

# OPERATION MANUAL

## MITSUBISHI TRANSPORT REFRIGERATION UNIT

### TFV2000E-E TFV2000EM-E

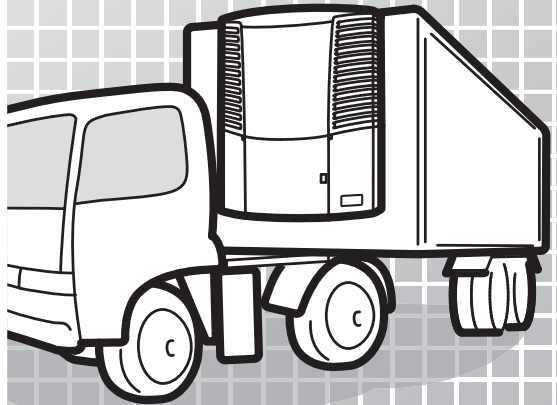
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### PEGASUS

This operation manual is intended to provide users with a good knowledge to use Mitsubishi Refrigeration Unit safely.

Operate or service the refrigeration unit only after you have read this manual and understand its contents.

Carefully store this manual in a fixed place so that it is immediately available for your reference when you need it.



**Thank you for your purchase of Mitsubishi Transport Refrigeration Unit.**

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## **Purpose of use and application**

This Refrigeration Unit is intended to carry the cargo (with the exception of volatile, inflammable, hazardous and corrosive matters) on a transportation vehicle, keeping the inside container temperature at a certain degree.

If the Refrigeration Unit is used for any purposes other than this purpose, it may cause accidents or damages.

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## **Important information**

For questions or information, contact your nearest dealer.

- Be sure to follow the contents described in this manual in order to protect yourself and other people from potential risks of this refrigeration unit and to prevent it from getting damaged.
- We are not able to foresee all potential risks of this refrigeration unit or dangers due to mishandling by the customers. Therefore, it is necessary to take measures for safety in addition to the items described in this manual or on warning labels.
- For the following works, contact your nearest dealer. If those works were carried out by customer, the refrigeration unit may lose its performance and we may not be able to ensure the safety of the customer.
  - (a) Installation, modification, specification change and disposal for the refrigeration unit
  - (b) Maintenance of electric appliances
  - (c) Abnormal treatments which are not described in this manual
- This product contains fluorinated greenhouse gases.
  - Refrigerant : R452A (GWP (Global Warming Potential)=2141)  
Refer to a label on unit about weight of fluorinated greenhouse gases and CO<sub>2</sub> equivalent. (☞ Refer to pages 4.)
  - Form blown with fluorinated greenhouse gases : R134a.  
(GWP (Global Warming Potential)=1430)

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## Operation manual

- This operation manual is prepared for people who speaks 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 customer. Furthermore, the warning labels described in their native language must be prepared and stuck on the proper places.
- This operation 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 for the purposes other than above-mentioned and reduced to any electronic medium or machine-readable form without prior written consent with our company.
- This manual also contains the explanation of optional specification.
- The contents of this operation manual may differ from that of the refrigeration unit used by a customer due to specification change.
- The contents described in this operation manual may be changed without a prior notice.
- When transferring or lending the refrigeration unit, attach this operation manual together with the unit so that the operators should be able to have a good knowledge on safety.
- Keep this operation manual in the vehicle so that it is available for your reference when you need it.
- Unless otherwise noted, "right" and "left" directions are given as viewed from the front of the refrigeration unit.

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## For disposal

Contact your nearest dealer when disposing the refrigeration unit. Observe the applicable laws and regulations in your country to dispose refrigerants and cooling water.

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# 1 Function of Refrigeration Unit

This refrigeration unit has following functions.

## (1) Drive switching function

This is the function to switch the drive (engine/motor) depending on whether the commercial power supply is connected or not.

☞ Refer to page 40 for how to switch the drive.

Regarding the function to switch from the motor drive operation to the engine drive after a power failure, contact your nearest dealer.

## (2) Operation pattern selection function

This is the function to switch operation pattern (automatic start/stop operation/continuous operation).

☞ For the switching of operation pattern, refer to pages 41 and 42.

## (3) Defrosting operation function

This is the function to protect evaporator from frosting during cooling operation and to prevent refrigerating power from decreasing.

There are following 2 methods to start defrosting operation.

### 1) Automatic defrosting operation

Defrosting starts automatically by the timer setting.

☞ Refer to page 35 for defrosting timer setting.

### 2) Manual defrosting operation

Defrosting starts forcibly by pressing the switch of controller.

☞ Refer to page 51 for how to operate.

As the defrosting operation is completed, the refrigeration unit returns to the cooling operation.

Defrosting operation will not start when the evaporator temperature is high even during the cooling operation.

## (4) Whisper operation function

This is the function to lower the operation sound with fixing the engine at slow speed forcibly during engine driving.

☞ Refer to page 49 for how to operate.

**(5) Timer operation function**

This is the function to set starting time and stopping time of the operation.

☞ Refer to pages from 50 to 53 for how to set.

**(6) Self diagnosis operation function [PTI (Pre Trip Inspection) operation]**

This is the function to diagnose the refrigeration unit automatically if it has any trouble or not.

☞ Refer to pages 54 and 55 for how to operate.

**(7) Sleep operation function (Long-term stop protection)**

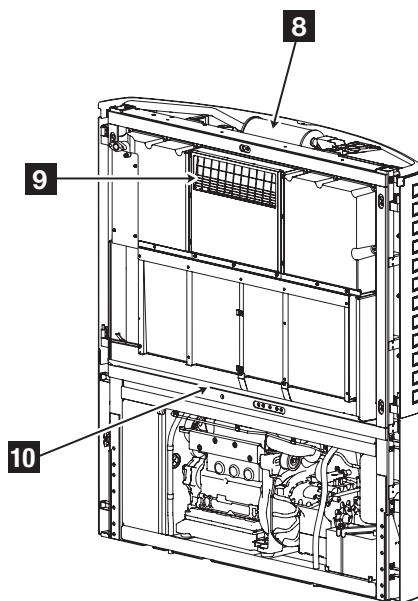
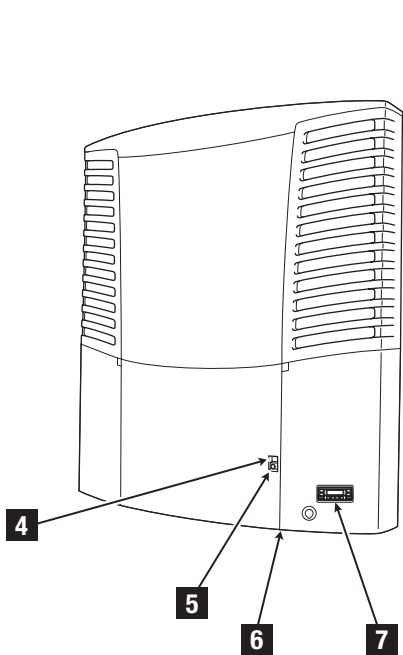
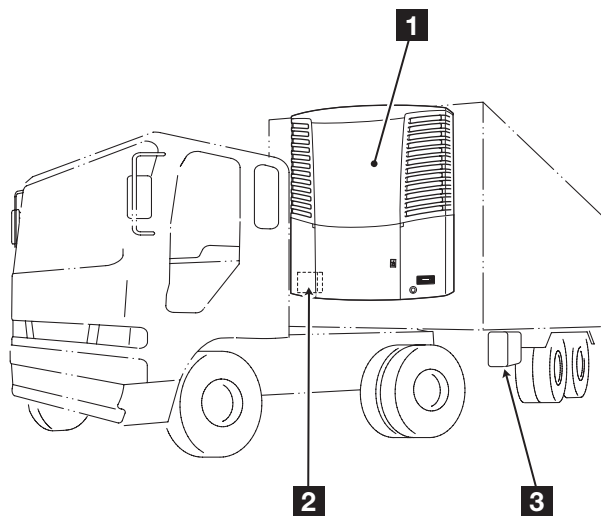
When the refrigeration unit is not used for 1 week, the unit starts and runs for 5 minutes automatically so that battery and compressor could be protected.

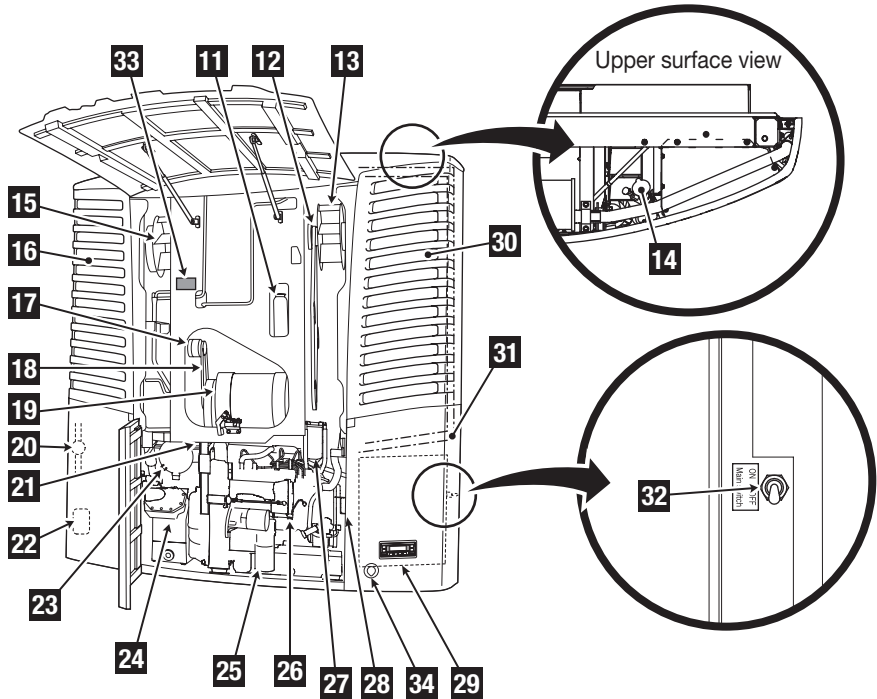
☞ Refer to page 30 for how to operate.

## 2 Name of each part

### Arrangement plan for main parts

■ Host unit

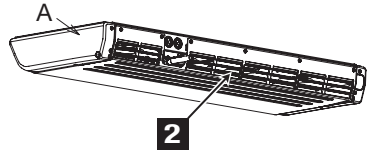
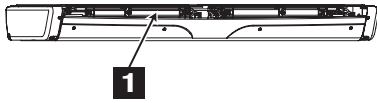




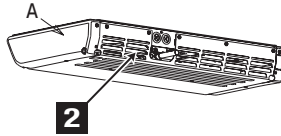
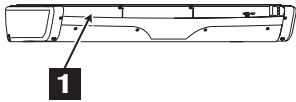
<b>1</b>	Refrigeration unit	<b>18</b>	Alternator belt (Ribbed belt – 6 ribs)
<b>2</b>	Battery	<b>19</b>	Standby motor
<b>3</b>	Fuel tank	<b>20</b>	Sight glass
<b>4</b>	Panel opening lever	<b>21</b>	Compressor belt (Ribbed belt – 10 ribs)
<b>5</b>	Panel lock key	<b>22</b>	Fuel filter (for water separation)
<b>6</b>	Receptacle for connection to commercial power (Bottom face)	<b>23</b>	Air cleaner
<b>7</b>	Control panel	<b>24</b>	Compressor
<b>8</b>	Muffler	<b>25</b>	Oil filter
<b>9</b>	Evaporator supply air outlet	<b>26</b>	Sub-engine
<b>10</b>	Drain pan	<b>27</b>	Fuel filter
<b>11</b>	Reservoir tank	<b>28</b>	Water pump belt (V belt)
<b>12</b>	Fan belt (Ribbed belt – 6 ribs)	<b>29</b>	Control box
<b>13</b>	Right condenser fan	<b>30</b>	Right condenser
<b>14</b>	Radiator cap	<b>31</b>	Exhaust pipe
<b>15</b>	Left condenser fan	<b>32</b>	Main switch
<b>16</b>	Left condenser	<b>33</b>	Label (F-Gas)
<b>17</b>	Alternator	<b>34</b>	Communication port USB

# Evaporator unit

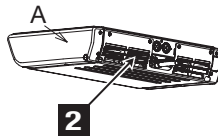
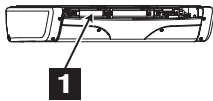
- Thin type (Large): TMEVX-L



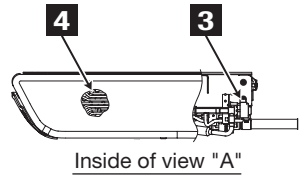
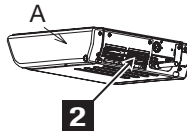
- Thin type (Middle-Wide): TMEVX-MW



- Thin type (Middle): TMEVX-M

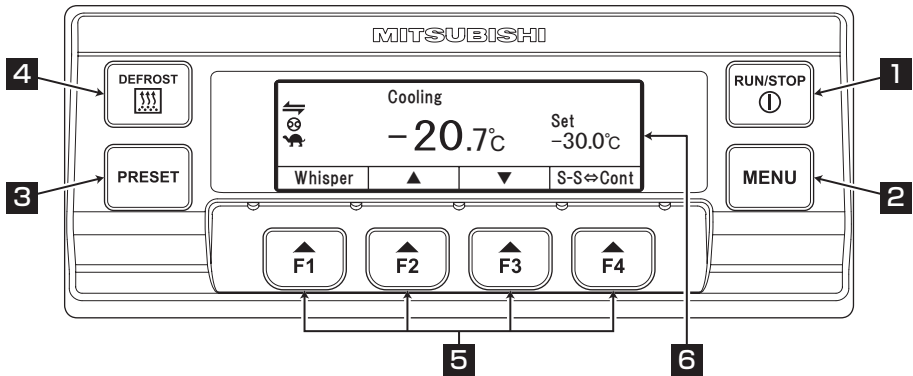


- Thin type (Small): TMEVX-S



<b>1</b>	Supply air outlet for evaporator	<b>3</b>	Electronic expansion valve
<b>2</b>	Evaporator fan motor	<b>4</b>	Evaporator coil

# Controller



## ■ 2-compartment model

	A	Cooling	B	Heating
	Set	-30.0°C		20.0°C
	Ret	-20.7°C		10.6°C
Whisper	A setting	B setting	S-S⇌Cont	

6

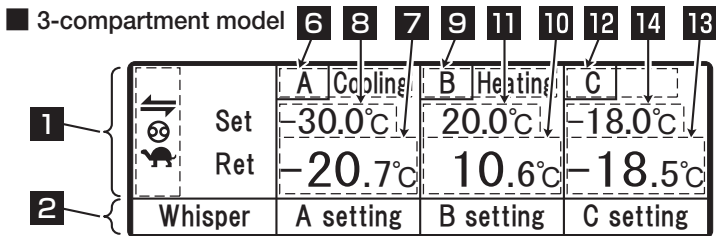
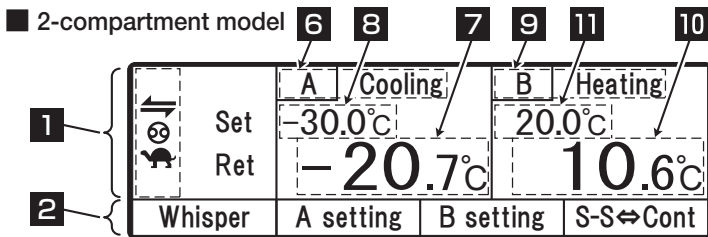
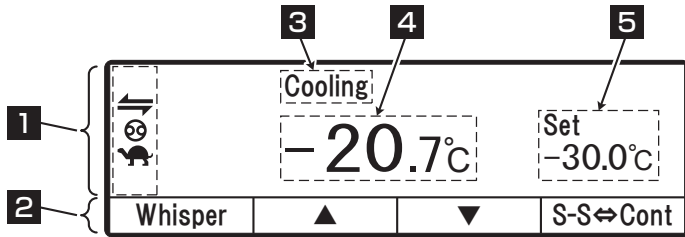
## ■ 3-compartment model

	A	Cooling	B	Heating	C
	Set	-30.0°C		20.0°C	-18.0°C
	Ret	-20.7°C		10.6°C	-18.5°C
Whisper	A setting	B setting	C setting		

6

<b>1</b>	RUN/STOP switch	Starts and stops the refrigeration unit.
<b>2</b>	MENU switch	Selects the normal display screen or the menu display screen. Displays the screen while the refrigeration unit is stopped.
<b>3</b>	PRESET switch	Selects the normal display screen or the preset display screen.
<b>4</b>	DEFROST switch	Starts the manual defrost.
<b>5</b>	FUNCTION switches 1 - 4	Functions corresponding to respective setting screens are allocated.
<b>6</b>	LCD	Displays the inside compartment temperature, setting temperature, state of operation, etc.

## Digital display area



### Description of monitor display item

- 1** Monitor displays following items corresponding to respective setting states.  
The display items light or blink depending on the operation of respective functions.

- ..... Abnormal display.  
Lights or blinks when any error occurs.
- ..... Display for the state of external communication.  
Lights when the operation administration input, such as the remote monitor device, etc., is turned ON.
- ..... Displays for ON/OFF timer.  
Lights when the ON timer and the OFF timer are set simultaneously.
- ..... Displays the ON timer.  
Lights when the ON timer operation is set.
- ..... Displays for OFF timer.  
Lights when the OFF timer operation is set.
- ..... Display for automatic operation start/stop.  
Lights when the automatic operation start/stop is selected.
- ..... Display for commercial power supply.  
Lights when the unit is connected to the commercial power supply.
- ..... Display for Whisper operation.  
Lights when Whisper operation is selected.



**2** Displays the allocation of function switch corresponding to the screen.

**3** Displays the operation modes.

<Display contents> Cooling, Heating, Defrost, Sleep, Stop and Fan.

\* There is no display when Thermostat is OFF with evaporator fan motor OFF.

Fan is displayed when Thermostat is OFF with evaporator fan motor ON.

If temperature is out of adequate range, the Cooling or Heating display blinks.

**4** Displays the inside compartment temperature.

**5** Displays the setting temperature.

#### In case of 2- (3-) compartment model

**6** Displays "A" (compartment) and the operation mode of compartment A.

**7** Displays the inside compartment temperature at compartment A.

**8** Displays the setting temperature at compartment A.

**9** Displays "B" (compartment) and the operation mode of compartment B.

**10** Displays the inside compartment temperature at compartment B.

**11** Displays the setting temperature at compartment B.

**12** Displays "C" (compartment) and the operation mode of compartment C. (3-compartment)

**13** Displays the inside compartment temperature at compartment C. (3-compartment)

**14** Displays the setting temperature at compartment C. (3-compartment)

## Protective devices

This refrigeration unit is provided with the following protective devices to ensure the safety of the operators.

(a) Main switch

If the engine or motor starts during the work such as inspection, it may cause an accident. In such a case, set this switch to "OFF" so that the safety is secured.

(b) Buzzer before start

Buzzer sounds 5 seconds before the start of engine or motor to announce the start of operation to people working nearby.

(c) Panel

The panel prevents operators from contacting with the rotating part during operation.

(d) Panel 1 opening detection switch

When the panel 1 is opened for inspection or another, this switch detects it and stops the start of engine or motor.

(☞ Refer to page 61.)

(e) Panel lock key

Key is provided on panel 1 to prevent un-intentional start of the unit or setting change.

(☞ Refer to page 61.)

People who handle this refrigeration unit are requested to understand the functions of these protective devices completely to use it safely. Do not deactivate these protective devices or do not operate the refrigeration unit in the situation that the devices are inactivated. It is most important for safety ensuring to keep functions of the protective devices in normal status continuously.




# 3 Precaution for safety

In this section, necessary safety precautions are provided to prevent accidents resulting in injuries or death, property damages and environment pollution. Read and understand contents of the cautions before starting to use this Refrigeration Unit.






## Signs on safety

Signs and Symbols on safety in this operation manual and the warning labels call the attention of the people who handle this refrigeration unit.

### Signs on safety


Sings	Description
 <b>DANGER</b>	Indicates high and imminent potentially dangerous situation, which if mis-handle, will result in death, injury, or serious accident such as damage of the refrigeration unit.
 <b>WARNING</b>	Indicates dangerous situation, which if mis-handled, will result in death, serious injury, and serious accident such as damage of the refrigeration unit.
 <b>CAUTION</b>	Indicates potentially dangerous situation, which if mis-handled, will result in minor injury or moderate property damage.

### Symbols

Symbols	Description	Symbols	Description
	Never perform.		Always observe the instructions.
	Disconnect power supply plug from socket.		Never touch.
	Repairs and disassembly must be done only by qualified personnel		

### Other symbol

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

Kind	Description
 NOTE	Useful information for function or performance of equipment

## Precautions

### General precautions

#### **DANGER**



**Please maintain a safe distance from the vehicle in case a fire occurs from the refrigeration unit. Always use a fire extinguisher for electric fire when doing fire fighting. Do not use water or improper fire extinguishers, it may result in serious injury or electric shock.**

**Do not touch the refrigeration unit or vehicle, in case of accident/damage to unit. Please contact the nearest dealer and inform the details.**



**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.)**

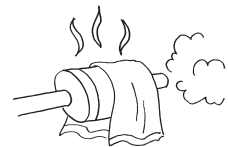
- Cracking occurs in design panel, which cause a risk of falling down of panel while the vehicle is running.

#### **WARNING**



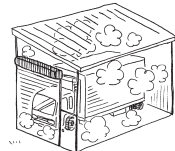
**Do not place combustible materials in the vicinity of muffler and exhaust pipe. Do not park on the area where combustibles such as falling leaves accumulate on.**

- Otherwise, it may cause a fire because muffler and exhaust pipe will be hot.



**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.

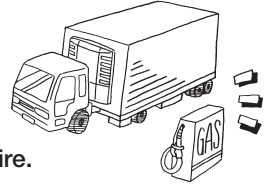


## ! WARNING



**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.



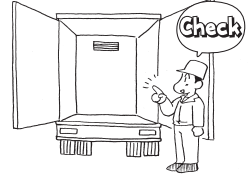
**Contact your nearest dealer when injecting or recovering the refrigerant or refrigeration machine oil.**

- It may cause a serious accident if a customer performs injection or recovery by himself/herself.



**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.



**Be sure to carry out the periodic inspections.**

- Otherwise, it may cause troubles of the refrigeration unit or accidents.



## ! CAUTION



**Do not insert sticks or fingers into cold air outlet or inlet.**

- Otherwise, it may cause damage of the equipment or injury due to a fan.



**Do not climb up, hang down or put your leg onto the refrigeration unit.**

- Otherwise, it may cause damage of the equipment or injury.



**Use the refrigeration unit as the equipment for transport refrigeration.**

- Otherwise, it may deteriorate quality of the cargo if it is used for any other purpose.

## During and after the operation

### WARNING



**Make sure that all the panels of the unit are closed before starting operation.**

- Otherwise, it may cause accidents.



### CAUTION



**Do not touch the muffler, exhaust pipe and refrigerant pipe during operation or immediately after the operation.**

- Otherwise it may cause burns, as the muffler, exhaust pipe and refrigerant pipe will get hot.

**Do not open the radiator cap during operation or immediately after the operation.**

- High temperature steam may blowout and cause burns.

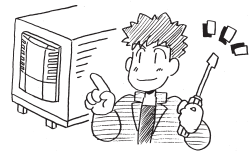
## Inspection/Cleaning/Repair

### WARNING



**Do not disassemble and repair by yourself.**

- Otherwise, it may cause damages or an electric shock.



### CAUTION



**When refrigerant and compressor oil leak out or when you handle antifreeze coolant or engine oil, 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.

## ⚠ CAUTION



**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.



**When inspecting or cleaning the refrigeration unit, stop the unit by turning the "Main switch" to "OFF" and disconnect the battery terminals and power supply cord plug.**

- Otherwise, it may cause injury or an electric shock due to unexpected start.



**When inspecting or cleaning the refrigeration unit, apply the parking brake and put chocks under wheels.**

- Otherwise, the vehicle may start to move, causing injury or accident.

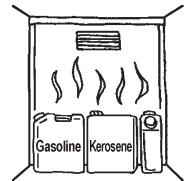
## Loading

## ⚠ WARNING



**Do not load the volatile or inflammable cargos in the container.**

- Otherwise, it may cause an explosion or a fire.



## ⚠ CAUTION



**Cool down or heat up the cargos to the designated temperature in advance with other refrigerating device.**

- If the cargos are not kept in the designated temperature, it may deteriorate quality of the cargos due to inside container temperature rise.

**Waterproof the cargos if they need to be.**

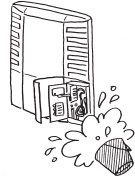
- Water may drip or splash from the evaporator unit.

## Handling of electric equipment and power codes

### **WARNING**



- 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.



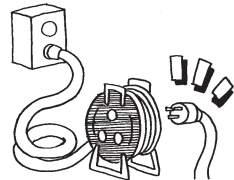
- Do not modify the power code or apply force on it, by bending it by force, pulling it strongly or twisting it, or do not put cargos on it.



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



- Use 4-core cabtyre cables (conductor cross section with 8mm<sup>2</sup> or more) for power cable. Do not connect it to extension code.  
(☞ Refer to page 40.)



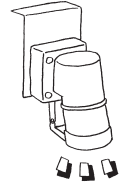
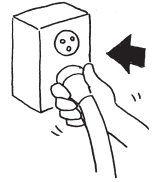
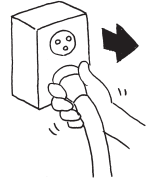
- Use MENNEKES Part no.6 (400V 32A) for power supply plug.
- Otherwise, it may cause an electric shock or a fire due to the heat, breaking of wire and leaking of water, etc.



## ! WARNING



- 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.



## ! CAUTION



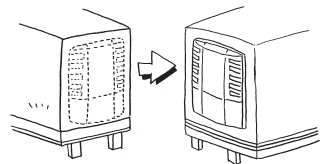
- Do not start and stop the operation with pulling out or inserting the power supply breaker or power code.**
- Otherwise, it may cause troubles of electric circuit, damages of power supply code or an electric shock.

### Reinstallation of refrigeration unit

## ! WARNING



- User should not attempt to move the refrigeration unit to another vehicle. When it is necessary, consult your nearest dealer.**
- The refrigeration unit may fall down and cause a serious accident due to improper installation or insufficient strength if the work is performed by the customer.



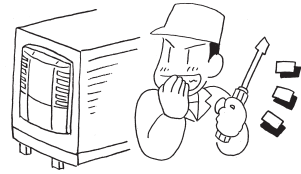
## Modification of refrigeration unit and specification change

### WARNING



**Do not modify the refrigeration unit or change the specification.**

- It may cause a serious accident if customer modifies the refrigeration unit or changes the specification by himself/herself.



**Do not use any refrigerant, compressor oil, engine fuel, engine oil and cooling water other than those specified. (Refer to page 72.)**

- Otherwise, it may cause explosion or fire.



**Be sure to use a device that emits radio waves (on-vehicle radio device, etc.) within its setting range.**

- When a device with an illegal output is used, this may cause the refrigerator to malfunction or an accident.

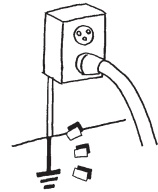
## Power supply equipment

### WARNING



**Be sure to ground the power supply equipment to supply the electricity to the refrigeration unit.**

- 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.**

- It may cause an electric shock or a fire if there is capacity shortage of electric circuit or inadequate wiring work.



## Emergency measure

### (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

- **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.

### 3 Precaution for safety

- **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.)

### (3) Antifreeze coolant

- **When antifreeze coolant 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 antifreeze coolant comes in contact with your skin**

Wipe the antifreeze coolant off his/her skins with a piece of paper or cloth. Wash the part well with lots of water and soap. If any visual changes or pain are observed, consult a physician as soon as possible.

- **When inhaling evaporated gas**

When someone inhaled the gas a lot, 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 breathes irregularly or feels sick, consult a physician immediately.

- **When swallowing antifreeze coolant**

Throw it up immediately and consult a physician as soon as possible. When inside the mouth is contaminated, wash it well with water.

### (4) Engine oil

- **When engine 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. Then, consult a physician as soon as possible.

- **When engine oil comes in contact with your skin**

Wash the part well with lots of water and soap.

- **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.

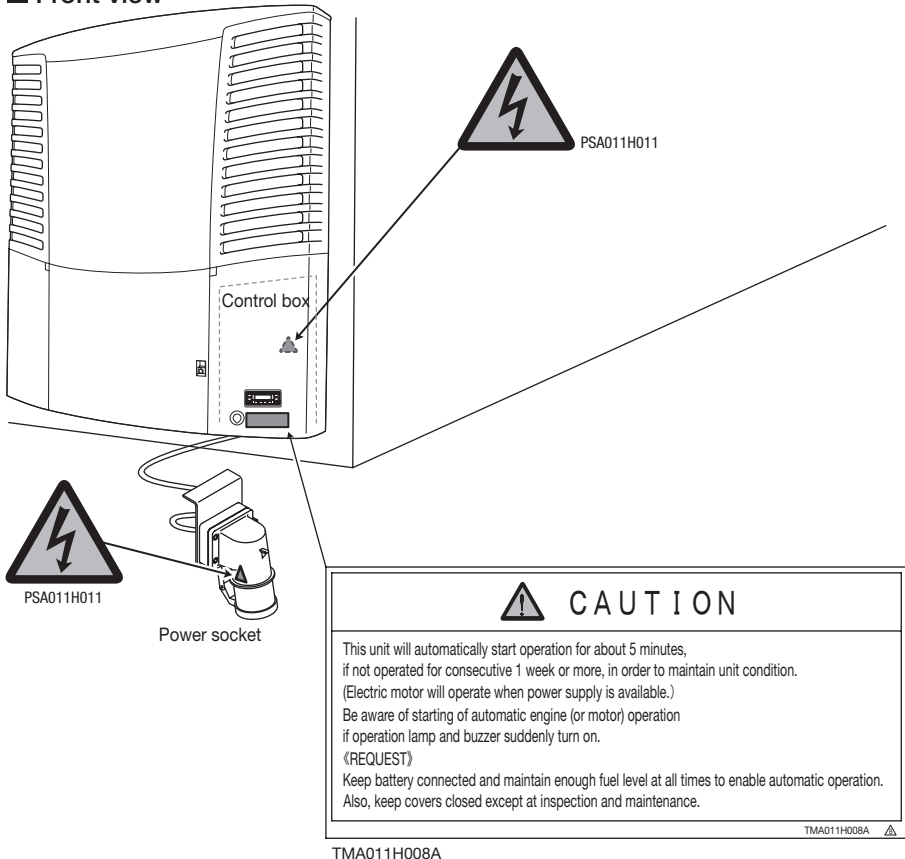
- **When swallowing engine oil**

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.

## Handling of warning labels

- 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 nearest dealer.
- 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.
- When the labels become illegible, purchase them from your nearest dealer and change them.

### ■ Front view

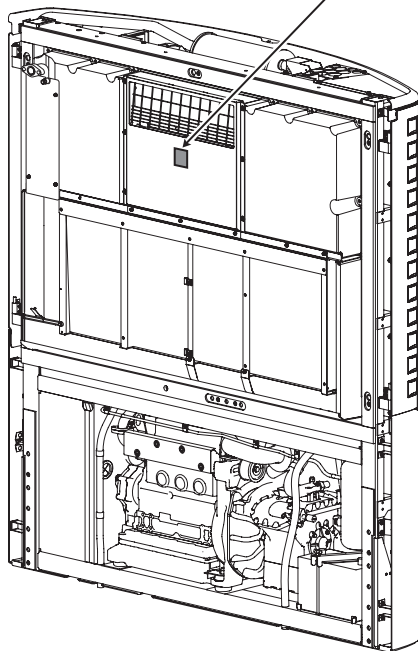


### 3 Precaution for safety

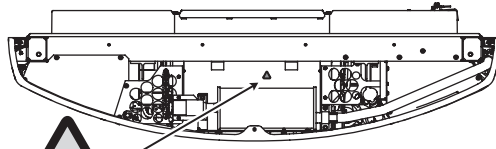
#### ■ Rear view



TSJ011H023

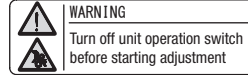


■ Top view



PSA011H011A

《Method of adjusting tension of Alternator Belt》

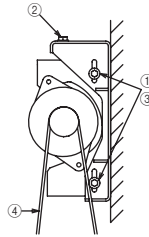


WARNING

Turn off unit operation switch before starting adjustment

《STEP》

- ① Loosen two bolts.
- ② Turn tension bolt clockwise to apply nominal tension on the belt.
- ③ Tighten two bolts.  
(Tightening torque: 24N·m)
- ④ Check tension of the belt.



<Nominal tension>  
In case of new belt :750~850N  
In case of re-tensioning :500~600N

■ Front view inside

TMA011H005C



CAUTION FAN

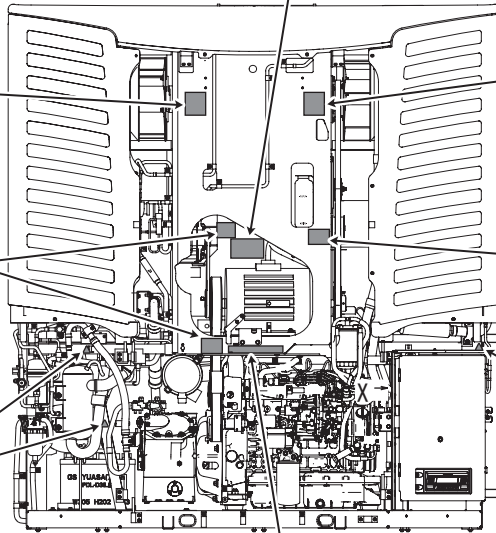
TSJ011H023



TSJ011H022A



PSA011H011A



CAUTION FAN

TSJ011H023



TSJ011H022A



PSA011H011A



TSJ011H022A



TSJ011H072G



View Y

View X

	<p>警告 ドアリミットスイッチの改造、取外しをしないこと。ドア開のままユニットが起動しケガをする恐れ有。</p>
	<p>WARNING Never modify or remove the door limit switch. Otherwise, you may be injured by accidental start of the unit with the door opening.</p>

TSJ011H078

## Prevention of start during inspection 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.

Place a cautionary tag stating “WORKING! STARTING UNIT PROHIBITED.” on the controller.

---

## Clothing and protective equipment

Wear proper clothing and protective equipment to prevent from getting injured.

- Wear the clothing such as long sleeves, long pants, gloves and eye protections.
  - Do not wear accessories such as necklaces or a necktie to prevent it from getting rolled in. Fasten the cuffs firmly.
- 

## Handling of grease and oil

As for the measure how to handle or dispose the fuel, engine oil and antifreeze coolant and so on to be used for this refrigeration unit, follow the precautions stated on each product.

These are harmful to human body or environment when mishandling them.

---

## When abnormal conditions are detected

Refer to Section 9 “For emergency” (pages from 75 to 81) when abnormal conditions are detected. Please contact your nearest dealer when it is too difficult to handle.

---

## For emergency

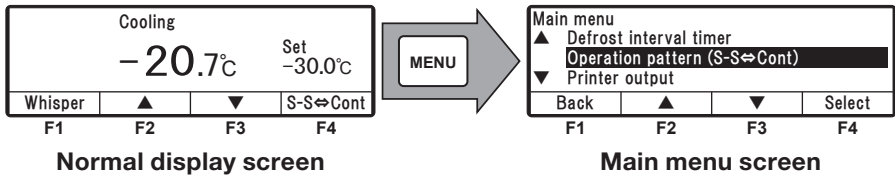
Contact the public agencies such as the police or the fire department immediately when an accident that could result in serious injury, death, serious property damage or environmental damage occurred. Contact your nearest dealer as well to prevent derivative disaster.



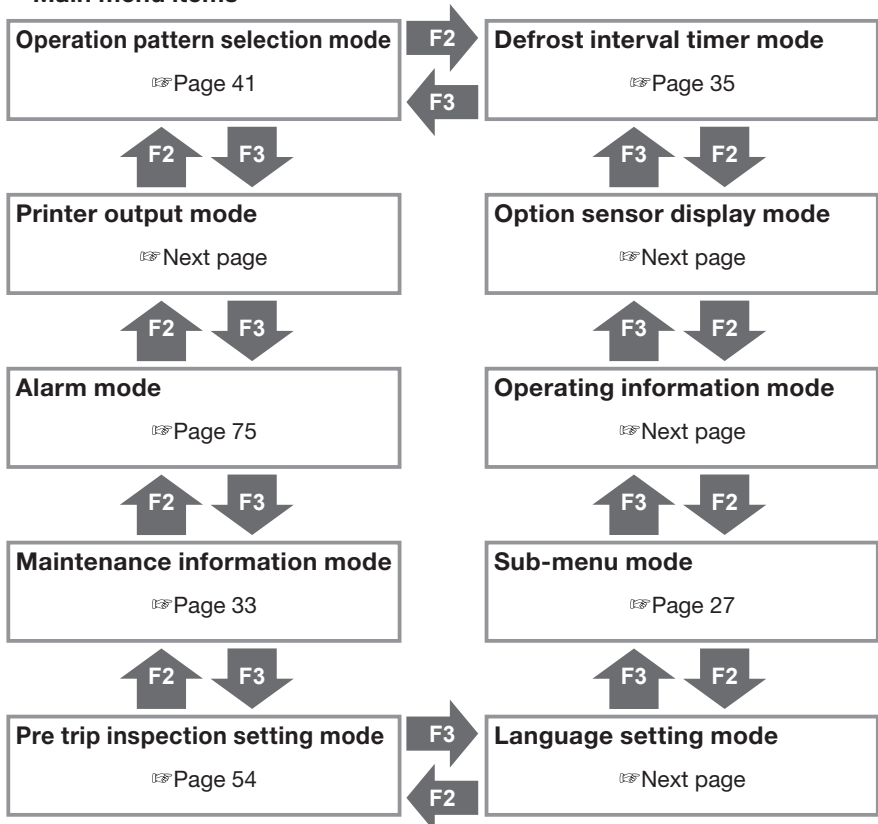
# 4 Initial setting

## Display and function of main menu

If you press the “MENU” switch once on the “Normal display screen” which is displayed when the refrigeration unit is stopped or operating, the display changes to the “Main menu” screen. Each push on “F2 (▲)” or “F3 (▼)” switch changes the display so that various settings can be made. In the following figure, “F2” switch changes sequence clockwise while “F3” switch changes counter clockwise.



### • Main menu items



## 4 Initial setting



If you press “F4 (Select)” switch on each MAIN menu screen on previous page, the display changes to the following screens.

Current setting			
Start-Stop operation			⊗
Back	Start-Stop	Continuous	Set

### Operation pattern selection mode

Mode to select the operation mode start/stop or continuous operation  
(☞ Page 41)

Printer output			
Printout period	12Hr		
Temp range	±30°C		
Center temp	0°C		
Back		Change	Start

### Printer output setting mode

The temperature graph is printed in this mode. Provide a printer to print the graph.  
(Option)

Alarm1			
E010	16 Jan 2021	07:10	
E016	15 Jan 2021	08:15	
E013	30 Nov 2020	10:30	
Back		Clear	Next

### Alarm display mode

Up to 5 error codes and dates/times of alarm occurred are displayed. These are cleared by pressing “F3 (Clear)” switch.  
(☞ Page 75)

Maintenance information			
Engine operation time 1/1520Hr			
Back	Reset		Next

### Maintenance information display mode

Operation time and number of operations of each device are displayed in this mode.  
(☞ Page 33)

Current setting			
Pre trip inspection(Basic)			
Back	Basic (Min)	Detail (Max)	PTI Start

### Pre trip inspection (PTI) setting mode

Mode to set the self diagnosis operation (PTI)  
(☞ Page 54)

Language setting			
▲	German		
	English		
▼	French		
Back	▲	▼	Set
F1	F2	F3	F4

### Language setting mode

Selects a language (English, French, Italian, Swedish or German). Press “F2 (▲)” or “F3 (▼)” switch to select a language, and finalize the selection by pressing “F4 (Set)” switch.

Sub-menu			
▲	Whisper operation reset setting		
	Calendar and clock setting		
▼	Set On Timer		
Back	▲	▼	Select

### Sub-menu selection mode

Functions of the controller operability, or other, are displayed and set in this mode.  
(☞ Page 27)

Operating information1 C---			
HP	2560kPa	TD	125°C
LP	150kPa	REV	2150/H
AT	38°C		
Back	Unlock	Lock	Next

↑F1 [Back] [Next] F4↓

Operating information2	
State	Cooling
EVT	-24°C
Back	Unlock
Lock	

\* 2-compartment model

Operating information2			
State	A Cooling	B Heating	
EVT	-24°C	16°C	
Back	Unlock	Lock	

\* 3-compartment model

Operating information2				
State	A Cooling	B Heating	C Fan	
EVT	-24°C	16°C	9°C	
Back	Unlock	Lock		

### Operation information display mode

State of operation is displayed in this mode.  
State of engine operation (High speed; H, low speed; L) is indicated at the end of "Speed (rpm)".

Option sensor display			
-20.0°C			
Back			

### Option sensor temperature display mode

When the optional sensor is installed, the sensor temperature is displayed in this mode. If no option sensor is installed, it displays "Lo".

Current setting			
6.0Hr			
Back	▲	▼	Set

### Defrost interval timer setting mode

The defrost interval is displayed and set in this mode. Factory default is set at "6.0Hr". The interval can be changed in steps of 1.0Hr.

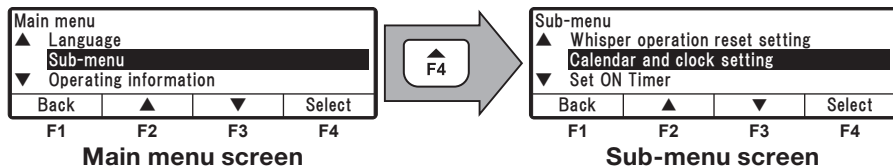
( Page 35)

## Display and function of Sub-menu

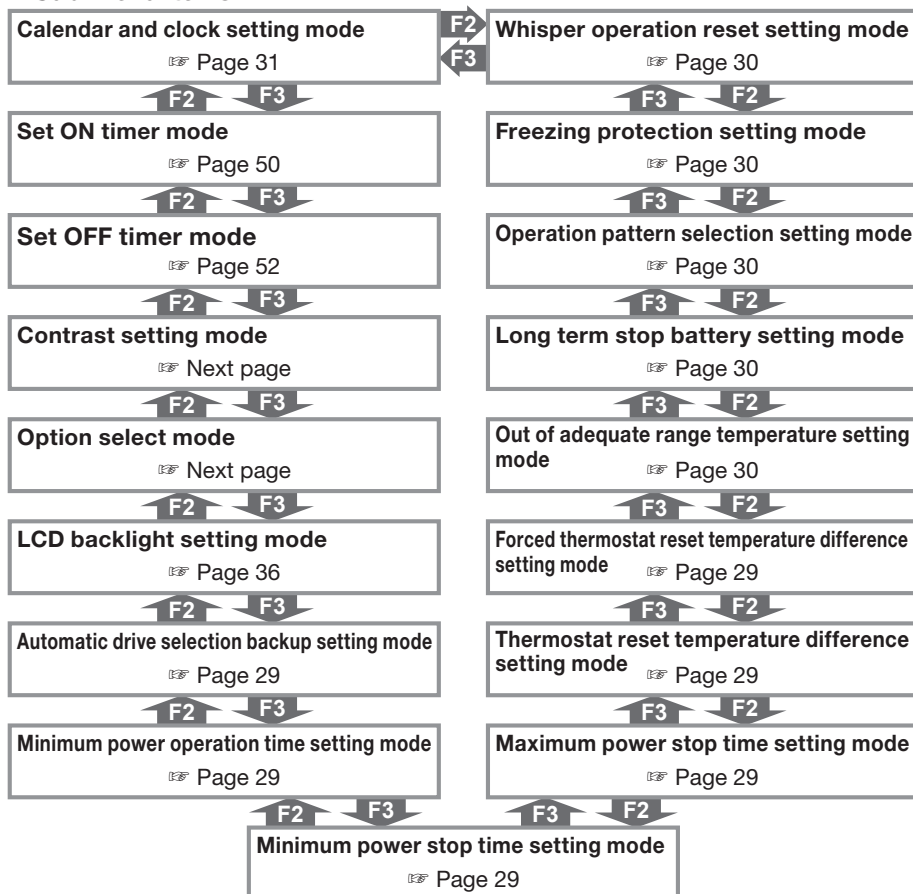
On the “Sub-menu”, the screen changes in the following order at each push on “F2 (▲)” or “F3 (▼)” switch. In the following figure, “F2” switch changes sequence clockwise while “F3” switch changes counter clockwise.

 **NOTE**

- If “MENU” switch is pressed for more than 1 second on the way of changing setting, the display returns to the normal display screen, and the change content is not reflected. The change content will be lost also when the setting change is aborted on the way.



• **Sub-menu items**





If “F4 (Select)” switch is pressed on each Sub-menu screen on previous page, the display changes to following screens.

Calendar and clock setting			
01 Jan 2021 00:00			
Back	▲	▼	Next

### Calendar and clock setting mode

Date, Month, Year and current time are set in this mode. (☞ Page 31)

Set ON timer			
ON timer disable			
Back	Enable	Disable	Set

### Set ON timer mode

Date and time to start the refrigeration unit automatically is set in this mode. (☞ Page 50)

Set OFF timer			
OFF timer disable			
Back	Enable	Disable	Set

### Set OFF timer mode

Date and time to stop the refrigeration unit automatically is set in this mode. (☞ Page 52)

Contrast setting			
Back	▲High	▼Low	Set
F1	F2	F3	F4

### Contrast setting mode

Screen contrast is adjusted in this mode.  
Use “F2 (▲)” switch to intensify the contrast or “F3 (▼)” switch to diminish the contrast.

Option select			
Option1 setting		OFF	
Back	Previous	Next	Select

### Option select/set mode

Press “F2 (Previous)” or “F3 (Next)” switch to select options 1 to 8.

Press then “F4 (Select)” switch to change to Option1 (~ 8) setting mode. Press then “F2 (ON)” or “F3 (OFF)” switch to select ON or OFF, and press “F4 (Set)” switch to finalize the selection.

Option1 setting			
OFF			
Back	ON	OFF	Set
F1	F2	F3	F4

LCD backlight setting			
▲ Always ON			
Light SW linked			
▼ Lit at key operation only(20sec)			
Back	▲	▼	Select

### LCD backlight setting mode

LCD backlight is set in this mode. (☞ Page 36)

## 4 Initial setting

Automatic drive selection backup setting			
Disable			
Back	Enable	Disable	Set

### Automatic drive selection backup setting mode

Setting automatic switching from motor drive to engine drive when power failure happens.

(Setting option)

OFF: Disable (Default)

ON : Enable

Minimum power operation time setting			
4min			
Back	▲	▼	Set

### Minimum power operation time setting mode

Setting minimum power operation continue time even if all-room thermostat OFF is commanded after starting power operation, to secure battery charge level. (Automatic start/stop operation)

(Setting option)

4-30 minutes, which can be changed minute by minute.

(Default: 4 minutes)

Minimum power stop time setting			
8min			
Back	▲	▼	Set

### Minimum power stop time setting mode

Setting minimum time before starting operation after thermostat OFF to improve fuel consumption by reducing frequent starting actions.

(Setting option)

1~30 minutes, which can be changed minute by minute.

(Default: 8 minutes)

Maximum power stop time setting			
OFF			
Back	▲	▼	Set

### Maximum power stop time setting mode

Setting maximum time to restart unit forcibly after thermostat OFF to prevent no start trouble due to sensor failure or the like.

(Setting option)

OFF, 10~240 minutes which can be changed minute by minute.

(Default: OFF)

Thermostat reset temp. diff. setting			
2.0°C			
Back	▲	▼	Set

### Thermostat reset temperature difference setting mode

Setting temperature difference from target temperature to be used as thermostat resetting condition.

(Setting option)

1~6°C which can be changed in the unit of 0.5°C.

(Default: 2°C)

Forced thermostat reset temp. diff. setting			
4.0°C			
Back	▲	▼	Set

### Forced thermostat reset temperature difference setting mode

Setting temperature difference from target temperature to be used as forced thermostat restarting condition after thermostat OFF.

(Setting option)

2~10°C which can be changed in the unit of 0.5°C.

(Default: 4°C)

Out of adequate range temp. setting			
4.0°C			
Back	▲	▼	Set

**Out of adequate range temperature setting mode**

Setting allowable temperature range which can be recognized as adequate around the target temperature.

(Setting option)

2~6°C which can be changed in the unit of 0.5°C.

(Default: 4°C)

Long term stop battery setting			
▲ Enable			
Disable			
▼ Enable			
Back	▲	▼	Select

**Long term stop battery setting mode**

Setting for automatic unit operation for about 5 minutes when unit is stopped for 1 week or more, to protect the unit.

(Default: Enable)

Operation pattern selection setting			
Hand			
Back	Hand	Auto	Set

**Operation pattern selection setting mode**

Setting whether auto start/stop operation or continuous operation is selected by hand or automatically by setting temperature.

(Default: Hand)

Freezing protection setting			
Enable			
Back	Enable	Disable	Set

**Freezing protection setting mode**

Setting to prevent continuous operation when temperature cannot be lowered to setting temperature, so that thermostat is not turned OFF, during cooling operation in chilled zone, for protection against freezing hazard.

(Automatic start/stop operation, TFFV2000E-E only)

(Default: Enable)

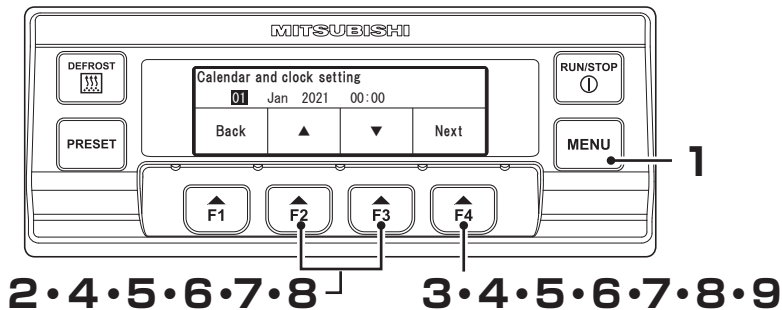
Whisper operation reset setting			
Disable			
Back	Enable	Disable	Set

**Whisper operation reset setting mode**

Setting to continue whisper operation at start of unit operation when it was actuated in previous operation.

(Default: Disable)

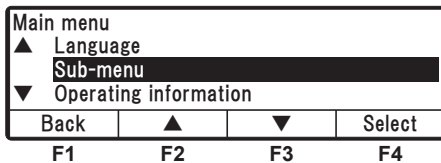
## Setting the calendar and clock (Date, Month, Year)



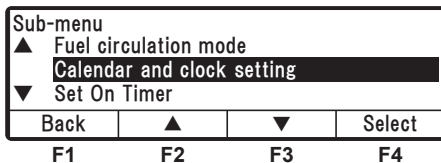
### 1 Press "MENU" switch.

⇒ The display changes to "Main menu" screen.

### 2 Press "F2 (▲)" or "F3 (▼)" switch till "Sub-menu" screen is displayed.

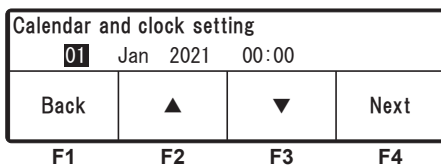


### 3 Press "F4 (Select)" switch to change to "Sub-menu" screen (Right figure).



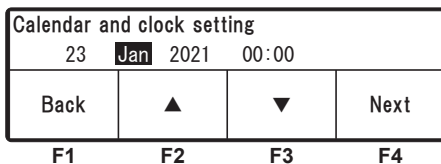
### 4 Press "F4 (Select)" switch to change to "Calendar and clock setting" mode (Right figure).

⇒ Press "F2 (▲)" or "F3 (▼)" switch to adjust at current date.



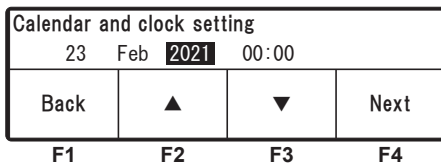
### 5 Press "F4 (Next)" switch.

⇒ Press "F2 (▲)" or "F3 (▼)" switch to adjust at current month.



### 6 Press "F4 (Next)" switch.

⇒ Press "F2 (▲)" or "F3 (▼)" switch to adjust at current year.





**7 Press “F4 (Next)” switch.**

⇒ Press “F2 (▲)” or “F3 (▼)” switch to adjust at current time (Hour).

**NOTE**

- Time is displayed in the 24-hour scale. If it is “7 PM”, set as “19:00”.

Calendar and clock setting			
23	Feb	2021	00:00
Back	▲	▼	Next
F1	F2	F3	F4

**8 Press “F4 (Next)”.**

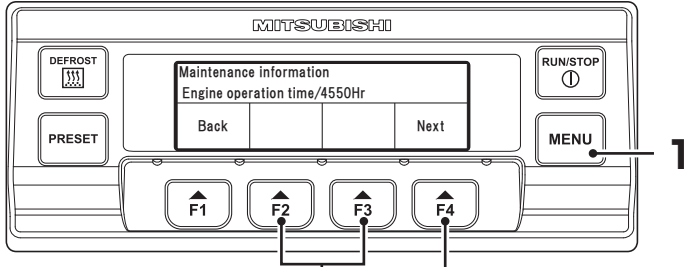
⇒ Press “F2 (▲)” or “F3 (▼)” switch to adjust at current time (Minute).

Calendar and clock setting			
23	Feb	2021	09:00
Back	▲	▼	Set
F1	F2	F3	F4

**9 Press “F4 (Set)” switch.**

⇒ The setting is completed, and the display returns to the screen of Step 3, “Sub-menu”.

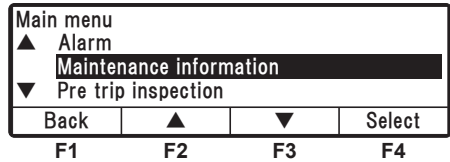
## Displaying the maintenance information



**1** Press “MENU” switch.

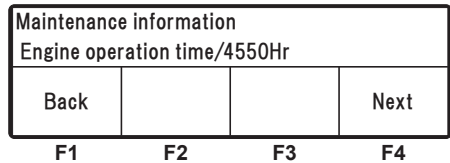
⇒ The display changes to the “Main menu” screen.

**2** Press “F2 (▲)” or “F3 (▼)” switch till the display changes to the “Maintenance information” mode.



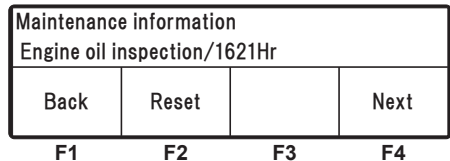
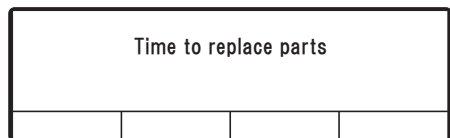
**3** Press “F4 (Select)” switch.

⇒ “Engine operation time” is displayed.




## Display of Time to replace parts

- If the operation time or number of operations reaches the “Maintenance required time” on each device, this screen (Right figure) is displayed for 10 seconds after the start of operation of the refrigeration unit. In case of oil replacement interval, “Time to change oil” is displayed.
- If you press “F4 (Next)” switch, the display changes to each parts in the table next page. In case part other than listed in the table is displayed when pressing “F4 (Next)”, it is the maintenance required part. The replacement of part that is listed in the table should be done based on the interval of the table.



**[At engine oil replacement]**

⇒ Hold down F2 switch (Reset) for 3 seconds to reset the operation time.

 **NOTE**

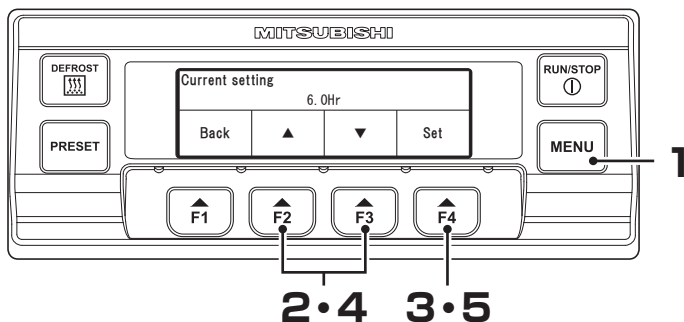
- Reset after replacing engine oil.
- When “Time to replace parts” is displayed in other items, contact your nearest dealer.

---

●Parts replacement time/cycle.

	Display item	Replacement interval
1	Engine oil inspection	1,500 hours or more
2	Engine operation time	—
3	Standby operation time	—
4	Water pump belt operate time	4,000 hours or more
5	Engine overhaul	10,000 hours or more
6	Starter start-stop cycles	30,000 cycles or more
7	Fan clutch operation time	30,000 hours or more
<b>8 to 11 displayed only 2-/3-compartment model</b>		
8	EF-B1 operation time	30,000 hours or more
9	EF-B2 operation time	30,000 hours or more
10	EF-B3 operation time	30,000 hours or more
11	EF-B4 operation time	30,000 hours or more
<b>12 to 15 displayed only 3-compartment model</b>		
12	EF-C1 operation time	30,000 hours or more
13	EF-C2 operation time	30,000 hours or more
14	EF-C3 operation time	30,000 hours or more
15	EF-C4 operation time	30,000 hours or more

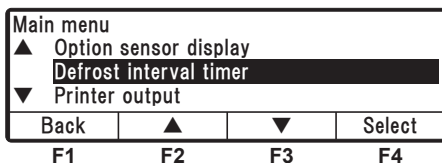
## Setting the defrost interval



### 1 Press "MENU" switch.

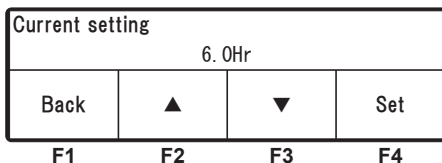
⇒ The display changes to "Main menu" screen.

### 2 Press "F2 (▲)" or "F3 (▼)" switch till the display changes to "Defrost interval timer".



### 3 Press "F4 (Select)" switch.

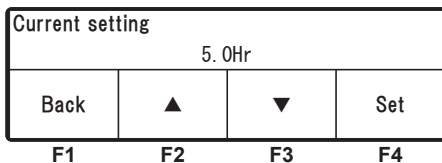
⇒ Current setting of "Defrost interval timer" is displayed.



### 4 Press "F2 (▲)" or "F3 (▼)" switch to select a setting time.

#### NOTE

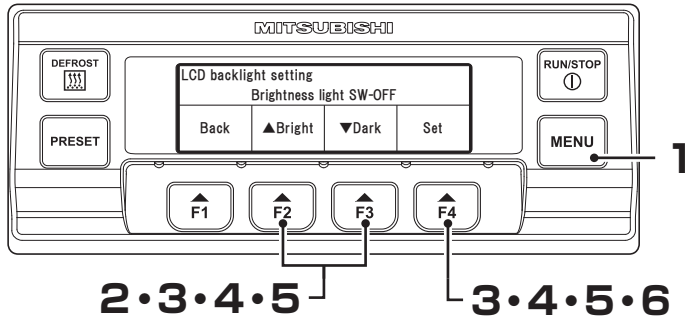
- The defrosting can be set at OFF, or at every 1 hour in the range of from 1.0 hours to 12 hours.



### 5 Press "F4 (Set)" switch.

⇒ The setting completes, and the display returns to the screen of Step 2, "Main menu".

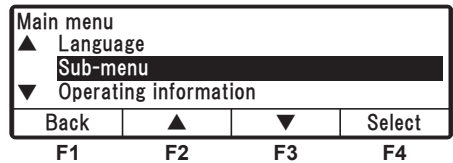
## Setting LCD backlight



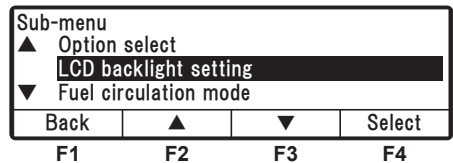
### 1 Press “MENU” switch.

⇒ The display changes to “Main menu” screen.

### 2 Press “F2 (▲)” or “F3 (▼)” switch till the display changes to “Sub-menu” screen (Right figure).

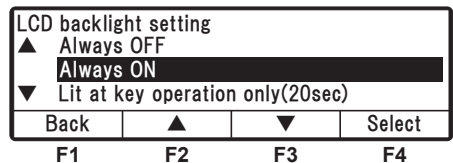


### 3 Press “F4 (Select)” switch to change to “Sub-menu” screen. Press “F2 (▲)” or “F3 (▼)” switch till the display changes to “LCD backlight setting” screen (Right figure).



### 4 Press “F4 (Select)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch to select the following LCD backlight setting.



**[Lit at key operation only(20sec)]** : Lights for 20 seconds only when any switch is pressed.

**[Always OFF]** : Always turning off the light.

**[Always ON]** : Always lighting.

#### 4 Initial setting

### 5 Press “F4 (Select)” switch. 【Lit at key operation only(20sec)】

⇒ Step 6

LCD backlight setting			
Lit at key operation only(20sec)			
Back			Set
F1	F2	F3	F4

【Always OFF】

⇒ Step 6

LCD backlight setting			
Always OFF			
Back			Set
F1	F2	F3	F4

【Always ON】

⇒ Adjust the brightness of the LCD backlight for Always ON by pressing “F2 (▲Bright)” or “F3 (▼Dark)” switch. ⇒ Step 6

LCD backlight setting			
Brightness of always ON			
Back	▲Bright	▼Dark	Set
F1	F2	F3	F4

### 6 Press “F4 (Set)” switch.

⇒ The setting completes, and the display returns to “Sub-menu” screen of Step 3.

## 5 Operation

### **WARNING**



**Do not operate the refrigeration unit in the place where there is a risk of combustible gas leakage.**

- Otherwise, it may cause a fire.

---

**Do not touch the electric devices such as power plug and so on with wet hands.**

- Otherwise, it may cause an electric shock.



---

**Operate the refrigeration unit with motor drive when operating it indoor. The place must be well ventilated when operating it with engine drive.**

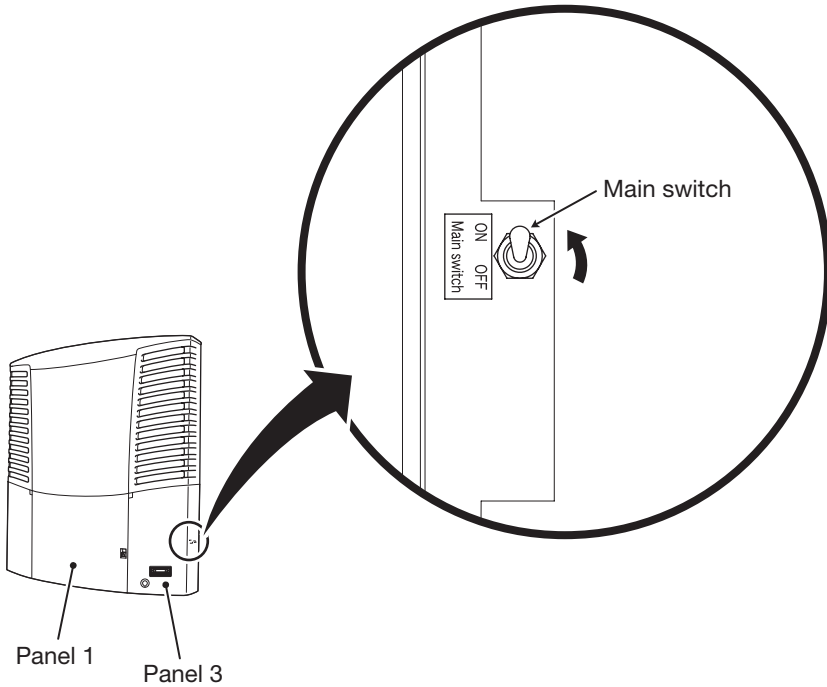
- Otherwise, it may cause oxygen deficiency due to exhaust gas.



### **NOTE**

- 
- Be sure to carry out the self diagnosis operation (PTI operation) before the operation.
-

## Power on



**1** Open the panel 1 (☞ Refer to page 61.)

**NOTE**

- Panel 3 cannot be opened unless opening panel 1.

**2** Open the panel 3 (☞ Refer to page 62.)

**3** Turn the "Main switch", which is located at the right side of control box, to "ON".

**4** Close all the panels. (☞ Refer to page 63.)



## Switching the drive

The refrigeration unit switches between the engine drive and the motor drive by detecting automatically, at the start of operation, whether it is connected to the commercial power supply or not.

### Operating with the engine

- 1 Make sure that the commercial power supply is not connected to the refrigeration unit.

#### NOTE

- Engine will not start if the commercial power supply is connected to the refrigeration unit. The unit is operated with the motor.

### Operating with the motor

#### WARNING



Use 4-core cabtyre cables (conductor cross section with 8 mm<sup>2</sup> or more) for power cable. Do not connect it to extension cord. Use MENNEKES Part no.6 (400V 32A) for power supply plug.


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

#### CAUTION

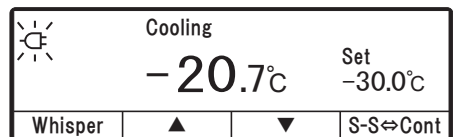


Use 3-phase AC400V 50Hz for power supply.

- It may cause damage of the refrigeration unit or a fire if any other power supply is used.

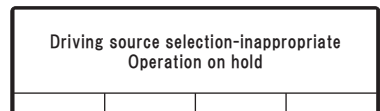
- 1 Connect the socket of the refrigeration unit to the commercial power supply. (For the specification of power supply system,  refer to page 72.)

⇒ Commercial power supply icon lights.

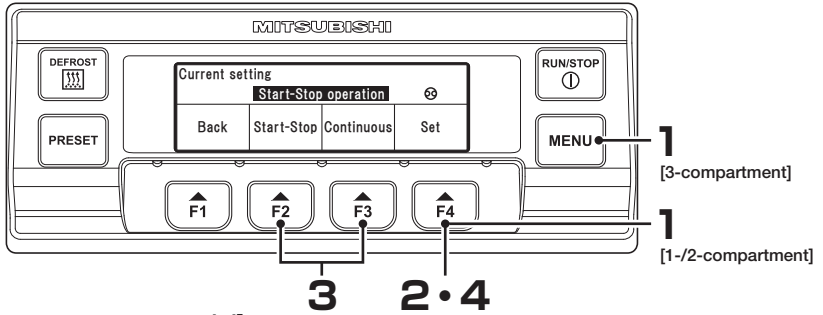


### Operation on hold display

When the commercial power supply is connected while the engine drives, the refrigeration unit holds its operation (figure shown on the right). Use either power supply described above for the refrigeration drive source.



## Selecting the operation pattern

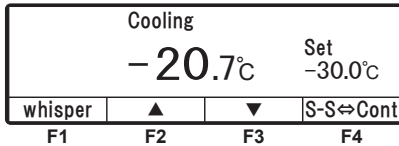


**1** [1-/2-compartment model]

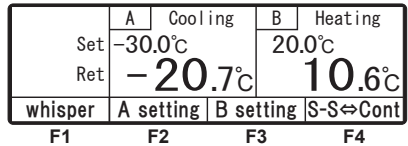
On the normal display screen (Below figure), press “F4 (S-S⇌Cont)” switch.

⇒ The display changed to the mode screen of Step 2 below. Further steps are same for 1-/2-/3-compartment specifications.

[1-compartment model]



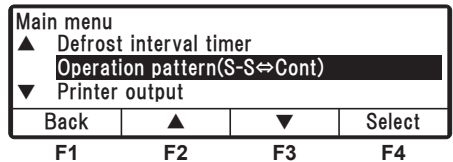
[2-compartment model]



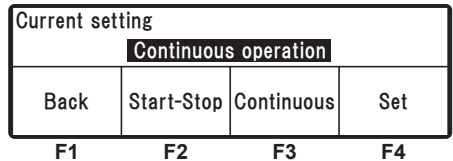
**1** [In case of 3-compartment specifications] (\* It is OK with 1-/2-compartment specifications as well.)

Press “MENU” switch.

⇒ The display changes to “Main menu” screen.

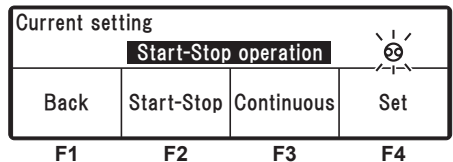


**2** Press “F4 (Select)” switch to change to “Operation pattern selection” screen (Right figure).



**3** Press “F2 (Start-Stop)” or “F3 (Continuous)” switch to select the automatic Start/Stop operation or the continuous operation.

⇒ Start/Stop display lights when the Start/Stop operation is set.



**4** Press “F4 (Set)” switch.

⇒ The setting completes, and the display returns to the normal display screen.

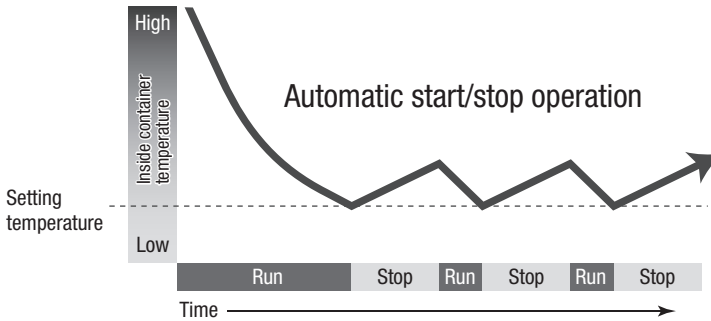
 **NOTE**

● What is the automatic start/stop operation?

Inside container temperature is maintained at around the setting temperature by turning thermostat ON or OFF\* for the engine during engine drive, or turning thermostat ON or OFF for the motor during motor drive. Automatic start/stop operation consumes less fuel (electricity) than the continuous operation but has a large deviation on the inside container temperature. This pattern of operation is suitable for cargoes with a larger allowance in the control temperature.

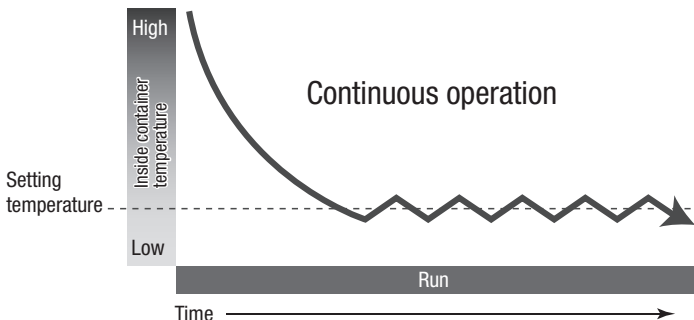
\* Thermostat OFF: The action that the engine (motor) stops automatically after inside container temperature reached to the setting temperature. (As the controller is active, it re-starts automatically.)

Thermostat ON: The action that the operation re-starts automatically when the inside container temperature goes beyond the designated range of the setting temperature during thermostat OFF.

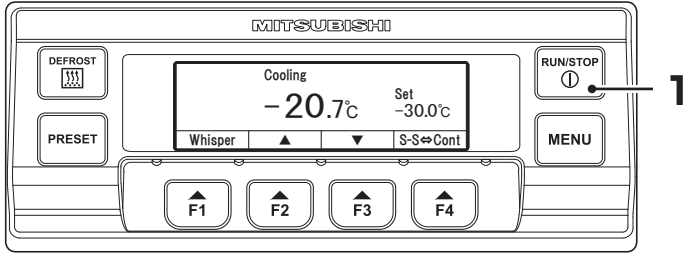


● What is the continuous operation?

The refrigeration unit operates without turning the thermostat ON or OFF, in which inside container temperature is maintained at around the setting temperature by adjusting the refrigerating capacities automatically and by turning on/off the electromagnetic clutch of the compressor. Since this operation can maintain the inside container temperature very close to the setting temperature, it is suitable for cases such as chilled transportation, which require strict quality control.



## Starting the operation



### **WARNING**



**Confirm that all the panels of refrigeration unit are closed before starting operation.**

- It may cause accidents if the operation is attempted with the panels opened.

**1**

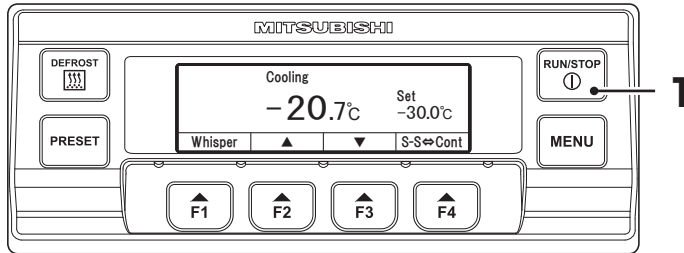
**Press the [RUN/STOP] switch.  
(Refrigeration unit is turned "ON".)**

- ⇒ Inside container temperature and setting temperature are displayed on the LCD display.  
Commercial power supply icon lights when the unit is driven by the motor.
- ⇒ Warning buzzer sounds before the engine or motor starts to run.  
Operation starts with the selected drive (engine or motor) and operation pattern (automatic start/stop operation or continuous operation).

### **NOTE**

- The refrigeration unit will not start while the panel 1 is open, because the safety device is tripped. (Error code E030 is displayed. If you close the panel 1, the unit starts to operate automatically.)
- Operation may not start if the inside container temperature is close to the setting temperature when the automatic start/stop operation is selected.

## Stopping the operation



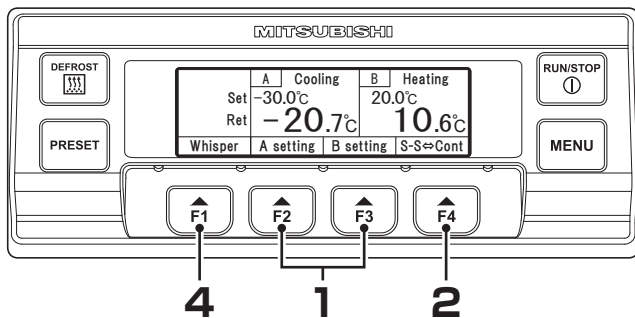
### Normal stop

1 Press the [RUN/STOP] switch.  
(Refrigeration unit is turned “OFF”.)

- ⇒ The refrigeration unit stops the operation automatically after performing the device protecting operation for 10 to 20 seconds. (During the device protecting operation, “Stopping process ...” is displayed on the LCD display.)
- ⇒ If all steps of operation stop are completed, the controller is turned off automatically.

#### NOTE

- When the motor operation stops, the buzzer sounds and “Remove the power plug” is displayed on the LCD display in order to prevent failure to disconnect the power plug from the AC power socket.



## Suspending (sleep) the compartment operation (2-/3-compartment model)

**1** On the normal display screen (Right figure), press “F2 (A setting)” or “F3 (B setting)” switch to select the compartment of which operation is suspended.

	A	Cooling	B	Heating
Set	-30.0°C		20.0°C	
Ret	-20.7°C		10.6°C	
Whisper	A setting	B setting	S-S⇌Cont	
	F1	F2	F3	F4

[3-compartment model]

On the normal display screen (Right figure), press “F2 (A setting)” or “F3 (B setting)” or “F4 (C setting)” switch to select the compartment of which operation is suspended.

	A	Cooling	B	Heating	C
Set	-30.0°C		20.0°C		-18.0°C
Ret	-20.7°C		10.6°C		-18.5°C
Whisper	A setting	B setting	C setting		
	F1	F2	F3	F4	

**2** Press “F4 (Sleep)” switch.

⇒ When the operation is suspended at the selected compartment (the screen of Step 3), press “F4 (Operate)” switch.

Set point			
-30.0°C			
Back	▲	▼	Sleep
F1	F2	F3	F4

**3** “Sleep” is displayed.

⇒ If “F4 (Operate)” switch is pressed, the display of “Sleep” extinguishes. (the screen of Step 2)

Set point			
-30.0°C		Sleep	
Back			Operate
F1	F2	F3	F4

**4** Press “F1 (Back)” switch.

⇒ Operation/Suspension is completed at the selected compartment, and the display returns to the normal display screen.

	A	Sleep	B	Heating
Set			20.0°C	
Ret			10.6°C	
Whisper	A setting	B setting	S-S⇌Cont	
	F1	F2	F3	F4

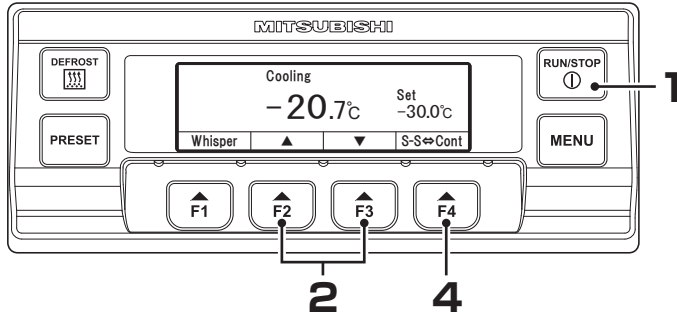
[3-compartment]

	A	Sleep	B	Heating	C
Set			20.0°C		-18.0°C
Ret			10.6°C		-18.5°C
Whisper	A setting	B setting	C setting		
	F1	F2	F3	F4	

**NOTE**

- It is impossible to suspend operation at all compartments.

## Setting the temperature



1 Start the operation of refrigeration unit. (☞ Page 43)

2 [In case of 2-compartment model]  
On the normal display screen (Right figure), press “F2 (A setting)” or “F3 (B setting)” switch.

	A	Cooling	B	Heating
Set	-30.0°C		20.0°C	
Ret	-20.7°C		10.6°C	
Whisper	A setting	B setting	S-S⇄Cont	
F1	F2	F3	F4	

[In case of 3-compartment model]  
On the normal display screen (Right figure), press “F2 (A setting)” or “F3 (B setting)” or “F4 (C setting)” switch.

	A	Cooling	B	Heating	C
Set	-30.0°C		20.0°C		-18.0°C
Ret	-20.7°C		10.6°C		-18.5°C
Whisper	A setting	B setting	C setting		
F1	F2	F3	F4		

3 Press “F2 (▲)” or “F3 (▼)” switch, and set a temperature.

[2-/3-compartment]  
“F4 (Sleep)” is displayed.

Sleep
F4

Set point			
-30.0°C			
Back	▲	▼	
F1	F2	F3	F4

### NOTE

- Each push on “F2” switch increases the value by 0.5 while the value decreases by 0.5 at each push on “F3” switch. If the switch is held down, the value changes continuously.

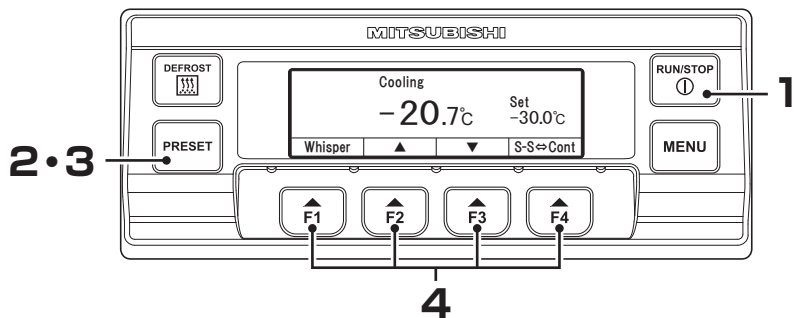
4 Press “F4 (Set)” switch.

⇒ The setting completes, and the display returns to the normal display screen.

Set point			
-25.5°C			
Back	▲	▼	Set
F1	F2	F3	F4

### NOTE

- The “Preset” function is provided, with which it can be selected from 4 setting temperatures which have already been registered. (Next page)

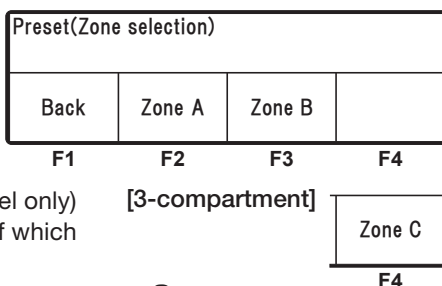


## Setting the preset temperature

1 Start the refrigeration unit. (▶ Page 43)

2 [In case of 2-/3-compartment model] Press the “Preset” switch.

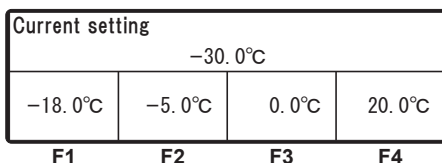
⇒ In the “Preset (Zone selection)” mode (Right figure), press “F2 (Zone A)” or “F3 (Zone B)” or “F4 (Zone C)” (3-compartment model only) switch to select the compartment of which the setting temperature is changed.



⇒ The display changes to the mode screen of Step 3 below. Further procedure is same as in the case of 1-compartment model.

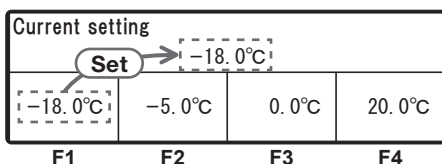
3 [In case of 1-compartment model] Press the “Preset” switch.

⇒ The display changes to the preset setting screen. Right figure shows the setting values at the shipping from factory.



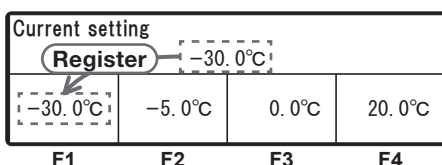
4 Press “F1 (~ F4)” switch.

⇒ Desired preset temperature is set, and the display returns to the normal display screen.



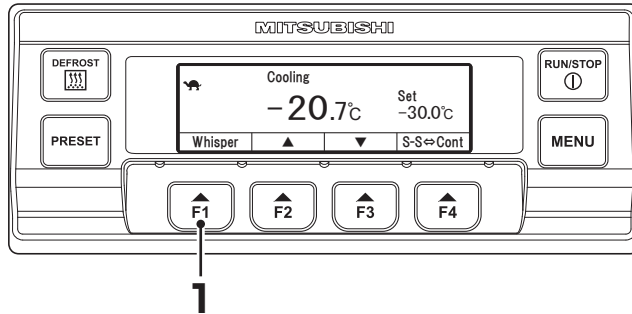
4 [Preset registration of current setting temperature] Hold down “F1 (~ F4)” switch for 3 seconds.

⇒ The preset temperature is registered, and the display returns to the normal display screen.






## Whisper operation (Only for engine drive)



1 Press the “F1 (Whisper)” switch.

⇒ It changes to the whisper operation and one more press on the switch returns it to the normal operation.

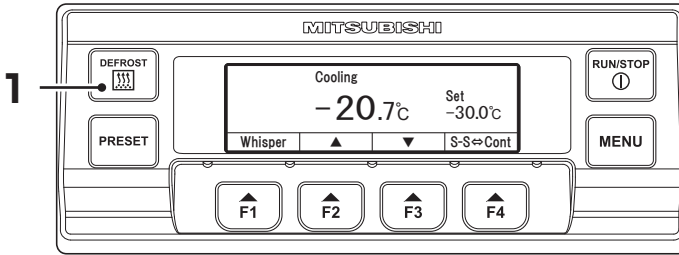
When the whisper operation is enabled, the  (whisper operation icon) lights on the LCD display.

If the operation is stopped when the whisper operation is selected, the setting is reset. If you need the whisper operation, you have to press the “F1 (Whisper)” switch at each time when the operation is started.

### NOTE

- The whisper operation is the function to run the engine at the slow speed revolution only. Use this function when it is necessary to suppress the sound of unit operation temporarily during stopping time of the vehicle and so on.
- The setting can be changed so that the whisper operation setting will not be reset even if the refrigeration unit stopped the operation. When you need this setting, contact your nearest dealer.

## Manual defrost operation



### Starting the manual defrost operation

1 Press the “DEFROST” switch once during cooling operation.

⇒ The defrost operation starts.

#### NOTE

- The defrost operation may not start when the inside container temperature is higher.

### Ending the manual defrost operation

If the defrost operation completes, it returns to the cooling operation.

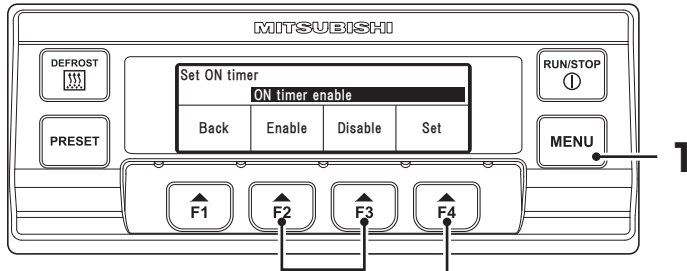
If it is necessary to interrupt the defrost operation and to return to the cooling operation, press the “DEFROST” switch once more.

If the “RUN/STOP” switch is turned “OFF”, it interrupts the defrost operation and stops the operation of refrigeration unit.

#### NOTE

- The manual defrost operation can be made also during the thermostat OFF stop.
- The manual defrost operation cannot be made during the operation stop and the heating operation.
- During automatic defrosting operation, it cannot interrupt even if “Defrost switch” is pressed.

## Setting the ON timer



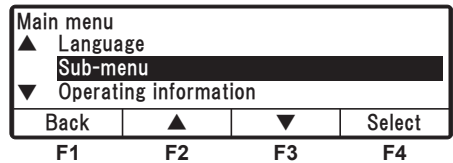
2 • 3 • 4 • 5 • 6 • 7 • 8

3 • 4 • 5 • 6 • 7 • 8 • 9

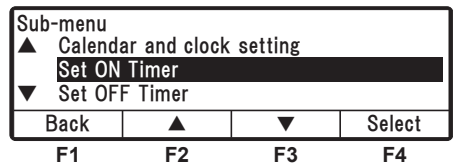
### 1 Press "MENU" switch.

⇒ The display changes to "Main menu" screen.

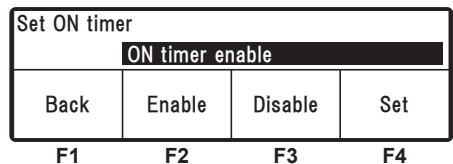
### 2 Press "F2 (▲)" or "F3 (▼)" switch till the display changes to "Sub-menu" screen (Right figure).



### 3 Press "F4 (Select)" switch to change to "Sub-menu" screen. Press "F2 (▲)" or "F3 (▼)" switch till the display changes to "Set ON Timer" screen (Right figure).



### 4 Press "F4 (Select)" switch to change to "ON timer enable" mode (Right figure).

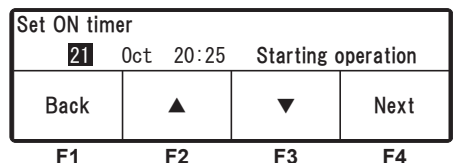


⇒ If Enable is selected by pressing "F2 (Enable)" switch, go to Step 5.

⇒ When Disable has been selected by pressing "F3 (Disable)" switch, if "F4 (Set)" switch is pressed, the display returns to the screen of Step 3.

### 5 Press "F4 (Set)" switch.

⇒ Press "F2 (▲)" or "F3 (▼)" switch, and set the time (Date) of Set ON timer.



## 6 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and set the time (Month) of Set ON timer.

Set ON timer			
22	Oct	20:25	Starting operation
Back	▲	▼	Next
F1	F2	F3	F4

## 7 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and adjust the time (Hour) of Set ON timer.

Set ON timer			
22	Oct	23:25	Starting operation
Back	▲	▼	Next
F1	F2	F3	F4

### NOTE

- Time is displayed in the 24-hour scale. If it is “7 PM”, set as “19:00”.

## 8 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and adjust the time (Minute) of Set ON timer.

Set ON timer			
22	Oct	23:30	Starting operation
Back	▲	▼	Set
F1	F2	F3	F4

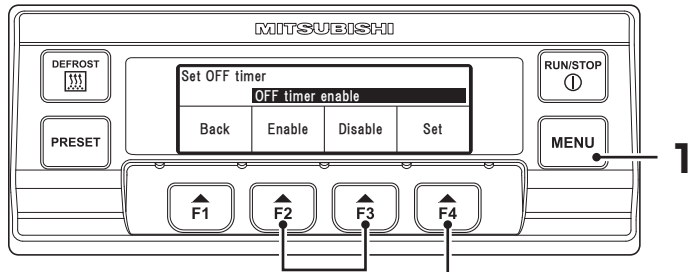
## 9 Press “F4 (Set)” switch.

⇒ The setting completes, and the display returns to the screen of Step 3, “Sub-menu”.

### NOTE

- Take note that the refrigeration unit starts the operation automatically at the setting time when the ON timer is set.

## Setting the OFF timer



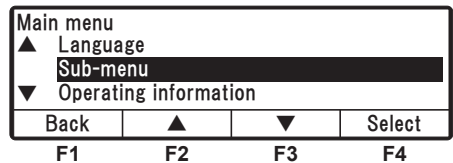
2 • 3 • 4 • 5 • 6 • 7 • 8

3 • 4 • 5 • 6 • 7 • 8 • 9

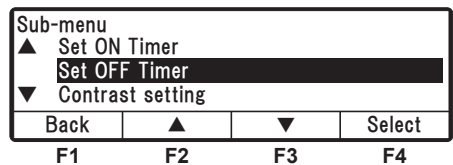
### 1 Press "MENU" switch.

⇒ The display change to "Main menu" screen.

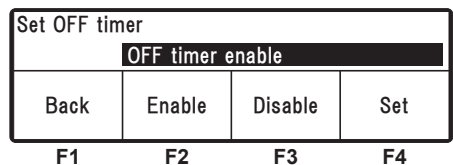
### 2 Press "F2 (▲)" or "F3 (▼)" switch till the display changes to "Sub-menu" screen (Right figure).



### 3 Press "F4 (Select)" switch to change to "Sub-menu" screen. Press "F2 (▲)" or "F3 (▼)" switch till the display changes to "Set OFF Timer" screen (Right figure).



### 4 Press "F4 (Select)" switch to change to "Set OFF timer" mode (Right figure).

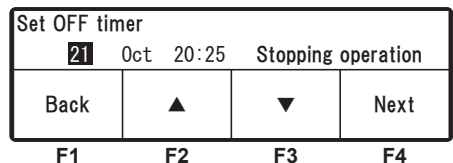


⇒ If Enable is selected by pressing "F2 (Enable)" switch, go to Step 5.

⇒ When Disable has been selected by pressing "F3 (Disable)" switch, if "F4 (Set)" switch is pressed, the display returns to the screen of Step 3.

### 5 Press "F4 (Set)" switch.

⇒ Press "F2 (▲)" or "F3 (▼)" switch, and set the time (Date) of Set OFF timer.



## 5 Operation

### 6 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and set the time (Month) of Set OFF timer.

Set OFF timer			
22	Oct	20:25	Stopping operation
Back	▲	▼	Next
F1	F2	F3	F4

### 7 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and adjust the time (Hour) of Set OFF timer.

Set OFF timer			
22	Oct	23:25	Stopping operation
Back	▲	▼	Next
F1	F2	F3	F4



#### NOTE

- Time is displayed in the 24-hpur scale. If it is “7 PM”, set as “19:00”.

### 8 Press “F4 (Next)” switch.

⇒ Press “F2 (▲)” or “F3 (▼)” switch, and adjust the time (Minute) of Set OFF timer.

Set OFF timer			
22	Oct	23:30	Stopping operation
Back	▲	▼	Set
F1	F2	F3	F4

### 9 Press “F4 (Set)” switch.

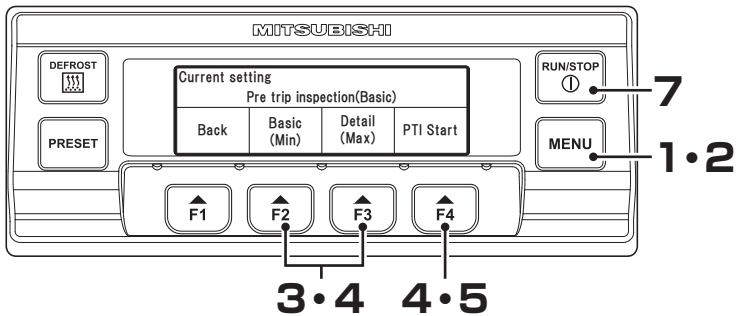
⇒ The setting completes, and the display returns to the screen of Step 3, “Sub-menu”.



#### NOTE

- Take note that the refrigeration unit stops the operation automatically at the setting time when the OFF timer is set.

## Self diagnosis operation (PTI operation)



### NOTE

- Perform the self diagnosis operation without fail before the operation.
- The inspection of the commercial power supply is skipped when the power supply is not connected.

## Starting the operation

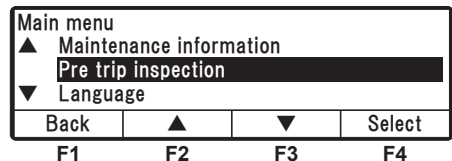
- 1 Press the “MENU” switch when the refrigeration unit is stopped.  
⇒ The controller becomes activated and the display changes to the “Normal display screen”.

### NOTE

- Go to the procedure 2 while the refrigeration unit is operating.

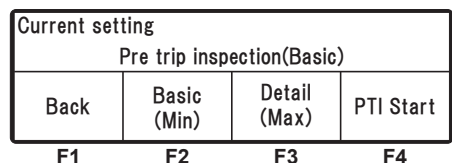
- 2 Press the “MENU” switch.  
⇒ The display changes to the “Main menu”.

- 3 Press “F2 (▲)” or “F3 (▼)” switch till “Pre trip inspection” screen display.



- 4 Press “F4 (Select)” switch to change to “PTI selection” mode (Right figure).

⇒ Press “F2 [Basic (Min)]” or “F3 [Detail (Max)]” switch to select the pre trip inspection.



## 5 Operation

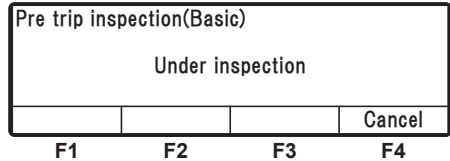
- [Basic (Min)] Basic self diagnosis operation**
- [Detail (Max)] Detail self diagnosis operation**  
(With the cooling and defrost operations)

### NOTE

- Self diagnosis operation takes approx. 5 minutes for “Basic (Min)” or 2.5 hours (It may take a little longer depending on the setting temperature and the outdoor air temperature.) for “Detail (Max)” from start to end.

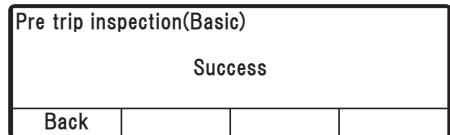
## 5 Press the “F4 (PTI Start)” switch.

- ⇒ If the “F4 (PTI Start)” switch is pressed during operation, the refrigeration unit stops temporarily.
- ⇒ To interrupt PTI operation, press “F4 (Cancel)” switch.
- ⇒ When the diagnosis is completed, the engine stops and the result of diagnosis will be displayed.



## Finishing the operation when no defects are detected

### 6 When no abnormal condition has been detected, “Success” is displayed.



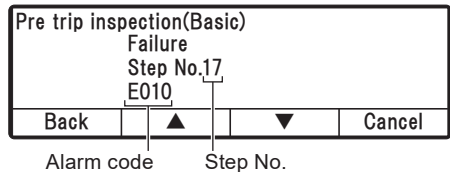
### 7 Press the “RUN/STOP” switch to turn it “OFF”.

- ⇒ The controller will stop.

Perform the same procedures when stopping the PTI operation during the inspection.

## When abnormal conditions are detected

“Failure”, “Step No.” and the error code corresponding to the abnormal condition are displayed. When multiple abnormalities occur, display contents are switched and displayed every 2 seconds. Check the alarm code (👉 Refer to pages from 79 to 81) and perform proper treatment or contact your nearest dealer.





# 6 Loading and unloading

## 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 damages of the cargoes or deterioration of the quality. Or it may cause emergency stop of the refrigeration unit.

- 1 Cargoes must be cooled down or heated up to the designated temperature with other refrigeration device in advance.
- 2 Clean inside of the container.
- 3 Perform the inspection of the refrigeration unit and the body\*.  
(👉 Refer to page 59.)  
\* Consult with your body manufacturer for the contents of inspection.
- 4 Set the right temperature for transportation of the cargo and cool down or heat up inside of the container to the setting temperature.  
(👉 Refer to page 46.)

### NOTE

- The temperature inside of the closed container may reach 60°C under a blazing sun. Loading in such a container causes damages or deterioration of the quality. Be sure to cool down inside of the container to the setting temperature before loading.
- When it is hardly cooled down, contact your nearest dealer before loading.

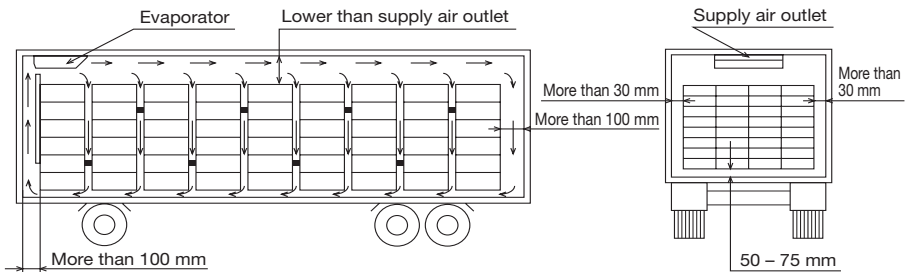
## Loading and unloading

### Loading procedure

1 Stop the cooling operation. (☞ Refer to page 44.)

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. (☞ Refer to page 43.)

---

## Unloading procedure

- 1 Stop the cooling operation. (☞ Refer to page 44.)
- 2 Unload the cargoes.

---

 **NOTE**

- 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.
-

# 7 Inspection

## Precautions for inspection

Always carry out the following inspections before the operation to prevent any damages of the refrigeration unit before happening.

### **WARNING**



**Do not perform the inspection in the place where the combustible gas leakage may happen.**

- Otherwise, if the gas might leak out, it stays around the refrigeration unit and may catch a fire.



**Do not modify or remove the protective device installed on the panel.**

- It may cause injury if the refrigeration unit is operated with the panel opened.



**Be sure to perform daily and periodic inspections.**

- Otherwise, it may cause troubles of the refrigeration unit or accidents.

**The area must be well ventilated when performing the inspection indoors.**

- Otherwise, it may cause oxygen deficiency due to the exhaust gas.

 **CAUTION****Use 3-phase AC400V 50Hz for power supply.**

- It may cause damage of the refrigeration unit or a fire if any other power supply was used.
- 

**Sufficient care must be taken for foothold when working at a higher place on a stepladder.**

- If you step off, you may fall down and get injured.
- 

**When leakage of the refrigerant is detected, contact your nearest dealer immediately.**

- Otherwise, it may cause blindness or frostbite.
- 

**Stop the operation and wait until engine and others are cooled down before performing the inspection.**

- Since the engine, exhaust pipe, refrigerant pipe, or the like, become very hot, it may cause burns if you touch them.
- 

**Set the “Main switch” to “OFF” to stop the refrigeration unit and disconnect battery terminals and the power cord plug during inspection.**

- Otherwise, it may cause injury or an electric shock due to unexpected start.
- 

**Apply the parking brake and put chocks under wheels during inspection.**

- If the vehicle moves, it could cause injury or accident.
-

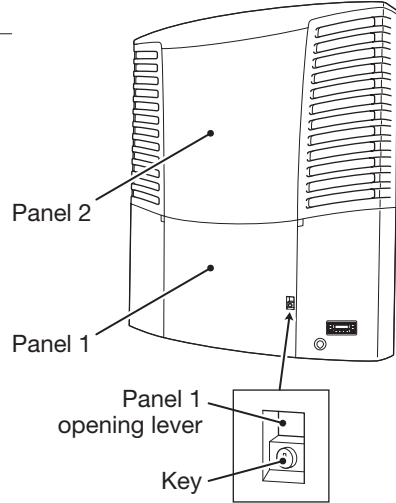
## Opening the panels

 **NOTE**

- Open the panel 1 at first.

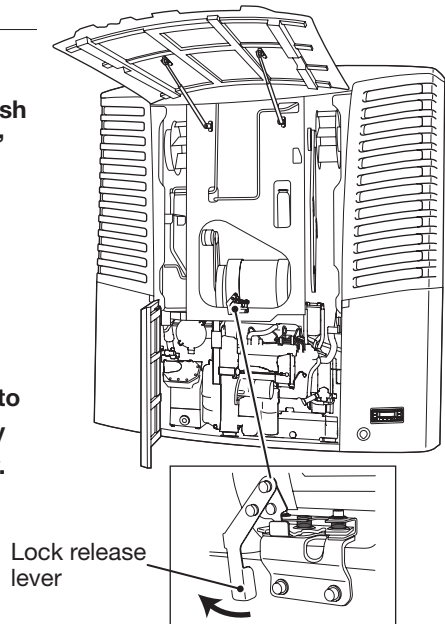
### Opening the panel 1

- 1** Unlock the key below the “Panel 1 opening lever” on the panel 1.
- 2** Push in the “Panel 1 opening lever”.  
⇒ The lock is released and the panel 1 will come out a little.
- 3** Open the panel 1 by hand.



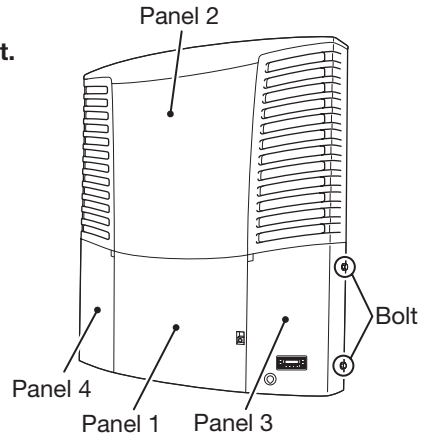
### Opening the panel 2

- 1** When the panel 1 is fully opened, push in to the left the “Lock release lever” located at the bottom center of the panel 2.  
⇒ The lock is released and the panel 2 will come out a little.
- 2** Pull up the lower end of the panel 2 to open. The panel will open upward by the force of gas spring from halfway.



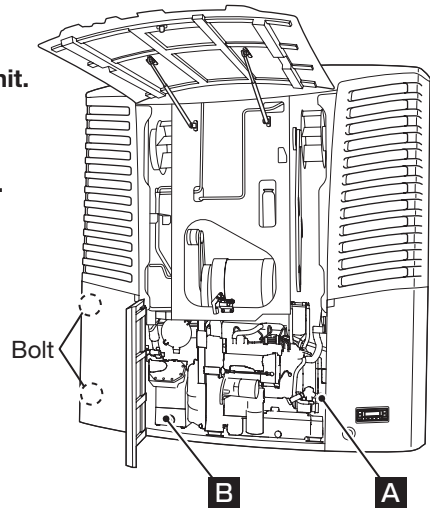
### Opening the panel 3

- 1 Remove two bolts from the side of unit.
- 2 Pull the wire loop located at the position **A** while the panel 1 is open.  
⇒ The lock is released and the panel 3 will come out a little.
- 3 Open the panel 3 by hand.



### Opening the panel 4

- 1 Remove two bolts from the side of unit.
- 2 Pull the wire loop located at the position **B** while the panel 1 is open.  
⇒ The lock is released and the panel 4 will come out a little.
- 3 Open the panel 4 by hand.



## Closing the panels

When closing the panels, from a safety standpoint, firstly close the panels 2, 3 and 4 and then close the panel 1 having protective device in the end.

### 1 Fully open the panel 1.

**NOTE**

- The panel 2 cannot be closed unless the panel 1 is fully opened.

### 2 Pull the panel 2 down by hooking the metal fitting on the panel using the pull-down bar provided at the center of the unit. Close the panel 2 by pushing in the ● position indicated in the figure at right.

⇒ The panel is locked.

### 3 Close the panels 3 and 4 by pushing in the PUSH label positions of each panel.

⇒ The panels are locked.

### 4 Close the panel 1 by pushing in the PUSH label position of the panel 1.

⇒ The panel is locked.

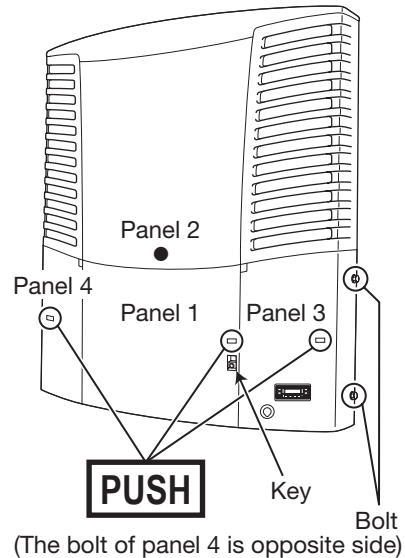
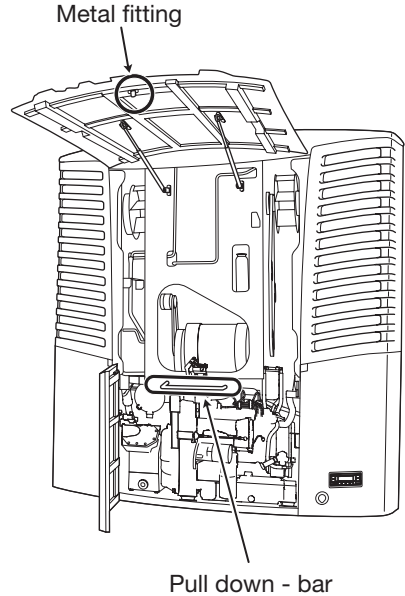
### 5 Check if panels 1 through 4 are fully locked.

### 6 Tighten the bolts on the panels 3 and 4.

### 7 Apply the lock on the key on the panel 1.

**NOTE**

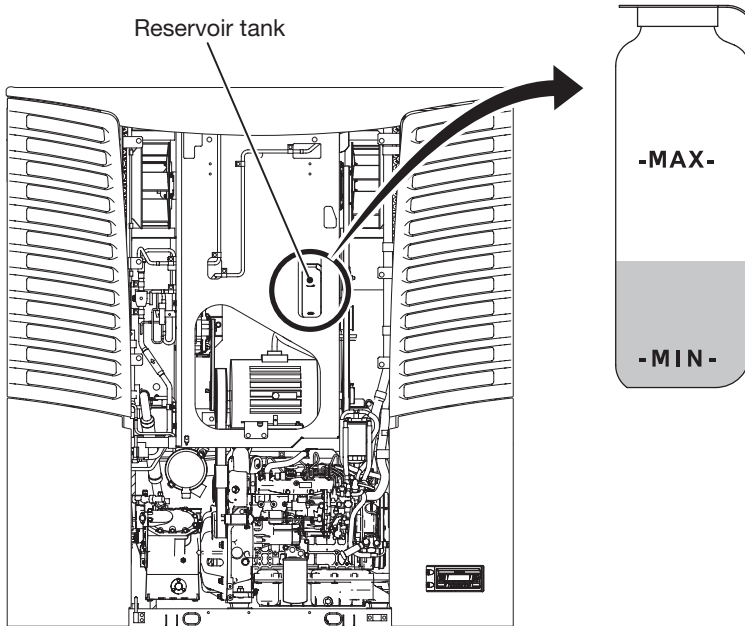
- Unless the panel is pushed in firmly, the lock will not catch properly. In such occasion, the panel may be opened during driving. Make sure to lock the panel securely.





## Daily inspection

### Inspection of cooling water quantity



### CAUTION



**Do not perform inspection of the cooling water or refill it immediately after the engine stopped.**

- High temperature steam may blow out and it may cause heat injury.



**Use the designated antifreeze coolant.**

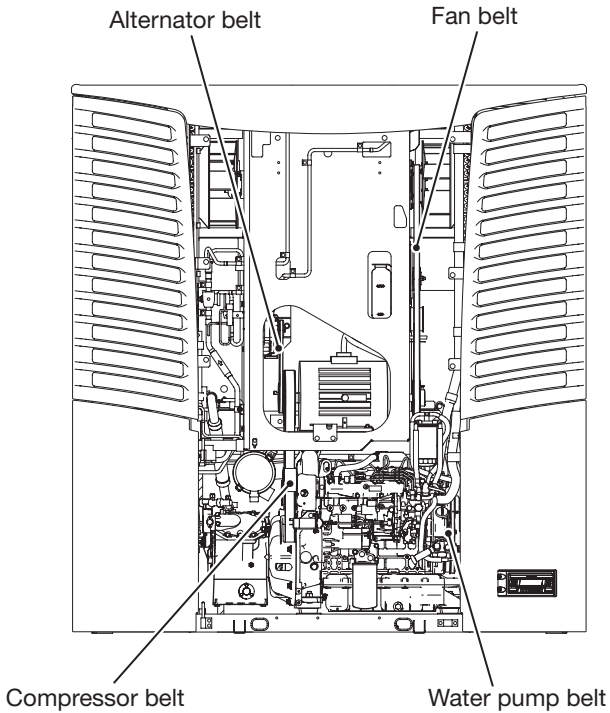
- Otherwise, it may cause troubles.

**1** Check that the fluid level is between “MAX” and “MIN” in the reservoir tank.

**2** When the fluid level is lower than “MIN”, refill the designated antifreeze coolant to the level of “MAX”.

(☞ Refer to page 72 for the designated antifreeze coolant.)

## Inspection of belt



**1** Visually inspect 4 kinds of belt for defects such as scratch, crack or one-sided wear, etc.

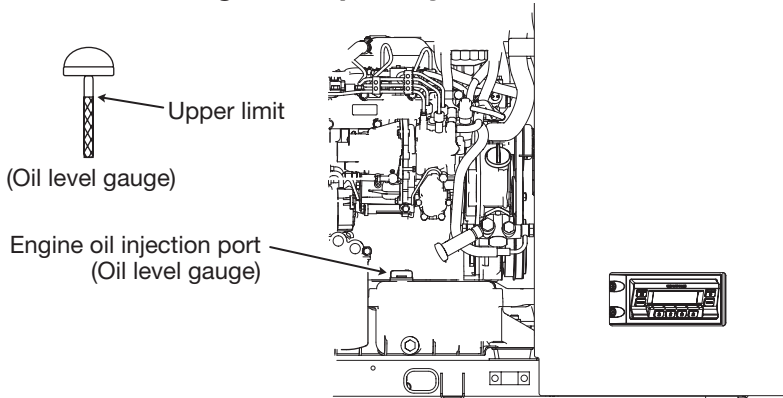
**2** Check the moving sections for interference with other parts.



**NOTE**

- When there is any abnormal condition or any slack of the belts, surely contact your nearest dealer.

## Inspection of sub-engine oil quantity



### CAUTION



**Do not perform inspection of the engine oil or refill it immediately after the engine stopped.**

- Since the engine oil becomes very hot, it may cause heat injury.

**Do not refill the engine oil excessively.**

- Engine may not be stopped due to abnormal combustion of the oil, or white smoke or oil may come up from the exhaust pipe.



**Use the designated engine oil.**

- Otherwise, it may cause troubles.

**Surely wipe off spilled engine oil during refilling.**

- If the oil is heated up, it may cause a fire.


**1** Check if the fluid level of engine oil is in the vicinity of the upper limit of the oil level gauge.

- \* Tighten the screw of oil level gauge firmly to check.

**2** When the quantity of engine oil is not enough, supply the designated engine oil from the oil injection port to the level not to exceed the upper limit.

[ Refer to page 72 for the designated engine oil.]

### NOTE

- If “Time to change oil” is displayed on the controller at the start of operation and “Engine oil inspection” exceeds 1,500 hrs in the maintenance information mode, it is the time to change engine oil. Contact your nearest dealer and request them to change the oil and the oil filter. Reset the cumulative time after changing the engine oil. ( Refer to pages from 33 to 34.)

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## Inspection of sub-engine fuel quantity

### CAUTION



**Use the designated engine fuel.**

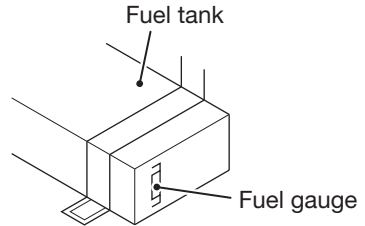
- Otherwise, it may cause damage of the engine.

---

**1** Always check the fuel quantity with the fuel level gauge to avoid running short of fuel during transportation.

**2** If there is not enough fuel left in the tank, refuel it.

[ Refer to page 72 for designated fuel.]



### NOTE

- Stop the operation with the “Operation switch” when refueling during unit operation.
- When fuel has run out, purge air from the fuel hose by the manual pump of the engine after refueling before starting operation.

---

## Inspection of leakage and wiring condition

**1** Check if there is no leakage of cooling water, engine oil or engine fuel from the tanks, pipes or connecting parts.

**2** Check if there is no damage on the wire connected to the battery.

**3** If any abnormal conditions are detected, contact your nearest dealer.

---


## Inspection with sight glass

1 Operate the refrigeration unit for 10 minutes.



2 Check if the check-color is green.

---

 **NOTE**

- If the check-color is yellow, contact your nearest dealer.
- 

---

## When continuously operating the refrigeration unit with low temperature

When operating the refrigeration unit continuously for a long time at 10°C or below, stop the unit operation once or twice a week to remove the ice in the drain pan, etc. Open up the van door to completely melt the ice in the drain pan and discharge it outside of the van.

## Periodic inspection

Please ask your nearest dealer to perform periodic inspection to ensure to use the refrigeration unit in the best condition all the time.

Periodic inspection consists of the following items.

1. Inspection at every 500 hours
2. Inspection at every 1000 hours
3. Inspection at every 1500 hours

Check the contents of inspection with the check sheet submitted after the periodic inspection.

## Periodic inspection check sheet

Customer name							Customer's signature		
Inspection interval				Refrigeration Unit	Model	TFV2000E/EM-E #/No.	BL	Delivery date	
					Ops hour	H1:[     ], H2:[     ], H3:[     ]		Inspection date	
Every 1500 hrs	Every 1000 hrs	Every 500 hrs	Daily inspection	Vehicle	Model			Inspection company	
					Serial No.			Inspector	
				Inspection item			Inspection result	Remarks	
			<input type="radio"/>	Sub-engine oil quantity- Inspection / Replenish					
			<input type="radio"/>	Fuel quantity- Inspection / Replenish					
			<input type="radio"/>	Cooling water- Inspection / Replenish					
			<input type="radio"/>	Sub-engine oil leakage check					
			<input type="radio"/>	Fuel leakage check					
			<input type="radio"/>	Cooling water leakage check					
			<input type="radio"/>	Fuel filter (for water separation) - Inspection / Drainage					
			<input type="radio"/>	Inspection of damage on belt, interference with moving sections					
			<input type="radio"/>	Battery check (fluid quantity, specific gravity, loose/corroded terminals, wiring)					
			<input type="radio"/>	Cleaning of condenser coil, radiator coil, entire refrigeration unit					
			<input type="radio"/>	Inspection of refrigerant sight glass color, refrigerant quantity, degree of flashing					
			<input type="radio"/>	Inspection of abnormal sound, abnormal vibration from refrigeration unit					
				Cleaning of air cleaner (at every 250hrs.)					
			<input type="radio"/>	Sub-engine revolution speed check, revolution sensor check, cleaning					
			<input type="radio"/>	Replacement of air cleaner					
			<input type="radio"/>	Inspection of fuel filter					
			<input type="radio"/>	Greasing of door latch, hinge, etc.					
			<input type="radio"/>	Inspection of slackened belt, damage on belt					
			<input type="radio"/>	Inspection of pulley belt groove (rust, abrasion)					
			<input type="radio"/>	Replacement of cooling water					
			<input type="radio"/>	Cleaning of evaporator coil, drain port					
			<input type="radio"/>	Inspection, retouch of painting on main unit					
			<input type="radio"/>	Inspection of damage (crack, split) on rubber cushion					
			<input type="radio"/>	Inspection of electromagnetic clutch (noise, vibration)					
			<input type="radio"/>	Inspection of sub-engine governor lever link and solenoid link related parts					
			<input type="radio"/>	Operation check of solenoid relays					
			<input type="radio"/>	Inspection of noise from centrifugal clutch					

## 7 Inspection

Customer					Customer's signature		
Inspection interval				Refrigeration Unit	Model	TFV2000E/EM-E #/No. BL	Delivery date
					Ops hour	H1:[ ], H2:[ ], H3:[ ]	Inspection date
Every 1500 hrs	Every 1000 hrs	Every 500 hrs	Daily inspection	Vehicle	Model		Inspection company
					Serial No.		Inspector
				Inspection item		Inspection result	Remarks
	<input type="radio"/>			Inspection of alternator (noise), measurement of charge amount (high speed, low speed)			
	<input type="radio"/>			Inspection, retightening of refrigeration unit mounting bolts			
	<input type="radio"/>			Inspection, retightening of mounting bolts (sub-engine, compressor, compressor head, motor, alternator, rubber cushion, pulley, electromagnetic clutch, fan, solenoid, fan shaft bearing, cover, etc.)			
	<input type="radio"/>			Inspection of gas leakage from refrigerant system, function test of valves (solenoid, expansion, DPR)			
	<input type="radio"/>			Inspection of cooling (inspection of temperature display on the display, high/low pressure, thermostat operation)			
	<input type="radio"/>			Inspection of defrost operation			
	<input type="radio"/>			Check of motor-driven movements, insulation resistance (deterioration of cables, damage on power plug)			
	<input type="radio"/>			Inspection of slackened electronic wiring terminals, damage on wire cover (battery harness, starter harness)			
	<input type="radio"/>			Motion check of high pressure switch, door switch			
	<input type="radio"/>			Inspection of dirty compressor oil			
<input type="radio"/>				Replacement of sub-engine oil (including inspection of oil leakage: at 100 hours at initial inspection only)			
<input type="radio"/>				Replacement of oil filter (at 100 hours at initial inspection only)			
<input type="radio"/>				Inspection of starter (operation, abnormal noise, vibration)			
<input type="radio"/>				Water draining from fuel tank			
<input type="radio"/>				Inspection of idling pulley bearing, tension pulley bearing, fan shaft bearing, electromagnetic clutch bearing (noise)			
				Replacement of belts, alternator, idling pulley bearing, tension pulley bearing, electromagnetic clutch bearing, fan shaft bearing, fan shaft seal (at every 4000 hrs.)			
				Inspection of wear on centrifugal clutch shoe (at every 4000 hrs.)			
				Replacement of engine stop solenoid, pre-heater, standby motor bearing, fuel hose, cooling water hose (at every 6000 hrs.)			
				Replacement of starter, engine high solenoid (at every 10000 hrs.)			
				Overhaul of sub-engine (at every 10000 hrs.)			



## Details of applicable oils and cooling water

		Type / Name	Capacity
Engine fuel		Diesel fuel * <sup>1</sup>	-
Engine oil		Type API Class CE or higher 10W-30	13.5L (including engine oil filter)
Compressor oil		Diamond Freeze MA32R	2.4L
Cooling water	Antifreeze coolant * <sup>2</sup>	Fuso Diesel Long Life Coolant	7.8L (including reservoir)
	Water	Soft water with fewer impurities	

\*<sup>1</sup> At a cold region, use a type of kerosene adapted to the cold weather. Otherwise, the fuel could freeze and damage the engine.

\*<sup>2</sup> Use the antifreeze coolant with the following concentrations according to the lowest ambient temperature of the region.

Antifreeze coolant concentration (%wt)	30	35	40	45	50	55	60
Antifreeze coolant quantity (L)	2.34	2.73	3.12	3.51	3.90	4.29	4.68
Lowerst ambient temperature (°C)	-10	-15	-20	-25	-30	-35	-40

\*Initial setting: Antifreeze coolant concentration: 50%wt

### NOTE

- Adjust antifreeze coolant concentration according to the expected lowest ambient temperature.  
If it is not appropriate, the cooling water may be frozen and cause the damage of the radiator or engine.
- As the cooling water is an industrial waste, observe the applicable laws and regulations in your country to dispose it.

## Power supply system

(50Hz)

Specification of power supply (for Motor drive)					
Capacity of power supply (kVA)	Switch		Voltage fluctuation	Voltage drop at start-up	Interphase imbalance
	Molded-case circuit breaker	Rated capacity of over-current breaker (A)			
31.2	Capacity of switch (A)	100	Within 10% of rated voltage	Within 15% of rated voltage	Within 3%

## 8 Operation or stop for long period of time

### When operating at a low inside container temperature for a long period of time:

If the refrigeration unit is operated for a long period of time with the inside container temperature below 10°C, ice will grow on the drain pan, etc. Stop the operation of refrigeration unit once or twice every week and open up the door on the vehicle body to return the inside of container to ordinary temperature and melt grown ice.

### CAUTION



**Park the vehicle at a flat place to operate the refrigeration unit.**

- Otherwise, the evaporator becomes unable to drain and water overflows in the container, damaging cargoes with water.

### When stopping the refrigeration unit for a long period of time:

To prevent troubles by stopping for prolonged time, operate the refrigeration unit for 15 minutes once every 3 to 4 days.

A protective operation for extended interruption of operation will be automatically conducted if the duration of operation stop continues for one week. (☞ Refer to page 74)

### NOTE

- When the unit is stopped for a long period of time, the protective operation will be conducted automatically. Follow the instruction of section 3 "Precaution for safety".
- When the unit is to be stopped with a situation unable to operate for a long period of time due to trouble and so on, contact with your nearest dealer to take measures for long-term stopping.

---

## Sleep operation (Long-term stop protection)

If the refrigeration unit is left over without operating for one week, protective operation (long-term stop protection operation) is conducted automatically.

☞ Refer to page 30 for setting the sleep operation.

- Protective operation is conducted between 10:00 and 16:00 hours.
- The operation time is approximately 5 minutes including the time for start and stop of sub-engine.
- When the unit is connected to the commercial power supply, the unit operates with the motor drive irrespective of the position of the drive selector switch.
- In case of the sub-engine drive, the unit operates with the sub-engine slow speed.
- There is no air supply in the container. (Evaporator fan does not operate.)
- During the protective operation, “Long term stop battery operation” is displayed on the LCD.

---


## Pre-operation preparation

Set the refrigeration unit in the following conditions to conduct long-term protection operation.

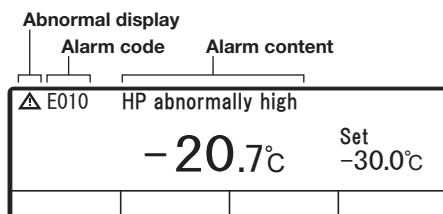
- Turn the main switch to “ON” side.
- Leave the battery terminals be connected.
- Close all the panels of the refrigeration unit.
- Fill the fuel tank. (Or, leave the power cable be connected to the commercial power supply.)

## 9 For emergency

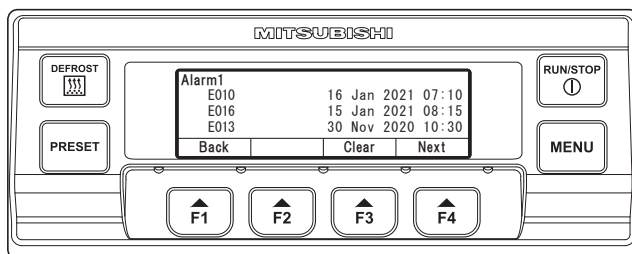
### Alarm display

- If any error occurs, the abnormal display  lights or blinks on the LCD (the backlight lights or blinks).
- Check the alarm code displayed at the right-hand side of the abnormal display. (If it is a light error, the alarm content at the right-hand side of the alarm code is not displayed.)

When no error code is displayed at the LCD, change to the alarm display as described below, and check the alarm content.



### Switching “Normal display” and “Alarm display”



#### Switching from “Normal display screen” to “Alarm display mode”

Press once each on the [MENU] switch, [F3(▼)] switch and [F4(Select)] switch. (The display returns to the “Normal display screen” 20 seconds later.)

#### Switching from “Alarm display mode” to “Normal display screen”

Press the [F1(Back)] switch 2 times on the extended display of “Alarm display mode”. (The screen changes to “Normal display screen” in 20 seconds in case of 1 press.) or hold down [MENU] switch.

---

## Countermeasures

Refer to “List of alarm codes” for the contents of each alarm code and its countermeasure.

(☞ Refer to pages 79 to 81)

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### CAUTION



**Surely follow the instructions of this operation manual for the countermeasures of the troubles.**

- Otherwise, it may cause injury or an electric shock due to unexpected start.
- 

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## Changing the fuse

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### CAUTION



**Use the fuse with designated capacity and specification.**

- If any other fuses or other substitutes are used, it may cause a fire or an electric shock.
- 

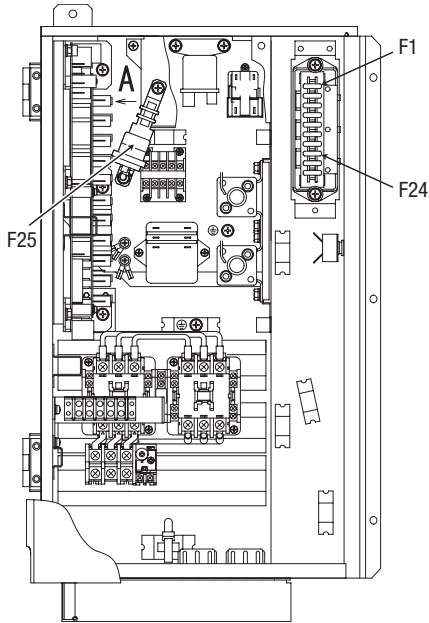
**Surely stop the operation of refrigeration unit with the “Operation switch” and set the “Main switch” to “OFF”, then disconnect the battery terminal and plug for power code to change the fuse.**

- Otherwise, it may cause injury or an electric shock due to unexpected start.
-

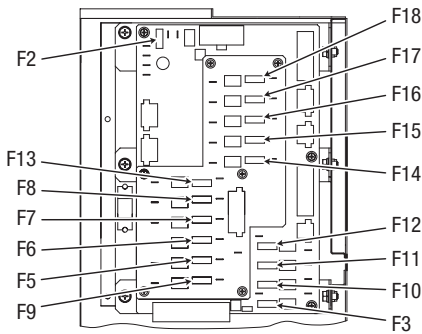
## 9 For emergency

Fuses are mounted in the control box of refrigeration unit.

■ Common to single spec. (TFV2000E-E) and multi spec. (TFV2000EM-E)



- F1 : 15 A (operation circuit)
- F2 : 15 A (Relay circuit)
- F3 : 10 A (Fan electromagnetic clutch)
- F5 : 15 A (Evaporator fan motor B1)
- F6 : 15 A (Evaporator fan motor B2)
- F7 : 15 A (Evaporator fan motor B3)
- F8 : 15 A (Evaporator fan motor B4)
- F9 : 30 A (Throttle solenoid)
- F10 : 10 A (Output during operation)
- F11 : 10 A (Output at error occurrence)
- F12 : 10 A (Output at deviation from adequate temperature)
- F13 : 15 A (Evaporator fan motor C1)
- F14 : 15 A (Evaporator fan motor C2)
- F15 : 15 A (Evaporator fan motor C3)
- F16 : 15 A (Evaporator fan motor C4)
- F17 : 10 A (Drain hose heater B)
- F18 : 10 A (Drain hose heater C)
- F24 : 5 A (Remote monitoring (Option))
- F25 : 3 A (Sleep mode line fuse)



View A

## When you contact your nearest dealer

When you contact your nearest dealer for the trouble occurred during operation of the refrigeration unit, give them the following information.

- Company name
- Customer's name
- Company telephone number
- Number of the plate
- Type of the refrigeration unit
- Present location of the vehicle
- Destination
- Kind of cargo
- Setting temperature
- Present inside container temperature
- Specific condition of trouble
- Alarm code displayed in the digital display area.

## Resuming operation after an emergency stop

If a remark "Automatic operation resume" is written in the column for the Unit Condition in the list of alarm codes, the operation will resume as soon as required conditions are satisfied. If a remark "Unit stops" is written in the same column, start the operation in usual procedure after removing causes of the troubles.

### Resuming operation after an emergency stop

- Press the RUN/STOP switch on the controller to stop the unit. (Confirm that the LCD display is turned off.)
- Press the RUN/STOP switch again to resume the operation of the unit.

## CAUTION



**If the unit stops by the same trouble immediately after the operation is resumed, stop the operation and contact your nearest dealer.**

- Otherwise, it may cause serious damages or accidents.

## List of alarm codes

Alarm Code	Trouble	Countermeasure	Alarm Lamp	Unit Condition
E004	Throttle solenoid fuse break	Fuse F9 has blown. Replace fuse F9 (30 A) in the control box. If trouble persists after replacement, ask a dealer for inspection.	Blinking	Unit operation continues. (Emergency operation with low engine speed only)
E006	Load drive circuit fuse break	Fuse F2 has blown. Replace fuse F2 (15 A) in the control box. If trouble persists after replacement, ask a dealer for inspection.	On	Unit stops.
E009	Commercial power supply defective	Commercial power supply is in failure or disconnected. Check the power supply.	Blinking	Unit stops. (Automatic operation resume)
E010	HP abnormally high	High-pressure switch has tripped. (1) Open the panel 1 and inspect the condenser fan drive system for any abnormality. (2) Check to see if the condenser coil is fouled heavily. If so, cleanse it with water. (High-pressure cleansing is prohibited.)	On	Unit stops.
E013	Td abnormally high	Refrigerant temperature at the compressor discharge side has reached the protective temperature. Consult a dealer.	Blinking	Unit stops. (Automatic operation resume)
			On	Unit stops.
E016	LPT failure	Refrigerant pressure at compressor suction side has dropped to the protective pressure, or low-pressure sensor is in failure. Ask a dealer for inspection.	On	Unit stops.
E017	HP failure	High-pressure sensor is in failure. Ask a dealer for inspection.	Blinking	Unit stops.
E020	Engine oil depleted	Engine oil level switch has tripped. Replenish engine oil (Diesel, 10W30, CE or above) until oil level comes to the upper limit of oil level gauge.	On	Unit stops.
E021	Engine coolant temperature high	Engine cooling water temperature switch has tripped. Inspect the water quantity in the reservoir tank and replenish if necessary. Also inspect and clean the radiator (heat exchanger placed at right as seen facing the refrigeration unit).	On	Unit stops.
E023	Engine speed abnormally low	Engine speed is extremely low. Ask a dealer for inspection	On	Unit stops. (Automatic operation resume repeats up to 9 times.)
E024	Engine start failure	Inspect the fuel tank to see if fuel is reserved. If fuel is reserved, inspect the battery.	On	Unit stops.
E027	Engine speed abnormally high	Engine speed has increased far beyond the setting value. Ask a dealer for inspection.	On	Unit stops.
E030	Unit panel not close	Unit panel is open. Close all the panels completely.	Blinking	Unit stops. (Automatic operation resume)
E031	OCR tripped	Motor over-current protection device has tripped. Ask a dealer for inspection.	Blinking (lights after 1 blinking)	Unit stops. (Automatic operation resume repeats up to 1 times.)
E032	Alternator generation not enough	Power generation signal from the alternator is not detected. When the unit operation has been stopped due to this error, ask a dealer for inspection.	Blinking (On when battery voltage is low.)	Unit operation continues. (Unit stops when battery voltage is low.)
E033	HTS tripped	Electric heater device has tripped. Ask a dealer for inspection.	Blinking	Unit operation continues.
E050	TH failure	Return air temperature sensor A or B or C is disconnected or shorted. Ask a dealer for inspection.	Blinking	Unit operation continues.
E054	Throttle solenoid failure	Engine cannot operate at high speed due to failure on throttle solenoid. Ask a dealer for inspection.	Blinking	Unit operation continues.



## 9 For emergency

Alarm Code	Trouble	Countermeasure	Alarm Lamp	Unit Condition
E060	HPS failure	High-pressure switch has failed. Ask a dealer for inspection.	Blinking	Unit stops. (Automatic operation resume)
E063	Td sensor failure	Discharge gas temperature sensor is disconnected or shorted. Ask a dealer for inspection.	Blinking	Unit operation continues.
E070	OPS failure	Engine oil pressure switch has failed. Ask a dealer for inspection.	On	Unit stops.
E081	OCR failure	Motor over-current protection device has failed. Ask a dealer for inspection.	On	Unit stops.
E099	Controller communication failure	Controller cannot communicate properly. Ask a dealer for inspection.	On	Unit stops. (Automatic operation resume repeats up to 9 times.)
E201	Contacting failure	Motor contactor has failed to operate properly. Ask a dealer for inspection.	On	Unit stops.
E202	R/L1-phase loss (standby)	L1-phase of commercial 3-phase power supply is open-phased (no current). (When L2 or L3 phase has open-phased, no error occurs but the motor does not rotate.) Ask for inspection on electric power supply.	Blinking	Unit operation continues.
E203	Fan clutch fuse break	Fuse F3 has blown. Replace the fuse F3 (10A) in the control box with a spare fuse. If the same trouble repeats after the replacement, ask a dealer for inspection.	On	Unit stops.
E204	DCS fuse break	Fuse F10, F11 or F12 has blown. Replace the blown fuse (10A) in the control box. If the same trouble repeats after the replacement, ask a dealer for inspection.	Blinking	Unit operation continues.
E205	Drain hose heater fuse break	Fuse F17 or F18 has blown. Replace the blown fuse (10A) in the control box. If the same trouble repeats after the replacement, ask a dealer for inspection.	Blinking	Unit operation continues.
E210	Pump down failure	Pump down error has been detected during self diagnosis operation (PTI operation).	On	Unit stops.
E220	Engine oil replenishment request	Engine oil reserved scarcely. Replenish engine oil (Diesel, 10W30, CE or above) until oil level comes to the upper limit of oil level gauge.	Blinking	Unit operation continues.
E221	Engine low speed failure	Engine low speed is extensively deviated from the rated speed. Ask a dealer for inspection.	Blinking	Unit operation continues.
E222	Engine high speed failure	Engine high speed is extensively deviated from the rated speed. Ask a dealer for inspection.	Blinking	Unit operation continues.
E223	Engine stall	Engine stalls frequently. Check if fuel exists in the fuel tank. If fuel exists, ask a dealer for inspection.	On	Unit stops.
E250	EVT sensor failure	Evaporator outlet temperature sensor A or B or C is disconnected or shorted. Ask a dealer for inspection.	Blinking	Unit operation continues.
E252	THD sensor failure	Supply air temperature sensor A or B or C is disconnected or shorted. Ask a dealer for inspection.	Blinking	Unit operation continues.
E256	ATS sensor failure	Ambient air temperature sensor is disconnected or shorted. Ask a dealer for inspection.	Blinking	Unit operation continues.
E260	Defrost SV failure	Defrost solenoid valve (SV2-A1 or SV2-M) has failed. Ask a dealer for inspection.	On	Unit stops.
E261	Defrost SV failure (Zone X)	Defrost solenoid valve (SV2-A2 or SV2-B or SV2-C) has failed. Ask a dealer for inspection.	On	Unit stops.

## 9 For emergency

Alarm Code	Trouble	Countermeasure	Alarm Lamp	Unit Condition
E263	Unloader SV failure	Compressor unloader solenoid valve has failed. Ask a dealer for inspection.	Blinking	Unit operation continues.
E264	Condenser inlet SV failure	Condenser inlet solenoid valve (SV4) has failed. Ask a dealer for inspection.	On	Unit stops.
E265	Liquid bypass SV failure	Liquid bypass solenoid valve (SV5) has failed. Ask a dealer for inspection.	On or blinking	Unit operation continues. (Operation stops at PTL)
E266	EEV failure	Electronic expansion valve (EEV-A or -B or -C) has failed. Ask a dealer for inspection.	On	Unit stops.
E267	Receiver pressurizing SV failure	Receiver pressurizing solenoid valve (SV7) has failed. Ask a dealer for inspection.	Blinking	Unit operation continues.
E268	Buzzer failure	Buzzer circuit is shorted. Ask a dealer for inspection.	On or blinking	Unit stops. (Operation continues partially.)
E269	Stop solenoid&relay failure	Stop solenoid circuit is disconnected or shorted. Ask a dealer for inspection.	On	Unit stops.
E270	Starter relay circuit failure	Drive coil circuit of starter relay (SR) is disconnected or shorted. Ask a dealer for inspection.	On	Unit stops.
E271	ARMO circuit failure	Drive coil circuit of motor relay (ARMO) is disconnected or shorted. Ask a dealer for inspection.	On	Unit stops.
E272	Pre-heater relay circuit failure	Drive coil circuit of pre-heater relay (ARPH) is disconnected or shorted. Ask a dealer for inspection.	On	Unit stops.
E273	Electric heater relay failure (Option)	Drive coil circuit of evaporator electric heater relay A or B or C is disconnected or shorted. ASK a dealer for inspection.	Blinking	Unit operation continues.
E280	Battery voltage low	Battery voltage has dropped. Replace the battery if aged.	On or blinking	Unit stops. (Operation continues partially.)
E281	Evaporator fan motor fuse break	One or more of evaporator fan motor fuses F5, F6, F7, F8, F13, F14, F15 and F16 have blown. Replace the blown fuse (15A) in the control box. If the same trouble repeats after the replacement, ask a dealer for inspection.	Blinking	Unit operation continues.

# 10 Specification

Item		Type	TFV2000E-E		
Freezing capacity	Conditions (Ambient temperature 30°C)	°C	Return air temperature -20 <sup>-3</sup>	Return air temperature 0 <sup>-3</sup>	
	Motor drive (50Hz)	W	5200	10900	
	Sub-engine drive		7550	16200	
Functions			Cooling/heating		
Working environment	Inside container temperature	°C	-30 to +25		
	Ambient temperature		-20 to +40		
Unit dimensions	W×H×D	Outside	2000×2138×430		
		Inside	1659×1150×100		
Unit weight		kg	890 (Excluding battery)		
Drive system			Exclusive sub-engine and motor		
Operating system			Automatic start/stop and continuous operation selection		
Sub-engine	Model		4TNV86F-BWMR		
	Displacement		cm <sup>3</sup>	2091	
	Bore × Stroke × Cylinders		mm	φ86×90×4	
	Continuous operation fuel consumption		L/h	5.2 (Ambient temperature 30°C, inside container 0°C)	
	Oil capacity		L	13.5 (Diesel oil 10W30, CE (API))	
	Fuel			Diesel fuel	
Rated output / speed		kW/min <sup>-1</sup>	High speed: 18.9/2000, low speed: 17.7/1450		
Compressor	Model		CR2453LVR-A		
	Working speed		min <sup>-1</sup>	High speed: 2000, low speed: 1450	
	Bore × Stroke × Cylinders		mm	φ55×55.6×4	
	Compressor oil charge volume		L	2.4 (Diamond Freeze MA32R)	
Evaporator	Type		Aluminum fin & copper tubes		
	Fan		Double suction turbo fan with casing		
	Fan speed		min <sup>-1</sup>	Sub-engine drive: high speed 2430, low speed 1760, standby motor drive (50Hz): 1333	
Condenser	Type		Aluminum fin & copper tubes		
	Fan		Turbo fan × 2		
	Fan speed		min <sup>-1</sup>	Sub-engine drive: high speed 2430, low speed 1760, standby motor drive (50Hz): 1333	
Standby motor	Type		Totally-enclosed fan-cooled outdoor type		
	Power supply		3-phase AC 400V 50Hz		
	Number of poles		4		
Refrigerant charge volume		kg	R452A, 8.1		
Design pressure	High pressure side	MPa	3.24		
	Low pressure side		2.26		
Sound power level		dB	104		
Inside container temperature control			Electronic thermostat		
Operation control			Microcomputer controller		
Defrosting device			Automatic (with defrost timer) and manual		
Safety device			High-pressure switch, engine oil pressure switch, engine water temperature switch, fusible plug, motor over-current relay, limit switch		

# 10 Specification

Item			Model	TFV2000EM-E				
Evaporator unit type				Host eva. <sup>2</sup>	TMEVX			
					-L <sup>3</sup>	-MW <sup>3</sup>	-M <sup>2</sup>	-S <sup>3</sup>
Freezing capacity <sup>*1</sup>	Ambient temperature		°C	30	30	30	30	30
	Inside container temperature	0°C	W	16990	10700	9700	8700	7400
-20°C		8522		5700	4900	4636	4100	
Function				Refrigeration/heating				
Working environment	Inside container temperature		°C	-30~+25				
	Ambient temperature			-20~+40				
Unit dimensions	W×H×D	Outer side	mm	2000 × 2138 × 430				
		Evaporator		1659 × 1150 × 100	2000× 200× 743	1450× 200× 743	1000× 200× 743	760× 200× 743
Unit weight			kg	920 (Excluding battery)	50	37	31	25
Drive system				Dedicated engine (diesel) and motor				
Operating system				Automatic start/stop and continuous operation selection				
Engine	Model			4TNV86F-BWMR				
	Displacement		cm <sup>3</sup>	2091				
	Bore × Stroke × Cylinders		mm	ø86 × 90 × 4				
	Continuous operation fuel consumption		ℓ/h	5.2 (Ambient temperature 30°C, Inside container 0°C)				
	Oil capacity		ℓ	13.5 (Diesel oil 10W30, CE (API) or above)				
	Fuel			Diesel fuel				
Rated output / speed			kW/min <sup>-1</sup>	High speed: 18.9/2000, Low speed: 17.7/1450				
Compressor	Model			CR2453LVR-A				
	Working speed		min <sup>-1</sup>	High speed: 2000, Low speed: 1450				
	Bore × Stroke × Cylinders		mm	ø55 × 55.6 × 4				
	Refrigeration machine oil charge volume		ℓ	2.4 (Diamond Freeze MA32R)				
Evaporator	Type			Aluminum fin & copper tubes				
	Fan	Type		Double suction turbo fan with casing	Turbo fan			
		Outer diameter		310	222			
	Quantity	mm	1	4	3	3	2	
Condenser	Type			Aluminum fin & copper tubes				
	Fan			ø440 Turbo fan × 2				
Motor	Type			Totally-enclosed fan-cooled outdoor type				
	Power supply			3-phase AC 400V 50Hz				
	Number of poles			4				

Item	Model	TFV2000EM-E
Refrigerant charge volume	kg	R452A, 11.3
Inside container temperature control		Electronic thermostat
Operation control		Microcomputer controller
Defrosting device		Automatic (with defrost timer) and manual
Safety device		High-pressure switch, engine oil pressure switch, engine water temperature switch, fusible plug, motor over-current relay

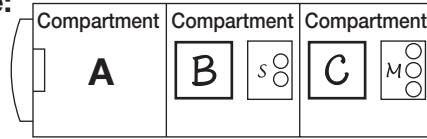
Note \*1: Freezing capacity shows the value in case of single evaporator operation.

\*2: ATP tested.

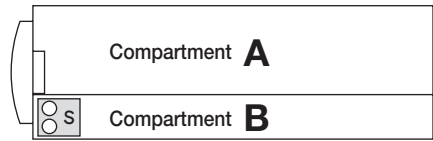
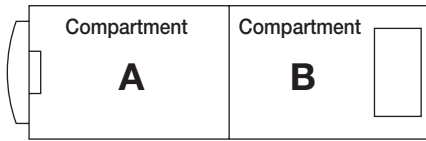
\*3: ATP untested, internal test result.

# Arrangement of compartments A, B and C

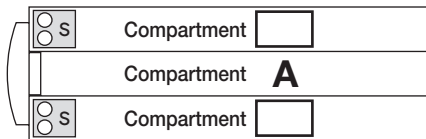
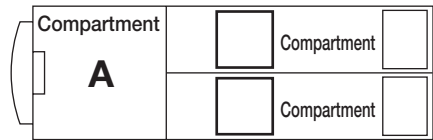
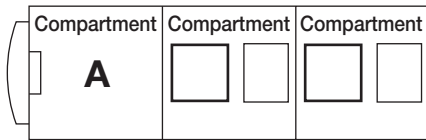
Entry example:



**In case of 2-compartment layout:**



**In case of 3-compartment layout:**



Draw the partitions and designation of compartments A, B and C on the figure below if any other layout than above is expected.







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