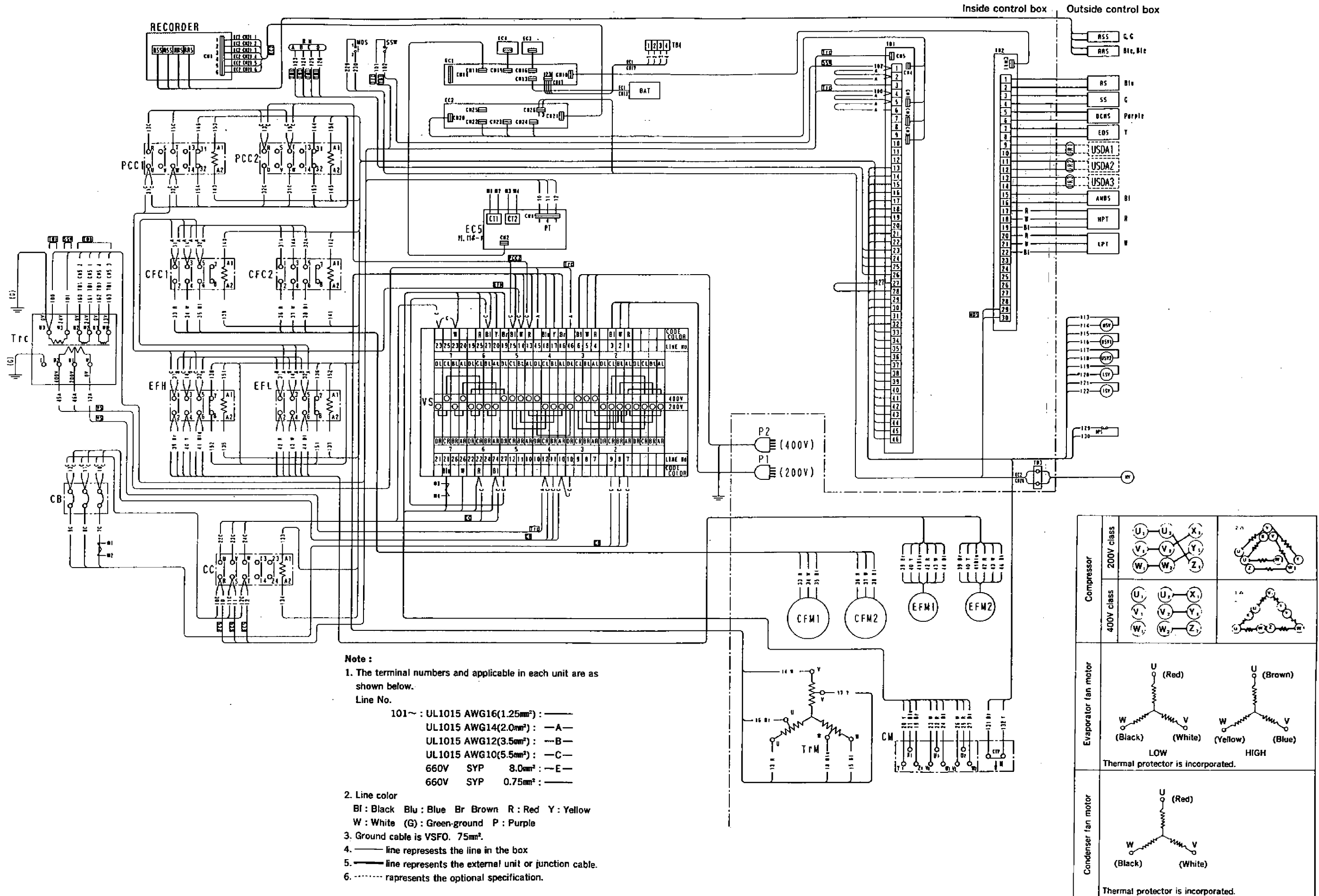
5. — line represents the external unit or junction cable.

6. represents the optional specification.

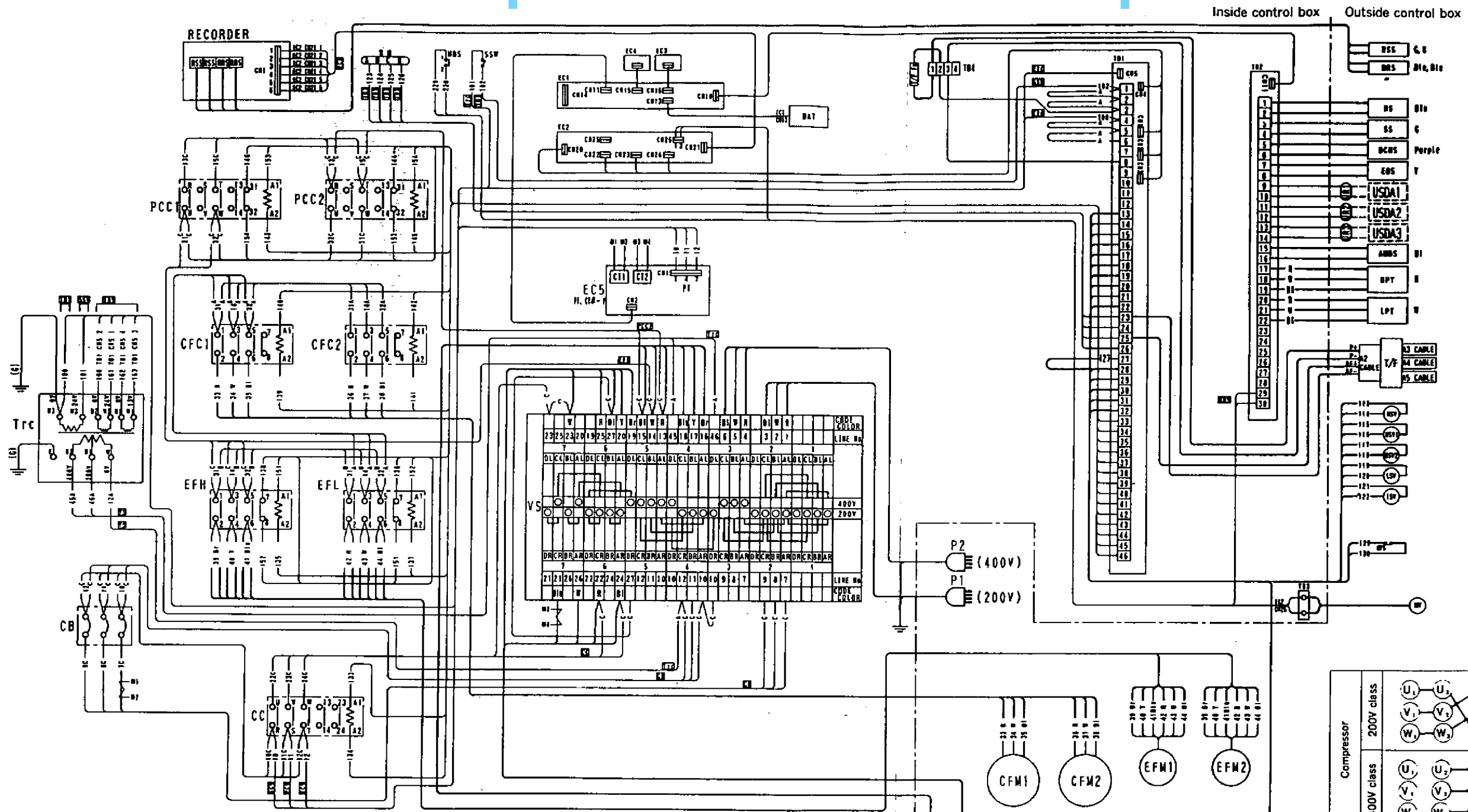


●LXE10CA-1





●LXE10CA-A2



Note :

1. The terminal numbers and applicable in each unit are as shown below.

Line No.
 101~ : UL1015 AWG16(1.25mm²) : —
 UL1015 AWG14(2.0mm²) : —A—
 UL1015 AWG12(3.5mm²) : —B—
 UL1015 AWG10(5.5mm²) : —C—
 660V SYP 8.0mm² : —E—
 660V SYP 0.75mm² : —

2. Line color

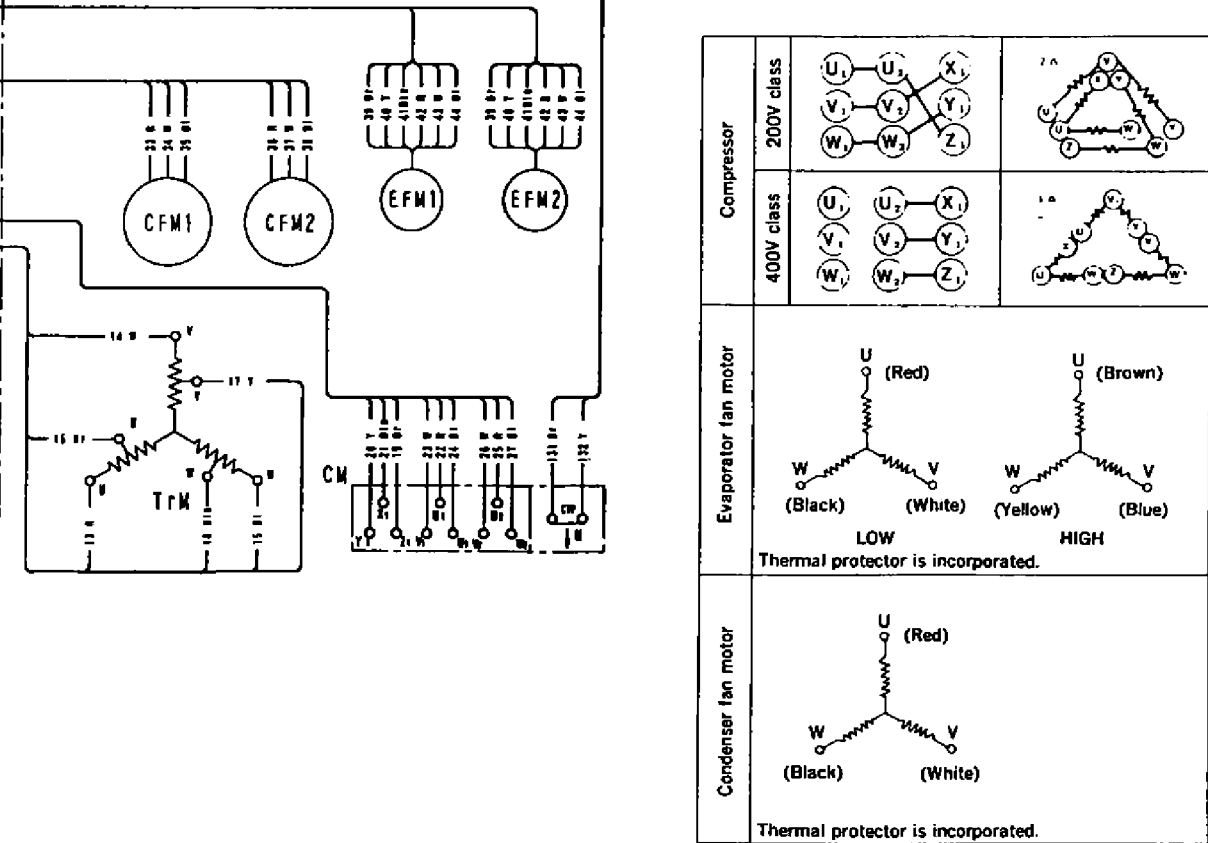
Bl : Black Blu : Blue Br Brown R : Red Y : Yellow
 W : White (G) : Green-ground P : Purple

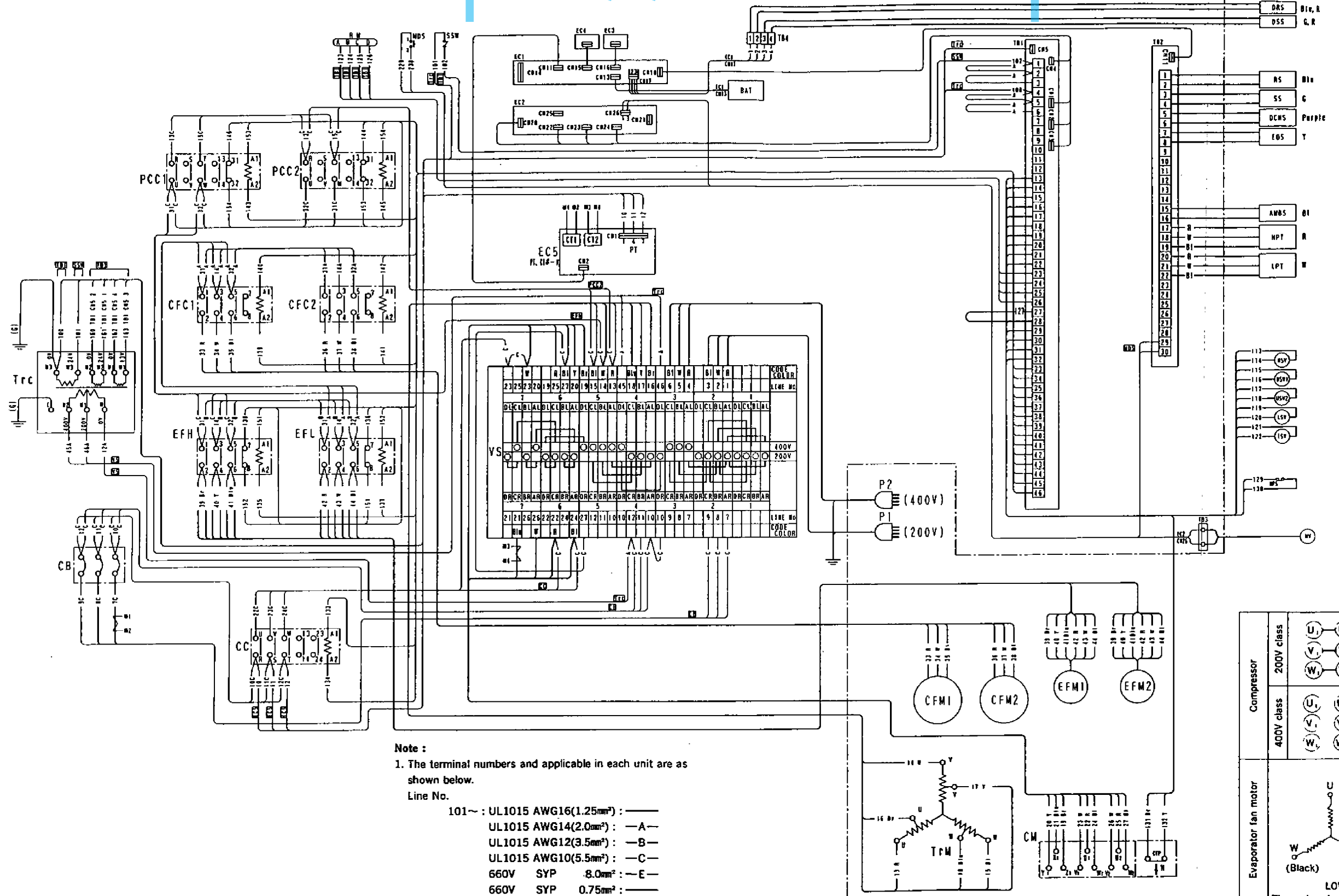
3. Ground cable is VSFO. 75mm².

4. — line represents the line in the box

5. — line represents the external unit or junction cable.

6. - - - - - represents the optional specification.





- Note :**
- The terminal numbers and applicable in each unit are as shown below.
Line No.
101~ : UL1015 AWG16(1.25mm²) : —
UL1015 AWG14(2.0mm²) : —A—
UL1015 AWG12(3.5mm²) : —B—
UL1015 AWG10(5.5mm²) : —C—
660V SYP 8.0mm² : —E—
660V SYP 0.75mm² : —
 - Line color
Bl : Black Blu : Blue Br : Brown R : Red Y : Yellow
W : White (G) : Green-ground P : Purple
 - Ground cable is VSFO. 75mm².
 - line represents the line in the box
 - line represents the external unit or junction cable.
 - represents the optional specification.

Compressor	200V class		
	400V class		
Evaporator fan motor	LOW		
	HIGH		
Condenser fan motor			

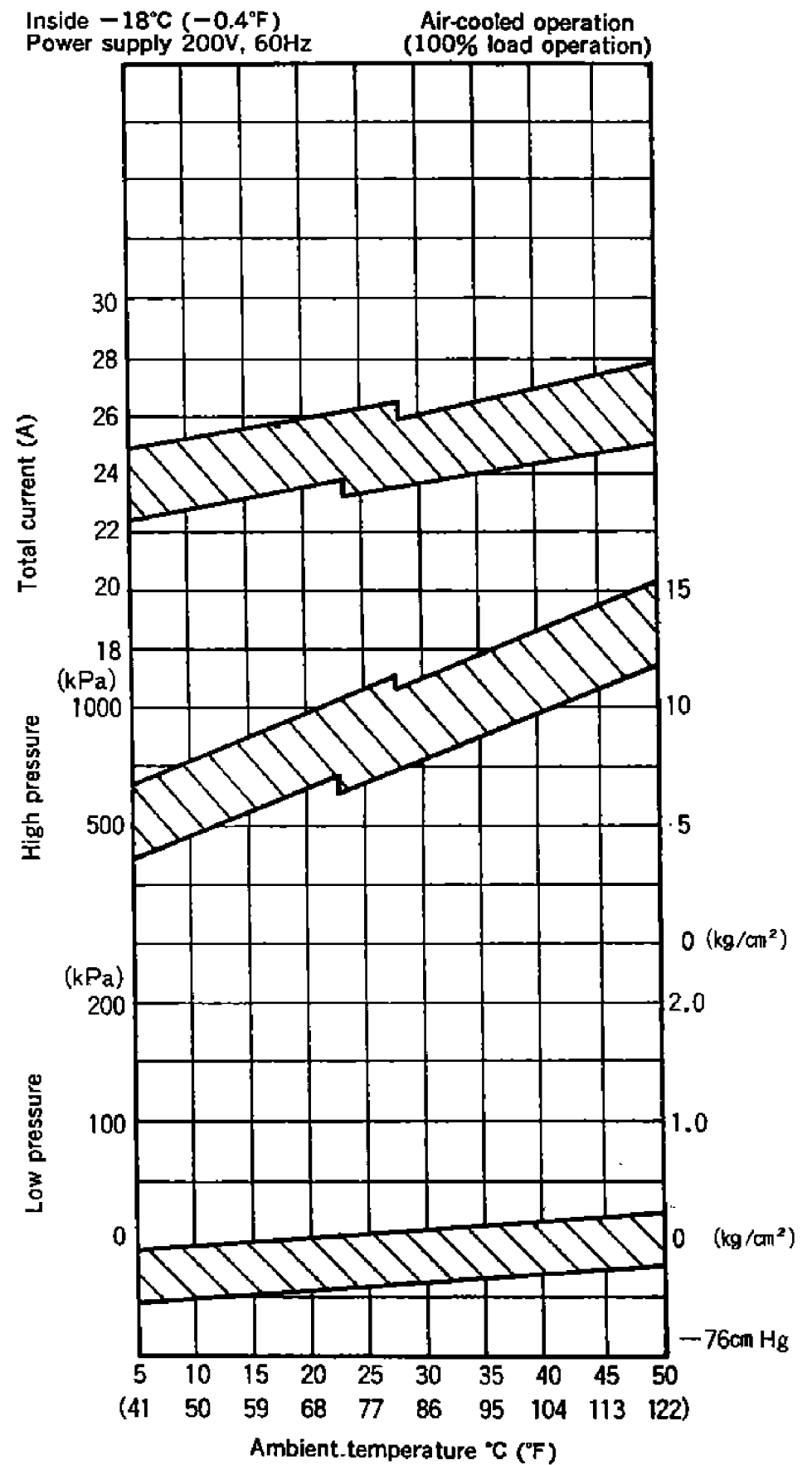
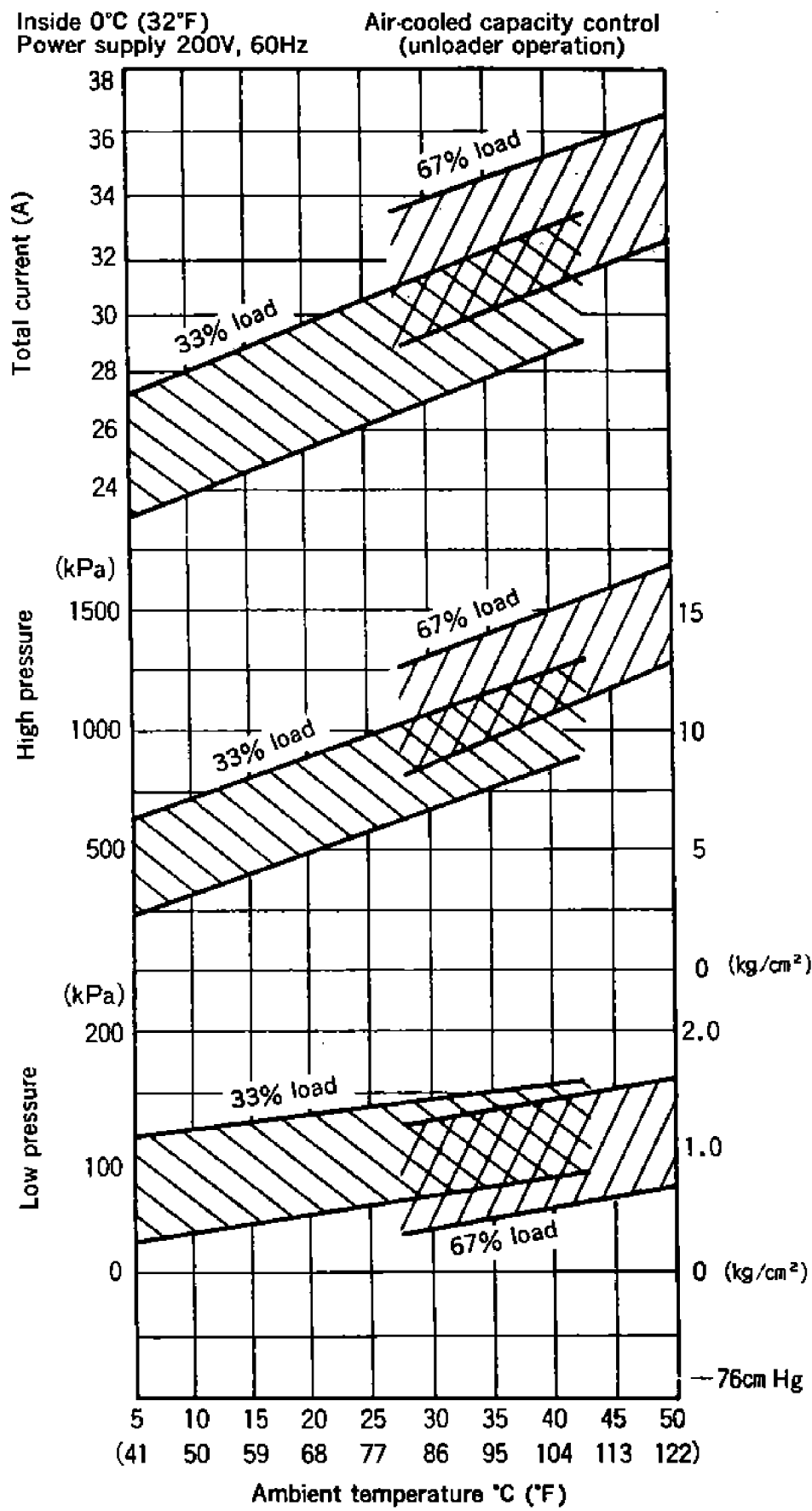
1.5 Set values of functional and protective devices

Device name		Activation	Set value	Detection method	Symbol			
Pressure switch	High-pressure switch	OFF ON	2059kPa (21kg/cm ²) 1569kPa (16kg/cm ²)	High-pressure switch	HPS			
	Water pressure switch	OFF ON	98kPa (1.0kg/cm ²) 39kPa (0.4kg/cm ²)	Water pressure switch	WPS			
Model			DECOSIII DECOSIIIa					
Electronic controller	Mode switch	Chilled mode	ON	+25.0°C ~ -2.9°C (+77.0°F ~ +26.8°F)		Set temperature	EC	
		Partial frozen mode		-3.0°C ~ -10.0°C (+26.6°F ~ +14°F)				
		Frozen mode		-10.1°C ~ -25.0°C (+13.8°F ~ -13.0°F)	-10.1°C ~ -30.0°C (+13.8°F ~ -22.0°F)			
	Delay timer	Fan	Change-over for H-L	ON	10 seconds			
			After defrosting		60 seconds			
		Compressor	Starting		3 seconds			
	Defrost timer	Initiation	Short	ON	4 hours	4 hours* 1		
			Long		3, 6, 9, 12 and 24 hours			
		Back-up		OFF	90 minutes			
		In-range masking			90 minutes			
		Out-range guard		ON	30 minutes			
	Evaporator fan motor (Frozen mode)		H→L L→H		-10.0°C (14°F) -5.0°C (23°F)	Return air temperature	RS	
	Condenser fan motor (Water cooled operation)		OFF ON		25°C (77°F) 30°C (86°F)	Ambient temperature sensor	AMBS	
Defrost termination		OFF Reset		35°C (95°F) 20°C (68°F)	Evaporator outlet sensor	EOS		
Low-pressure cutout * Only when starting		Cutout Reset		-72kPa (540mmHgV)	Low-pressure sensor	LPT		
High-pressure control (Condenser fan)		OFF ON		720kPa (7.3kg/cm ²) 1180kPa (12.0kg/cm ²)	High-pressure sensor	HPT		
Compressor discharge temperature protection		Cutout Reset		130°C (266°F) After 3 minutes elapse	Discharge sensor	DCHS		
Injection solenoid valve		ON OFF		120°C (248°F) 110°C (230°F)	Discharge sensor	DCHS		
Overcurrent protection		Cutout Reset		14A (LXE10C/10CA) 8.2A (LXE5C) After 3 minutes elapse	CT/PT board	CT2		
Breaker	Circuit breaker (main circuit) EA53B	OFF		50A (LXE10C/10CA) 30A (LXE5C)		CB		
	Fuse (controller)	OFF		10A		Fu		
Motor	Evaporator fan motor thermal protector	OFF		132°C (270°F)				
	Condenser fan motor thermal protector	OFF		140°C (284°F)				
	Compressor motor thermal protector	OFF		105°C (221°F)		CTP		

* 1. 6 hours when the control temperature is -20°C or below.

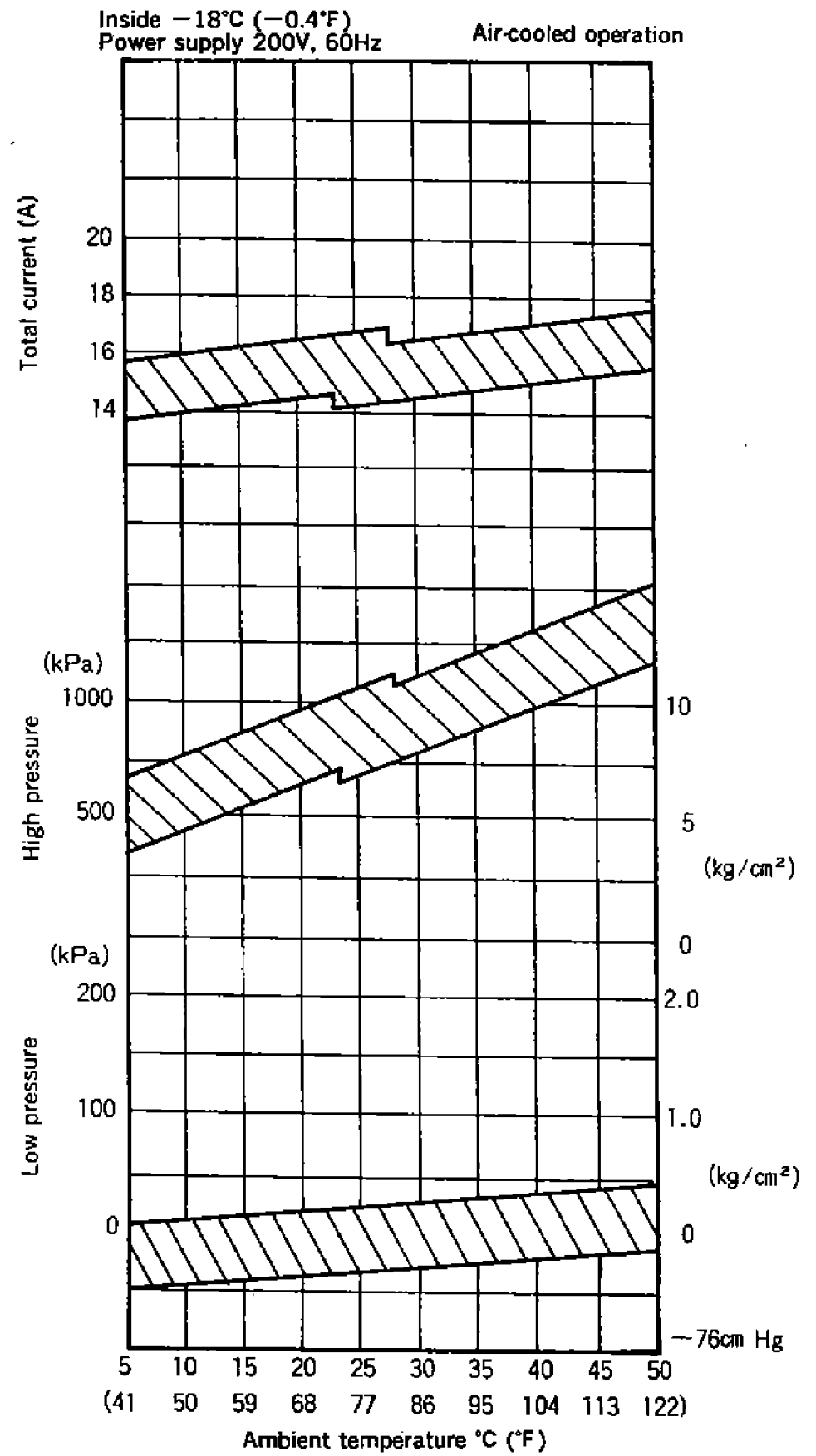
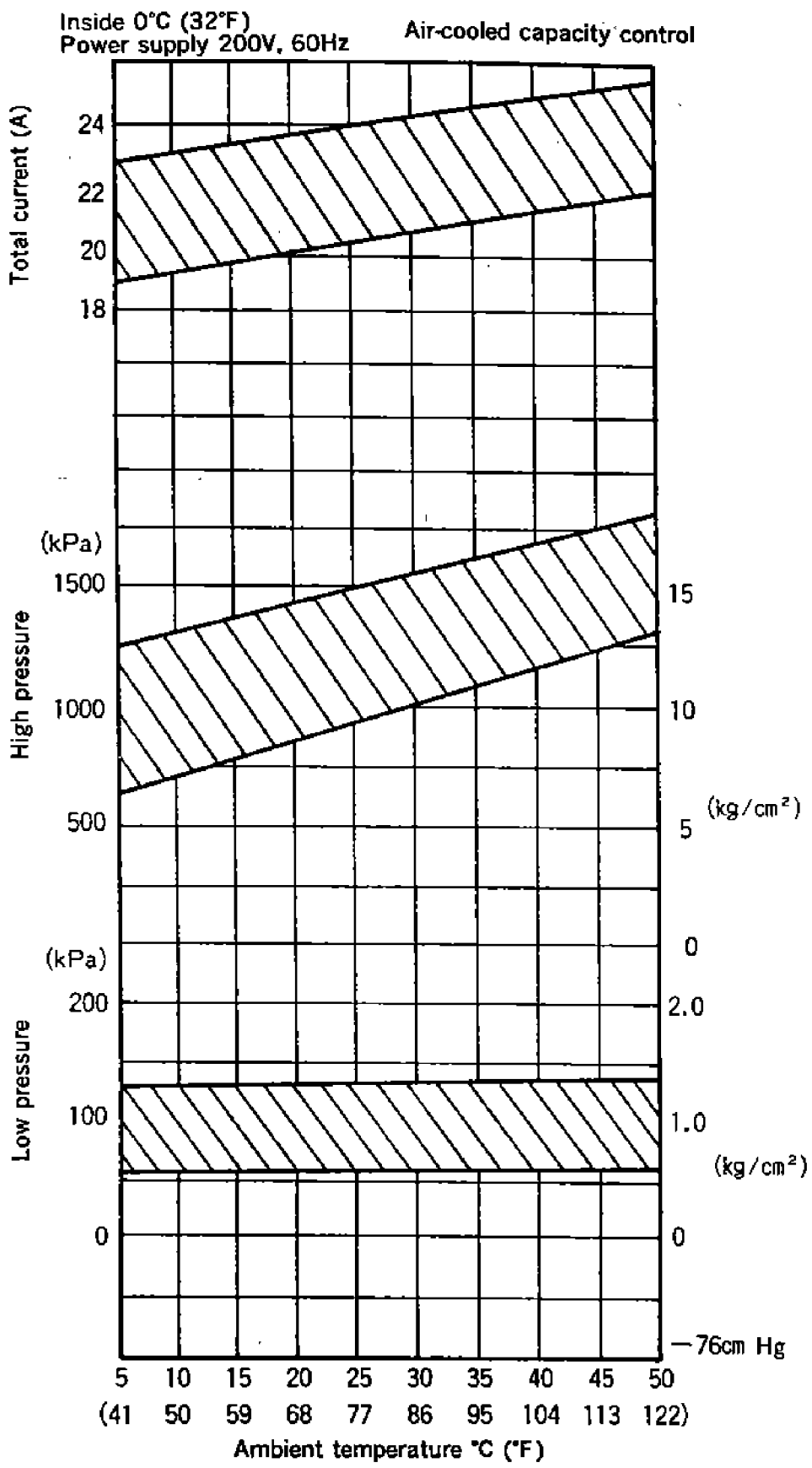
1.6 Operation pressure and running current

●LXE10C(-A)/LXE10CA(-A)



	Item	Unit	Amperage
1	Condenser fan motor running current (2 mortors)	A	1.7 (AC400V)
2	Evaporator fan motor running current (2 mortors)	A	High speed 3.2 (AC400V)
			Low speed 0.9 (AC400V)

●LXE5C(-A)



	Item	Unit	Amperage
1	Condenser fan motor running current (2 mortors)	A	0.8 (AC400V)
2	Evaporator fan motor running current (2 mortors)	A	High speed 2.2 (AC400V)
			Low speed 0.6 (AC400V)

2. Operation modes and control

● There are two major kinds of the operation modes: the cargo cooling control mode and unit inspection mode.

The mode to cool the cargo is explained in this item.

※ For the unit inspection mode, refer to chapter for maintenance and repair 4.

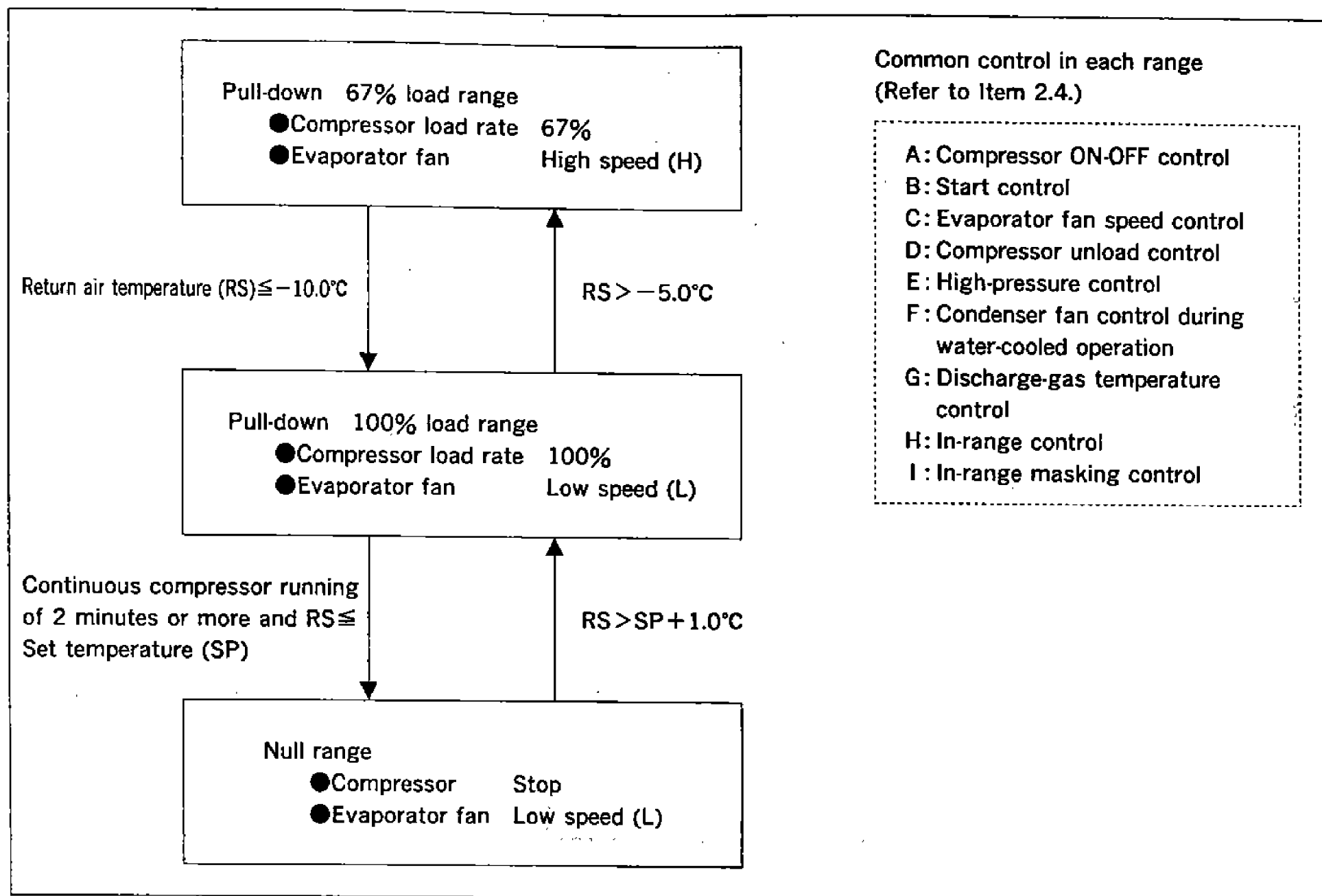
● The relationship between the operation mode and set point of temperature is as follows.

Operation mode	Set point of temperature		Control sensor	Operation description
	DECOSIII	DECOSIIIa		
Frozen	-10.1~-25.0°C (+13.8~-13.0°F)	-10.1~-30.0°C (+13.8~-22.0°F)	Return air sensor	Compressor ON/OFF control
Partial frozen	-3.0~-10.0°C (+26.6~+14.0°F)		Return air sensor	Hot-gas bypass control with modulating valve
Chilled	+25.0~-2.9°C (+77~+26.8°F)		Supply air sensor	Hot-gas bypass control with modulating valve
Defrost			Evaporator outlet sensor	Hot-gas defrosting with refrigerant charge and release control

※ For details, refer to Item 2.1 to 2.4.

2.1 Frozen operation

Control state transition and common control



Operation of magnetic contactor and solenoid valve

Component name		Pull-down 67% load	Pull-down 100% load	Null	
Magnetic contactor	Compressor	CC	○	○	×
	Evaporator fan. High speed	EFH	○	×	×
	Evaporator fan. Low speed	EFL	×	○	○
	Condenser fan	CF	△	△	×
Solenoid valve	Liquid solenoid valve	LSV	○	○	×
	Injection solenoid valve	ISV	△	△	×
	Hot-gas 3-way solenoid valve	HSV	×	×	×
	Unload solenoid valve 1	USV1	○	×	×
	Unload solenoid valve 2	USV2	×	×	×
Opening, modulating valve		MV	0%	0%	0%

Note) ○: Energized ×: Deenergized △: Depending on the control
 Unload solenoid valves (USV1 and USV2) are provided in LXE10C(-A).

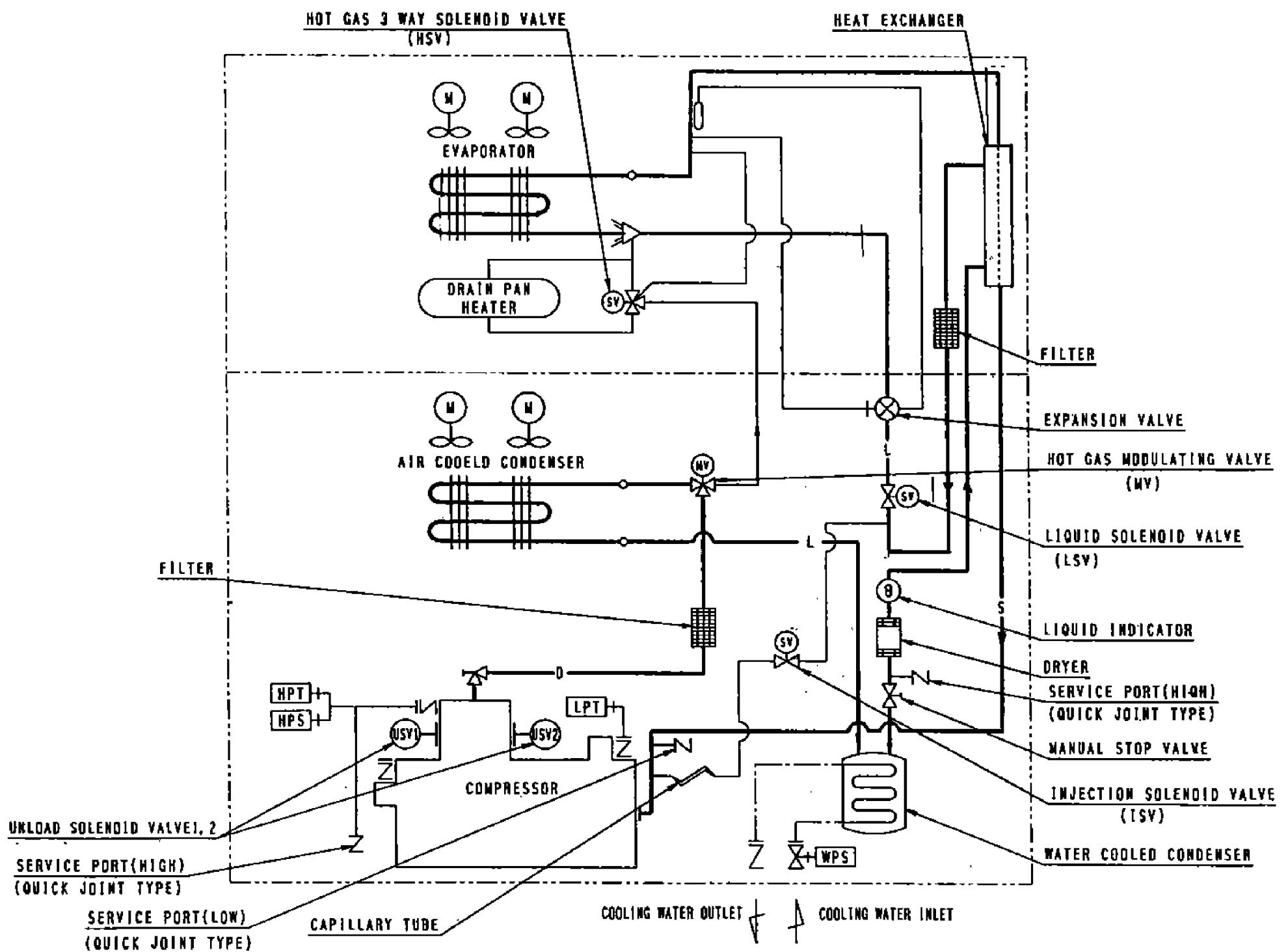
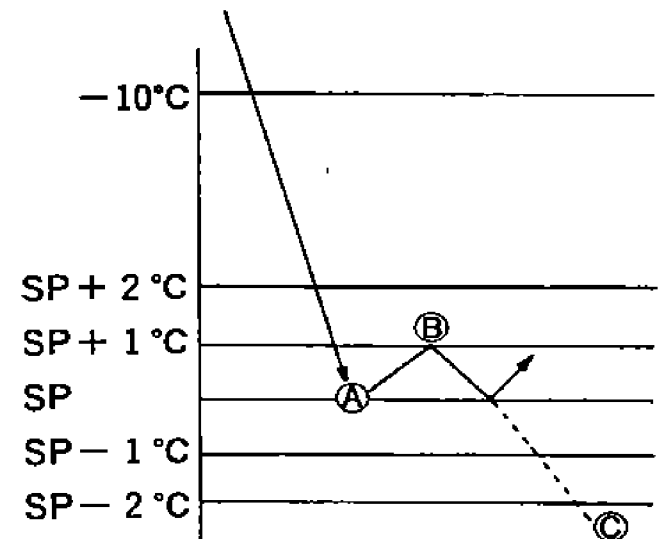
Frozen operation

(1) Temperature setting and control sensor

If the set point of temperature (referred to as SP hereafter) is -10.1°C ($+13.8^{\circ}\text{F}$) or lower, the compressor is operated on and off, sensing return air temperature of the evaporator.

(2) Control

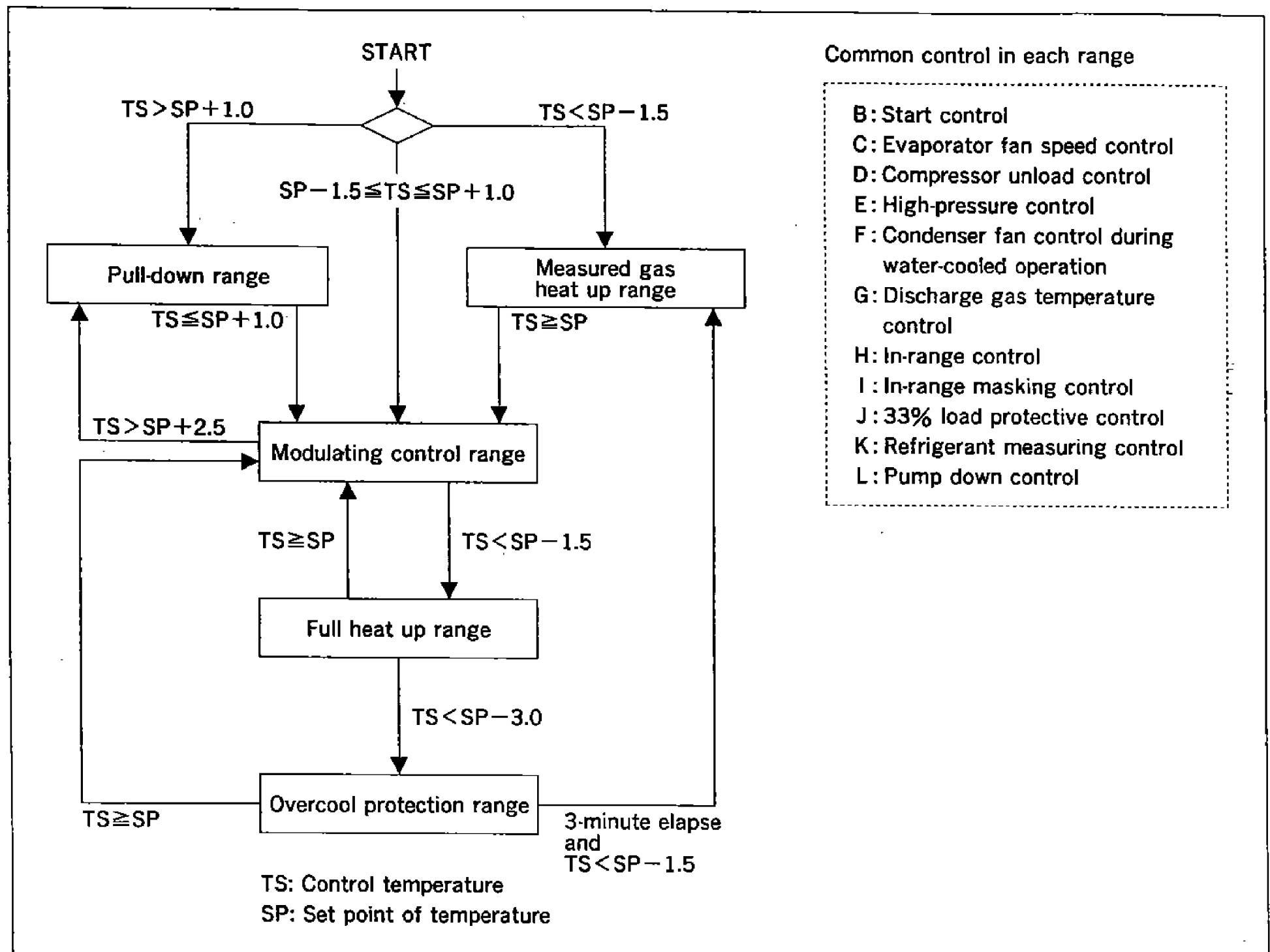
- ① If the control temperature reaches SP (point A), the compressor, condenser fan and liquid solenoid valve (LSV) are turned off.
- ② If the control temperature exceeds $\text{SP} + 1.0^{\circ}\text{C}$ (point B), the compressor, liquid solenoid valve and condenser fan are turned on. Here, the compressor runs for 2 minutes every time when it is turned on once. Even if the control temperature becomes below SP (point C) within 2 minutes after the compressor is turned on, the compressor, condenser fan and liquid solenoid valve are not turned off. (2 minutes compressor forced operation)



Note: LXE10CA is shown above.

2.2 Chilled and partial frozen operation

Control state transition and common control



Operation of magnetic contactor and solenoid valve

Component name			Pull-down	Modulating control	Full heat up	Overcool protection	Measured gas heat up	
Magnetic contactor	Compressor	CC	○	○	○	×	○	
	Evaporator fan. High speed	EFH	○	○	○	○	○	
	Evaporator fan. Low speed	EFL	×	×	×	×	×	
	Condenser fan	CF	△	△	△	×	△	
Solenoid valve	Liquid solenoid valve	LSV	○	○	○	×	×	
	Injection solenoid valve	ISV	△	△	×	×	△	
	Hot-gas 3-way solenoid valve	HSV	×	×	×	×	○	
	Unload solenoid valve 1	USV1	○	○	○	×	×	
	Unload solenoid valve 2	USV2	×	△	×	×	×	
Opening, modulating valve			MV	0%	0.1~99.9%	100%	0%	100%

Note) ○: Energized ×: Deenergized △: Depending on the control

Unload solenoid valves (USV1 and USV2) are provided in LXE10C(-A).

Chilled and partial frozen operation

(1) Temperature setting and control sensor

Chilled operationIf the set point of temperature is -2.9°C ($+26.8^{\circ}\text{F}$) or higher, the modulating valve (MV) is controlled sensing the supply air temperature in order to adjust the hot gas bypass amount.

Partial frozen operation....If the set point of temperature is -3.0°C to -10.0°C ($+26.6^{\circ}\text{F}$ to $+14.0^{\circ}\text{F}$), the modulating valve is controlled sensing the return air temperature in order to adjust the hot gas bypass amount.

※The operation mode is automatically switched according to the set value of the electronic controller. Chilled and partial frozen operations are controlled in the same manner except the sensor for the temperature control.

(2) Description of control state

- | | |
|--------------------------------|---|
| (a) Pull-down range | Cooling is executed to lower the inside temperature to the set temperature. |
| (b) Modulating control range | The hot gas bypass amount is adjusted by the modulating valve in order to keep the control temperature. |
| (c) Full heat up range | Rapid heating is executed to prevent the inside temperature from over cooling. |
| (d) Measured gas heat up range | The refrigerant is measured for heating in order to gain the control temperature. |
| (e) Overcool protection range | The compressor is stopped but the evaporator fan is kept running. |

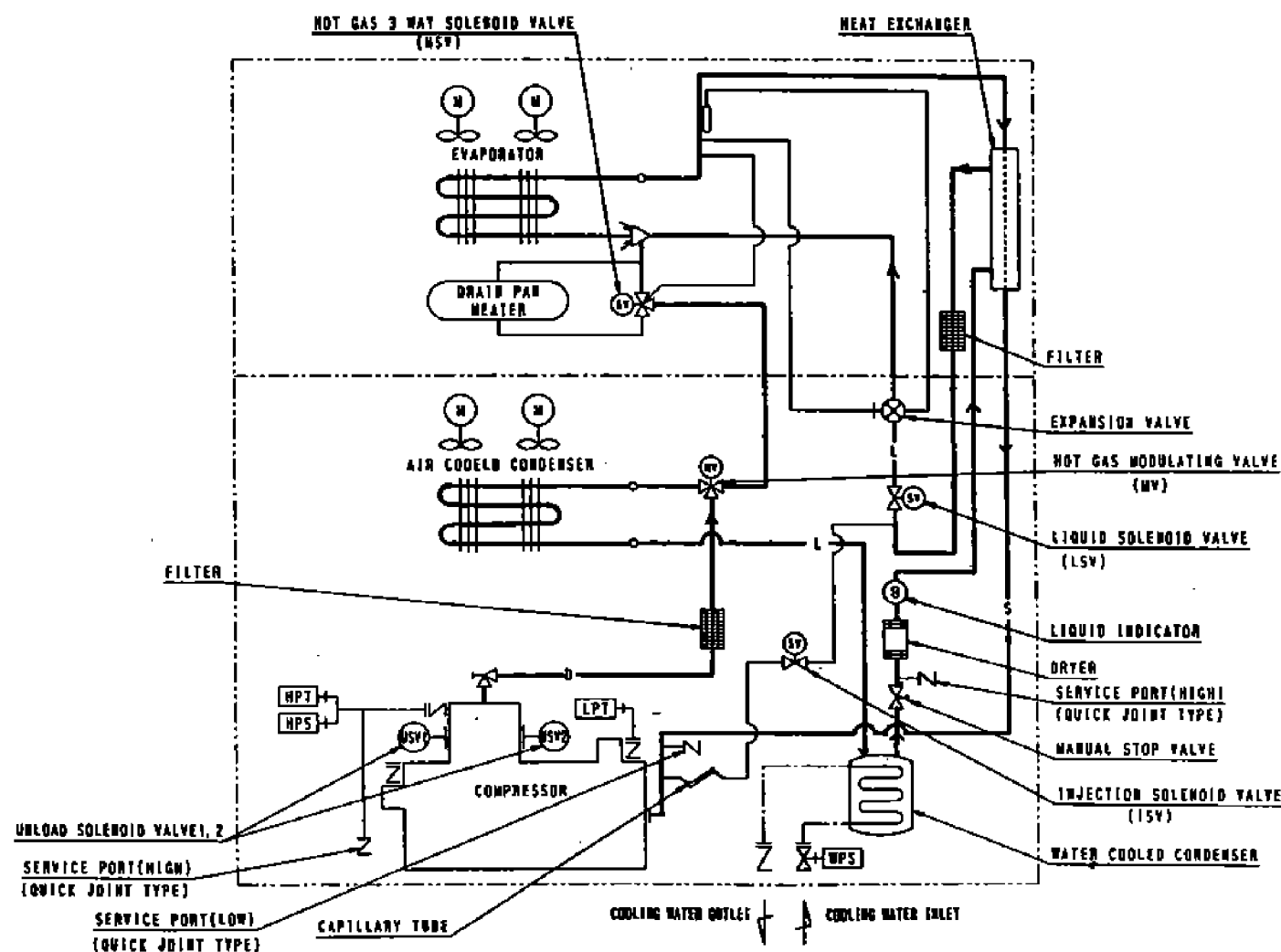
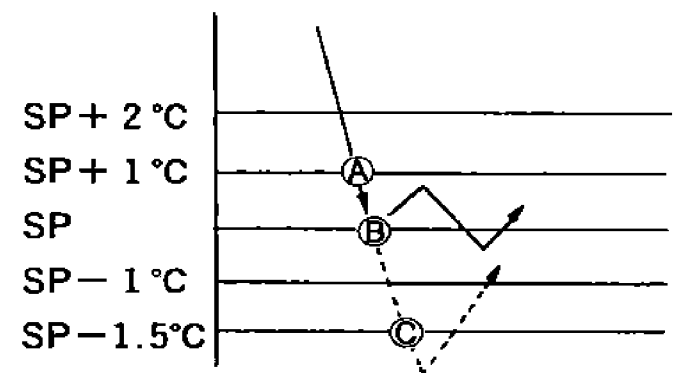
(3) Control

Note: In case of LXE5C(-A), the compressor is operated at 100% load.

- ① In the pull-down range, the opening of the modulating valve (MV) is 0%, and the compressor is operated at 67% load.
- ② When the control temperature reaches the point A, the in-range lamp is turned on. At the same time, the modulating valve is opened to make the hot gas start flowing to the evaporator.
- ③ When the control temperature reaches SP (point B), if the pull-down time is 30 minutes or more, 67% load of compressor is kept and 33% load is selected in the other cases.

※Pull-down time: Time required for the control temperature to reach $\text{SP} + 1^{\circ}\text{C}$ (point A).

- ④ When the hot gas bypass starts, the temperature sometimes temporarily rises with the in-range lamp turned off. After this operation is repeated several times, it will come into the stable state.
- ⑤ The flow rate of the hot gas will be gradually varied by the modulating valve in order to put the control temperature into the stable state.
- ⑥ Even after the stable state is achieved, the full heat up is executed if the control temperature falls to $\text{SP} - 1.5^{\circ}\text{C}$ (point C) since the ambient temperature varies.



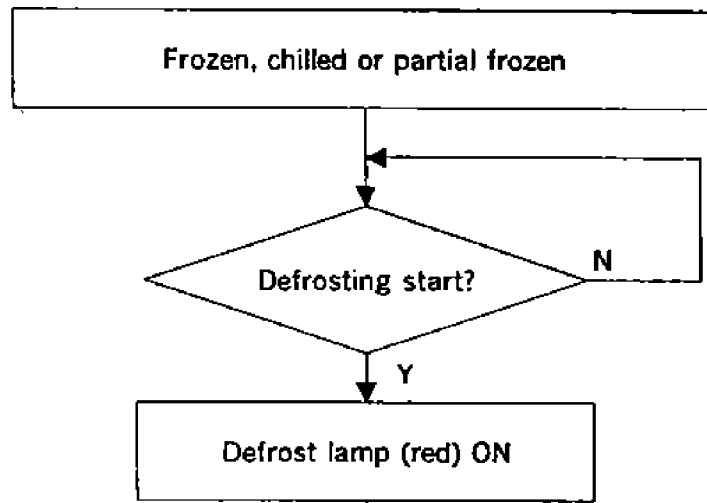
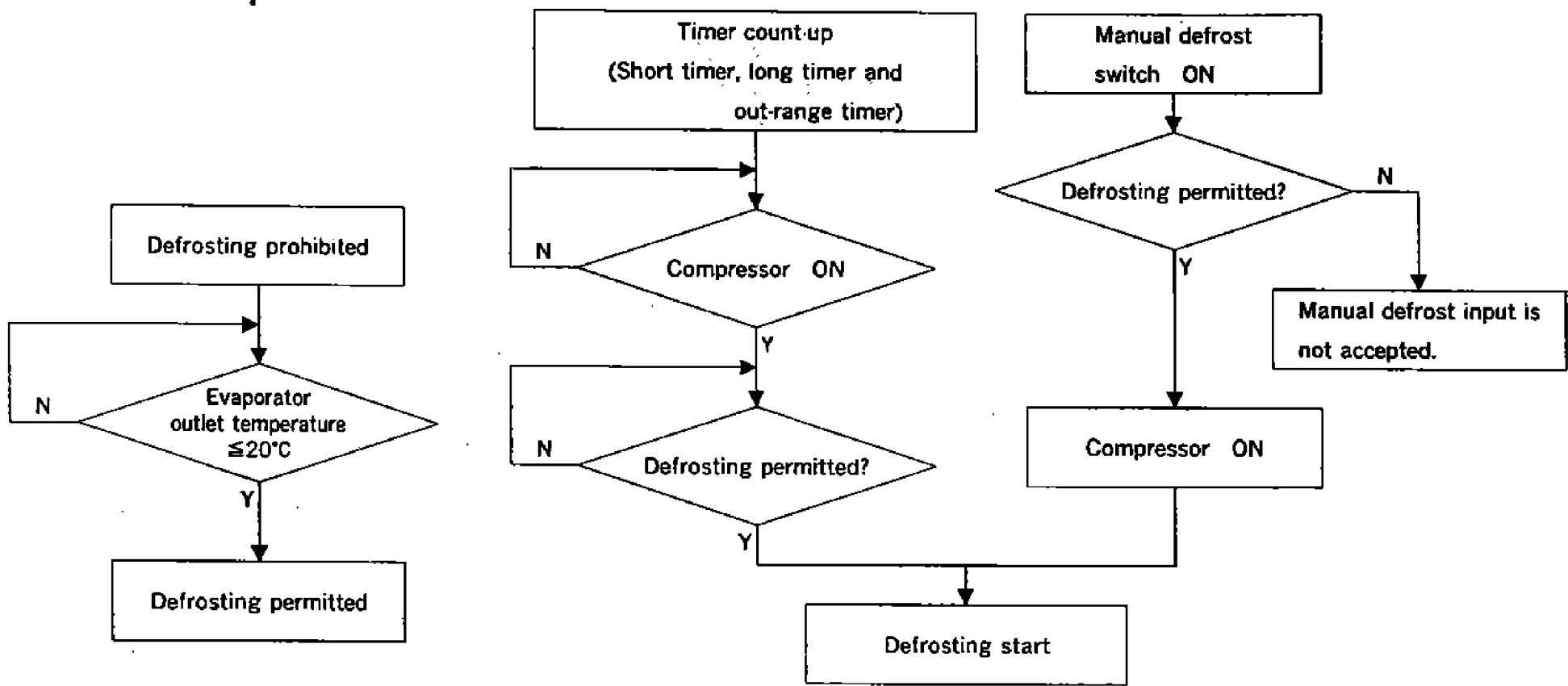
Note: LXE10CA is shown above.

※The left figure shows the hot gas bypass state in the modulating control range. In other cases.

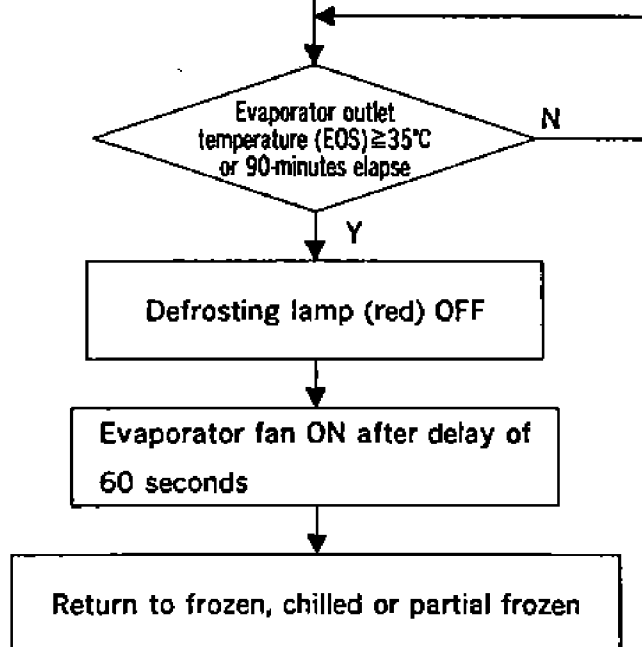
Full heat up range
...MV is 100% opened toward the evaporator.

Measured gas heat up range
...Same as for defrosting

2.3 Defrost operation



Defrosting range		Common control (Refer to Item 2.4.)	
● Compressor load rate	100%	<div style="border: 1px dashed black; padding: 2px;"> K: Refrigerant measuring control L: Pump-down control </div>	
● Evaporator fan	OFF		
● Condenser fan	OFF		
● Modulating valve (MV)	100%		



Operation of magnetic contactor and solenoid valve

Component name			Defrosting	
Magnetic contactor	Compressor	CC	○	
	Evaporator fan. High speed	EFH	×	
	Evaporator fan. Low speed	EFL	×	
	Condenser fan	CF	×	
Solenoid valve	Liquid solenoid valve	LSV	×	
	Injection solenoid valve	ISV	△	
	Hot-gas 3-way solenoid valve	HSV	○	
	Unload solenoid valve 1	USV1	×	
	Unload solenoid valve 2	USV2	×	
Opening, modulating valve			MV	100%

Note) ○: Energized ×: Deenergized
 △: Depending on the control
 Unload solenoid valves (USV1 and USV2) are provided in LXE10C(-A).

Defrost operation

(1) Defrost system

The hot-gas defrost system is adopted in the units; i.e. the high temperature and high pressure refrigerant (hot gas) from the compressor is sent to the evaporator and drain pan for defrosting. Since the evaporator is heated directly by the hot refrigerant in the evaporator, defrosting can be performed effectively.

(2) Defrost initiation

Defrosting is initiated by the timer or manual switch.

However, defrosting is not initiated when the temperature of the evaporator outlet exceeds 20°C.

- ① Timers (Timer intervals are set at the electronic controller and refer to item 3.2 for its operating method.)

Kind of timer	Timer interval set	Function
Long timer	3, 6, 9, 12 and 24 hours are selectable.	Regardless of the control temperature, defrosting is initiated according to the selected intervals.
Short time	4 hours* 1	Defrosting is initiated every 4 hours while the control temperature reaches within the suitable temperature after pull-down.
Out-range timer	30 minutes	After the control temperature reaches within the suitable temperature once, defrosting will be started 30 minutes later if the control temperature rises out of the suitable temperature.

* 1. 6 hours when the control temperature is -20°C or below. (only DECOSIIIa)

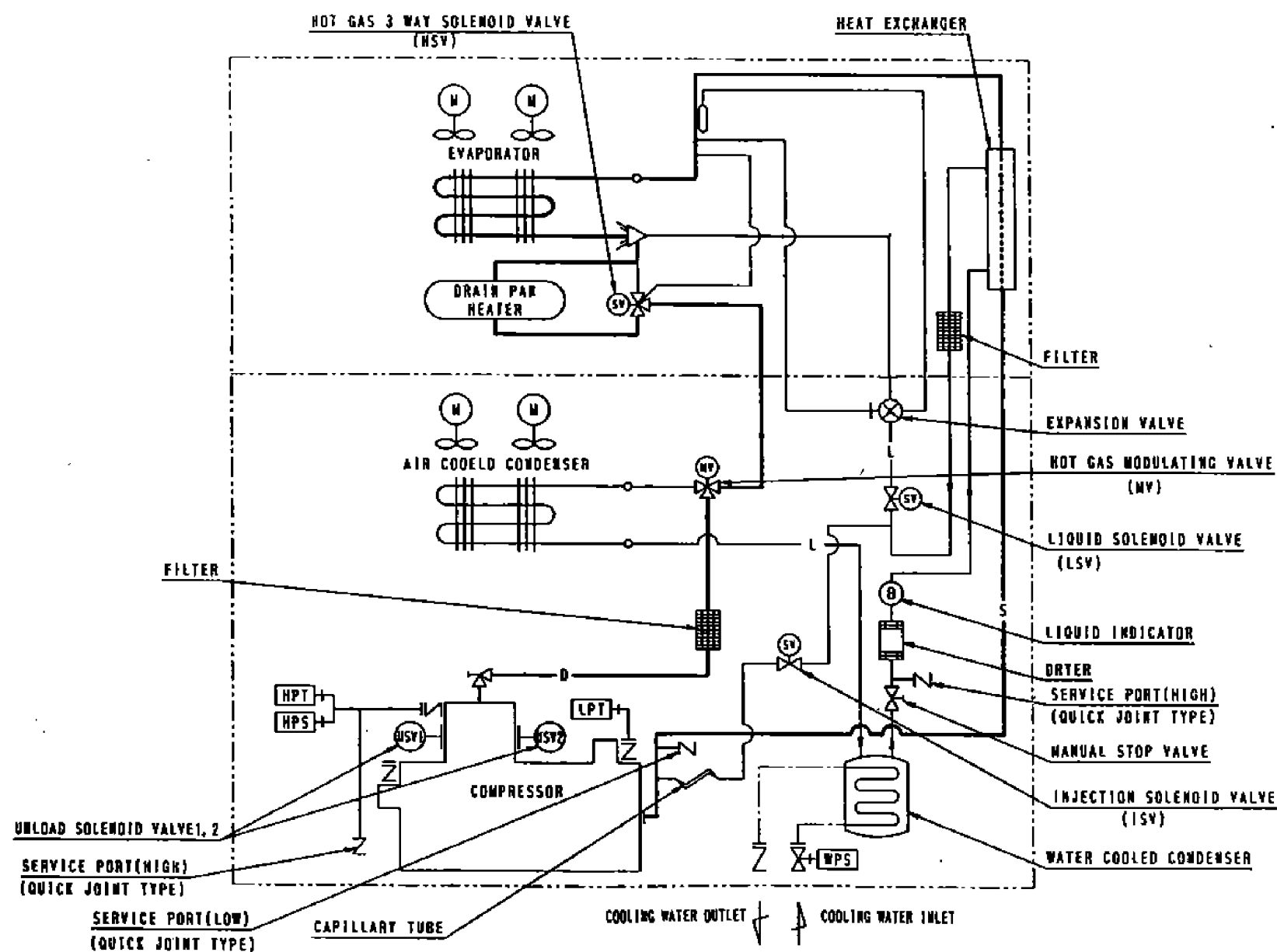
- ② Manual switch (installed on the control box)

Turn the manual defrost switch to the "MANUAL", and it will be turned on to initiate defrosting.

(3) Defrost termination

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

- ① The temperature of the evaporator outlet becomes 35°C or higher.
- ② 90 minutes have elapsed.
- ③ Any one of protective devices is activated.



Note: LXE10CA is shown above.

2.4 Common control

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

	Control name	Control content	Operation mode			
			Frozen	Chilled	Partial frozen	Defrost
A	Compressor ON-OFF control	The compressor is operated on and off to adjust the inside temperature.	○			
B	Start control	If the low pressure is higher, the liquid solenoid valve is temporarily closed to reduce the start load.	○	○	○	
C	Evaporator fan speed control	The evaporator fan is switched to the high or low speed according to the return air temperature.	○			
D	Unload control (LXE10C(-A)/LXE10CA(-A))	According to the required cooling capacity, the compressor load rate is controlled. Load rate: 100%—67%—33%	○ Except 33%	○*	○*	
E	High-pressure control	In order to keep the high pressure optimal, the condenser fan is controlled.	○	○	○	
F	Condenser fan control during water cooled operation	In order to prevent the temperature of the control box from rising, the condenser fan is controlled.	○	○	○	
G	Discharge gas temperature control	In order to prevent the refrigeration oil from deterioration, the liquid injection is made.	○	○*	○*	
H	In-range control	When the control temperature is within $SP \pm 2^{\circ}\text{C}$, the in-range lamp is turned on.	○	○	○	
I	In-range masking control	After defrost initiation, the in-range lamp is kept on for 90 minutes.	○	○	○	○
J	Modulating control	The amount of hot gas bypass to the evaporator is proportionally controlled to keep the control temperature variation within $\pm 0.5^{\circ}\text{C}$.		○*	○*	
K	Refrigerant measuring control	For optimal heating, the measured refrigerant is controlled.		○*	○*	○
L	Pump down control	The liquid refrigerant is collected into the water-cooled condenser (liquid receiver).		○	○	○

※: Only in the modulating control range

☆: Only in the measuring heat up range

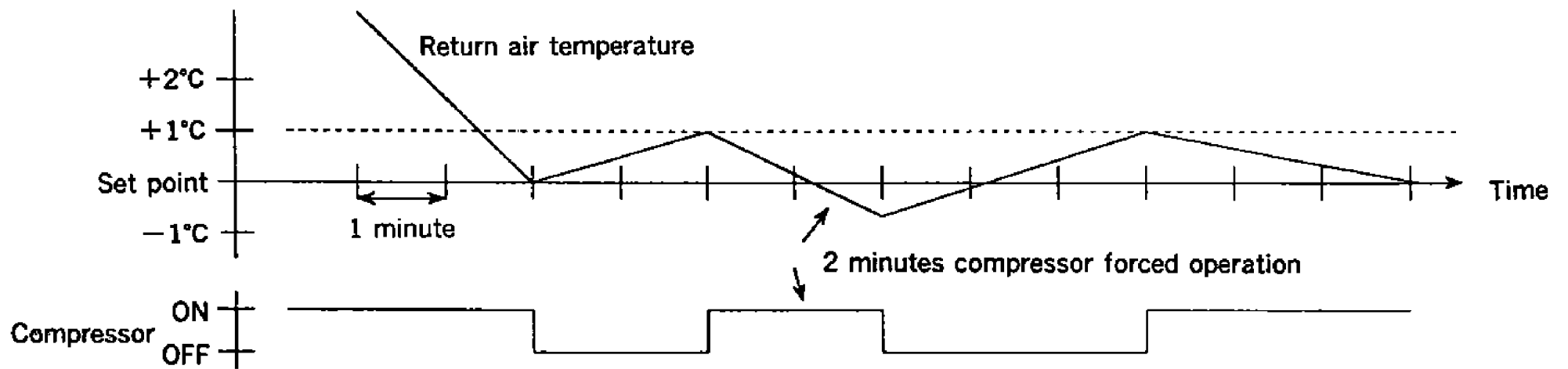
★: Excluding the measuring heat up range

Common control

A: Compressor ON-OFF control

In case of control temperature \leq set point of temperature, the compressor is stopped. If set point of temperature $+1.0^{\circ}\text{C} <$ control temperature is achieved, the compressor runs again.

When the compressor runs, it is forcibly run for 2 minutes. (2 minutes compressor forced operation). Because it prevents the compressor from deterioration due to shortage of lubricant.



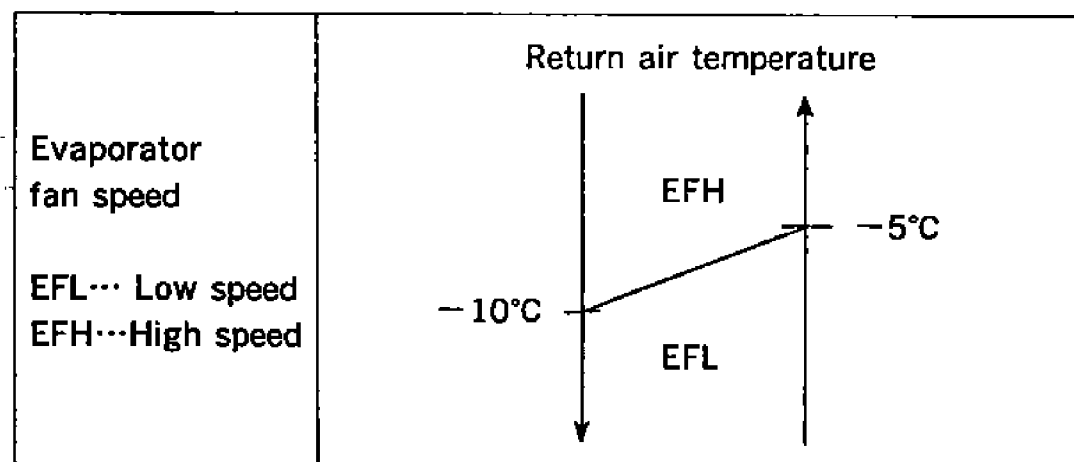
B: Start control

The compressor is started with a delay of 3 seconds from the start of fan motors to reduce the starting current, and the pump-down start is carried out since the start load of the compressor is reduced. If the low pressure exceeds 350kPa when the compressor is started, the liquid solenoid valve (LSV) is closed to start the pump in order to reduce the low pressure to 200kPa or lower. When the low pressure becomes 200kPa or lower, the liquid solenoid valve is opened to put the control into the normal operation. The pump-down start is not carried out if the low pressure is 350kPa or lower when the compressor starts.

C: Evaporator fan speed control

The speed of the evaporator fan is switched sensing the return air temperature. When the power is supplied, it is judged according to the temperature drop basis.

A delay time of 10 minutes is provided to switch the high speed to the low speed and vice versa.



D: Unload control (LXE10C/10C-A)

The load rate of the compressor is optimized according to the required cooling capacity. The control content is mainly separated to the frozen mode and the chilled mode.

The frozen mode prevents frost from sticking to the evaporator in order to reduce the power consumption as well as shorten the pull-down time.

The chilled mode optimizes the capacity according to the required cooling capacity in order to reduce the power consumption. The load rate of the compressor is determined according to the states of two unload solenoid valves (USV1 and 2).

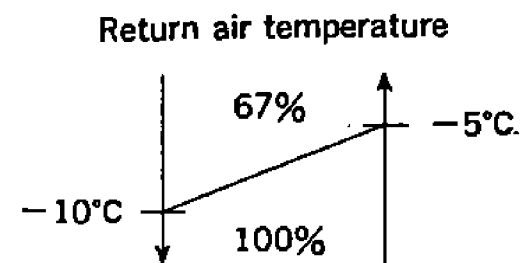
Refer to the right table. Here, ON expresses the energized state and OFF does the not-energized state.

Load rate	USV1	USV2
100%	OFF	OFF
67%	ON	OFF
33%	ON	ON

① Frozen

The speed of the evaporator fan is switched sensing the return air temperature. When the power is supplied, it is judged according to the temperature drop basis.

(Load rate in case of $-5^{\circ}\text{C} \leq \text{return air temperature} < -10^{\circ}\text{C}$ is 67%)



② Chilled (partial frozen)

The unload control in the chilled mode is executed in the modulating control range alone. The partial frozen mode has the same control method as the chilled mode except the different control sensor. The unload control of the chilled mode continues monitoring the control temperature since the start time, and determines the suitable load rate.

The load rate is determined in the following steps.

Step 1: Determination of load rate according to the control temperature at the start time

Step 2: Determination of load rate according to the pull-down time

Step 3: Determination of load rate according to the required cooling capacity variation

Step 1: The load rate at the start time is determined according to the value of the control temperature—set point of temperature (referred to as SP hereafter).

Control temperature at the start time	Load rate
$\text{SP} < \text{Control temperature} \leq \text{SP} + 1.0^{\circ}\text{C}$	67%
$\text{SP} - 1.5^{\circ}\text{C} \leq \text{Control temperature} \leq \text{SP}$	33%
$\text{Control temperature} < \text{SP} - 1.5^{\circ}\text{C}$	100%

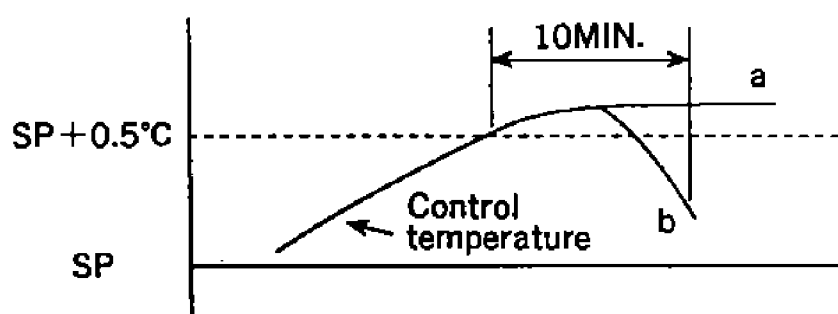
Step 2: If the control temperature is higher than $\text{SP} + 1.0^{\circ}\text{C}$ at the start time, the pull-down range is selected. The time from the pull-down range to the modulating control range ($\text{SP} + 1.0^{\circ}\text{C}$) is called the pull-down time. The load rate is determined from this time. If the control temperature has been lower than $\text{SP} + 1.0^{\circ}\text{C}$ since the start time, the pull-down time will be zeroed. The change of the load rate at Step 2 is executed when the control temperature reaches SP.

Pull-down time	Load rate	State transition of refrigeration unit
30 minutes or lower	33%	Pull-down range → Modulating control range
30 minutes or higher	67%	Pull-down range → Modulating control range
0	33%	Modulating control range*
0	33%	Measured gas heat up range → Modulating control range

※: The load rate is determined at Step 1.

Step 3: If the control temperature can not be kept at $\text{SP} \pm 0.5^{\circ}\text{C}$ due to the variation of required cooling capacity, the load rate is changed to maintain the control temperature. It is changed only when the load rate is 33% but not changed when it is 67%. The load rate will be changed when the control temperature is continuously out of $\text{SP} \pm 0.5^{\circ}\text{C}$ for 10 minutes. If the control temperature is out of the modulating control range, the change of the control state will be preferable.

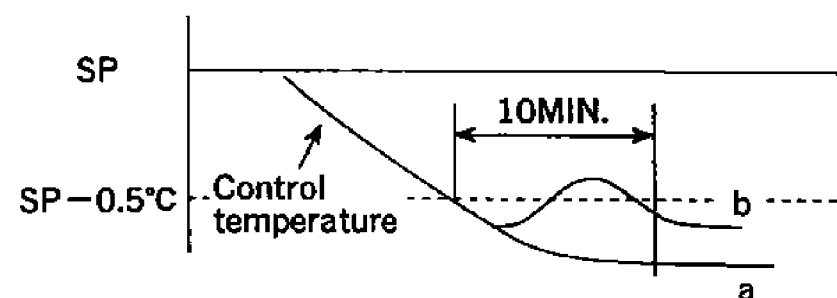
<Case 1>



a: The load rate is changed after keeping the control temperature $> \text{SP} + 0.5^{\circ}\text{C}$ for 10 minutes.

b: The load rate is not changed when keeping the control temperature $> \text{SP} + 0.5^{\circ}\text{C}$ less than 10 minutes.

<Case 2>



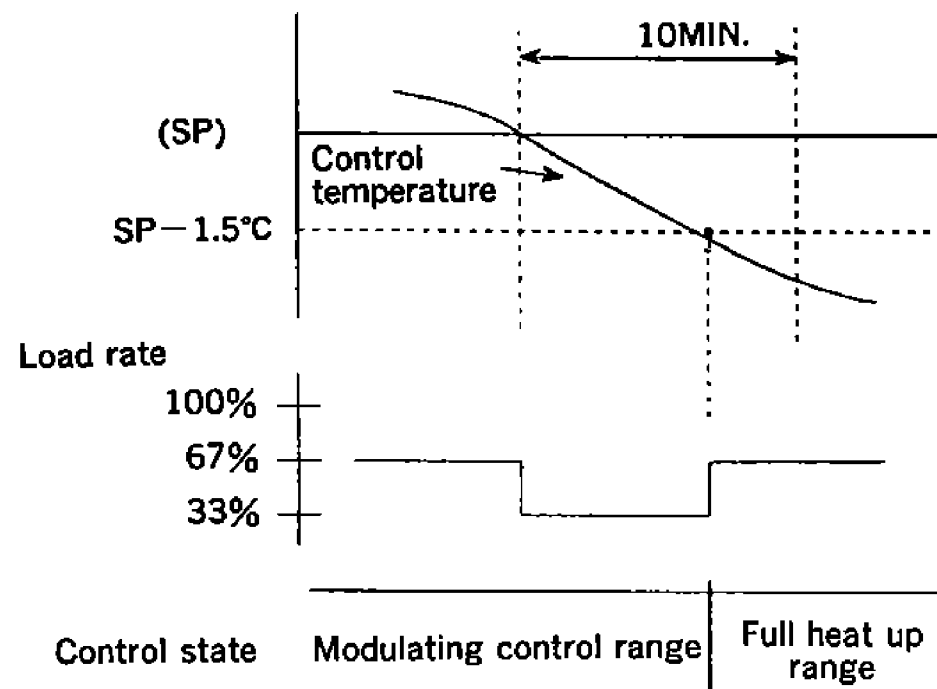
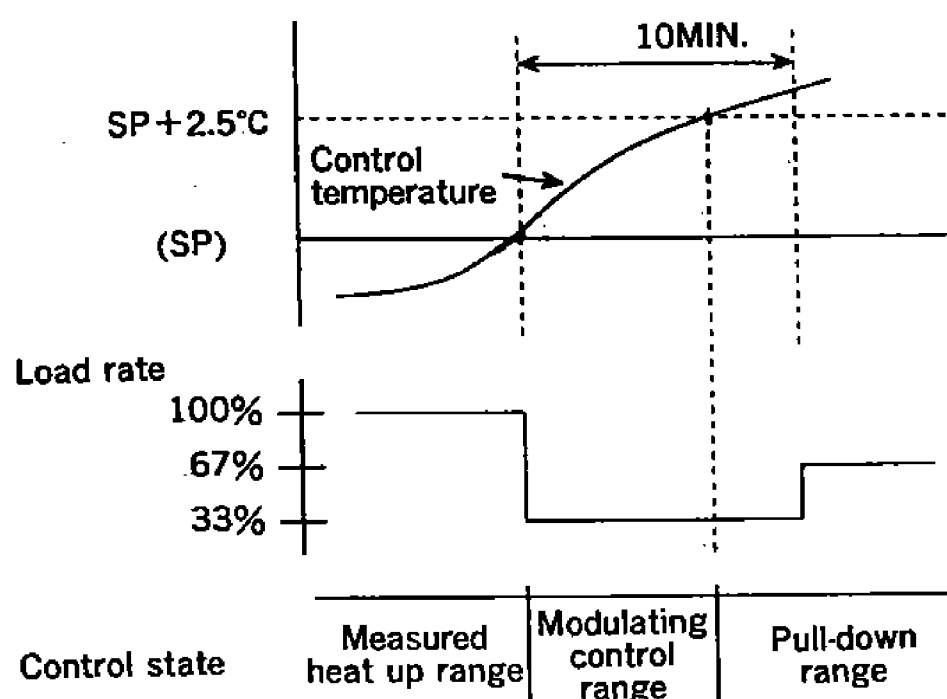
a: The load rate is changed after keeping the control temperature $> \text{SP} - 0.5^{\circ}\text{C}$ for 10 minutes.

b: The load rate is not changed when keeping the control temperature $> \text{SP} - 0.5^{\circ}\text{C}$ less than 10 minutes.

If the load rate becomes 33%, it will be protected by preventing the load rate from varying during transition. This protection will continue for 10 minutes to prevent the load rate from varying even if the state transition (modulating control range → pull-down range) occurs. However, the overcool protection will have the priority but this control will not be applied while the state transition of the modulating control range → the full heat up range is activated.

<Case 1>

<Case 2>



: Even if the state transition of the modulating control range → the pull-down range is activated, the load rate will not be varied for 10 minutes.

: If the state transition of the modulating control range → the whole heating range is activated, the load rate will be varied.

E: High-pressure control

If the ambient temperature is low in the air-cooled operation, the condensing pressure (high pressure) will drop accordingly. If the high pressure is made to be lower than 720kPa, the right condenser fan will be stopped to prevent the high pressure from excess dropping. If the high pressure exceeds 1180kPa later, the operation will be restarted.

F: Condenser fan control during water cooled operation (LXE10C/5C)

The refrigeration unit can be operated in any mode of air-cooled operation and water-cooled operation. Though the condenser fan is not operated in the water-cooled operation, the condenser fan (left) is sometimes operated to cool the control box. The air-cooled operation and water-cooled operation are automatically switched with the water pressure switch. That is, cooling water is flowed into the water-cooled condenser, and when the water pressure is applied to the inlet of the condenser, the contact point of the water pressure switch will be opened to stop the condenser fan motor. Thus, the water-cooled operation will be selected. On the contrary, when water supply is stopped during water-cooled operation, the contact point of the water pressure switch will be closed to operate the condenser fan motor for the water-cooled operation.



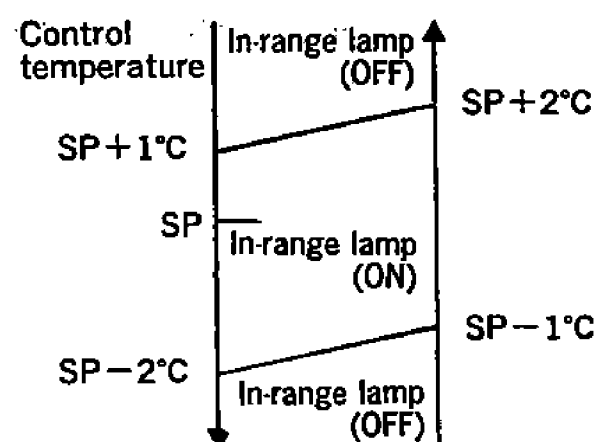
CAUTION Even in the water-cooled operation, the condenser fan sometimes be operated.

G: Discharge gas temperature control

This refrigeration unit uses HFC134a as the refrigerant. In order to prevent the refrigeration oil used with the refrigerant from the high-temperature deterioration, the liquid refrigerant is injected to the suction pipe of the compressor. If the temperature of the discharge gas exceeds 120°C, the injection will be started. It will be stopped at the temperature of 110°C or lower.

H: In-range control

In order to observe at a glance whether the refrigeration unit properly controls the inside temperature or not, the orange lamp on the display panel will come on when the control temperature is near the set value (SP). At the same time, AC24V will be output to the monitoring output (D). (The monitoring output is used for observation in the bridge on the ship.)

**I: In-range masking control**

If the inside temperature is within the in-range when defrosting is started, the in-range lamp will be kept turned on for 90 minutes regardless of the following inside temperature.

Since the control temperature temporarily rises during defrosting, it will prevent the error that it is regarded as a trouble when the in-range lamp goes out.

J: Modulating control

In the chilled mode operation the opening of the modulating valve is adjusted by proportionally controlling the supply air temperature for the set point of temperature (SP) in order to control the amount of the hot gas bypass fed to the evaporator.

Thus, the supply air temperature is controlled to be in the range of $\pm 0.5^\circ\text{C}$. Here, the partial frozen operation has the same control method as the chilled operation except the different control sensor.

K: Refrigerant measuring control

The amount of the refrigerant in the hotgas circuit is controlled to keep the high pressure in the optimal range in the measured heat up range or during defrosting. If the high pressure is lower than ① kPa, the injection solenoid valve will be opened (called as refrigerant charge) till ② kPa or higher. If the high pressure exceeds 1300kPa, the modulating valve will be half opened (called as refrigerant release) till 1200kPa or lower.

Unit : kPa

Model name	LXE10CA(-A)	LXE5C-XX	LXE10C(-A)	LXE5C-1
Controller	DECOSIIIa		DECOSIII	
① Refrigerant charge (start)	400	630	400	630
② Refrigerant charge (stop)	500	700	500	700
③ Refrigerant release (start)	1,300	1,300	—	—
④ Refrigerant release (stop)	1,200	1,200	—	—

L: Pump down control

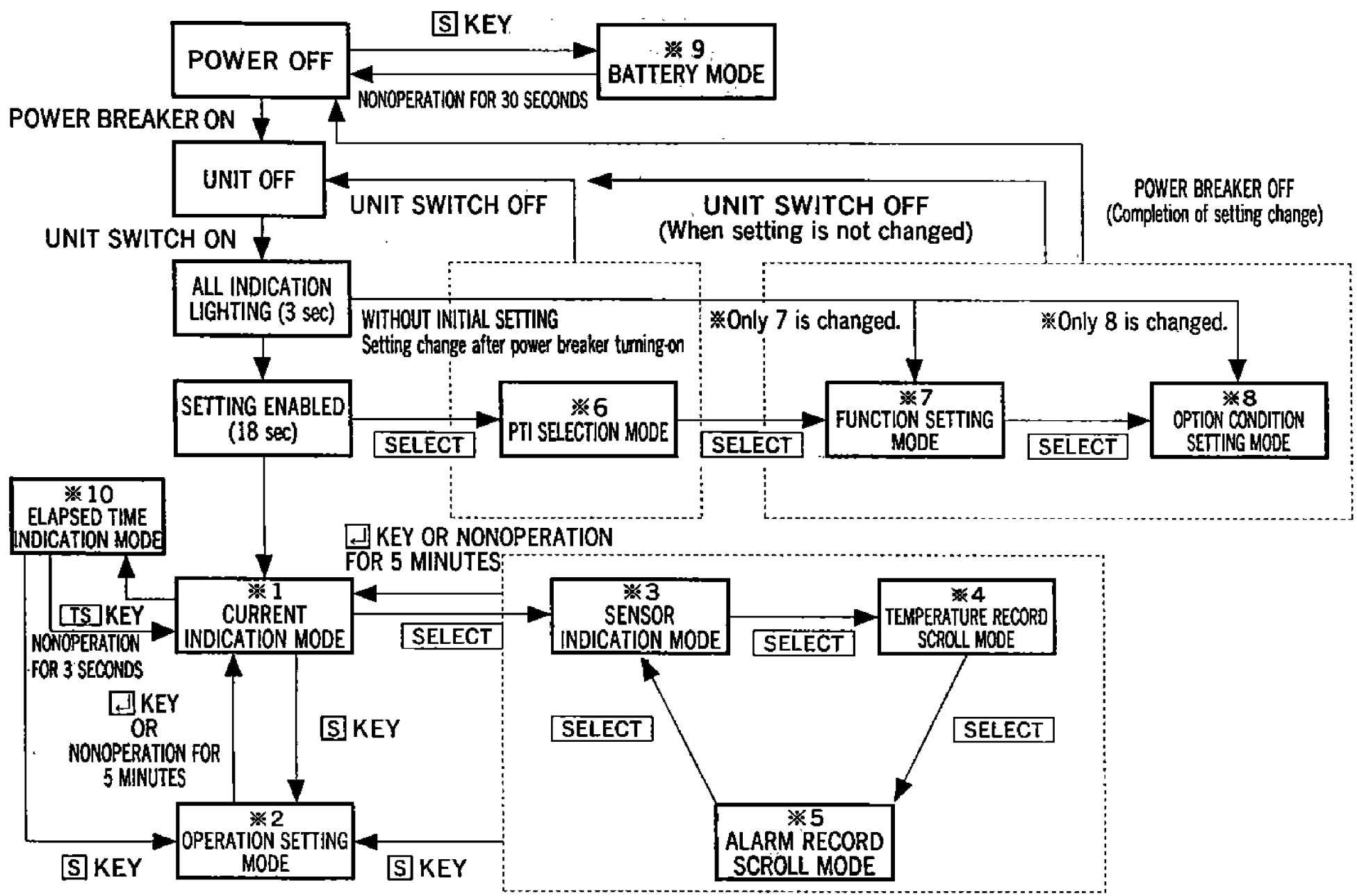
Before measured gas heat up or defrost mode, the refrigerant in the refrigeration circuit is liquidized and collected in the water cooled condenser (or receiver) by closing the liquid solenoid valve (LSV) and the modulating valve (MV). When the low pressure reaches -55kPa or lower, the pump down is terminated and it turns to the measured gas heat up or defrost mode.

In case of LXE10C(-A), the pump down is accomplished at 67% load of the compressor when the low pressure exceeds 0 kPa, and it is accomplished at 100% load when the low pressure is 0kPa or lower.

No.	Function division	Function	DECOSIII	DECOSIIIa
6	Manual inspection function	<ul style="list-style-type: none"> • Compressor run-hour display • Evaporator fan motor operation (high speed) • Evaporator fan motor operation (low speed) • Condenser fan motor operation • Battery replacement data reset • Controller horsepower setting display • [PC].....Pulp temperature sensor calibration • [PC].....Header information display of logger • [PC].....Display of all sensor data • [PC].....Controller-internal relay output display/MV output (opening degree) display • [PC].....Battery replacement data reset 	<ul style="list-style-type: none"> ○ ○ ○ ○ ○ ○ Optional ○ ○ ○ ○ 	<ul style="list-style-type: none"> ○ ○ ○ ○ ○ ○ Optional ○ ○ ○ ○
7	Automatic inspection (PTI)	<ul style="list-style-type: none"> • Automatic PTI (short)=Operation check of components • Automatic PTI (full) 	<ul style="list-style-type: none"> ○ ○ 	<ul style="list-style-type: none"> ○ ○
8	Data logging	<ul style="list-style-type: none"> • Compressor run-hour • Trip data • Pulp temperature data • Alarm data • Automatic PTI data 	<ul style="list-style-type: none"> ○ ○ Optional ○ — 	<ul style="list-style-type: none"> ○ ○ Optional ○ ○
9	Data retrieving	<ul style="list-style-type: none"> • [PC].....Alarm data • [PC].....Trip data • [PC].....Automatic PTI data • [PC].....Pulp temperature data 	<ul style="list-style-type: none"> ○ ○ ○ Optional 	<ul style="list-style-type: none"> ○ ○ ○ Optional
10	Communication	<ul style="list-style-type: none"> • Remote monitoring • Remote control 	<ul style="list-style-type: none"> Optional Optional 	<ul style="list-style-type: none"> Optional Optional
11	Power back-up	<ul style="list-style-type: none"> ※ Even if power is off, the following works are possible. • Setting Temperature Humidity Defrost interval [PC].....Container ID data • Battery backup of the data logger record 	<ul style="list-style-type: none"> ○ Optional ○ ○ ○ 	<ul style="list-style-type: none"> ○ Optional ○ ○ ○
12	Chartless	<ul style="list-style-type: none"> • Alarm indicating function (H code) • Operation history indicating function (D code) • Pull-down time indicating function (P code) • Temperature record scroll function • Alarm record scroll function 	<ul style="list-style-type: none"> — — — — — 	<ul style="list-style-type: none"> ○ ○ ○ ○ ○

3.2 Operation procedure

3.2.1 Indication mode flow chart



* [SELECT] indicates that both UP key and DOWN key are held down simultaneously for 3 seconds.

*** 1 Current indication mode**

The supply air temperature (SS), return air temperature (RS), current alarm and humidity are indicated.

*** 2 Setting mode**

The control temperature, defrost interval, and control humidity (option) can be set.

*** 3 Sensor indication mode**

The following sensor values are indicated.

High pressure (HP), low pressure (LP), voltage 1 (PT1), voltage 2 (PT2), total current (CT1), compressor current (CT2), ambient temperature (AMBS)

*** 4 Temperature record scroll mode (only DECOSIIIa)**

Records of control sensor are indicated successively (Scrolled), beginning with the latest one.

*** 5 Alarm record scroll mode (only DECOSIIIa)**

Records of alarm are indicated successively (Scrolled), beginning with the latest one.

*** 6 PTI selection mode**

The Full PTI (F. PTI), Short PTI (S. PTI), and Manual Check (M. CHECK) test modes can be selected.

*** 7 Option function setting mode (only DECOSIIIa)**

Setting change must be made according to shipping company's instructions.

*** 8 Option condition setting mode (only DECOSIIIa)**

Setting change must be made according to shipping company's instructions.

*** 9 Battery mode**

This mode enables operation when power is not supplied.

*** 10 Elapsed time indication mode**

The elapsed time after trip start is indicated.

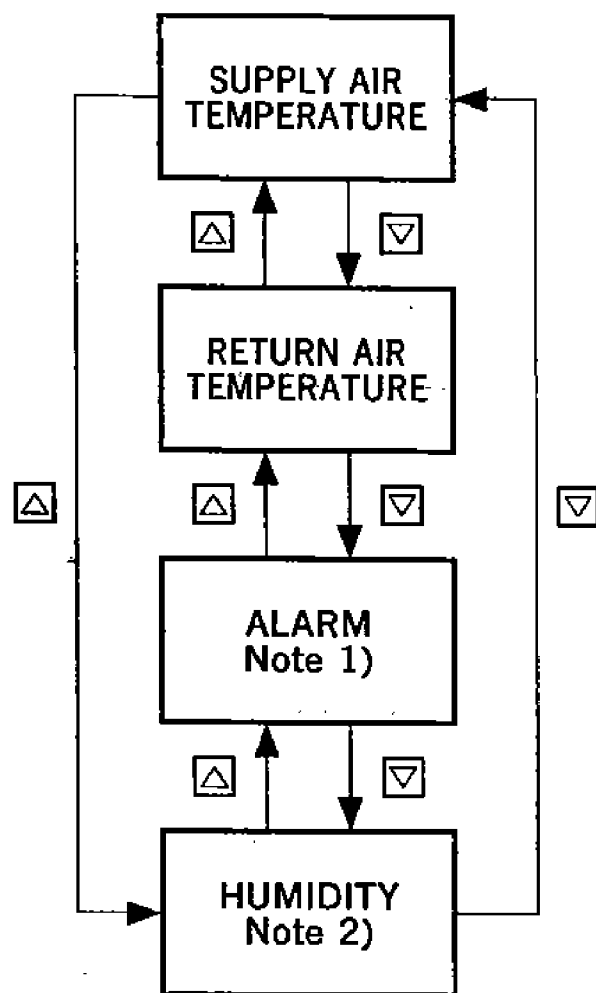
Note:

When setting was changed on the screen of * 7 or * 8, be sure to turn off the power breaker.

3.2.2 Indication mode operation procedure

1. CURRENT INDICATION MODE

The supply air temperature (SS), return air temperature (RS), alarm, and humidity are indicated.



Select an item to see, using the ▲ or ▼ arrow key.

Note 1)

(1) In case of alarm indication all the currently existing alarms are indicated, and then process proceeds to the next item. If there are no alarms, "Good" is displayed.

(2) To erase the D code or H code alarm, hold down the □ key for 3 seconds while alarm is indicated.

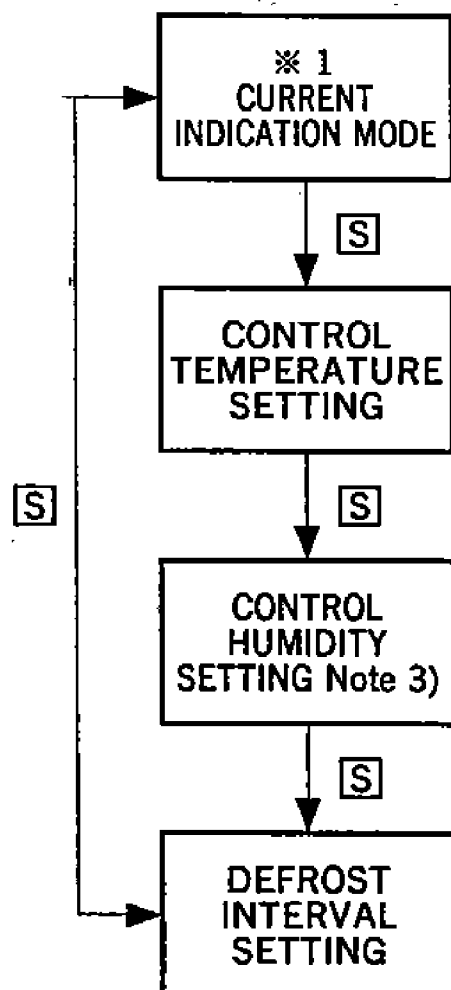
At this time only the currently indicated alarm is erased.

Note 2)

The value of humidity sensor is indicated on LED according to the humidity setting (*7) and flower bulb setting (*8).

2. SETTING MODE

The control temperature, defrost interval, and control humidity can be set.



Change the set temperature, using the ▲ or ▼ arrow key. To fix the change, press the □ key.

Change the set humidity, using the ▲ or ▼ arrow key. To fix the change, press the □ key.

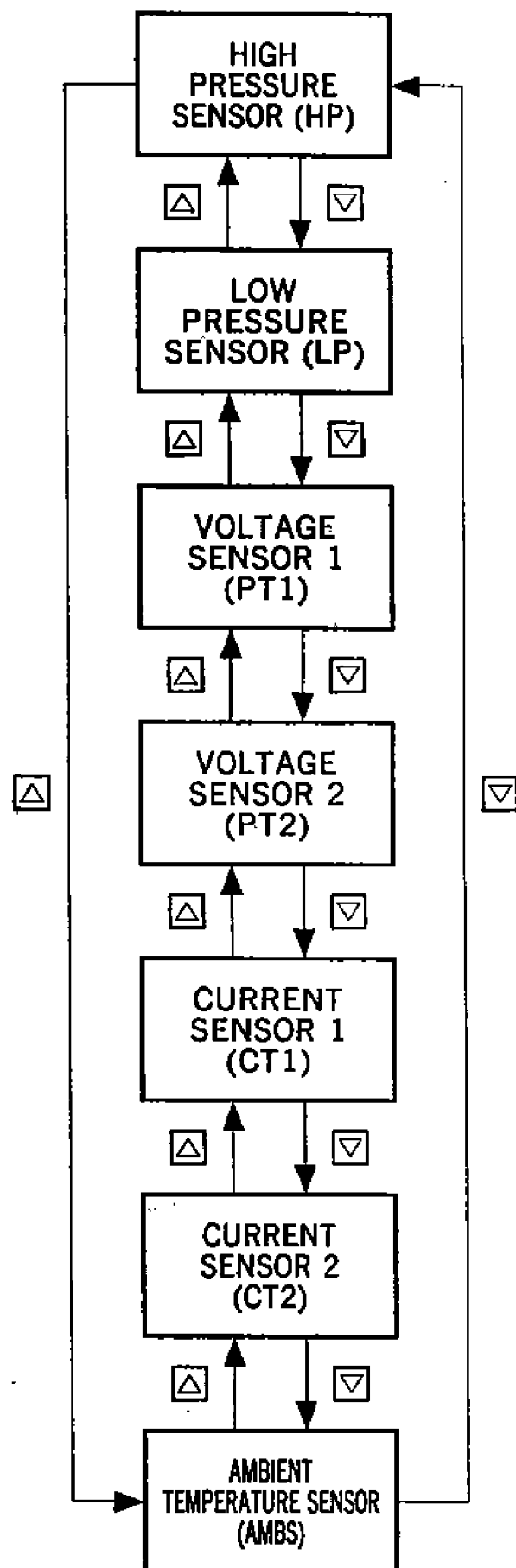
Note 3)



Unless humidity control is performed, no indication appears.

Select a defrost interval 24h, 12h, 9h, 6h or 3h, using the ▲ or ▼ arrow key. To fix the selection, press the □ key.

3. SENSOR INDICATION MODE

Sensor value can be checked. High pressure (HP), low pressure (LP), voltage 1 (PT1), voltage 2 (PT2), total current (CT1), compressor current (CT2), ambient temperature (AMBS)








Whenever the  or  arrow key is pressed, indication Changes.

4. TEMPERATURE RECORD SCROLL MODE

Records of control sensor are indicated successively (scrolled), beginning with the newest one.

LED indicates control sensor temperature, and LCD indicates alternately date and temperature record of another sensor.




To halt indication, press the  or  arrow key. To advance successively the indication, press again the  or  arrow key. If the arrow key is not pressed for 10 seconds, successive (scroll) indication appears again.


If you want to see data, beginning with its start, hold down the  arrow key for 3 seconds.

5. ALARM RECORD SCROLL MODE

Records of alarm are indicated successively (scrolled), beginning with the newest one.

LED indicates the alarm code, and LCD indicates date.

To halt indication, press the  or  arrow key. To advance successively the indication, press the UP or DOWN arrow key again. If the arrow key is not pressed within 10 seconds, successive (scroll) indication appears again. If you want to see data, beginning with start, hold down the  key for 3 seconds.

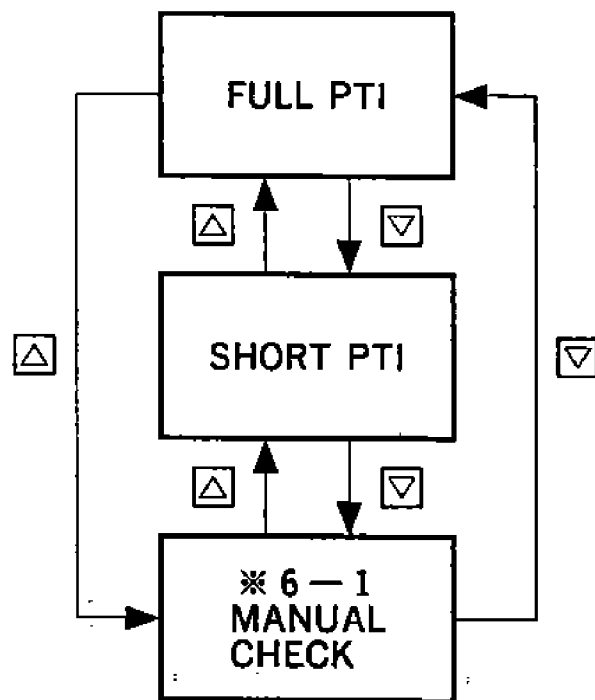
To restore the ordinary screen, press the  key.

If operation is not performed within 5 minutes, the ordinary screen is resumed. If the successive (scroll) screen appears at present, the ordinary screen is resumed when 5 minutes elapses after indication ends.

To return to the operation setting screen, press the "S" key.

6. PTI SELECTION MODE

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



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

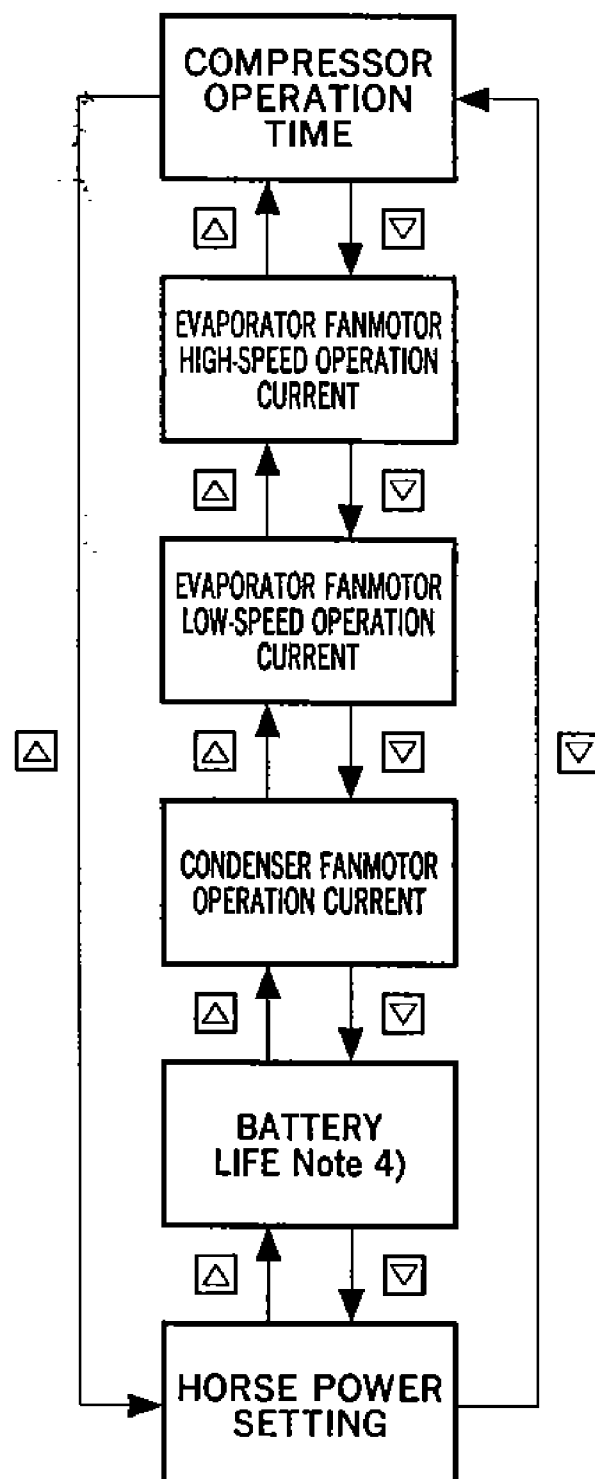
To start SHORT PTI, press the key while "S. PTI" is displayed on the LCD.

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

6.1 MANUAL CHECK SELECTION MODE

LED indicates the following data.

Compressor operation time, evaporator fanmotor high-speed operation current, evaporator fanmotor low-speed operation current, condenser fanmotor operation current, battery life (years and months), power setting.



To indicate the compressor operation time:
Press the key while the LCD indicates "C".
The operation time is Indicated Value x 10 hours.

To indicate current value of evaporator fanmotor high-speed operation:
Press the key while the LCD indicates "EFH".

To indicate current value of evaporator fanmotor low-speed operation:
Press the key while the LCD indicates "EFL".

To indicate current value of condenser fanmotor operation:
Press the key while the LCD indicates "CF".

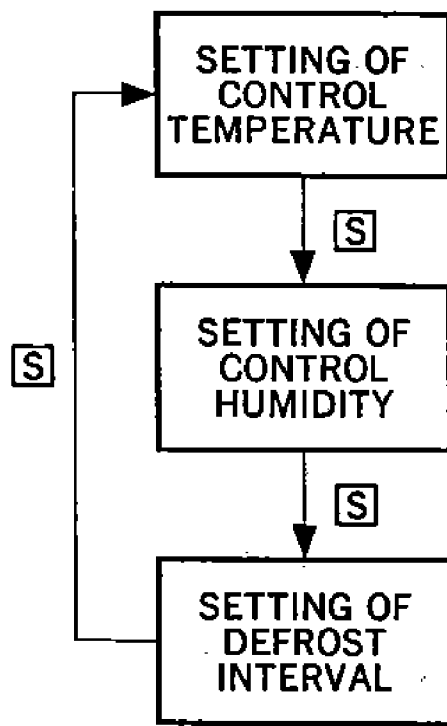
To indicate lithium battery service life (years and months):
Press the key while the LCD indicates "b-CH".
If the battery life limit is reached, "E801" appears.
Note 4)

This indication is used when the lithium battery is used.

To check compressor horse power setting:
Press the key while the LCD screen indicates "HP".

9. BATTERY MODE

If commercial power is not available, you can set the control temperature and defrost interval control humidity, using the built in wake-up battery.



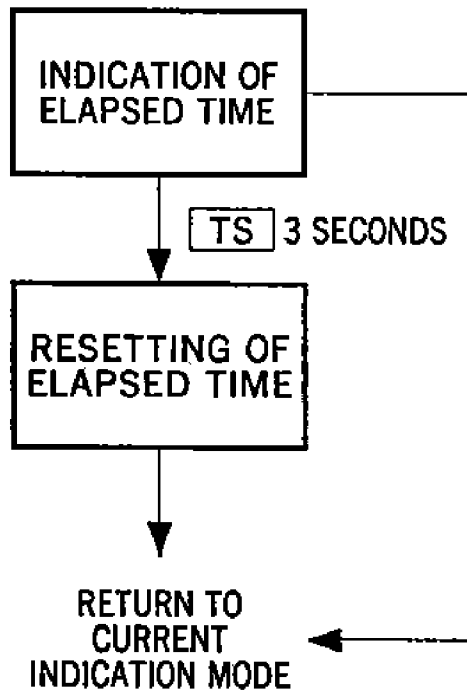
To change the set temperature, use the ▲ or ▼ arrow key. To fix the change, press the □ key.

No indication appears if humidity control is not performed.

Select a defrost interval 24h, 12h, 9h, 6h, 3h, or 2h, using the ▲ or ▼ arrow key. To fix the selection, press the □ key.

10. ELAPSED TIME INDICATION MODE

The elapsed time after trip start is indicated.



LCD indicates the elapsed time after trip start.

If the "TS" key is held down for 3 seconds while the elapsed time is indicated, the TRIP START is set, and the elapsed time display is reset to "0" (Hr.).

After 3-second noninput state.

3.3 Operation pattern and operation of each equipment

● Operation pattern

Output	Mode	Sensor		-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 SP 1 2 3 4 5 6 7 8 9 10 (°C)																
		Normal	Abnormal																	
Liquid solenoid valve (LSV), Compressor (CC)	Chilled	SS	/	OFF (from -6 to -1), ON (from 1 to 4)																
		RS	/	OFF (from -6 to -1), ON (from 1 to 4)																
	Partial frozen	RS	/	OFF (from -6 to -1), ON (from 1 to 4)																
		SS	/	OFF (from -6 to -1), ON (from 1 to 4)																
	Frozen	RS	/	OFF (from -6 to -1), ON (from 1 to 4)																
		Without back-up sensor	/	Kept on (from -10 to 10)																
In-range lamp (IRS)	Chilled	SS	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
		RS	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
	Partial frozen	RS	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
		SS	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
	Frozen	RS	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
		Without back-up sensor	/	OFF (from -6 to -1), ON (from 1 to 4), OFF (from 4 to 10)																
Modulating valve (MV) *Fully closed during frozen mode	Chilled	SS	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
		RS	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
	Partial frozen	RS	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
		SS	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
	Frozen	RS	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
		Without back-up sensor	/	Fully closed (from -10 to -1), Fully opened (from -1 to 1), PID (from 1 to 4), Fully closed (from 4 to 10)																
Defrost enable conditions	Chilled, partial frozen, frozen	EOS	/	Enable (from -10 to 20°C), Inhibit (from 20°C to 10)																
		Without back-up sensor	/	Fully enable (from -10 to 10)																
Evaporator fan (EFH, L)	Frozen	RS	/	EFL (from -10 to -5°C), EFH (from -5 to 10)																
		Without back-up sensor	/	Only EFL (from -10 to 10)																
	Chilled Partial frozen	/	/	Only EFH (from -10 to 10)																

Output	Mode	Sensor		-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 SP 1 2 3 4 5 6 7 8 9 10 (°C)																
		Normal	Abnormal																	
Mode switching																				
Unload switching (LXE10C/10C-A)	Frozen	RS																		
			SS																	

● Operation of each equipment

Name of component			Frozen mode setting temperature -10.1°C or lower			Chilled mode setting temperature -2.9°C or higher Partial frozen mode setting temperature -3.0 to -10.0°C					Defrost	
			Pull-down 67%	Pull-down 100%	Null	Pull-down	Modulating control	Full heat up	Overcool protection	Measured gas heat up		
Magnetic contactor	Compressor	CC	○	○	×	○	○	○	×	○	○	
	Condenser fan	CF	△	△	×	△	△	△	×	△	×	
	Evaporator fan (High)	EFH	○	×	×	○	○	○	○	○	×	
	Evaporator fan (Low)	EFL	×	○	○	×	×	×	×	×	×	
Solenoid valve	Liquid solenoid valve	LSV	○	○	×	○	○	○	×	×	×	
	Solenoid valve for injection	ISV	△	△	×	△	△	×	×	△	△	
	Hot-gas 3-way solenoid valve	HSV	×	×	×	×	×	×	×	○	○	
	Unload solenoid valve 1	USV1	○	×	×	○	○	○	×	×	×	
	Unload solenoid valve 2	USV2	×	×	×	×	△	×	×	×	×	
Modulating valve			MV	0%	0%	0%	0%	0.1~99.9%	100%	0%	100%	100%

○ : Energized × : Deenergized. △ : Depending on the control

Note: Unload solenoid valves (USV1 and USV2) are not provided in LXE5C(-A).

3.4 Alarm display and back-up function

3.4.1 Alarm list

Alarm division	Alarm code	Alarm content	Activation for alarm occurrence	
Permanent stop	F101	High-pressure cutouts within 30 seconds after operation start	Controller shuts off all output	
	F109	Low-pressure cutouts within 2 seconds after operation start.	Controller shuts off all output	
	F301	Set point setting requirement (SRAM failure/CPU board)	Controller shuts off all output	
	F401	Return/supply air sensor failure (chilled mode)	Controller shuts off all output	
	F403	Return/supply air sensor failure (Partial frozen mode)	Controller shuts off all output	
	F701	Abnormal high voltage	Controller shuts off all output	
	F705	Single phase	Controller shuts off all output	
	F803	5 compressor alarms continued E101, E103, E105, E107, E109, E203, E707	Controller shuts off all output	
Display alone or restartable alarm	Protector activation	E101	High pressure cutout	Restart after 3-minute
		E103	Compressor thermal protector or electronic OC activated	Restart after 3-minute
		E105	Compressor over current	Restart after 3-minute
		E107	High compressor discharge temperature	Restart after 3-minute
		E109	Low pressure cutout (low pressure drops at -72kPa or lower for 20 seconds.)	Restart after 3-minute
	Control error	E201	Long pump down. (pump-down does not end within 120 seconds.)	Alarm display alone
		E203	Overcool protection activates in the chilled or partial frozen mode. (Control temperature drops at the set point -3°C or lower)	Restart after 3-minute
		E207	Long defrost.	Alarm display alone
	Printed-circuit board alarm	E303	Temperature setting request (SRAM failure/CPU board)	Alarm display alone
		E305	Defrost timer setting request (SRAM failure/CPU board)	Alarm display alone
		E307	Calendar setting request (SRAM failure/CPU board)	Alarm display alone
		E311	Trip-start setting request (SRAM failure/CPU board)	Alarm display alone
	Sensor alarm	E401	Supply air temperature sensor (SS) failure	Back-up operation
		E402	Data recorder supply air temperature sensor (DSS) error*1	Only error indication
		E403	Return air temperature sensor (RS) failure	Back-up operation
		E404	Data recorder return air temperature sensor (DRS) error*1	Only error indication
		E405	Discharge temperature sensor (DCHS) failure	Alarm display alone
		E409	Evaporator outlet sensor (EOS) failure	Back-up operation
		E411	Ambient sensor (AMBS) failure	Alarm Display alone
		E413	Low-pressure sensor (LPT) failure	Back-up operation
		E415	High-pressure sensor (HPT) failure	Back-up operation
		E417	Voltage sensor (PT1) failure	Alarm Display alone
		E419	Voltage sensor (PT2) failure	Alarm Display alone
		E421	Current sensor (CT1) failure	Alarm Display alone
		E423	Current sensor (CT2) failure	Restart after 3-minute
		E425	USDA1 sensor (pulp temperature) failure	Alarm display alone
	E427	USDA2 sensor (pulp temperature) failure	Alarm display alone	
E429	USDA3 sensor (pulp temperature) failure	Alarm display alone		
E431	Humidity sensor (HuS) failure	Alarm display alone		
Electrically functional part alarm	E603	Modulating control valve failure (wiring cut or driver failure)	Back-up operation	
	E607	Manual defrost switch failure	Alarm display alone	
Power alarm	E707	Momentary power shut off	Restart after 3-minute	
Other alarms	E801	Backup battery replace requirement	Alarm display alone	
	E805	USDA dip switch setting error (USDA sensor)*2	Alarm display alone	
	E807	Humidity dip switch setting error (Humidity sensor)*2	Alarm display alone	

* 1. Only DECOSIIIa

* 2. Only DECOSIII

3.4.2 Chartless function alarm list

	Code	Description	Operation mode
Only error indication	H 0 0 1	The alarm is output when the control temperature does not lower by (3°C) or more for every 4 hours in pull-down state.	C, F, PF
	H 0 0 2	The alarm is output when the integrated time of IN RANGE+OUT state become equal to (2 hours) (count is not performed during defrosting).	C, F, PF
	H 0 0 3	The alarm is output when the integrated time of state "below SP-1°C becomes equal to (2 hours) .	C
	H 0 0 4	The alarm is output when the integrated time of state "below SP-2°C" becomes equal to (one hour) .	C
	H 0 0 5	The alarm is output when IN RANGE was changed to +OUT but IN RANGE was not set, and defrosting was performed successively (three times) .	C, F, PF
	H 0 0 6	The alarm is output when the integrated time of difference 2°C or more between control sensor data and record sensor data becomes equal to (one hour) or more.	C, F, PF
Operation history indicating function	D 3 × ×	XX: When the integrated time of state "above SP+3°C" becomes equal to (one hour) , an indication $[XX=01]$ appears.	C, F, PF
	D 2 × ×	XX: When the integrated time of state "above SP+2°C" becomes equal to (one hour) , an indication $[XX=01]$ appears.	C
	D 1 × ×	XX: When the integrated time of state "above SP+1°C" becomes equal to (one hour) , an indication $[XX=01]$ appears.	C
	D - 1 ×	X: When the integrate time of state "below SP-1°C" becomes equal to (one hour) , an indication $[1x=11]$ appears.	C
	D - 2 ×	X: When the integrated time of state "below SP-2°C" becomes equal to (one hour) , an indication $[2x=21]$ appears.	C
	P × × ×	XXX: When the integrated pull-down time becomes equal to one hour, an indication $XXX=001$ appears.	C, F, PF

Note:

The encircled setting can be changed.

The data enclosed in rectangles vary depending on the encircled settings. } Settings must be changed according to shipping company's instructions.

Alarm cancel

* The alarm can be canceled by one of the following three methods.

1. While an alarm is displayed, hold down the $[]$ key for 3 seconds.
2. If the breaker is held continuously in OFF state for three days or more, the machine judges that cargo transportation has been completed, and the alarm is automatically canceled.
3. Hold down the $[TS]$ key for 3 seconds.

3.4.3 Alarm list during PTI (pre-trip inspection)

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

The alarms caused by automatic PTI are indicated in J***, being discriminated from those during normal operation.

Though there are alarms which are not displayed on the controller panel, they can be checked referring to the PTI report.

Check No. (LCD display)	Check content	Alarm display	Alarm content	S.PTI	F.PTI	Remarks
P00	Basic data check	Not displayed	Basic-data volatilization	↑	↑	
P02	Whole sensor check	Same as normal operation	Basic-data volatilization			
P04	Power check	Not displayed	Basic-data volatilization			
P06	HPS check	J061	Abnormal OFF point			
	//	J062	Not return (closed)			
	//	J063	Abnormal ON point			
	//	J064	High pressure does not rise.			
	//	J065	High pressure does not drop.			
P08	Pump-down check	J081	Long pump-down			
P10	Liquid solenoid valve check	J101	Valve leaks.			
P12	RS, SS accuracy check	J121	Accuracy of both sensors is poor.			
P14	HPT, LPT accuracy check	J141	Accuracy of both sensors is poor.			
P16	Evaporator fan motor check	J161	Evaporator fan motor failure.			
P18	Operation check	Not displayed.	Judged with P20 and P24			
P20	Unload solenoid valve 1, 2 check	J201	Unload solenoid valve 1 or 2 failure	↓		
P22	Evaporator fan reverse-turn check	J221	Evaporator fan wiring			
P24	Unload solenoid valve 2 check	J241	Unload solenoid valve 2 failure			
P26	Operation check	Not displayed.	Judged with P28			
P28	Evaporator fan reverse-turn check	J281	Abnormal evaporator fan wiring			
P30	Injection solenoid valve check	J301	Injection solenoid valve failure			
P32	Hot-gas 3-way solenoid valve check	J321	Hot-gas 3-way solenoid valve failure			
P50	Pull-down cooling effect check	J501	Out of ambient temperature conditions			
P50	0°C control check	J502	Long pull-down			
P60	0°C control check	Not displayed.				
P70	Pull-down cooling effect check	J701	Long pull-down			
P80	-18°C control check	Not displayed.				
P90	Defrosting check	J901	Outside start conditions			
	Basic-data check	J902	Long defrost			

3.4.4 Back-up correspondence for sensor abnormality

C: Chilling, PF: Partial freezing, F: Freezing, DF: Defrosting, Meter: Metering heating

Abnormality sensor		Mode	Back-up content	
			Item	Control content
Return air sensor	RS	PF	Normal control	Executed at SS-2.0°C (Refer to Item 3.3 operation pattern.) When SS is also failure, the controller shuts off all outputs.
		F	Compressor operation	Continuous operation
			Evaporator fan speed switch over	Fixed at the low-speed operation.
			In-range lamp	Not lit.
		DF	Unload switching	Executed at SS-5.0°C. (Refer to the unload switching at Item 3.3 operation pattern.) When SS is also failure, the compressor is fixed at 100% load.
		C/DF	Continue operation	
Supply air sensor	SS	C	Normal control	Executed at RS+2.0°C. (Refer to Item 3.3. When RS is also failure, the controller shut off all outputs. Operation pattern.)
		PF/F DF	Continue operation	
Ambient sensor	AMBS	All modes	Continue operation	
Discharge gas sensor	DCHS	All modes	Injection	Not executed.
			Alarm protection	Not executed.
Evaporator outlet sensor	EOS	C/PF F	Continue operation	
		DF	Defrosting start enable	Always enable
			Defrosting terminated	LPT > 200kPa or 90-minute timer count-up
High-pressure sensor	HPT	C/PF F	Condenser fan switch (High-pressure control)	Executed by AMBS. (AMBS alarm) When AMBS is also failure, both 2 condenser fan motors are operated
		DF	Refrigerant charge (Injection solenoid valve Charge operation with ON)	Charging in performed by the timer depending on the preceding defrosting time.
			Refrigerant release*2 (Release at 47% opening of modulating valve)	None
Low-pressure sensor	LPT	All modes	Compressor start control	Pump-down start is not executed.
		DF	Defrosting termination	90-minute timer count-up for termination
High-pressure switch	HPS	All modes	High-pressure abnormal judgment	Controller shuts off all outputs at HPT > 2300kPa When HPT is also failure, the controller shuts off all outputs
Water pressure switch	WPS	All modes	Continuous operation	
Compressor motor thermal protector	CTP	All modes	Continuous operation	

*Combination of sensor alarms which cause operation stop

- ① SS&RS
- ② HPS&HPT

* 1. If DECOSIIIa is provided with the temperature sensor (DSS/DRS) (option) for recorder, it is possible to easily replace the sensors merely by changing the terminal block wirings since interchangeability with each control sensor (SS/RS) is ensured. (Refer to 1.4.4 Sequence).

* 2. DECOSIII does not perform refrigerant release in regular control.

3.5 Data logging

●The data logging function records various operation data. There are six kinds of logging.

	Type	Data (DECOSIII)	Data (DECOSIIIa)
1	ID data	<ul style="list-style-type: none"> • Container No. • Departure port • Set temperature • Set ventilation • Set humidity • Comment 	<ul style="list-style-type: none"> • Loading date • Load • Transit place • Final destination • Navigation No. <p style="text-align: center;">←</p>
2	Trip data	<ul style="list-style-type: none"> • Operation mode • Blow-out air temperature (SS) • Suction air temperature (RS) • Internal humidity (option) • Set temperature • Set humidity (option) • Year/month/day, time <p>※Logging interval is 30 minutes (fixed).</p>	Data of DECOSIII + Data recorder sensor temperature (DSS/DRS) Ambient temperature (AMBS) ※Changeable logging intervals are 15, 30 and 60 minutes.
3	Alarm	<ul style="list-style-type: none"> • Alarm output year/month/day and time • Alarm code 	←
4	PTI	<ul style="list-style-type: none"> • SHORT PTI • FULL PTI 	←
5	USDA (option)	<ul style="list-style-type: none"> • Core temperature sensor temperature #1 to #3 • Year/month/day/time 	←
6	Event	/	<ul style="list-style-type: none"> • Power ON/OFF • H code • D code } Record <ul style="list-style-type: none"> • Unit ON/OFF • Year/month/day/time

Logged data are retrieved with the aid of personal computer software. The usage of personal computer software is explained in the Operation Manual for Personal Computer Software.

3.6 Battery

3.6.1 Types and characteristics of batteries

The electronic controller (DECOSIII and DECOSIIIa) is designed so that settings of temperature and defrosting interval can be changed with the aid of wake-up battery even when commercial power supply is not connected. (Refer to 3.2 Operation Method ※9 Battery mode.)

The following two types of battery can be used as a wake-up battery according to intended uses.

	Lithium battery	Alkali battery
Specification	BR-CCF3M	6LR61 or equivalent
Temperature characteristics	Applicable at temperature as low as -30°C or above	Applicable at temperature as low as 0°C or above
Service life	Approx. 2 years	Approx. 1 year
Availability	Exclusive-use parts	Commercially available parts

※For USDA transportation replace the alkali battery with new one in case of PTI.

3.6.2 Battery replacement

The lithium battery which is used as a wake-up battery for DECOSIII can be replaced with the alkali battery at the specified time of replacement. When replacing the battery, insert the cushion into the battery box. (For details refer to "Service", Section 3.9.)

3.6.3 Checking the battery replacement period

(1) Lithium battery

Select "LITHIUM BATTERY SERVICE LIFE (YEARS AND MONTHS) [b-CH]" of "PTI SELECTION MODE/MANUAL CHECK", and press the ? key. If "E801" is indicated, this code indicates that the service life of lithium battery has expired. You have to replace the lithium battery with new one. (The alarm LED does not light.) When the ? key is pressed while the code E801 is indicated after replacement, LED indicates year and month, and the alarm disappears.

※Check the battery replacement period whenever PTI is performed.

(2) Alkali battery

If the set temperature cannot be changed in the "BATTERY mode", replace the alkali battery with new one.

Note : Do not use the item "b-CH" of "PTI SELECTION MODE/MANUAL CHECK".



CAUTION

Transportation of lithium battery (BR-CCF3M) is legally restricted.

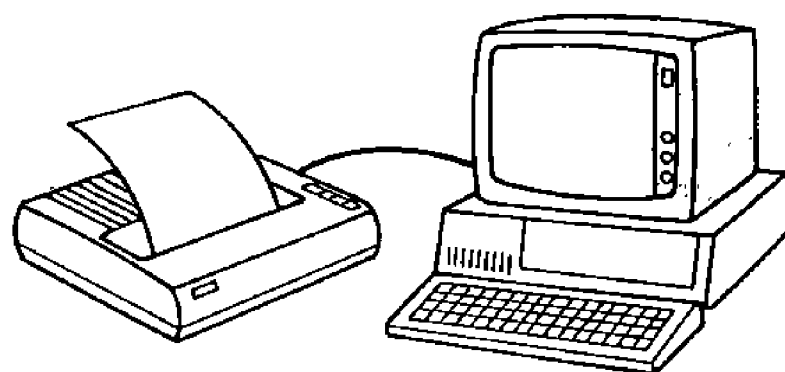
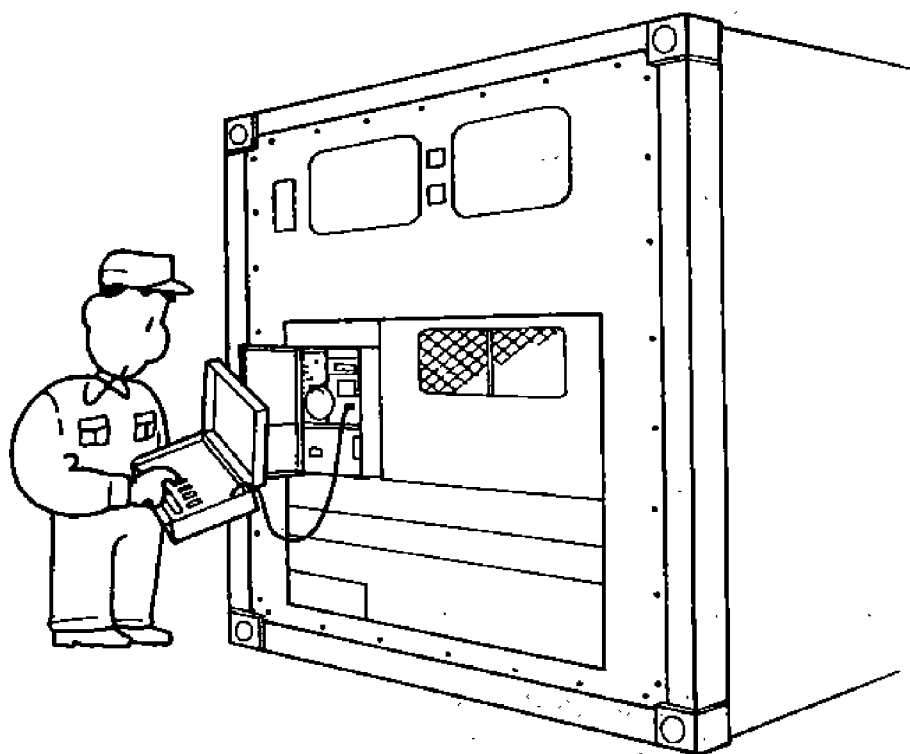
- (1) When the lithium battery is transported singly, the packing case conforming to the UN* standard specification must be used.
- (2) When the lithium battery is transported by air, the freighter must be used.

※ : UN (United Nations)

3.7 Information exchange with personal computer

The electronic controller DECOSIII of LXE10C/5C has internally a memory function to record the set point of temperature, inside temperature, operation mode, occurrence alarm and other data during transportation in addition to the normal operation control.

On the other hand, the serial communication port (RS232C) provided on the front panel of the controller allows the recorded data and unit operation state data with the personal computer to be exchanged. This is also used as an effective means to analyze the troubles which occurred during transportation and investigate the cause of the trouble. Various reports can be also produced. Moreover, the container No., cargo name, destination and other information can be sent from the personal computer to the controller for memorization. For details refer to the Operation Manual for Personal Computer.



● Personal computer software configuration

	MAIN MENU	SUB MENU	Function description	Remarks
FIELD JOB	LOGGER DATA DOWN LOAD	TRIP DATA	Down load the logger records from controller to DISK or harddisk of the personal computer.	Not indicated on display.
		USDA DATA		
		PTI DATA		
		ALL DATA		
		AFTER TRIP START		
	CONTAINER I. D. /HEADER	SET CONTAINER I. D. /HEADER -From DISK	Change the LOGGER HEADER which is the memorandum and consists of set point of temperature, product name, destination etc. • Transfer the data stored in DISK.	DISK →Controller
		CHANGE CONTAINER I. D. -From Keyboard	Change the container number (container 1. D.) in the controller.	Input from keyboard.
		CHANGE CONTAINER HEADER -From Keyboard	Change the LOGGER HEADER in the controller.	Input from keyboard.
		CHANGE CALENDAR	Change the controller internal calendar. • Controller is adopting GMT (Greenwich mean time) as internal calendar.	Convert from personal computer timer
	MAINTENANCE & REPAIR	DISPLAY CURRENT OPERATING DATA	Indicate the all sensor reads, internal relay actions and MV opening on display.	Able to log into DISK.
		DISPLAY CURRENT ALARM	Indicate current alarms on display.	
		DISPLAY ALARM LOG	Indicate the alarm log records on display.	Able to log into DISK.
		DISPLAY TEMPERATURE CHART	Indicate the temperatue graph of Trip Log on display.	
		REPLACE BATTERY	Change the backup battery replace date.	Able to change from the controller panel.
	USDA COLD-TREATMENT	CALIBRATION USDA SENSORS	Carry out calibration of the pulp temperature sensors for cold-treatment.	Use ice-bath.
DISPLAY TEMPERATURE CHART		Indicate the pulp temperatue graph of USDA Log on display.		
OFFICE JOB	MAKE REPORT	TRIP REPORT	Print reports from the data in the disk.	
		USDA REPORT		
		PTI REPORT		
		ALARM REPORT		
		MONITOR REPORT		
	EVENT REPORT			
MAKE CONTAINER I. D. /HEADER	SET CONTAINER I. D. /HEADER into DISK	Make the disk data of LOGGER HEADER to transfer to the controller.		
CONFIG. set	<ul style="list-style-type: none"> • CHART MARK • CRT MODEL • SET TIME ZONE 	<ul style="list-style-type: none"> • SELECT JOB • TRIP REPORT 	The environment where the personal computer software is used is set.	Only when DECOSIIIa is used.

3.8 Inspection procedure of the electronic controller

DECOSIII enable to make the personal computer indicate the internal data of the controller CPU (RAM data) on its display by connecting each other with a communication cable. Thus makes it possible to make easy inspection of the controller and diagnose the defective point of the controller.

(1) Inspection of sensors

The inspection is carried out by comparing with the sensor readings on the controller display and on the display of the personal computer. In case of the sensor reading is abnormal the sensor should be replaced to new one, but be sure to make checking for the sensor characteristics, internal wirings and its connectors before replacement. (Refer Appendix for the sensor characteristics.)

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

The inspection is carried out by checking the controller output (AC24V) utilizing the electric tester or test lamp according to the display of the personal computer. In case of the controller output is abnormal the power I/O board should be replaced to new one, but be sure to make checking for the internal wirings and its connectors before replacement.

(3) Inspection of the MV driver and its circuit

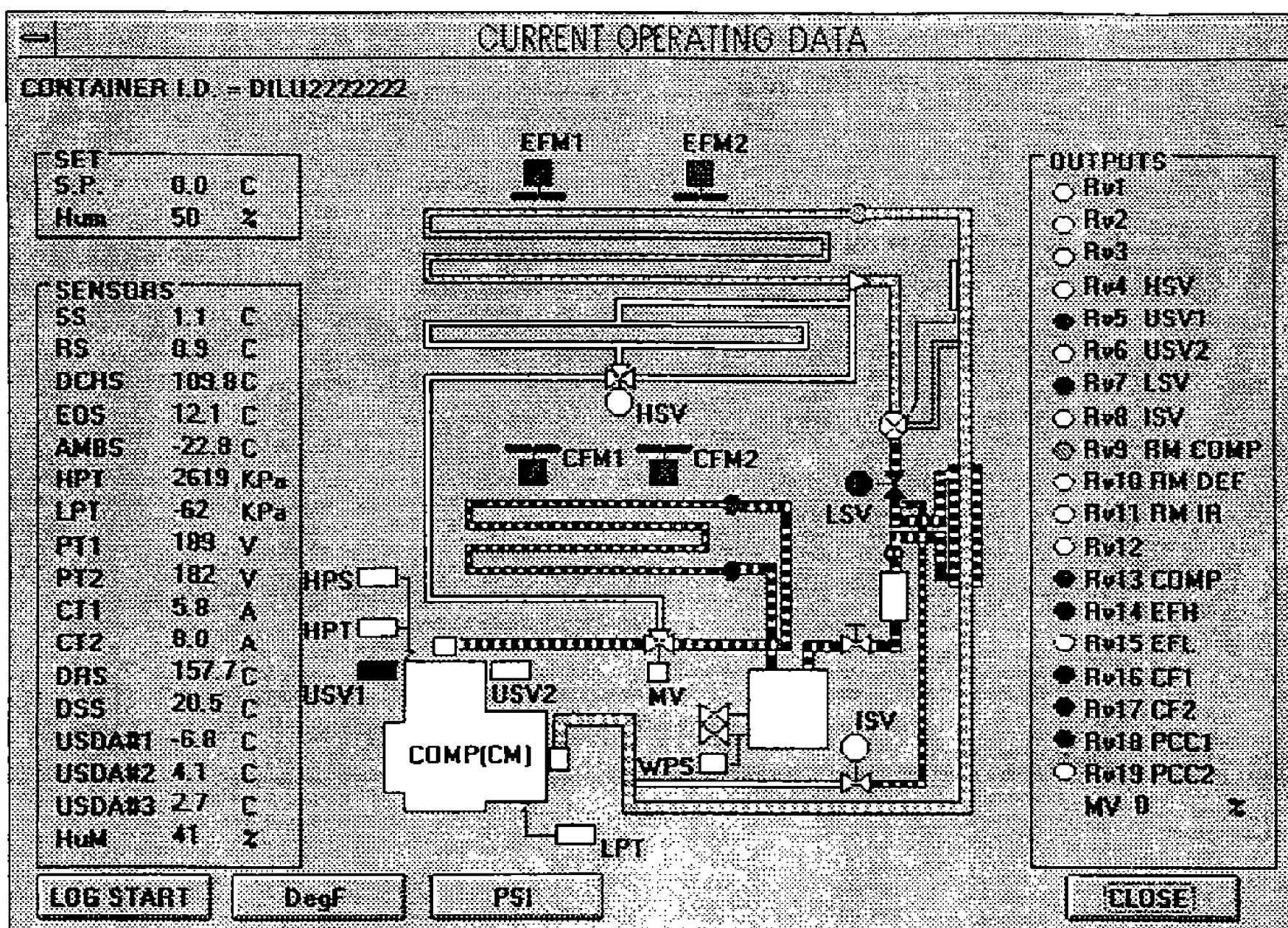
The inspection is carried out by checking of the controller output voltage according to the following table.

MV opening (%)	Output (DCV)
0	0.0
100	More than 2.55V

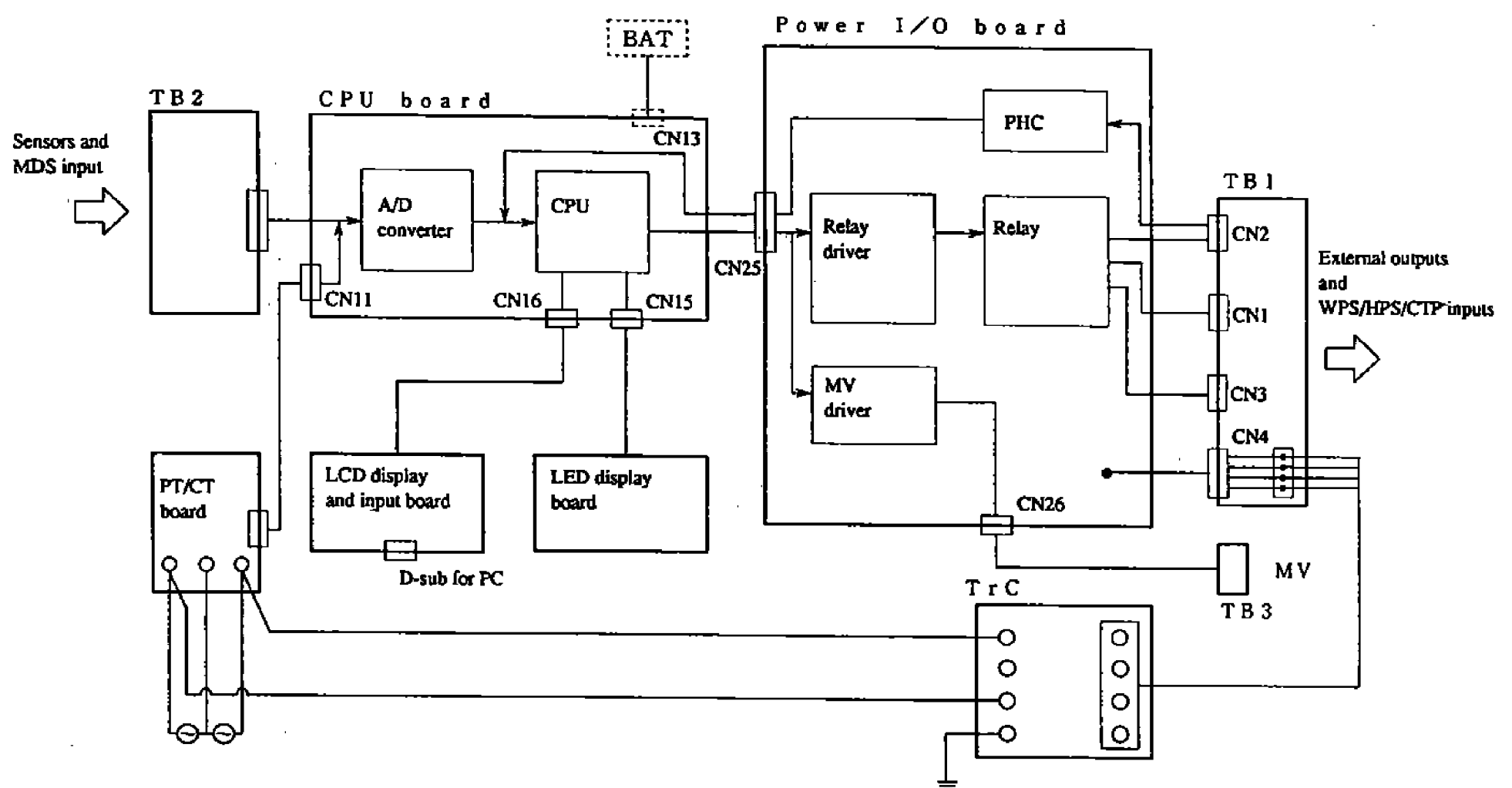
In case of the controller output is abnormal the power I/O board should be replaced to new one, but be sure to make checking for the internal wirings and its connectors before replacement.

● The picture of the personal computer display

Menu selection: FIELD JOB — MAINTENANCE & REPAIR — DISPLAY CURRENT OPERATING DATA



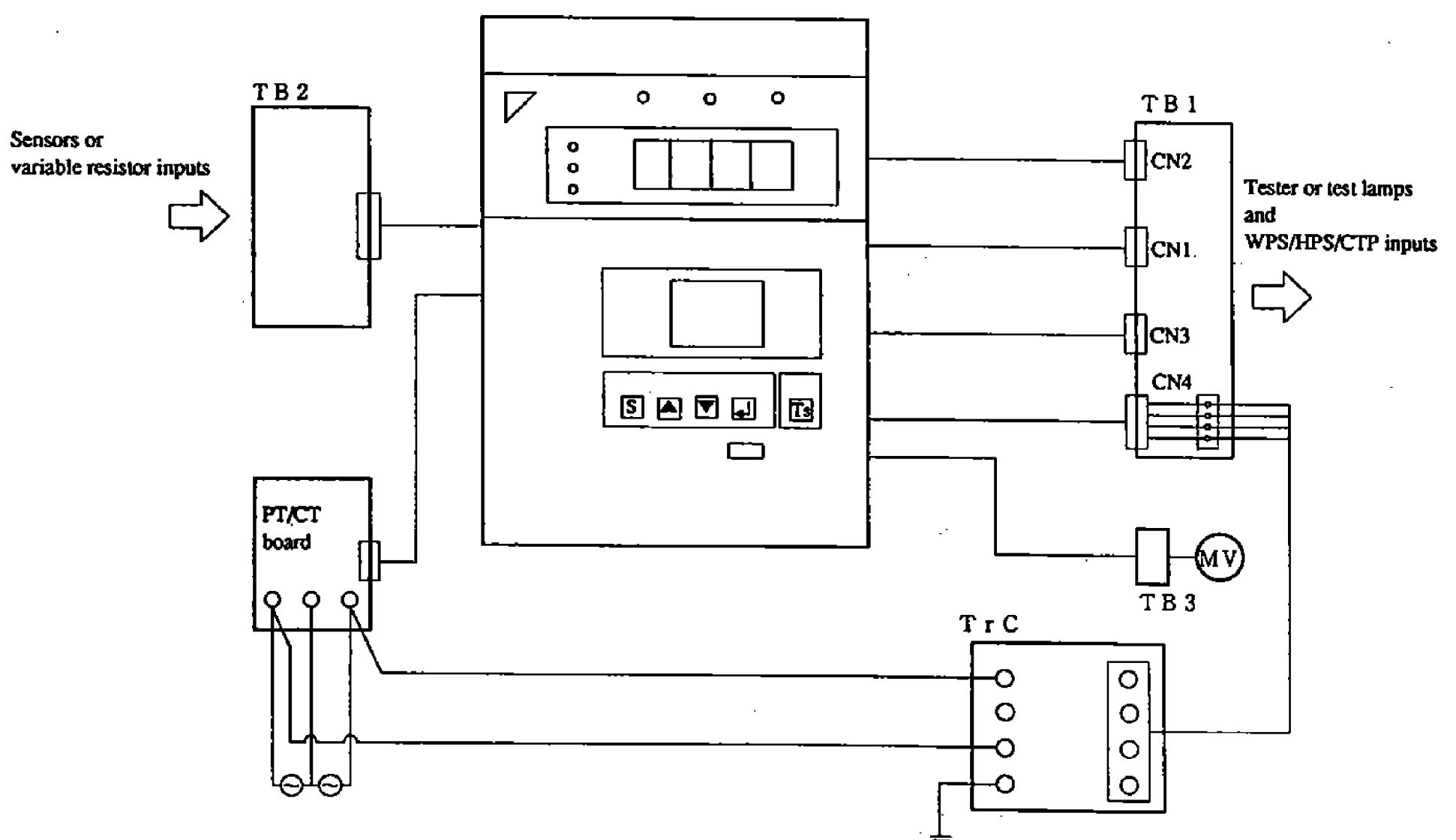
●The basic internal wiring of the electronic controller



The dotted line indicates optional equipment (data recorder sensor).

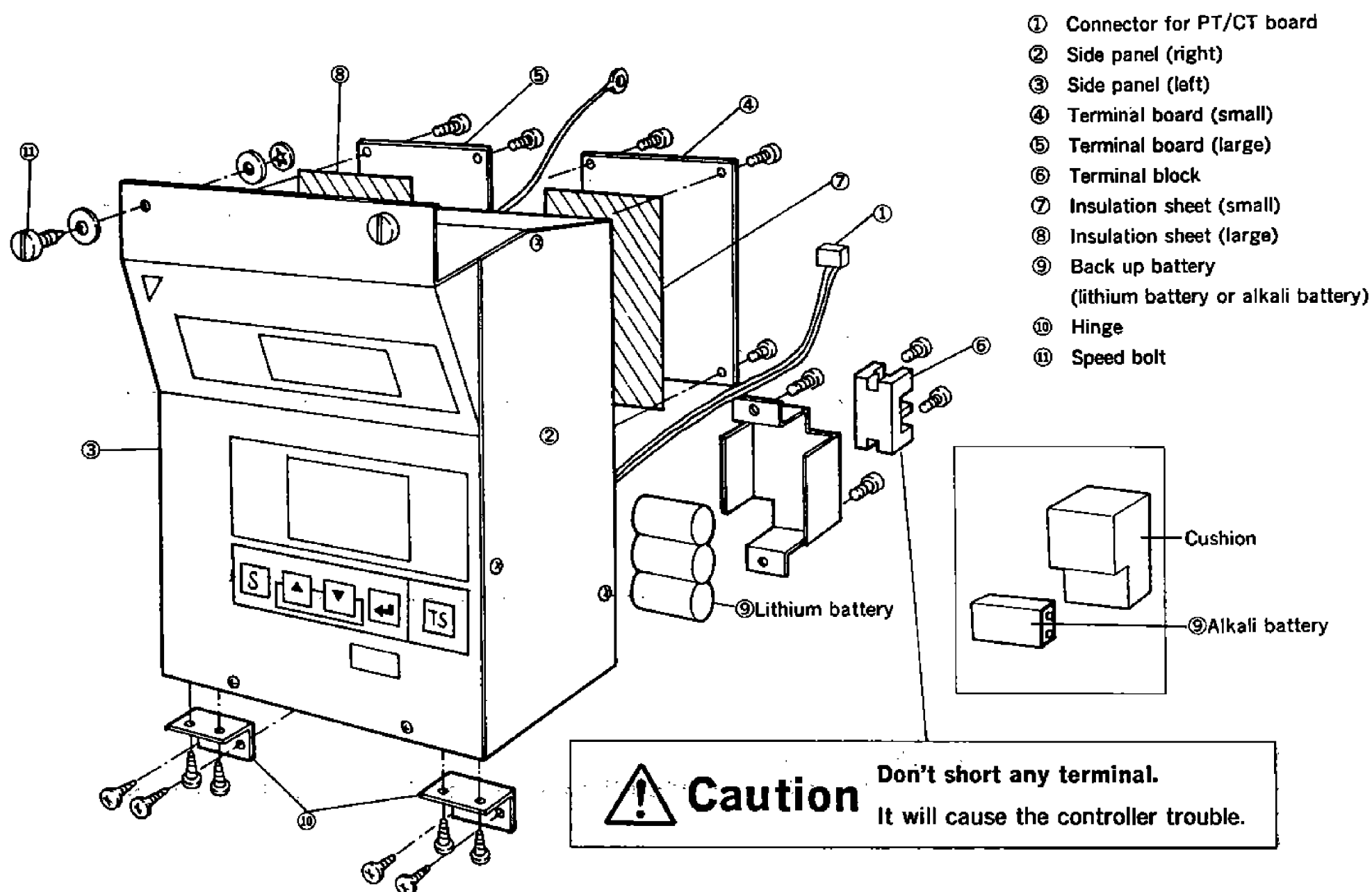
●The bench test of the electronic controller

The inspection of the controller can be made under the condition that the controller is installed in the refrigeration unit. It is necessary to connect the following relative components to the controller to operate the controller normally if the inspection is carried out after controller is removed from the refrigeration unit.



3.9 Replacement and initialization

3.9.1 Replacement procedure



- (1) Disconnect the connector ① for PT/CT board in the depth of the control box.
- (2) Remove the side panels ② and ③ of the controller, and disconnect the external wiring.
Left side: Connector for recorder and connector for modem (option)
Right side: Connector (blue) for modulating valve, terminal block ⑥ and connector ⑨ for backup battery
- (3) Disconnect all the connectors for the terminal boards ④⑤ (large and small) on the back of the controller.
* Don't disconnect the connection wiring to the terminal block.
(Leave the terminal board in the control box.)
- (4) Remove the terminal boards ④⑤ (large and small), insulation sheets ⑦⑧ and backup battery ⑨.
- (5) Remove two mounting hinges ② on the bottom of the controller.
Left hinge: Screw, nut and toothed lock washer
Right hinge: Screw and plate nut.
- (6) Remove the controller, and replace the speed bolt ⑪ and hinge ⑩ with new controller.
Apply the adhesive "Loctite" on the set screws of the hinge to prevent from losing.
- (7) In the reverse procedure, bring the new controller and new backup battery (lithium) into position. To replace the lithium battery with the alkali battery, fit the cushion into the battery box, and then replace the battery.
- (8) Finally, check the wiring once more and check whether any screw is missing in the switch box.



Caution

1. If any screw drops on the terminal section of the cam switch, it will cause burning.
2. Verify that all connectors are securely connected.



CAUTION When installing the new controller, be sure to observe the following items.

3.9.2 Initial setting of controller

① DECOSIII

※Since the spare part is not initially set, it can not be operated as it is. (The alarm will be displayed.)

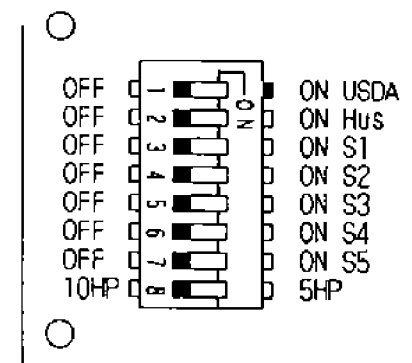
●Setting item list

	Setting item	Setting method	Setting content
A	Dip switch	Dip switch	<ul style="list-style-type: none"> • Controller horsepower setting • Humidity control (option) provided/not provided • USDA logging (option) provided/not provided
B	Container No.	Personal computer	Container No.
C	Calendar	Personal computer	Year, month, day, hour and minute by the internal timer of the computer.
D	Control data	Display panel	Set point of temperature, Defrost interval, Trip start, Battery replacement date, humidity set (if optionally provided)

●Setting procedure

(A) Dip switch setting

- ① Remove the display panel of the controller (three screws)
- ② The dip switches are provided on the printed circuit board of the display panel.
- ③ Switch the horsepower setting according to the model name of the refrigeration unit.
Example: LXE10C → 10HP
LXE5C → 5HP
- ④ Switch ON-OFF according to whether it is optionally provided or not.
- ⑤ Finally verify that the controller is set at the same values as before controller.



(B) Container number setting

(C) Calendar setting

For details of the setting methods in (B) and (C), refer to "DECOSIII personal computer software operation manual".

(D) Control data setting

In the operating method (Refer to Item 3.2) of the controller, set the set point of temperature, defrost interval, trip start, battery replacement date and humidity set (option).

② DECOSIIIa

When the unit is turned on, the controller is automatically set to OPTION FUNCTION SETTING mode. After that, initialize according to 3.2 Operation Procedure.

(After initialization is input, be sure to turn off the breaker.)

3.10 Option

The following optional equipments are available.

a) Date recorder sensor (DSS/DRS)**(1) Checking of control sensors (SS/RS)**

Sensor values of SS-DSS/RS-DRS are compared, and if any deviation is found, an alarm is output.

(2) Substitution of control sensors (SS/RS)

When an alarm stated in item (1) above is output and the control sensor (SS/RS) is out of order, the substitute sensor can be used by changing the wiring connection.

b) Communication function

The communication function enables data transfer through the ISO high-speed communication (HRCD) modem and power line. DECOSIIIa replies to inquiries and commands from the modem.

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

4. PTI (pre-trip inspection) and periodic inspection

- This item explains the mode in which the unit is inspected.
- The controller (DECOSIII) has the function which automatically executes PTI. The mode which executes the automatic PTI consists of three processes of SHORT PTI (referred to as S. PTI hereafter), FULL PTI (referred to as F. PTI hereafter) and MANUAL CHECK (referred to as M. CHECK hereafter).

Mode	Operation description
S. PTI	The components are checked for abnormalities. Even if any abnormal components is found, a series of inspection is all executed.
F. PTI	S. PTI + unit cooling effect are checked. The cooling effect check is executed only if any abnormal components is not found with S. PTI. If any abnormality is found during the cooling effect check, end F. PTI.
M. CHECK	The continuous operation of each component and indication data are executed.

* For details, refer to the following Item 3. 2.

- The abnormalities which occur during automatic PTI will be displayed on the controller when automatic PTI is terminated.
 - For the method to check the alarm codes, refer to Item 3.2 "Operating method (automatic PTI mode)".
 - For the alarm code content, refer to Item 3.4 "Alarm display and back-up function".
- When automatic PTI is terminated, it is possible to make the personal computer print the PTI report. (Refer to the Operation Manual for Personal Computer Software.)

4.1 Inspection items

In order to continue operating the unit properly, periodically inspect the parts, and adjust or repair them if necessary. The following table shows an example of the inspection plan.

No.	Inspection item	Inspection content	PTI	2nd year	4th year	8th year	
General structure	1	Inspection for physical damage	○	○	○	○	
	2	Loose mounting bolts	1) Casing frame	○			
			2) Compressor	○			
			3) Condenser fan motor	○			
			4) Evaporator fan motor	○			
			5) Control box	○			
			6) Access panel	○			
			7) Others		○	○	○
	3	Conditions of panel, hinge and lock		○	○	○	
	4	Drain pan and drain hose cleaning		○			
	5	Control box inspection	1) Cover packing inspection and replacement	○	○	○	○
			2) Loose cable gland		○	○	○
			3) Internal cleaning		○	○	○
	6	Conditions of casing insulation through area	1) Air leakage and clearance	○	○	○	○
	7	Packing inspection and replacement	1) Ventilator cover packing		○	○	○
			2) Unit seal packing				○
	8	Painted area recondition	1) Compressor		○	○	○
			2) Water-cooled condenser/liquid receiver		○	○	○
			3) Solenoid valve (coil cap)		○	○	○
4) Casing frame					○	○	
9	Repainting	1) Compressor				○	
		2) Water-cooled condenser/liquid receiver				○	
		3) Condenser fan motor				○	
		4) Condenser fan				○	
Refrigerant system	1	Gas leakage	○	○	○	○	
	2	Refrigerant/refrigeration oil	1) Inspection of moisture in the refrigerant, and refrigerant charged amount	○			
			2) Inspection of refrigeration oil amount	○			
			3) Replacement of refrigerant and refrigeration oil			○	○
	3	Inspection of high pressure switch operational pressure		○			
	4	Operation and leakage of solenoid valve	1) Liquid solenoid valve	○			
			2) Injection solenoid valve	○			
	5	Operation and leakage of modulating valve		○			
	6	Compressor	1) Inspection of unload function (LXE10C/10C-A)	○			
			2) Inspection of electric terminal for internal water entry		○	○	○
			3) Valve plate inspection/replacement			○	○
4) Oil filter cleaning					○	○	
5) Compressor disassembly and inspection						○	

No.	Inspection item	Inspection content	PTI	2nd year	4th year	8th year	
Refrigerant system	7	Dryer replacement		○	○	○	
	8	Functional inspection and replacement of liquid moisture indicator				○	
	9	Check of cap gasket of service valve for missing		○	○	○	
	10	Conditions of fasteners on the refrigerant pipes and gauge pipes		○	○	○	
	11	Conditions of thermal insulation of refrigerant pipe		○	○	○	
	12	Evaporator coil cleaning (water-washing)		○	○	○	
	13	Condenser coil washing	1) Water-washing	○	○	○	○
2) Steam-washing (after removing refrigerant)					○	○	
14	Water-cooled condenser inspection (LXE10C/5C)	1) Water-leakage inspection		○	○	○	
		2) Operation of water pressure switch		○	○	○	
Electrical system	1	Damage of power cable and plug		○	○	○	
	2	Inspection of conditions of electric wiring		○	○	○	
	3	Terminal looseness inspection and retightening	1) Voltage selector (cam switch)	○	○	○	○
			2) Magnetic contactor	○	○	○	○
			3) Electronic controller terminal block	○	○	○	○
			4) Terminal block	○	○	○	○
	4	Conditions of monitoring receptacle cap		○	○	○	
	5	Fuse conditions	1) Molten off or not.	○	○	○	○
	6	Magnetic contactor contact point inspection and replacement	1) Contact point inspection	○	○	○	
			2) Compressor contactor replacement			○	○
			3) Evaporator fan motor contactor replacement				○
4) Condenser fan motor contactor replacement						○	
7	Electric insulation check	1) Power cable and plug	○	○	○	○	
		2) Compressor	○	○	○	○	
		3) Condenser fan motor	○	○	○	○	
		4) Evaporator fan motor	○	○	○	○	
8	Starting procedure inspection		○				
9	Thermosensor	1) Installation conditions of sensor	○	○	○	○	
		2) Inspection of sensor and sensor lead for damage		○	○	○	
		3) Indication error inspection and replacement		○	○	○	
10	PT/CT (voltage and current) indication error inspection		○	○	○		
11	Pressure sensor indication error inspection and replacement		○	○	○		

	No.	Inspection item	Inspection content	PTI	2nd year	4th year	8th year
Electrical system	12	Temperature recorder inspection	1) Calibration	○			
			2) Sensor error inspection and replacement		○	○	○
			3) Chart drive inspection	○			
			4) Recording operation inspection	○			
			5) Loose terminal		○	○	○
			6) Chart drive dry battery inspection, and replacement	○			
			7) Check and replacement of pen lifting battery				○
	13	Electronic controller	1) Check and replacement of wake-up battery*	○			
			2) LCD panel replacement			○	○
	14	Evaporator fan motor	1) Speed switchover sequence	○			
			2) Revolution direction	○			
			3) Motor replacement				○
	15	Condenser fan motor	1) Revolution direction	○			
			2) Motor replacement				○
	16	Evaporator fan	1) Deformation and damage inspection	○		○	○
	17	Condenser fan	1) Deformation and damage inspection	○	○	○	○
	Others	1	Check for abnormal noise and vibration during operation		○		
2		Temperature control conditions	1) 0°C operation	○			
			2) -18°C operation	○			
3		Defrosting function		○			
4	Unit water-washing		○				

*The service life of wake-up battery is approx. 2 years (lithium battery) or approx. One year (alkali battery). Especially for USDA transportation, replace the battery with a new alkali battery when PTI is executed.

4.2 Automatic PTI (Pre-trip inspection)

● The automatic PTI are provided for time saving and secure inspection during PTI.

Among the following items, the components mainly related to the unit operation are automated. (For the operating method of the controller, refer to Item 3.2 Operating method.)

(1) Appearance inspection of unit

- ① Inspection for physical damage
- ② Casing insulation through area
- ③ Drain hose (dust and clogging)
- ④ Power cable and plug damage
- ⑤ Conditions of refrigerant piping fasteners
- ⑥ Installation conditions of each sensor
- ⑦ Loose installing fasteners
 - Bolts and nuts.....Casing frame, compressor, fan motor and control box
 - Cable glandsControl box
- ⑧ Conditions of packing of control box cover (water-proof)
- ⑨ Inspection of magnetic contactor contact point for burning

(2) Inspection before operation

- ① Gas leakage inspection

② Power voltage inspection

(Automatic PTI range)

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

- ① Starting
 - Inspect whether the starting procedure is proper or not.
 - Inspect for abnormal noise and abnormal vibration.
 - Oil level in the compressor
 - Moisture in the refrigerant.....Reinspect it at the end of PTI.
 - Revolution direction of fan motor

② Safety device

HPSMeasure the operational pressure by stopping the condenser fan motors.

③ Control equipment

Solenoid valve and MVInspection of operation (open and close) and leakage
 EFMSpeed switchover and revolution direction
 UnloadUnload switching function

(4) Operation in each mode

- ① Pull-down → 0°C
- ② Chilled control 0°C
- ③ Pull-down → -18°C
- ④ Frozen control -18°C
- ⑤ Defrost

Electronic temperature recorder calibration
 Pull-down time, voltage and current
 Unload, return/supply air temperature difference, voltage and current
 Electronic temperature recorder calibration
 Pull-down time, evaporator fan motor speed switch (Temperature difference and revolution direction)
 ON-OFF, voltage and current

Defrosting time

Residual frost inspection

(5) Print PTI report

●Automatic PTI enable conditions

	Water cooled operation	Air cooled operation	
		Ambient temperature > 43°C	Ambient temperature ≤ 43°C
S. PTI	×	○	○
F. PTI	×	×	○
M. CHECK	○	○	○

※During S. PTI at the ambient temperature of 43°C or higher, the compressor protective device may activates depending on the conditions of the inside temperature. In this case, the refrigeration unit is not abnormal.

●Start and end operation of automatic PTI
(Refer to Item 3.2 "controller operating method")

4.2.1 S. PTI

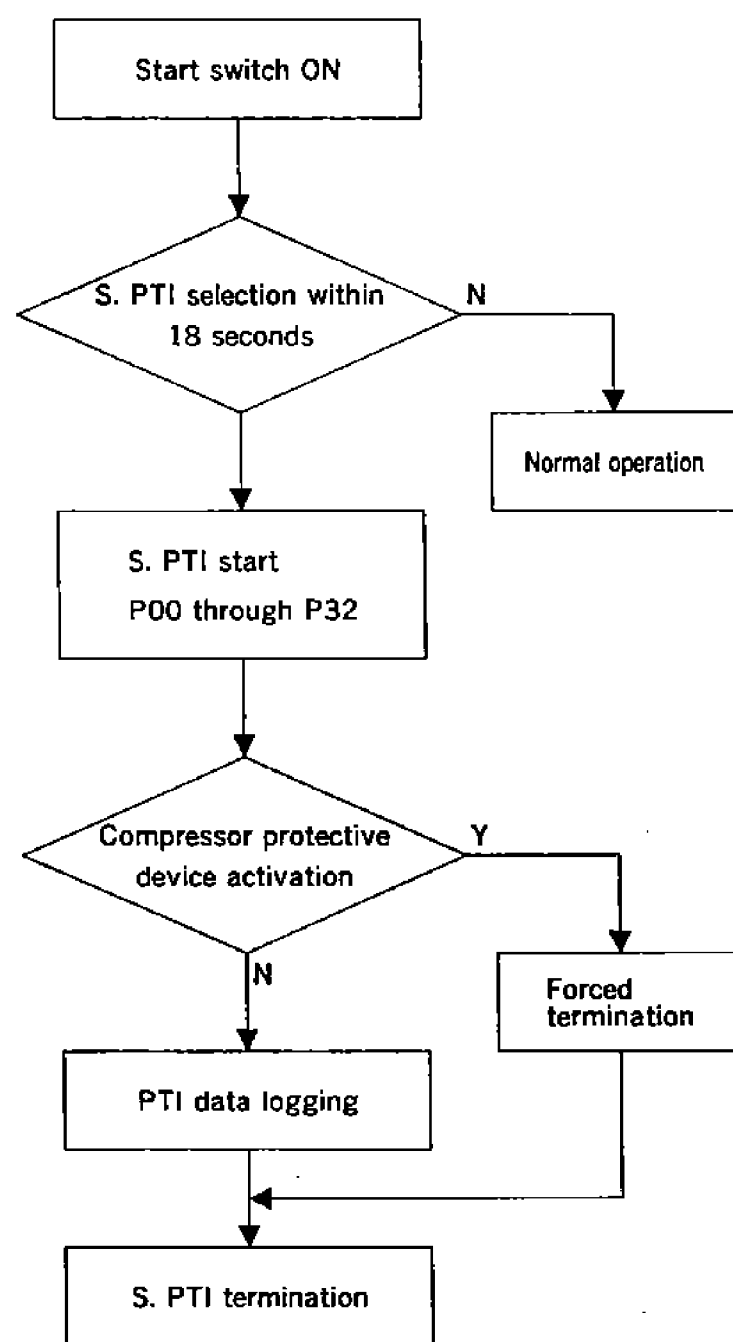
●Select S. PTI within 18 seconds after turning start switch on, and Steps P00 through P32 will be executed (displayed on LCD). The information of sensor indication mode can be displayed by key operation.

●Step display and content

Step	Content
P00	Basic data record (container No., year, month, day, time, compressor run-hour, ambient temperature)
P02	Alarm check of all sensors
P04	Power conditions (voltage and frequency) check
P06	High pressure switch (HPS) OFF/ON points check
P08	Pump-down check
P10	Solenoid valve leak check • Liquid solenoid valve (LSV) • Injection solenoid valve (ISV) • Modulating valve (MV)
P12	Return/supply sensor (SS/RS) accuracy check
P14	Pressure sensor (HPT, LPT) accuracy check
P16	Evaporator fan high/low-speed operation check

P18	Standard pull-down operation • Unload solenoid valve #1 (USV1) is energized.
P20	Unload solenoid valves 1, 2 (USV1, 2) check
P22	Reverse-phase operation check • Check visually for the rotation of condenser fan(s)
P24	Unload solenoid valve 2 (USV2) check
P26	Standard pull-down operation
P28	Reverse-phase operation check • Check visually for the rotation of condenser fan(s)
P30	Injection solenoid valve (ISV) open-/closing check
P32	Hot-gas 3-way solenoid valve (HSV) open-/closing check

●S. PTI flow chart operation

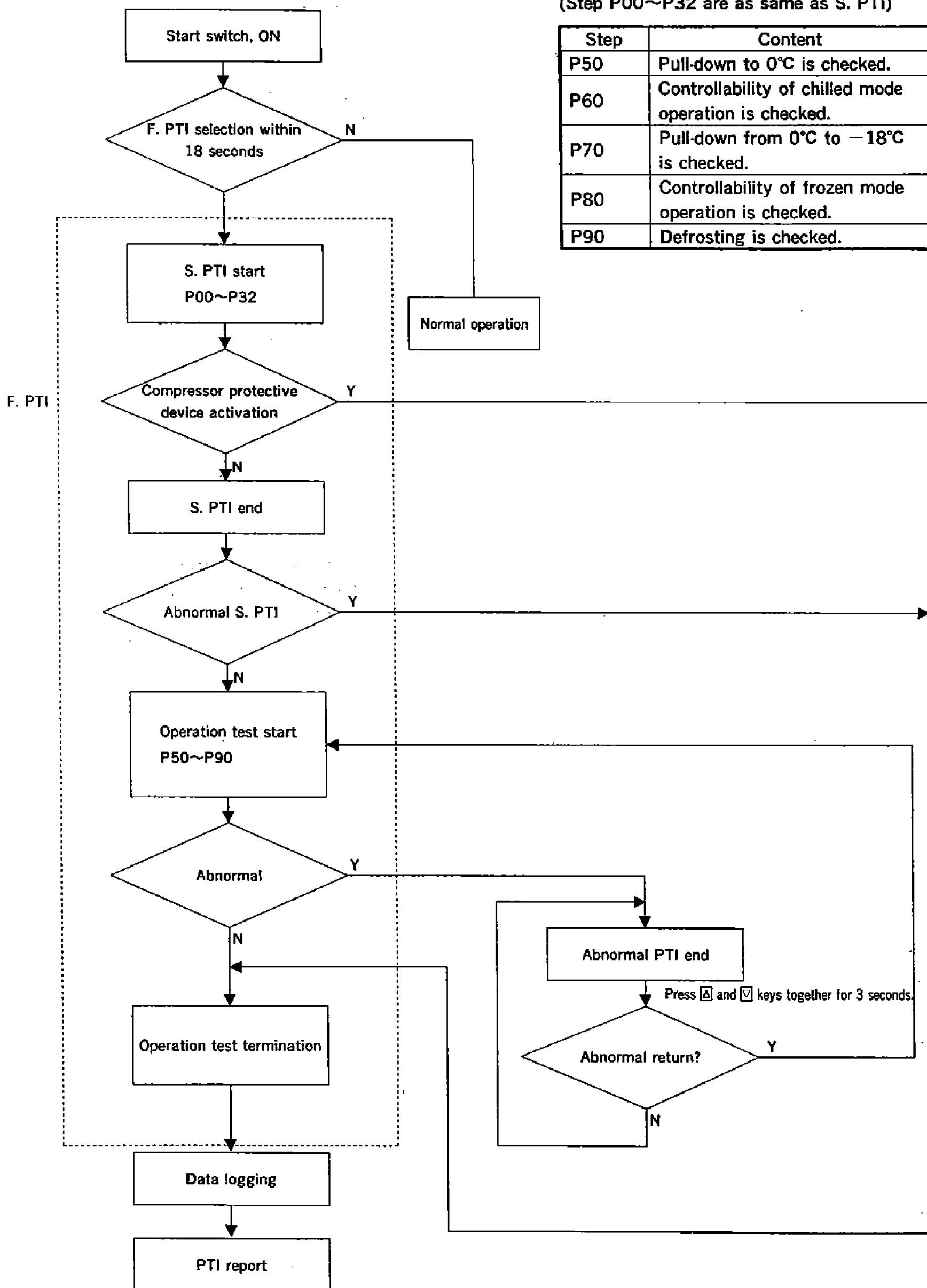


4.2.2 F. PTI

- Select F. PTI within 18 seconds after turning start switch on, and Steps P00 through P90 will be started.
- F. PTI is S. PTI + operation test.
- F. PTI flow chart

- Step display and content
(Step P00~P32 are as same as S. PTI)

Step	Content
P50	Pull-down to 0°C is checked.
P60	Controllability of chilled mode operation is checked.
P70	Pull-down from 0°C to -18°C is checked.
P80	Controllability of frozen mode operation is checked.
P90	Defrosting is checked.



4.2.3 Alarm list during PTI (pre-trip inspection)

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

The alarms caused by automatic PTI are indicated in J***, being discriminated from those during normal operation.

Though there are alarms which are not displayed on the controller panel, they can be checked referring to the PTI report.

Check No. (LCD indication)	Check	Alarm indication	Error	S.PTI	F.PTI	Remarks
P00	Basic data check	Indication failure	Basic data was lost.	↑	↑	
P02	All sensor check	The same as in regular operation	Basic data was lost.			
P04	Power check	Indication failure	Basic data was lost.			
P06	HPS check	J061	OFF value error			
	//	J062	ON (return) failure			
	//	J063	ON value error			
	//	J064	High pressure does not rise.			
	//	J065	High pressure does not lower.			
P08	Pump down check	J081	Pump down failure			
P10	Liquid solenoid valve check	J101	Valve leak			
P12	RS and SS accuracy check	J121	Accuracy of both sensors is low.			
P14	HPT and LPT accuracy check	J141	Accuracy of both sensors is low.			
P16	Evaporator fan check	J161	Evaporator fan is out of order.			
P18	Operation check	Indication failure	Judgment with P20 or P24			} Only LXE10C and LXE10CA
P20	Unload solenoid valve 1 and 2 check	J201	Unload solenoid valve 1 or 2 failure			
P22	Evaporator fan reversing check	J221	Evaporator fan wiring connection failure			
P24	Unload solenoid valve 2 check	J241	Unload solenoid valve 2 failure			} Only LXE5C Only LXE5CE
P26	Operation check	Indication failure	Judgment with P28			
P28	Evaporator fan reversing check	J281	Evaporator fan wiring connection failure			
P30	Injection solenoid valve check	J301	Injection solenoid valve failure			
P32	Hot-gas 3-way solenoid valve check	J321	Hot-gas 3-way solenoid valve check	↓		
P50	Pull-won capacity check	J501	Atmospheric temperature is not as specified.			
P50	0°C control check	J502	Pull-down time-over			
P60	0°C control check	Indication failure				
P70	Pull-down capacity check	J701	Pull-down time-over			
P80	-18°C control check	Indication failure				
P90	Defrost check	J901	Start condition is not as specified.			
	Basic data check	J902	Defrosting time-over		↓	

4.2.4 M. CHECK

● Select M. CHECK within 18 seconds after turning start switch on, and M. CHECK will be executed.

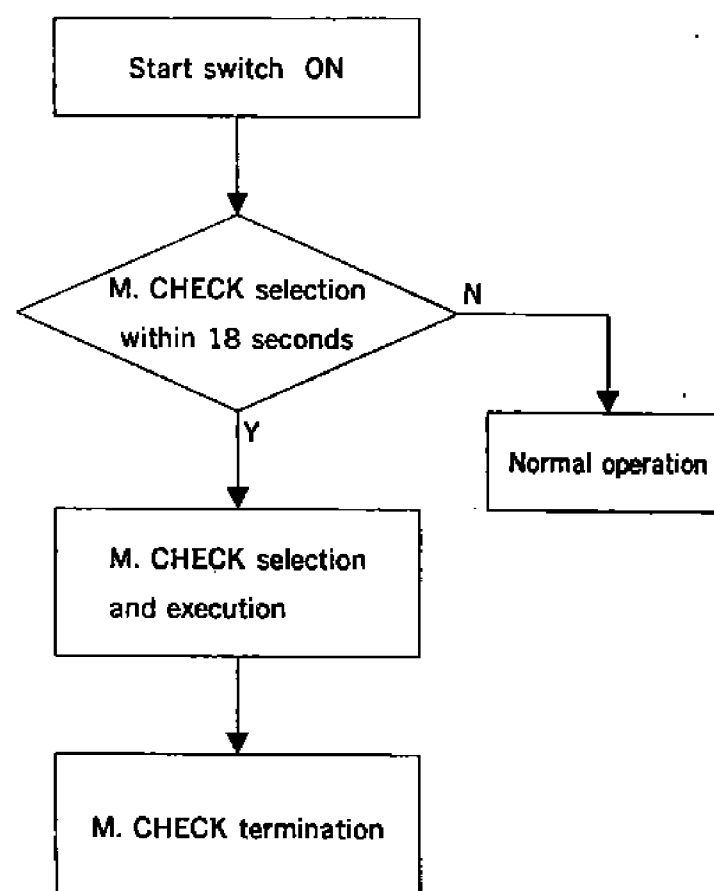
Since the components are respectively operated differing from S. PTI and F. PTI, the steps can be respectively selected and executed. Here, any error code indication does not occur during execution.

● Unless the key is not operated by the operator, M. CHECK will not be ended. (Press the  and  keys together.)

● Step display and content

● M. CHECK flow chart

Step	Content
C	Compressor run-hour is displayed on LED.
EFH	Evaporator fans run at the high speed. Operating current is displayed on LED.
EFL	Evaporator fans run at the low speed. Operating current is displayed on LED.
CF	Condenser fans run. Operating current is displayed on LED.
b-CH	Battery replacement date is displayed on LED. If replacement date is exceeded, "E801" is displayed.
HP	Horsepower of controller selected with dipswitch is displayed on LED. (5 or 10)




4.2.5 Example of automatic PTI report

Example of FULL PTI

 * PRE-TRIP INSPECTION REPORT *
 * < DAIKIN CONTAINER COMMUNICATION SYSTEM Ver.2 > *
 * CONTAINER No. *
 * DATE * TIME *

 *PTI OPTION : * *POWER SOURCE : V Hz *
 *PTI START : * *HP CUTOFF SWITCH : *
 *PTI END STATUS : * *SOLENOID & MODULATION VALVE : *
 *RUN HOUR OF COMPRESSOR : HR * *EVAP FAN MOTOR : *
 ***** *INJECTION : *
 ***** *HOTGAS SOLENOID VALVE : *

Installed ship name	Date of inspection
Container No.	Place of inspection
Loaded cargo	Unit Model No.
Customer's staff	Unit No.
Service staff	Comperessor No.

Check	No.	Check point	Check method	Reference value
	1	External appearance of importants parts of container (doors, equipment, damaged points)	Visual	
	2	Cleaning Interior and exterior of container	Visual	
	3	Checking the smudge of the unit (air-cooled condenser, evaporator)	Visual	
	4	Checking penetration between inside and outside of unit	Visual	
	5	Checking external appearance of power cable and plug	Visual	
	6	Cleaning drain hose	Visual	Shall be free from clogging
	7	Checking appearance of defrost termination thermostat	Visual	
	8	Tightened condition of cable glands and monitoring receptacle	Retighten with tool	Make sure that they are firmly tightened
	9	Checking condenser and evaporator fan motors for vibration and noise	Touch and listen	
	10	Checking seal of liquid indicator	Check liquid indicator	Make sure that it is sealed
	11	Checking for water in refrigerant	Check liquid indicator	Dry indication
	12	Checking compressor oil level (operating condition)	Check compressor oil level gauge	 (Oil level 1/4~3/4)
	13	Checking operation and battery of recorder	Visual	
	14	Checking operation of each solenoid valve.	Listen or touch each tube	
	15	Checking operation of controller and pilot lamps	Refer check instrument	
	16	Checking operation of high pressure control	Visual right side air cooled condenser fan to be stopped	
	17	Checking power supply change over switch	Checking 200V class operation Place changeover switch level horizontal	
		Checking 400V class operation Place changeover switch level vertical		
	18	Unit insulation resistance	Compressor circuit <input type="text"/> MΩ Evaporator fan circuit <input type="text"/> MΩ Condenser fan circuit <input type="text"/> MΩ	DC 500V megger 2MΩ or more
		19	Checking manual defrosting operation	Manual defrost switch
		20	Checking leakage of gas and oil on refrigrant circuit (mainly at joints)	Gas leak detector
	21	Unit operating current R <input type="text"/> S <input type="text"/> T <input type="text"/>		-18℃ R-S <input type="text"/> V S-T <input type="text"/> V T-R <input type="text"/> V
	22	Checking operation of high pressure switch	H-CUTOFF <input type="text"/> kg/㎩(Kpa)	Operate the air cooled condenser without fan operation 21kg/㎩(2060Kpa)
	23	Checking operation of low pressure control	L-CUTOFF <input type="text"/> ㎩(HgV(Kpa))	
	24	Ambient temperature <input type="text"/> ℃	0℃ (32℉)	-18℃ (-0.4℉)
		LP kg/㎩(Kpa)	<input type="text"/>	<input type="text"/>
		HP kg/㎩(Kpa)	<input type="text"/>	<input type="text"/>
		Operating time	Immediately after operation Operation starting → 0℃ <input type="text"/> H r <input type="text"/> M	Operation 0℃ → 18℃ <input type="text"/> H r <input type="text"/> M
	25	Checking automatic defrosting operation	Defrost time <input type="text"/> M	
	26	Checking operation of heat-up function	Check operation	

 *ALARM DURING PTI : *

4.3 Example of PTI sheet

Container refrigeration unit inspection card

DAIKIN INDUSTRIES, LTD.

Installed ship name				Date of inspection				
Container No.				Place of inspection				
Loaded cargo				Unit Model No.				
Customer's staff				Unit No.				
Service staff				Compressor No.				
Check No.	Check point			Check method		Reference value		
1	External appearance of important parts of container (doors, equipment mount, damaged points)			Visual				
2	Cleaning interior and exterior of container			Visual				
3	Checking the smudge of the unit (air-cooled condenser, evaporator)			Visual				
4	Checking penetration between inside and outside of unit			Visual				
5	Checking leakage of gas and oil on refrigerant circuit (mainly at joints)			Gas leak detector				
6	Checking external appearance of power cable and plug			Visual				
7	Cleaning drain hose			Visual		Shall be free from clogging		
8	Cleaning defrost air hose and checking that there is no trap on it. (option)			Visual		Shall be free from clogging		
9	Checking operation of heat-up function			Check operation				
10	Checking appearance of defrost termination thermostat			Visual				
11	Tightened condition of cable glands and monitoring receptacle			Retighten with tool		Make sure that they are firmly tightened		
12	Checking condenser and evaporator fan motors for vibration and noise			Touch and listen				
13	Checking seal of liquid indicator			Check liquid indicator		Make sure that it is sealed		
14	Checking for water in refrigerant			Check liquid indicator		Dry indication		
15	Checking compressor oil level (operating condition)			Check compressor oil level gauge		☉ (Oil level 1/4 ~ 3/4)		
16	Checking operation and battery of recorder			Visual				
17	Checking operation of each solenoid valve			Listen or touch each tube				
18	Checking operation of controller and pilot lamps			Refer check instrument				
19	Checking operation of defrost initiation air switch (option)			Check with U tube		☉ mm H ₂ O CUT IN		
20	Unit operating current R <input type="text"/> S <input type="text"/> T <input type="text"/>			Clamp meter		-18°C <input type="text"/> V <input type="text"/> Hz		
21	Unit insulation resistance	Compressor circuit <input type="text"/> MΩ		DC 500V megger		2MΩ or more		
		Evaporator fan circuit <input type="text"/> MΩ						
22	Checking manual defrosting operation			Manual defrost switch				
23	Checking operation of defrost termination thermostat (Completing temperature) <input type="text"/> °C			Mount thermistor to completion thermostat mounting position		OFF 35 °C		
24	Checking operation of high pressure control			Visual right side air cooled condenser fan to be stopped				
25	Checking operation of high pressure switch		H-CUT OUT <input type="text"/> kg/cm ² (Kpa)	Operate the air cooled condenser without fan operation		21 kg/cm ² (2060Kpa) 16 kg/cm ² (570Kpa)		
	Checking operation of low pressure control		L-CUT OUT <input type="text"/> mm HgV (Kpa) after <input type="text"/> min. from unit off	Accomplish pump down by use of the stop valve at the water cooled condenser outlet		under 540 mm HgV for 20sec. (-72Kpa) after 3min. from unit off		
26	Checking operation of water pressure switch		Checking switchover from air-cooled to water-cooled operation		Disconnect water coupling		Condenser fan motor shall operate	
			Checking switchover from air-cooled to water-cooled operation		Connect water coupling and supply water		Condenser fan motor shall stop	
27	Checking power supply changeover switch		Checking 200V class operation		Place changeover switch lever horizontal			
			Checking 400V class operation		Place changeover switch lever vertical			
28	Storage temperature °C		<input type="text"/>	0°C	-18°C	Automatic operation at -18°C		
	Ambient temperature °C		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> In one cycle		
	Lp kg/cm ² (Kpa)		<input type="text"/>	<input type="text"/>	<input type="text"/>	COMP OFF <input type="text"/> M		
	HP kg/cm ² (Kpa)		<input type="text"/>	<input type="text"/>	<input type="text"/>	COMP ON <input type="text"/> M		
	Operating time		Immediately after operation	Operation → 0°C <input type="text"/> Hr <input type="text"/> M	Operation 0°C → -18°C <input type="text"/> Hr <input type="text"/> M	Automatic operation at -18°C <input type="text"/> Hr <input type="text"/> M		
	Operation starting time		<input type="text"/>		<input type="text"/>			
29	Checking automatic defrosting operation			Defrost time <input type="text"/> M				

5. Chartless function (only DECOSIIIa)

The function of temperature recorder is provided as one of functions of controller, so that inside temperature can be easily controlled. The following four functions are available.

- Alarm indicating function
- Operation history indicating function
- Temperature record scrolling function
- Alarm record scrolling function

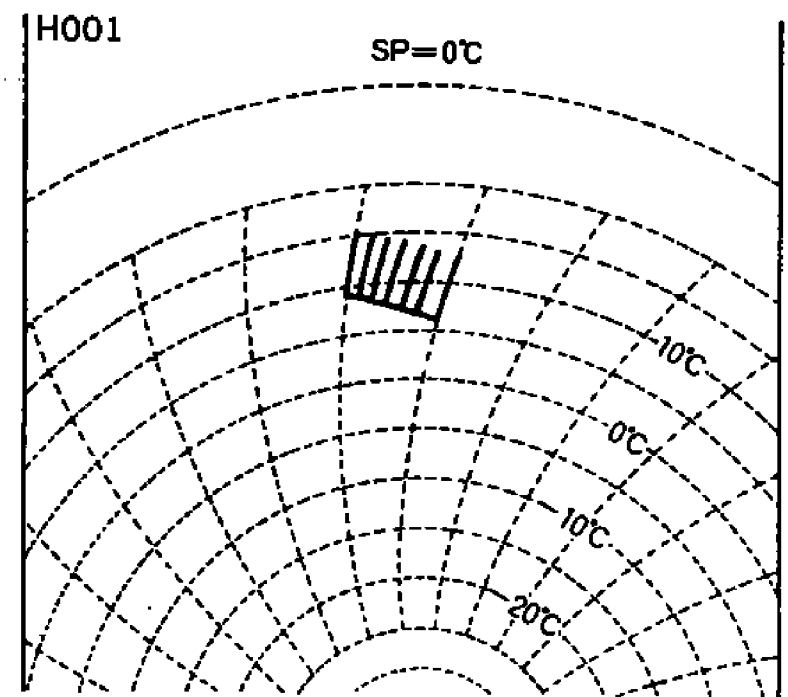
The chartless function is controlled by the control sensor (SS/RS). If the optional data record sensor (DSS/DRS) has been installed, data of data record sensor is recorded.

5.1 Alarm indicating function

Abnormal temperature record is indicated as an alarm code on the chart paper of temperature recorder.

An example H001 alarm

Setting: An alarm is output when the control temperature does not lower by 3°C or more for every 4 hours in pull-down state.



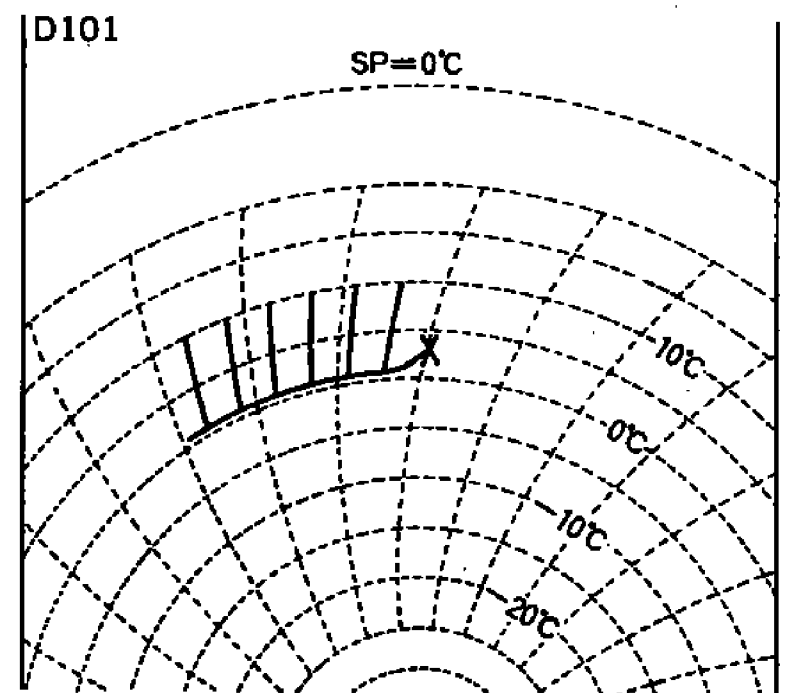
5.2 Operation history indicating function

The code indicating the current operation state of unit is displayed. It is not an alarm.

An example D101

Setting: D1XX








When the integrated time of duration of state SP+1°C or more is one hour, XX=01 is displayed.



5.3 Temperature record scrolling function

Control temperature data for max. 7 days are scroll-displayed, beginning with the latest one and ending with oldest one, so that you can get the previous operation data of unit on board.

<Operation procedure>

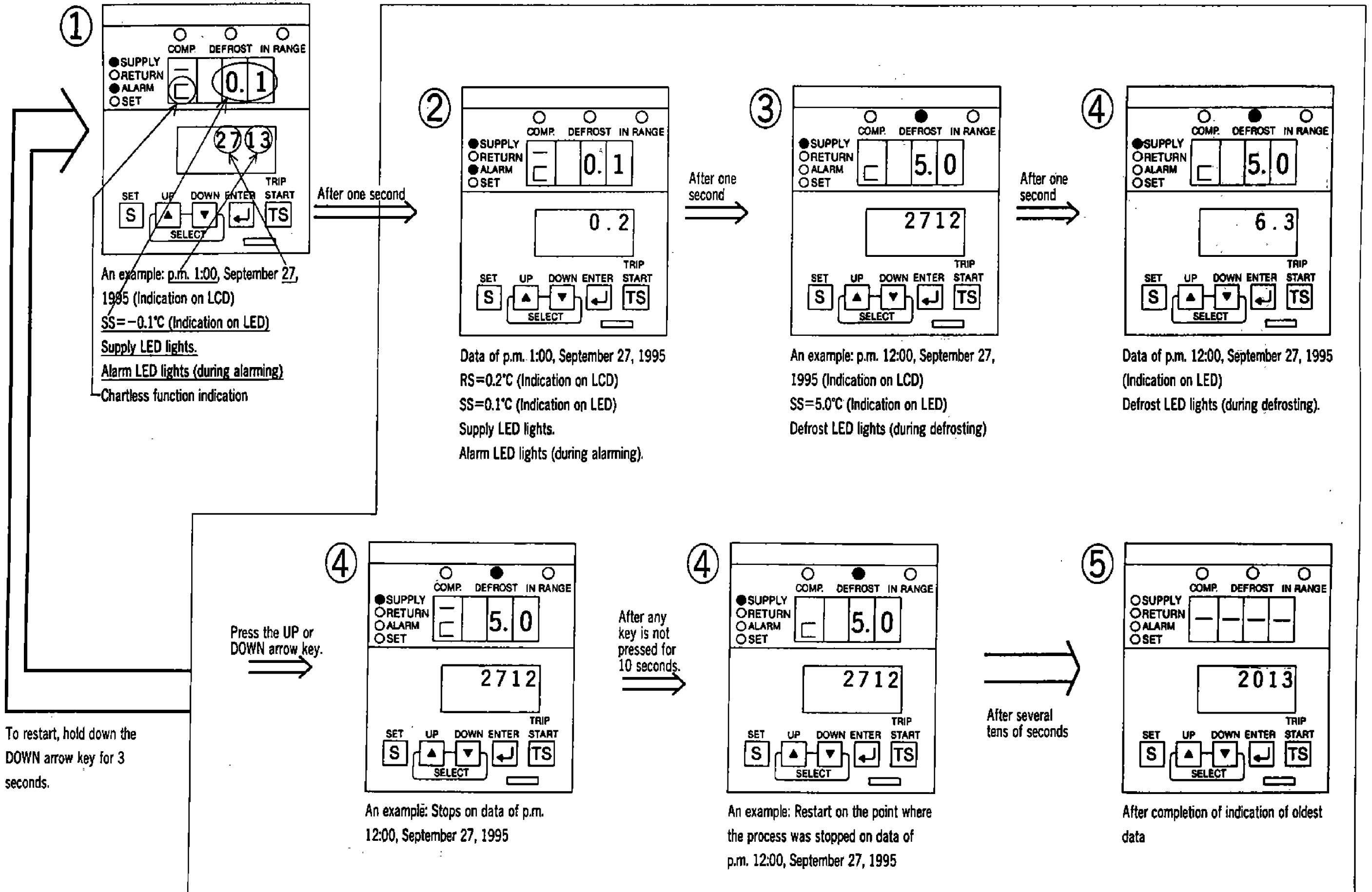
- (1) Display the temperature record in the scroll mode by the method described in section 3.2.
- (2) When the temperature scroll-back screen appears, it starts at once to indicate the control temperature record. At this time the controller indication (only ALARM LED and DEFROST LED lighting) at the pertinent time is also given.
- (3) The display scrolls back automatically from the present time to past time (at the rate of one data/2 seconds).
- (4) If you want to stop scroll, press the  or  arrow key.
- (5) To see the previous or next data from the stop point, press the  (to see the previous data) or the  key (to see the next data).
- (6) If any key is not pressed in this state for 10 seconds, auto-scroll-back is resumed.
- (7) If you want to start again from the beginning, hold down the  arrow key for 3 seconds.
- (8) To resume the regular operation screen, press the  key, or any keys not pressed for 5 minutes.
To resume the operation setting screen, press  key.

CAUTION

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

<Indication>

Here, it is assumed that the control temperature is SS and the logging interval is 1 hour, and the current date and time are September 27, 1995, 14:00.

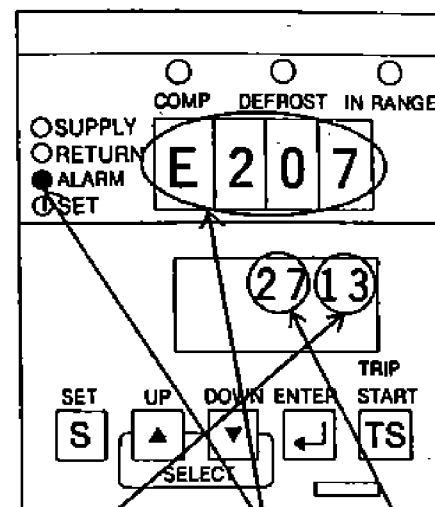


5.4 Alarm record scrolling function

The previous alarms are displayed on the control at the rate of one alarm/sec alarm for max. 7 days.

<Operation procedure>

The basic operation is the same as that stated in section 5.3. Output alarm are displayed at rate of one alarm/sec.



An example: Alarm E207 occurred from p.m. 11:00 till p.m. 2:00, September 27, 1995 (to be indicated on LCD).

5.5 Chartless function alarm list

	Code	Description	Operation mode
Alarm indicating function	H 0 0 1	The alarm is output when the control temperature does not lower by (3°C) or more for every 4 hours in pull-down state.	C, F, PF
	H 0 0 2	The alarm is output when the integrated time of IN RANGE+OUT state becomes equal to (2 hours) (count is not performed during defrosting).	C, F, PF
	H 0 0 3	The alarm is output when the integrated time of state "below SP-1°C" becomes equal to (2 hours) .	C
	H 0 0 4	The alarm is output when the integrated time of state "below SP-2°C" becomes equal to (one hour) .	C
	H 0 0 5	The alarm is output when IN RANGE was changed to +OUT but IN RANGE was not set, and defrosting was performed successively (three times) .	C, F, PF
	H 0 0 6	The alarm is output when the integrated time the difference 2°C or more between control sensor data and record sensor data becomes equal to (one hour) or more.	C, F, PF
Operation history indicating function	D 3 X X	X X : When the integrated time of state "above SP+3°C" becomes equal to (one hour) , an indication $[X X = 01]$ appears.	C, F, PF
	D 2 X X	X X : When the integrated time of state "above SP+2°C" becomes equal to (one hour) , an indication $[X X = 01]$ appears.	C
	D 1 X X	X X : When the integrated time of state "above SP+1°C" becomes equal to (one hour) , an indication $[X X = 01]$ appears.	C
	D - 1 X	X : When the integrate time of state "below SP-1°C" becomes equal to (one hour) , an indication $[1 X = 11]$ appears.	C
	D - 2 X	X : When the integrated time of state "below SP-2°C" becomes equal to (one hour) , an indication $[2 X = 21]$ appears.	C
	P X X X	X X X : When the integrated pull-down time becomes equal to one hour, an indication $X X X = 001$ appears.	C, F, PF

Note : The encircled setting can be changed.

The data enclosed in rectangles very depending on the encircled settings.

Settings must be changed according to shipping company's instructions.

6. Major components and maintenance

6.1 Components related with refrigeration circuit

6.1.1 Compressor

The compressor is of a semi-hermetic type with the built-in motor so that there are few places where refrigerant may leak. The reversible trochoid pump used produces the required oil pressure regardless of the direction of the built-in motor.

The compressor also adopts the cylinder unload system (LXE10C/10C-A). So the load ratio is switched to 100%-67%-33% in the frozen mode by the unload solenoid valve (USV1 and USV2).

●The cylinder unload system is of the blocked suction type. Unusual noise may sometimes be given out of the suction valve due to pressure drop before the suction valve during unloading operation, but this is not a sign of trouble.

(1) Replacement

Remove the compressor by the following procedure.

- ① Remove the front and base plates of the cable stowage and protective stay.
- ② Remove discharge stop valve, suction stop valve, gauge piping flare nut (compressor side), coil of unload solenoid valve (LXE10C/10C-A), and power cable.
- ③ Remove compressor set bolts (two for each of left and right).
- ④ Pull out the compressor to the front of the unit.
- ⑤ Remove the unload solenoid valve bodies and the spacer of suction solenoid valve from the original compressor, and install them to new one. (LXE10C/10C-A)



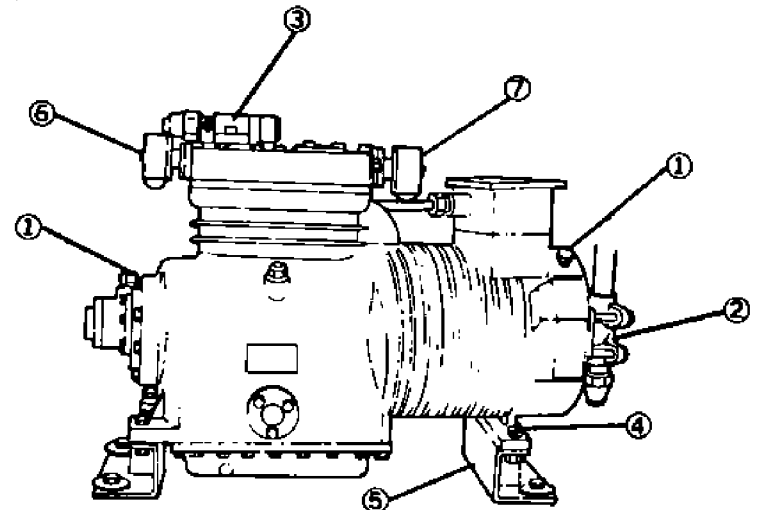
CAUTION

LXE10CA(-A) is not provided with suction side stop valve. When replacing the compressor, apply the moisture entry preventing tape (packing tape) to the suction piping.

(2) Installing procedure

For installation, reverse the above procedure. When tightening the bolts, refer to the standard tightening-torque table.

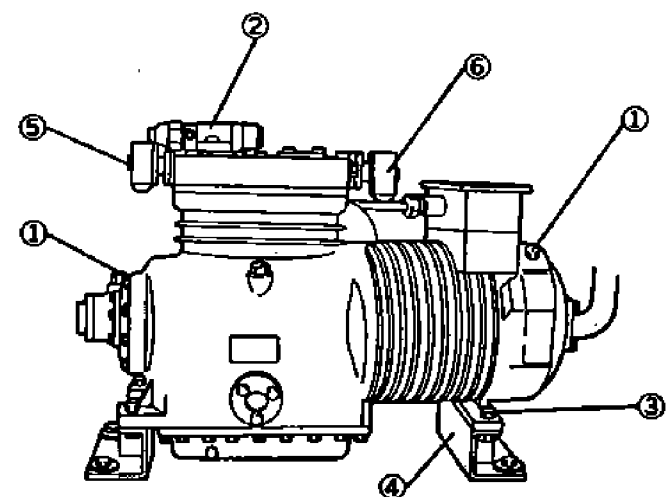
●LXE10C/5C-1



- ① Flare nut, gauge
- ② Suction stop valve
- ③ Discharge stop valve
- ④ Set bolt
- ⑤ Mounting base
- ⑥ Unload solenoid valve (USV1)
- ⑦ Unload solenoid valve (USV2)

Note: Unload solenoid valves (USV1 and USV2) are provided in LXE5C-1.

●LXE10CA/5C-XX



- ① Flare nut, gauge
- ② Discharge stop valve
- ③ Set bolt
- ④ Mounting base
- ⑤ Unload solenoid valve (USV1)
- ⑥ Unload solenoid valve (USV2)

Note: Unload solenoid valves (USV1 and USV2) are provided in LXE5C-XX.

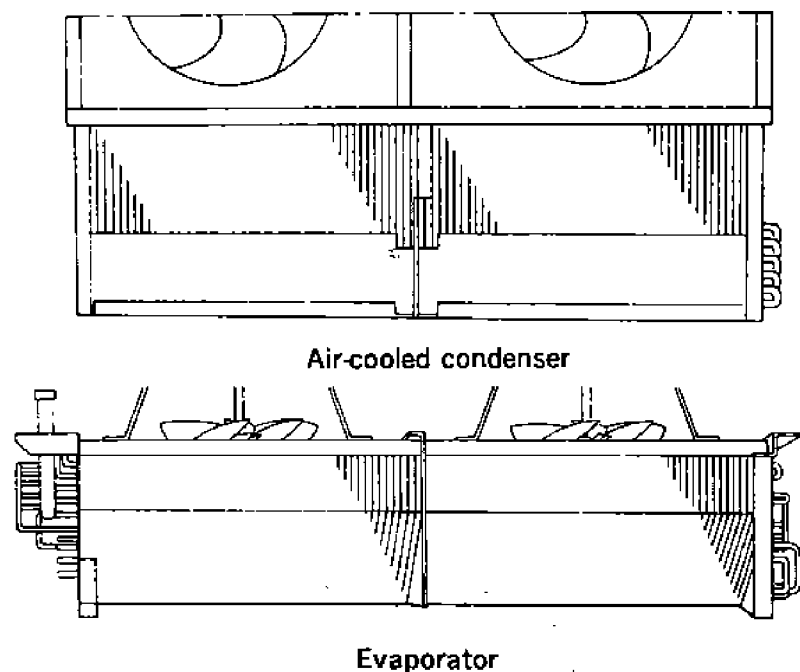
6.1.2 Air-cooled condenser and evaporator

The "cross fin" coil type having special corrugated fins is compact, and very efficient in producing uniform heat exchange efficiency.

●Washing of air-cooled evaporator

Though the air-cooled condenser employs thick fins, slant construction, dip-coating for corrosion resistance, specially wash the air-cooled condenser with fresh water since much salty material sticks.

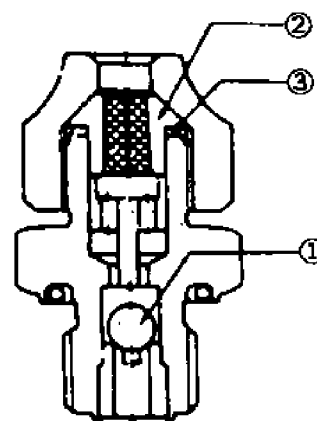
●For maintenance, remove the front plate from the air-cooled condenser and the rear panel from the evaporator.



●Replacement of fusible safety plug

When pressure rises abnormally in the refrigerant system, the fusible plug melts by itself. So, thoroughly check possible causes if the fusible plug melts.

When the fusible safety plug functions, the center of the fusible plug alloy ② melts, from which the refrigerant jets out. When the flare nut is removed, ① is apt to come out by pressure and clogs the passage of the refrigerant outlet, which prevents the refrigerant from jetting out and also the air from entering. Thus, refrigerant loss is extremely minimized.

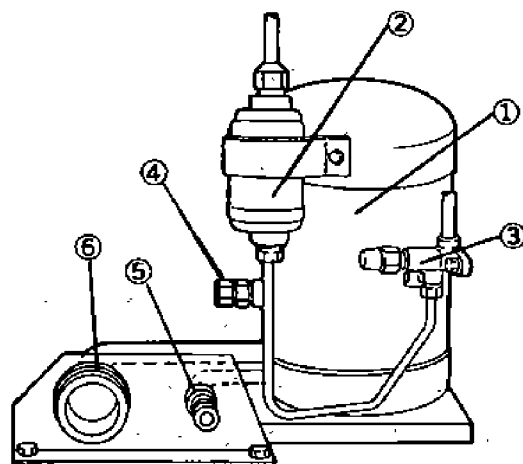


- ① Ball
- ② Fusible plug alloy
- ③ Packing

For replacement, insert a new ② with ③, and tighten the flare nut.

6.1.3 Water-cooled condenser (Air/water-cooled type) and Receiver (Air-cooled type)

The water-cooled condenser is mounted on the air/water-cooled type, and the receiver is mounted on the air-cooled type. Since the condenser is of shell and coil type, the cooling water flows in the inner cooling tube and the refrigerant flows in the shell. The cooling tube having special fins are used to make it light and compact.



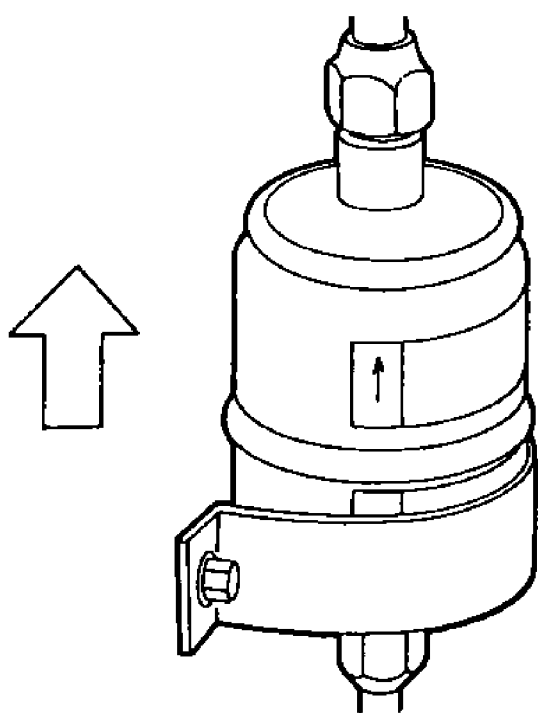
- ① Water-cooled condenser (receiver)
- ② Dryer
- ③ Liquid stop valve
- ④ Fusible plug
- ⑤ Cooling water inlet
- ⑥ Cooling water outlet

6.1.4 Dryer

The dryer automatically absorbs moisture from the refrigerant while it is circulated. It commonly works as a filter to remove dust from the refrigerant. Replace the dryer if it does not remove moisture or is clogged. When installing the new dryer, follow the directions given on the label and do not make any mistake about the direction of the dryer. (Flange connection type is option)

(1) Replacement

- ① In the "pump down" state (refer to "Maintenance"), close the compressor suction stop valve.
- ② Then, loosen the flares (the flange bolts) at the both ends of the dryer, and replace the dryer quickly.
- ③ After reattaching the dryer, do vacuum drying with keeping the liquid stop valve at the outlet of water cooled condenser (or receiver) closed.
- ④ After completing vacuum drying, open the stop valve to its original state, and be sure to inspect the system for refrigerant leak. Confirm no gas leakage is found.
- ⑤ After operation, confirm the liquid/moisture indicator shows green.



6.1.5 Liquid/moisture indicator

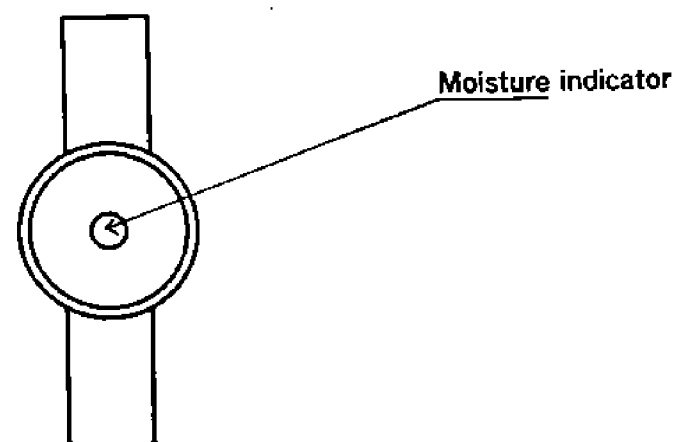
This indicator permits checking of flow of the refrigerant and moisture content in the refrigerant.

(1) Moisture mixture

The indicator indicates the moisture mixture content by the color at the center of the window.

Check this indicator during the unit is operating.

Color	Judgment
Green	Dry
Yellow	Wet (moisture inclusion)



- Note)
1. The indicator may appear yellow if it has been exposed to gaseous refrigerant for a long time.
 2. The indicator must be checked while the indicator is sealed by liquid refrigerant after operation of a few hours.
 3. The indication is influenced by the temperature of the liquid refrigerant. At the low temperature, a long time is required for the indicator to change.
 4. To shorten the indication changing time, raise up the temperature of the liquid refrigerant. (Block the air discharge grill of the condenser fan to increase the working pressure in order to raise up the temperature.)

(2) Flow of refrigerant

When the sight glass is sealed with the liquid bubbles will disappear on the sight glass.

(3) Check

Operation	Indicator state
At start	Bubbles appear but liquid refrigerant is sealed in 30 minutes to an hour after starting.
During operation	Bubbles may appear more or less.

If bubbles continues violently appearing, the refrigerant may be short.

6.1.6 Expansion valve

- Model: ATX-34023DMS (LXE10C/10C-A)
- ATX-34035DMS (LXE10CA/10CA-A)
- ATX-34013DMS (LXE5C/5C-A)

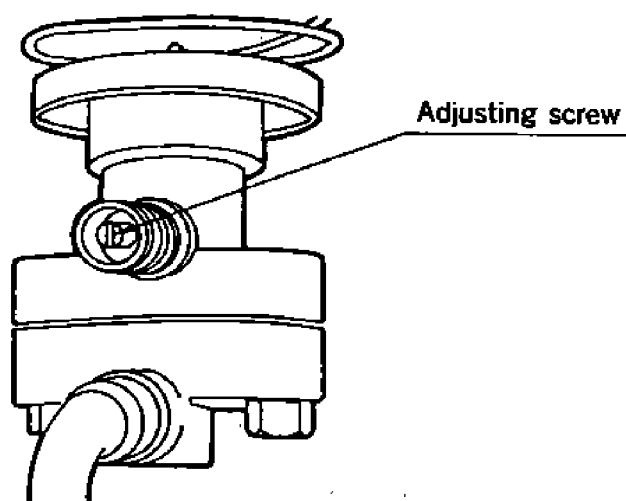
The externally equalized thermal expansion valve located at the inlet of the evaporator senses super-heat of leaving evaporator refrigerant and controls flow of the refrigerant automatically according to the operating conditions. The expansion valve with MOP (Maximum Operating Pressure) is adopted to protect the compressor from overload.

(1) Adjustment

- ① Confirm that the specified volume of the refrigerant has been charged.
- ② Operate the refrigeration unit, maintaining inside temperature at -18°C (-0.4°F). (Refer to "Maintenance".)
- ③ When the inside temperature comes to the set point of temperature, compare the suction pressure reading of controller with the normal operation pressure. (Refer to "1.6 Operation pressure".)
- ④ If suction pressure reading differs with the normal operation pressure, adjust the expansion valve as stated below.
- ⑤ Note that pressure will not change after a certain lapse of time.

(2) Adjusting procedure

- ① If the working suction pressure is higher than normal operation pressure, turn it clockwise, and the working pressure will drop.
- ② If the working suction pressure is lower than normal operation pressure, turn it counterclockwise, and the working pressure will rise.

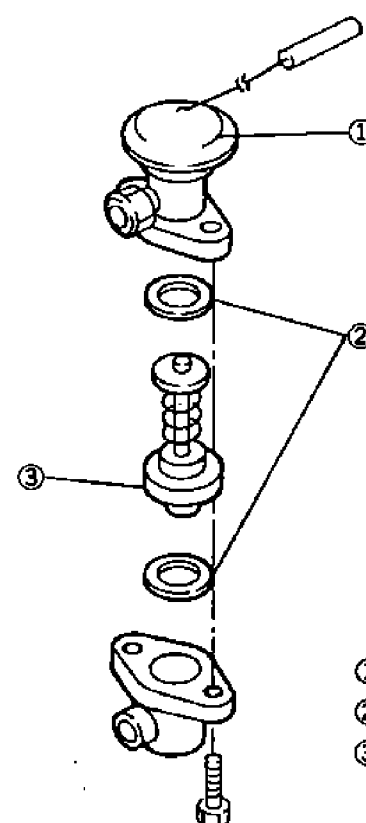
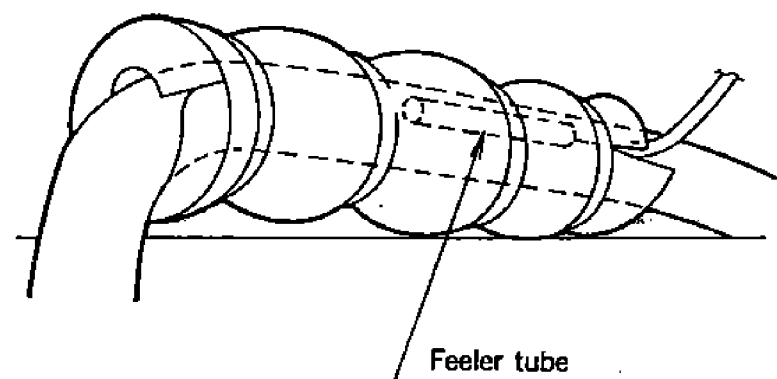


(3) Maintenance after operation

- ① Before adjusting the expansion valve, remember the original setting of the expansion valve. If any change is not found with the setting after adjustment of the expansion valve, return the adjusting screw to the original position, as trouble occurred due to other reasons.
- ② When returning the adjusting screw to its original position, first turn it beyond the original position and then return it to the original position.
- ③ After adjustment, be sure to cap the fastening screw to prevent the refrigerant from leaking.
- ④ After adjustment, operate the unit, keeping the inside temperature at -18°C (-0.4°F) and confirm that low pressure does not go down below normal operation pressure.

(4) Replacement

- ① Put the system into the "pump down" state and close the compressor suction stop valve.
- ② Remove the feeler tube from the piping of evaporator outlet, and the pressure equalizing flare and bolts from the body. (When only the cage assembly is replaced, it is unnecessary to remove the feeler tube.)
- ③ Remove the power assembly, cage assembly and packings. (For the tightening torques, refer to the appended table.)
- ④ Be sure to replace all the packings with new ones.
- ⑤ After replacement, carry out vacuum drying.



- ① Power assembly
- ② Packing
- ③ Cage assembly

6.1.7 Modulating valve (MV)

●Model: DMR1101

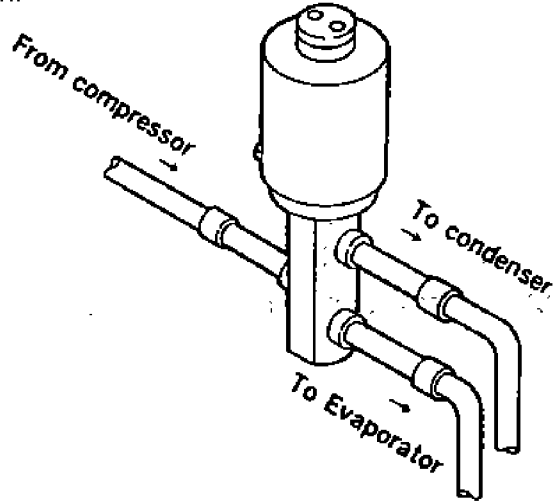
The flow rate in two directions can be automatically adjusted from 0 to 100% by the magnetic valve. It carry out switching of the refrigerant circuit in the hot gas bypass of chilled and partial frozen, heating and defrosting.

(1) Replacement

- ① Disconnect the MV wiring lead from the terminal block of the controller.
- ② Remove two bands which fasten the body of MV.
- ③ Remove MV after cutting three pipes on the body, and remove remaining pipes from soldering part.
- ④ In the installation of MV, first insert a pipe (inlet) at the left and next remaining two pipes (outlet), then solder them.

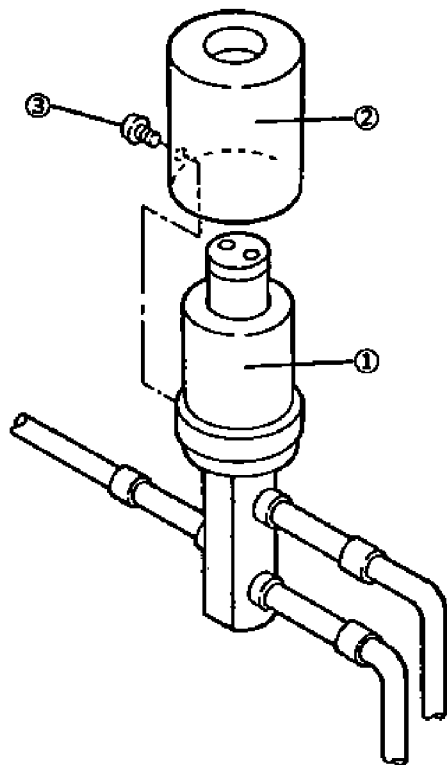
When soldering, sufficiently cool the lower valve body (lower than 120°C (248°F)) with wet cloth.

- ⑤ Return the band and wiring lead into the original state.
- ⑥ After working, be sure to carry out refrigerant leak checking, and confirm that any refrigerant does not leak.



(2) Coil replacement

- ① Disconnect the MV wiring lead from the terminal block of the controller.
- ② Remove the screw from the side of the coil, and pull out the coil upward.
- ③ Install the new coil, tighten the screw, and connect the wiring lead at the controller.



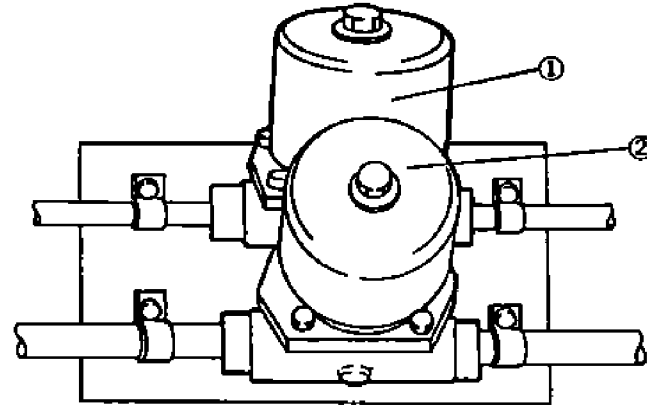
① Modulating control valve body
② Coil
③ Set screw

6.1.8 Liquid solenoid valve (LSV)

●Model : REV1004DXF

●Power supply: AC24V, 50/60Hz

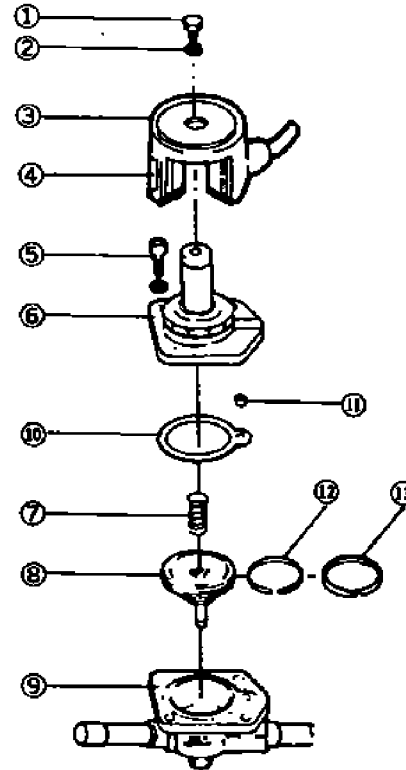
LSV is opened or closed according to the signal of the controller. When it is closed, flow of the refrigerant is closed. (It is opened when it is energized)



① Injection solenoid valve (ISV)
② Liquid solenoid valve (LSV)

(1) Replacement

- ① The internal structure of the solenoid valve is as shown below. (For disassembly, checking and reassembly, refer to this illustration.)
- ② When soldering the pipe, cool down the body with wet cloth. (It is not required to disassemble the valve. Remove the coil assembly from the body.)
- ③ In case of reassembly, tighten the four set bolts ⑤ with torque of 50-60 kg-cm.



No.	Parts name
①	Set bolt (M5)
②	Spring lock washer (M5)
③	Name plate
④	Coil assembly
⑤	Set bolt
⑥	Cover assembly
⑦	Spring
⑧	Piston
⑨	Body
⑩	Packing (teflon)
⑪	Sleeve
⑫	Inner ring
⑬	Piston ring

6.1.9 Injection solenoid valve (ISV)

●Model SEV-502DXF

●Power supply AC24V, 50/60Hz

ISV is opened or closed according to the signal of the controller. When it is closed, flow of the refrigerant is closed. (It is opened when it is energized.)

Inspection and replacement

Refer to Item 6.1.8 "Liquid solenoid valve". However, be noted that ISV is impossible to be disassembled.

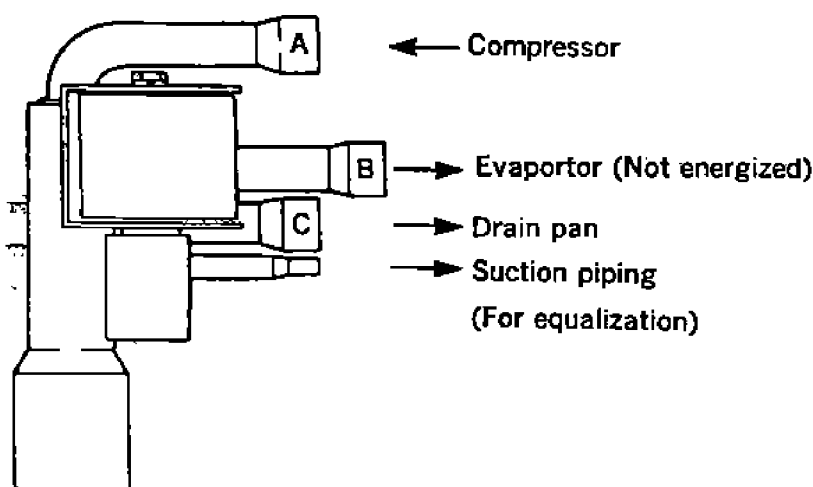
6.1.10 Hot-gas 3-way solenoid valve (HSV)

●Model DHV804DXF

●Power supply AC24V, 50/60Hz

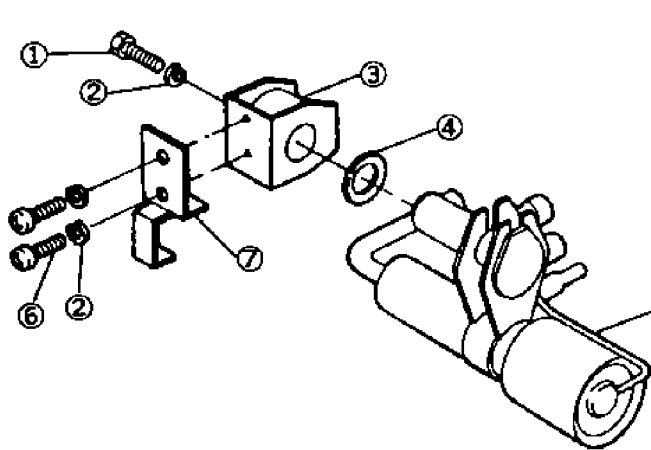
○The discharge gas directly flows to the evaporator in the defrosting and measuring gas heatup modes. The 3-way valve is provided to switch the discharge gas to the evaporator via the drain pan heater in the defrosting mode.

○Piping connection



○Replacement

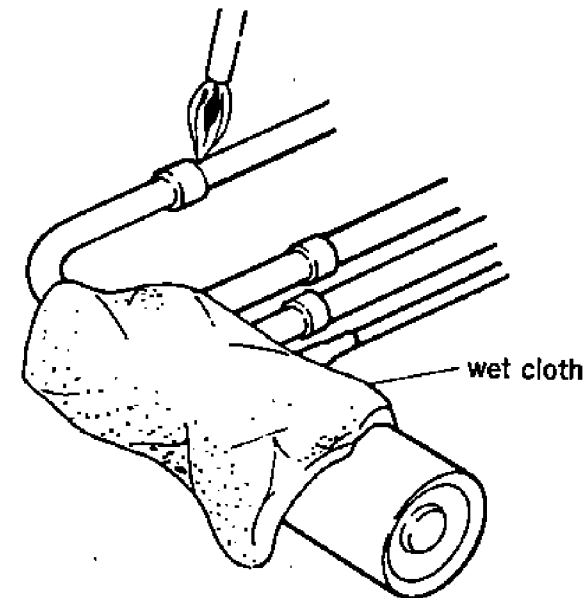
(1) Coil replacement



No.	Name
①	Set bolt (M4)
②	Spring lock washer (M4)
③	Coil
④	Washer
⑤	Body
⑥	Set screw (M4)
⑦	Bracket

(2) Replacement of valve body

When soldering the valve body, remove the coil and cool down the body with wet cloth to 120°C (248°F) or lower.



6.1.11 Unload solenoid valves (USV1,2)

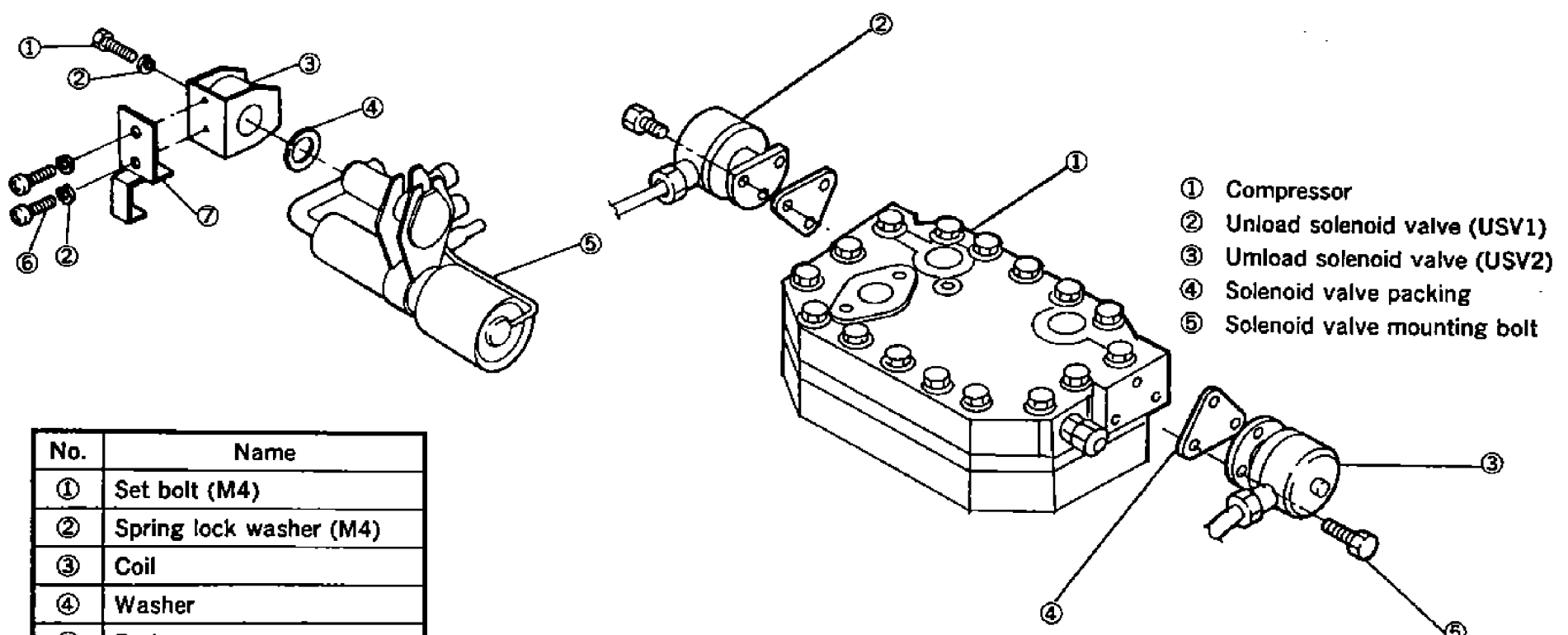
●Model SB39

●Power supply AC24V, 50/60Hz

USV1 and 2 are turned on and off according to the signal of the controller. For USV 1, 2 and compressor operating modes, refer to the following.

	USV 1	USV 2
100% load	OFF	OFF
67% load	ON	OFF
33% load	ON	ON

Inspection and replacement



6.1.12 High-pressure switch (HPS)

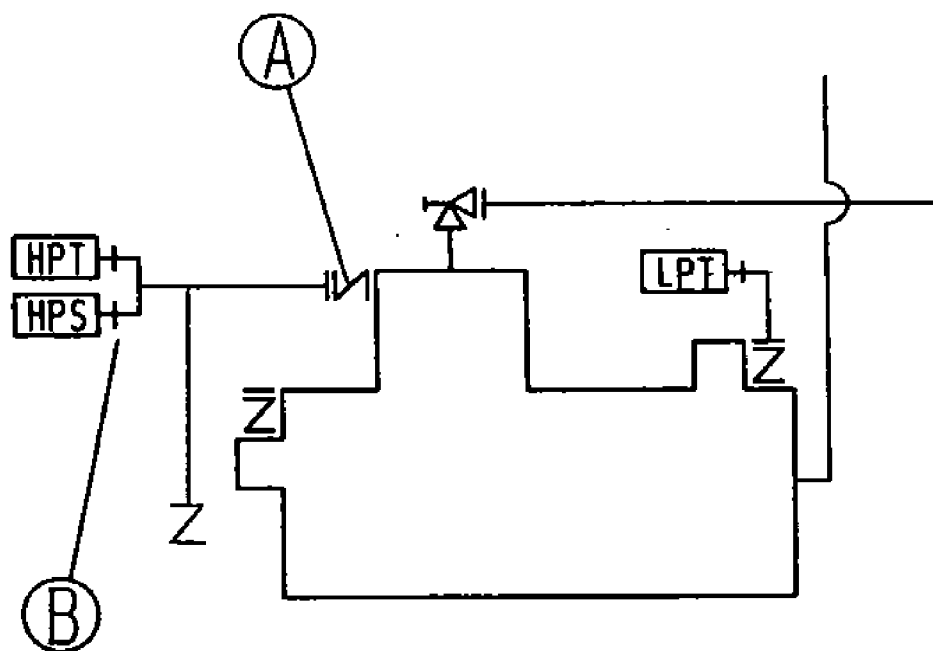
●Model 20PS780

●Set value OFF 2059kPa (21.0 kg/cm²)
ON 1569kPa (16.0 kg/cm²)

●When the refrigeration pressure of the unit abnormally rises, the switch causes the compressor to stop for safety. It will be activated when the high pressure exceeds the set value due to the trouble of the condenser fan or the poor supply of the cooling water.

(1) Replacement

- ① Disconnect the HPS wiring lead from the terminal block of the controller.
- ② In order to prevent refrigerant from flowing out, disconnect the high-pressure gauge piping from the gauge joint (with check valve) **A** on the compressor side.
- ③ Remove the flare nut **B** and fastening screws of HPS on the left side of the condenser (across the control box).
- ④ Replace HPS. After tightening the flare nut **B**, tighten the flare nut **A**.
- ⑤ After tightening **A**, slightly loosen the flare nut **B**, purge air, and retighten **B**.
- ⑥ After completing the work, be sure to carry out the refrigerant leak checking, and check that any refrigerant does not leak.



6.1.13 Water pressure switch (WPS)

LXE10C/10CA/5C

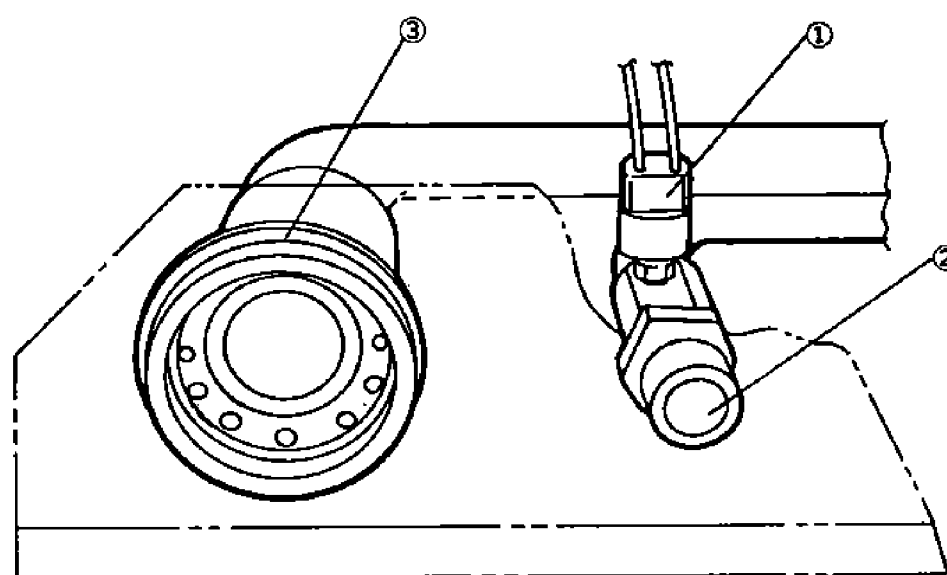
●Model LCB-MB10

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

●This switches over air and water cooled operations. If cooling water flows and water pressure rises above a preset water pressure at the inlet, the contact is open to stop the condenser fan motor and water cooled operation will start.

(1) Replacement

- ① Disconnect the WPS wiring lead from the terminal block of the controller.
- ② Replace WPS. After wrapping the dry seal tape on the thread, screw in the thread.



- ① Water pressure switch (WPS)
- ② Cooling water inlet
- ③ Cooling water outlet

6.2 Fans and fan motors

(1) Specifications

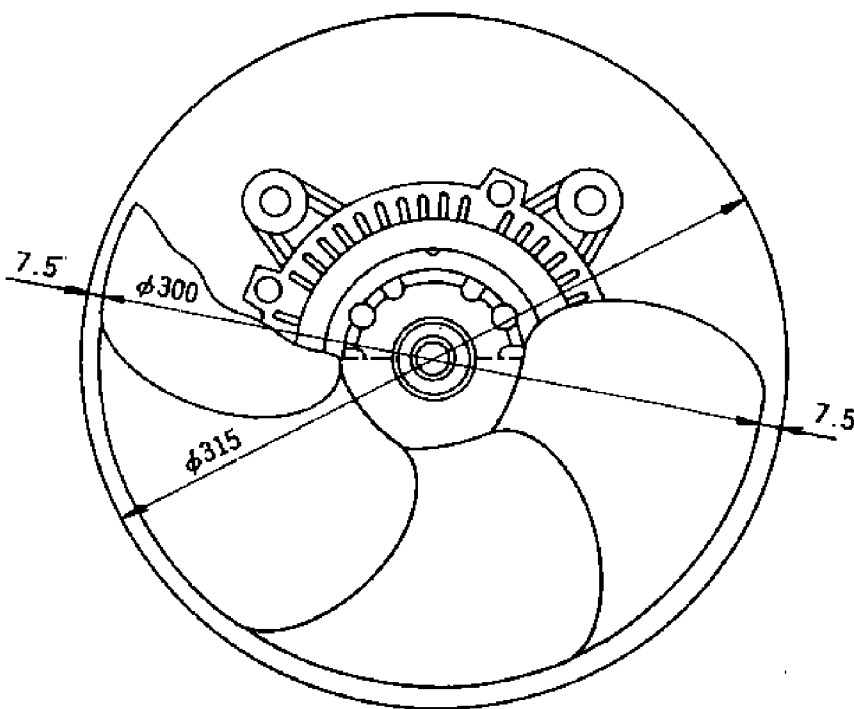
		LXE10C (-A)		LXE5C (-A)	
		Evaporator	Condenser	Evaporator	Condenser
Fan	Model	Propeller fan			
	Blade diameter	320mm	300mm	300mm	300mm
	Color	Clear	Black	Clear	Black
Motor	Model	3-phase squirrel-cage induction motor			
	Output (60Hz) (Pole number)	700/90W (2P/4P)	340W(2P)	400/50W (2P/4P)	150W(4P)
	Bearing	Shielded ball bearing with rubber seal 6203WNC	Shielded ball bearing with rubber seal 6203W	Shielded ball bearing with rubber seal 6203WNC	Shielded ball bearing with rubber seal 6203W

Note: The condenser fans of LXE10C(-A) and LXE5C(-A) are interchangeable.

(2) Installation structure

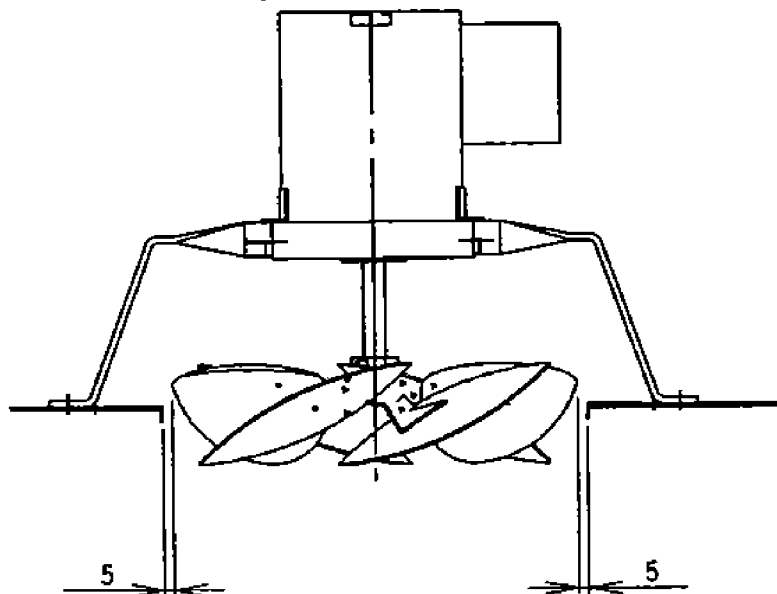
a. Condenser fan and motor

Condenser fan and motor



b. Evaporator fan and motor

Evaporator fan and motor



(3) Replacement

1) Condenser fan

Remove the front panel and fan guide, loosen two set bolts on the boss of the fan, and pull out the fan forward.

2) Condenser fan motor

- ① Remove the condenser fan.
- ② Disconnect the motor cable from the magnetic contactor in the control box.
- ③ Remove the motor mounting bolts, and replace the motor.
- ④ Install the fan motor and connect the cable.
- ⑤ After replacement, confirm that the fan is not in contact with the fan guide.

3) Evaporator fan

Loosen two set bolts on the boss area of the fan, and pull out the fan downward.

4) Evaporator fan motor

- ① After removing the fan at Item 3), cut the motor cable in the terminal box.
- ② Remove the motor mounting bolts. (Don't remove the motor set base.)
- ③ After removing the motor, connect the wiring with the cable by solderless connector.
- ④ Install the fan.
- ⑤ After replacement, confirm that the fan does not touch with the fan guide. (For checking, rotate the fan with hand.)



CAUTION

Apply the adhesive "Loctite" on the set bolts of the fan to prevent from loosing. Otherwise, fan may drop from the motor.

6.3 PT/CT board (EC9239)

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

(1) Function

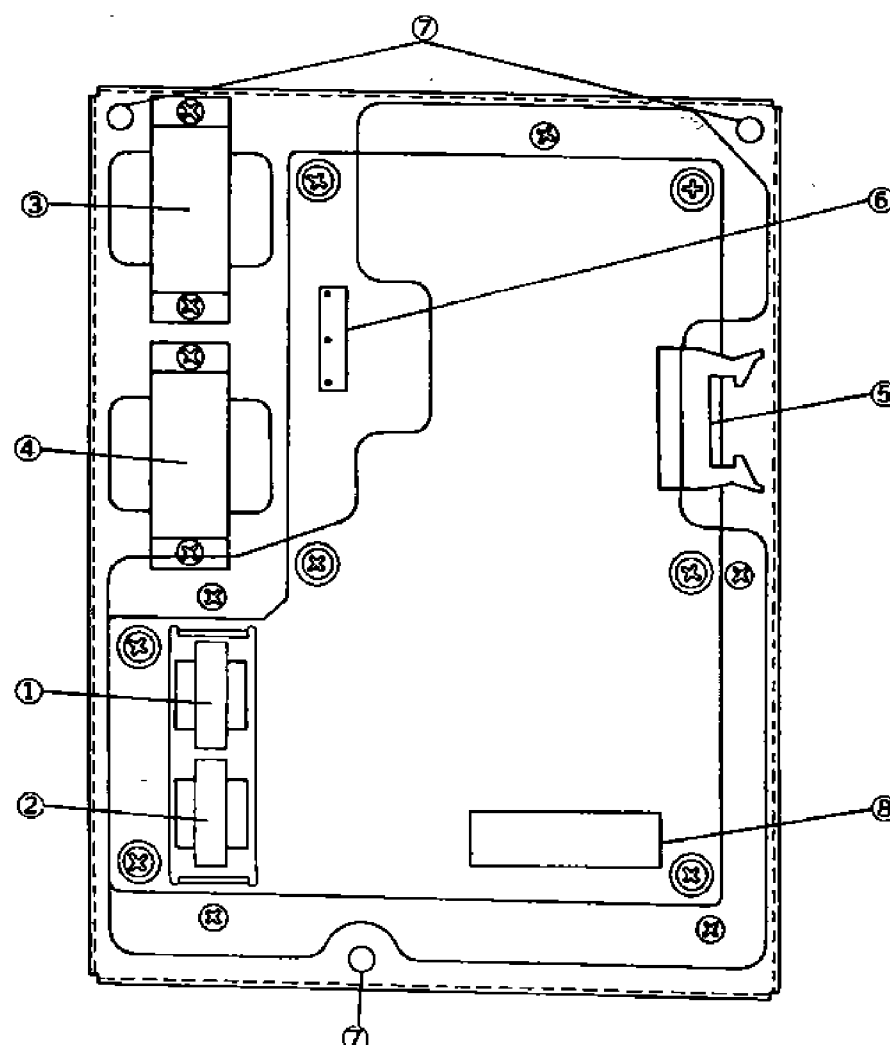
Name	Content
Current measurement, (CT1, CT2)	AC0 thru 50A (50/60Hz)
Voltage measurement, (PT1, PT2)	AC150 thru 600V (50/60Hz)
Compressor overcurrent protection	Setting value LXE10C(-A) } : 14A LXE10CA(-A) } LXE5C(-A): 8.2A
Phase sequence detection	The phase sequence is detected by sending the voltage waveform to the controller.

(2) Replacing method

- ① Disconnect the wiring leads which passes through CT1 and CT2 at the voltage selector (cam switch).
※At this time, take care to prevent breaking CT1 and CT2.
- ② Disconnect the connector (CN1) for the controller and the connector (CN2) for the main circuit.
- ③ Remove three installing nuts.
- ④ After replacing the PT/CT board, reverse the above sequence for installation.
- ⑤ After checking the wiring once, test-run the system to verify that no trouble is found.

CAUTION

Since there are two kinds for use of LXE10C/LXE10CA and LXE5C, be sure to verify them before replacement.

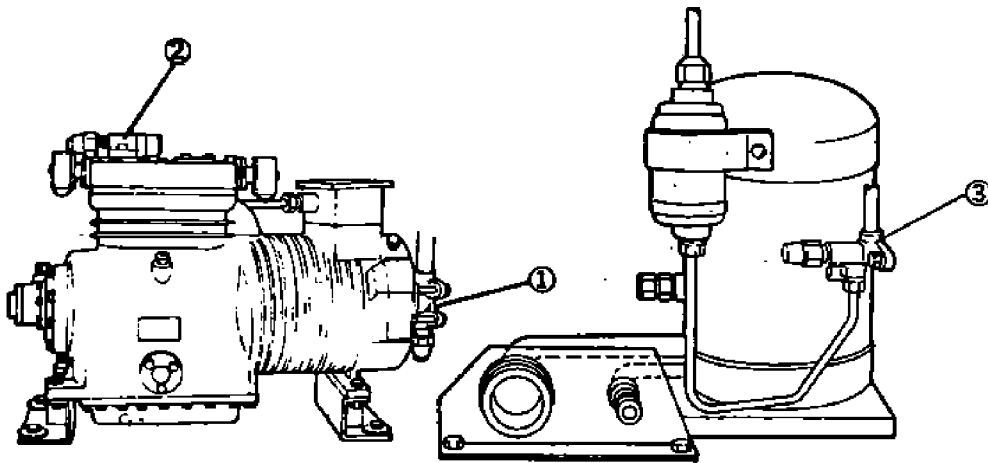


- ① CT1 (total current)
- ② CT2 (compressor current)
- ③ PT2 (S-T voltage)
- ④ PT1 (R-S voltage)
- ⑤ Connector (CN2) for main circuit
- ⑥ Connector (CN1) for controller
- ⑦ Installation hole (3 places)
- ⑧ Indication label of applicable model.

7. Maintenance

7.1 How to handle stop valves

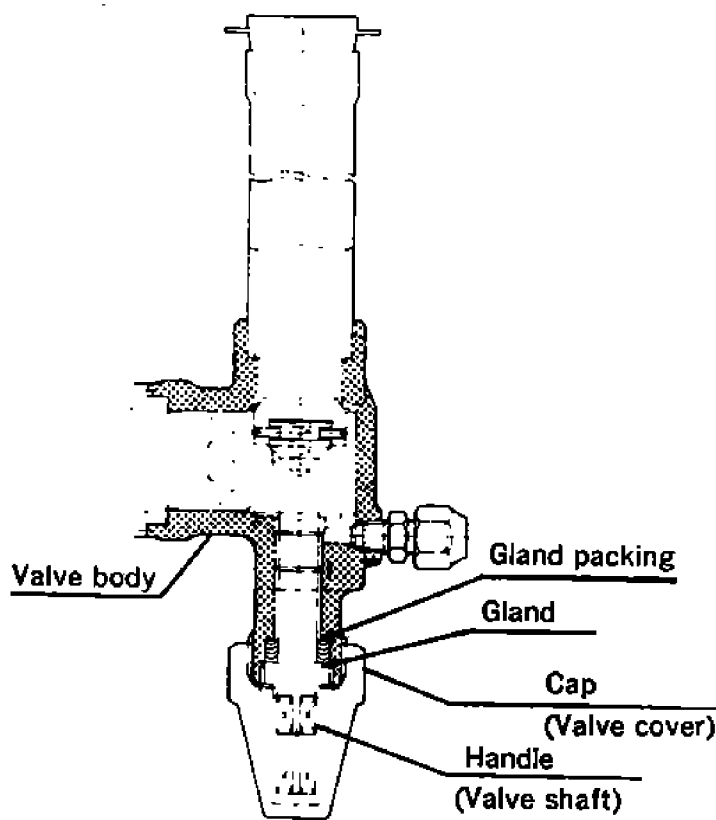
(1) Locations and kinds of stop valve



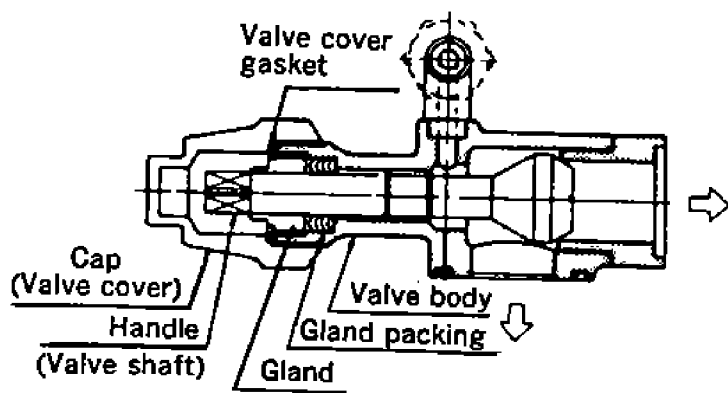
- ① Suction stop valve, compressor
- ② Discharge stop valve, compressor
- ③ Stop valve of water-cooled (or receiver)

(2) Structure of stop valve

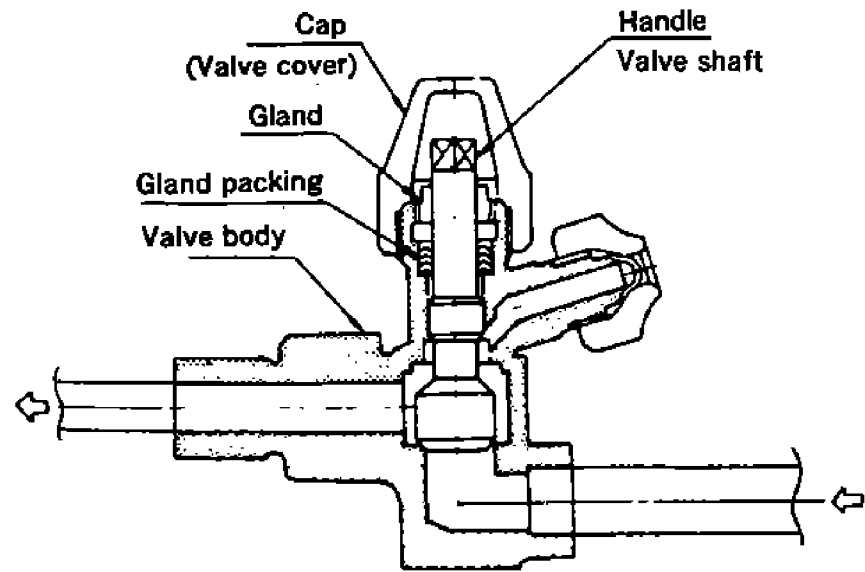
① Suction stop valve of compressor (VSH26C-10S)



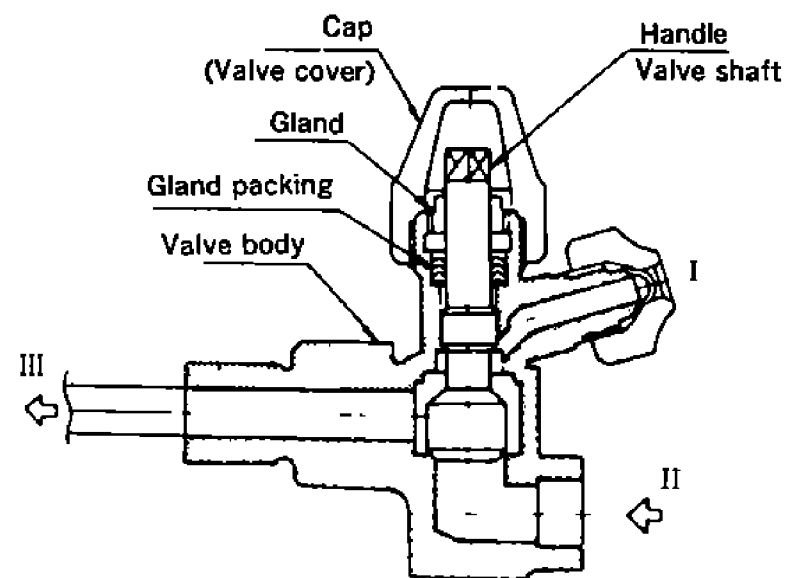
② Discharge stop valve of compressor (VSH22XBP)



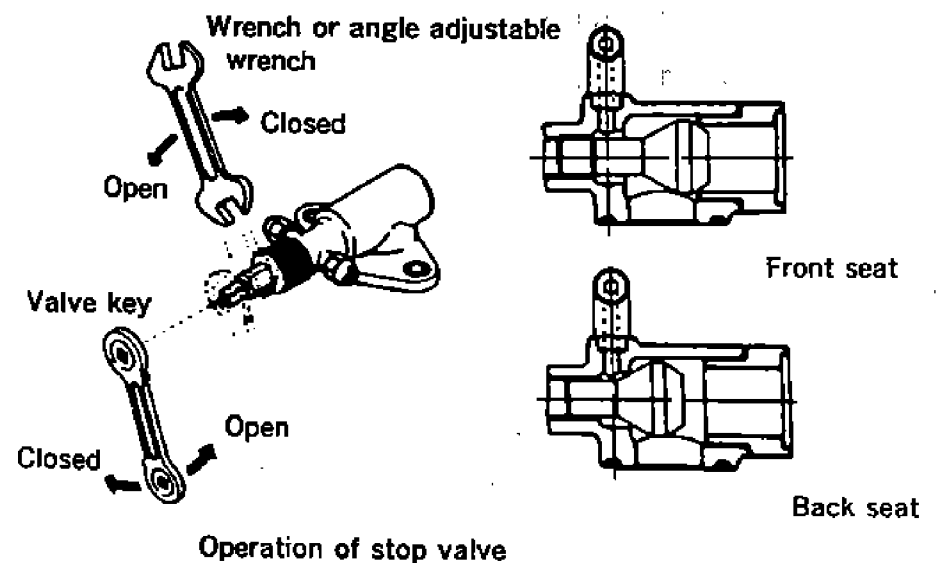
③ Liquid stop valve of water-cooled condenser (or receiver) outlet (VSH10CBP-4S-4SR)



(3) Stop valve handling method



- 1) Remove the cap (valve cover). At this time, take care to prevent missing the gasket.
- 2) Loosen the gland as far as no gas is released.
- 3) Turn the handle to its full closing extent. → The refrigerant passage routes from I to III. (Front seat)
- 4) Return the handle to its full extent. → The refrigerant passage routes from II to III.
- 5) Set the handle at the neutral position. → The refrigerant passage routes from I through II to III.
- 6) Since the refrigerant passage is different depending on Steps 3, 4 and 5, select a desired step.
- 7) After completing the work by operating the handle, be sure to close the gland, and place the valve cap. At this time, don't forget to attach the gasket.



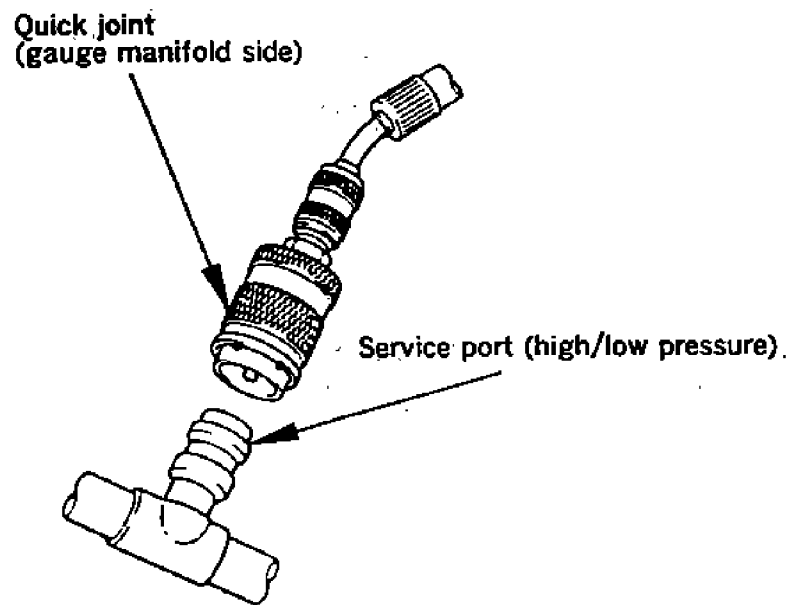
Operation of stop valve

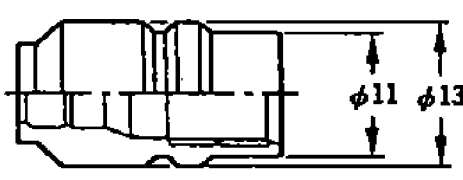
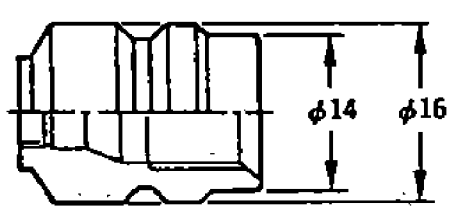
7.2 Installation and removal of pressure gauge

CAUTION

1. Use the pressure indicating function of the controller to refer the working pressure as possible instead of attaching the gauge manifold in order to prevent foreign particles or moisture from mixing into the refrigerant system.
2. Don't use any of the pressure gauge, gauge manifold, charge hose and charging cylinder which have been used for CFC12 in order to prevent refrigerant or refrigeration oil of a different kind from mixing. Use the exclusive tools of HFC 134a.

The service ports of quick joint type are provided to make improved handling.

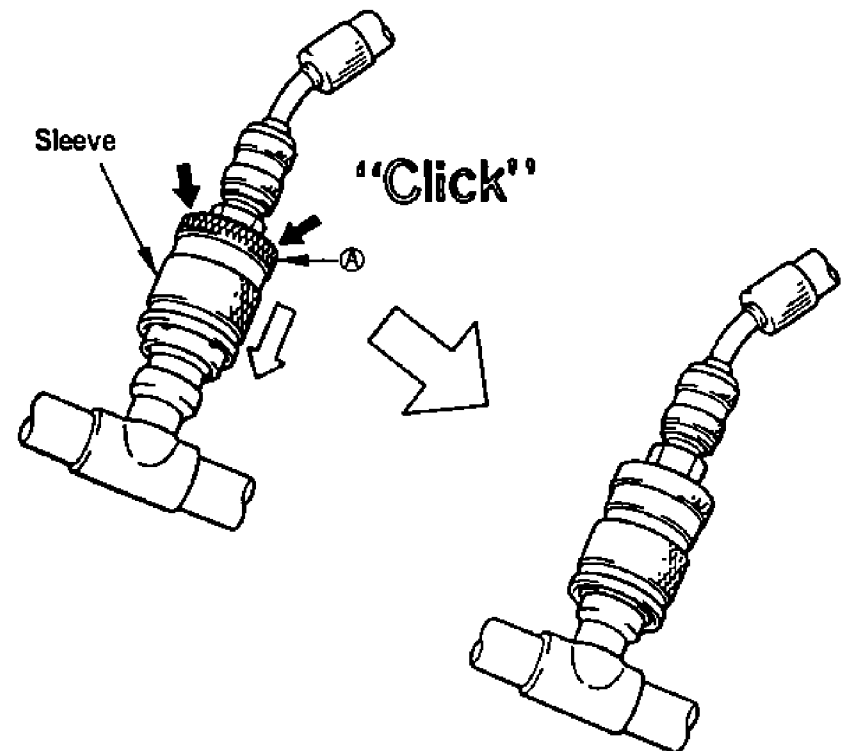


SAE quick joints for R134a	
Low presser	
High presser	

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

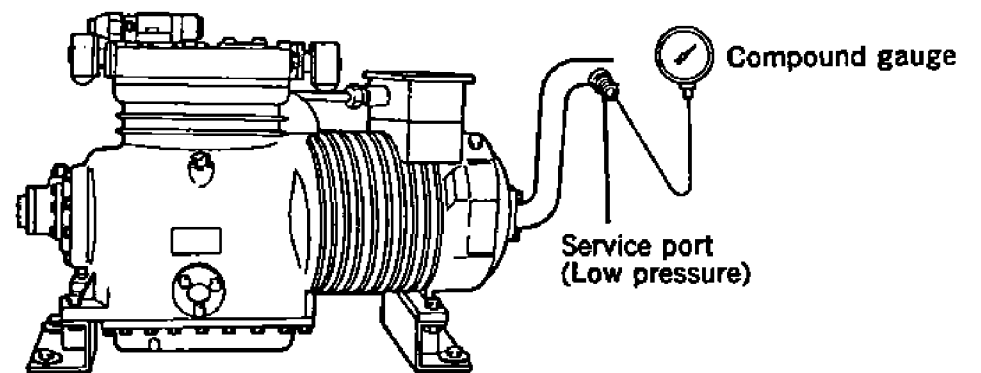
(1) Attaching the gauge manifold

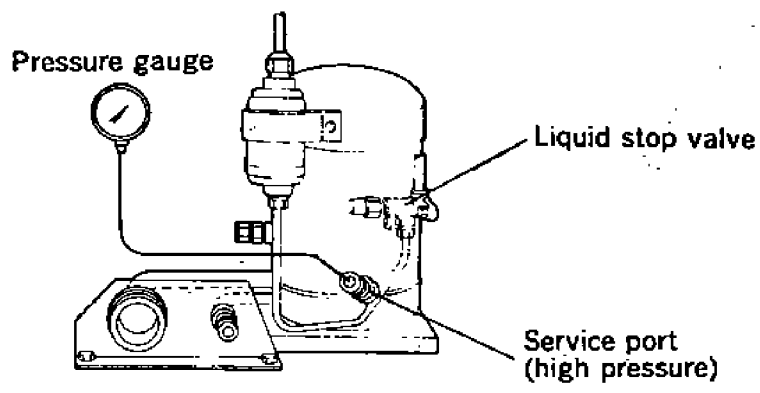
Put the quick joint to the service port and push it at **Ⓐ** until a "click" is heard.



Note

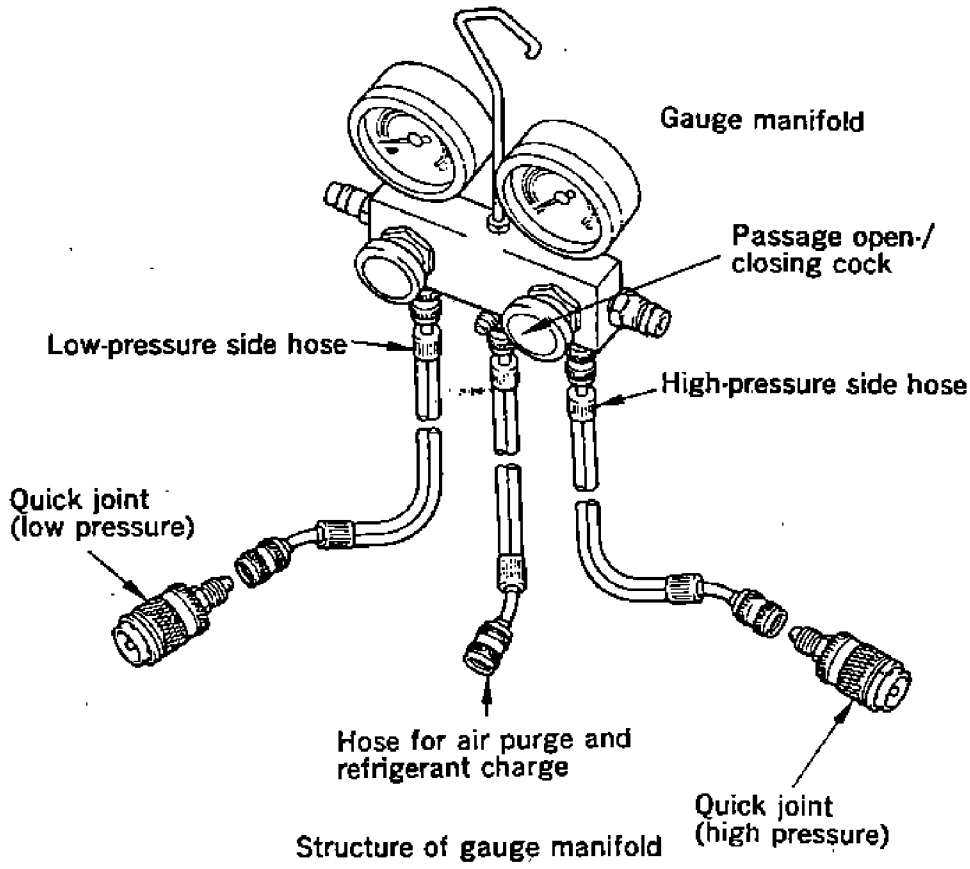
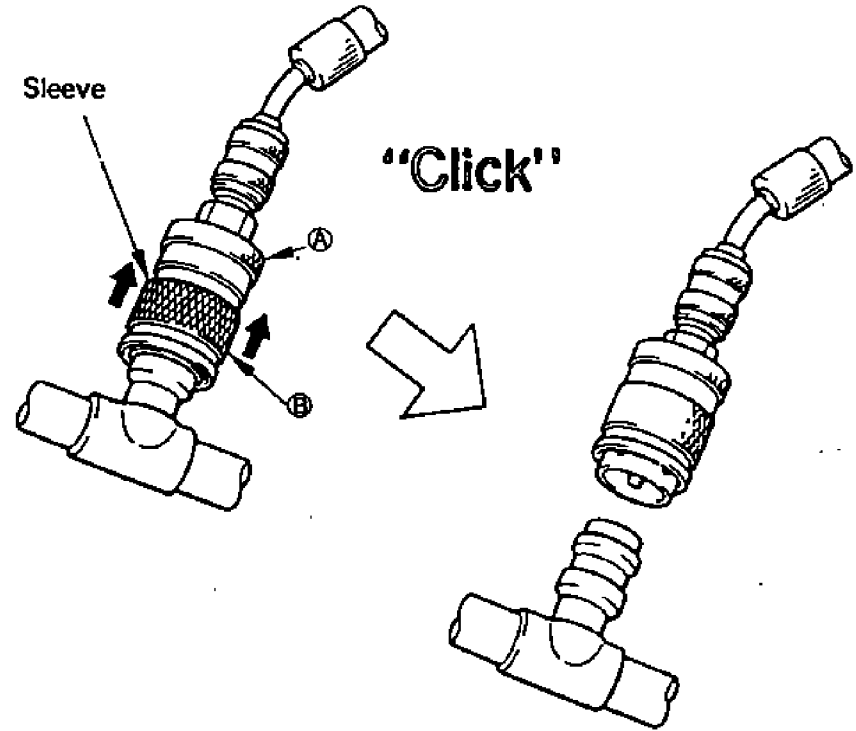
- ① Be sure not to bend the refrigerant pipe when pushing the quick joint.
- ② If the installation is failed due to movement of the sleeve, try it again after returning the sleeve at the original position.
- ③ The remaining pressure in the charge hose may cause the installation failure, then try it again after removing the pressure in the hose.





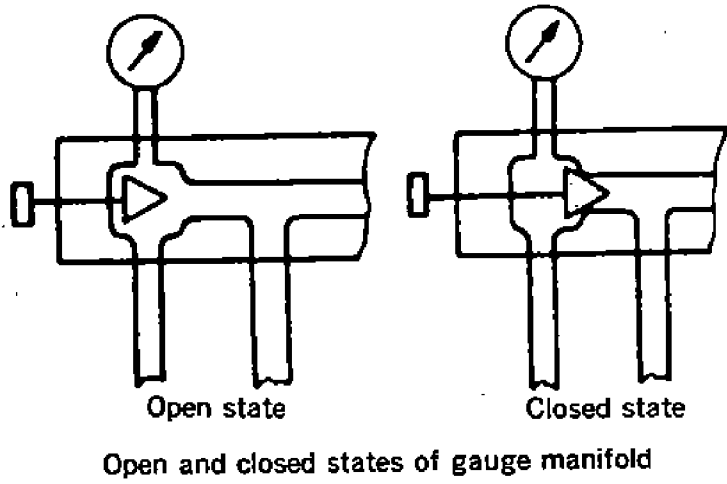
(2) Removal of pressure gauge and gauge manifold

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



⚠ CAUTION

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



Open and closed states of gauge manifold

7.3 Pump down

Pump down means that the refrigerant in the refrigeration circuit is liquidized and collected in the water-cooled condenser (or receiver). When the refrigeration circuit is repaired, this work is required to minimize the leaking of the refrigerant and avoid the risk caused by the leakage or rising pressure.

- 1) Run the refrigeration unit in the cooling mode.
- 2) Close the stop valve at the water-cooled condenser (or receiver) outlet.
- 3) Turn off the unit start switch when low pressure reaches to 10kPa (0.1 kg/cm²), and close the discharge stop valve of the compressor.
- 4) After a short while, open the compressor discharge valve and repeat the same procedure.
- 5) Repeat the same procedure a couple of times, and the refrigerant will be collected in the water-cooled condenser (or receiver).

7.4 Replacement and charge of refrigerant and refrigeration oil



CAUTION

Make operation check of the refrigeration unit and replace a dryer after the replacement or charge of refrigerant or refrigeration oil.

(1) Purging non-condensable gas

If non-condensable gas such as air exists in the refrigerant circuit, it is collected by the water-cooled condenser (or receiver), which raise pressure in the water-cooled condenser (or receiver) abnormally high and reduces heat transferring ratio of the condenser surface. It is, therefore, very important to purge non-condensable gas.

If the discharge pressure is abnormally high (even though cooling water amount is increased in the water-cooled operation) and will not return to the normal pressure, inspect if non-condensable gas such as air exists in the following method.

- Stop the compressor, close the outlet of water-cooled condenser (or receiver) and wait until leaving and entering cooling air (or water) of the air(water)-cooled condenser become equal. If there is any difference between saturated pressure corresponding to cooling air (water) and condensing pressure, non-condensable gas exists. In this case, purge non-condensable gas as stated below.

- ① Accomplish pump down.
- ② Condense the refrigerant as much as possible, and then discharge gas from the service port of the compressor discharge side.
- ③ Reading the pressure gauge, discharge the non-condensable gas repeatedly until condensing pressure becomes saturated pressure.

(2) Refrigerant purge

There are two methods of refrigerant purge; i.e. one is for collecting the refrigerant purged in a cylinder and the other is collecting the refrigerant by using a refrigerant recovery unit.

(a) Collecting the refrigerant in a cylinder

- 1) Prepare an empty cylinder which has been dried by evacuating inside, and weigh it.
- 2) The cylinder is connected to the service port of the liquid line by piping with the cylinder cock closed, and then loosen the flare nut on the cylinder side a little to vent the air from the piping.
- 3) Operate the refrigeration unit to pump down the refrigerant by the liquid solenoid valve.
- 4) After completion of pump down, open the cock of the cylinder to collect the liquid refrigerant into the cylinder.
- 5) After collecting the refrigerant, close the cock, and then remove the piping.
- 6) Be certain that the refrigerant has been collected in the cylinder by weighing it.
- 7) As for the refrigerant remaining in the refrigeration circuit, release it to the atmosphere.

Note: Use the refrigerant recovery unit to collect refrigerant in the refrigeration unit, and be sure not to purge it to the atmosphere except emergency case.

(3) Vacuum-drying, and refrigerant/refrigeration oil charging

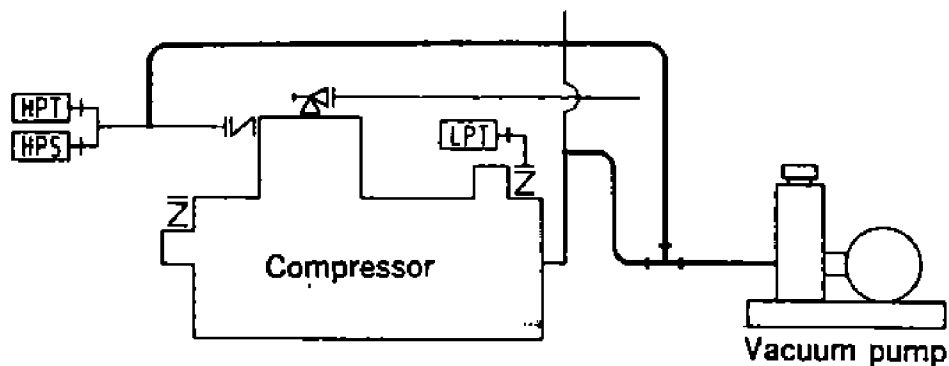
If all the refrigerant has leaked out and the air is intermixed in the refrigeration circuit, repair a cause of trouble and carry out vacuum-drying. Then charge the specified amount of refrigerant. To replace the refrigeration oil, do the same.

[Required tools]

1. Refrigerant cylinder (20 kg) for HFC134a
2. Refrigeration oil (1 ℓ or 5 ℓ can) CASTROL ICEMATIC SW46
3. φ6.4 copper tube (with two flare nuts)
4. Gauge manifold with quick joints
5. Weighing scale (up to 50 kg)
6. Tools
7. Vacuum pump

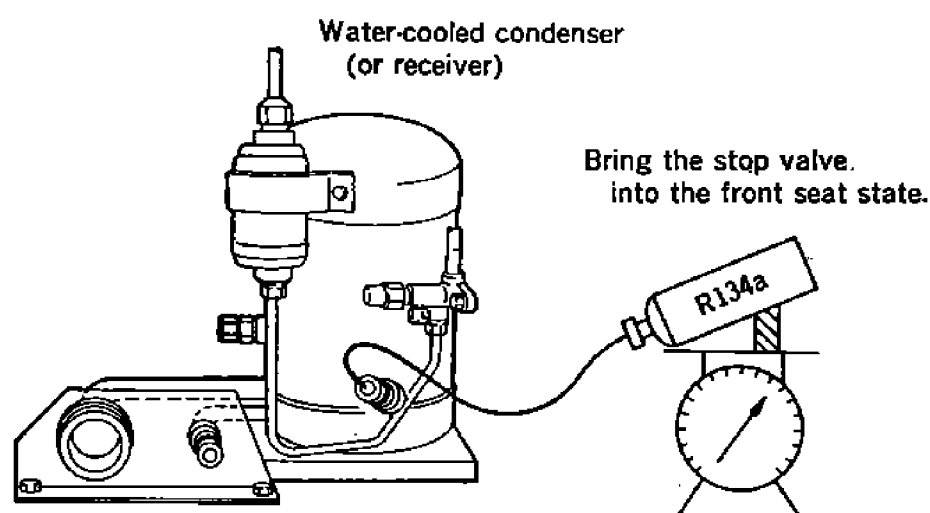
(a) **Charge of refrigerant alone without replacement of refrigeration oil**

- 1) Connect the vacuum pump to the service ports of the compressor suction and discharge, form vacuum down to 76cmHg. Disconnect the vacuum pump, leaving the refrigeration circuit in the vacuum state. However, when air enters in the refrigeration circuit, form the vacuum in the circuit down to 76cmHg, and leave it for 2 hours or more. (Vacuum-drying)

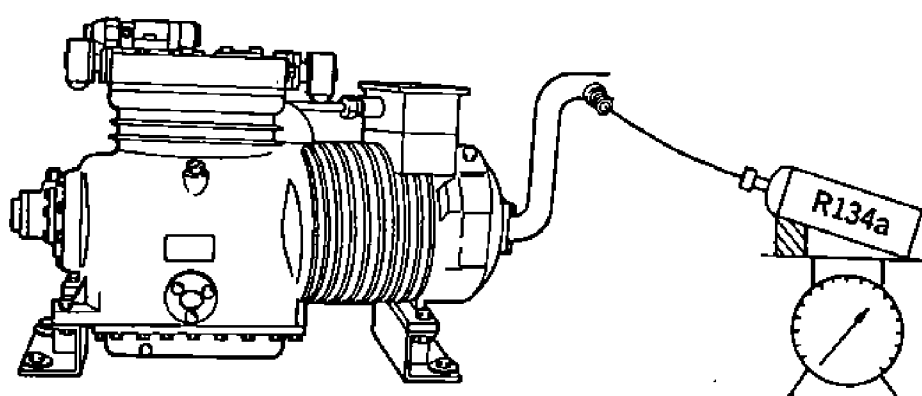


- 2) Place a refrigerant cylinder on the weighing scale, and record the weight of the cylinder.
- 3) To charge the refrigerant in the liquid state, do it as shown in the figure (A) below. Prevent the liquid refrigerant collected in the water-cooled condenser (or receiver) from flowing to the low pressure side. If the refrigerant is hardly charged, operate the compressor to charge it.

(A)



(B)

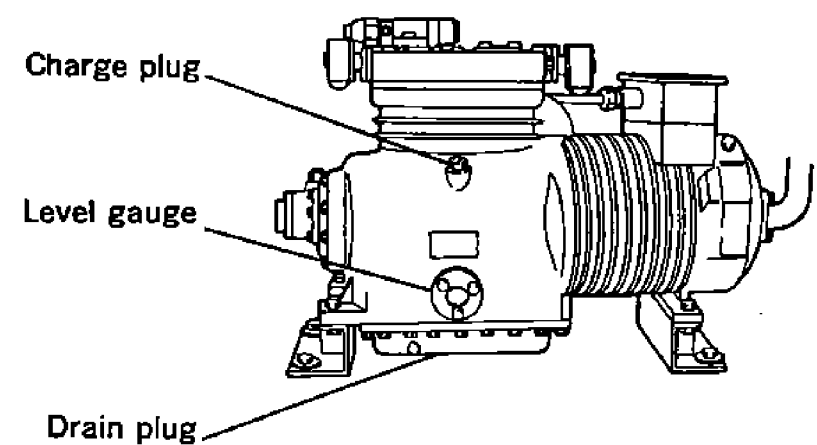


- 4) To charge the refrigerant in the gaseous state, do it as shown in the figure (B) above. If the refrigerant is hardly charged, operate the compressor to charge it.
 - 5) Charge the specified amount of the refrigerant in the above stated methods in either 3 or 4.
 - 6) After completing the refrigerant charge, confirm that if the specified amount of the refrigerant has been charged by operating the refrigeration unit.
- (b) **Charge of refrigerant with refrigeration oil replacement**

1) Refrigeration oil draining

First discard all the gas to zero the pressure in the refrigerant circuit.

Then loosen the drain plug at the bottom of the compressor to extract all the oil. At this time, first open the oil charge plug and then the drain plug to prevent the oil from spouting out.



- 2) Tighten up the drain plug.
- 3) Charge the specified volume of the oil from the charge port of the compressor.
- 4) Accomplish the vacuum drying and refrigerant charge stated in (1).

CAUTION

- Before this work, be sure to stop the compressor.
- When discarding the refrigeration oil, be sure to remove the oil level gauge for cleaning.
- Be sure to use CASTROL-ICEMATIC SW46 as the refrigeration oil.
- Never attempt to mix other kinds of refrigeration oils.
- Do not use any oil which is left opened to the atmosphere for a long time, as it may have contained moisture.

(c) Replacement of refrigeration oil alone

- 1) Pump down the refrigeration unit. (For details, refer to 'pump down procedure':
- 2) After pump down, close the discharge and suction stop valves of the compressor.
- 3) From the oil charge port, release the remaining refrigerant in the compressor. (At this time, remain the remaining pressure a little, and the later draining work will be done faster.)
- 4) Loosen the drain plug at the bottom of the compressor, and discard all the oil.
- 5) After draining the refrigeration oil, be sure to remove the level gauge for cleaning.
- 6) Close the oil drain plug.
- 7) Charge the specified volume of the refrigeration oil from the oil charge port of the compressor.
- 8) Vacuum-dry at the oil charge plug.
- 9) Return the stop valve into the original state.
- 10) Be sure to use the refrigeration oil of the following specified brand.

Manufacture	Castrol
Type	Icematic SW46
- 11) Take sufficient care to handle the refrigerant oil. (Moisture mixture, different-oil mixture, etc)

 **CAUTION**

Take the following care to handle the can which contains the refrigeration oil.

1. Just before charging the oil, open the can. At once, use all the oil in the can which is opened once. Using dry air or dry nitrogen gas, replace the air in the empty space which is produced as the oil is used. Transfer the small remaining amount of the oil to a small can (with label) which can be excellently sealed.
 - ※ Since the commercially available refrigeration oil is filled in the can in the dry state (approx. 50ppm as the moisture contents), take the following care to handle the can.
 - Since Icematic SW46 is hygroscopic ester oil, moisture will be absorbed to approx. 1500ppm if it is exposed to the atmosphere.
2. As possible, select a dry day for charging the oil.
3. Never leave the can opened for a long time.
4. Be sure not to charge the refrigeration oil from a same can several times since it may cause the refrigeration oil being exposed to the moisture.

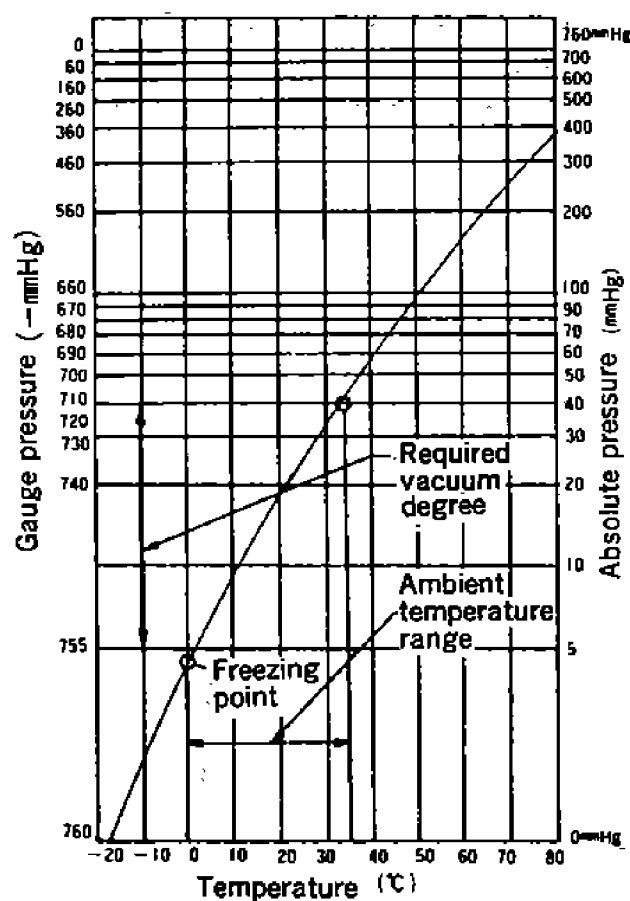
7.5 Vacuum drying

After repairing the refrigerant system, evacuate and dry the system before charging the refrigerant and refrigeration oil.

Vacuum-drying means to use the vacuum pump to purge moisture (liquid) in the system to outside by converting it into the vapor (gas). Thus, the system will be internally dried.

As the pressure is lower than normal atmosphere (760mm Hg), the boiling point of water will rapidly drop. If the boiling point drops beyond the atmospheric temperature, water will be vaporized.

Example: If the atmospheric temperature is 7.2°C (45°F), vacuum drying will be impossible unless the vacuum degree is lower than -752mmHg. For vacuum-drying, it is first important to select and maintain the vacuum pump.



(1) Vacuum pump selection

To select the vacuum pump, take care for the following two points.

- ① Select the vacuum pump whose achievability is excellent.
(A pressure of -755mmHg or lower is achievable.)
- ② The displacement must be relatively large (approx. 40 ℓ/min. or more).

Before vacuum-drying work, be sure to use the vacuum gauge to confirm that the pump reaches a pressure of -755mmHg or lower.

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

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

(Reference) Kinds of vacuum pumps and achievable vacuum

Type	Achievable vacuum Displacement	Application	
		Vacuum-drying	Air exhaust
Oil rotary type (oil-necessary type)	-759.98mmHg 100 ℓ/min.	Applicable	Applicable
Oilless rotary type (oil-unnecessary type)	-750mmHg 50 ℓ/min.	Inapplicable	Inapplicable
	-759.98mmHg 40 ℓ/min.	Applicable	Applicable

Take care that this type is often used as the handy type.

- (2) There are two methods of vacuum drying of normal vacuum-drying and special vacuum drying. As general, the normal vacuum-drying is applied. If any moisture is mixed in the system, apply the special vacuum-drying method.

[Normal vacuum-drying]

① Vacuum drying (first time)

Connect the gauge manifold to the service ports of the liquid line and the suction line. Run the vacuum pump 2 hours or more. (The achievable vacuum must be -755mmHg or less.)

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

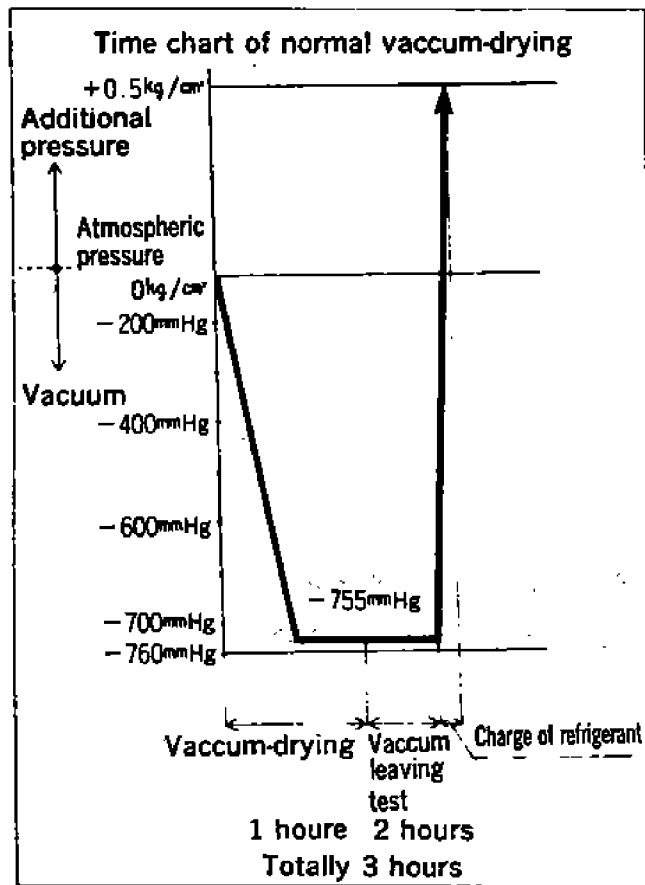
Note: Evacuate the system at service ports of both liquid and suction line. Because the system is blocked on the way since the liquid solenoid valve is provided on the way of the system.

② Vacuum leaving test

Leave the system at a pressure of -755mmHg or lower for 1 hour more, and confirm that the reading does not rise on the vacuum gauge. If it rises, moisture may remain in the system or it may leak. Here, take care not to leak air from the gauge manifold. If air may mix, it is recommended to use the copper pipe.

③ Charge of refrigerant

After the vacuum-leaving test, evacuate the system again for approx. 10 minutes. Charge the specified amount to the service port of the liquid line with the charging cylinder.



[Special vacuum-drying]

This method is that the vacuum breaking process with nitrogen is integrated one time or more on the way of the normal vacuum-drying process.

① Vacuum-drying (first time) 2 hours

② Vacuum-breaking (first time)

Nitrogen gas is pressurized to 0.5 kg/cm^2 . Since nitrogen gas breaks the vacuum, the effect of the vacuum-drying is achieved. However, if there are much moisture, it can not be removed by this method. Therefore, don't make water enter or produce water during the refrigerant piping work.

③ Vacuum-drying (second time)

Run the vacuum pump one hour or more. (The achievable vacuum must be -755mmHg or lower.)

If a pressure of -755mmHg or lower can be achieved even after evacuation of 2 hours, repeat Steps ② vacuum-breaking to ③ vacuum-drying.

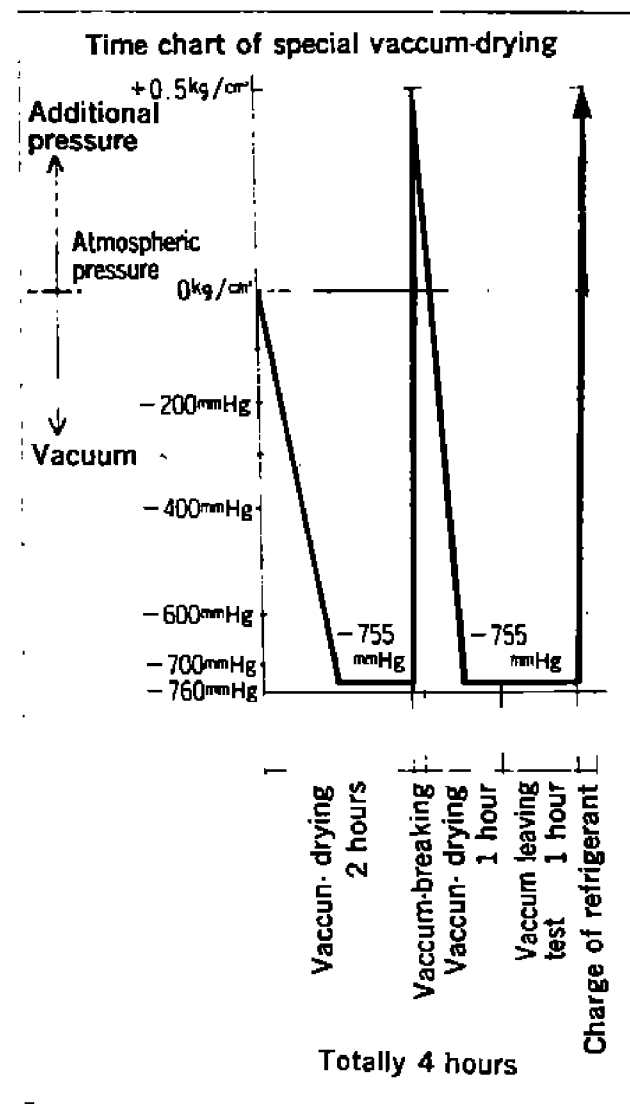
④ Vacuum leaving test 1 hour

⑤ Charge of refrigerant

} Same as normal vacuum drying

Note: For vacuum-breaking, be sure to use nitrogen gas.

(If any oxygen gas is used, it may explode.)



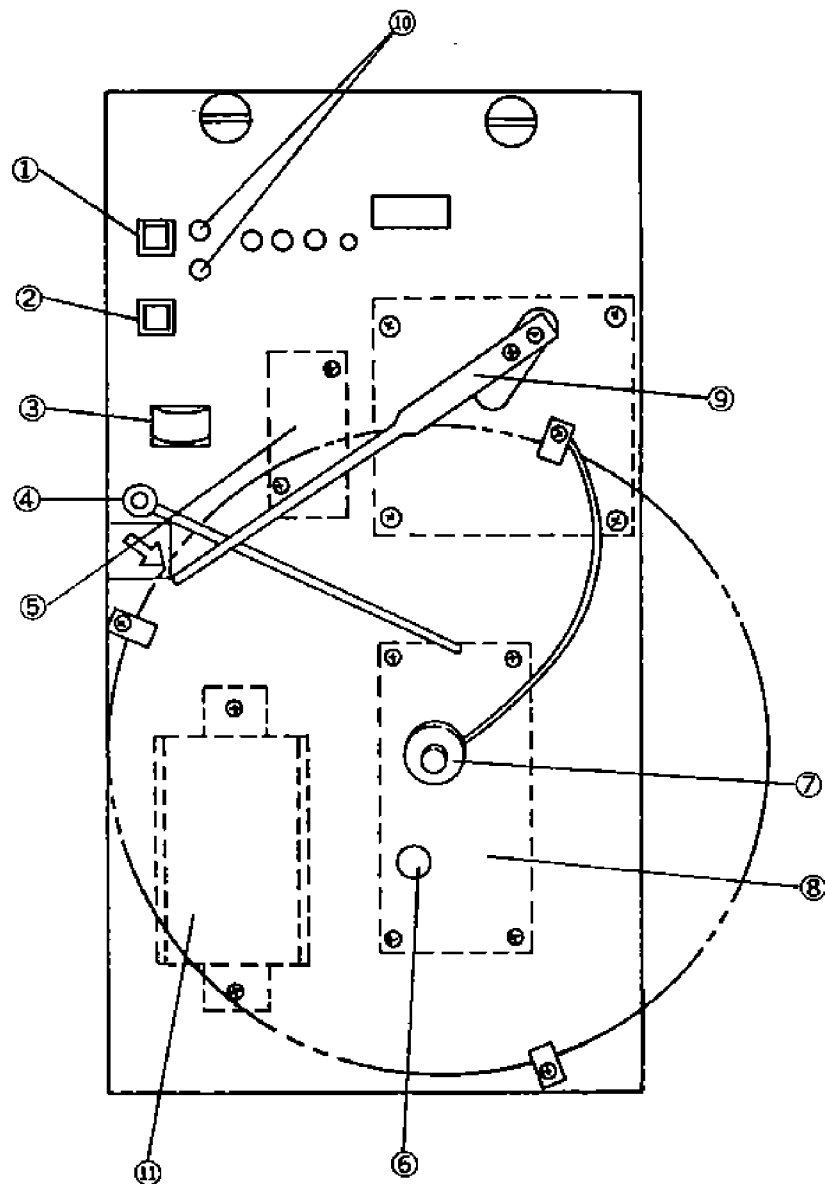
($1\text{mmHg}=0.0013\text{kg/cm}^2=0.133\text{kPa}$)

8. Option

The following optional equipments are available for some models.

8.1 Electronic temperature recorder (DER9301)

This recorder automatically records the control temperature (either return air temperature or supply air temperature) with the chilled/partial frozen and frozen switching signals. As the maintenance and inspection functions, the sensor failure detecting function and calibration function are integrated.



DER9301

- | | |
|-------------------------------|-------------------------------|
| ① Calibration button | ⑥ Rotation check window |
| ② Chart drive battery button | ⑦ Chart nut |
| ③ Remaining voltage indicator | ⑧ Chart drive |
| ④ Pen lift arm | ⑨ Pen |
| ⑤ Dry battery | ⑩ Adjustable volume |
| | ⑪ Battery (Alkaline dry cell) |

⚠ CAUTION

The sensors are of same characteristics for the recorder and controller.

In emergency, they can be reconnected for getting correct control.

Recorder	Controller
RRS (blue, blue) ↔	RS (blue)
RSS (green, green) ↔	SS (green)

(1) Specifications

- Model DER9301
- Power supply AC13V 50/60Hz
- Recording temperature range $-30.0 \sim +25.0^{\circ}\text{C}$
($-22 \sim +77^{\circ}\text{F}$)
- Recording paper Round type 8-inch pressure-sensitive paper
(PARTLOW PSD-217C (REV.A) or equivalent) (31days/rev.)
- Chart drive battery

JIS C8501...SUM2	} Equivalent (DC1.5V)
IECR14	

Battery life
Approx. 1 year (Check with the remaining voltage indicator.)

 - Green zone: Operable
 - Silver zone: 7 days usable
 - Red zone : Battery replacement is necessary.
- Recording pen drive system Pulse motor drive
- Sensor (Thermistor)

Model	Use
ST9001-2	RSS : Supply temperature sensor
ST9001-5	RRS : Return temperature sensor

● Display—LED

Name of LED	Descriptions
RET (Return)	Recorded temperature is "Return".
SUP (Supply)	Recorded temperature is "Supply".
ALARM	Alarm exists.

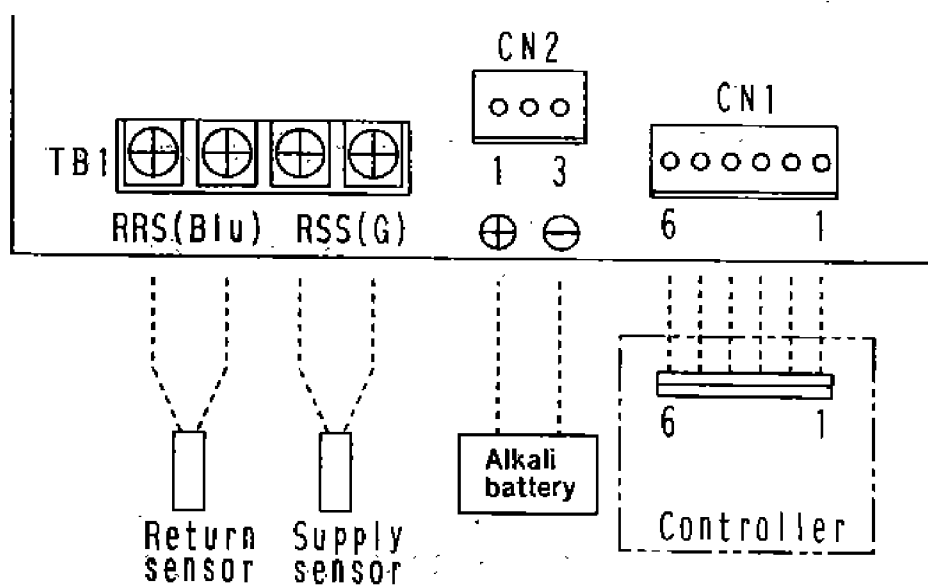
Note: Recording accuracy

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

Adjustment with the calibration is possible on the recorder.

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

(2) Wiring connections



(3) Checking the indications of the recorder (Calibration)

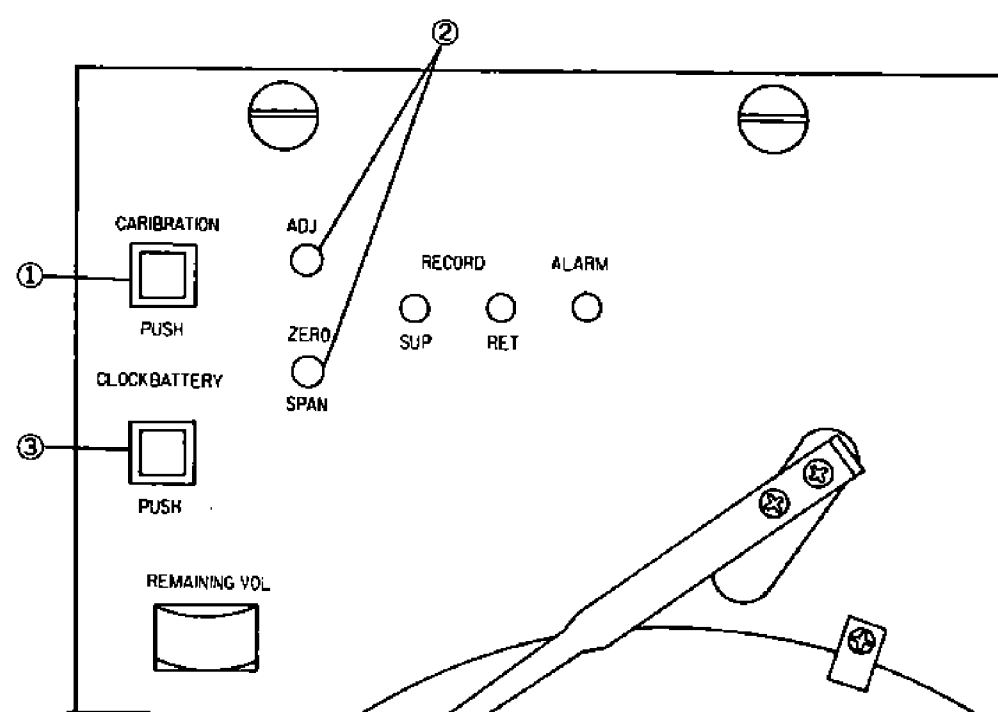
This recorder can be checked for its switching function for recording sensors and temperature indication functions regardless of inside temperature, and can be adjusted.

1) Switching function for recording sensors

Manipulate the set point of the controller and check whether the recording sensors can be switched over from RETURN (Frozen) to SUPPLY (Chilled) and vice versa with operation of the LED on the recorder.

Set point of temperature (°C)	Record sensor
-25.0 to -3.0	Return temperature sensor
-2.9 to 25.0	Supply temperature sensor

DER9301



- ① Calibration button
- ② Adjustable volume
- ③ Chart drive battery button

DER9301



2) Calibration function (DER9301)

The step-by-step switch system is employed.
 When the calibration button is pressed one first time, 0°C will be displayed.
 When it is pressed two continual times, -20°C will be displayed.
 When it is pressed three continual times, +20°C will be displayed.
 When it is pressed four continual times, it will return to the normal recording. Here, keep it pressed, and the temperature will be held. Release it, and it will return to the normal recording in 3 seconds.

●Zero adjustment and span adjusting method

- ① Press the calibration button two times, and turn the zero adjustable volume, and the needle will indicate -20°C.
- ② Press the calibration button once, and turn the span adjustable volume to make the needle indicate +20°C.
- ③ Repeat ① and ②, and use the calibration button to verify that the needle indicates -20°C, 0°C and +20°C.

●Zero adjustable range

-  Turn it clockwise, and the indicated temperature will drop.
 (Turn it extremely clockwise at -20°C, and approx. -20.5°C will be indicated.)
-  Turn it counterclockwise, and the indicated temperature will rise.
 (Turn it extremely counterclockwise at -20°C, and approx. -17.0°C will be indicated.)

●Span adjustable range

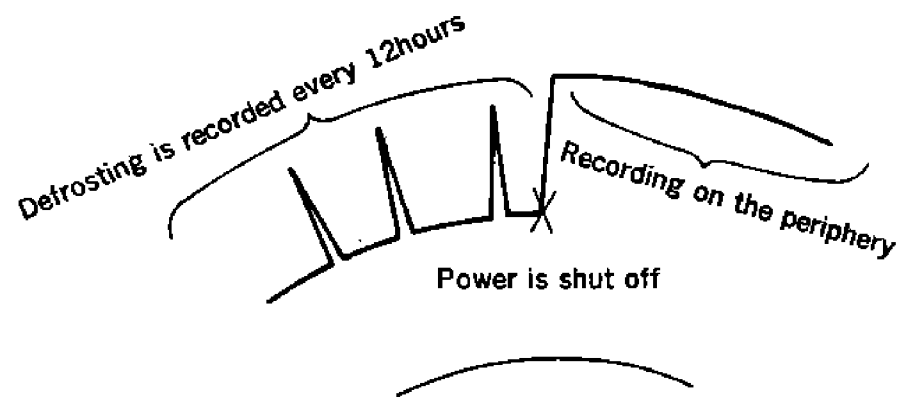
- Turn it clockwise, and the indicated temperature will drop.
 (Turn it extremely clockwise at the zero adjustment of +20°C, and approx. +17°C will be indicated.)
- Turn it counterclockwise, and the indicated temperature will rise.
 (Turn it extremely counterclockwise at the zero adjustment of +20°C, and approx. +22.0°C will be indicated.)

Notes :

1. The recording pen is adjusted to suit PSD-217C (REV. A) recording chart or similar kinds. Do not use recording charts which are not corresponding to PSD-217C (REV. A).
2. Do not adjust span when charts which are not corresponding to PSD-217C (REV. A) are used.
3. Do not adjust the recording pen while transporting goods.
4. When the power is supplied, the pen vibrates momentarily and will return to its original position because of the recording characteristics, but this is not a sign of trouble.

(4) Temperature record (DER9301) when power is shut off

At the same time when power is shut off, the pen will swing out to the outer periphery of the recording chart.



(5) LED display function

Depending on the states of the applied power supply and recording sensor, LED display is lit according to each mode as follows.

Here, when the set point of temperature of the controller is in the chilled mode, SUP is lit. When it is in the partial frozen or frozen mode, the state of RET is lit.

Commercial power supply		Energized							
		Chilled mode				Frozen or partial frozen mode			
Sensor switch mode		RSS (SUP)				RRS (RET)			
Record temperature		RSS (SUP)				RRS (RET)			
SUP sensor		Normal		Abnormal		Normal		Abnormal	
RET sensor		Normal	Ab-normal	Normal	Ab-normal	Normal	Ab-normal	Normal	Ab-normal
LED display	SUP (LED2)	○	○	○	○	●	●	●	●
	RET (LED1)	●	●	●	●	○	○	○	○
	ALARM (LED3)	●	●	○	○	●	○	●	○

○ Lit ● Unlit

• When commercial power supply is shut off, all LEDs will go out after the pen is swung up to the outer periphery of the recording chart.

(6) Replacing method

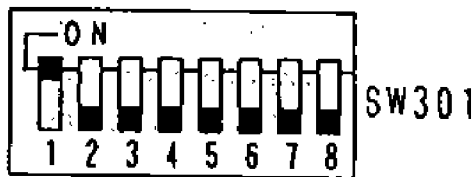
- ① Turn off the circuit breaker.
- ② Remove the wiring connector and sensors from the back of the temperature recorder.
- ③ Referring to Item 4.1.4 "replacement of electronic controller", remove the hinges installed on the bottom and the speed bolts on the top.
- ④ Set the dipswitch, on the printed circuit board and install it.
- ⑤ After replacement, be sure to check the wiring and LED operation and execute the calibration.



CAUTION

Be sure to set the dip switches as follows.

Setting procedure of dipswitches



No.1 O N: Specified as standard (DER9301).

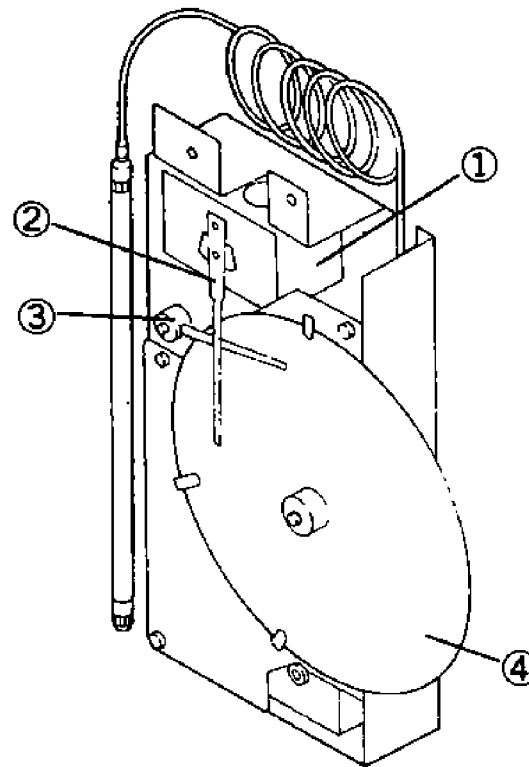
OFF: Defrosting is constantly recorded.

No. 2 to No. 8: Not in use (OFF).

8.2 Mechanical temperature recorder

8.2.1 Specification

- Model : SKM-2924Q14
- Temperature sensing tube : Filled with gas
- Recording system : Pressure sensing
- Temperature record range : -29.9°C to $+25^{\circ}\text{C}$ (-22°F to $+77^{\circ}\text{F}$)
- Record paper : $\phi 203$ round pressure sensing paper (scale $1/1^{\circ}\text{C}$) (PSSD-217C (REV.A) made by Partlow or equivalent)
- Record paper drive system : Timer (Quartz motor + Reduction gear), one revolution/31 days
 Quartz motor drive power source : UM-2 battery (DC1.5V)
 JIS C8501 ...SUM-2 } Or equivalent, service life approx. one year (to be checked with
 IECR14 } remaining voltage indicator)



- ① Element
- ② Pen
- ③ Pen lift arm
- ④ Record paper

8.2.2 Checking of record indications

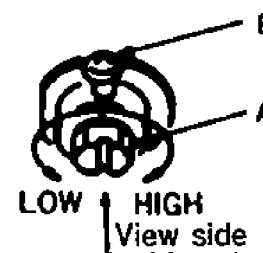
After setting the unit to 0°C and refrigeration mode, make sure that the blow-out air temperature has been stabilized (0°C) by seeing the digital temperature indicator of controller. After that, set the digital temperature indication switch to Suction side, and adjust the recorder pen according to the suction air temperature indicated on the digital temperature indicator.

8.2.3 Adjustment

1) Adjust after checking as stated in item (2).

2) To adjust, turn the indication temperature setting screw

A. Loosen the lock screw B, turn the setting screw A clockwise to raise once the indication temperature by about 5°C. Then, turn the setting screw A counterclockwise to lower the indication temperature of pen down to 0°C – 18°C. After adjustment tighten the lock screw B.



Notes:

(1) One turn of setting screw A changes the indication temperature by about 5°C (9°F).

(2) When the lock screw B is fitted, the indication temperature may change insignificantly.

3) The recorder is generally adjusted based on 0°C. If you know the internal set temperature when making an adjustment, you can change the standard temperature as follows.

● Refrigeration (Set value: –5°C or above):

0°C standard

● Freezing (Set value: –5°C or below):

–18°C standard

4) Cares when checking or adjusting

(1) Make an adjustment when temperature lowers.

The pen records based on temperature drop. Do not adjust when temperature rises. This is due to that the indicated temperature may be lower than the real temperature by 1 to 3°C owing to effect of hysteresis which occurs when the pen moves in the temperature rise direction.

(2) Record may fluctuate insignificantly depending on ambient temperature. It is negligible. Indication fluctuation is less than +0.2°C when atmospheric temperature changes by 10°C (atmospheric temperature 25°C is taken as a reference).

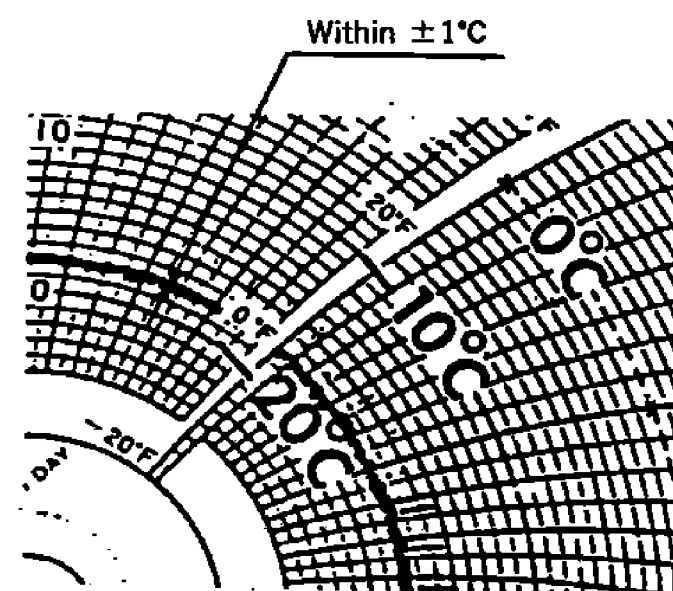
(3) If adjustment has been made based on 0°C and operation is performed at –18°C, record may be as follows. This is within regular characteristics range peculiar to recorder.

If any deviation from the range is found, adjust again based on 0°C (or –18°C).

(4) Do not move the recorder pen by your hand.

Excessive force is applied to the pen, resulting in significant record error.

(5) If the pen lift has been raised, the pen may move less smoothly, which is negligible.



8.2.4 Parts replacement

1) Dry cell

A. Replacement standard

- Check remaining voltage of dry cell. If the indicator pointer is not in the blue zone, replace the dry cell. (If the pointer remains in the white zone, the dry cell can be used for about one month.)

B. Replacement method

- Remove the record plate, and insert the dry cell without mistaking its polarity. The dry cell to be used is SUM-2 (JIS C8501) or R14 (IEC) or equivalent. (UM-2 dry cell DC1.5V)
- After replacing the dry cell make sure that the remaining voltage indicator pointer is in the blue zone, and check operation of quartz motor.

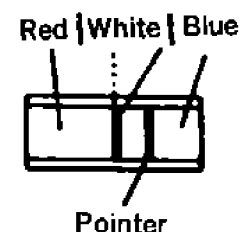
2) Remaining voltage indicator for battery

A. Replacement standard

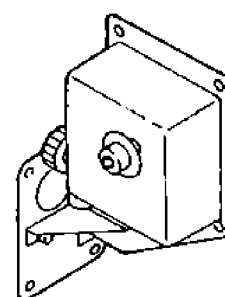
- When the push switch is pressed to check the remaining voltage, the pointer swings unstably, replacement is required.
- When the remaining voltage indicator pointer remains in the white or red zone after dry cell has been replaced with new one, replacement is required.

B. Replacement method

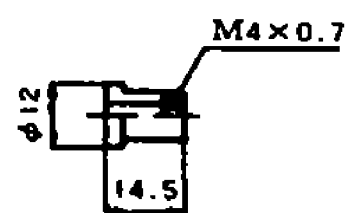
- Remove the record plate, and loosen the screw to remove the remaining voltage indicator battery from the main body. Then, replace the battery with new one.
- When replacing the battery, connect correctly ("Red-Red", "Black-Black") on the terminal block.
- After replacement insert dry cell to make sure that the remaining voltage indicator pointer indicates the blue zone, and check operation of quartz motor.
- Replace dry cell every 12 months.



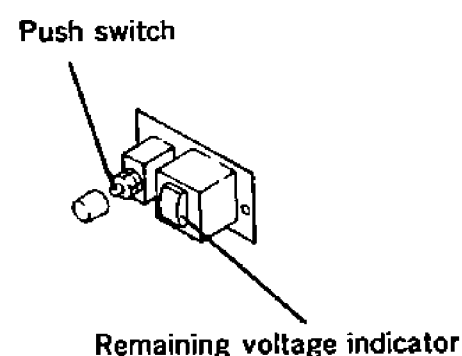
Remaining voltage indicator



Timer (quartz motor reduction gear) (WKM-AA012)



Attachments (antivibration rubber, 5 pcs.)



Remaining voltage indicator battery (DKM-AA003)

3) Timer (quartz motor reduction gear)

A. Replacement standard

- When the quartz fails to operate although the dry cell has a sufficient capacity, replacement is required.
- When time lag is 3 hours or more per day, replacement is required.

B. Replacement method

- Remove the record plate, and remove the terminal block wiring. Then, loosen the screws (5 pcs.), remove the timer, and replace it with new one.
- When replacing the timer, replace also the attached antivibration rubbers (5 pcs.). The red wire is "+" and the black wire is "-". Connect correctly ("Red-Red", "Black-Black") on the terminal block. Tighten the antivibration rubbers with a tightening torque 4 to 5 kg-cm.
- After replacing check operation of quartz motor.

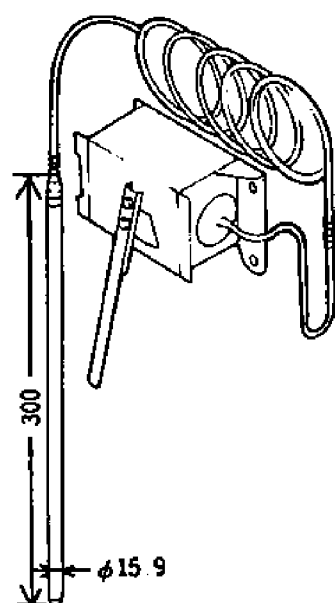
4) Temperature sensing tube-element

A. Replacement standard

- After adjusting the pen, run the machine at set temperature within the range of -18 to $+10^{\circ}\text{C}$ (-0.4 to $+50^{\circ}\text{F}$). If in this state the indication temperature differs from the set temperature by 2°C (4°F) or more although the internal temperature is kept stable (equal to set temperature), replacement is required. (Significant deviation of indication temperature from the temperature sensing tube temperature in negative direction implies gas leak.)

B. Replacement method

- Loosen the screw, remove the temperature sensing tube-element, and replace it with new one.
- After replacement check and adjust.



Temperature sensing tube-element (SKM-AA006)

8.3 USDA receptacle and sensors

If the units are provided with the following receptacle according to the specification enabling low-temperature treatment transportation as regulated by USDA (United States Department of Agriculture), it is allowed to install the core temperature sensor. Moreover, it is possible to install only the specific USDA sensor for this receptacle.

<Requirements for USDA low-temperature treatment transportation>

1. Precool cargo at the set temperature.
2. Cool also the container before loading cargo into it.
3. Calibrate the USDA sensor when PTI is performed.

(For sensor calibration use the software (Windows version) "USDA COLD TREATMENT-CALIBRATION USDA SENSORS" supplied by Daikin.) (Refer to the Operation Manual for Personal Computer Software.)

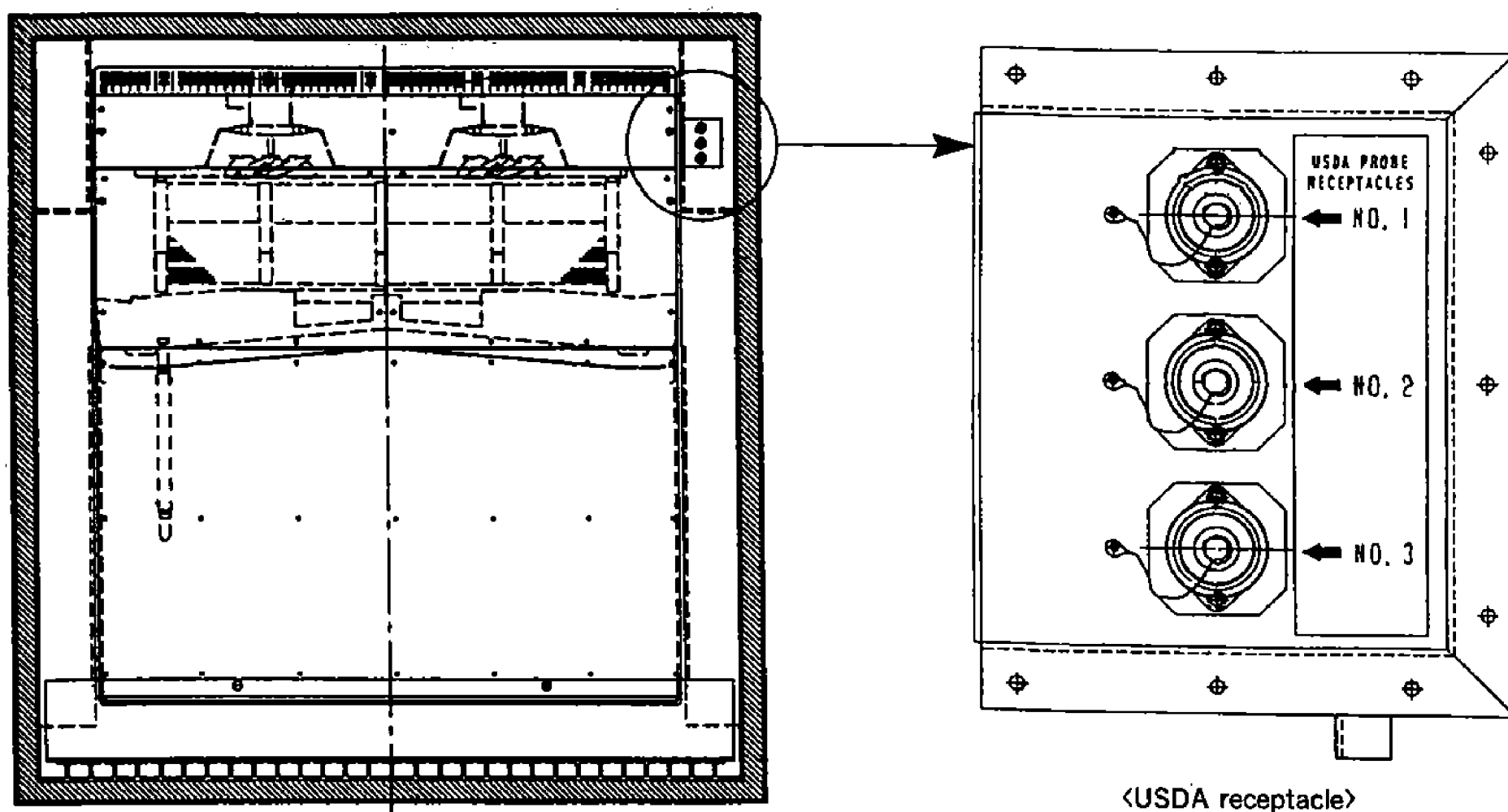
● Sensor Calibration Procedure (Connect the personal computer to the controller, and perform the following operation.)

- (1) Prepare the ice bath, put the three sensors to be calibrated into the ice bath, and thoroughly stir it so as to get uniform distribution of temperature.
- (2) Select CALIBRATION SENSORS from the <SUB MENU>. Then, temperature of three sensors is displayed on the screen.
- (3) Press the OK button. Then, the message "Do you cancel former calibration?" appears. If you want to cancel the previous calibration, select YES.
- (4) If YES is selected, the message "Push [OK] button when the temperature of ice-bath is stabilized at 0 degC." appears. When the temperature of ice bath has stabilized at zero, press the OK button.
- (5) The personal computer calculates deviation of each sensor and sends data to the controller, and the message "Completed! Hit" appears.
- (6) To resume the <SUB MENU>, press the OK button.

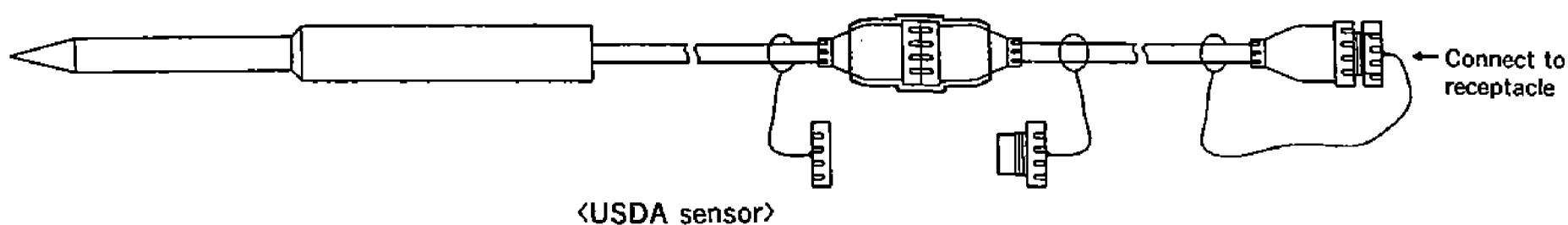
Note : If deviation is remarkable (over 1.0°C), the indication of pertinent sensor name is reversed. This implies that the sensor has been degraded. Replace it with new one.

<USDA low-temperature treatment transport data control>

The electronic controller stores as data the sensor values obtained in case of USDA low-temperature treatment transportation (up to 62 days). It is possible also to display graphically changes of sensor values.



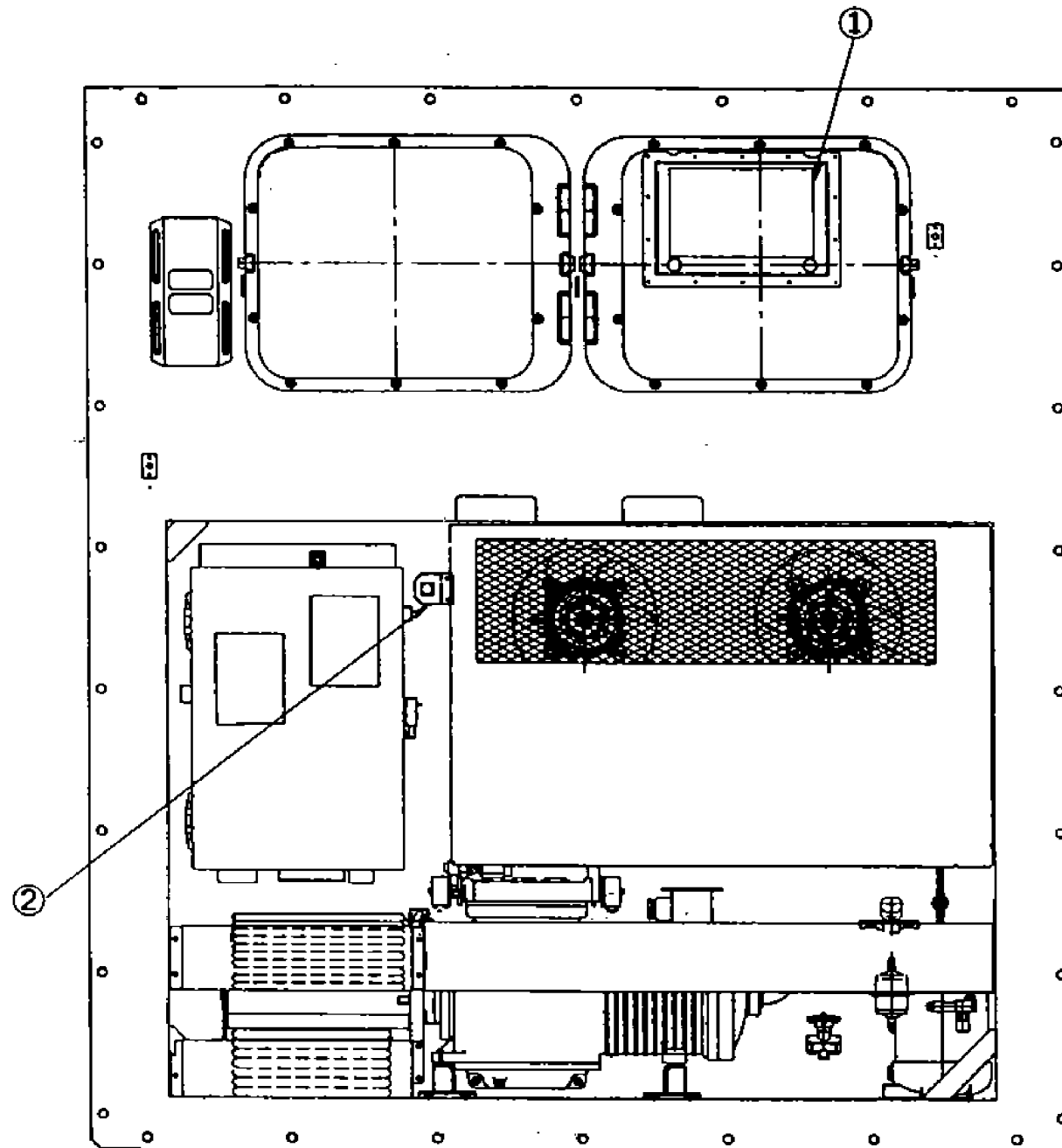
<An example of installation of USDA receptacle in unit>



8.4 TransFRESH

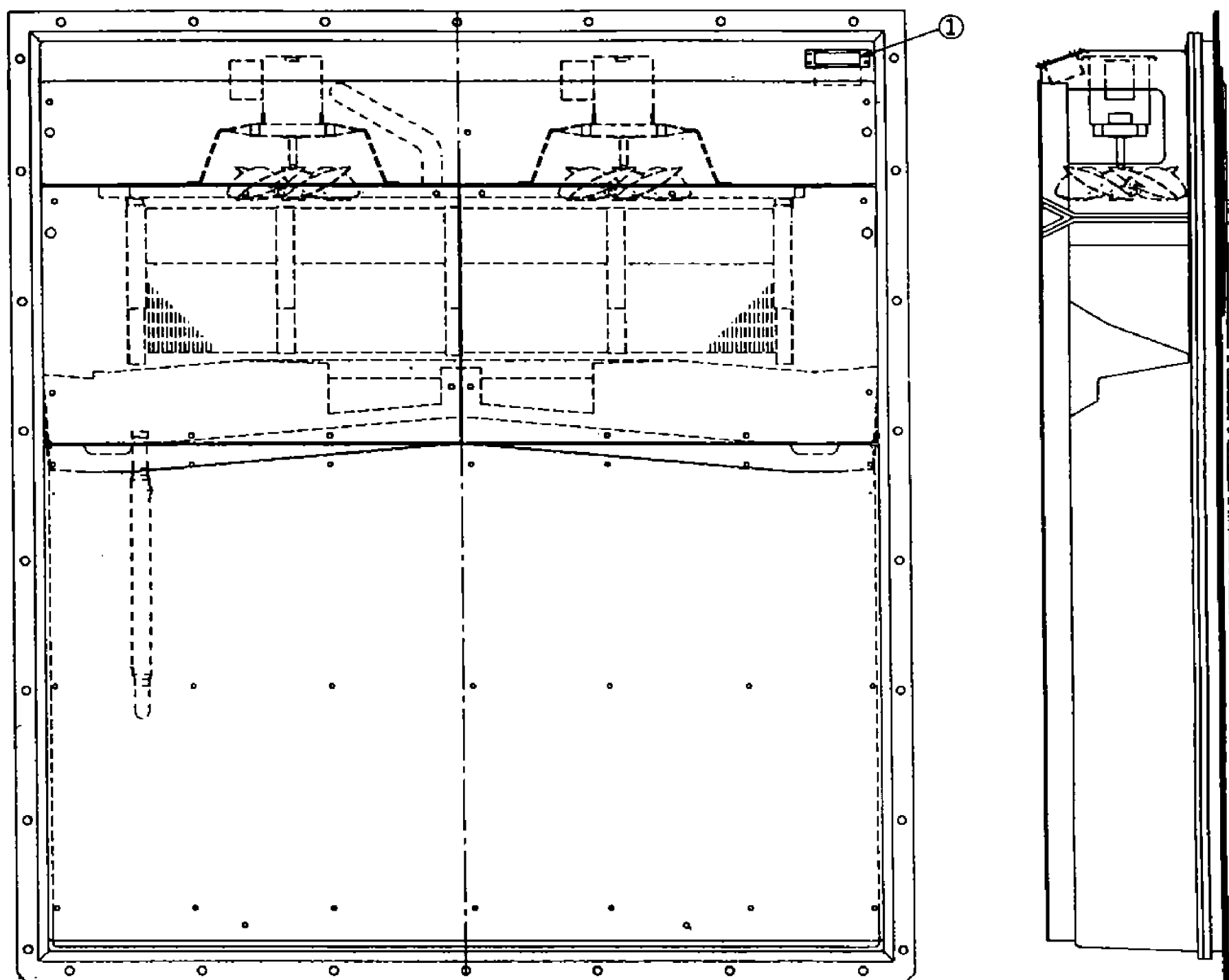
An attachment made by TransFRESH for CA unit is provided to control the internal atmosphere (quantity of O₂ and CO₂).

Use the CA unit according to the Operation Manual supplied by TransFRESH. The CA unit controller and sensor are installed by the TransFRESH's agent before transportation.



<An example of installation of CA unit, outside the unit>

- ① Trans FRESH SECURITY ENCLOSER
- ② Trans FRESH COMMUNICATION BRACKET



<An example of installation of CA unit, inside the unit>

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

<https://daikin-p.ru>

Troubleshooting

1. Refrigeration system and electrical system

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

State	Phenomenon	Abnormal place	Possible cause
I Unit does not operate.	A. Neither evaporator fan, condenser fan nor compressor run.	① No trouble with unit	Power failure
			External power supply OFF
			Power plug is not connected.
			Power plug is in poor contact.
		② Circuit breaker	Circuit breaker is turned off.
		Solenoid coil is burnt out or short circuited.	
		Contacting coil is burnt out or short-circuited.	
		Wiring lead is short-circuited	
	③ Start switch	Off or troubled.	
	④ Voltage selector is in incorrect position.		
	⑤ Controller	Wire breakage in the control circuit transformer	
		Fuse cut off (10A)	
		Open phase (R or T)	
		Shut down due to alarm display content	
	B. Evaporator fan rotates, but condenser fan and compressor do not rotate.	① No trouble with unit	Inside temperature is lower than SP. (frozen mode)
C. Condenser fan rotates, but evaporator fan and compressor do not rotate.	① Electronic OC, PT/CT board activation	Overcurrent due to overload operation, etc	
D. Compressor rotates, but evaporator fan and condenser fan do not rotate.	① Transformer for fan motor	Wire breakage or open phase	
	② Fan motor thermal protector is activated.	Fan is locked by foreign material. Contact of thermal protector does not close.	
E. Compressor runs, and it does not operate.		Single phase	
		Lock	
		Voltage is excessively low.	
		Compressor motor coil is burnt out or short-circuited.	
II Unit stops soon after operation.	A. All start but soon stop.	① HPS activates within 30 seconds after compressor operation.	Discharge stop valve is closed.
		② LP abnormally drops within 2 seconds after compressor operation.	Suction stop valve is closed.
		③ Electronic OC, PT/CT board activates.	Overcurrent due to overload operation, etc
		④ Compressor thermal protector activates.	Overcurrent due to overload operation, etc
	B. Evaporator fan rotates, but condenser fan and compressor do not rotate.	① No trouble with unit	Stop due to normal control in the frozen mode.
	C. Condenser fan rotates, but evaporator fan and compressor do not rotate.	① Activation of high-pressure switch	Refrigerant overcharge
			Air mixture in the refrigerant system
			Insufficient air flow in the air cooled condenser
			○ Clogged condenser
			○ Air passage blocked by obstacle.
			○ Broken blade of condenser fan
			○ Condenser fan motor does not rotate.
			○ Condenser fan motor thermal protector activates.
			○ Condenser fan short-circuit
			○ Condenser fan is wrong.
○ Condenser fan rotates reversely.			
Insufficient cooling water flow rate			
○ Water-cooled condenser is clogged by scale.			
② Electronic OC, PT/CT board activation	Overcurrent due to overload operation, etc		
③ Abnormal LP drop	Expansion valve is clogged.		
	Liquid stop valve is closed.		
	Filter-dryer is clogged.		
④ Abnormal discharge gas temperature	Injection solenoid valve is closed.		
	Capillary for injection is clogged.		
	High pressure rises due to overload.		

State	Phenomenon	Abnormal place	Possible cause
III Inside temperature does not drop.	A. Suction pressure is high.	① Poor compression of compressor	Suction valve or discharge valve is broken. Piston ring is worn.
		② Modulating control valve	Leak at the valve.
		③ Expansion valve	Superheat is poorly adjusted.
		④ Injection solenoid valve	Valve leakage
	B. Suction valve is excessively low.	① Liquid solenoid valve (Not opened.)	Defective solenoid valve coil
		② Shortage of refrigerant charge	Refrigerant leaking
		③ Dryer	Clogging
		④ Suction stop valve or liquid stop valve (Partially closed.)	Opening is skipped.
		⑤ Expansion valve	Moisture choke
			Clogged by foreign particle
			Gas leaks from the feeler tube
			External pressure equalizing tube is clogged.
			Power assembly goes wrong.
		⑥ Evaporator	Superheat is set to be excessively high.
			Abnormal frost
	Insufficient air flow rate in the evaporator		
	• Air passage is blocked by obstacle.		
	• Evaporator fan motor goes wrong.		
	C. Defrosting is impossible.	① Manual defrost switch	Continuity is defective.
		② Evaporator outlet sensor	Incorrect installation of sensor.
③ Modulating control valve		It is clogged by dust. Magnetic coil is defective.	
D. Defrosting is frequent.	① No trouble with the unit	Cargo moisture is excessive.	
	② Injection solenoid valve	Leakage	
	③ Defrost timer	Interval set is excessively short.	
E. Refrigeration unit is normal.	① Container	Cargo is insufficiently precooled	
		Poor thermal insulation or air leakage	
IV Inside temperature goes not rise (in the heating mode).	A. Discharge pressure is low.	① Poor compression of compressor	Suction valve or discharge valve is broken. Piston ring is worn.
		② Modulating control valve	Hot gas leaks to condenser side.
		③ Injection solenoid valve	Clogged by foreign particle
	B. Discharge pressure is high.	① Evaporator fan	Fan blade is broken. Fan motor does not rotate. Fan motor thermal protector activates.
V Control is unstable.	A. Hunting	① Modulating control valve	Dust clogging
		② Expansion valve	Feeler bulb is influenced by ambient temperature.
		③ Controller	Dip switch No.8 setting error
	B. Temperature continues dropping.	① Modulating control valve	Clogged by foreign particle
			Magnetic coil is defective.
		② Unload solenoid valve	Wire breakage
			Coil is defective.
	C. Temperature continues rising.	③ Evaporator	Wire breakage
			Clogged by foreign particle
Clogged by foreign particle			
④ Dryer		Evaporator air flow rate is insufficient. (Refer to III-B-⑥.)	
⑤ Short of refrigerant charge		Clogging	
VI Abnormal vibration or abnormal noise	A. Abnormal noise generates.	① Compressor	Metal is worn.
			Suction or discharge valve is broken.
			Bolt is loose.
		② Evaporator fan	Fan motor set bolt is loose.
			Fan motor set leg is deformed, or bolt is loose.
			Fan motor shaft is bent.
			Fan motor bearing is worn.
Fan guide is deformed.			
Contact between fan and fan guide			

State	Phenomenon	Abnormal place	Possible cause
VI Abnormal vibration or abnormal noise	A. Abnormal noise generates.	③ Condenser fan	Fan motor set bolt is loose. Fan motor shaft is bent. Fan motor shaft is bent. Fan motor bearing is worn. Fan guide is deformed. Condenser front panel is deformed.
	B. Abnormal vibration generates.	① Compressor ② Piping	Set bolt is loose. Clamp bolt gets off or loose.
VII Water-cooled operation is impossible	Although water couplings are connected, condenser fan continues rotating.	① Water pressure switch does not operate.	Cooling water flow rate is insufficient. Water pressure switch goes wrong.
		② No trouble with the unit	To prevent temperature from rising in the control box, the condenser fan rotates on the left side at the ambient temperature of 30°C or higher.

2. Alarm codes on electronic controller

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

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

Alarm code	Content	Possible cause		
F101	The high-pressure switch (HPS) activates within 30 seconds after the compressor start.	The discharge stop valve is closed.		
		The wiring lead of the high-pressure switch is cut.		
		The high-pressure switch is defective.		
		The condenser fan motor is defective.		
	Failure of the controller.	Failure of the CPU board	Failure of the I/O board	
F109	The low pressure becomes – 72kPa or lower within 2 seconds after compressor start.	The suction stop valve is closed.		
		The low pressure sensor (LPT) value is abnormal.	Failure of CPU board	Failure of low-pressure sensor
F111	High-pressure switch (HPS) does not activate even when the set value is reached.	The high-pressure switch is defective		
		High-pressure sensor (HRT) value is abnormal.	Failure of CPU board	Failure of high-pressure sensor
F301	Temperature setting request	Set point of temperature is not input.		
		Failure of SRAM (CPU board)		
F401	In the chilled or partial frozen mode, the supply air sensor (SS) or return air sensor (RS) is defective.	Short-circuit or cut on both sensor		
		Wrong wiring connection on both sensors		
		Defective on both sensors		
		Failure of printed-circuit board		
F701	Abnormal power voltage, Note 1			
F705	Single phase (S phase is open)	The voltage selector is in poor contact.		
		The circuit breaker is in poor contact.		
		Power plug is in poor contact.		
		Power cable breakage		
		Single phase of power source		
F803	The following error code is counted 5 times E101 · E103 · E105 E107 · E109 · E203 E707	Refer to the possible cause of the left error code.		
E101	The high-pressure switch (HPS) activates during operation.	Refrigerant is overcharged.		
		Incorrect refrigerant is charged. (ie HCFC22)		
		Air mixture in the refrigerant system		
		Insufficient air blow, air-cooled condenser	Clogged fins	Air passage is blocked by some obstacle.
			Condenser fan short-circuit.	Condenser fan is wrong.
			Condenser fan rotates reverse.	Condenser fan breakage
			Condenser fan drop	
			Excess high ambient temperature	
			Defective condenser fan motor operation	Motor stops due to thermal protector activation.
				Air passage is blocked by some obstacle.
				Wiring lead breakage
			Motor does not run.	Wrong wiring
		Water-cooled condenser	Shortage of cooling-water	
Cooling-water temperature rise				
Scale clogging				

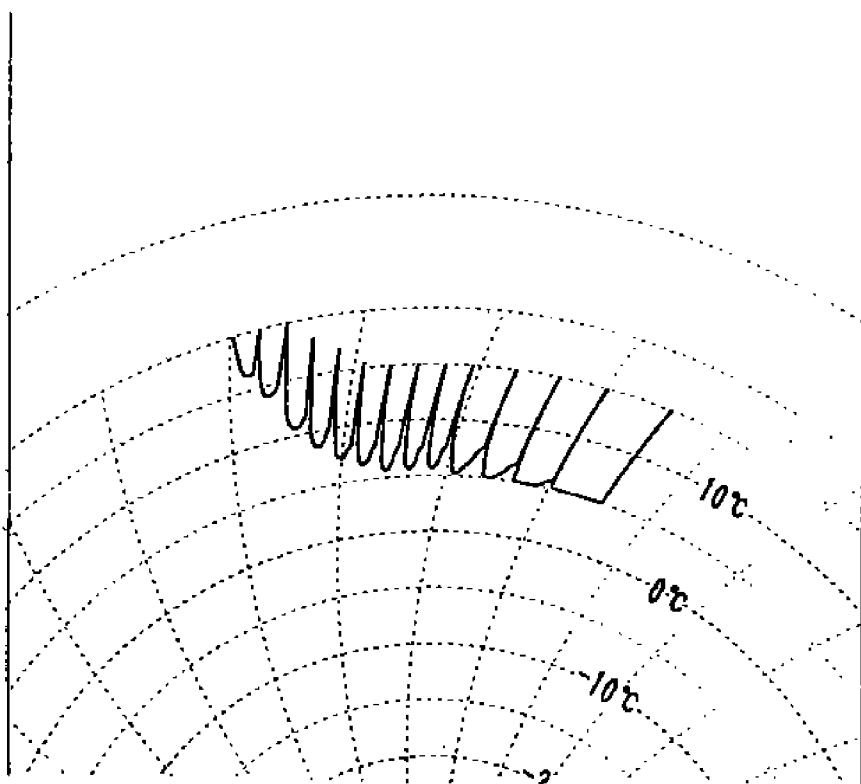
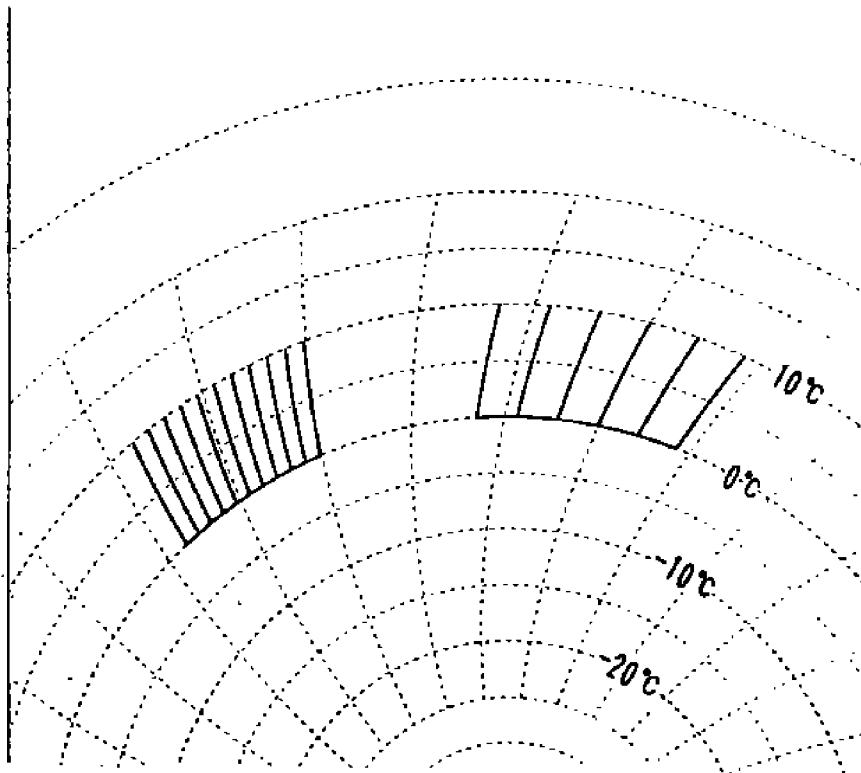
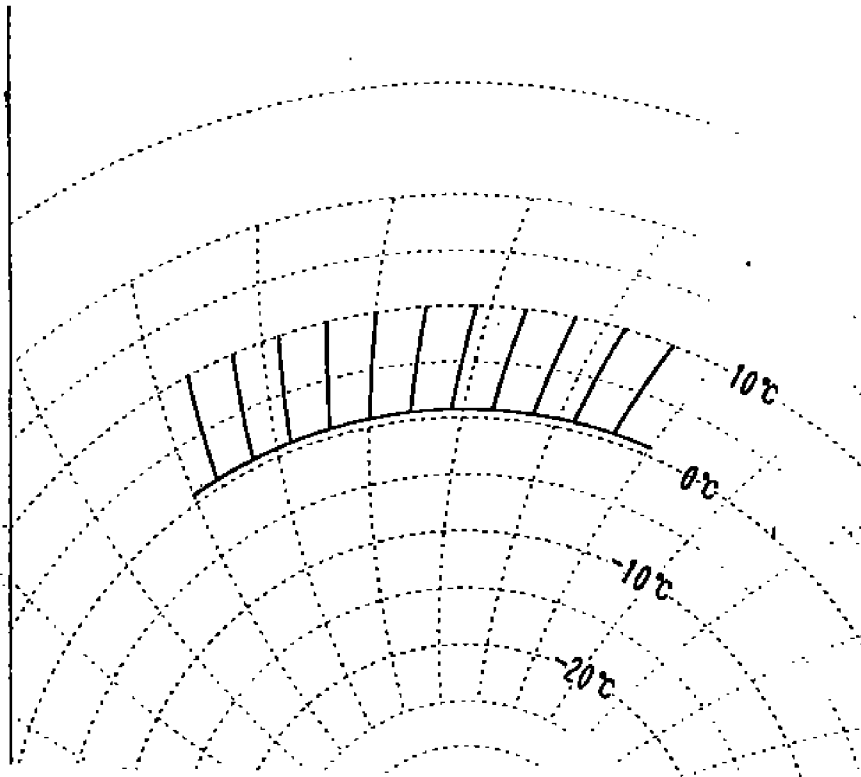
Note: 1. If S phase is open, F701 may occur. When F701 and F705 are displayed together, inspect the S phase for opening.

Alarm code	Content	Possible cause			
E101	The high-pressure switch (HPS) activates during operation.	Failure of HPS			
		Wiring lead breakage			
		Defective connection with terminal block board			
		Wrong wiring of high pressure switch			
		Failure of CPU board			
E103	Electronic overcurrent protector (electronic OC) activates.	Failure of I/O board			
		Compressor lock			
		Failure of CPU board			
		Failure of PT/CT board			
	Compressor thermal protector (CTP) activates.	Shortage of refrigerant	Refrigerant leakage		
		Injection solenoid valve is not opened.	Wiring lead breakage		
			Defective wiring		
			Coil burning		
			Coil drop		
		Injection capillary is clogged.			
Failure of CTP.					
E105	Micro-computerized overcurrent protector (micro-computerized OC) activates.	Failure of compressor (Compressor lock)			
		Excessive refrigerant supply during defrosting and measuring gas heat up	Injection solenoid valve is not closed due to foreign particles.		
		The current sensor (CT2) value is abnormal.	Failure of CPU board		
			Failure of current sensor		
E107	Discharge sensor (DCHS) becomes 130°C or higher during operation.	Injection solenoid valve operates improperly.	Dust clogging		
			Wiring lead breakage		
			Wrong wiring		
			Coil burned out.		
			Coil drop		
		Injection capillary is clogged.			
		High pressure is abnormally high.	Refrigerant is overcharged		
		Compressor valve lead breakage			
		Shortage of refrigerant			
		Dryer clogging			
		Excessive frost on the evaporator			
		Discharge sensor value is abnormal.	Failure of CPU board		
			Failure of sensor		
			Failure of evaporator outlet sensor during defrosting		
		E109	Low pressure continues -72kPa or lower for 20 seconds.	Insufficient refrigerant flow	Shortage of refrigerant
Refrigerant leakage					
Liquid solenoid valve is not opened.	Dust clogging				
	Wiring lead breakage				
	Wrong wiring				
	Coil burned out				
	Coil drop				
Expansion valve is not opened. (Clogging)	Moisture choke				
	Clogging of foreign particles				
	Gas leakage, feeler bulb			Feeler bulb is damaged. Capillary damage	
	External pressure-equalizing tube is clogged.				
	Super heat is set to be excessively high.				
Dryer is clogged.					
Stop valve is closed.	Liquid stop valve is closed				
	Suction stop valve is partially closed.				
Excessive frost on evaporator	Insufficient air circulation, evaporator fan	Air passage is blocked with obstacle.			
		Evaporator fan breakage			
		Short-circuit, air around the evaporator			
		Evaporator fan rotates reverse.			
		Evaporator fan drop			

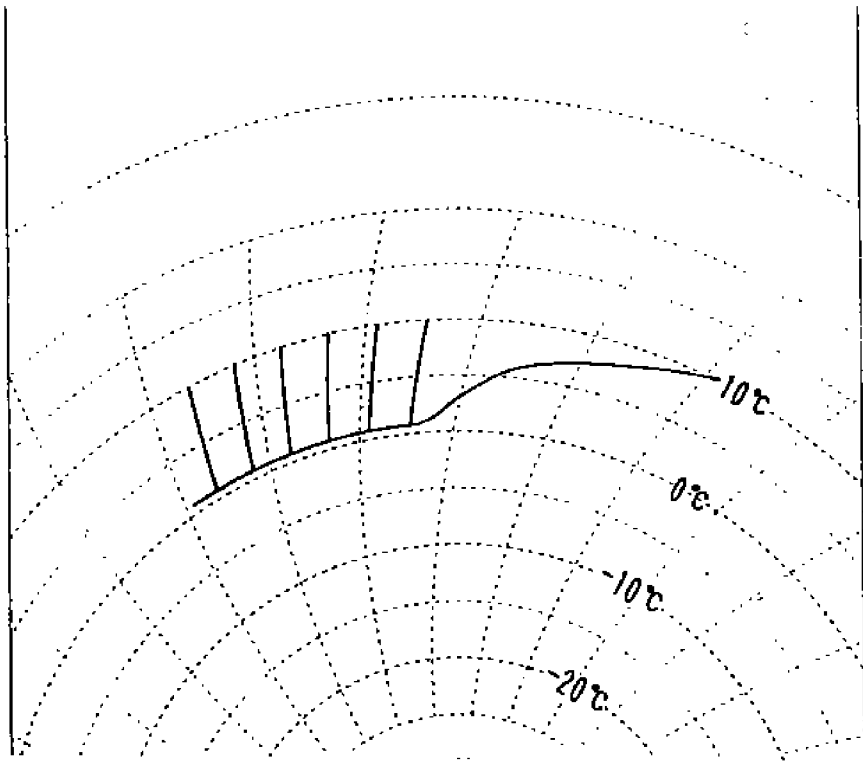
Alarm code	Content	Possible cause			
E109	Low pressure continues -72kPa or lower for 20 seconds.	Excessive frost on evaporator	Evaporator fan motor does not operate.		
			Wrong wiring		
		Low-pressure sensor value is abnormal.	Fan motor thermal protector activates.		
			Lead line breakage Wrong wiring Air passage is blocked by obstacle.		
E201	Pull-down does not end within 120 seconds.	Liquid solenoid valve does not close.	Air leaks on the access panel.		
			Ventilator is open. (frozen mode)		
			Failure of CPU board		
			Failure of sensor		
			Dust clogging		
			Lead line breakage		
		Injection solenoid valve does not close.	Wrong wiring		
			Coil burning		
			Coil drop		
		Leakage of modulating valve.	Compressor valve lead breakage.		
			Dust clogging		
			Lead line breakage		
E203	Overcool protection function activates (control sensor \leq SP-3.0) in the chilled or partial frozen mode.	Modulating valve does not open fully.	Wrong wiring		
			Coil burn		
			Coil drop		
			Dust clog		
			Air passage is blocked by obstacle.		
		Insufficient evaporator fan air blow	Evaporator fan breakage		
			Air short-circuit around evaporator		
			Evaporator fan interferes with guide.		
		Evaporator fan motor thermal protector activates.	Lead wire breakage		
			Air passage is blocked by obstacle.		
E 207	Defrosting time is 90 minutes long.	Evaporator outlet sensor gets off from the evaporator outlet tube.	Failure of printed-circuit board		
			Failure of sensor		
			Evaporator outlet sensor value is abnormal.		
		Thermal insulation of evaporator outlet sensor is improperly installed.	Failure of CPU board (SRAM)		
			Resetting		
		Evaporator outlet tube thermosensor is defective.	Failure of CPU board (SRAM)	Resetting	
					Modulating valve does not fully open.
		Injection solenoid valve is not opened.			Coil burn or short-circuited
					Dust clog
					Wiring lead breakage
Wrong wiring					
High-pressure sensor or low-pressure sensor is defective.	Coil burn				
	Coil drop				
Evaporator outlet sensor value is abnormal.	Dust clog				
	Humidity setting request	Failure of CPU board (SRAM)	Resetting		
Defrosting sensor setting request					
				Calendar setting request	
					Battery replacement date setting request
	E401	Failure of supply air temperature sensor (SS)	Line breakage		
Short circuit					
Wrong wiring					
Failure of CPU board					
E402	Failure of data recorder supply air temperature sensor (DSS)	Line breakage			
		Short circuit			
		Wrong wiring			
		Failure of CPU board			

Alarm code	Content	Possible cause
E403	Failure of return air temperature sensor (RS)	Line breakage
		Short circuit
		Wrong wiring
		Failure of CPU board
E404	Failure of data recorder return air temperature sensor (DRS)	Line breakage
		Short circuit
		Wrong wiring
		Failure of CPU board
E405	Data recorder blow-out air temperature sensor (DRS) error	Line breakage
		Short circuit
		Wrong wiring
		Failure of CPU board
E409	Failure of evaporator outlet sensor (EOS)	Line breakage
		Short circuit
		Wrong wiring
		Failure of CPU board
E411	Failure of ambient air thermosensor (AMBS)	Line breakage
		Short circuit
		Wrong wiring
		Failure of CPU board
E413	Failure of low pressure sensor (LPT)	Lead line breakage
		Wrong wiring
		Defective main body
		Failure of CPU board
E415	Failure of high pressure sensor (HPT)	Lead line breakage
		Wrong wiring
		Defective of the high pressure sensor
		Failure of CPU board
E417	Failure of voltage sensor (PT1)	Failure of sensor
		Failure of CPU board
E419	Failure of voltage sensor (PT2)	Failure of sensor
		Failure of CPU board
E421	Failure of current sensor (CT2)	Failure of sensor
		Failure of CPU board
E423	Failure of current sensor (CTT2)	Failure of sensor
		Failure of CPU board
E425 E427 E429	Failure of pulp temperature sensor (USD1 thru 3)	Wrong wiring in the relay terminal box
		Line breakage in the relay terminal box
		Short circuited in the junction box
		Relay cable breakage
		Poor contact, relay cable
		Wrong wiring in the control box
		Short circuit in the control box
		Defective main body
Failure of CPU board		
E431	Failure of humidity sensor (HuS)	Lead line breakage
		Wrong wiring
		Defective main body
		Failure of CPU board
E603	Line breakage or failure of drive circuit of modulating valve (MV)	Lead line breakage
		Wrong wiring
		Failure of CPU board
E607	Abnormal contact point of manual defrost switch (MDS)	Defective switch
		Short circuit
		Failure of CPU board
E707	Momentally power shut off	40 to 300msec commercial power supply stops.
E801	Battery replacement request	Set time is exceeded.
E805	Dipswitch is improperly set (USDA sensor)	Sensor is connected but it is regarded as no-setting.
		Failure of CPU board
E807	Dipswitch is improperly set (Hu sensor).	Sensor is connected but it is regarded as no-setting.
		Failure of CPU board

3. Diagnosis from the recording chart



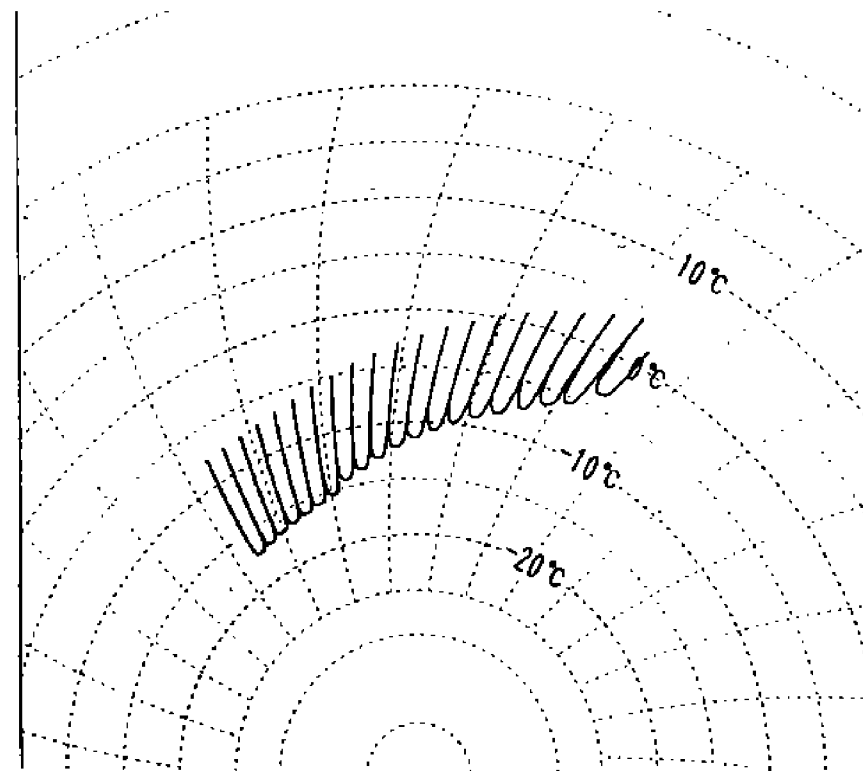
Set point of temperature	0°C
Phenomenon read out from the recording chart Defrosting is periodically executed by the timer.	
Abnormal content and abnormal point Normal	
Set point of temperature	0°C
Phenomenon read out from the recording chart Since the chart nut which retains the recording chart is loose, the recording paper is not properly fed. <p style="text-align: right;">(Left side)</p>	
Abnormal content and abnormal point Fasten the chart nut, and it will return to normal. <p style="text-align: right;">(Right side)</p>	
Set point of temperature	5°C
Phenomenon read out from the recording chart When moisture in the cargo is much or when fresh air amount is excessive, the cooling capacity becomes insufficient during pull-down operation since frosting occurs excessively. Since the temperature rises before reaching the set point of temperature, defrosting is repeated at outside of the in-range temperature.	
Abnormal content and abnormal point The operation is not abnormal. Until the amount of the frost on the evaporator becomes reduced, defrosting with the short timer is repeated. In 2 to 3 days, defrosting interval will return to normal.	



Set point of temperature 0°C

Phenomenon read out from the recording chart
Though the temperature record is normal, the temperature rapidly rise.

Abnormal content and abnormal point
Due to abnormality, the compressor stops or the fusible safety plug is molten.

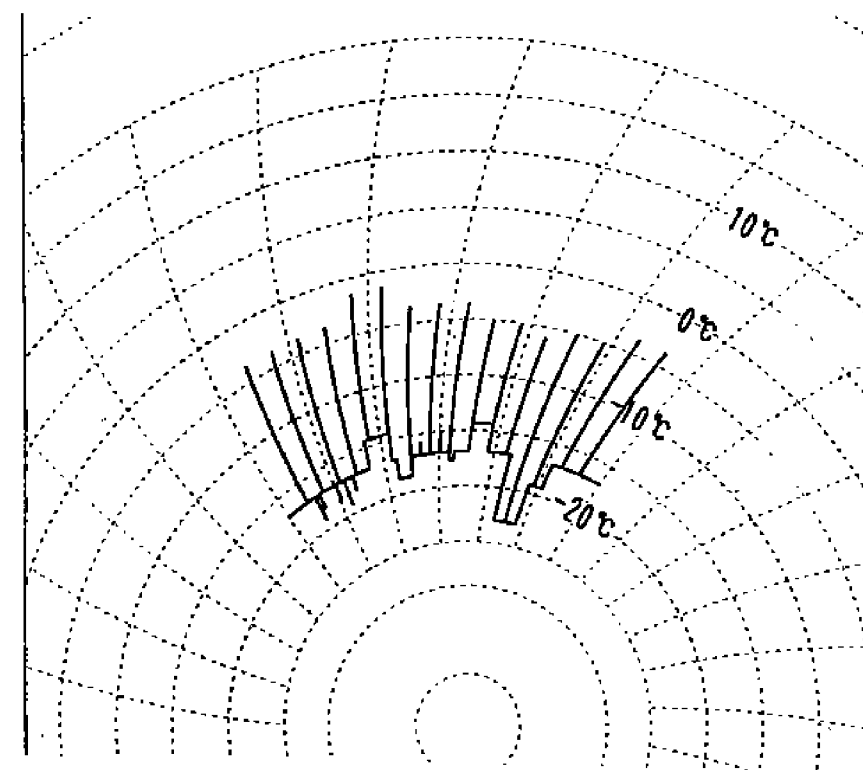


Set point of temperature -18°C

Phenomenon read out from the recording chart
Though defrosting is periodically made, the inside temperature gradually rises.

Abnormal content and abnormal point
Due to the insufficient cooling capacity, the inside temperature rises.

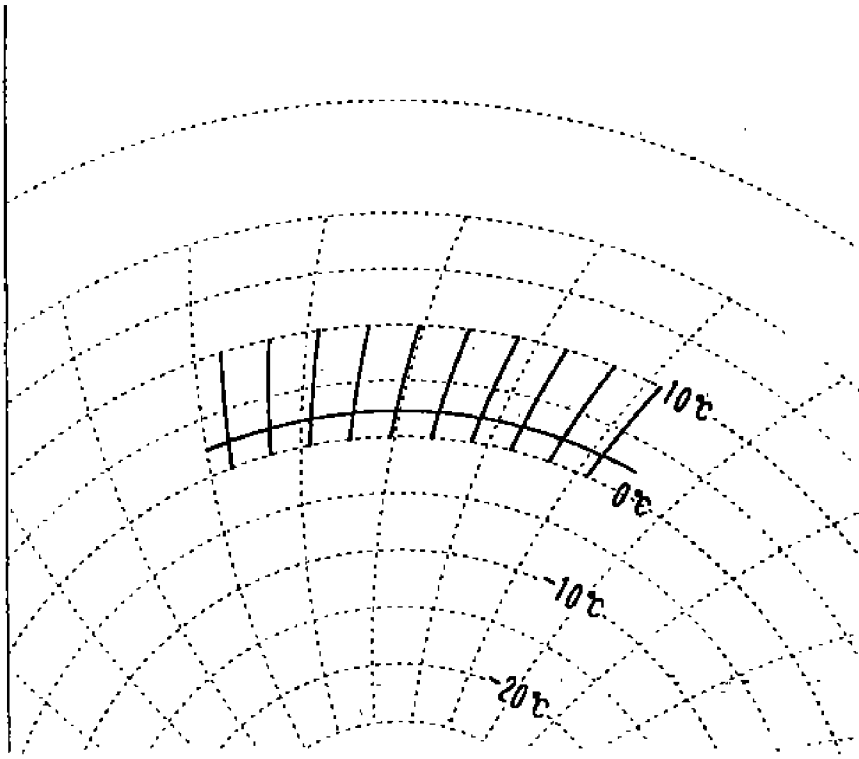
- Refrigerant is short due to leakage.
- Compressor valve lead is broken.
- Hot gas bypasses due to leakage on the modulating control valve.
- Expansion valve or liquid solenoid valve are clogging.
- High pressure rises due to shortage of air blow rate of the condenser.



Set point of temperature -18°C

Phenomenon read out from the recording chart
The recording temperature suddenly varies.

Abnormal content and abnormal point
The connector in the temperature recorder is in poor contact.



Set point of temperature	0°C
Phenomenon read out from the recording chart	
During defrosting, the inside temperature temporarily drops.	
Abnormal content and abnormal point	
Since the liquid solenoid valve is not closed, pump-down operation before defrost start is not completed, and cooling operation continues with the evaporator fan stopped.	

4. Operation for emergency

4.1 Expansion valve trouble

Maintenance impossible from inside (with cargo)

- ① Execute the pump down.
- ② Remove the right access panel, and from outside, replace the feeler bulb which is installed on the suction pipe at the top of the evaporator. During replacement, install the capillary of the feeler tube through the opening of access panel as temporary repair.
- ③ Remove the flare and bolts of the pressure equalizing pipe which is connected to the body of the expansion valve. (When only the cage assy is replaced, it is unnecessary to remove the feeler bulb.)
- ④ Replace the power assembly, cage and packing to new one. (For the tightening torque, refer to Appendix.)
- ⑤ During replacement, be sure to replace the old packing with new one.
- ⑥ After replacement, be sure to purge air from the pressure equalizing pipe.

⚠ CAUTION

- 1) Be sure to install the feeler bulb on the pipe at the top of the evaporator.
- 2) When fitting the access panel, take care to prevent breaking the capillary of the feeler tube.

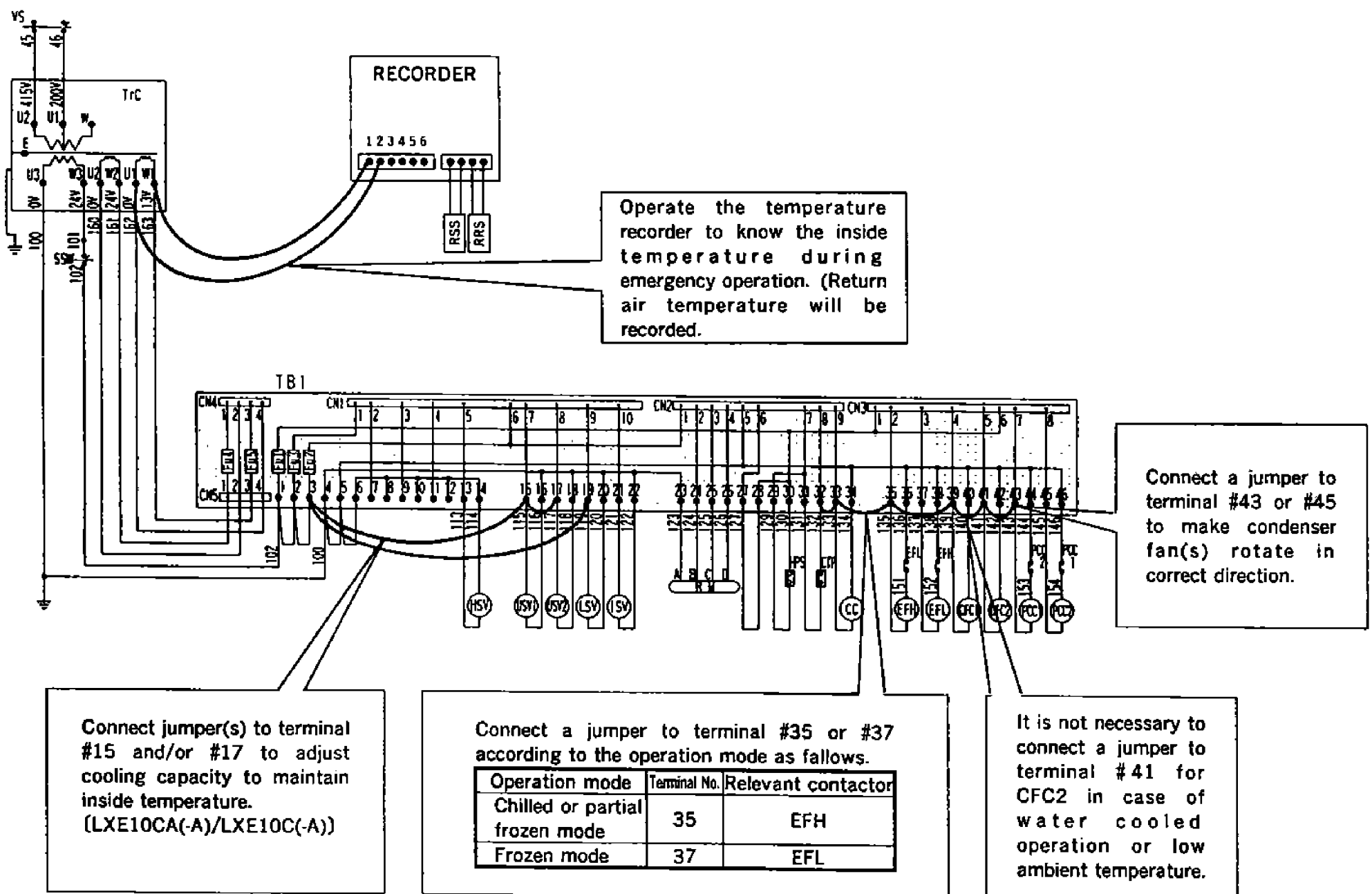
4.2 Controller trouble

- (1) If repair is impossible because of malfunctions of controller, the emergency operation is possible in the following procedure.

Here, only the cycling ON-OFF operation with the start switch (SSW) is possible but automatic temperature control or defrosting operation is impossible.

- (2) Wiring modification procedure

- ① Disconnect the power connectors CN1~CN4 from the back of the controller.
- ② According to the following figure, short-circuit the relevant line (terminal) No..



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Appendix

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1. Standard tightening torques of bolts

	Bolt size	Major part	Tightening torque	
			kg·cm	lb·ft
Stainless steel	M4	Small part	16	1.3
	M5	Solenoid valve	30	2.5
	M6	Access panel	50	4.3
	M8	Evap. fan motor, Flange connected dryer Control box	125	10
	M10	Expansion valve	180	15
		Evap. fan motor mounting base Cond. fan motor Suction stop valve	255	21
M12	Compressor	435	36	
Steel	M8 (10T)	Discharge stop valve (LXE5C/5C-A)	302	25
	M10 (10T)	Discharge stop valve (LXE10C/10C-A)	620	51

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

2. HFC134a, temperature - vapor pressure characteristics table

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

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

3. Temperature conversion table and temperature sensor (SS/RS/RSS/RRS/EOS/AMBS) characteristics table

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

4. Temperature conversion and temperature sensor (DCHS) characteristics table

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

5. High pressure sensor characteristics table

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

6. Low pressure sensor characteristics table

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