



Chapter 1 Safety Warnings and Cautions

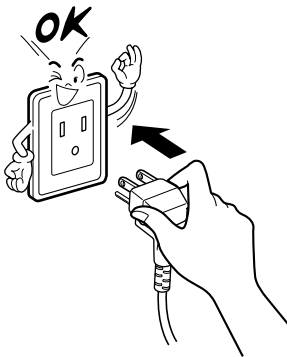
- Always observe SAFETY WARNINGS and CAUTIONS, which are intended to ensure safety while repairing or operating the product.
- Hazards are separated into **Warnings** and **Cautions**, as explained below.

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

Warning

Use Caution to prevent electric shock.

- The control board (Main PCB) uses 310 V. When replacing PCB parts, wait at least 3 minutes after unplugging. Always unplug the storage before repairing.



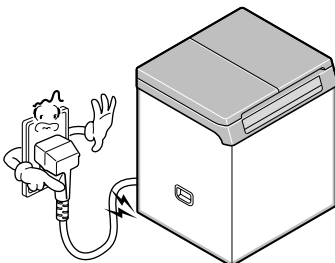
Make sure that the power plug is not be pressed by the back of storage.

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



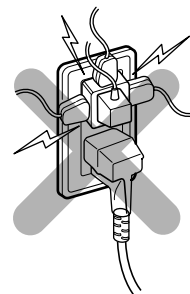
Do not allow the consumer to repair, disassemble or modify the storage.

- There is a risk of damage, injury, electric shock or death.



Use a dedicated circuit.

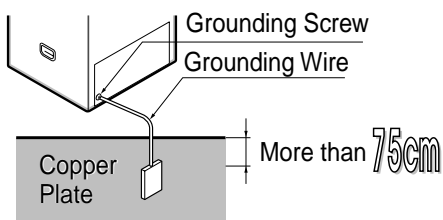
- This storage should be installed on a dedicated circuit. Overloading circuits or outlets could cause a fire.



Warning

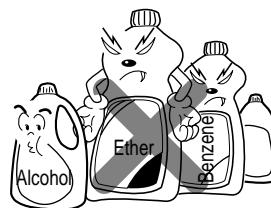
This product should always be grounded.

- The product is equipped with a 3-wire grounding cord which should be plugged into a properly wired outlet. If you don't have the proper outlet or are in doubt of the voltage or grounding, we recommend consulting a qualified electrician.



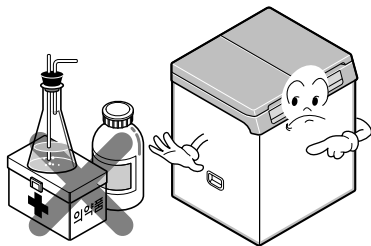
Do not store flammable liquids or gases in the storage.

- Storing gasoline, ether, benzene, alcohol, etc. can create the possibility of fire or explosion.



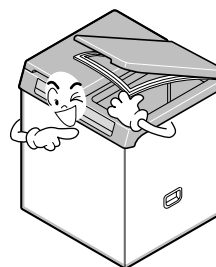
Use this product for its intended purpose.

- This storage is for making and storing kimchi. Do not use it as a substitute for a precisely controlled environment (as for storing medications, documents, etc.) or for any purpose.



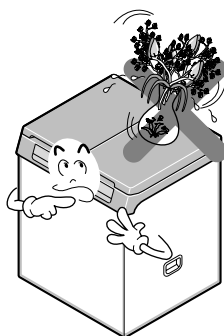
Use caution when disposing of a storage.

- Remove the door and do not leave it where children may play in or around it. There is a risk of child entrapment.



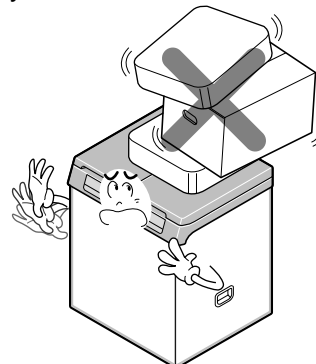
Do not set items, particularly flowers or containers of liquid, on top of the storage.

- Spillage could result in safety, slippage or electrical shock hazards.



Do not store item on the storage. Use the containers and racks included with your storage.

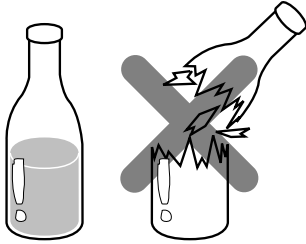
- Items stored on the storage could fall and cause injury.



Caution

Do not place bottles or cans in the storage.

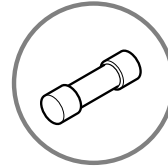
- There is a possibility they could freeze, causing the container to burst. This could present a hazard in the form of broken glass or sharp edges.



Always use exact replacement parts.

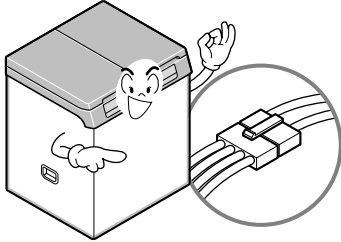
- Make certain replacement parts are the correct part by part number and model number. Ensure that voltage, current, and temperature ratings are correct for the application.

Rated Parts



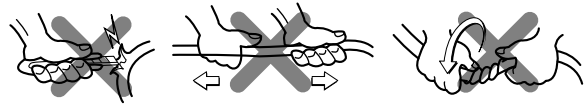
During repairs, be sure all connectors are tight and wires are properly routed.

- Loose wires could be damaged, causing shock or fire hazards.



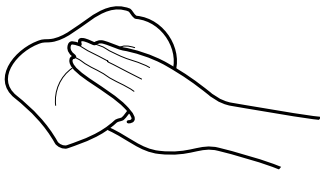
Be sure the power cord is undamaged.

- Do not bend, twist, pull or damage the cord. It could result in fire or electrical shock.



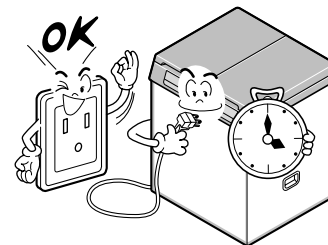
During repairs, remove all dust and foreign materials from the work area.

- Keeping these areas clean makes work easier and will prevent problems like overheating, fire and short circuits.



Allow time for resetting if you unplug the storage.

- If you unplug the storage during repair, wait 5 minutes before plugging it in and restarting it. Otherwise, you might cause compressor failure.



Standards of Product

Chapter 2 Product Specifications

1. GR-K13PBQ

ITEM		SPEC
Volume	Usable Volume	132 /(4.66 ft ³ .)
	Left compartment	66 /(2.33 ft ³ .)
	Right compartment	66 /(2.33 ft ³ .)
Outside Dimension	Width	713 mm (28 inches)
	Depth	714 mm (28 inches)
	Height	877 mm (34.5 inches)
Total weight		54 kg (119 lbs.)
Motor power consumption		180 W
Cooling method		Direct cooling
Defrost method		Manual Defrost
Insulation material		Polyurethane Foam
BASKET		1 pc.
Kimchi storage method		6 pcs.
Low crystal deorderant system		2 pcs.
Cold Cycle	Compressor	KX56LACM
	Evaporator	PIPE ON SHEET
	Refrigerant	R134a (120 g)
	Oil	FREOL @15 G (280 cc)
Electrical Part Rating	PTC	P6R8MD
	Overload protection device	4TM314TFB
	Fan motor for compressor cooling	Ø110 fan adhesion
	Kimchi ripening heater in the left compartment	115 V 60 W
	Kimchi ripening heater in the right compartment	115 V 60 W
	Condensation, heater	115 V 16 W
	Capacitor	250 Vac 10 µF

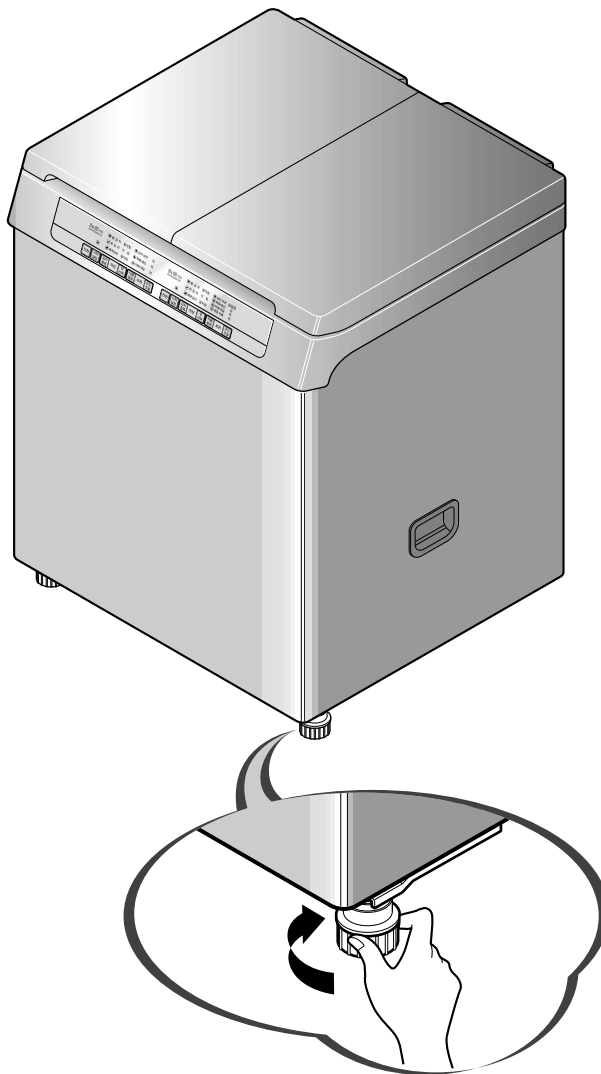
Product installation method

Chapter 3 Product Installation Method

1. Method to adjust height of storage

■ Adjust the level of storage.

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



- ▶ Adjust the front level by turning the height adjustment screws under the front corners. Tilting the unit slightly backward may make this easier.

Product Installation Method

2. Grounding method

Plug the cord into a 110 V 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:

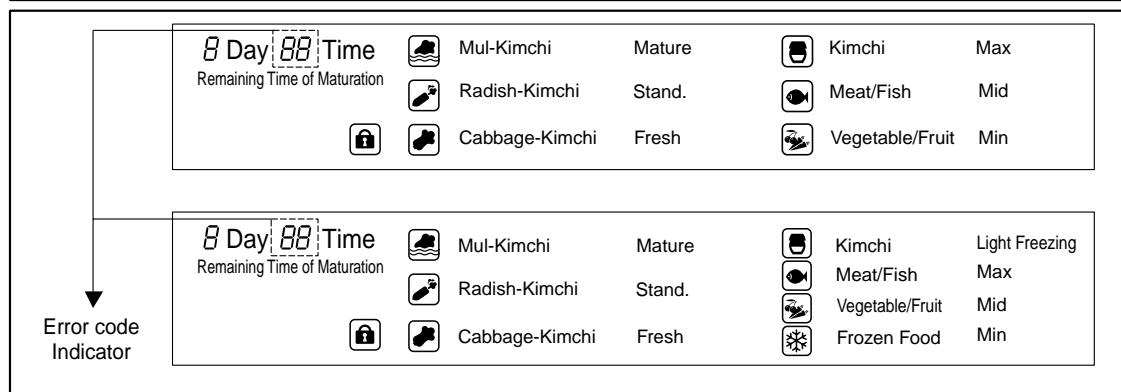
1. **Water pipe:** If there is plastic piping within the system, the ground may not be valid.
2. **Gas pipe:** There is the danger of fire or explosion.
3. **Phone line or lightning rod:** If lightning strikes, dangerous voltage may be induced on the circuit.

FUNCTION TEST METHOD

- CAUTION**
1. The failure diagnosis function assists in determining the type of failure.
 2. If a failure occurs, the control panel buttons do not work and the alarm sounds a ding. The POWER button will still function.
 3. If a failure occurs and is rectified, the storage will default to the NORMAL status. (The refrigerator is reset.)
 4. The failure codes shown on the remaining Ripening Time display of the compartment experiencing the failure.
 5. The display on the unaffected compartment performs normally.

1) TROUBLE DIAGNOSIS FUNCTION

No	Item	Indication	Method of Error Detection
1	Failure of left compartment sensor.	Left compartment displays E1	Left compartment Sensor is cut or short-circuits
2	Failure of right compartment sensor.	Right compartment displays E2	Right compartment Sensor is cut or short-circuits
3	Failure of ambient temperature sensor (RTS)	Pressing Select Kimchi and Select Maturation at the left compartment simultaneously for 1 second or more. If the ambient temperature sensor fails, it does not display a failure code. At the LED check, if the ambient temperature is normal, ALL LEDs light. If there is a failure, ALL LED's will light and then the left Remaining Ripening Time LED will turn OFF.	



2) TEST FUNCTION

- There is a test switch on PCB.

MODE	OPERATION	COMP FAN MOTOR	VALVE	LEFT/RIGHT RIPENING HEATER	CONDENSATION HEATER	DISPLAY LED	REMARKS
TEST1	Press test S/W once	ON	Left compartment 20min Right compartment 20min	OFF	OFF	Indication "111"	In checking cold system of Left compartment/ Right compartment
TEST2	Press test S/W once at the Test 1 status	ON	Right compartment VALVE OPEN	OFF	OFF	Indication "222"	In checking cold system of Right compartment
TEST3	Press test S/W once at the Test 2 status	ON	Left compartment VALVE OPEN	OFF	OFF	Indication "333"	In checking cold system of Left compartment
TEST4	Press test S/W once at the Test 3 status	OFF	※	ON	ON	Indication "444"	In checking Heater * Note 1
Normal returning	Press test S/W once at the Test 4 status	COMP operates after delay 7 minutes.					

* **Note 1:** Returns to initial status after maximum 30 minutes. However, when temperature of the rooms is more than 40°C, returns to the initial status.

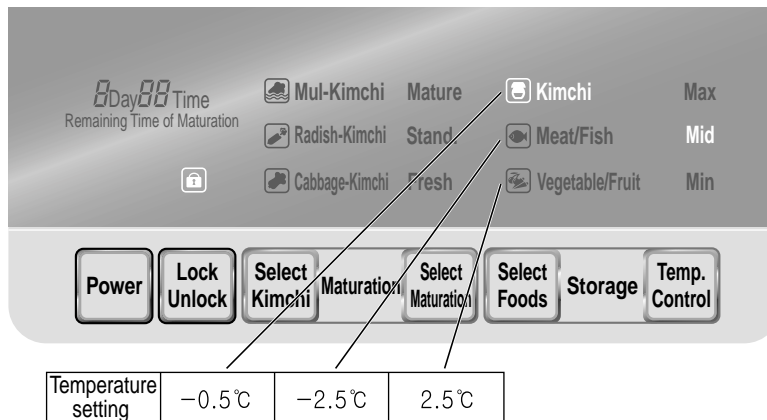
MICOM Function and Description of Circuit

Chapter 5 MICOM Function and Description of Circuit

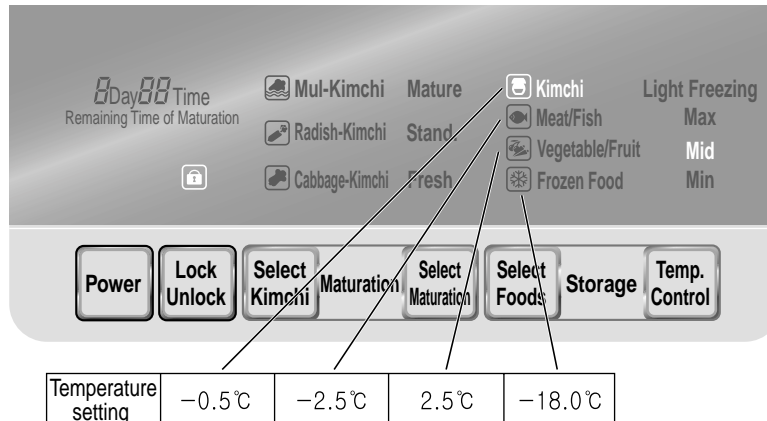
1. Description of Function

1) Display part

Left Compartment



Right Compartment



On power-up, the display lights **Kimchi** for both compartments and the temperature status is **Mid**.

1. In the event of a power interruption, the displayed settings are maintained.

However, when a power interruption occurs during the ripening process, the unit defaults to its original status; that is, **Kimchi/Mid**.

2. Press the **Type of Food** button to cycle through kimchi keeping, which is **Frozen Food** → **Vegetable/Fruit** → **Meat/Fish** → **Kimchi**.

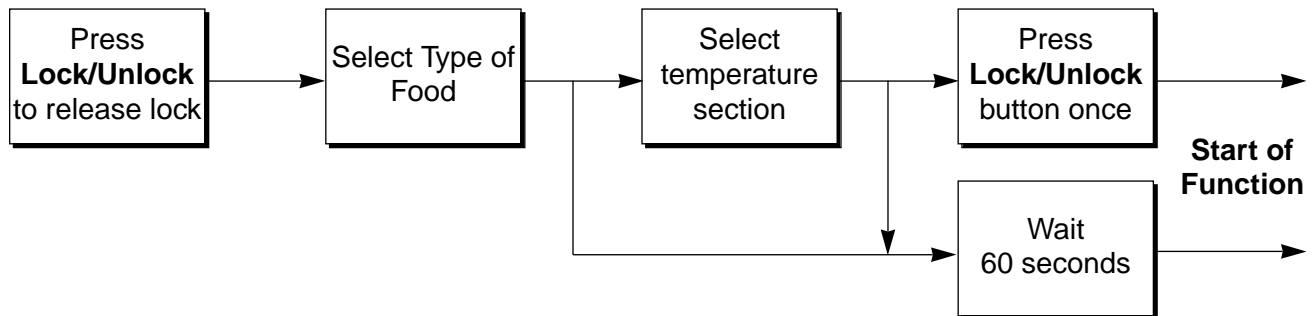
3. Press the **Temperature Control** button to cycle through the selections of **Mid** → **Max** → **Light Freezing** → **Min**.

Light Freezing can be selected ONLY if the Right Compartment is set for **Meat/Fish**.

MICOM Function and Description of Circuit

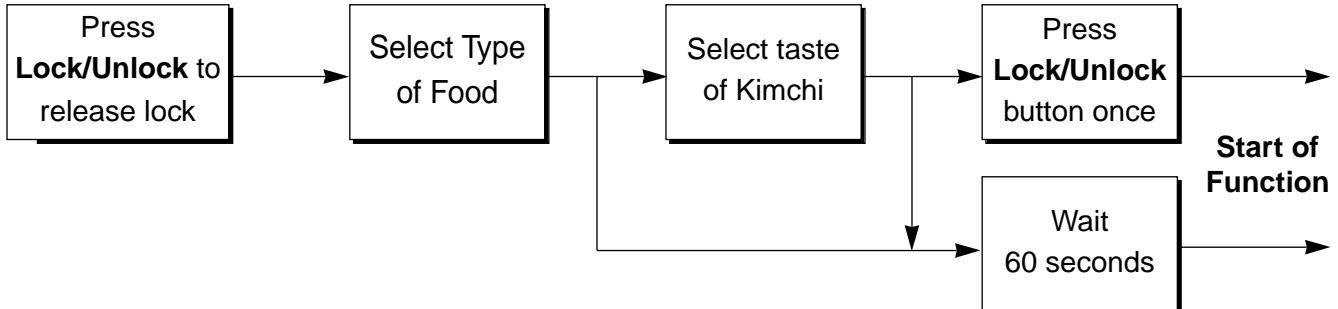
2) Food Storage/Maturation function

(1) In selection of Food Storage



1. Press **Lock/Unlock** to release the lock.
2. Select Type of Food to keep and temperature.
3. If you wait more than 60 seconds, selection of Food storage is completed.
4. **Cabbage-Kimchi/Stand** is the default unless you change it during the Keeping of Food process.

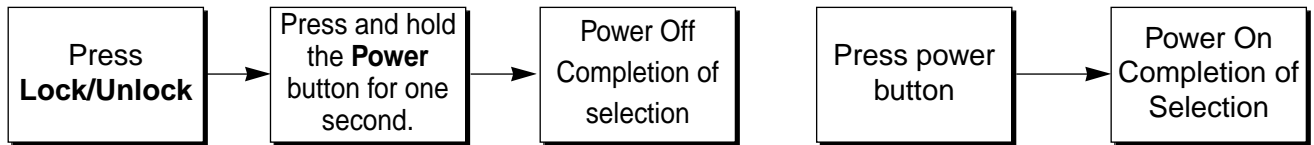
(2) In selection of Maturation function



1. Press **Lock/Unlock** to release the lock.
2. Select **Kimchi** and **Maturation** by pressing the appropriate buttons and cycling through the choices.
3. If you wait more than 60 seconds, selection of Maturation function is completed.
4. The display counts down the time remaining in the cycle as ripening progresses.
5. The compressor switches on or off depending on the ambient temperature and the temperature in the compartments of the storage. Additionally, the 3-way valve operates and the ripening heater turns on and off.
6. As the ripening process completes (45~102 hours,) the storage defaults to the **Kimchi/Mid** status and the kimchi is kept in cold storage.
7. At the end of the ripening process, the display shown **0 Day/00 Time** Remaining Ripening Time. Press the **Lock/Unlock** button once to turn the display off.

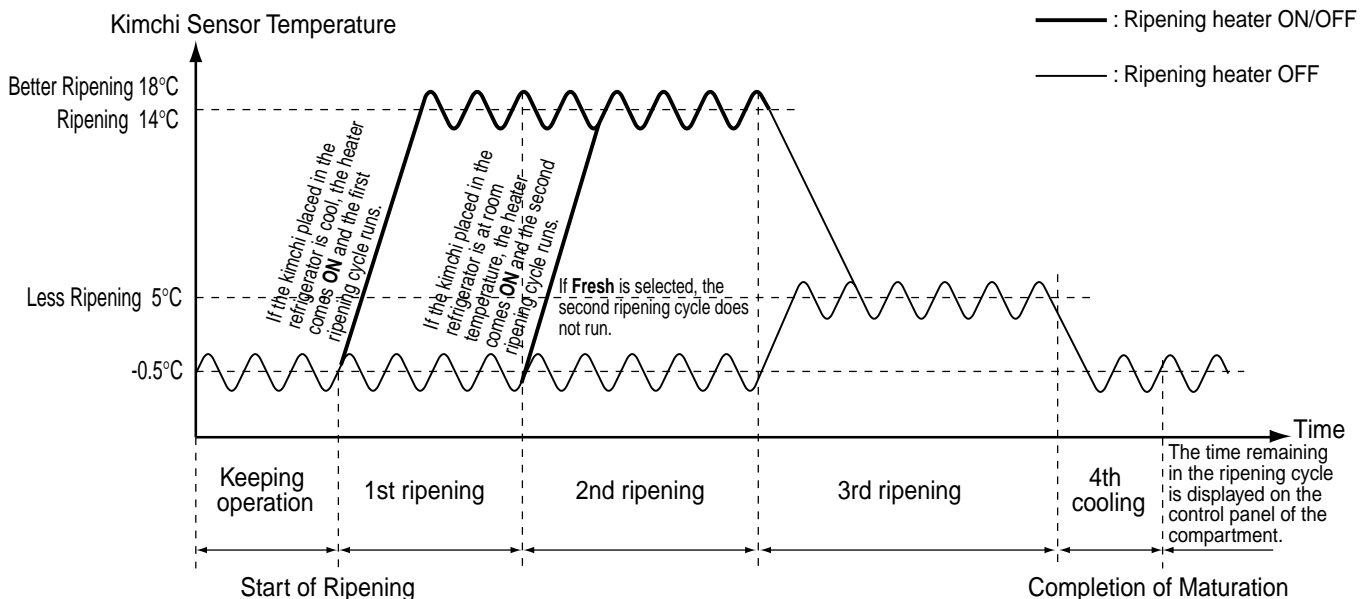
MICOM Function and Description of Circuit

(3) In selection of power On/Off function



1. Press **Lock/Unlock** to release lock.
2. If you press and hold the **Power** button for one second, all functions of the affected compartment stop and the LED displays **OFF**.
3. When the heater of one compartment is turned **OFF**, the 3-way valve of the opposite compartment is opened.
4. When the heaters of both rooms are turned **OFF**, the condensation heaters of both rooms are also turned **OFF**.
5. If you wish to use a compartment that is not currently in use, press the **Power** button, which will default the compartment to **Kimchi/Mid** status.

(4) Control Pattern Drawing for Kimchi Ripening



1. The ripening control pattern varies, depending upon the temperature of the kimchi when it is placed into the storage, the type of kimchi being made, and the degree of ripening selected.
2. In the 1st ripening cycle, the cold control is operated.
3. In the 3rd ripening cycle, if the kimchi is cold, the ripening heater is turned ON.
4. If a failure occurs, such as a sensor error during ripening, the storage will default to **Kimchi/Mid** status.

3) Temperature Control Method

1. The compressor runs and the 3-way valve opens or closes depending on the temperature sensed in the left and right compartments.

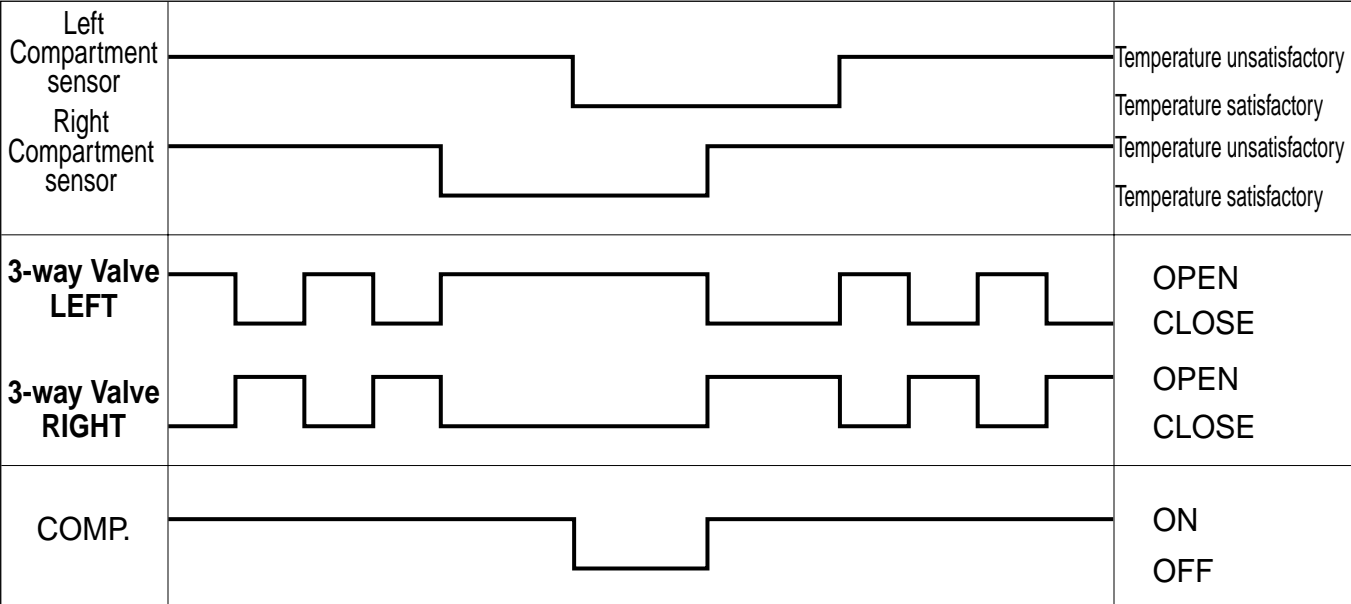
MICOM Function and Description of Circuit

- If the temperature in **either** compartment is unsatisfactory, the compressor is turned on and the 3-way valve is opened.
- 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.
- During the ripening cycle, if the temperature is LOW, the heater is turned ON; if the temperature is HIGH, the 3-way valve is opened.

Left temperature	Right temperature	3way valve position	COMP
Satisfactory	Satisfactory	NOTE ※	OFF
Satisfactory	Unsatisfactory	Right compartment	ON
Unsatisfactory	Satisfactory	Left compartment	ON
Unsatisfactory	Unsatisfactory	Left 20min/Right 20min	ON

NOTE) When the temperature is satisfactory in both compartments, the 3-way valve is opened at the compartment that likely has an satisfactory temperature.

■ Summary Operation Chart of COMP and 3way Valve



4) Condensation Heater Control

- At the top of the storage around the gasket, the condensation heater is always **ON**.
- If you turn both compartments **OFF**, the condensation heater is also turned **OFF**.

5) Buzzer Sound

- If you press a button on the control panel, the buzzer sounds **Ding-Dong**. (See Buzzer Operation circuit, page 19, section 2.)
- If you begin entering a program by pressing buttons but don't complete the program, the buzzer sounds **Ding**.

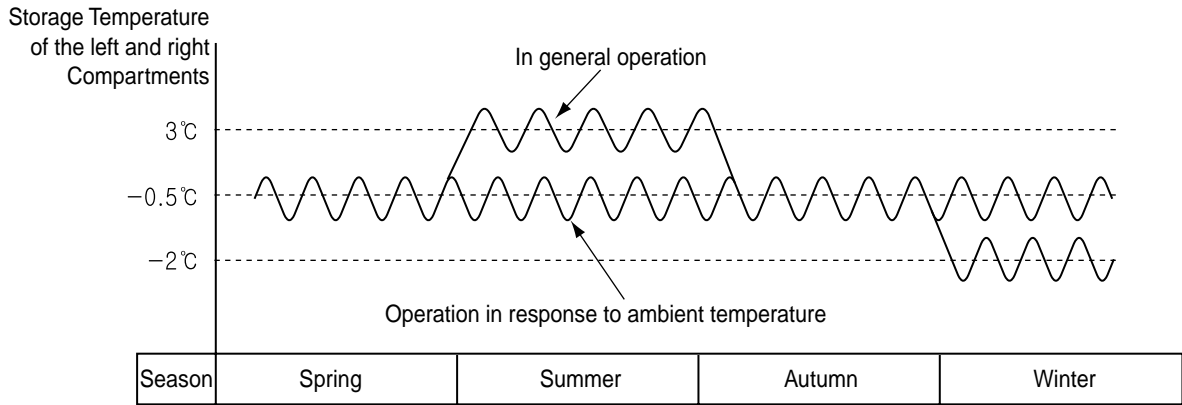
6) Power Failure Compensation Function

- When the power comes on after an outage, the storage performs the setting originally programmed. However, if the unit defaults to **Error** Status, the **Test Mode** is skipped.
- If the power fails during the ripening process, there is no power outage compensation function and the storage defaults to **Kimchi/Mid** status to protect against excessive ripening.

MICOM Function and Description of Circuit

7) 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.



8) Sequential Operation of Components

Components (Compressor, 3-way Valve, Left Ripening Heater and Condensation Heater) are operated in a specific order to prevent damage, noise, and electrical overload caused by simultaneous operation of all parts when the unit is started and after completing the self-test routine.

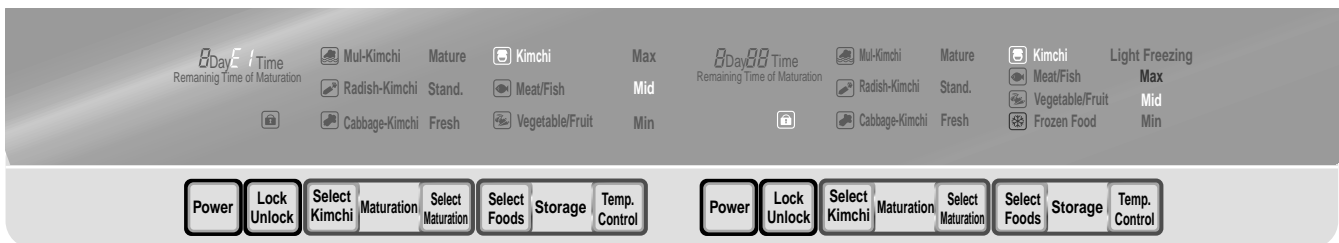
Operation Status		Operation Order	Remarks
Initial Power-up	Temperature of Left or Right sensor is $>10^{\circ}\text{C}$ (at purchase, after moving or after a long period of no use.)		Condensation heater is OFF when storage is set for ALWAYS ON or if the power is OFF on either the left or right compartment, but not both
	Temperature of Left and Right sensor is $<10^{\circ}\text{C}$. (In Power failure or Service)		
When returning normal status in test mode			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 Description of Circuit

9) Failure diagnosis function

1. The failure diagnosis function assists in determining the type of failure.
2. If a failure occurs, the control panel buttons do not work and the alarm sounds a ding. The POWER button will still function.
3. If a failure occurs and is rectified, the storage will default to the NORMAL status. (The storage is reset.)
4. The failure codes shown on the remaining Ripening Time display of the compartment experiencing the failure.
5. The display on the unaffected compartment performs normally.



○ : Normal operation

No	Item	Indication	Product operation status in failure				
			COMP	Left 3-way valve	Right 3-way valve	Left heater	Right heater
1	Failure of left compartment sensor.	Left compartment displays E1	○	2 minutes OPEN/30 minutes CLOSE	○	Heater OFF	○
2	Failure of right compartment sensor.	Right compartment displays E2	○	○	2 minutes OPEN/30 minutes CLOSE	○	Heater OFF
3	Failure of ambient temperature sensor (RTS)	Note 1	○	○	○	○	○

Note 1: Pressing **Select Kimchi** and **Select Maturation** at the left compartment simultaneously for 1 second or more.

If the ambient temperature sensor fails, it does not display a failure code.

At the LED check, if the ambient temperature is normal, ALL LEDs light. If there is a failure, ALL LED's will light and then the left Remaining Ripening Time LED will turn OFF.

MICOM Function and Description of Circuit

10) Test Function

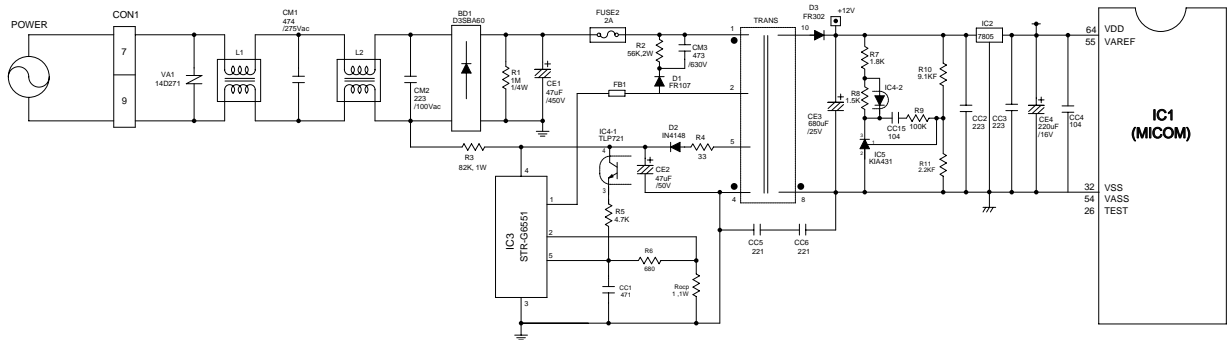
1. The test function checks the functions of the PCB and the storage, searching for failure indications.
2. The test switch on the PCB operates the **test mode**. The storage reverts to the **normal mode** after 2 hours if you forget to end it manually.
3. When the **test mode** is active, the buttons on the control panel are disabled but the buzzer still sounds a **ding** one is pressed.
4. When the **test mode** is completed, unplug the storage briefly and plug it in again to 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.

Mode	Operation	Contents	Remarks
TEST1	Press the test switch once.	1) Compressor ON . 2) 3-way valve opens to the left and right compartments alternatively at 20-minute intervals. 3) Left and right ripening heaters OFF . 4) Condensation heater OFF . 5) LED displays 111 .	* This test checks the refrigeration system for the left and right compartments. * The system reverts to initial status after a maximum of 2 hours.
TEST2	Press the test switch once when Test 1 indicates it is completed.	1) Compressor ON . 2) 3-Way Valve opens to the Right Compartment. 3) Left and right ripening heaters OFF . 4) Condensation heater ON . 5) LED displays 222 .	* This test checks the refrigeration system for the right compartment only. * The system reverts to initial status after a maximum of 2 hours.
TEST3	Press the test switch once when Test 2 indicates it is completed.	1) Compressor ON . 3-way valve OPEN . 2) 3-Way Valve opens to the Left Compartment. 3) Left and right ripening heaters OFF . 4) Condensation heater OFF . 5) LED displays 333 .	* This test checks the refrigeration system for the left compartment only. * The system reverts to initial status after a maximum of 2 hours.
TEST4	Press the test switch once when Test 3 indicates it is completed.	1) Compressor ON . 2) Left and right ripening heaters ON . 3) Condensation heater ON . 4) LED displays 444 .	* This test checks the ripening heaters and the condensation heater. * The system reverts to initial status after a maximum of 30 minutes. When the temperature of the compartments is greater than 40°C, the storage defaults to its initial status.
Normal returning	Press the test switch once when Test 4 indicates it is completed.	Return to initial status.	* The compressor operates after a delay of 7 minutes.

MICOM Function and Description of Circuit

2. Description of Circuit

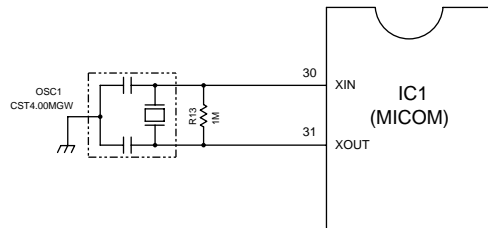
1) Power circuit



The power circuit consists of the noise attenuation part and the SMPS (switch mode power supply) part. The SMPS consists of the rectifying part (BD1 & CE1) to convert AC voltage to DC voltage, switching part (IC2) 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 (IC3, ZD1) to feedback the secondary voltage to the first side of transformer in order to maintain the secondary voltage constant.

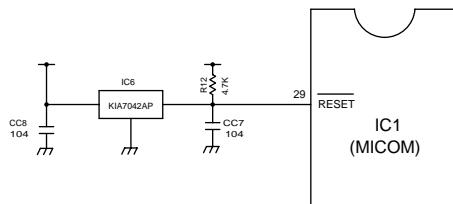
Caution : High voltage (310 V_{dc}) is maintained in this circuit. Wait at least 3 minutes after unplugging to allow the current to dissipate. There is a danger of electric shock.

2) Oscillation circuit



The oscillation circuit provides the clock signal for synchronization and calculation of time in relation to the logic elements of microprocessor IC 1. OSC 1 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.

3) Reset circuit

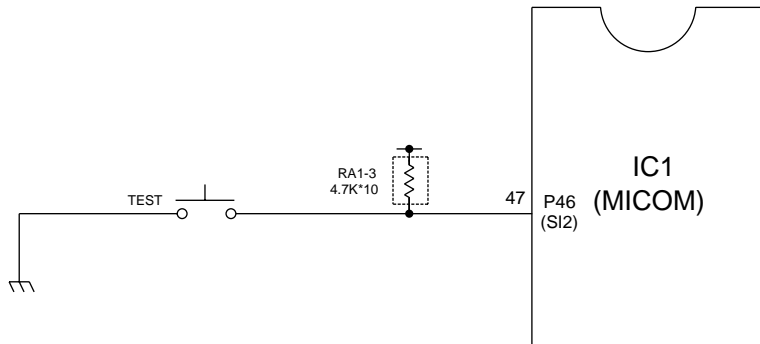


The reset circuit allows the entire process to be started from the initial status by resetting the microprocessor whenever power is applied to it at pin 29. LOW voltage is applied to the reset terminal for 10 ms at the beginning of power input. The reset terminal has a voltage of 5.3 V_{dc} during general operation. If the reset operation fails, the microprocessor will not operate.

MICOM Function and Description of Circuit

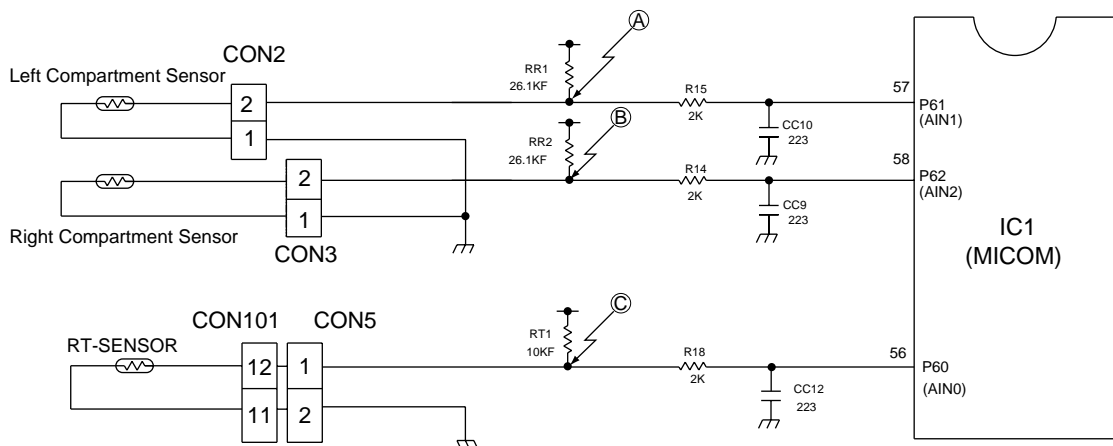
5) Switch input circuit

The switch input circuit detects the test switch signal.



6) Temperature sense circuit

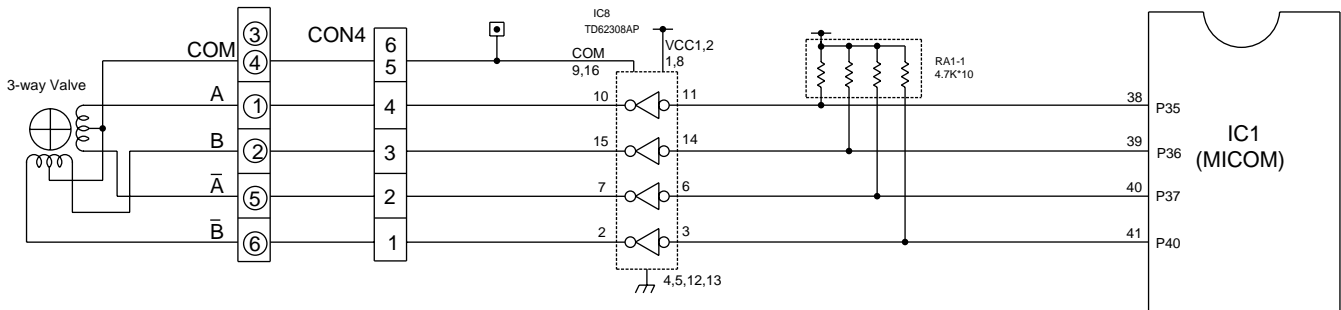
The temperature sense circuit consists of a sensor to detect the outside (ambient) temperature and sensors in the left and right compartments for storing/ripening kimchi. The status of each sensor, whether open or shorted, is shown below.



Sensor	Checkpoint	Normal (-50° C~+80° C)	Shorted	Open
Left sensor	POINT A Voltage	0.5 V _{dc} ~4.5 V _{dc}	0 V _{dc}	5 V _{dc}
Right sensor	POINT B Voltage			
Outside sensor	POINT C Voltage			

MICOM Function and Description of Circuit

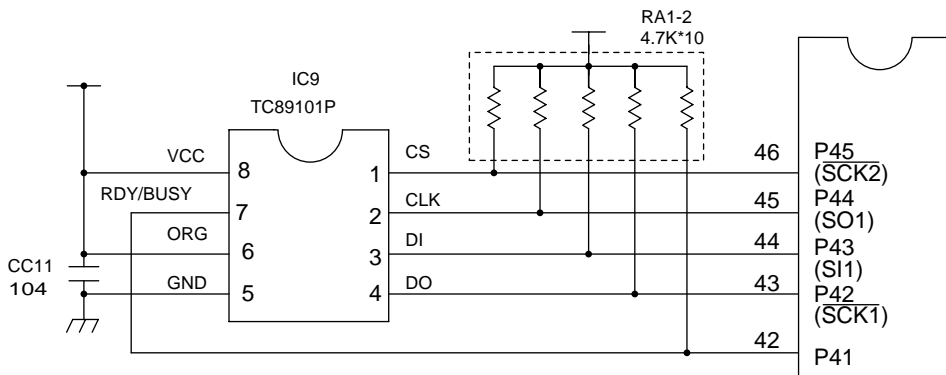
7) Stepping Motor Operation Circuit (3-way Valve)



- The rotation of the 3-way valve is controlled by the output of pins 38~41 of IC1. Changes in these outputs rotate the valve.

Explanation) The stepping motor is driven by IC8. Signals are transmitted via IC8 as the motor driving IC. The motor coil wound on each phase of the stator forms the rotation magnetic field and causes the stepping rotation.

8) Power Failure Compensation Circuit

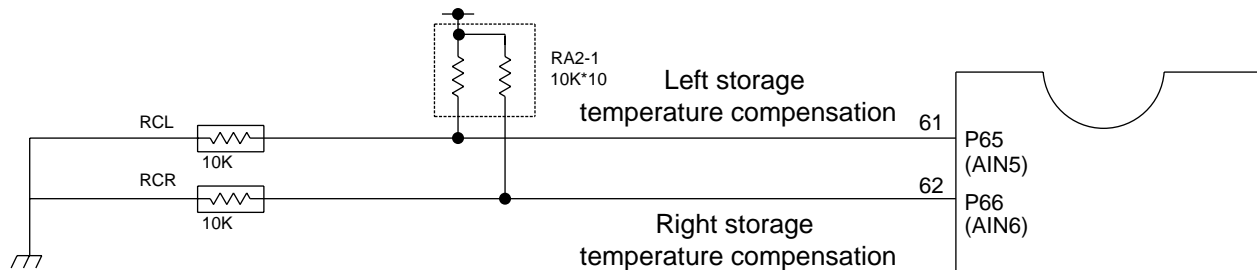


- The power failure compensation circuit recalls the temperature range of the right and left compartments and maintains these levels if power is interrupted briefly. Temperature setting information is delivered to IC9 via its serial interface with the microprocessor IC1. If the power failure compensation does not work, replace IC9.

MICOM Function and Description of Circuit

9) Keeping temperature compensation and excessive cold/weak cold cut compensation circuit

(1) Keeping temperature compensation



- This circuit is a 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 K Ω		+2.5° C	Warmer ↑
56 K Ω		+2.0° C	
33 K Ω		+1.5° C	
18 K Ω		+1.0° C	
12 K Ω		+0.5° C	
10 K Ω		0° C	Standard temperature
8.2 K Ω		-0.5° C	↓ Cooler
5.6 K Ω		-1.0° C	
3.3 K Ω		-1.5° C	
2 K Ω		-2.0° C	
470 Ω		-2.5° C	

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

MICOM Function and Description of Circuit

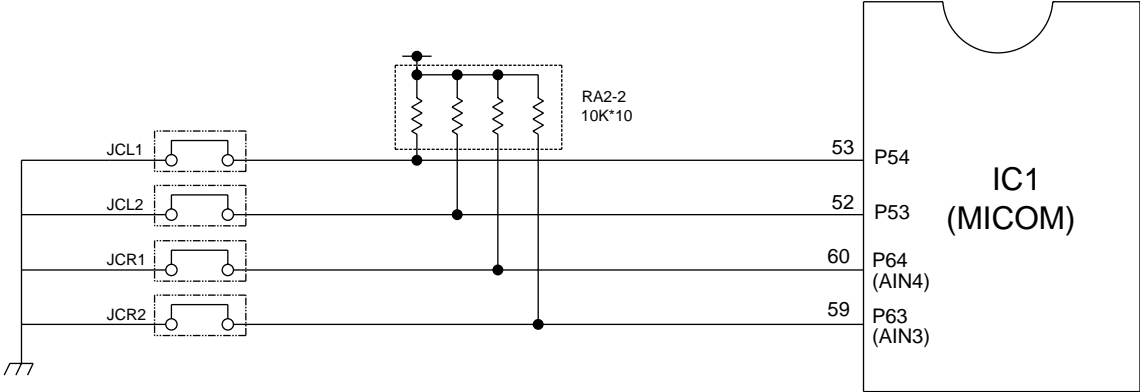
Example) If changing the resistance of compensation at left compartment (RCL) to 18 K (current resistance) from 10 K (modification resistance), storage temperature at the left compartment increases by +1° C .

Division	Current	470 Ω	2 KΩ	3.3 KΩ	5.6 KΩ	8.2 KΩ	10 KΩ
	Modification						
Left Compartment (RCL)	470 Ω	No change	0.5° C UP	1° C UP	1.5° C UP	2° C UP	2.5° C UP
	2 KΩ	0.5° C DOWN	NO CHANGE	0.5° C UP	1° C UP	1.5° C UP	2° 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
	5.6 KΩ	1.5° C DOWN	1° C DOWN	0.5° C DOWN	NO CHANGE	0.5° C UP	1° 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
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
	12 KΩ	3° C DOWN	2.5° C DOWN	2° C DOWN	1.5° C DOWN	1° C DOWN	0.5° C DOWN
	18 KΩ	3.5° C DOWN	3° C DOWN	2.5° C DOWN	2° C DOWN	1.5° C DOWN	1° C DOWN
	33 KΩ	4° C DOWN	3.5° C DOWN	3° C DOWN	2.5° C DOWN	2° C DOWN	1.5° C DOWN
	56 KΩ	4.5° C DOWN	4° C DOWN	3.5° C DOWN	3° C DOWN	2.5° C DOWN	2° C DOWN
	180 KΩ	5° C DOWN	4.5° C DOWN	4° C DOWN	3.5° C DOWN	3° C DOWN	2.5° C DOWN

Division	Current	12 KΩ	18 KΩ	33 KΩ	56 KΩ	180 KΩ
	Modification					
Left Compartment (RCL)	470 Ω	3° C UP	3.5° C UP	4° C UP	4.5° C UP	5° C UP
	2 KΩ	2.5° C UP	3° C UP	3.5° C UP	4° C UP	4.5° C UP
	3.3 KΩ	2° C UP	2.5° C UP	3° C UP	3.5° C UP	4° C UP
	5.6 KΩ	1.5° C UP	2° C UP	2.5° C UP	3° C UP	3.5° C UP
	8.2 KΩ	1° C UP	1.5° C UP	2° C UP	2.5° C UP	3° C UP
Right Compartment (RCR)	10 KΩ	0.5° C UP	1° C UP	1.5° C UP	2° C UP	2.5° C UP
	12 KΩ	NO CHANGE	0.5° C UP	1° C UP	1.5° C UP	2° C UP
	18 KΩ	0.5° C DOWN	NO CHANGE	0.5° C UP	1° C UP	1.5° C UP
	33 KΩ	1° C DOWN	0.5° C DOWN	NO CHANGE	0.5° C UP	1° C UP
	56 KΩ	1.5° C DOWN	1° C DOWN	0.5° C DOWN	NO CHANGE	0.5° C UP
	180 KΩ	2° C DOWN	1.5° C DOWN	1° C DOWN	0.5° C DOWN	NO CHANGE

MICOM Function and Description of Circuit

(2) Excessive cold/Weak cold cut compensation



Left compartment cut compensation		Left compartment keeping temperature compensation value
Excessive cold compensation	Weak cold compensation	
JCL1	JCL2	
CUT		+2° C
	CUT	-2° C
CUT	CUT	0° C
		0° C (When shipping from factory)

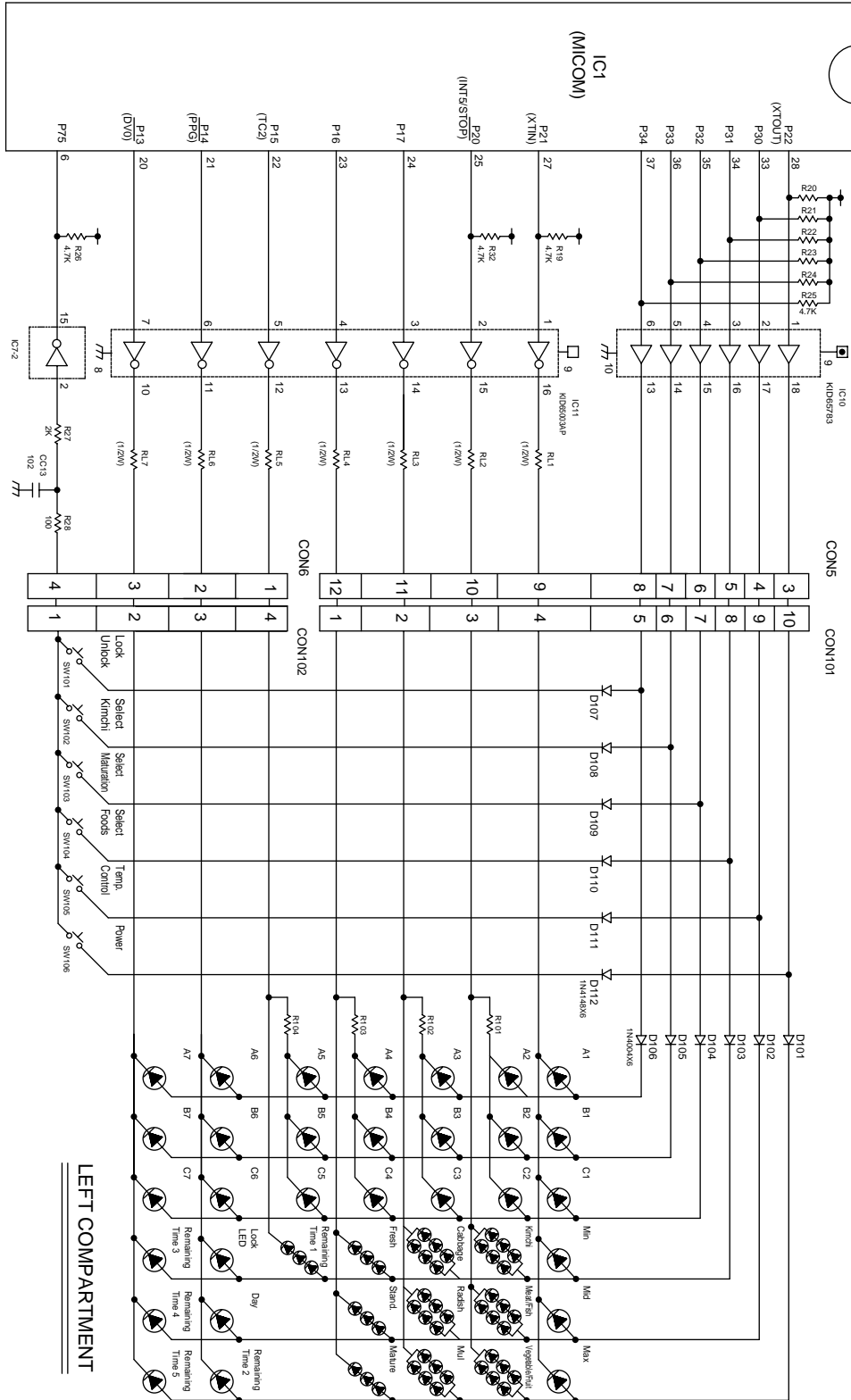
Right compartment cut compensation		Right compartment keeping temperature compensation value
Excessive cold compensation	Weak cold compensation	
JCR1	JCR2	
CUT		+2° C
	CUT	-2° C
CUT	CUT	0° C
		0° C (When shipping from factory)

► The above cut compensation circuit is a circuit to compensate keeping temperature of left/right room by cutting it simply in service.

MICOM Function and Description of Circuit

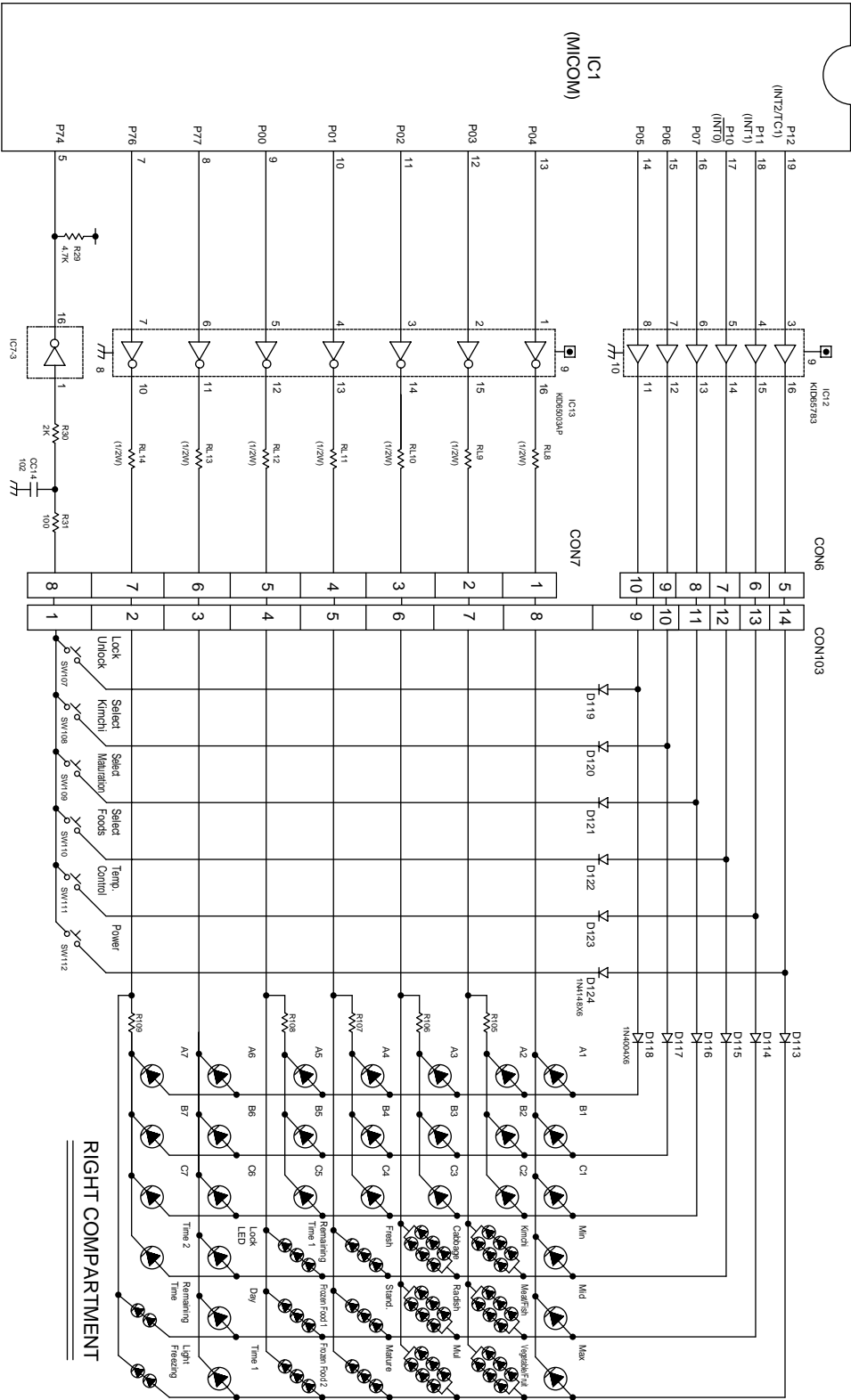
10) Button input and displaying part illumination circuit

(1) Left Compartment



MICOM Function and Description of Circuit

(2) Right Compartment



◉ The above circuit is a circuit to determine pressing status of the function adjustment button at the operation display part and to turn the LED for displaying function on, whose driving method is a scan method.

MICOM Function and Description of Circuit

3. Sensor Resistance Characteristics Table

Measuring Temperature(°C)	Left Sensor, Right 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

- ▶ Allowance of sensor resistance is 5%.
- ▶ Measure resistance value of sensor after leaving it for more than 3 minutes (delay is required due to sensing speed).
- ▶ Always use a digital tester! Analog testers have too great a margin of error.
- ▶ For the left compartment sensor, measure both ends of N^o. 1 and N^o. 2 after separating CON2 from the PCB Assembly. For the right compartment sensor, measure both ends of N^o. 1 and N^o. 2 of CON3. For the outside (ambient) sensor, measure both ends of measure both ends of N^o. 1 and N^o. 2 of CON5.

MICOM Function and Description of Circuit

2) Parts List

NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK
1	6870JB2052A	PWB,MAIN	FR-1(DS-1107A)	DOO SAN	t=1.6
2	6170JB2010B	TRANS,SMPS(COIL)	EER2828/2.3mH	JAE EUN	TRANS
3	6630JB8001D	WAFER	JE202-1T-05(9P-2,4,6,8)	JAE EUN	CON1
4	6630JB8001B		JE202-1T-03(5P-2,4)		
5	6630JB8008A		JE202-1T-04(7P-3,4,6)		CON2
6	6630JB8008B		JE202-1T-04(8P-3,4,6,8)		CON3
7	6630JB8007E		917784-1	AMP	CON4
8	6630JB8007G		917786-1		CON7
9	6630JB8007J		917788-1		CON6
10	6630JB8007L		917790-1		CON5
11					
12	0IZZJB2005C		MICOM	TMP87CK40AN	TOSHIBA
13	J570-00009A	EEPROM	TC89101P	TOSHIBA	IC9
12	0IRH178050B	REGULATOR	BA17805T	ROHM	IC2
	0INE780500E		(uPC7805AHF)	NEC	
	0IKE780050A		(KIA7805AP)	K.E.C	
13	0IKD010100A	RESET IC	BMR0101D	고덴사	IC6
	0IKE704200A		KIA7042AP	K.E.C	
14	0IKE650030B	DRIVE IC	KID65003AP	K.E.C	IC7,11,13
15	0IKE657830A		KID65783	K.E.C	IC10,IC12
	0IMI545630A		M54563P	MITSUBISHI	
	0ITO627830A		TD62783AP	TOSHIBA (JAPAN)	
16					
17	0IKE431000A	V/REGULATOR	KIA431	K.E.C	IC5
18	0ITO721000A	PHOTO TR	TLP721F	TOSHIBA	IC4
19	J570-00012B	RESONATOR	CST4.00MGW-TF01	MURATA	OSC1
20	0ITO623080A	DRIVE IC	TD62308AP	TOSHIBA	IC8
21					
22	6102JB8001B	VARISTOR	INR14D271	IL JIN	VA1
23	6920JB2004A	RELAY	DH12DI-O-Q	JAEIL	RY1
	6920JB2005A		(JW1aFHN)	NAIS	

NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK
24	6920JB2003A	RELAY	G5N-1A	OMRON	RY2,3
	6920JB2003B		ALD112	NAIS	
25	6920JB2009A		G5S-1A	OMRON	RY4
26	0ISK655100A	DRIVE IC	STR-G6551	SANKEN	IC3
27	0TR106009AC	TRANSISTOR	KTA106M	K.E.C	Q3
28	0TR106009AF		KTC106M		Q4
29					
30					
31					
32					
33	0DB360000AA	BRIDGE DIODE	D3SBA60	SHINDENKEN	BD1
34	0DR302009AA	FR DIODE	FR302	DELTA	D3
35	0DR107009AA		FR107		D1
36					
37					
38	0DD400409AA	RECTIFIER DIODE	1N4004	DELTA	D4
39	0DD400709AB		1N4007		
40	0DD414809BB	SWITCHING DIODE	1N4148	ROHM	D2,5,6,7
41					
42					
43					
44					
45					

MICOM Function and Description of Circuit

NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK		
46	OCE476AK638	ELE' CAP(HE)	47uF/450V	SAM HWA	CE1		
47		(HE,105°C)					
48	OCE1087J690	ELE' CAP (RX,105°C)	1000uF/35V				
49	OCE1087H638		1000uF/25V				
50	OCE687AH690		680uF/25V		CE3		
51	OCE227AH638		220uF/25V				
52	OCE107AH638	ELE' CAP (RG,105°C)	100uF/25V	RUBYCON (SAM HWA)			
53	OCE477AH638		470uF/25V				
54	OCE227AF638		220uF/16V		CE4		
55	OCE1071H638		100uF/25V				
56	OCE476AK638		47uF/50V		CE2		
57	OCE476AH638		47uF/25V		CE5		
58	OCE106AK638		10uF/50V				
59	OCE105AK638		1uF/50V				
60	OCQ47418670		MYL' CAPACITOR		474/275Vac	SAM HWA	CM1
61	OCQ2231N4009				223/100Vac		CM2
62	OCQ4732Y430				473/630Vdc		CM3
63							
64	OCK22102510		CER' CAPACITOR		221/2KVA	SAM HWA	CC5,CC6
65	OCK1040H919				104/50V	TAE YANG	CC4,7,8,11
				CC15			
66	OCK2230H908	223/50V		CC2,3,9,10,12,			
67	OCK1030H519	103/50V					
68	OCK1020K519	102/50V		CC13,CC14			
69	OCK4710K519	471/50V		CC1			
70	OCK1010K519	101/50V					
71							
72	6104JB8001B			4.7K*10			RA1
73	6104JB8001A		10K*8		RA2		
74							
75	ORM1202N661	R,CEMENT	12K,5W				

NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK
76	0RS5602K600	R,METAL OXIDE FILM	56K,2W		R2
77	0RS082J609		82K,1W		R3
78	0RS0101J609		1,1W		Rocp
79					
80	0RD1500H609	R,CARBON FILM	150,1/2W	SMART	RL14
81	0RD1800H609		180,1/2W		RL1,6,7,8,13
82	0RD0680H609		68,1/2W		RL4,5,11,12
83	0RD0510H609		51,1/2W		RL2,3,9,10
84	0RD1002G609		10K,1/4W		RCL
85	0RD1002G609		12K,1/4W		RCR
86			33K, 1/4W		OP1
87					
88	0RD0330G609		33, 1/4W		R4
89	0RD1000G609		100, 1/4W		R28,31
90	0RD2200G609		220, 1/4W		R16
91	0RD6800G609		680, 1/4W		R6
92	0RD1001G609		1K, 1/4W		R17

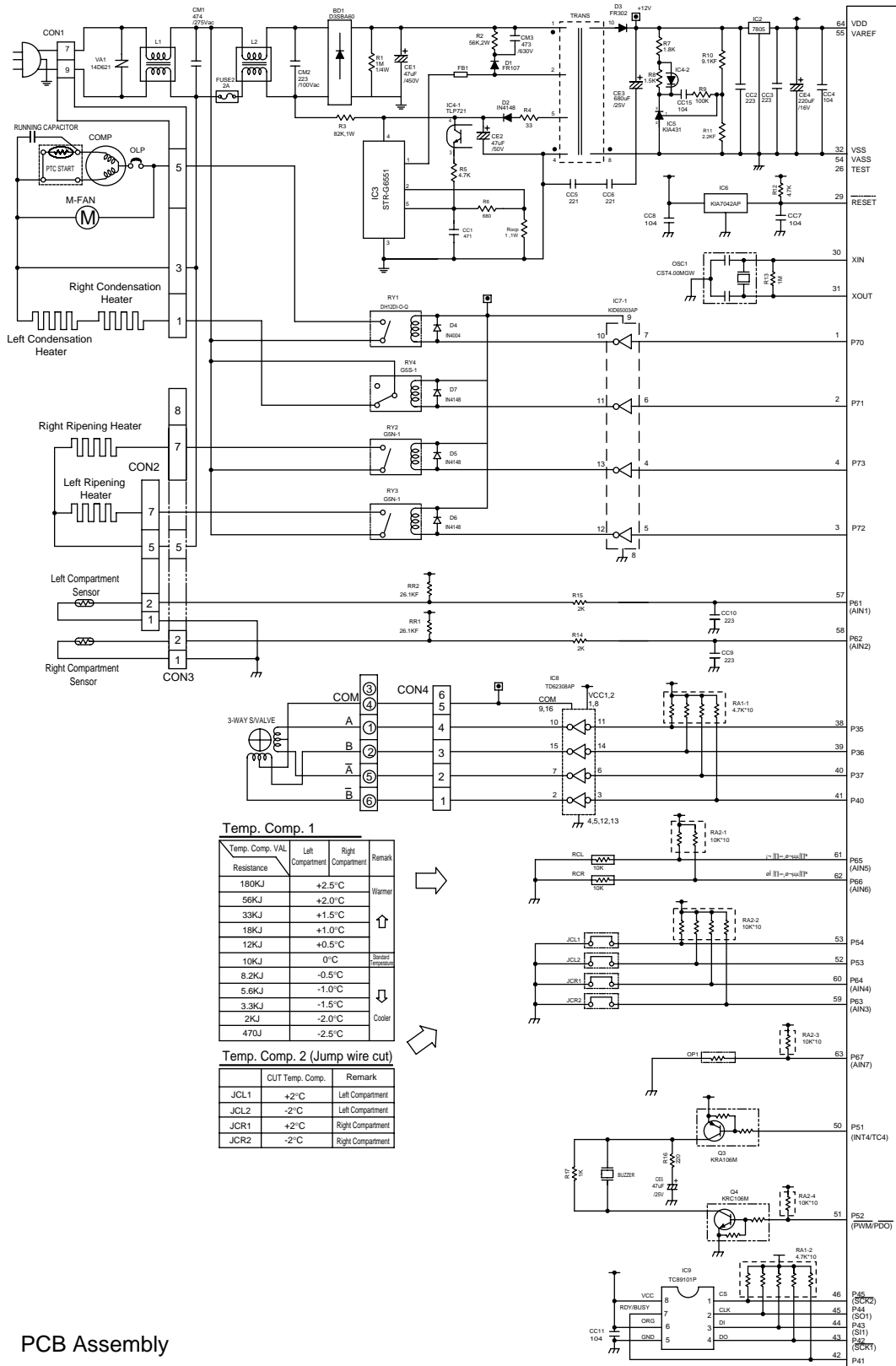
MICOM Function and Description of Circuit

NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK	NO.	DWG. NO.	DESCRIPTION	SPEC'	MAKER	REMARK
93	0RD1501G609	R,CARBON FILM	1.5K, 1/4W	SMART	R8	117	43607015	JUMP WIRE	0.6X10mm		JCL1
94	0RD1801G609		1.8K, 1/4W		R7						JCL2
95	0RD2001G609		2K, 1/4W		R14,15,18,27,30						JCR1
96	0RD2001G609		2.2K,1/4W								JCR2
97	0RD4701G609		4.7K, 1/4W		R5,12,19-26,29 R32						J1,3-12,20-22
98	0RD8201G609		8.2K,1/4W								J24-34
99	0RD1002G609		10K,1/4W								
100	0RD1004G609		1M, 1/4W		R1,13						J16
101	ORN2201G409		2.2KF, 1/4W		R11						
102	ORN9101G409		9.1KF, 1/4W		R10						
103	ORN1002G409	10KF, 1/4W	RT1								
104	ORN1622G409	R,METAL FILM	16.2KF, 1/4W		0.6X12.5mm	J2,13-15					
105	ORN2052G409		20.5KF, 1/4W			J17-19					
106	ORN2612G409		26.1KF, 1/4W	RR1,RR2		0.6X15mm	J23				
107											
108	6908JB3002A	BUZZER,PIGZO CE	BM-20K	BUJEON	BUZZER	118	4920JB3001A	HEAT SINK(5V)	(=J572-00002A)		
						119	4920JB3007A	HEAT SINK(STR)	23.3X17X30		
109	6210JB8001A	CORE(CIRE),BEADS	BFS3510A0	SAM HWA	FB1	120					
110	6600JB8001A	TEST S/W	SKHV10910	LG	TEST	121	1SBF0302418	SCREW	H/SINKfi		
111	6200JB3004A	COMMON COIL	2mH/7A	T.N.C	L1	122	49111001	SOLDER	ALMIT KR-19RMA		SOLD
112	6200JB3005A		32mH/1A		L2						
115	0FM5001B511	FUSE	250V/2A	SAMJU		123	49111004	SOLDER LEAD BAR	H63A		
116	6500JB3001A	SENSOR	PBN-40	JAMES TEC	RT-SNR	124	59333105	FLUX AUTO	JS71	KOKI	
						125					
						126					
						127					
						128					
						129					
						130					
						131					
						132					

MICOM Function and Description of Circuit

5. PCB Circuit drawing

* The Circuit may vary slightly depending on market area.



IC 1 TOSHIBA TMP87CK40AN

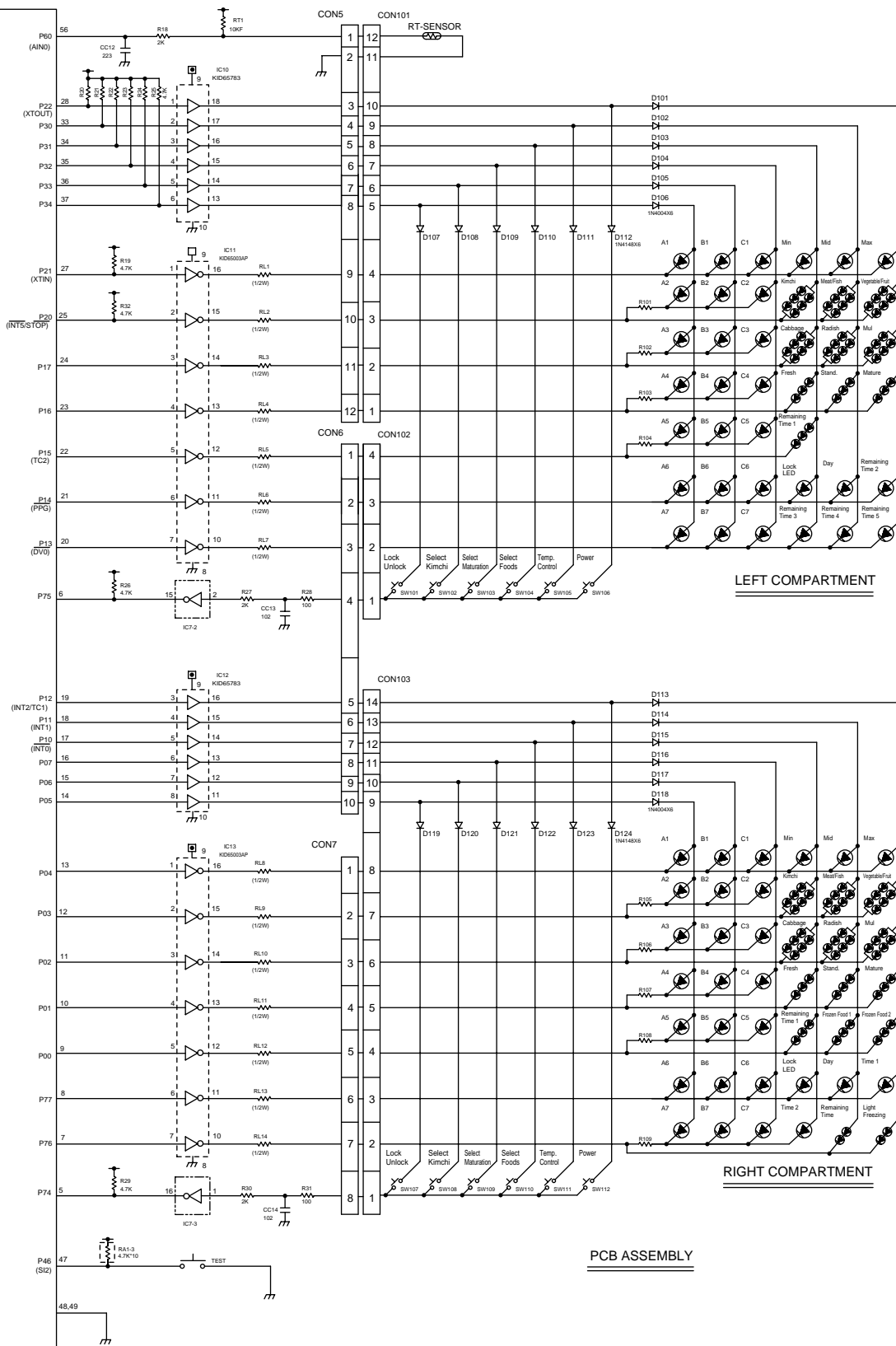
Temp. Comp. 1

Temp. Comp. VAL	Left Compartment	Right Compartment	Remark
180KJ	+2.5°C		Warmer
56KJ	+2.0°C		
33KJ	+1.5°C		↑
18KJ	+1.0°C		
12KJ	+0.5°C		
10KJ	0°C		Steady
8.2KJ	-0.5°C		
5.6KJ	-1.0°C		↓
3.3KJ	-1.5°C		
2KJ	-2.0°C		Cooler
470J	-2.5°C		

Temp. Comp. 2 (Jump wire cut)

CUT Temp. Comp.	Remark
JCL1	+2°C Left Compartment
JCL2	-2°C Left Compartment
JCR1	+2°C Right Compartment
JCR2	-2°C Right Compartment

PCB Assembly



Refrigeration Cycle and Refrigerant

Chapter 6 Refrigeration Cycle and Refrigerant

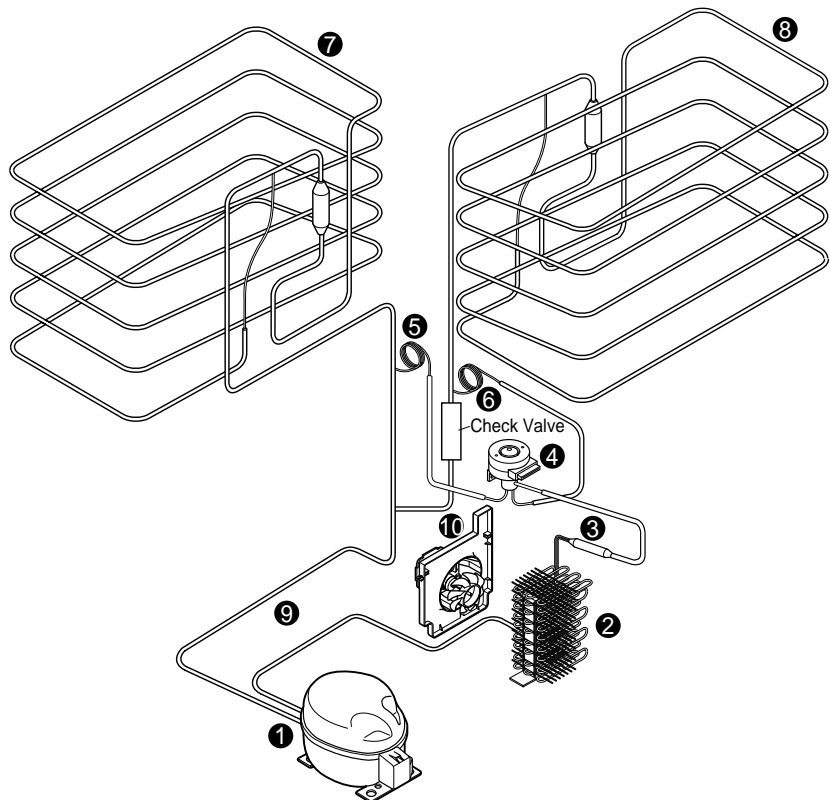
1. Cold Cycle (Cold principle/refrigerant gas circulation drawing)

1) Principle of Refrigeration

Refrigeration is operation to maintain at a lower temperature (less than 0°C) than natural temperature (usually ambient temperature) and for maintaining this temperature, the circulation circuits (compressor, condenser, evaporator) for operating phase change of refrigerant and the refrigerant (R134a) for absorbing heat and the insulated space are required.

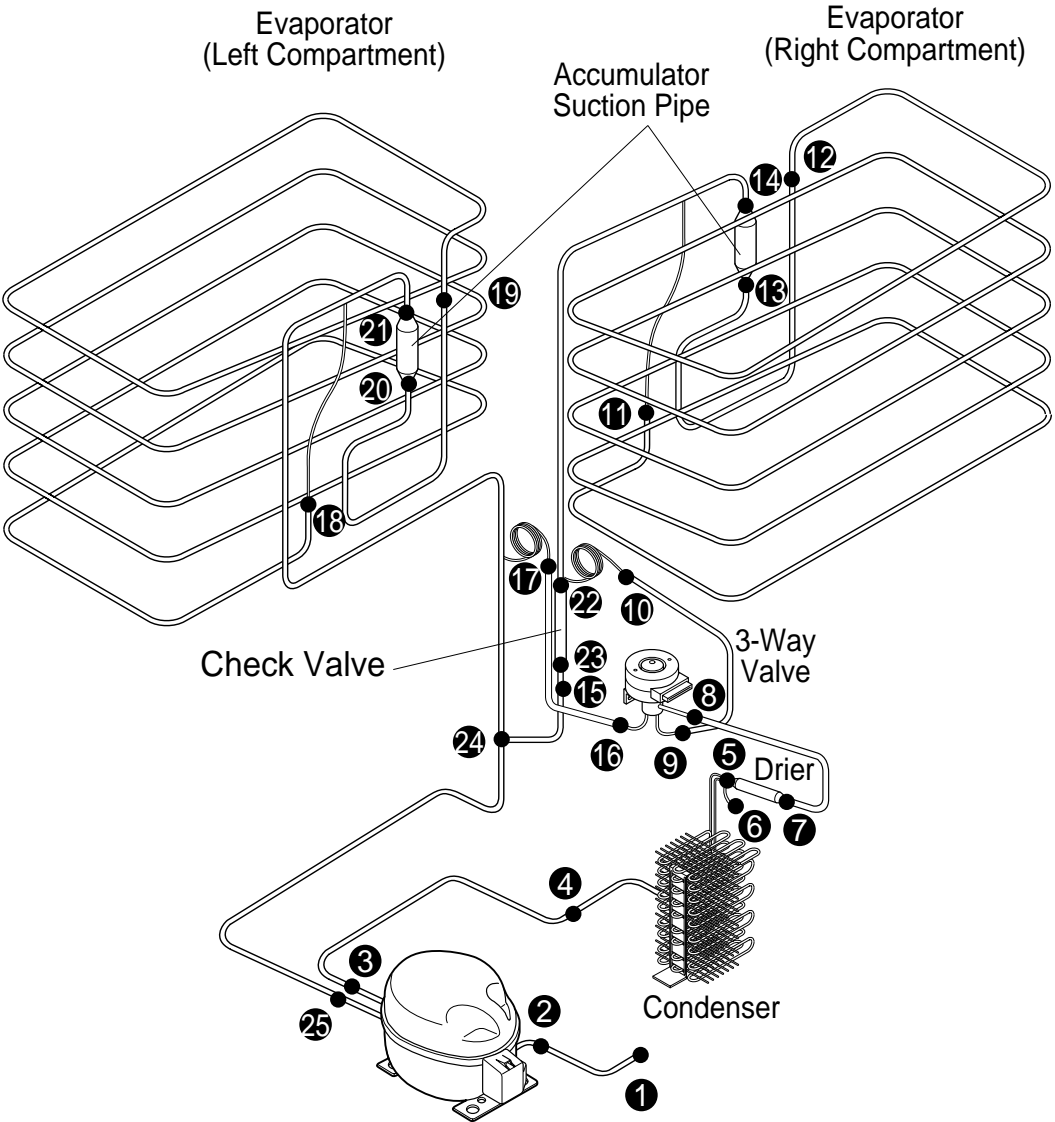
2) Refrigerant gas circulation drawing

- (1) Compressor
- (2) Wire Condenser
- (3) Drier
- (4) 3-way valve
- (5) Capillary Tube (left)
- (6) Capillary Tube (right)
- (7) Evaporator (left)
- (8) Evaporator (right)
- (9) Suction pipe
- (10) Cooling fan (radiating fan)



Refrigeration Cycle and Refrigerant

2. Reference Drawing for Soldering

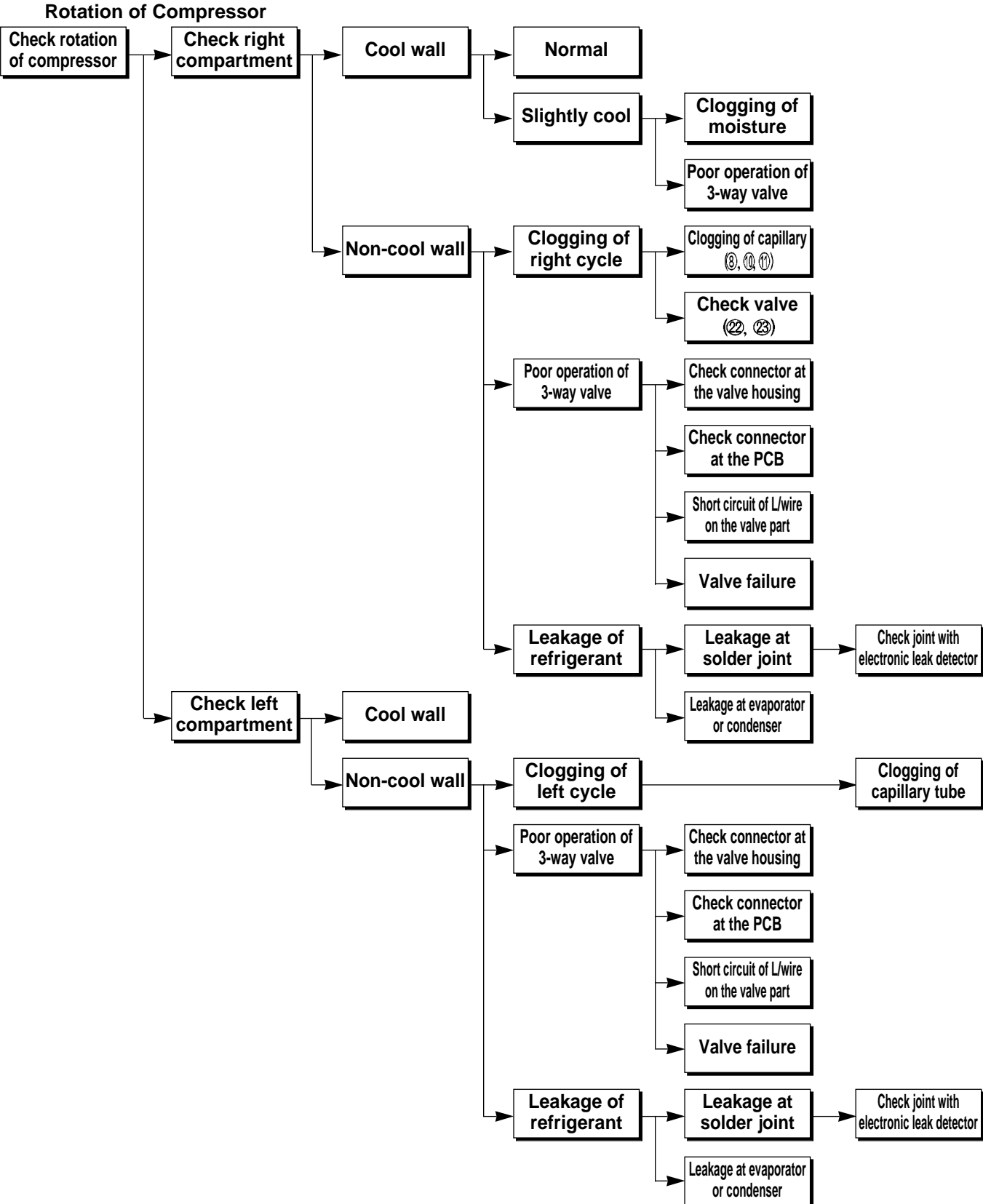


Type of Soldering	Part Applied	Remarks
Copper soldering	① ② ③ ⑥ ⑦ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑰ ⑱ ⑳ ㉑ ㉒ ㉓ ㉔ ㉕	
Silver soldering	④ ⑤ ⑧ ⑨ ⑫	

Method of Repairing Cold Cycle

Chapter 7 Method of Repairing Cold Cycle

1. Failure Check Procedure

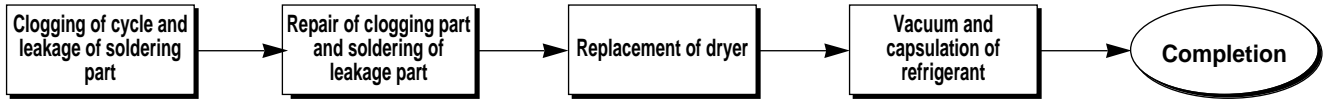


Method of Repairing Cold Cycle

2. Cautions for Repair Service

1) Clogging and leakage of cycle

- For parts replacement and soldering due to clogging and leakage of cycle or re-capsulation of refrigerant, always replace dryer to remove moisture inside of cycle.



2) 3-way valve service

- The 3-way valve controls the refrigerant flow by moving a plastic damper inside the valve body. Soldering to the tubes attached to the valve can conduct heat to the inside of the valve and damage it. Always use the following procedure to prevent heat damage.

(1) Leakage service for valve soldering part

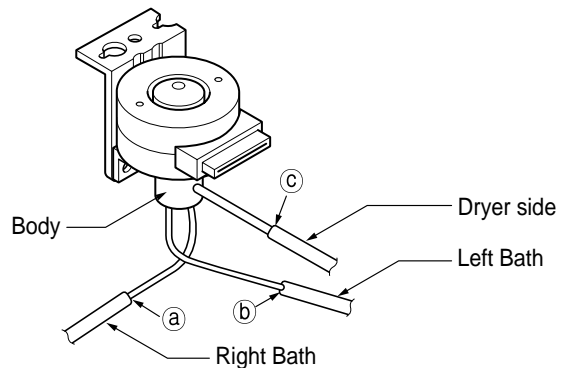
When soldering at points **a**, **b**, or **c**, (see diagram) wrap the body of the valve with a wet towel. Use no more heat than absolutely necessary to flow the solder (100° C or less).

(2) Service in valve replacement (valve failure)

carry out service in the same method as above.

(3) Other cautions

- (1) Be certain the capillary tube is properly and exactly inserted when soldering.
- (2) Handle the 3-way valve carefully. It can be easily damaged by dropping or impact.



3) Check valve service

The check valve is a device that ensures the refrigerant flows in only one direction.

(1) Leakage service of valve soldering part

Use caution when soldering the check valve. Keep the temperature below 300° C while soldering. Wrap a wet towel around the check valve to protect it from oxidation and contamination during soldering.

(2) Service in replacement of valve (valve failure)

Carry out service in the same method as above.

Be certain the check valve is installed in the proper orientation. Otherwise, refrigerant will not flow and the storage will not work.

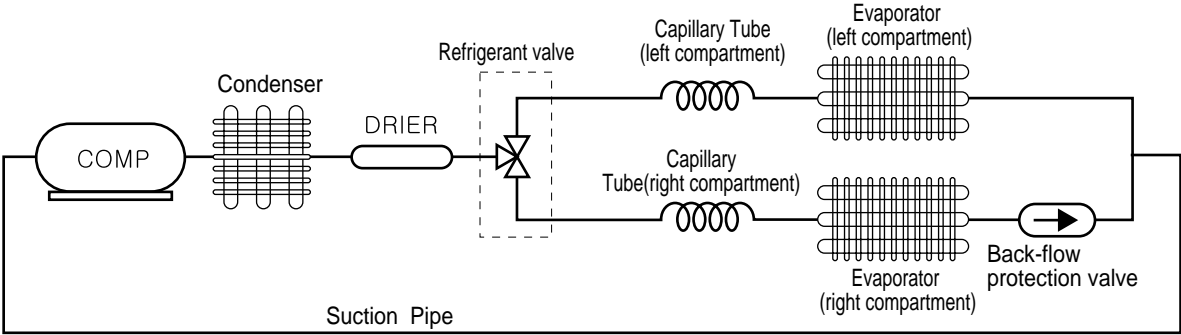


Method of Repairing Cold Cycle

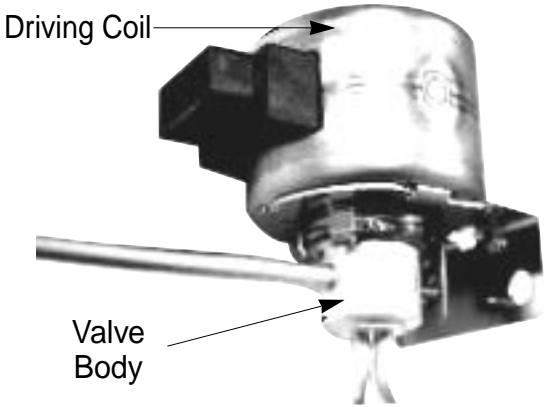
4) Refrigerant valve (3-way valve)

(1) Function

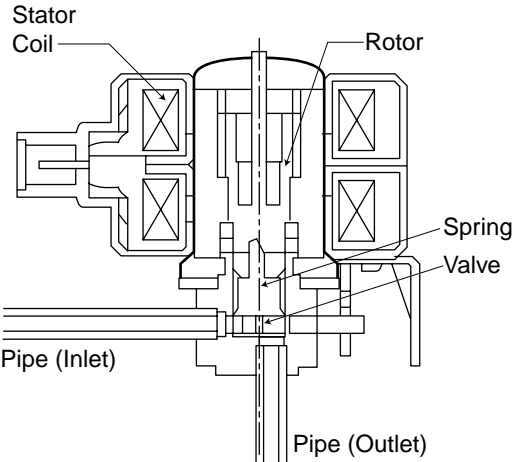
The refrigerant valve (3-way valve) directs the refrigerant to the right or left compartment.



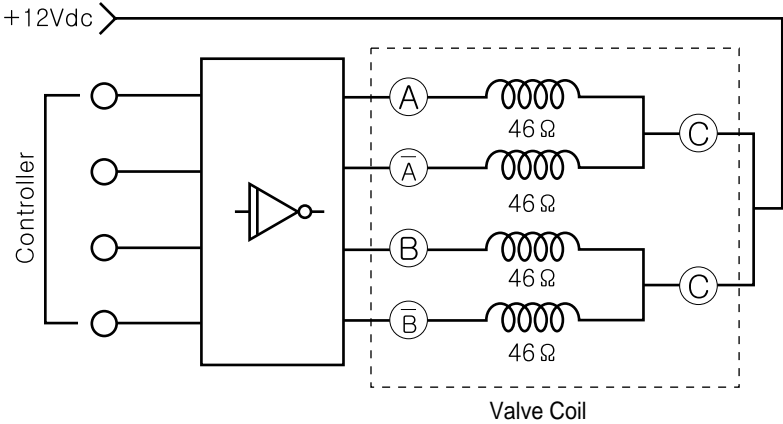
(2) Operation Structure



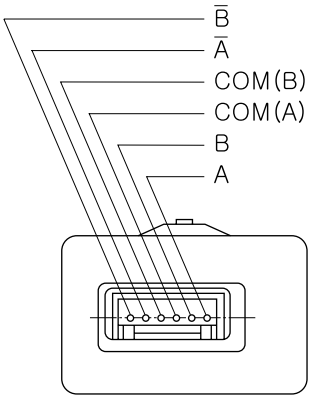
(Outside Look)



(Inside Structure)



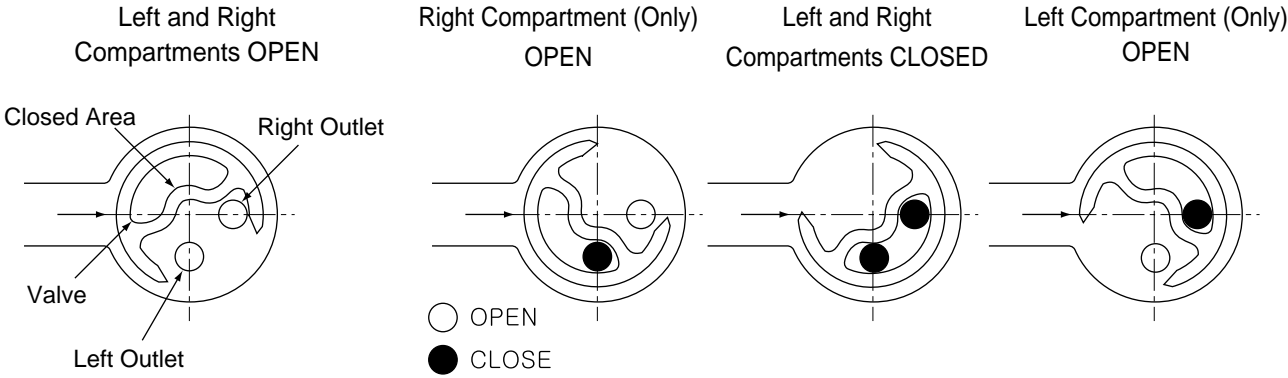
(Driving Circuit)



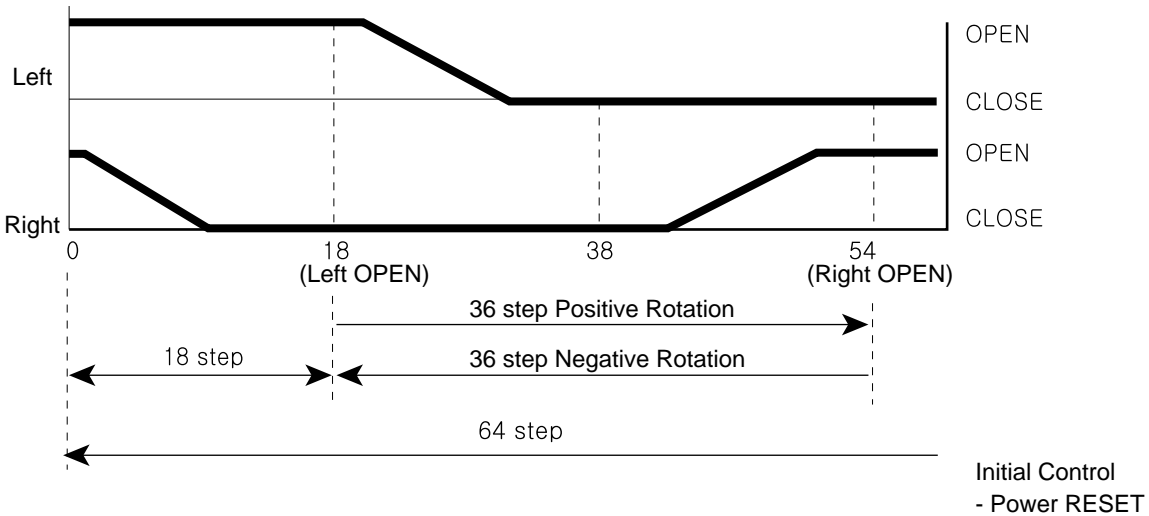
Method of Repairing Cold Cycle

(3) Principle of operation

The 3-way valve directs the refrigerant to either or both compartments by rotating a control part within the valve body. By addressing the stepping motor, precise control is obtained.



(4) Characteristics of operation



Understanding of Characteristics of Every Parts

Chapter 8 Understanding of Characteristics of Every Parts

1. Heater

(1) **Summary:** Several heaters are used to remove or prevent frost on the evaporator while the storage is in operation. They also keep condensation from forming.

(2) Type and function of heater

Division	Applied Section	Function	Resistance Value	Rewards
Heater Assembly	Inside case at the top	To prevent condensation	827Ω	16W
Heater	Opposite surface of inner case	To ripen kimchi	220Ω/EA	60W x 2EA

(3) Failure Symptom

1. Condensation Heater Assembly

Failure	Symptom of Product	Checking Method	Counter-measure
1. Open in heater assembly wire. Open in connection wire.	Formation of condensation	1. Measure resistance of connectors at both ends of heater with tester → ∞ Ω	1. Condensation does not occur in every case.
2. Poor contact of terminal.		2. Measure resistance of connectors at both ends of heater with tester → severe change.	2. Immediately insert connector.

2. Heater ASSY (ripening heater)

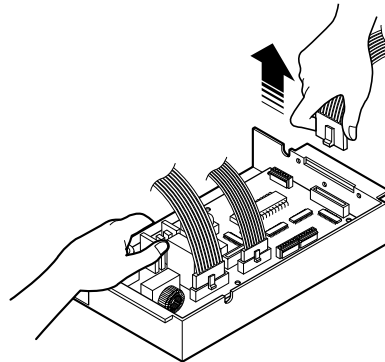
Inferior Item (parts)	Symptom of Product	Checking Method	Counter-measure
1. Open in heater assembly wire. Open in connection wire	Kimchi doesn't ripen properly.	1. Measure resistance of connectors at both ends of heater with tester → ∞ Ω	1. Replacement of products.
2. Poor contact of terminal		2. Measure resistance of connectors at both ends of heater with tester → severe change.	2. Immediately insert connector.

Warnings For Disassembling Product

Chapter 9 Warnings For Disassembling Product

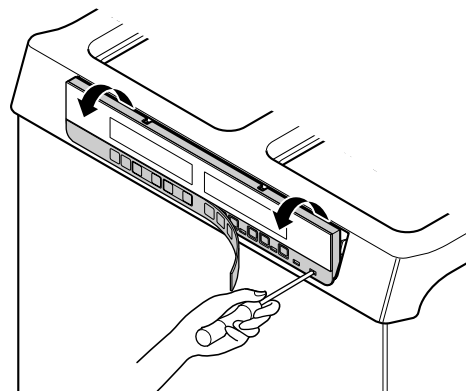
1. Main PCB Assembly

- When removing the Main PCB from the storage, disassemble it carefully and do not let the lead wires touch any part of the PCB.
- There is danger of short as a lead wire is broken or cover is stripped.



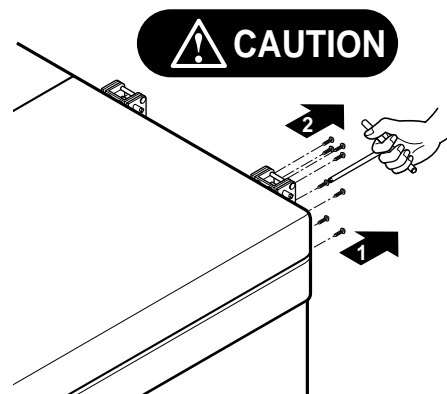
2. Display Frame Assembly

- When replacing a display PCB, remove it using a slotted screwdriver.
 1. Peel off the right side of the Deco.
 2. Insert the end of a slotted screwdriver into the rectangle hole. (see drawing.)
 3. Lean the screwdriver backward and then the Display Frame Assembly is removed.
- Be extremely careful so the Display and the Case are not damaged.



3. Hinge Assembly

- When removing the door assembly, first separate the hinge assembly on the back side. Use a T-handle driver to get the appropriate torque. After removing the 4 screws on the back side along the bottom, take out the 4 screws on the door side along the top.



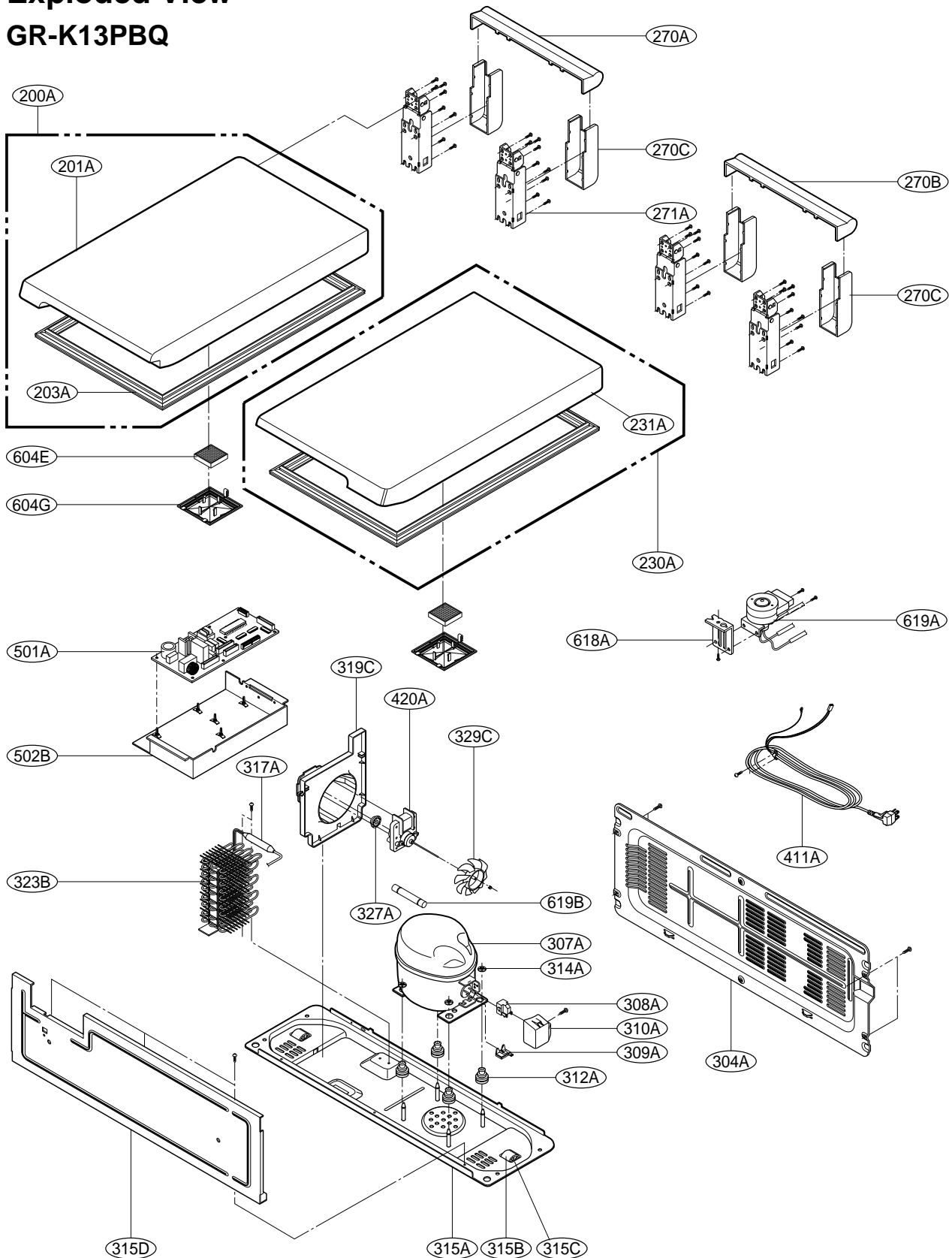
- Caution** ◻ Follow the sequence of removal in Step 3 Hinge Removal. If the screws are still under pressure from the hinge spring, they could present a hazard.

Exploded view and Parts List

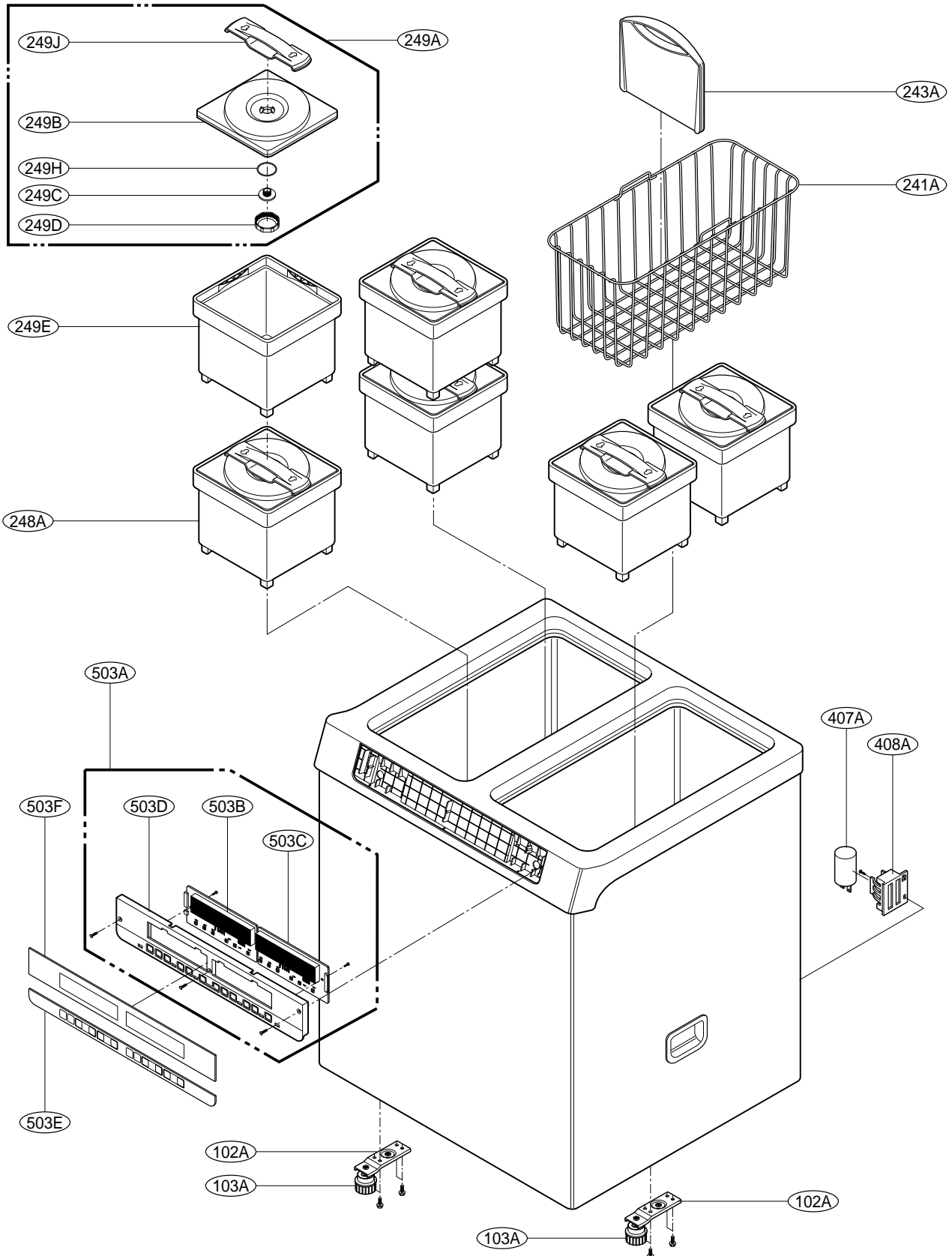
Chapter 10 Exploded view and Parts List

1) Exploded View

■ GR-K13PBQ



Exploded view and Parts List



Exploded view and Parts List

2) Service Parts List

Location No.	Description	Part No.	Quantity
102A	LEG ASSY	4779JA3003B	2
103A	LEG ADJUST	4980JA3047A	2
200A	DOOR ASSY, L	3581JA8418Q	1
201A	DOOR FOAM ASSY, L	5433JA0057P	1
203A	GASKET ASSY, DOOR	4987JA2005C	1
230A	DOOR ASSY, R	3581JA8419Q	2
231A	DOOR FOAM ASSY, R	5433JA0055P	1
241A	BASKET, WIRE	5004JA0003A	1
243A	GUIDE, BASKET	4974JA2038A	1
248A	BANK ASSY	5075JA2012A	6
249A	COVER ASSY, BANK	3551JA8008A	6
249B	COVER BANK	3550JA1147A	6
249C	JOINT HANDLE	4402JA3002A	6
249D	COVER KNOB	3550JA3107A	6
249E	BANK	5074JA1021A	6
249H	RING, POT	4350JA3003A	6
249J	HANDLE	3650JA1082A	6
270A	COVER, HINGE DOOR	3550JA1157E	1
270B	COVER, HINGE DOOR	3550JA1157E	1
270C	COVER, HINGE CASE	3550JA2140D	4
271A	HINGE ASSY	4775JA2048D	4
304A	COVER BACK ASSY, M/C	3551JA1034C	1
307A	COMP ASSY	2521C-B5603	1
308A	PTC	6748C-0004D	1
309A	OLP	6750C-0004S	1
310A	COVER, PTC	3550JA2087B	1
312A	RUBBER, SEAT	5040JA3021A	4
314A	STOPPER	4J03277A	4
315A	COMP BASE ASSY	3103JA0009A	1
315B	ROLLER	3J02312A	2
315C	PIN	4J03238A	2
315D	BARRIER ASSY, BOTTOM	4791JA2003C	1
317A	DRIER ASSY	5851JA2005A	1
319C	BRACKER, MOTOR	4810JA1030A	1
323B	WIRE COND' ASSY	5403JA1034A	1
327A	RUBBER, MOTOR-N	J756-00008B	1

Exploded view and Parts List

Location No.	Description	Part No.	Quantity
329C	FAN ASSY	5901JA1007A	1
407A	CAPACITOR, R	0CZZJB2003F	1
408A	HOLDER CAPACITOR	4930JA2040A	1
411A	POWER CORD ASSY	6411JB2025C	1
420A	MOTOR, COOLING	4860JB1017Q	1
501A	PWB ASSY, MAIN	6871JB1090H	1
502B	CASE ASSY, PWB	3111JA2009A	1
503A	FRAME ASSY, DISPLAY	3211JA1012Z	1
503B	DISPLAY, PWB(L)	6871JB2033B	1
503C	DISPLAY, PWB(R)	6871JB2032B	1
503D	FRAME, DISPLAY	3210JA1025E	1
503E	DECO, CONTROL(G)	3806JD1039N	1
503F	DECO, PANEL(G)	3806JD1040E	1
604E	DEODORIZER	5986JA3006A	2
604G	COVER, DEODORIZER	3550JA2134A	2
618A	BRACKET, 3-WAY	4810JA3054A	1
619A	VALVE ASSY, 3-WAY	5221JB1001A	1
619B	VALVE, CHECK	5221JA3002A	1