MITSUBISHI
TRANSPORT REFRIGERATION UNIT

SERVICE MANUAL

TDJS35DAE
TDJS50DAE
TDJS70DZAE

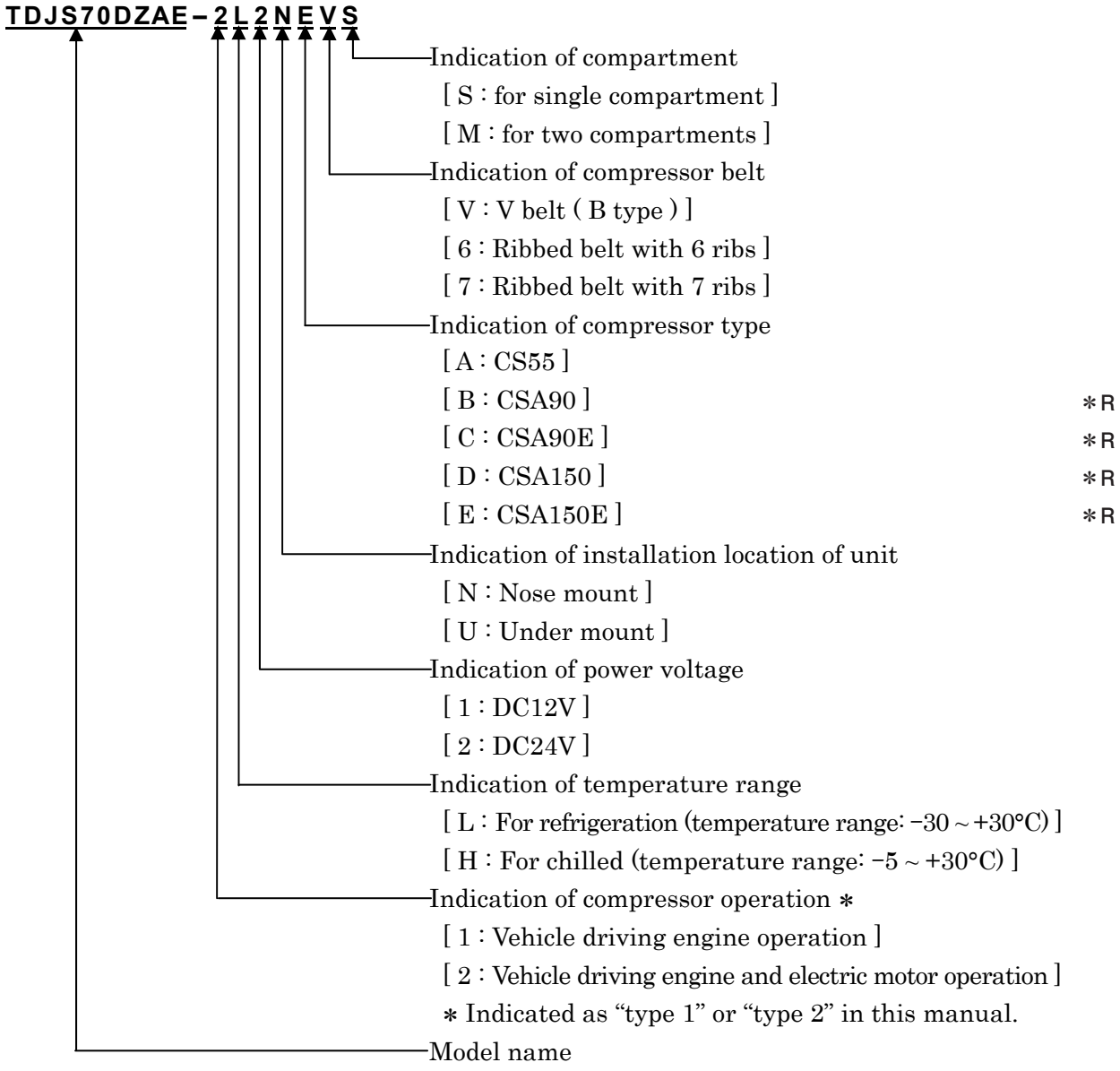
〈Revised edition〉

Main changes in this revised edition
- Addition of detail trouble-shooting guide
- Latest control specification
- F-GAS label information

CE

'18･TDJ-S･002

● How to read the type



Introduction

This service manual describes fundamental matters and particular information of Mitsubishi transport refrigeration units TDJS35DAE, TDJS50DAE and TDJS70DZAE and is intended to be used by the service personnel of the unit to perform test operation, inspection, trouble shooting and maintenance properly.
Read this manual thoroughly before working. Test operation, inspection, trouble shooting and maintenance of above units must be done by the personnel fully understands the operation method and resulted movement of the machine.
To perform the proper installation of the unit, follow the instruction of the separated installation manual.

Important information

■ Purpose of use and application

These refrigeration units are intended to carry the cargo (with the exception of volatile, inflammable, hazardous matters) on a transportation vehicle, keeping the inside container temperature at a certain temperature.
If the refrigeration unit is used for any purposes other than above, it may cause accidents or damages.

■ General

- To achieve above objective safely
  (a) Installation, test operation, inspection, trouble shooting and maintenance of this unit must be performed by the personnel who received a fundamental education of technical knowledge of refrigeration unit and have experienced a training about the hazard of the unit and prevention of such hazard.
  (b) Read this service manual thoroughly and fully understand the contents before executing installation, test operation, inspection, trouble shooting and maintenance of the refrigeration unit. Working with insufficient understanding may lead to an accident resulting in injury or death and a damage of refrigeration unit due to unexpected operation of the equipment.
  (c) Do not make modifications of the refrigeration unit and do not alter the contents of instructions regarding specification, operation and maintenance in principle. Otherwise, it may result in not only loosing capability of the unit but also being unable to secure the safety of the users. It may also lead to an accident resulting in injury or death and a damage of the equipment.
- All rights regarding the software of this unit are reserved by our company.
- Never use, reproduce or modify the software, in whole or part, to use with other product without prior written consent with our company.
- This service manual may contain descriptions for the items beyond the supply from our company.

■ Important matters for working safety

- The function of this product must be well understood in advance to maintain its function and to prevent potential hazard.
- Preventive measures for accidents must correspond with the operational function of this product to avoid occurrence of disasters.

- A safety-first activity must be performed systematically and continually by drafting a plan as a labor safety and health management system. The labor safety and health management system must include following items.
  (a) Proper arrangement of work place
  (b) Direction about preparation and usage of protective device for workers
  (c) Preparation of working management system such as fixing of working standard and clarification of directive structure
  (d) Implementation of education and training for workers
- Individual worker must participate in this activity positively and try to prevent happening of disasters by recognizing his/her role.
- Most important objective of safety measures is to prevent accidents resulting in injury or death as well as to protect products.
- Observe the precautions, advices and normal directions of the product described in this service manual with a thought of safety-first to prevent fatal disaster, injury, or damage of the refrigeration unit. If not observed,
  (a) your life could be threatened,
  (b) your health could be obstructed, and
  (c) the refrigeration unit could be damaged.
- We are not able to foresee all the potential risks inherent in this refrigeration unit itself, risks caused by people such as human error, and risks induced by the environmental conditions in which the refrigeration unit is used.
- There are so many things which「cannot be done」or which「should not be done」and it is not possible to convey everything by this service manual or by warning labels. Therefore, not only the items described in this service manual but also the safety measures generally required are necessary to perform test operation, inspection, trouble shooting and maintenance of the refrigeration unit.
- Our company is not responsible at all for any damage or injury introduced by not keeping the directions in this service manual or by not paying attention normally required.

■ Service manual

- This service manual is prepared for people who speak English. In case that person whose native language is not English handles this refrigeration unit, he or she must be instructed on safety by the dealer. Furthermore, the warning labels described in their native language must be prepared and stuck on the proper places.
- This service manual is copyrighted and all rights are reserved by our company. The drawings and technical information described in this manual may not, in whole or part, be published, copied, translated and reduced to any electronic medium or machine-readable form without prior written consent with our company.
- The refrigeration unit to be serviced may differ from the drawing of this service manual. Cover may be removed from the drawing to make the explanation of the inside easy.
- The contents described in this service manual may be changed without a prior notice.
- Keep this service manual in the prescribed place so that it is available for your reference when you need it.
- The part changed in a revised edition indicates「＊R」in the margin. ＊R

■ For disposal

- Contact your dealer when disposing the refrigeration unit.
- Observe the applicable laws and regulations in your country to dispose refrigeration unit and waste oil.

Contents

1. Safety

1.1 Summary

Safety matters described in this section is to be a guideline to prevent an accident of workers resulting in injury or death.

(1) Safety measures by the manufacturer
(Reference item) 1.4 Protective functions ……See page 14.

(2) Understanding and practice by the users for the security of safety on machine operators
(Reference items) 1.3 Precautions ……See pages 9 ~ 13.
1.5 Prevention of start during work ……See page 14.
1.6 Clothing and protective equipment ……See page 14.
1.8 For emergency ……See pages 15, 16.

(3) Management by the users for machine operator and machine itself
(Reference item) 1.9 Labor safety and health management ……See pages 17, 18.

The information related to safety and items related to installation, test operation, inspection, trouble shooting and maintenance described in this service manual must be used not only by itself but also in conjunction with periodical safety education and training in order to operate this refrigeration unit according to the labor safety and health management system elaborated by the entrepreneur.

This service manual contains the classification of importance (warning, caution and notice) explained in「1.2.1 Kinds and meanings of warning terms」(see pages 5, 6) and the warning messages in order to secure safety and to prevent damage of the refrigeration unit.
Understand and observe the contents of the warning message at each work.
These messages constitute important information at each work together with「1.3 Precautions」(see pages 9 ~ 13).

1.2 Warning

Following three measures are applied in the refrigeration unit to call worker's attention to a hazard.
・ Indication of the warning messages in this service manual
・ Warning labels on the refrigeration unit
・ Warning buzzer
Read carefully all the warning messages related to safety described in this service manual. Check all the places and contents of warning labels affixed on the refrigeration unit before test operation, inspection, trouble shooting and maintenance.

1.2.1 Kinds and meanings of warning terms

Indication related to safety

Warning messages shown on the warning labels and in this service manual give warnings to the expected dangerous situations during work together with「warning signs」classified in the following kinds.
Disregarding the warning message may lead to the accident corresponding to the「warning sign」shown with the message. In an extreme case, it may result in a fatal accident, damage of important part of the refrigeration unit and its accessories, and environmental damage to the out side of the service facility.

Kinds	Description	
⚠ **Danger**	Indicates high and imminent potentially dangerous situation, which if mis-handled, will result in death, injury, or serious accident such as damage of the refrigeration unit.	＊R
⚠ **Warning**	Indicates dangerous situation, which if mis-handled, will result in death, serious injury, and serious accident such as damage of the refrigeration unit.	＊R
⚠ **Caution**	Indicates potentially dangerous situation, which if mis-handled, will result in minor injury or moderate property damage.	＊R

Symbols

Symbols	Description	Symbols	Description	
	Never perform.		Always observe the instructions.	
	Disconnect power supply plug from socket.		Never touch.	
	Repair and disassembly must be done only by qualified personnel.		Warning against dangerous place and act. Danger may happen due to the act neglecting safety duty or carelessness.	＊R

Other symbol

Other advice for the refrigeration unit is described with the following symbol.

Kind	Description
	Useful information for function or performance of equipment.

1.2.2 Handling of warning labels

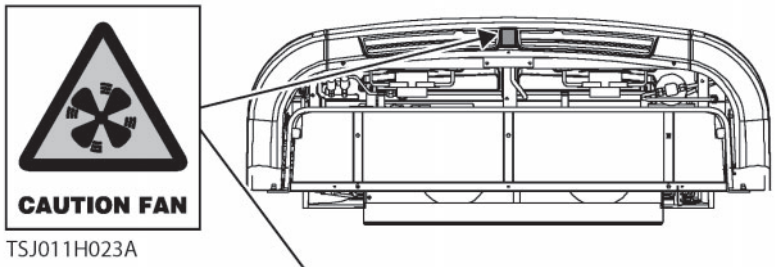
(1) Important precautions are stated on the warning labels. Never operate the refrigeration unit unless fully understanding the meanings of the warning labels. When you found some difficulties to understand, contact your dealer.

(2) Always keep the labels in good condition to read. Do not peel off, tear off or damage the labels or do not wipe with solvent or paint them.

(3) When the labels become illegible, purchase them from your dealer and change them.

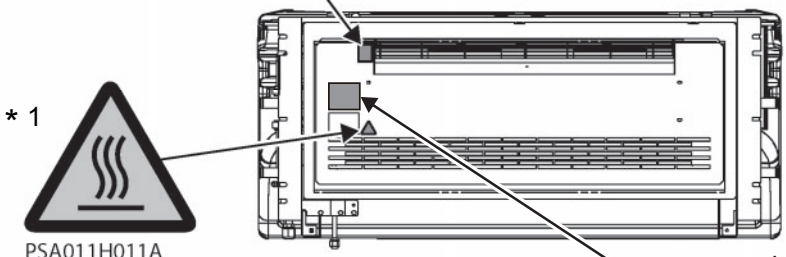
Refrigeration unit

■ Top view



TSJ011H023A

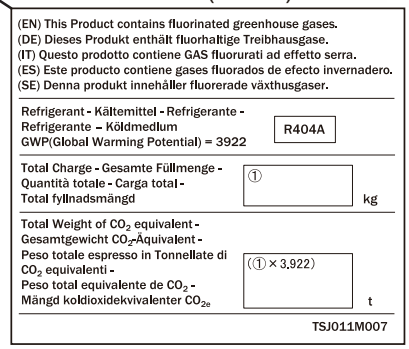
■ Back view



* 1

PSA011H011A

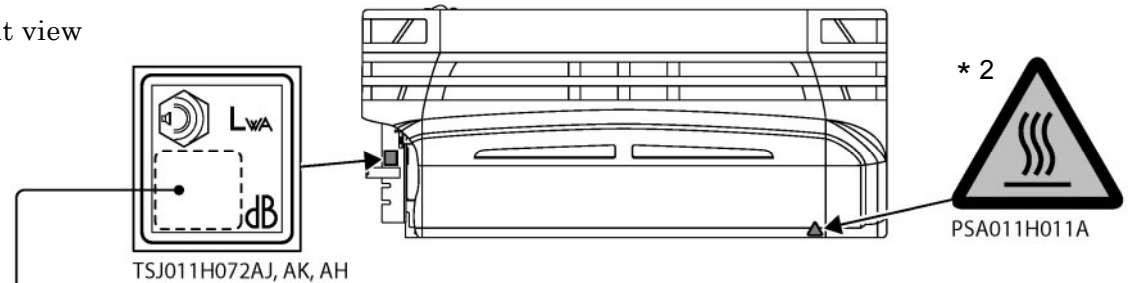
Label (F-Gas)



TSJ011M007

* R

■ Front view



* 2

PSA011H011A

TSJ011H072AJ, AK, AH

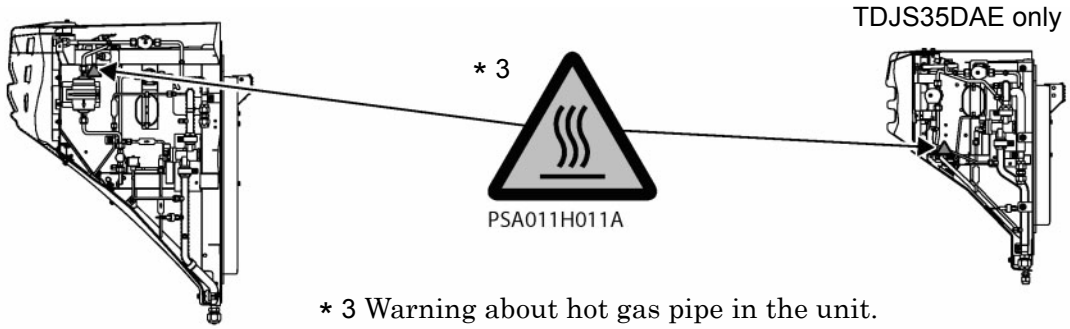
Sound power level (dB)

Label / Model	TSJ011H072		
	AJ	AK	AH
TDJS35DAE	82	–	–
TDJS50DAE	–	81	–
TDJS70DZAE	–	–	83

* 1 Warning about high temperature sections on the hot gas pipe and the drain pan.

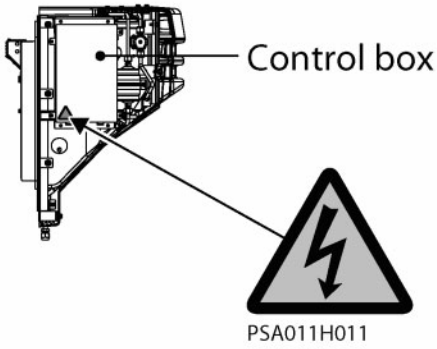
* 2 Warning about high temperature sections on the pipe cover and the discharge pipe in the unit.

■ Left side view inside



＊3 Warning about hot gas pipe in the unit.

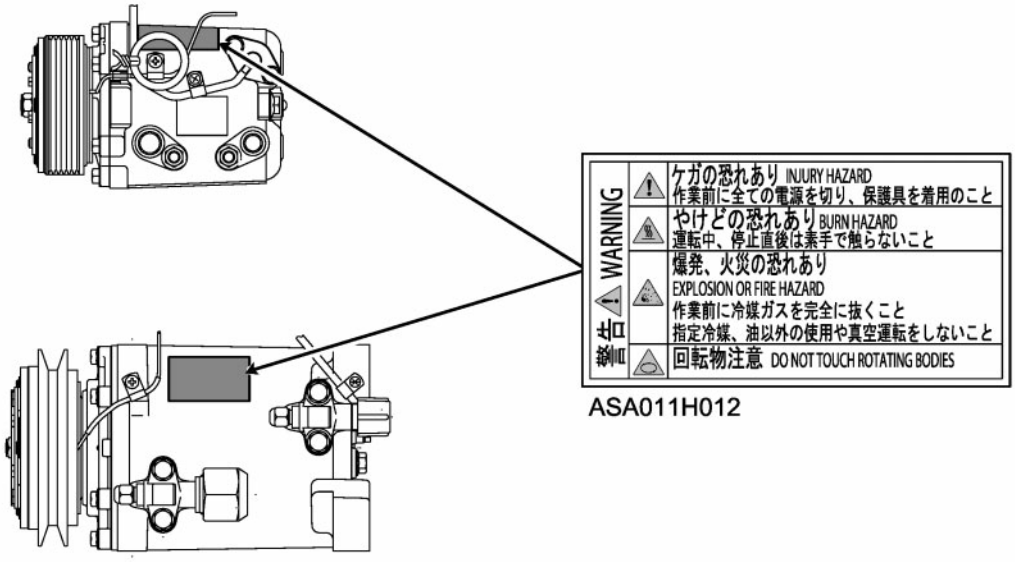
■ Right side view inside



Compressor

■ CS55

CSA90, CSA150



＊R

1.3 Precautions

1.3.1 General precautions

*R

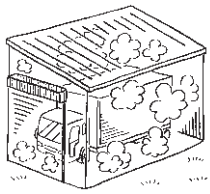
⚠ DANGERS
Do not modify or perform specification change for the refrigeration and vehicle. (This will make refrigeration unit out of warranty.) It may cause a serious accident if customer modify the refrigeration unit or change the specification by himself/herself.
Do not paint on resinic design panel. (This will make refrigeration unit out of warranty.) Cracking occurs in design panel, which cause a risk of falling down of panel while the vehicle is running.

⚠ CAUTIONS
Securely chock the front and rear wheels and apply the side breaks to prevent the vehicle from moving during the work. Otherwise, it may cause accidents such as worker injury from the vehicle advancing or retracting.
Put on helmets, gloves and protective devices as required when working. Otherwise, it may cause injury.
Make it clear to all persons related to the work that work is in progress. If work is being carried out jointly, an effort should be made so that the workers involved understand the other's work. Otherwise, it may cause accidents or failure.
If the refrigerant gas leaks during work, always ventilate the area. Toxic gas could be generated if the refrigerant gas contacts fire and it may cause poisoning.
Do not insert fingers or rods in air intake and outlet ports. Inserting fingers or rods could result in mechanical failure or injury by rotating fan.

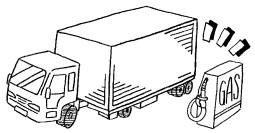
1.3.2 Operation

⚠ WARNINGS

Do not start the engine in poorly ventilated places such as an indoor parking lot.
Otherwise, it may cause carbon monoxide poisoning due to exhaust gas.

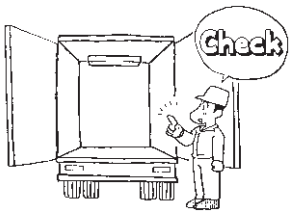


Do not use the refrigeration unit in the atmosphere which could cause explosion at such place like gas station.
Otherwise, it may cause an explosion or a fire.



＊R

Make sure that no one left inside the container before closing the door.
He or she might be frozen to death if the refrigeration unit is operated with someone inside.



＊R

Always use the specified refrigerant and compressor oil. (See page 75.)
Otherwise, it may cause an explosion or a fire.

＊R

⚠ CAUTIONS

Do not touch the refrigerant pipe during operation or immediately after the operation.
Otherwise, it may cause burns as the refrigerant pipe will get hot.

When refrigerant and compressor oil leak out, be careful not to have them get in your eyes, not to have them contact with your skin, not to inhale them or not to drink them by mistake.
Otherwise, it may cause health disorders such as frostbite, loss of eyesight and pneumonia.

＊R

Confirm that there are no workers on all sides of the vehicle or under the vehicle body and inside of the container before starting the refrigeration unit and warn workers in the area that the refrigeration unit is to be started.
Otherwise, it may cause accidents.

Whenever any abnormal operation, noise or error display has occurred during testing, stop the unit immediately and inspect. After removing the cause test operate and check the unit again.
Otherwise, it may cause accidents.

Make sure that no tools, instruments or other parts have been left in the refrigeration unit or chassis before starting the refrigeration unit.
If such items are left behind, it may cause damage of refrigeration unit or injury.

＊R

1.3.3 Inspection

⚠ WARNINGS

Be sure to carry out the periodic inspections.
Otherwise, it may cause troubles of the refrigeration unit or accidents.

Use adequate tools and the specified tightening tools when tightening flare nuts and bolts and tighten them to the designated tightening torques.
Otherwise, it may cause disasters and equipment damage due to refrigerant leakage by loosening of flare nuts and falling off of parts by loosening of bolts.

⚠ CAUTIONS

When refrigerant and compressor oil leak out, be careful not to have them get in your eyes, not to have them contact with your skin, not to inhale them or not to drink them by mistake. ＊R

Otherwise, it may cause health disorders such as frostbite, loss of eyesight and pneumonia.

Do not wash the refrigeration unit with a steam washer or a high pressure washer.

Otherwise, it may cause a rupture due to pressure rise in the refrigeration unit or distortions of the condenser fin.

Do not charge refrigerant from the suction side while the refrigeration unit is stopped.

Otherwise, it may cause damage of the compressor due to liquid compression.

Wait till the temperature drops sufficiently before starting inspection.
Otherwise, it may cause burns when touching since temperatures of high pressure pipe could become extremely high.

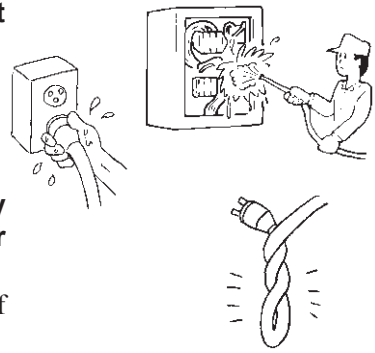
When inspecting the refrigeration unit, stop the unit by cabin controller and disconnect the battery terminals and power supply cord plug. ＊R
Otherwise, it may cause injury or an electric shock due to unexpected start.

1.3.4 Handling of electric equipment and power codes

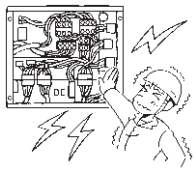
⚠ WARNINGS

- **Do not directly splash water on the electric equipment or wash them with water.**
- **Never touch the electric equipment such as power plug and so on or operate the switches with wet hands.**
- **Do not modify the power code or apply force on it, by bending it by force, pulling it strongly or twisting it, or do not put cargoes on it.**

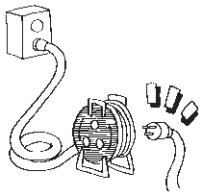
Otherwise, it may cause troubles of electric circuit, damages of power codes or an electric shock.



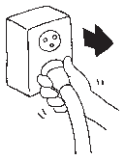
Refrain from touching the high voltage area when opening the control box.
Otherwise, it may cause electric shock.



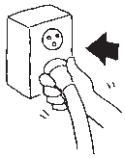
- **Use 4-core cabtyre cables (conductor cross section with 5mm^2 or more) for power cable. Do not connect it to extension code.**



- **Pull out the power code by holding the plug part at the end of the code.**

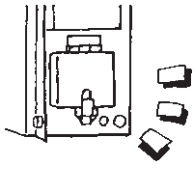


- **Check the plug of the power code for dust. If there is no dust, insert it firmly.**



- **Surely protect the power socket with a cover when it is not used. When the cover is damaged, repair it immediately.**

Otherwise, it may cause an electric shock or a fire due to the heat, breaking of wire and leaking of water, etc.



⚠ CAUTIONS

Take care of short circuit when touching the live parts such as terminals while checking the electric circuit.
Otherwise, it may cause electric shock or troubles.

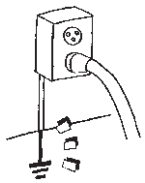
Take care of the polarity of the battery wiring.
Connecting the (+) and (-) poles in reverse may cause damage of electric parts.

Do not start and stop the operation with pulling out or inserting the power supply breaker or power code.
Otherwise, it may cause troubles of electric circuit, damages of power supply code or an electric shock.

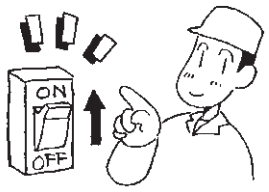
1.3.5 Power supply equipment

⚠ WARNINGS

Be sure to ground the power supply equipment to supply the electricity to the refrigeration unit.
Otherwise, it may cause an electric shock if the grounding work is not carried out properly.



Be sure to provide a dedicated circuit and an earth leakage breaker to the power supply.
Otherwise, it may cause an electric shock or a fire if there is capacity shortage of electric circuit or inadequate wiring work.



1.3.6 Dismounting

⚠ CAUTIONS

Pay attention not to be getting caught hands or feet by the refrigeration unit during dismounting.
Otherwise, it may cause injury.

Lifting of refrigeration unit must always be done by qualified personnel by using proper slings suitable for the weight.
Otherwise, it may cause damage of equipment and injury.

When using a crane to move the refrigeration unit, lift it by the center of gravity position as a center.
Otherwise, it may cause damage of equipment and injury.

Do not attempt outdoor crane work in the strong windy day.
Otherwise, it may cause damage of equipment or injury fanned by the wind.

1.3.7 Disposal

⚠ CAUTION

When disposing the refrigeration unit, dismantle or dispose with separation by type of parts according to the applicable laws, regulations and standards.
Otherwise, it may cause environmental destruction.

1.4 Protective functions

This refrigeration unit is provided with following protective functions to secure the safety of workers.

(1) Refrigerant system
- ・High・low pressure sensors and discharge gas temperature sensor and so on protect the refrigerant system.
- ・Fusible plug protects the refrigerant circuit from rupture.

(2) Electrical system
- ・Fuses prevent failure and accidents.

(3) Others
- ・Back up operation will be done to protect cargoes when the sensors are abnormal.

The cabin controller displays the abnormal indication when the functions (1) ~ (3) are activated.
Handle the refrigeration unit safely with enough knowledge of protective functions. Never operate the unit with the protective device removed or deactivated. It is most important to maintain the functions of protective device continuously normal in order to secure safety.

1.5 Prevention of start during work

When several people are working simultaneously for inspection and so on, it is necessary to protect them from getting injured by accidental start of operation.
Remove the ignition key and keep it in a safe place during the work. Place a cautionary plate indicating "WORK IN PROGRESS! STARTING ENGINE PROHIBITED." at a visible place in the driver's seat.

1.6 Clothing and protective equipment

Necessary clothing and protective equipment differ by working environment and contents of work. Wear proper clothing and protective equipment by making a rule. Otherwise, it may lead to unexpected accidents such as getting rolled in, burns and electrical shock, etc.

- ・ Wear the clothes such as long sleeves and long pants appropriate for the work and fasten the cuffs firmly.
- ・ Wear the work clothes made of materials preventing electrical shock or static electricity.
- ・ Do not wear accessories such as necklaces or a necktie to prevent it from getting rolled in. Long hair must be tied at the back or put under the working clothes.
- ・ Wear gloves and protective eye glasses.
- ・ Wear protective shoes, protective caps/helmets as required.

1.7 Refrigerant

This product contains fluorinated greenhouse gases. ＊R

- ・ Refrigerant: R404A (GWP (Global Warming Potential) =3922)
  Refer to a label on unit about weight of fluorinated greenhouse gases and CO_2 equivalent.
  (Refer to pages 7.)
- ・ R404A is a chemical compound of carbon, hydrogen and fluorine. It is a colorless, transparent liquid.
- ・ It is extremely volatile and has a boiling point at -46.13 °C under the atmospheric pressure.
- ・ It has no smell but slightly smells when extremely dense.
- ・ It has almost no toxicity but it may cause nausea, headache or temporary decline of nervous system if existed extensively.
- ・ Allowable density in a closed space is 1000 ppm. Ventilate while handling.
- ・ It may cause frostbite if touching with the liquid refrigerant directly.
- ・ It may generate toxic gas as a result of thermal decomposition when touching with flames or metal heated to 300～400°C.

1.8 For emergency

Prepare the followings in advance to deal with emergencies such as injury or death, property damage and environmental disaster.

(1) Assignment of people to call for as supplementary personnel for countermeasures to deal with emergencies such as a disaster resulting in injury or death, property disaster with equipment damage, and environmental disaster such as spilling of waste oil or chemical material.

(2) Preparation of a manual to release hand, finger or a part of body caught by machine.
Preparation of a manual to handle property accident such as equipment damage due to interaction of equipment and works.
Preparation of a manual to handle accident affecting environment such as spilling of waste oil or chemical material.

(3) Inclusion of at least one personnel experienced training for emergency countermeasures in one work team.

(4) Preparation of adequate tools and equipment for the emergency countermeasures.

1.8.1 Countermeasures for a disaster resulting in injury or death

In case of a disaster resulting in injury or death, stop the work immediately and rescue the victims. If possible, follow the instructions below as well.

(1) Make emergency calls to the relevant agencies listed below.
  (a) Fire station
  (b) Nearest dealer

Notice

- It may be necessary to disassemble or scrap the refrigeration unit depending on the place and situation of the disaster. As the refrigeration units are structurally complicated, disassembling and scrapping require a technical knowledge and cooperation between a rescue team of fire station and service personnel is inevitable to save victims in a short time. Be sure to contact above two places.

1.8.2 Countermeasures for property disaster

Follow the instructions below when the refrigeration unit is damaged due to miss operation or others.

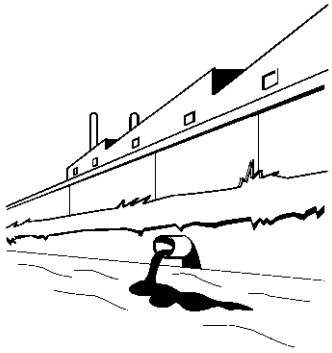
(1) Make calls to the relevant agency listed below.
  (a) Dealer

Notice

- Visual inspection only is not sufficient for accurate judgment of damage conditions when the refrigeration unit is damaged. Cooperation of service personnel is inevitable so that contact them without fail.

(2) Stop the operation and follow the instruction of your dealer after the disaster to avoid expansion of damage.

1.8.3 Countermeasures for environmental disaster



Follow the instructions of public agencies when spilling waste oil or chemical materials from drainage or the like to the outside by mistake.

(1) Make emergency calls to the relevant agency listed below.
  (a) Official agencies controlling local environment
  (b) Fire station
  (c) Police station
  (d) Fishermen's association, agricultural cooperative accociation, etc.

(2) Act following the instructions from the official agencies.

1.8.4 Countermeasures for earthquake・fire

When you have an earthquake or a fire during work:

- If someone is injured, move him or her to a safe place and give adequate medical treatment.
- If a fire started, make a call to fire station and fight the fire with fire extinguishers until arrival of fire engines.
- If refrigerant gushes out, take refuge since hypoxia could be resulted.
- If you have an earthquake or a fire started, move to a safe place except for some people to fight the fire.
- The person in charge is requested to call a dealer.

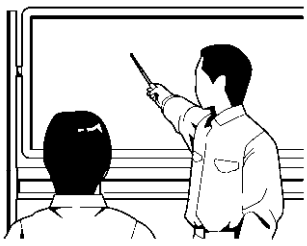
1.9 Labor safety and health management

This section describes the labor safety and health management related matters at servicing work. Apply the suggestions to prevent injury or property accidents and environmental accidents together with requirements from your government or local administrative agency and self-imposed safety management restraints.

1.9.1 Understanding and observance for the contents of service manual

Fully understand the contents of this service manual and observe the rules during work. It may cause serious accidents if working under the conditions of insufficient understanding of the contents or by disregarding the contents.

1.9.2 Safety related education and training



Safety related skills will be improved same as skills for other works by education and training. All workers must receive safety related education and training. Each worker is able to become recognizing potential risks, avoiding dangerous behavior and to enter dangerous places, and taking action to save him-self/her-self by improving sense of safety with the education and training.

1.9.3 Dangerous・harmful chemical materials

It may cause serious health problem (for example, cardiac disease, damage to kidney and lungs, sterility, cancer, burns and rash) if exposed to dangerous・harmful chemical materials. Furthermore, several chemical materials have risks to become causing generation of fire, explosion and other serious disasters if miss-handled.

■ Education・training

Execute transmission of information and provide education and training to a person in charge of chemical materials.

(1) Give appropriate ventilation in the area using chemical materials.
(2) Chemical materials must be handled by the recommended manual and SDS (Safety data sheet) of the manufacture.
(3) Wear protective equipment (protective gloves, apron, etc.) according to the recommended manual and SDS of the manufacture when handling the chemical materials.
(4) Put labels on the containers of the chemical materials and take custody of the containers according to the recommended manual and SDS of the manufacture. Keep the chemical materials away from hot places or the place having sparks or flames and keep them under the cool and dry conditions.
(5) Wash hands before eating, drinking or smoking when handling chemical materials.
(6) Let the workers aware of the place and its usage procedure of eye-washer in advance if it is expected to hurt their eyes by the chemical material.

■ Usage of SDS (Safety data sheet)

When purchasing chemical materials, obtain the SDS from the manufacture and keep it at the fixed place so that it can be available whenever necessary.

SDS contains such detailed information as dangerous matters for health and safety, influence to the environment, safe handling procedures, countermeasures against emergency situation, and so on. Let the people in charge of handling chemical materials know the contents of SDS and provide education and training for handling.

Give the SDS to a doctor when the worker has his or her physical condition diagnosed by the doctor for the effect of chemical material.

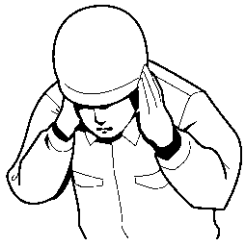
■ Treatment of waste liquid, waste material and waste product

Disposal of chemical material such as solvent and cleaning cloths stained with such chemicals and so on is controlled by many regulations from the stand point of environmental preservation. Follow the regulations of your government or local administrative agency for disposal.

1.9.4 Noise

There is a fear of suffering from permanent hearing impairment under the environment of dangerous noise level. Take following measures to prevent hearing impairment.

- Wear adequate ear protectors when entering a place with sound level of over 85dB.
- Forbid a person not wearing ear protectors from entering a place with sound level of over 85dB.
- Do not stay longer in a place with sound level of over 85dB.



1.9.5 House keeping

Poor house keeping (sort out and order) may result in stumble and fall. Implementation of house keeping will lead to prevention of accident by stumble and fall.

1.9.6 Prevention of fire

General measures to prevent fire are listed below. Always execute fire preventive measures not limited to the below. Perform fire-fighting drills periodically.

- Do not leave combustible matters near the place using fire.
- Obtain permission from a manager before work when using fire temporarily.
- Take care of fire with incombustible sheet or the like when executing welding or fusing work.
- Prepare fire extinguisher or water while using fire.
- Clean the place after using fire.
- Place fire extinguishers and fire hydrants and replace them periodically.
- Immediately repair or replace the electric wire if any damage is found on the sheath.
- Inspect or replace the electric wires used for a long time.

1.10 First aid treatment

(1) Refrigerant

- **When refrigerant got in your eye**
  Wash your eye with lots of clean running water for more than 15 minutes immediately.
  Wash rear side of the eyelid as well. Then, consult a physician as soon as possible.

- **When refrigerant comes in contact with your skin**
  Take off wet clothes, shoes and socks immediately, as it may cause frostbite if you touch the refrigerant. Wash the part well with lots of water. If you still have irritation, consult a physician as soon as possible.

- **When inhaling evaporated gas**
  When someone inhaled high level of gas, move to the place with fresh air immediately holding him/her with a blanket or the like to keep warm. Then consult a physician as soon as possible.
  When he/she does not breathe or hardly breathe, loosen his/her clothes and practice artificial respiration after securing the air passage. Depending on the circumstance, have him/her inhale oxygen and take him/her to a physician as soon as possible.

- **When swallowing refrigerant**
  Do not throw up by force and consult a physician as soon as possible.

*** Precautions for physician**
Use of Catecholamine system medicine such as adrenaline and so on may cause heart arrhythmia. Therefore it is required to use only for the emergency life-sustaining treatment with special consideration.

(2) Compressor oil ＊R

- **When compressor oil got in your eye**
  Wash your eye with lots of clean running water for more than 15 minutes immediately. Wash rear side of the eyelid as well. If you still have irritation, consult a physician as soon as possible.

- **When compressor oil comes in contact with your skin**
  Wash the part with lots of water and soap well and apply conditioning cream on it.

- **When inhaling evaporated gas**
  Move to the place with fresh air immediately holding him/her with a blanket or the like to keep warm. Then, consult a physician if it is necessary.
  When he/she does not breathe or hardly breathe, loosen his/her clothes and practice artificial respiration after securing the air passage. Depending on the circumstance, have him/her inhale oxygen and take him/her to a physician as soon as possible.

- **When swallowing compressor oil**
  Do not throw up the oil by force and consult a physician as soon as possible.
  When inside the mouth is contaminated, wash it well with water.
  (When throwing up the oil by force, it easily gets into air passage and causes high fever if it gets into lung. It may cause hardly incurable hemorrhagic pneumonia accordingly.)

2. Features

(1) These products are high efficiency direct-driven transport refrigeration units for chilling and freezing purpose using 3-dimensional (3D) scroll compressor which is developed for the first time in the world. TDJS70DZAE has realized large capacity and high efficiency by adopting economizer cycle called “Eco-injection” which is introduced for the first time in the industry.

(2) The 3D scroll compressor uses axial compression also in addition to the conventional radial compression to achieve 3-dimensional compression to realize small sized, high capacity and high efficiency compressor so that it is most suitable for freezing purpose that requires high compression ratio.

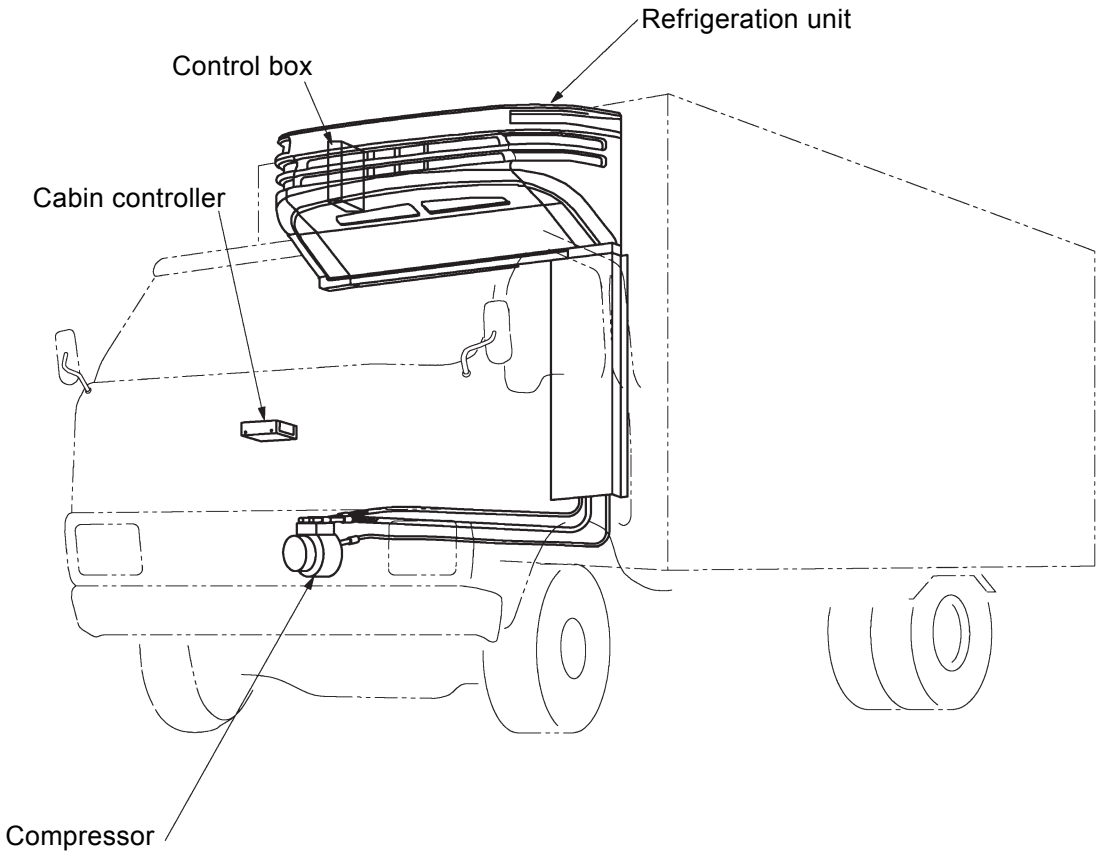
(3) It is an integral type refrigeration unit integrating compactly the evaporator and the condenser and the piping unit is no more necessary which was required for the previous version.

(4) The cabin controller has advanced operational panel display features added with a function to prompting the customer to replace functional parts and expendables upon reaching the replacing period.

(5) The refrigeration unit is able to operate in the range of the outside temperature of −10°C ~ +40°C to keep the inside temperature in the range of −30°C ~ +30°C.

(6) DC brushless motors are introduced for the evaporator fan and the condenser fan except for the condenser fan of TDJS35DAE.

(7) The defrost system using the non–condensing refrigerant heating is introduced which releases compressor power (heat source) in the container. This system assures stable heating capacity by depressurizing the discharged refrigerant to the pressure not possible for condensing in the evaporator and adjusting the amount of gas during heating cycle.



3. Specifications

TDJS35DAE-CS55 compressor

Item \ Type				TDJS35DAE-1L1NA6S TDJS35DAE-1L2NA6S	Remarks
Inside temperature (RT)			°C	−30 ~ +30	
Ambient temperature (AT)			°C	−10 ~ +40	
Cooling capacity Engine drive (AT=35°C)	RT=10°C		W (kcal/h)	4200 (3610)	Compressor revolution Nc=2750 min^{-1} (Equivalent vehicle speed 40km/h)
	RT= 0°C			3300 (2840)	
	RT=−18°C			1800 (1550)	
	RT=−25°C			1200 (1030)	
Refrigerant	Name			R404A	
	Charge amount		kg	1.7	
Refrigeration oil	Name			Nippon Oil Corporation (ENEOS) Diamond Freeze MA32R	
	Charge volume		cc	600	Including additional oil of 500 cc
Compressor driving method				Belt drive by vehicle engine	
DC power source				Vehicle battery	
DC power consumption			W	<for DC24V vehicle> 420 (Motor terminal voltage 27V) <for DC12V vehicle> 420 (Motor terminal voltage 13.5V)	<Measurement condition> JIS B8614
Defroster				Non-condensing hot gas defrost type (Automatic timer or manual)	
Safety device				High pressure switch Fusible plug	
Total weight			kg	86	Excluding special part for each vehicle
Refrigeration unit	Type			TDJS35-1L2^{1}	The fan characteristic is at motor terminal voltage of 27V for DC24V and motor terminal voltage of 13.5V at DC12V. (JIS B8614)
	Dimension		mm	W1585 x H695 x D470	
	Evaporator fan			ø 220 turbo fan & DC brush less fan motor x 2	
		Flow rate	m^3/h	1300	
		Revolution	min^{-1}	2450	
		Power	W	165	
	Air reach		m	9.6	
	Condenser fan			ø 270 propeller fan & DC fan motor with brush x 2	
		Flow rate	m^3/h	1510	
		Revolution	min^{-1}	2350	
		Power	W	165	
	Weight		kg	75.1	
Compressor	Type			CS55R6	Open 3D scroll
	Dimension		mm	ø 113 x L179	
	Displacement		cc/rev	52	
	Clutch outer dia.		mm	ø 95.0	
	Clutch power		W	40	
	Belt			Ribbed belt PK6-rib x 1	
	Weight		kg	4.0	Including magnet clutch
Accessory weight			kg	6.4	

TDJS35DAE-CS90 compressor

Item \ Type				TDJS35DAE-1L1NB6S TDJS35DAE-1L2NB6S	TDJS35DAE-1L1NBVS TDJS35DAE-1L2NBVS	Remarks
Inside temperature (RT)			°C	−30 ~ +30		
Ambient temperature (AT)			°C	−10 ~ +40		
Cooling capacity Engine drive (AT=35°C)	RT=10°C		W (kcal/h)	4850 (4170)	4700 (4040)	Compressor revolution Nc=2750 min^{-1} (Ribbed belt) Nc=2050 min^{-1} (V belt) (Equivalent vehicle speed 40km/h)
	RT= 0°C			3750 (3220)	3700 (3180)	
	RT=−18°C			2550 (2190)	2050 (1760)	
	RT=−25°C			1700 (1460)	1500 (1290)	
Refrigerant	Name			R404A		
	Charge amount		kg	1.7		
Refrigeration oil	Name			Nippon Oil Corporation (ENEOS) Diamond Freeze MA32R		
	Charge volume		cc	600		Including additional oil of 500 cc
Compressor driving method				Belt drive by vehicle engine		
DC power source				Vehicle battery		
DC power consumption			W	<for DC24V vehicle> 420 (Motor terminal voltage 27V) <for DC12V vehicle> 420 (Motor terminal voltage 13.5V)		<Measurement condition> JIS B8614
Defroster				Non-condensing hot gas defrost type (Automatic timer or manual)		
Safety device				High pressure switch Fusible plug		
Total weight			kg	88	89	Excluding special part for each vehicle
Refrigeration unit	Type			TDJS35-1L$^{1}_{2}$		The fan characteristic is at motor terminal voltage of 27V for DC24V and motor terminal voltage of 13.5V at DC12V. (JIS B8614)
	Dimension		mm	W1585 x H695 x D470		
	Evaporator fan			ø 220 turbo fan & DC brush less fan motor x 2		
		Flow rate	m^3/h	1300		
		Revolution	min^{-1}	2450		
		Power	W	165		
	Air reach		m	9.6		
	Condenser fan			ø 270 propeller fan & DC fan motor with brush x 2		
		Flow rate	m^3/h	1510		
		Revolution	min^{-1}	2350		
		Power	W	165		
	Weight		kg	75.1		
Compressor	Type			CS90R6	CS90B1	Open 3D scroll
	Dimension		mm	ø 130 x L220	ø 130 x L220	
	Displacement		cc/rev	92	92	
	Clutch outer dia.		mm	ø 95.0	ø 126.7	
	Clutch power		W	40	40	
	Belt			Ribbed belt PK6-rib x 1	V belt B type x 1	
	Weight		kg	6.7	7.1	Including magnet clutch
Accessory weight			kg	6.4		

TDJS50DAE

Item \ Type				TDJS50DAE-1L2NB6S	TDJS50DAE-1L2NDVS	Remarks
Inside temperature (RT)			°C	−30 ~ +30		
Ambient temperature (AT)			°C	−10 ~ +40		
Cooling capacity Engine drive (AT=35°C)	RT=10°C		W (kcal/h)	6400 (5500)	6500 (5590)	Compressor revolution Nc=2850 min^{-1} (Ribbed belt) Nc=2050 min^{-1} (V belt) (Equivalent vehicle speed 40km/h)
	RT= 0°C			5000 (4300)	5150 (4430)	
	RT=−18°C			2900 (2490)	3000 (2580)	
	RT=−25°C			2300 (1980)	2350 (2020)	
Refrigerant	Name			R404A		
	Charge amount		kg	2.0		
Refrigeration oil	Name			Nippon Oil Corporation (ENEOS) Diamond Freeze MA32R		
	Charge volume		cc	600		Including additional oil of 500 cc
Compressor driving method				Belt drive by vehicle engine		
DC power source				Vehicle battery		
DC power consumption			W	<for DC24V vehicle> 410 (Motor terminal voltage 27V)		<Measurement condition> JIS B8614
Defroster				Non-condensing hot gas defrost type (Automatic timer or manual)		
Safety device				High pressure switch Fusible plug		
Total weight			kg	101	104	Excluding special part for each vehicle
Refrigeration unit	Type			TDJS50-1L2		The fan characteristic is at motor terminal voltage of 27V. (JIS B8614)
	Dimension		mm	W1585 x H695 x D530		
	Evaporator fan			ø 220 turbo fan & DC brush less fan motor x 2		
		Flow rate	m^3/h	1270		
		Revolution	min^{-1}	2450		
		Power	W	165		
	Air reach		m	9.2		
	Condenser fan			ø 320 propeller fan & DC brush less fan motor x 2		
		Flow rate	m^3/h	1760		
		Revolution	min^{-1}	2100		
		Power	W	155		
	Weight		kg	86.9		
Compressor	Type			CS90R6	CS150B1	Open 3D scroll
	Dimension		mm	ø 130 x L220	ø 140 x L250	
	Displacement		cc/rev	92	144.5	
	Clutch outer dia.		mm	ø 95.0	ø 132.7	
	Clutch power		W	40	43	
	Belt			Ribbed belt PK6-rib x 1	V belt B type x 1	
	Weight		kg	6.7	9.3	Including magnet clutch
Accessory weight			kg	7.3		

TDJS70DZAE−CS90E compressor

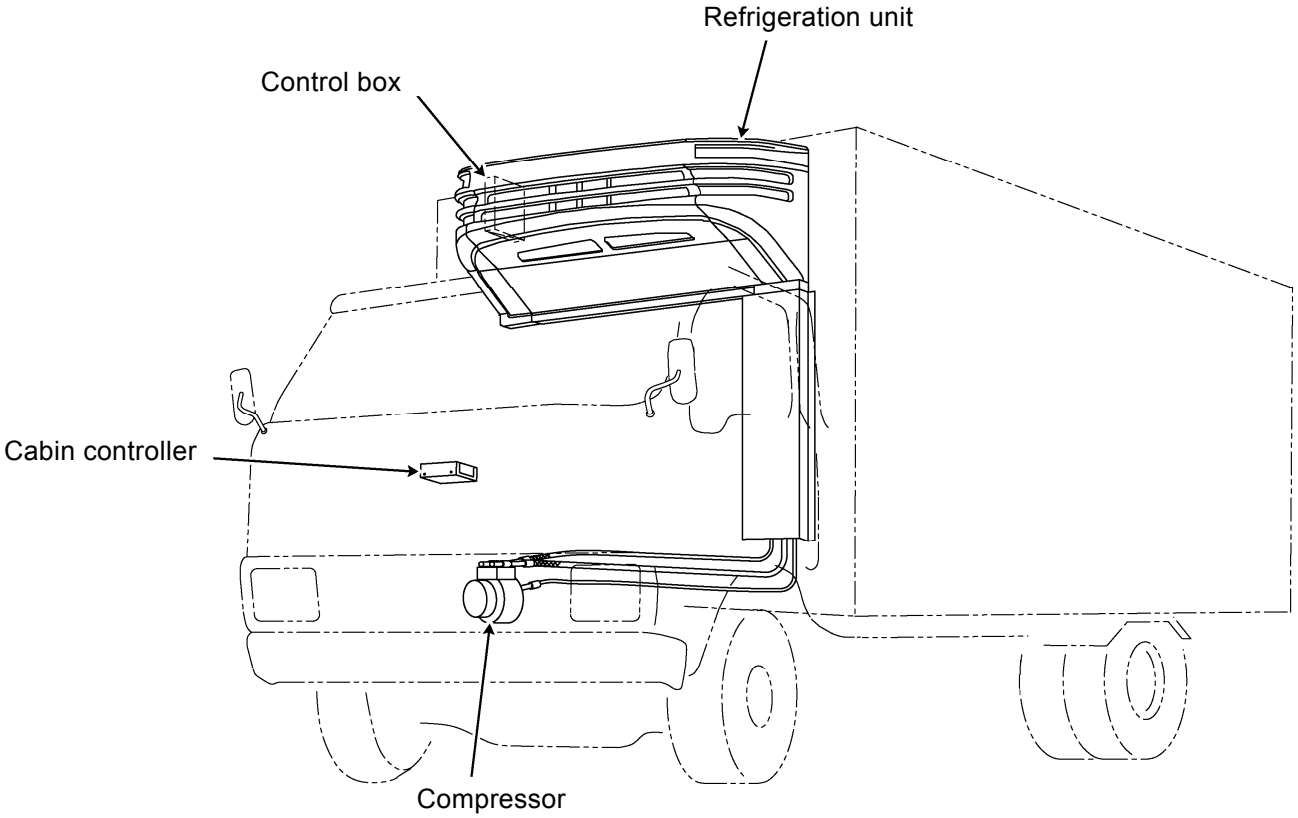
Item \ Type				TDJS70DZAE-1L2NC6S TDJS70DZAE-1L2NC7S	Remarks
Inside temperature (RT)			°C	−30 ~ +30	
Ambient temperature (AT)			°C	−10 ~ +40	
Cooling capacity Engine drive (AT=35°C)	RT=10°C		W (kcal/h)	8200 (7050)	Compressor revolution Nc=2950 min^{-1} (Equivalent vehicle speed 40km/h)
	RT= 0°C			6700 (5760)	
	RT=−18°C			3900 (3350)	
	RT=−25°C			2900 (2490)	
Refrigerant	Name			R404A	
	Charge amount		kg	2.8	
Refrigeration oil	Name			Nippon Oil Corporation (ENEOS) Diamond Freeze MA32R	
	Charge volume		cc	600	Including additional oil of 500 cc
Compressor driving method				Belt drive by vehicle engine	
DC power source				Vehicle battery	
DC power consumption			W	690 <for DC24V vehicle>	<Measurement condition> Motor terminal voltage: 27V (JIS B 8614)
Defroster				Non-condensing hot gas defrost type (Automatic timer or manual)	
Safety device				High pressure switch Fusible plug	
Total weight			kg	126	Excluding special part for each vehicle
Refrigeration unit	Type			TDJS70-1L2	The fan characteristic is at motor terminal voltage of DC27V (JIS B 8614)
	Dimension		mm	W1900 x H695 x D530	
	Evaporator fan			ø 220 turbo fan & DC brush less fan motor x 4	
		Flow rate	m^3/h	1820	
		Revolution	min^{-1}	2450	
		Power	W	320	
	Air reach		m	11.9	
	Condenser fan			ø 320 propeller fan & DC brush less fan motor x 3	
		Flow rate	m^3/h	2810	
		Revolution	min^{-1}	2100	
		Power	W	235	
	Weight		kg	106.9	
Compressor	Type			CS90ER6/R7	Open 3D scroll
	Dimension		mm	ø 130 x L220	
	Displacement		cc/rev	92	
	Clutch outer dia.		mm	ø 95.0	
	Clutch power		W	40	
	Belt			Ribbed belt PK6-rib/PK7-rib x 1	
	Weight		kg	7.2	Including magnet clutch
Accessory weight			kg	11.5	

TDJS70DZAE−CS150E compressor

Item \ Type				TDJS70DZAE-1L2NE6S TDJS70DZAE-1L2NE7S	TDJS70DZAE-1L2NEVS	Remarks
Inside temperature (RT)			°C	−30 ~ +30		
Ambient temperature (AT)			°C	−10 ~ +40		
Cooling capacity Engine drive (AT=35°C)	RT=10°C		W (kcal/h)	8600 (7400)	8200 (7050)	Compressor revolution Nc=2450 min^{-1} (Ribbed belt) Nc=2100 min^{-1} (V belt) (Equivalent vehicle speed 40km/h)
	RT= 0°C			7000 (6020)	6700 (5760)	
	RT=−18°C			4200 (3610)	3900 (3350)	
	RT=−25°C			3200 (2750)	2900 (2490)	
Refrigerant	Name			R404A		
	Charge amount		kg	2.8		
Refrigeration oil	Name			Nippon Oil Corporation (ENEOS) Diamond Freeze MA32R		
	Charge volume		cc	600		Including additional oil of 500 cc
Compressor driving method				Belt drive by vehicle engine		
DC power source				Vehicle battery		
DC power consumption			W	690 <for DC24V vehicle>		<Measurement condition> Motor terminal voltage: 27V (JIS B 8614)
Defroster				Non-condensing hot gas defrost type (Automatic timer or manual)		
Safety device				High pressure switch Fusible plug		
Total weight			kg	128		Excluding special part for each vehicle
Refrigeration unit	Type			TDJS70-1L2		The fan characteristic is at motor terminal voltage of DC27V (JIS B 8614)
	Dimension		mm	W1900 x H695 x D530		
	Evaporator fan			ø 220 turbo fan & DC brush less fan motor x 4		
		Flow rate	m^3/h	1820		
		Revolution	min^{-1}	2450		
		Power	W	320		
	Air reach		m	11.9		
	Condenser fan			ø 320 propeller fan & DC brush less fan motor x 3		
		Flow rate	m^3/h	2810		
		Revolution	min^{-1}	2100		
		Power	W	235		
	Weight		kg	106.9		
Compressor	Type			CS150ER6/R7	CS150EB1	Open 3D scroll
	Dimension		mm	ø 140 x L250	ø 140 x L250	
	Displacement		cc/rev	144.5	144.5	
	Clutch outer dia.		mm	ø 115.0	ø 132.7	
	Clutch power		W	46	46	
	Belt			Ribbed belt PK6-rib/PK7-rib x 1	V belt B type x 1	
	Weight		kg	9.8	9.9	Including magnet clutch
Accessory weight			kg	11.5		

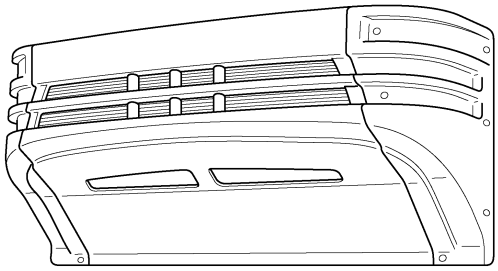
4. Name of Each Component

■ Integral type, single compartment



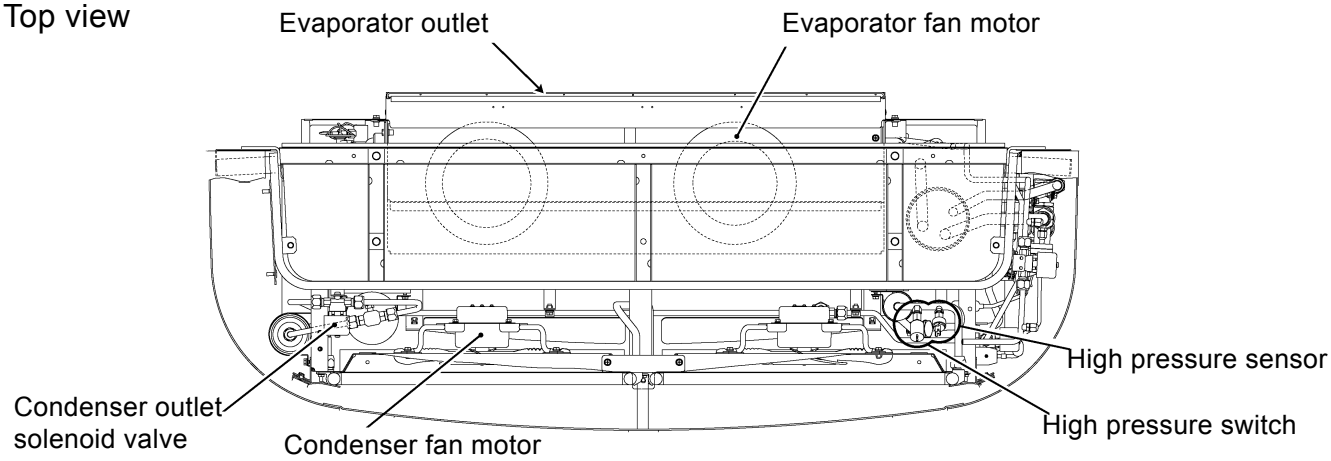
(1) Refrigeration unit

- TDJS50DAE

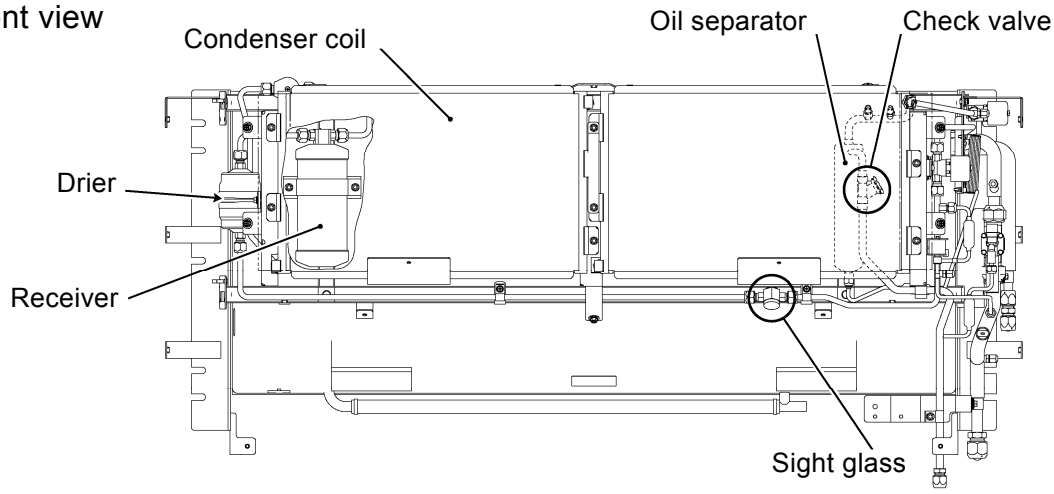


Note: Configulation and specification may differ slightly depending on the unit type.

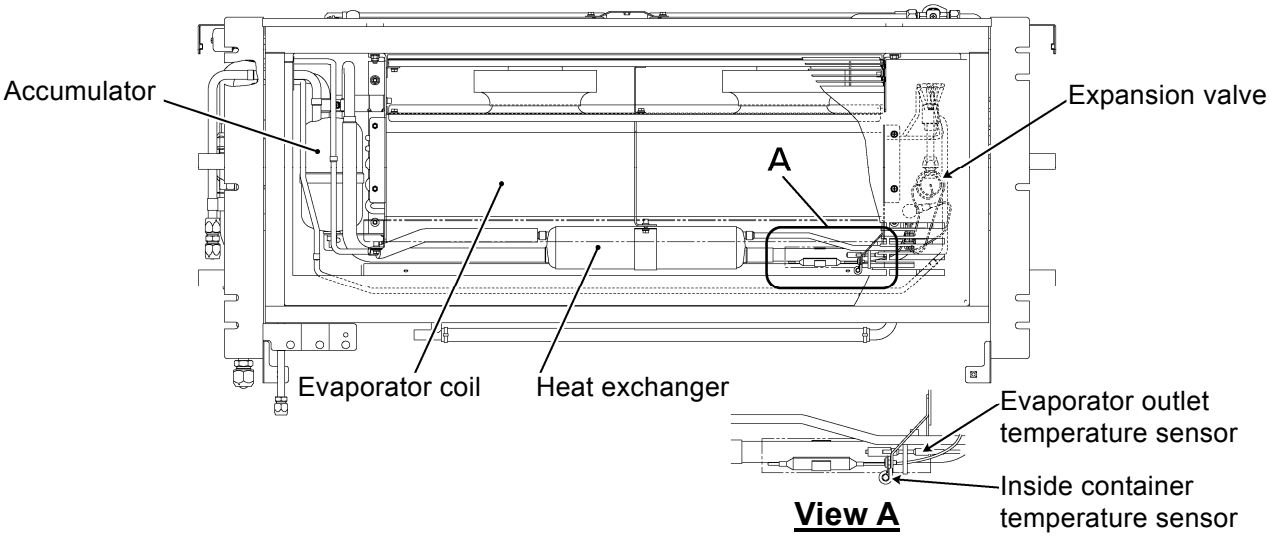
■ Top view



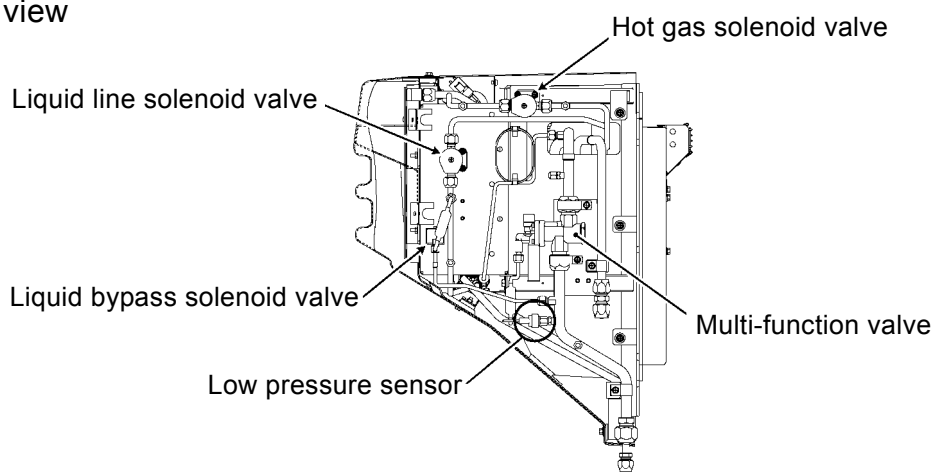
■ Front view



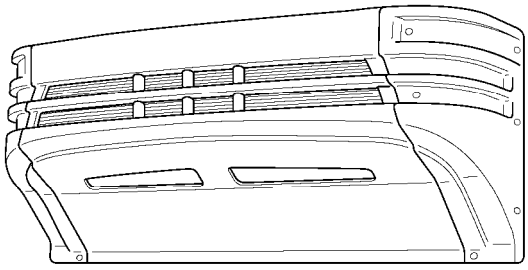
■ Rear view



■ Left side view

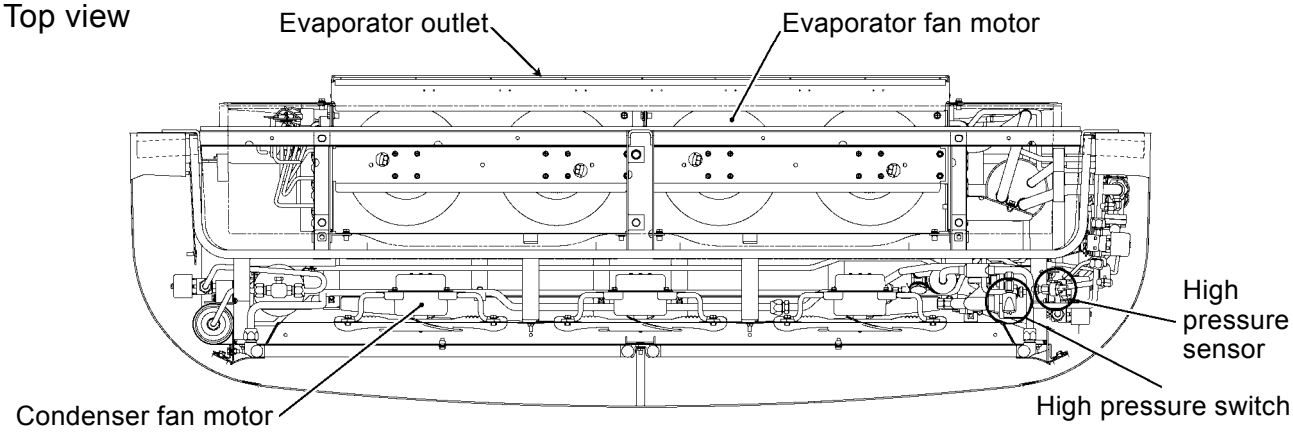


- TDJS70DZAE

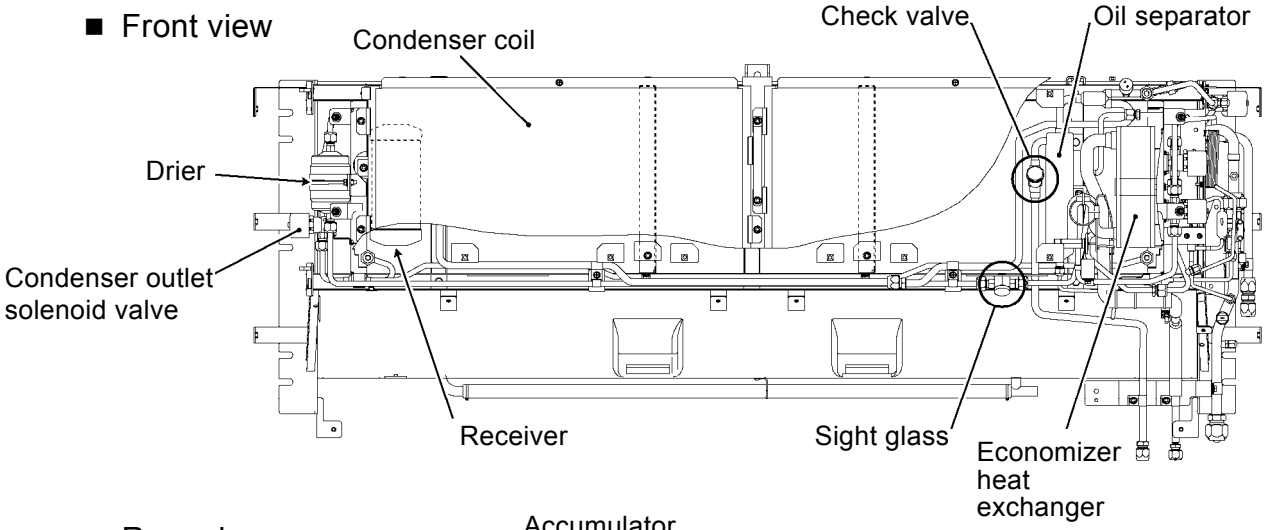


Note: Configulation and specification may differ slightly depending on the unit type.

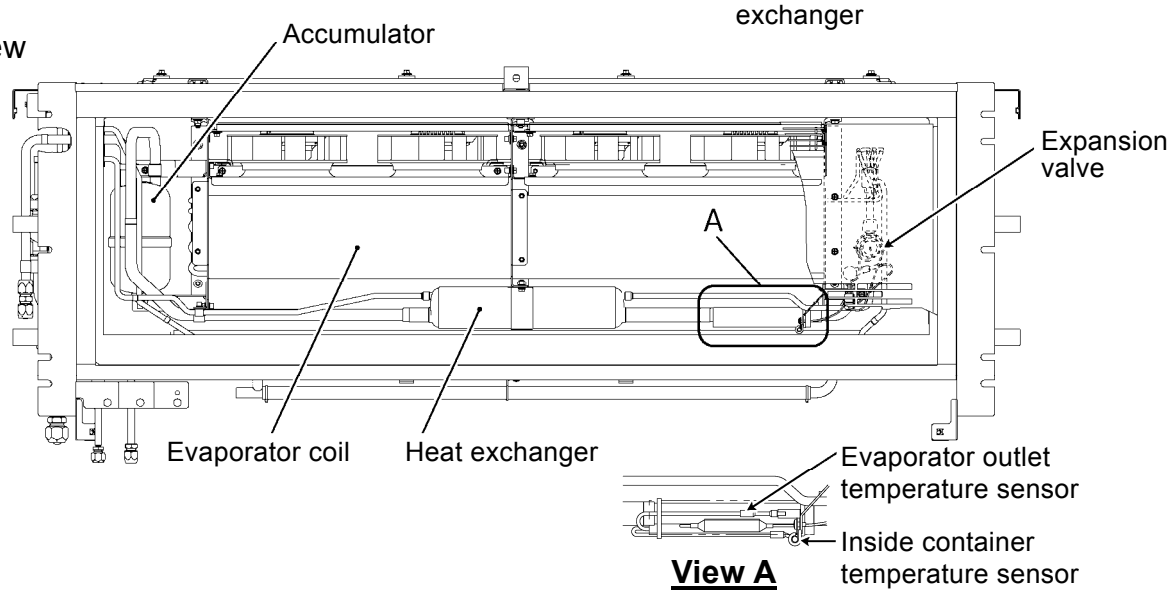
■ Top view



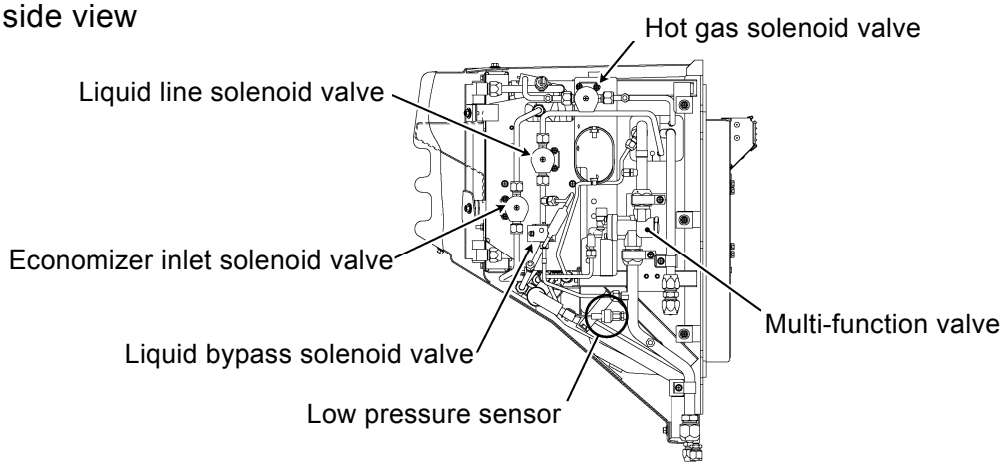
■ Front view



■ Rear view

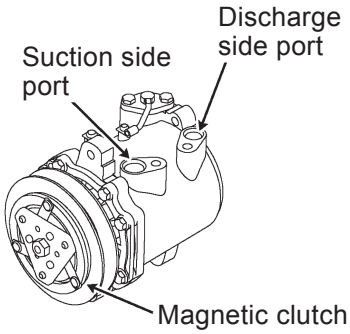


■ Left side view



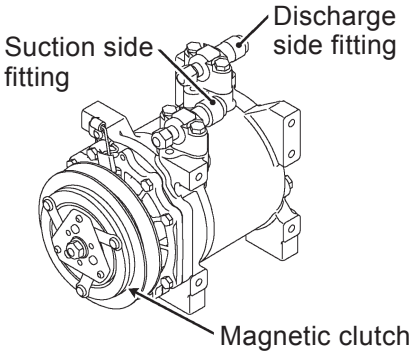
(2) Compressor

■ CS55



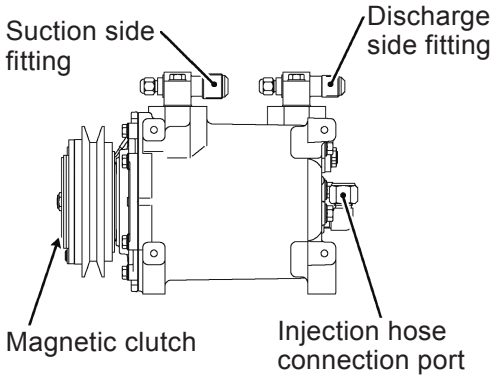
■ CSA90, 150

・CSA90



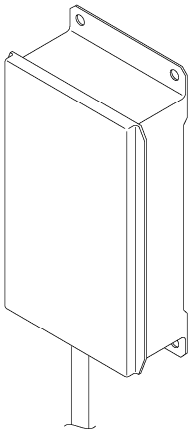
■ CSA90E, 150E ＊R

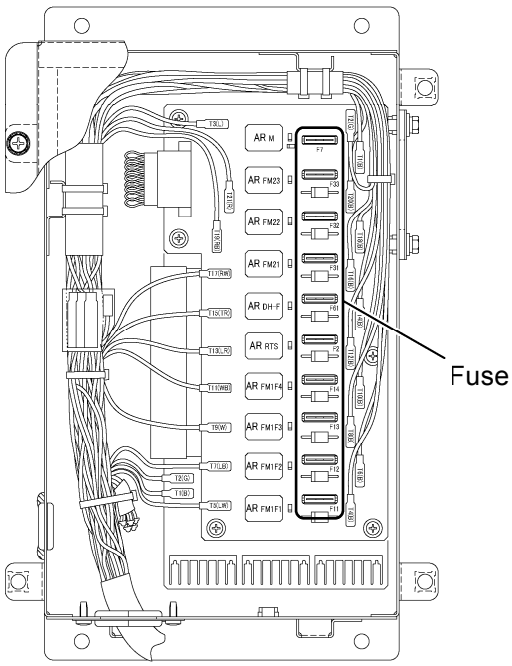
・CSA150E



Note: Configulation and specification may differ slightly depending on the unit type.

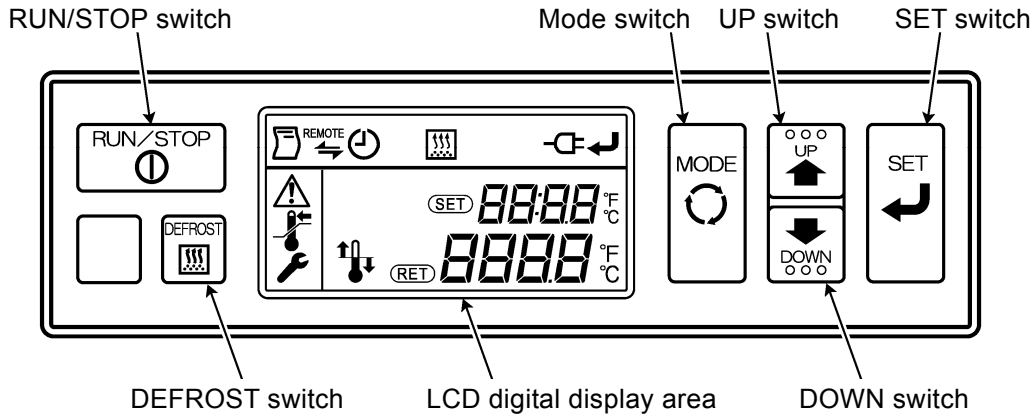
(3) Control box





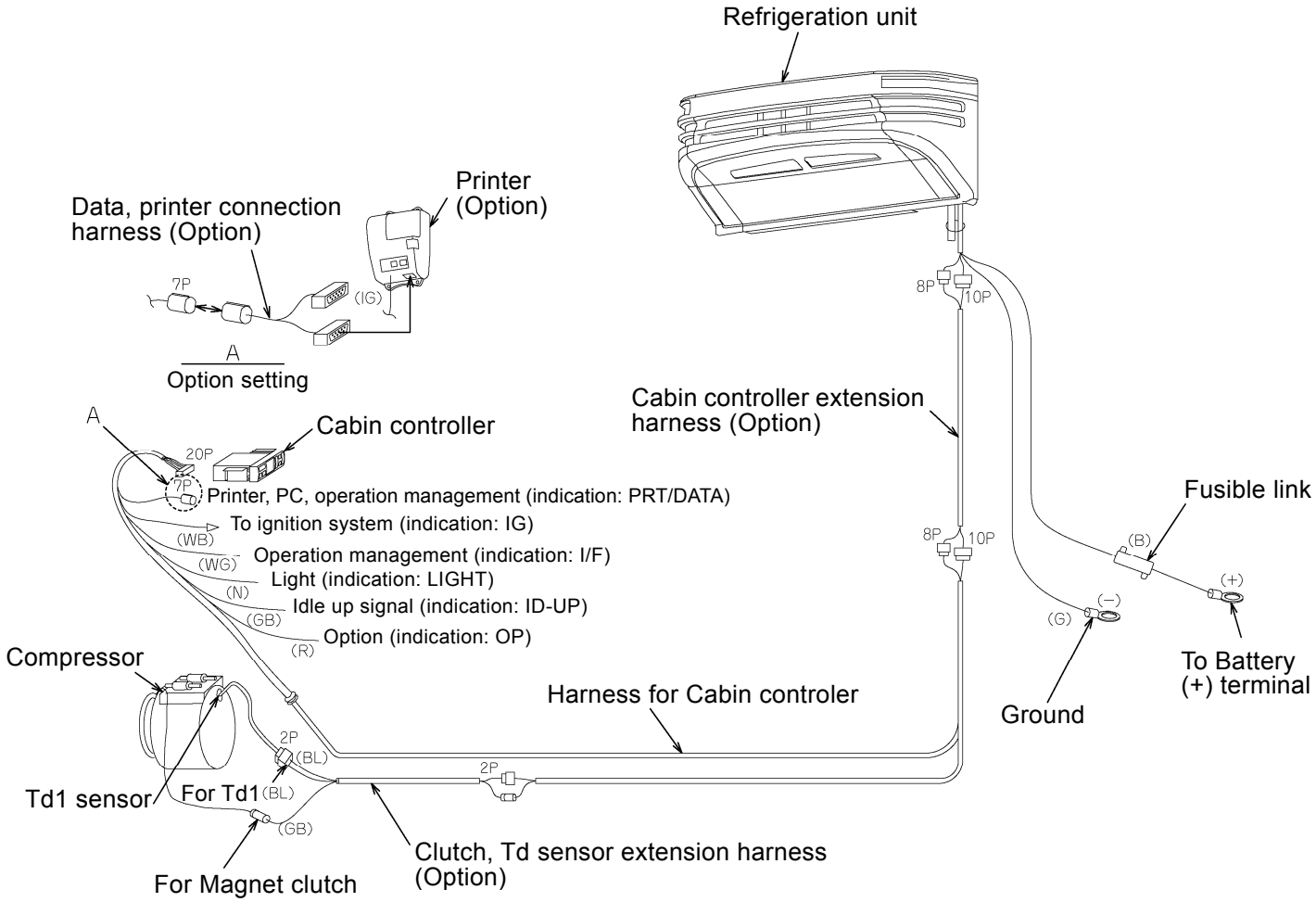
Note: Configulation and specification may differ slightly depending on the unit type.

(4) Cabin controller

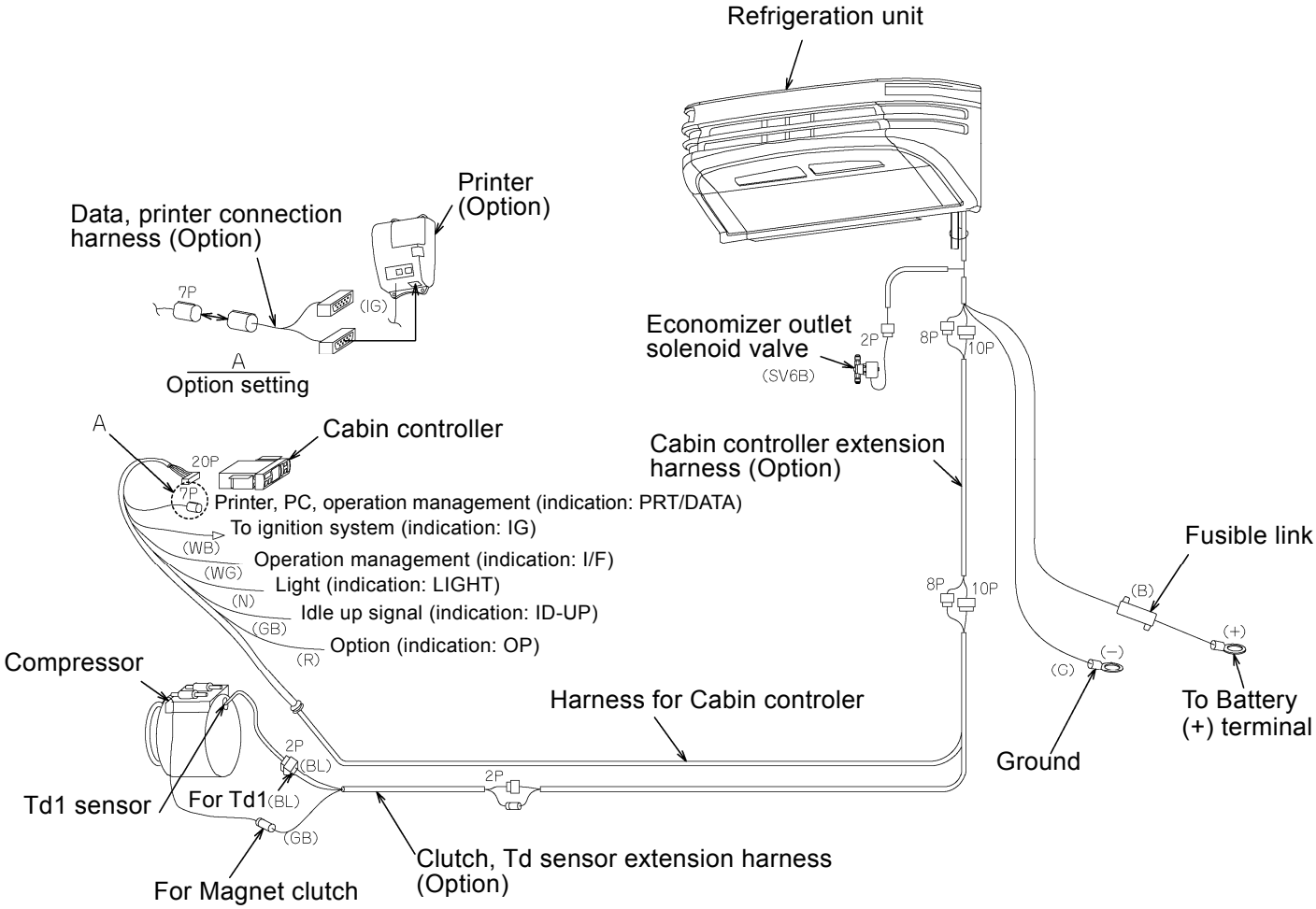


(5) Control system

- TDJS50DAE



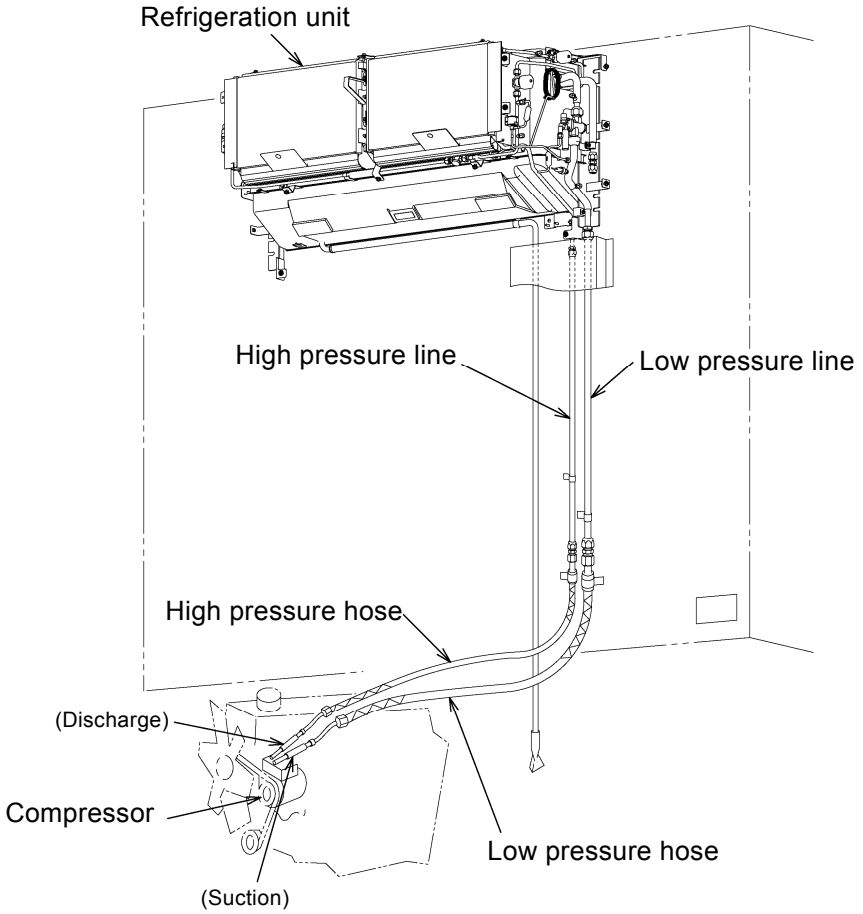
- TDJS70DZAE


Refrigeration unit
Printer
(Option)
Data, printer connection
harness (Option)
7P
(IG)
A
Option setting
Economizer outlet
solenoid valve
(SV6B)
2P
8P
10P
A
Cabin controller
20P
7P
Cabin controller extension
harness (Option)
Printer, PC, operation management (indication: PRT/DATA)
To ignition system (indication: IG)
(WB)
Operation management (indication: I/F)
(WG)
Light (indication: LIGHT)
(N)
Idle up signal (indication: ID-UP)
(GB)
Option (indication: OP)
(R)
Fusible link
(B)
(+)
(−)
(G)
To Battery
(+) terminal
Ground
Compressor
Harness for Cabin controler
2P
(BL)
2P
Td1 sensor
For Td1
(BL)
(GB)
For Magnet clutch
Clutch, Td sensor extension harness
(Option)

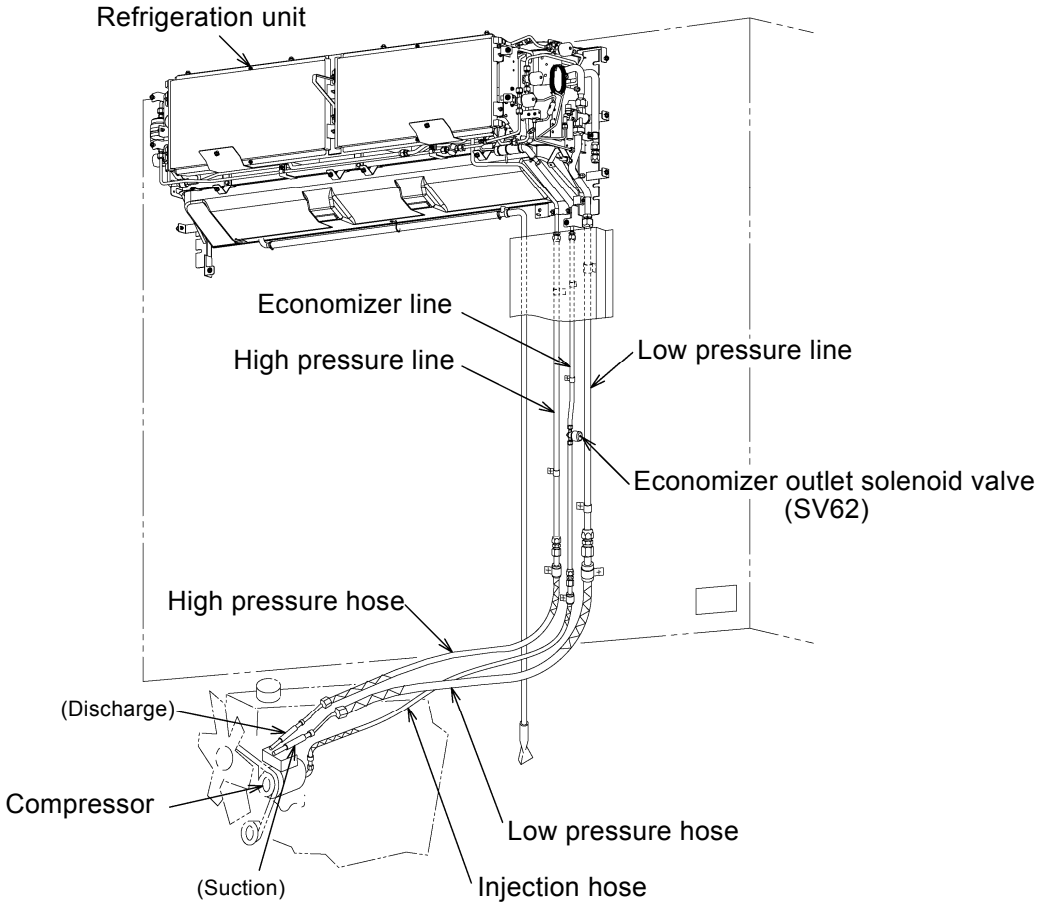
5. Refrigerant Piping System

5.1 Refrigerant piping system drawing

- TDJS50DAE



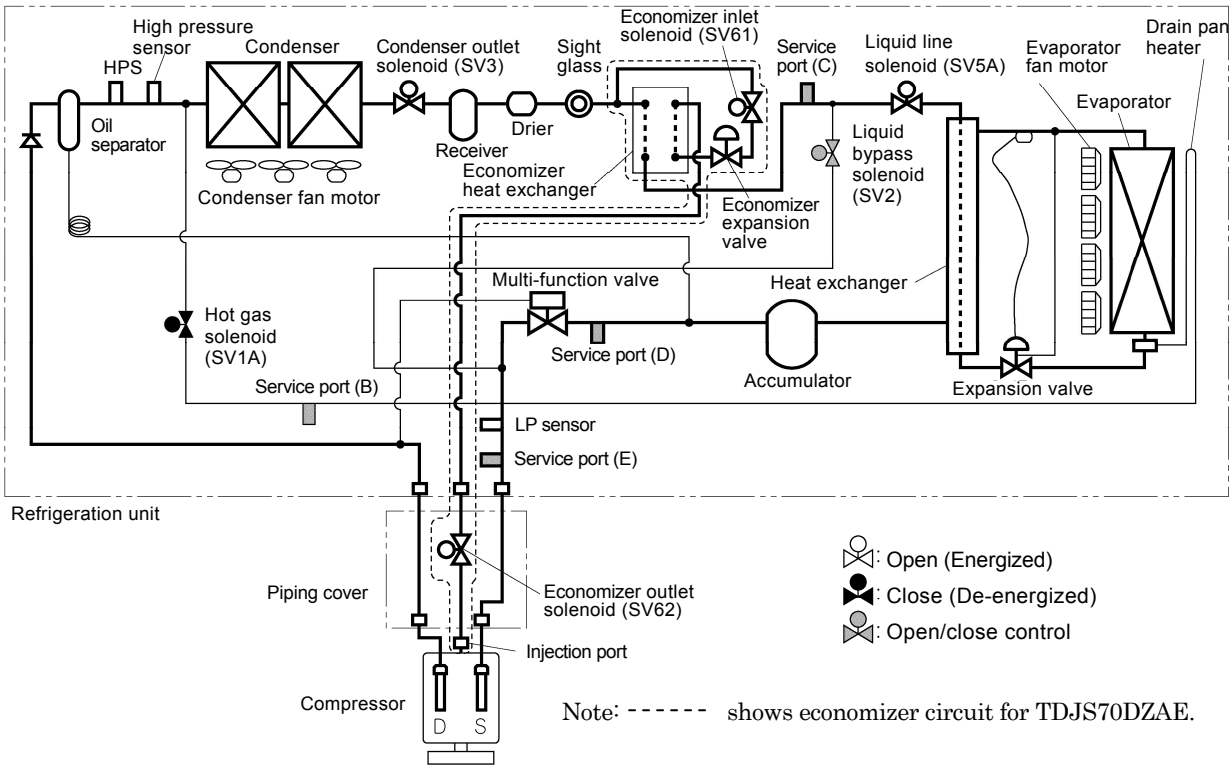
- TDJS70DZAE



5.2 Refrigerant cycle

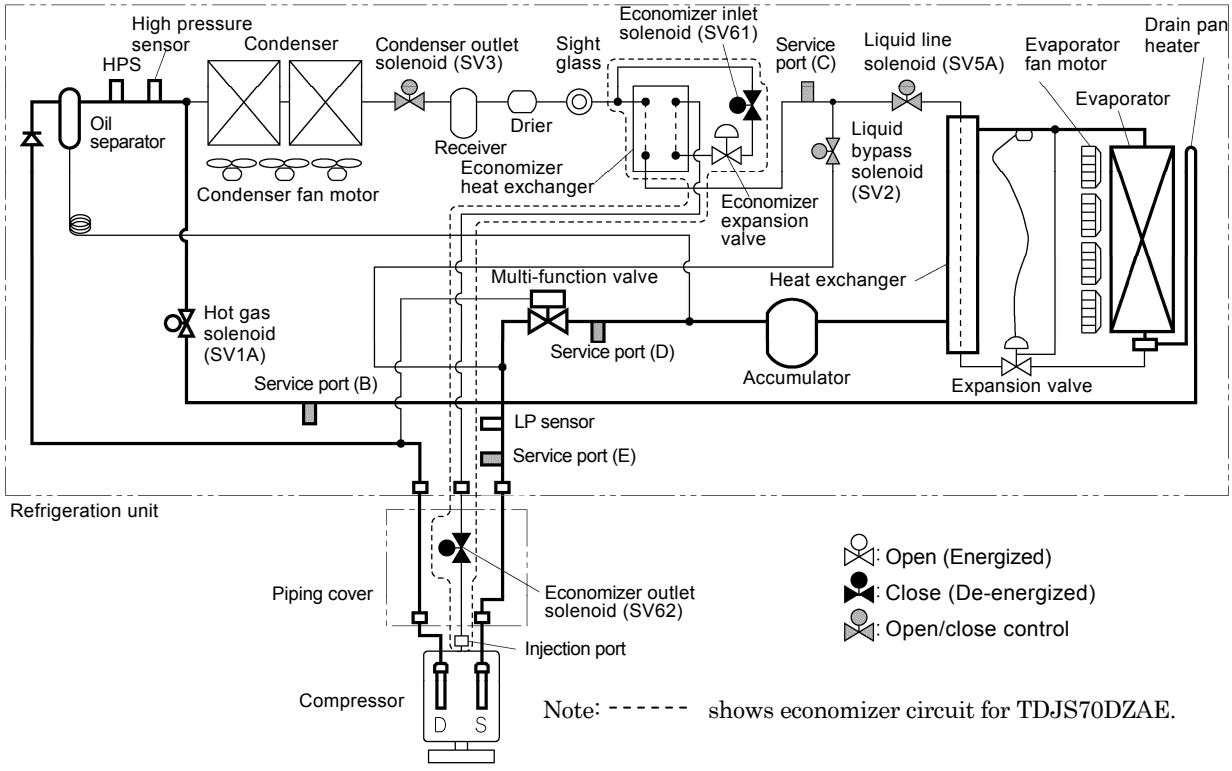
Following figures indicate refrigerant cycle of TDJS70DZAE (type 1).
TDJS35DAE and TDJS50DAE do not have economizer, compressor injection port and the circuit between them. Detail operation of solenoid valve is described in Section 8 Description of operation.

< Cooling cycle >



Note: ------ shows economizer circuit for TDJS70DZAE.

< Defrosting ・ heating cycle >

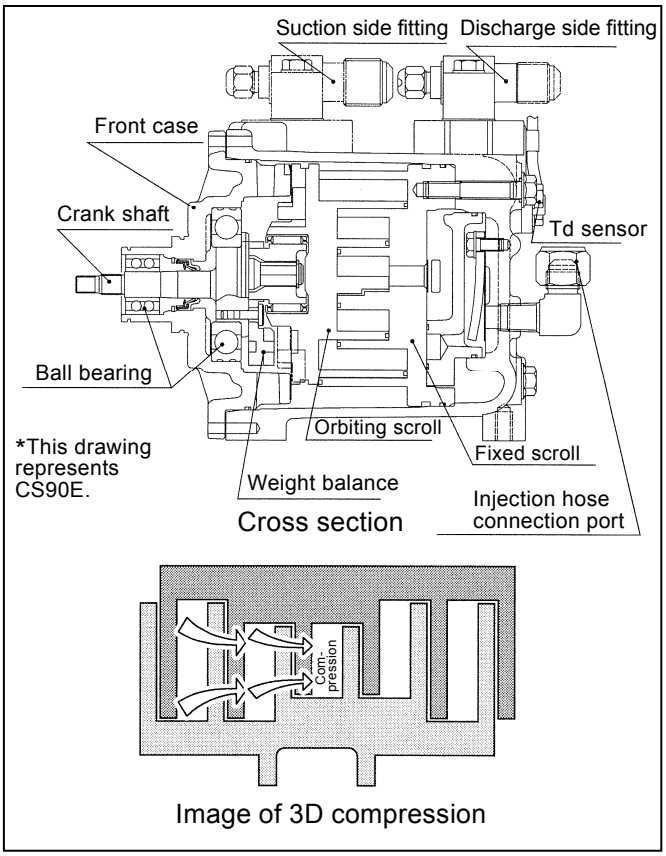


Note: ------ shows economizer circuit for TDJS70DZAE.

6. Description of Major Components

6.1 Compressor

This is a 3D scroll compressor compresses gas in 3 dimensional directions by adding axial direction to the conventional radial direction with the height of blade at center portion lower than peripheral portion. This is most suitable for low temperature product which requires high compression ratio and it realizes substantial miniaturization, high capacity, and high efficiency.



Compressor

< CS55 >

Name	Specifications
Model	Open 3D scroll CS55R6
Displacement	52 cc/rev
Compressor oil	Nippon Oil Corporation Diamond Freeze MA32R
Dimensions	ø 113 x L179
Weight	4.0kg (including Magnet clutch)

< CSA90, CSA90E > *R

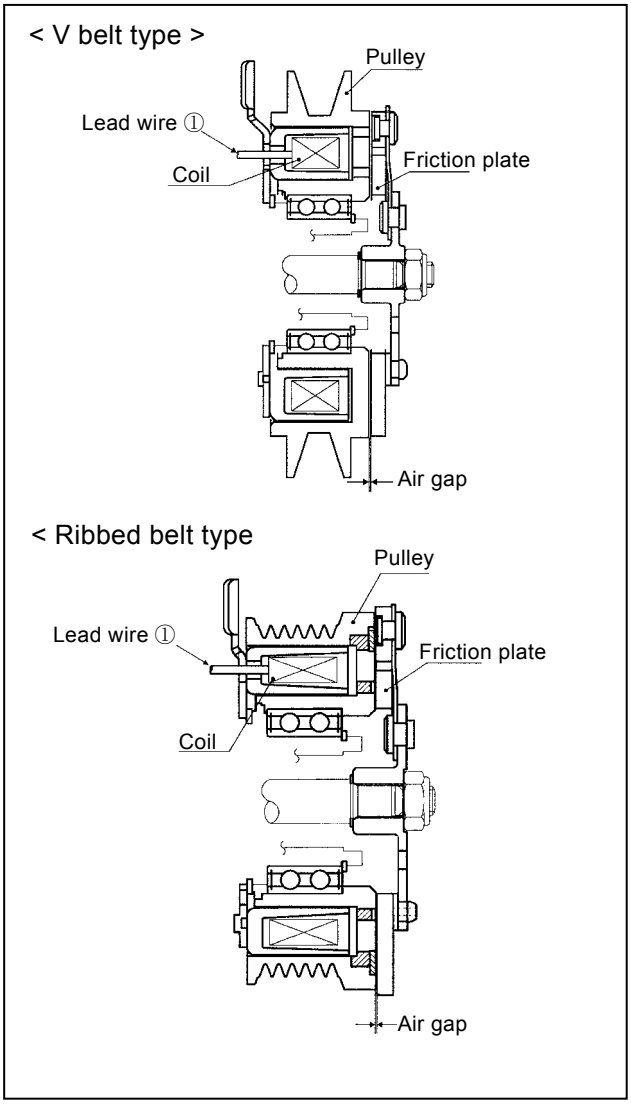
Name	Specifications
Model	Open 3D scroll CSA90R6/R7/B1, CSA90E R6/R7/B1
Displacement	92 cc/rev
Compressor oil	Nippon Oil Corporation Diamond Freeze MA32R
Dimensions	ø 130 x L220
Weight	Ribbed belt CSA90:6.7kg, CSA90E:7.2kg V belt CSA90:7.1kg, CSA90E:7.6kg (including Magnet clutch)

< CSA150, CSA150E > *R

Name	Specifications
Model	Open 3D scroll CSA150R6/R7/B1, CSA150E R6/R7/B1
Displacement	144.5 cc/rev
Compressor oil	Nippon Oil Corporation Diamond Freeze MA32R
Dimensions	ø 140 x L250
Weight	Ribbed belt CSA150:9.2kg, CSA150E:9.8kg V belt CSA150:9.4kg, CSA150E:9.9kg (including Magnet clutch)

6.2 Magnet clutch

The magnet clutch is installed on the crank shaft of the compressor, and turns on and off the compressor according to the signal from the thermostat. Two types of belt, V belt and ribbed belt (flat belt) can be used for magnet clutch.



Magnet clutch

< For CS55 compressor >

	V belt		Ribbed belt	
Voltage	12V	24V	12V	24V
Power consumption	36W	44W	36W	44W
Static torque	15.68 N·m (1.6 kgf·m)			
Direction of revolution	Right			
Weight	1.44kg		1.16kg	

< For CSA90, CSA90E compressor > ＊R

	V belt		Ribbed belt	
Voltage	12V	24V	12V	24V
Power consumption	50W	44W	52W	40W
Static torque	26.5 N·m (2.7 kgf·m)			
Direction of revolution	Right			
Weight	1.94kg		1.54kg (PK6) 1.51kg (PK7)	

< For CSA150, CSA150E compressor> ＊R

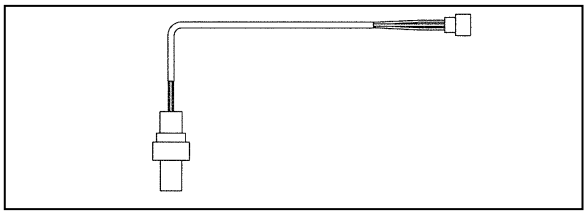
	V belt		Ribbed belt	
Voltage	12V	24V	12V	24V
Power consumption	46W			
Static torque	33.32 N·m (3.4 kgf·m)			
Direction of revolution	Right			
Weight	2.37kg		2.29kg (PK6) 2.28kg (PK7)	

How to determine defective or not defective: When the battery voltage is applied between the lead ① and the ground wire of the main body, the compressor will rotate if the pulley and the friction plate stick together (it clicks). If it will not rotate even when voltage is applied, it is defective. Measure by a tester the continuity between the lead ① and the ground of the main body, and it is normal if there is continuity and defective if there is no continuity due to disconnection of the coil. When sound is heard, it is defective due to wear of the bearing. If the magnet clutch is defective, replace its assembly.

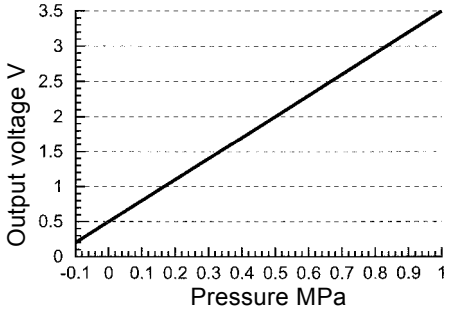
Measuring of air gap
For ribbed belt of CS55/CSA90/CSA90E compressors: 0.3 ~ 0.5 mm ＊R
For V belt of CSA90/CSA90E compressors and for CSA150/CSA150E compressors: 0.3 ~ 0.6 mm Otherwise, replace. ＊R

6.3 Low pressure sensor (LP)

It detects low pressure and controls the unit.



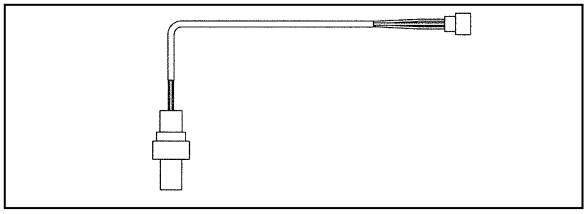
Low pressure sensor



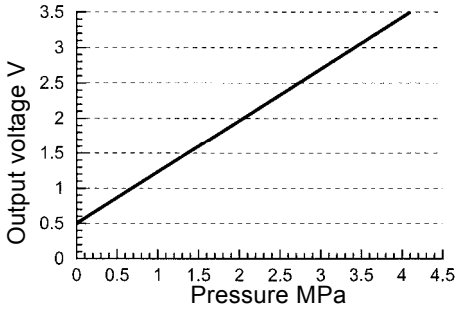
Low pressure sensor characteristic

6.4 High pressure sensor (HP)

It detects high pressure and controls the unit.



High pressure sensor



High pressure sensor characteristic

6.5 Evaporator outlet temperature sensor (EVT)

This sensor detects the gas temperature at the outlet of the evaporator to control the start or stop timing of defrosting and other control actions. ＊R

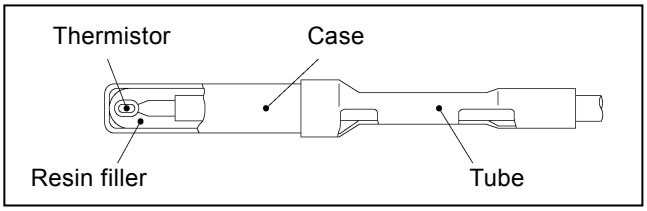
Defrost termination temperature: 15.0 ± 1.5 °C
(Defrost timer counting condition: 5.0 ± 1.5 °C or below)

How to determine defective or not defective:

(1) Measure continuity of the lead wire of thermister sensor by removing the wire at the connector.

(2) Evaluate the resistance value by referencing the temperature/resistance characteristics table of the thermister.

(3) Replace the sensor by removing it at the connector if the resistance deviation is large.



Evaporator outlet temperature sensor

(Unit: kΩ)

°C	R min.	R nom.	R max.
−30	25.293	26.316	27.376
−20	15.125	15.572	16.031
−10	9.342	9.524	9.709
0	5.940	6.000	6.060
10	3.810	3.882	3.955
20	2.505	2.573	2.644
25	2.049	2.113	2.179
30	1.687	1.746	1.808
40	1.163	1.213	1.265
50	0.819	0.860	0.903

6.6 Inside container temperature sensor (TH)

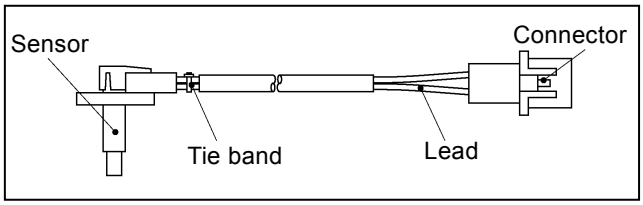
This sensor detects an inside container temperature (return air temperature) in order to keep it to a setting temperature by controlling the magnet clutch or the relay "ON" and "OFF".

The specifications of the sensor are the same with the evaporator outlet temperature sensor.

6.7 Discharge gas temperature sensor (TD)

This sensor detects the discharge gas temperature of the compressor and stops the refrigeration unit or opens the liquid bypass solenoid valve when the discharge gas temperature is getting high.

- When the temperature becomes higher than 140°C, it opens the liquid bypass solenoid valve and lowers the discharge temperature by refrigerant.
- When the temperature becomes higher than 145°C, it stops the refrigeration unit.



Discharge gas temperature sensor

Solenoid valve opens: Above 140°C
Solenoid valve closes: Below 130°C
Refrigeration unit stops: Above 145°C
Operation resumes: Below 130°C
(In detail, please refer to page 50.) *R

How to determine defective or not defective:
Measure the resistance value by removing the connector.

Resistance value in normal condition

200°C	0.430kΩ	100°C	5.228kΩ
175°C	0.738kΩ	25°C	80.470kΩ
115°C	3.352kΩ		

6.8 High pressure switch (HPS)

When the discharge pressure of the compressor becomes excessively high, the high pressure switch trips to stop the operation to prevent dangerous situation.

Setting value MPa (kgf/cm²)

CUT OUT	3.2 (32.5)
CUT IN	2.2 (22.5) (Automatic resume)

Setting is not adjustable. If defective, replace its assembly.

How to determine defective or not defective:
Measure the continuity between the lead wires during unit stops, if there is continuity it is normal and if not it is defective.

6.9 Solenoid valves

(1) Hot gas solenoid, condenser outlet solenoid, liquid line solenoid, economizer inlet solenoid, economizer outlet solenoid

(i) Hot gas solenoid valve

It is installed in order to flow hot gas refrigerant into the evaporator side when heating or defrosting. When cooling, the valve is closed.

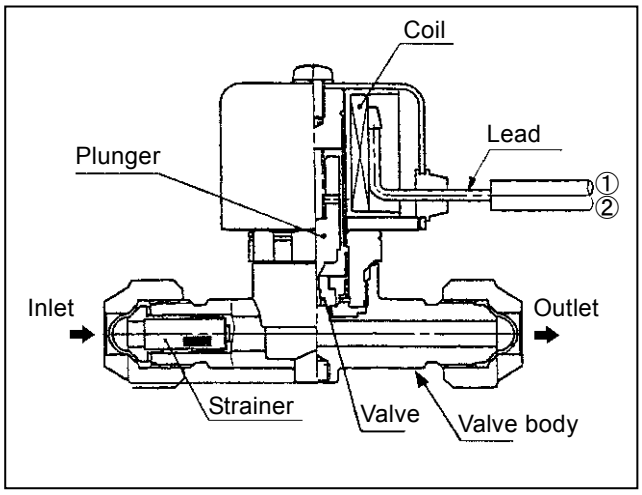
(ii) Condenser outlet solenoid, liquid line solenoid

・ It is installed to flow refrigerant into the condenser side by opening during cooling operation.

・ It normally closes during heating and defrosting operation but it opens during protective controls.

(iii) Economizer inlet solenoid, economizer outlet solenoid (TDJS70DZAE only)

・ It is installed to flow refrigerant into the economizer circuit by opening during cooling operation.



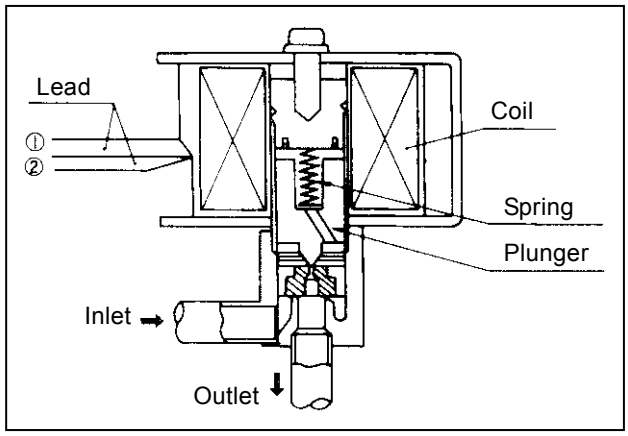
Hot gas solenoid, condenser outlet solenoid, liquid line solenoid, economizer inlet solenoid, economizer outlet solenoid

How to determine defective or not defective:
When continuity of the lead between ① and ② is measured, the coil is normal if there is continuity and if not it is defective.
If the temperatures at the inlet and outlet of refrigerant are different before the coil is electrified and if the temperatures become the same after the coil is electrified, the plunger is operating normally. If the temperatures are different the plunger is stuck.

Easy way to find out the problem:
When you electrify the coil with your hand touching the solenoid valve, it is normal if you feel a shock as the plunger goes up with a click sound.

(2) Liquid bypass solenoid
When the discharge temperature of compressor becomes higher than 140°C, this solenoid opens to prevent discharge temperature from getting high.

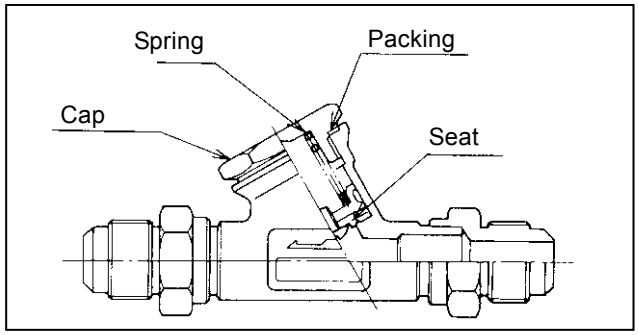
How to determine defective or not defective:
Refer the explanation for hot gas solenoid since the method is same.



Liquid bypass solenoid

6.10 Check valve

It is installed to prevent the refrigerant from flowing back ward.



Check valve

How to determine defective or not defective:
Make a judgment by the difference of temperature at the inlet and outlet of the check valve and replace if it is leaking.

6.11 Multi-function valve

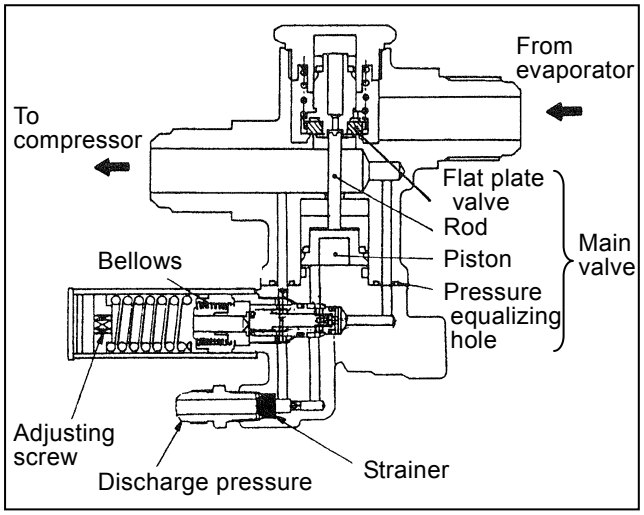
The multi-function valve features the following.

(1) At the abnormally high pressure, the suction pressure is controlled to allow the unit to operate without any abnormal stop (high pressure cutting).

(2) Since the main valve of the multi-function valve is closed when the unit is stopped, the liquid does not return. This eliminates a danger of liquid compression to improve the reliability of the compressor.

(3) The pressure equalizing hole of the multi-function valve makes the pressure difference early balanced soon after the unit is stopped. This will reduce the starting torque.

Factory setting pressure:
High pressure side: 2.94 $\pm$ 0.05 MPa
(30.0 $\pm$ 0.5 kgf/cm^2)



Multi-function valve

⚠ CAUTIONS

Do not adjust the multi-function valve at the site since it was factory set at shipment.

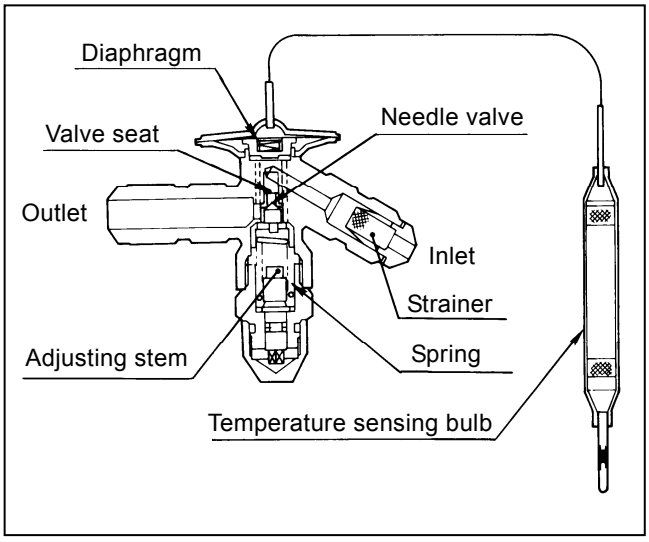
※Turning the adjusting screw will result in disturbance of setting to cause poor operation.

Do not apply any shock to the multi-function valve when installing it and connecting the pipe.

※ Otherwise, it will cause gas leakage or improper operation.

6.12 Expansion valve

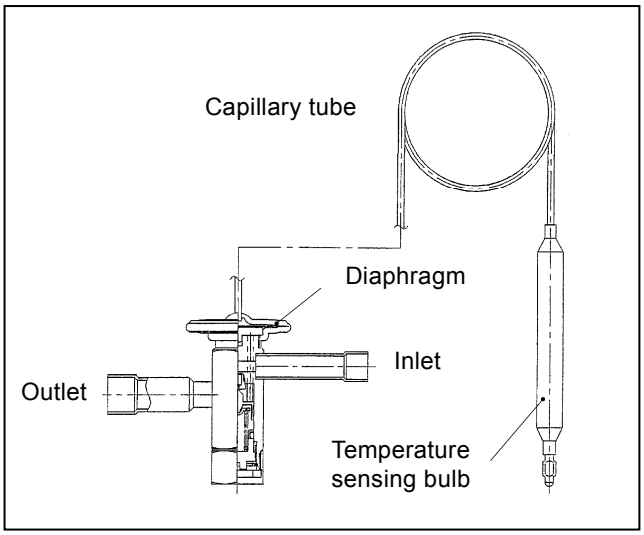
The expansion valve detects super-heat at the outlet of the evaporator so that the proper amount of refrigerant will flow into the evaporator.



Expansion valve

6.13 Economizer expansion valve (TDJS70DZAE only)

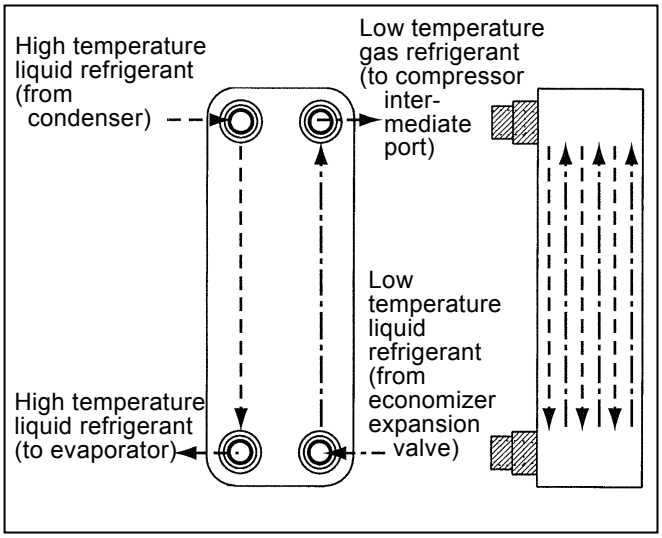
The economizer expansion valve detects super-heat at the outlet of the economizer heat exchanger so that the proper amount of refrigerant will flow into the economizer heat exchanger.



Economizer expansion valve

6.14 Economizer heat exchanger (TDJS70DZAE only)

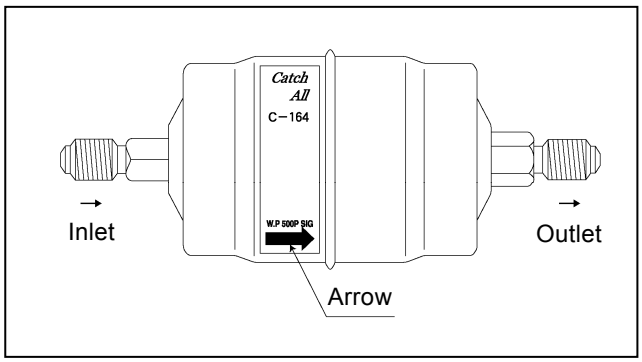
The refrigeration capacity is increased by exchanging the heat between the high temperature liquid refrigerant and low temperature liquid refrigerant.



Economizer heat exchanger

6.15 Drier

It eliminates moisture and foreign materials from the refrigerant. If the desiccant (molecular sieve) in the drier becomes unable to remove moisture (the check color of the sight glass becomes yellow), replace the drier assembly.

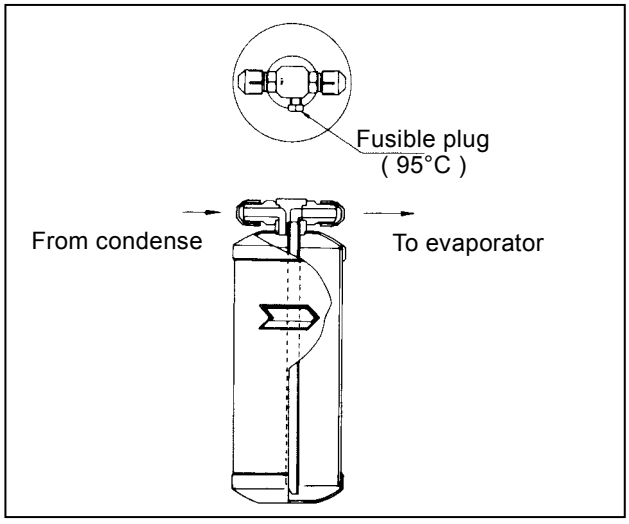


Drier

When installing the drier, pay attention to its direction and install it on the unit with the arrow mark aligned to the flow of refrigerant.
Exchange work must be done quickly since drier is highly absorbent.

6.16 Receiver

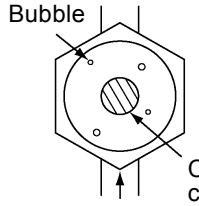
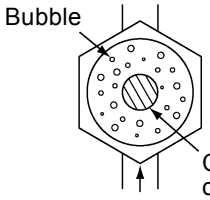
It reserves the liquid refrigerant which has been liquefied by the condenser.
The receiver has a fusible plug which will melt and discharge the refrigerant in order to prevent a danger due to unusual high temperature (95°C).
When the plug has been melted, replace it with a new one.



Receiver

6.17 Sight glass

It can judge the circulating amount of refrigerant and existence of water in the refrigerant.

	Amount of refrigerant is proper	Amount of refrigerant is short
Sight glass	 (A few bubbles are moving or no bubbles)	 (A lot of bubbles or it looks white when the refrigerant is extremely in shortage.)

Sight glass

If the refrigerant is short, repair the leaking place and then charge gas.

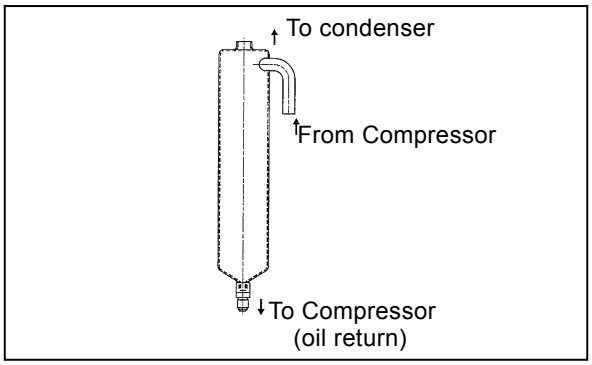
How to determine existence of water:

Check color	Judgment	Moisture in R404A(ppm) Refrigerant temperature	
		25°C	43°C
Green	Normal	20 or less	25 or less
Light green	Rather abnormal	20 ~ 70	25 ~ 100
Yellow	Abnormal	70 or more	100 or more

In case of yellow color, it is necessary to evacuate and to replace the drier.

6.18 Oil separator

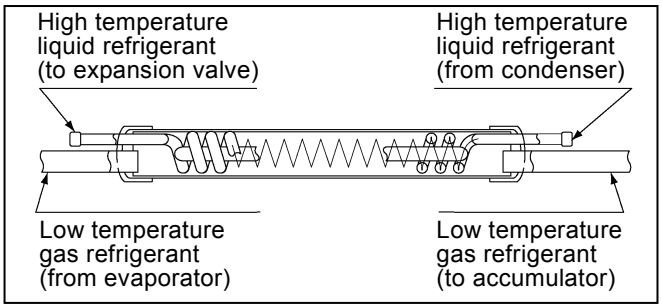
The oil separator separates gas refrigerant and oil discharged from compressor and prevents compressor from oil shortage and heat exchanger from efficiency decrease by returning proper amount of oil to the compressor through the oil return capillary.
Make sure to replace the oil return capillary when clogging of foreign matter is suspected where the compressor has to be changed.



Oil separator

6.19 Heat exchanger

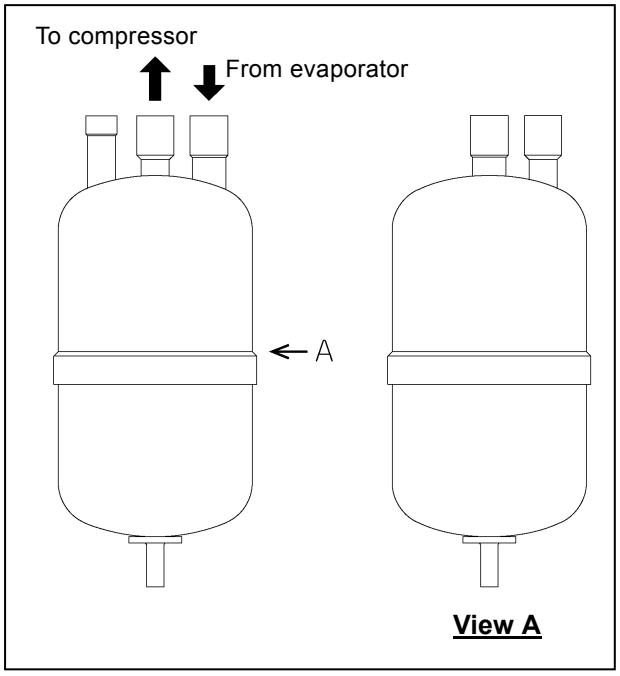
The refrigeration capacity is increased by exchanging the heat between the high temperature liquid refrigerant and low temperature gas refrigerant.



Heat exchanger

6.20 Accumulator

In order to prevent the liquid refrigerant from being sucked into the compressor, the liquid refrigerant and gas refrigerant are separated.



Accumulator

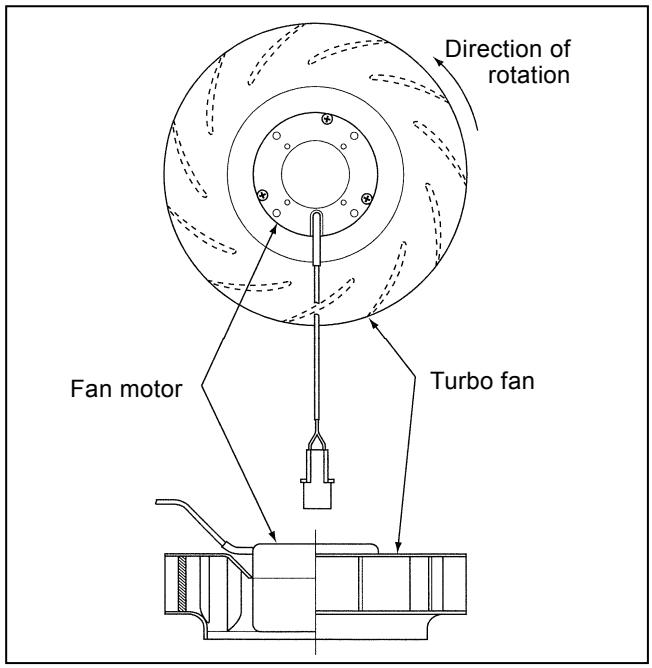
6.21 Fan and motor

(1) Evaporator fan and motor

A blushless type turbo fan and motor is adopted. It realizes characteristics of compact, light weight and energy saving.

Elemental characteristics (without load):

Voltage	Revolution	Pole	Current	Input
DC12V	2500 min^{-1}	2	4.8A	65W
DC24V			2.4A	



Turbo fan assembly

Note: The fan motor is press-fit to the turbo-fan. Replace it as an assembly of turbo-fan.

(2) Condenser fan and motor

A blushless type motor is adopted to realize large air flow and energy saving. (Except for TDJS35DAE)

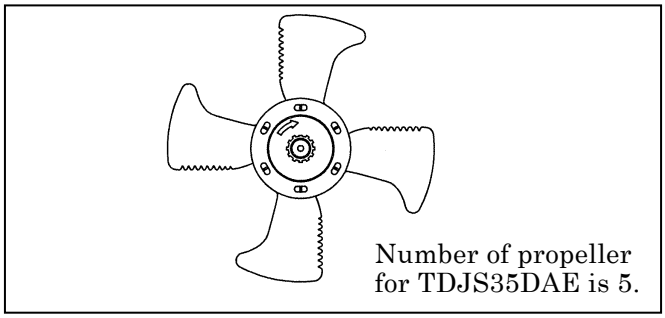
Elemental characteristics (without load):

Model	Voltage	Revo-lution	Pole	Cur-rent	Power	Propeller diameter
TDJS 35DAE	DC12V	2100 min^{-1}	2	6.0A	75W	ø 270
	DC24V			3.2A		
TDJS 50DAE	DC12V			5.2A	70W	ø 320
	DC24V			2.6A		
TDJS 70DZAE	DC12V			5.2A	70W	ø 320
	DC24V			2.6A		

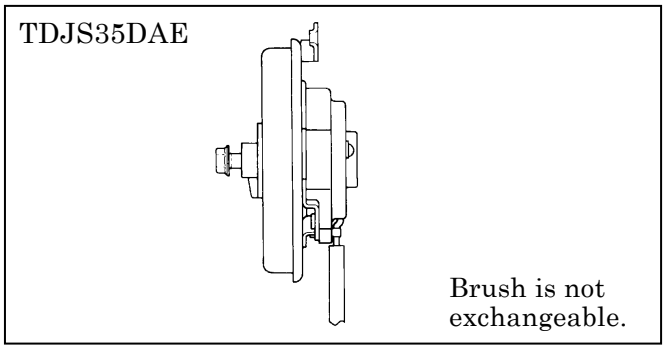
<Lock detection circuit>

When the motor is locked by sticking foreign materials, etc. the lock detection circuit shuts off the motor power circuit and prevent the motor from overheating. (TDJS35DAE)

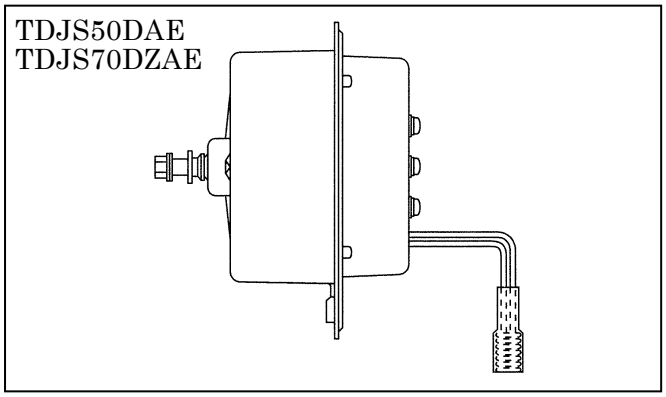
TDJS50DAE and TDJS70DZAE have the lock detection function inside the motor.



Propeller fan



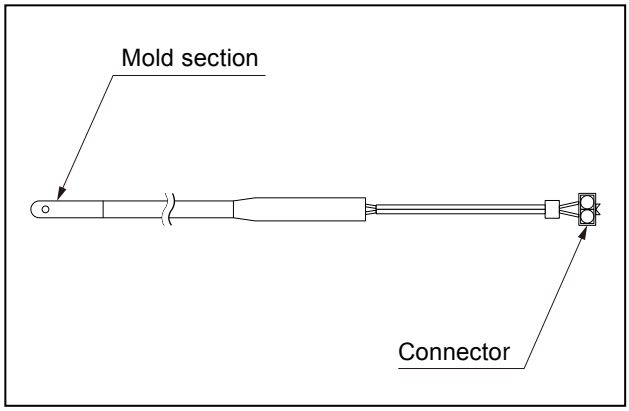
Motor with brush



Brushless motor

6.22 Drain hose heater (Option)

It is electrified when the defrost thermostat is "ON" and up to 10 minutes after the end of defrost. (Capacity 6 W)



Drain hose heater

7. Electric Wiring Diagram

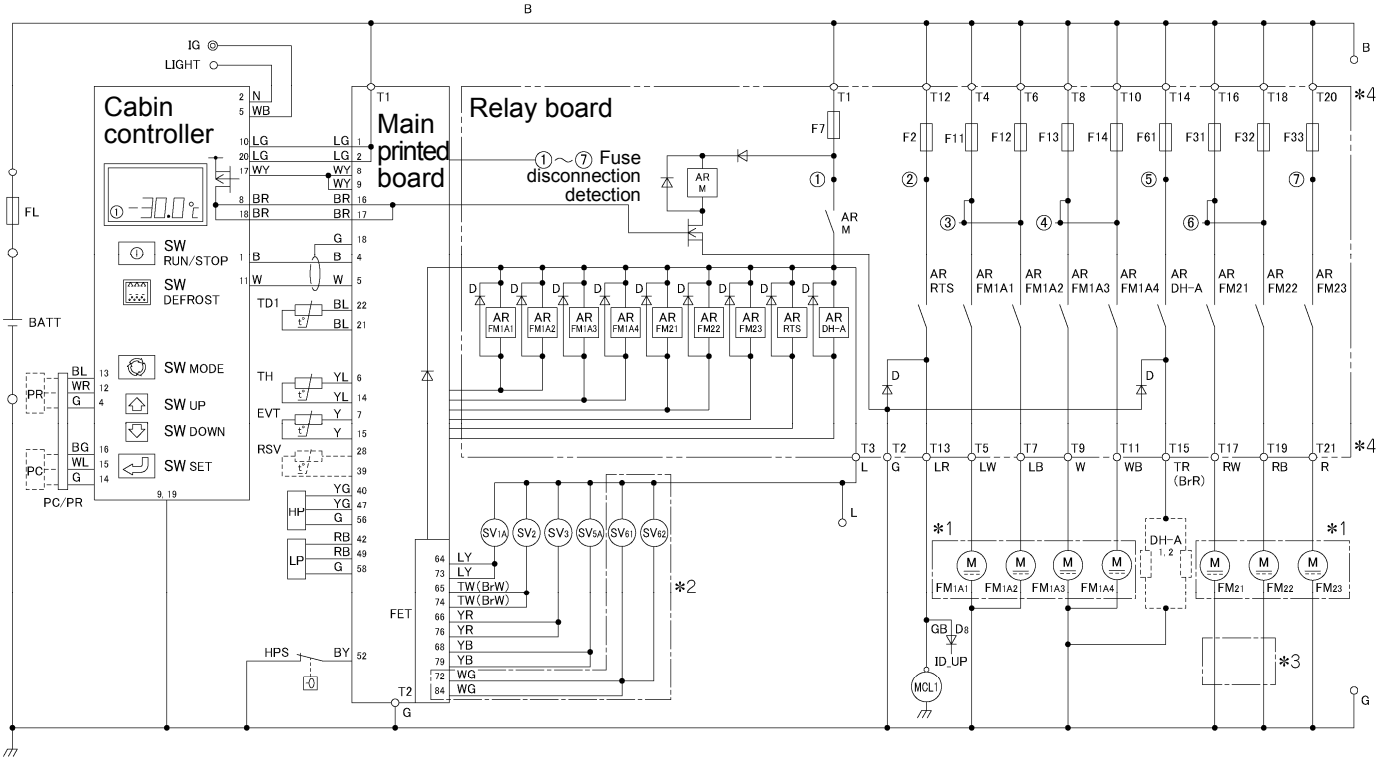
7.1 Ladder diagram

Wire color codes

Wire colors are identified by the following alphabetical codes.

Code	Wire color	Code	Wire color	Code	Wire color
B	Black	Y	Yellow	P	Pink
W	White	L	Blue	V	Violet
R	Red	T or Br	Brown	N or Gy	Gray
G	Green	D or O	Orange	H or Lg	Light green

(1) TDJS70DZAE-1L$^{1}_{2}$



*1 Number of fan motor for TDJS35DAE and TDJS50DAE: 2 evaporator fan motors FM1A1, FM1A2, 2 condenser fan motors FM21, FM22.

*2 Only for TDJS70DZAE.

*3 Lock detection circuit is provided for TDJS35DAE.

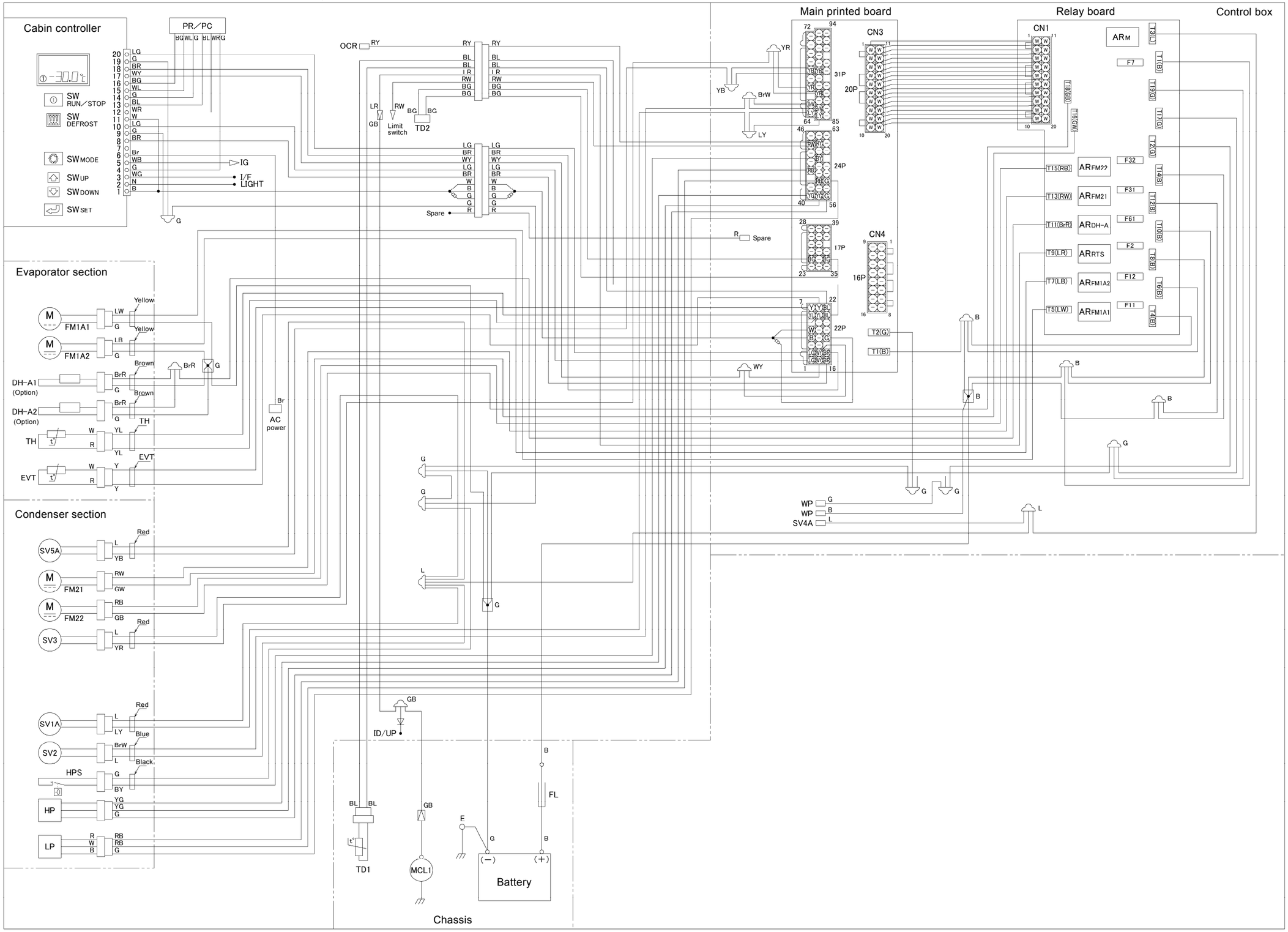
*4 Terminal number on relay board (such as T9(W) etc.) is different by unit model because number of motor is different. Refer to wiring layout drawing of each model.

Explanation of code

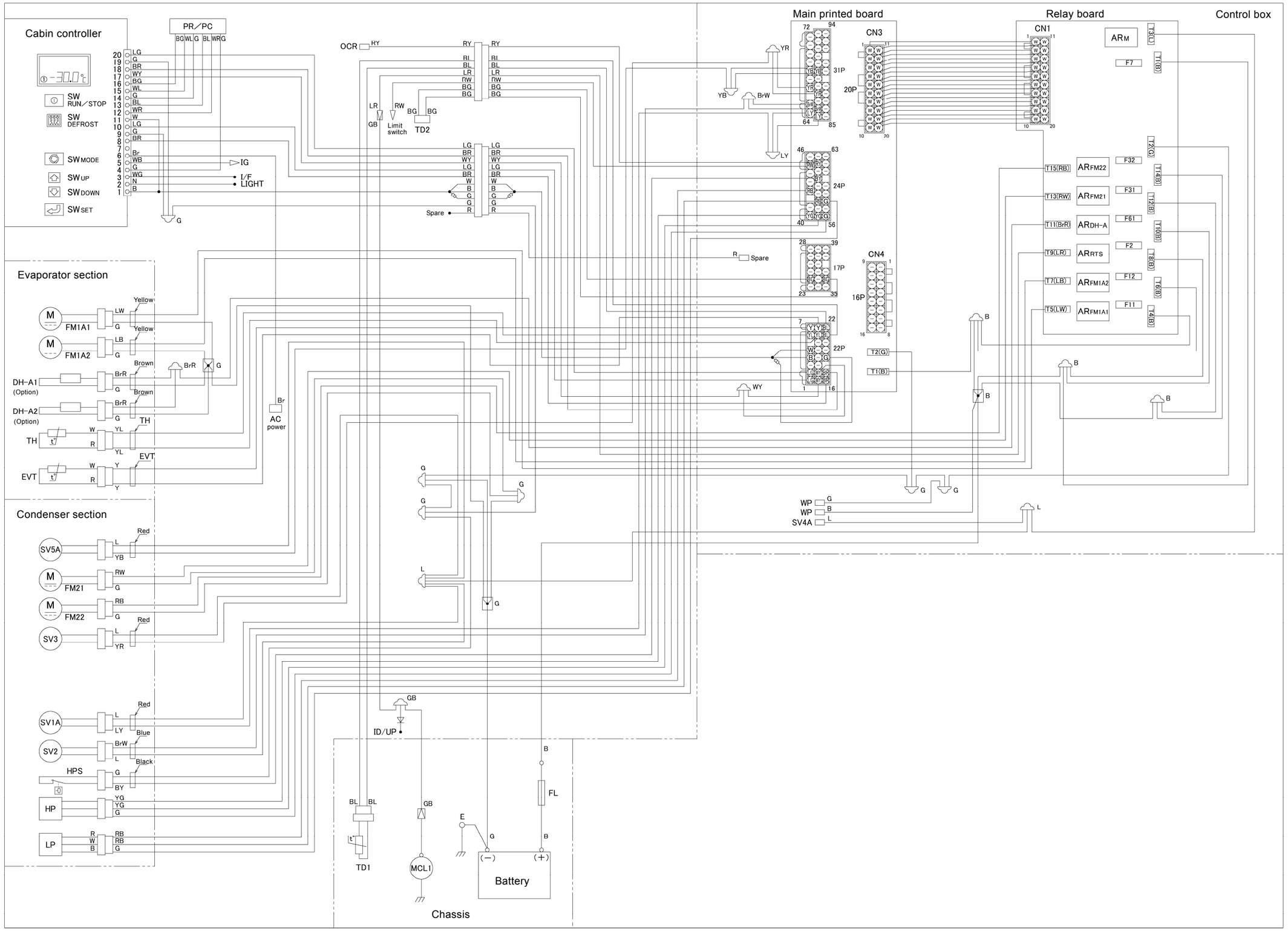
Code	Name	Code	Name	Code	Name	Code	Name
SW RUN/STOP	Operation switch	TH	Inside container temperature sensor	AR M	Load power relay	FM1A1,1A2,1A3,1A4	Evaporator fan motor
SW DEFROST	Switch (Defrost)	EVT	Evaporator outlet temperature sensor	AR RTS	Thermostat relay	FM21, 22, 23	Condenser fan motor
SW MODE	Switch (Mode)	HP	High pressure sensor	AR FM1A1,1A2,1A3,1A4	Evaporator fan motor relay	DH-A1,2	Drain hose heater (Option)
SW UP	Switch (Up)	LP	Low pressure sensor	AR FM21, 22, 23	Condenser fan motor relay	MCL1	Magnet clutch (Engine side)
SW DOWN	Switch (Down)	TD1	Td sensor (Engine side)	AR DH-A	Drain hose heater relay	SV1A	Hot gas solenoid
SW SET	Switch (Set)	D8	Diode	F11, 12, 13, 14	Fuse (15A)	SV2	Liquid bypass solenoid
		HPS	High pressure switch	F2	Fuse (10A)	SV3	Condenser outlet solenoid
IG	Ignition terminal	RSV	Auxiliary temperature sensor	F31, 32, 33	Fuse (15A)	SV5A	Liquid line solenoid
LIGHT	Lighting terminal	FL	Fusible link	F61	Fuse (15A)	SV61	Economizer inlet solenoid
ID_UP	Idle up output	BATT	Battery	F7	Fuse (10A)	SV62	Economizer outlet solenoid
PC/PR	External equipment communication						

7.2 Wiring layout drawing

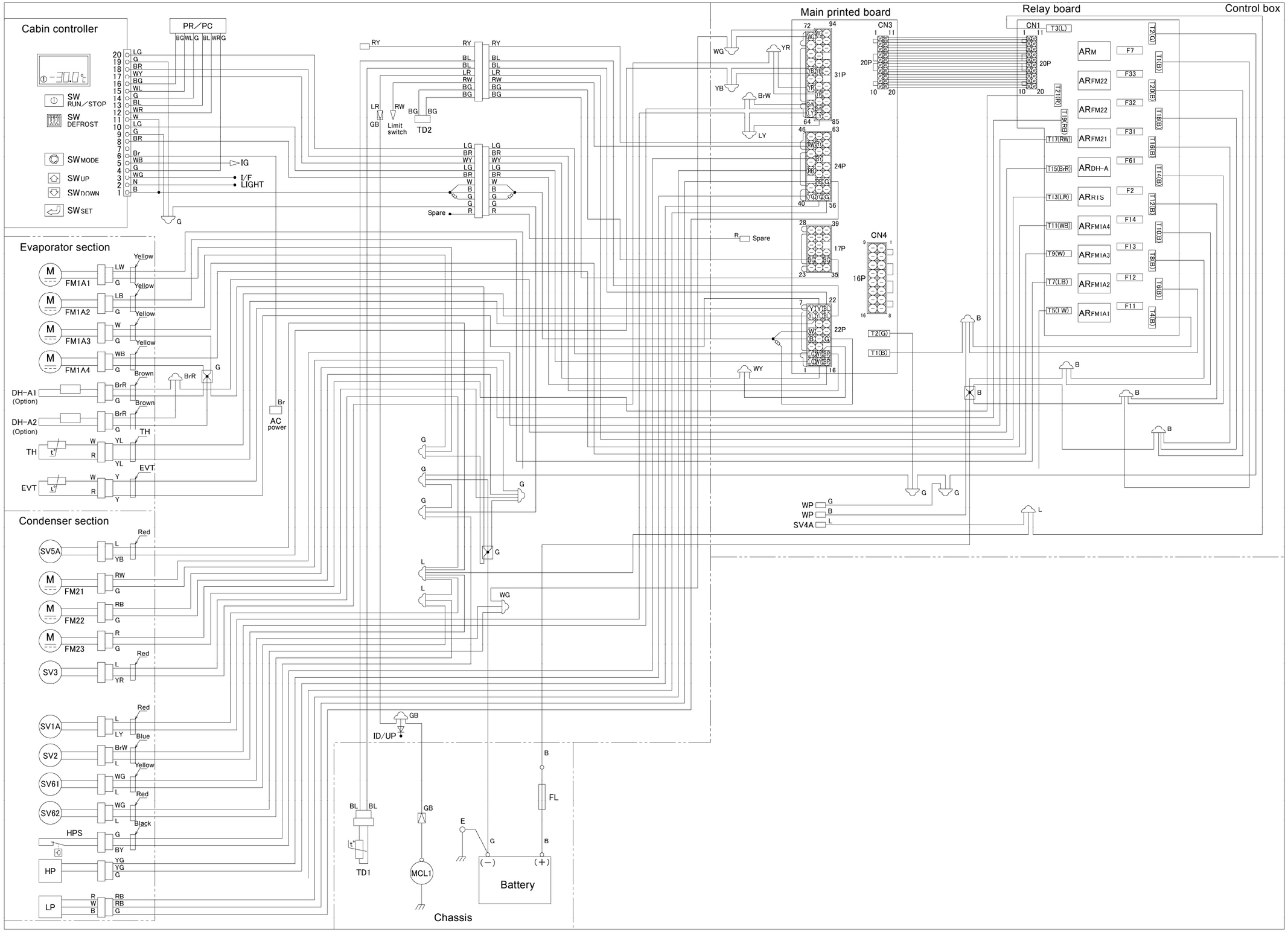
(1) TDJS35DAE-1L$^1_2$



(2) TDJS50DAE-1L$^{1}_{2}$



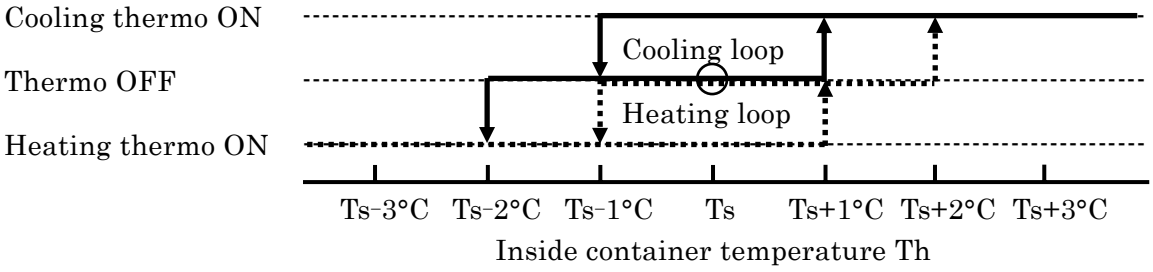
(3) TDJS70DZAE-1L$^{1}_{2}$



8. Description of Operation

8.1 Operation pattern

This unit will conduct cooling operation, heating operation and defrost operation as shown in the table below. The judgment of thermostat ON or OFF against the setting temperature Ts is determined according to the detected value Th of inside container temperature sensor.



Note: When starting, operation starts from thermo OFF [mark ○] if (Ts-1) < Th < (Ts+1).

Control signal at each operation pattern

Operation pattern for TDJS70DZAE is shown below. The operation of economizer solenoid is not applicable for TDJS35DAE and TDJS50DAE.

The symbols ○, ×, (○) in the table below indicate following status.

【○: power on, ×: power off, (○): power on only when the condition meets】

		Power supply to the controller					Detail operation (Next page)
		Yes				No	
		Cooling	Thermo OFF	Heating	Defrost		
Magnet clutch	RTS	○	×	○		×	
Evaporator fan motor *1	FM1A1	○	○ Factory setting	○ <×at right after start of operation>	×	×	①
	FM1A2					×	
	FM1A3					×	
	FM1A4					×	
Condenser fan motor *1	FM21	(○)	×	×		×	②
	FM22					×	
	FM23					×	
Drain hose heater	DH-A1, 2	×			○	×	③
Hot gas solenoid	SV1A	×	×	○		×	
Liquid bypass solenoid	SV2	(○)	×	(○)		×	④
Condenser outlet solenoid	SV3	○	×	(○)		×	⑤
Liquid line solenoid	SV5A	○	×	× <○at right after start of operation>		×	⑥
Economizer inlet solenoid	SV61	○*2	×	×		×	
Economizer outlet solenoid	SV62	○*2	×	×		×	
RUN/STOP output	RUN	○				×	
Abnormal output	ALM	(○) <While operation stop abnormal is happening.>				×	
Out of adequate temperature output	TSD	(○) <When the deviation between inside container temperature and set temperature exceeds 5°C. (factory setting)>				×	

*1 Number of fan motor differs by unit type. FM1A3, FM1A4 and FM23 are applicable to TDJS70DZAE only.

*2 Solenoid valve open when all of following condition meet. *R

- Compressor is driven by engine.
- Return temperature (Inside container temperature) is lower than 3°C.
- More than 5 minutes passed after compressor is activated.

Detail of operation

① Evaporator fan motor

- Evaporator fan motor continues operation at thermostat OFF in case of factory setting. It can be changed to stop the motor at thermostat OFF by the unit type setting mode, fan motor operation is selected to continue by factory setting in order to improve temperature distribution inside the container.
- During the heating operation, evaporator fan motor starts operation after supplying refrigerant to heating cycle for 60 seconds. Starting of fan motor operation is delayed because liquid line solenoid is open during refrigerant supply operation.
- Start of evaporator fan motor operation delays 1 minute after defrost termination in case of cooling thermostat is ON.

② Condenser fan motor

- At the start of cooling operation, condenser fan motor starts operation when the high pressure exceeds the specified value (1 MPa).
- During the cooling operation, condenser fan motor is de-energized when the pressure difference between high and low pressures decreases below the specified value (1.2 MPa) to increase the high pressure. It restarts operation when the pressure difference exceeds the specified value (1.5 MPa). ＊R

③ Drain hose heater

- Drain hose heater is energized for 10 minutes during and after the defrost operation.

④ Liquid bypass solenoid

- At the start of unit operation, liquid bypass solenoid opens when the low pressure decreases below the specified value (1 MPa) to increase the pressure. It closes the solenoid after 10 seconds.
- During the cooling operation, it opens liquid bypass solenoid when the compressor discharge gas temperature exceeds the specified value (140 °C) to decrease the discharge gas temperature. The solenoid closes when the temperature decreases below the specified value (130 °C). ＊R
  When compressor discharge gas temperature is lower than specified value (25 °C) at the start of operation with unit stops for more than 1 hour, above control value is controlled 10 °C lower. (Liquid bypass ON: 130 °C, Liquid bypass OFF: 120 °C) ＊R
- During the heating and defrost operation, liquid bypass solenoid opens when the high pressure decreases below the specified value (1.5 MPa) to increase the high pressure. It closes the solenoid when the high pressure exceeds the specified value (1.8 MPa).

⑤ Condenser outlet solenoid

- During the heating and defrost operation, condenser outlet solenoid opens in an instant when the high pressure exceeds the specified value (2.5 MPa) to decrease the high pressure. It opens condenser outlet solenoid when the high pressure exceeds the specified value (2.7 MPa) until the high pressure decreases below the specified value (2.4 MPa) to decrease the high pressure.
- During the heating and defrost operation, condenser outlet solenoid opens in an instant when the low pressure becomes high to decrease the low pressure. It stops the unit automatically when the low pressure is still high and resumes operation automatically.

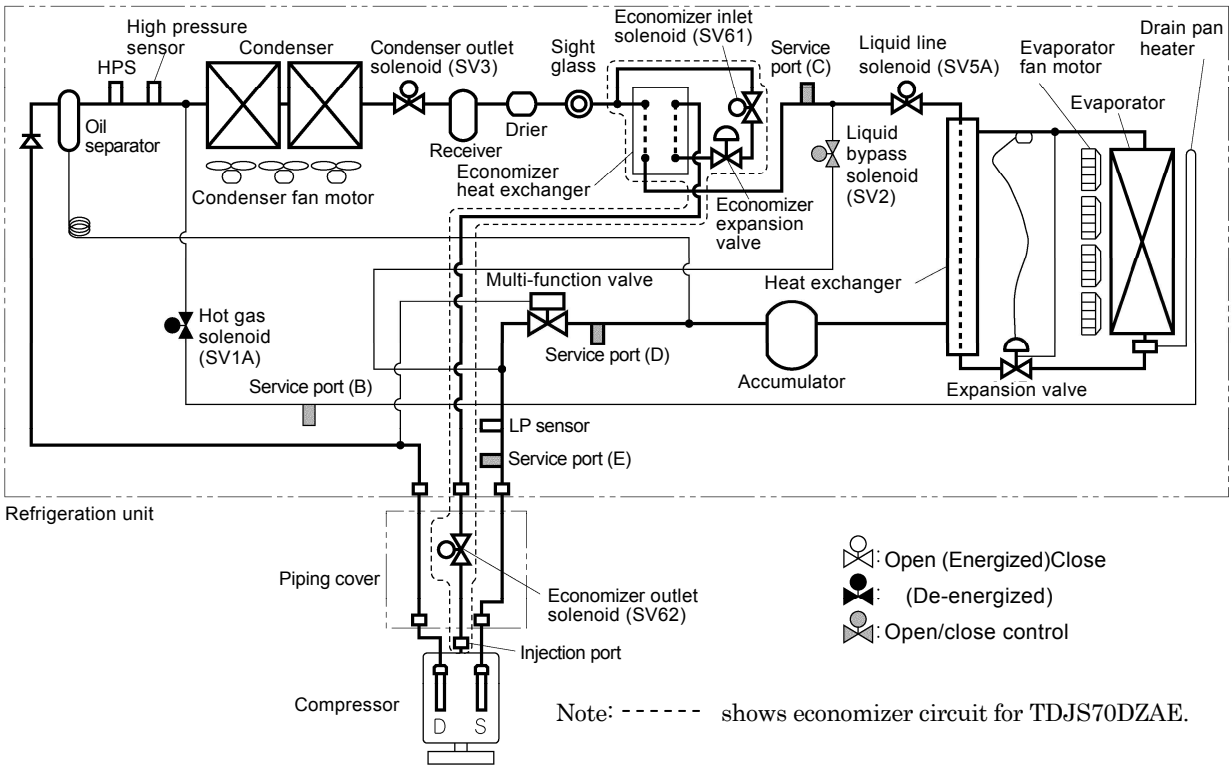
⑥ Liquid line solenoid

- During the heating and defrost operation, liquid line solenoid opens for 60 seconds to supply refrigerant into heating cycle. (During supplying refrigerant, it turns ON the compressor, the hot gas solenoid and the liquid line solenoid.)

8.2 Refrigerant cycle

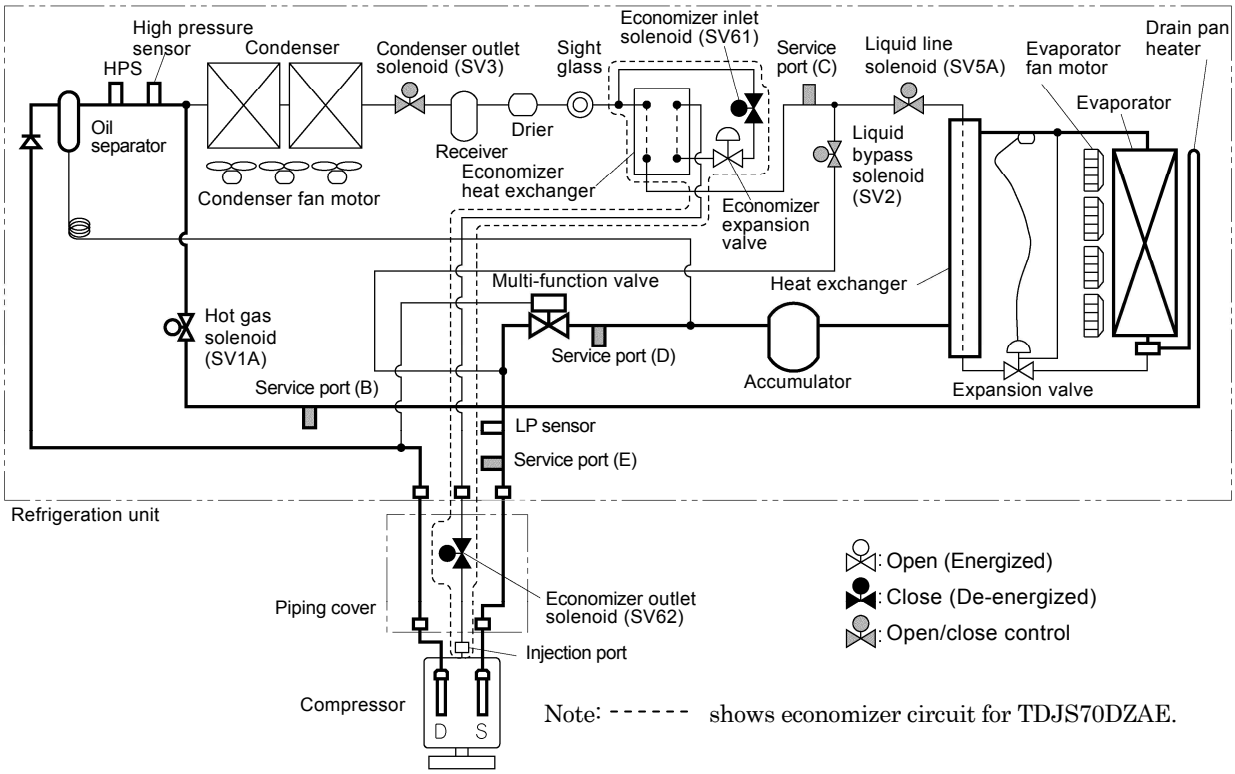
(1) Cooling operation

Cooling cycle is established as shown in the figure below. Liquid bypass solenoid is controlled by pressure and discharge temperature. (Refer to Section 8.1 Operation pattern.)



(2) Heating operation

After operation starts, operation to transfer refrigerant to the heating cycle is performed followed by establishing the heating cycle shown below. The solenoid valves are controlled by the pressure. (Refer to Section 8.1 Operation pattern.)



(3) Hot gas defrost

① Refrigerant cycle

Similar control with (2) Heating operation on page 48 is performed. However, evaporator fan motor does not operate.

② Start and stop of defrost

Start and stop of defrost are performed according to the detected temperature of evaporator outlet temperature sensor (EVT) and operation time.

③ Defrost interval timer

Defrost interval timer starts counting when the evaporator outlet temperature sensor (EVT) detects lower than +5 °C.

Factory setting of defrost interval timer is 3 hours and it is selectable from timer invalid (OFF) and from 0.5 hours to 6 hours with the interval of 0.5 hours. If the timer invalid (OFF) is selected, automatic defrost and defrost with frost auto-detection will not be performed.

Timer counting will not be reset even the unit is stopped, it will be reset when either of the following conditions is satisfied.

- When the defrost operation starts. (Operation will not resume with defrost even defrost is interrupted.)
- When the defrost interval timer setting is changed.
- When 12 hours elapsed after unit stopped and the inside container temperature ≧ 10 °C at operation resumes.

Start and stop of defrost

《Starting condition》 When either of the following is satisfied.	《Stopping condition》 When either of the following is satisfied.
① Manual defrost ・ When the 「DEFROST」 switch is pressed during cooling operation. ② Automatic defrost ・ When the DEFROST interval timer elapses a setting time. ・ When the negative pressure protection is activated and the frost is considered to be progressing. (However, only after more than 1 hour from the end of previous defrost.) ・ When the frost auto-detection function is enabled and defrost interval timer counts more than 1 hour and the frost is considered to be progressing. (Frost is detected by the relation of evaporator outlet temperature and inside container temperature.)	・ When the temperature detected by the evaporator outlet temperature sensor becomes higher than the specified value (15 °C). ・ When the operation stops. 「RUN/STOP SW」 off, IG-off, Abnormal stop ・ When the defrost operation compulsory stop timer (30 minutes) is activated. ・ When the 「DEFROST」 switch is pressed again. (Manual defrost only)

(4) Protective Control

Contents of protective control

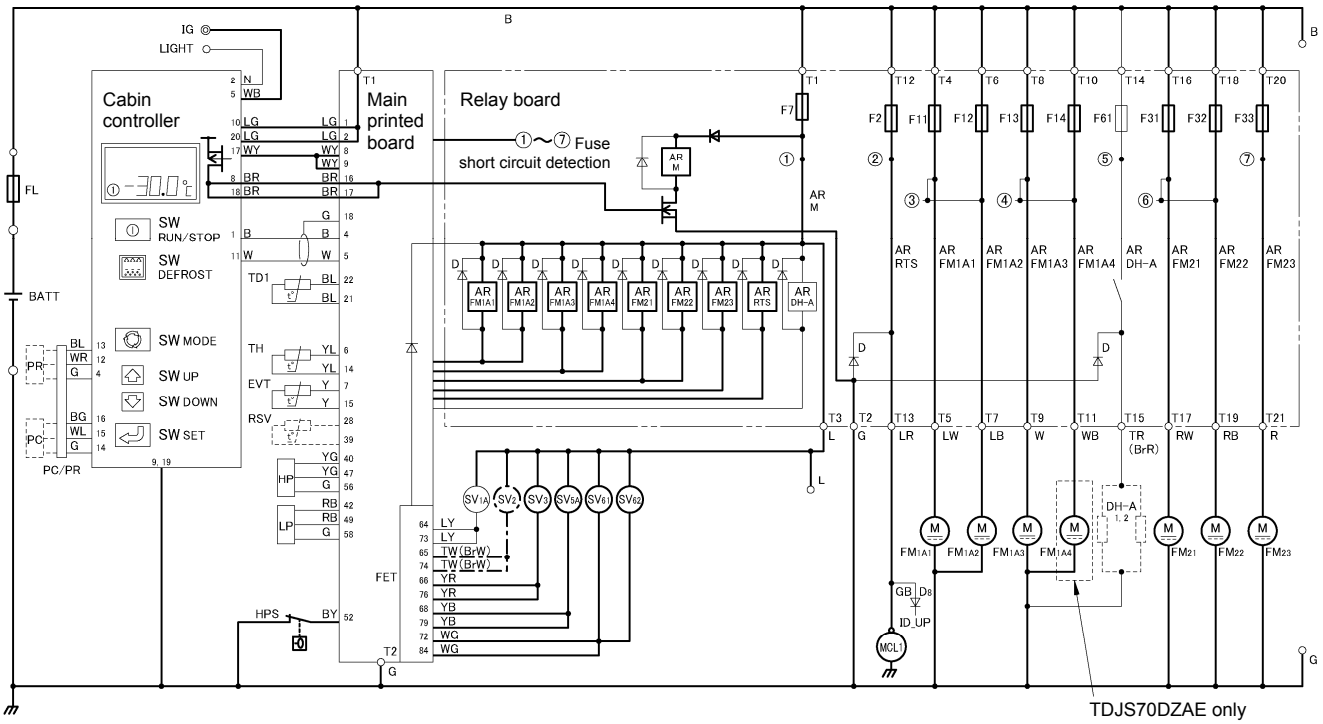
Title	Control
High pressure protection	When the high pressure increases and exceeds the setting value of the high pressure switch (3.18 MPa), electricity to all equipment except condenser fan motor is shut off. (Automatically resumes.) When the high pressure exceeds the setting value of the high pressure switch again within 5 minutes after operation resumes, electricity to all equipment is shut off and error code [E0 10] is displayed. (Abnormal stop)
Negative pressure protection	When the suction pressure becomes excessively negative, electricity to all equipment except evaporator fan motor is momentarily shut off to prevent the air from entering through the sealing, etc. (Automatically resumes.) When the pressure becomes excessively negative again within 5 minutes after operation resumes, evaporator is considered to be frosted and defrost operation is started.
Refrigerant shortage protection	When the high pressure is below the specified value (0.05 MPa), electricity to all equipment is shut off and error code [E0 14] is displayed to prevent operation with insufficient refrigerant. (Abnormal stop) Note: Only when the inside container temperature ≥ −10°C.
Compressor discharge gas temperature protection	<Cooling operation> When the compressor discharge gas temperature (Td) exceeds the specified value (140°C), it turns on the liquid bypass solenoid to open and cools down the compressor. If Td continues to increase and exceeds the abnormal stop temperature (145°C), electricity to all equipment is shut off. (Automatically resumes when Td is lower than 130°C) When Td is lower than specified value (25°C) at the start of operation with unit stops for more than 1 hour, all of control value for Td that mentioned above is controlled 10°C lower. <Defrost/heating operation> When Td exceeds abnormal stop temperature (135°C), electricity to all equipment is shut off. (Automatically resumes when Td is lower than 120°C) When Td is lower than specified value (25°C) at the start of operation with unit stops for more than 1 hour, all of control value for Td that mentioned above is controlled 10°C lower. <Both cooling and defrost/heating operation> When Td exceeds the abnormal stop temperature again within 5 minutes after operation resumes, error code [E0 13] is displayed. (Abnormal stop)
Excess oil return protection	When the compressor stops (= operation stop, thermo off), it turns on the hot gas solenoid SV1A for 10 seconds to open to prevent the oil inside oil separator from returning to compressor rapidly.
Excess refrigerant return protection	When the liquid refrigerant is returning to compressor during operation, electricity to all equipment except evaporator fan motor is shut off and resumes automatically after 1 minute. The liquid refrigerant return is judged by the high pressure and the degree of super heat of discharge.
Refrigerant discharge operation	When the refrigeration unit is not used for a long time, the liquid refrigerant migrated into compressor is evacuated periodically. When more than 24 hours have passed while vehicle ignition switch is off, the refrigeration unit is operated for 4 seconds at the next ignition on of the vehicle and is automatically shut down.
Solenoid valve output short circuit detection	When the short circuit is detected on either of the solenoid valve outputs, the operation is temporarily stopped and the cabin controller displays [Auto CHEC] to identify the output being short circuited. Back up operation is conducted depending on the place of short circuit. However, operation is terminated if more than two short circuits are detected.
High pressure preservation control	When the pressure difference between high and low pressures becomes less than 1.2 MPa during cooling, condenser fan motor is de-energized and the high pressure is increased. (The fan motor is energized again at 2.0 MPa.) At the start of compressor operation, condenser fan motor is energized at or more than 1.0 MPa. When the high pressure becomes less than 1.5 MPa during heating, liquid bypass solenoid is energized (open) and the high pressure is increased. (De-energized if it becomes more than 1.8 MPa.)
Oil recovery control	When the heating operation continues for long time, oil inside oil separator could become short due to oil stagnation in the liquid refrigerant at condenser and so on. Oil recovery is performed by introducing 3 minutes of cooling operation (with evaporator fan OFF) after 1 hour of heating operation. However, oil recovery is not performed during hot gas defrost since the frost freezing could be encouraged.

*R

8.3 Description of operation

Following explanation is based on TDJS70DZAE.

A　Cooling operation



1. After starting the vehicle engine and turning the RUN/STOP switch to "ON", the display panel turns on and following equipment begins to function.

① 2 seconds after power on

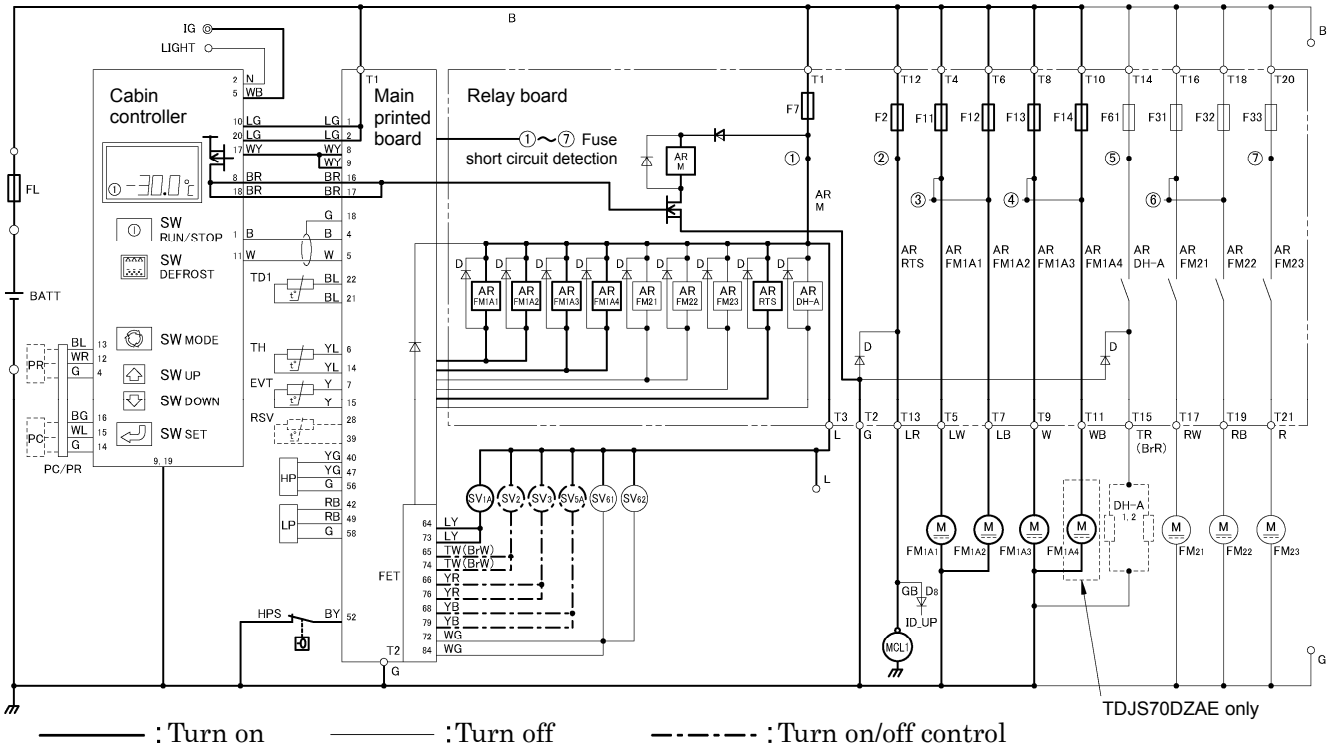
- Load power relay (AR M) is turned on and battery voltage is applied to the upstream of each loads.
- Evaporator fan motor relays (AR FM1A1 ~ FM1A4) are turned on and evaporator fan motors FM1A1 ~ 1A4 start rotating.

② 5 seconds after power on

- Thermostat relay (AR RTS) is turned on and compressor clutch is engaged.
- Condenser outlet solenoid valve (SV3) and liquid line solenoid valve (SV5A) are electrified and the valves open. ＊R
- Liquid bypass solenoid valve (SV2) opens for 10 seconds if the low pressure is lower than the specified value (1 MPa). ＊R
- Condenser fan motor relays (AR FM21 ~ FM23) are turned on and condenser fan motors (FM21 ~ FM23) start rotating when the high pressure increases to the specified value (1 MPa). ＊R

③ Economizer inlet solenoid valve (SV61) and economizer outlet solenoid valve (SV62) are electrified and the valves open when condition that shows page 46 meets. ＊R

B　Heating operation



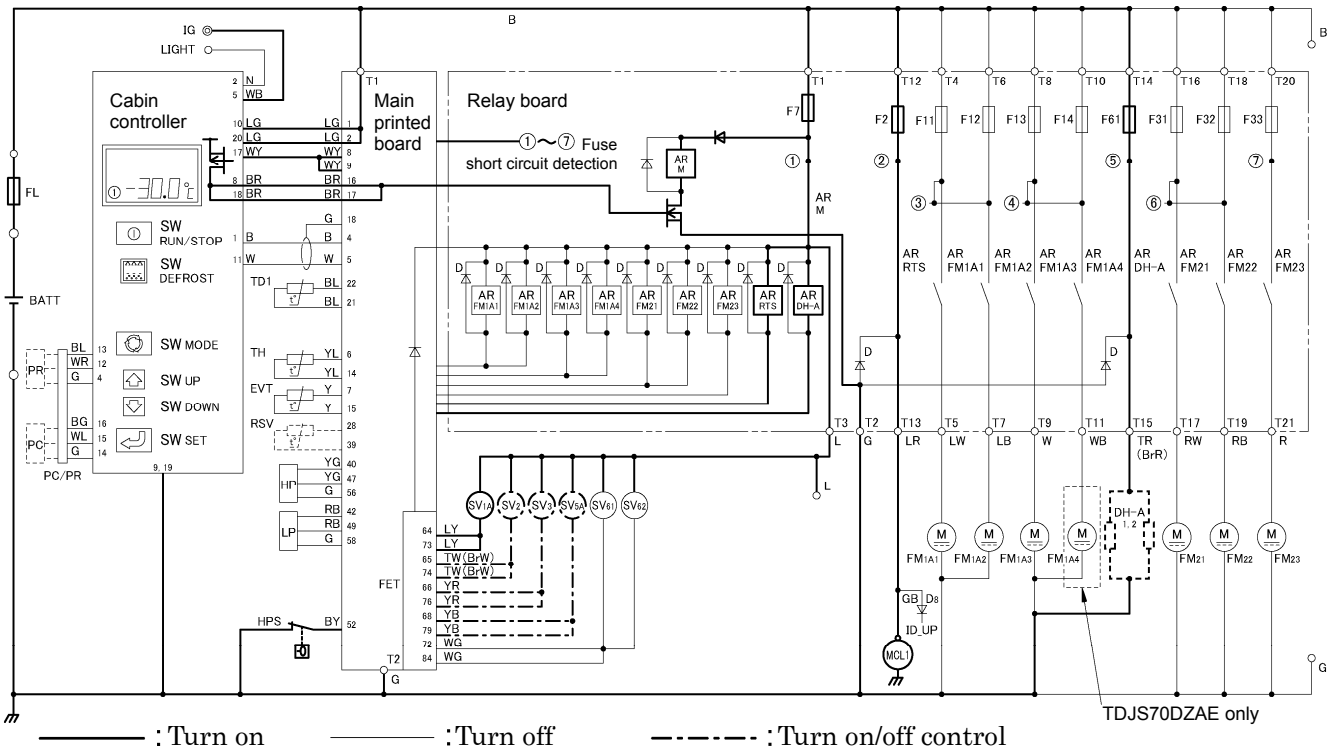
1. After starting the vehicle engine and turning the RUN/STOP switch to “ON”, the display panel turns on and following equipment begins to function.
   ① 2 seconds after power on
   - Load power relay (AR M) is turned on and battery voltage is applied to the upstream of each loads.

   ② 5 seconds after power on　＊R
   - Thermostat relay (AR RTS) is turned on and compressor clutch is engaged.
   - Hot gas solenoid valve (SV1A) and liquid line solenoid valve (SV5A) open and refrigerant is supplied to the heating cycle.

   ③ 60 seconds after supplying refrigerant
   - Liquid line solenoid valve (SV5A) closes and evaporator fan motor relays (AR FM1A1 ~ FM1A4) are turned on and evaporator fan motors (FM1A1 ~ 1A4) start rotating.

2. When the high pressure is higher than the specified value (2.5 MPa), condenser outlet solenoid valve (SV3) is electrified and the valve opens.
   When the high pressure is lower than the specified value (1.5 MPa) and evaporator outlet superheat is higher than specified value, liquid bypass solenoid valve (SV2) opens.　＊R
   When the low pressure is high, condenser outlet solenoid valve (SV3) opens. If the low pressure does not drop after opening the solenoid, thermostat relay (AR RTS) is turned off and the unit is automatically stopped. The unit will automatically resume.　＊R

C　Defrost operation



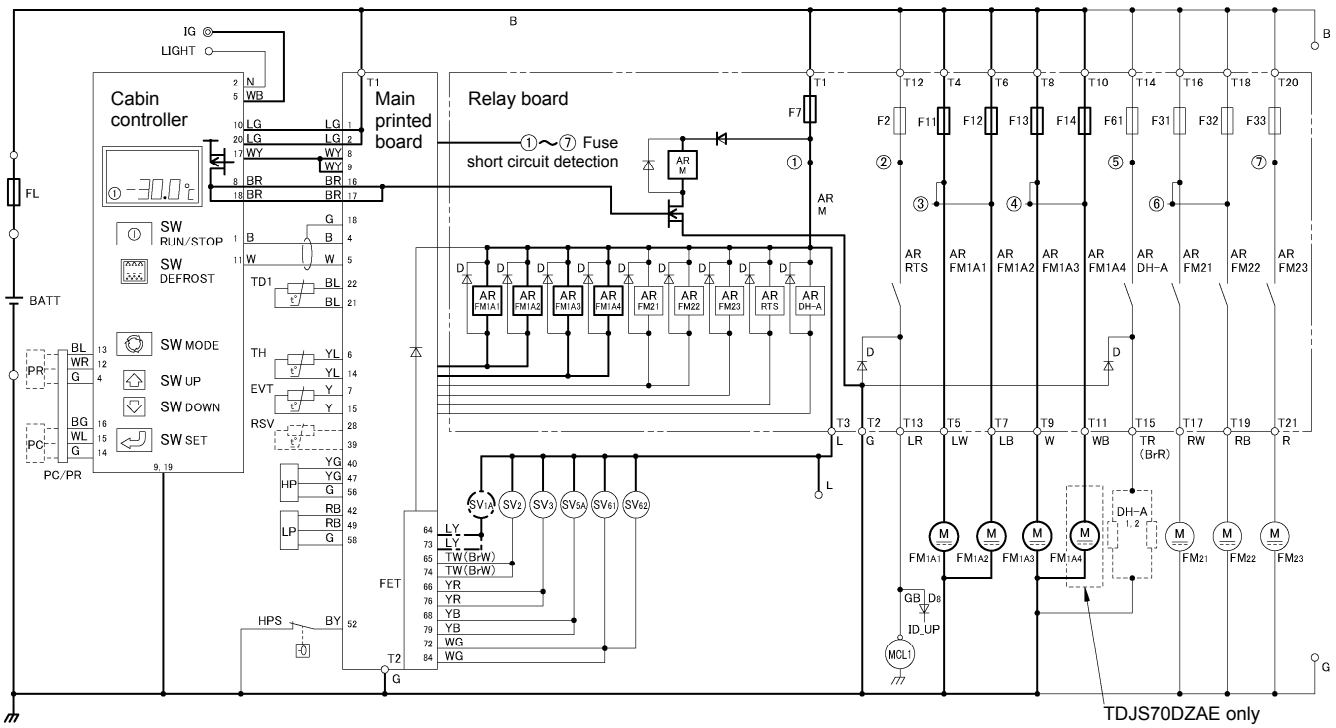
1. When the defrost timer is activated or the defrost switch is turned on during the unit operation, following equipment begins to function.
   ① After starting defrost
   - Fan motor that was in operation stops. ＊R
   - Condenser outlet solenoid valve (SV3) is closed, and hot gas solenoid valve (SV1A) and liquid line solenoid valve (SV5A) are electrified and the valves open to supply refrigerant into heating cycle. ＊R
   - Drain hose heater relay (AR DH-A) is turned on and drain hose heaters DH-A1, A2 (option) are electrified.

   ② 60 seconds after supplying refrigerant
   - Liquid line solenoid valve (SV5A) is closed.

2. When the high pressure is higher than the specified value (2.5 MPa), condenser outlet solenoid valve (SV3) is electrified and the valve opens.
   When the high pressure is lower than the specified value (1.5 MPa) and evaporator outlet superheat is higher than specified value, liquid bypass solenoid valve (SV2) opens. ＊R
   When the low pressure is high, condenser outlet solenoid valve (SV3) opens. If the low pressure does not drop after opening the solenoid, thermostat relay (AR RTS) is turned off and the unit is automatically stopped. The unit will be automatically resumed. ＊R

3. When the temperature detected by evaporator outlet temperature sensor (EVT) is higher than the specified value (15°C), all the loads on that system are turned off and defrost operation on that system terminates. After the termination of defrost, unit operation resumes automatically. Furthermore, defrost operation will be forcibly terminated when it exceeds 30 minutes.
   (Remarks) Evaporator fan motors (FM1A1 ~ 1A4) start rotating right after restart of heating operation, but they delay to start rotation than other equipment for 1 minute in case of cooling operation restart.

D Thermostat off ＊R



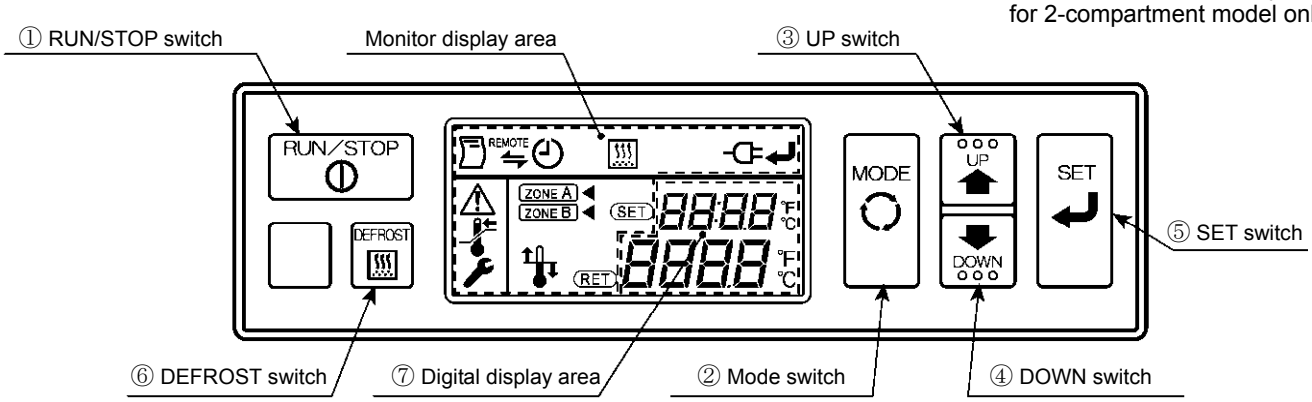
——— : Turn on　　——— : Turn off　　—·—·—· : Turn on/off control

1. When the inside container temperature reaches the setting temperature during operation and thermostat is OFF, following equipment is activated.
   (Remarks) Refer to page 46 for the judgment of thermostat ON/OFF. ＊R
   - Thermostat relay (AR RTS) is turned off and at the same time hot gas solenoid valve (SV1A) is electrified for 10 seconds (or until HP – LP ≦ 0.2 MPa).
   - Evaporator fan motor relays (AR FM1A1 ~ FM1A4) are turned on and evaporator fan motors (FM1A1 ~ 1A4) start rotating. However, evaporator fan motors will not rotate when the evaporator fan motor operation during thermostat OFF is disabled by the unit type setting mode.

9. Cabin Controller

9.1 Name of each part and function

∗ ZONE A, B will be displayed for 2-compartment model only.



① RUN/STOP switch ・・・ Turns the refrigeration unit ON and OFF.
② MODE switch ・・・・・・・ Changes the display mode between normal display screen and setting display screen. It displays the screen during refrigeration unit is stopped.
③ UP switch ・・・・・・・・・・ Changes the setting temperature, various setting change screen, and setting value.
④ DOWN switch ・・・・・・ Changes the setting temperature, various setting change screen, and setting value.
⑤ SET switch ・・・・・・・・・ Registers various setting changes.
⑥ DEFROST switch ・・・・ Performs a manual defrost operation.
⑦ Digital display area ・・・ Displays setting temperature on the upper and inside container temperature on the lower area.

9.2 Description of monitor display item

・・・Display for printer. The lamp blinks while setting the printer and lights when data are being output to printer.

REMOTE ・・・Display for external communication status. The lamp lights when the operation management input is on for a remote monitoring device.

・・・Display for timer. The lamp blinks while setting the timer and lights when the timer operation is displayed or activated.

・・・Display for defrosting. The lamp blinks while setting the defrost operation and lights when the defrost operation is displayed or activated.

・・・Display for commercial power supply. The lamp lights when the unit is connected to the commercial power supply. It blinks if the unit is connected simultaneously to the commercial power supply and battery.

・・・Display for registration. The lamp blinks when prompting you to finalize a setting.

・・・Display for warning. The lamp lights (backlight blinks) or blinks when any error occurs.

・・・Display for out of adequate temperature range condition. The lamp blinks when the return air temperature runs out the adequate range.

・・・Display for need of maintenance. The lamp lights when the operation time or number of start/stop cycle reached the amount to request maintenance.

・・・Display for operation. The lamp lights when the unit is operating (including thermostat OFF).

・・・Display for heating operation. The lamp lights during the heating operation.

・・・Display for cooling operation. The lamp lights during the cooling operation.

(SET) ・・・Display for setting temperature. The lamp lights when displaying the setting temperature.

(RET) ・・・Display for inside container temperature. The lamp lights when displaying the return air temperature of evaporator unit.

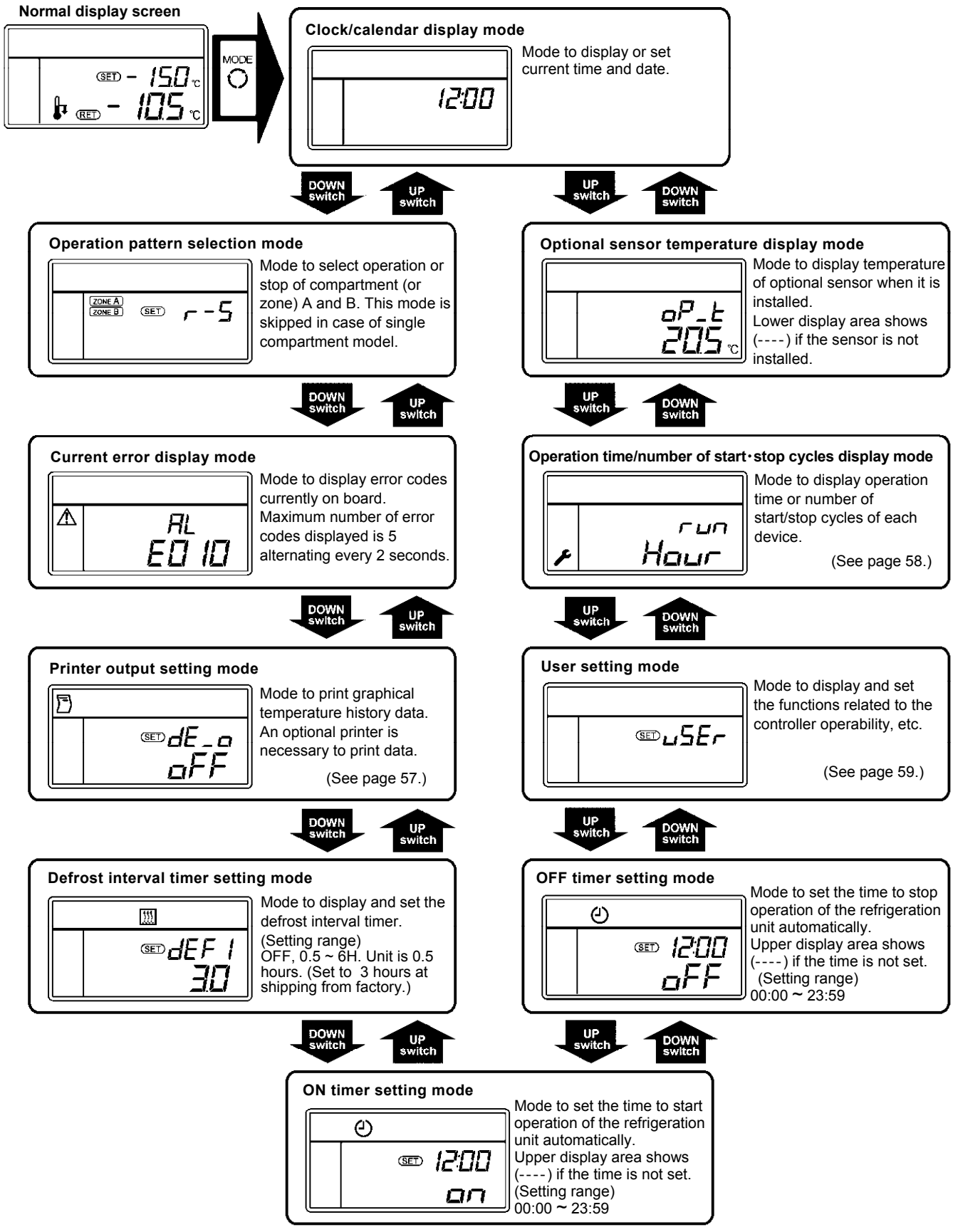
ZONE A ・・・Display for compartment A operation. The lamp lights while operation at compartment (or zone) A. When the setting item for compartment (or zone) A is selected, it displays like ZONE A ◀ .

ZONE B ・・・Display for compartment B operation. The lamp lights while operation at compartment (or zone) B. When the setting item for compartment (or zone) B is selected, it displays like ZONE B ◀ .

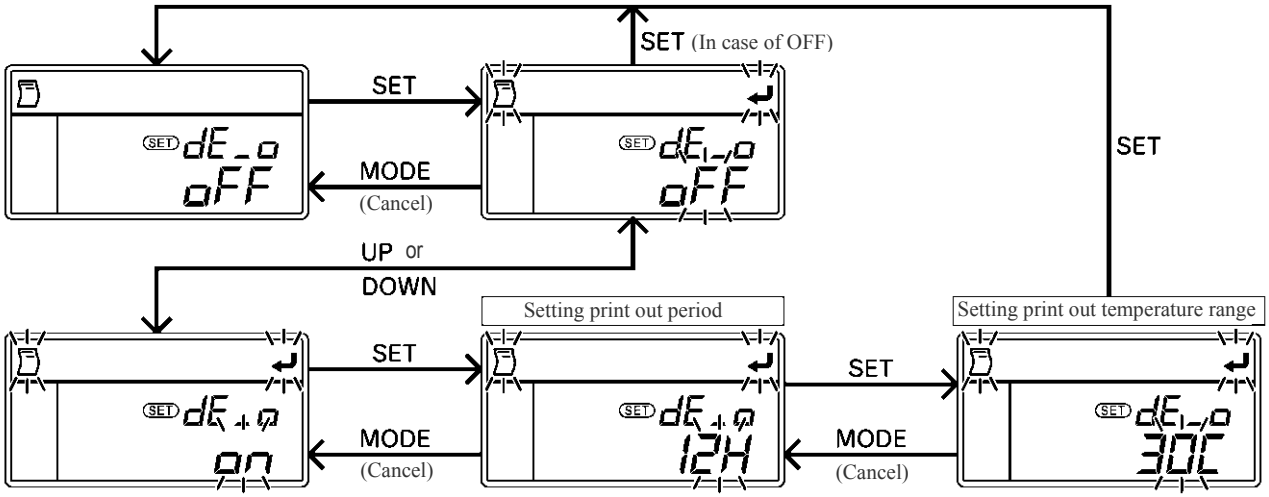
9.3 Normal display screen

Press the [MODE] switch once on the normal display screen to change to the clock/calendar display mode. Each press on the [UP] or [DOWN] switch changes the display.

In the following figure, the [UP] switch changes sequence clockwise while the [DOWN] switch changes counter clockwise.



(1) Printer output



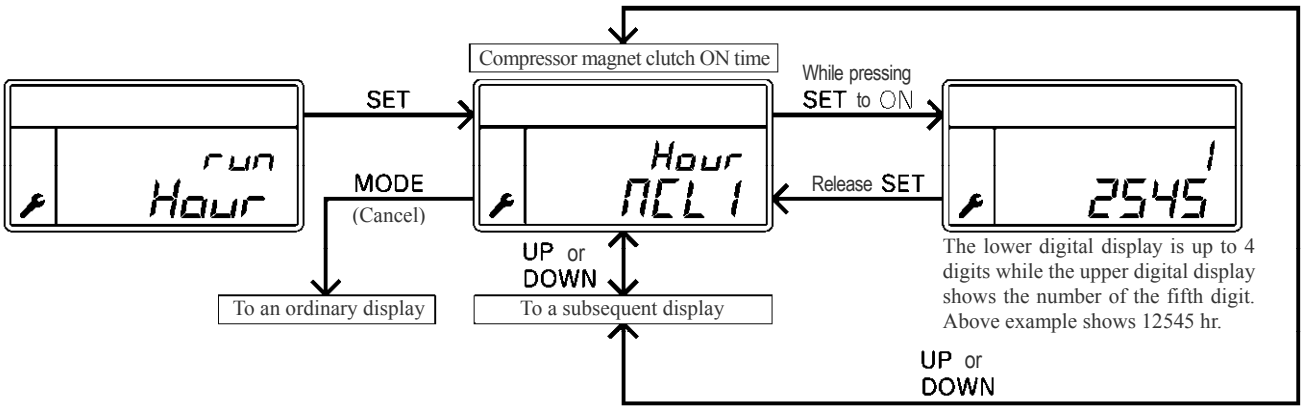
This is to print out a graphical history of temperature. (Optional printer is required.)

- Press the [UP] or [DOWN] switch and select “on”.
- Press the [SET] switch to fix “on”.
- Press the [UP] or [DOWN] switch and select print out period, press the [SET] switch to fix the period.
  Setting period: 12H, 24H, 36H, 2d, 3d, 4d, 5d, 6d, 7d, 1 run
  ∗ 1 run means 1 operation trip.
- Press the [UP] or [DOWN] switch and select print out temperature range, press the [SET] switch to fix the range and start printing.
  Setting printing range:
  15C: Print within setting temperature ± 15°C,
  30C: Print within setting temperature ± 30°C

Notice

- Print out is possible with the previous setting by pressing the [PRINT] switch of the printer body. Print out with the previous setting is possible even if the printer [OFF] is selected.

(2) Operation time/number of start･stop cycles display



This is to display operation time and number of start･stop cycles of various kinds of equipment.

- Press the [SET] switch to display Compressor magnet clutch ON time mode.
- Compressor magnet clutch ON time is displayed while pressing the [SET] switch. Releasing [SET] switch resumes previous screen.
- Press the [UP] or [DOWN] switch to select subsequent displays of operation time/number of start･stop. Procedure to display various times or numbers is similar to Compressor magnet clutch ON time.
- Maintenance icon will turn on when the required maintenance hours have been reached. If it turns on, identify the corresponding expendable supplies or functional items on the operation time/number of start･stop cycles display and encourage your customer to replace them. (will turn on only when the applicable expendable supplies or functional items are displayed.)
- Clear off applicable display of the operation time/number of start･stop of expendable supplies or functional items after replacement according to the service and maintenance mode. (See page 60.)

List of operation time/number of start･stop cycles display

No.	Digital display		Contents of display	Maintenance Icon display (hr or times)
	Upper section	Lower section		
1	Hour	nCL 1	Compressor electromagnetic clutch operation time	30,000 hr
2	Cnt	nCL 1	Compressor electromagnetic clutch on･off cycles	200,000 times
3	Hour	nPC 1	Standby compressor operation time (Not applicable)	—
4	Cnt	SV 1A	Hot gas solenoid valve SV1A open･close cycles	200,000 times
5	Cnt	SV2	Liquid bypass solenoid valve SV2 open･close cycles	200,000 times
6	Cnt	SV3	Condensor outlet solenoid valve SV3 open･close cycles	200,000 times
7	Cnt	SV4A	Water pump solenoid open･close cycles (Not applicable)	—
8	Cnt	SV5A	Liquid line solenoid valve SV5A open･close cycles	200,000 times
9	Cnt	SV6	Economizer solenoid valve SV6 open･close cycles *1	—*2
10	Hour	dH-A	Drain hose heater DH-A turn on time	30,000 hr
11	Hour	HP	Hot water pump operation time (Not applicable)	—
12	Hour	EFM 1	Evaporator fan motor 1 operation time	30,000 hr
13	Hour	EFM2	Evaporator fan motor 2 operation time	30,000 hr
14	Hour	CFM 1	Condenser fan motor 1 operation time (brush less) *3	30,000 hr
			Condenser fan motor 1 operation time (with brush) *3	5,000 hr
15	Hour	CFM2	Condenser fan motor 2 operation time (brush less) *3	30,000 hr
			Condenser fan motor 2 operation time (with brush) *3	5,000 hr

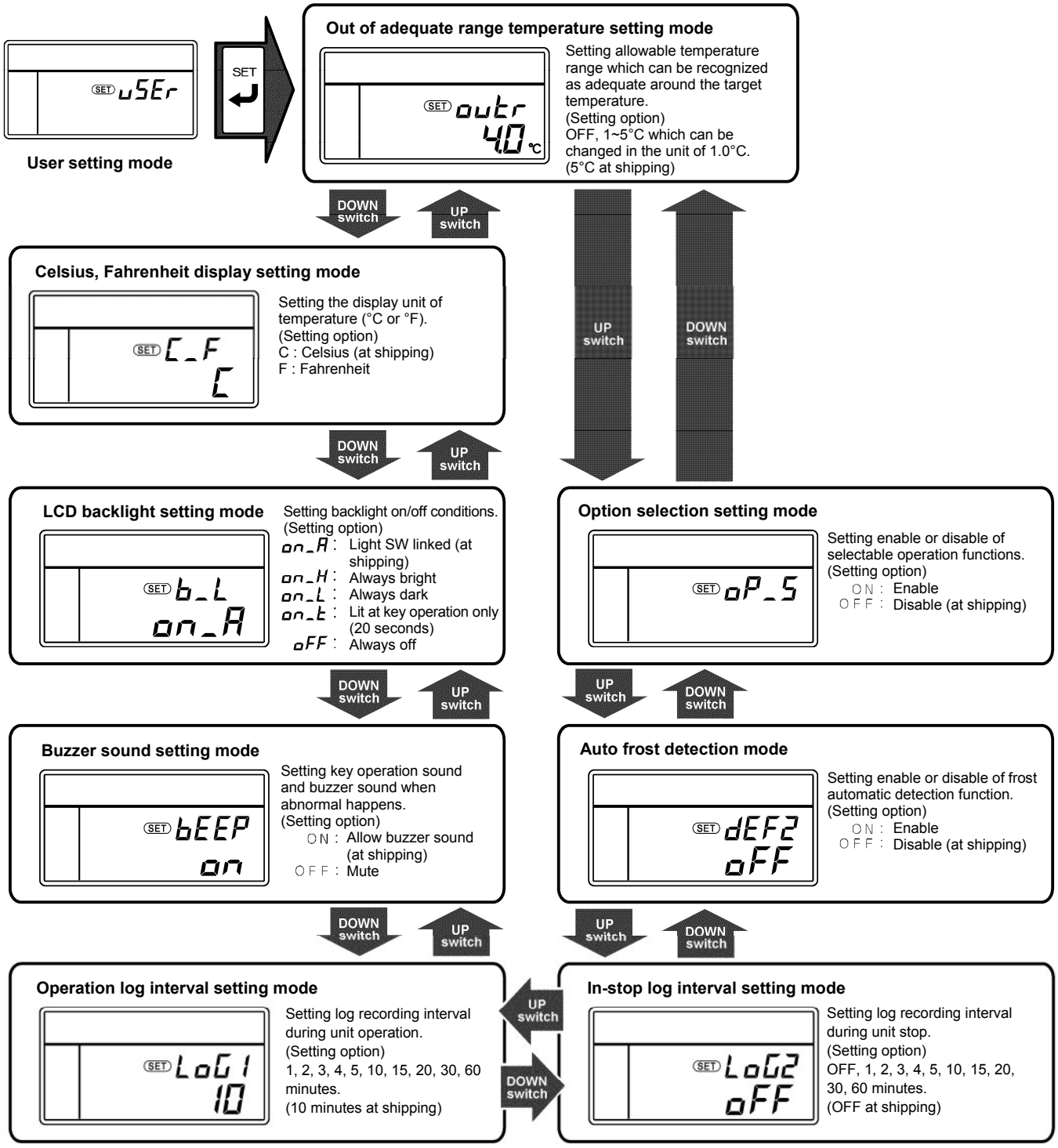
*1 SV6 represents both Economizer inlet (SV61) and outlet (SV62) solenoid valves.

*2 For Economizer solenoid valve SV6, counting and display of turn on･off (open･close) cycles only are executed but will not be displayed.

*3 Condenser fan motor is with brush for TDJS35DAE and brush less for TDJS50DAE and TDJS70DZAE. For TDJS35DAE, set the unit type as (y_br), i.e. with brush, when installing unit or exchanging printed board according to the unit type setting mode. (See page 65.)

9.4 User setting mode

Following items are displayed with the user setting mode. Each press on the [UP] or [DOWN] switch changes the display. In the following figure, the [UP] switch changes sequence clockwise while the [DOWN] switch changes sequence counter clockwise.



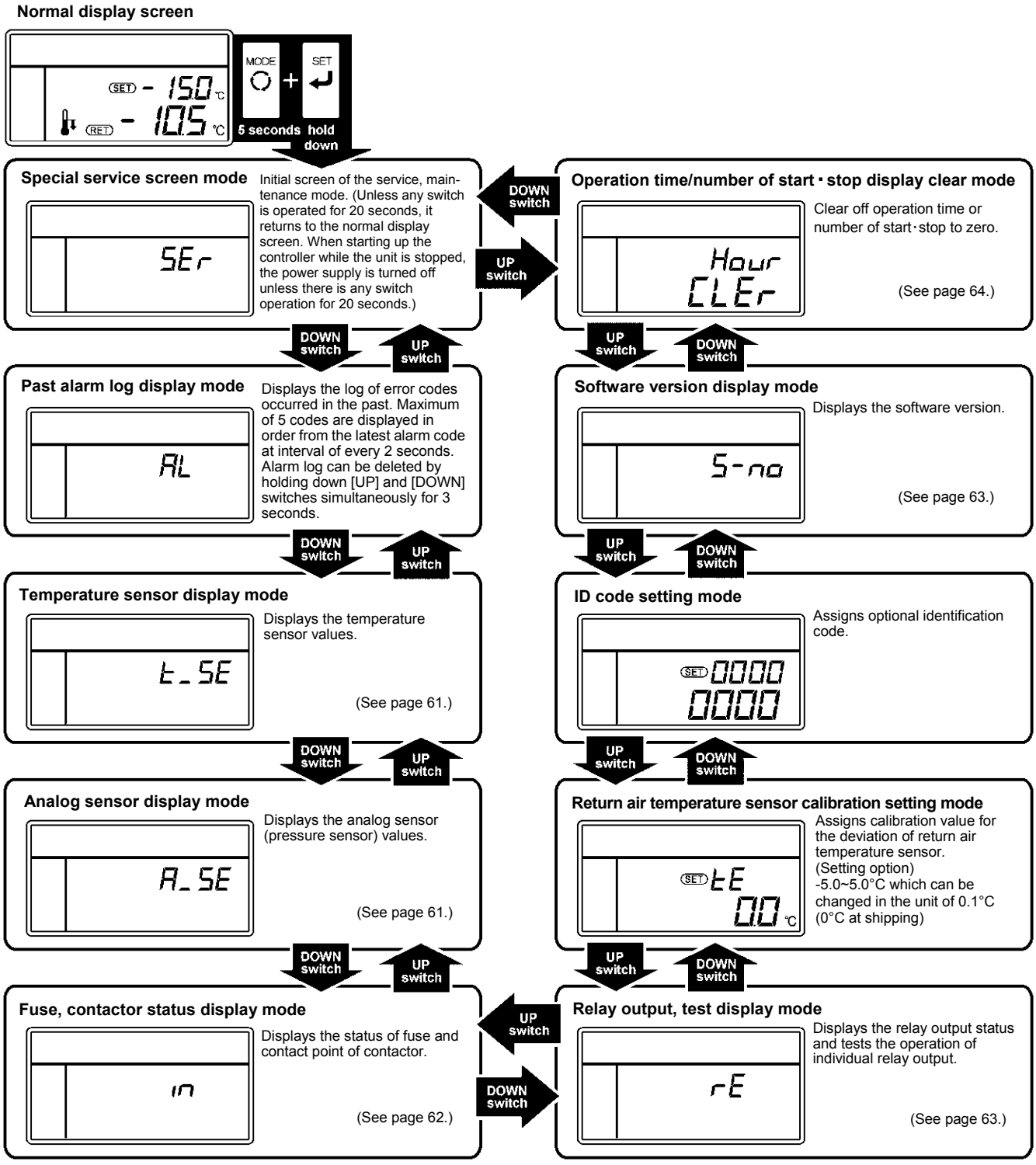
ADVICE

At each step of setting change operation, each press on the [MODE] switch scrolls back to the last previous step. If this scroll back is operated, subsequent settings after the scroll back point made before become invalid. When the setting change is aborted on the way, foregoing setting change is not reflected so that the previous setting remains valid.

9.5 Service and maintenance mode

Hold down the [MODE] and [SET] switches simultaneously for 5 seconds on the normal display screen to select the service and maintenance mode. Following items are displayed in the service and maintenance mode.

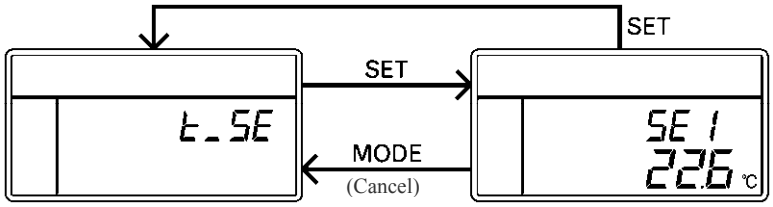
In the following figure, the [UP] switch changes sequence clockwise while the [DOWN] switch changes counter clockwise.



ADVICE

In the service and maintenance mode, selected screen will be kept displayed unless any switch is operated except for the Special service screen mode. When starting up the controller while the unit is stopped, the power supply is turned off unless there is any switch operation for 10 minutes.

(1) Displaying the sensor temperature



This is to display various sensor temperatures.

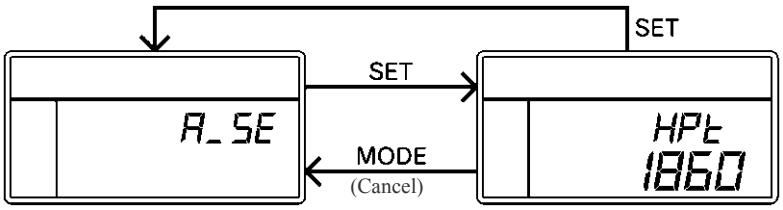
■ Press the [UP] or [DOWN] switch and select sensor to display.

Sensor temperature display list

SE 1	TH (Inside container temperature sensor)	SE6	–
SE2	TD1 (Td sensor - engine side)	SE7	–
SE3	EVT (Evaporator outlet temperature sensor)	SE8	–
SE4	–	SE9	RSV (Auxiliary temperature sensor)
SE5	–		

* Hold down the [UP] or [DOWN] switch for more than 1 second and sensors can be fast-forwarded.

(2) Displaying the analog sensor



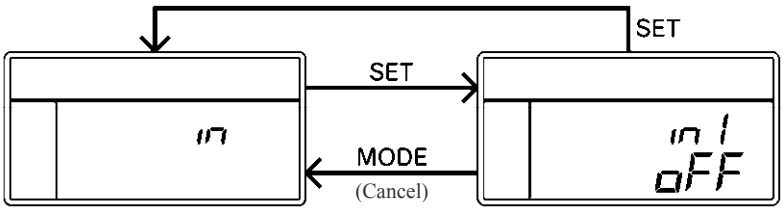
This is to display pressure sensor values.

■ Press the [UP] or [DOWN] switch and select sensor to display.

Analog sensor display list

HPt	High pressure	LPt	Low pressure
HPt2	–	LPt2	–

(3) Displaying the fuse, contactor status



This is to display status of various fuse and contactor condition.

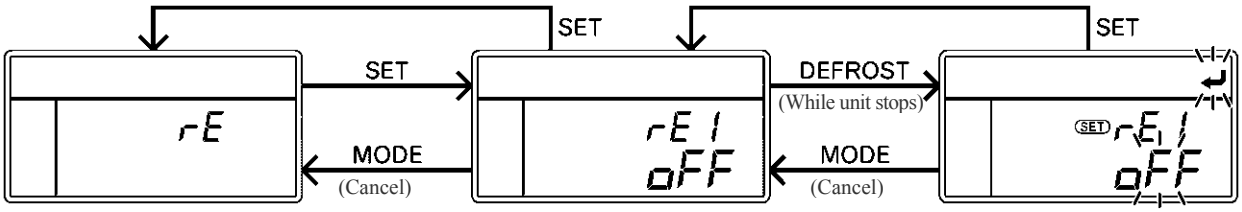
■ Press the [UP] or [DOWN] switch and select fuse and contactor status to display.

Fuse, contactor status display list

Upper digital display			Lower digital display	
Display code	Fuse, contactor name		on	oFF
	TDJS35DAE, TDJS50DAE	TDJS70DZAE		
in 1	F7	F7	Disconnection	Normal
in2	F32	F33	Disconnection	Normal
in3	F31	F31, F32	Disconnection	Normal
in4	F61	F61	Disconnection	Normal
in5	F2	F2	Disconnection	Normal
in6	F12	F13, F14	Disconnection	Normal
in7	F11	F11, F12	Disconnection	Normal
in8	–	–	–	–
in9	–	–	–	–
in 10	–	–	–	–
in 11	–	–	–	–
in 12	–	–	–	–
in 13	–	–	–	–
in 14	HPS	HPS	Abnormal	Normal
in 15	–	–	–	–
in 16	–	–	–	–
in 17	LS	LS	Power box cover open	Power box cover close
in 18	–	–	–	–
in 19	–	–	–	–
in20	–	–	–	–
in21	–	–	–	–
in22	–	–	–	–

* Hold down the [UP] or [DOWN] switch for more than 1 second and display codes can be fast-forwarded.

(4) Displaying and testing the relay output



This is to display relay output status and to test individual relay output. (Testing of relay output is possible only when the unit is stopped.)

- Press the [UP] or [DOWN] switch and select relay to display output or to test.

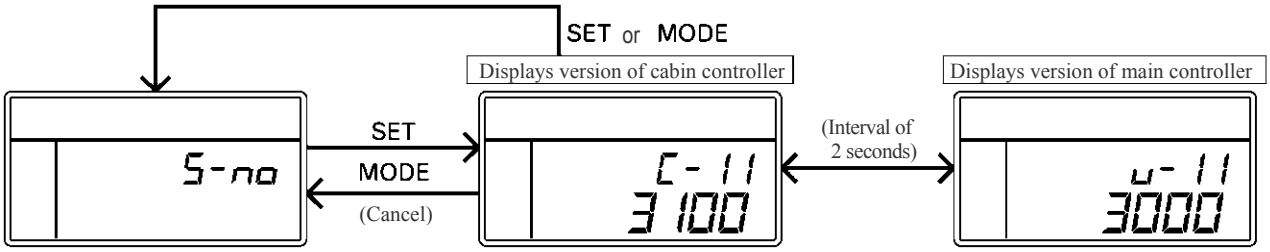
Relay output display list

Code	Relay for single compartment model	Code	Relay for single compartment model
rE 1	–	rE 15	–
rE2	RUN	rE 16	–
rE3	ALM	rE 17	FM1A1
rE4	SV1A	rE 18	FM1A2
rE5	SV2	rE 19	RTS
rE6	TSD	rE20	DH-A
rE7	SV3	rE21	FM21
rE8	–	rE22	FM22
rE9	SV5A	rE23	–
rE 10	–	rE24	–
rE 11	–	rE25	–
rE 12	–	rE26	–
rE 13	SV61, SV62	rE27	–
rE 14	–	rE28	–

* Hold down the [UP] or [DOWN] switch for more than 1 second and list of relays can be fast-forwarded.

- Press the [DEFROST] switch to display relay output test screen.
- Press the [UP] or [DOWN] switch and select “on” or “off”, and press the [SET] switch to fix the selection.

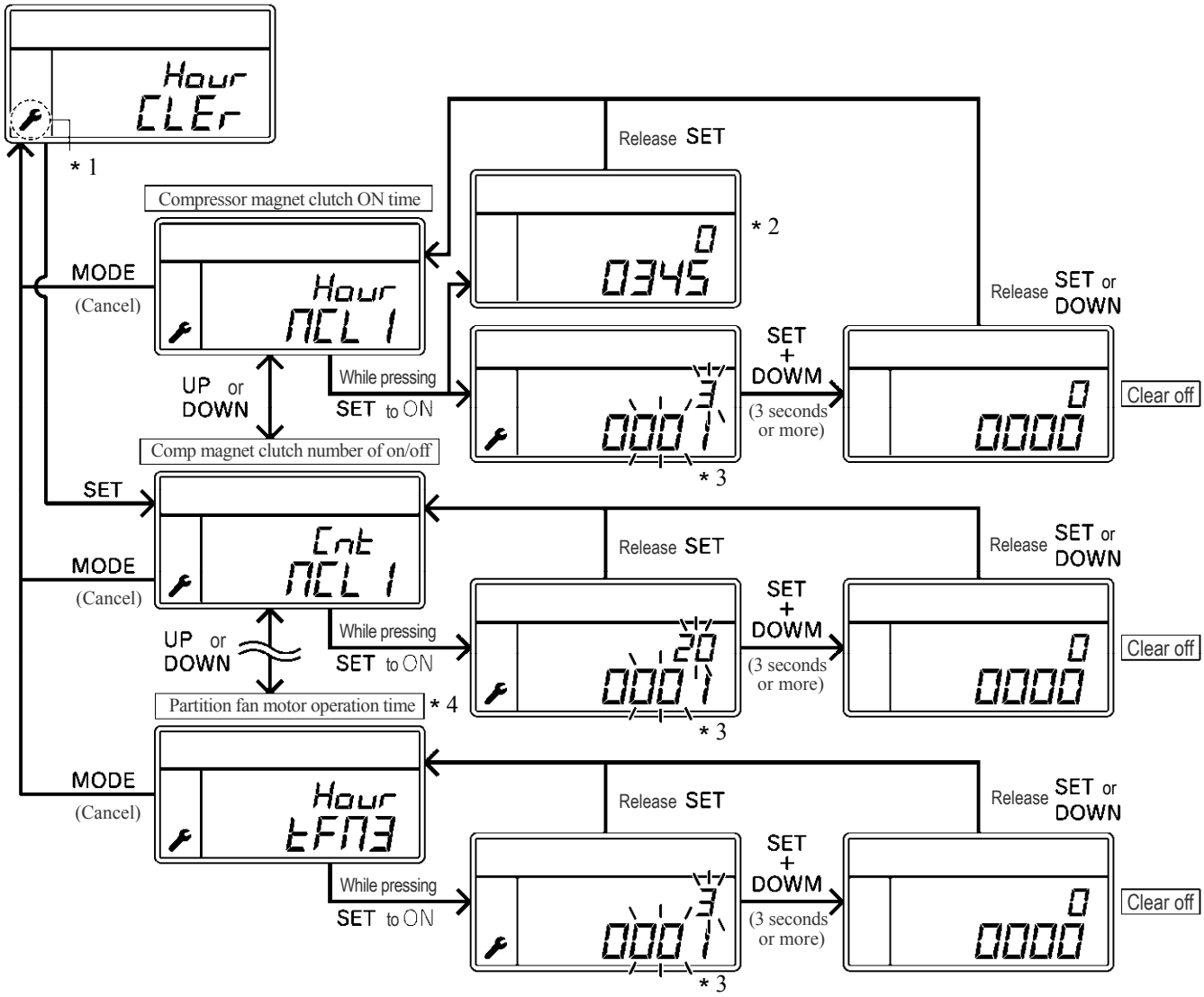
(5) Displaying the software version



This is to display the version of software.

The software version of cabin controller and the software version of main controller are displayed alternately with the interval of 2 seconds.

(6) Clearing the operation time/number of start・stop



* 1 Maintenance icon lights only when exceeding specified operation time or number of start・stop.
* 2 Digital display lights when not exceeding specified operation time or number of start・stop.
* 3 Digital display blinks when exceeding specified operation time or number of start・stop.
* 4 Partition fan is not applicable for CE version of refrigeration units.

Operation time or number of start・stop is displayed while pressing [SET] switch to ON.

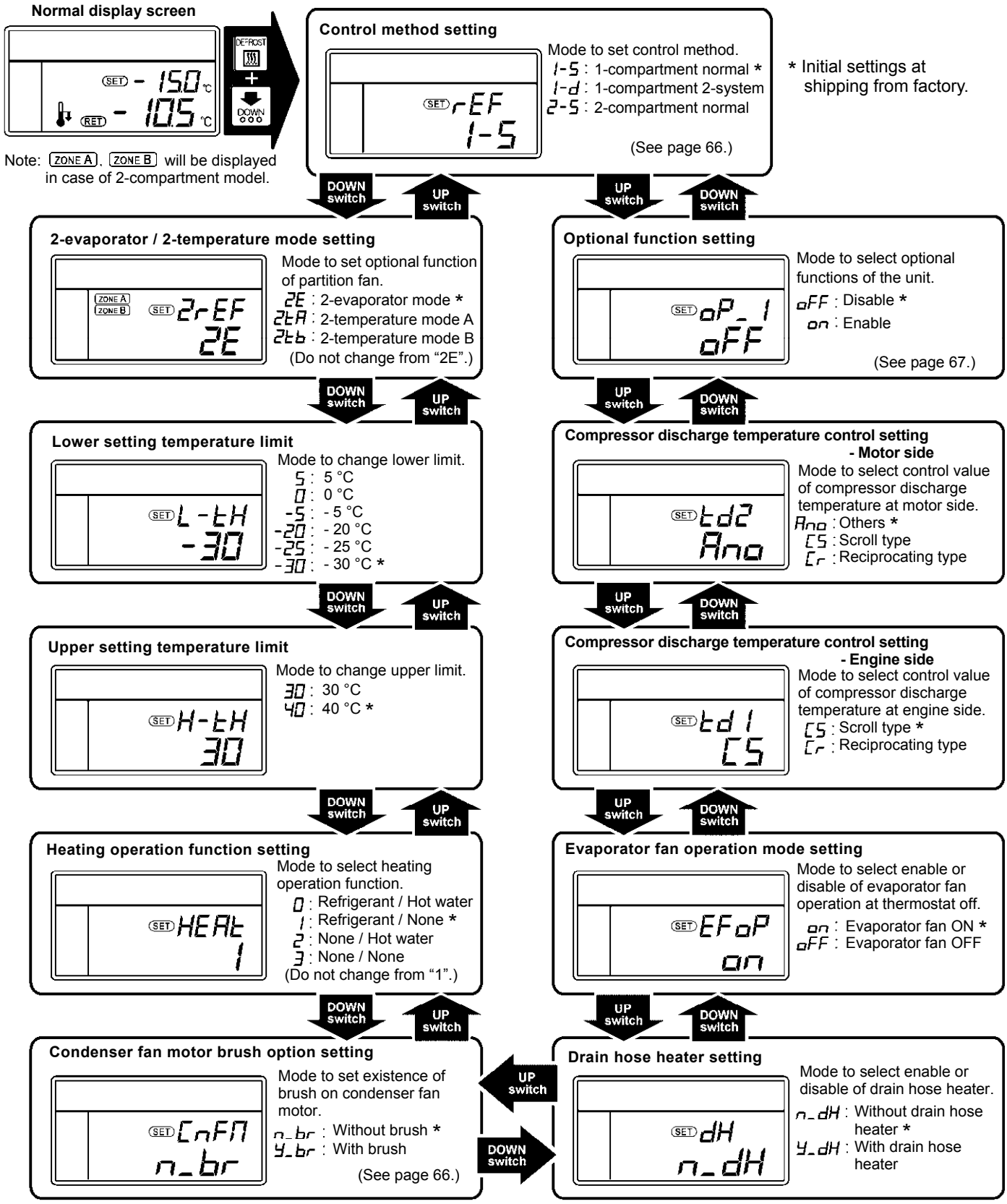
- Press the [UP] or [DOWN] switch and select operation time or number of start・stop to be cleared off.
- Hold down the [SET] and [DOWN] switches simultaneously for more than 3 seconds to clear off the numbers to zero.

9.6 Unit type setting mode

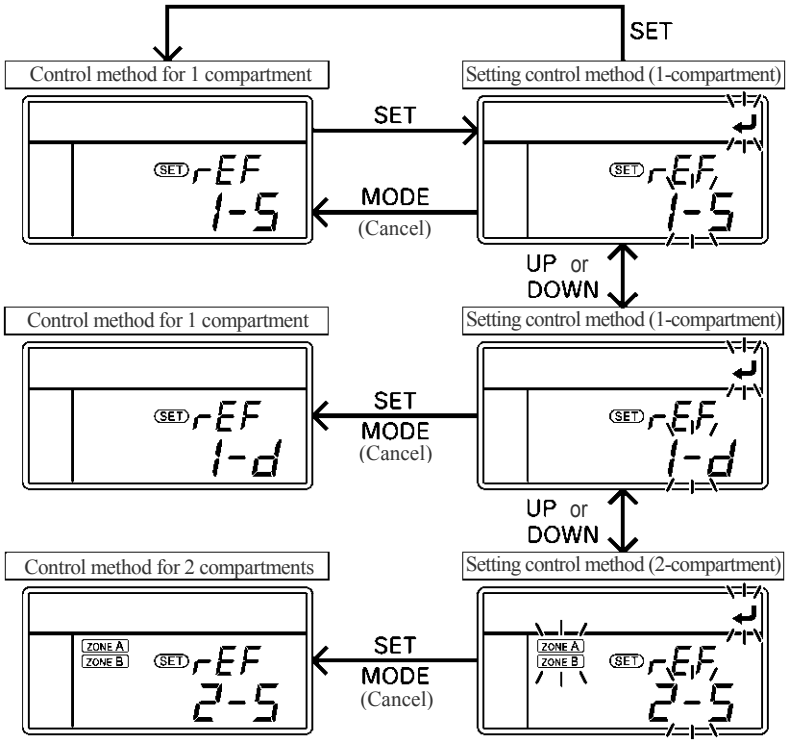
- Confirm that the vehicle engine is stopped and the unit main switch is OFF.
- Hold down the [DEFROST] and [DOWN] switches simultaneously for more than 3 seconds to display the screen for unit type setting mode within 10 seconds after turning on the cabin controller by pressing the [MODE] switch.

Notice

- Execute unit type setting when installing the unit or exchanging the main printed board.



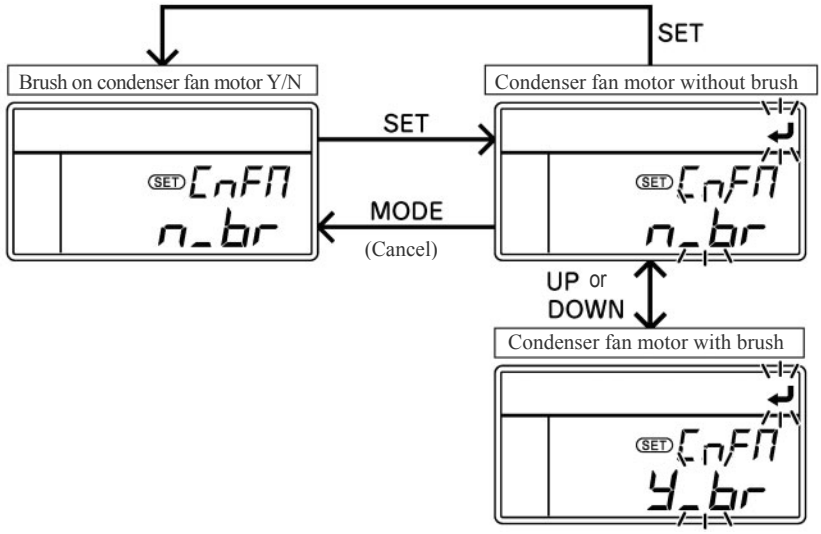
(1) Setting the control method



This is to set the control method based on the number of compartment.

- Press the [SET] switch to display control method setting screen.
- Press the [UP] or [DOWN] switch and select the control method.
  1-S: Normal cycle for 1 compartment (in case of TDJS35DAE, 50DAE and 70DZAE).
  1-d: Two system cycle for 1 compartment (in case of TDJS100DAE).
  2-S: Normal cycle for 2 compartments
- Press the [SET] switch to fix the control method.

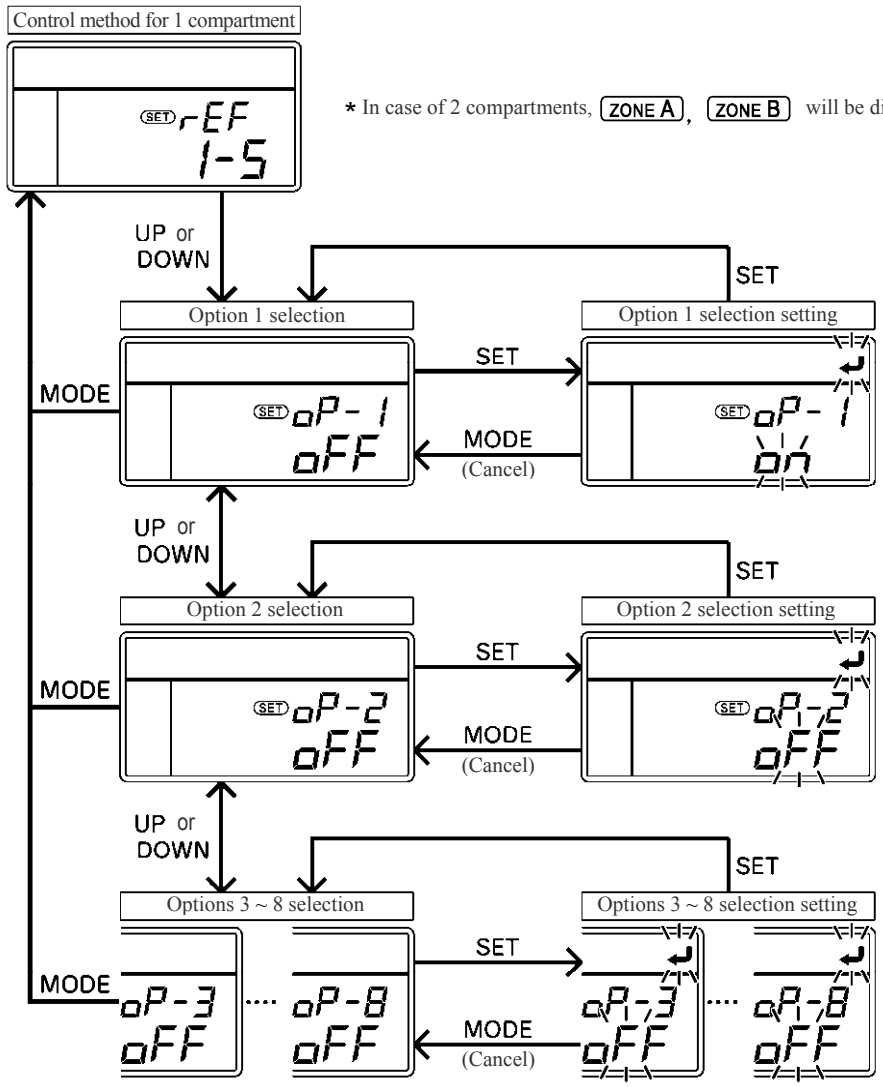
(2) Setting the existence of brush on condenser fan motor



This is to select with or without brush on the condenser fan motor.

- Press the [SET] switch to display “Brush on condenser fan motor Y/N” screen.
- Press the [UP] or [DOWN] switch to select with or without brush on condenser fan motor.
  n_br : Without brush (TDJS50DAE, TDJS70DZAE)
  y_br : With brush (TDJS35DAE)
- Press the [SET] switch to fix the selection.

(3) Selecting the options



This is to set ON and OFF of optional functions. **Do not change the settings.**

- Press the [UP] or [DOWN] switch to display “Option 1 selection” screen.
- Press the [SET] switch to display “Option 1 selection setting” screen.
- Press the [UP] or [DOWN] switch to select “ON” or “OFF” and press the [SET] switch to fix the setting.
- Press the [UP] or [DOWN] switch to display “Option 2 selection” screen.
  Execute similar operation as above. (The same as above until Option 8.)
- Press the [MODE] switch to finish the setting.

10. Inspection

Perform the inspection for the items required on the following period and record necessary matters on the check sheet on page 74.

1. Inspection at the time of installation and test operation
2. Monthly inspection
3. Six-month inspection

10.1 Inspection at installation and test

(1) Check seals of refrigeration unit at the sections where piping and wiring passing through a van wall.
Check if the sealant is processed for sure and no air goes in.

(2) Check the piping clamp for adequacy.
Make sure piping does not vibrate during driving.

(3) Check the drain hose for connection and drainage and the clamp for adequacy.

(4) Check the belt for tension, degree of parallel (stick-out of interline), and scratches.
<Tension of V belt B type>
New installation:600 ± 100 N
Re-tightening: 420 ± 50 N
<Tension of flat belt 6 ribs>
New installation:800 ± 100 N
Re-tightening: 560 ± 50 N
<Tension of flat belt 7 ribs>
New installation:900 ± 100 N
Re-tightening: 630 ± 50 N

(5) Check if compressor, pulley, belt, piping and wiring are touching another part.
Especially check if abnormal sound is heard from moving parts.

(6) Check if the tightening of mounting bolt is enough, if the refrigeration unit, compressor, magnet clutch, tension pulley, bracket, fan motor and fan are properly installed, if the unit is deformed or if a truck has scratches on the body.

(7) Check for wrong electrical wiring, clamp, and loose terminal.

(8) Check refrigerant system for oil leakage and gas leakage at the connecting section of piping and installation section of functional parts, etc.

(9) Abnormal sound and vibration
Check the compressor, magnet clutch, motor, fan and piping for abnormal sound and vibration.

(10) Inspection of sight glass
Color of the sight glass is to be green and there are no excessive bubbles to be seen.

(11) Check starting and stopping of compressor, magnet clutch and condenser fan by thermostat.

(12) Cooling operation
Check display for temperature indication and dropping of temperature.

(13) Check defrosting for operation.
Check it by turning on manual defrost switch.

(14) Check HPS (high pressure switch) for operation.
Shelter the condenser or unplug condenser fan motor and check if HPS operates to stop the unit. CUT OUT [high side]:3.18MPa ($32.5kgf/cm^2$)

(15) Check wiring for power (ground line, insulation resistance).
(Type 2 unit only)
Insulation resistance measuring procedure:
Short power terminal (R･S･T or pins of power plug) by a thin copper wire and measure insulation resistance between the portions shorted and grounding by an megohmmeter (500 V megohms).

(16) Check motor drive operation (measurement of operation current) (Type 2 unit only).

(17) Check buzzer for sound (Type 2 unit only).

(18) Check the operation manual.

10.2 Daily inspection

Be sure to explain to the customer to implement the following items.

(1) Check the compressor belt for scratch, crack or one-sided wear. (Both engine side and motor side)

(2) Check if anything is touching the movable portions.

(3) Check if any dust is sticking on the condenser coil. If it is dirty clean with water and soft brush

10.3 Monthly inspection

(1) Check the belt for looseness, degree of parallel (stick-out of interline) and scratches.
<Tension of V belt B type>
Re-tightening: 420 ± 50 N
<Tension of flat belt 6 ribs>
Re-tightening: 560 ± 50 N
<Tension of flat belt 7 ribs>
Re-tightening: 630 ± 50 N

(2) Check if anything is touching to another part. (Compressor pulley, belt, piping and wiring)

(3) Cleaning of refrigeration unit, drain port

Clean carefully the unit and drain pipe with soft brush. The fins will be deformed or damaged if a hard brush is used.

CAUTIONS

Never use steam washing machine or high pressure washing machine.
※It may cause burst due to pressure rise inside of refrigeration unit or deformation of condenser fin.

(4) Check the refrigerant sight glass for color and degree of flash.
Green = Normal
Yellow = Abnormal (water in it)
Lots of bubbles = Insufficient refrigerant
(Replacement of drier and refrigerant is needed if water is in it.)

(5) Check refrigeration. (Check temperature indication on the display and high and low pressures.)
As to high and low operating pressure range, refer to pages 77 and 78.

(6) Carry out inspection by referring the "Cautions at periodic inspection" listed on pages 71 through 73.

10.4 Six-month inspection

(1) Implement the checking items required at the time of installation test operation and monthly inspection (excluding a check for miss wiring).

(2) Check relays for contact point and operation.
Correct defective contact point due to short circuit.

(3) Carry out inspection by referring the "Cautions at periodic inspection" listed on pages 71 through 73.

10.5 Bolt tightening table for each section

(1) Standard tightening torque of flare nuts

Applicable copper pipe	Tightening torque N·m (kgf·m)
ø 6.35	16 ± 2 (1.6 ± 0.2)
ø 9.52	38 ± 4 (3.8 ± 0.4)
ø 12.7	55 ± 6 (5.5 ± 0.6)
ø 15.88	75 ± 7 (7.5 ± 0.7)
ø 19.05	110 ± 10 (11.0 ± 1.0)

＊R

(2) Tightening torque of general bolts

N·m (kgf·m)

Material / Head mark / Thread diameter	SS400	S45C	SUS304
	None or 4	Δ or 7	None
M3	0.8 ± 0.2 (0.08 ± 0.02)	1.15 ± 0.35 (0.12 ± 0.04)	0.9 ± 0.1 (0.09 ± 0.01)
M4	1.25 ± 0.25 (0.13 ± 0.03)	2.0 ± 0.5 (0.20 ± 0.05)	2.16 ± 0.25 (0.22 ± 0.03)
M5	2.16 ± 0.25 (0.22 ± 0.03)	3.9 ± 0.5 (0.40 ± 0.05)	3.9 ± 0.5 (0.40 ± 0.05)
M6	3.95 ± 0.45 (0.40 ± 0.05)	7.1 ± 0.7 (0.72 ± 0.07)	7.1 ± 0.7 (0.72 ± 0.07)
M8	9.1 ± 0.7 (0.93 ± 0.07)	17.2 ± 1.5 (1.76 ± 0.15)	17.7 ± 1.5 (1.81 ± 0.15)
M10	18.3 ± 1.3 (1.87 ± 0.13)	34.4 ± 3.0 (3.51 ± 0.31)	35.6 ± 2.7 (3.63 ± 0.28)
M12	31.3 ± 2.1 (3.19 ± 0.21)	58.8 ±4.9 (6.00 ± 0.50)	61.1 ± 4.7 (6.23 ± 0.48)
M14	50.0 ± 3.4 (5.10 ± 0.35)	94.7 ± 7.4 (9.66 ± 0.76)	98.1 ± 7.4 (10.01 ± 0.76)
M16	78.9 ± 5.4 (8.05 ± 0.55)	149.1 ± 11.8 (15.21 ± 1.20)	154.2 ± 11.5 (15.73 ± 1.17)

10.6 Cautions at daily inspection

Be sure to explain to the customer to implement the following items.

No.	Item	Contents	Care to be taken at the time of operation	Anticipated defect	Disposition (Remarks)
1	Inspection of moving sections	Prevention of abnormal sound. Prevention of poor cooling due to broken belt.	·Visually inspect the compressor belt for defects such as scratch, crack or one-sided wear, etc. ·Check the moving sections for interference with other parts.	· Abnormal sound · Poor cooling due to broken belt.	· Replace belt if scratches, cracks and so on are found. · Amend the interfering portion.
2	Cleaning of condenser coil	Prevention of dropping of heat exchange due to stain of coil	·Check if dust is on the coil. ·The fin will be crushed if it is washed directly by high pressure water current. So wash it with soft brush by water current from a hose.	· High pressure abnormal and deterioration of refrigeration capacity due to stain of condenser coil.	· Remove and wash stain of coil as often as possible.

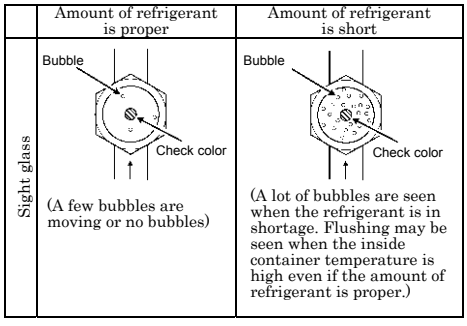
10.7 Cautions at usage

Be sure to explain to the customer to implement the following items.

No.	Item	Contents	Care to be taken at the time of operation	Anticipated defect	Disposition (Remarks)
1	Caution to be taken when the refrigeration unit is driven with motor drive mode	Prevention of compressor troubles due to poor circulation of oil	·Operate the unit continuously for more than 30 minutes to keep circulation of refrigeration machine oil normal.	· Compressor locking due to poor circulation of oil.	
2	Caution to be taken when a reefer truck is used as a substitute of a refrigerator	Prevention of defrost troubles when the refrigeration unit with commercial power drive system is used for preparatory load refrigeration, keeping load in refrigeration, and over-night refrigeration of undelivered load for long time as a substitute of a refrigerator.	·In case of using a reefer truck for long time as a substitute of a refrigerator, make an inside container temperature up to plus degree by opening doors once or twice a week and melt the ice frosted.	· Clogging of drain pipe due to freezing of defrosted water. Developing of ice may crush defrost pipe and cooling coil.	
3	Caution to be taken when not using for long time	When not using for long time, decrease the refrigerant migration in the compressor and prevent the shaft seal from running out of oil.	· When the unit is not used for long time operate it about 15 minutes once in every three or four days. <In case of type 2 unit> Operate the unit by engine and motor drive modes about 30 minutes once in every three or four days.	· When the compressor is not used for long time it will hold liquid refrigerant in it, which when started will cause lack of lubrication and seizure of the compressor. Also running out of oil in shaft seal section may cause leakage of refrigerant gas.	

10.8 Cautions at periodic inspection

<table>
<tr><th>No.</th><th>Item</th><th>Care to be taken at inspection</th><th>Anticipated defect</th><th>Disposition</th></tr>
<tr><td>1</td><td>Inspection of sealing of piping and wiring going through van wall</td><td>· Check if sealing materials are applied on all feed holes.
· Check if sealing materials look fine with no bubbles.</td><td>· Deterioration of cooling capacity by penetration of ambient air.
· Frost of evaporator by penetration of rain water.</td><td>· Complete sealing of entire feed hole.</td></tr>
<tr><td>2</td><td>Inspection of piping clamp</td><td>· Check if piping clamps are fixed at proper interval according to the piping diameter.<table><tr><th>Copper pipe diameter</th><th>Clamp interval</th></tr><tr><td>ø 9.52</td><td>600mm</td></tr><tr><td>ø 12.7</td><td>700mm</td></tr><tr><td>ø 15.88</td><td>800mm</td></tr><tr><td>ø19.05</td><td>900mm</td></tr></table></td><td>· Piping crack and gas leakage due to insufficient clamping.</td><td>· Clamping of piping with proper intervals.</td></tr>
<tr><td>3</td><td>Inspection of drain hose connection</td><td>· Check if band at insert on evaporator side of drain hose is installed and fastened.
· Check if drain port is installed and sealed.
· Check if drain hose is inclined toward discharge side.
· Check if drain hose is not clogging and cool air is coming out.</td><td>· Flowing in of drain water into the container due to clogging of drain hose.</td><td>· Correction of drain hose connection.
· Cleaning of drain hose.</td></tr>
<tr><td>4</td><td>Inspection of slack, miss-alignment and damage on belt</td><td>· Check if there is any one-sided wear or damage on belt.
· Check if belt is not slackened with a tension gauge.
<Tension of B belt>
New installation: 600 ± 100 N
Re-tightening: 420 ± 50 N
<Tension of flat belt 6 ribs>
New installation: 800 ± 100 N
Re-tightening: 560 ± 50 N
<Tension of flat belt 7 ribs>
New installation:900 ± 100 N
Re-tightening: 630 ± 50 N
· Check if miss-alignment of belt is less than 0.5 degrees.</td><td>· Abnormal sound.
· Slip of belt and deterioration of cooling capacity due to slackened belt.
· Abnormal wear of belt.</td><td>· Retighten the belt if it is slackened.
· Replace the belt if damage or one-sided wear is found.
· Adjust if miss-aligned.</td></tr>
<tr><td>5</td><td>Inspection of contact with other part (compressor, belt, piping, wiring)</td><td>· Check if there is any interference or contact with edge.
· Check if refrigerant hose is routed close to engine exhaust pipe. If the distance is less than 50mm, be sure that heat insulator is provided. If the distance is less than 30mm, be sure that heat insulation plate is provided.</td><td>· Gas leakage from piping due to contact.
· Disconnection of wiring due to contact.
· Breaking of belt.
· Gas leakage from refrigerant hose.</td><td>· Ensure necessary distance or add protection.</td></tr>
<tr><td>6</td><td>Retightening of fixing bolt</td><td>· Retighten various fixing bolts according to the bolt tightening table.</td><td>· Over tightening of bolts and nuts may result in break due to stretch of bolt and insufficient tightening may cause trouble or accident due to loosening.</td><td>· Periodically inspect bolts and nuts if they are tightened at specified torque.</td></tr>
<tr><td>7</td><td>Inspection of routing and clamping of electrical wiring</td><td>· Check if wiring is clamped with proper intervals.<table><tr><th>Harness diameter</th><th>Clamp interval</th></tr><tr><td>Less than ø 5</td><td>Less than 300mm</td></tr><tr><td>ø 5 ~ ø 10</td><td>Less than 400mm</td></tr><tr><td>ø10 ~ ø 20</td><td>Less than 500mm</td></tr></table>· Check if non-insulated wires are not tie-wrapped.
· Check if opening of corrugated tube is facing downward at the lowest part of wiring for cabin controller.</td><td>· Interference with other equipment.
· Damage of wiring.
· Short circuit due to water immersion.</td><td>· Apply clamping with proper interval.
· Fix with tie-wrap band on the corrugated tube.
· Orient the opening of corrugated tube downward at the lowest position.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th>Care to be taken at inspection</th><th>Anticipated defect</th><th>Disposition</th></tr>
<tr><td>8</td><td>Inspection of loosening electric wiring terminal, sheath and damage</td><td>· Check the electric wiring for interference with any vibratory object on the way.
· Make sure that the wiring should not be slid or pulled out when pulled lightly.
· Make sure that the connector is inserted securely until it makes “click” sound.</td><td>· Damage of wiring sheath
· Inteference with other equipment.
· Broken wire and poor contact.
· Unit may be subject to fire owing to heating and firing caused by increase of the contact resistance.</td><td>· Arangement of distance to avoid contact or addition of protection.
· Replace wiring if damaged.</td></tr>
<tr><td>9</td><td>Inspection of wrong connection of electric wiring and checking of relay operation</td><td>· Check if evaporator fan motor and condenser fan motor are operating.
· Check if the armature of compressor magnet clutch is sticking to the roter.
· Check if cooling operation is normal.</td><td>· Increase of high pressure due to stopping of condenser fan motor.
· Frosting of evaporator due to stopping of evaporator fan motor.
· No cooling due to stopping of magnet clutsh.</td><td>· Replace if relay board is defective.
· Replace part if functional part is defective.</td></tr>
<tr><td>10</td><td>Cleaning of condenser coil, evaporator and drain port</td><td>· Check if cool air is flowing from the evaporator.
· Check if foreign object and dust are not in the dain pan, check if the tip of drain hose outlet is not clogged by dust.
· Check if the water gushes out from the drain hose outlet when supplied to drain pan.
· Cleaning of condenser coil.</td><td>· Drop of freezing capacity due to dirt on evaporator.
· Overflow of drain water into container due to clogging of drain hose.
· High pressure abnormal and drop of freezing capacity due to dirt on condenser coil.</td><td>· Cleaning of dirt.</td></tr>
<tr><td>11</td><td>Inspection of gas leakage and oil leakage from refrigerant system</td><td>· Check if gas leak detector responds or any bubble is seen on soapsuds.</td><td>· Non cooling due to gas leakage.
· Compressor seizure due to oil leakage.</td><td>· Repairing of gas/oil leak point.</td></tr>
<tr><td>12</td><td>Inspection of abnormal sound and abnormal vibration</td><td>· Check if abnormal sound is heard from compressor, magnet clutch, electric motor, fan and piping during cooling operation.</td><td>· Damage of fan due to contact.
· Compressor locking.</td><td>· Repairing of seizure.
· Securing of distance in case of contact of moving part.</td></tr>
<tr><td>13</td><td>Inspection of color and degree of flushing in the refrigerant sight glass</td><td>· Check if the color in sight glass is green.
· Operate refrigeration unit for 10 minutes and check the degree of flushing.
<Inspection of refrigerant amount>
 

<Inspection of water content>
<table><tr><th rowspan="3">Check color</th><th rowspan="3">Judgment</th><th colspan="2">Water content of R404A</th></tr><tr><th colspan="2">Refrigerant temperature</th></tr><tr><th>25°C</th><th>43°C</th></tr><tr><td>Green</td><td>Normal</td><td>20 ppm or less</td><td>25 ppm or less</td></tr><tr><td>Light green</td><td>Rather abnormal</td><td>20 ~ 70 ppm</td><td>25 ~ 100 ppm</td></tr><tr><td>Yellow</td><td>Abnormal</td><td>70 ppm or more</td><td>100 ppm or more</td></tr></table></td><td>· Poor cooling and abnormal rise of exhaust temperature due to shortage of refrigerant quantity.
· Clogging of expansion valve and drier due to entering of water content.</td><td>· If the refrigerant is leaking, identify the leaking place and repair.
· When the check color is yellow, replace the drier and execute evacuation.</td></tr>
</table>

No.	Item	Care to be taken at inspection	Anticipated defect	Disposition
14	Inspection of unit on/off by thermostat	· Check if magnet clutch and condenser fan motor stop and evaporator fan motor continues operation when the setting temperature is achieved. (Evaporator fan motor stops if its operation is disabled during thermostat is OFF.) · Check if above functional parts turns on/off depending on the inside container temperature.	· Poor temperature control.	· Replace the main printed board if it is faulty. · Replace the part if the functional part is faulty.
15	Cooling inspection	· Check if the pressure is normal by referring to the standard operating pressure. · Check if the temperature and resistance value of the temperature sensor are normal. · Check if inside container temperature is dropping.	· Abnormal pressure. · Poor cooling.	· Replace the temperature sensor if it is faulty. · Replace the pressure sensor if it is faulty. · Clean the condenser coil if it is dirty. · Replace the compressor if the compression is poor.
16	Inspection of defrost operation	· Lower inside container temperature to 0°C and turn on manual defrost switch. Check if condenser fan motor and evaporator fan motor are stopped. Check if magnet clutch is operating. · Check if inside container temperature increases and defrost ends when the evaporator outlet temperature reaches to 15±1.5°C. · Check if drain water is evacuated from drain hose.	· Defrost function does not operate. ·Defrost operation is terminated compulsory at 30 minutes.	· Replace the evaporator outlet temperature sensor (EVT) if it is faulty. · Replace the hot gas solenoid valve (SV1A) if it is faulty. · Replace the main printed board if it is faulty.
17	Inspection of high pressure switch operation	· Check if the unit stops when the high pressure exceeds 3.18 MPa while blocking air flow through condenser or stopping condenser fan motor by removing motor connector.	· Abnormal increase of high pressure.	· Replace the high pressure switch.

10.9 Check sheet (Installation, test operation and periodic inspection)

<table>
<tr><td colspan="3">Customer</td><td colspan="4"></td><td>Customer's signature</td><td colspan="2"></td></tr>
<tr><td colspan="3" rowspan="3">Inspection interval</td><td colspan="2"></td><td>Serial No.</td><td rowspan="3">Van maker</td><td rowspan="3"></td><td>Delivery date</td><td></td></tr>
<tr><td colspan="2">Compressor kit</td><td></td><td rowspan="2">Inspection date</td><td rowspan="2"></td></tr>
<tr><td colspan="2">Refrigeration unit</td><td></td></tr>
<tr><td rowspan="2">Every six months</td><td rowspan="2">Every one month</td><td rowspan="2">Installation trial operation</td><td rowspan="2">Vehicle</td><td>Model</td><td></td><td rowspan="2">Refrigeration unit installation company</td><td rowspan="2"></td><td>Inspection company</td><td></td></tr>
<tr><td>Serial No.</td><td></td><td>Inspector</td><td></td></tr>
<tr><td colspan="6">Inspection items</td><td>Inspection result</td><td>Remarks</td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for seal sections of van where refrigeration unit passes through</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for adequacy of piping clamps</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for secure drain hose connections and adequacy of clamps</td><td></td><td></td></tr>
<tr><td>○</td><td>○</td><td>○</td><td colspan="6">Inspection for belt slack, parallelism (alignment), and damage</td><td></td><td></td></tr>
<tr><td>○</td><td>○</td><td>○</td><td colspan="6">Inspection for contact with other parts (compressor, pulley, belt, piping, wiring)</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Tightening of installation bolts (refrigeration unit, compressor, compressor head, bracket, magnet clutch, tension pulley, fan motor, fan)</td><td></td><td></td></tr>
<tr><td></td><td></td><td>○</td><td colspan="6">Inspection for incorrect wiring and for adequacy of clamps</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for electrical wiring terminal looseness, damage on wiring and sheath</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td></td><td colspan="6">Inspection of relay operation</td><td></td><td></td></tr>
<tr><td>○</td><td>○</td><td></td><td colspan="6">Cleaning of refrigeration unit and drain discharge ports</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for refrigerant system gas leaks (oil leaks)</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Inspection for abnormal noise and abnormal vibration (compressor, magnet clutch, motor, fan, piping)</td><td></td><td></td></tr>
<tr><td>○</td><td>○</td><td>○</td><td colspan="6">Inspection of refrigerant sight glass color and degree of flush</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Confirmation of compressor and magnet clutch start/stop, and condenser fan start/stop with thermostat</td><td></td><td></td></tr>
<tr><td>○</td><td>○</td><td>○</td><td colspan="6">Cooling inspection (indication of digital display temperature, high/low pressure inspection)</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Confirmation of defrosting operation</td><td></td><td></td></tr>
<tr><td>○</td><td></td><td>○</td><td colspan="6">Confirmation of high pressure switch operation</td><td></td><td></td></tr>
<tr><td colspan="3">Daily inspection</td><td colspan="6">Operation check</td><td></td><td></td></tr>
<tr><td colspan="3">Seasonal inspection</td><td colspan="6">Cleaning of condenser coil</td><td></td><td></td></tr>
</table>

After installation, make sure cargo room temperature should be down to ATP certified set-temperature (*) in order to confirm the test result.
(*) FRA: 0 degree, FRB: −10 degrees, FRC: −20 degrees

10.10 Refrigerant and compressor oil *R

	Kind・Brand
Refrigerant	R404A
Compressor oil	Nippon Oil Corporation Diamond Freeze MA32R

*R

10.11 Method of refrigerant recovery, evacuation and refrigerant charge

(1) Refrigerant recovery

<In case service port (D) locates at the inlet of multi-function valve> *R

Open condenser outlet solenoid valve (SV3) by adding voltage and connect high pressure side charge hose of gauge manifold to service port (C) and connect low pressure side charge hose to service port (E). Recover the refrigerant from 2 places. (When you open condenser outlet solenoid valve, please check the voltage is DC 12V or 24V.)

* If refrigerant recovery machine have oil separation function, you can recover refrigerant from 3 places by following procedure. And add (return) the recovered amount of oil from service port (B) during evacuation.

<In case service port (D) locates at type 2 LP line>

Connect high pressure side charge hose of gauge manifold to service port (C) and connect low pressure side charge hose to service port (D) and (E) by using tee. Recover refrigerant from 3 places.

(2) Evacuation

① Connect high pressure side charge hose of gauge manifold to service port (C) and connect low pressure side charge hose to service ports (D) and (E) by using a tee.
② After evacuating 10 to 20 minutes, stop vacuum pump and check if there is no leakage after leaving 5 to 10 minutes.
③ Start vacuum pump again and evacuate up to 755 mmHg. Continue evacuation 40 minutes further.

(3) Refrigerant charge

① After the evacuation close the valve at service port (E) and put the refrigerant cylinder on the measure. Charge liquid refrigerant from the service ports (C) and (D) up to 30 to 50 g less than specified quantity while checking the weight of the cylinder.
② Close the valve at service port (D), open the valve at service port (E), and charge liquid refrigerant from service port (E) for 30 to 50 g. This system is provided with a multi-function valve and therefore charging from service port (E) is required to open the main valve.
③ If the specified amount of refrigerant can not be charged, start the compressor by operating the engine in idling mode and replenish refrigerant from service port (E).

Specified amount of refrigerant Unit:kg

	TDJS35DAE	TDJS50DAE	TDJS70DZAE
Type 1	1.7	2.0	2.8

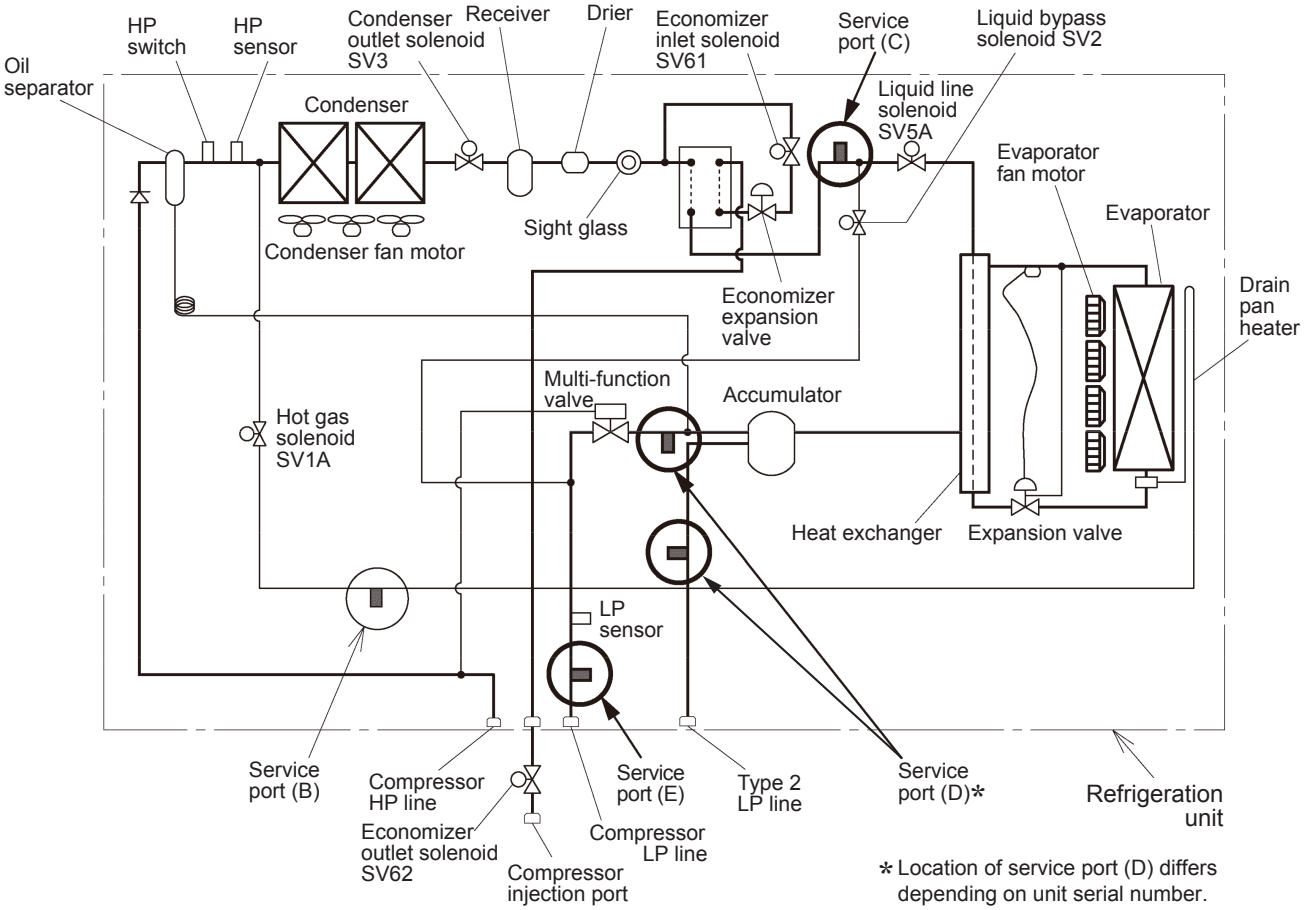
⚠ CAUTION

Securely connect the hose to prevent refrigerant from leaking during charging.
※ Otherwise, it could cause frostbite or leakage of refrigerant.

Never charge refrigerant more than specified.

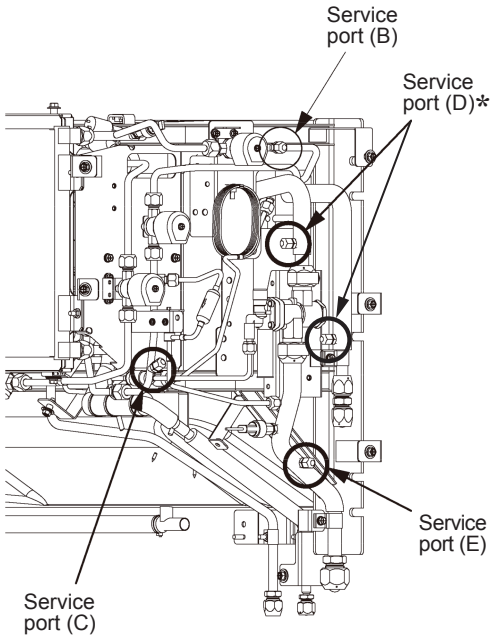
Check the amount of compressor oil during refrigerant recovery and evacuation. *R
Be sure to replenish same amount of oil if oil leaks during working. To replenish the oil, let the oil be sucked into the refrigerant circuit from service port (B) after evacuation.
※ Otherwise, it could cause seizure of compressor due to shortage of oil.

■ Refrigerant circuit inside unit (In case of TDJS70DZAE)

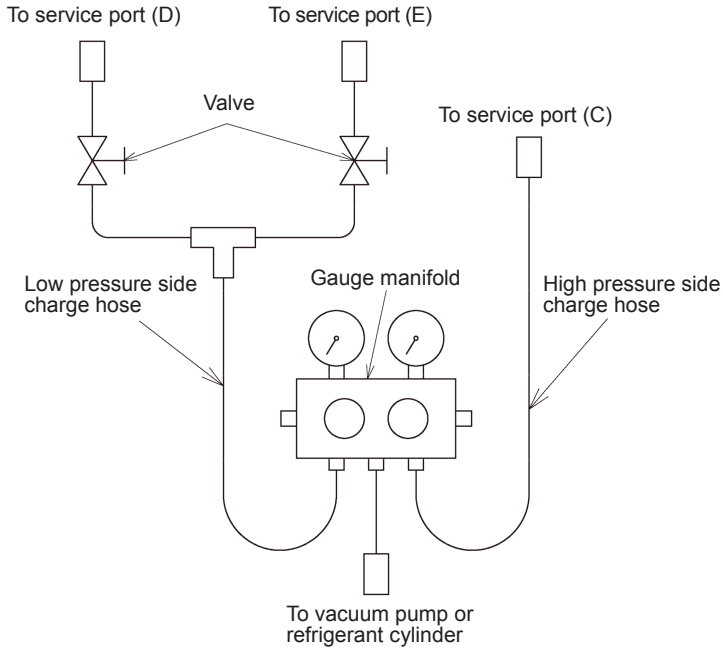


*R

■ Location of service port



■ Gauge manifold

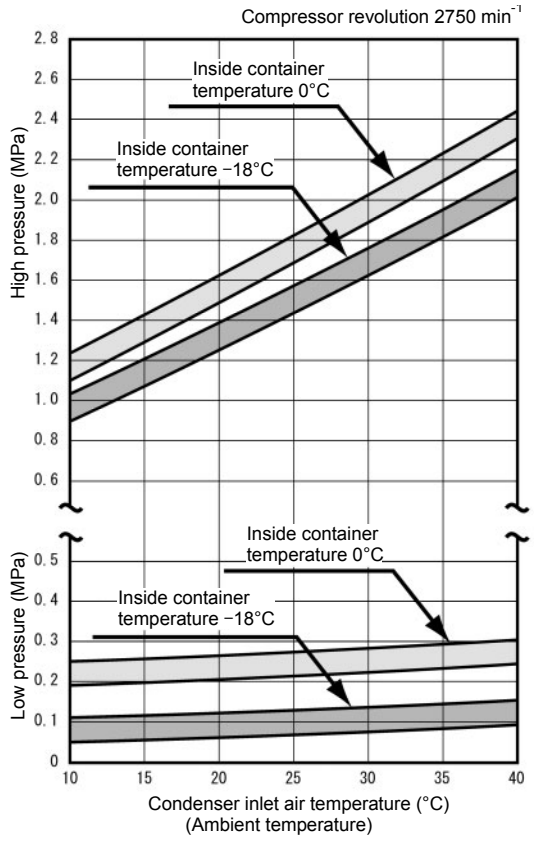


*R

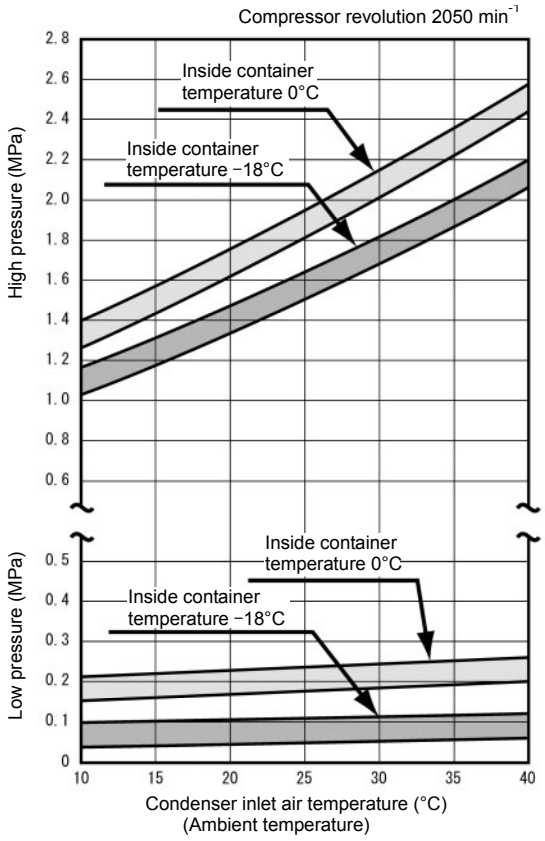
10.12 Standard operating pressure

(1) TDJS35DAE

(a) TDJS35DAE-CS55R compressor

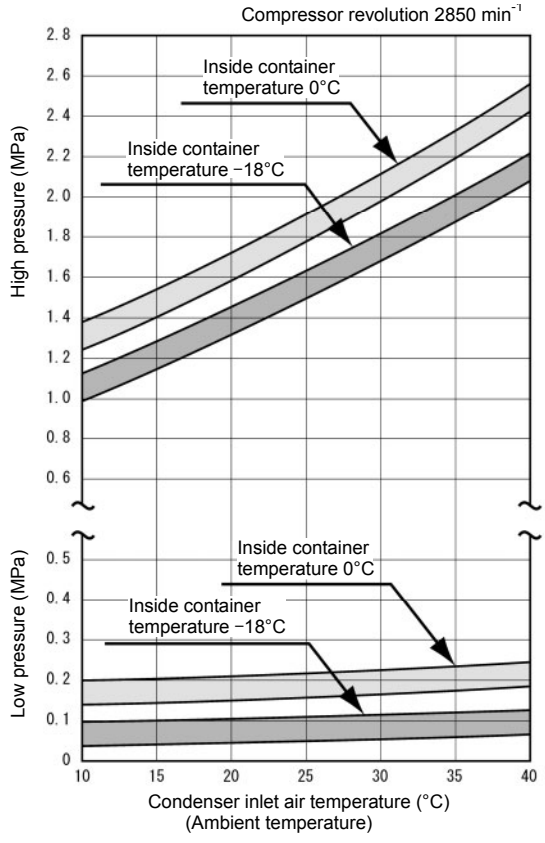


(b) TDJS35DAE-CS90V compressor

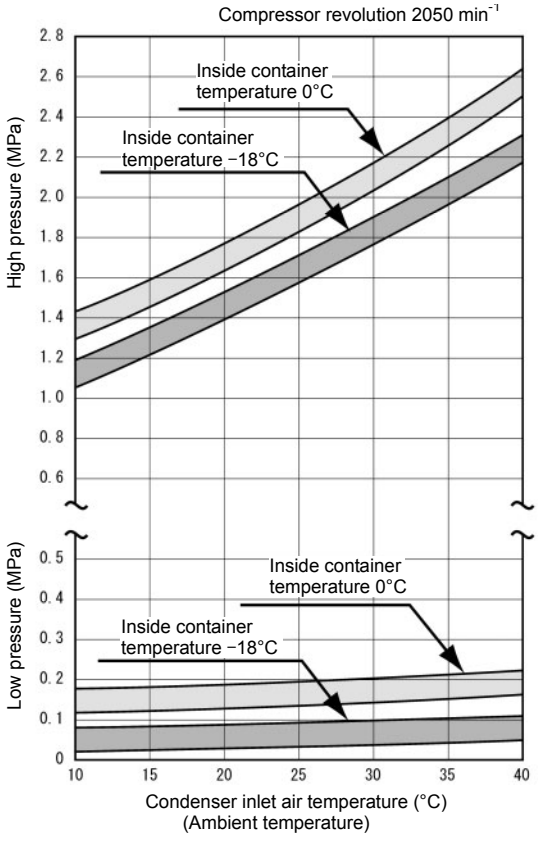


(2) TDJS50DAE

(a) TDJS50DAE-CS90R compressor

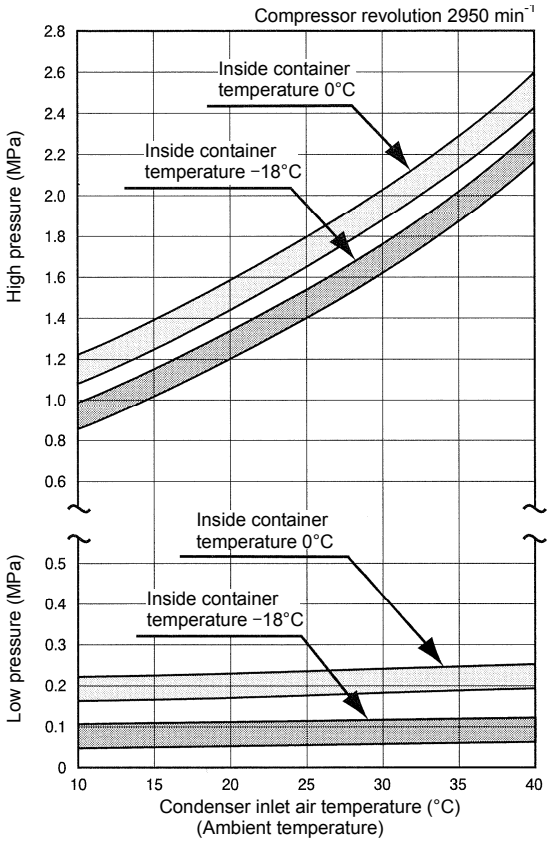


(b) TDJS50DAE-CS150V compressor

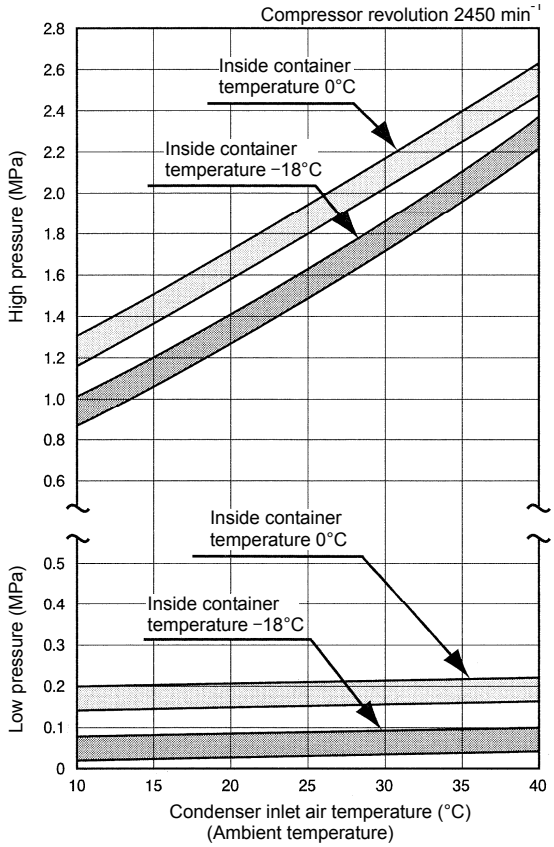


(3) TDJS70DZAE

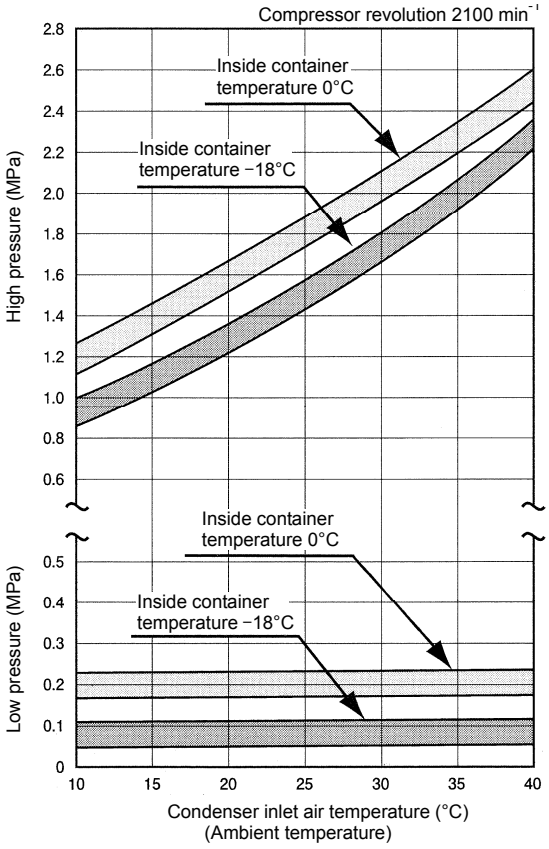
(a) TDJS70DZAE-CS90ER compressor



(b) TDJS70DZAE-CS150ER compressor



(c) TDJS70DZAE-CS150EV compressor



11. Loading and Unloading

(1) Preparation before loading

⚠ CAUTION

Before loading, cool down or heat up inside of the container to the appropriate setting temperature for the transportation of cargoes. Cargoes must be cooled down or heated up to the designated temperature with other refrigeration device in advance.

※ Otherwise, it may cause damage of the cargoes or deterioration of the quality. Or it may cause emergency stop of the refrigeration unit.

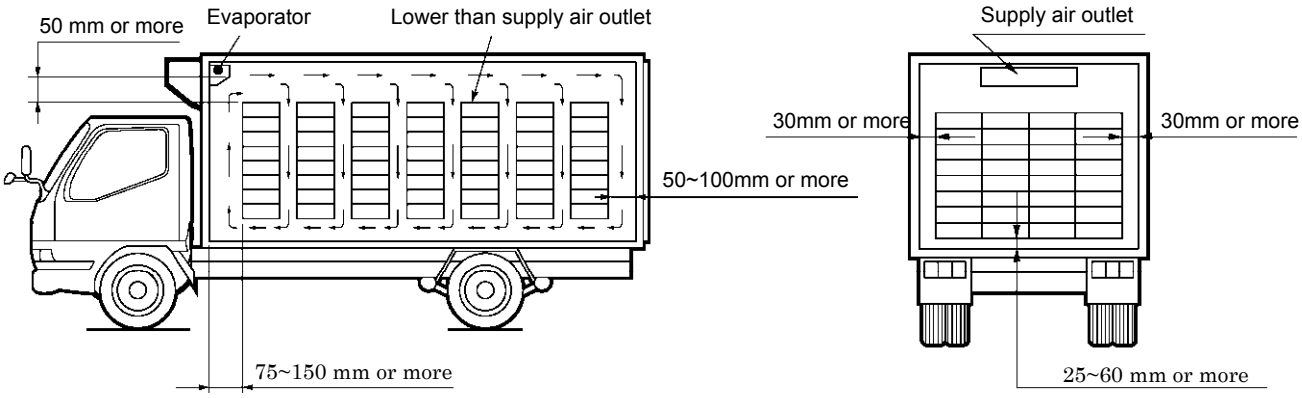
1) Cool down or heat up the cargoes to the designated temperature with other refrigeration device in advance.
2) Clean inside of the container.
3) Perform inspection of the refrigeration unit and the body.
4) Set the right temperature for transportation of the cargoes and cool down or heat up inside of the container to the setting temperature.

Notice

- The temperature inside of the closed container may reach 60°C under a blazing sun. Loading in such a container causes damage or deterioration of the quality. Be sure to cool down inside of the container to the setting temperature before loading.

(2) Loading procedure

1) Stop the cooling operation.
2) Load the cargoes in the container.
   Leave a space between the cargo and inner wall of the container as shown in the following figure in order to circulate cool air.



3) Keep the top layer of the cargo as flat as possible.

⚠ CAUTION

Waterproof the cargoes if they need to be.

※ Water may drip or splash from the evaporator unit.

4) When transporting any cargo to be protected from water damage, cover the cargo placed under the evaporator unit or near its outlet with waterproof sheet.
5) After completing loading, start the operation of the refrigeration unit.

(3) Unloading

1) Stop the cooling operation.
2) Unload the cargoes.

Notice

- Frost forms and accumulates on the evaporator coil while the refrigeration unit is operated during loading or unloading.
- Since the inside container temperature rises (or falls during cold winter) while the door is kept opened, load or unload as quickly as possible.
- A curtain helps to prevent ambient air from entering or inside air from escaping during loading or unloading.

12. Troubleshooting

12.1 Troubleshooting of refrigerant system

(1) Abnormality and its cause of refrigerant system

Cause \ Abnormality	Defrosting is not possible.	Refrigerating capacity is not observed.	Compressor generates noise.	Compressor does not maintain the suction pressure.	Compressor does not suck.	Pump down is not possible.	Suction pipe is frosted.	Sight glass is flushing.	Low pressure is high.	Low pressure is low.	High pressure is high.	High pressure is low.
Refrigerant is overcharged.							○		○		○	
Refrigerant is insufficient or leaking.	○	○						○		○		○
Temperature of inlet air of the condenser is excessively high.									○		○	
Condenser is clogged.											○	
Temperature of inlet air of the condenser is excessively low.								○		○		○
Air is mixed in the refrigerating cycle.		○	○								○	
Condenser fan stops.											○	
Evaporator coil is clogged.		○					○			○		
Evaporator coil is frosted.		○					○			○		
An excessive amount of refrigeration oil circulates.		○										
Compressor is defective (bearing, scroll lap, etc.).		○	○	○	○	○			○			○
Improper mounting of expansion valve temperature sensing bulb		○					○		○			
Expansion valve is excessively opened.		○					○		○		○	
Expansion valve is excessively closed.		○								○		○
Expansion valve is clogged.		○								○		○
The low pressure side is clogged. (Defective operation of multi-function valve, etc.)		○								○		○
The high pressure side is clogged. (Defective of condenser outlet solenoid valve and check valve, etc.)										○	○	
Evaporator fan is stopped. (During cooling operation)		○					○			○		
Defective hot gas solenoid valve SV1A	○	○							○			

(2) Insufficient cooling capacity

Trouble cause	Countermeasure
(1) Airflow is insufficient. (a) The evaporator coil is frosted. (b) Defective evaporator fan motor	(a) Reset the time on the defrost timer. ・ Confirm hot gas solenoid is working during defrosting operation. ・ Conduct manual defrost. (b) Check the short circuit・breaking of wire.
(2) Since an opening exists on the refrigeration van, air enters from outdoor through the opening.	Check for opening, and repair to eliminate the opening.
(3) The sight glass is flushing.	Inspect for gas leakage and replenish refrigerant after repair.
(4) Condenser coil is dirty.	Wash with water. Take care of the fins which may be deformed if rubbed with hard-haired brush. WARNING • If the high pressure washer is used, the condenser fins will be deformed. Be sure to prevent using the high pressure washer. • Avoid using the steam washer because the pressure in the equipment will abnormally rise and it is very dangerous.
(5) When Items (1) ~ (4) are normal. (a) The expansion valve or the drier is clogged.	(a) Connect a gauge manifold, and start engine. Check that the compressor is rotating. The expansion valve or drier may be clogged if a slightly lower value is indicated as the pressure on the high pressure side and the pressure indicated on the lower side is lower than the standard operating pressure. (See pages 77-78.) 1) Expansion valve may be clogged if moisture freezes at and blocks the hole of expansion valve outlet. Stop operation once and then after inside ice being melted operate compressor again with temperature sensing bulb in floating condition so that the pressure at the low side will increase. If the pressure at the low pressure side indicates lower than the normal operation value again after a while, it is suspected that water is in the refrigeration circuit. In case the low pressure gauge will not go up even if temperature sensing bulb is floated, it is suspected that expansion valve is stuck or gas leaks from temperature sensing bulb. Replace. 2) Recover the refrigerant if moisture is mixed. Then replace the drier. After completely removing the moisture with the "repeated evacuating method", charge the refrigerant. Furthermore when the drier is clogged, the low pressure gauge may also show the lower value than the normal operating condition. In this case, the drier and subsequent tubing will be covered by frost. If it is slightly clogged, the temperature difference is observed between before and after the drier. Replace the drier in such cases.
(b) The expansion valve is excessively opened.	(b) When the pressure on the low pressure side is high together with the low pressure piping up to the compressor frosted, the expansion valve is excessively opened and refrigerant enters into the compressor in liquid state. Check whether the expansion valve temperature sensing bulb is not afloat or the expansion valve is not seized.

Trouble cause	Countermeasure
(c) Defective hot gas solenoid valve	(c) Replace hot gas solenoid valve if there is no temperature difference between the front and the rear sides of hot gas solenoid valve during cooling operation so that the valve is suspected to be opened.
(d) Defective multi-function valve	(d) Replace multi-function valve if the pressure at the outlet side of multi-function valve is excessively lower than that of inlet side by inspection so that the valve is suspected to be defective.
(e) Excessive refrigerant	(e) If the high pressure and the low pressure are higher than the standard operating pressure, refrigerant is overcharged. Recover refrigerant once and then re-charge the specified quantity.
(f) Much air is mixed in the refrigerant piping.	(f) If the high pressure gauge shows a fairly high value, a lot of bubbles are seen in the sight glass and cooling is poor, air is mixed. It is necessary to recover refrigerant and evacuate system.

(3) Abnormal sound is heard.

Trouble cause	Countermeasure
(1) Loosened bolt and nut due to improper mounting work	Check, repair or retighten.
(2) Compressor (a) Metallic noise is heard from the internal. (b) Oil is excessively filled.	 (a) Replace. (b) Drain oil to the specified amount.
(3) Belt is loose.	Retighten to the specified tension.
(4) Fan interference	Inspect and repair if necessary.
(5) Liquid compression in the compressor	Check expansion valve and quantity of refrigerant.

(4) High pressure is too high during cooling operation.

Trouble cause	Countermeasure
(1) Mixing of air in the refrigerant piping	Recover refrigerant, and evacuate the system.
(2) Dirty condenser coil	Clean the condenser coil.
(3) Excessive refrigerant amount	Recover refrigerant once and re-charge the proper quantity.
(4) Defective condenser fan	Inspect.
(5) Condenser outlet solenoid valve (SV3) does not open.	Repair or replace if necessary.
(6) Clogged pipe on the high pressure side (Defective operation of condenser outlet solenoid valve, defective check valve, etc.)	Repair or replace if necessary.
(7) Condenser coil fin is damaged.	Repair.
(8) Ambient temperature is high.	Move the unit into the shade or to a cool airy place.
(9) Belt slip	Adjust the tension.

(5) High pressure is too low during cooling operation.

Trouble cause	Countermeasure
(1) Refrigerant quantity is insufficient.	Inspect leakage area and recharge the refrigerant after repair.
(2) Defective compressor	Replace.
(3) Clogged drier	Replace.
(4) Hot gas solenoid valve (SV1A) is open.	Repair or replace if necessary.
(5) Ambient temperature is low.	Not abnormal.
(6) Frosted evaporator coil	Inspect and conduct the defrosting operation.

(6) Low pressure is too high during cooling operation.

Trouble cause	Countermeasure
(1) Defective compressor	Replace.
(2) Refrigerant quantity is excessive.	Recover refrigerant once and then re-charge the proper quantity.
(3) Hot gas solenoid valve (SV1A) is open.	Repair or replace if necessary.
(4) Ambient temperature is high.	Move the unit into the shade or to a cool airy place.
(5) Expansion valve is open excessively. (Defective operation)	Inspect expansion valve temperature sensing bulb and adjust if it is not contact with suction piping. Adjust or replace if expansion valve is open excessively.

(7) Low pressure is too low during cooling operation.

Trouble cause	Countermeasure
(1) Refrigerant quantity is insufficient.	Inspect and repair the leakage area and recharge the refrigerant.
(2) Frosted evaporator coil	Inspect and conduct defrosting operation.
(3) Clogged drier	Replace
(4) Ambient temperature is low.	Not abnormal.
(5) Clogged pipe on the low pressure side (Defective operation of multi function valve, etc.)	Inspect and repair.
(6) Expansion valve is clogged or closed excessively. (Defective operation)	Recover refrigerant and evacuate system if moisture freezes. Replace if expansion valve is seized.
(7) Defective evaporator fan	Inspect, and repair or replace if necessary.

12.2 Troubleshooting of electrical system

(1) Type of abnormal

Counter measures and recovery actions are different depending on the effect that is caused by the abnormal of the refrigeration unit to its operation. There are 3 types of abnormal as shown below.

Type of abnormal	Unit operation	Recovery action	7-segment display	LCD back light	Abnormal display ⚠	Buzzer sound
Temporary operation abnormal	Continues. (Temporary operation)	- (Normal operation resumes when abnormal detection condition becomes unsatisfied.)	Upper: AL and setting temperature are alternately displayed at 2 seconds of interval Lower: Alarm code and inside container temperature are alternately displayed at 2 seconds of interval	No	Flicker	No
Automatic recovery abnormal	Stops.	Operation resumes automatically when satisfying recovery condition.	Normal display	No	No	No
Manual recovery abnormal	Stops.	Operation resumes by OFF/ON of cabin controller.	Upper: AL Lower: Alarm code	Flicker	On	Yes

”ZONE A” (or “ZONE B”) on the display area of cabin controller is turned on when abnormal happens on the device controlling compartment A (or compartment B) in case of multi-temperature or 2-temperature unit.

(2) Alarm code list

Alarm Code	Trouble	Type of abnormal	Countermeasures
E003	Magnet clutch fuse F2 has blown.	Manual recovery	No voltage input from magnet clutch fuse is supplied to controller so that all the loads are disconnected. Inspect magnet clutch and harness after inspecting the fuse.
E006	Load power relay fuse F7 has blown.	Manual recovery	No voltage input from load power relay fuse is supplied to controller so that all the loads are disconnected. Inspect relay and harness after inspecting the fuse.
E010	High pressure switch tripped.	Automatic recovery	High pressure switch has tripped so that all the loads except condenser fan motor are disconnected. Operation automatically resumes if high pressure switch contact is closed. (1) Check if high pressure switch is normal. (2) Check if condenser fan is rotating. If not, inspect fuse inside of control box and mating of connectors. (3) Inspect if condenser coil is too dirty. If so, clean up with water.
		Manual recovery	High pressure switch had been activated again within 5 minutes after operation resumes so that abnormal is registered. Inspect above conditions.
E013	Discharge gas temperature abnormal.	Automatic recovery	Discharge gas temperature increased over 145℃ so that all the loads are disconnected. Operation automatically resumes if discharge gas temperature decreases below 130℃. (1) Check if high pressure and low pressure are normal and inspect if there is gas leakage or refrigerant is short. (2) Inspect if expansion valve is defective or drier is clogged.
		Manual recovery	Discharge gas temperature increased over 145℃ again within 5 minutes after operation resumes so that abnormal is registered. Inspect above conditions.
E014	Refrigerant shortage abnormal.	Manual recovery	High pressure is below 0.05 MPa while inside container temperature is above -10℃ so that refrigerant is considered to be short and all loads are disconnecred. Inspect gas leakage and charge proper quantity of refrigerant since refrigerant is extremely in short.
E016	Low pressure sensor abnormal.	Temporary operation	Low pressure sensor is disconnected (voltage is below 0.2V) or shorted (voltage is over 3.5V). Inspect refrigerant amount and low pressure sensor. Temporary operation continues.
E017	High pressure sensor abnormal.	Temporary operation	High pressure sensor is disconnected (voltage is below 0.3V) or shorted (voltage is over 3.5V). Temporary operation continues for cooling, evaporator fan motor only is energized for heating. For defrosting, fan defrost is conducted if setting temperature is equal to or above 5℃ while defrost is not conducted if setting temperature is below 5℃. Inspect high pressure sensor.
E040	Abnormal stop output shortcircuit abnormal.	Temporary operation	Abnormal stop output is short circuited. Inspect external equipment connected, wiring and connectors.
E041	Operation output shortcircuit abnormal.	Temporary operation	Operation output circuit is shorted. Inspect external equipment connected, wiring and connectors.
E042	Out of adequate temperature output shortcircuit abnormal.	Temporary operation	Out of adequate temperature sensor output circuit is shorted. Inspect external equipment connected, wiring and connectors.

Alarm Code	Trouble	Type of abnormal	Countermeasures
E050	Return air temperature sensor abnormal.	Temporary operation	Return air temperature sensor is disconnected (detected value is below -60℃), shorted (detected value is above 80℃) or poor contacted. When the setting temperature is equal to or below -10℃, forced cooling operation continues and defrost operation is also conducted. Inspect resistance of return air temperature sensor, wiring and connectors.
		Manual recovery	When the setting temperature is equal to or above -9.5℃, all the loads are de-energized . Inspect above conditions.
E057	Evaporator outlet temperature sensor abnormal.	Temporary operation	Evaporator outlet temperature sensor is disconnected (detected value is below -60℃) or shorted (detected value is above 80℃). Normal operation continues for cooling and heating. For defrosting, defrost timer counting continues during cooling operation and defrost is conducted based on the timer count and setting temperature (≦ 15℃). Inspect resistance of evaporator outlet temperature sensor, wiring and connectors.
E063	Discharge gas temperature sensor abnormal.	Temporary operation	Discharge gas temperature sensor at engine side is disconnected (detected value is below -10℃) or shorted (detected value is above 180℃). Inspect resistance of discharge gas temperature sensor, wiring and connectors.
E099	Controller communication error.	Temporary operation	Controller cannot communicate properly so that it retries communication automatically. Inspect connection of connectors. Further inspect cabin controller, main printed board and main harness.
		Manual recovery	Communication error alarm had tripped 10 times. All the loads are de-energized. Inspect above conditions.
E101	Evaporator fan motor fuses, F11 ~ F14, are disconnected.	Temporary operation	More than one evaporator fan motor fuse voltage inputs to controller are missing. Inspect evaporator fan motor fuse, evaporator fan motor and wiring.
E102	Condenser fan motor fuses, F31 ~ F33, are disconnected.	Temporary operation	More than one condenser fan motor fuse voltage inputs to controller are missing. Inspect condenser fan motor fuse, condenser fan motor and wiring.
E104	Drain hose heater fuse, F61, is disconnected.	Temporary operation	Drain hose heater fuse voltage input to controller is missing. Inspect drain hose heater fuse, drain hose heater and wiring.
E160	Economizer solenoid valve shortcircuit abnormal. *1	Temporary operation	Economizer solenoid valve circuit is shorted. Temporary operation continues with economizer solenoid valve de-energized. Inspect economizer solenoid valve, wiring and connectors.
E161	Liquid line solenoid valve shortcircuit abnormal. *1	Temporary operation	Liquid line solenoid valve circuit is shorted. Temporary operation continues for heating. Inspect liquid line solenoid valve, wiring and connectors.
		Manual recovery	All the loads are de-energized for cooling and no defrosting is conducted. (All the loads are de-energized if abnormal happens during defrosting.) Inspect above conditions.
E163	Hot gas solenoid valve shortcircuit abnormal. *1	Temporary operation	Hot gas solenoid valve circuit is shorted. Temporary operation continues for cooling, evaporator fan motor only is energized for refrigerant heating. For defrosting, fan defrost is conducted if setting temperature is equal to or above 5℃ while defrost is not conducted if setting temperature is below 5℃. Inspect hot gas solenoid valve, wiring and connectors.

Alarm Code	Trouble	Type of abnormal	Countermeasures
E 167	Condenser outlet solenoid valve shortcircuit abnormal. *1	Temporary operation	Condenser outlet solenoid valve circuit is shorted. Evaporator fan motor only is energized for refrigerant heating. Inspect condenser outlet solenoid valve, wiring and connectors.
		Manual recovery	All the loads are de-energized for cooling and no defrosting is conducted. (All the loads are de-energized if abnormal happens during defrosting.) Inspect above conditions.
E 168	Liquid bypass solenoid valve shortcircuit abnormal. *1	Temporary operation	Liquid bypass solenoid valve circuit is shorted. Inspect liquid bypass solenoid valve, wiring and connectors.

*1: All the loads are de-energized if more than 2 short circuits are detected for shortcircuit abnormal.

(3) Diagnosis by cabin controller display

From the next page, the diagnosis is described in two-page spread.

Remarks: (1) Measure voltage with body ground wire.
(2) Alphabetic code such as B, RW, YG and G shows the color of wiring.
(3) Refer to terminal number of main board in page 155.
(4) See pages 42 through 45 for wiring diagram.

MEMO

Alm display	Alarm contents	Unit operation when alarm happened
E003	Magnet clutch fuse has blown	E003 is displayed and unit stops operation

Alarm detection condition	Recovery condition
There is no voltage input from magnet clutch fuse to main PCB	• Operation resumes by OFF/ON of cabin controller • There is voltage input from magnet clutch fuse to main PCB when unit start operation

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

Fuse "F2" has blown? — YES → Is there any abnormal such as lock, burnout in magnet clutch? — YES → Replace magnet clutch

Fuse "F2" has blown? — NO → Is there any abnormal such as lock, burnout in magnet clutch? — NO →

1 Is there any shortcircuit for wiring between T∗ terminal on relay PCB and magnet clutch? — YES → Repair wiring

Unit Model	T∗ terminal	Wiring
TDJS35, 50	T9	LR (Blue Red)
TDJS70	T13	LR (Blue Red)

1 — NO →

- Check current if magnet clutch load exceeds fuse specified capacity temporary
- Check poor contact at terminal
- Check correct capacity fuse is installed.

If there is no abnormal for above, replace fuse.

2 Is battery voltage detected on primary side of fuse "F2"? — YES → 3 Is battery voltage detected on 18 pin of CN1 connector of relay PCB? — NO → Replace relay PCB

2 — NO →

3 — YES → 4 Is battery voltage detected on 18 pin of CN3 connector of main PCB? — YES → Replace main PCB

4 — NO → Repair wiring between relay and main PCB

5 Is battery voltage detected on T∗ terminal on relay PCB? — YES → Replace relay PCB

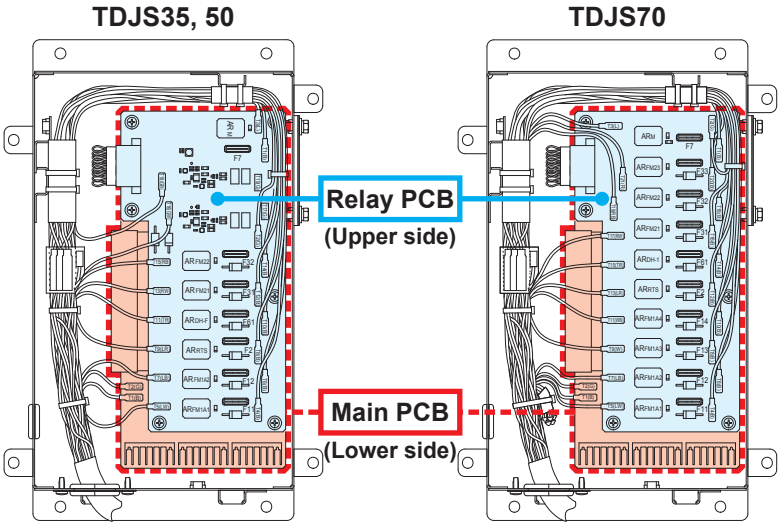
Unit Model	T∗ terminal	Wiring
TDJS35, 50	T8	B (Black)
TDJS70	T12	B (Black)

5 — NO →

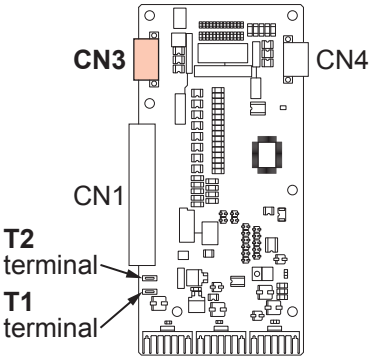
- Check poor contact at T* terminal
- Check disconnection of wiring between battery and T* terminal

Control box (TDJS series)

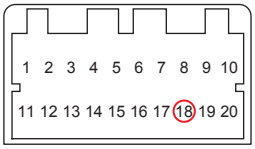
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



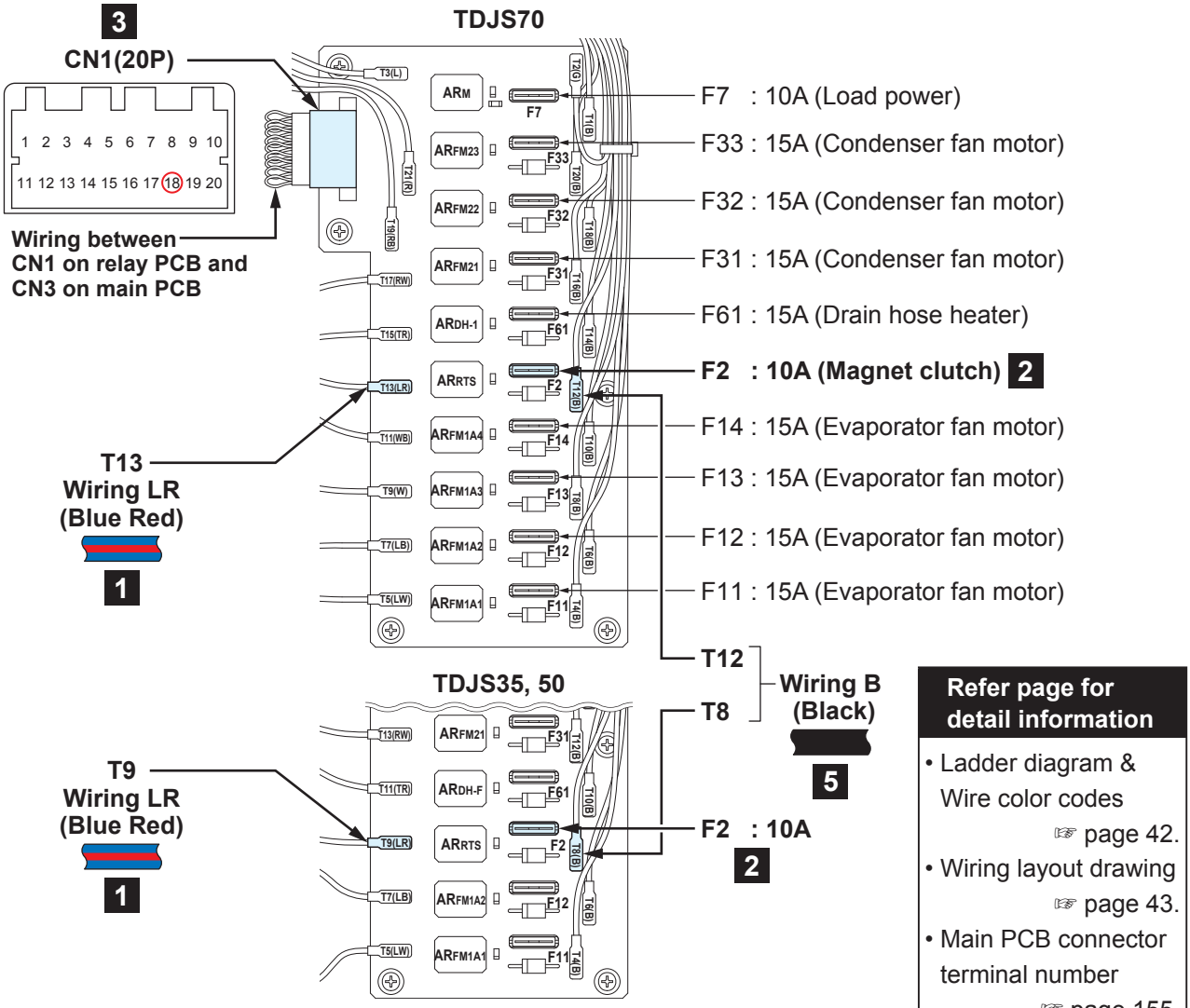
CN3 (20P)



4

Wiring connection to Relay PCB, Fuse arrangement

Wiring for magnet clutch fuse is connected to 18 pin of CN1 connector on relay PCB.



Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E006	Load power relay fuse has blown	E006 is displayed and unit stops operation

Alarm detection condition	Recovery condition
There is no voltage input from load power relay fuse to main PCB	• Operation resumes by OFF/ON of cabin controller • There is voltage input from load power relay fuse to main PCB when unit start operation

Troubleshooting procedure

1 shows the refer point for next page.

Fuse "F7" has blown?

YES → Is there any abnormal such as coil burnout in solenoid valve? (Judgement ☞ page 126 **1**.)

YES → Replace solenoid valve

NO

Unit Model	Solenoid valve
TDJS35, 50	SV1A, 2, 3, 5A
TDJS70	SV1A, 2, 3, 5A, 61, 62

NO

1 Is there any shortcircuit for wiring between T3 terminal (Blue wiring) on relay PCB and each solenoid valve?

YES → Repair wiring

NO → • Check current if solenoid valve load exceeds fuse specified capacity temporary
• Check poor contact at terminal
• Check correct capacity fuse is installed.
If there is no abnormal for above, replace fuse.

2 Is battery voltage detected on primary side of fuse "F7"?

YES → **3** Is battery voltage detected on 14 pin of CN1 connector of relay PCB?

NO → Replace relay PCB

YES

NO

4 Is battery voltage detected on 14 pin of CN3 connector of main PCB?

YES → Replace main PCB

NO → Repair wiring between relay and main PCB

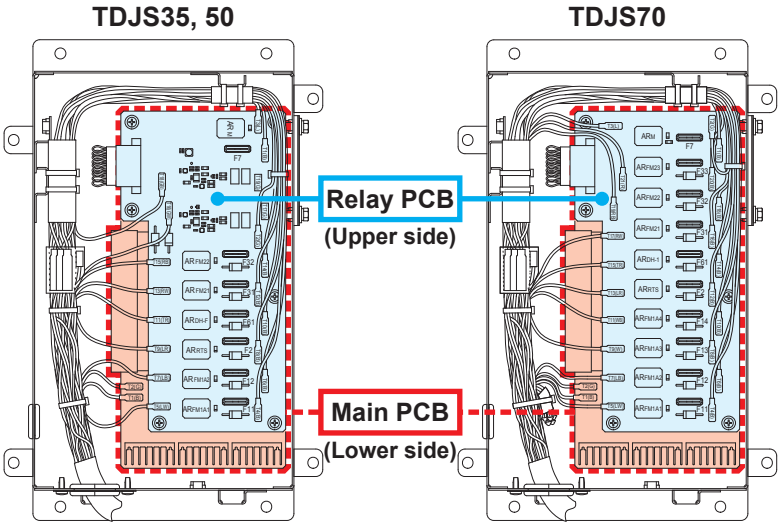
5 Is battery voltage detected on T1 terminal (Black wiring) on relay PCB?

YES → Replace relay PCB

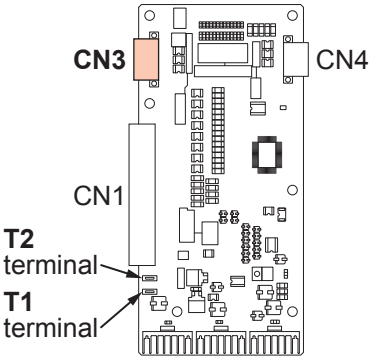
NO → • Check poor contact at T1 terminal
• Check disconnection of wiring between battery and T1 terminal

Control box (TDJS series)

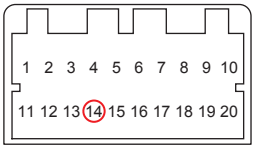
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



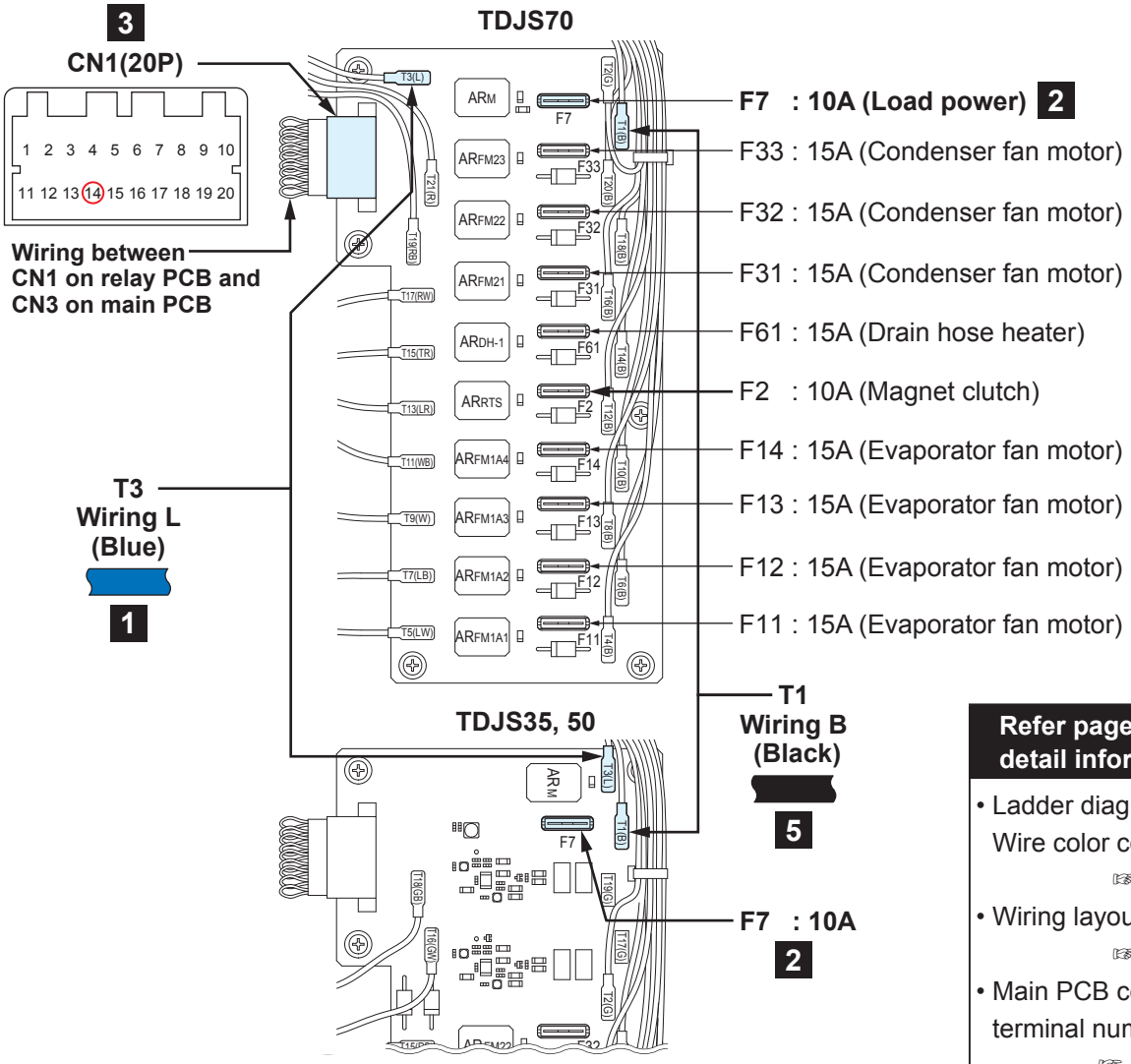
CN3 (20P)



4

Wiring connection to Relay PCB, Fuse arrangement

Wiring for load power relay fuse is connected to 14 pin of CN1 connector on relay PCB.

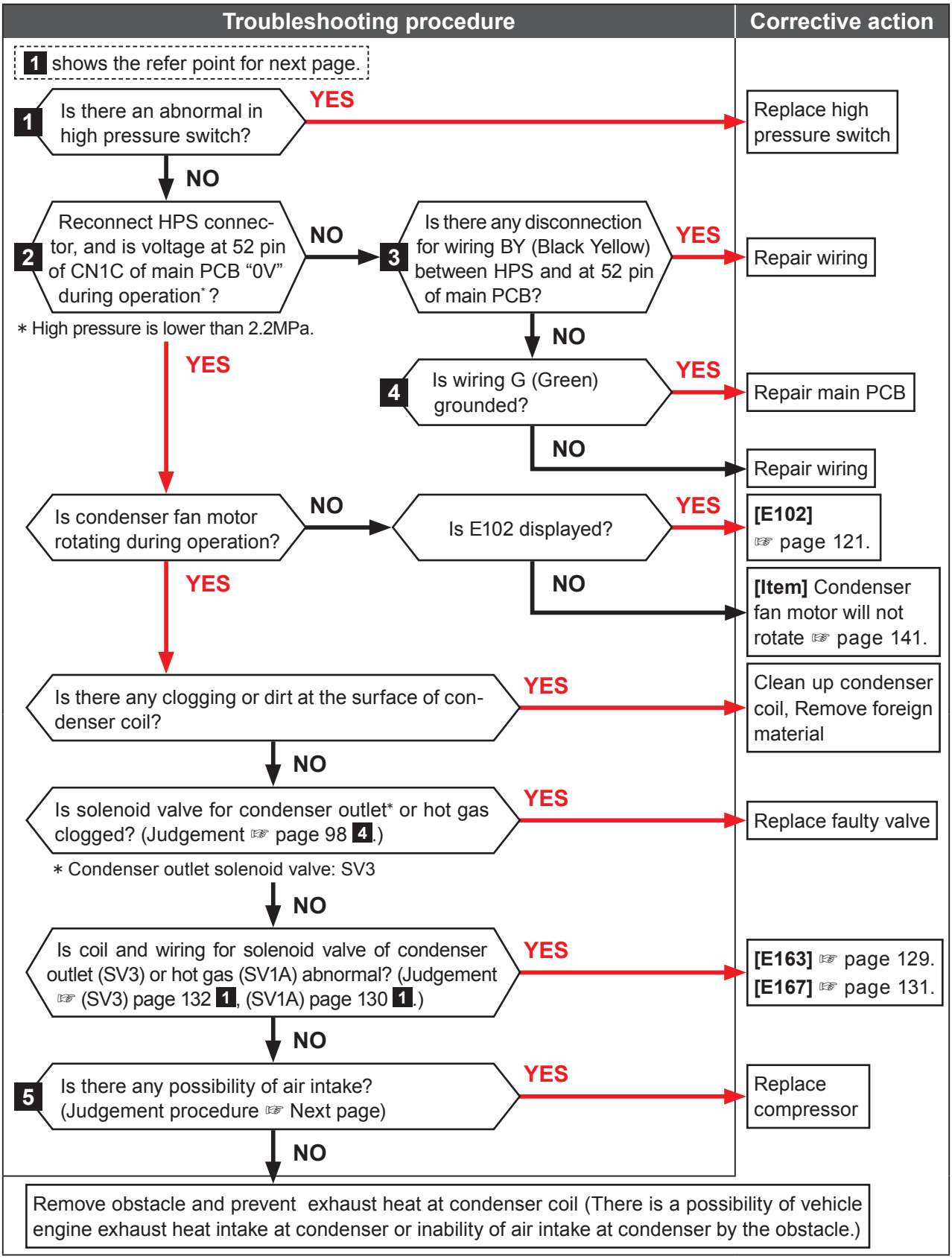


Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

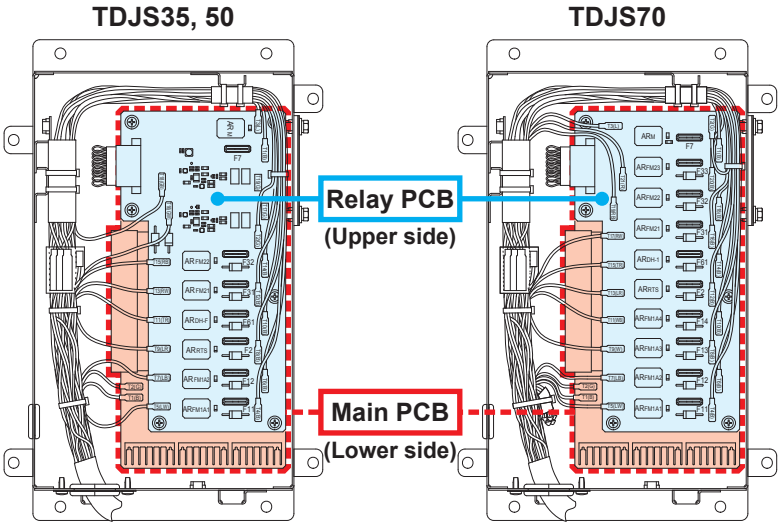
Alm display	Alarm contents	Unit operation when alarm happened
E010	High pressure switch (HPS) tripped	E010 is displayed and unit stops operation

Alarm detection condition	Recovery condition
High pressure switch is activated (contact is open).	• Operation resumes automatically 60 seconds after high pressure switch is deactivated (contact is closed). • Operation resumes by OFF/ON of cabin controller when HPS is activated again within 5 minutes after restart operation resumes.

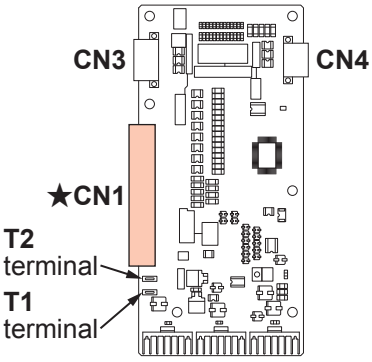


Control box (TDJS series)

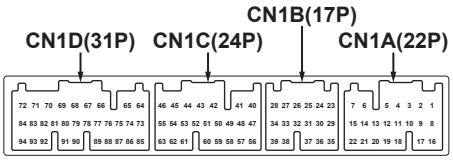
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



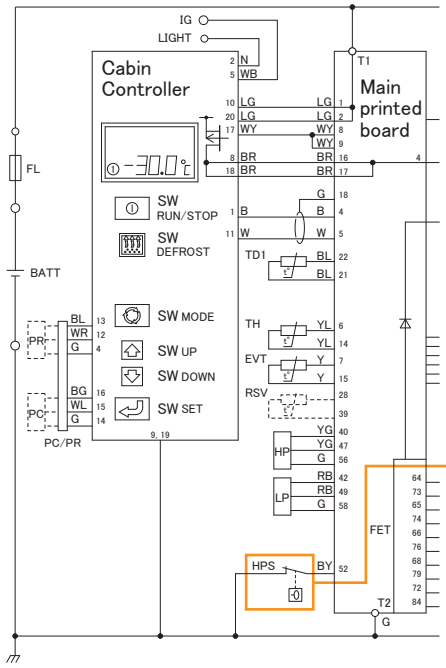
Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**

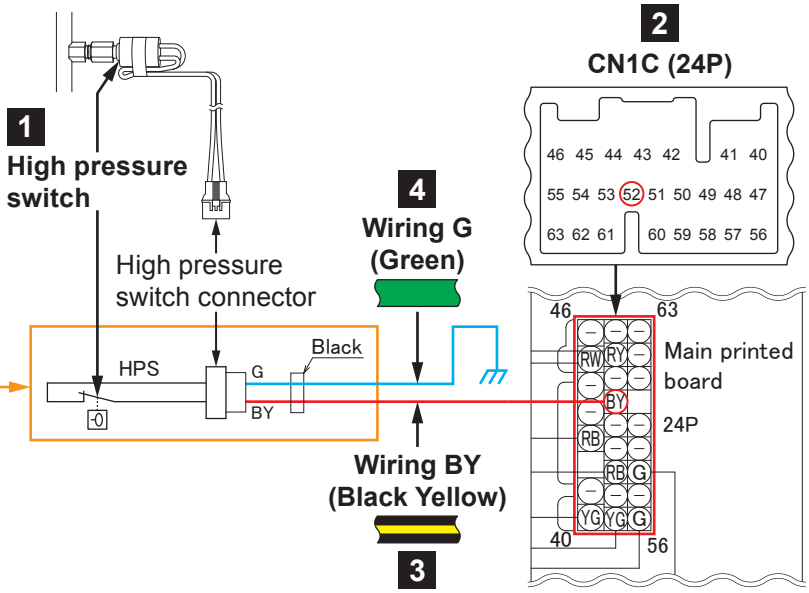


Ladder diagram



Wiring connection to Main PCB for high pressure switch

Wiring for high pressure switch is connected to 52 pin of CN1C connector on main PCB.



1

Judgement procedure for HPS

(1) Stop unit operation.
(2) Check if high pressure is lower than 2.2MPa.
(3) Remove connector for high pressure switch.
(4) Check continuity between the lead wires for HPS.

If there is continuity, HPS is judged **normal**.

5

Judgement procedure for air intake

(1) Recover refrigerant. (☞ 75 page.)
(2) Remove compressor.
(3) Perform evacuation only for compressor.

If pressure increases 5 minutes after evacuation, air is thought to be mixed in the refrigeration cycle. Replace compressor.

Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Refrigerant recovery, evacuation and refrigerant charge ☞ page 75.

Alm display	Alarm contents	Unit operation when alarm happened
E013	Compressor discharge gas temperature abnormal	E013 is displayed and unit stops operation

Alarm detection condition	Recovery condition
During unit operation, compressor discharge gas temperature ≥ 145℃	• Operation resumes automatically when discharge gas temperature is lower than 130℃ • OFF/ON of cabin controller when discharge gas temperature ≥ 145℃ again within 5 minutes after operation resumes

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

1 Is resistance of compressor discharge gas temperature sensor abnormal? (Relation of temperature and resistance ☞ Next page)
- YES → Replace discharge gas temperature sensor
- NO → E013 happened during cooling?
  - YES → Is high and low pressure significantly low against standard operating pressure[*1] compared with gauge manifold or controller display[*2]?
    - YES → Find and repair refrigerant leakage portion
    - NO → Is low pressure significantly low against standard operating pressure[*1] compared with gauge manifold or controller display[*2]?
      - NO → Replace compressor
      - YES → **2** Is dryer clogged? (Judgement ☞ Next page)
        - YES → Replace dryer
        - NO → **3** Is multi-function valve abnormal? (Judgement ☞ Next page)
          - YES → Replace multi-function valve
          - NO → **4** Is hot gas solenoid valve clogged? (Judgement ☞ Next page)
            - YES → Replace hot gas solenoid valve
            - NO → Is coil and wiring for hot gas solenoid valve abnormal? (Judgement ☞ page 130 **1**.)
              - YES → **[E163]** ☞ page 129.
              - NO → **4** Is liquid bypass solenoid valve clogged? (Judgement ☞ Next page)
                - YES → Replace liquid bypass solenoid valve
                - NO → Is coil and wiring for liquid bypass solenoid valve abnormal? (Judgement ☞ page 134 **1**.)
                  - YES → **[E168]** ☞ page 133.
                  - NO → Replace main PCB
  - NO → Is coil and wiring for liquid bypass solenoid valve abnormal? (Judgement ☞ page 134 **1**.)
    - NO → Replace expansion valve

Reference page

∗1 : **Standard operating pressure** ☞ page 77.
∗2 : **[Cabin controller]** Analog sensor display ☞ page 61.

1

How to check resistance for compressor discharge gas temp. sensor

(1) Remove discharge gas temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 25℃ and resistance is 78.06 - 82.88kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
25℃	78. 06	80. 47	82. 88
100℃	5. 07	5. 23	5. 38
115℃	3. 25	3. 35	3. 45
135℃	1. 89	1. 94	2. 00
175℃	0. 72	0. 74	0. 76
200℃	0. 42	0. 43	0. 44

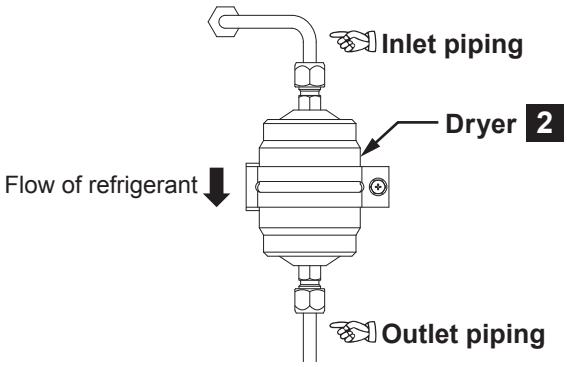
(For more data ☞ page 158.)

2

How to check clogging of dryer

(1) Touch the piping at the inlet and outlet of dryer (Refer to right figure)

When there is a temperature difference between inlet and outlet of piping, dryer is judged **clogging**. Replace dryer.



3

How to check abnormality of multi-function valve

(1) Put air shield board at condenser coil. Or remove connector for condenser fan motor to stop motor operation. (Preparation for high pressure increase)
(2) Operate the unit in cooling mode and confirm if low pressure starts lowering when high pressure reaches around 2.94±0.05MPa.

If low pressure starts lowering at above timing, multi-function valve is judged **normal**.

4

How to check clogging of solenoid valve

(1) Stop the unit operation.
(2) Energize solenoid valve by relay output test of cabin controller. ☞ page 63.
• Hot gas solenoid valve: SV1A
• Liquid bypass solenoid valve: SV2

Touch the piping at the inlet and outlet of solenoid valve. If there is temperature difference before energization and there is no temperature difference after energization, solenoid valve is judged **normal**.

Compressor discharge gas temperature control depending on compressor type

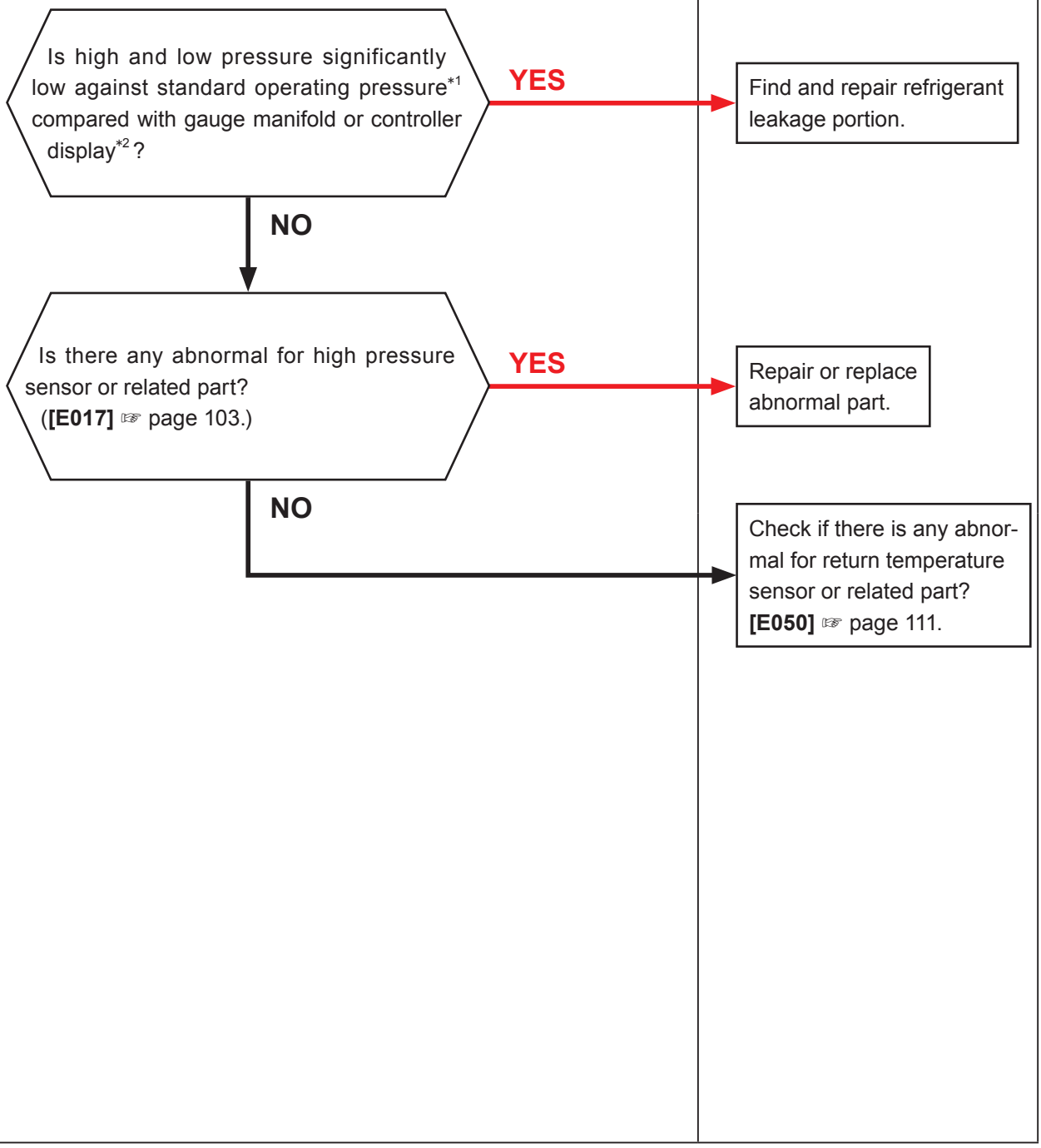
When reciprocating or swash plate type compressor is installed and compressor discharge temperature setting is changed, unit control is changed as following table.
∗ How to change compressor discharge temperature setting
[Cabin controller] Unit type setting mode ☞ page 65.

Compressor type		Temperature at operation resumes automatically	Temperature at liquid bypass solenoid valve acitivation	Alarm detection tempertature
CS	Scroll type	Lower than 130°C	Higher than 140°C	Higher than 145°C
Cr	Reciprocating type Swash plate type	Lower than 115°C	Higher than 125°C	Higher than 135°C

Alm display	Alarm contents	Unit operation when alarm happened
E014	Refrigerant shortage abnormal	E014 is displayed and unit stops operation

Alarm detection condition	Recovery condition
When unit starts operation, return temperature ≥ -10℃ and high pressure ≤ 0.05MPa.	Operation resumes by OFF/ON of cabin controller

Troubleshooting procedure	Corrective action



Reference page	∗1 : **Standard operating pressure** ☞ page 77. ∗2 : **[Cabin controller]** Analog sensor display ☞ page 61.

MEMO

Alm display	Alarm contents	Unit operation when alarm happened
E016	Low pressure (sensor) abnormal	E016 is displayed, however unit continues operation

Alarm detection condition	Recovery condition
Disconnection abnormal: Sensor output voltage < 0.2V Short-circuit abnormal: Sensor output voltage ≥ 3.5V, 2 minutes after compressor ON	Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure

1 shows the refer point for next page.

1 Is voltage between RB (Red Black)* and G (Green) "5±0.25V" at low pressure (LP) sensor connector (unit side)?

YES

2 Reconnect the connector and remove LP sensor at flare nut connection. Is LP sensor value*1 at controller within "0±10KPa"?

YES → Follow E013 after "Is high and low pressure significantly low against ... or controller display ?" **[E013]** ☞ page 97.

NO

3 Is voltage between 49 and 58 pin of CN1C on main PCB "0.5V"? (Flare nut connection is still removed.)

YES → Replace main PCB

NO

4 Is there any disconnection or water penetration on RB (Red Black)* and the connector between LP sensor connector and 49 pin of CN1C?

YES → Check and repair connector or wiring

Sensor side wiring color	Unit side wiring color	Target
R (Red)	RB (Red Black)	
W (White)	**RB (Red Black)**	←

NO → Replace LP sensor

∗ **There is 2 pcs of RB wiring. Check the voltage based on the wiring color at LP sensor.**

Sensor side wiring color	Unit side wiring color	Target
R (Red)	**RB (Red Black)**	←
W (White)	RB (Red Black)	

NO

5 Is voltage between 42 and 58 pin of CN1C on main PCB "5±0.25V"?

NO → Replace main PCB

YES

6 Is there any disconnection for wiring RB (Red Black)* and G (Green) between LP sensor connector and 42 & 58 pin of main PCB?

YES → Repair wiring

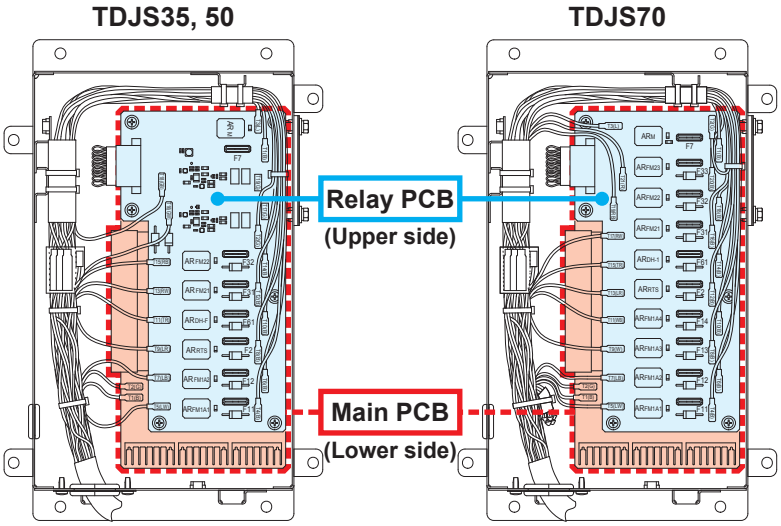
Sensor side wiring color	Unit side wiring color	Target
R (Red)	**RB (Red Black)**	←
W (White)	RB (Red Black)	

NO → Repair connector or insert connector correctly

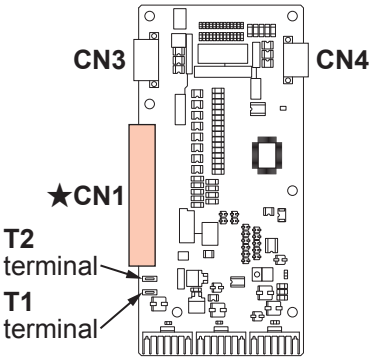
Reference page ∗1 : **[Cabin controller]** Analog sensor display ☞ page 61.

Control box (TDJS series)

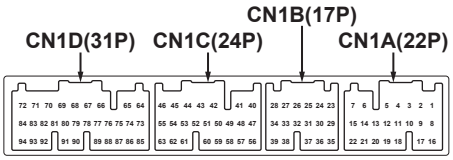
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

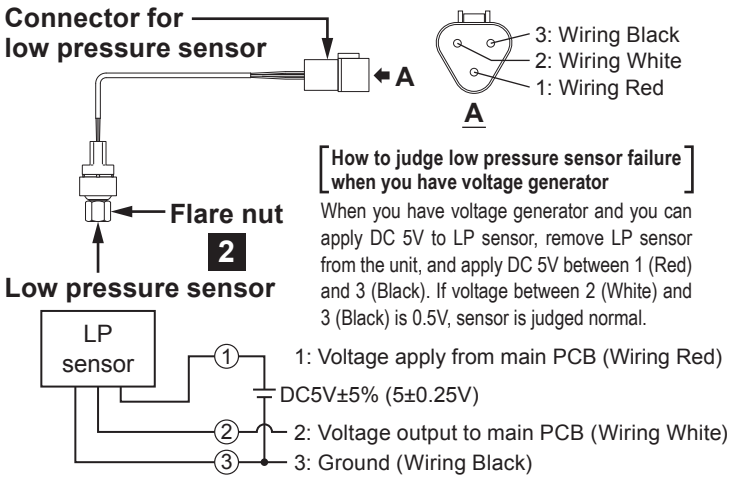


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



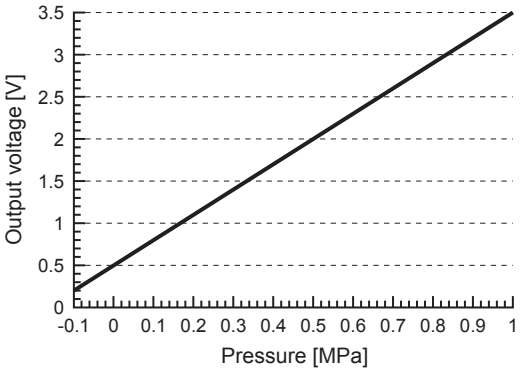
Wiring connection to Main PCB for low pressure sensor

Wiring for low pressure sensor is connected to 42, 49 and 58 pin of CN1C connector on main PCB.

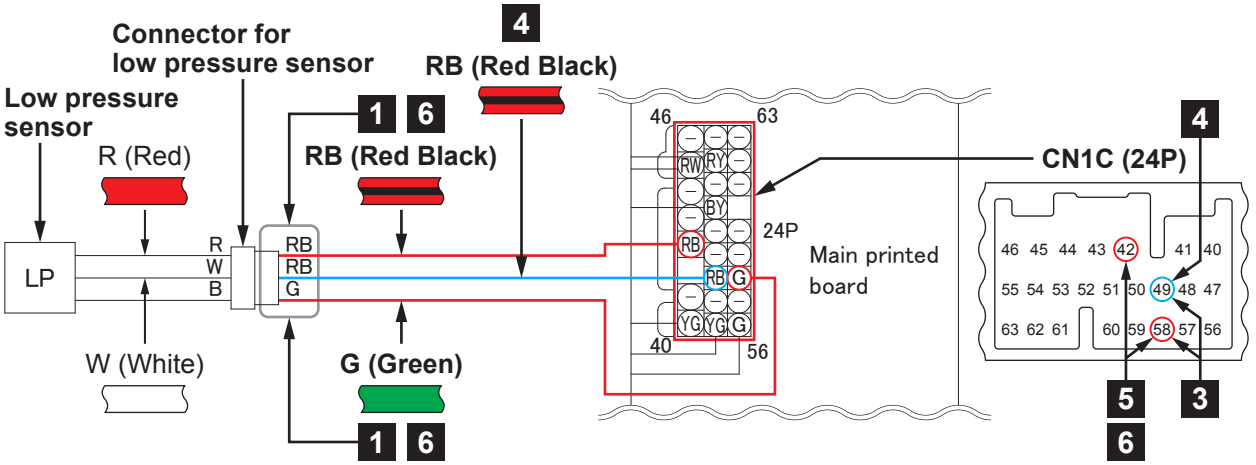


[How to judge low pressure sensor failure when you have voltage generator]

When you have voltage generator and you can apply DC 5V to LP sensor, remove LP sensor from the unit, and apply DC 5V between 1 (Red) and 3 (Black). If voltage between 2 (White) and 3 (Black) is 0.5V, sensor is judged normal.



LP sensor characteristic



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E017	High pressure (sensor) abnormal	E017 is displayed, however unit continues operation. In case of heating, only evaporator fan is ON.

Alarm detection condition	Recovery condition
Disconnection abnormal: Sensor output voltage ＜ 0.3V Short-circuit abnormal: Sensor output voltage ≥ 3.5V and HPS is deactivated. (Contact is close.)	Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

1 Is voltage between YG (Yellow Green)* and G (Green) "5±0.25V" at high pressure (HP) sensor connector (unit side)?

YES → **2** Reconnect the connector and remove HP sensor at flare nut connection. Is HP sensor value*1 at controller within "0±10KPa"?

YES → **[E010]** ☞ page 95.

NO → **3** Is voltage between 47 and 56 pin of CN1C on main PCB "0.5V"? (Flare nut connection is still removed.)

YES → Replace main PCB

NO → **4** Is there any disconnection or water penetration on YG (Yellow Green)* and the connector between HP sensor connector and 47 pin of CN1C?

YES → Check and repair connector or wiring

NO →

Pin No.	Unit side wiring color	Target
1	YG (Yellow Green)	
2	**YG (Yellow Green)**	←

NO → Replace HP sensor

* **There is 2 pcs of YG wiring. Check the voltage based on the Pin Number at HP sensor.**

Pin No.	Unit side wiring color	Target
1	**YG (Yellow Green)**	←
2	YG (Yellow Green)	

NO → **5** Is voltage between 40 and 56 pin of CN1C on main PCB "5±0.25V"?

NO → Replace main PCB

YES → **6** Is there any disconnection for wiring YG (Yellow Green)* and G (Green) between HP sensor connector and 40 & 56 pin of main PCB?

YES → Repair wiring

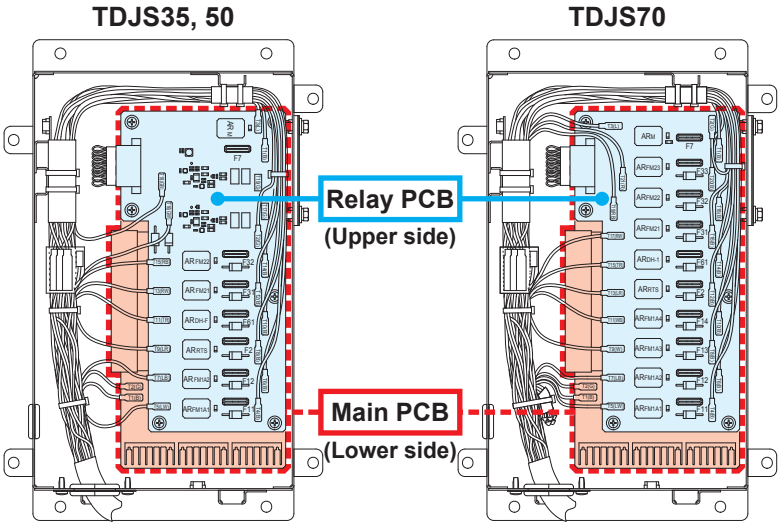
Pin No.	Unit side wiring color	Target
1	**YG (Yellow Green)**	←
2	YG (Yellow Green)	

NO → Repair connector or insert connector correctly

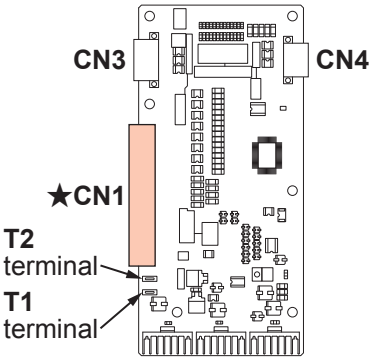
Reference page ∗1 : **[Cabin controller]** Analog sensor display ☞ page 61.

Control box (TDJS series)

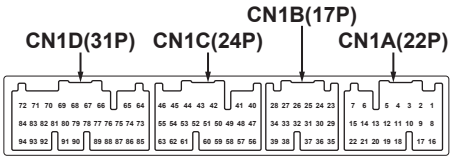
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

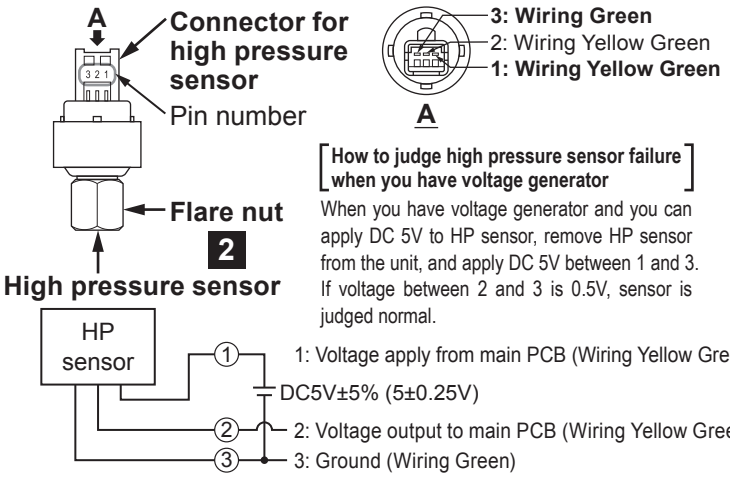


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



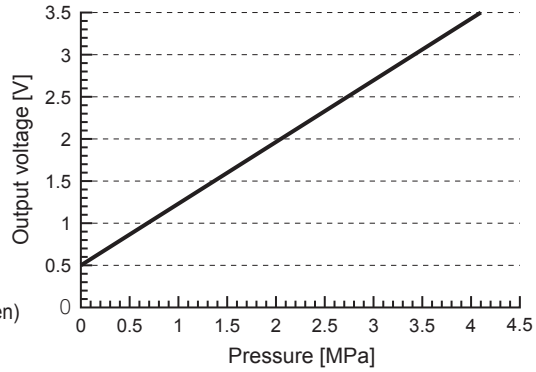
Wiring connection to Main PCB for high pressure sensor

Wiring for high pressure sensor is connected to 40, 47 and 56 pin of CN1C connector on main PCB.

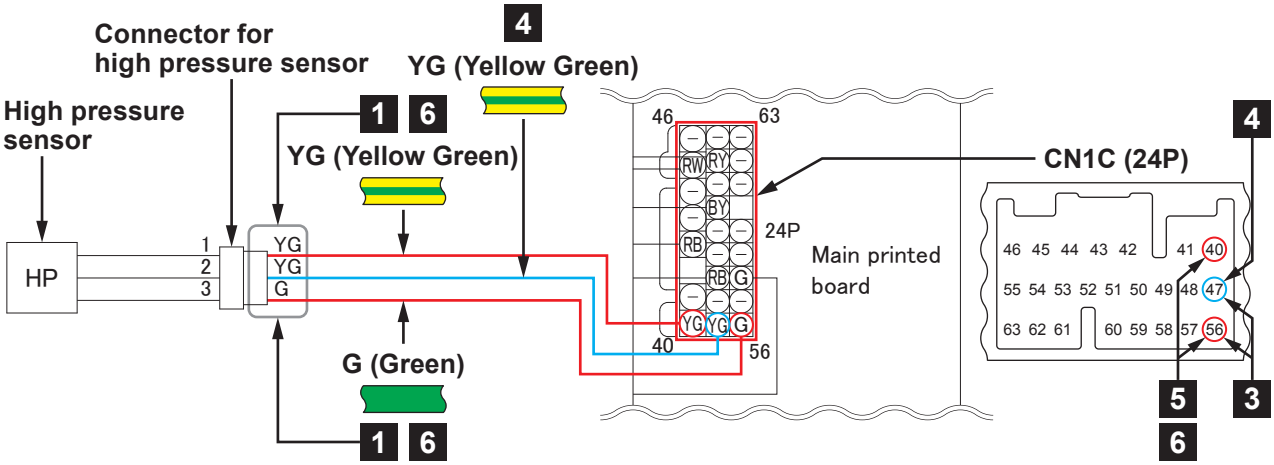


[How to judge high pressure sensor failure when you have voltage generator]

When you have voltage generator and you can apply DC 5V to HP sensor, remove HP sensor from the unit, and apply DC 5V between 1 and 3. If voltage between 2 and 3 is 0.5V, sensor is judged normal.



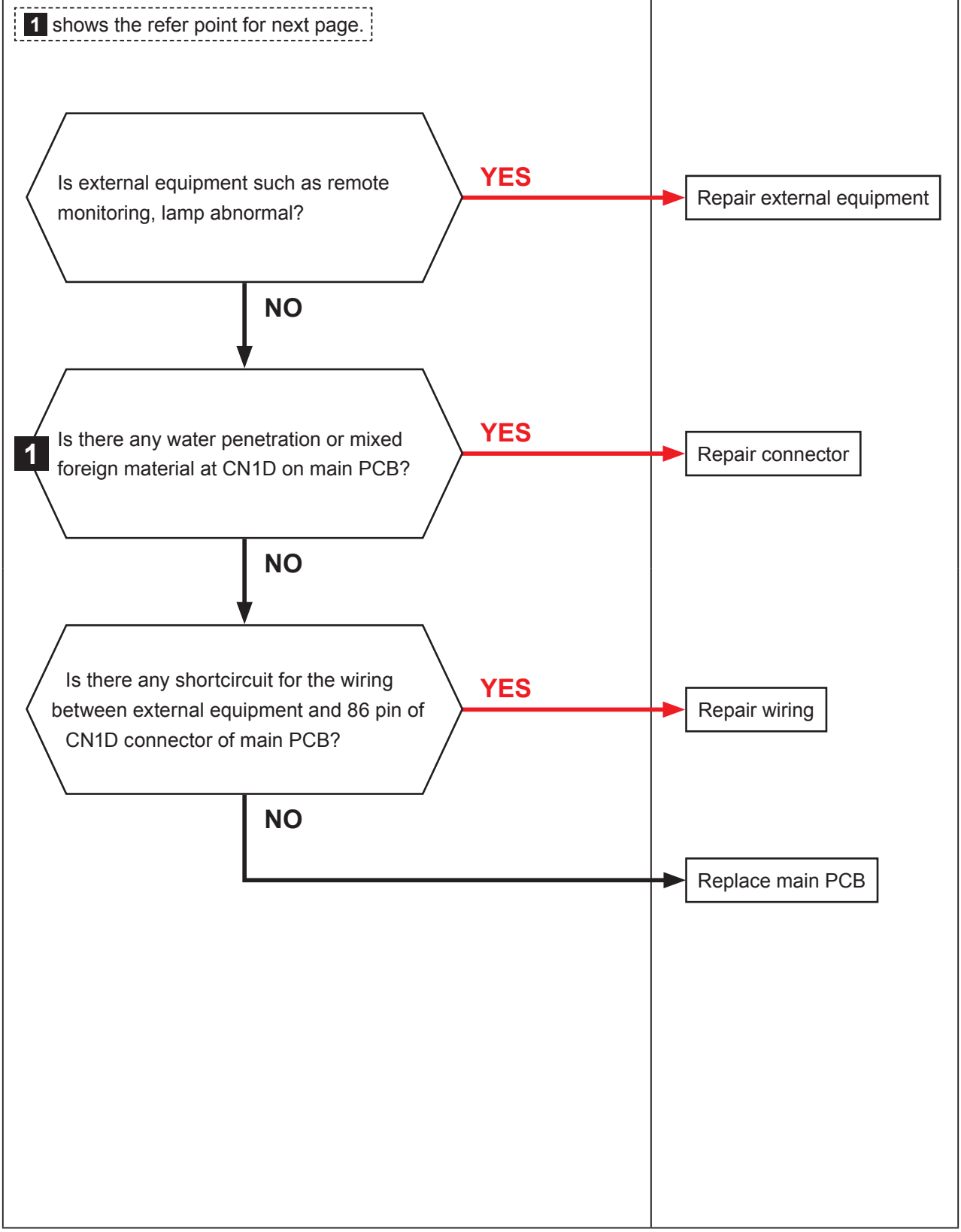
HP sensor characteristic



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

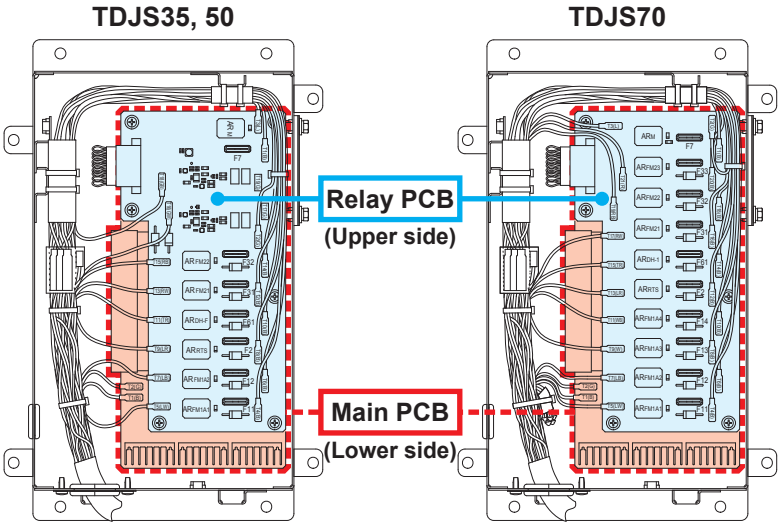
Alm display	Alarm contents	Unit operation when alarm happened
E040	Abnormal stop output shortcircuit abnormal	E040 is displayed, however unit continues operation
Alarm detection condition		**Recovery condition**
Shortcircuit detection of FET on main PCB for abnormal stop output		Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

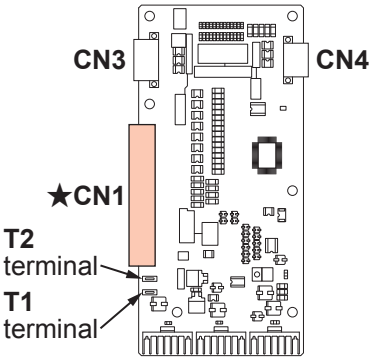


Control box (TDJS series)

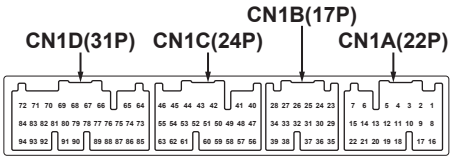
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

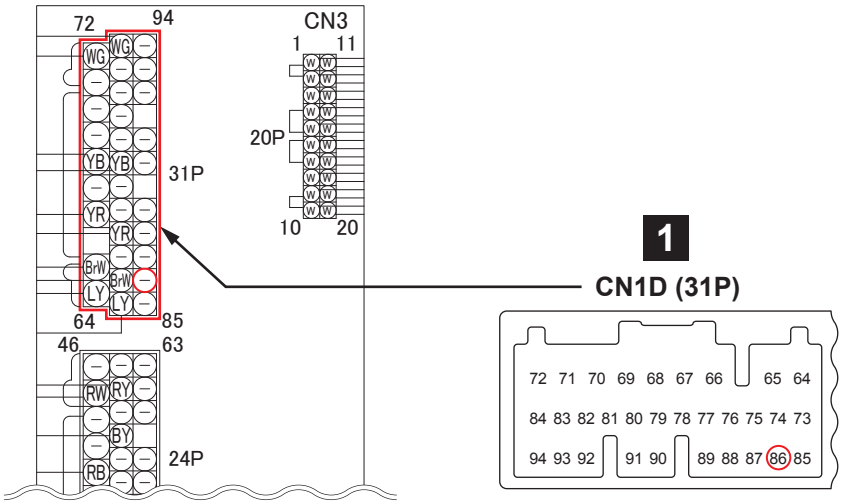


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB

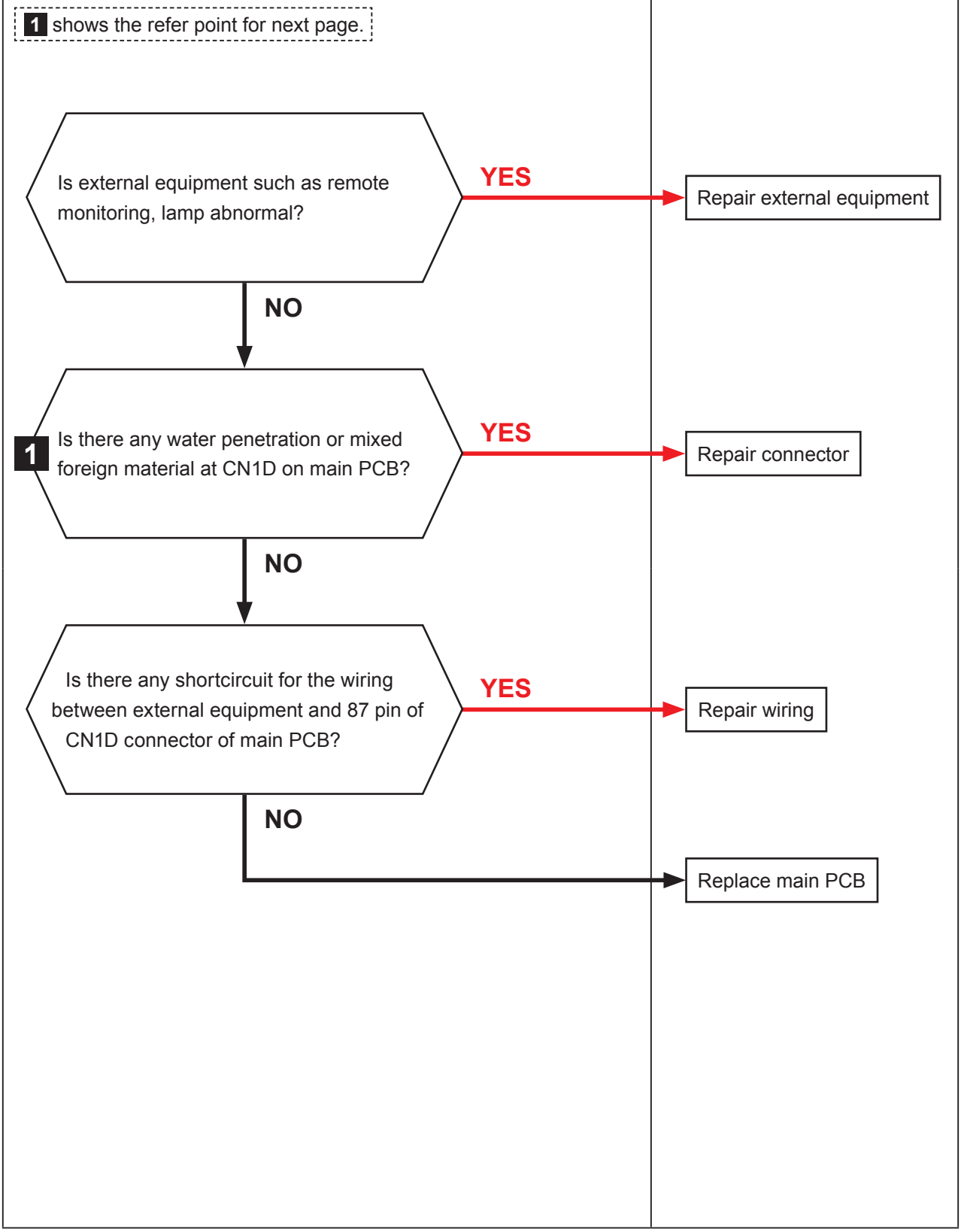
External equipment is connected to 86 pin of CN1D connector on main PCB.



Refer page for detail information	• Ladder diagram ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

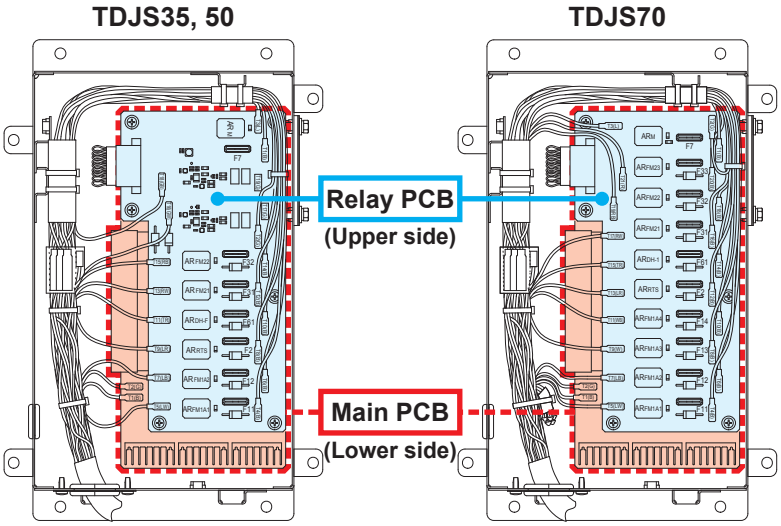
Alm display	Alarm contents	Unit operation when alarm happened
E041	Operation output shortcircuit abnormal	E041 is displayed, however unit continues operation
Alarm detection condition		**Recovery condition**
Shortcircuit detection of FET on main PCB for operation output		Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

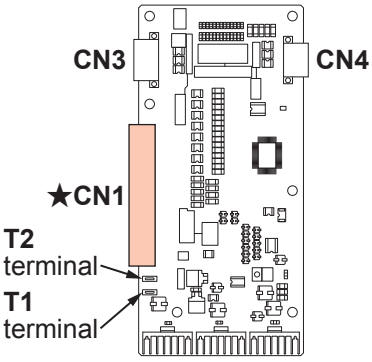


Control box (TDJS series)

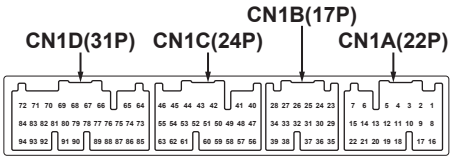
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

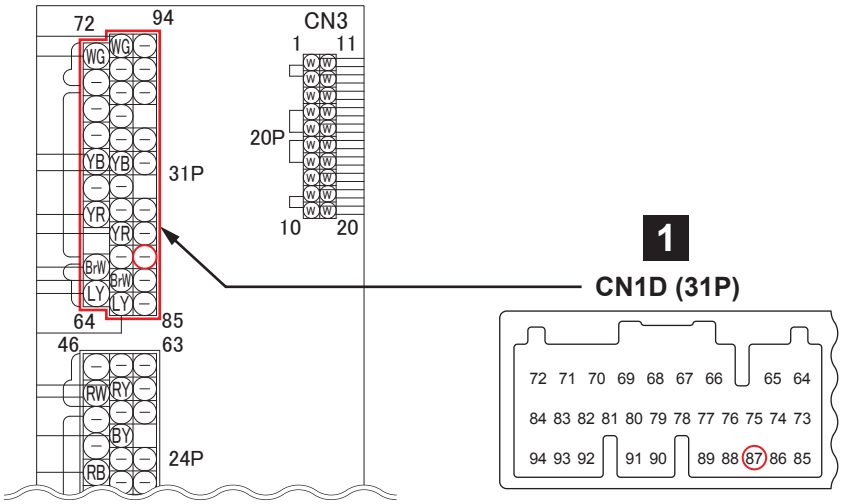


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



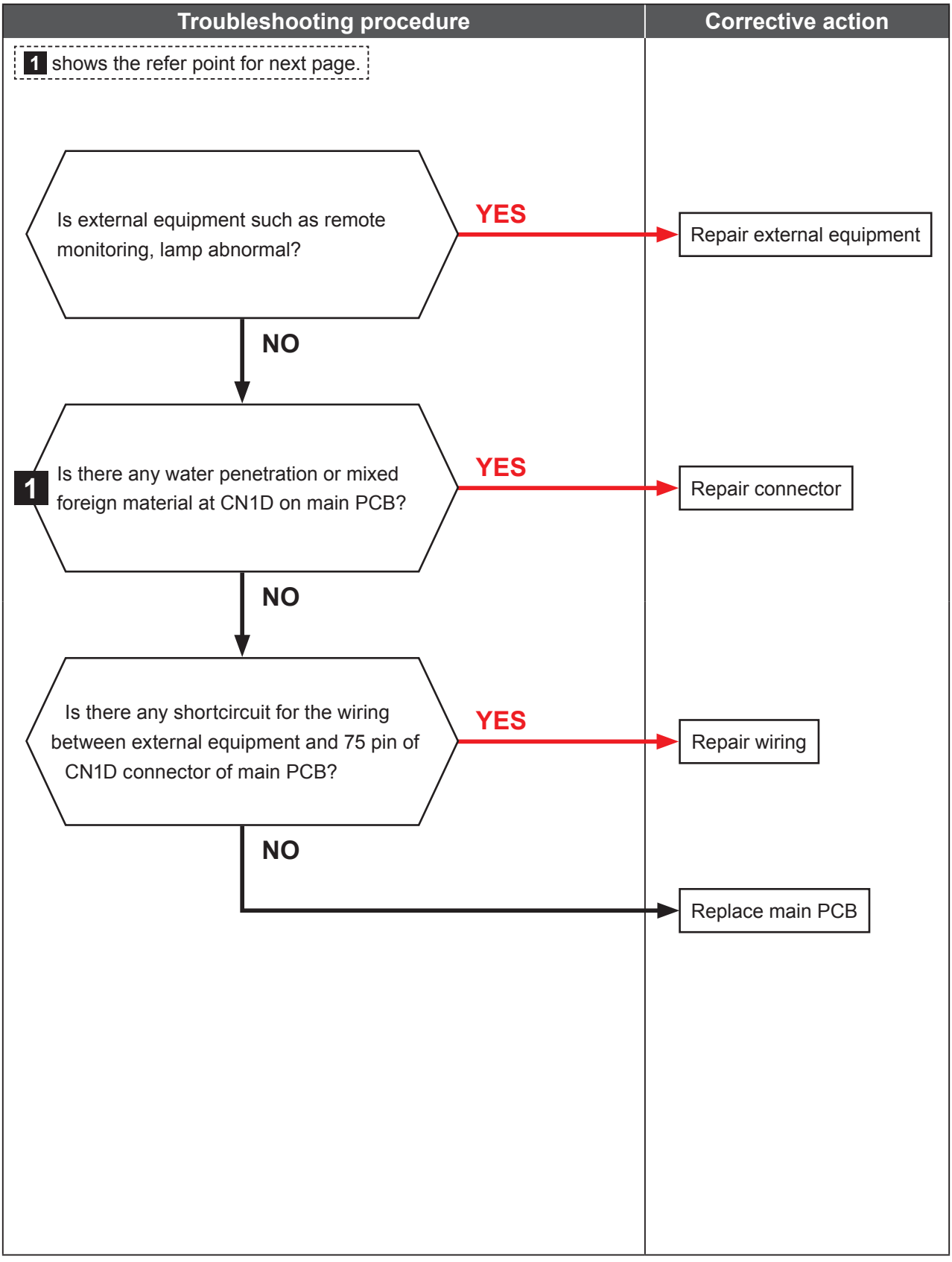
Wiring connection to Main PCB

External equipment is connected to 87 pin of CN1D connector on main PCB.



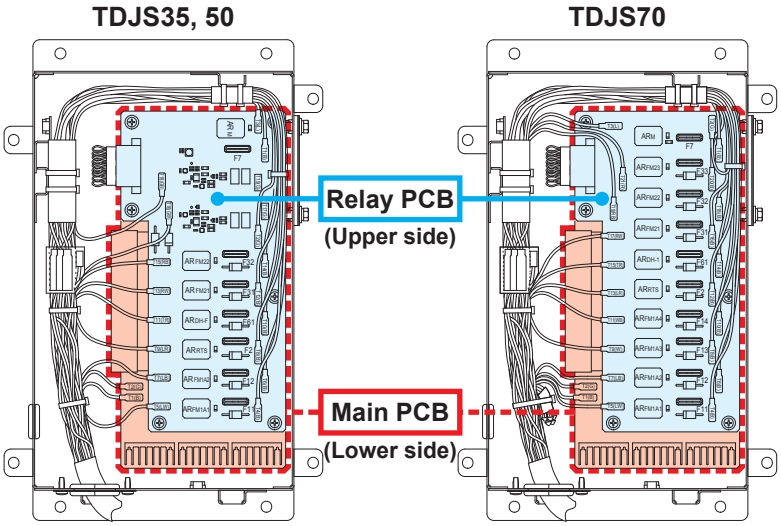
Refer page for detail information	• Ladder diagram ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E042	Out of adequate temperature output shortcircuit abnormal	E042 is displayed, however unit continues operation
Alarm detection condition		**Recovery condition**
Shortcircuit detection of FET on main PCB for out of adequate temperature output		Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

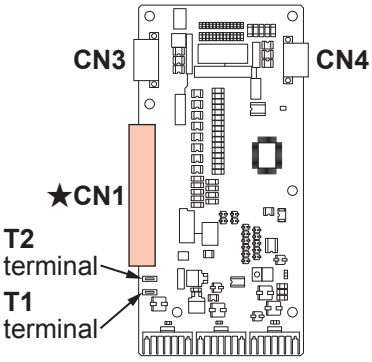


Control box (TDJS series)

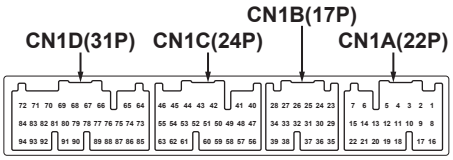
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

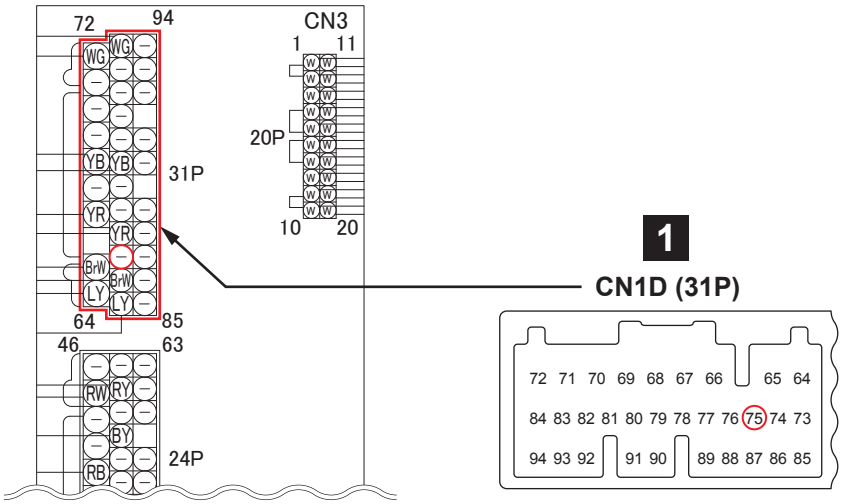


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



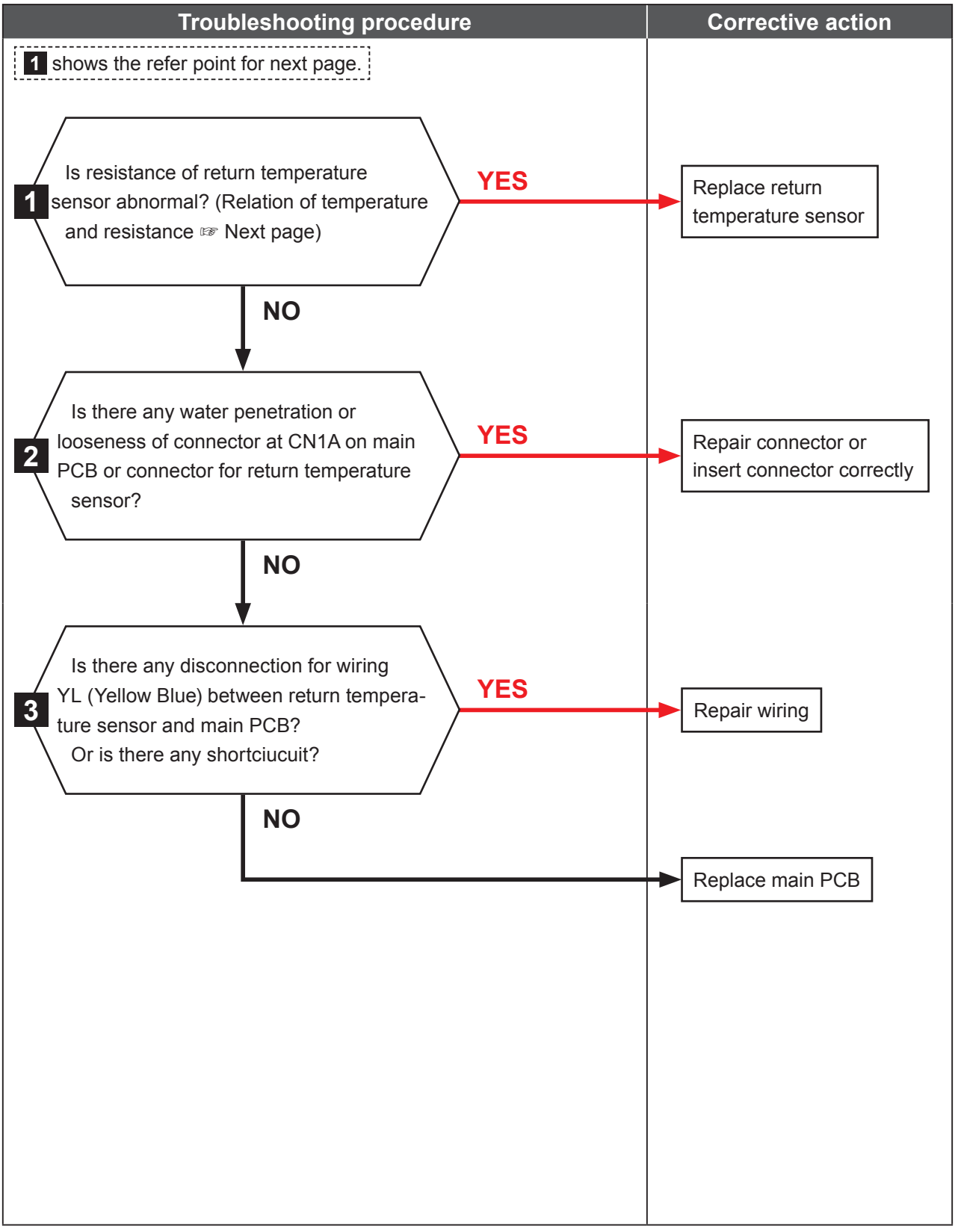
Wiring connection to Main PCB

External equipment is connected to 75 pin of CN1D connector on main PCB.



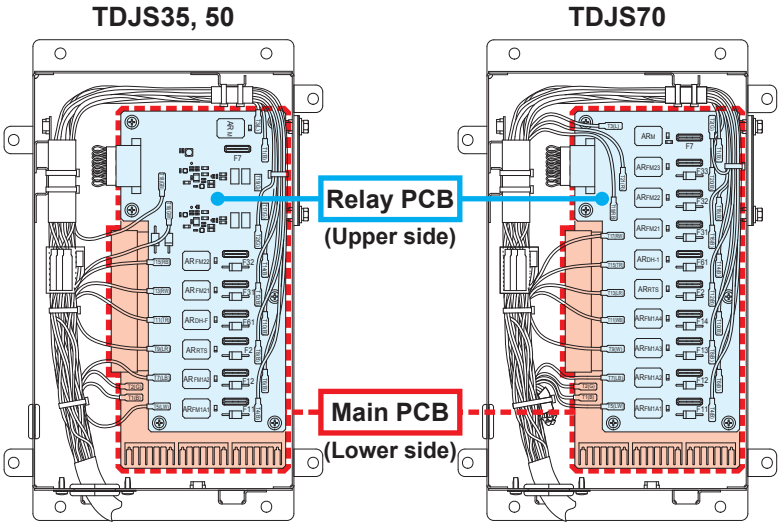
Refer page for detail information	• Ladder diagram ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E050	Return air temperature sensor abnormal	(1) In case set temp. ≥ -9.5℃, E050 is displayed and unit stops operation (2) In case set temp. ≤ -10℃, E050 is displayed, however unit continues operation
Alarm detection condition		**Recovery condition**
Detection of out of following temperature -60 ＜ return temp. ＜ +80℃		(1) Operation resumes by OFF/ON of cabin controller (2) Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

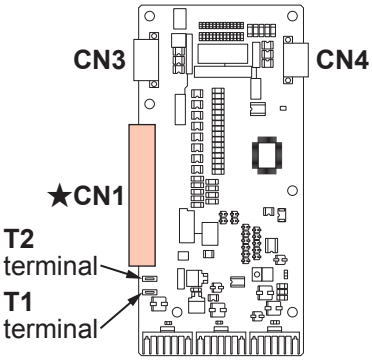


Control box (TDJS series)

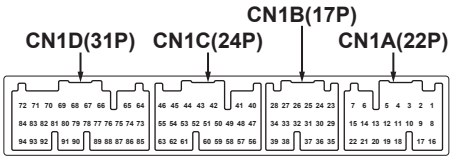
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB

Wiring for return temperature sensor is connected to 6 and 14 (Ground) pin of CN1A connector on main PCB.

1

How to check resistance for return temp. sensor

(1) Remove return temp. sensor at connector.

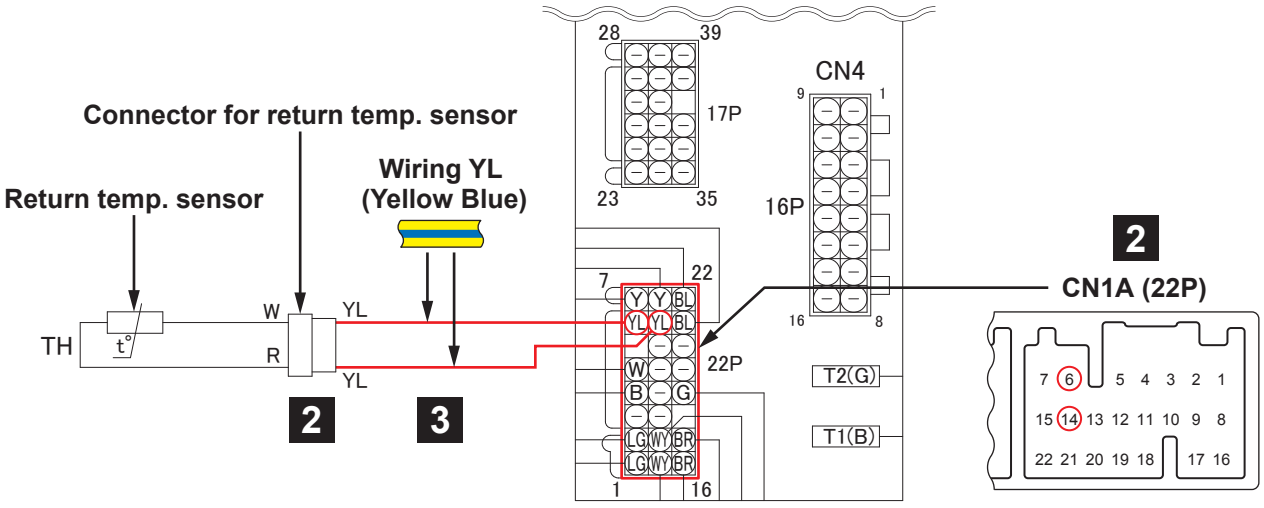
(2) Measure the resistance by multimeter and compare with right chart.

Ex) When ambient temperature is 30℃ and resistance is 1.687 - 1.808kΩ, sensor is judged **normal**. (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
−30℃	25. 293	26. 316	27. 376
−20℃	15. 125	15. 572	16. 031
−10℃	9. 342	9. 524	9. 709
0℃	5. 940	6. 000	6. 060
10℃	3. 810	3. 882	3. 955
20℃	2. 505	2. 573	2. 644
25℃	2. 049	2. 113	2. 179
30℃	1. 687	1. 746	1. 808
40℃	1. 163	1. 213	1. 265
50℃	0. 819	0. 860	0. 903

(For more data, ☞ page 158.)

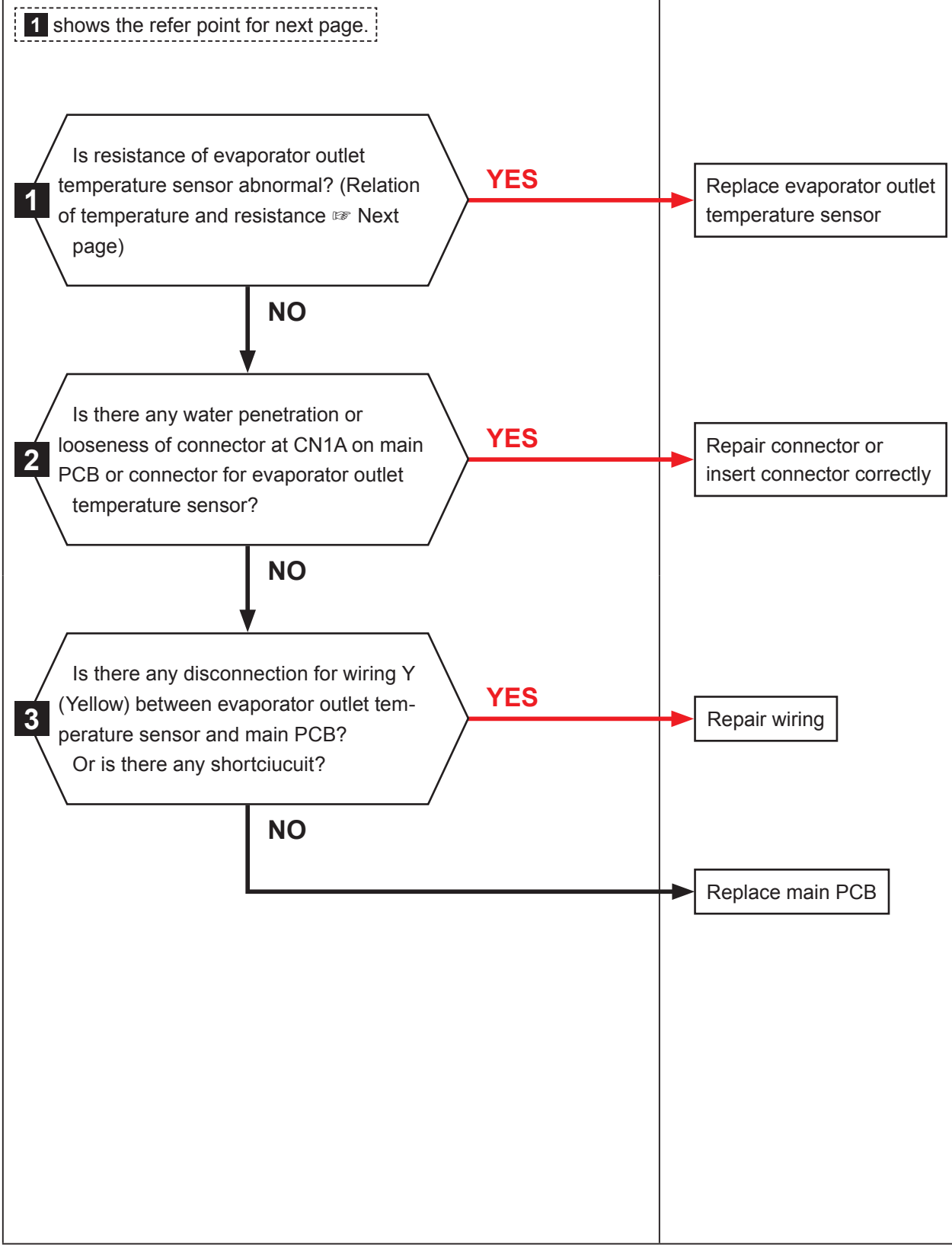


Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E057	Evaporator outlet temperature sensor abnormal	E057 is displayed, however unit continues operation

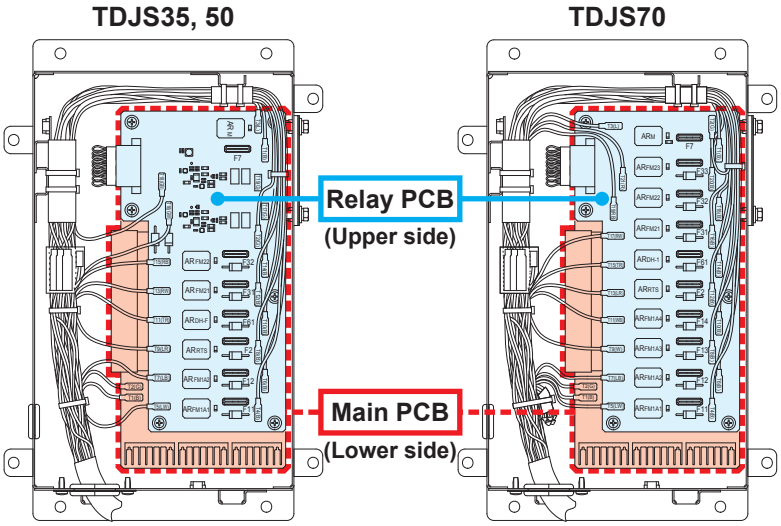
Alarm detection condition	Recovery condition
Detection of out of following temperature -60 ＜ evaporator outlet temp. ＜ +80℃	Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

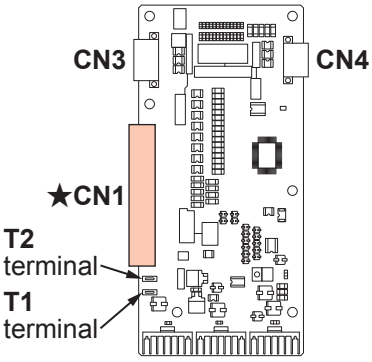


Control box (TDJS series)

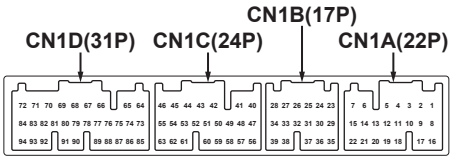
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB

Wiring for evaporator outlet temperature sensor is connected to 7 and 15 (Ground) pin of CN1A connector on main PCB.

1

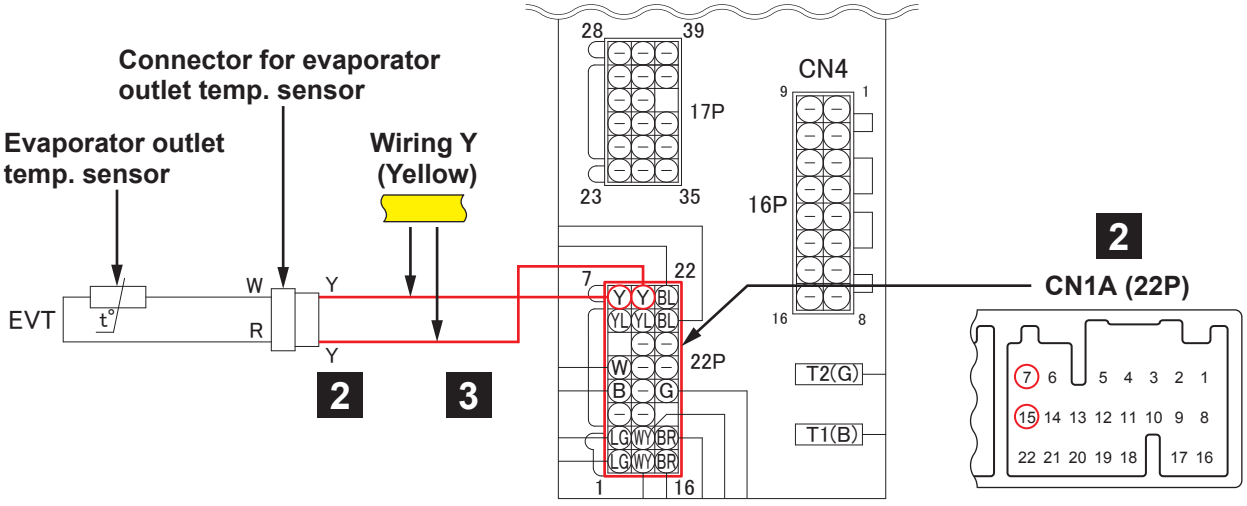
How to check resistance for evaporator outlet temp. sensor

(1) Remove evaporator outlet temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 30℃ and resistance is 1.687 - 1.808kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
−30℃	25. 293	26. 316	27. 376
−20℃	15. 125	15. 572	16. 031
−10℃	9. 342	9. 524	9. 709
0℃	5. 940	6. 000	6. 060
10℃	3. 810	3. 882	3. 955
20℃	2. 505	2. 573	2. 644
25℃	2. 049	2. 113	2. 179
30℃	1. 687	1. 746	1. 808
40℃	1. 163	1. 213	1. 265
50℃	0. 819	0. 860	0. 903

(For more data, ☞ page 158.)

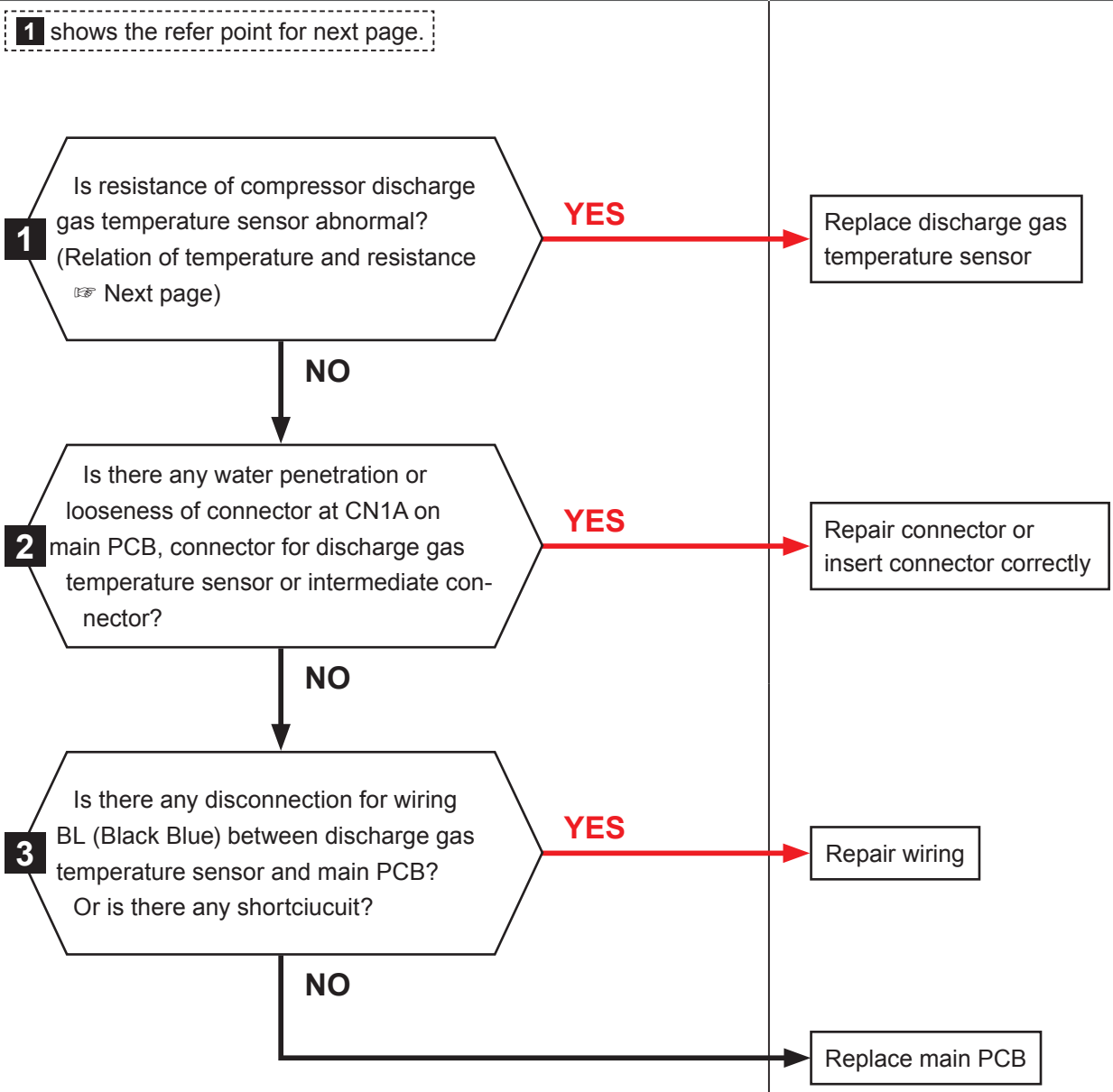


Refer page for detail information • Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E063	Compressor discharge gas temperature sensor abnormal	E063 is displayed, however unit continues operation

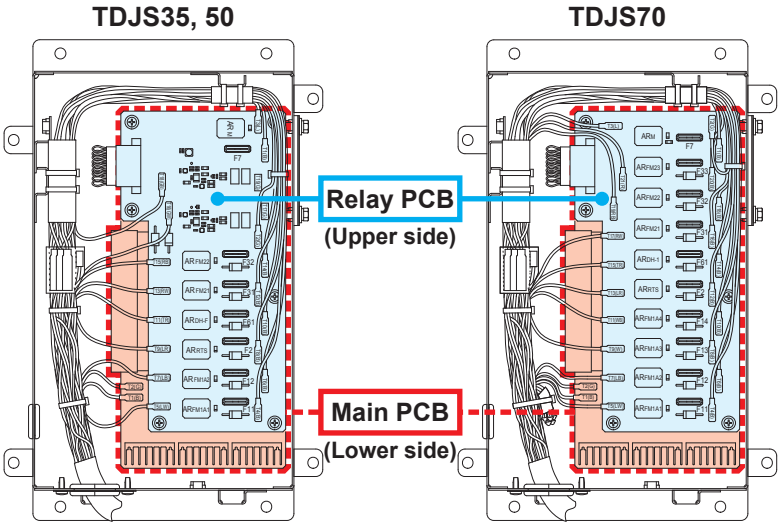
Alarm detection condition	Recovery condition
Detection of out of following temperature -10 ＜ discharge temp. ＜ +180℃	Continue operation (Resume normal operation when alarm detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

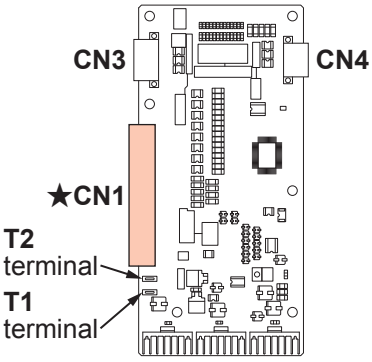


Control box (TDJS series)

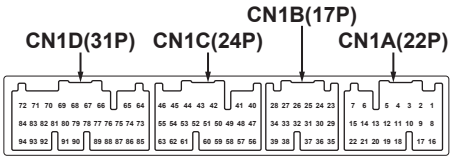
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB

Wiring for discharge gas temperature sensor is connected to 21 (Ground) and 22 pin of CN1A connector on main PCB.

1

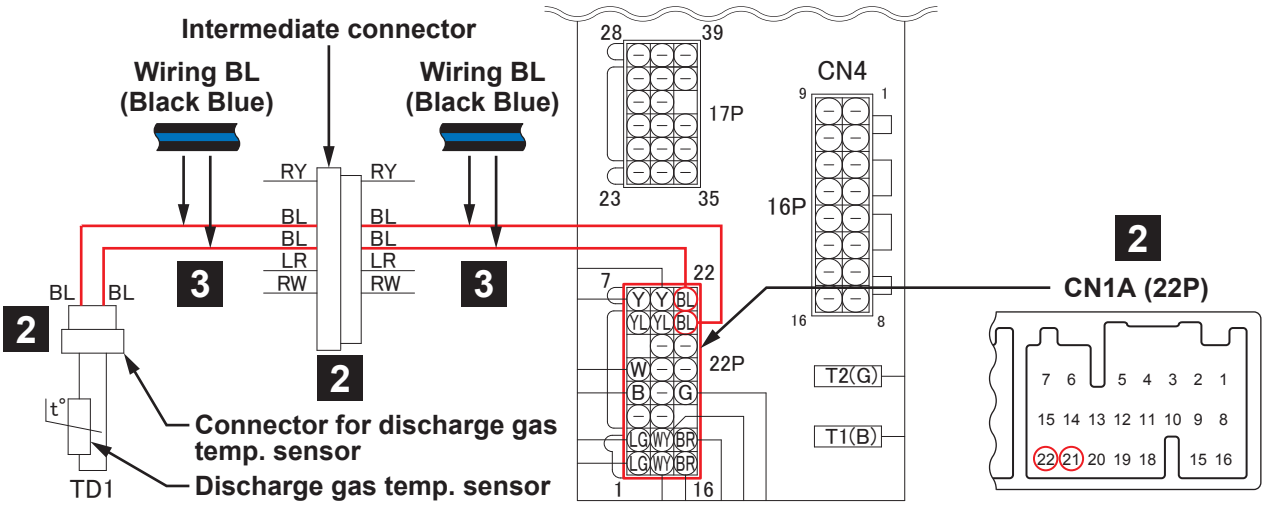
How to check resistance for compressor discharge gas temp. sensor

(1) Remove discharge gas temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 25℃ and resistance is 78.06 - 82.88kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
25℃	78. 06	80. 47	82. 88
100℃	5. 07	5. 23	5. 38
115℃	3. 25	3. 35	3. 45
135℃	1. 89	1. 94	2. 00
175℃	0. 72	0. 74	0. 76
200℃	0. 42	0. 43	0. 44

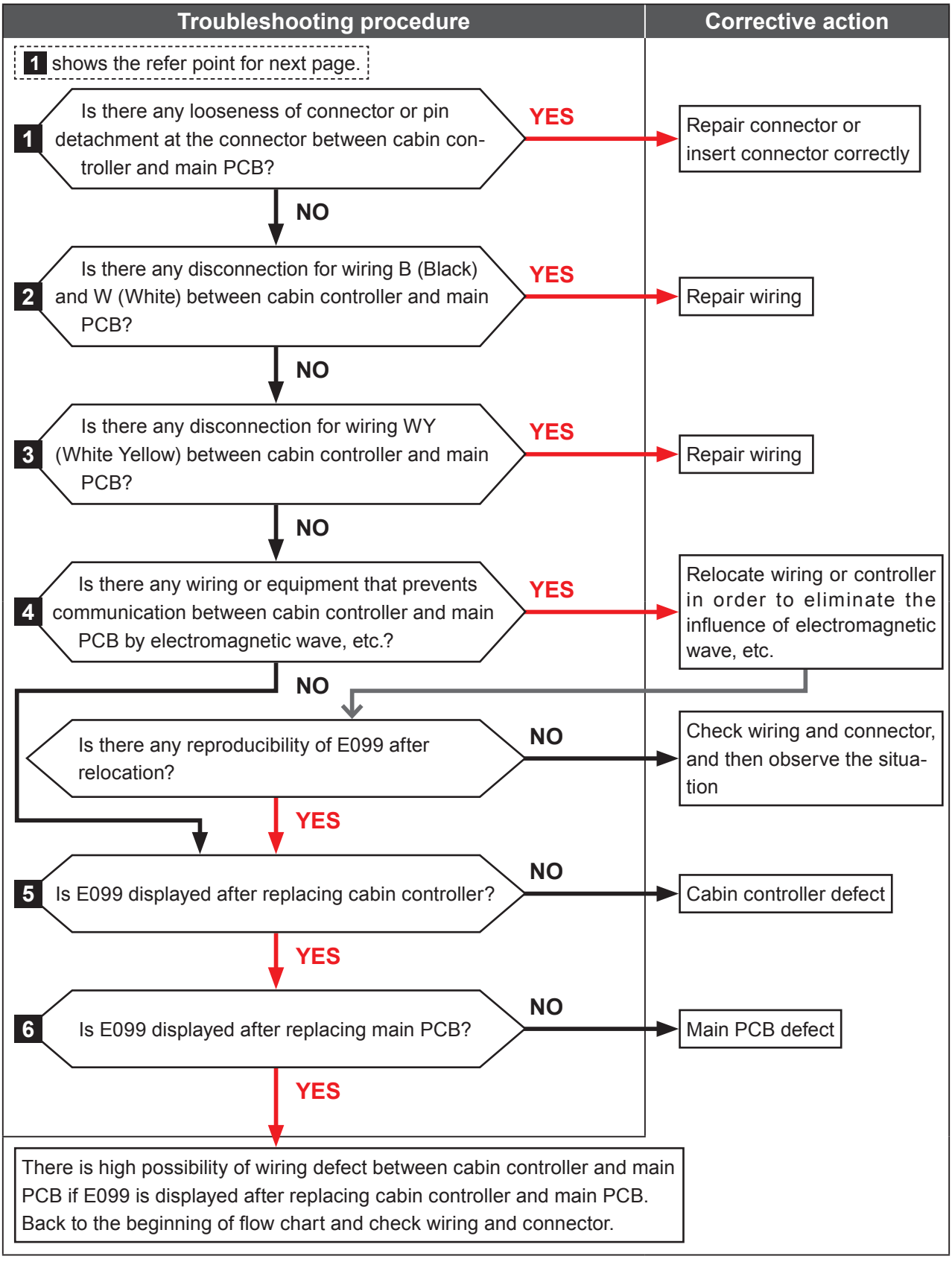
(For more data, ☞ page 158.)



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

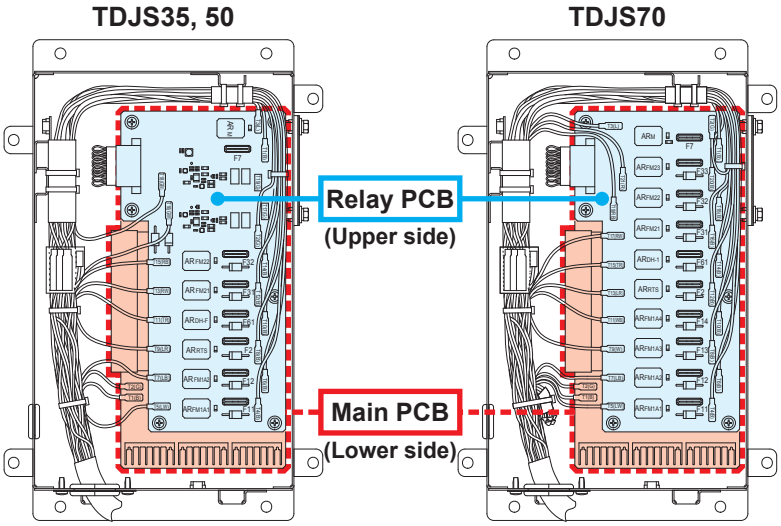
Alm display	Alarm contents	Unit operation when alarm happened
E099	Controller communication error	E099 is displayed and unit stops operation

Alarm detection condition	Recovery condition
Communication between Main PCB and Cabin controller has not been correctly established for a certain period of time	• Communication between Main PCB and Cabin controller is established. • Operation resumes by OFF/ON of cabin controller

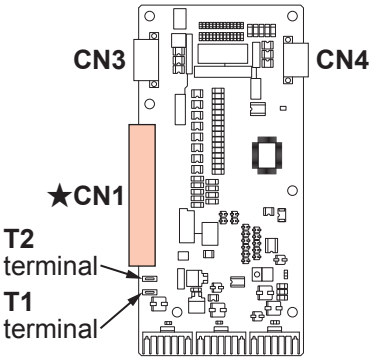


Control box (TDJS series)

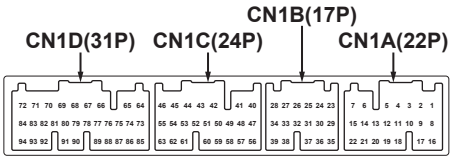
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB

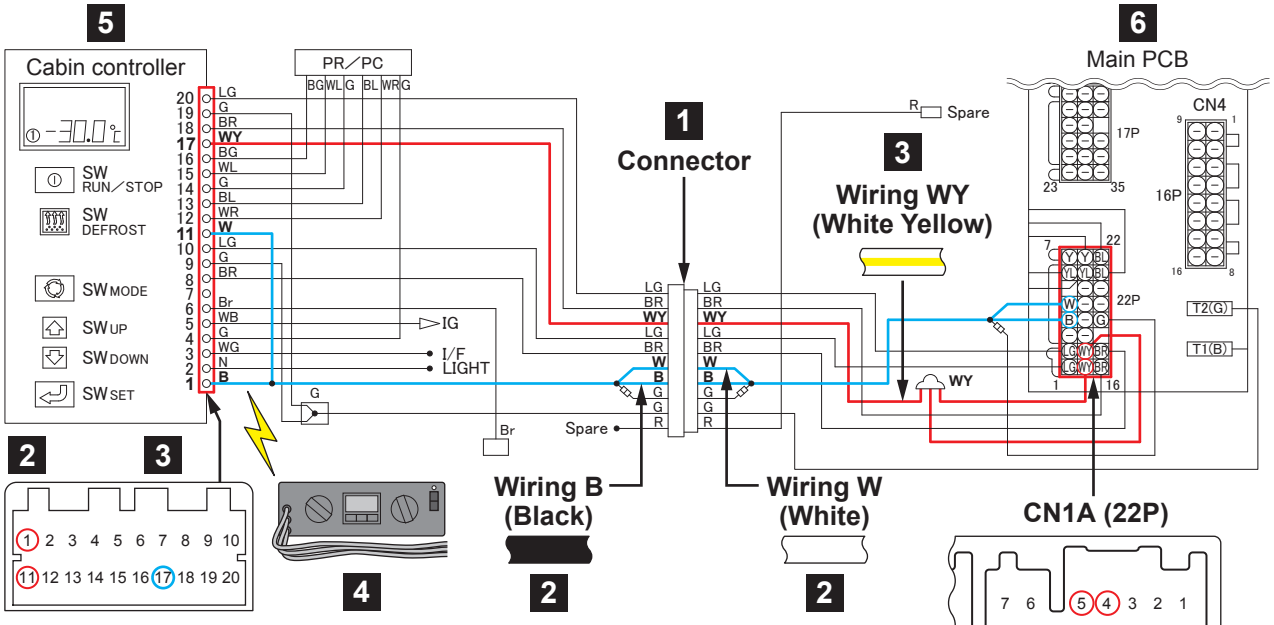


★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection between Cabin controller and Main PCB

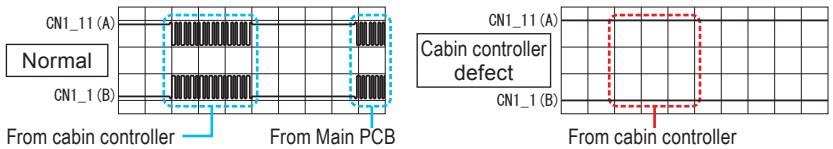
Communication wiring between cabin controller and main PCB is connected to 1, 11 & 17 pin of cabin controller and 4, 5, 8 & 9 pin of CN1A connector on main PCB.



Judgement procedure by oscilloscope

5
6

You can judge that defect part is cabin controller or main PCB by measuring communication wave by basic oscilloscope.



From cabin controller to Main PCB, there is communication wave.
⇒**Cabin controller is normal.**

From Main PCB to cabin controller, there is communication wave.
⇒**Main PCB, wiring harness normal**

From cabin controller to Main PCB, there is no communication wave.
⇒**Cabin controller defect**

In case of cabin controller, data is measured at 1 and 11 pin.
In case of main PCB, data is measured at 4 and 5 pin of CN1A.

Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E101	Evaporator fan motor fuse has blown	E101 is displayed, however unit continues operation

Alarm detection condition	Recovery condition
[TDJS35,50] There is no voltage input from evaporator fan motor fuse both F11 and F12 to main PCB. **[TDJS70]** There is no voltage input from evaporator fan motor fuse both F11&F12 or both F13&F14 to main PCB.	• Operation resumes by OFF/ON of cabin controller • There is voltage input from evaporator fan motor fuse to main PCB when unit start operation

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

Fuse has blown? — YES → Is there any abnormal such as lock, burnout in evaporator fan motor? — YES → Replace fan motor

Fuse has blown? — NO

Is there any abnormal such as lock, burnout in evaporator fan motor? — NO

1 Is there any shortcircuit for wiring between T* terminal on relay PCB and evaporator fan motor? — YES → Repair wiring

Unit Model	T* terminal	Wiring
TDJS35, 50	T5	LW (Blue White)
	T7	LB (Blue Black)
TDJS70	T5	LW (Blue White)
	T7	LB (Blue Black)
	T9	W (White)
	T11	WB (White Black)

Is there any shortcircuit for wiring between T* terminal on relay PCB and evaporator fan motor? — NO → Corrective action:
- Check current if fan motor load exceeds fuse specified capacity temporary
- Check poor contact at terminal
- Check correct capacity fuse (15A) is installed.

If there is no abnormal for above, replace fuse.

2 Is battery voltage detected on primary side of fuse "F*"? — YES → **3** Is battery voltage detected on 19 and 20 pin of CN1 connector of relay PCB? — NO → Replace relay PCB

Unit Model	Fuse F*
TDJS35, 50	F11, F12
TDJS70	F11, F12, F13, F14

Is battery voltage detected on 19 and 20 pin of CN1 connector of relay PCB? — YES → **4** Is battery voltage detected on 19 and 20 pin of CN3 connector of main PCB? — YES → Replace main PCB

Is battery voltage detected on primary side of fuse "F*"? — NO → **5** Is battery voltage detected on T* terminal on relay PCB? — YES → Replace relay PCB

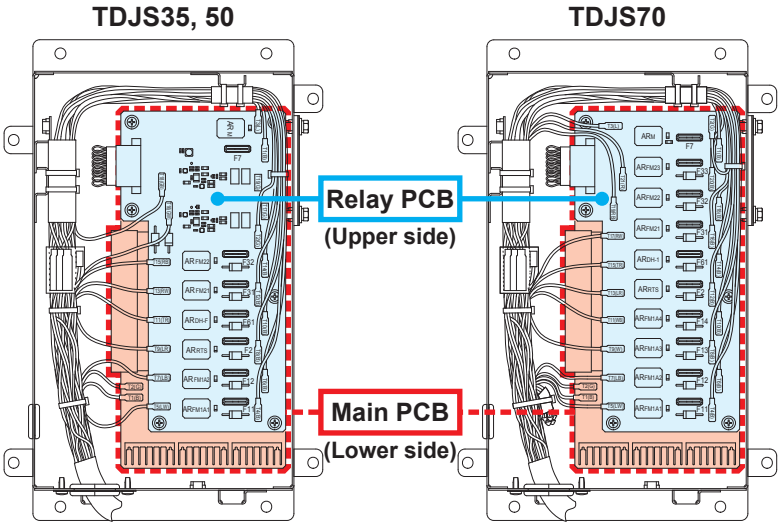
Unit Model	T* terminal	Wiring
TDJS35, 50	T4, T6	B (Black)
TDJS70	T4, T6, T8, T10	B (Black)

Is battery voltage detected on T* terminal on relay PCB? — NO → Corrective action:
- Check poor contact at T* terminal
- Check disconnection of wiring between battery and T* terminal

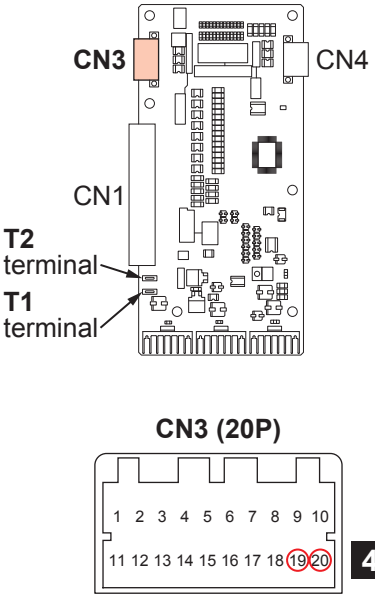
Is battery voltage detected on 19 and 20 pin of CN3 connector of main PCB? — NO → Repair wiring between relay and main PCB

Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.

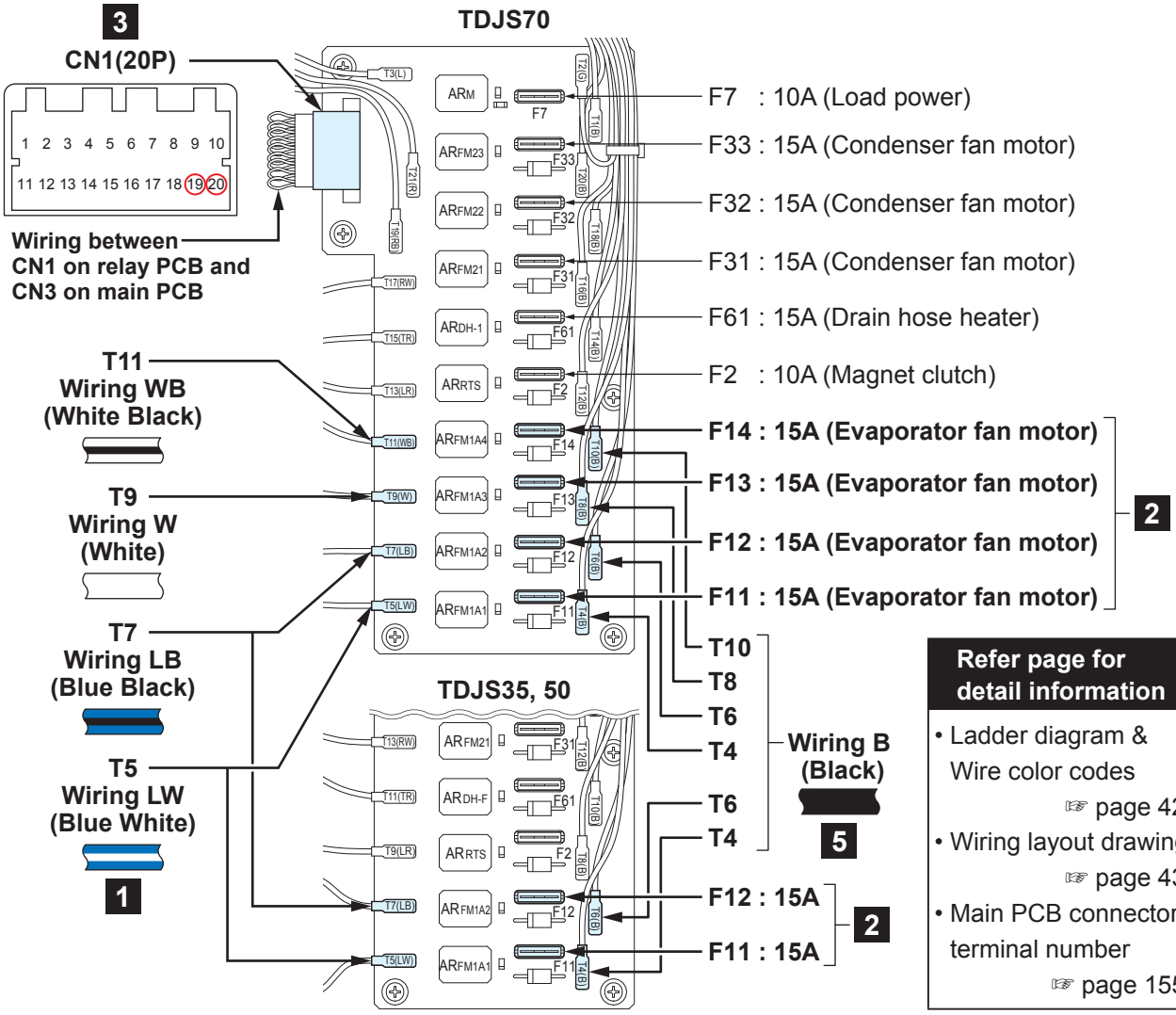


Arrangement of connector on Main PCB



Wiring connection to Relay PCB, Fuse arrangement

Wiring for evaporator fan motor fuse is connected to 19 and 20 pin of CN1 connector on relay PCB.



Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E102	Condenser fan motor fuse has blown	E102 is displayed, however unit continues operation

Alarm detection condition	Recovery condition
There is no voltage input from condenser fan motor fuse both F31 and F32 to main PCB. Or there is no voltage input from condenser fan motor fuse F33 to main PCB.	• Operation resumes by OFF/ON of cabin controller • There is voltage input from condenser fan motor fuse to main PCB when unit start operation

Troubleshooting procedure / **Corrective action**

1 shows the refer point for next page.

Fuse has blown? — YES → Is there any abnormal such as lock, burnout in condenser fan motor? — YES → Replace fan motor

Fuse has blown? — NO

Is there any abnormal such as lock, burnout in condenser fan motor? — NO

1 Is there any shortcircuit for wiring between T* terminal on relay PCB and condenser fan motor? — YES → Repair wiring

Unit Model	T* terminal	Wiring
TDJS35, 50	T13	RW (Red White)
	T15	RB (Red Black)
TDJS70	T17	RW (Red White)
	T19	RB (Red Black)
	T21	R (Red)

1 — NO → • Check current if fan motor load exceeds fuse specified capacity temporary
• Check poor contact at terminal
• Check correct capacity fuse (15A) is installed.
If there is no abnormal for above, replace fuse.

2 Is battery voltage detected on primary side of fuse "F*"? — YES → 3 Is battery voltage detected on 15 and 16 pin of CN1 connector of relay PCB? — NO → Replace relay PCB

Unit Model	Fuse F*
TDJS35, 50	F31, F22
TDJS70	F31, F32, F33

3 — YES → 4 Is battery voltage detected on 15 and 16 pin of CN3 connector of main PCB? — YES → Replace main PCB

2 — NO

4 — NO → Repair wiring between relay and main PCB

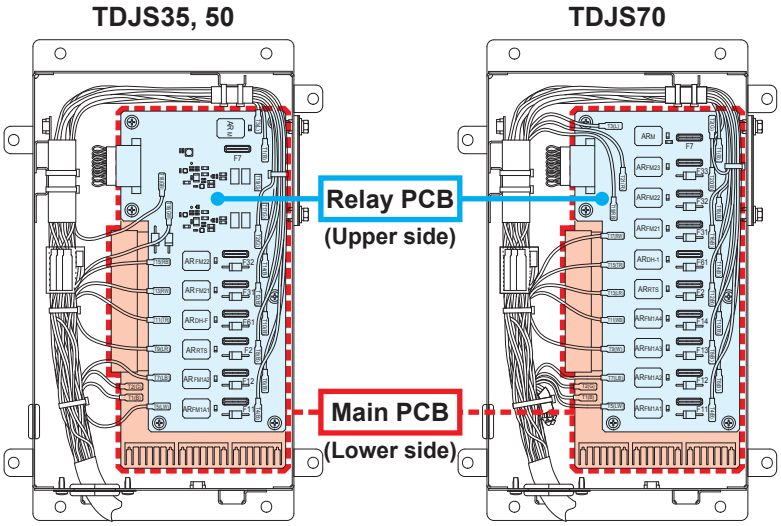
5 Is battery voltage detected on T* terminal on relay PCB? — YES → Replace relay PCB

Unit Model	T* terminal	Wiring
TDJS35, 50	T12, T14	B (Black)
TDJS70	T16, T18, T20	B (Black)

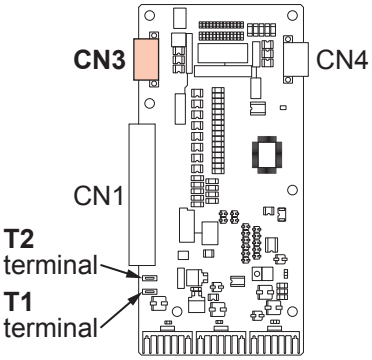
5 — NO → • Check poor contact at T* terminal
• Check disconnection of wiring between battery and T* terminal

Control box (TDJS series)

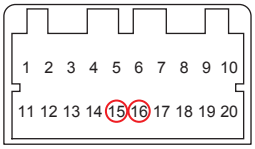
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



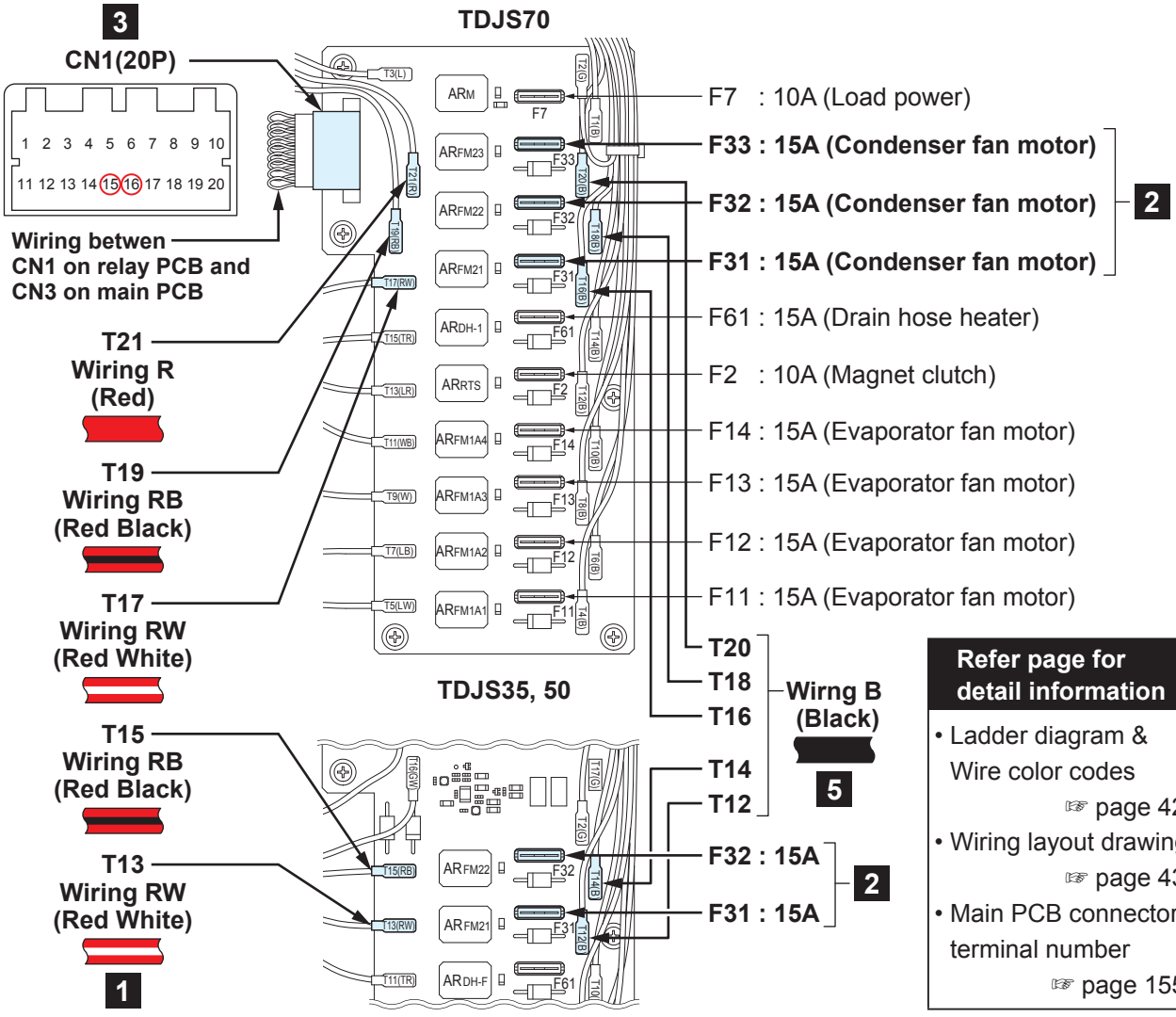
CN3 (20P)



4

Wiring connection to Relay PCB, Fuse arrangement

Wiring for condenser fan motor fuse is connected to 15 and 16 pin of CN1 connector on relay PCB.



Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E104	Drain hose heater fuse has blown	E104 is displayed, however unit continues operation

Alarm detection condition	Recovery condition
There is no voltage input from drain hose heater fuse to main PCB	• Operation resumes by OFF/ON of cabin controller • There is voltage input from drain hose heater fuse to main PCB when unit start operation

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

Fuse "F61" has blown? — YES → Is there any abnormal such as burnout in drain hose heater? — YES → Replace drain hose heater

Fuse "F61" has blown? — NO → Is there any abnormal such as burnout in drain hose heater? — NO →

1 Is there any shortcircuit for wiring between T∗ terminal on relay PCB and drain hose heater? — YES → Repair wiring

Unit Model	T∗ terminal	Wiring
TDJS35, 50	T11	TR (Brown Red)
TDJS70	T15	TR (Brown Red)

1 — NO →
- Check current if drain hose heater load exceeds fuse specified capacity temporary
- Check poor contact at terminal
- Check correct capacity fuse (15A) is installed.

If there is no abnormal for above, replace fuse.

2 Is battery voltage detected on primary side of fuse "F61"? — YES → **3** Is battery voltage detected on 17 pin of CN1 connector of relay PCB? — NO → Replace relay PCB

3 — YES → **4** Is battery voltage detected on 17 pin of CN3 connector of main PCB? — YES → Replace main PCB

4 — NO → Repair wiring between relay and main PCB

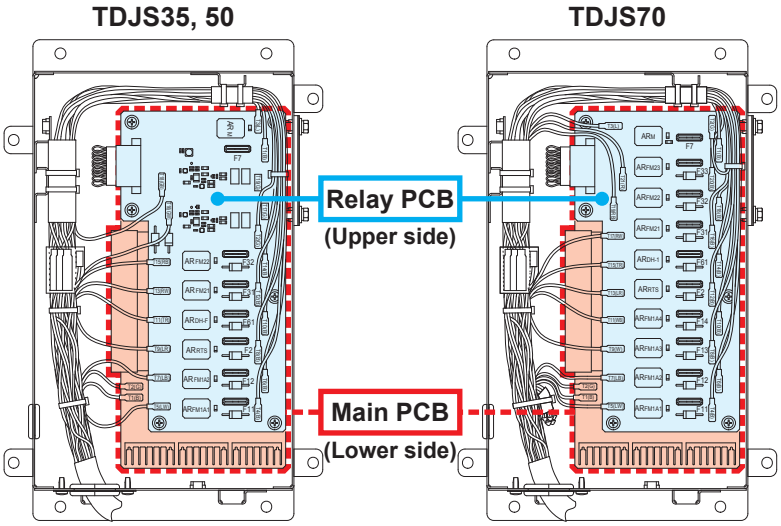
2 — NO → **5** Is battery voltage detected on T∗ terminal on relay PCB? — YES → Replace relay PCB

Unit Model	T∗ terminal	Wiring
TDJS35, 50	T10	B (Black)
TDJS70	T14	B (Black)

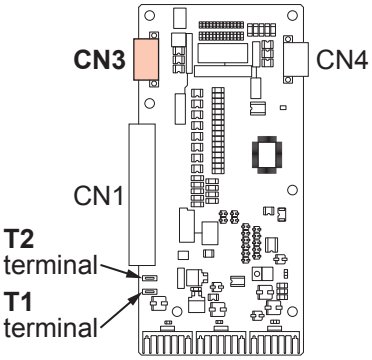
5 — NO →
- Check poor contact at T∗ terminal
- Check disconnection of wiring between battery and T∗ terminal

Control box (TDJS series)

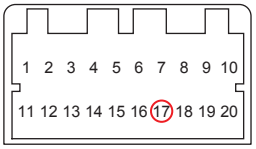
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



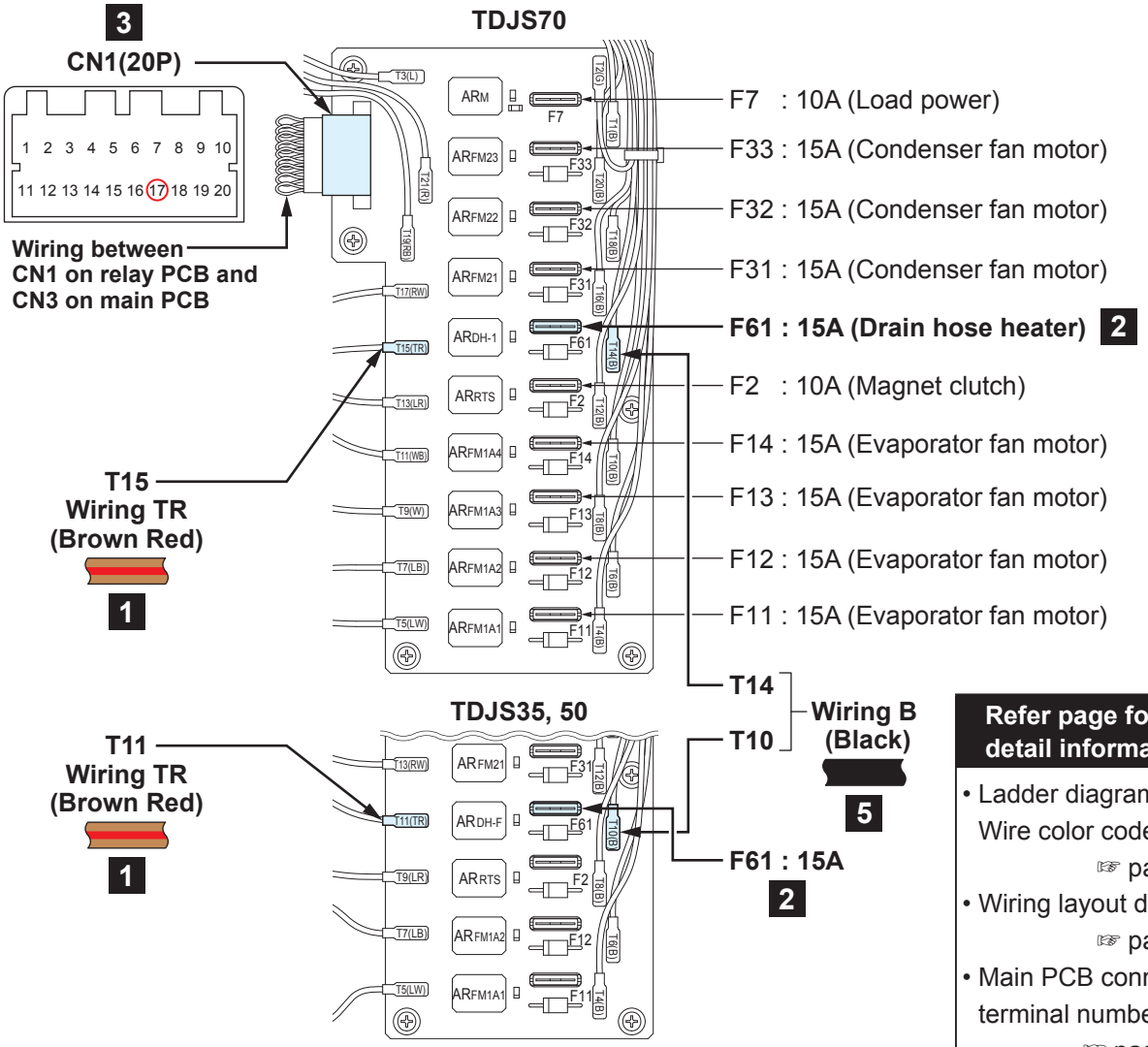
CN3 (20P)



4

Wiring connection to Relay PCB, Fuse arrangement

Wiring for drain hose heater fuse is connected to 17 pin of CN1 connector on relay PCB.



Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E160	Economizer solenoid valve shortcircuit abnormal	E160 is displayed, however unit continues operation with economizer solenoid valve OFF.

Alarm detection condition	Recovery condition
Detection of shortcircuit for economizer solenoid valve circuit	• Operation resumes by OFF/ON of cabin controller • Continue operation (Resume normal operation when abnormal detection condition is unsatisfied.)

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

1 Is coil for inlet (SV61) and/or outlet (SV62) of economizer solenoid valve abnormal? (Judgement ☞ Next page)

YES → Replace economizer solenoid valve (coil)

NO

2 Is there any water penetration or mixed foreign material at economizer solenoid valve connector?

YES → Repair connector

NO

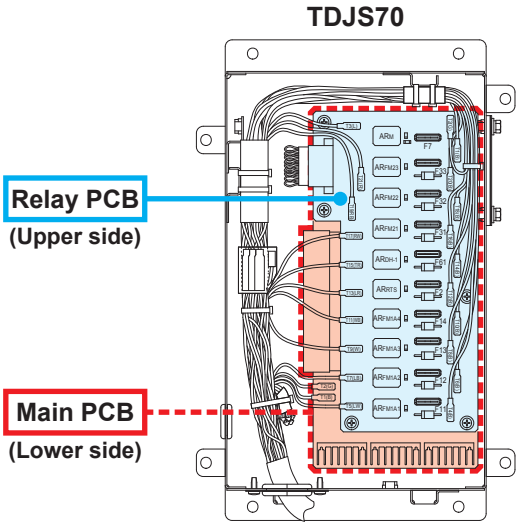
3 Is there any shortcircuit generated between wiring L (Blue) and WG (White Green) in the corrugated tube (protective tube)? (Judgement ☞ Next page)

YES → Repair wiring

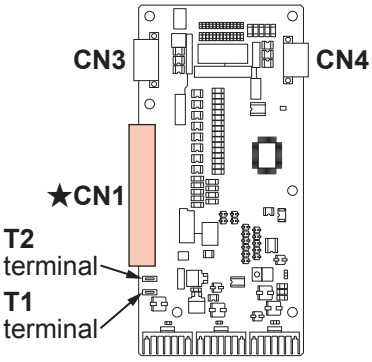
NO → Replace main PCB

Control box (TDJS series)

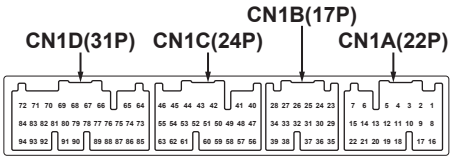
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB and Relay PCB

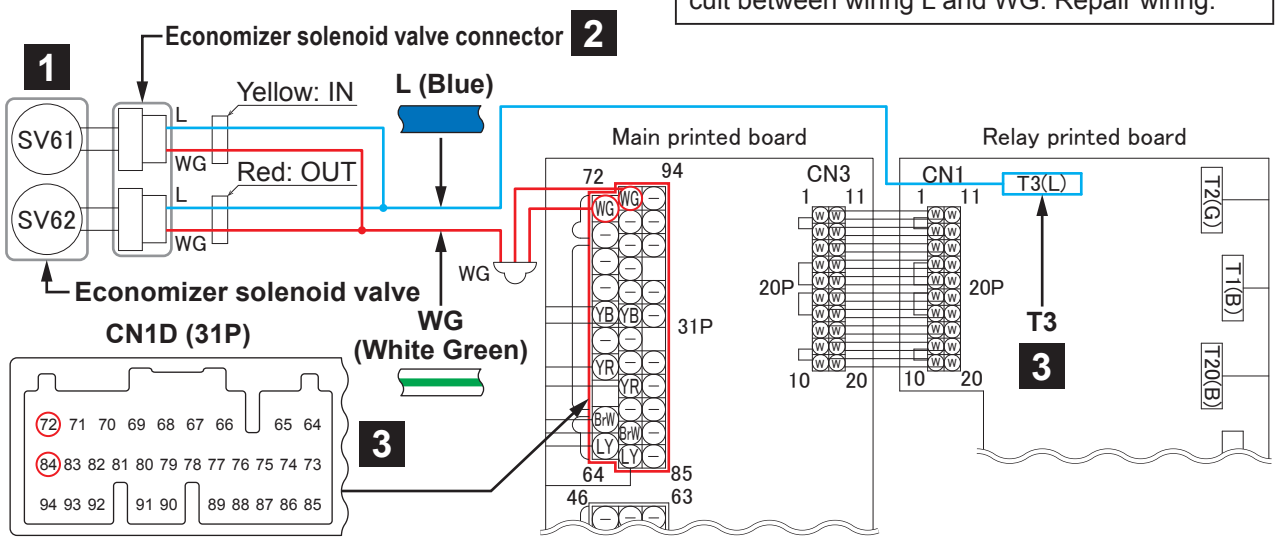
Wiring for economizer solenoid valve is connected to 72 and 84 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

1

How to check abnormality of coil for solenoid valve
(1) Stops the unit operation (2) Remove connector for both of economizer solenoid valve (3) Measure the resistance at solenoid valve connector by multimeter
If resistance is out of following value significantly, valve is judged **abnormal**. <12 voltage type> **15Ω** <24 voltage type> **60Ω**

3

How to check shortcircuit between wiring
(1) Stops the unit operation (2) Remove connector for both of economizer solenoid valve (3) Remove T3 terminal on relay PCB (4) Measure the resistance between T3 terminal on relay PCB and 72 or 84 pin of CN1D connector on main PCB
If there is electrical continuity, there is shortcircuit between wiring L and WG. Repair wiring.



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 45. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E161	Liquid line solenoid valve shortcircuit abnormal	(1) E161 is displayed and unit stops operation in case of cooling and defrost operation. (2) E161 is displayed, however unit continues operation in case of heating operation.

Alarm detection condition	Recovery condition
Detection of shortcircuit for liquid line solenoid valve circuit	(1) Operation resumes by OFF/ON of cabin controller (2) Continue operation (Resume normal operation when abnormal detection condition is unsatisfied.)

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

1 Is coil for liquid line solenoid valve abnormal?
(Judgement ☞ Next page)

YES → Replace liquid line solenoid valve (coil)

NO

2 Is there any water penetration or mixed foreign material at liquid line solenoid valve connector?

YES → Repair connector

NO

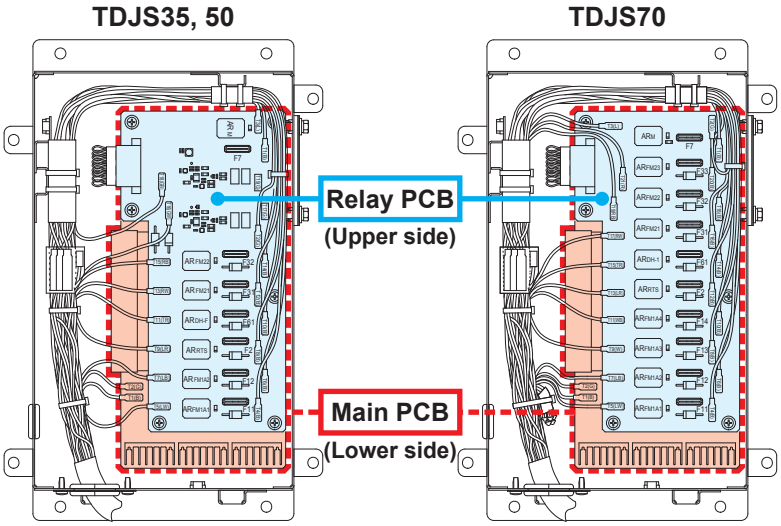
3 Is there any shortcircuit generated between wiring L (Blue) and YB (Yellow Black) in the corrugated tube (protective tube)?
(Judgement ☞ Next page)

YES → Repair wiring

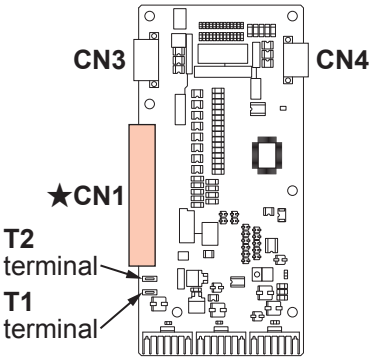
NO → Replace main PCB

Control box (TDJS series)

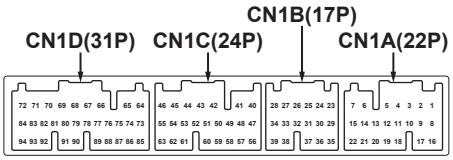
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB and Relay PCB

Wiring for liquid line solenoid valve is connected to 68 and 79 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

1

How to check abnormality of coil for solenoid valve

(1) Stops the unit operation
(2) Remove connector for liquid line solenoid valve
(3) Measure the resistance at solenoid valve connector by multimeter

If resistance is out of following value significantly, valve is judged **abnormal**.
<12 voltage type> **15Ω** <24 voltage type> **60Ω**

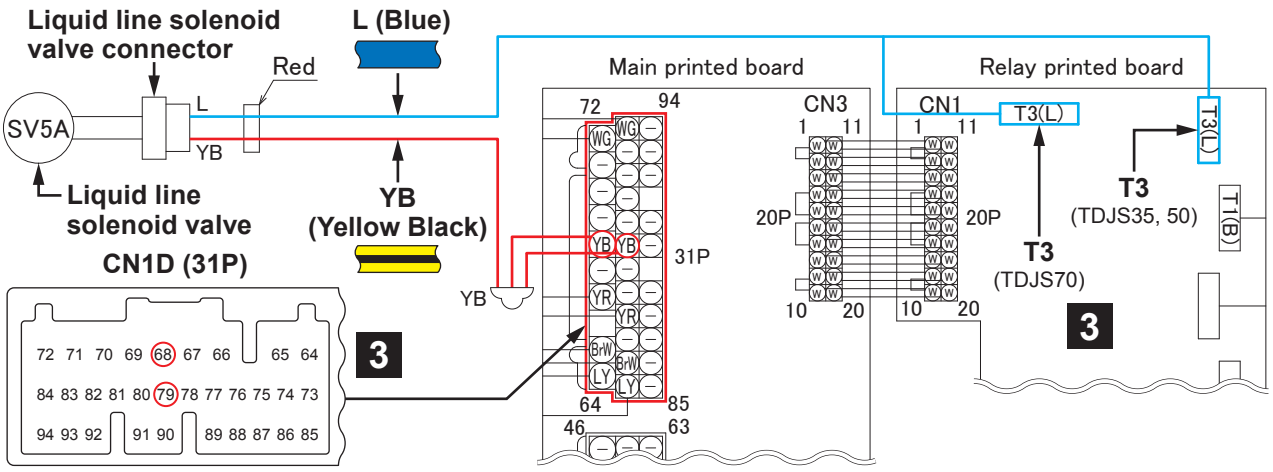
3

How to check shortcircuit between wiring

(1) Stops the unit operation
(2) Remove connector for liquid line solenoid valve
(3) Remove T3 terminal on relay PCB
(4) Measure the resistance between T3 terminal on relay PCB and 68 pin of CN1D connector on main PCB

If there is electrical continuity, there is shortcircuit between wiring L and YB. Repair wiring.

2

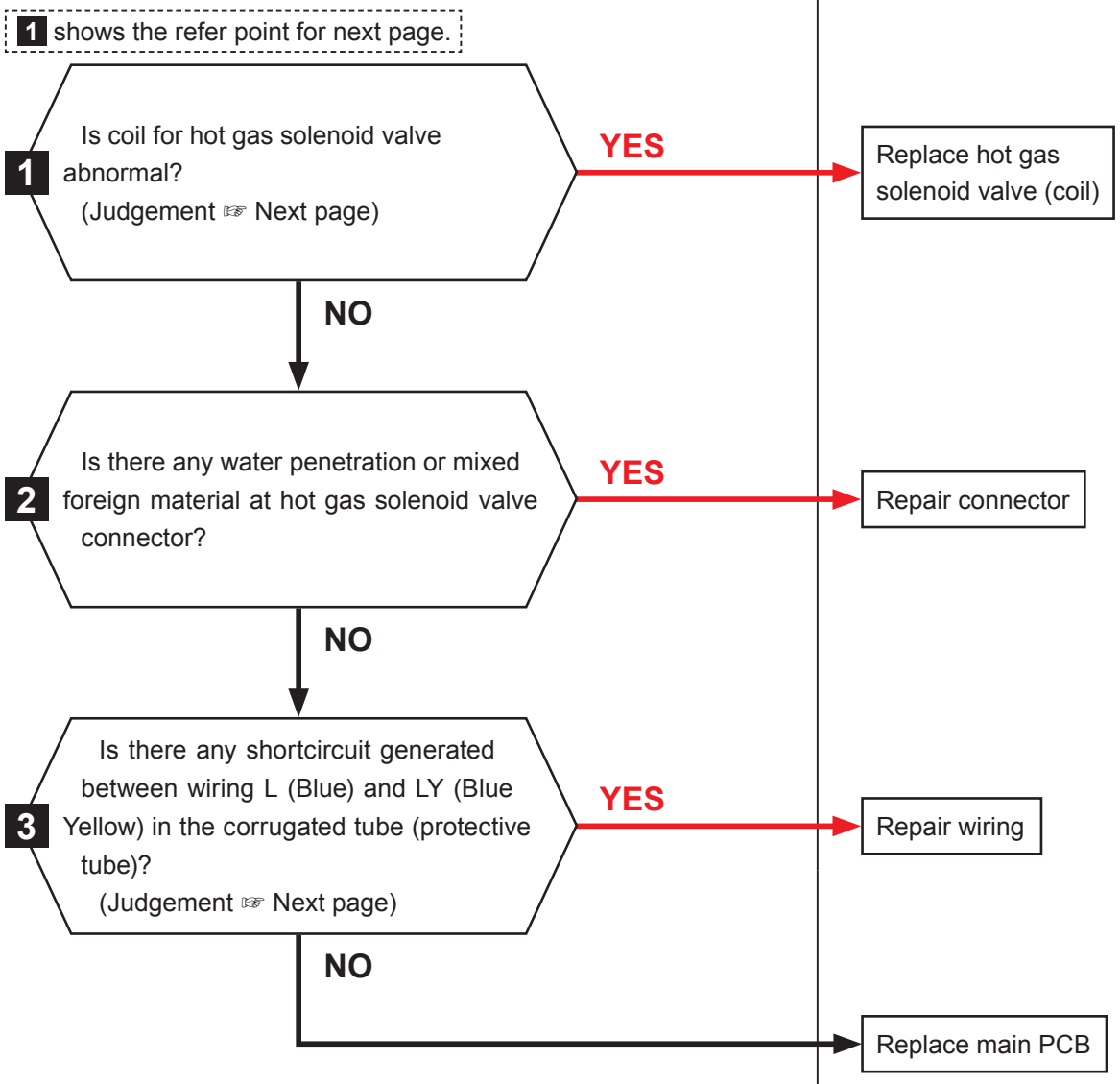


Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alm display	Alarm contents	Unit operation when alarm happened
E163	Hot gas solenoid valve shortcircuit abnormal	(1) E163 is displayed, however unit continues operation in case of cooling. (2) E163 is displayed and only evaporator fan motor operates in case of heating. (3) E163 is displayed and fan defrost is performed in case of defrost and set temp ≥ 5℃. E163 is displayed and return to cooling operation in case of defrost and set temp < 5℃.

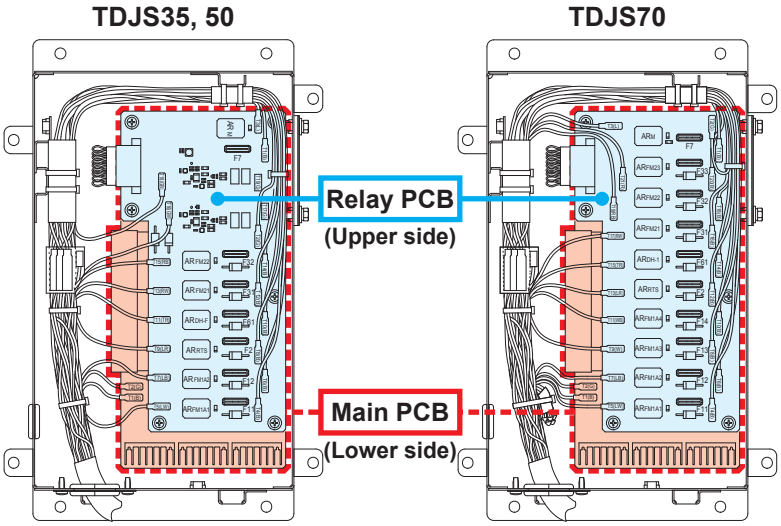
Alarm detection condition	Recovery condition
Detection of shortcircuit for hot gas solenoid valve circuit	Continue operation (Resume normal operation when abnormal detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

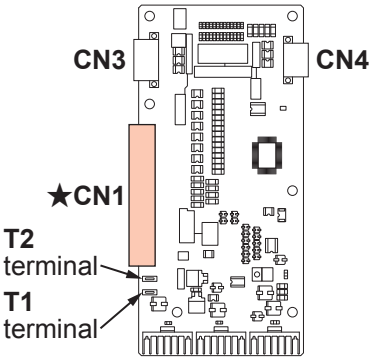


Control box (TDJS series)

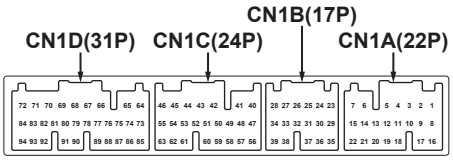
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB and Relay PCB

Wiring for hot gas solenoid valve is connected to 64 and 73 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

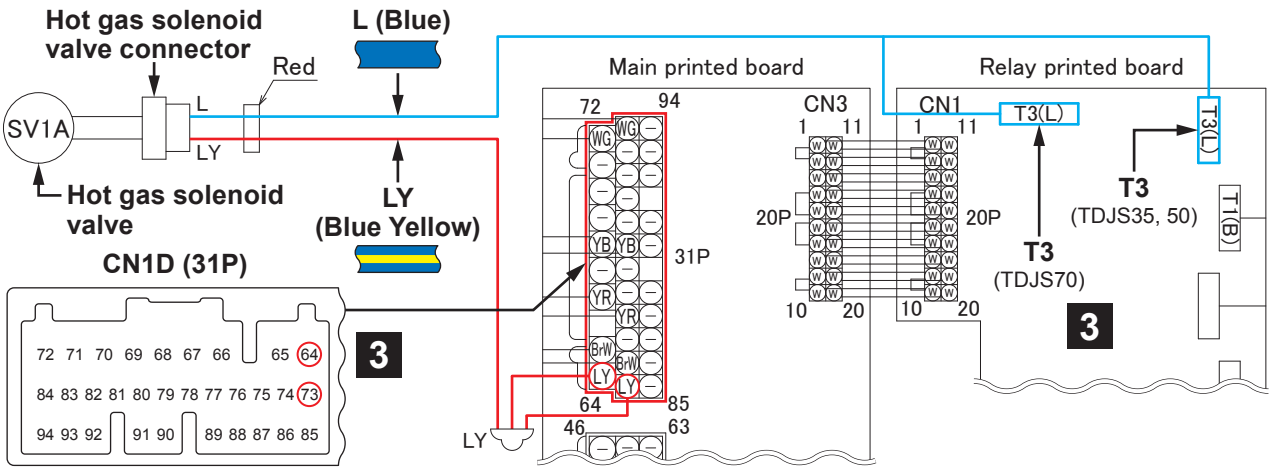
1

How to check abnormality of coil for solenoid valve
(1) Stops the unit operation (2) Remove connector for hot gas solenoid valve (3) Measure the resistance at solenoid valve connector by multimeter
If resistance is out of following value significantly, valve is judged **abnormal**. <12 voltage type> **15Ω** <24 voltage type> **60Ω**

3

How to check shortcircuit between wiring
(1) Stops the unit operation (2) Remove connector for hot gas solenoid valve (3) Remove T3 terminal on relay PCB (4) Measure the resistance between T3 terminal on relay PCB and 64 pin of CN1D connector on main PCB
If there is electrical continuity, there is shortcircuit between wiring L and LY. Repair wiring.

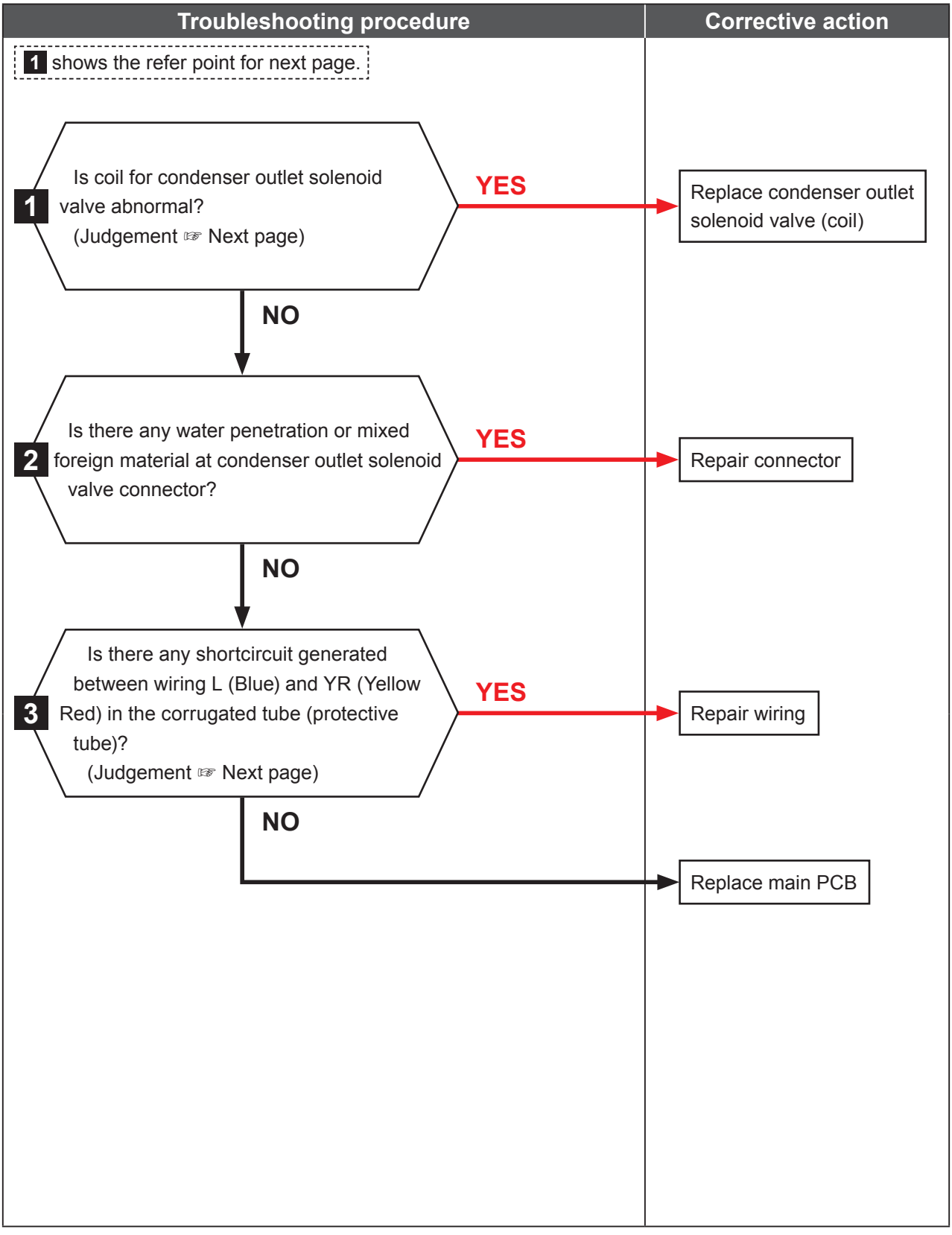
2



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

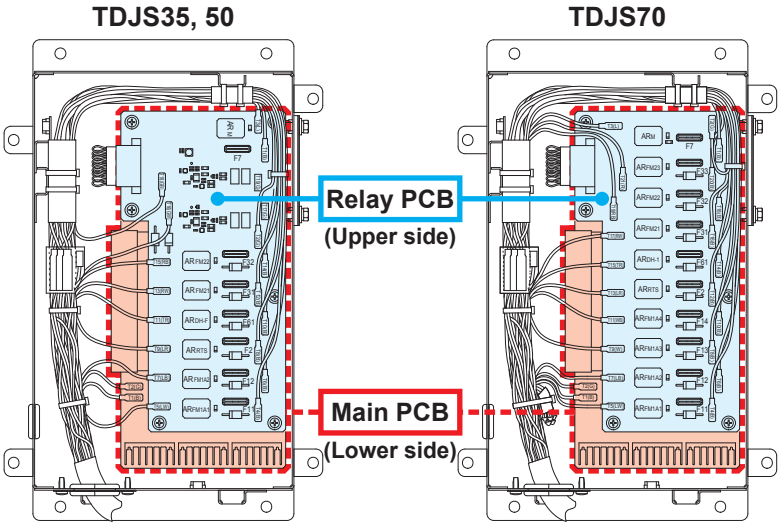
Alm display	Alarm contents	Unit operation when alarm happened
E167	Condenser outlet solenoid valve shortcircuit abnormal	(1) E167 is displayed and unit stops operation in case of cooling and defrost operation. (2) E167 is displayed and only evaporator fan motor operates in case of heating.

Alarm detection condition	Recovery condition
Detection of shortcircuit for condenser outlet solenoid valve circuit	(1) Operation resumes by OFF/ON of cabin controller (2) Continue operation (Resume normal operation when abnormal detection condition is unsatisfied.)

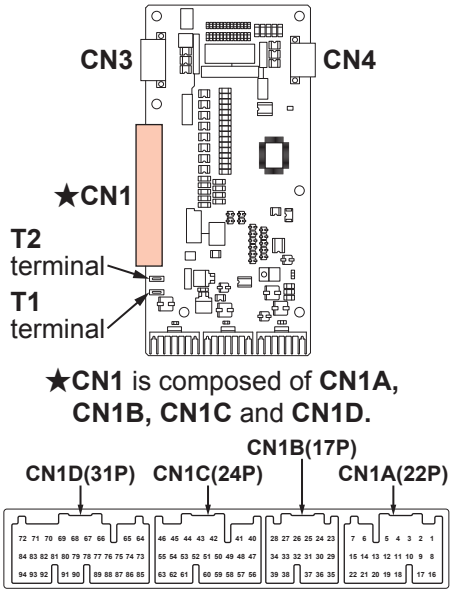


Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



Wiring connection to Main PCB and Relay PCB

Wiring for condenser outlet solenoid valve is connected to 66 and 76 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

1

How to check abnormality of coil for solenoid valve

(1) Stops the unit operation
(2) Remove connector for condenser outlet solenoid valve
(3) Measure the resistance at solenoid valve connector by multimeter

If resistance is out of following value significantly, valve is judged **abnormal**.
<12 voltage type> **15Ω** <24 voltage type> **60Ω**

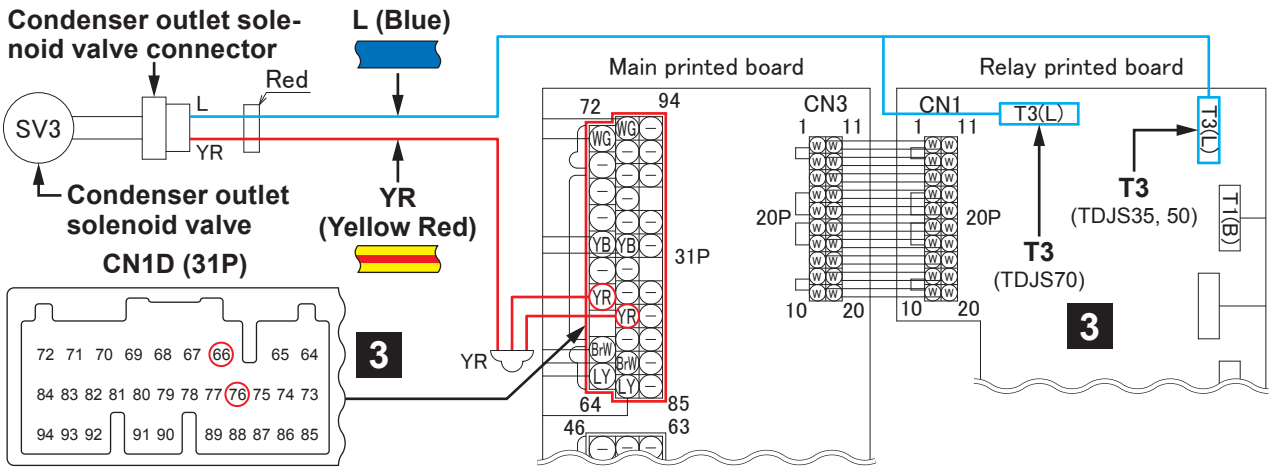
3

How to check shortcircuit between wiring

(1) Stops the unit operation
(2) Remove connector for condenser outlet solenoid valve
(3) Remove T3 terminal on relay PCB
(4) Measure the resistance between T3 terminal on relay PCB and 66 pin of CN1D connector on main PCB

If there is electrical continuity, there is shortcircuit between wiring L and YR. Repair wiring.

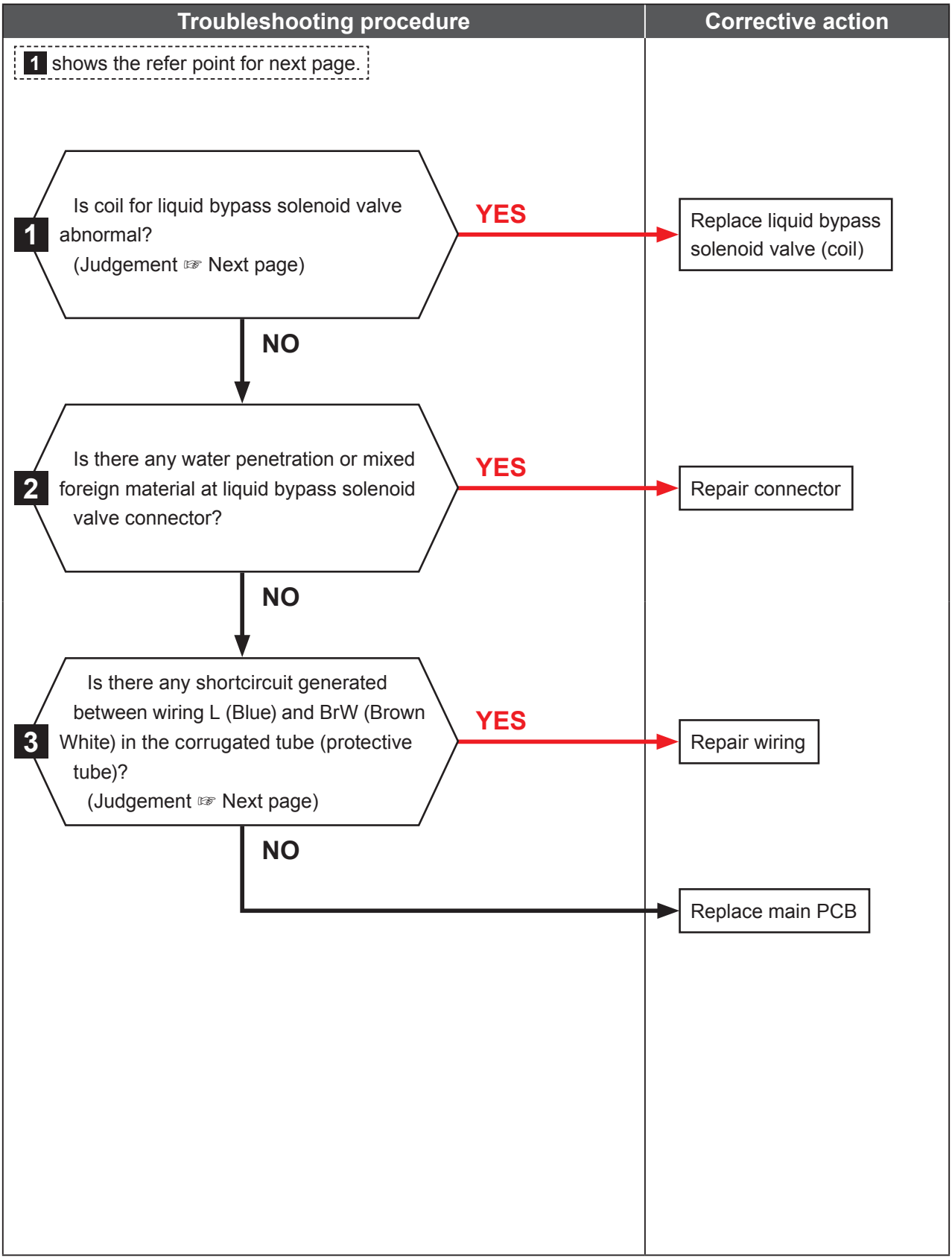
2



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

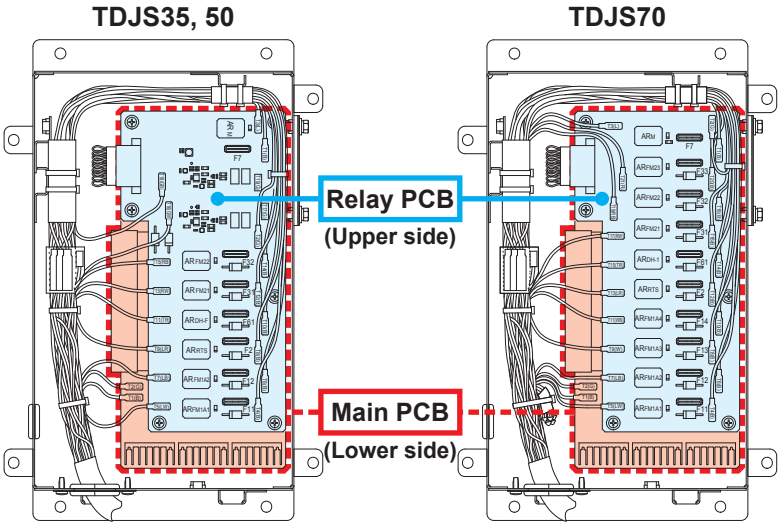
Alm display	Alarm contents	Unit operation when alarm happened
E168	Liquid bypass solenoid valve shortcircuit abnormal	E168 is displayed, however unit continues operation with liquid bypass solenoid valve OFF.
Alarm detection condition		**Recovery condition**
Detection of shortcircuit for liquid bypass solenoid valve circuit		Continue operation (Resume normal operation when abnormal detection condition is unsatisfied.)

Troubleshooting procedure	Corrective action

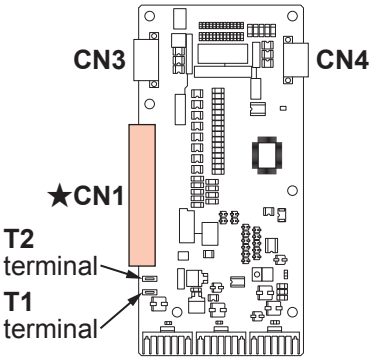


Control box (TDJS series)

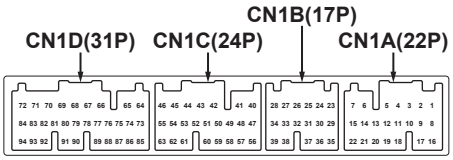
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of connector on Main PCB



★**CN1** is composed of **CN1A, CN1B, CN1C** and **CN1D.**



Wiring connection to Main PCB and Relay PCB

Wiring for liquid bypass solenoid valve is connected to 65 and 74 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

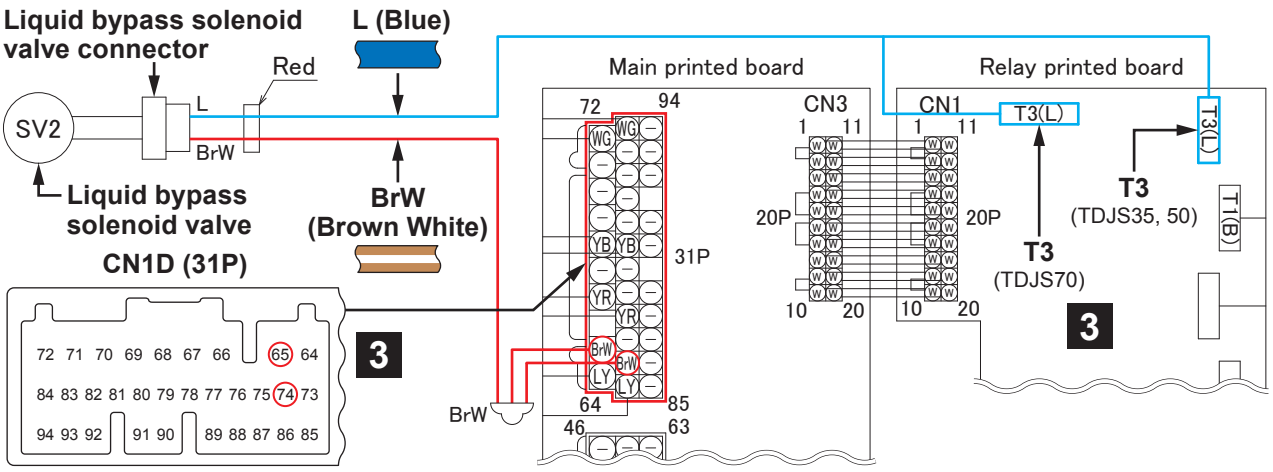
1

How to check abnormality of coil for solenoid valve
(1) Stops the unit operation (2) Remove connector for liquid bypass solenoid valve (3) Measure the resistance at solenoid valve connector by multimeter
If resistance is out of following value significantly, valve is judged **abnormal**. <12 voltage type> **15Ω** <24 voltage type> **60Ω**

3

How to check shortcircuit between wiring
(1) Stops the unit operation (2) Remove connector for liquid bypass solenoid valve (3) Remove T3 terminal on relay PCB (4) Measure the resistance between T3 terminal on relay PCB and 65 pin of CN1D connector on main PCB
If there is electrical continuity, there is shortcircuit between wiring L and BrW. Repair wiring.

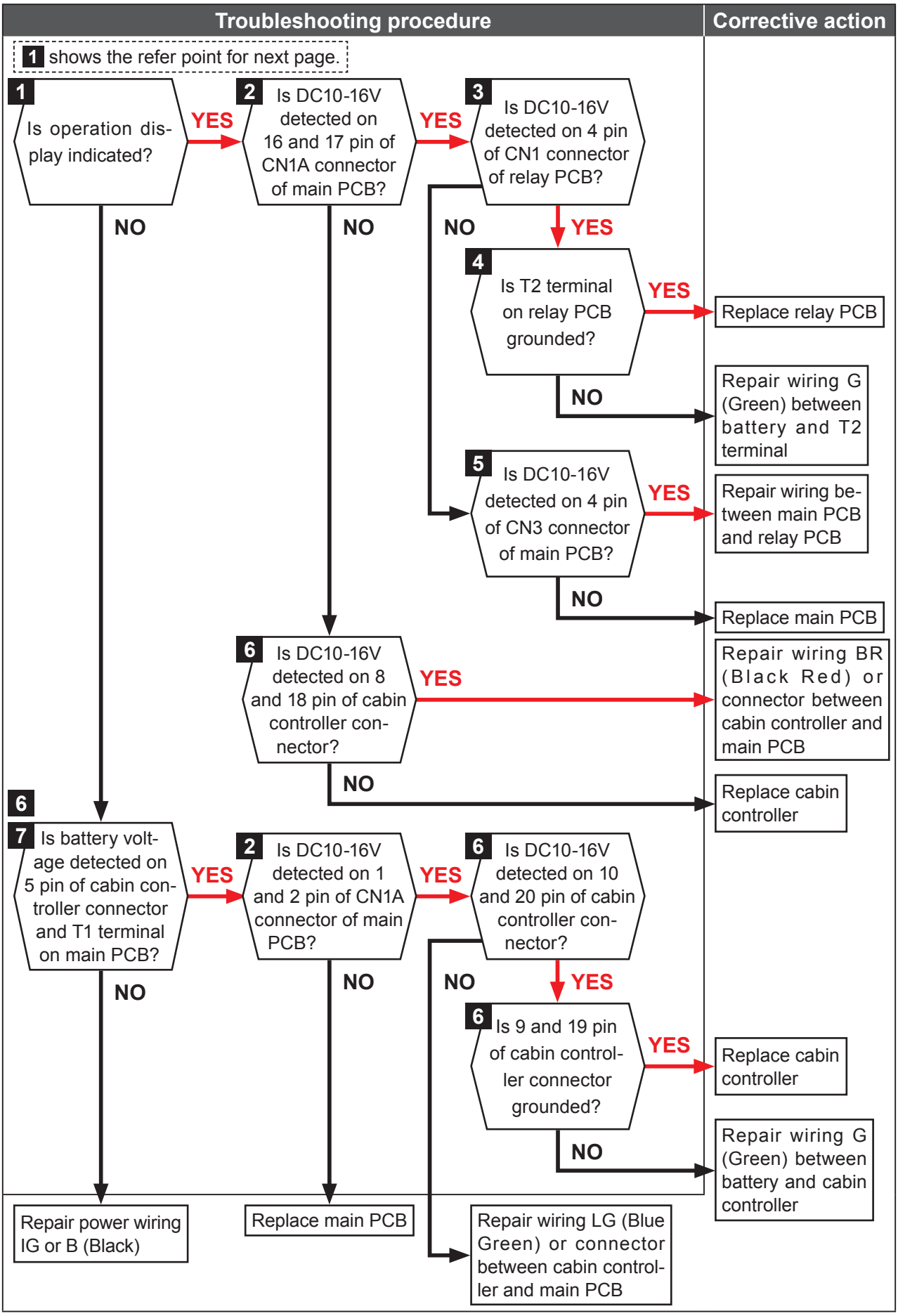
2



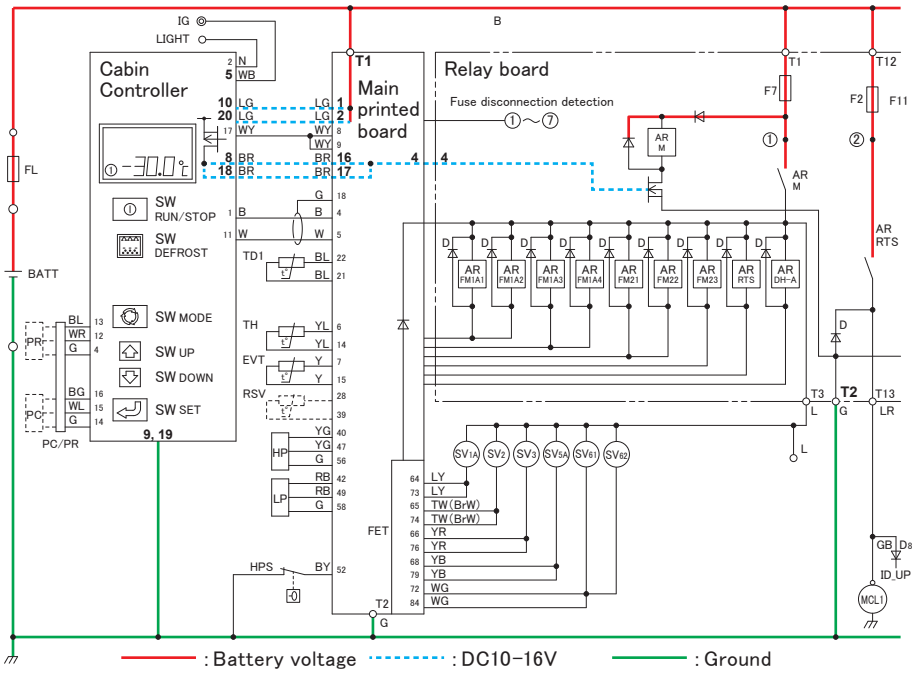
Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alarm contents

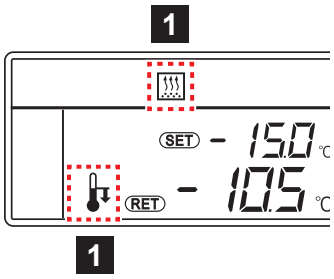
Unit will not start operation even turning RUN/STOP switch of cabin controller to “ON”.



Voltage on ladder diagram



Display of cabin controller

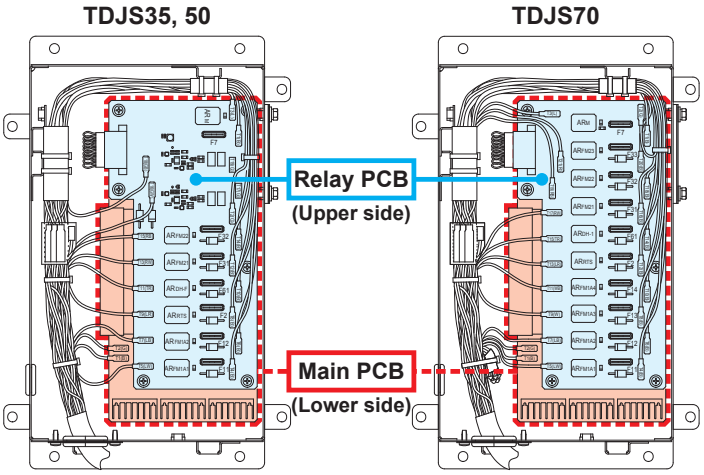


Check if ↧, ↥ or ⧚ display is indicated.
In case of “Thermostat OFF*” there is no above display, and it is normal not to start operation.

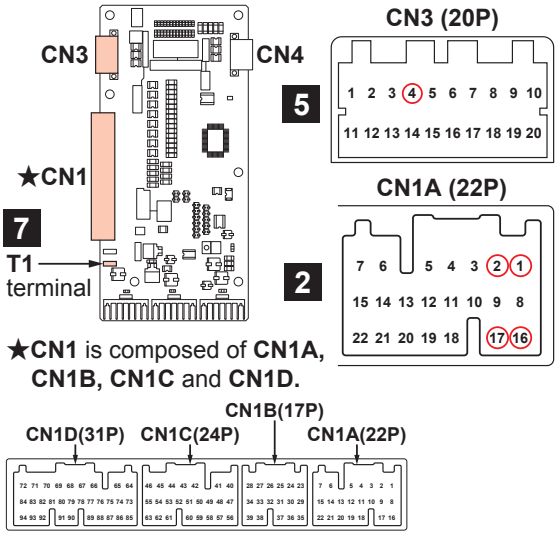
* Thermostat OFF: Return temperature is almost reached to set temperature.

Control box (TDJS series)

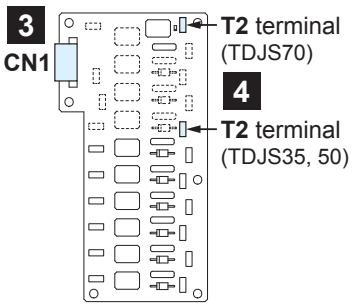
PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



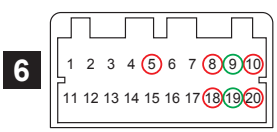
Arrangement of connector on Main PCB



Arrangement of connector on Relay PCB



Pin arrangement for cabin controller



Judgement for normal voltage

⑤ Battery voltage (During IG ON)
⑧⑩⑱⑳ DC10-16V during operation
⑨⑲ Ground

Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.
- Main PCB connector terminal number ☞ page 155.

Alarm contents

Evaporator fan motor will not operate, although other functional parts such as compressor is in operation.

Troubleshooting procedure	Corrective action

1 shows the refer point for next page.

Is connector for evaporator fan motor abnormal?

YES → Repair connector or insert connector correctly

NO

1 Is battery voltage detected on wiring ∗ for evaporator fan motor connector?

YES → **2** Is wiring G (Green) for evaporator fan motor grounded?

YES → Replace evaporator fan motor

NO → Repair wiring G (Green)

Unit Model	Wiring ∗
TDJS35, 50	LW (Blue White) LB (Blue Black)
TDJS70	LW (Blue White) LB (Blue Black) W (White) WB (White Black)

NO

3 Is battery voltage detected on T∗ terminal on relay PCB?

YES → Repair wiring LW, LB, W or WB between relay PCB and fan motor

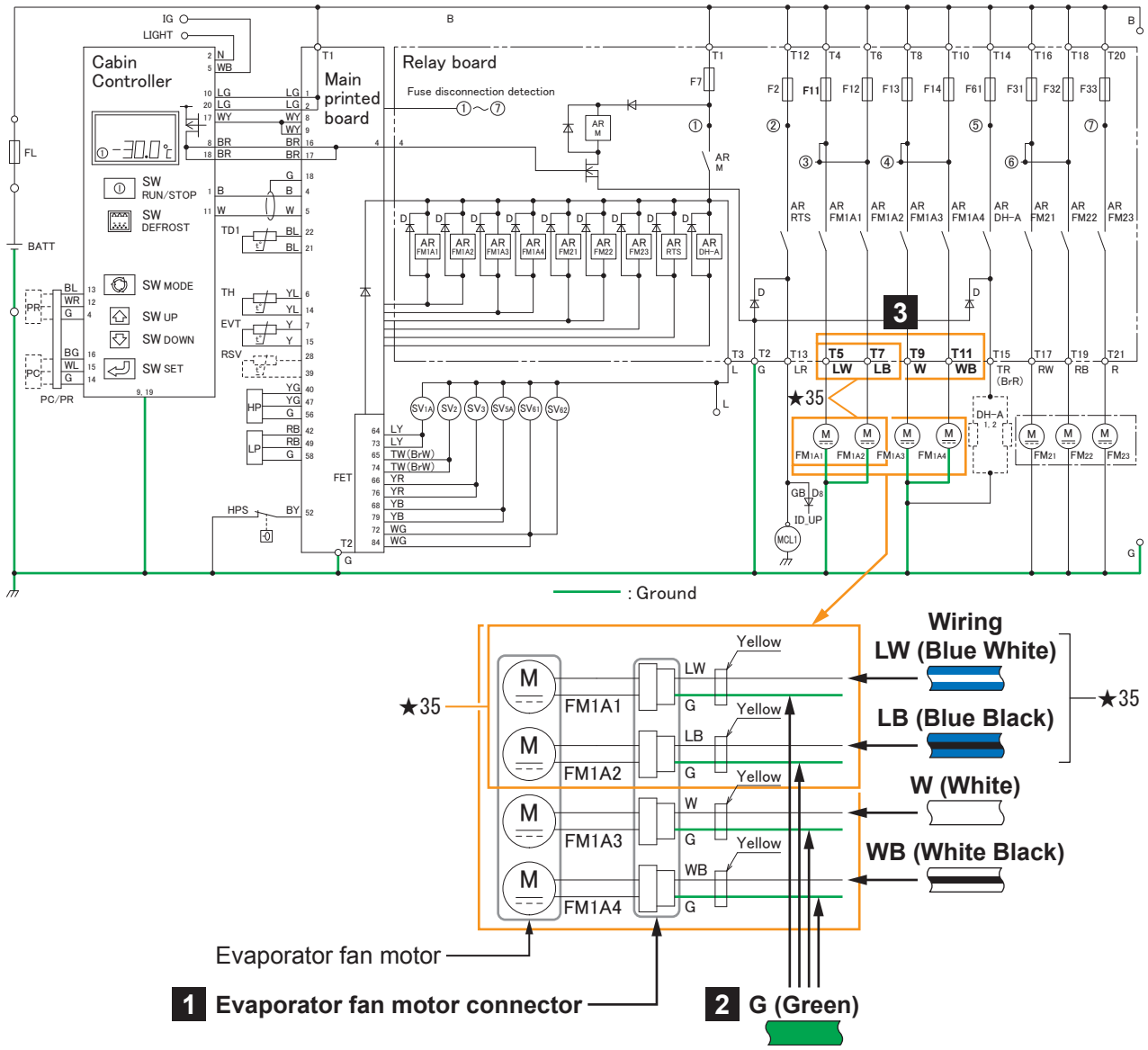
Unit Model	T∗ terminal
TDJS35, 50	T5, T7
TDJS70	T5, T7, T9, T11

NO → Replace relay PCB

Reference page In case of [E101] Evaporator fan motor fuse has blown ☞ page 119.

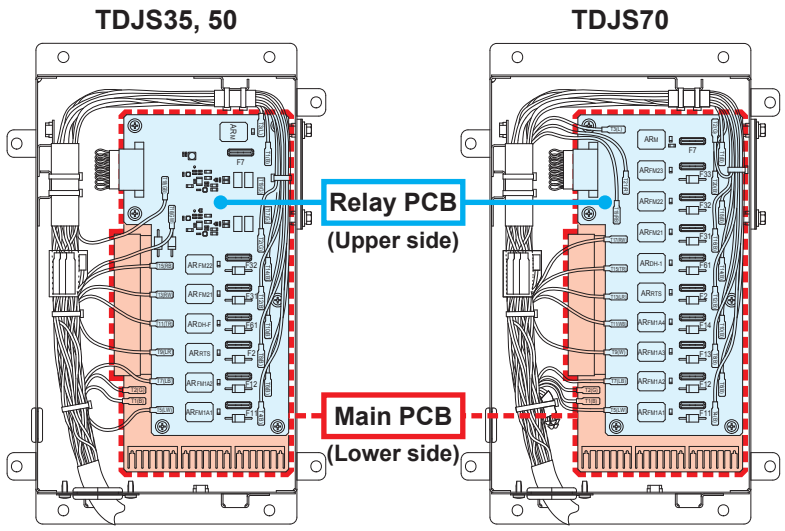
Ladder diagram (TDJS70)

★35 : TDJS35, 50

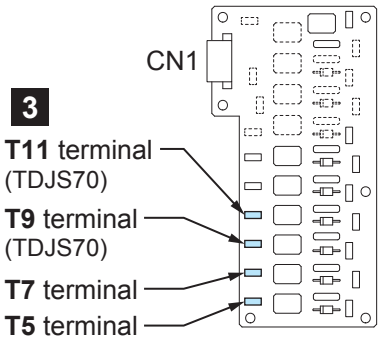


Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of terminal on Relay PCB



Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.

Alarm contents

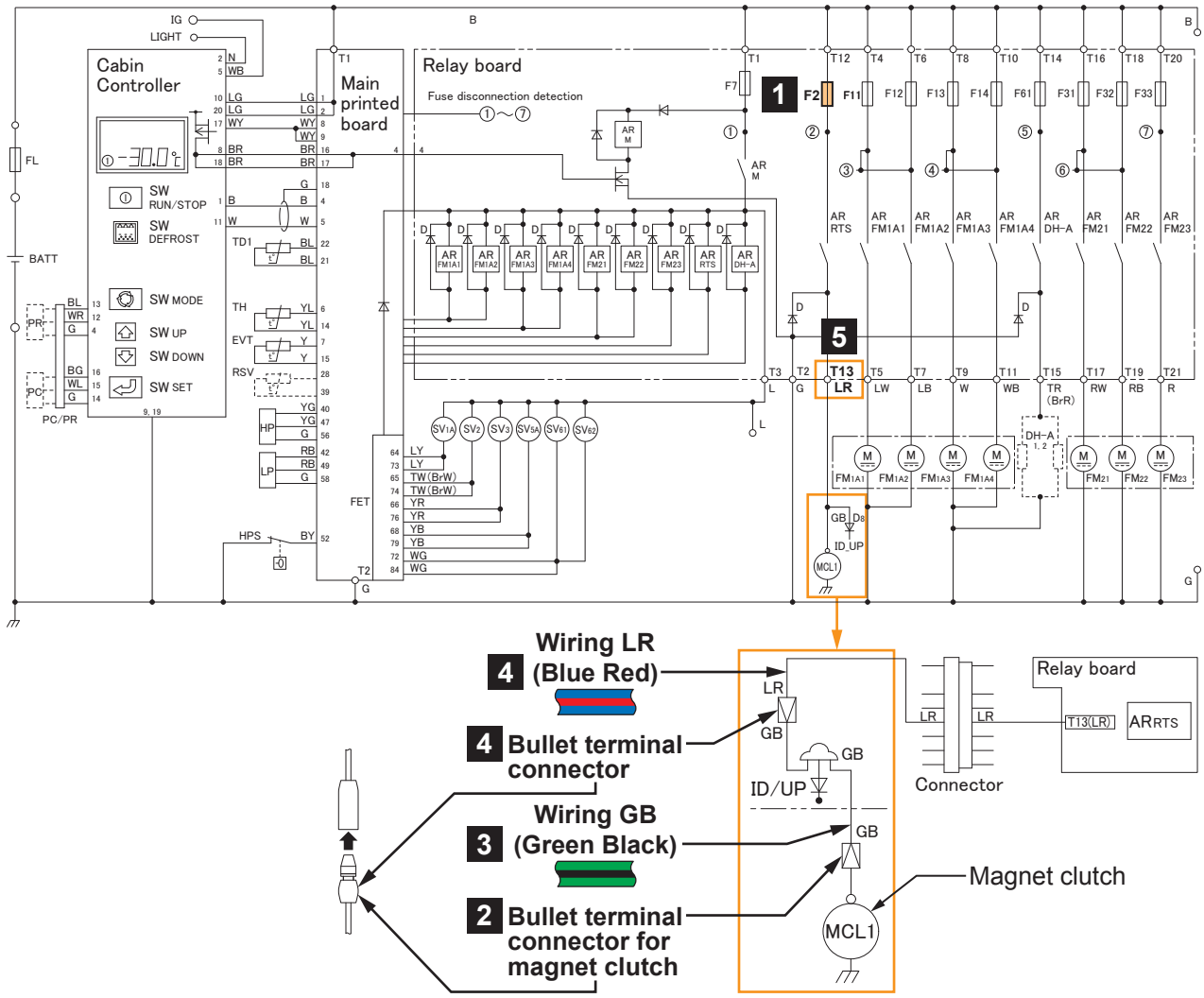
Compressor will not operate, although other functional parts such as fan motor is in operation.

Troubleshooting procedure	Corrective action
1 shows the refer point for next page.	
Is compressor abnormal such as lock? **YES**	Replace compressor
NO	
1 Is compressor magnet clutch fuse “F2” blown or E003 displayed? **YES**	**[E003]** ☞ page 91.
NO	
2 Is bullet terminal connector for magnet clutch abnormal? **YES**	Repair bullet terminal connector or insert connector correctly
NO	
3 Is battery voltage detected on wiring GB (Green Black) at bullet terminal connector for magnet clutch? **YES**	Replace magnet clutch
NO	
4 Is battery voltage detected on wiring LR (Blue Red) at bullet terminal connector? **YES**	Repair wiring GB (Green Black) between bullet terminal
NO	
5 Is battery voltage detected on T∗ terminal on relay PCB? **YES**	Repair wiring LR (Blue Red) between relay PCB and bullet terminal

Unit Model	T∗ terminal
TDJS35, 50	T9
TDJS70	T13

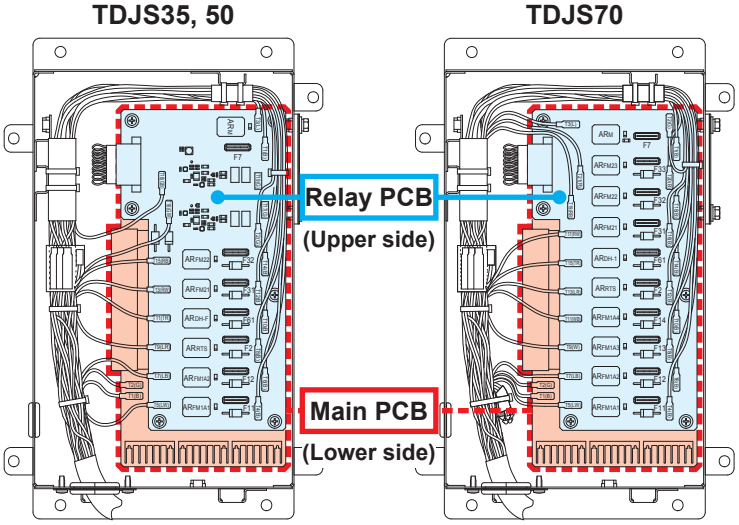
NO → Replace relay PCB

Ladder diagram

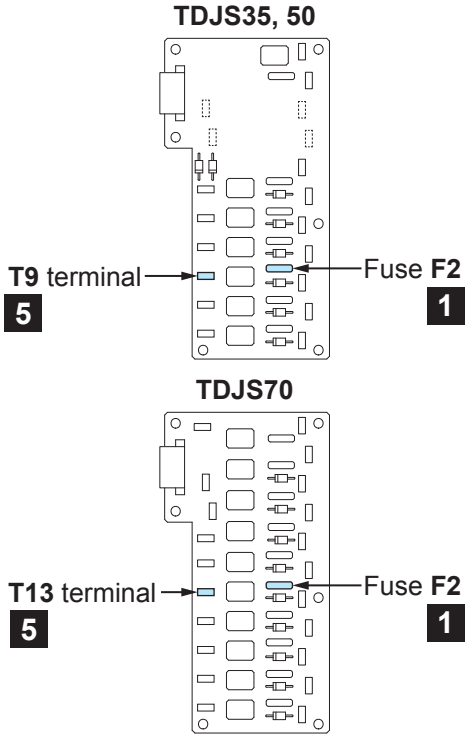


Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of fuse and terminal on Relay PCB



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43.

Alarm contents	Condenser fan motor will not operate in case of followings.
Condenser fan motor will not operate, although other functional parts is in operation.	(1) During heating or defrost operation (2) High pressure < 1.0MPa when compressor starts operation (3) Pressure difference between high pressure and low pressure ≤ 1.2MPa, and low pressure ≤ 0.2MPa during cooling operation

Troubleshooting procedure | **Corrective action**

1 shows the refer point for next page.

Is condenser fan motor abnormal such as lock? — YES → Replace condenser fan motor

NO

1 Fuse "F∗" for condenser fan motor has blown or E102 displayed? — YES → [E102] ☞ page 121.

Unit Model	Fuse F∗
TDJS35, 50	F31, F22
TDJS70	F31, F32, F33

NO

2 Is connector for condenser fan motor abnormal? — YES → Repair connector or insert connector correctly

NO

Is unit model TDJS35? — YES → 4 Is there any disconnection for wiring ∗ between condenser fan motor connector and T∗ terminal of relay PCB? — YES → Repair wiring GW or GB

Wiring ∗	T∗ terminal
GW (Green White)	T16
GB (Green Black)	T18

NO

5 Is there electrical continuity between T16 and T17 of relay PCB? And is there continuity between T18 and T19 of relay PCB? — YES → Replace condenser fan motor

NO → Replace relay PCB

NO → 3 Is battery voltage detected on wiring ∗ of condenser fan motor connector? — YES → Is unit model TDJS35?

Unit Model	Wiring ∗
TDJS35, 50	RW (Red White) RB (Red Black)
TDJS70	RW (Red White) RB (Red Black) R (Red)

NO

6 Is wiring G (Green) for condenser fan motor grounded? — YES → Replace condenser fan motor

NO → Repair wiring G

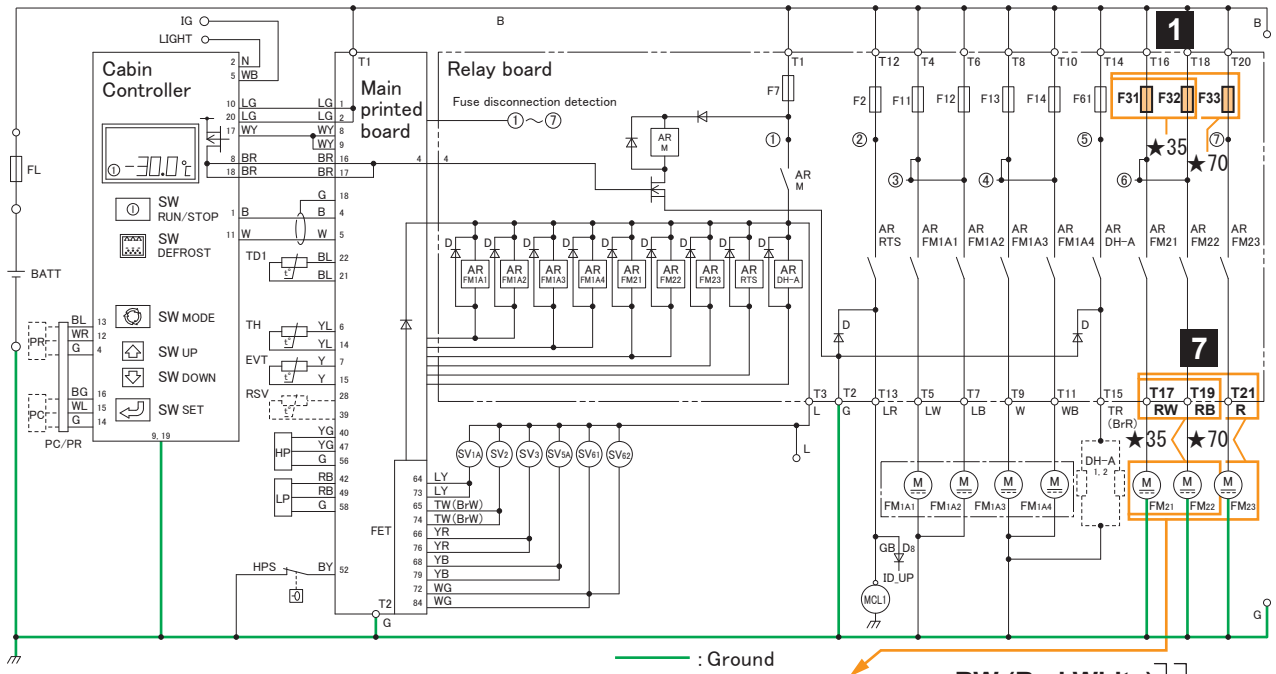
7 Is battery voltage detected on T∗ terminal of relay PCB? — YES → Repair wiring RW, RB or R between fan motor and relay PCB

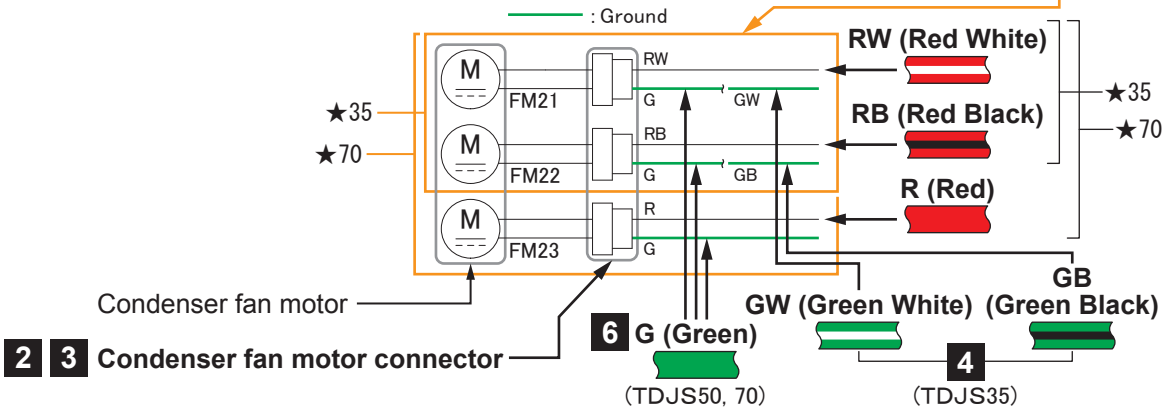
Unit Model	T∗ terminal
TDJS35, 50	T13, T15
TDJS70	T17, T19, T21

NO → Replace relay PCB

Ladder diagram (TDJS70)

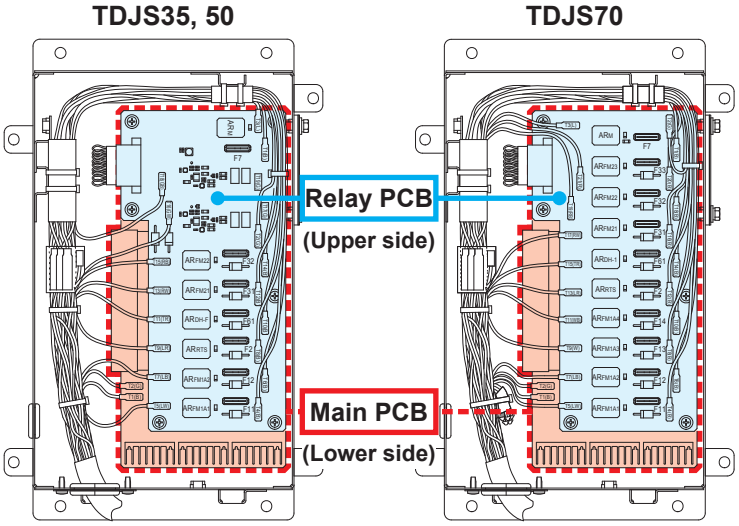
★35 : TDJS35, 50　　★70 : TDJS70





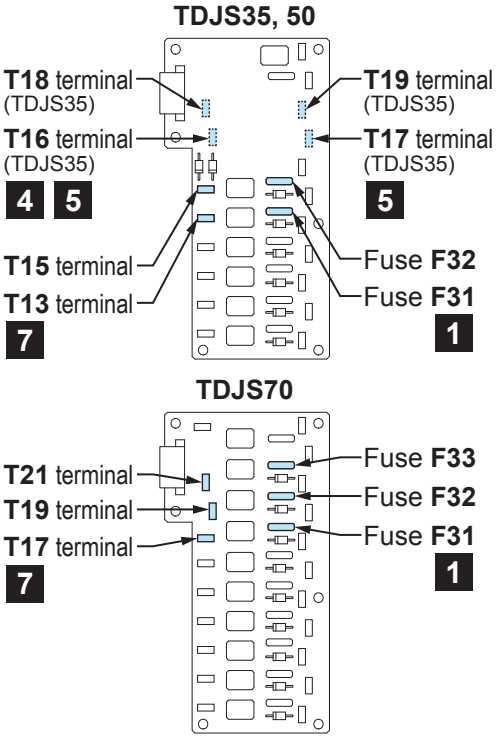
Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.

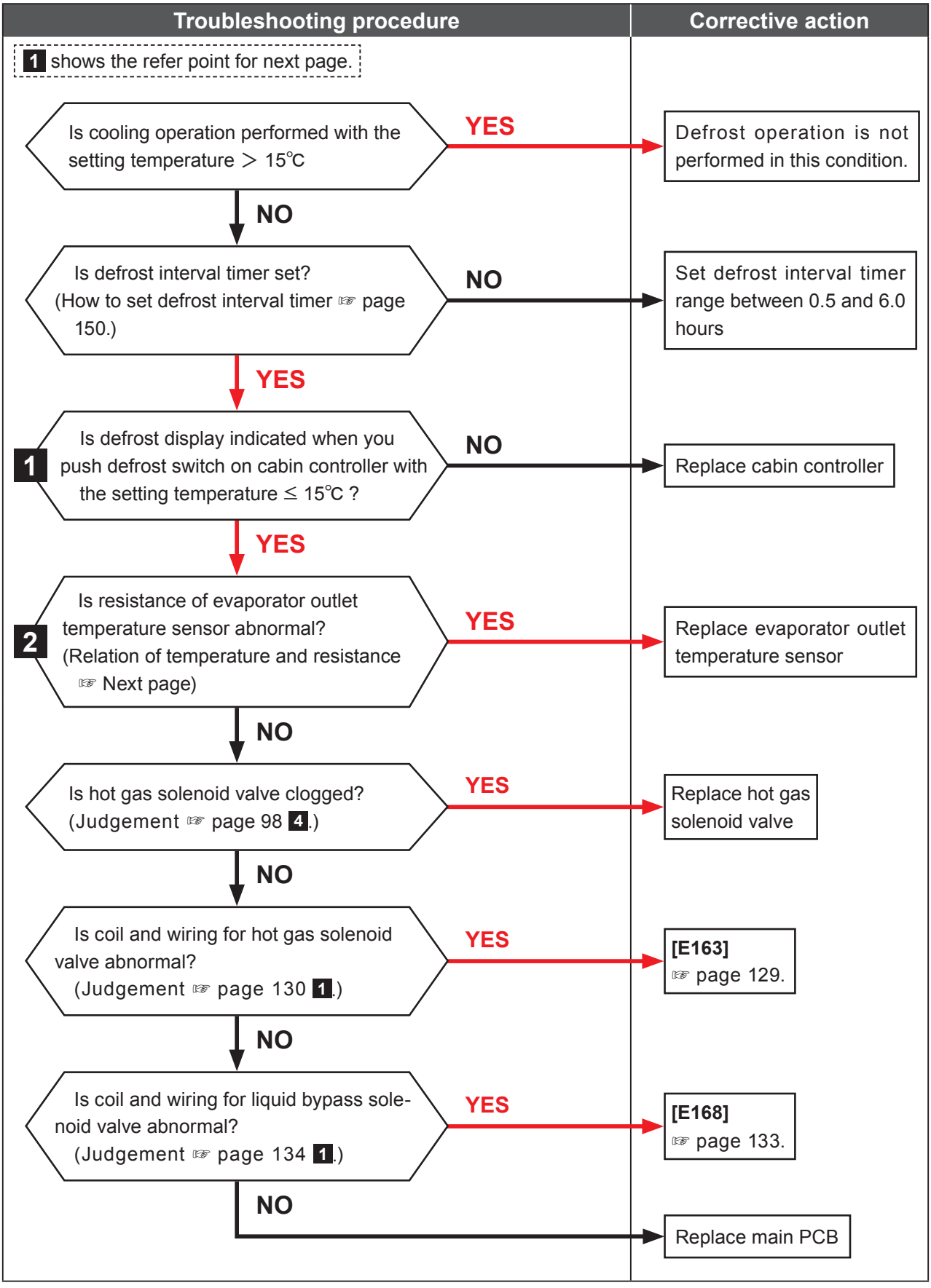


Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43.

Arrangement of fuse and terminal on Relay PCB

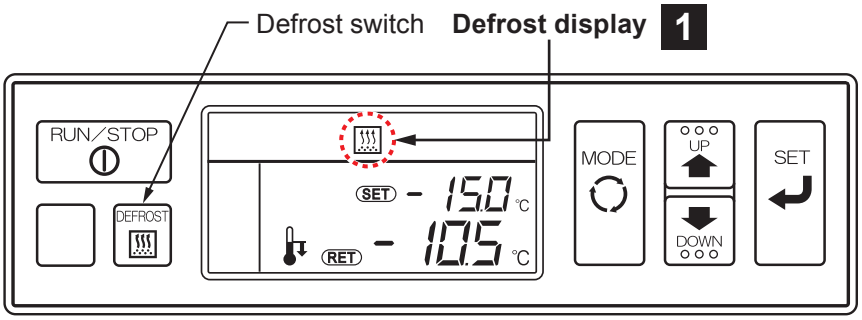


Alarm contents
Unit will not perform automatic defrost operation. (Defrost display is not indicated.)



Reference page	Defrost operation ☞ page 49. In case of [E057] Evaporator outlet temperature sensor abnormal ☞ page 113.

Defrost display for cabin controller



Wiring connection to Main PCB

2

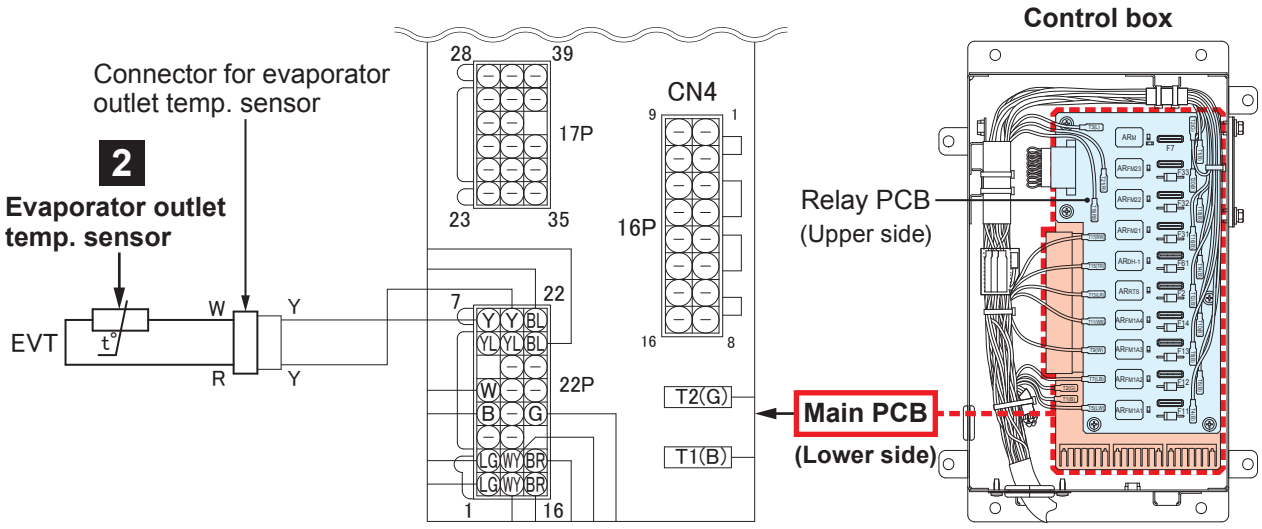
How to check resistance for evaporator outlet temp. sensor

(1) Remove evaporator outlet temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 30℃ and resistance is 1.687 - 1.808kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

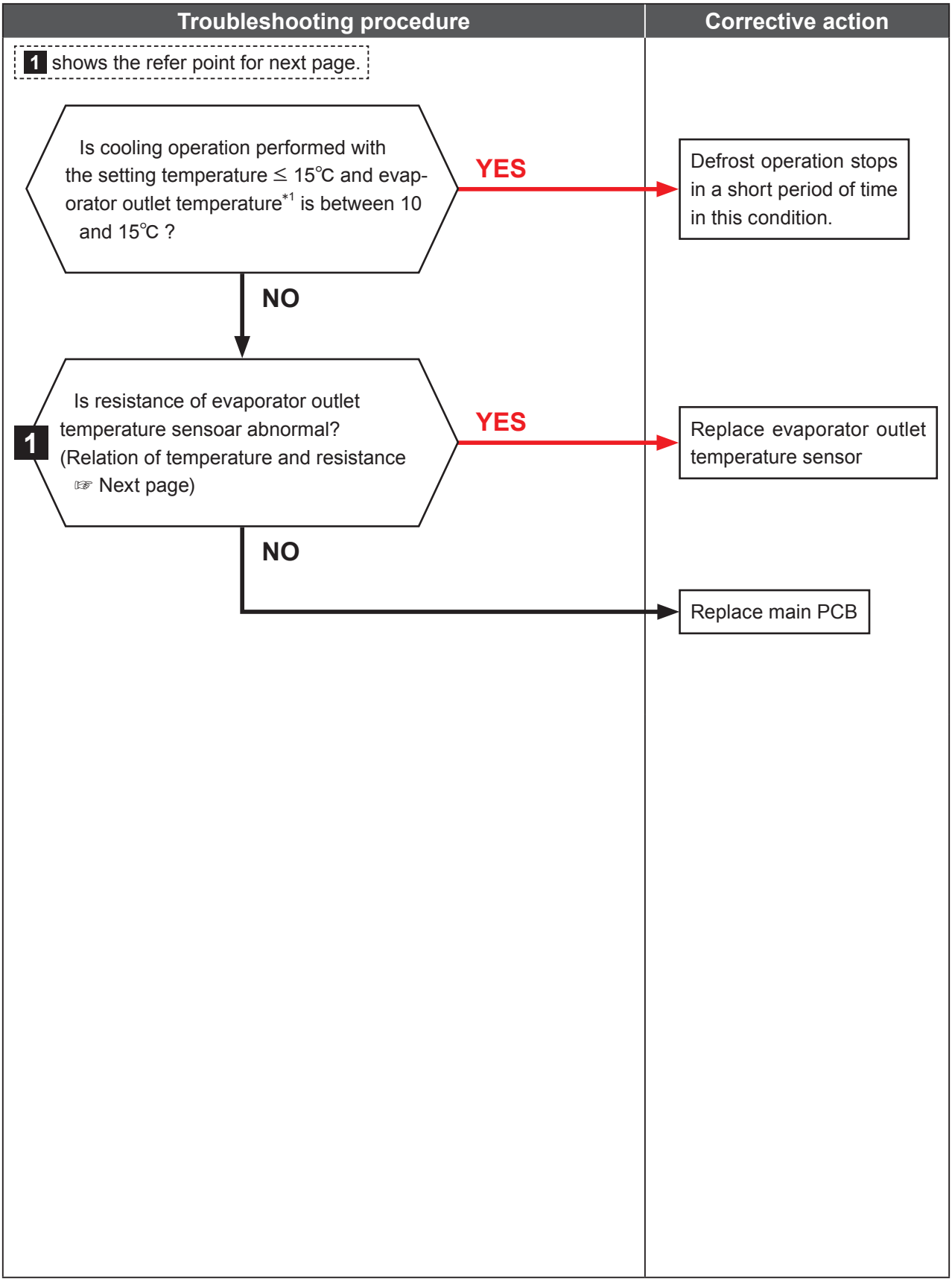
Amb temp.	Min	Avg	Max
−30℃	25. 293	26. 316	27. 376
−20℃	15. 125	15. 572	16. 031
−10℃	9. 342	9. 524	9. 709
0℃	5. 940	6. 000	6. 060
10℃	3. 810	3. 882	3. 955
20℃	2. 505	2. 573	2. 644
25℃	2. 049	2. 113	2. 179
30℃	1. 687	1. 746	1. 808
40℃	1. 163	1. 213	1. 265
50℃	0. 819	0. 860	0. 903

(For more data, ☞ page 158.)



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43.

Alarm contents
Defrost operation stops in a short period of time.



Reference page	∗1 : **[Cabin controller]** Analog sensor display ☞ page 61. Defrost operation ☞ page 49. In case of [E057] **Evaporator outlet temperature sensor abnormal** ☞ page 113.

Wiring connection to Main PCB

1

How to check resistance for evaporator outlet temp. sensor

(1) Remove evaporator outlet temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 30℃ and resistance is 1.687 - 1.808kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
−30℃	25. 293	26. 316	27. 376
−20℃	15. 125	15. 572	16. 031
−10℃	9. 342	9. 524	9. 709
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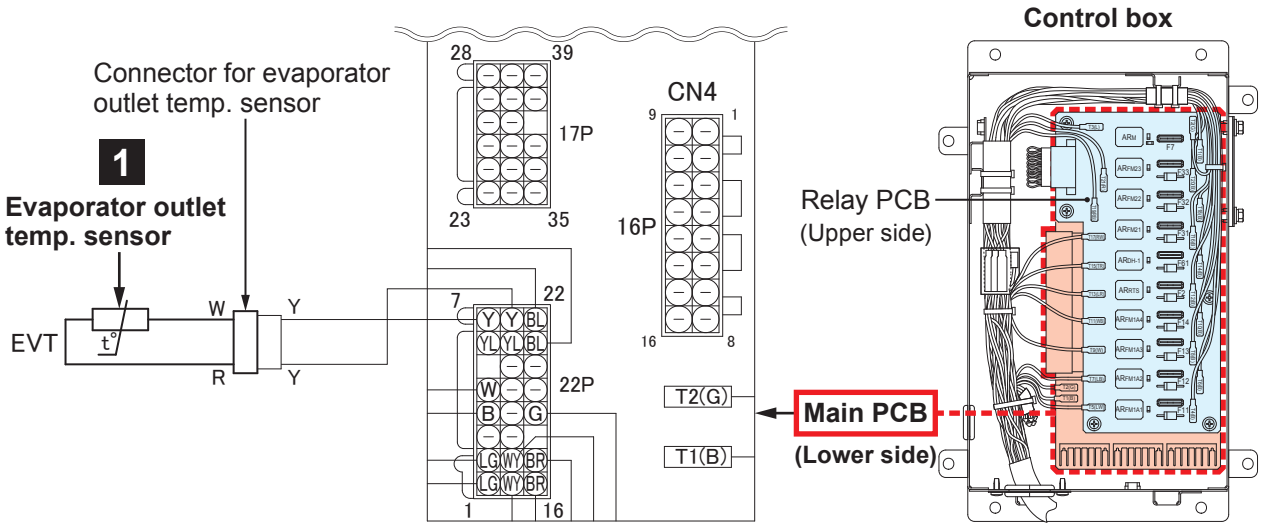
25℃	2. 049	2. 113	2. 179
30℃	1. 687	1. 746	1. 808
40℃	1. 163	1. 213	1. 265
50℃	0. 819	0. 860	0. 903

(For more data, ☞ page 158.)



Refer page for detail information	• Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43.

Alarm contents

Unit will not finish defrost operation.

Troubleshooting procedure	Corrective action
1 shows the refer point for next page.	
1 Is resistance of evaporator outlet temperature sensor abnormal? (Relation of temperature and resistance ☞ Next page) **YES**	Replace evaporator outlet temperature sensor
NO	
2 Is installation of evaporator outlet temperature sensor abnormal? (Peeling of insulation material, coming off of sensor folder, etc.) **YES**	Correct installation for evaporator outlet temperature sensor
NO	
Is high and low pressure significantly low against standard operating pressure*1 in cooling operation compared with gauge manifold or controller display*2? **YES**	Find and repair refrigerant leakage portion
NO	
When touching the piping at the inlet and outlet of hot gas solenoid valve during defrost, is there a temperature difference? **NO**	Explain customer how to use the unit correctly in order to prevent the entering of humid into container inside. (1) Pre-cooling for goods (2) Dry the container inside before loading (3) Stop unit operation before unloading
YES	
Is there a magnetic force at the bolt located top of hot gas solenoid valve coil during defrost? (Iron screw driver stick to the bolt?) **YES**	Replace hot gas solenoid valve (body)
NO	
3 Is coil for hot gas solenoid valve abnormal? (Judgement ☞ Next page) **YES**	Replace hot gas solenoid valve (coil)
NO	
4 Is there any water penetration or mixed foreign material at hot gas solenoid valve connector? **YES**	Repair connector
NO	
5 Is there any disconnection or shortcircuit for wiring L (Blue) or LY (Blue Yellow)? (Judgement for shortciruit ☞ Next page) **YES**	Repair wiring
NO	Replace main PCB

Reference page

*1 : **Standard operating pressure** ☞ page 77.

*2 : **[Cabin controller]** Analog sensor display ☞ page 61.

In case of [E057] **Evaporator outlet temperature sensor abnormal** ☞ page 113.

In case of [E167] **Hot gas solenoid valve shortcircuit abnormal** ☞ page 131.

Wiring connection to Main PCB (evaporator outlet temp. sensor)

1

How to check resistance for evaporator outlet temp. sensor

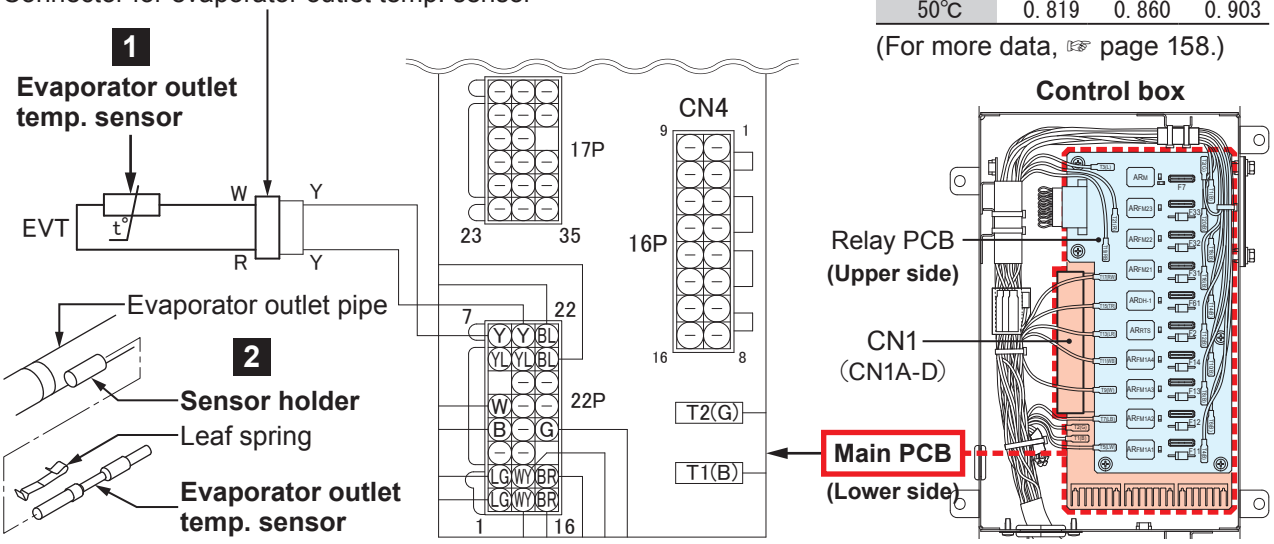
(1) Remove evaporator outlet temp. sensor at connector.
(2) Measure the resistance by multimeter and compare with right chart.
Ex) When ambient temperature is 30℃ and resistance is 1.687 - 1.808kΩ, sensor is judged **normal.** (In case out of above range, sensor is abnormal.)

Resistance for the normal sensor kΩ

Amb temp.	Min	Avg	Max
−30℃	25. 293	26. 316	27. 376
−20℃	15. 125	15. 572	16. 031
−10℃	9. 342	9. 524	9. 709
0℃	5. 940	6. 000	6. 060
10℃	3. 810	3. 882	3. 955
20℃	2. 505	2. 573	2. 644
25℃	2. 049	2. 113	2. 179
30℃	1. 687	1. 746	1. 808
40℃	1. 163	1. 213	1. 265
50℃	0. 819	0. 860	0. 903

(For more data, ☞ page 158.)

Connector for evaporator outlet temp. sensor



Wiring connection to Main PCB and Relay PCB (hot gas solenoid valve)

Wiring for hot gas solenoid valve is connected to 64 and 73 pin of CN1D connector on main PCB and T3 terminal on relay PCB.

3

How to check abnormality of coil for solenoid valve

(1) Stops the unit operation
(2) Remove connector for hot gas solenoid valve
(3) Measure the resistance at solenoid valve connector by multimeter

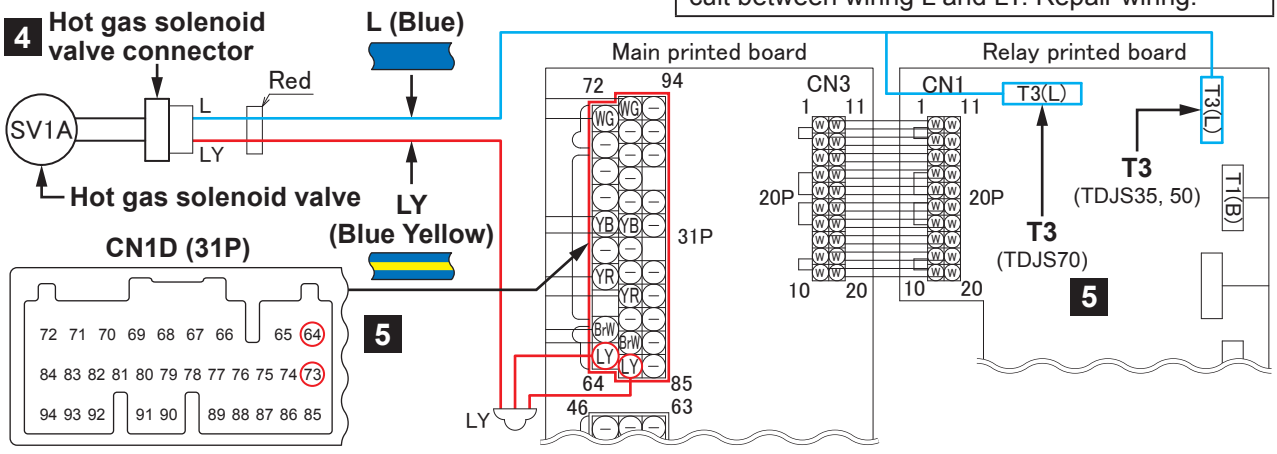
If resistance is out of following value significantly, valve is judged **abnormal**.
<12 voltage type> **15Ω** <24 voltage type> **60Ω**

5

How to check shortcircuit between wiring

(1) Stops the unit operation
(2) Remove connector for hot gas solenoid valve
(3) Remove T3 terminal on relay PCB
(4) Measure the resistance between T3 terminal on relay PCB and 64 pin of CN1D connector on main PCB

If there is electrical continuity, there is shortcircuit between wiring L and LY. Repair wiring.



Refer page for detail information • Ladder diagram & Wire color codes ☞ page 42. • Wiring layout drawing ☞ page 43. • Main PCB connector terminal number ☞ page 155.

Alarm contents

Unit will do defrost operation frequently.

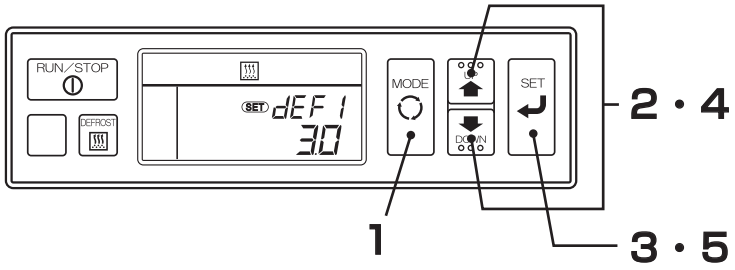
Troubleshooting procedure	Corrective action
1 shows the refer point for next page.	
1 Is defrost interval timer set? YES → Is defrost interval timer set as 0.5 hour or 1.0 hour? YES	Change the defrost interval timer at an appropriate interval
NO / NO	
2 Is drain port at the tip of drain hose dropping or coming off? YES	Install drain port correctly
NO	
Is there a possibility of entering much humid into container inside? (1) Loading the goods without pre-cooling (2) Insufficient drying of container inside (3) Unloading with unit operation YES	Explain customer how to use the unit correctly in order to prevent the entering of humid into container inside. (1) Pre-cooling for goods (2) Dry the container inside before loading (3) Stop unit operation before unloading
NO	Replace cabin controller and observe the situation
	Reoccurence
	Replace main PCB

Reference page

When following alarm code is confirmed at the past alarm, perform the troubleshooting corresponding to each alarm because it might be a cause of failure.

In case of [E016] **Low pressure (sensor) abnormal** ☞ page 101.
In case of [E057] **Evaporator outlet temperature sensor abnormal** ☞ page 113.

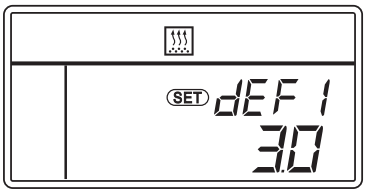
1 Setting the defrost interval timer



1 **Press the [MODE] switch.**

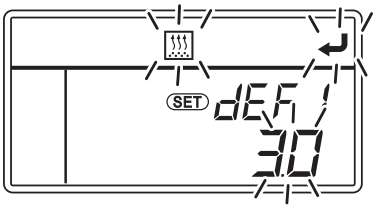
⇒ The display changes to the "Clock/calendar display mode".

2 **Press the [UP] or [DOWN] switch until the display changes to the "Defrost interval timer setting mode". (Right figure)**



3 **Press the [SET] switch.**

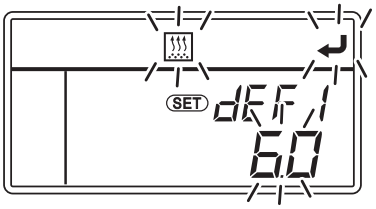
⇒ Time starts to blink on the lower digital display.
Icons and starts to blink.



4 **Press the [UP] or [Down] switch to select the setting time.**

NOTE

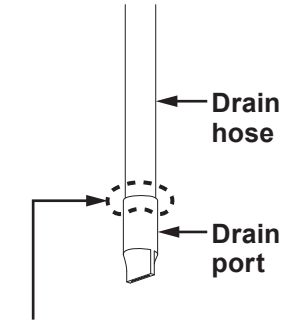
- The defrost interval time can be selected from 12 steps ranging from 0.5H (0.5 hour) at the minimum to 6H (6 hours) at the maximum.



5 **Press the [SET] switch.**

⇒ Setting is completed, and the display returns to the "Defrost interval timer setting mode".

2



Alarm contents

Icing of drain hose.

Troubleshooting procedure	Corrective action

1 shows the refer point for next page.

1 Perform manual defrost by pushing defrost switch on cabin controller. Then is icing of drain hose resolved?

YES → • Perform manual defrost periodically. • Change defrost interval timer ☞ page 150.

NO

Is there an abnormal that defrost operation stops in a short period of time?

YES → **[Item]** Defrost operation stops in a short period of time. ☞ page 145.

NO

Is drain hose clogged?

YES → Clean drain hose

NO

2 Is optional drain hose heater installed?

NO → Install drain hose heater

YES

3 Fuse “F61” has blown or E104 displayed?

YES → **[E104]** ☞ page 123.

NO

4 Is battery voltage detected on wiring TR (Brown Red) of drain hose heater connector during defrost?

NO → **5** Is battery voltage detected on T∗ terminal on relay PCB?

NO → Replace relay PCB

Unit Model	T∗ terminal
TDJS35, 50	T11
TDJS70	T15

YES → Repair wiring between drain hose heater connector and relay PCB

YES

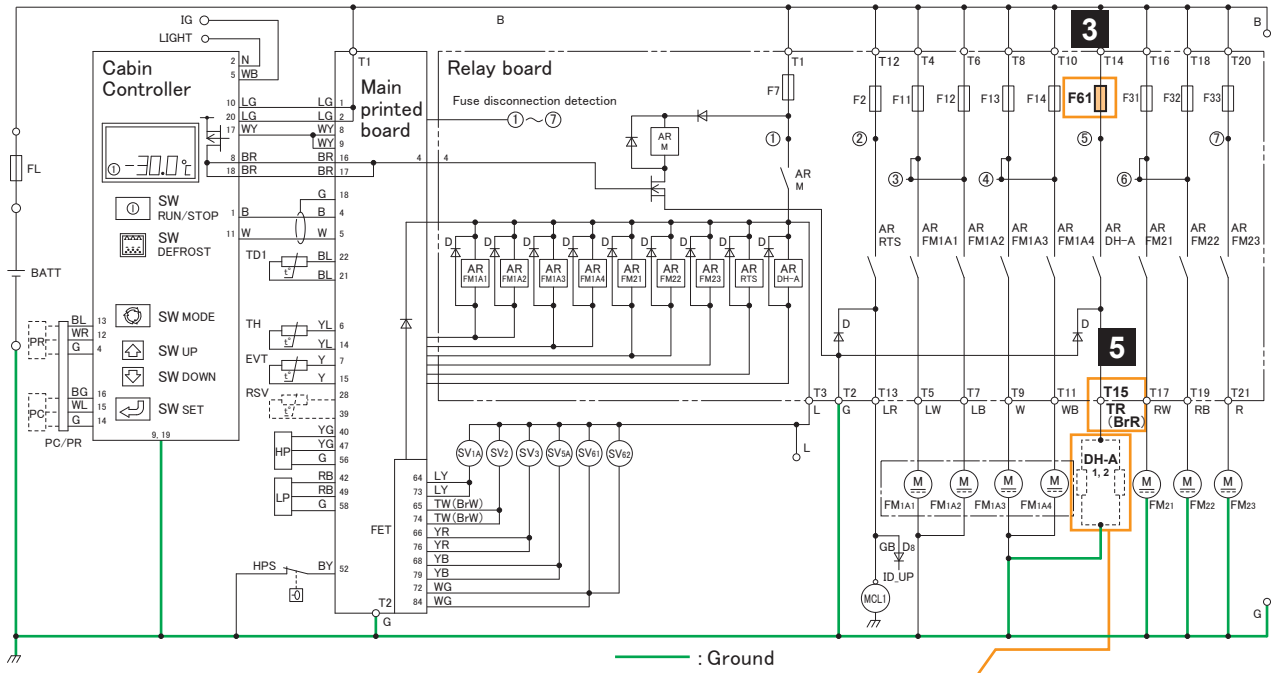
6 Is wiring G (Green) for drain hose heater grounded?

NO → Repair wiring G

YES → Replace drain hose heater

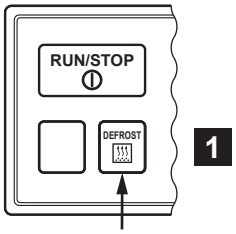
Ladder diagram (TDJS70)

∗ The following ladder diagrams are different with each model.
Please confirm it by a ladder diagram in accord with a model.



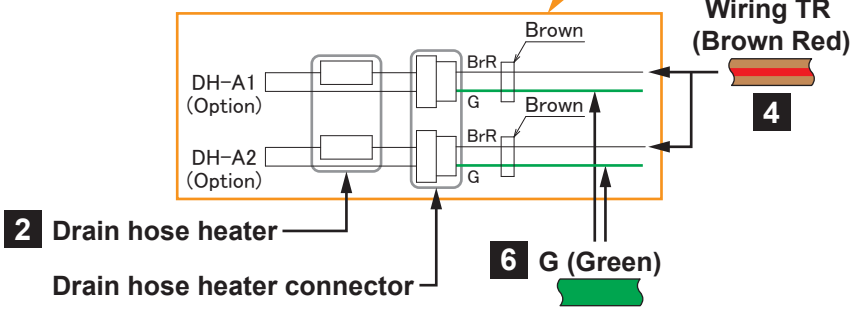
Manual defrost operation

Cabin controller



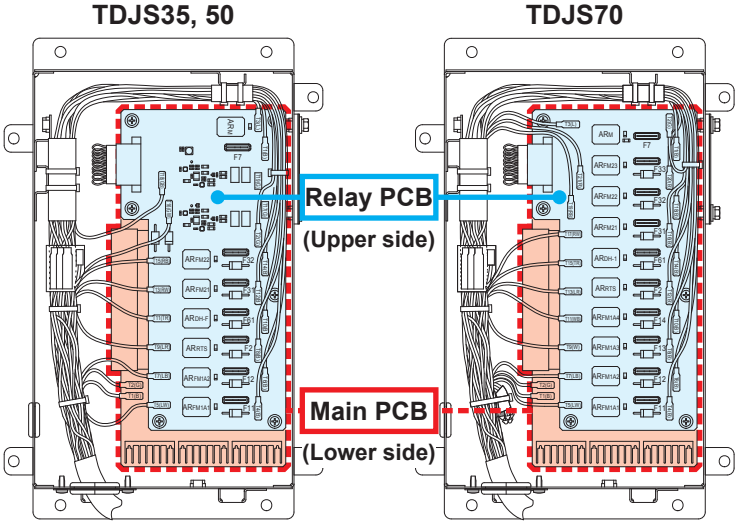
1

Press the **[DEFROST]** switch.

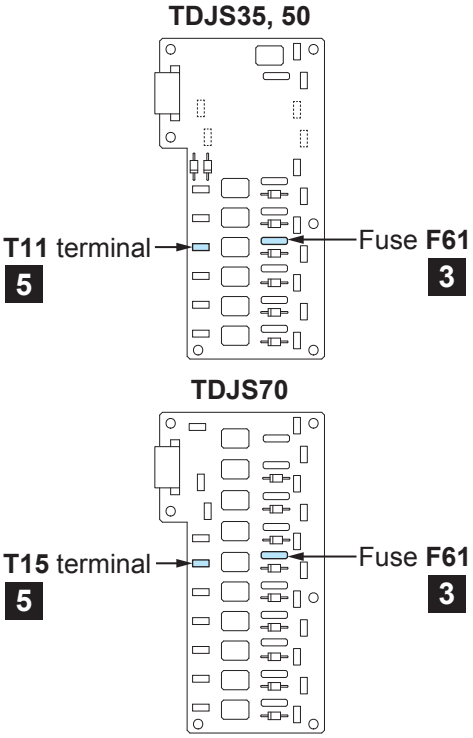


Control box (TDJS series)

PCB is arranged in 2 layer structure in the control box, relay PCB is upper and main PCB is lower side.



Arrangement of fuse and terminal on Relay PCB



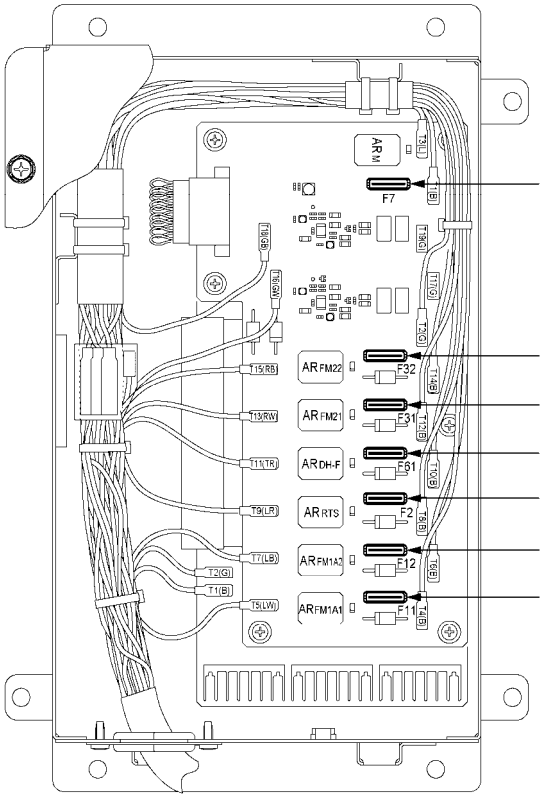
Refer page for detail information

- Ladder diagram & Wire color codes ☞ page 42.
- Wiring layout drawing ☞ page 43.

12.3 Location of fuse

Fuses are located on the relay board in the control box.

■ TDJS35DAE, TDJS50DAE



F7 : 10A (Load power)

F32 : 15A (Condenser fan motor)

F31 : 15A (Condenser fan motor)

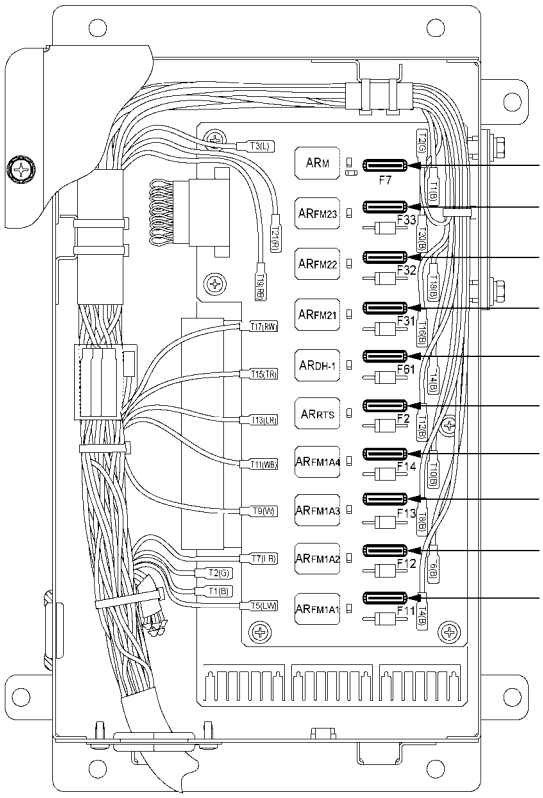
F61 : 15A (Drain hose heater)

F2 : 10A (Magnet clutch)

F12 : 15A (Evaporator fan motor)

F11 : 15A (Evaporator fan motor)

■ TDJS70DZAE



F7 : 10A (Load power)

F33 : 15A (Condenser fan motor)

F32 : 15A (Condenser fan motor)

F31 : 15A (Condenser fan motor)

F61 : 15A (Drain hose heater)

F2 : 10A (Magnet clutch)

F14 : 15A (Evaporator fan motor)

F13 : 15A (Evaporator fan motor)

F12 : 15A (Evaporator fan motor)

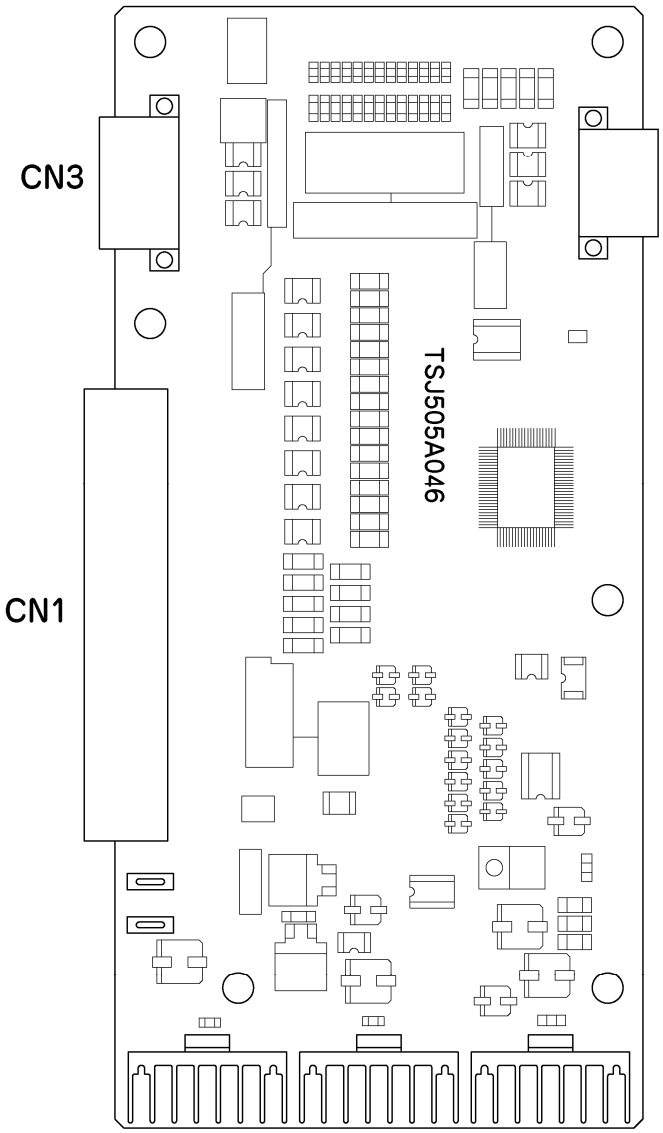
F11 : 15A (Evaporator fan motor)

12.4 Inspection of controller printed circuit board

(1) Cautionary points for handling the printed circuit board

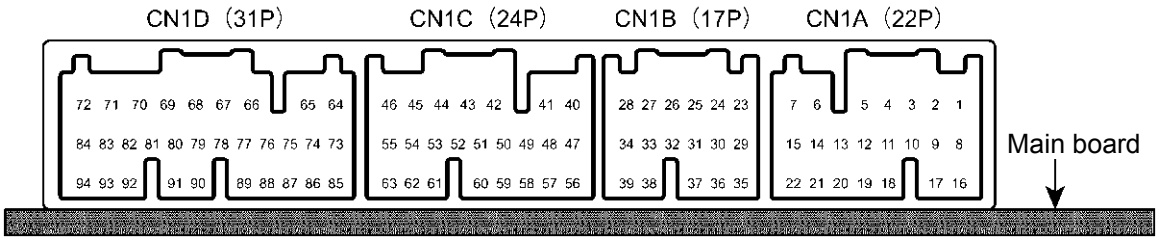
1) When taking the board, prevent touching any pattern or part with hand.
   To take the board, pinch it at both sides with hand.
2) Prevent touching the board with hand which oil or similar sticks to.
3) Prevent applying any load to the parts on the board with hand or similar.
4) Be sure to prevent any shock which is caused by drop or similar.
5) Prevent water from splashing on the board due to rain or similar.
6) Prevent handling any area where static electricity generates (dry area, room laid with carpet or similar and so on).
7) To temporarily put the board, store it wrapping with the aluminum foil and or conductive bag, etc.

(2) Main board layout

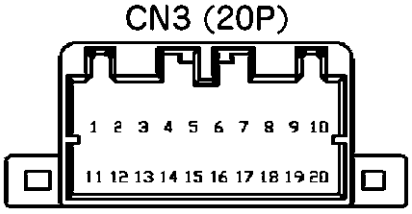


* In case of 2 temperature, multi-temperature and 2 systems in 1 compartment.

(3) Main board connector terminal numbers

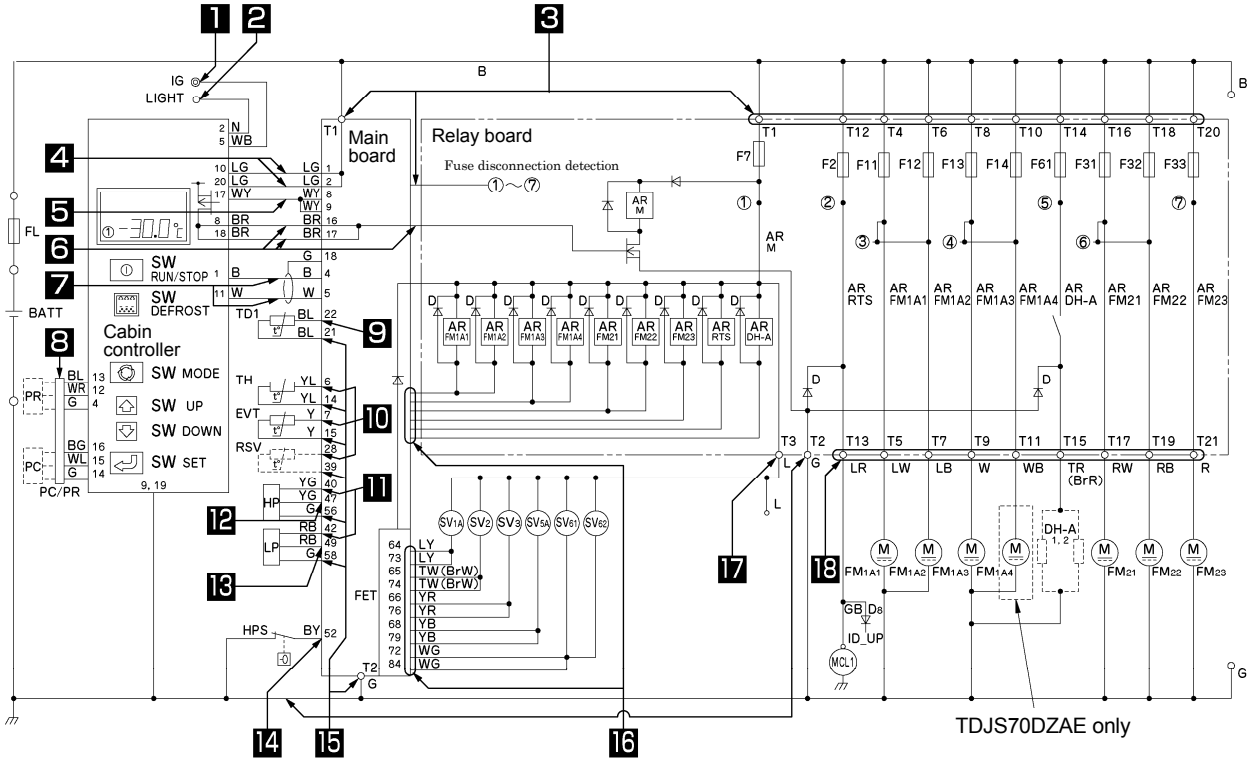


Name			Code	PIN number	Housing location
Power	1	Cabin controller power (12V)		1, 2	CN1A 22P (PIN1-22)
	2	Main power ON	MAIN-ON	8, 9	
	3	Load power relay ON	RELAY-ON	16, 17	
Communi-cation	1	Cabin controller communication	RS485-A	5	
			RS485-B	4	
			RS485-SHIELD	18	
	2	RS232C Reserve	RS232C-TXD	11	
			RS232C-RXD	12	
			RS232C-GND	19	
Temperature sensor input	1	Inside container temperature	TH-A	6	
			GND	14	
	2	Discharge temperature (Engine)	TD1	22	
			GND	21	
	3	Evaporator outlet temperature	EVT-A	7	
			GND	15	
	4			23	CN1B 17P (PIN23-39)
			GND	35	
	5	Discharge temperature (Motor) (Not applicable)	TD2	24	
			GND	36	
	6			25	
			GND	37	
	7			26	
			GND	32	
	8			27	
			GND	38	
	9	Option	RSV	28	
			GND	39	
Pressure sensor input	1	High pressure sensor	VCC	40	CN1C 24P (PIN40-63)
			HP	47	
			GND	56	
	2	Low pressure sensor	VCC	42	
			LP	49	
			GND	58	
	3			50	
				59	
			GND	60	
	4			41	
				48	
			GND	57	
Digital input	1	High pressure switch	HPS	52	
	2			44	
	3	Limit switch	LS	45	
	4			46	
	5			55	
External output	1	Hot water pump (Not applicable)	WP	85	CN1D 31P (PIN64-94)
	2	Operation output	RUN	87	
	3	Abnormal output	ALM	86	
	4	Out of adequate temperature output	TSD	75	
Solenoid drive output	1	Hot gas solenoid (Front compartment)	SV1A	64, 73	
	2	Liquid bypass solenoid	SV2	65, 74	
	3	Condenser outlet solenoid	SV3	66, 76	
	4	Hot water solenoid (Front) (Not applicable)	SV4A	67, 78	
	5	Liquid line solenoid (Front compartment)	SV5A	68, 79	
	6			69, 80	
	7			70, 82	
	8	Economizer solenoid	SV61 (SV62)	72, 84	
	9			77, 89	
	10			93, 94	
	11			90, 91	



Name			Code	PIN number	Remarks
Fuse input	1	Evaporator fan motor fuse (Front compartment) ①	F11	20	
	2	Evaporator fan motor fuse (Front compartment) ②	F12	19	
	3	Operation thermostat (Magnet clutch) fuse	F2	18	
	4	Drain hose heater fuse	F61	17	
	5	Condenser fan motor fuse ①	F31	16	
	6	Condenser fan motor fuse ②	F32	15	
	7	Main relay fuse	F7	14	
Relay drive output	1	Evaporator fan motor relay (Front compartment) ①	AR FM1A1	10	
	2	Evaporator fan motor relay (Front compartment) ②	AR FM1A2	9	
	3	Operation thermostat relay (Magnet clutch)	AR RTS	8	
	4	Drain hose heater (Front compartment)	AR DH-A	7	
	5	Condenser fan motor relay ①	AR FM21	6	
	6	Condenser fan motor relay ②	AR FM22	5	
	7	Main relay	AR M	4	
Lock detection	1	Condenser fan motor lock detection ①	FM21L	3	
	2	Condenser fan motor lock detection ②	FM22L	13	
	3	Lock detection circuit power (12V)	VIN2	2	
	4	Lock detection circuit GND	GND	12	
		Load power (For surge absorption diode common terminal connection)	VPW1	1 11	

(4) Controller inspection procedure



1 IG OFF: 0V
IG ON: Battery voltage

2 LIGHT OFF: 0V
LIGHT ON: Battery voltage

3 Disconnection of power supply line or short circuit of each terminal: 0V
Normal: Battery voltage

4 Normal: 10 ~ 16V
Abnormal: Other than above

5 Main board ON;
Normal: 0V
Abnormal: Other than above

6 During operation;
Normal: 10 ~ 16V
Abnormal: Other than above

7 Communication line of cabin controller and main board
E099 is shown if abnormal.

8 Communication interface with external equipment
If abnormal, external equipment will not operate correctly.

9 Normal: About 4V (at 90°C) ＊1

10 Normal: About 2V (at 15°C) ＊2

11 Pressure sensor power;
Normal: 5 ± 0.25V
Abnormal: Other than above

12 Normal: About 1.5V (at 1.5MPa) ＊3

13 Normal: About 1V (at 0.2MPa) ＊4

14 High pressure normal: 0V
High pressure abnormal: Battery voltage

15 Always: 0V

16 Each apparatus ON: 0V
Each apparatus OFF: Battery voltage
However, always 0V if unit is OFF.

17 Unit ON: Battery voltage
Unit OFF: 0V

18 Each apparatus ON: Battery voltage
Each apparatus OFF: 0V

＊1: For other voltage than 4V, refer to conversion table for TD (discharge gas temperature sensor) on next page.

＊2: For other voltage than 2V, refer to conversion table for TH (inside container temperature sensor) and EVT (evaporator outlet temperature sensor) on next page.

＊3: Refer to conversion table for HP (high pressure sensor) on next page.

＊4: Refer to conversion table for LP (low pressure sensor) on next page.

- When measuring voltage, measure it between ground and terminal to be measured.
- Although commercially available tester is applicable for check, use the tester whose testing rod is cut to sharp. (Approximately 1mm diameter)

(5) Standard value of resistance and voltage for TH (inside container temperature sensor) and EVT (evaporator outlet temperature sensor)

Temperature (°C)	Resistance (kΩ)	Voltage (V)	Temperature (°C)	Resistance (kΩ)	Voltage (V)
−30	26.316	4.187	20	2.573	1.759
−25	20.155	4.004	25	2.113	1.543
−20	15.572	3.795	30	1.746	1.349
−15	12.131	3.564	35	1.451	1.175
−10	9.524	3.313	40	1.213	1.022
−5	7.533	3.050	45	1.019	0.888
0	6.000	2.779	50	0.860	0.772
5	4.811	2.509			
10	3.882	2.246			
15	3.154	1.995			

(6) Standard value of resistance and voltage for TD (discharge gas temperature sensor)

Temperature (°C)	Resistance (kΩ)	Voltage (V)	Temperature (°C)	Resistance (kΩ)	Voltage (V)
0	263.1	4.952	110	3.881	3.295
10	161.2	4.929	120	2.916	2.962
20	101.4	4.894	130	2.220	2.628
30	65.34	4.842	140	1.707	2.300
40	43.09	4.769	150	1.327	1.993
50	29.01	4.669	160	1.041	1.710
60	19.91	4.535	170	0.824	1.458
70	13.92	4.364	180	0.658	1.237
80	9.892	4.152	190	0.530	1.047
90	7.139	3.900	200	0.430	0.884
100	5.228	3.611			

(7) Standard value of pressure and voltage for HP (high pressure sensor)

High pressure (MPa)	Output voltage (V)
0	0.5
2.08	2.0
4.15	3.5

(8) Standard value of pressure and voltage for LP (low pressure sensor)

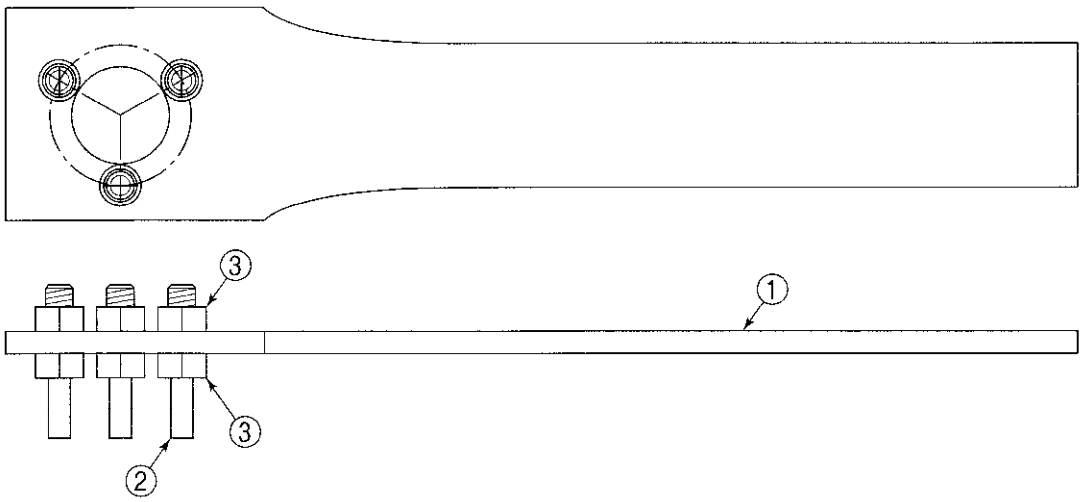
Low pressure (MPa)	Output voltage (V)
−0.1	0.2
0	0.5
0.5	2.0
1.0	3.5

13. Saturated Temperature Pressure Table

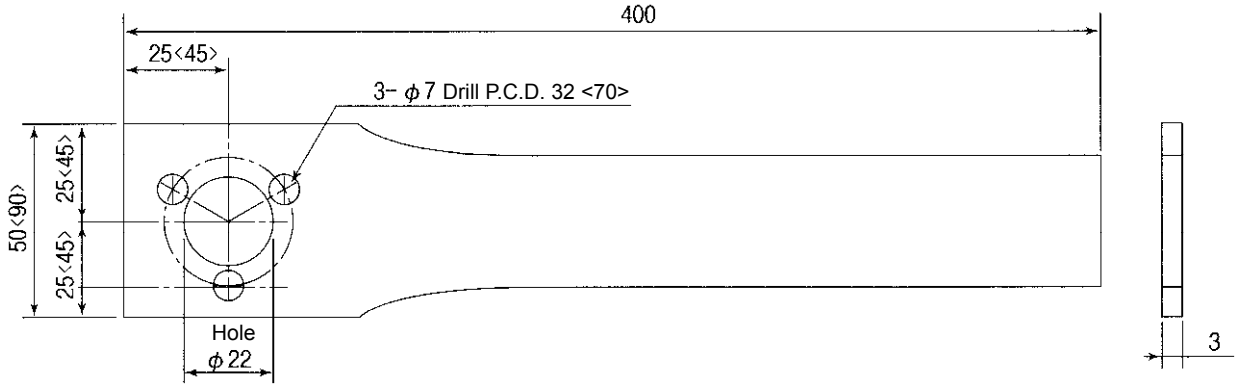
Temperature °C	Saturated pressure MPa (kgf/cm²)	Temperature °C	Saturated pressure MPa (kgf/cm²)	Temperature °C	Saturated pressure MPa (kgf/cm²)	Temperature °C	Saturated pressure MPa (kgf/cm²)	Temperature °C	Saturated pressure MPa (kgf/cm²)
–50	–0.019 (144.0mmHg)	–26	0.137 (1.4)	–2	0.461 (4.7)	22	1.049 (10.7)	46	1.991 (20.3)
–48	–0.011 (79.5mmHg)	–24	0.157 (1.6)	0	0.500 (5.1)	24	1.108 (11.3)	48	2.089 (21.3)
–46	–0.001 (9.8mmHg)	–22	0.177 (1.8)	2	0.539 (5.5)	26	1.177 (12.0)	50	2.197 (22.4)
–44	0.010 (0.1)	–20	0.196 (2.0)	4	0.579 (5.9)	28	1.245 (12.7)	52	2.295 (23.4)
–42	0.020 (0.2)	–18	0.226 (2.3)	6	0.628 (6.4)	30	1.314 (13.4)	54	2.412 (24.6)
–40	0.029 (0.3)	–16	0.245 (2.5)	8	0.667 (6.8)	32	1.393 (14.2)	56	2.520 (25.7)
–38	0.039 (0.4)	–14	0.275 (2.8)	10	0.716 (7.3)	34	1.461 (14.9)	58	2.638 (26.9)
–36	0.059 (0.6)	–12	0.304 (3.1)	12	0.765 (7.8)	36	1.550 (15.8)	60	2.766 (28.2)
–34	0.069 (0.7)	–10	0.333 (3.4)	14	0.814 (8.3)	38	1.628 (16.6)		
–32	0.088 (0.9)	–8	0.363 (3.7)	16	0.872 (8.9)	40	1.716 (17.5)		
–30	0.098 (1.0)	–6	0.392 (4.0)	18	0.923 (9.4)	42	1.804 (18.4)		
–28	0.118 (1.2)	–4	0.432 (4.4)	20	0.981 (10.0)	44	1.893 (19.3)		

14. Special Tool for Magnet Clutch

Armature plate fixing tool

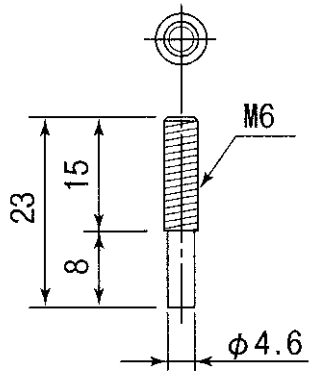


① Plate (Material: S45C)

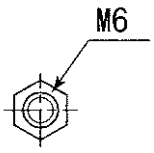


Note: < > shows dimensions for CS150 compressor.

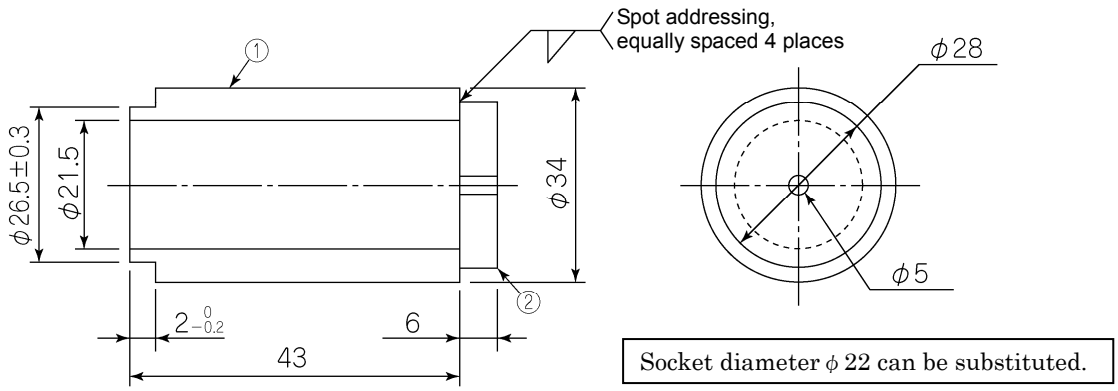
② Pin (3 pcs.) (Material: S45C)



③ JIS B 1181 Hexagonal nut M6 (6 pcs.) (Material: S45C)



Magnet clutch remover (Material ① ②: S45C)

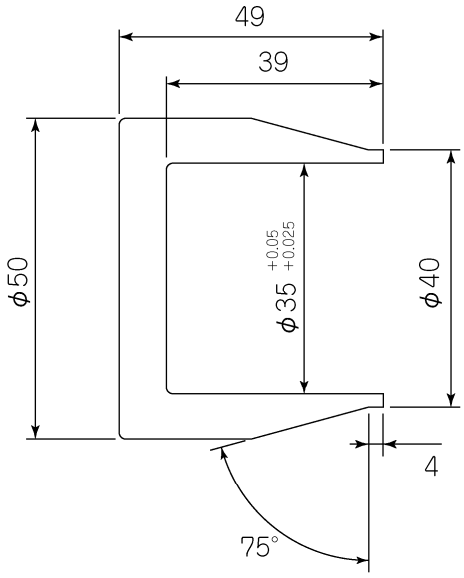


Socket diameter φ 22 can be substituted.

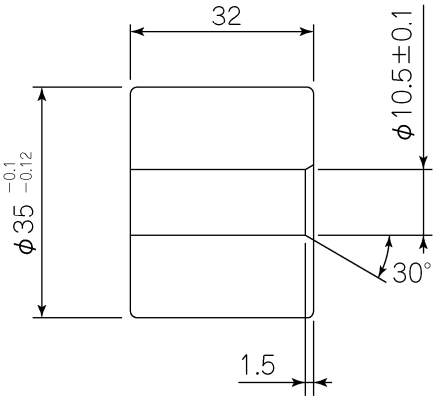
Magnet clutch rotor installer (For nose diameter φ 35) (Material ① ②: S45C)

For CS55, CS90

① Pusher



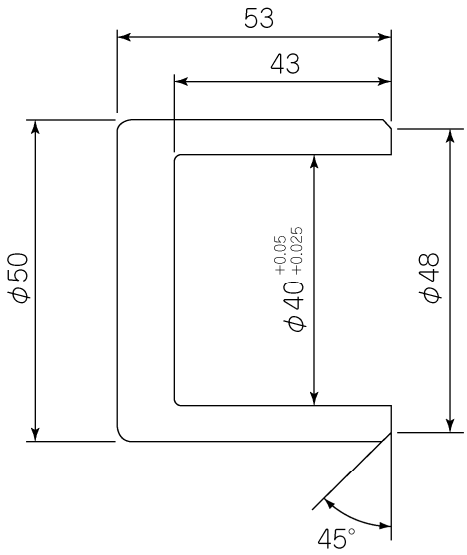
② Guide



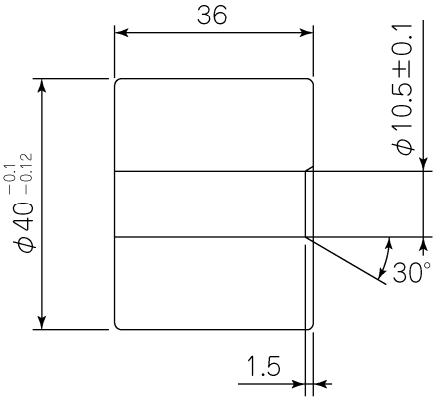
Magnet clutch rotor installer (For nose diameter φ 40) (Material ① ②: S45C)

For CS150

① Pusher



② Guide



15. Abbreviations and Codes

3D	Three dimensional	**M**	Motor
AC	Alternating current	**MCL**	Compressor magnet clutch
ALM	Abnormal output control signal	**MHI**	Mitsubishi Heavy Industries, Ltd.
AR DH-A	Drain hose heater relay	**N**	Gray (Wire color code)
AR FM1A	Evaporator fan motor relay	**O**	Orange (Wire color code)
AR FM2	Condenser fan motor relay	**OCR**	Over current relay (Not applicable)
AR M	Load power relay	**P**	Pink (Wire color code)
AR RTS	Thermostat relay	**PC**	Connector (personal computer)
AT	Ambient air temperature	**PCD**	Pitch circle diameter
B	Black (Wire color code)	**PR**	Connector (printer)
BATT	Battery	**R**	Red (Wire color code)
Br	Brown (Wire color code)	**RSV**	Auxiliary temperature sensor
CE	The Council of the European Union	**RT**	Return air temperature
CN	Connector	**RTS**	Thermostat relay control signal
D	Orange (Wire color code)	**RUN**	Operation/stop signal
D8	Diode	**SDS**	Safety data sheet
DC	Direct current	**SV1A**	Hot gas solenoid valve
DH-A	Drain hose heater	**SV2**	Liquid bypass solenoid valve
E	Ground	**SV3**	Condenser outlet solenoid valve
EVT	Evaporator outlet temperature sensor	**SV4A**	Water pump solenoid (Not applicable)
F1	Evaporator fan motor relay fuse	**SV5A**	Liquid line solenoid valve
F2	Magnet clutch fuse	**SV6**	Economizer solenoid valve
F3	Condenser fan motor relay fuse	**SV61**	Economizer inlet solenoid valve
F61	Drain hose heater relay fuse	**SV62**	Economizer outlet solenoid valve
F7	Load power relay fuse	**SW DEFROST**	Switch (defrost)
FET	Field effect transistor	**SW DOWN**	Switch (down)
FL	Fusible link	**SW MODE**	Switch (mode)
FM1A	Evaporator fan motor	**SW RUN/STOP**	Operation switch
FM2	Condenser fan motor	**SW SET**	Switch (set)
G	Ground, Green (Wire color code)	**SW UP**	Switch (up)
GND	Ground	**T**	Brown (Wire color code)
Gy	Gray (Wire color code)	**TD**	Discharge gas temperature sensor
H	Light green (Wire color code)	**TD1**	Td sensor (Engine side)
HP	High pressure, High pressure sensor	**TD2**	Td sensor (Motor side) (Not applicable)
HPS	High pressure switch	**TH**	Return air temperature sensor Inside containe temperature sensor
ID_UP	Idle up output	**Th**	Inside container temperature
I/F	Terminal (operation management)	**Ts**	Setting temperature
IG	Terminal (ignition)	**TSD**	Out of adequate temperature control signal
L	Blue (Wire color code)	**V**	Violet (Wire color code)
LCD	Liquid crystal display	**W**	White (Wire color code)
Lg	Light green (Wire color code)	**WP**	Cooling water pump (Not applicable)
LIGHT	Terminal (night illumination)	**Y**	Yellow (Wire color code)
LP	Low pressure, Low pressure sensor		

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