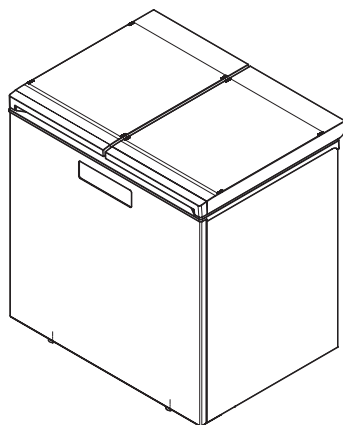


REFRIGERATOR

SERVICE MANUAL

CAUTION
BEFORE SERVICING THE UNIT,
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



MODEL : LKIM08121V /00
GKIM08121V /00

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SAFETY PRECAUTIONS

Please read the following instructions before servicing your refrigerator.


1. Unplug the power before handling any electrical components.
2. Check the rated current, voltage, and capacity.
3. Take caution not to get water near any electrical components.
4. Use exact replacement parts.
5. Remove any objects from the top prior to tilting the product.

Safety Instructions

Chapter 1 : Safety Instructions

Your safety and the safety of others are very important.

We have provided many important safety messages in this manual and on your appliance. Always read and follow all safety messages.

-  This is the safety alert symbol.
This symbol alerts you to potential hazards that can kill or injure you and others.
All safety messages will follow the safety alert symbol and either the word WARNING or CAUTION.

These words mean:

WARNING

You may be killed or seriously injured if you do not follow instructions.

CAUTION

You may be injured or cause damage to the product if you do not follow instructions.

All safety messages will tell you what the potential hazard is, tell you how to reduce the chance of injury, and tell you what may happen if the instructions are not followed.

IMPORTANT SAFETY INSTRUCTIONS

WARNING

To reduce the risk of explosion, fire, death, electric shock, scalding or injury to persons when using this product, follow basic precautions, including the following:

California Safe Drinking Water and Toxic Enforcement Act

- This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. ***Wash hands after handling.***

INSTALLATION

- To reduce the risk of injury to persons, adhere to all industry recommended safety procedures including the use of long-sleeved gloves and safety glasses.
- Never attempt to operate this appliance if it is damaged, malfunctioning, partially disassembled, or has missing or broken parts, including a damaged cord or plug.
- Only connect this product to a dedicated grounded electrical outlet rated for use with this product (115 V, 60 Hz, AC only). It is the user's responsibility to replace a standard 2-prong wall outlet with a standard 3-prong wall outlet.
- Do not use an outlet that can be turned off with a switch. Do not use an extension cord.
- The appliance must be positioned for easy access to a power source.
- When moving the refrigerator, be careful not to roll over or damage the power cord.
- Contact an authorized service center when installing or relocating the refrigerator.
- Do not, under any circumstances, cut or remove the third (ground) prong from the power cord.
- Keep packing materials out of the reach of children. Packaging material can be dangerous for children. There is a risk of suffocation.

Safety Instructions

- Do not install the refrigerator in a damp or dusty place where insulation on electrical parts may deteriorate.
- Do not place the refrigerator in direct sunlight or expose it to the heat from heating appliances such as stoves or heaters.
- Do not bend or pinch the power cord excessively or place heavy objects on it.

OPERATION

- This appliance is intended to be used in household and similar applications such as
 - Staff kitchen areas in shops, offices and other working environments;
 - Farm houses and by clients in hotels, motels and other residential type environments;
 - Bed and breakfast type environments;
 - Catering and similar non-retail applications.
- This product is not to be used for special purposes such as the storage of medicine or test materials or for use on ships, etc.
- DO NOT allow children to climb, stand, or hang on the refrigerator doors or on the shelves in the refrigerator. They could damage the refrigerator and seriously injure themselves.
- Do not allow children to climb into the refrigerator. They could be trapped and suffocated.
- Children should be supervised to ensure that they do not play with the refrigerator.
- Keep fingers out of pinch point areas; clearances between the doors and cabinets are necessarily small. Be careful closing doors when children are nearby.
- Do not touch frozen food or the metal parts in the freezer compartment with wet or damp hands. Doing so may cause frostbite.
- Do not refreeze frozen food that has thawed completely. Doing so may result in a serious health hazard.
- If the refrigerator is fitted with light bulbs that require replacing, unplug the refrigerator or turn off the power before doing so.
- Do not use an adapter plug or plug the power plug into a multi-outlet extension cord.
- Do not use a cord that shows cracks or abrasion damage along its length or at either the plug or connector end. Immediately have all power cords that have become frayed or otherwise damaged repaired or replaced by qualified service personnel.
- Do not operate the refrigerator or touch the power cord with wet hands.
- Do not modify or extend the power cord.
- Do not use an uncertified power outlet. Do not plug appliance into a damaged wall outlet.
- Do not put hands, feet or other objects into the air vents or bottom of the refrigerator. Doing so could result in personal injury or electric shock.
- In the event of a gas leak (propane/LPG), ensure the area is adequately ventilated and contact an authorized service center before resuming use. Do not touch the refrigerator or power cord of the refrigerator.
- Disconnect the power cord immediately and contact an authorized service center if there is a strange noise, odor, or smoke coming from the appliance.
- Do not use any fuse (such as copper, steel wire, etc.) other than a standard fuse.
- Do not place or use an electrical appliance inside the refrigerator, unless it is of a type recommended by the manufacturer.
- Do not put animals inside the appliance.
- Do not place heavy or fragile objects, liquid filled containers, combustible substances, or flammable objects (such as candles and lamps) on the appliance.
- Keep or dispose of the packing materials out of reach of children. Plastic packing materials pose a risk of suffocation.
- If connected to a circuit protected by fuses, use time delay fuse.

Safety Instructions

MAINTENANCE

- Do not use a hair dryer to dry the inside of the refrigerator.
- Do not light a candle to remove odors in the refrigerator.
- In the event of a refrigerant leak, move flammable objects away from the refrigerator. Ensure the area is adequately ventilated and contact an authorized service center.
- Keep flammable materials and vapors, such as gasoline, away from the refrigerator.
- Unplug the power plug before cleaning or repairing the refrigerator.
- Unplug the power plug immediately in the event of a blackout or thunderstorm.
- Turn the power off if water or dust penetrates into the refrigerator. Call a service agent.
- Do not store glass containers or soda in the freezer compartment. Contents may expand when frozen, break the container and cause injury.
- Do not store, disassemble or repair the appliance yourself or allow unqualified personnel to do so.

DISPOSAL

- Junked or abandoned refrigerators are dangerous, even if they are sitting for only a few days. When disposing of the refrigerator, remove the packing materials from the door or take off the doors but leave the shelves in place so that children may not easily climb inside.
- If disposing of a refrigerator, make sure the refrigerant is removed for proper disposal by a qualified servicer. If you release the refrigerant, you may be fined or imprisoned in accordance with the relevant environmental law.

WARNING

- Keep ventilation openings, in the appliance enclosure or in the built-in structure, clear of obstruction.
- Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.
- Do not damage the refrigerant circuit.
- Do not use electrical appliances inside the food storage compartments of the appliance, unless they are of the type recommended by the manufacturer.
- The refrigerant and insulation blowing gas used in the appliance require special disposal procedures. When disposing, please consult with service agent or a similarly qualified person.



This appliance contains a small amount of isobutane refrigerant (R600a), a natural gas with high environmental compatibility, but which is also combustible. When transporting and installing the appliance, care should be taken to ensure that no parts of the refrigerating circuit are damaged. Refrigerant squirting out of the pipes could ignite or cause an eye injury. If a leak is detected, avoid any naked flames or potential sources of ignition and air the room in which the appliance is standing for several minutes.

In order to avoid the creation of a flammable gas air mixture if a leak in the refrigerating circuit occurs, the size of the room in which the appliance may be sited depends on the amount of refrigerant used. The room must be 10.8 square feet (1 square meter) in size for every 8g of R600a refrigerant inside the appliance. The amount of refrigerant in your particular appliance is shown on the identification plate inside the appliance. Never start up an appliance showing any signs of damage. If in doubt, consult your dealer.

Safety Instructions

GROUNDING INSTRUCTIONS

- Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service person if you are in doubt whether the appliance is properly grounded. Do not modify the plug provided with the appliance; if it will not fit the outlet, have a proper outlet installed by a qualified electrician.
- Have a certified electrician check the wall outlet and wiring for proper grounding.
- Never unplug the appliance by pulling on the power cord. Always grip the plug firmly and pull straight out from the outlet. Failure to do so may damage the power cord, resulting in a risk of fire and electric shock.

CAUTION

To reduce the risk of minor or moderate injury to persons, malfunction, or damage to the product or property when using this product, follow basic precautions, including the following:

INSTALLATION

- Do not install the refrigerator where there may be a danger of the unit falling.
- The refrigerator must be properly installed in accordance with the Installation Instructions.

OPERATION

- Do not use aerosols near the refrigerator.
- This appliance is intended to be used only in domestic and similar applications.
- Do not strike or apply excessive force to any glass surface. Do not touch glass surfaces if they are cracked or broken.
- Do not overfill the appliance with food. Doing so may cause personal injury or property damage.

MAINTENANCE

- Do not use strong detergents like wax or thinners for cleaning. Clean with a soft cloth.
- Remove foreign objects (such as dust and water) from the prongs of the power plug and contact areas. Do not use a wet or damp cloth when cleaning the plug.
- Do not spray water directly on the inside or outside of the refrigerator.
- Do not clean glass shelves or covers with warm water when they are cold. They may break if exposed to sudden temperature changes.

SAVE THESE INSTRUCTIONS

Product Specifications

Chapter 2: Product Specifications

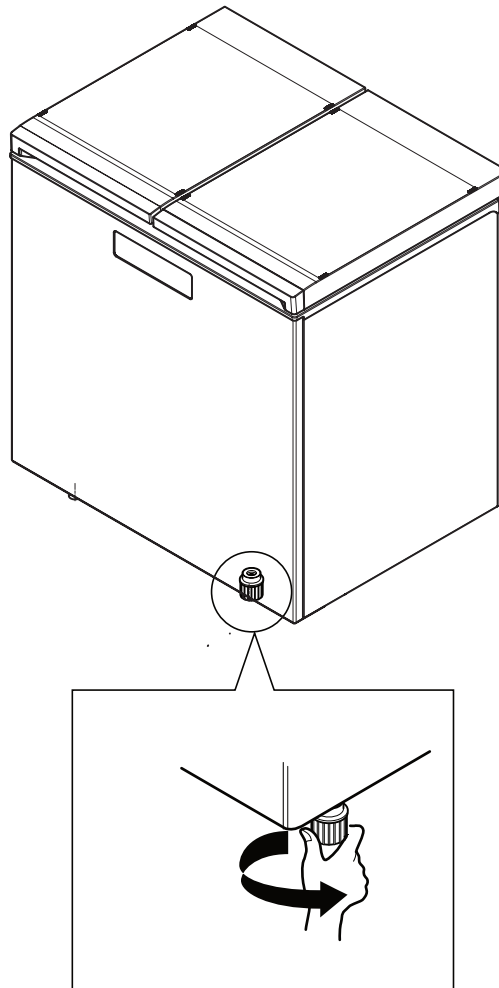
Items		LKIM08121V, GKIM08121V
Volume	Total available volume	7.6 cu. ft. (219 L)
	Left compartment	3.8 cu. ft. (109.5 L)
	Right compartment	3.8 cu. ft. (109.5 L)
Dimensions	Height	37 3/8 in. (949 mm)
	Width	36 1/4 in. (920 mm)
	Depth	27 1/4 in. (691 mm)
Gross weight		137 lb (62 kg)
Power consumption of electric motor		
Cooling method		Direct Cooling Type
Store / Ferment		Electronic type
Insulator		CYCLOPENTANE
Fresh vegetables storage		-
Kimchi storage container		8EA
Low temperature catalyst deodorization system		2EA
Refrigeration cycle	Compressor	BMG089NHMV
	evaporator	PIPE ON SHEET
	Refrigerant	600a(57g)
	Refrigerator oil	S5HFP(170cc)
Electric parts specifications	PTC	-
	Overload protection device	MRA12091-9201
	Fan motor for condenser cooling	Φ130, 3BLADE
	Left Kimchi Fermentation heater	
	Right Kimchi Fermentation heater	
	Protection fuse	
	CAPACITOR(CS	-

Installation Instructions

Chapter 3: Installing the Product

3-1. Leveling

- Level the refrigerator first.
(If the floor is uneven, the refrigerator may produce noise.)



- ▶ Level the refrigerator by rotating the leveling legs on the left and right side located at the front.

Installation Instructions

3-2. Grounding

1. The product must be manually grounded in the following situations:
 - 1) When used with 110V power supply.
 - 2) When the outlet being used is not grounded, even if the power supply used is 220V.

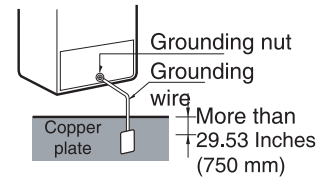
2. In places where grounding is difficult, an earth leakage breaker (rated current 15mA, rated non-operating current 7.5mA) must be installed. Use an earth leakage breaker with a plug and outlet.

3. Purchase an annealed copper wire with a diameter of 0.063 Inches (1.6 mm) or more or a single core cable with a nominal cross-sectional area of 0.049 Inches (1.25 mm) or more, connect it to the ground terminal on the back of the refrigerator, and solder it, and bury the copper plate to a depth of 29.53 Inches (750 mm) or more beneath the surface.

▶ Copper plate size: Thickness (0.028 Inches (0.7 mm) or more), surface area (35.43 Inches (900 mm) or more)

▶ Do not connect the ground wire to the following:

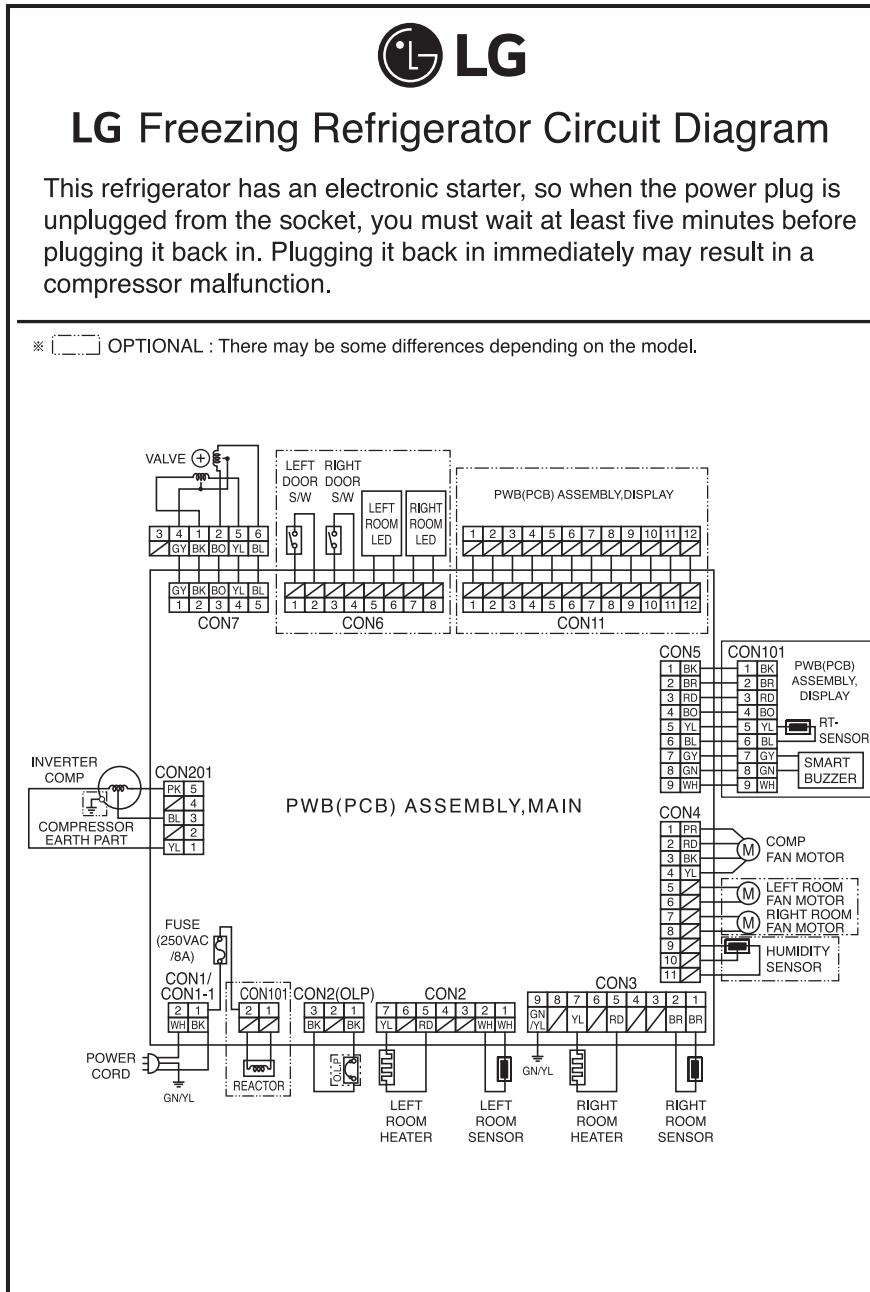
1. Water pipe: If there is a plastic part in the pipe, the grounding will not work.
2. Gas pipe: Never use it for grounding as there is a risk of explosion.
3. Telephone line / lightning rod: It is very dangerous as these have high electrical current flows when lightning strikes.



Circuit Diagram

Chapter 4: Circuit Diagram

LKIM08121V, GKIM08121V

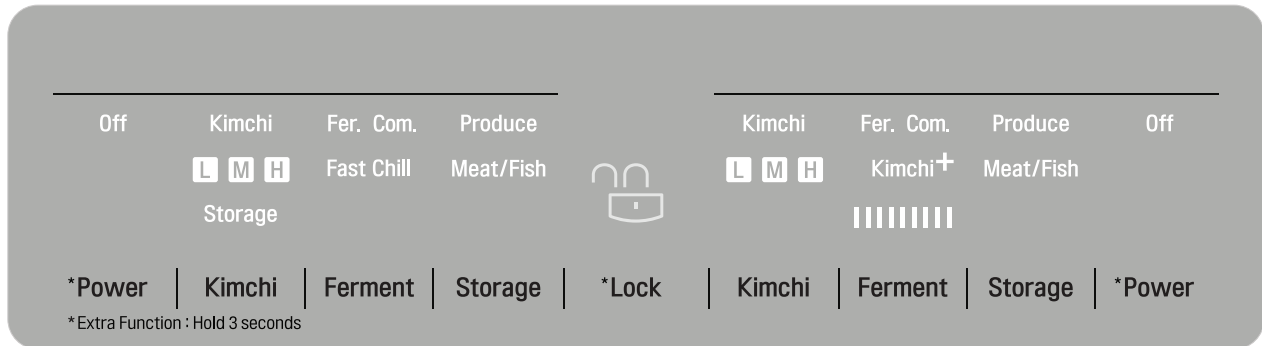


MICOM Function and Circuit Description

Chapter 5: MICOM Function and Circuit Description

5-1 Settings

5-1-1 Control Panel Features



NOTCH	Kimchi storage			Produce	Meat/Fish
	Low	Middle	High		
Set Temperature	31°F (-0.7°C)	30°F (-1.2°C)	29°F (-1.7°C)	37°F (2.5°C)	27.5°F (-2.5°C)

1. On initial startup, the refrigerator display is unlocked and the default setting is Kimchi M.
2. If power is restored after a power outage, the refrigerator retains the last settings, with the following exceptions. If power is lost while the refrigerator is set to the Fer., Fast Chill, or Kimchi+ modes, it defaults to Kimchi M when power is restored.
3. When the display is locked, the button and other sounds are turned off. If the Lock button is pressed, the lock/unlock icon blinks 3 times.

MICOM Function and Circuit Description

5-1-2. Food Storage / Ferment Mode

(1) When selecting the food type and storage temperature

■ LKIM08121V, GKIM08121V

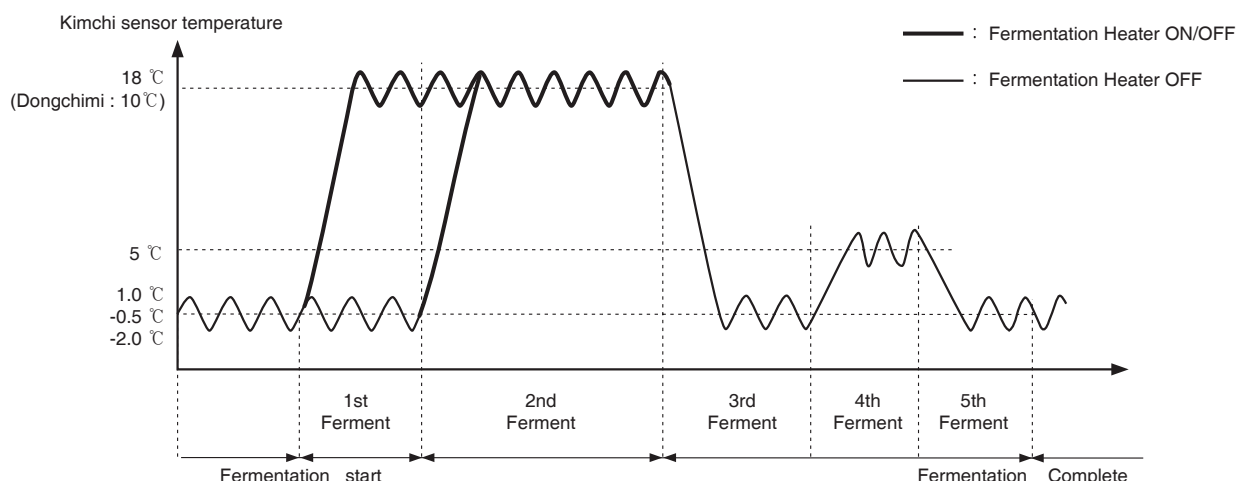
1. To set the refrigerator to "Unlock" status, press the *Lock button for more than three seconds.
2. Pressing the left compartment Kimchi button changes the setting from M→H→L→Storage, and pressing the right compartment Kimchi button changes the setting from M→H→L
3. When the left compartment Ferment button is pressed, Fer. →Fast Chill is displayed. When the right compartment Ferment button is pressed, the setting changes from Fer.→Kimchi+.
4. Pressing the left compartment Storage button changes the setting from Produce→meat/Fish. Pressing the right compartment Storage button changes the setting from Produce→meat/Fish.
5. Pressing the left compartment and right compartment *Power button for more than 3 seconds will display the Off indicator.
6. Pressing the *Lock button for more than 3 seconds will change the setting to "Lock" Status, which finishes Food Type and Storage Temperature Selection. Additionally, if one minute passes with no button being pressed, the refrigerator will automatically enter "Lock" Status and Food Type and Storage Temperature Selection will end.

5-1-3. When selecting Power ON/OFF Mode

1. To set the refrigerator to "Unlock" status, press the *Lock button for more than three seconds.
2. Pressing the *power button for more than 3 seconds in this state will turn the power OFF.
3. At this time, all of the LED lights for the compartment will turn OFF on the DISPLAY, and the Power LED will turn ON.
4. Pressing the *Power button for more than 3 seconds in the Power OFF state will turn the Power ON while restoring the setting to Kimchi M.
5. When the Power is OFF, the heater for the that compartment is turned OFF and the valve is set to CLOSE.

5-1-4. Fermenting Control Pattern FIG.

1. When fermenting kimchi, the control pattern will be different depending on the temperature of the fridge when the kimchi was first put in and the desired level of fermentation.
2. If the fridge temperature is high when the kimchi is put in during the 1st stage of Fermentation Mode, Cooling Control is turned on.
3. During Kimchi Fermentation Mode, if the temperature of the kimchi is too cold, the Fermentation Heater will turn ON. If the temperature of the kimchi is too warm, the Fermentation Heater will turn OFF. (However, this only applies to the 1st and 2nd stage of Fermentation Mode.)



4. If a malfunction such as a sensor error occurs while in Fermentation Mode, the setting automatically reverts to Kimchi M.

MICOM Function and Circuit Description

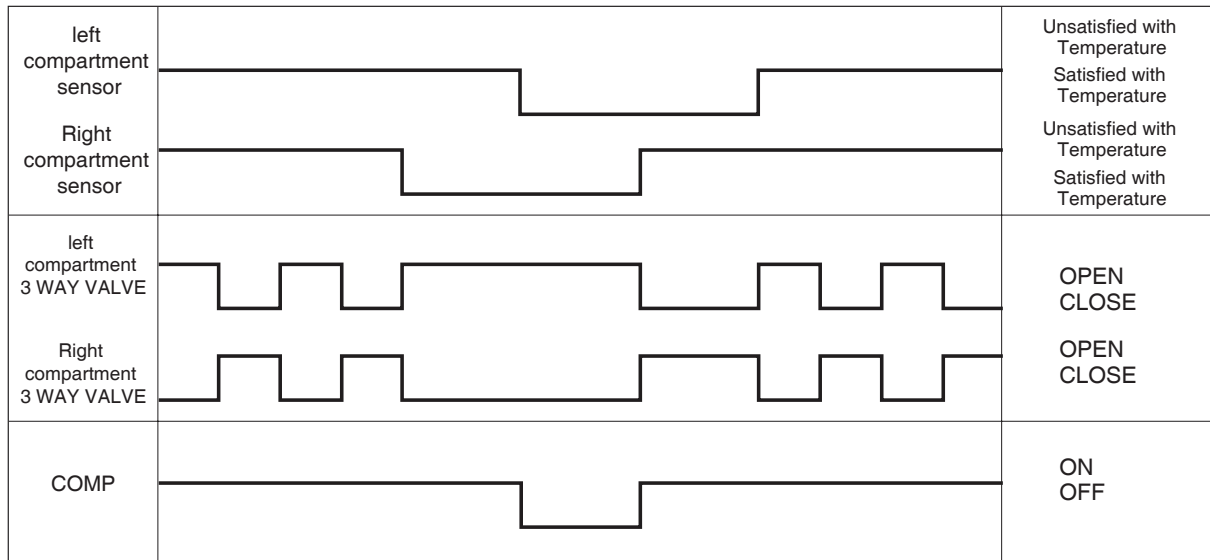
5-1-5. Temperature Control Method

1. COMP will be set to ON or OFF and 3 WAY VALVE will be set to OPEN or CLOSE depending on the sensor temperature of the left and right compartments.
2. If you are unsatisfied with the temperature of only one of the compartments, OPEN only that compartment's 3 WAY VALVE and turn ON the COMP.
3. If you are unsatisfied with the temperature of both compartments, set COMP to ON and take turns switching the left and right 2 WAY VALVES to OPEN and CLOSE.
4. If the temperature lowers during Ripening Mode, the Ripening Heater turns "ON". If the temperature gets too high, COMP turns "ON", and the 3 WAY VALVE of that compartment becomes "OPEN".

Left Temperature	Right Temperature	Location of the 3-Way Valve	COMP
Satisfied	Satisfied	Note 1)	OFF
Satisfied	Dissatisfied	Right Compartment	ON
Dissatisfied	Satisfied	Left Compartment	ON
Dissatisfied	Dissatisfied	Left 25minutes/Right 25Minutes	ON

Note 1) In either the left or right compartment, the 3-Way Valve is "OPEN" in the one with the satisfactory temperature.

► Operation Summary CHART of the COMP and 3 WAY VALVE



5-1-6. Buzzer Alert

The front DISPLAY buttons make different sounds when pushed depending on the type and function of the button.

5-1-7. Power Outage Protection Function

1. After a power outage, even if the power is reset, the previous operations will be performed. (However, this does not apply to ERROR and TEST MODE states.)
2. There is no power outage protection while in Fer. Mode, and settings will return to Kimchi M. (to avoid excessive fermentation).

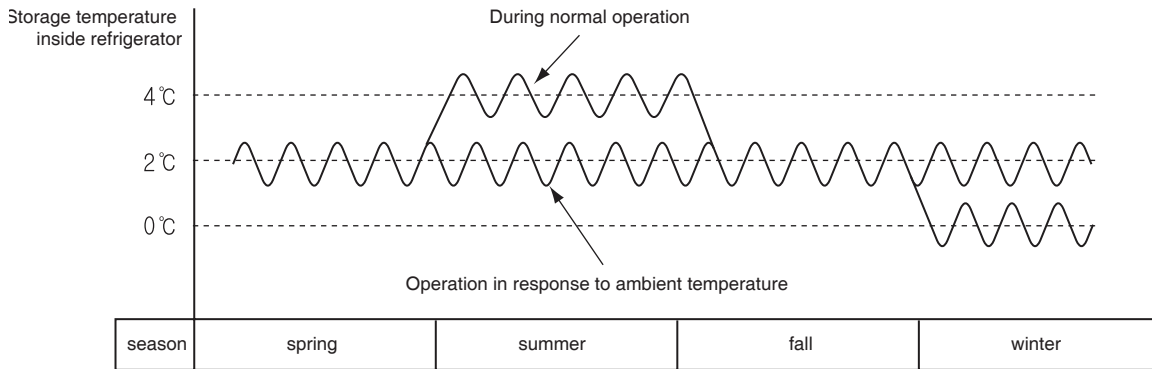
MICOM Function and Circuit Description

5-1-8. TCM COMP forward/reverse rotation control (Restricted to TCM models)

1. After purchase, if the initial power-on and surrounding temperature is higher than 38 °C, the refrigerator uses forward rotation control.
2. Otherwise, the refrigerator uses reverse rotation control

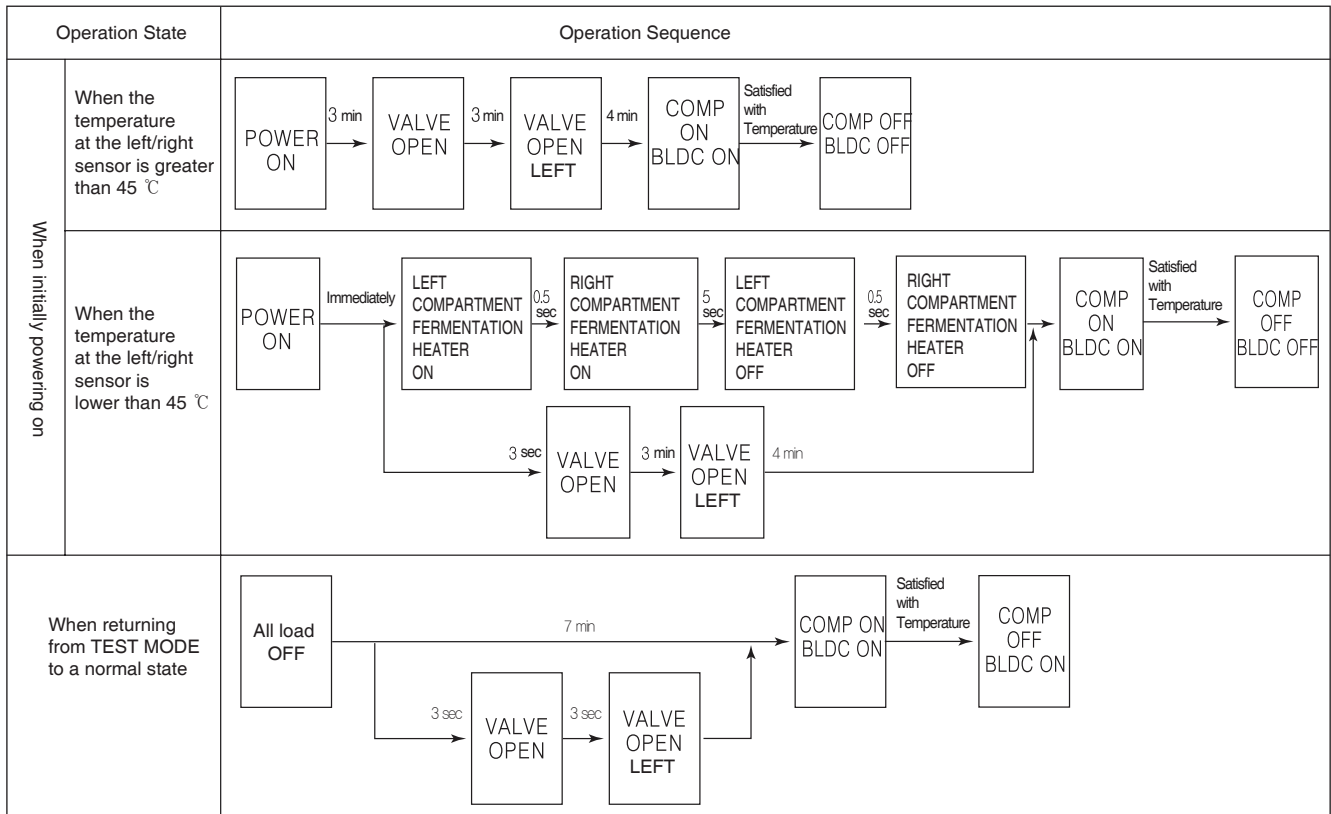
5-1-9. Operation in response to ambient temperature

This function maintains a constant storage temperature in all seasons by detecting the surrounding temperature and compensating for the refrigerator's internal temperature in order to protect against changes in internal temperature (excessive cooling in winter, weak cooling in summer) due to ambient temperature.



5-1-10. Sequential Operation of Electronic Components

Electronic devices such as COMP, 3 WAY VALVE, the left compartment fermentation heater and the right compartment fermentation heater run in the following sequence when initially power-up or after TEST has finished in order to prevent component damage and NOISE emission from a number of components starting at the same time.

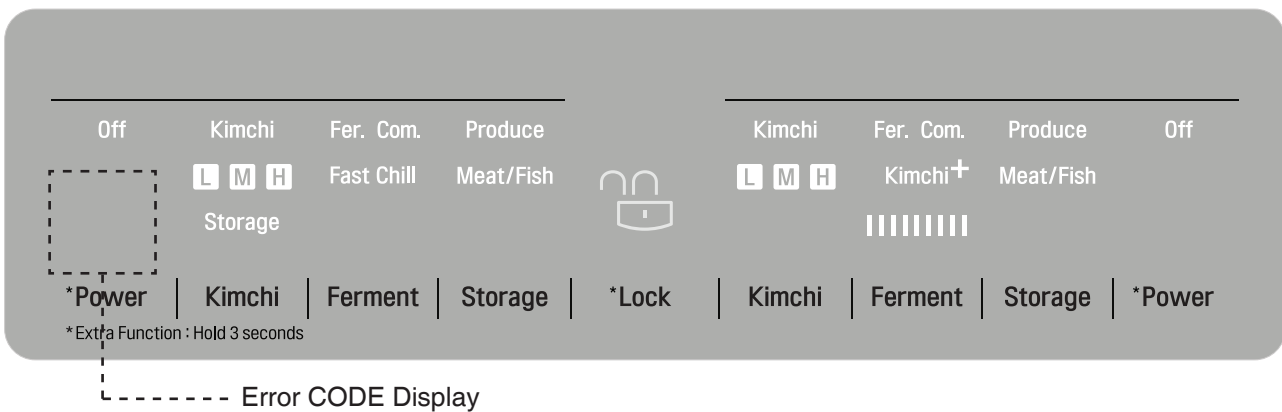


MICOM Function and Circuit Description

- After a VALVE has been open for 3 minutes, the VALVE will OPEN either in the left compartment or right compartment depending on the internal temperature.
- The above mentioned BLDC stands for the machine room DC BLDC C-Fan Motor

5-1-11. Diagnostic Function

1. The Diagnostic function facilitates service if a failure occurs that affects the performance of the product during use.
2. When a malfunction occurs, the function will not run even when the button is pushed
3. After a failure has occurred, once "Failure" is cleared from the Error CODE Display, the refrigerator will return to its normal status
4. The error CODE is displayed as left component 88 Segment, and the remaining LED lights turn off



MICOM Function and Circuit Description

■ LKIM08121V, GKIM08121V

※ When a malfunction occurs, for 3 hours* check using All On Mode, and after 3 hours, it will be displayed as an error code.

* When the left/right compartment kimchi buttons are held simultaneously for more than 1 second

NO	Malfunction items	Error Code	Operating state of the product in case of failure					Malfunction Content	NOTE
			COMP	Left 3-WAY VALVE	Right 3-WAY VALVE	Left fermentation heater	Right fermentation heater		
1	Left compartment sensor malfunction	E1	○	2minutes OPEN/20minutes CLOSE	○	Heater Off	○	Left compartment sensor disconnection or short circuit	Test connection of each relevant sensor
2	Right compartment sensor malfunction	E2	○	○	2minutes OPEN/20minutes CLOSE	○	Heater Off	Right compartment sensor disconnection or short circuit	
3	Open air sensor malfunction (location on DISPLAY)	LED Off	○	○	○	○	○	Ambient Sensor disconnection or short circuit	
4	Communication malfunction	CO	○	○	○	Heater Off	Heater Off	When there has been 30 seconds continuously	Connector not inserted. WIFI communication unit circuit malfunction

- When a malfunction occurs, the heating function does not run, but the storage function for the left and right compartments runs.
- If 2 or more defects occur simultaneously, only information about the malfunction detected first will be displayed.
- When a malfunction occurs and both the DISPLAY's function button and TEST S/W are pressed, the function is disabled and the buzzer will not sound.
- If a sensor error is detected even during Test Mode function, reset operation.
- When a communications defect occurs, the appliance will revert to the storage temperature set before the defect occurred.

MICOM Function and Circuit Description

5-1-12 TEST Function

1. The TEST function attempts to identify the malfunctioning part within the PCB and the product's function CHECK and malfunctioning state.
2. The TEST S/W is in the MAIN PCB board, and any TEST MODE will last a maximum of 2 hours, after which it will return to a normal state.
3. While running TEST MODE, function buttons are not detected and buzzers do not work.
4. When TEST MODE finishes, make sure to unplug and plug back in the POWER CORD, after which the appliance will return to a normal state.
5. While running TEST MODE, if a defect is detected such as a sensor problem, TEST MODE is deactivated and an error code is displayed.
6. While the error code is being displayed, the TEST MODE will not work even if you press the TEST S/W button.
7. Holding the left compartment kimchi button and right compartment kimchi button simultaneously for more than 1 second will turn all the LED lights on. The LED display returns to its previous state once the buttons are released.

MODE	Operation	Comp / fan motor	Valve	Left/Right compartment fermentation heater	DISPLAY LED	notes
TEST1	Push TEST S/W 1 time	ON	Left Compartment 25 minutes / Right Compartment 25minutes	OFF	"11" appears in the display below Left Off	when checking the cooling system of the left /right compartment
TEST2	During TEST 1, push TEST S/W 1 time	ON	Right Compartment Valve OPEN	OFF	"22" appears in the display below Left Off	when checking the cooling system of the right compartment
TEST3	During TEST 2, push TEST S/W 1 time	ON	Left Compartment Valve OPEN	OFF	"33" appears in the display below Left Off	when checking the cooling system of the left compartment
TEST4	During TEST 3, push TEST S/W 1 time	OFF	Left Compartment Valve OPEN	ON	"44" appears in the display below Left Off	when testing the heater
restore to normal	During TEST 4, push TEST S/W 1 time	Factory settings are restored when, during TEST4, a maximum of 30 minutes has passed and each compartment has reached a temperature of 104 F (40°C) or more.				

※ LED CHECK (function)

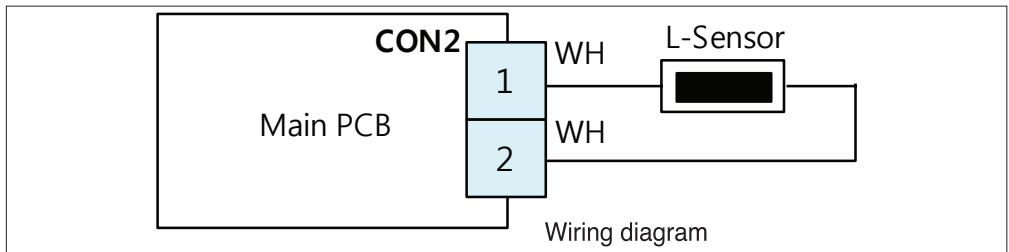
Holding the left compartment kimchi button and right compartment kimchi button simultaneously for more than 1 second will turn all the LED lights on. The LED display returns to its previous state once the buttons are released.

Troubleshooting

Chapter 6: Troubleshooting Errors

Sensor error in the left compartment

※ Since the connector number and the pin number may vary depending on the model (PCB), please refer to the pin-specific function of each connector marked on the PCB.



Is E1 shown on the DISPLAY?

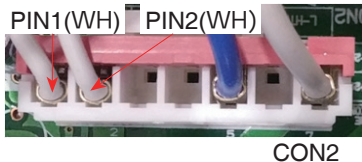
Is the connector connected to the MAIN PCB inserted improperly?



Turn the power off
Tip: For the protection of MICOM

Reconnect the connector

Separate CON2 from MAIN PCB and check if the resistance between pin 1 and pin 2 is as shown below. (White, White)



Measuring Points	RESULT
Pin1 to pin2	5 ~ 130kΩ

Reconnect CON2 and turn the power on

If F 1 is shown on the DISPLAY, replace the MAIN PCB, otherwise explain to the customer.

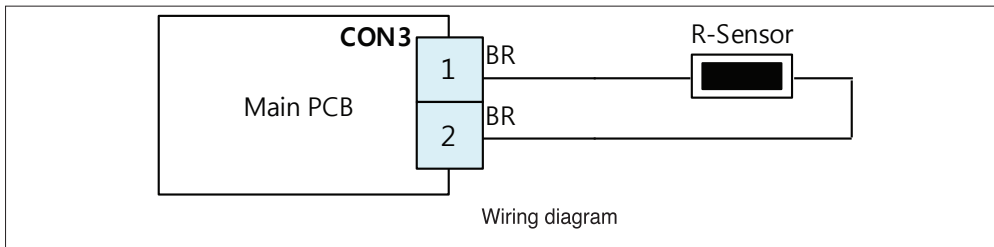
Replace sensor of the left compartment

Troubleshooting

6-2. Troubleshooting Errors

Sensor error in the right compartment

※ Since the connector number and the pin number may vary depending on the model (PCB), please refer to the pin-specific function of each connector marked on the PCB.



Is E2 shown on the DISPLAY?

Is the connector connected to the MAIN PCB inserted improperly?

YES → Reconnect the connector

NO → Turn the power off
Tip: For the protection of MICOM

Separate CON3 from MAIN PCB and check if the resistance between pin 1 and pin 2 is as shown below. (White, White)

Measuring Points	RESULT
Pin1 to pin2	5 ~ 130kΩ

NO → Replace sensor of the Right compartment

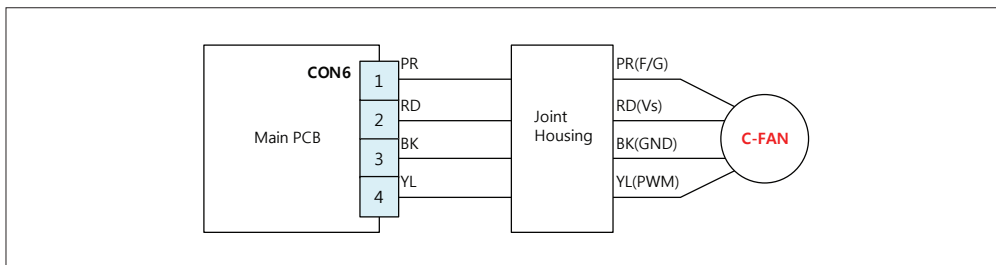
YES → Reconnect CON3 and turn the power on

If F 1 is shown on the DISPLAY, replace the MAIN PCB, otherwise explain to the customer.

Troubleshooting

C-Fan Motor Error

※ Since the connector number and the pin number may vary depending on the model (PCB), please refer to the pin-specific function of each connector marked on the PCB.



Is CF shown on the DISPLAY?

YES

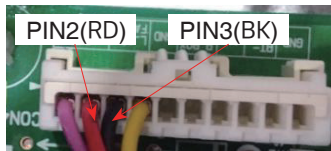
Is the connector connected to the MAIN PCB inserted improperly?



YES → Reconnect the connector

NO

Turn off the refrigerator and then turn it on again. Then after entering TEST 1 MODE, is the voltage between pin 2 and pin 3 as shown below?



NO → Replace the main PCB.

Measuring Points	RESULT
Pin2 to pin3	12V

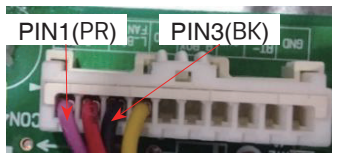
YES

Is the machine room fan running normally in the TEST1 mode?



YES

Is the feedback voltage between pin 1 and 3 as shown below? (From the motor to the main PCB)



Measuring Points	RESULT
Pin1 to pin3	1 ~ 4 V

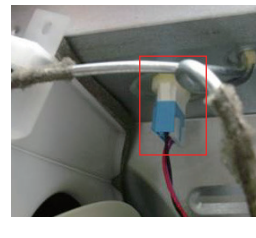
YES

Explain to the customer.

NO → Check the FAN motor (Connector, Frost, Jam, etc.)



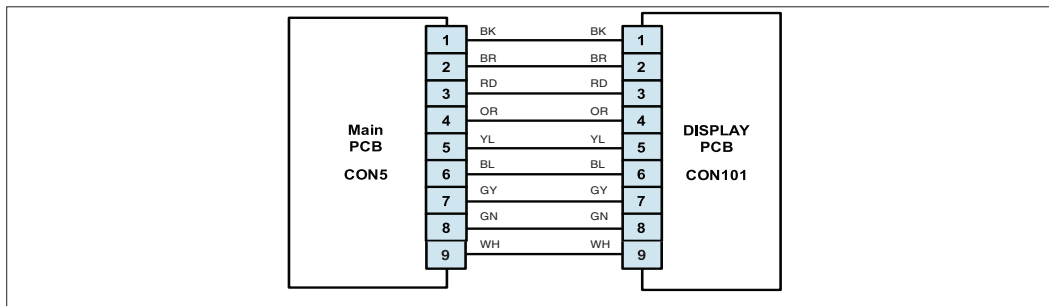
Check the connection of HOUSING



NO → Replace the main PCB.

Troubleshooting

Communication Failure



Is "CO" displayed on the DISPLAY PCB?

YES

Has the Connect fallen out or is it loosely fastened?

YES

Reconnect the connector



NO

Is the voltage between pin 2 and 3 on the CON101 of the DISPLAY PCB as shown be easure while connected)

YES

Replace the display PCB.



Measuring Points	RESULT
Pin2 to 3	0 V or 5 V

NO

Is the voltage between pin 2 and 4 on the CON101 of the DISPLAY PCB as shown below? (Measure while connected)

YES

Replace the display PCB.



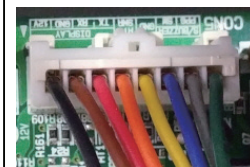
Measuring Points	RESULT
Pin2 to 4	0 V or 5 V

NO

Is the voltage between pin 2 and 3 on the CON5 of the DISPLAY PCB as shown below? (Measure while connected)

YES

Replace the Main PCB.



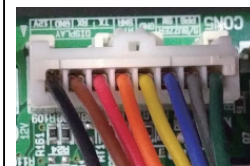
Measuring Points	RESULT
Pin2 to 3	0 V or 5 V

NO

Is the voltage between pin 2 and 4 on the CON5 of the DISPLAY PCB as shown below? (Measure while connected)

YES

Replace the Main PCB.



Measuring Points	RESULT
Pin2 to 4	0 V or 5 V

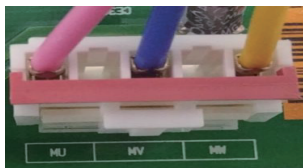
NO

Turn off the refrigerator and turn it on again. One minute later, check if "CO" appears in the all-on mode, and if it does not, check the connector and explain it to the customer.

Troubleshooting

Weak Cooling in the Left/Right
Compartment

MAIN PCB
Is the connector connected to the
MAIN PCB inserted improperly?



CON201

Yes

Reconnect the
connector

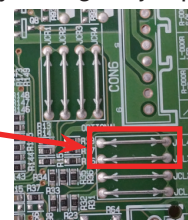
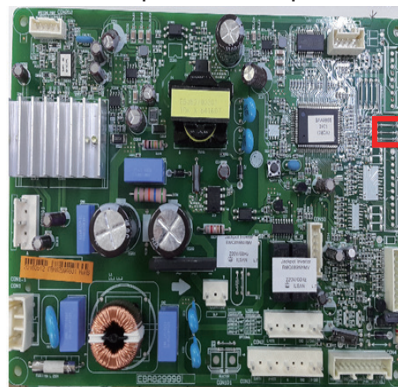
No

※ Since the connector number and the pin number may vary depending on the model (PCB), please refer to the pin-specific function of each connector marked on the PCB.

Reset the power of the refrigerator and perform temperature compensation of the freezer as below.

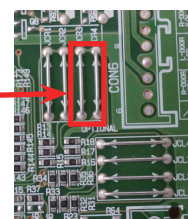
1. PCB P/No : EBR829998

Perform temperature compensation by cutting the jump wire



ROOM	JUMP WIRE	Temperature compensation value	
Left Compartment	JCL3	-1.0°C	-2.0°C
	JCL4	-1.0°C	

Perform temperature compensation by -1 °C by cutting the jump wire



ROOM	JUMP WIRE	Temperature compensation value	
Right Compartment	JCR3	-1.0°C	-2.0°C
	JCR4	-1.0°C	

Perform temperature compensation by -1 °C by cutting the jump wire

Troubleshooting

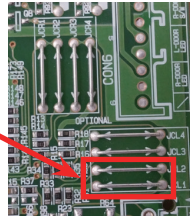
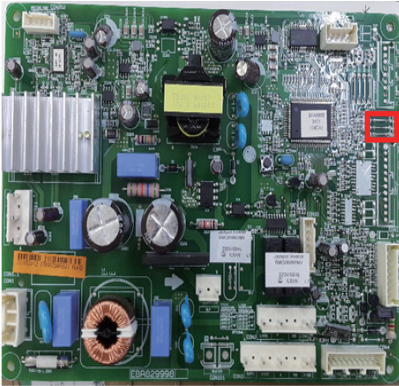
Overcooling in the Left/Right Compartment

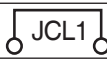
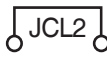
※ Since the connector number and the pin number may vary depending on the model (PCB), please refer to the pin-specific function of each connector marked on the PCB.

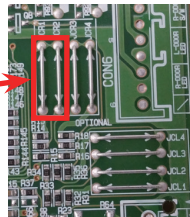
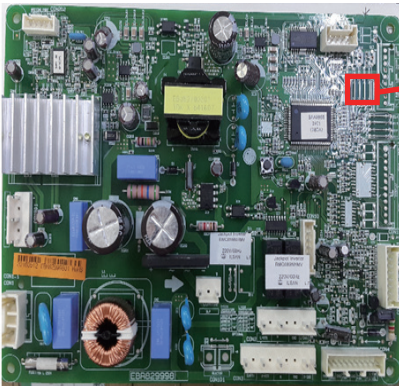
Reset the power of the refrigerator and perform temperature compensation of the freezer as below.


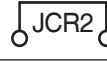
1. PCB P/No :EBR829998

Perform temperature compensation by cutting the jump wire



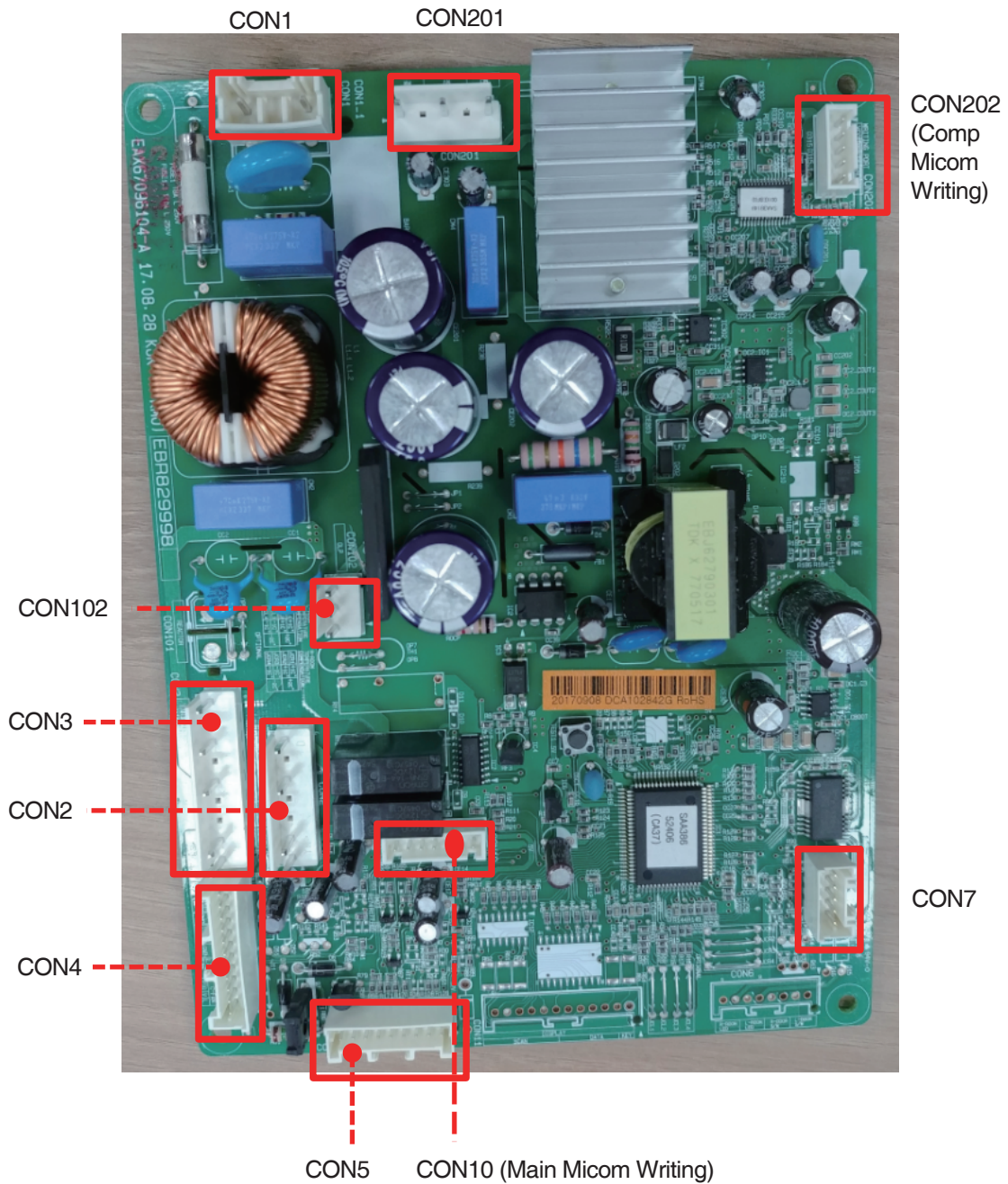
ROOM	JUMP WIRE	Temperature compensation value	
Left Compartment		+1.0°C	+2.0°C
		+1.0°C	
Perform temperature compensation by +1 °C by cutting the jump wire			



ROOM	JUMP WIRE	Temperature compensation value	
Right Compartment		+1.0°C	+2.0°C
		+1.0°C	
Perform temperature compensation by +1 °C by cutting the jump wire.			

Troubleshooting

EBR829998

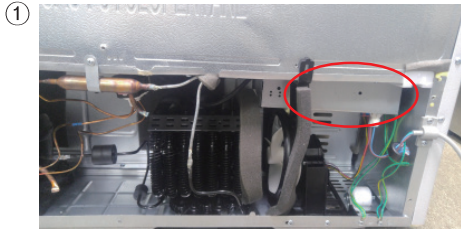


Compressor

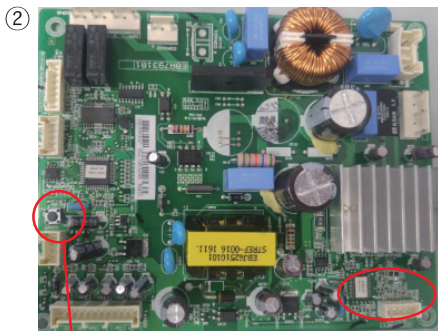
Chapter 7: Compressor

7-1 PCB Check

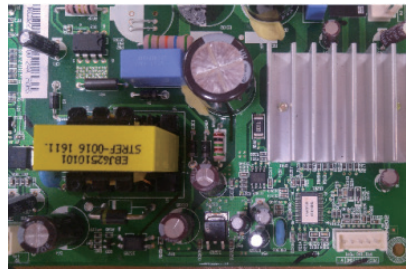
Malfunction of COMP



Open the Back Cover of the Machine Room to take out the Case PCB



After Pressing the Test Button, Check the number of LED blinks
(Refer to the next chapter for measures depending on the number of LED blinks)



If COMP is normal, LED does not blink

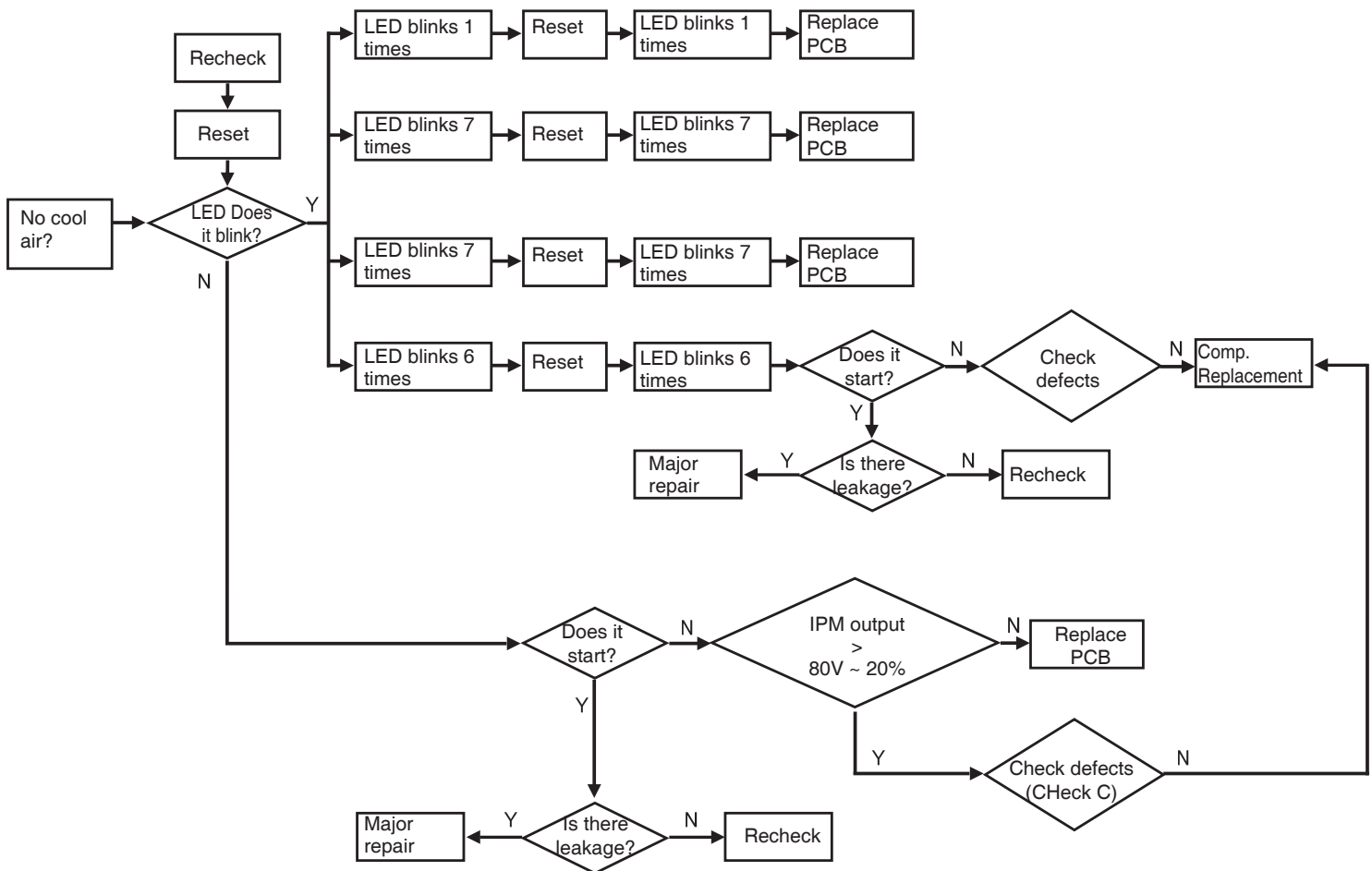
MICOM Function and Circuit Description

Comp SVC Manual

1. LED Trip Check





- ① After Opening the PCB cover n, Check the number of LED blinks
- ② Measures by the number of LED blinks → Without resetting(Before turning off the refrigerator), check
- ③ Record: Record the number of LED blinks Record on the failure label sheet
- ④ Power reset to reconfirm.

Simple Check Sequence



Compressor

Diagnosis Using LED Blinks

No.	LED operating condition	Cause	Service guide
1	<p>LED blinks once</p>  <p>· · Blink -Off-Blink-Off-Blink-Off-Blink-Off-Blink-Off · · Repeat</p>	AD-Offset Error	<ol style="list-style-type: none"> 1. Reset the power and check if it starts normally 2. Replace PCB if the problem persists after step 1
2	<p>LED blinks six times</p>  <p>· · Blink -Blink-Blink-Blink-Blink-Blink-Off-Blink -Blink--Blink-Blink-Blink-Blink-Off- · · Repeat</p>	Circuit overcurrent error	<ol style="list-style-type: none"> 1. Reset the power and check if it starts normally 2. Replace PCB if the problem persists after step 1 3. If the problem persists after step 2, replace COMP
3	<p>LED blinks seven times</p>  <p>· · Blink -Blink-Blink-Blink-Blink-Blink-Blink-Off-Blink -Blink--Blink-Blink-Blink-Blink-Blink-Off- · · Repeat</p>	PCB parts defect (IPM)	<ol style="list-style-type: none"> 1. Reset the power and check if it starts normally 2. Replace PCB if the problem persists after step 1
4	<p>LED blinks two times</p>  <p>· · Blink -Blink-Off-Blink-Blink-Off-Blink-Blink-Off · · Repeat</p>	Circuit overvoltage error	<ol style="list-style-type: none"> 1. Reset the power and check if it starts normally 2. Replace PCB if the problem persists after step 1

Compressor

Diagnosis Using LED Blinks

2. LED blinks six times (Current Trip)



Blink Blink Blink Blink Blink Blink OFF

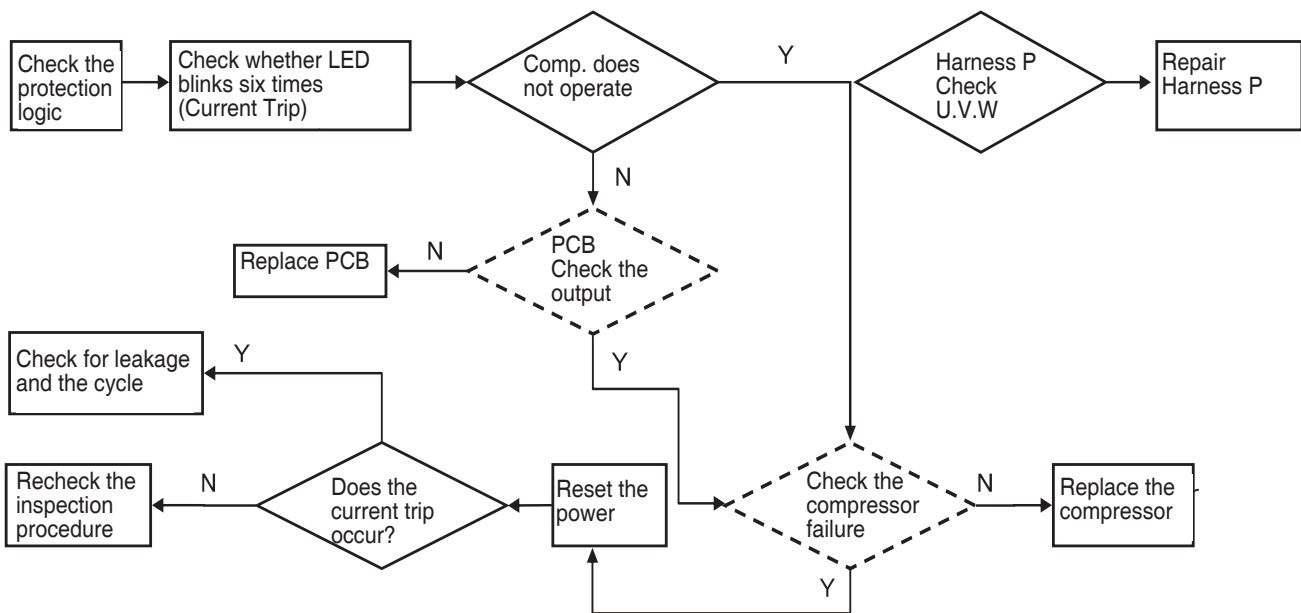
※ A six-flash (Current Trip) can occur in situations such as intermittent power outages where the refrigerator power turns on/off within 3 minutes.

1. If there is a six-flash status, or if there is not a large difference between the set temperature and the internal temperature, there is no problem with the PCB Compressor or Cycle.
2. This means a Cycle Leakage or blockage (water or dirt) when there is a six-flash state and problems such as cooling failure occur.

→ Causes: Cycle leakage or blockage, excessive COMP temperature increase due to Condenser fan defect, constraint of the compressor piston, or PCB IPM element burnout

→ Causes: Overcurrent protection

→ Measures: Check PCB Output, check Compressor part operation, check leakage test and Cycle blockage



Compressor

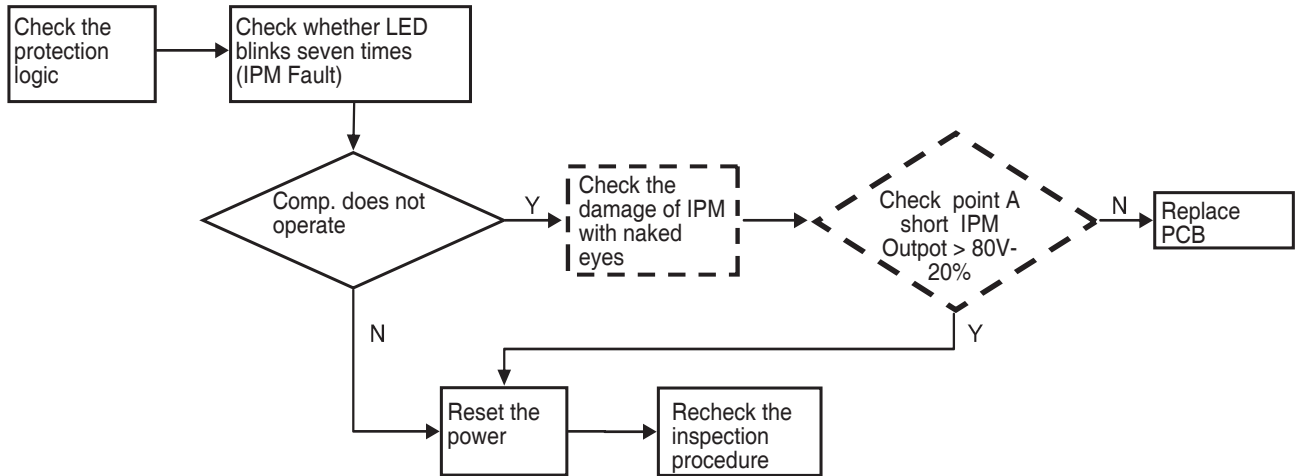
Diagnosis Using LED Blinks

3. LED blinks seven times (IPM Fault)



Blink Blink Blink Blink Blink Blink Blink OFF

- Cause: IPM short, failure
- Purpose: To prevent overcurrent due to IPM short-circuit or failure
- Measures : When Comp has no movement, visually check for IPM damage U, V, W
→ Replace PCB



Compressor

Check Compressor & Harness

- Comp terminal resistance measurement
- Check for insulation breakdown: Measure the resistance between the Comp's Power terminal and the ground

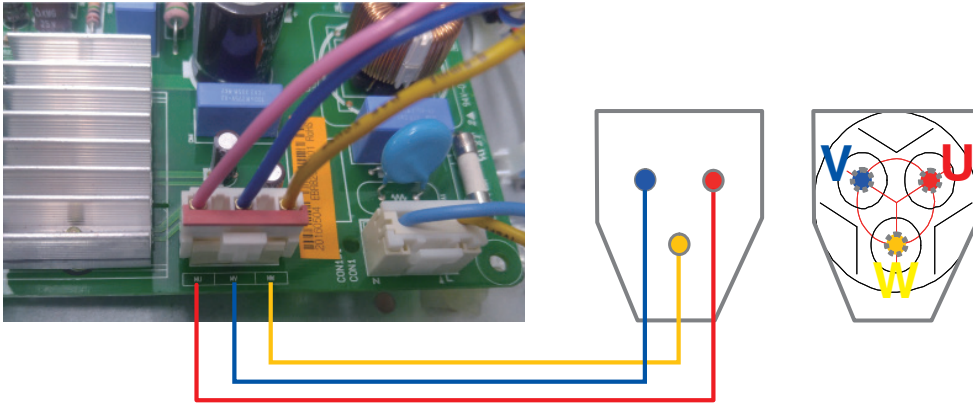


Fig. A

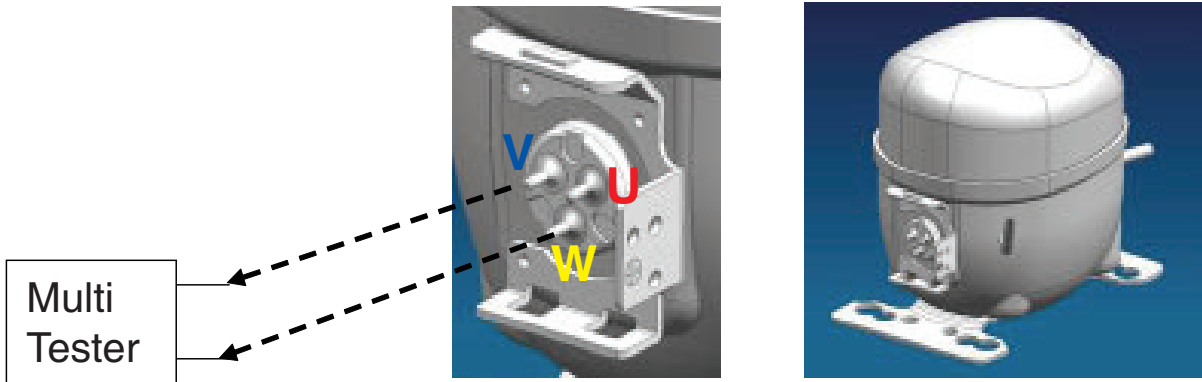


Fig. B

Compressor	Resistance
BMG089NHMV	9.0 ~ 18.0 Ω

※ Resistance may vary by several Ω depending on the ambient te

Compressor

7-2 Judging Defects in Inverter BLDC Compressor

To check for BLDC compressor defects, perform checks in the following order.

7-2-1 Measuring the Compressor Winding Resistance

Caution

1. Turn off the power to the refrigerator and wait a few minutes before measuring.
2. If you do not accurately measure the resistance, it can be determined incorrectly.

Normal Criteria

- When measuring the resistance value of the Harness (connected to the Compressor) connecting to the Main PWB's Connect201 (CON201) using a Multi-tester, the resistance value can be determined as having returned to normal when the displayed value matches the one in the drawing on Page 31.

Defect Criteria

- If the resistance value measured at the Fig. A is infinity or hundreds of $M\Omega$, check the clamping state of the Compressor connection Harness-P (Lead Wire) in the machine room and separate the machine room Connect (Fig. point B) and re-measure the resistance in Connect. If the resistance value matches the standard value, the Compressor can be deemed as normal. Check the Harness connection
(Machine room Connect contact defect, CON201 Housing Connect Defect, Harness disconnection.)
- If the resistance value measured in Fig. B is also infinity or hundreds of $M\Omega$, turn off the Compressor terminal's Cover PTC and check the status of Fig. point B's terminal bond. If it is normal, check the contact state of O.L.P. that is fixed in the Cover PTC. O.L.P abnormalities can also be determined by the resistance values of both O.L.P. ends. If the resistance value is less than 5Ω when measuring both O.L.P ends, it is normal. If the resistance value is large, an O.L.P. short can be determined, power is not supplied to the Compressor and it doesn't run.
- If there is no problem with the connection state and the resistance value is infinity or hundreds of $M\Omega$, Compressor failure can be determined.
- If there is no problem with the Compressor's resistance value, there could be a Main PWB defect. Check for PCB failure.
- When you determine there is a defect by measuring the resistance, if the PCB's COM201's MU & MV or MU & MW or MW & MU resistance value matches the value of page 31, motor winding can be determined as normal

General Information about the Product

Chapter 8: General Information about the Product

8-1 Refrigerator Noise

The structure of the machine room and freezer, where cause of the kimchi refrigerator's noise is located, is shown in the following figure. When the refrigerator is running, the main source of noise is the fan Motor that cools the machine room's Compressor and Condenser.

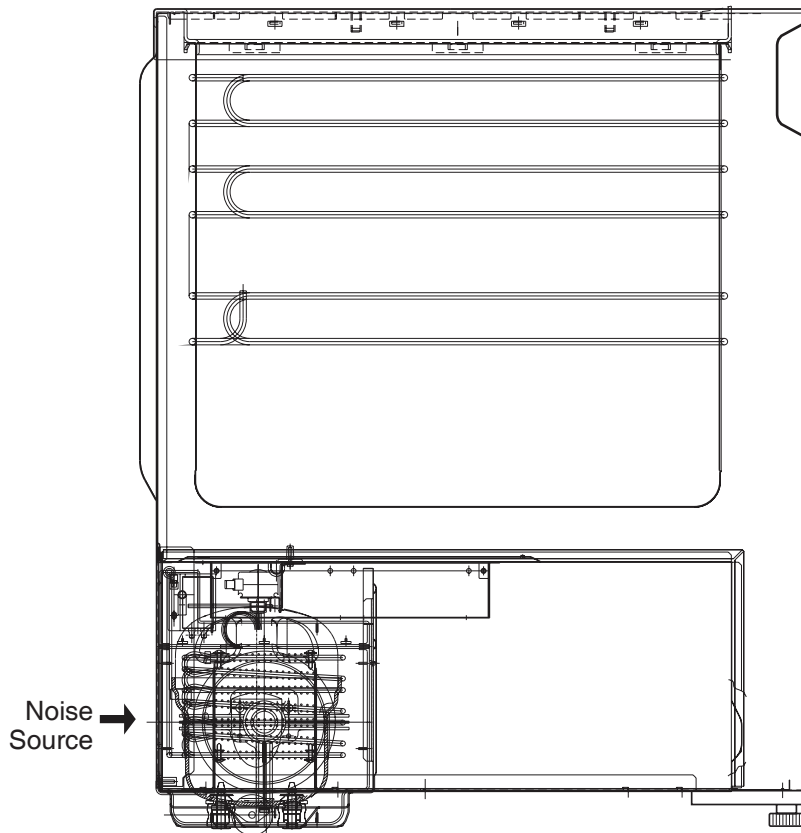


Figure. kimchi refrigerator noise generator schematic

8-1-1 How to SVC a Noise Claim

(1) The default method for noise reduction

- ▶ Block : The propagation path of the sound is blocked with high-density sound insulation material so that the noise from the sound source doesn't reach people's ears. (Effective in high frequency areas)
- ▶ Using sound-absorbing materials : Similar to blocking, putting materials like Styrofoam or glass wool in the sound's propagation path to absorb the sound. (Effective in low frequency areas)
- ▶ anti-vibration : Does not let the mechanical vibrations generated when operating machines with driving parts spread to other remaining materials. (Using anti-vibration rubber, etc.)
- ▶ Maintain dynamic equilibrium : The dynamic imbalance of the rotor is reduced to a minimum
- ▶ Affix the vibrating part : Depending on the situation, affix the vibrating part firmly so that it doesn't shake any more.
- ▶ Removing the contact : For sounds made when objects periodically collide with each other, separate the two objects or affix the parts firmly.

General Information about the Product

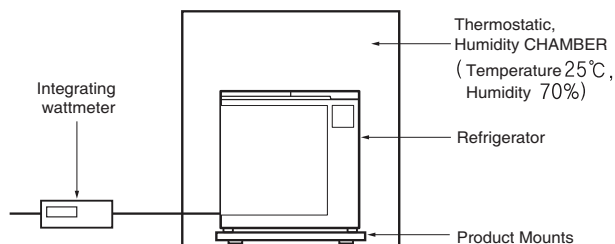
(2) SVC method for kimchi refrigerator's major noise Claim

noise Claim	Occurring phenomena		
Installation defect noise	<ul style="list-style-type: none"> ▶ The refrigerator's bottom is weak ▶ The refrigerator is not level 	<ul style="list-style-type: none"> ■ Supplement the strength of the bottom ■ Move the installation location ■ Adjust the level using the Adjust Screw in the front of the refrigerator 	
Part vibrations	<ul style="list-style-type: none"> ▶ Whirring sound 	<ul style="list-style-type: none"> ■ Insert all refrigerator parts in their correct place 	<ul style="list-style-type: none"> ▶ Mainly inside the fridge
Compressor resonant sound	<ul style="list-style-type: none"> ▶ Zooming sound 	<ul style="list-style-type: none"> ■ Noise reduction by adjusting the Pipe and Seat Rubber 	
Compressor noise	<ul style="list-style-type: none"> ▶ Balance defect of the Compressor ▶ Contact noise from things surrounding the Compressor part, like the Pipe 	<ul style="list-style-type: none"> ■ Maintain Compressor balance of equilibrium by adjusting the surrounding Pipe and Seat Rubber ■ Remove contact 	
Starter noise	<ul style="list-style-type: none"> ▶ Sound caused by contact with the OLP contact point when the Compressor starts up ▶ "Crackle" sound 	<ul style="list-style-type: none"> ■ Exchange of OLP 	
Wire Condenser noise (vibration)	<ul style="list-style-type: none"> ▶ Zooming sound ▶ "Grimace" sound 	<ul style="list-style-type: none"> ■ Recheck the screw fixing ■ Remove the heat sink welds → Remove the heat sink 	

8-2 Measuring Power Consumption

Power consumption measurements of the refrigerator are measured in the Chamber, where temperature and humidity are kept constant. In the neighboring picture, the chamber is maintained at a temperature of 25°C and a humidity of 70% and the power consumption is measured by matching the right and left shipment notches while the refrigerator is unloaded. Energy consumption is calculated as follows:

There could be a discrepancy between actual energy consumption and the energy consumption **Caution** displayed by the refrigerator.



$$\text{Monthly power consumption (kWh/month)} = \text{Measure(kWh/day)} \times 365\text{day} / 12\text{month}$$

Handling R600a Refrigerant During Major Repairs

Chapter 9: Handling R600a Refrigerant During Major Repairs

9-1. Outline

9-1-1. Checkpoints before Major Repair

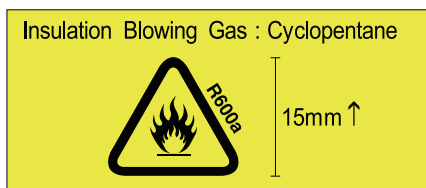
Open the Cover ASM, Back-M/C of refrigerator and check the type of refrigerant indicated on a compressor before starting work. A yellow label is adhered to the compressor for the refrigerator using R600a as refrigerant.

9-1-2. Features of R600a Refrigerant

- Non-polar natural gas refrigerant (CH(CH₃)₃)
- Since R600a is same series as butane gas, there is danger of fire when discharged into air at appropriate concentration (extreme handling is required for heavy repair of cycle).
Explosion concentration : .8% ~ 8.4%/Vol.
Burning temperature : 494°C

9-1-3. Features of R600a Refrigerator

- With refrigerant quantity of 60% or so for the refrigerator using R134a as refrigerant
- Large vacuum level at suction pressure (at low pressure side)
- COMP capacity of the refrigerator using R609a as refrigerant is large by 1.7 times than that of the refrigerator using R134a.
- Labels as in Figure are displayed at the compressor of a refrigerator for R600a and the back plate of refrigerator.



[Warning sign according to ISO 3864]



9-1-4. Location and Environment for Major Repair

- Check that drafting and air ventilation are well done at a working area and perform work after making drafting and air ventilation smooth (use refrigerant return bag indoors).
- Check that there are fire appliances or heating source around the working area and then remove them before work.
- Since R600a refrigerant is very inflammable, they should not be discharged indoors.
- Be sure to follow heavy repair SVC procedures during work.

9-1-5. Required Tools

- R600a refrigerant
- Bombe
- Pinch Pliers
- Refrigerant Discharge Hose
- Refrigerant Return Bag
- Vacuum Pump
- Handy Welding Machine
- Charging Tube
- Leakage Tester
- Drier

Handling R600a Refrigerant During Major Repairs

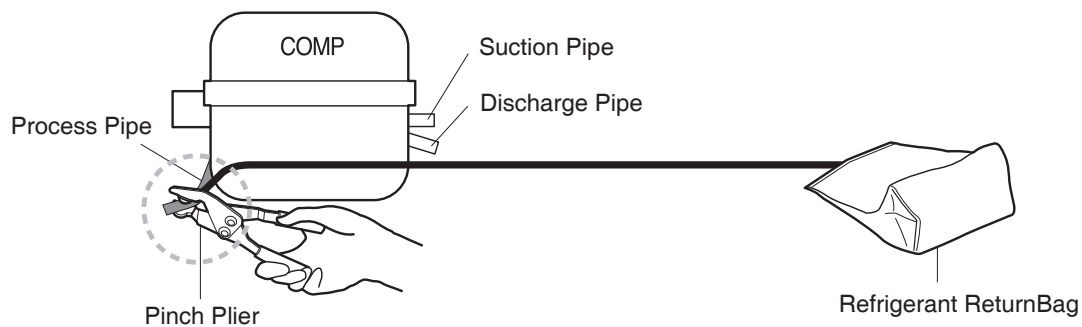
9-2. Major Repair SVC Method

For the major repair of R600a type of refrigerator, perform work according to following SVC method.

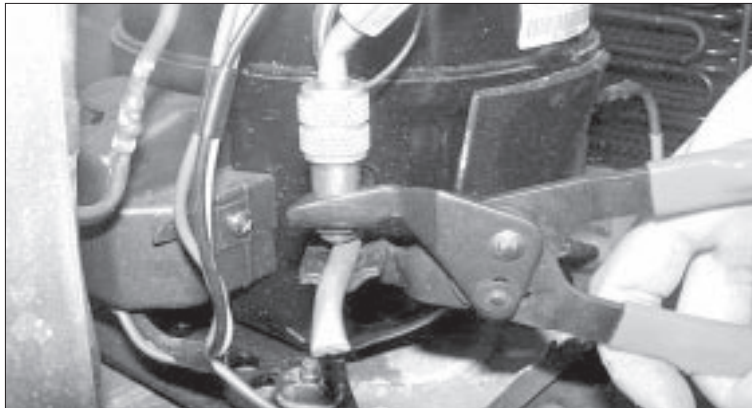
9-2-1. Return of Refrigerator Refrigerant

Required equipment: Pinch pliers, refrigerant discharging hose, refrigerant returnbag

- Take power cords out and remove power between 6sec through 12sec after powering ON to open all both sides of 3way valve.
- Leave doors of a refrigerator so that they are not closed.
- Connect pinch pliers with a refrigerant discharging hose.
- Place the outlet of a refrigerant discharging hose outside.
(Remove fire appliances or heating sources near a refrigerant discharging hose.)
- Always use a refrigerant returnbag for working at the contained space.
- Bore the charging pipe of a compressor with pinch pliers.
(Remove fire appliances or heating sources near a refrigerator.)
- Perform refrigerant discharge for more than 7 minutes.



※ The position of the Suction Pipe, Charging Tube and Discharge Pipe needs to be checked since the their positions may vary depending on the shape of the Comp

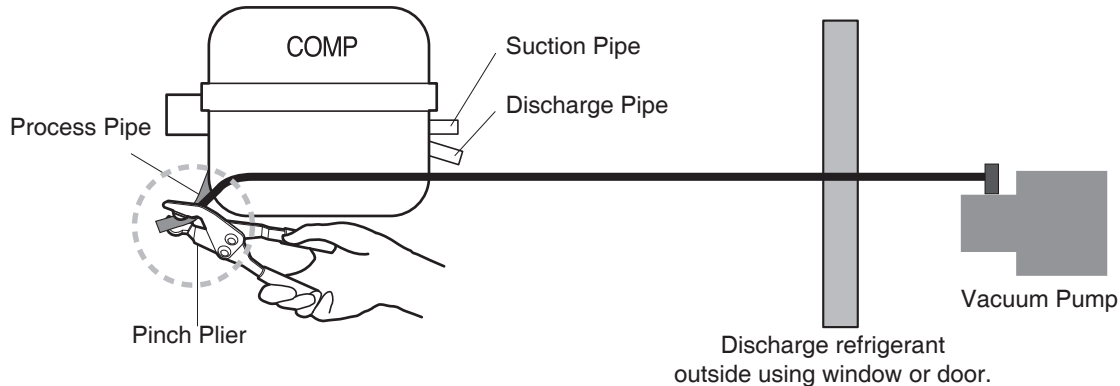


Handling R600a Refrigerant During Major Repairs

9-2-2. Return of Remaining Refrigerant

Required equipment: Pinch pliers, hose for refrigerant recovery, vacuum pump

- If refrigerant return time of 7 minutes has passed, connect a vacuum pump at the ends of a refrigerant return hose outdoor. (Vacuum pump must operate outdoor.)
- Operate a vacuum pump in order to return refrigerant remained in the pipe.
- Vacuum working time should be for more than 10 minutes.



※ The position of the Suction Pipe, Charging Tube and Discharge Pipe needs to be checked since their positions may vary depending on the shape of the Comp

9-2-3. Welding Repair Step

Required equipment: Simple welding machine

- Remove pinch pliers if remaining refrigerant return is completed.
- Cut the front part of a process pipe with a cutter. (Check that remaining refrigerant comes out.)
- Perform welding work such as replacement of compressor and dryer, or repair of leakage part. (Be cautious of fire during welding work.)



※ Cautions during Major Repair Service

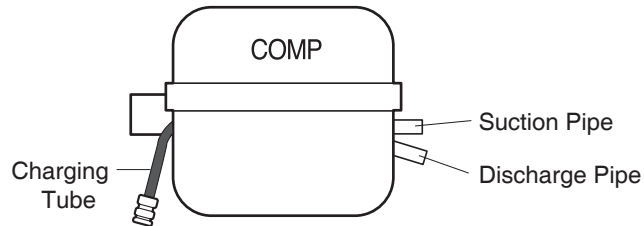
There is a risk of fire when performing welding repairs. Special care should be taken because the refrigerant may remain at high pressure, even after vacuum air discharge, due to cycle clogging. Avoid welding repairs where cycle clogging is a known issue or the cause of errors is unclear. (For models using R600a refrigerant)

Handling R600a Refrigerant During Major Repairs

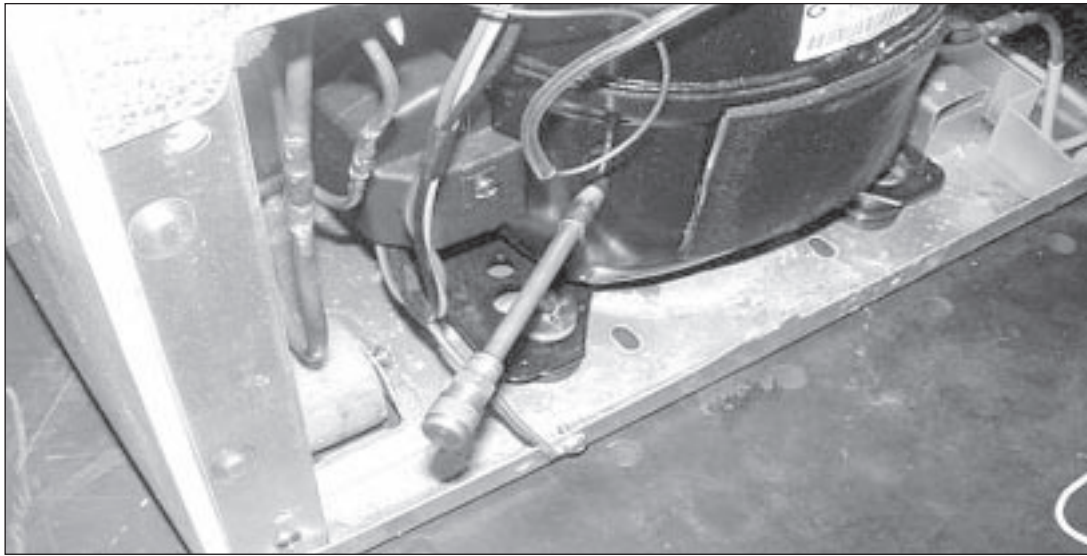
9-2-4. Charging Tube Connection

Required equipment: Charging tube, simple welding machine

- Remove a charging pipe to recharge R600a refrigerant after completing work, and then connect a charging tube with welding



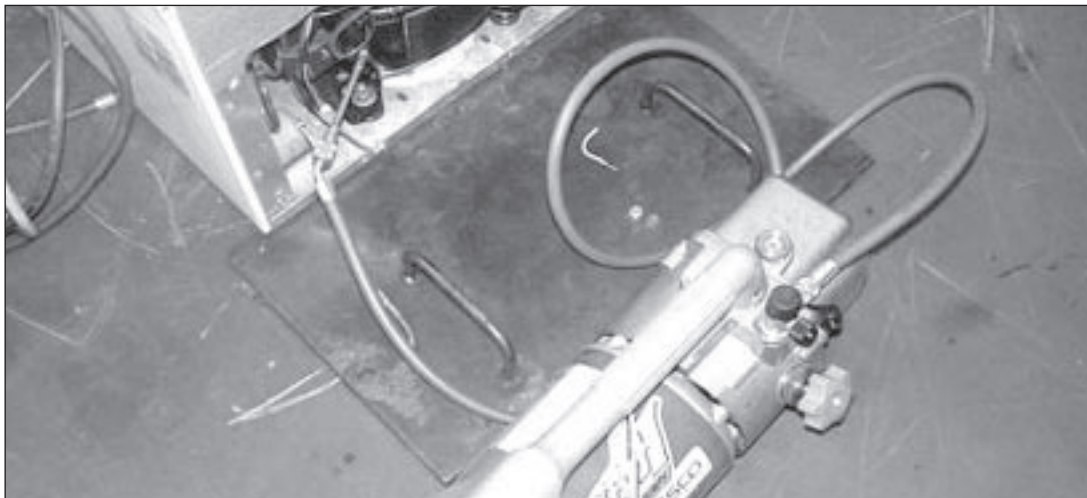
- ※ The position of the Suction Pipe, Charging Tube and Discharge Pipe needs to be checked since their positions may vary depending on the shape of the Comp



9-2-5. Vacuum Air Removal

Required equipment: Vacuum pump

- Connect a vacuum pump to a charging tube to perform vacuum cycle.
- Vacuum work should be performed for an hour. (If vacuum time is short, normal cooling performance may not be exerted due to failure of cooling cycle.)



Handling R600a Refrigerant During Major Repairs

9-2-6. Refrigerant Charging

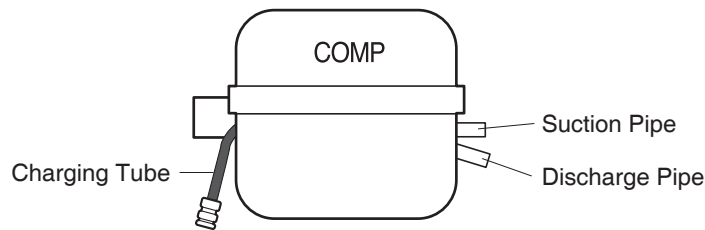
Required equipment: Bombe, R600a refrigerant (80g)

- Firstly remove fire appliances and heating source for performing work when charging scaled refrigerant. (Do not spray refrigerant indoor.)
- Measure the accurate quantity (80g) of refrigerant to charge it into a Bombe.
- Make the Bombe as vacuum status to charge refrigerant.
(If there is air or moisture in a Bombe, it may give effect on performance of a cooling cycle.)
- Please manage refrigerant quantity as $80g \pm 1$. Differently from R134a, R600a gives much effect on cooling performance depending on change of refrigerant quantity.

Refrigerant quantity = Weight after charging - Weight before charging (weight of vacuumed Bombe)

- Connect Bombe with a charging tube to charge refrigerant.
- Turn on power of refrigerator to operate a compressor.
- Measure Bombe weight after 5 through 10 minutes to check remained refrigerant quantity to complete charging of refrigerant.
(After charging refrigerant, never perform welding work or work using fire appliances.)

9-2-7. Leak Inspection and Cycle Check



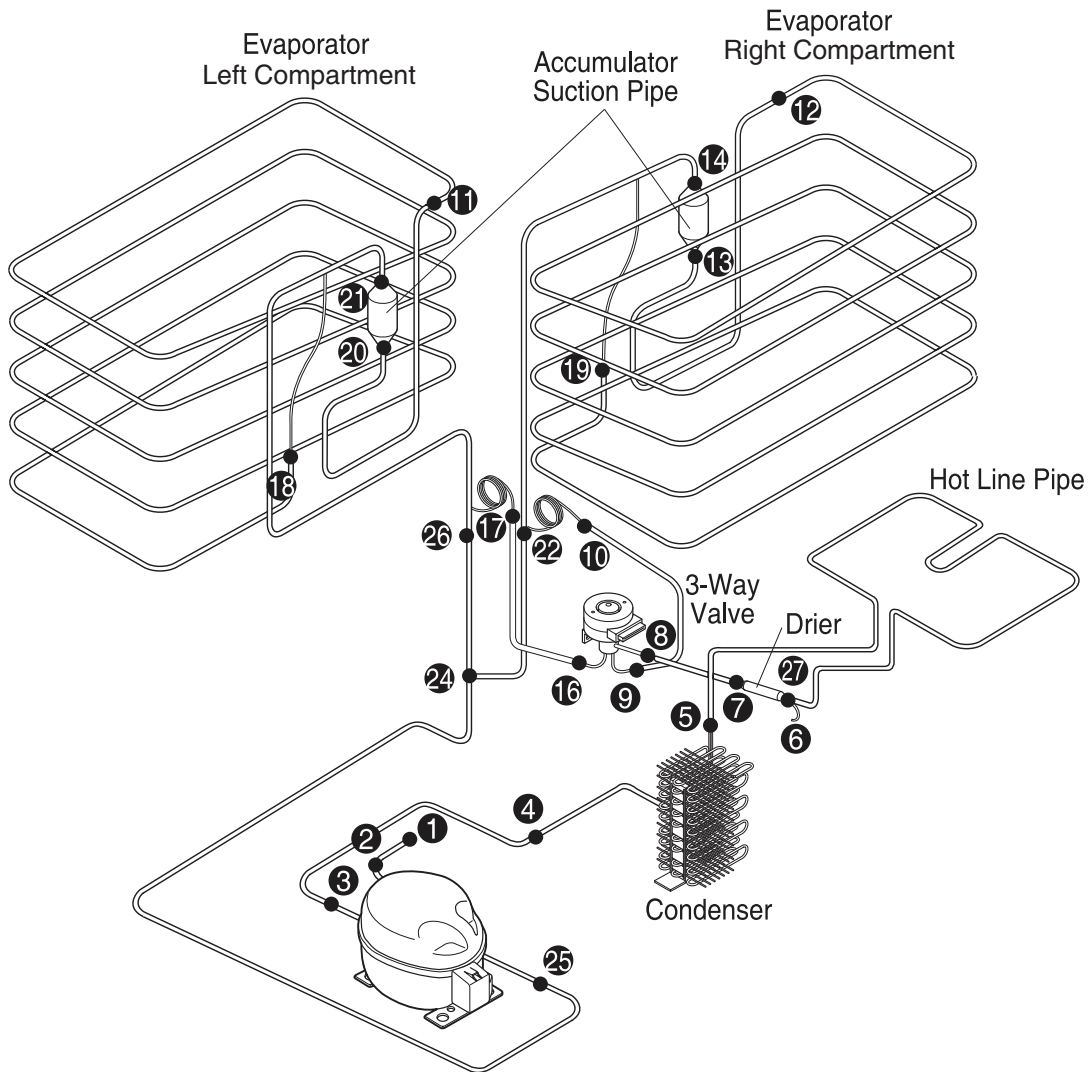
※ The position of the Suction Pipe, Charging Tube and Discharge Pipe needs to be checked since the their positions may vary depending on the shape of the Comp

Required equipment: Leakage checking machine (foam and leakage inspection machine)

- Check for leakage by using foam or a leakage inspection machine at the worked part if charging of refrigerant is completed.
- Check for leakage at the low pressure part with the compressor stopped, and check at the high pressure part with the compressor being operating.
- If leakage is detected, proceed to repair according to repair process again starting from "2-1. Return of Refrigerator Refrigerant".
(Never perform welding work or work using fire appliances.)
- Check that heat remains at a discharge pipe or condenser with the hands if leakage check is completed. If heat remains, the cooling cycle is normal.
(Take care since a discharge pipe may be hot.)

Handling R600a Refrigerant During Major Repairs

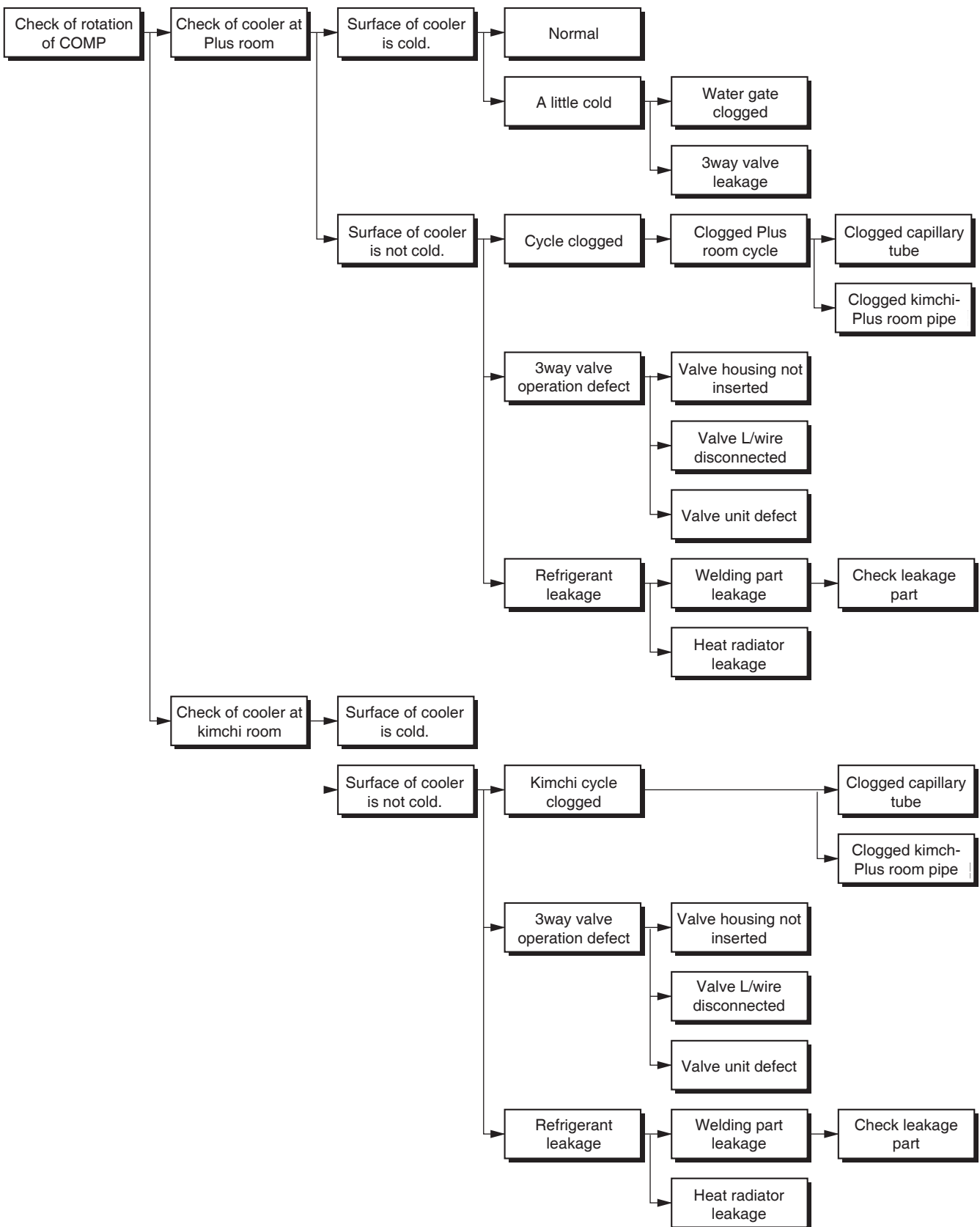
9-3 Welding Reference



Welding types	Applied site	Notes
Copper alloy	①②③④⑤⑥⑦⑧⑨⑩⑪⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒㉓㉔㉕㉖	
Silver alloy	⑧⑨⑩⑬⑰	
LOKRING	⑪⑫⑬⑱	

Handling R600a Refrigerant During Major Repairs

9-4. Failure Checking Procedures



Handling R600a Refrigerant During Major Repairs

8-4. Cautions during Major Repair Service

There is a risk of fire when performing welding repairs. Special care should be taken because the refrigerant may remain at high pressure, even after vacuum air discharge, due to cycle clogging. Avoid welding repairs where cycle clogging is a known issue or the cause of errors is unclear.

(For models using R600a refrigerant)

8-4-1. 3-Way Valve Service

■ Since 3-way valve controls refrigerant with an inner plastic damper, defect may occur because the plastic damper is deteriorated and welding heat is delivered to a pipe during repair and replacement of the valve welding part. So perform service in following service method.

1) Valve welding part service

Replace 3way valve ASSY where refrigerant leakage occurs at the joint pipe (a,b,c) connected with the Body service valve of valve welding part. (For unavoidable welding, wrap the body part of valve with a water towel so that delivery of welding heat is minimized (100 or less).

2) Service in replacement of valve (valve failure)

Perform service in the same method as above.

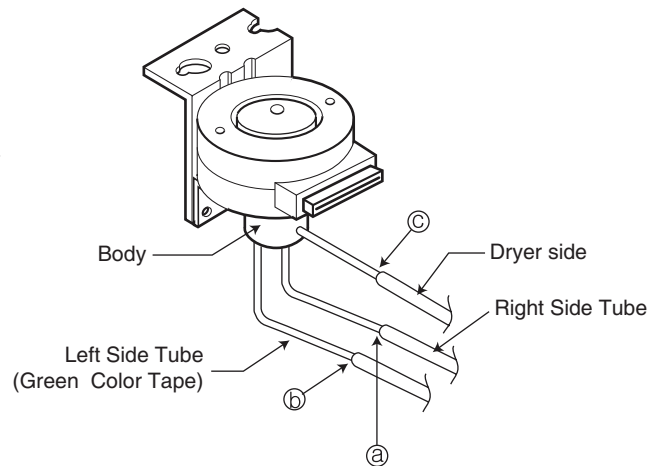
3) Other cautions

(1) Pipe for capillary tube should be welded through insertion by 20-3+3mm.

(For preventing clogging during welding)

(2) Take care since inner ejecting objects may be damaged if falling a valve or giving a strong shock.

(Poor operation and leakage quantity may be increased due to damage of inner parts.)



Replacing the Deodorizer

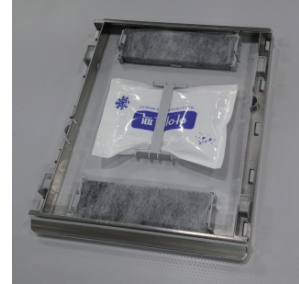
Chapter 10: Replacing the Deodorizer



① Press down on the Cover strongly and separate the Hook



② The Hook is separated



③ Turn the Cover over and check the nonwoven fabric deodorant



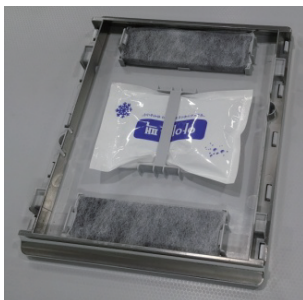
⑥ Insert the new deodorant



⑤ Open the Hook and insert a new deodorant



④ Open the Hook where the deodorizer hangs and remove the deodorizer



⑦ The deodorant has been inserted



⑧ Press the Cover upwards strongly to fasten the Hook



⑨ The deodorant has been replaced

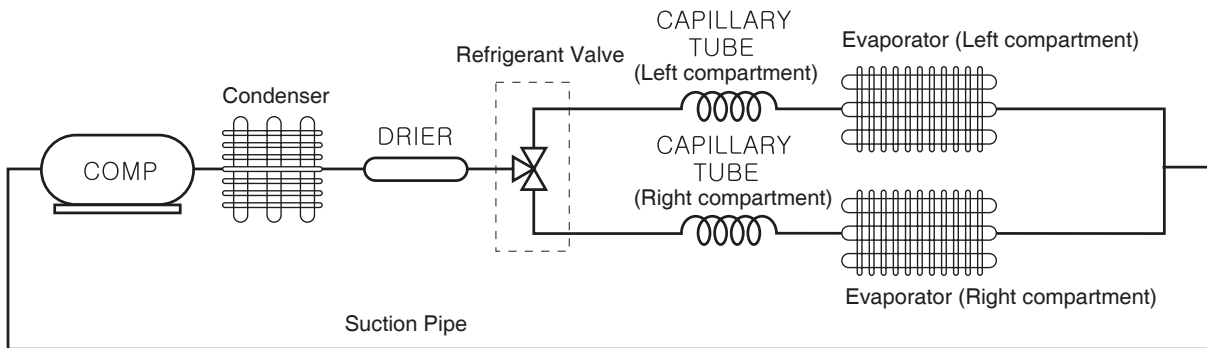
Understanding the Characteristics of Each Part

Chapter 11 Understanding the Characteristics of Each Part

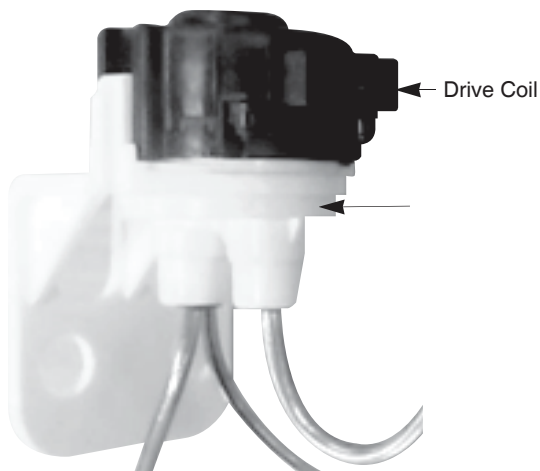
11-1 3-WAY Valve

(1) Function

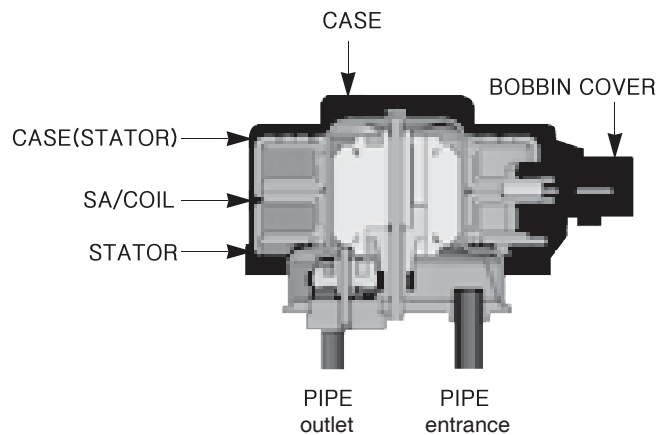
Refrigerant passing through the condenser is transferred via the left or right compartment's evaporator



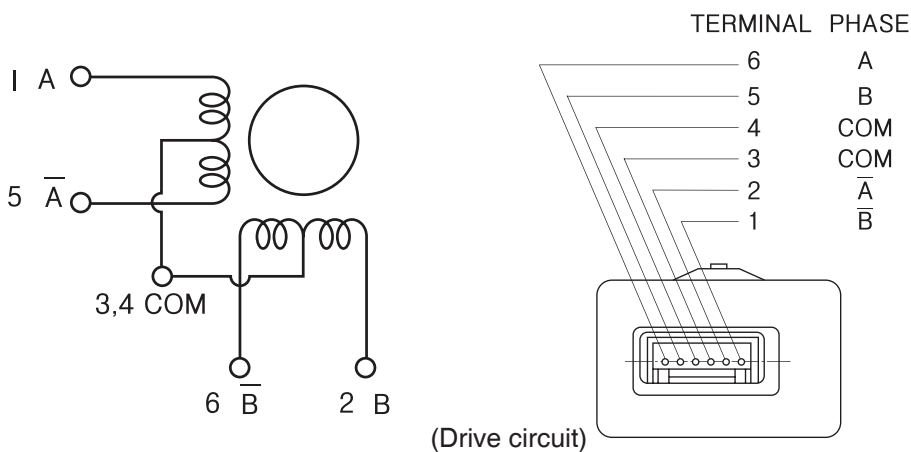
(2) Operating structure



(Exterior)



(Internal Structure)

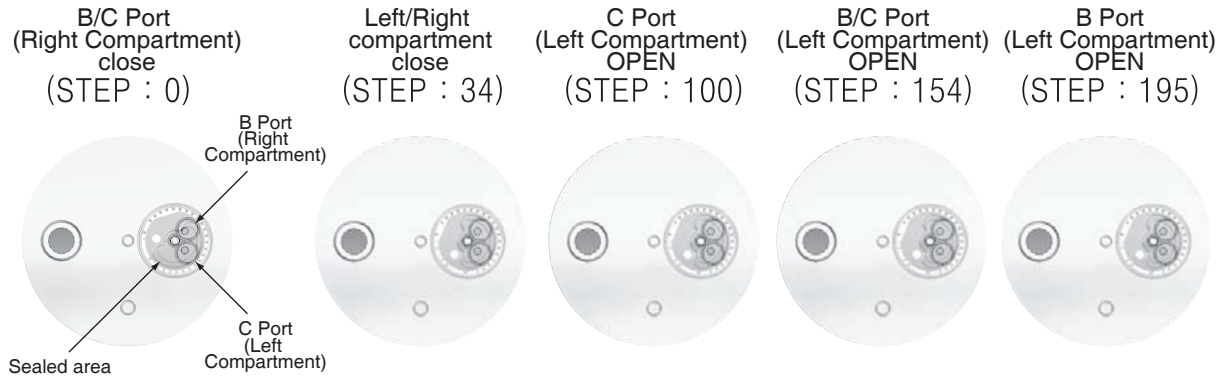


(Drive circuit)

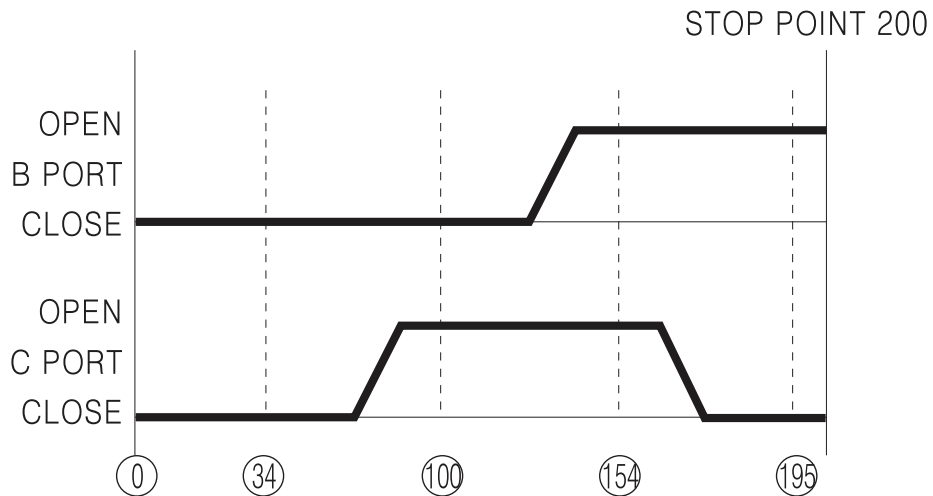
Understanding the Characteristics of Each Part

(3) Operating principles

By controlling the rotational angle of the SEPPING MOTOR, the shape of the valve connected to the ROTOR's lower part causes the mouth of the outlet PIPE to open and close



(4) Operation characteristics



Understanding the Characteristics of Each Part

11-2 Heater

(1) Summary

When using the refrigerator, a Heater for ripening kimchi is affixed to the side of the Inner case in order to implement the fermentation algorithm program

(2) Type and role of heater

Type	Applied site	function	Resistance value	Notes
heater	Lower part of the Inner Case's side surface	For kimchi ripening use	11W 2EA (Resistance value : 4,400ohm) Specifications are the same for each capacity	

(3) Defect symptoms (product) : If due to Heater defect

■ Heater Assy (Fermentation/Rice storage)

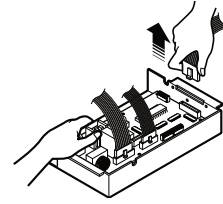
Defect	Symptom	Way to check	Measures to take
1. Hot wire disconnection / Connection Wire disconnection	Kimchi Under-ripeness	1. Measure the resistance of both heater connectors using a Tester → The results are $\infty\Omega$	1. Product Exchange
2. Terminal contact failure		2. Measure the resistance of both heater connectors using a Tester → Severe fluctuation	2. The connector is inserted

Notes on Disassembling the Product

Chapter 10 Notes on Disassembling the Product

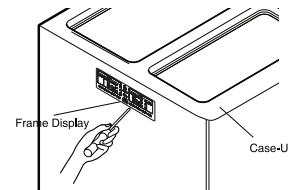
1. PWB(PCB) ASSEMBLY, MAIN

- When removing the PWB (PCB) Assembly and Main located in the machine room, be careful disassembling the Lead Wire current connected to the interior so that it doesn't touch the Edge.
- A break in the Lead Wire or peeling of the coating could lead to a short circuit
- After installing the PCB, organize the Lead Wire and affix it to the Holder before clamping the Case PCB



2. FRAME ASSEMBLY, DISPLAY

- After attaching the protective film, use a flat-head screwdriver to tilt the Frame Display's lower svc hole forward and separate it. At this time, be careful not to impact to the PWB (PCB) Assembly and Display affixed to the inner surface and not to scratch the Frame Display and Out Plate



※ Display SVC

①



① Attach the Front Plate protective film (Tape)

②



② Insert a knife or a flat-head screwdriver with a pointed end into the lower part of the Frame Display to pull out the Frame Display (Lower left part)

③



③ The same as 2 (Lower center part)

④



④ The same as 2 (Lower right part)

⑤



⑤ Remove the Frame Display

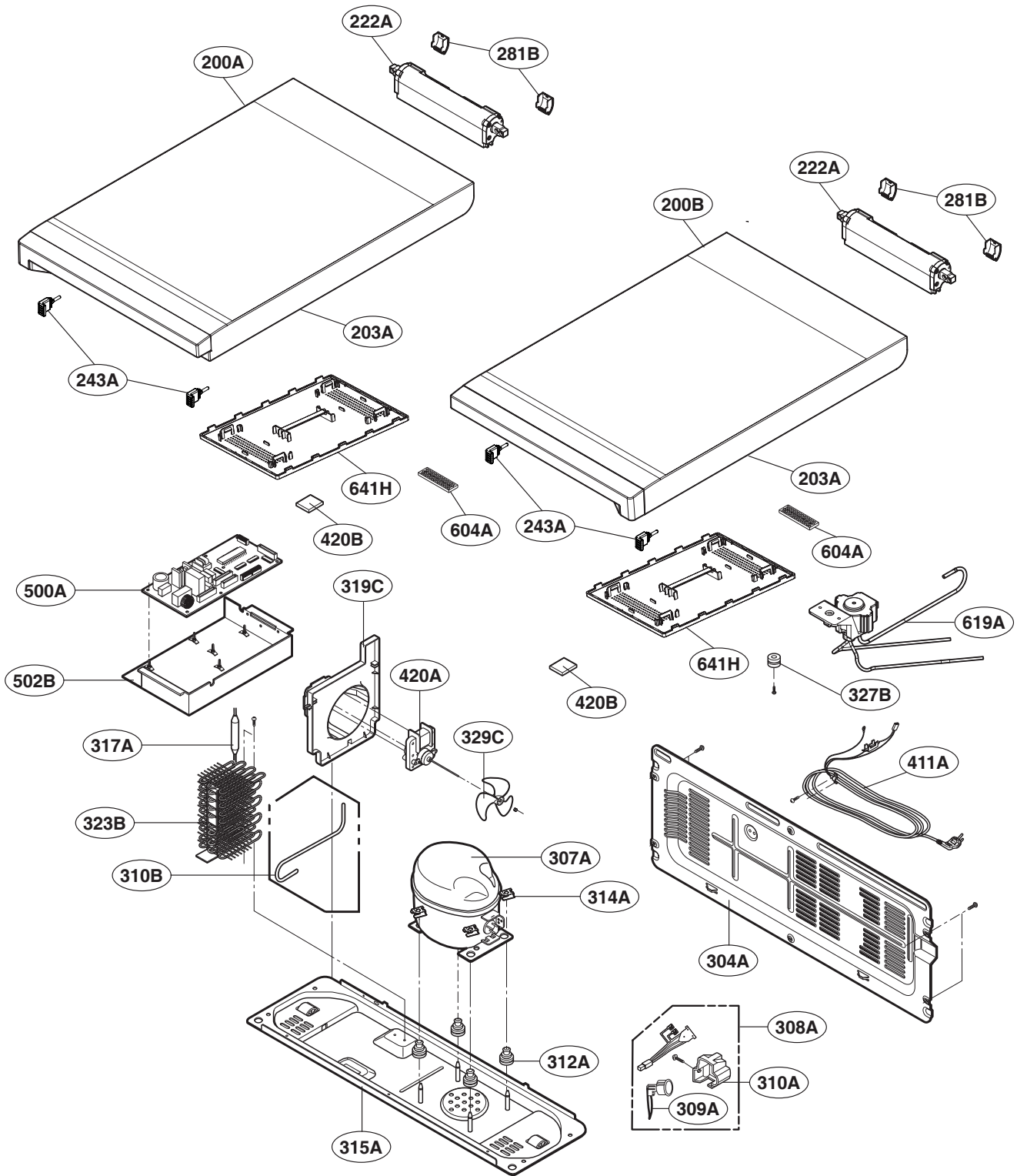
⑥



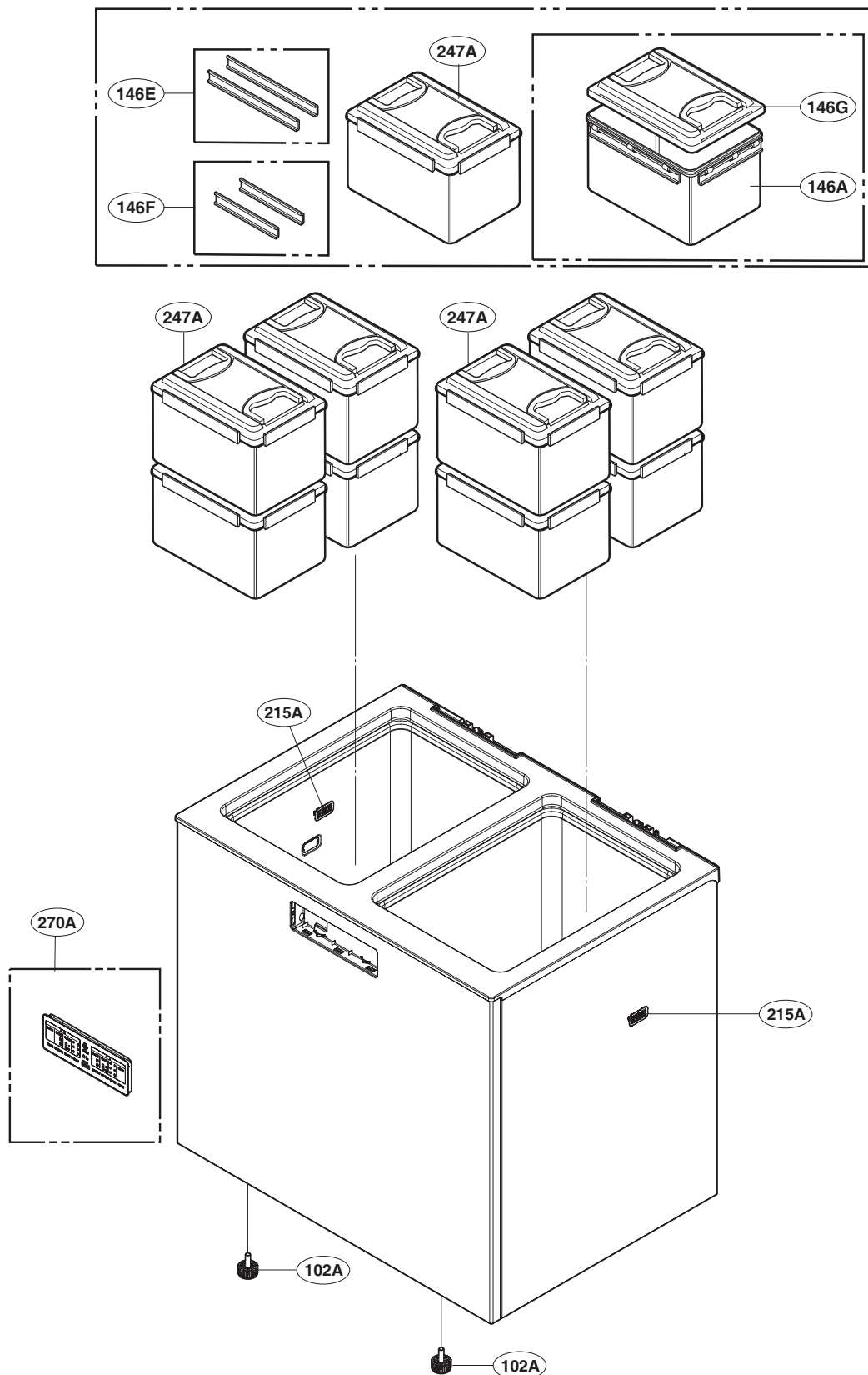
⑥ Remove the Harness

Exploded View and Service Parts List

Chapter 11 Exploded View and Service Parts List



Exploded View and Service Parts List





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