



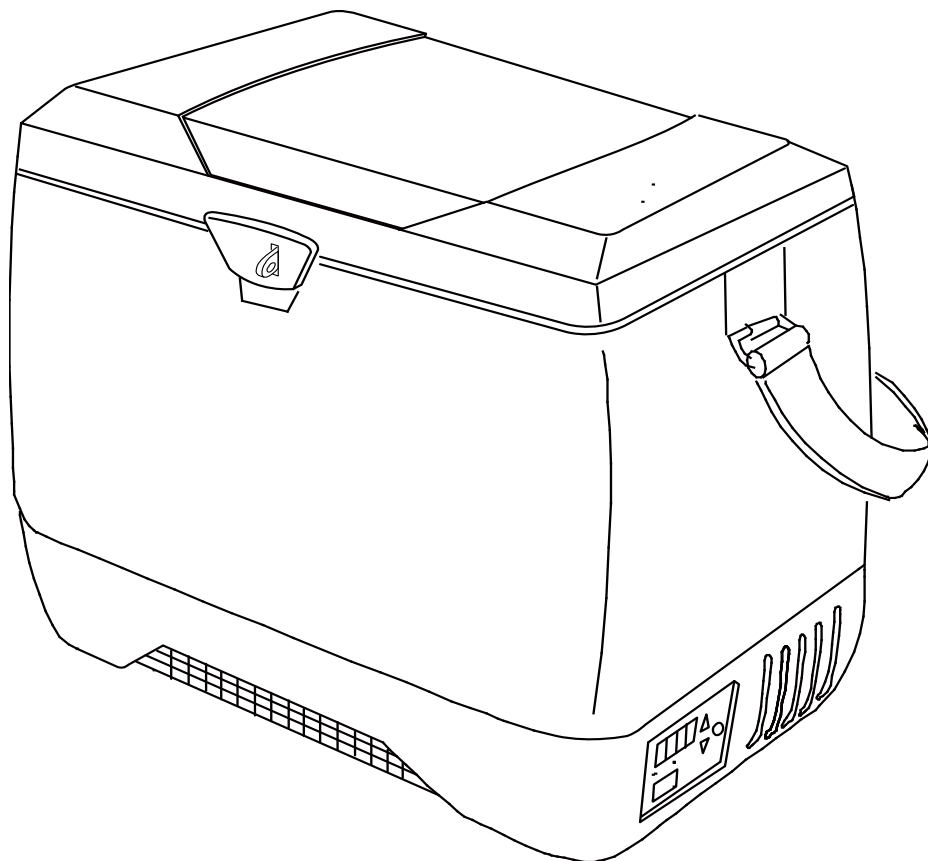
ENGEL

SERVICE MANUAL

MODEL :

MHD13F-DM

0642 013 4020



SAWAFUJI ELECTRIC CO.,LTD.

2020.12

#1

This service manual describes maintenance procedures for ENGEL refrigerator.

This manual is intended for repair engineers who are familiar with basics service skills and knowledge for ENGEL refrigerator.

This manual does not guarantee correct maintenance when service is done by a non-skilled worker without technical knowledge.

Note that the content of this booklet including product specifications is subject to change for improvement without notice.

● FOR REFRIGERATOR USERS



- Failing to service properly may result in poor reliability of the refrigerator.
- Read this booklet carefully and perform servicing with great care.
- Always comply with the procedures, directions, and work tips in this booklet when servicing the refrigerator.

● FOR SAFETY OF YOURSELF

- To secure safe and correct servicing, read this manual thoroughly in advance and check if there are protective equipment and appropriate tools and service parts ready as well as technical skills necessary to perform servicing.

● SAFETY SYMBOLS

- The following warning labels in this booklet indicate precautions for service work. Comply with what each symbol indicates whenever it appears.

 DANGER	May lead to death or serious injury if failed to comply with this precaution
 CAUTION	May lead to injury if failed to comply with this precaution
WORK TIPS	Lead to failure of the refrigerator set or its components if failed to comply with this precaution

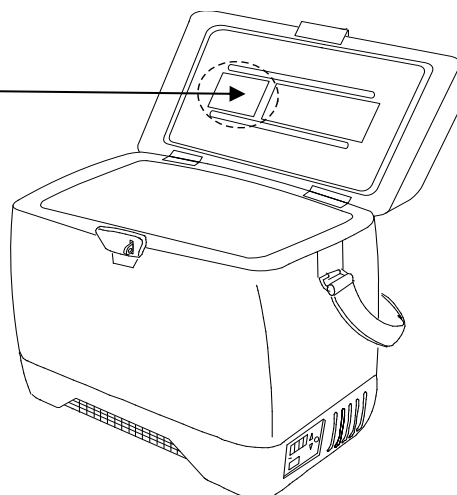
● REFRIGERATOR MODEL

- This manual is compatible with described model in below.

Please check refrigerator model.

(Lable place as picture)

MODEL
MHD13F-DM



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1. SPECIFICATIONS

■ Specifications Table

MODEL		MHD13F-DM	
MODEL CODE		0642 013 4020	
STORAGE VOLUME	L	13	
EXTERIOR DIMENSIONS W×D×H	in	17.4×11.2×14.6 ※	
	mm	442×284×372 ※	
INTERIOR DIMENSIONS W×D×H	in	13.7×7.5×7.5 ※	
	mm	348×190×190 ※	
DOOR	Material	Polypropylene resin	
	Heat insulator	Foamed polyurethane	
CABINET	Material	Polypropylene resin	
	Heat insulator	Foamed polyurethane	
INPUT VOLTAGE	V	DC 12/24	
INPUT CURRENT	Refrigerator (With fan)	A	DC12V/3.0A DC24V/1.5A
	Warm (The fan motor stop)	A	DC12V/2.8A DC24V/1.4A
COMPRESSOR RATING		AC 15V, 27W	
REFRIGERANT		Dichlorodifluoromethane (HFC-134a)	
TEMPERATURE RANGE		-18°C to 45°C (Ambient of 25°C at no load)	
TEMPERATURE CONTROL		Automatic temperature control by dial setting (Electronic thermostat control type)	
WEIGHT	LBS.	25.3	
	Kg	11.5	

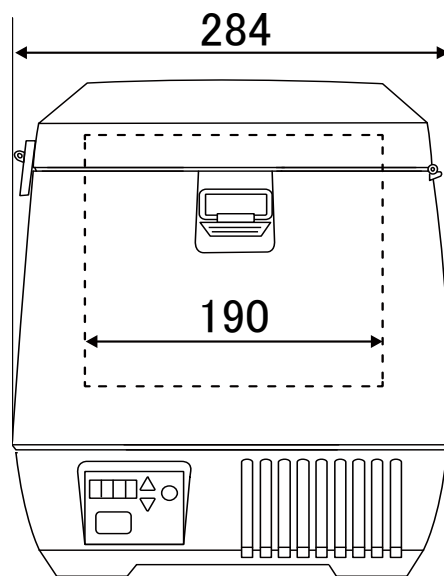
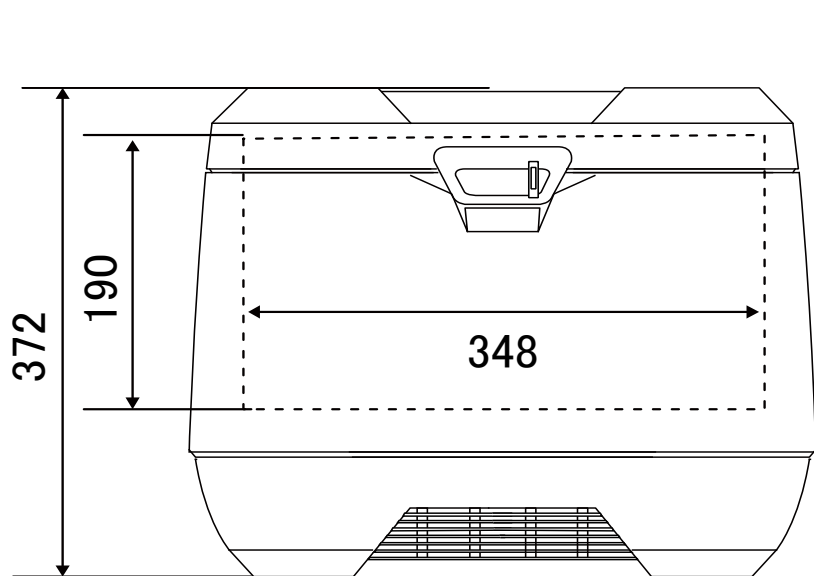
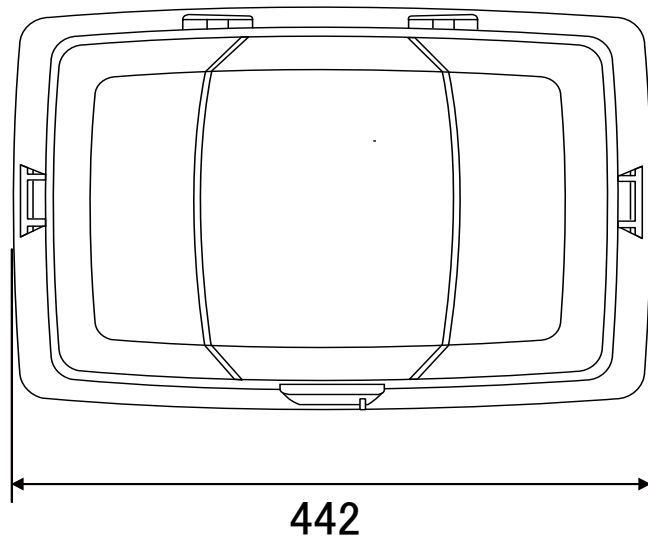
※ Tolerance is omitted

1. SPECIFICATIONS

■ Dimensions

※ Tolerance is omitted

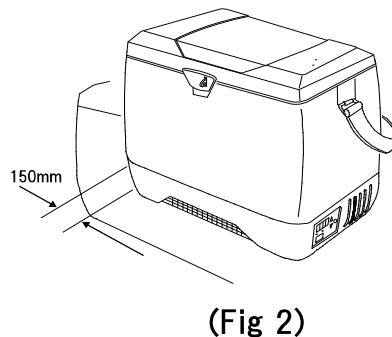
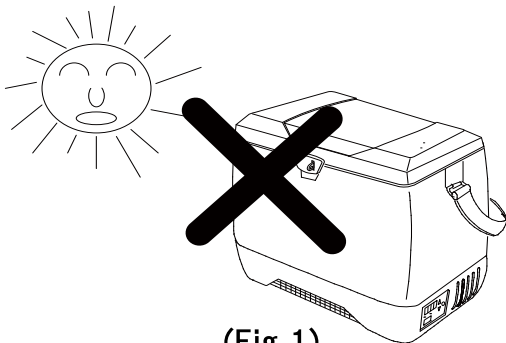
(mm)



2. INSTALLING A REFRIGERATOR

■ Installation

- ① Your shockproof fridge should be installed on a level and solid surface although it will operate satisfactory for long period on angles of up to 30° .
- ② Be sure your fridge is not in direct sunlight, (Fig 1) near a gas stove, heater, or other heat-generating appliances.
- ③ In order to get good cooling performance and less current consumption, adequate ventilation for refrigerator is needed.
- ④ Install refrigerator away from each wall at least 150mm or more. (Fig 2)
- ⑤ Avoid installing your fridge close to a kitchen sink or faucet. (water)
- ⑥ Clean the interior with a cloth moistened in warm water and wipe with a dry cloth.
- ⑦ Never use the ENGEL refrigerator inside a freezer container car or refrigerator container car.
Condensation can easily occur in the interior of the refrigerator container car and freezer container car, causing water drops to fall in the refrigerator and damage the equipment.



2. INSTALLING A REFRIGERATOR

■ Temperature Setting

Set the cabinet inside air temperature range by means of the Temperature controller.

TEMPERATURE SETTING (see Fig 6)□

Temperature range – Achievable temperature from $-18 \sim 55^{\circ}\text{C}$ ($0 \sim 131^{\circ}\text{F}$) at Ambient of 25°C (77°F).□

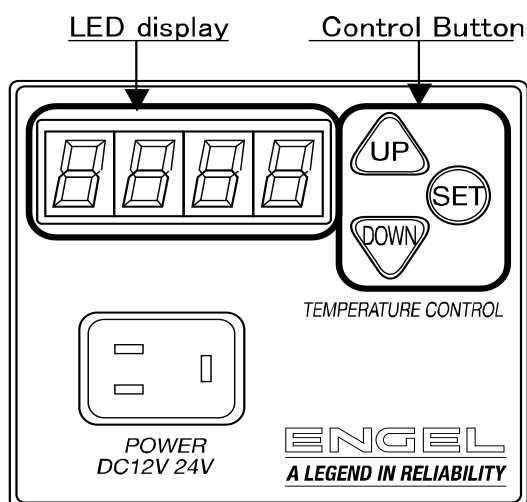
The preset temperature is displayed when the LED starts blinking.□

The approximate interior temperature of the cabinet will be displayed once the LED lights up.□

When the “SET” button is depressed for 3 seconds (long push), the LED display will blink.□

During this mode, the cabinet temperature can be selected by pressing the “UP” and ”DOWN” button.□

Pressing/holding onto the “UP” and ”DOWN” buttons will continuously change the range of the temperature.



(Fig 6)

After pre-setting the temperature, the LED display will stop blinking (after a few seconds), indicating the temperature has been set (lock).

It is not necessary to reset the temperature again as the temperature has been stored.

The product will now operate at the selected temperature.

SELECTING TEMPERATURES ($^{\circ}\text{C}$ or $^{\circ}\text{F}$).

It is possible to select between Celsius or Fahrenheit with product.

When the “SET” button is depressed for 3 seconds, the LED display will blink. Pressing the “SET” button during this mode will display the $^{\circ}\text{C} \rightarrow ^{\circ}\text{F} \rightarrow ^{\circ}\text{C} \rightarrow ^{\circ}\text{F}$ change.

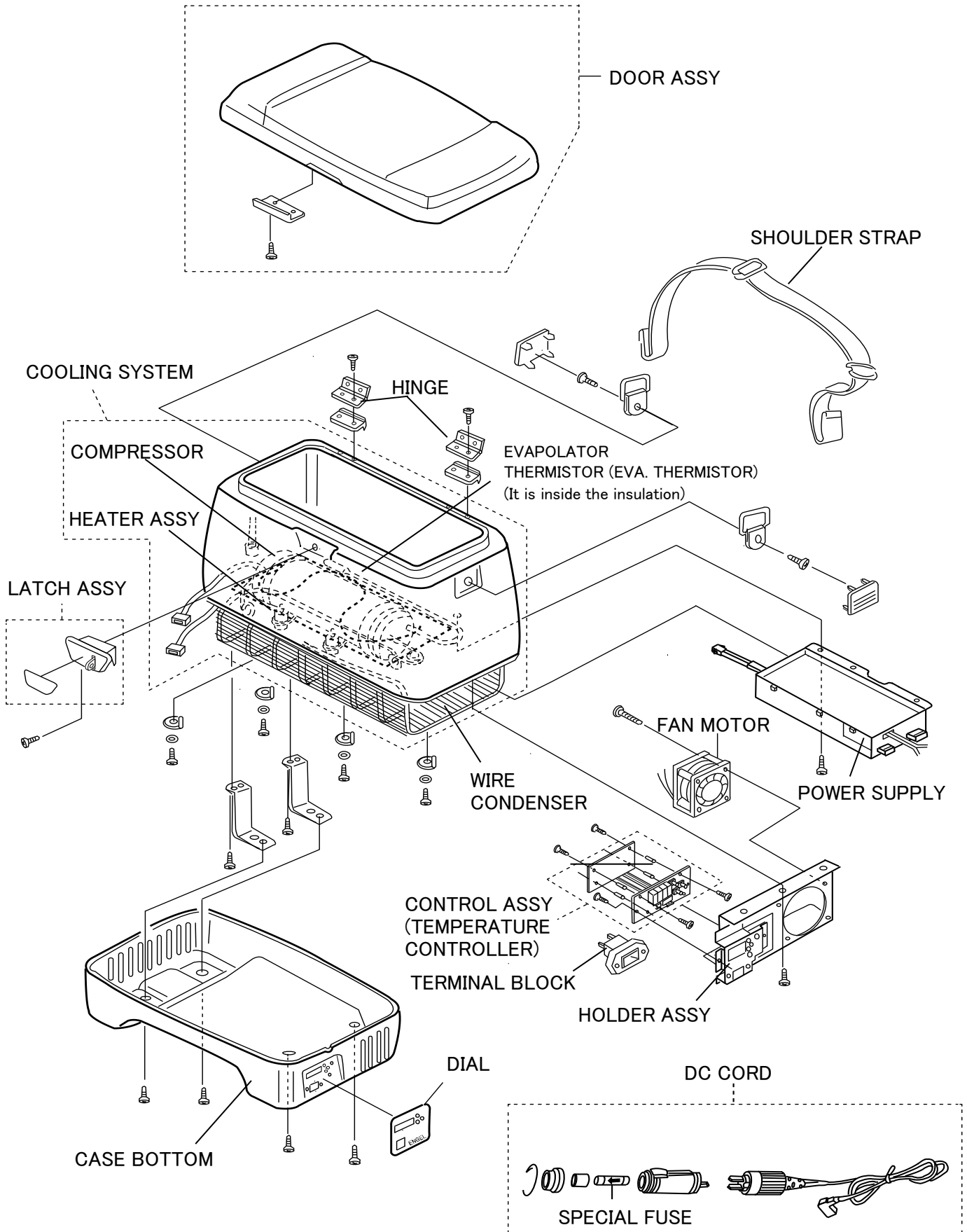
After pre-setting the temperature, the LED display will stop blinking (after a few seconds), indicating the temperature has been set (lock).

TROUBLESHOOTING

Error message will be displayed if the voltage of the battery is low or in the event of any malfunctions – (See page 9).

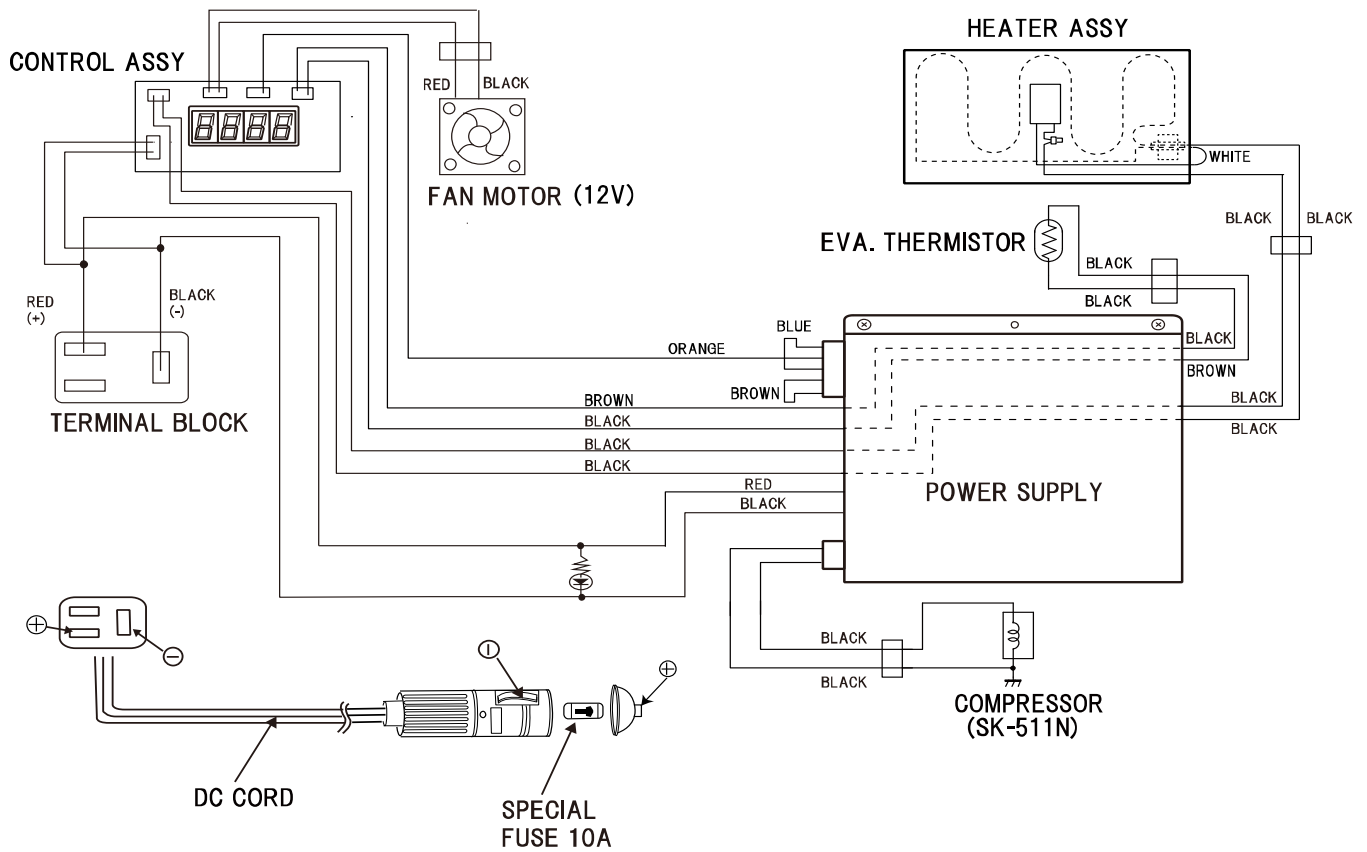
When error message is displayed, the unit will be on “standby mode”. Operations will stop.

3. PARTS NAME

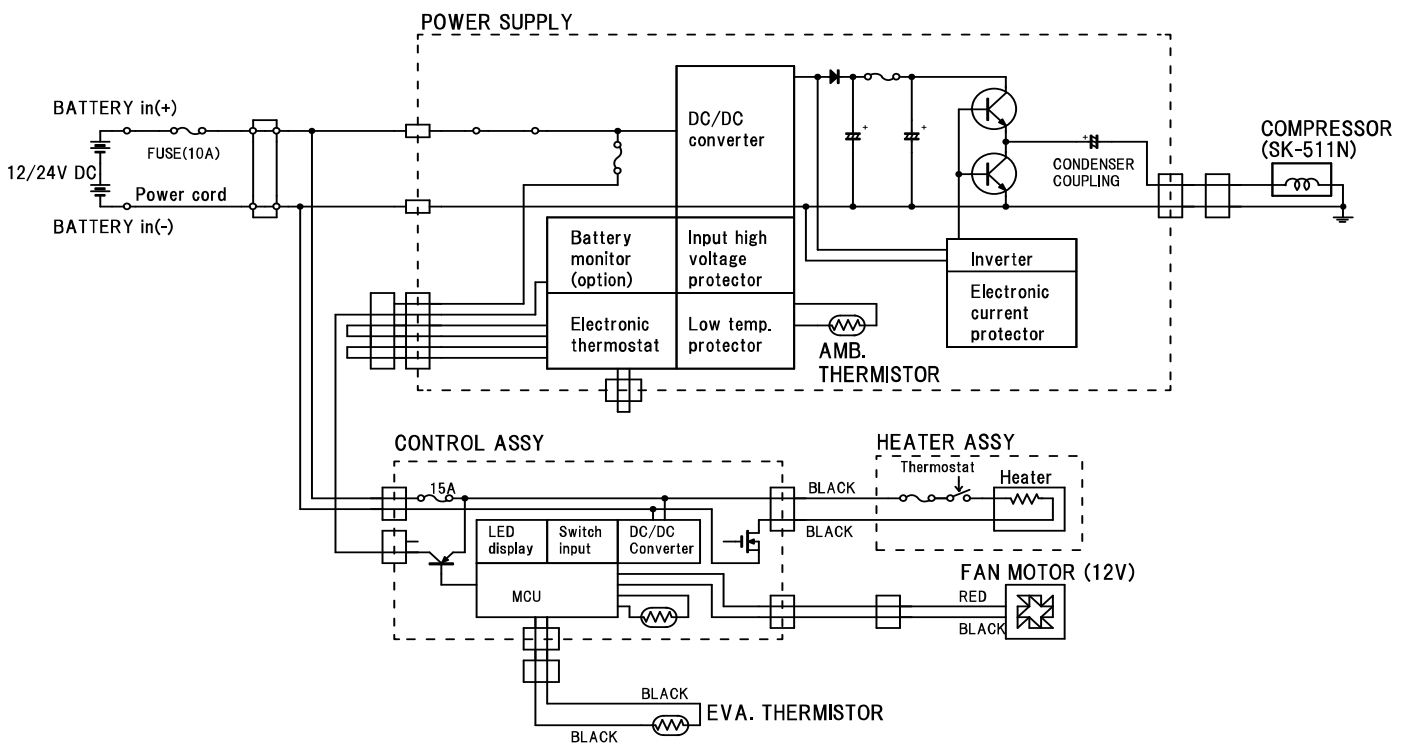


4. CONNECTING DIAGRAM

■ Block Diagrams



■ Wiring Diagrams



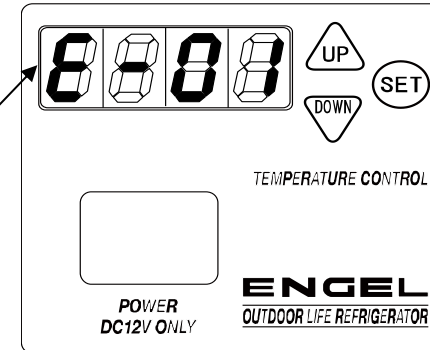
5. TROUBLE SHOOTING

■ Error Code (digital display)

Error message will be displayed if the voltage of the battery is low or in the event of any malfunctions – (see table below).

When error message is displayed, the unit will be on “standby mode”. Operations will stop.

An error is displayed on the digital display.



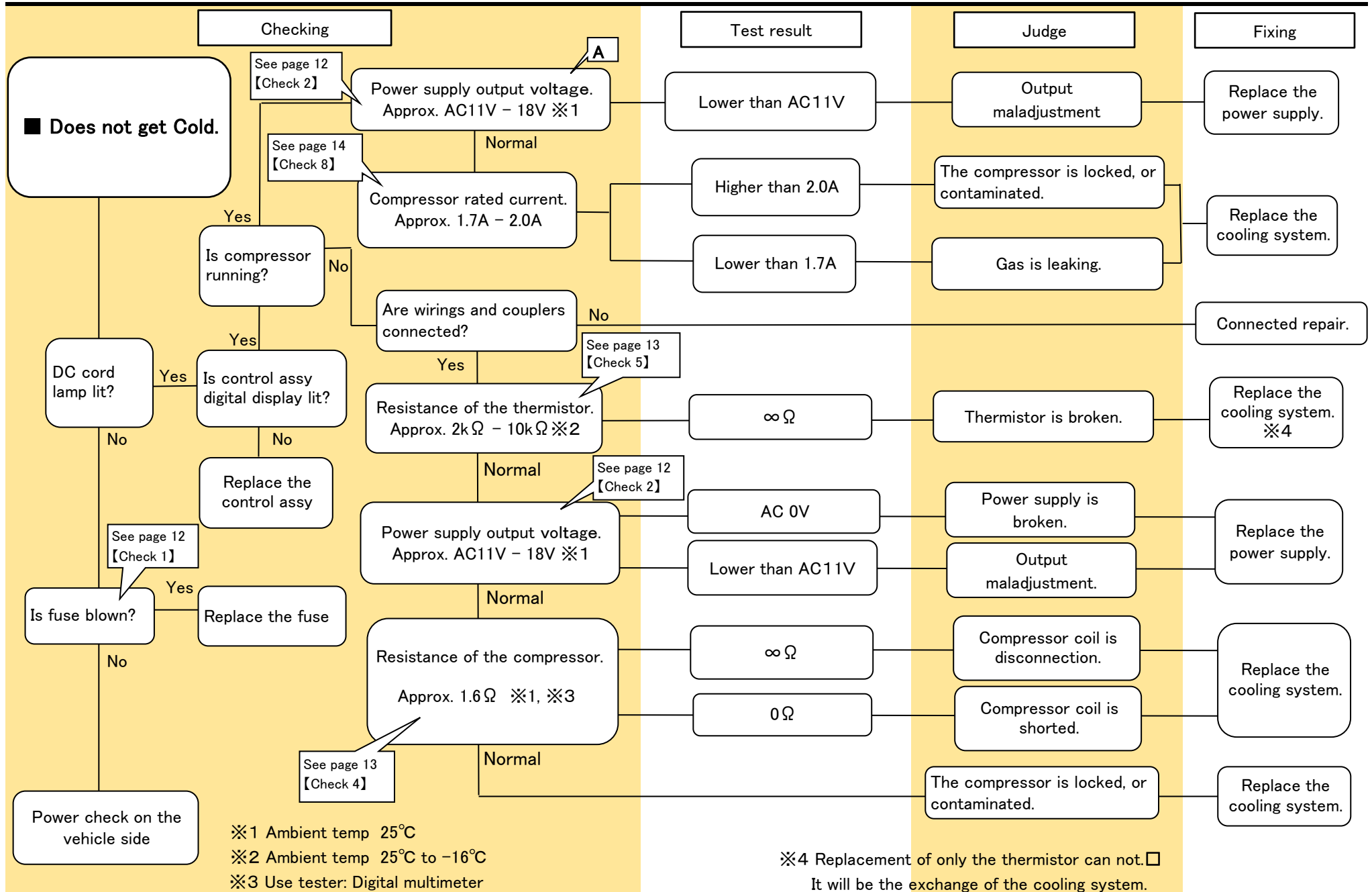
Table

ERROR CODE	DESCRIPTION	SOLUTIONS
E-01	Abnormal Input Voltage	Check whether the power voltage is too low or too high.
E-02	Abnormal FAN connection	Check whether the fan works.
E-03 ※(MHD13F-DM Only)	Abnormal Ambient Temperature (heat)	Check whether the ambient temperature is too high or whether the air-entrance is blocked. Make sure the Louver is not closed.
E-04	Ambient Temperature is too low	Check whether the ambient temperature is too low.
E-05	Abnormal cabinet temperature (heat)	Check whether the temperature inside the cabinet is too high.
E-06	Cabinet Temperature is too low	Check whether the temperature inside the cabinet is too low

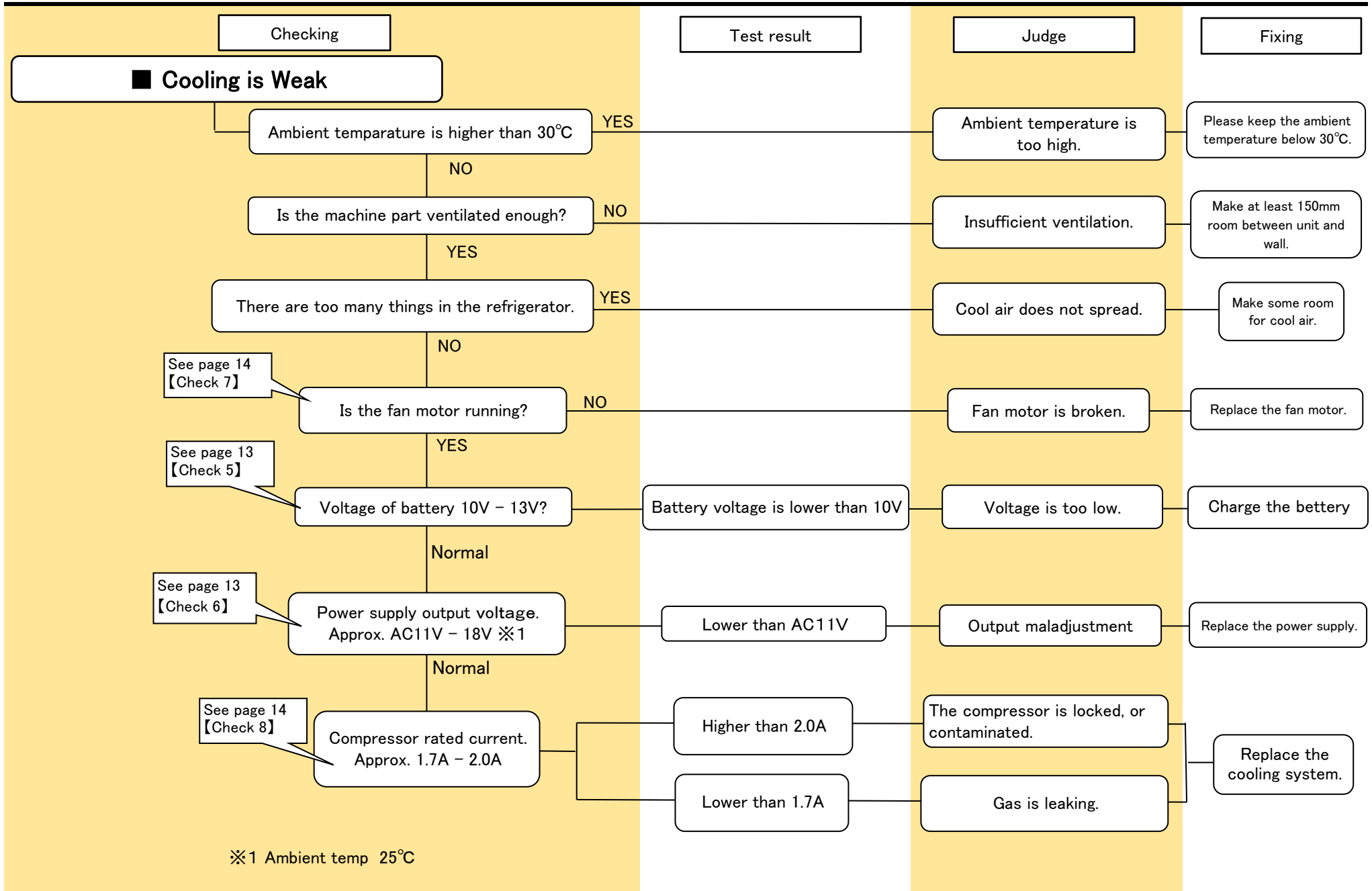
※DEFAULT VALUES FOR BATTERY PROTECTION

12V cut out [V]	12V cut in [V]	24V cut out [V]	24V cut in [V]
10.5	12.5	22.7	24.7

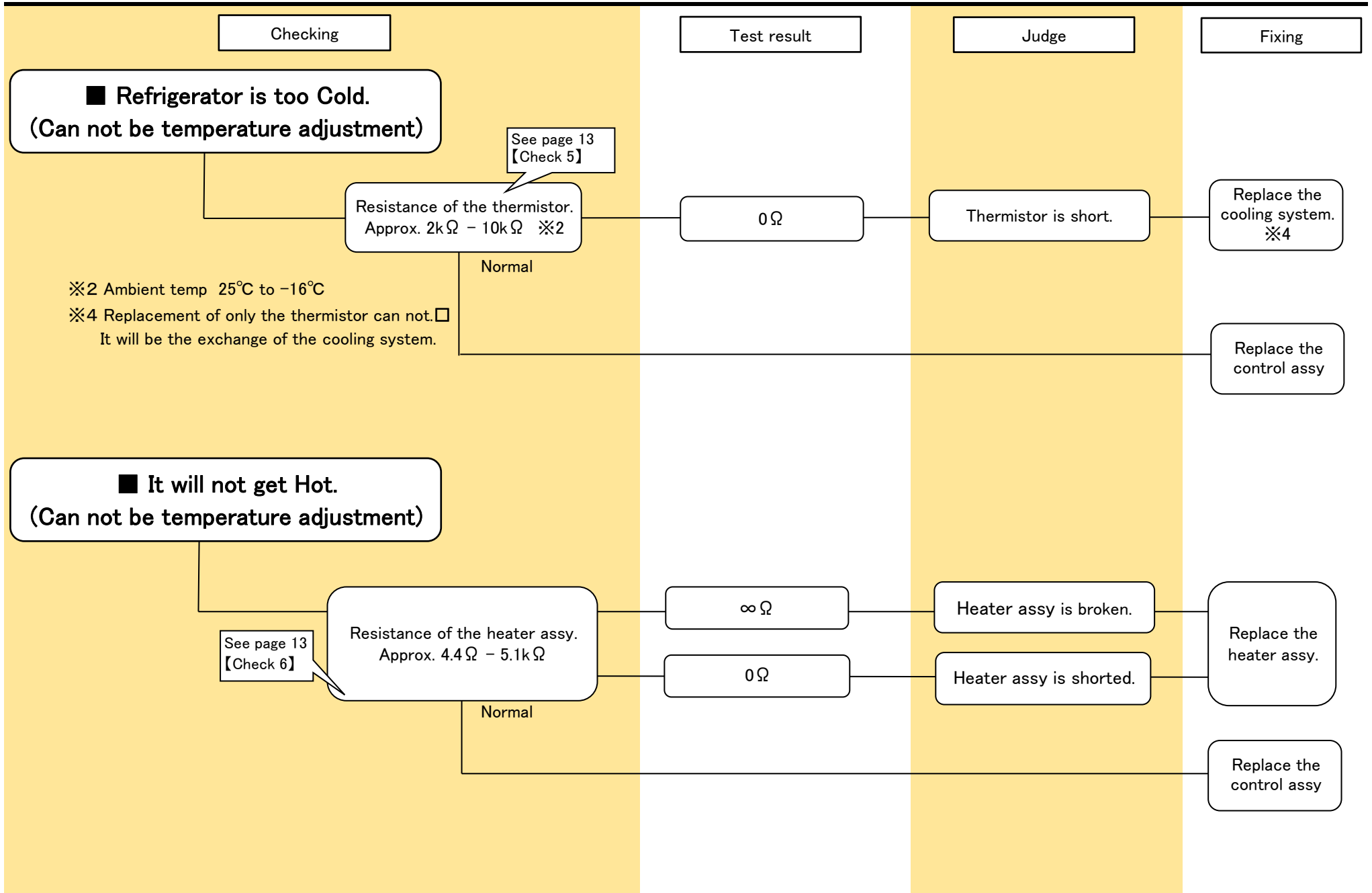
5. TROUBLE SHOOTING



5. TROUBLE SHOOTING



5. TROUBLE SHOOTING



5. TROUBLE SHOOTING

■ Typical Problem

※1 Ambient temp 25°C

※2 Ambient temp 25°C to -16°C

※3 Use tester: Digital multimeter

※4 Replacement of only the thermistor can not. □

It will be the exchange of the cooling system.

	Symptoms	Cause	Test Result	Treatment
Digital display is lit.	Inside of the fridge does not get cold	Coil of the compressor is open	Resistance of compressor is $\infty \Omega$ •Normal: Approx. 1.6 Ω ※1, ※3	Replace the cooling system
		Power supply is broken	Output voltage of power supply is AC 0V •Normal: Approx. AC11-18V ※1	Replace power supply
	Compressor does not work	EVA. thermistor is open	Resistance of EVA. thermistor $\infty \Omega$ •Normal: Approx. 2k Ω -10k Ω ※2	Replace the cooling system ※4
		Cooling is weak	Gas is leaking from Cooling Unit	
	Fan motor is broken			Replace fan motor
	Input voltage is lower than 10V			Charge the battery
	Ambient temperature is higher than 30°C			-
	Ventilation at mechanical part is not enough			Make at least 150mm room between unit and wall
	It will not get hot.	Too many things are put inside		Make some room for cool air
		Heater assy is broken	Resistance of the heater assy is $\infty \Omega$ •Normal: Approx. 4.4 Ω - 5.1k Ω	Replace the heater assy
DC cord lamp is not lit.		The special fuse inside DC cord is open		Replace the fuse
		Fuse in the vehicle is open		Replace the fuse
		Socket or other DC power line in the vehicle is bad		Check the vehicle

■ Technical Data

※1 Ambient temp 25°C

※2 Ambient temp 25°C to -16°C

※3 Use tester: Digital multimeter

Checking items	Checking Points	Normal data
Input voltage at compressor	Between terminals of compressor	Approx. AC 11V - 18V ※1
Output voltage of power supply	Between outgoing cords from power supply	Approx. AC 11V - 18V ※1
Resistance of the compressor	Between incoming cords to compressor	Approx. 1.6 Ω ※1, ※3
Resistance of EVA. thermistor	Between two pin of the coupler	Approx. 2K Ω - 10K Ω ※2
Special Fuse	Fuse at power supply	0 Ω
Resistance of the heater assy	Between two pin of the coupler	Approx. 4.4 Ω - 5.1k Ω
Compressor rated current	Current value measurement with clamp meter between input cord terminals.	Approx. 1.7A - 2.0A

6. CHECK POINT & CHECK METHOD

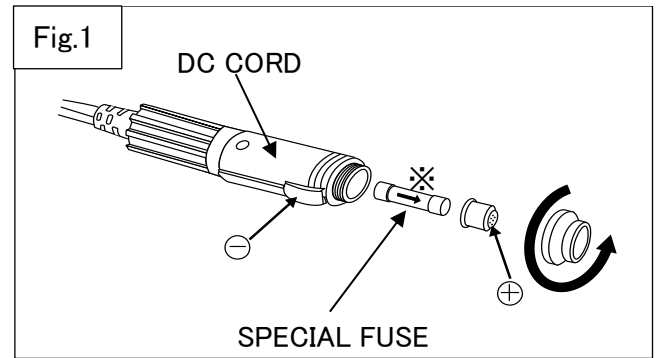
【Check 1】 Special Fuse. (Fig.1)

◇ Check the resistance of special fuse by tester.

Test result	Judge
0 Ω	Normal
∞ Ω	Broken

WORK TIPS

- Please attach attention to the special fuse of orientation.
- It can not detect the temperature is in the wrong special fuse orientation. (※)



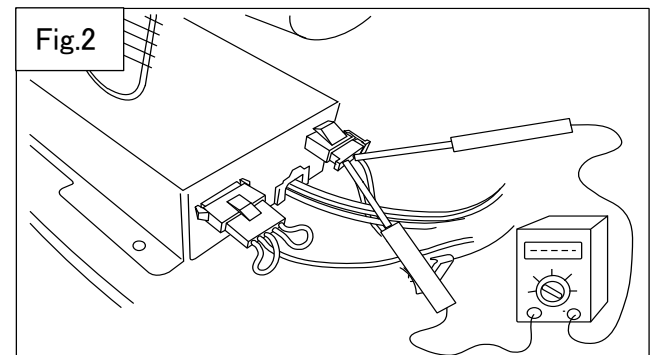
【Check 2】 Output Voltage of the Power Supply. (Fig.2)

◇ Checking point

- Check at two pin coupler of power supply or at input terminals of the compressor. (See 【Check 3】)

(Ambient temp 25°C)

Test result	Judge
Approx. AC11V – 18V	Normal
Lower than AC11V	Power Supply is broken
AC 0 V	

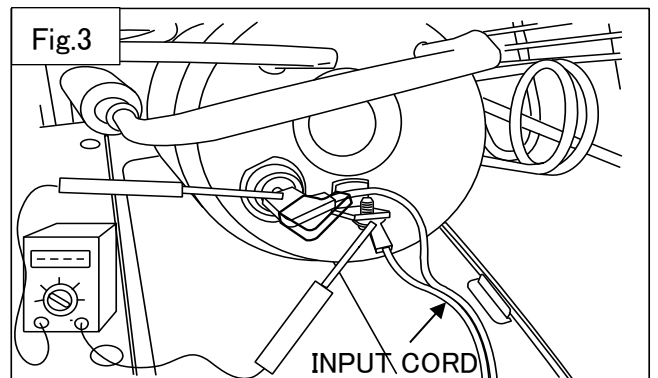


【Check 3】 Input Voltage of the Compressor. (Fig.3)

◇ Checking point

Voltage measurement between terminals of input cord.

Test result	Judge
Approx. AC11V – 18V	Normal
Lower than AC11V	Power Supply is broken
AC 0 V	Power Supply is broken or input cord disconnection



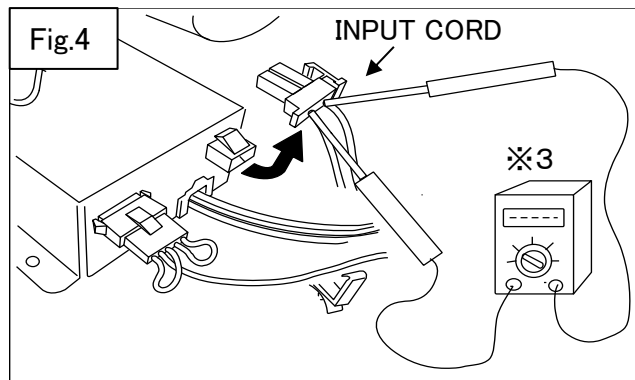
6. CHECK POINT & CHECK METHOD

【Check 4】 Resistance of the Compressor. (Fig.4)

◇Checking points

Remove two pin couplers at input cord, and check.
(Ambient temp 25°C)

Test result	Judge
Approx. 1.6 Ω	Normal
∞ Ω	Broken
0 Ω	Coil of compressor is short circuit



※3 Use tester: Digital multimeter

【Check 5】 Resistance of the EVA. Thermistor. (Fig.5)

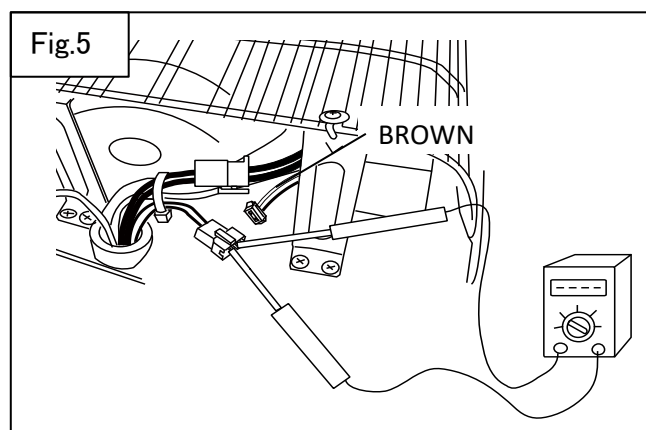
◇Checking points

Remove the two pin couplers from power supply, and test.

(Ambient temp 25°C to -16°C)

Test result	Judge
Approx. 2 kΩ - 10 kΩ	Normal
∞ Ω	Broken
0 Ω	Short Circuit

※ When short circuit, compressor runs continuously.



WORK TIPS

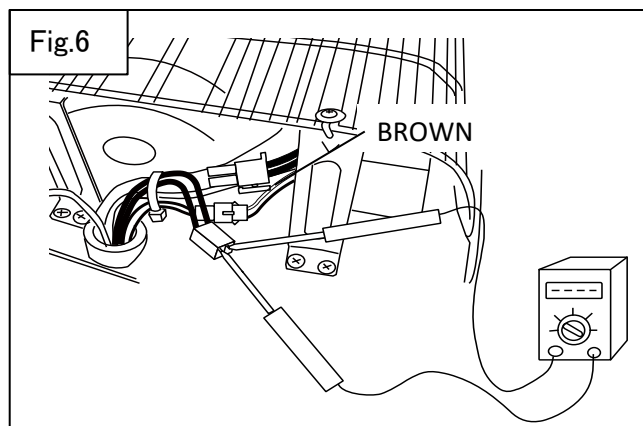
Replacement of only the EVA thermistor can not.
It will be the exchange of the cooling system.

【Check 6】 Resistance of the Heater Assy. (Fig.6)

◇Checking points

Remove the two pin couplers from power supply, and test.

Test result	Judge
Approx. 4.4 Ω - 5.1 Ω	Normal
∞ Ω	Broken
0 Ω	Short Circuit



WORK TIPS

Replacement of only the heater assy can not.
It will be the exchange of the cooling system.

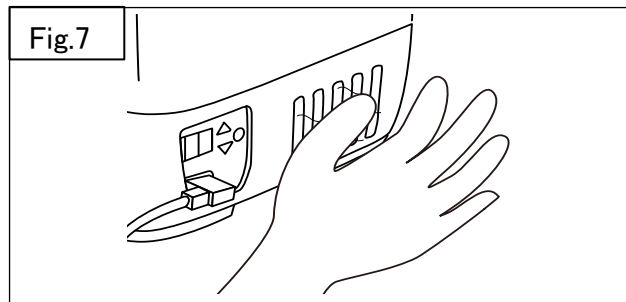
6. CHECK POINT & CHECK METHOD

【Check 7】 Fan motor Assy. (Fig.7)

◇Checking point

If the refrigerator of the switch is ON, the fan motor will start. Please make sure that the wind has come out by hand.(Fig.7)

If the wind does not come out (fan is not moving), the failure of the fan motor or, will be the code breaking.

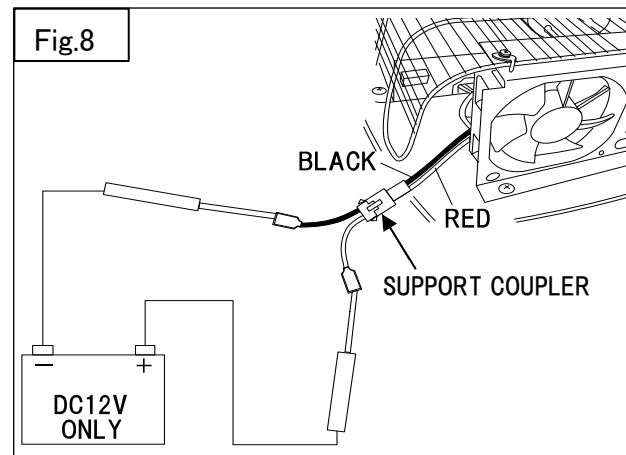


◇Checking point

If want to check the start-up of the fan motor directly, can check by connecting the DC12V directly. (Fig.8)

⚠ CAUTION

- Please be careful not to mistake the polarity of the power supply.
- When connect with DC24V or wrong polarity, fan motor will fail.
- Please use such as support coupler so as not to short-circuit power.



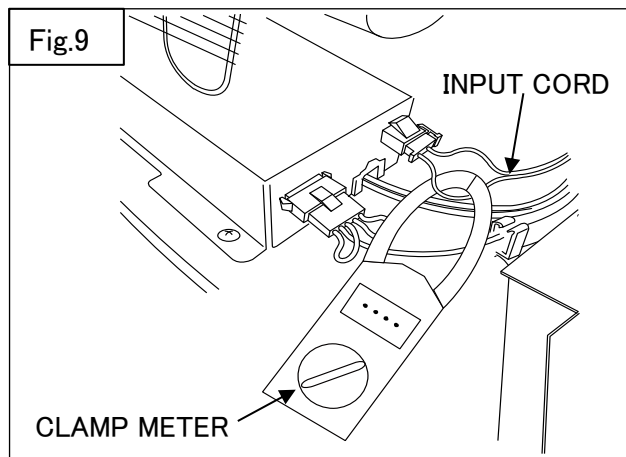
【Check 8】 Compressor rated current (Fig.7)

◇Checking point

Current value measurement with clamp meter between input cord terminals.

WORK TIPS

To measure the rated current of the compressor, please measure after 10 minutes or more after starting the refrigerator.

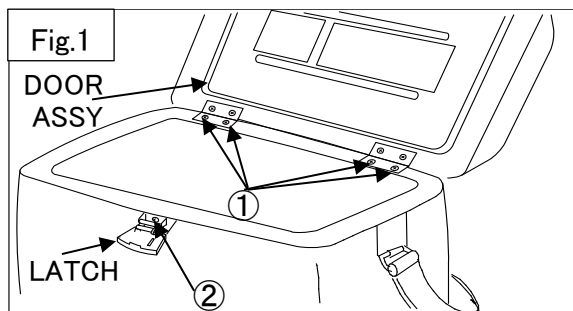


Test result	Judge
Approx. 1.7 - 2.0A	Normal
Higher than 2.0A	Compressor is locked, or contaminated.
Lower than 1.7A	Gas is leaking.

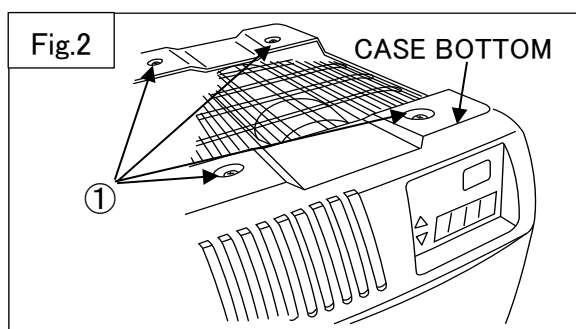
7. REPLACING PARTS

【How to Replace Cooling System】

1. Remove four screw (Fig.1-①), remove the door assy.
2. Remove screw (Fig.1-②), remove the latch



3. Remove four screw, remove the bottom case.(Fig.2-①)



4. Remove two screws that stop the wire condensor. (Fig3-①)

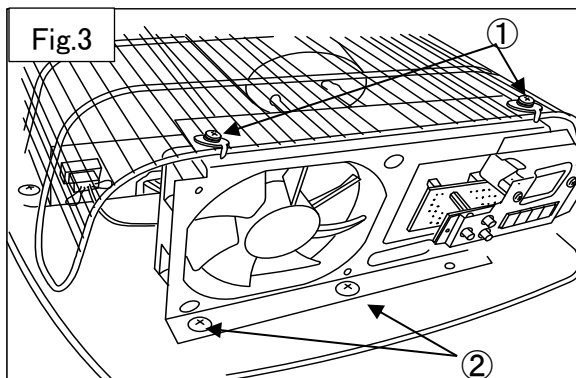
WORK TIPS

During assembly, please tighten the screws in the same position as the removed screw position. (See below; "Screws position")

5. Remove two screws, remove the holderassy. (Fig3-②)

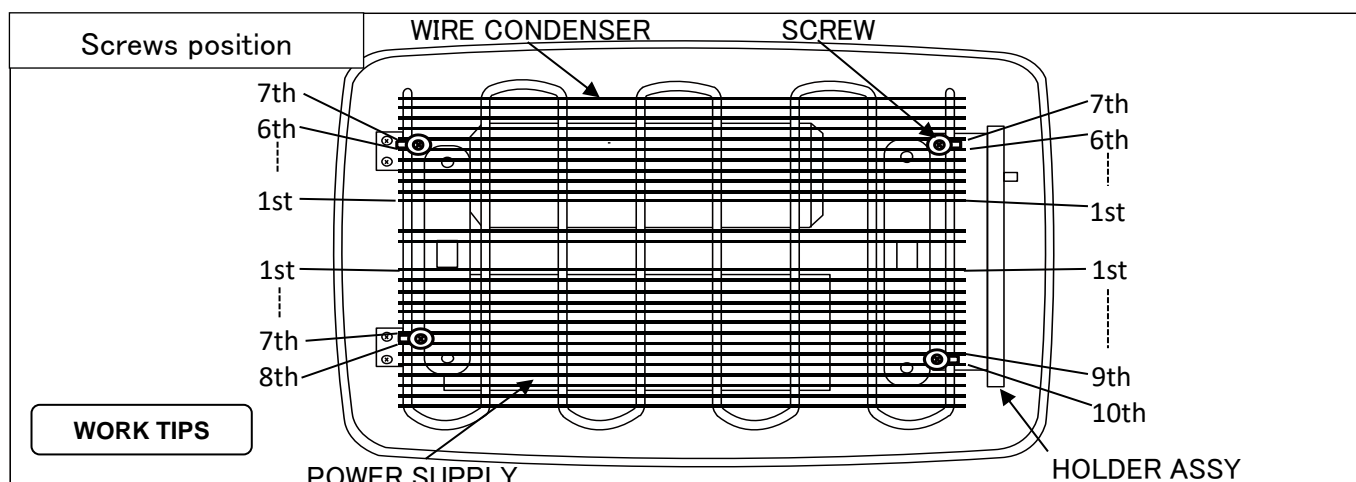
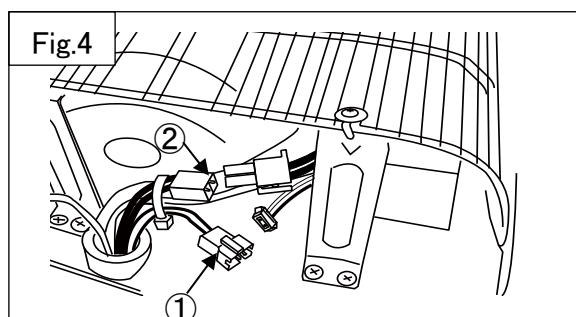
WORK TIPS

In the case of power supply only exchange,



6. Remove two pin coupler of EVA. thermistor. (Fig4-①)

7. Remove two pin coupler of heater assy. (Fig4-②)



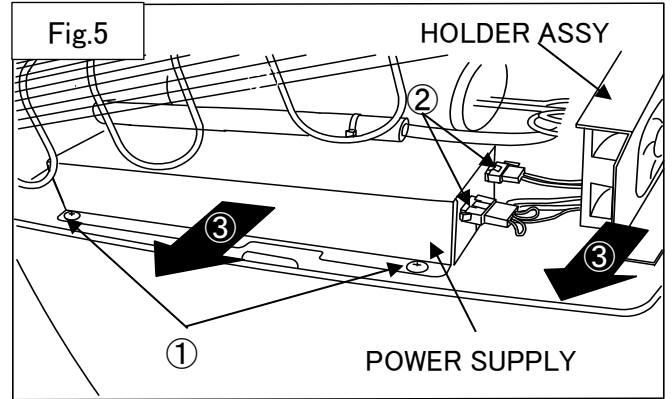
7. REPLACING PARTS

8. Remove two screws (Fig.5-①) and remove the two couplers.(Fig.5-②)

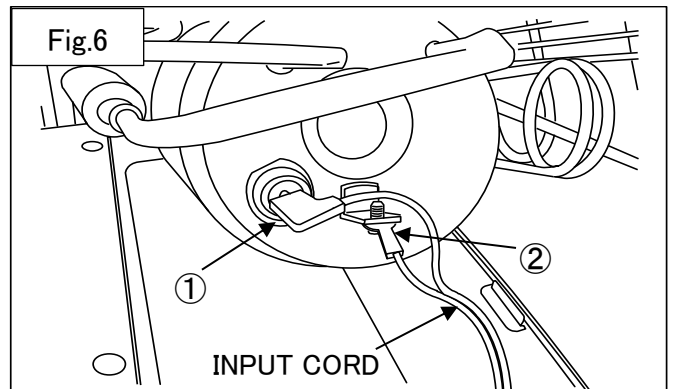
Pull out the power supply and holder assy from the main body. (Fig.5-③)

WORK TIPS

In the case of power supply only exchange, the holder assembly is not removed.

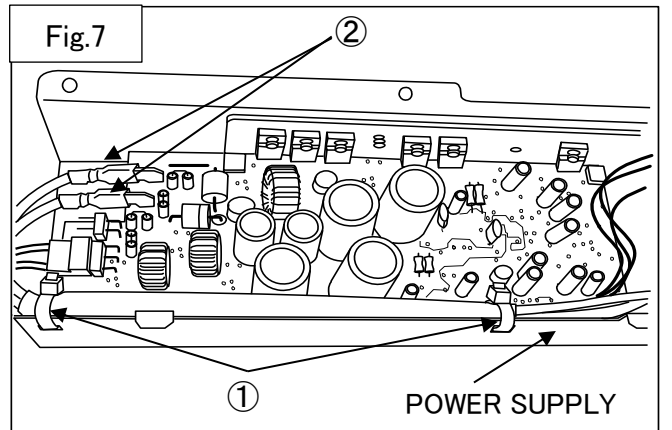


9. Remove the input cord from the compressor. (Fig.6-①、②)



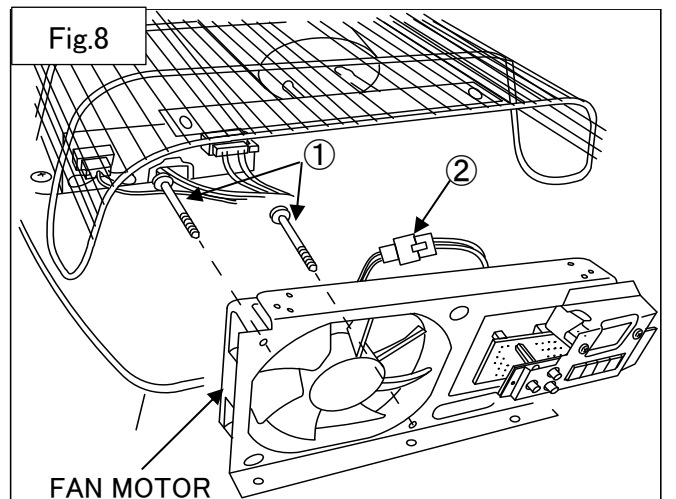
【How to Replace Power Supply】

1. Perform the procedure of how to replace the cooling system. (Page 17 Step 3~8)
2. The fastener is cut by two places.(Fig.7-①)
3. Remove two flag terminals. (Fig.7-②)



【How to Replace Fan Motor】

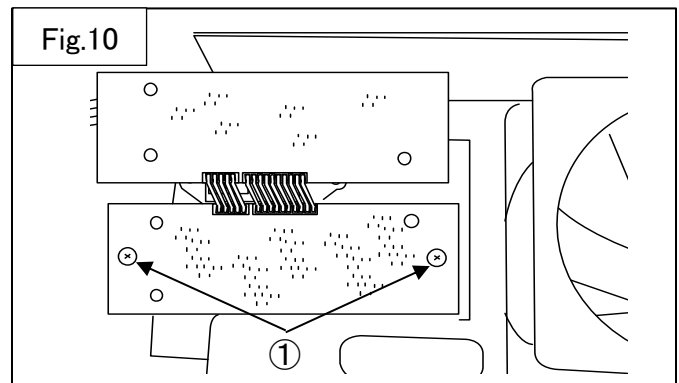
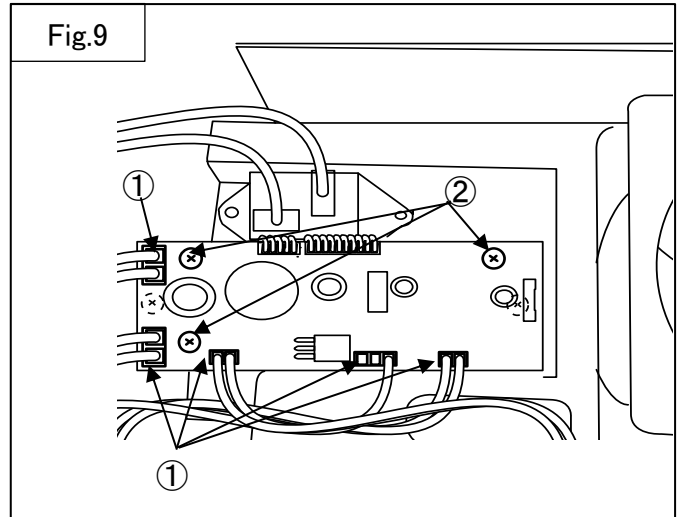
1. Perform the procedure of how to replace the cooling system. (Page 17 Step 3~5)
2. Remove two screws. (Fig.8-①)
3. Remove the coupler. (Fig.8-②)



7. REPLACING PARTS

【How to Replace Control Assy】

1. Perform the procedure of how to replace the cooling system. (Page 17 Step 3~5)
2. Remove the five coupler. (Fig.9-①)
3. Remove the screws. (Fig.9-②)
4. Remove the screws. (Fig.10-①)



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