



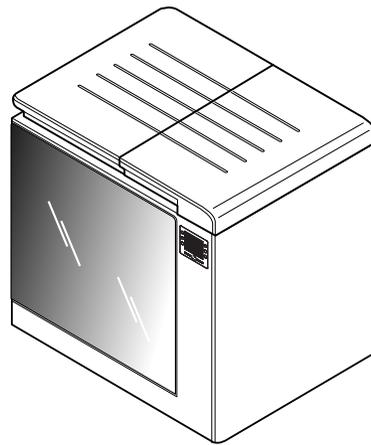
<http://biz.lgservice.com>

KIMCHI REFRIGERATOR

SERVICE MANUAL

CAUTION

PLEASE READ CAREFULLY THE SAFETY PRECAUTIONS OF THIS MANUAL
BEFORE CHECKING OR OPERATING THE REFRIGERATOR.



MODEL : GR-K192UF

Safety regulations

1. First check if there is any electric leakage in the refrigerator unit.
2. Always unplug the refrigerator before handling any electricity conducting parts.
3. When testing the refrigerator with the power on, use insulated gloves for safety.
4. When using measuring instruments, check the rated current, voltage and capacity.
5. Do not allow water or moisture to get into the mechanical or electrical parts of the refrigerator.
6. Remove all things on top of the refrigerator before tilting it during repairs to avoid spills.
Be especially careful for thin objects (glass sheet, book).
7. When the refrigerating cycle is damaged, always request service to the major repair service agency.
(This is to prevent the house from getting dirty from the gas within the cycle.)
8. Always double check for repairs related to safety to ensure customer safety.

Contents

1. Safety warnings and cautions	3
2. Product specification	6
3. Product installation method	7
4. Circuit diagram	8
5. MICOM function and circuit description.....	9
6. Freezing cycle and refrigerant.....	31
7. General details about the product	33
8. Major repair method for freezing cycle.....	35
9. Characteristics of each part	44
10. Cautions for disassembling the product.....	52
11. Assembly diagram and service parts list	53

Safety warnings and cautions

Chapter 1. Safety warnings and cautions

- ▶ Always observe the 'Safety Warnings' and 'Cautions', which are intended to ensure safety while repairing or operating the product.
- ▶ Precautions are classified into 'Warning' and 'Caution', as explained below.

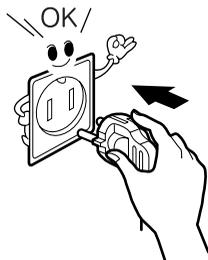
⚠ Warning Warning means a dangerous condition which could result in significant damage, injury or death if the instructions are not followed.

⚠ Caution Caution means a condition which could result in damage or injury if instructions are not followed.

⚠ Warning

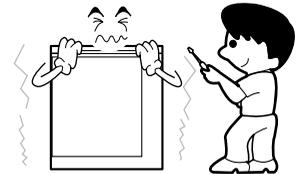
Use caution to prevent electric shock

The control panel (main PCB) uses 310V. When replacing PCB parts, wait at least 3 minutes after unplugging. Always unplug the refrigerator before repairing.



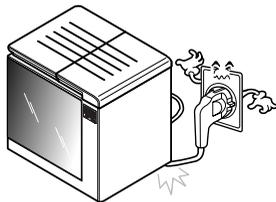
Do not allow the consumer to repair, disassemble or modify the refrigerator.

Damaged power plug can cause fire or electric shock.



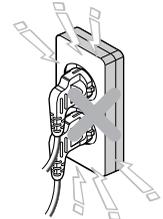
Make sure that the power plug is not pressed by the back of the refrigerator

Power plug may be damaged and cause a fire or electric shock.



Use a dedicated circuit.

Overloading circuits or outlets could cause a fire.

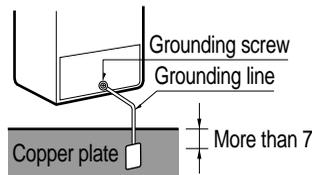


Safety warnings and cautions

⚠ Warning

This product should always be grounded, when needed.

If you think that there is a possibility of electricity leakage by water or moisture, always ground the unit.



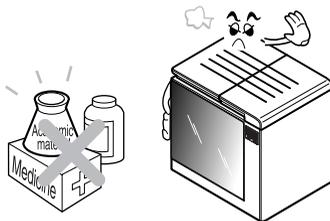
Do not store flammable liquid or gas in the refrigerator such as ether, benzene, alcohol, medicine, LP gas etc.

It can cause an explosion or a fire.



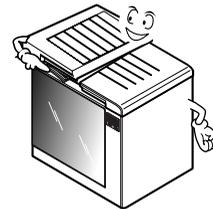
Do not store medicine or academic material etc. in the refrigerator.

Store an object that requires precise temperature control can cause deterioration in quality or unexpected reaction to cause a dangerous situation.



When disposing the refrigerator, remove the rubber packing on the door and do not leave it where children play.

A child can be dangerously entrapped in the refrigerator.



Do not set items, particularly flower vase, cup, cosmetic or medicine on top of the refrigerator.

It can cause fire and electric shock or cause an injury from dropping.



Do not stack items or carelessly store food on the refrigerator.

Items stored on the refrigerator could fall and cause injury.



Safety warnings and cautions

⚠ Caution

When using the refrigerator for low temperature in freezer or refrigerator, do not store bottles.

Bottles can freeze and cause the bottles to crack, which can cause an injury.



Always use exact replacement parts.

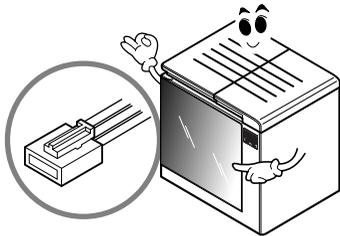
Make sure that the model name, voltage, current and temperature ratings are correct for the electric part.

Rated parts



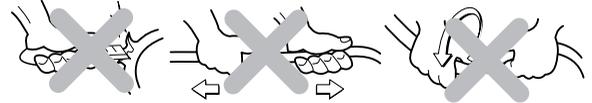
During repairs, be sure all connectors are tight and wires are properly routed.

Make sure the connectors of the housing part are properly connected.



Do not bend, modify, bend, pull or twist the power cord.

It can cause fire or electric shock.



During repairs, remove all dust and foreign material from the housing part, connector part and check part.

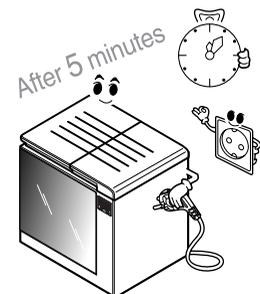
It can prevent problems such as tracking or short circuit.



Allow at least 5 minutes for resetting if you unplug the refrigerator.

If can cause an overload to the condenser operation and cause problems.

After 5 minutes



Product specification

Chapter 2. Product specification

2-1. GR-K192UF

Item		GR-K192UF
		SPEC
Volume	Usable volume	188.8Li
	Left compartment	94.3Li
	Right compartment	94.3Li
External dimensions	Width	922mm
	Depth	699mm
	Height	883mm
Total weight		66kg
Motor power consumption		115W
Cooling method		Direct cooling
Store/Season		Electronic
Insulation material		CYCLO PENTANE
Fresh vegetable basket		1 pc.
Kimchi refrigerator container		6 pcs. (6 large)
Low temperature catalytic deodorizing system		2 pcs.
Freeze cycle	Compressor	NR58LBQH
	Evaporator	PIPE ON SHEET
	Refrigerant (amount)	R134a(145g)
	Oil	FREOL@15G(210cc)
Electrical part rating	PTC	P6R8MB
	OLP	4TM412TFBYY
	Fan motor for compressor cooling	ø110,3 blades attached
	Left compartment seasoning heater	115V / 80W(Resistance:605Ω)
	Right compartment seasoning heater	115V / 80W(Resistance:605Ω)
	Capacitor (running)	250VAC 10μF
	Capacitor (starting)	200VAC 50μF

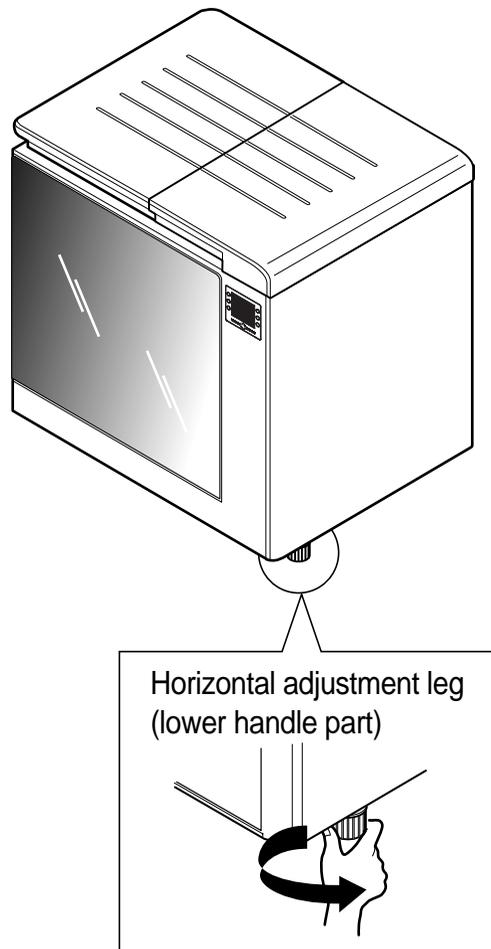
Product installation method

Chapter 3. Product installation method

3-1. Method to adjust height of refrigerator

■ First adjust the level of the refrigerator.

(If the floor is uneven, the refrigerator may vibrate or cause noise.)



▶ Adjust the front to be leveled by turning the height adjustment screws under the front corners in the arrow direction.

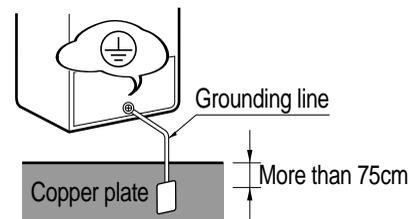
3-2. Grounding method

Plug the cord into a 115V grounded outlet. If you are unsure of the voltage or grounding integrity, consult a qualified electrician.

Caution

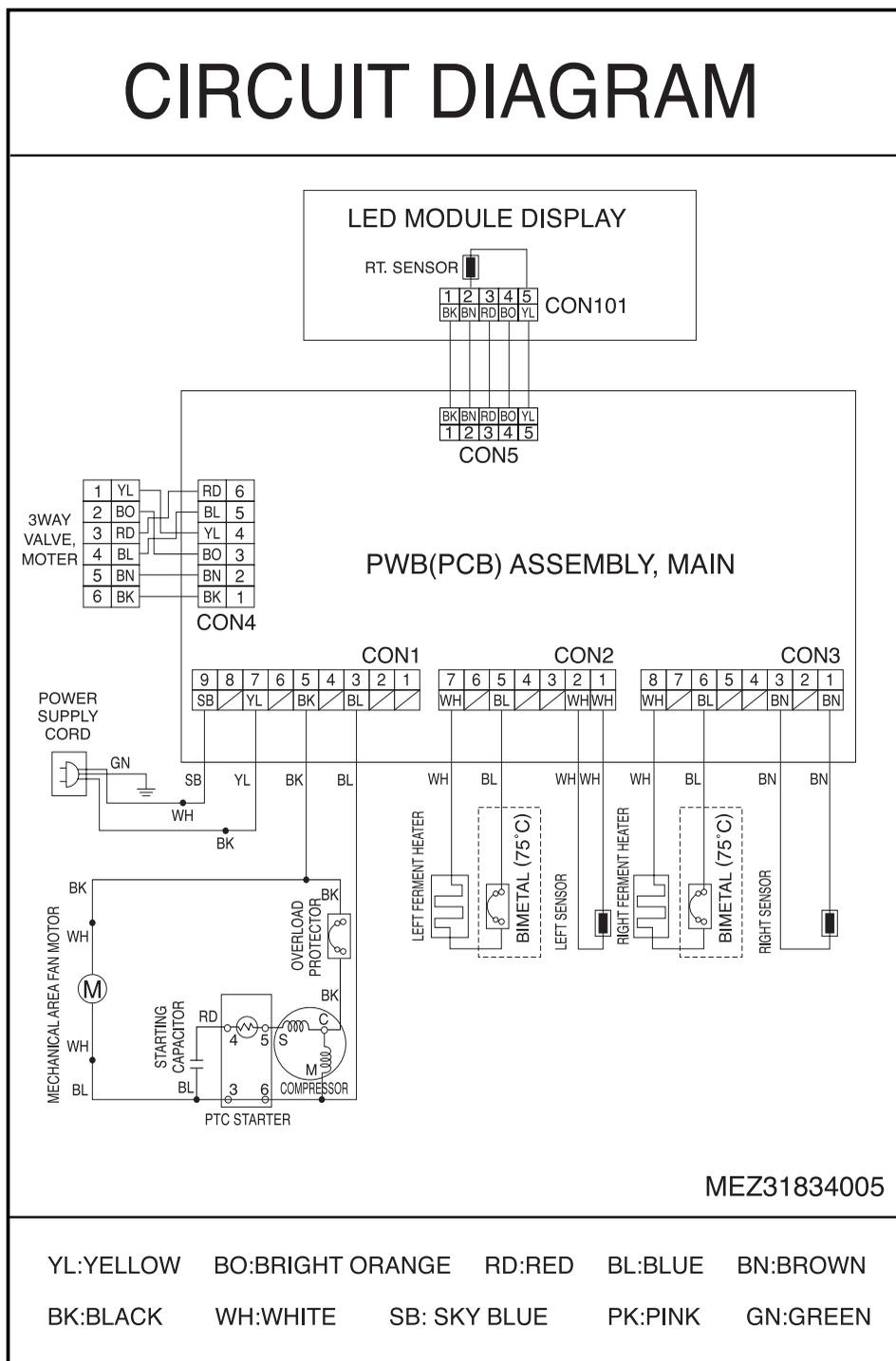
Take care not to ground the circuit at one of the following places:

1. **Water pipe:** If there is a plastic piping within the system, the ground may not be valid.
2. **Gas pipe:** There is a danger of fire or explosion.
3. **Phone line or lightning rod:** If lightning strikes, dangerous voltage may be induced in the circuit.



Circuit diagram

Chapter 4. Circuit diagram

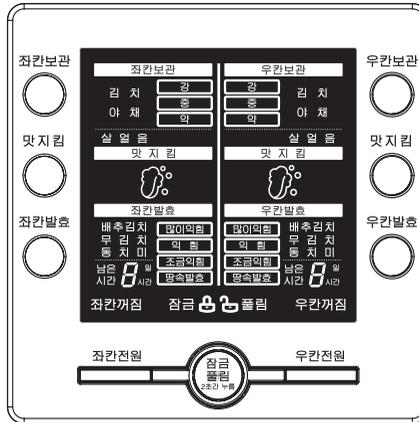


MICOM function and circuit description

Chapter 5. MICOM function and circuit description

5-1. Function description

5-1-1. Display part



Notch	Kimchi store			Vegetable/Fruit			Light freezing			Freezing food		
	Min	Mid	Max	Min	Mid	Max	Min	Mid	Max	Min	Mid	Max
Temperature	0°C	-1.0°C	-2.0°C	3.5°C	2.5°C	1.5°C	-4.0°C	-5.0°C	-6.0°C	-5°C	-18°C	-21°C

1. When the power is connected for the first time, it is set to "Lock", "Left compartment-Cabbage Kimchi-Mid" and "Right compartment-Cabbage Kimchi-Mid".
2. During a power shut-down or when the power is reconnected, the refrigerator maintains the prior display. But in case of a power-shut down or power reconnection during rhythm fermenting, the temperature returns to "Mid" for the applicable food type.
3. In "Lock" status, you will not hear a buzzer even when you press the buttons and the functions will not work.

MICOM function and circuit description

5-1-2. Food storage/seasoning function

(1) When selecting food type and storing temperature

1. Press the “Lock/Unlock” button for more than 2 seconds to switch to “Unlock” status.
2. Press the “Kimchi store” button to select “Mid” → “Max” → “Min” → “Mid”, “Vegetable / Fruit” button “Mid” → “Max” → “Min” → “Mid”, and “Freezing” button “Normal” → “Max” → “Light Freezing” → “Normal” in sequence
3. Press the “Lock/Unlock” button to complete the selection of food type and storing temperature. At this time, if a minute passes without pressing the “Lock/Unlock” button, it will automatically switch to Lock status and end the food type and storing temperature selection mode.

(2) When selecting rhythm fermenting (seasoning)

1. Press the “Lock/Unlock” button for more than 2 seconds to switch to “Unlock” status.
2. At this condition press “조칸발효” button to select **익힘** → **많이익힘** → **조금익힘** → **익힘** → **많이익힘**
→ **땅속발효** → **조금익힘** → **익힘** → **많이익힘** → **조금익힘** → **익힘**, food type will change in the order
동치미 → **배추김치** → **무김치**

Note1: 땅속발효 is only for 배추김치

Note 2: 땅속발효: Natural fermentation, 조금익힘: Little fermentation, 익힘: fermentation, 많이익힘: More fermentation, 동치미: watery radish Kimchi, 무김치: Radish Kimchi, 배추김치: Cabbage Kimchi

3. Press the “Lock/Unlock” button to complete the rhythm fermenting (seasoning). At this time, if a minute passes without pressing the “Lock/Unlock” button, it will automatically switch to Lock status and end the rhythm ferment (seasoning) selection mode.
4. When “Rhythmic fermentation” is terminated, the remaining time is displayed, and when the fermentation is completed, “0 hour” is displayed as the remaining time and the storing temperature is automatically set to “Mid”

(3) When selecting flavor keeping

1. Press the “Lock/Unlock” button for more than 2 seconds to switch to “Unlock” status.
2. Select “Kimchi store” as storing type. (Flavor keeping function is only limited to “Kimchi store”)
3. At this time, press the “Flavor keeping” button to select or cancel the flavor keeping function.
4. Press the “Lock/Unlock” button to end the flavor keeping selection mode. At this time, if a minute passes without pressing the “Lock/Unlock” button, it will automatically switch to Lock status and end the flavor keeping selection mode.
5. If you select flavor keeping during seasoning process, it will immediately end the seasoning and switch to flavor keeping. At this time the storing temperature will automatically be set to “Mid”.
6. If you select the flavor keeping function, the refrigerator will lower the temperature to maintain the current Kimchi flavor. (-1 degrees for “Min”, -0.5 degrees for “Mid” and -0 degrees for “Max”.)
7. During flavor keeping operation, a cold shock operation is done every 12 hours.
8. If you select rhythm fermenting during flavor keeping, the flavor keeping function will be canceled.

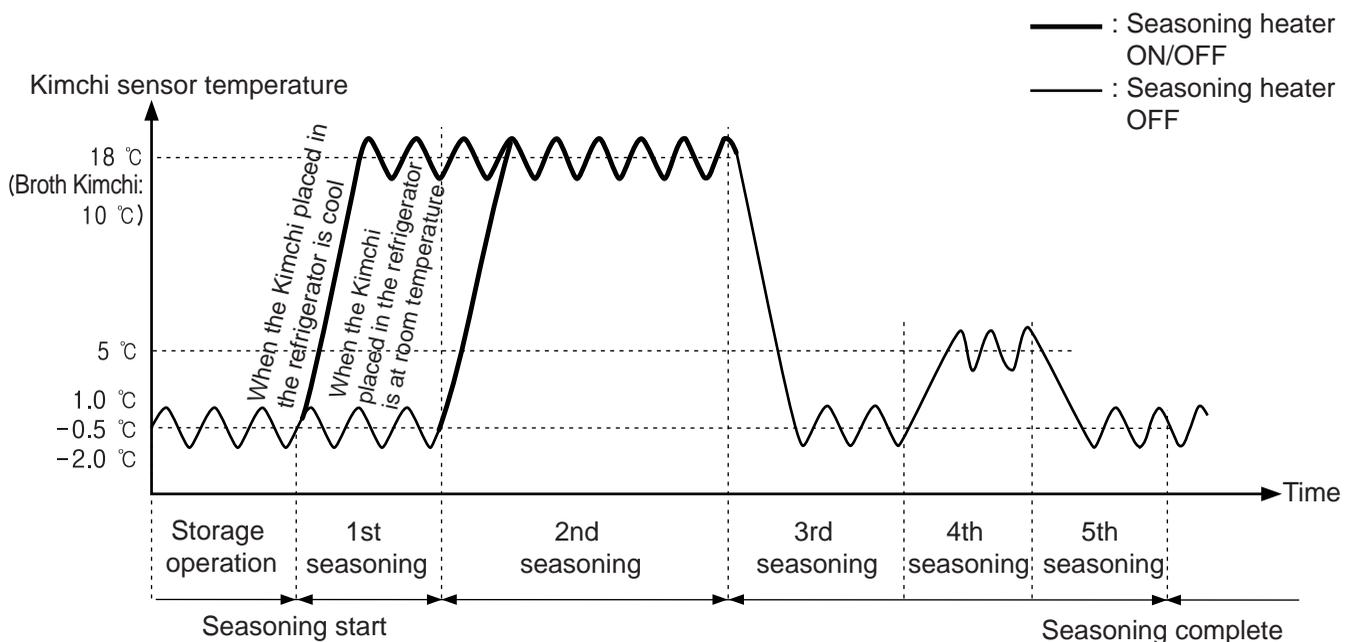
MICOM function and circuit description

5-1-3. When selecting power on/off function

1. Press the "Lock/Unlock" button for more than 2 seconds to switch to "Unlock" status.
2. At this time, press the power button for left or right compartment till more then 2 seconds to turn the power off.
3. At this time, all display will be turned off for the selected compartment except the power off display.
4. If you press the "Power" button when the power is off, it will turn on the power and recover to "Cabbage Kimchi" and "Mid".
5. When the power is turned off, the heater of the applicable compartment is turned off and the valve will be closed.

5-1-4. Rhythm fermenting control pattern diagram

1. The fermenting control pattern varies, depending on the temperature of the Kimchi when it is placed into the storage, the type of Kimchi being made and the degree of the seasoning selected.
2. In the 1st seasoning cycle, if the Kimchi is at room temperature, the cold control operates.
3. During the seasoning cycle, if the Kimchi is cold, the seasoning heater is turned on and if the Kimchi is warm, the seasoning heater is turned off. (Only 1st seasoning and 2nd seasoning)
4. If a failure occurs, such as a sensor error during seasoning, the storage will default to Cabbage Kimchi storage status.



MICOM function and circuit description

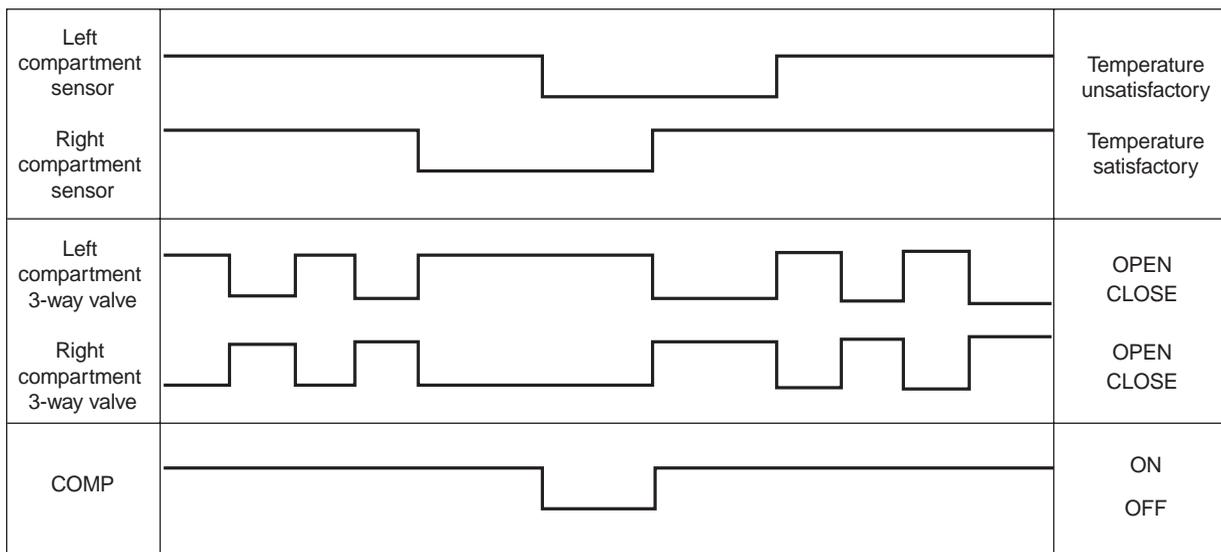
5-1-5. Temperature control method

1. The compressor runs or stops and the 3-way valve opens or closes depending on the temperature sensed in the left and right compartment.
2. If the temperature in either compartment is unsatisfactory, the compressor is turned on and the 3-way valve is opened to the affected compartment.
3. If the temperature in both compartments is unsatisfactory, the compressor is turned on and runs until both compartments become satisfactory. The 3-way valve is opened and closed to each compartment alternatively until the temperature is satisfactory.
4. During the seasoning cycle, if the temperature is low, the heater is turned on and if the temperature is high, the compressor is turned on and the 3-way valve is opened.

Left compartment temperature	Right compartment temperature	3-Way valve position	COMP
Satisfactory	Satisfactory	Note 1) ※	OFF
Satisfactory	Unsatisfactory	Right compartment	ON
Unsatisfactory	Satisfactory	Left compartment	ON
Unsatisfactory	Unsatisfactory	Left 25 min/Right 25 min	ON

Note1) When the temperature is satisfactory in both compartments, the 3-way valve is open to whichever compartment that has had a satisfactory temperature most recently.

■ Summary chart of COMP and 3-Way valve operation



5-1-6. Buzzer sound

When you press a button on the front display, you will hear a varying buzzer sound depending on the type and function. (Refer to Buzzer operating circuit in p21).

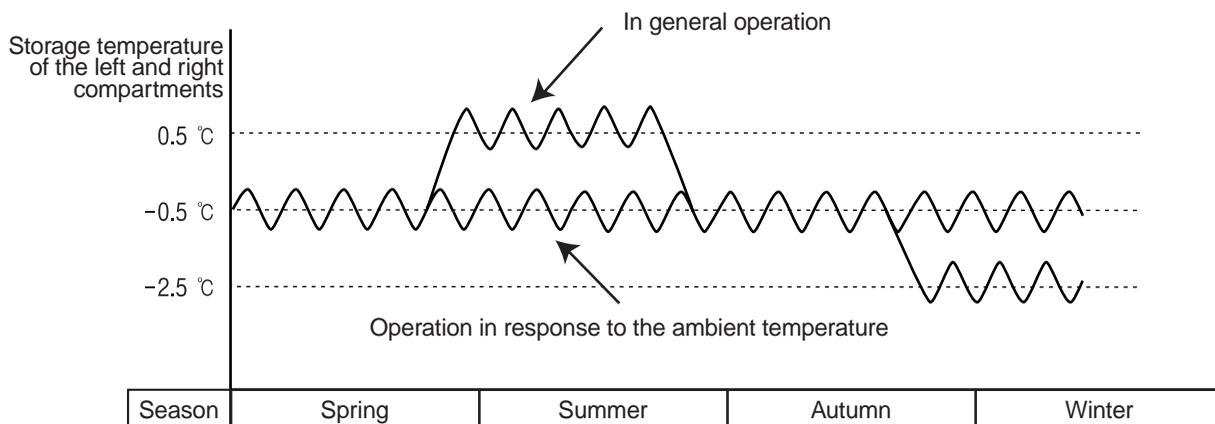
5-1-7 Power failure compensation function

1. When the power is restored after an outage, the refrigerator performs the setting originally programmed except for Error status and Test mode.
2. If the power fails during the seasoning process, there is not power outage compensation function and the storage defaults to previously set Kimchi type and temperature of "Mid". (to protect excessive seasoning)

MICOM function and circuit description

5-1-8. Operation in response to ambient temperature

The storage senses the ambient temperature and adjusts the temperature in the compartments accordingly. This keeps the storage from being too cold or too warm because of seasonal variations and maintains exact temperatures in the compartments.



5-1-9. Sequential operation of components

Components (compressor, 3-way valve and left/right seasoning heater) are operated in a specific order to prevent damage and noise caused by simultaneous operation of all parts when the unit is started and after completing the self-test routine.

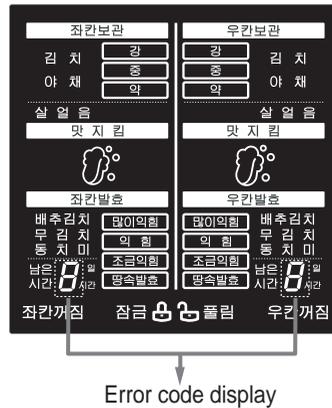
Operation status		Operating order	Remarks
Initial power-up	Temperature of the left of right sensor is >45°C	<p>Immediately 3 min 10 sec</p> <pre> graph LR A[Power on] --> B[3-way valve open] B --> C[3-way valve left open] C --> D[Compressor on] </pre>	
	Temperature of the left of right sensor is <45°C	<p>Immediately 0.5 sec 5 sec 0.5 sec</p> <pre> graph LR A[Power on] --> B[Left seasoning heater on] A --> C[3-way valve open] B -- 3 sec --> D[Right seasoning heater on] D -- 3 min --> E[Left seasoning heater off] E -- 10 sec --> F[Right seasoning heater off] F -- 0.5 sec --> G[Compressor on] </pre>	
When returning to normal status in test mode		<p>7 min</p> <pre> graph LR A[All loads off] --> B[Compressor on] A -- 3 sec --> C[3-way valve open] C -- 3 min --> D[3-way valve left open] D --> B </pre>	The 3-way valve is opened to both compartments for 3 minutes; then it is opened to either the left or the right compartment, depending on the temperature in the compartments.

* Operation order may slightly vary depending on temperature setting.

MICOM function and circuit description

5-1-10. Error diagnosis function

1. The error diagnosis function is the function to support SVC in case of an error that can affect the performance of the product.
2. If an error occurs, the control panel button will not work.
3. If an error occurs and is resolved, the refrigerator will default to the normal status. (The unit is reset.)
4. The error codes are shown in segment for the remaining seasoning time display of the right compartment, and all LEDs, except for failure code, are turned off.



NO	Item	Error code display (At the remaining fermentation time display)	Error contents
1	Left compartment sensor failure	"E1"	Left compartment sensor open or short
2	Right compartment sensor failure	"E2"	Right compartment sensor open or short
3	RT sensor failure	If press "좌칸보관" and "우칸보관" key together then except left/right remaining fermentation time display LED's all LED's will be off.	
4	Communication error	"CO"	When no communication occurs continuously for 30 seconds

Note 1) The failure code is not displayed for the outside temperature sensor failure, but for 'LED CHECK' (by pressing and holding "Kimchi store" button on the left chamber and "Kimchi store" button on the right chamber together for one second or longer). If the outside temperature sensor is normal, all LEDs are turned ON, but if abnormal, all LEDs are turned ON with the remaining time display on the right chamber OFF.

MICOM function and circuit description

5-1-11. Test function

1. The test function checks the functions of the PCB and the refrigerator, searching for errors in parts.
2. The test switch on the PCB operates the test mode. The refrigerator reverts to the normal mode after 2 hours if you forget to end it manually.
3. When the test mode is active, the buttons on the control panel are disabled but the buzzer still sounds a ding if one is pressed.
4. When the test mode is completed, unplug the refrigerator briefly and plug it in again to reset it and allow normal operation.
5. If a sensor failure or other failure is detected during the test mode, release the test mode to display the failure code.
6. During the display of the error code, test mode does not work even if you press the Test switch.

Mode	Operation	Comp, Fan motor	Valve	L/R ferment heater	Display LED (At the L/R remaining fermentation time display)	Remarks
TEST1	TEST S/W Press once	ON	Left valve25 min/Right valve25 min	OFF	Error code display "1", "1"	Check the left & right compartment cooling system
TEST2	During TEST1 Press once	ON	Right valve open	OFF	Error code display "2", "2"	Check right compartment cooling system
TEST3	During TEST2 Press once	ON	Left valve open	OFF	Error code display "3", "3"	Check left compartment cooling system
TEST4	During TEST3 Press once	OFF	-	ON	Error code display "4", "4"	Check heater * After a max. of 30 minutes or when the temperature of the each compartment is higher then 40°C,the storage will recover to its initial status
Recover to initial status	During TEST4 Press once	The compressor will operate after a delay of 7 min.				

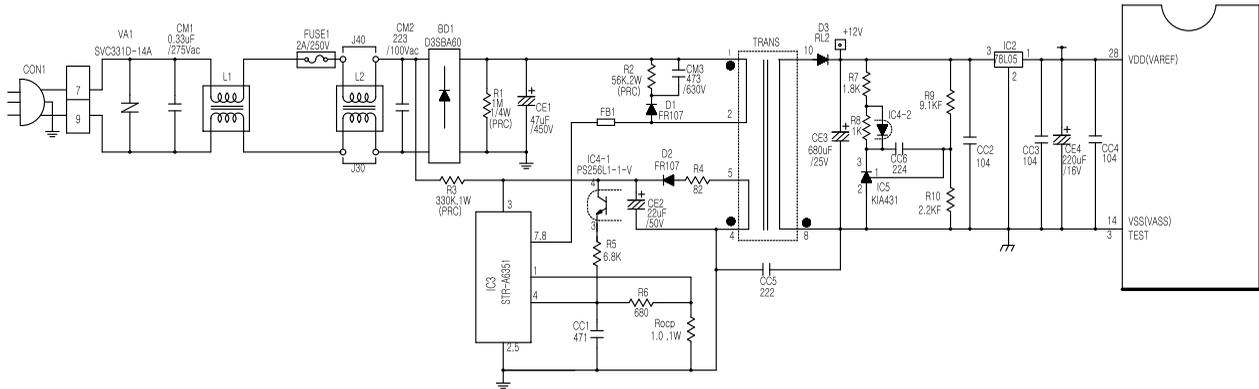
※ LED CHECK function

All LEDs are turned ON by pressing and holding "Kimchi store" button on the left chamber and "Kimchi store" button on the right chamber together for one second or longer. When these buttons are released, the LED returns to the previous state.

MICOM function and circuit description

5-2. Circuit description

5-2-1. Power circuit

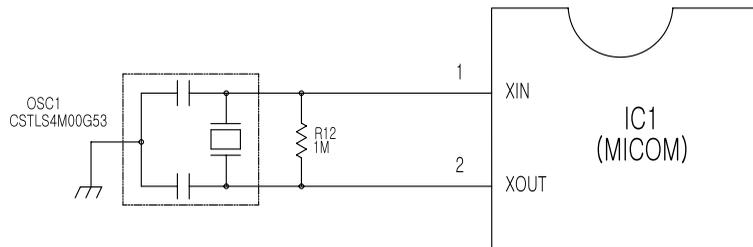


The power circuit consists of the noise attenuation part and the SMPS (Switch Mode Power Supply) part. The SMPS consists of the rectifier (BD1 & CE1) to convert AC voltage to DC voltage, switching part (IC3) to switch the converted DC voltage, transformer to transmit energy of the first side of the switching end to the second side, the secondary power to supply power to MICOM and IC, and the feedback part (IC4) to feedback the secondary voltage to the first side of the transformer in order to maintain the secondary voltage constant.

Caution : High voltage (DC 310V) is maintained in this circuit. Wait at least 3 minutes after unplugging to allow the current to dissipate. There is a danger of electric shock.

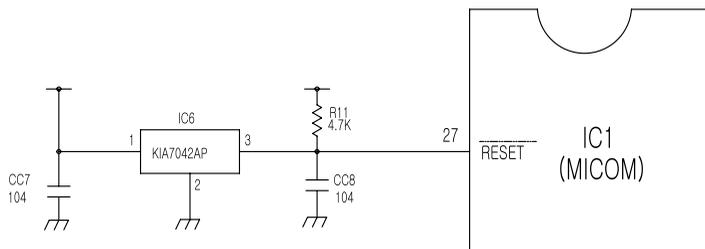
5-2-2. Oscillation circuit

The oscillation circuit provides the clock signal for synchronization and calculation of time in relation to the logic elements of microprocessor IC1 (MICOM). OSC1 must always use the original rated parts, because if the specification changes, the timing generated will not be correct, causing erratic functioning of the microprocessor.



5-2-3. Reset circuit

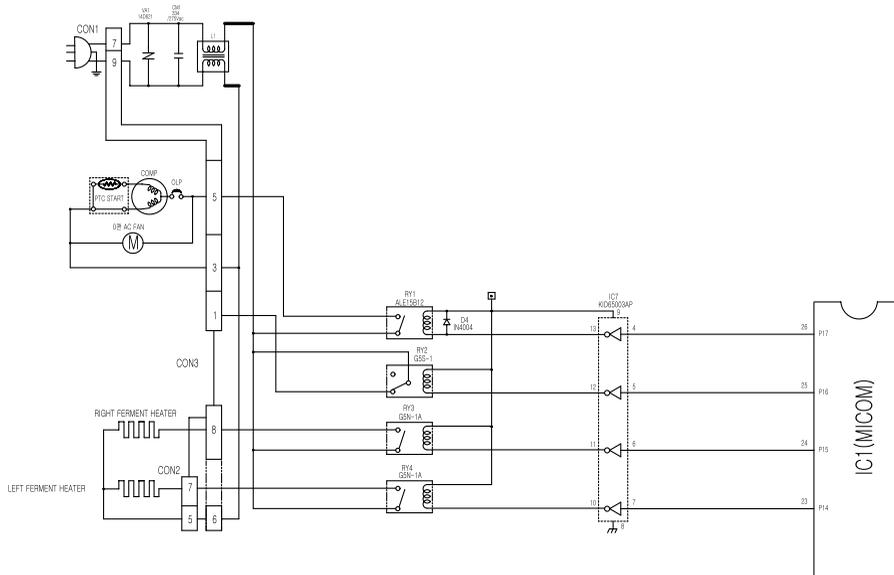
The reset circuit allows the entire process to be started from the initial status by resetting the various elements within the MICOM (IC1), such as RAM, whenever power is applied to the unit. Low voltage is applied to the reset terminal for 10ms at the beginning of the power input. The reset terminal has a voltage of 5 V during general operation. (If the reset operation fails, the microprocessor will not operate.)



MICOM function and circuit description

5-2-4. Load/Buzzer driving circuit

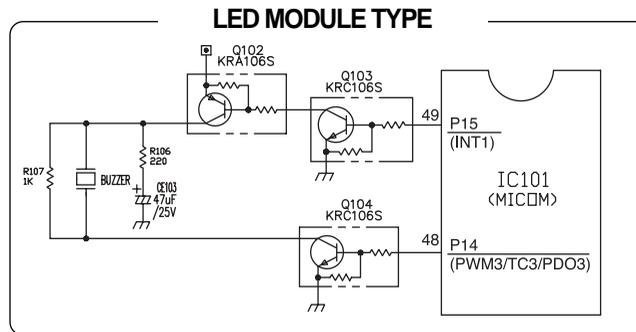
(1) Load driving circuit



Type of load		COMP. fan motor	Left seasoning heater	Right seasoning heater
Measuring point (IC7)		13	10	11
Status	ON	Within 1V		
	OFF	12V		

(2) Buzzer driving circuit (located on display PCB)

* Only the buzzer sound for the Lock/Unlock operation is shown in this SVC technical manual.

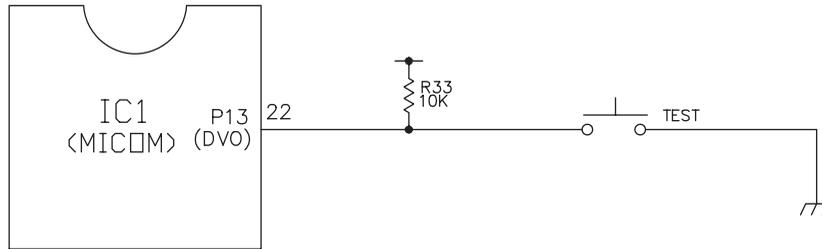


Status	Ex) Lock: "Ding-D-Dong" sound	Ex) Lock: "Ding-D-Dong" sound	Off
Measuring point			
IC101 (Pin 3/61)			5V
IC101 (Pin 2/62)			0V

MICOM function and circuit description

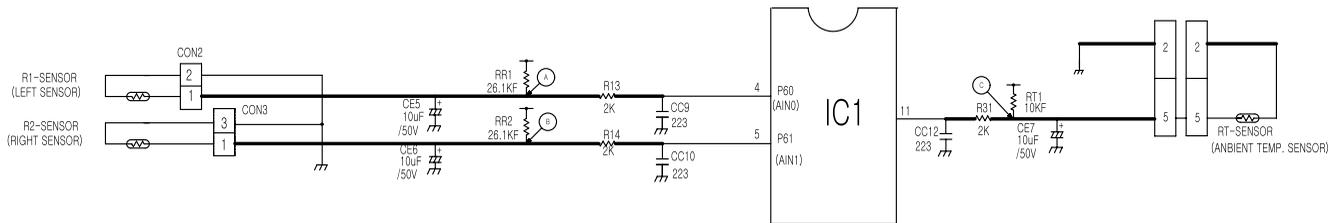
5-2-5. Switch input circuit

The following circuit is the input circuit to detect the test switch signal to check the refrigerator.



5-2-6. Temperature sensor circuit

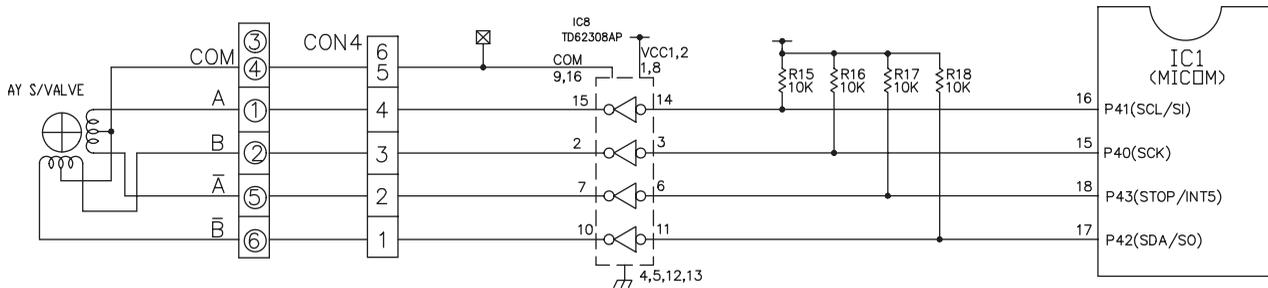
The following temperature sensor circuit consists of a sensor to detect the outside (ambient) temperature and sensors in the left and right compartments for storing and seasoning Kimchi. The status of each sensor, whether open or shorted, is shown below.



Sensor	Check point	Normal(-30°C~50°C)	Shorted	Open
Left compartment sensor	POINT (A) Voltage	0.5V~4.5V	0V	5V
Right compartment sensor	POINT (B) Voltage			
Ambient temp. sensor	POINT (C) Voltage			

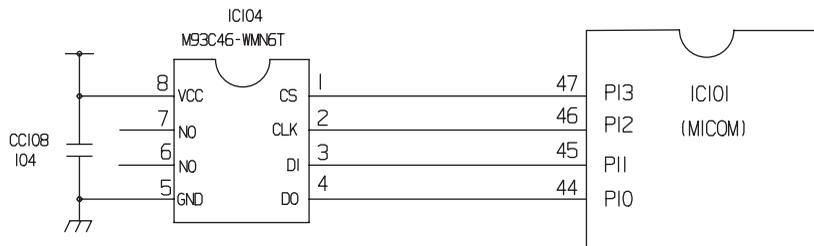
MICOM function and circuit description

5-2-7. Stepping motor operation circuit (3-way valve)



► The motor is operated by sending out "High" and "Low" signals as many as the designated number of steps through MICOM Pin 15, 16, 17, 18 to rotate the motor through the magnetic field formed by the motor and the coil wrapped around each stator.

5-2-8. Power failure compensation circuit (located on display PCB)

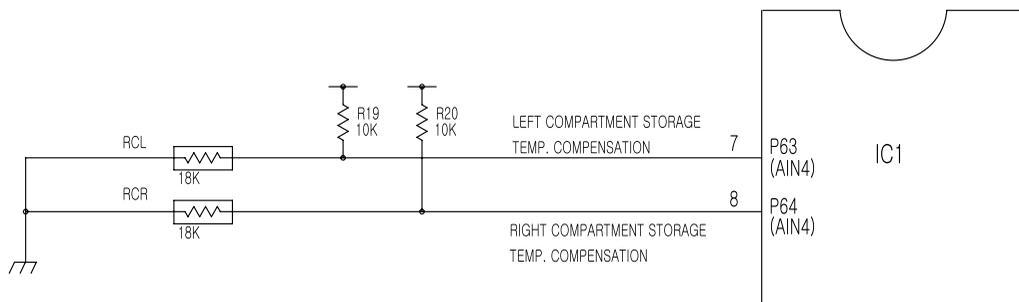


► The power failure compensation circuit recalls the temperature range of the right and left compartments and maintains these levels if power is interrupted briefly. The IC for power failure compensation (EEPROM) delivers to and maintains the information in MICOM through the serial interface.

MICOM function and circuit description

5-2-9. Storing temperature compensation and over-cool/under-cool cut compensation circuit

(1) Storing temperature compensation



► This is the circuit to input the temperature compensation level required for adjusting storage temperature at the left or right compartment.

Left compartment (RCL)	Right compartment (RCR)	Temperature compensation value	Remarks
180 KΩ		+2.5 °C	Warmer ↑
56 KΩ		+2.0 °C	
33 KΩ		+1.5 °C	
18 KΩ		+1.0 °C	
12 KΩ		+0.5 °C	
10 KΩ		0 °C	Standard temperature
8.2 KΩ		-0.5 °C	Cooler ↓
5.6 KΩ		-1.0 °C	
3.3 KΩ		-1.5 °C	
2 KΩ		-2.0 °C	
470 Ω		-2.5 °C	

► Temperature compensation table by adjustment of resistance value (difference against current temperature)

Ex) If you change the resistance of compensation at the left compartment (RCL) from 10KΩ (current resistance) to 18KΩ (adjusted resistance), the storage temperature in the left compartment will be increased by 1°C.

Classification	Modified resistance / Current resistance	470 Ω	2 KΩ	3.3 KΩ	5.6 KΩ	8.2 KΩ	10 KΩ	12 KΩ	18 KΩ	33 KΩ	56 KΩ	180 KΩ
		Left compartment (RCL)	470KΩ	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP	3°C UP	3.5°C UP	4°C UP
2 KΩ	0.5°C DOWN		No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP	3°C UP	3.5°C UP	4°C UP	4.5°C UP
3.3 KΩ	1°C DOWN		0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP	3°C UP	3.5°C UP	4°C UP
5.6 KΩ	1.5°C DOWN		1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP	3°C UP	3.5°C UP
8.2 KΩ	2°C DOWN		1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP	3°C UP
Right compartment (RCR)	10 KΩ	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP	2.5°C UP
	12 KΩ	3°C DOWN	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP	2°C UP
	18 KΩ	3.5°C DOWN	3°C DOWN	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP	1.5°C UP
	33 KΩ	4°C DOWN	3.5°C DOWN	3°C DOWN	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP	1°C UP
	56 KΩ	4.5°C DOWN	4°C DOWN	3.5°C DOWN	3°C DOWN	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change	0.5°C UP
	180 KΩ	5°C DOWN	4.5°C DOWN	4°C DOWN	3.5°C DOWN	3°C DOWN	2.5°C DOWN	2°C DOWN	1.5°C DOWN	1°C DOWN	0.5°C DOWN	No change

MICOM function and circuit description

(2) Over-cool/Under-cool cut compensation



Left compartment cut compensation		Left compartment storing temperature compensation	Right compartment cut compensation		Right compartment storing temperature compensation
Over-cool compensation	Under-cool compensation		Over-cool compensation	Under-cool compensation	
JCL1	JCL2		JCR1	JCR2	
CUT		+1°C	CUT		+1°C
	CUT	-1°C		CUT	-1°C
CUT	CUT	0°C	CUT	CUT	0°C
		0°C (Factory default)			0°C (Factory default)

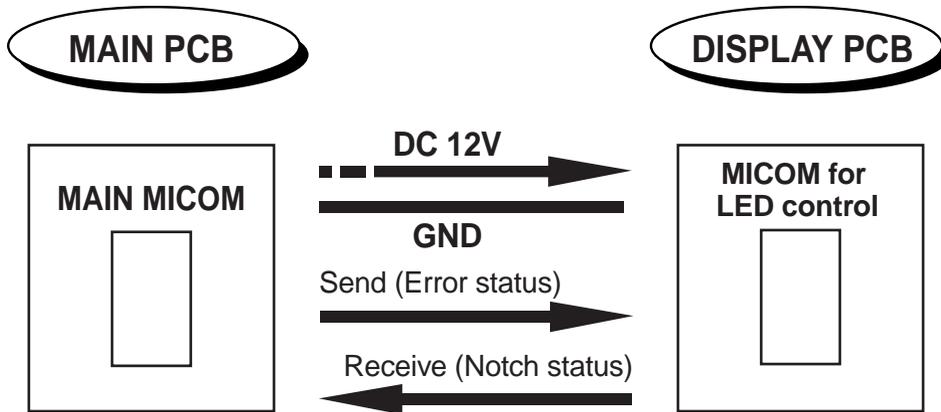
► The cut compensation circuit compensates the storing temperature of the left or right compartment by simply cutting it out of service for a brief period.

MICOM function and circuit description

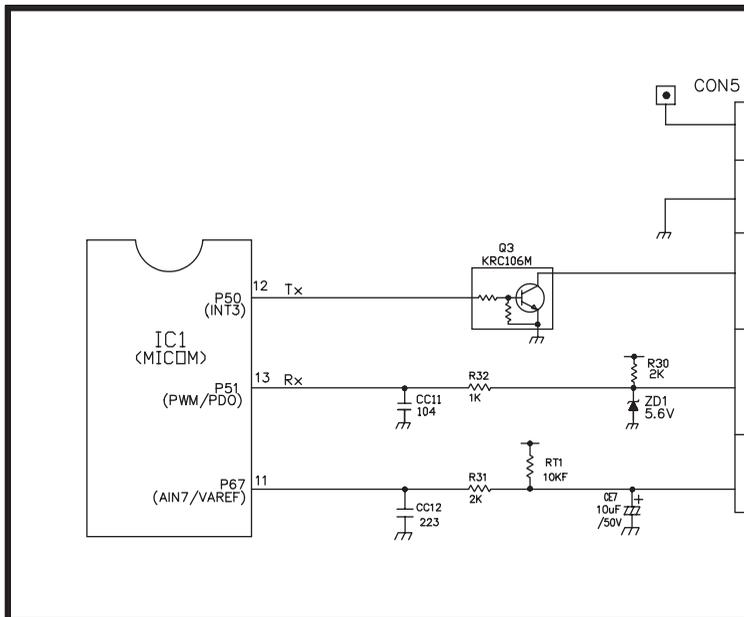
5-2-10. Communication circuit between main PCB and display PCB

This circuit provides communications between the MICOM on the main PCB and the MICOM of the display PCB.

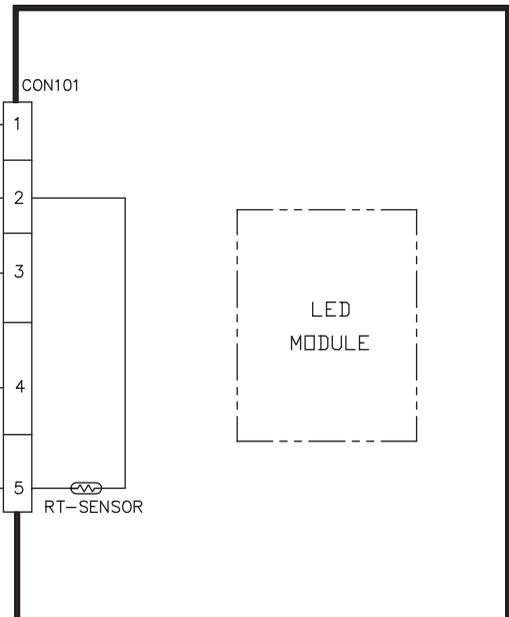
If there is no communication between these boards for 30 seconds, a communication error occurs.



PWB(PCB) ASSEMBLY, MAIN



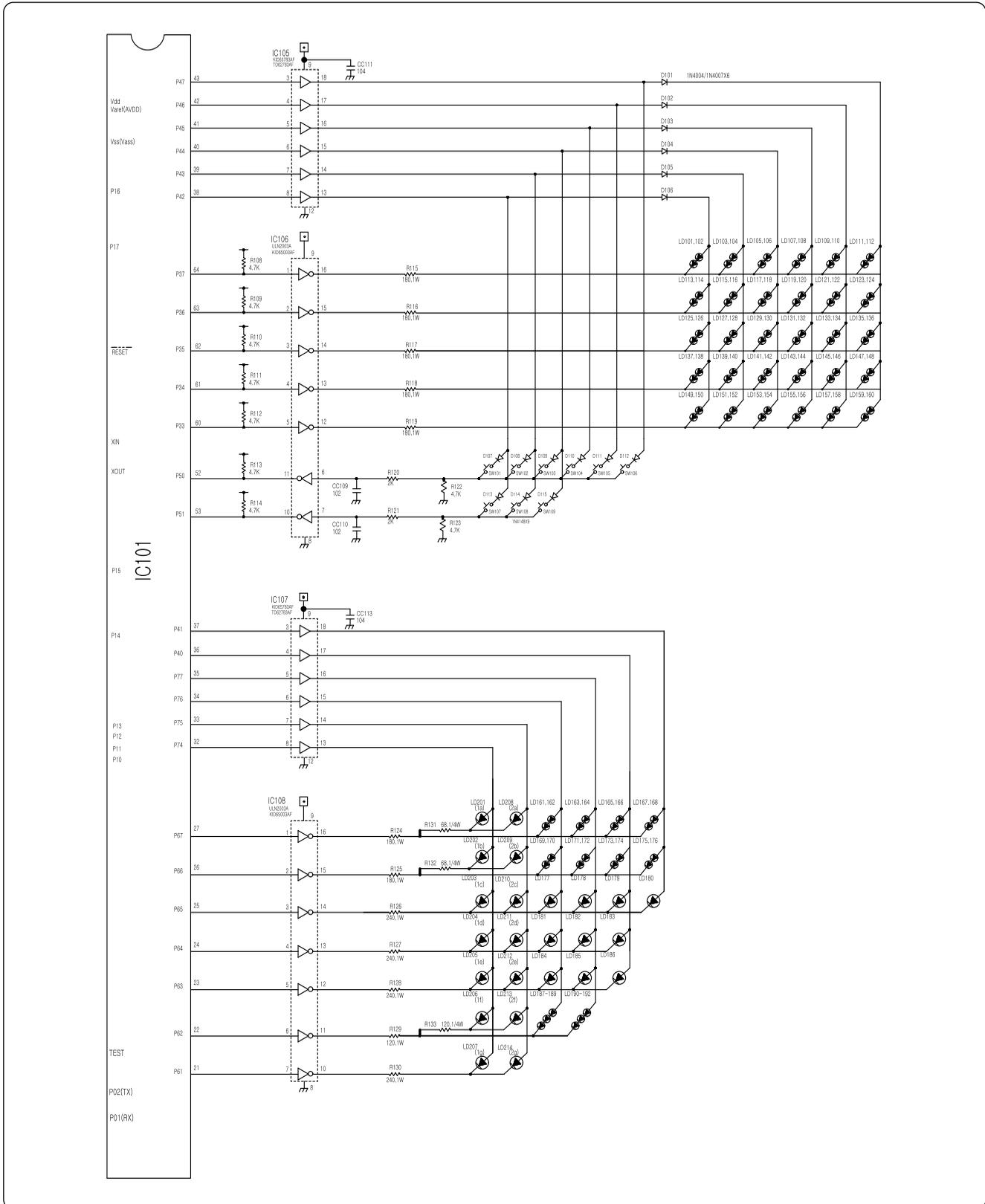
PWB(PCB) ASSEMBLY, DISPLAY



MICOM function and circuit description

5-2-11. Button input and display part illumination circuit

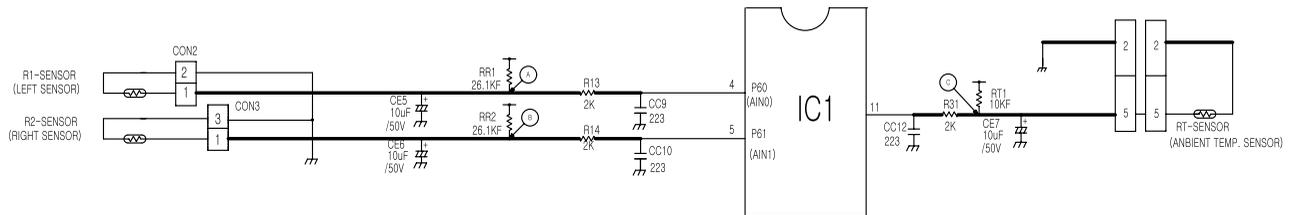
This circuit determines which buttons are pressed and drives the LED display, whose driving method is a scan method.



MICOM function and circuit description

5-3. Sensor resistance characteristics table

Measuring temperature (°C)	Left sensor, right sensor, outside sensor
-20°C	77 KΩ
-15°C	60 KΩ
-10°C	47.3 KΩ
-5°C	38.4 KΩ
0°C	30 KΩ
+5°C	24.1 KΩ
+10°C	19.5 KΩ
+15°C	15.9 KΩ
+20°C	13 KΩ
+25°C	11 KΩ
+30°C	8.9 KΩ
+40°C	6.2 KΩ
+50°C	4.3 KΩ

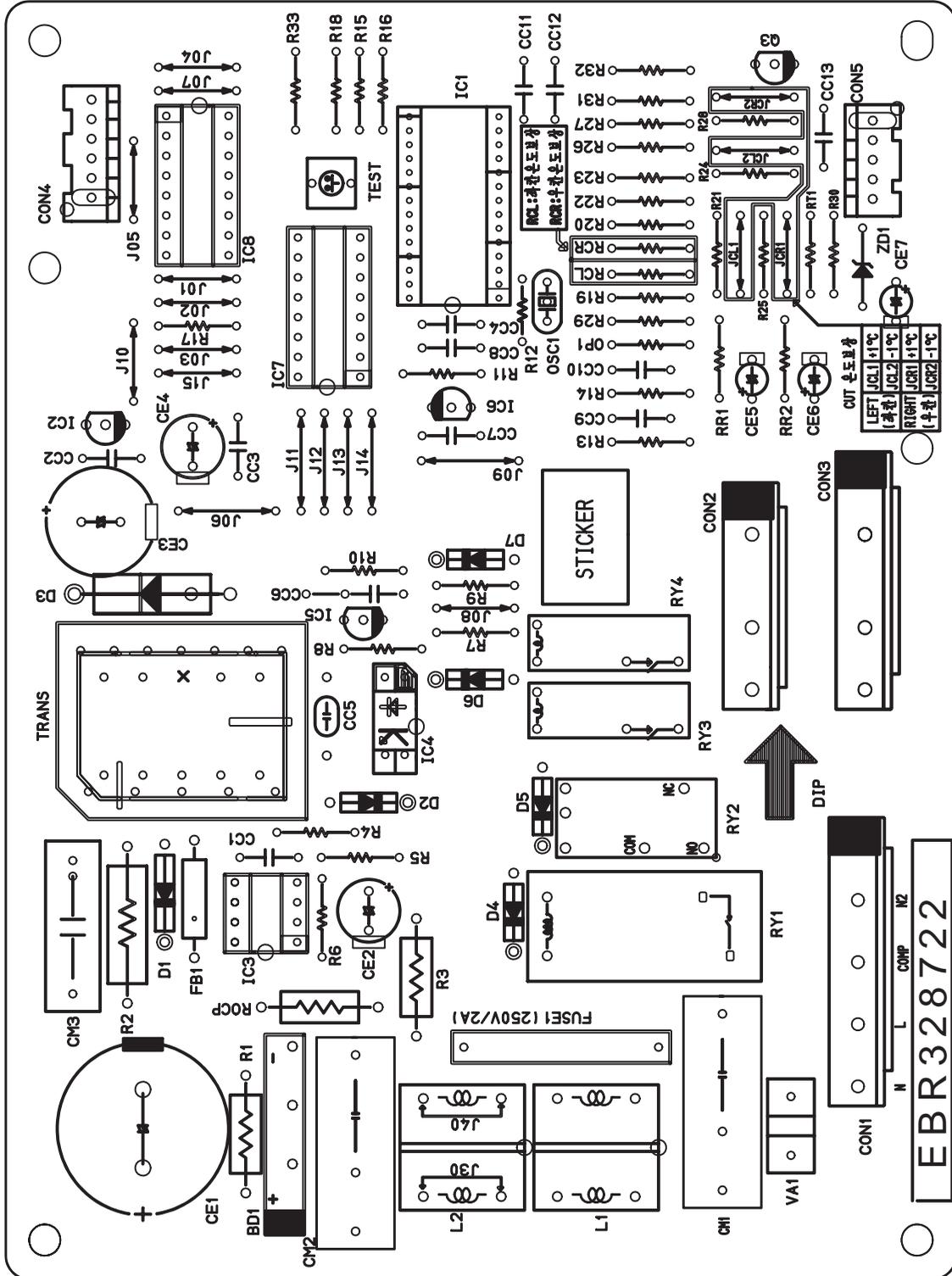


- ▶ The tolerance of the sensor resistance is $\pm 3\%$.
- ▶ Measure the resistance value of the sensor after leaving it for more than 3 minutes (delay is required due to sensing speed.)
- ▶ Always use a digital tester. Analog testers have a higher margin of error.
- ▶ For left and right sensor, measure both sensor ends of the connector after separating the connectors of CON2 and 3 of PWB (PCB) assembly and main part. For the outside sensor, measure end of 2 and 5 of CON5.

MICOM function and circuit description

5-4. PCB parts diagram and parts list

5-4-1. PWB (PCB) assembly and main parts diagram (The parts diagram can slightly change according to the situation.)



MICOM function and circuit description

5-4-2. PWB (PCB) assembly and main parts list

* The parts list can slightly change according to the situation.

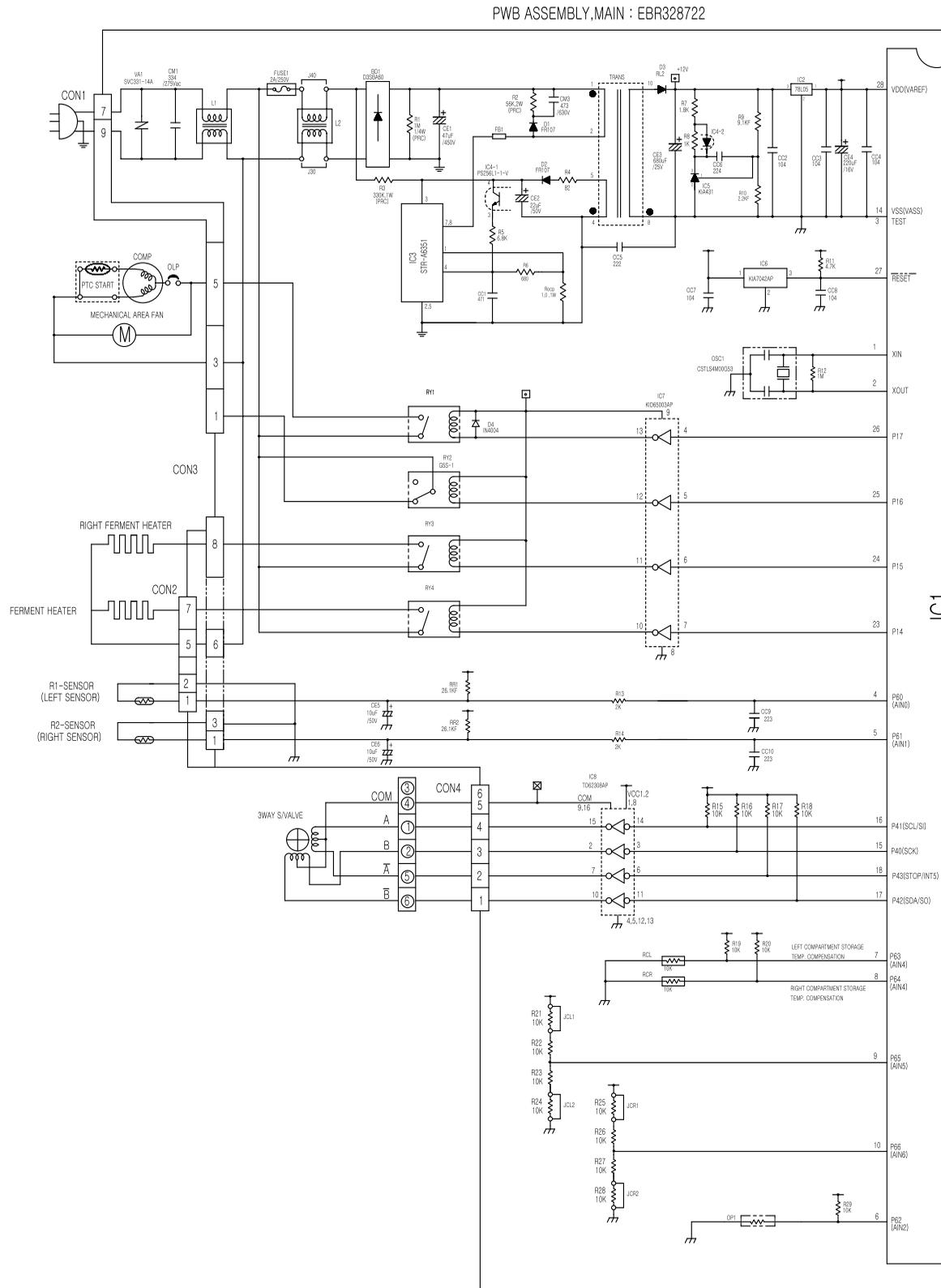
17		WORK					
08-CHEST TYPE 190L MIJU 1100~127V,50,60Hz		APPLICATION					
Qty	No	P/NO	DESCRIPTION	SPEC	MAKER	REMARK	
1	1	6870JB8105F	PWB(PCB)	LANDMARK-PJT MAIN PCB (FUE1 SILK MODIFIED)	DOOSAN	FR1,1.6T	
1	2	6170JB2010B	TRANSFORMER,SMPS(COIL	A3-PJT 12.5V 1A 110V/50.60HZ	SAM IL	TRANS	
1	3	6630AQ9106D	CONNECTOR,(CIRC),WAFE	YW396-09AV	YEON HO	CON1	
1	4	6630VM04107	CONNECTOR,(CIRC),WAFE	YW396-07AV(7P-1,2,5,7)	YEON HO	CON2	
1	5	6630VM04208	CONNECTOR,(CIRC),WAFE	YW396-08AV(8P-1,3,6,8),RED	YEON HO	CON3(RED)	
1	6	6630JB8004E	CONNECTOR,(CIRC),WAFE	SMW250 YEONHO 6P 2.5MM STRAIGHT	YEON HO	CON4	
1	7	6630JB8004D	CONNECTOR,(CIRC),WAFE	SMW250 YEONHO 5P 2.5MM STRAIGHT	YEON HO	CON5	
1	8	01STLKE016A	IC,KEC	KIA78L05BP	KEC	IC2	
1	9	01KE704200D	IC,KEC	KIA7042P 2K/TP 4.2 RESET KEC - - - -	KEC	IC6	
1	10	01KE650030B	IC,KEC	KID65003AP *18P,SDIP" BK DRIVE	KEC	IC7	
1	11	01TO623080C	IC,DRAWING	62308 16PIN SDIP BK DRIVE IC ST	TOSHIBA	IC8	
1	12	01KE431000A	IC,KEC	KIA431 3PIN TP - - -	KEC	IC5	
1	13	01PMGNE001A	IC,POWER MANAGEMENT	PS2561-1 NEC 4P,DIP BK = TLP762	NEC	IC4	
1	14	6212BA3041A	RESONATOR,CERAMIC	CSTLS4M00G53-A0 MURATA 4.00MHZ +/- 0.5% TA 15PF 3	MURATA	OSC1	
1	15	6102W5V007A	VARISTOR	SVC331D-14A	SAMHWA	VA1	
1	16	6920JB2004D	RELAY	DH12D1-O-Q, DH1U-Q (JAPAN) DAI	JAEIL	RY1	
2	17	6920JB2003D	RELAY	G5NB-1A-E(JAPAN) 250VAC 5A 12VDC 1A NO VENTING	OMRON	RY3,4	
		6920JB2003E	RELAY	G5NB-1A-E(CHINA) 250VAC 5A 12VDC 1A NO VENTING	OMRON		
1	18	01PMGSK003A	IC,POWER MANAGEMENT	STR-A6351 SANKEN 8 DIP ST SMPS	SANKEN	IC3	
1	19	0TR106009AF	TRANSISTOR,BIPOLARS	KRC 106M KEC	KEC	Q3	
1	20	0DB360000AA	DIODE,RECTIFIERS	D3SBA60 BK SHINDENGEN 600V 4A	SHINDENKEN	BD1	
1	21	0DRSA00070A	DIODE,RECTIFIERS	RL2 SANKEN BK NON 400V 2A 40A 5	SHINDENKEN	D3	
2	22	0DR107009AA	DIODE,RECTIFIERS	FR107 TP DELTA DO41 1000V 1A 3	DELTA/PYEONGCHANG	D1,2	
1	23	0DD400409AC	DIODE,RECTIFIER	RECT1N4004 TP	DELTA/PYEONGCHANG	D4	
1	24	0CE476ZV6E0	CAPACITOR,FIXED ELECT	47UF HE 450V 20% BULK SNAP IN	SAMHWA	CE1	
1	25	0CE687YH6E0	CAPACITOR,FIXED ELECT	680UF RX 25V 20% BULK SNAP IN	SAMHWA	CE3	
1	26	0CE227BF638	CAPACITOR,FIXED ELECT	220UF KME TYPE 16V 20% FM5 TP 5 (RG/YXA/SM)(105 °C)	SAMYOUNG,SAMHWA	CE4	
1	27	0CE226EK638	CAPACITOR,FIXED ELECT	22UF KMG TYPE 50V 20% FM5 TP 5 (RG/YXA/SM)	SAMYOUNG,SAMHWA	CE2	
3	28	0CE108EK638	CAPACITOR,FIXED ELECT	10UF KMG TYPE 50V 20% FM5 TP 5 (RG/YXA/SM)(105 °C)	SAMYOUNG,SAMHWA	CE5,6,7	
1	29	0CQ33418670	CAPACITOR,FIXED FILM	0.33UF D 275V M M/PP NI R	PILKOR	CM1	
1	30	0CF4731Y470	CAPACITOR,FIXED FILM	0.047UF D 630V 0.05 BULK M/PP NI	PILKOR	CM3	
1	31	0CG2220U630	CAPACITOR,CERAMIC,RADIAL	SD2G222M12BW1 2200 PF 20% 400V Y5U -20TO +85C R/TP	SAMHWA	CC5	
3	32	0CK2230K949	CAPACITOR,FIXED CERAM	22NF 50V Z F TA52	TAE YANG	CC9,10,12	
1	33	0CK2240K949	CAPACITOR,FIXED CERAM	220NF D 50V 80%,-20% F(Y5V) TA52	TAE YANG	CC6	
6	34	0CK1040K949	CAPACITOR,FIXED CERAM	0.1UF D 50V 80%,-20% F(Y5V) TA5	TAE YANG	CC2,3,4,7,8,11	
1	35	0CK4710K519	CAPACITOR,CERAMIC (HI	470PF 50V K B TA52	TAE YANG	CC1	
1	36	0DZMR00029A	DIODE,ZENERS	1N5232B MOTORORA TP DO34 0.5W 5	ROHM	ZD1	
1	37	EBC32066501	RESISTOR,SURGE	PRC 56K OHM 5% 2W 15.0X5.5MM 12.5MM AXIAL BK	SMART	R2	
1	38	EBC32066401	RESISTOR,SURGE	PRC 330K OHM 5% 1W 12X4MM AXIAL TA52	SMART	R3	
1	39	0RS0101J609	RESISTOR,FIXED METAL	1 OHM 1/4 W 5% TA52	SMART	ROCP	
1	40	0RD0822G609	RESISTOR,FIXED CARBON	82 OHM 1/4 W 5.00% TA52	SMART	R4	
1	41	0RD6800G609	RESISTOR,FIXED CARBON	680 OHM 1/4 W 5.00% TA52	SMART	R6	
4	42	0RD2001G609	RESISTOR,FIXED CARBON	2K OHM 1/4 W 5.00% TA52	SMART	R13,14,30,31	
1	43	0RD4701G609	RESISTOR,FIXED CARBON	4.7K OHM 1/4 W 5.00% TA52	SMART	R11	
1	44	0RD6801G609	RESISTOR,FIXED CARBON	6.8K OHM 1/4 W 5.00% TA52	SMART	R5	
1	45	EBC32066601	RESISTOR,SURGE	PRC 1M OHM 5% 1/2W 9.0X3MM AXIAL TA52	SMART	R1	
1	46	0RD1004F609	RESISTOR,FIXED CARBON	1M OHM 1/6 W 5.00% TA52	SMART	R12	
19	47	0RD1002G609	RESISTOR,FIXED CARBON	10K OHM 1/4 W 5.00% TA52	SMART	RCL,RCR,RT1,R15-29,33	
1	48	0RN1002G409	RESISTOR,FIXED METAL	10K OHM 1/4 W 1.00% TA52	SMART	RT1	
2	49	0RN2612G409	RESISTOR,FIXED METAL	26.1K OHM 1/4 W 1.00% TA52	SMART	RR1,RR2	
2	50	0RD1001G609	RESISTOR,FIXED CARBON	1K OHM 1/4 W 5.00% TA52	SMART	R8,32	
1	51	0RD1801G609	RESISTOR,FIXED CARBON	1.8K OHM 1/4 W 5.00% TA52	SMART	R7	
1	52	0RN2201G409	RESISTOR,FIXED METAL	2.2K OHM 1/4 W 1.00% TA52	SMART	R10	
1	53	0RN9101G409	RESISTOR,FIXED METAL	9.1K OHM 1/4 W 1.00% TA52	SMART	R9	
1	54	43607015	JUMP WIRE	0.6MM 10MM - - -	15MM	FB1	
1	55	6600RRT001W	SWITCH,TACT	THV502GAA POSTECH 12V DC 50MA	POSTEC	TEST	
1	56	6200JB8004A	FILTER(CIRC),EMC	CV940050 TNC - - -	TNC	L1	
1	57	0FZZJB3001A	FUSE	250V 2A SLOW-BLOW LITTELFUSE,T	SAMJU	FUSE1	
9	58	43607015	WIRE,JUMP	GC10 WHITE T0.6 L10 FOR A INSR	10MM	J01-05,07,08,10,15	
6	59	43607015	WIRE,JUMP	GC10 WHITE T0.6 L10 FOR A INSR	12.5MM	J06,09,11-14	
4	60	43607015	JUMP WIRE	0.6MM 10MM - - -	10MM	JCL1,2,JCR1,2	
2	61	43607015	JUMP WIRE	0.6MM 10MM - - -	10MM	J30,40	
3,59	62	SS0000008AA	SOLDER,SOLDERING	SR-34 PB FREE, LFM-48	HUISUNG		
25g	63	SSWZU-L05AA	SOLDER,SOLDERING	LFM-38, SN 3.0AG-0.5CU% 3.0MM			
3,59	64	7245ZB0004A	FLUX	SV-PBF-06 KSK 12.5 WT% 0.815+-0.003			
1	65	01TO878090A	IC,MICROCONTROLLERS	TMP87C809N 28P,SDIP LANDMARK 190L WITH FREEZER	TOSHIBA	IC1(OTP)	
1	66	SAA32961401	S/W,SYSTEM PROGRAM	TMP87C809N 28P,SDIP LANDMARK 190L WITH FREEZER	TOSHIBA	IC1 (PROGRAM - C/S : 51B3)	

MICOM function and circuit description

5-5. PCB circuit diagram

5-5-1. PWB (PCB) assembly and main circuit diagram

* PCB circuit diagram can slightly change according to the situation.



Freezing cycle and refrigerant

Chapter 6. Freezing cycle and refrigerant

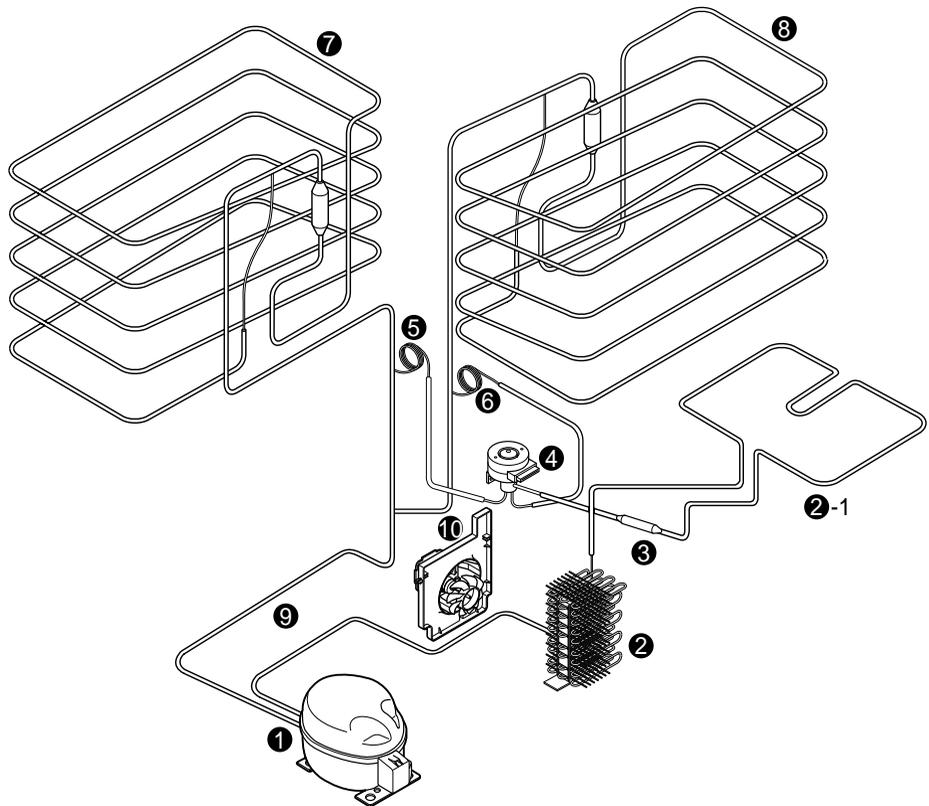
6-1. Freezing cycle (Freezing principle/Refrigerant gas circulation diagram)

6-1-1. Freezing principle

Freezing is an operation of maintaining a lower temperature (generally 0°C) than the natural temperature (usually ambient temperature surrounding us). This requires an insulated space, refrigerant (R134a) to absorb the heat and the circulation circuit (compressor, condenser, evaporator etc.) to operate the phase change of the refrigerant.

6-1-2. Refrigerant gas circulation diagram

1. Compressor
2. Wire condenser
- 2-1. Hot line pipe
3. Drier
5. Capillary tube (left)
6. Capillary tube (right)
7. Evaporator (left)
8. Evaporator (right)
9. Suction pipe
10. Cooling fan



Freezing cycle and refrigerant

6-1-3. Operation description of each circulation circuit

No.	Parts name	Operation details	Refrigerant gas condition (input and output)
1	Compressor	Compress the refrigerant from low pressure (0kg/cm ²) to high pressure (8-12kg/cm ²).	Low pressure gas-->High pressure gas (0kg/cm ²) (8~12kg/cm ²) Temperature (30°C) ; (80~120°C)
2	Condenser & hot line pipe	High pressure gas refrigerant exhausts heat and becomes liquid refrigerant.	High pressure gas-->High pressure liquid (8~12kg/cm ²) (8~12kg/cm ²) Temperature (80~120°C) ; (40~60°C)
3	Drier	There is an absorbent that absorbs the moisture within the circulation circuit. (Moisture absorption device)	
4	Capillary tube	This is the long narrow pipe where high pressure refrigerant passes to reduce the pressure.	High pressure liquid-->Low pressure liquid (8~12kg/cm ²) (0kg/cm ²) Temperature (40~60°C) ; (-27°C)
5	Evaporator	Low pressure liquid refrigerant absorbs heat to change to low pressure gas refrigerant.	Low pressure liquid-->Low pressure gas (0kg/cm ²) (0kg/cm ²) Temperature (-27°C)
6	Suction pipe	This connects the evaporator and the compressor.	Low pressure gas-->Low pressure gas (0kg/cm ²) (8~12kg/cm ²) Temperature (-27°C) ; (30°C)

Caution

- ▶ Because the outlet of the capillary tube is where the high pressure refrigerant changes from high to low pressure, the low pressure refrigerant quickly diffuses to the evaporator, making flash sounds. (shik shik sound)
- ▶ When the low pressure liquid refrigerant evaporates from the evaporator, it is done throughout the whole pipe from inlet to outlet, making a sound of liquid refrigerant flowing. This can happen depending on the load condition of the refrigerator and on the evaporation, but it is not a problem.

6-2. Refrigerant

Refrigerant	Characteristics	ODP	GWP	Remarks
R134a (HFC-134a)	Because it does not include chloride, which cause ozone destruction, it will not destruct the ozone and has a low GWP compared to the existing R12 (GWP: 15300).	0	1200	Refrigerant

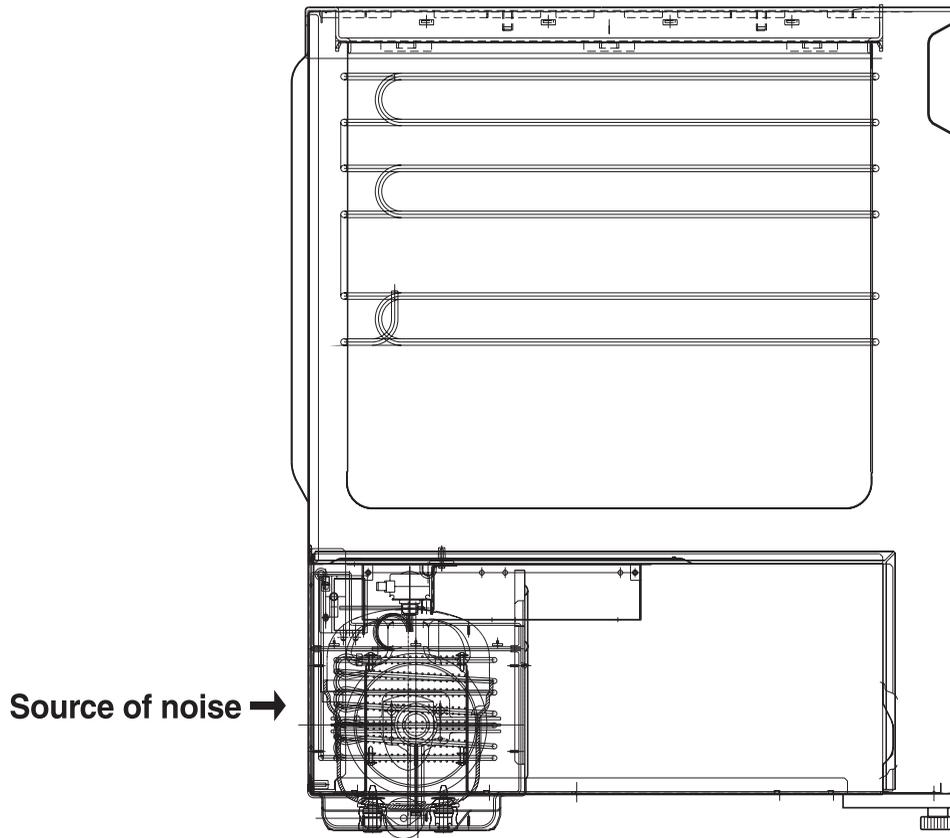
* ODP: Ozone Depleting Potential (Relative index with CFC11 as 1.0)
GWP: Global Warming Potential (Relative index with CO₂ as 1.0)

General details about the product

Chapter 7. General details about the product

7-1. Refrigerator noise

The structure of the freezing room and mechanical room, which are the sources of Kimchi refrigerator noise, is as follows. Here you can see that the main source of noise during refrigerator operation is the compressor, the condenser and the fan motor that cools the compressor in the mechanical room.



(Fig. Diagram of Kimchi refrigerator noise source)

7-1-1. SVC method for noise claim

(1) Basic method of noise reduction

- **Block:** This method blocks the noise from the source so that it does not reach the ears by blocking the transmission path of the sound with high density sound blocker. (This is effective in high frequency area)
- **Using sound absorber:** This method is similar to the blocking method but uses Styrofoam and glass wool in the transmission path to absorb the sound. (This is effective in low frequency area)
- **Vibration reduction:** This method blocks the mechanical vibration from the operating part so that it does not reach other parts. (using vibration reduction rubber etc.)
- **Dynamic balance maintenance:** This method minimizes the dynamic imbalance of the rotating object.
- **Fixing the vibrating part:** This method firmly fixes the vibrating part depending on the situation.
- **Removing contact:** Separate the two parts or firmly fix the object that periodically make sound by hitting each other.

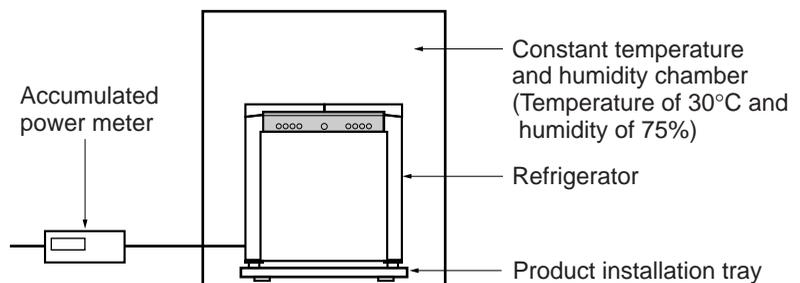
General details about the product

(2) Service method for major noise claim item for Kimchi refrigerator

Noise claim	Noise generation	Service method	Remarks
Noise from poor installation	<ul style="list-style-type: none"> ▶ The installation floor surface is not hard enough ▶ The refrigerator is not leveled 	<ul style="list-style-type: none"> • Reinforce the floor hardness • Move the installation location • Use the adjustment screw in front of the refrigerator to level the refrigerator 	
Parts vibration	<ul style="list-style-type: none"> ▶ "Wing" sound 	<ul style="list-style-type: none"> • Insert firmly all the parts of the refrigerator in the right location 	<ul style="list-style-type: none"> ▶ Mainly within the refrigerating compartment
Compressor resonance sound	<ul style="list-style-type: none"> ▶ "Woong Woong" sound 	<ul style="list-style-type: none"> • Reduce the noise by adjusting the pipe and seat rubber 	
Compressor noise	<ul style="list-style-type: none"> ▶ Poor balance of the compressor ▶ Contacting sound of the surrounding pipe of the compressor part 	<ul style="list-style-type: none"> • Adjust the surrounding pipe and seat rubber to maintain the level of the compressor • Remove contact 	
Operating device noise	<ul style="list-style-type: none"> ▶ Contact sound from the OLP contact point during compressor operation 	<ul style="list-style-type: none"> • Exchange OLP 	<ul style="list-style-type: none"> ▶ "Tak Tak"
Wire condenser noise (vibration noise)	<ul style="list-style-type: none"> ▶ "Woong Woong" sound ▶ "Ching" sound 	<ul style="list-style-type: none"> • Recheck the screws • Remove the welding part of the heat plate (wire) and remove the heat plate 	

7-2. Details on power consumption

The power consumption of the refrigerator is measured within the chamber where constant temperature and humidity is maintained. In the right figure, maintain the chamber to 30°C and 75% humidity with no load to the refrigerator and set the temperature of the left and right compartment to 3°C to measure the power consumption. The power consumption is calculated as follows.



$$\text{Monthly power consumption (kWh/month)} = \text{Measured value (kWh/day)} \times 365 \text{ days} / 12 \text{ months}$$

Caution

The actual power consumption and the one indicated on the refrigerator can differ due to the using condition.

Major repair method for freezing cycle

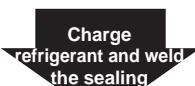
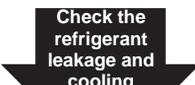
Chapter 8. Major repair method for freezing cycle

8-1. Major repair work standard for refrigerator using R134a refrigerant

No.	Work item	Unit	Work standard	Objective	Remarks
1	Opening time for pipe and piping parts	Min	Pipe part: Within 1 hour Compressor: Within 10 minutes Drier: Within 20 minutes	Prevent moisture penetration	Specially manage to half or lower of the prior standard during rain or rainy season. (Especially the water penetration within the piping can be crucial)
2	Welding work	Nitrogen supply pressure	Do the welding while supplying the nitrogen. (Nitrogen pressure: .1-0.2kg/cm ²)	Prevent oxidization scale generation within the pipe from high temperature heat during welding	<ul style="list-style-type: none"> - Refer to the Caution section of the major repair part for work methods of each part. - Because the R134a refrigerant has a smaller molecular size than that of R12 refrigerant, special care is needed when welding the pipe because leakage can occur more easily. - Do not apply pressure to the parts of the piping before and after the welding. It can cause the pipe to crack and cause leakage.
3	Refrigerator cycle	Vacuum time Vacuum degree Vacuum part Vacuum piping Pipe coupler Socket Plug	Min Torr: 40 minutes or more 0.03 Torr or below (reference) Simultaneous vacuum for high and low pressure EA: Use manifold for R134a Model name: 40134A Manufacturer: US Robin Air EA: For R134a Model name: PCV630-2SV 1EA Model name: PCV400-2PV 1EA Manufacturer: Japanese Nito EA: For R134a Model name: 2SV EA: For R134a Model name: 2PV	Remove moisture Prevent mixed penetration of mineral oil and ether oil Prevent mixed penetration of R12 refrigerant Prevent mixed penetration of R12 refrigerant Prohibit mixed use of R12 refrigerant	Manufacturer of 113l/min model WVP-Z: US Asco Note) The model should have a counter-current blocker. The vacuum effect can be increased during a vacuum with both high and low pressure while operating the compressor. For the refrigerant piping (rubber type), using the existing piping for R12 for the new R134a refrigerant can cause the rubber to be melted (can cause leakage).
4	Refrigerator cycle Refrigerant measurement (BOMBE)	EA	Use the one for R134a and the measurement tolerance is ±5g. Note) If it is -5g for winter and +5g for summer, it is well managed. (manufactured by LG)	Prohibit mixed use of R12 refrigerant	<ul style="list-style-type: none"> - When measuring the refrigerant, do not measure it in a very hot or cold location (ambient temperature of 25°C is best) When manufacturing an additional bombe, use copper for the material. - End socket: 2SV plug: Use the proper one for 2PV R134a Note) When welding the connection part of both ends, make sure the internal O ring (rubber) does not burn.
5	Exchange drier		<ul style="list-style-type: none"> - For R134a - When repairing the refrigerator cycle piping, always exchange the drier. 	Remove moisture existing within the piping	
6	Leakage test		<ul style="list-style-type: none"> - Never do a soap water test. The soap water can leak into the piping from the vibration. - Leakage detector model: 16170, 16500. Manufacturer: US Robin Air 	Detect refrigerant leakage part (for reference)	<ul style="list-style-type: none"> - For the refrigerant leaking part, check if oil is leaked and if not found, use the electric leakage detector.

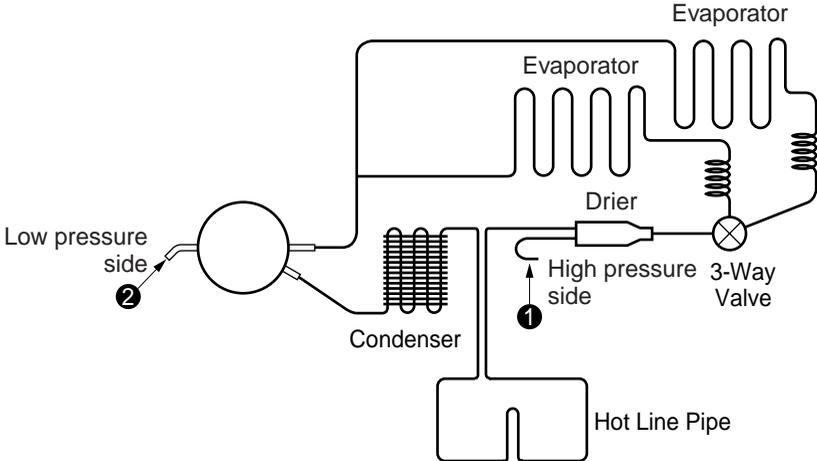
Major repair method for freezing cycle

8-2. Introduction to major repair work

Work sequence	Major repair details	Work tools
 Diagnose problem		
 Remove residual refrigerant	- Cut the end of the drier part (high pressure side) and compressor charging part to remove the refrigerant.	Pliers, nipper
 Exchange and weld parts	- Use the compressor, drier, oil and refrigerant for R134a. - For the parts with nitrogen sealing and vacuum wrapping, check the "pik" sound before assembling. Use only the ones with proper wrapping and immediately assemble and weld the parts. - When welding the parts always substitute the nitrogen. (nitrogen pressure: 0.1-0.2kg/cm ²) - Major repair work should be done in a clean work space with no humidity.	Pipe cutter, gas welder, nitrogen gas Welding rod (silver: IS430B, copper: BCup-2) Flux (Hydrux Korea)
 Vacuum	- Connect the hose and vacuum pump of the manifold gauge to the high pressure (drier part) and low pressure side (compressor refrigerant charging part), and make it vacuum for more than 60 minutes. - Vacuuming speed: 113l/min	Vacuum pump (for R134a), manifold gauge
 Charge refrigerant and weld the sealing	- Measure the bombe exclusively provided by LG for R134a within the regulated value $\pm 5g$ using an electric weight and insert it to the refrigerant charging part of the compressor. (insert refrigerant while operating the refrigerator) - Weld carefully after pinching the charging part.	Bombe for R134a (mass cylinder), refrigerant (R134a), manifold gauge, electric weight, punch off pliers, gas welder
 Check the refrigerant leakage and cooling performance	- Check for leakage in the re-welded parts <ul style="list-style-type: none"> • Minor leakage: Use the electric leakage detector • Major leakage: Use the naked eye or finger to check the oil from the compressor ※ Caution: Do not use soap water for the leakage parts - Cooling performance check <ol style="list-style-type: none"> 1. Check whether the heat emitter is warm by hand. 2. Check if the moisture is formed evenly around the evaporator surface within the refrigerator. 	Electric leakage detector, driver (+)
 Arrange the mechanical room and tools	- The flux of the silver welding part should be removed with soft brush or wet cloth etc. (Flux can accelerate rusting and cause leakage). - The tools for R134a should be wiped off well so that dust and moisture cannot be penetrated and kept in a clean tool box or specified location.	Brass brush, cloth, tool box.
 Move and install	- The installation after moving, should be done in accordance with the installation method of the major repair for the refrigerator. (Maintain a 5cm or more distance from the wall for the model with the cooling fan in the mechanical room.)	

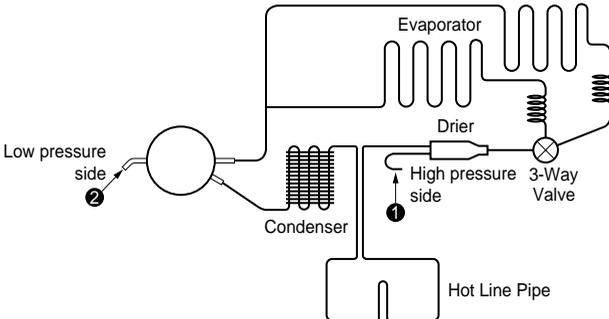
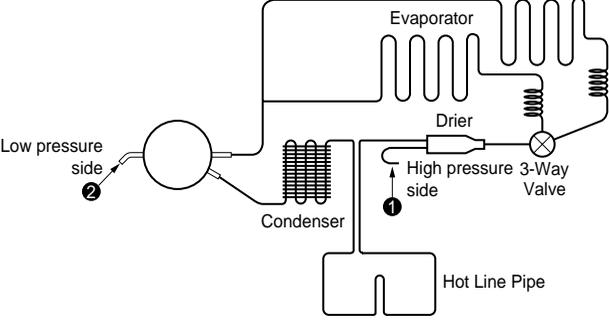
Major repair method for freezing cycle

8-3. Caution during major repair

Item	Caution
1. Using tools	1) Use the parts and tools for R134a.
2. Removing residual refrigerant	<p>1) When removing the residual refrigerant always turn the refrigerator off and then wait for more than 5 minutes. (If you work before waiting 5 minutes, the internal oil can leak out.)</p> <p>2) When removing the refrigerant, first cut the 1. high pressure side (drier part) with a nipper and secondly cut the 2. low pressure side to remove the residual refrigerant. (You must do it in this order. If this order is reversed a great amount of oil can leak out.)</p> 
3. Exchanging drier	1) During piping repair and inserting the refrigerant, always use the drier for R134a.
4. Welding nitrogen substitute	1) To prevent the oxidization scale from forming within the pipe, weld it while substituting the nitrogen with a constant pressure within the piping. (nitrogen pressure: 0.1-0.2kg/cm ²)
5. Others	<p>1) Internal cleaning and sealing within the cycle pipe should be done with nitrogen gas or R134a refrigerant.</p> <p>2) When checking for leakage, use the electric leakage detector.</p> <p>3) When cutting the pipe, always use the pipe cutter.</p> <p>4) Be careful not to let moisture penetrate within the cycle.</p>

Major repair method for freezing cycle

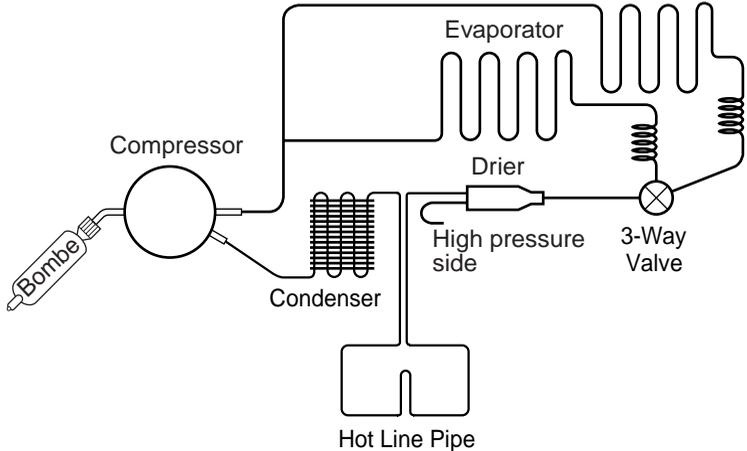
8-4. Actual major repair work

Item	Caution
<p>1. Removing residual refrigerant</p>	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 200px;"> <p style="text-align: center; background-color: black; color: white; margin: 0;">Key Point</p> <p>Maintain refrigerant removing order (Oil can leak from compressor)</p> </div> </div> <ol style="list-style-type: none"> 1. When removing the residual refrigerant always turn the refrigerator off and then wait for more than 5 minutes. (If you work before waiting 5 minutes, the internal oil can leak out.) 2. When removing the refrigerant, first cut the 1. high pressure side (drier part) with a nipper and secondly cut the 2. low pressure side to slowly remove the residual refrigerant.
<p>2. Nitrogen blowing welding (Welding nitrogen substitute)</p>	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; width: 200px;"> <p style="text-align: center; background-color: black; color: white; margin: 0;">Key Point</p> <p>If you do not blow the nitrogen while welding, it can form oxidization scale and have a negative effect on product performance and reliability.</p> </div> </div> <p>Exchanging drier After assembling the drier, blow the nitrogen gas to the high pressure side (0.1-0.2kg/cm²) and do the welding on part 1 and 2.</p> <p>Exchanging compressor Blow the nitrogen gas to the low pressure side and then do the welding on part 1 and 2.</p> <p>Note) The heating time during welding for other parts is very short and the possibility of forming an internal oxidization scale is very low. Exclude the nitrogen blowing for other parts.</p>

Major repair method for freezing cycle

Item	Caution
<p>4. Vacuuming</p>	<div data-bbox="584 414 1356 1138" data-label="Diagram"> </div> <div data-bbox="487 1159 1136 1372" data-label="Text"> <p>Connecting the pipe Connect the red hose to the high pressure side and the blue hose to the low pressure side.</p> <p>Vacuumping order Open valve 1 and 2 to vacuum for 40 minutes and then close valve 1.</p> </div> <div data-bbox="1153 989 1453 1372" data-label="Complex-Block"> <p>Key Point</p> <ul style="list-style-type: none"> - When vacuuming, connect the power to increase the vacuum effect. - When sucking the refrigerant operate the compressor. (Inserting refrigerant is easier and surer.) </div>
<p>5. Refrigerant charging</p>	<div data-bbox="487 1404 1136 1734" data-label="Text"> <p>Working order</p> <ol style="list-style-type: none"> 1) After completing the vacuuming, check the refrigerant amount for each model. 2) Using the vacuum pump, make the bombe vacuum. 3) Measure the refrigerant charging amount <ul style="list-style-type: none"> - Using an electric weight, measure the weight of the vacuum bombe. - After charging the refrigerant in the bombe, calculate and measure the weight. </div> <div data-bbox="511 1744 917 1989" data-label="Diagram"> </div> <div data-bbox="1153 1415 1453 1734" data-label="Complex-Block"> <p>Key Point</p> <ul style="list-style-type: none"> - Room temperature must be around 25°C during the operation. - Control the refrigerant charging amount as follow; -5g in winter and +5g in summer. </div> <div data-bbox="941 1851 1453 1989" data-label="Complex-Block"> <p>Calculation of refrigerant charging amount</p> <p>Refrigerant amount = Weight after charging - Weight before charging (Bombe weight)</p> </div>

Major repair method for freezing cycle

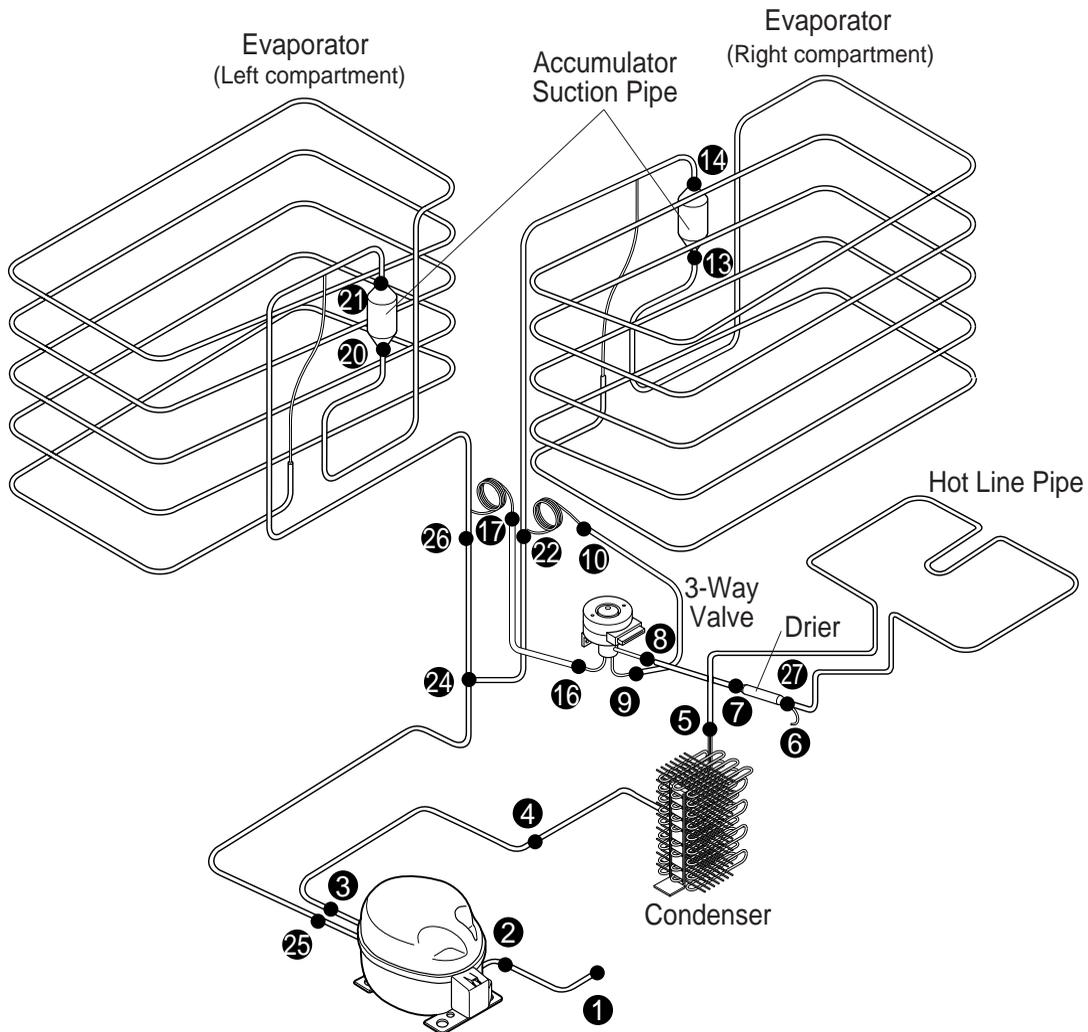
Item	Caution
5. Charging the refrigerant	 <p>4) Charging the refrigerant: As shown above, operate the compressor and charge the refrigerant with the charging pipe.</p> <p>5) When the charging is complete, pinch the charging pipe using the pinch-off plier.</p> <p>6) After welding the end of the pinched charging pipe with copper, test for gas leakage on the welding part.</p>
6. Testing for gas leakage	Using an electric weight, test for leakage on welded parts and other parts that you think can leak gas out.
7. Arranging cycle piping of each part	When the work is done, check whether all pipes are in its original position before closing the cover back-M/C. Especially maintain a distance (10mm) between the pipes so that it does not touch each other.

8-5. Basic principle for major repair

- 1) Follow the safety principles of handling gas.
- 2) Use a plate jig (or wet towel), if needed, to prevent any skin burn from wires during welding. (to ensure insulation is not damaged, to prevent safety accidents and to ensure product safety.)
- 3) Prevent pipe copper pipe oxidization from overheating during welding.
- 4) When doing the welding, make sure the suction tube does not be mixed with the charging tube. (High efficiency pump)

Major repair method for freezing cycle

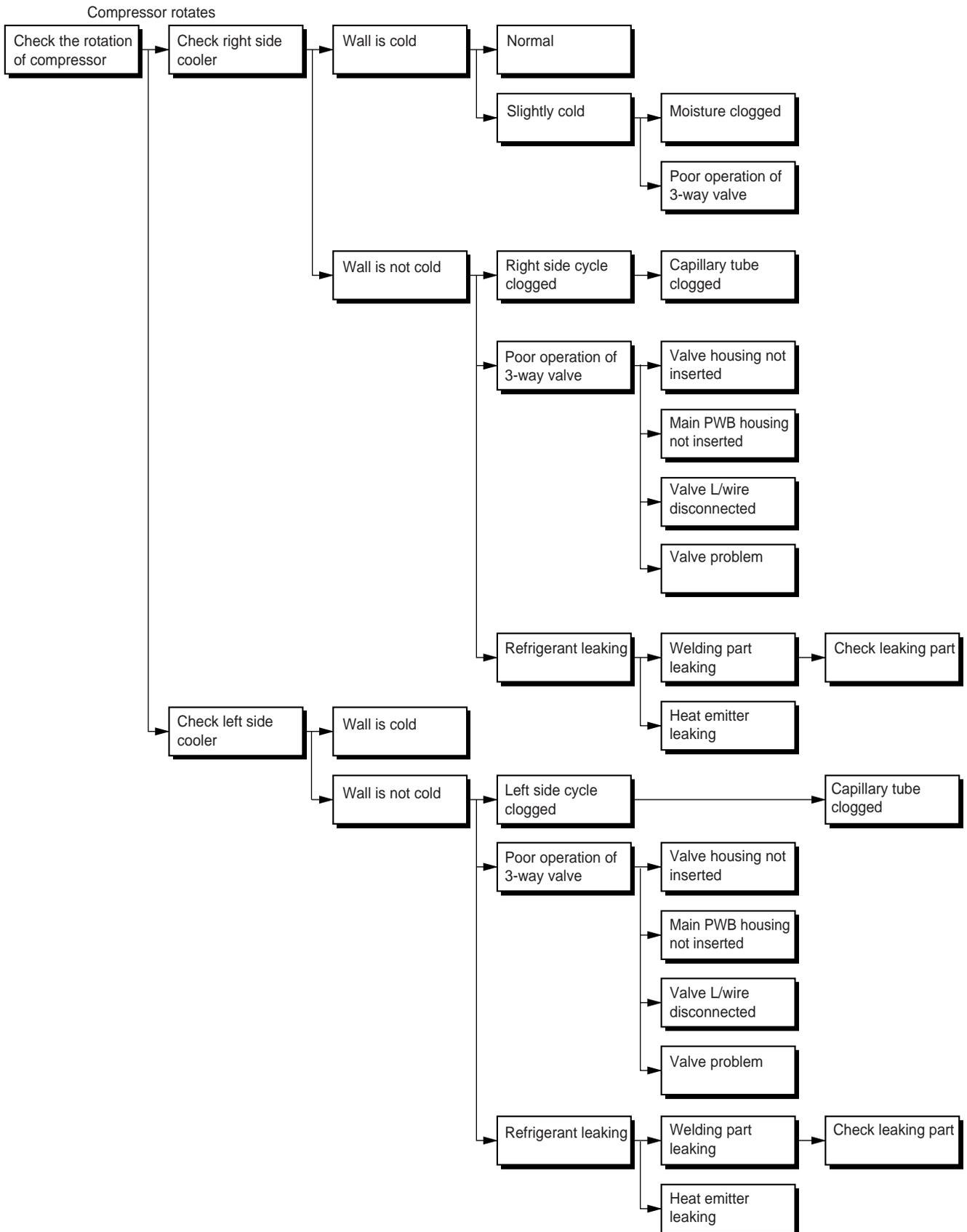
8-6. Welding reference diagram



Welding classification	Applied parts	Remarks
Copper	1,2,3,7,10,13,14,17,20,21,22,24,25,26,27	
Silver	4,5,6,8,9,16	
LOKRING	11,12,18,19	

Major repair method for freezing cycle

8-7. Problem checking procedure

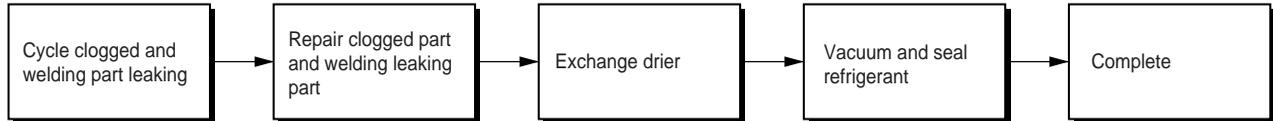


Major repair method for freezing cycle

8-8. Caution for major repair service

8-8-1. Cycle clogged and leaking

- When exchanging parts, welding or resealing the refrigerant from the cycle being clogged or leaking, always exchange the drier to remove the moisture within the cycle.



8-8-2. 3-Way valve service

- Because the 3-way valve controls the refrigerant with an internal plastic damper, when repairing or exchanging the welding part of the valve, the welding heat can be transmitted to the pipe to deform the plastic damper, causing poor operation. Therefore always service the product in the specified order.

1) Valve welding part service

- For type with a joint pipe in the 3-way valve: When the refrigerant leaked on the joint pipe (a, b, c part) connected to the valve, you must exchange the 3-way valve assembly.

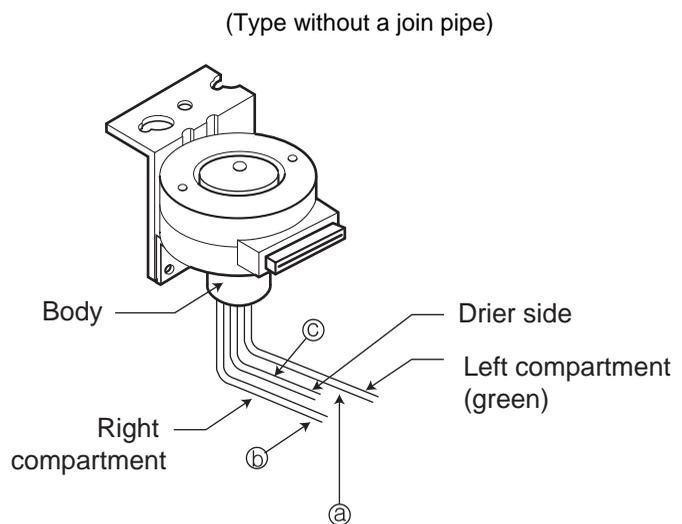
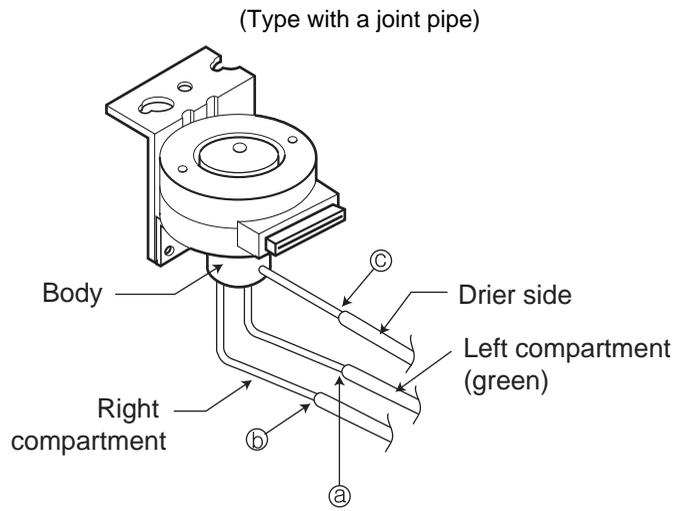
(If you have to weld it for a specific reason, cover the body with a wet towel and minimize the heat transmission (below 100°C).)

2) Valve exchange service (valve problem)

You must do the service operation in the same method as above.

3) Other cautions

1. You must insert the capillary tube by 13_{-0}^{+1} for welding. (This is to prevent the clogging of the tube during welding.)
2. Be careful not to drop or apply high impact to the valve because it can cause damage the internal injection mold part. (Damage to the internal part can increase the change of poor operation and leakage.)

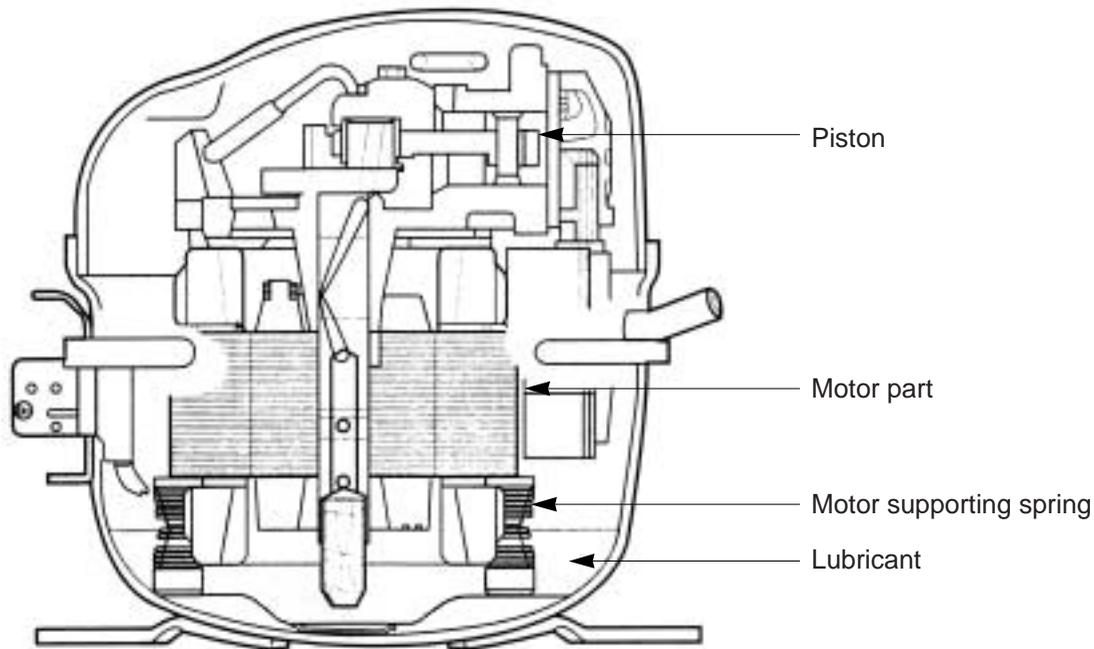


Characteristics of each part

Chapter 9. Characteristics of each part

9-1. Cycle part function and operating principle

9-1-1. Compressor function and operating principle (Back and forth movement type)



Compressor is composed of the piston part compressing the refrigerant gas from low to high pressure, the motor part for the operation, and lubricant to accelerate the cooling process and to lubricate the movement.

The low pressure refrigerant is distributed overall within the internal space of the compressor and after being compressed, the high pressure refrigerant is exhausted through the pipe connected to the external heat emitter.

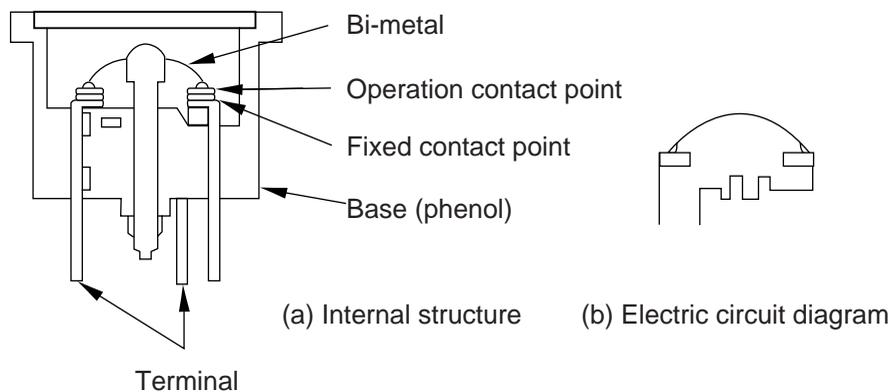
Caution

- ▶ The compressor for service is supplied with nitrogen gas charged and the rubber cap sealed. This is to prevent internal oxidization and the prevent moisture in the atmosphere from penetrating. When removing the cap for exchanging the compressor, you can hear a "pik" sound with nitrogen gas emitting, which means it is a normal product. If the nitrogen gas is emitted already it means that it is a poor product with moisture penetrated already and this must not be used.
- ▶ The center axis of the compressor is easily shifted from external impact. Therefore you must be especially careful from impact when carrying or storing the product.

Characteristics of each part

9-1-2. Overload protection relay (O.L.P) structure and function

- The overload protection relay cuts the power to protect the motor when the temperature of the compressor rises abnormally or when the overly high current is sent to the compressor motor.
- Overload protection relay structure is composed of the bi-metal element that cuts the power based on the temperature and the heater that heats during an over-current. They are attached to the external surface of the compressor and detects the temperature of the compressor. The composing circuit is connected to the compressor motor in direct connection.
- When the overload protection relay operates, you can here a "tak" sound and the operation contact point of the bi-metal separates from the fixed contact point. When the heat of the heater is reduced or when the temperature of the compressor is lowered after 3-5 minutes, the bi-metal connects the circuit with another "tak" sound to operate the compressor.



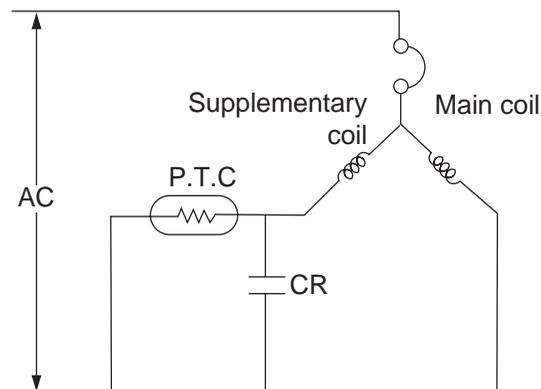
(Overload relay structure)

Caution

- ▶ The overload protection relay detects and operates by both the temperature and the current. Therefore even when the power is not connected, it can still operate when the temperature of the surface is high and it can operate when there is an over-current even with low temperature on the surface. But even though this will not happen in reality, just make sure that the relay operates by a combination of abnormal temperature and current. (But the effect from the current is bigger than that from the temperature.)
- ▶ After the overload protection relay operates and it recovers after 3-5 minutes when the heat is lowered, it can still operate again if the surface temperature or current is high. In other words, repeated operation for several hours can cause a customer claim. At this time, adequately cool the compressor and connect the power. Also there is a case when the relay operates but immediately recovers to operate again. At this time, exchange the relay.

9-1-3. Starter (P.T.C) function and operating principle

- The starter is directly connected to the supplementary coil of the compressor to accelerate the compressor operation. It is internally installed within the external case of the compressor like the overload protection relay.
- The starter is generally composed of P.T.C material but in the past there were ones in relay contact point type. P.T.C stands for Positive Temperature Coefficient, referring to a resistance that has a constant value initially (ex 33Ω) but when the power is connected the resistance becomes infinite. To understand the role of the starter you must understand the operating principle of the single phase inductive motor and simple AC circuit.



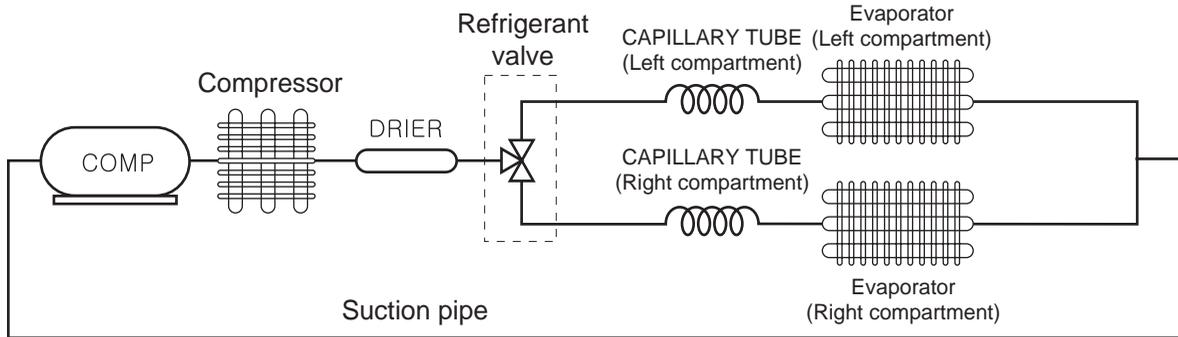
(Motor circuit)

Characteristics of each part

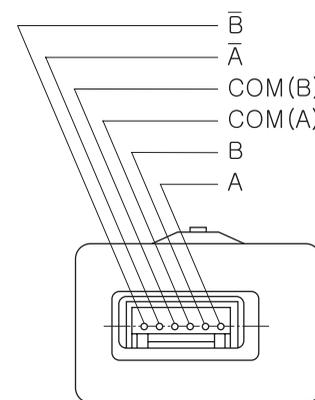
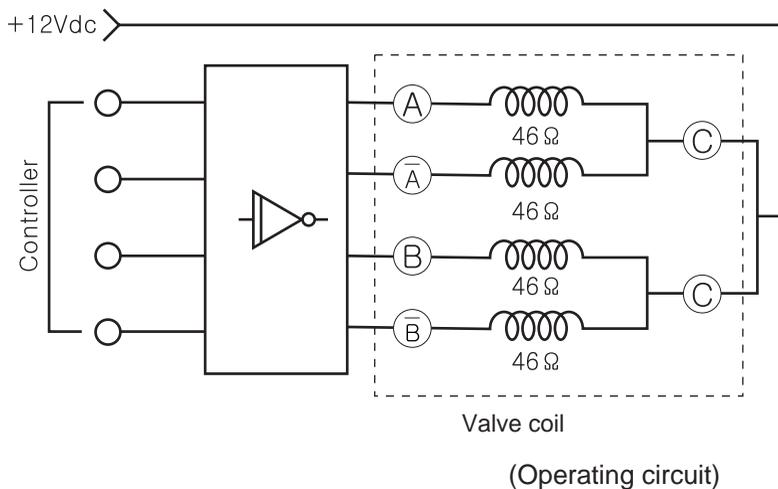
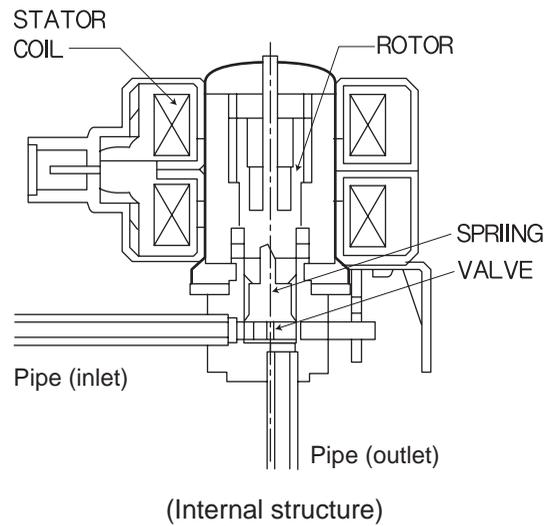
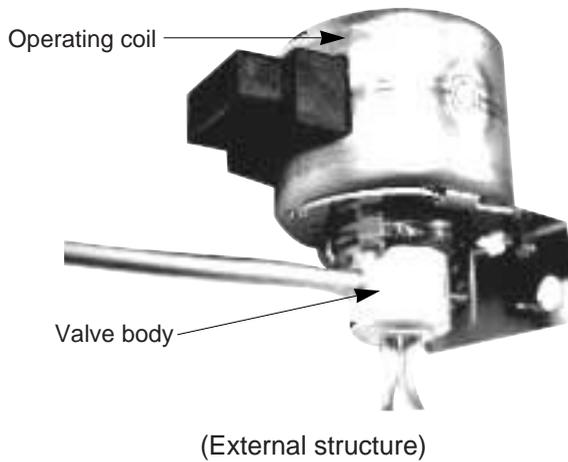
9-1-4. Refrigerant valve

(1) Function

This switches the refrigerant that went through the compressor to the left or right compartment evaporator.



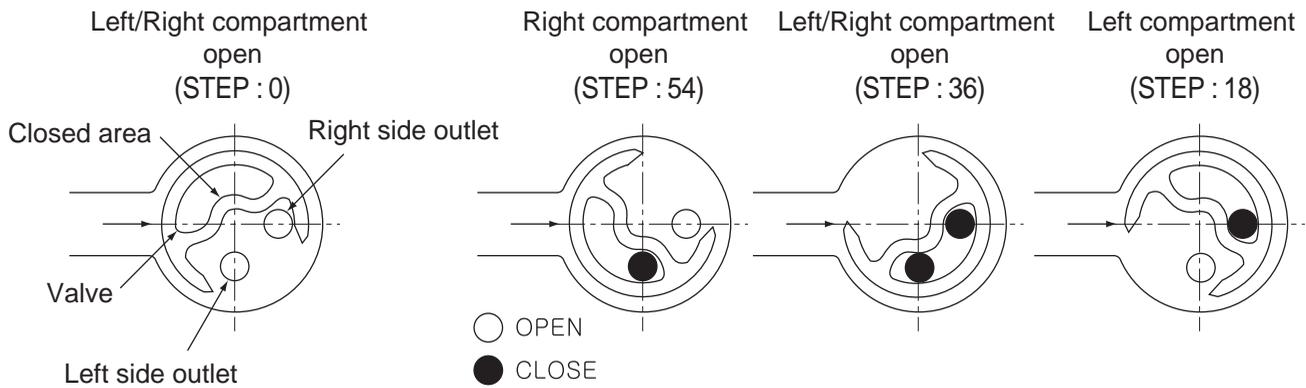
(2) Operating structure



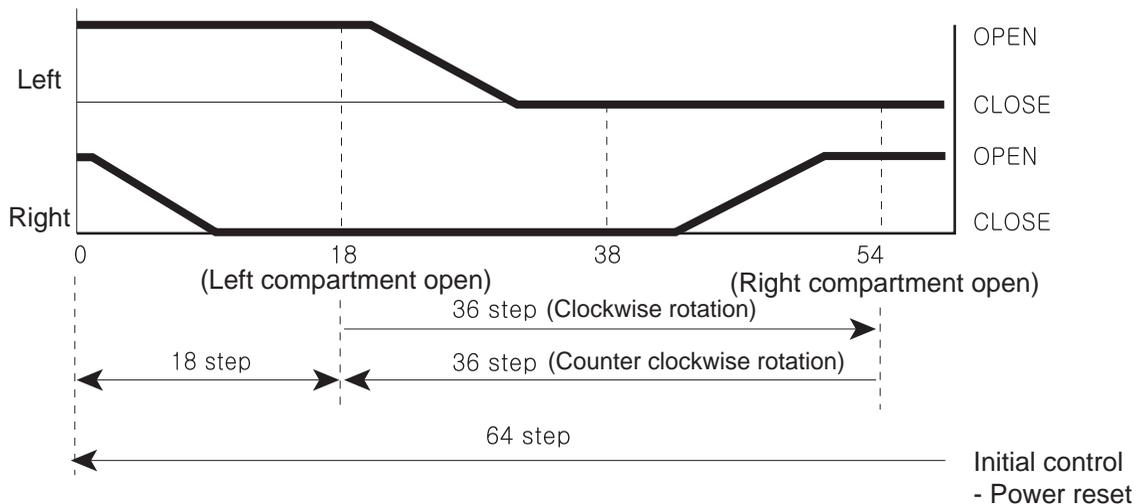
Characteristics of each part

(3) Operating principle

Controlling the rotating angle of the stepping motor will open/close the outlet pipe entrance by changing the shape of the valve connected to the bottom of the rotor.



(4) Operating characteristics



Characteristics of each part

9-1-5. Motor (mechanical room)

(1) Function

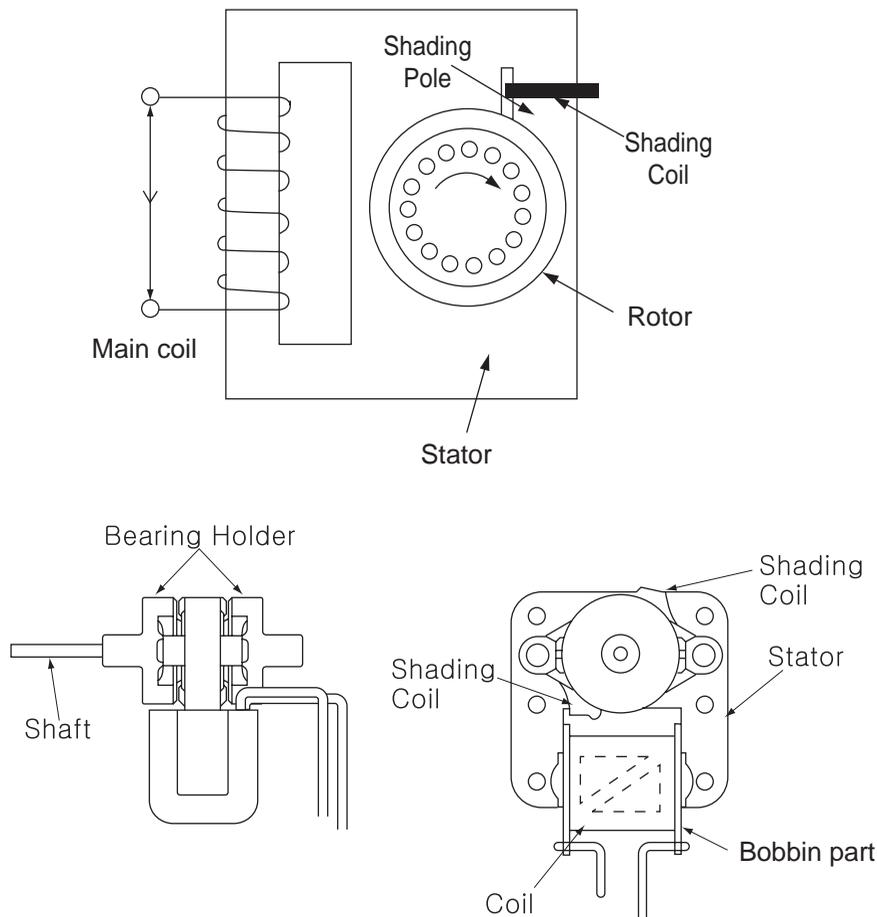
• Motor cooling (mechanical room)

This is the part used for circulating the air within the mechanical room and applies to the wire condenser type. This operates when the compressor operates and the heated refrigerant from the compressor lowers the temperature when passing through the wire condenser and also reduces the temperature of the compressor to improve the performance.

(2) Operating principle and characteristic

• Characteristic

The motor applied to the refrigerator is the shading pole motor of the inductive motors. As shown below, it is a 2 pole device with one pole composed of 2 parts. On the small pole called the shading pole, wire is connected (shorted) called the shading coil. In accordance with the characteristics of the AC motor, the motor switches between + and - to operate but because in the 2 pole device, the N and S pole changes within both poles without left and right rotation, the device cannot rotate without help from an external device. Therefore the shading pole and coil creates the rotating direction for operation. The shading pole motor cannot rotate in reverse direction. Therefore the rotating direction must be set during assembly to rotate in the desired direction.



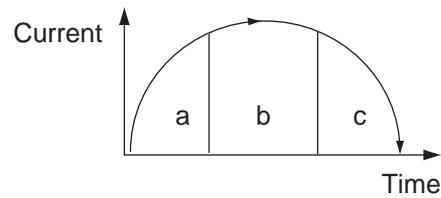
Characteristics of each part

• Operating principle

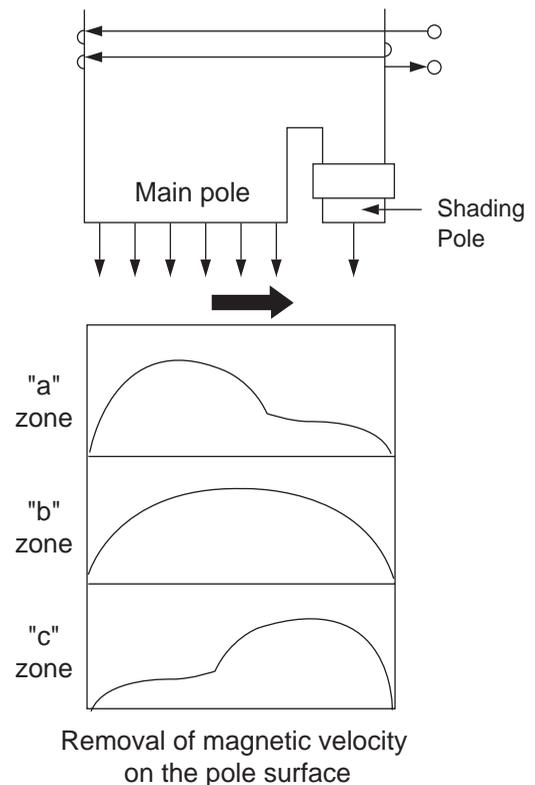
When the AC power is connected to the coil of the shading pole motor, the central axis of the magnetic field shifts in the bold arrow direction of <Fig. 2>. As the central axis moves, the rotor moves in the same direction to turn the motor.

Why does the central axis of the magnetic field shift?

<Fig. 1> shows a diagram of AC current changing as time changes. If you look at changes of magnetic velocity in "a" zone where the current abruptly increases, the velocity increases as the current increases in the main pole. But in the shading pole, the negative effect of the velocity increase is generated from the shading coil to reduce the velocity shifting the center of the magnetic field to the main pole. In "b" zone, the change in current is minimal and the negative effect of shading coil is minimal to have the center of the magnetic field in the middle as shown in <Fig. 2>. In "c" zone, the velocity of the main pole decreases but with the negative effect increasing the velocity from the shading pole side, the center shifts to the shading pole side. As shown, the center of the magnetic field shifts from the main pole to the shading pole to rotate the rotor.



<Fig. 1> Change of AC current



<Fig. 2> Change in magnetic velocity by changes in current

Characteristics of each part

9-1-6. Heater

(1) Introduction

When using the refrigerator to realize the fermenting algorithm program, a Kimchi seasoning heater is attached on the external surface of the inner case.

(2) Heater type and role

Classification	Applied part	Function	Resistance value	Remarks
Heater	External surface of inner case	For Kimchi seasoning	165Ω/EA	(Applicable to R-K19**)

(3) Poor product: Poor heater

■ Heater assembly (ferment/rice storage)

Problem (parts)	Symptom	Check method	Resolution
1. Heat wire disconnected/connecting wire disconnected	Kimchi not seasoned	1. Measure the resistance of both ends of the heater with a tester to see if it is $\infty \Omega$.	1. Exchange the product
2. Poor terminal contact		2. Measure the resistance of both ends of the heater with a tester to see if it fluctuates.	2. Properly insert the connector

Characteristics of each part

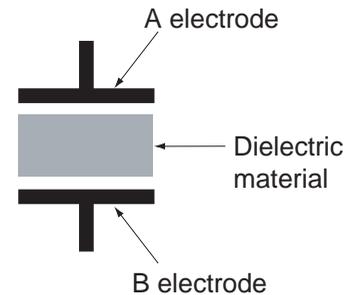
9-1-7. Capacitor operating principle and temperature characteristics

(1) Function

1. Capacitor (C/S): Sometimes called the starting capacitor, it is used to improve the motor operation characteristics in low pressure because the operating torque is weak based on the characteristics of the motor within the compressor of the refrigerator in low voltage areas (85% or less than rated).
2. Capacitor (C/R): Sometimes called the running capacitor, it is used to improve the operating torque of the motor within the compressor of the refrigerator. (Capacitor for operation)

(2) Concept

When you put dielectric material between two facing electrodes and connect the voltage, the electric charge will be accumulated. This functional device is called a capacitor and the basic structure is as shown in the right figure.



(3) Poor symptom (product)

Problem (parts)	Symptom	Check method	Resolution
Disconnected (open) Shorted Normal	1) Compressor does not work. 2) Compressor is heated. 3) OLP is operating. 4) Power fuse is disconnected. (Immediately after exchanging or frequently)	- Measure the both ends of the capacitor with a tester to see if there is no change: $\infty \Omega$.	- Exchange the capacitor
	1) Compressor does not work. 2) Compressor is heated. 3) Compressor repeatedly works and stops. 4) OLP is operating. 5) Power fuse is disconnected. (Immediately after exchanging or frequently)	- Measure the both ends of the capacitor with a tester to see if it is 0Ω .	- Exchange the capacitor
	1) Compressor does not work. 2) Compressor is heated. 3) Compressor repeatedly works and stops. 4) OLP is operating. 5) Power fuse is disconnected. (Immediately after exchanging or frequently)	- Measure the both ends of the capacitor with a tester to see if it decreases and then slowly increases (Move toward 0Ω and then to $\infty \Omega$).	- Check other parts

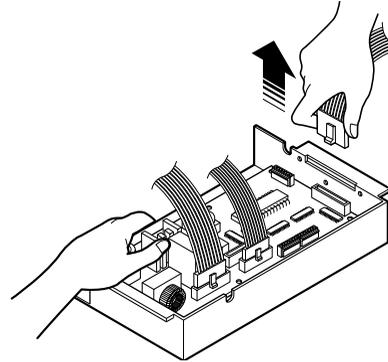
- Caution**
- ▶ Before the measurement, short the capacitor with a driver to discharge all the electricity.
 - ▶ After setting the multiplier rate to maximum within the resistance measuring range, measure while switching the terminals.

Cautions for disassembling the product

Chapter 10. Cautions for disassembling the product

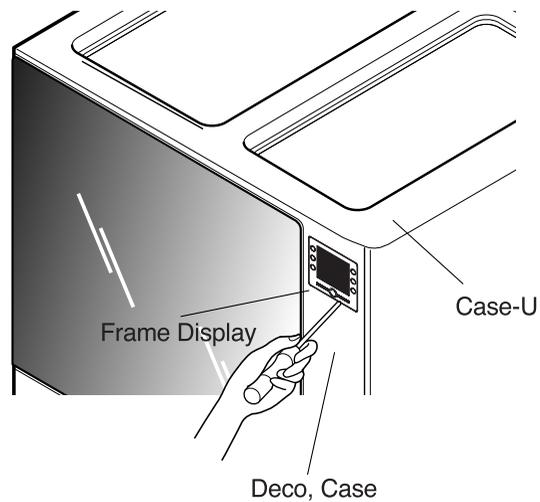
10-1. PWB (PCB) assembly, main

- When disassembling the PWB (PCB) assembly, main located in the mechanical room, be careful so that the lead wires do not touch the edge part.
- If the lead wire coating is disconnected or the coating is damaged, it can cause a short circuit.



10-2. Frame assembly, display

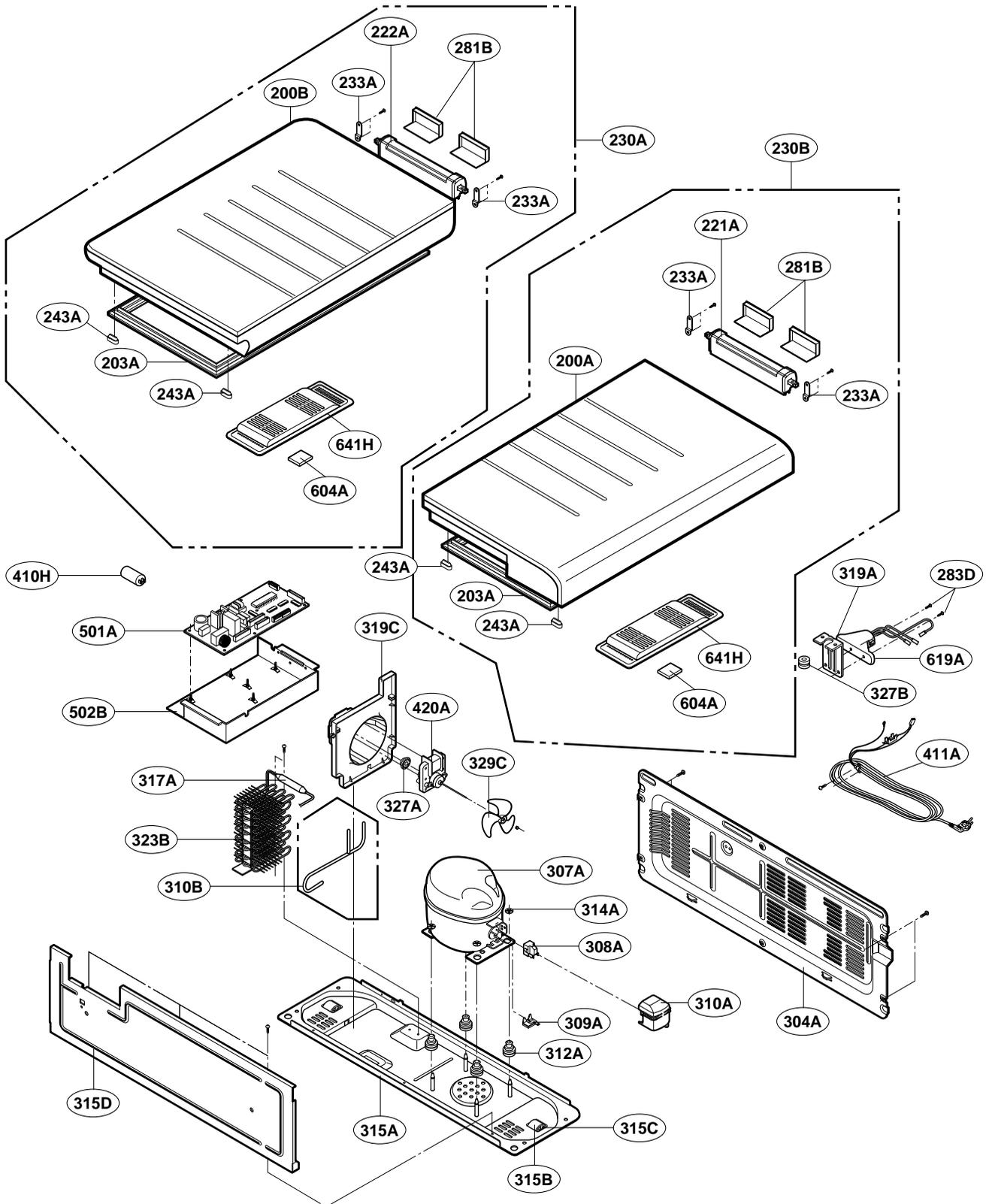
- Frame display의 하단 svc hole에 ⊖ 드라이버를 사용하여 앞으로 젖혀 주시면 분리됩니다. 이때 내측면에 결합되어 있는 PWB(PCB)ASSEMBLY DISPLAY에 충격이 가거나 Frame display 및 out plate에 흠집이 나지 않도록 주의하세요.
- ※ 모델에 따라 SVC 홈이 좌측상단 또는 우측상단에 있습니다.



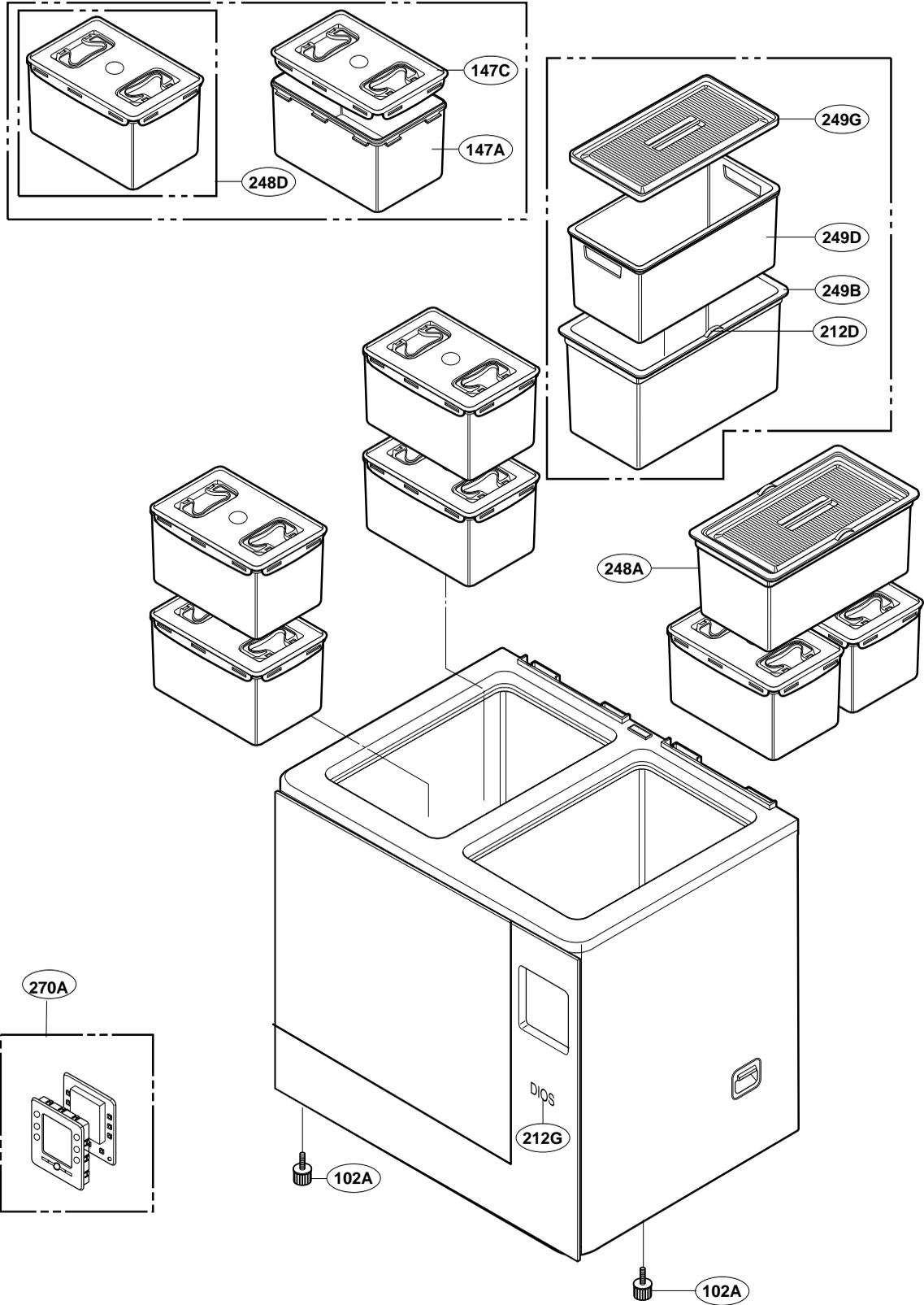
Assembly diagram and service parts list

Chapter 11. Assembly diagram and service parts list

11-1. Assembly diagram (GR-K192UF)



Assembly diagram and service parts list





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