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# LG GR-K30PS Owner's Manual

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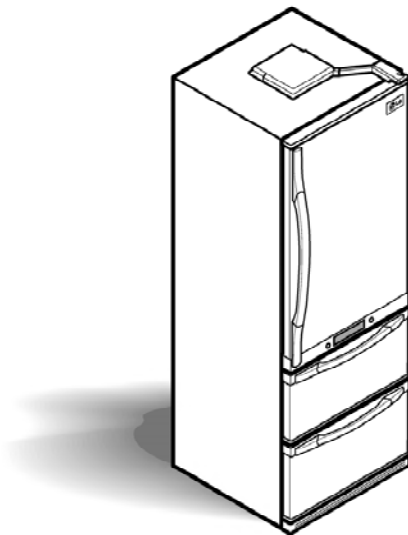
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# KIMCHI REFRIGERATOR

## SERVICE MANUAL

### CAUTION

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



MODEL : GR-K30\*\*

# SAFETY INSTRUCTIONS

1. Firstly check that there is electrical leakage in the main body of the product.
2. Perform work always after removing the power plugs in handling with the part where electricity conducts through.
3. Wear a rubber gloves(insulation gloves) for preventing electrical shock accident in case of testing with power on.
4. Always check rated current, voltage and capacity in using the instruments.
5. Exercise care so that water does not enter into electrical parts around the machine room.
6. Take care so that things should not fall down by removing them cleanly on the product when leaning the product forward or backward. Especially, take care of thin things (glass panels, books).
7. Ensure to consult the repair and maintenance center shop when the cold storage cycle is damaged (to prevent that gas inside of the cycle gets a room dirty).

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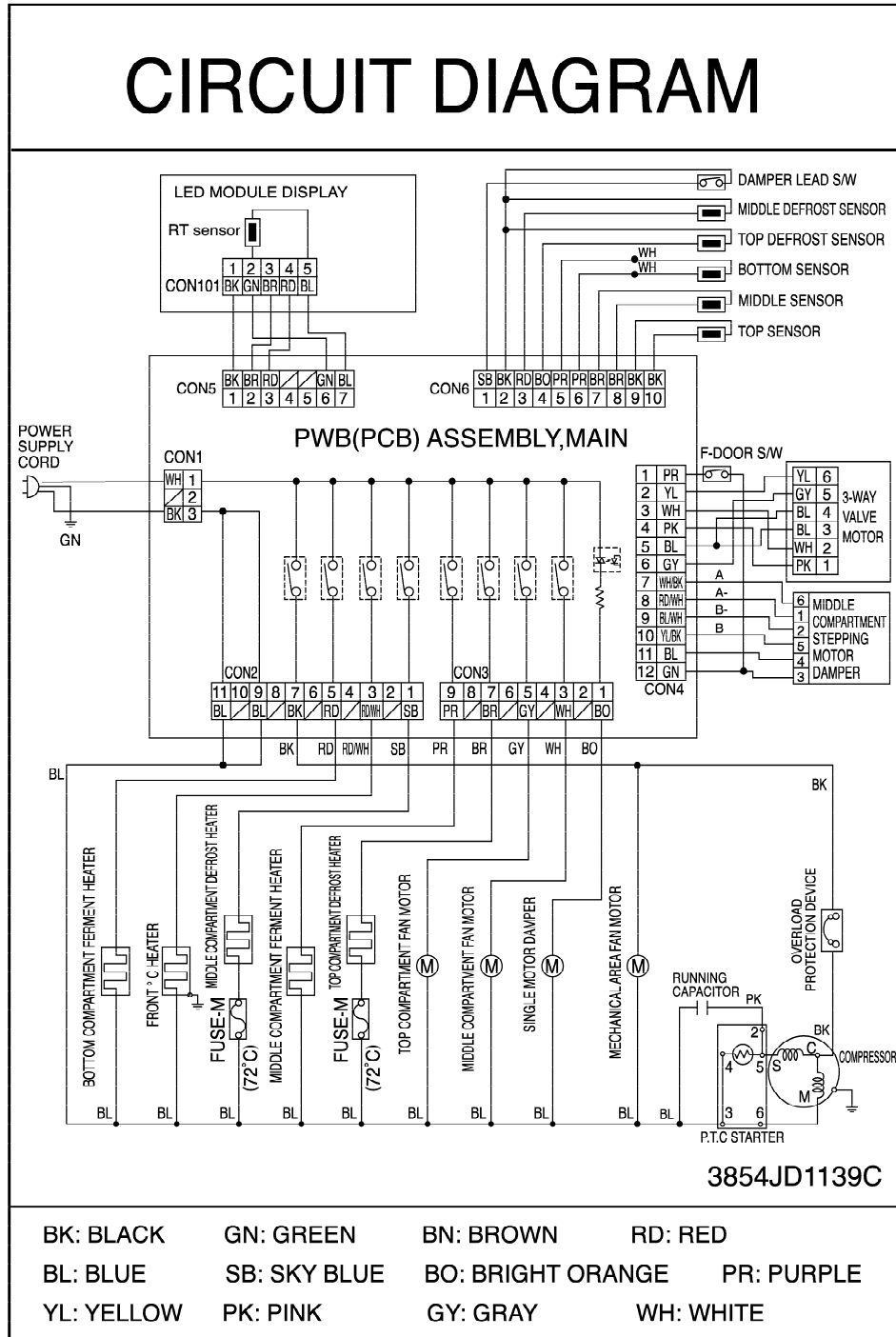
# 1. PRODUCT SPECIFICATIONS

## 1-1. GR-K30\*\*

ITEMS		SPEC
Rating		115V/60Hz
Capacity	Net Capacity	297 L
	Top Compartment	155 L
	Middle/Bottom Compartment	142 L
Dimensions (mm)		660(W) X 660(D) 1764(H)mm
Net Weight		100 Kg
Motor Power Consumption		138W
Cooling Method		Indirect Cooling System
Defrosting System	Method	Force
	Start	Automation
	End	Automation
	Evaporation	Force
Insulation		Light Polyurethane Foam
Evaporation Dish		1 EA (Behind)
Basket		2 EA
Storage Container		8 EA
Drawer		3 EA
Shelf		1 EA
Flap Door		1 EA
Low temperature Catalyst Deodorization		2 EA
Cooling Cycle	Compressor	LC62LBCM
	Evaporator of Top Compartment	Fin Tube Type
	Evaporator of Middle Compartment	Fin Tube Type
	Condenser 2 EA	Wire Condenser, Back Plate Condenser
	Refrigerant	R134a (160 g)
	Refrigerant Oil	α10G 310cc
Defrosting Device		Heater, Sheath

ITEMS		SPEC	
Electrical System Rating	P.T.C	P6R8MD	
	Overload Protector	4TM314TFB	
	Fan Motor(Top)	Ø110 Fan	
	Fan Motor(Middle)	Ø110 Fan	
	Condenser Cooling Fan Motor	Ø110 Fan	
	Defrosting Heater	Top	115 V 140 W
		Middle	115 V 180 W(Half wave 90 W)
	Front-C Heater	120 V(UL) 7 W	
	Fuse-M(Top)	Cutted at 70 °C	
	Fuse-M(Middle)	Cutted at 70 °C	
	Protection Fuse	250 V 9 A	
	Capacitor, R	14 $\mu$ F / 250Vac	

# 2. CIRCUIT DIAGRAM



# 3. MICOM FUNCTION AND EXPLANATIONS OF CIRCUITS

## 3-1. EXPLANATION OF FUNCTION

### 3-1-1. DISPLAY PART

(1) GR-K30\*\*



NOTCH	Cabbage/Radish/ Mul Kimchi			Vegetble/ Fruit			Light Freezing			Frozen Food				Chilled Food		
	Min	Mid	Max	Min	Mid	Max	Min	Mid	Max	Min	Mid	Max	Max	Min	Mid	Max
Temperature setting	1.0°C	-0.5°C	-2.0°C	4.5°C	3.5°C	2.5°C	-4.0°C	-5.0°C	-6.0°C	-15°C	-18°C	-21°C	-25°C	5.0°C	2.0°C	0.0°C

1. MICOM becomes "Lock" status in initial application of power, and the upper room is indicated as "Freezing Food." "Mid", the middle room as "Cabbage" "Mid", and the lower room as "Cabbage" "Mid".
2. MICOM maintains the previous display status in power failure and re-application of power. But in case of a power-shut or power reconnection during rhythm fermenting, the temperature returns to "Mid" for the applicable food type.
3. Buzzer sound neither ring ever pressing the button in "Lock" status, nor performs function.

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### 3-1-2. 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 "Store" button to change the storing temperature to "Mid" → "Max" → "Deep Frozen(only Upper Compartment)" → "Min" → "Mid". The food type changes from Upper: "Frozen Food" → "Chilled Food" → "Kimchi" → "Frozen Food" Middle: "CabbageKimchi" → "Mellow Kimchi" → "Mul Kimchi" → "vegetable/Fruit" → "Light Freezing" → "Cabbage Kimchi" Lower: "Cabbage Kimchi" → "Radish Kimchi" → "Mul Kimchi" → "Vegetable/Fruit" → "Cabbage kimchi" as the storing temperature changes from "Min" → "Mid".
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)

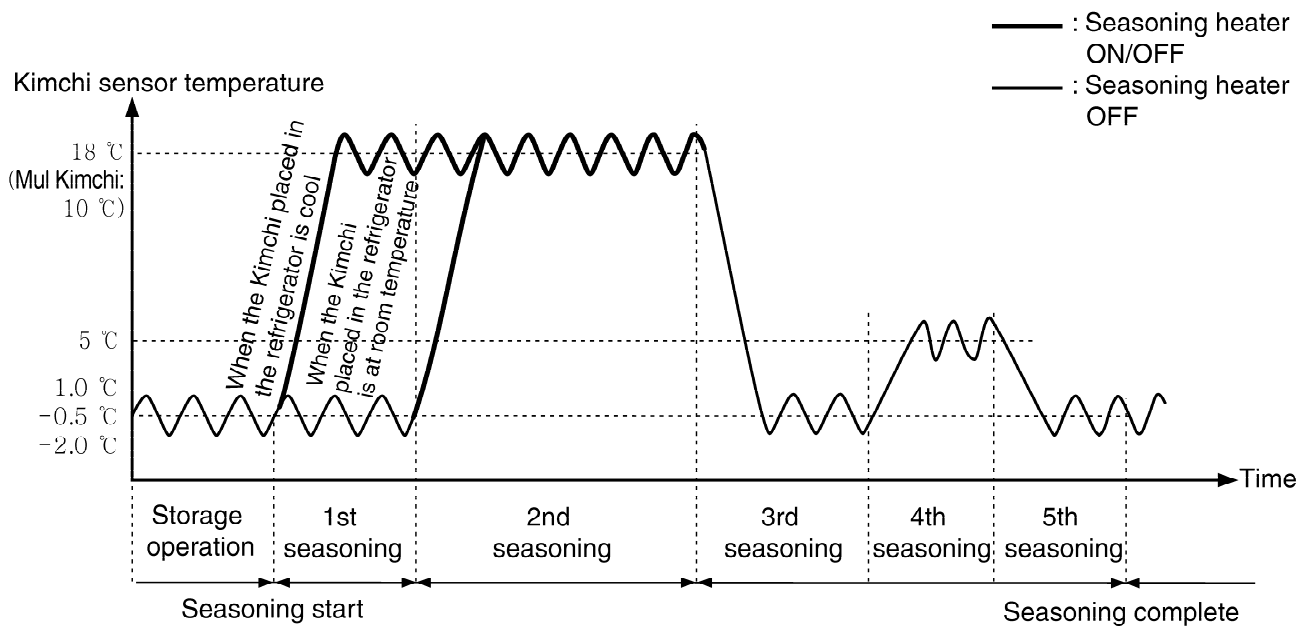
1. Press the "Lock/Unlock" button for more than 2 seconds to switch to "Unlock" status.
2. Press the "Ferment" button to change the seasoning stage to "Seasoning1" → "Seasoning2" → "Mature seasoning" → "땃속발효" → "Fresh seasoning1" → "Fresh seasoning2" → "Seasoning1". The food type changes from Middle: "Cabbage Kimchi" → "Mellow Kimchi" → "Mul Kimchi" → "Cabbage Kimchi" Lower: "Cabbage Kimchi" → "Radish Kimchi" → "Mul Kimchi" → "Cabbage Kimchi" as the seasoning degree changes from "Fresh seasoning2" → "Seasoning1".
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 the rhythm fermenting selection is completed, "Seasoning in process" LED will be on and when seasoning is done, the "Seasoning complete" LED will be on. And the storing temperature will automatically be 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. Press the "Store" button to select Cabbage Kimchi, Radish Kimchi or Mul Kimchi. (Flavor keeping function is only limited to Cabbage Kimchi, Radish Kimchi and Mul Kimchi.)
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.

### 3-1-3. 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.
4. If a failure occurs, such as a sensor error during seasoning, the storage will default to Cabbage Kimchi storage status.



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### **3-1-4. TEMPERATURE CONTROL AT UPPER, MIDDLE AND LOWER COMPARTMENT**

#### **(1) Temperature control at upper compartment**

1. Turn COMP, upper compartment fan motor depending on temperature of the upper compartment sensor and cool them by opening the 3-way valve to the upper compartment.
2. However, cooling of the upper compartment starts after cooling of the Middle/lower compartment is completed while the middle/lower compartment is cooling (Max 25 min).

#### **(2) Temperature control at middle/lower compartment**

1. Turn COMP, middle compartment fan motor depending on temperature of the middle/lower compartment sensor and cool them by opening the 3-way valve to the middle/lower compartment ,and opening the middle/lower damper.
2. However, cooling of the middle/lower compartment starts after cooling of the upper compartment is completed while the upper compartment is cooling (Max 35 min).

#### **(3) Operation conditions of COMP**

1. COMP turns on by the upper compartment sensor and lower compartment sensor.
2. COMP turns off by the upper compartment sensor, middle compartment sensor and lower compartment sensor.

#### **(4) Operation conditions of 3-way valve**

1. Open the upper, middle and lower compartment valve by the upper, middle or lower compartment sensor .
2. Perform operation for minimum 25 minutes (for 35 minutes at middle, lower compartment) upon request of “open” (unsatisfactory temperature) at the other side while COMP operates with the valve opened in one side, and then cutoff the valve to other side. In this case, immediately cutoff the valve if temperature is met even if 25 minutes (35 minutes for middle, lower compartment) have not passed.
3. In input of initial power, cool from the upper compartment where the upper compartment is Data Frz. (Deep Frz), Frz. when all upper/middle/lower compartment is not satisfactory, and firstly cool from the middle, lower compartment for the other case.

### **3-1-5. LOCK FUNCTION (DISPLAY BUTTON LOCK/UNLOCK)**

1. The “Lock” LED is turned on in the Lock status in application of refrigerator power.
2. Turn the “Unlock” LED by pressing the Lock/Unlock button for 2 seconds or more to allow operation of the display button.
3. Buzzer sound neither rings ever by pressing any button other than the Lock/Unlock button, nor performs function with the “Lock” LED turned on.
4. The “Lock” LED automatically turns on and becomes lock status unless operating the display button for more than a minute with the “Unlock” LED turned on.

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### 3-1-6. FRONT-C HEATER CONTROL

1. A heater for prevention of dewing is installed on the FRONT-C part between the middle compartment and the lower compartment, and turns on at the time of COMP ON and for 20 minutes after COMP OFF.
2. It turns off in the test mode (turn on after power off for normal operation).

### 3-1-7. BUZZER RINGING

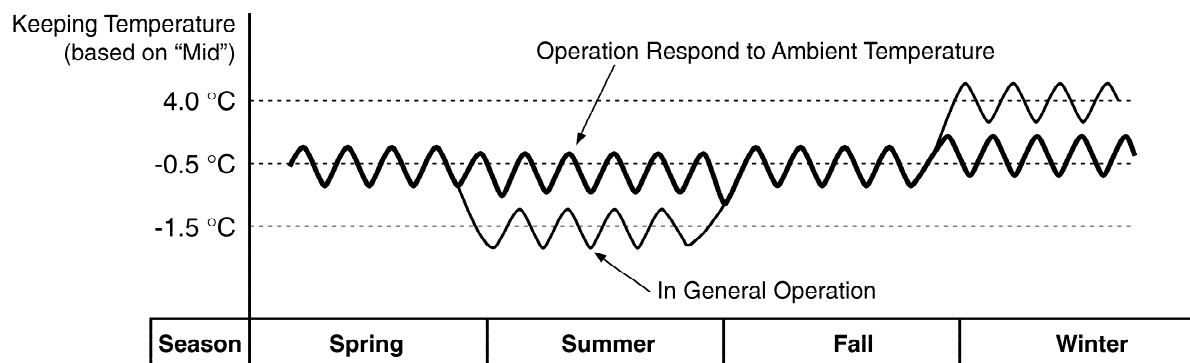
1. "Ding~Dong~" sound rings when pressing the front display button.
2. No buzzer rings if pressing the button not according to the operation order.

### 3-1-8. POWER FAILURE COMPENSATION FUNCTION

1. Previous operation is performed even applying power again after power failure. However, error status or test mode status is excluded.

### 3-1-9. OPERATION RESPOND TO AMBIENT TEMPERATURE

1. This is function of maintaining keeping temperature constantly irrespective of season by compensating for the in-refrigerator temperature through ambient temperature of the refrigerator to prevent that the in-refrigerator temperature changes according to ambient temperature (weak cold in winter, excess cold in summer).



### 3-1-10. DEFROSTING (REMOVAL OF FROST)

1. Defrosting is simultaneously performed by using the defrosting heater at the upper compartment and the middle compartment whenever sum of compressor operation time reaches to 6 hours.
2. Defrosting is started if sum of compressor operation time reaches to 4 hours in input of initial power (or in returning from power failure).
3. Complete defrosting function where defrosting sensor temperature of each room reaches to 7°C (16°C for GR-J213) for the upper compartment, 16°C for the middle compartment respectively, after starting defrost work.  
However, poor defrost is indicated if not reaching to 7°C (16°C for GR-J213) for the upper compartment, 16°C for the middle compartment respectively 2 hours after starting defrost (See 3-1-11 Failure Diagnosis Function).
4. Poor defrost is indicated if the defrosting sensor is poor, and defrosting of the relevant room is not done.

### 3-1-11. SEQUENTIAL OPERATION OF ELECTRICAL PARTS

Electrical parts such as COMP, defrosting heater at the upper & middle compartment, fan motor at the upper & middle compartment, single motor damper and FRONT-C heater sequentially operate as follows for preventing noise and damage of parts occurred by that various parts operate at the same time in input of initial power on and after test closing (including temporary power failure, either):

Function	Operation Sequence	Remarks
<p>When defrosting sensor temperature at the upper compartment is more than 45°C (In purchasing, movement)</p>		
<p>In initial power on</p> <p>When defrosting sensor temperature at the upper compartment is less than 45°C (In power failure, service)</p>		<p>No initial operation is done if error occurs during operation.</p>

### 3-1-12. FAILURE DIAGNOSIS FUNCTION

#### (1) Failure Mode

1. Failure diagnosis function is intended in order that service is easily done when failure to affect performance of the product during use occurs.
2. Function is neither done, nor buzzer sound rings even when pressing the button in occurrence of failure.
3. The product returns to normal operation if failure is released during display of failure code in occurrence of failure (RESET).
4. LEDs other than failure code turn off in occurrence of failure.



NO	Item	Failure Display (Food LED) F1 F2 F3 F4 F5	Failures	Remarks
1	Failure of upper compartment (K1) sensor	F5	Upper compartment sensor is disconnected or shorted	* Check wiring of respective relevant sensor.
2	Failure of middle compartment (K2) sensor	U5	Middle compartment sensor is disconnected or shorted	
3	Failure of lower compartment (K3) sensor	L5	Lower compartment sensor is disconnected or shorted	
4	Failure of upper compartment defrosting sensor	d1	Upper compartment defrosting sensor is disconnected or shorted	
5	Failure of middle compartment defrosting sensor	d2	Middle compartment defrosting sensor is disconnected or shorted	
6	sensor Failure of ambient temperature sensor	Note 1)	Ambient temperature sensor is disconnected or shorted	
7	Failure of single motor damper	dP	When ON/OFF of the reed-S/W is not detected even when driving the single motor damper for 2 minutes	Damper motor damaged, frozen, coil damaged, driving IC(photo coupler) failure
8	Poor defrosting at upper compartment	H1	When defrosting sensor at the upper compartment does not reach to more than 7°C even when two hours have passed after starting defrost	Short of temperature fuse, short of heater, clogging of drain, poor heater driving relay
9	Poor defrosting at middle compartment	H2	When defrost sensor at the middle compartment does not reach to more than 16°C even when two hours have passed after starting defrost	Short of temperature fuse, short of heater, clogging of drain, poor heater driving relay
10	Poor communication	CO	When no communication is consecutively done for 30 seconds	Taking out of connector, Poor TR on communication part

Note 1) All LEDs except for failure display LED (F1, F2, F3, F4, F5) turn on if simultaneously pressing both upper "Store" button and middle "Store" button for a second where poor ambient temperature sensor exists.

(2) Load Operation in Failure

NO	ITEM	Classification								
		COMP	UPPER COMPARTMENT FAN	MIDDLE COMPARTMENT FAN	DEFROSTING HEATER OF UPPER COMPARTMENT	DEFROSTING HEATER OF MIDDLE COMPARTMENT	STEPPING MOTOR DAMPER	SINGLE MOTOR DAMPER	3-WAY VALVE	FRONT-C HEATER
1	Normal	○	○	○	○	○	○	○		
2	Failure of Upper compartment (K1) sensor	15 min ON/ 15 min OFF	○	○	○	○	○	○		
3	Failure of Middle compartment (K1) sensor	○	○	○	○	○	○	15 min OPEN/ 15 min CLOSE	○	
4	Failure of Upper compartment (K1) sensor	○	○	○	○	○	○	○	10 min OPEN/ 15 min CLOSE	
5	Failure of Upper compartment defrosting sensor	○	○	○	Don't defrost (immediately return)	○	○	○	○	
6	Failure of Middle compartment defrosting sensor	○	○	○	○	Don't defrost (immediately return)	○	○	○	
7	Failure of ambient Temperature sensor	○	○	○	○	○	○	(No compensation of ambient temperature)	(No compensation of ambient temperature)	
8	Poor defrosting at upper compartment	○	○	○	○	○	○	○	○	
9	Poor defrosting at middle compartment	○	○	○	○	○	○	○	○	
10	Failure of single motor damper	○	○	○	○	○	○	○	○	Perform normal initialization by checking operation in the cycle of 1 hour
11	Poor communication	○	○	○	○	○	○	○	○	

○  
(Linked with COMP. However, FRONT-C heater turns off for 15 minutes and turn on again if the heater turn on time continues for more than 40 minutes)

### 3-1-13. TEST FUNCTION

1. Test function is intended to check function of PCB and the product and find a failure part with failure status.
2. The test S/W exists on the main PCB, and ends the test mode after 2 hours irrespective of the test mode, and then returns to normal status.
3. Function button is neither detected, nor button recognition sound comes out during the test mode.
4. Ensure to take the power cords out in completion of the test mode so that normal status will be arrived.
5. Release the test mode and display the failure mode if failure such as sensor failure during the test mode.
6. No test mode is performed even when pressing the test button during display of failure code.

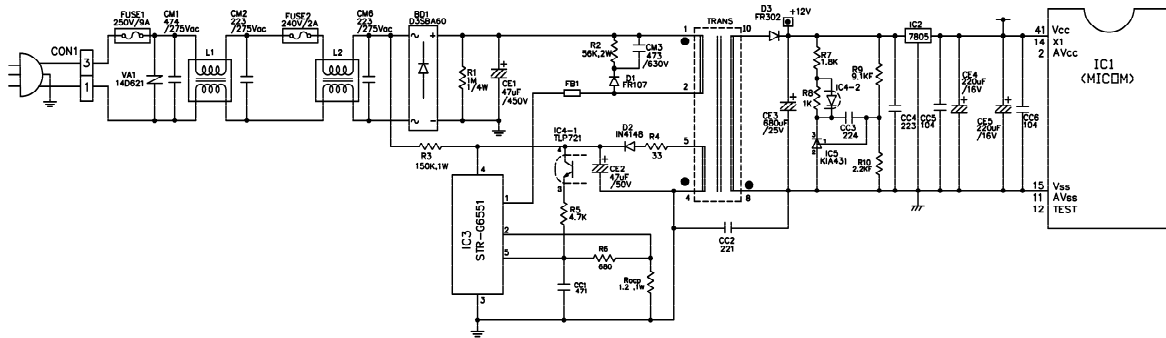
MODE	OPERATION	DETAILS	REMARKS
TEST1	Press the test S/W once	<ol style="list-style-type: none"> <li>1. COMP (* Fan motor at machine room) ON</li> <li>2. Defrost heater OFF at upper, middle compartment.</li> <li>3. FRONT-C heater OFF</li> <li>4. Fan motor at upper/middle compartment, damper at middle/lower compartment and 3-way valve operates to cool the upper/middle&amp;lower compartment in interval of 16/24 minute.</li> <li>5. For display, the only "Min" LED of the upper room turns on.</li> </ol>	Returns to normal status when maximum 2 hours have passed.
TEST2	Press the test S/W once in the test mode 1	<ol style="list-style-type: none"> <li>1. COMP (* Fan motor at machine room) OFF</li> <li>2. Fan motor OFF at upper, middle compartment</li> <li>3. Defrost heater ON at upper, middle compartment</li> <li>4. FRONT-C heater ON</li> <li>5. All dampers at middle, lower compartment are closed.</li> <li>6. 3-way valve maintains previous status.</li> <li>7. For display, the only "MIN" LED of the upper room turns on.</li> </ol>	Defrost sensor at the upper compartment performs initialization at more than 7 °C, and middle defrost sensor at more than 16 °C (COMP delay for 7 minutes)
Normal status	Press the test S/W 3 times in the test mode 2	Returns to initial status	COMP operates after delay for 7 minutes

- LED check function  
All LEDs turn on if pressing both upper "Store" button and middle "Store" button at the same time for 1 second or more, and display the previous status if releasing the button.
- FRONT-C Heater touching inspection mode  
The FRONT-C heater consecutively turns on for 5 minutes and is then released if pressing both upper "Store" button and lower "Ferment" button for 5 seconds or more. It is released if pressing them again for 5 seconds or more.
  - Release check: LED on the remainder time display part of the lower compartment turns on with pressing for 5 seconds or more.
  - Input check: LED on the flavor keeping part turns on with pressing for 5 seconds or more.

### 3-2. EXPLANATION OF CIRCUITS

#### 3-2-1. POWER CIRCUIT

Power circuits consist of SMPS (Switching Mode Power Supply) power, and the SMPS consists of the rectification part (BD1, CE1) to convert AC voltage to DC voltage, the switching part (IC3) to switch the converted DC voltage, a transformer to transfer energy of the primary side on the switching terminal, secondary side power to supply power to the MICOM and IC and the feed back part (IC4, IC5) to feedback the secondary side voltage to the primary side of transformer in order to maintain it uniformly.



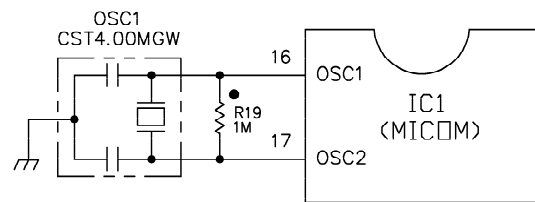
**Caution.:** Take a measure after more than 3 minutes have passed after removing the power cords in abnormal operation of circuits since high voltage (DC310V) is maintained at the power terminal. Otherwise, it may cause electric shock.

Part	Both ends of VA1	Both ends of CE1	Both ends of CE2	Both ends of CE3	Both ends of CE4
Voltage	220 Vac	310 Vdc	16 Vdc	12.5 Vdc	5 Vdc

Voltage of each part is as follows:

#### 3-2-2. OSCILLATION CIRCUIT

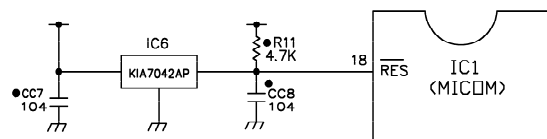
Oscillation circuits are intended to generate clock for synchronization for information transmission/receipt of logic elements inside of the IC1 (MICOM) and generate basic time for time calculation. Rated parts must be used since the OSC1 does not operate or time calculated at the IC1 changes where SPEC changes.



#### 3-2-3. RESET CIRCUIT

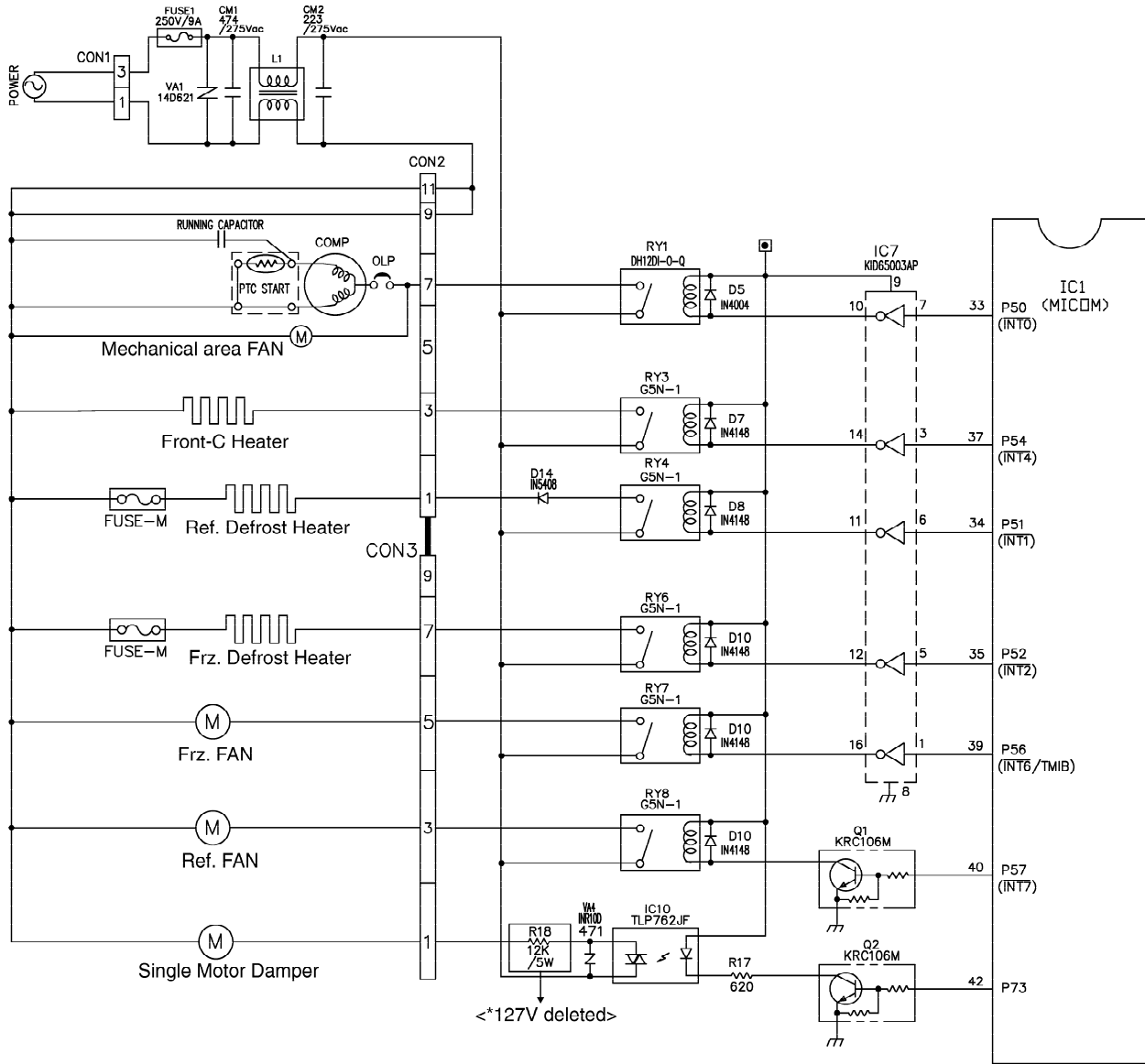
The reset circuits are intended so that the whole of function is started at the initial status by initializing various parts such as ram inside of the MICOM (IC1) when power is applied to MICOM again in input of initial power or by temporary power failure. "LOW" voltage is applied to the reset terminal of MICOM for the fixed time (10ms) at the start of power input.

During general operation, the reset terminal is at 5V (No MICOM operates in case of poor reset IC).



### 3-2-4. LOAD/BUZZER DRIVE CRICUIT

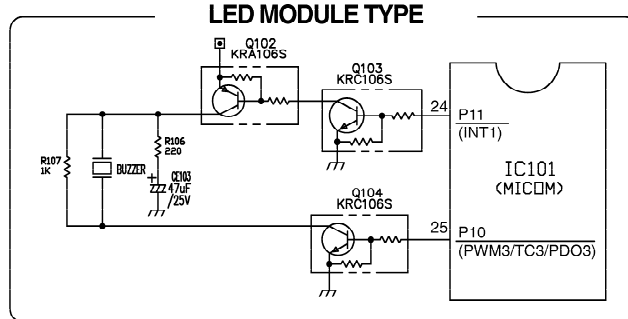
#### (1) Load Drive Circuit



Type of Load	COMP, Mechanical Area FAN	UPPER FAN MOTOR	UPPER DEFROST HEATER	MIDDLE FAN MOTOR	MIDDLE DEFROST HEATER	SINGLE MOTOR DAMPER	FRONT-C HEATER
Measuring Point(IC7)	No.10	No.16	No.12	Q1 Collector	No.11	Q2 Colletor	No.14
Status	ON	Within 1V					
	OFF	11 ~ 13 V					

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

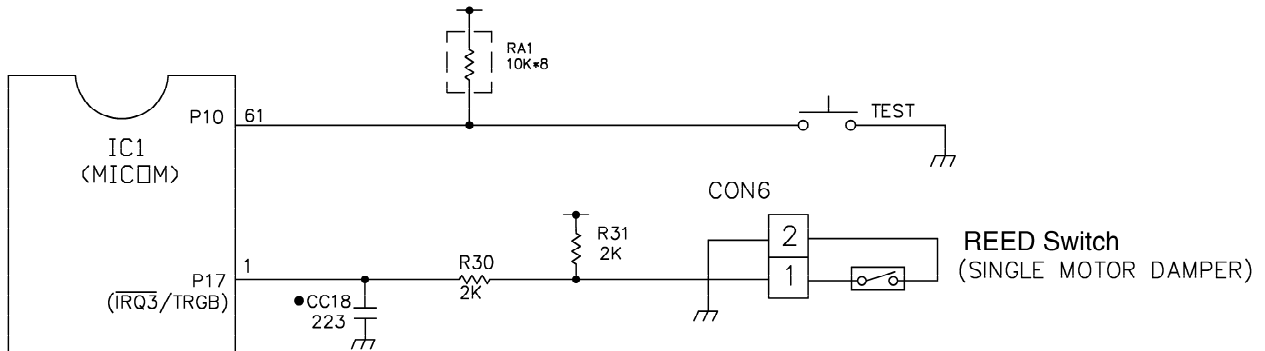
※ Only the buzzer sound for the Lock/Unlock operation is shown in this SVC technical manual.



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

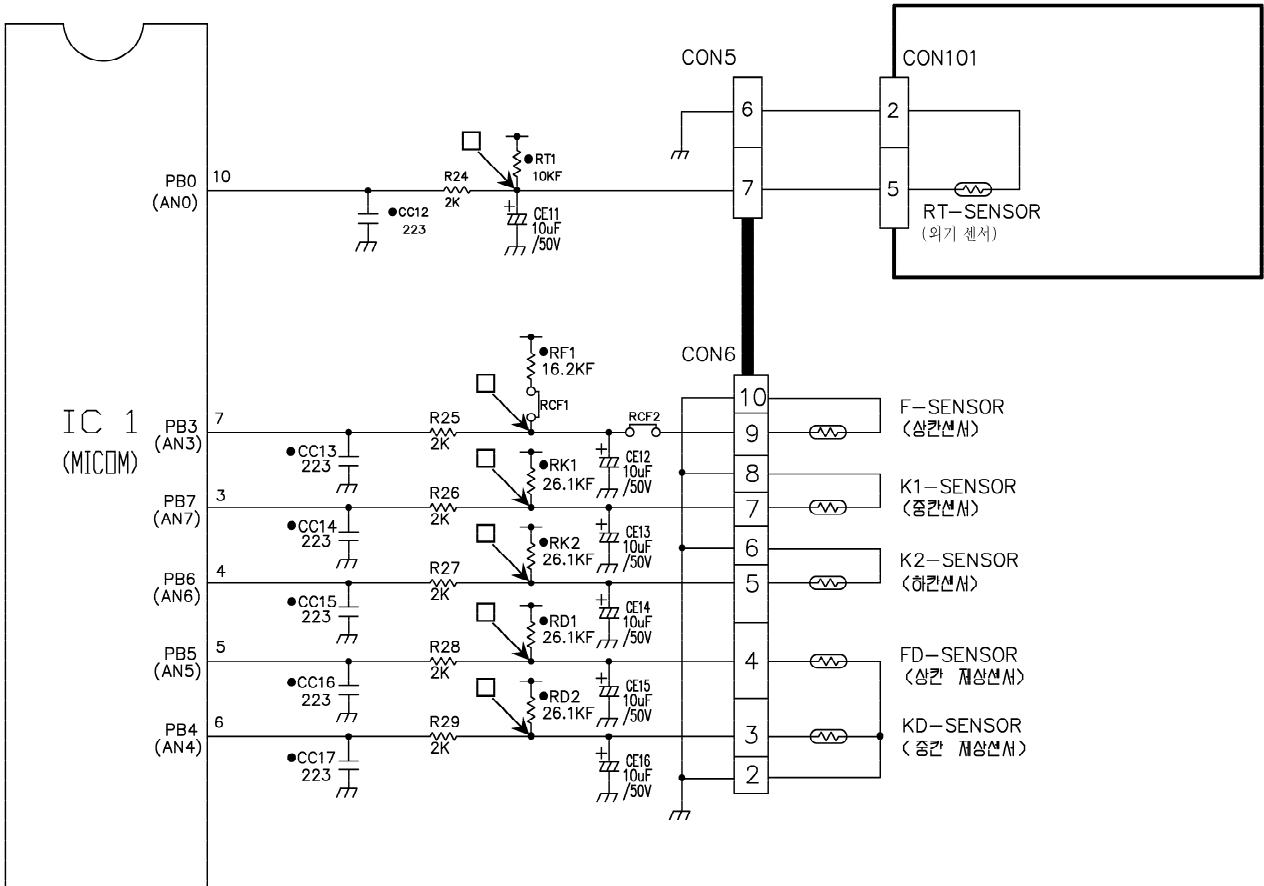
**3-2-5. SWITCH INPUT CIRCUIT**

Following circuits are input circuits for detecting signal of the test switch for checking refrigerator or the reed switch of the single motor damper.



### 3-2-6. TEMPERATURE SENSING CIRCUIT

PWB(PCB) ASSEMBLY,DISPLAY  
(LED:6871JB1400, LCD:6871JB1399)

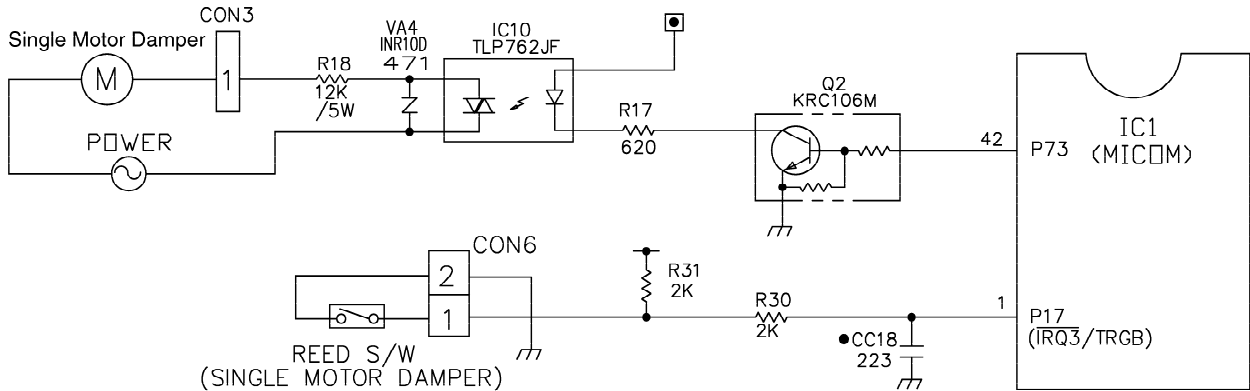


Above circuits consist of the upper sensor, middle sensor, lower sensor for adjusting setup temperature at the upper, middle and lower compartment, the ambient temperature sensor to detect ambient air temperature, the upper defrost sensor and the middle defrost sensor attached to the evaporator at the upper, middle compartment to detect the defrost return temperature. Status in short or open are as follows:

Sensor	Check points	Normal (-30 °C ~ 50 °C)	In Short	In Open
Ambient temp. Sensor	POINT □ Voltage	0.5V ~ 4.5V	0V	5V
Upper Sensor	POINT □ Voltage			
Middle Sensor	POINT □ Voltage			
Lower Sensor	POINT □ Voltage			
Upper Defrost Sensor	POINT □ Voltage			
Middle Defrost Sensor	POINT □ Voltage			

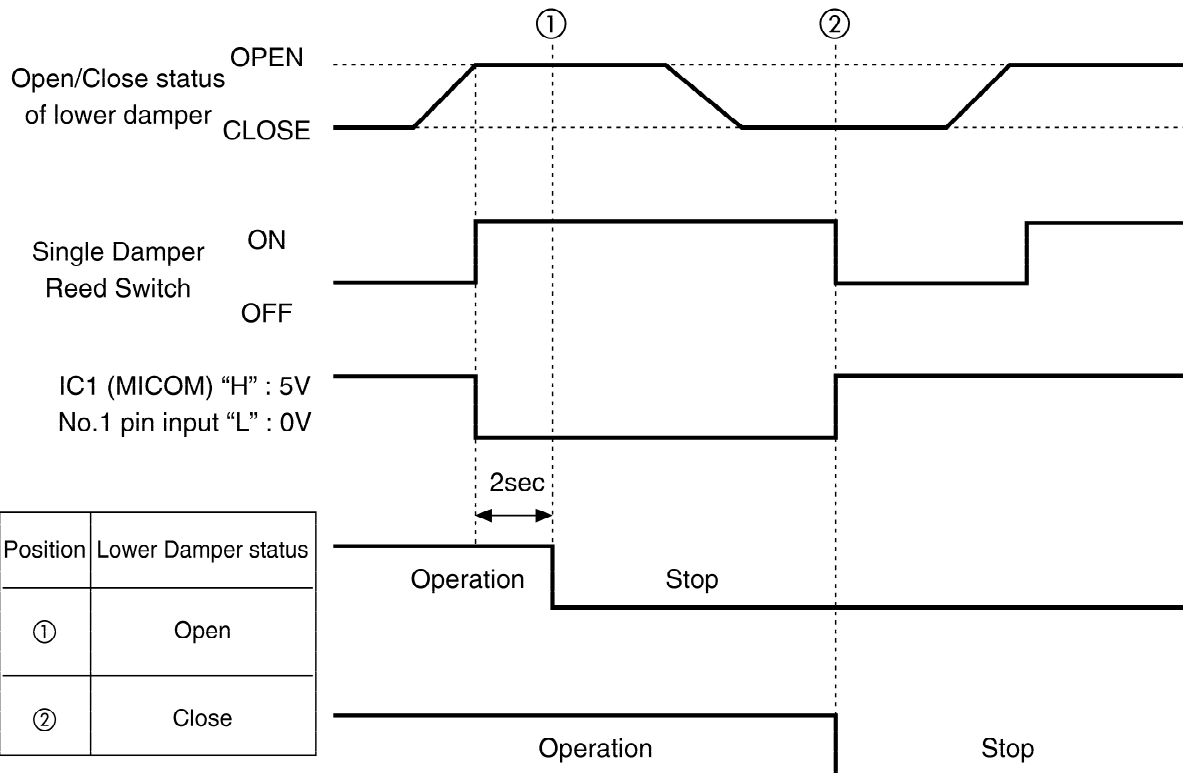
### 3-2-7. TEMPERATURE SENSING CIRCUIT

1. Temperature adjustment at the lower compartment consists of the circuit part for driving the damper, as electronic single motor damper, to open or close the baffle and the reed switch part to detect open/close status of the damper.
2. Drives the motor, and if there is no status change of the reed switch within 2 minutes, determines it as failure and displays as failure (See 3-1-11. Failure Diagnosis Function).
3. Rotates once for 15 seconds irrespective of temperature to detect damper status in input of initial power (initial drive inspection).



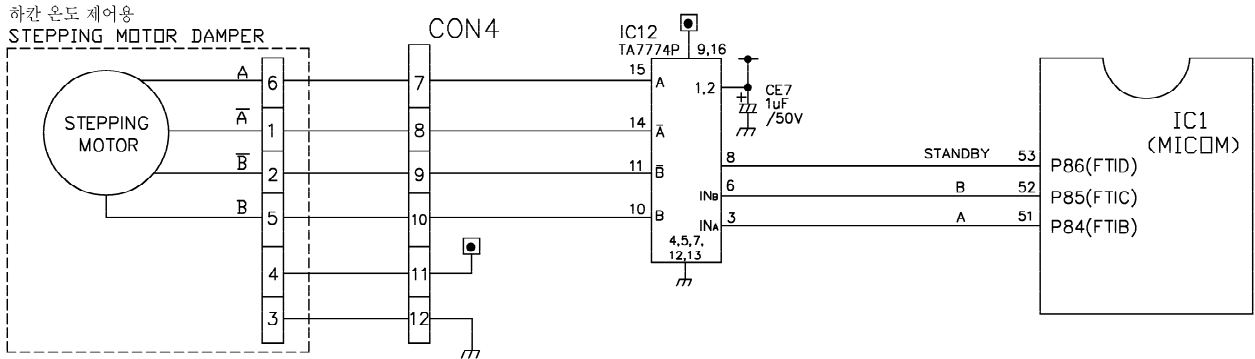
4. Open/Close of the damper, status of the reed switch and No.1 pin input of the IC1 (MICOM) are as follows:

#### <SINGLE MOTOR DAMPER>



► The above time is time until the single motor stops after status change of the reed switch.

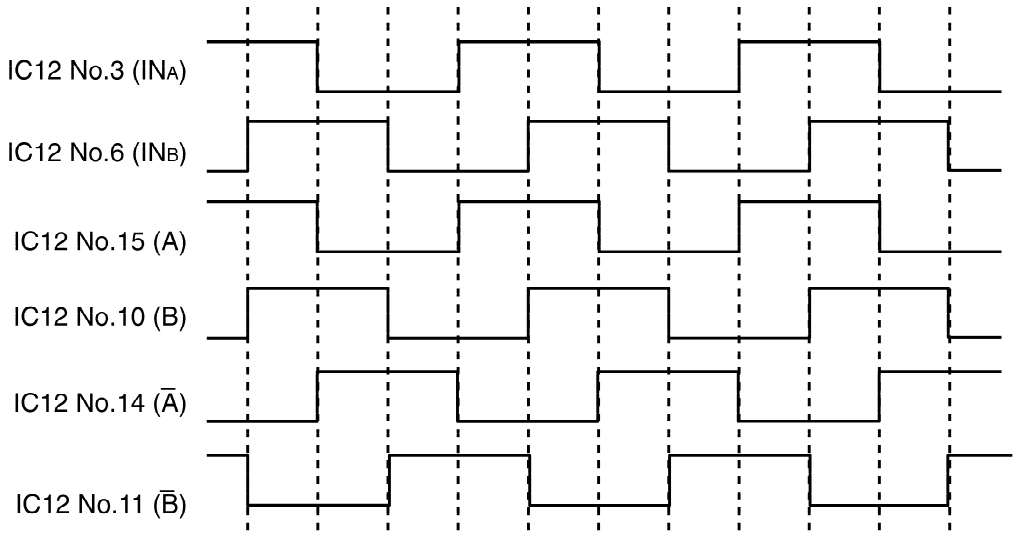
**3-2-8. STEPPING MOTOR DAMPER DRIVE CIRCUIT (FOR TEMPERATURE CONTROL AT MIDDLE COMPARTMENT)**



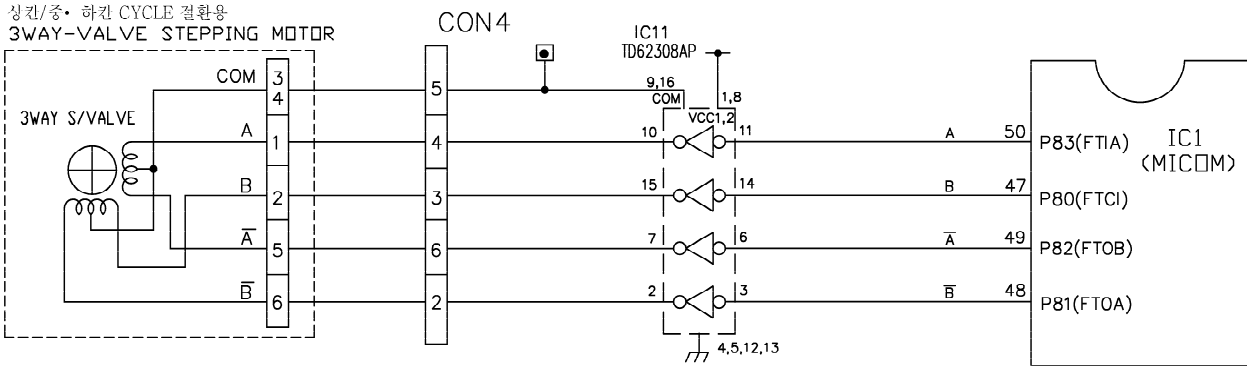
As for motor drive, the motor rotates since rotation magnetic force is formed at coils wound around each phase of the motor and the stator if outputting "High" "Low" signal as much as the fixed step numbers through the MICOM pin 51 and pin 52 after applying "High" signal to the IC 12 (TA7774P) from the MICOM pin 53.

Explanation) For driving method of the motor, send signal in the cycle of 3.33ms by using the terminal of the MICOM PIN53, 52 and 51 as shown in waveform of each part below. This signal is output to the output terminal No.10, 11, 14, 15 via the input terminal No.3, 6, 8 of the IC12 (TA7774P) as IC for motor drive. The motor rotates by which motor coils wound around each phase of the stator forms rotation magnetic field. The stepping motor damper rotates by which motor coils wound around each phase of the stator forms rotation magnetic field if inputting as figure to the input part (No.3 INA, No.6 INB) of the IC12 (TA7774P) for motor drive.

CCW (reverse rotation) ← ————— → CW (positive rotation)



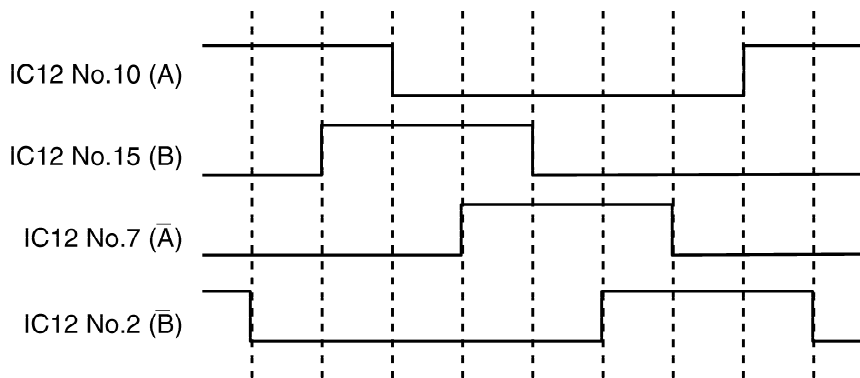
### 3-2-9. 3-WAY VALVE STEPPING MOTOR DRIVE CIRCUIT (FOR SWITCHING UPPER/MIDDLE/LOWER COMPARTMENT CYCLE)



As for motor drive, the motor rotates since rotation magnetic force is formed at coils wound around each phase of the motor and the stator via the IC11 (TD62308AP) as IC for motor drive if outputting “High” “Low” signal as much as the fixed step numbers from the MICOM pin 50, 47 and 48.

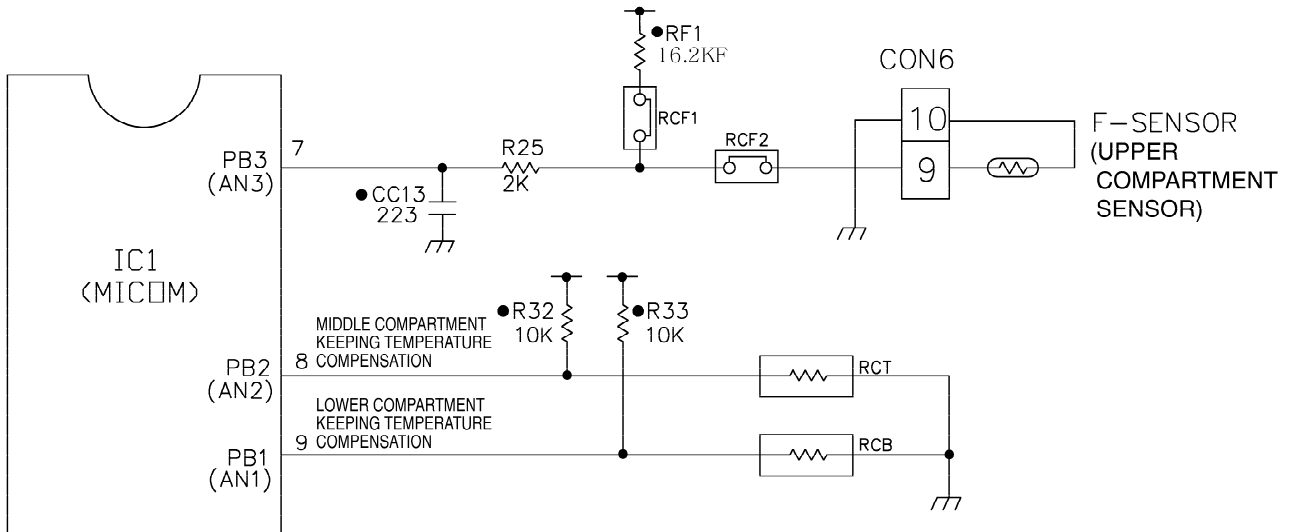
Explanation) For driving method of the motor, send signal in the cycle of 30ms by using the terminal of the MICOM PIN 50, 47, 49 and 48 as shown in waveform of each part below. This signal is output to the output terminal No.10, 15, 7, 2 via the input terminal No.11, 14, 6, 3 of the IC11 (TD62308AP) as IC for motor drive. The motor rotates by which motor coils wound around each phase of the stator forms rotation magnetic field.

CW (positive rotation) ← ————— → CCW (reverse rotation)



### 3-2-10. KEEPING TEMPERATURE COMPENSATION AND TOO COLD/ TOO WARM CUT COMPENSATION CIRCUIT

#### (1) Keeping Temperature Compensation Circuit



► This circuit is used for entering the required level of temperature compensation into MICOM to adjust keeping temperature at the upper, middle and lower compartment.

Upper Compartment		Temperature Compensation	Middle/Lower Compartment		Remarks
Resistance Value	Temperature Compensation		Resistance Value	Temperature Compensation	
RCF1	RCF2		RCT(Middle)	RCB(Lower)	
	6.2 KΩ	+2.5 °C	180 KΩ		↑ warmer
	5.1 KΩ	+2.0 °C	56 KΩ		
	3 KΩ	+1.5 °C	33 KΩ		
	2.4 KΩ	+1.0 °C	18 KΩ		
	1.2 KΩ	+0.5 °C	12 KΩ		
		0 °C	10 KΩ		Standard temperature
620 Ω		-0.5 °C	8.2 KΩ		↓ Cooler
1.2 KΩ		-1.0 °C	5.6 KΩ		
1.8 KΩ		-1.5 °C	3.3 KΩ		
2.4 KΩ		-2.0 °C	2 KΩ		
3 KΩ		-2.5 °C	470 Ω		

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

Ex) Temperature at the middle compartment increases by +1°C if changing compensation resistance at the middle compartment (RCT) from 10K (current resistance) to 18K (corrected resistance).

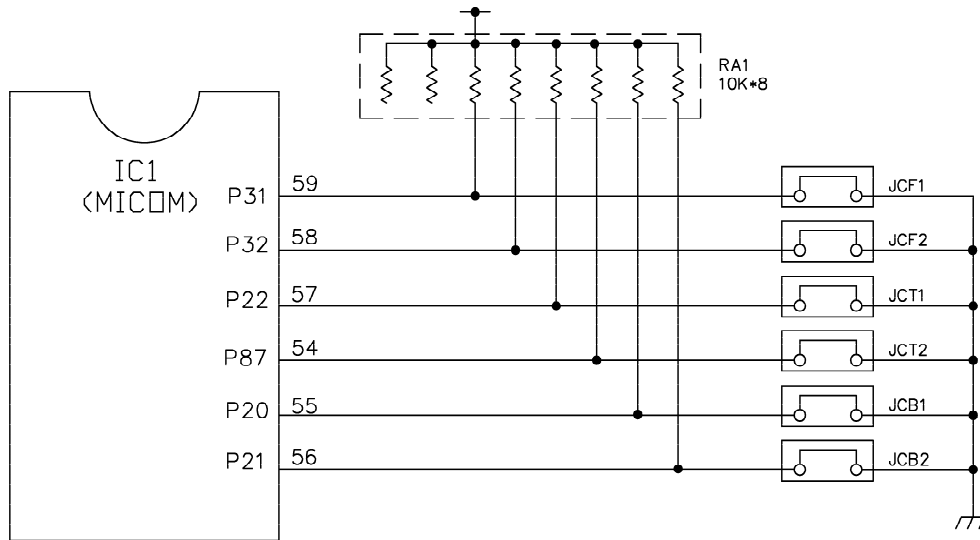
► Temperature compensation table at the upper compartment is as follows:

Division	Modification	RCF1:3 K $\Omega$	RCF1:2.4 K $\Omega$	RCF1:1.8 K $\Omega$	RCF1:1.2 K $\Omega$	RCF1:620 $\Omega$	RCF1:500 $\Omega$	RCF1:400 $\Omega$	RCF1:300 $\Omega$	RCF1:200 $\Omega$	RCF1:150 $\Omega$	RCF1:100 $\Omega$
	Current	RCF2:500 $\Omega$	RCF2:500 $\Omega$	RCF2:500 $\Omega$	RCF2:500 $\Omega$	RCF2:500 $\Omega$	RCF2:500 $\Omega$	RCF2:1.2 K $\Omega$	RCF2:2.4 K $\Omega$	RCF2:3 K $\Omega$	RCF2:5.1 K $\Omega$	RCF2:6.2 K $\Omega$
Upper Compartment (RCF1, RCF2)	RCF1:3 K $\Omega$ RCF2:500 $\Omega$	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	5 °C up
	RCF1:2.4 K $\Omega$ RCF2:500 $\Omega$	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
	RCF1:1.8 K $\Omega$ RCF2:500 $\Omega$	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
	RCF1:1.2 K $\Omega$ RCF2:500 $\Omega$	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
	RCF1:620 $\Omega$ RCF2:500 $\Omega$	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
	RCF1:500 $\Omega$ RCF2:500 $\Omega$	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
	RCF1:500 $\Omega$ RCF2:1.2 K $\Omega$	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
	RCF1:500 $\Omega$ RCF2:2.4 K $\Omega$	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
	RCF1:500 $\Omega$ RCF2:3 K $\Omega$	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
	RCF1:500 $\Omega$ RCF2:5.1 K $\Omega$	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
RCF1:500 $\Omega$ RCF2:6.2 K $\Omega$	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	

► Temperature compensation table at the middle/ lower compartment is as follows:

Division	Modification	470 $\Omega$	2 K $\Omega$	3.3 K $\Omega$	5.6 K $\Omega$	8.2 K $\Omega$	10 K $\Omega$	12 K $\Omega$	18 K $\Omega$	33 K $\Omega$	56 K $\Omega$	180 K $\Omega$
	Current											
Middle Compartment (RCT)	470 $\Omega$	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	5 °C up
	2 K $\Omega$	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 K $\Omega$	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 K $\Omega$	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 K $\Omega$	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
-----	10 K $\Omega$	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
Lower Compartment (RCB)	12 K $\Omega$	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 K $\Omega$	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 K $\Omega$	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 K $\Omega$	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 K $\Omega$	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

(2) Too Cold/Too Warm Cut Compensation Circuit.



Upper compartment cut compensation		Upper compartment temperature compensation value		Middle compartment cut compensation		Middle compartment temperature compensation value	Lower compartment cut compensation		Lower compartment temperature compensation value
Too cold compensation	Too warm compensation	Frozen Food	The others	Too cold compensation	Too warm compensation		Too cold compensation	Too warm compensation	
JCF1	JCF2			JCT1	JCT2		JCB1	JCB2	
CUT		+2 °C	+1 °C	CUT		+1 °C	CUT		+1 °C
	CUT	-2 °C	-1 °C		CUT	-1 °C		CUT	-1 °C
CUT	CUT	0 °C	0 °C	CUT	CUT	0 °C	CUT	CUT	0 °C
		0 °C (When shipping from factory)				0 °C (When shipping from factory)			0 °C (When shipping from factory)

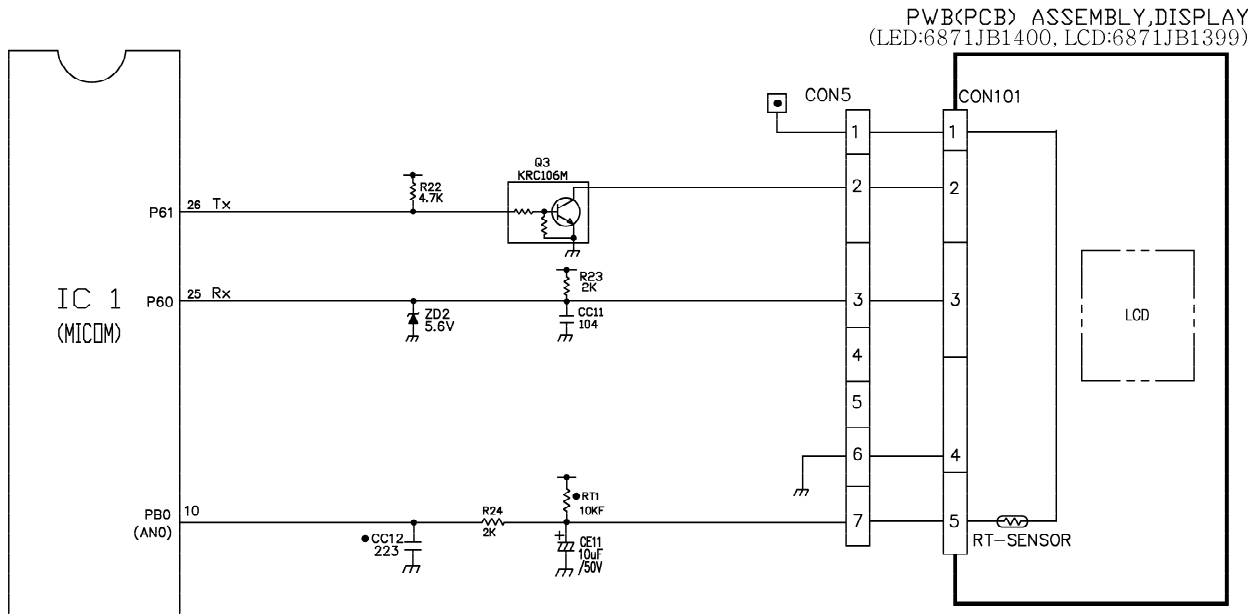
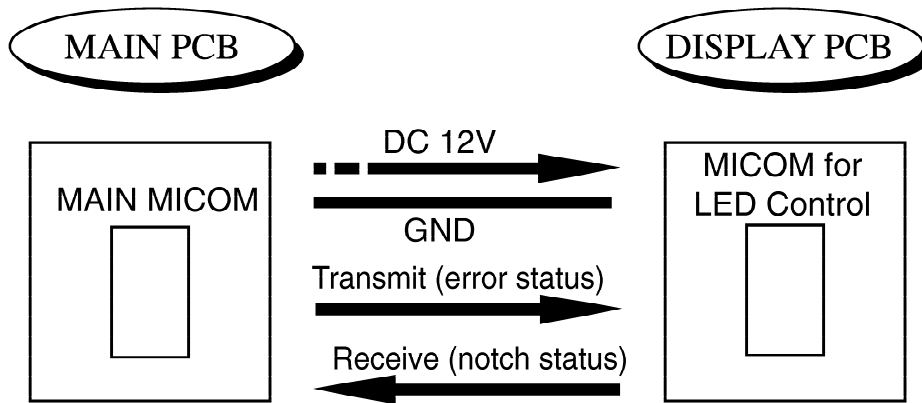
► The cut compensation circuit compensates the keeping temperature of the upper/middle/lower compartment by simply cutting it out of service for a brief period.

### 3-2-11. COMMUNICATION CIRCUIT BETWEEN MAIN PCB AND DISPLAY PCB

Following circuits as communication circuits are circuits for changing necessary information between the main MICOM of the main PCB and the MICOM for LED control of the display PCB.

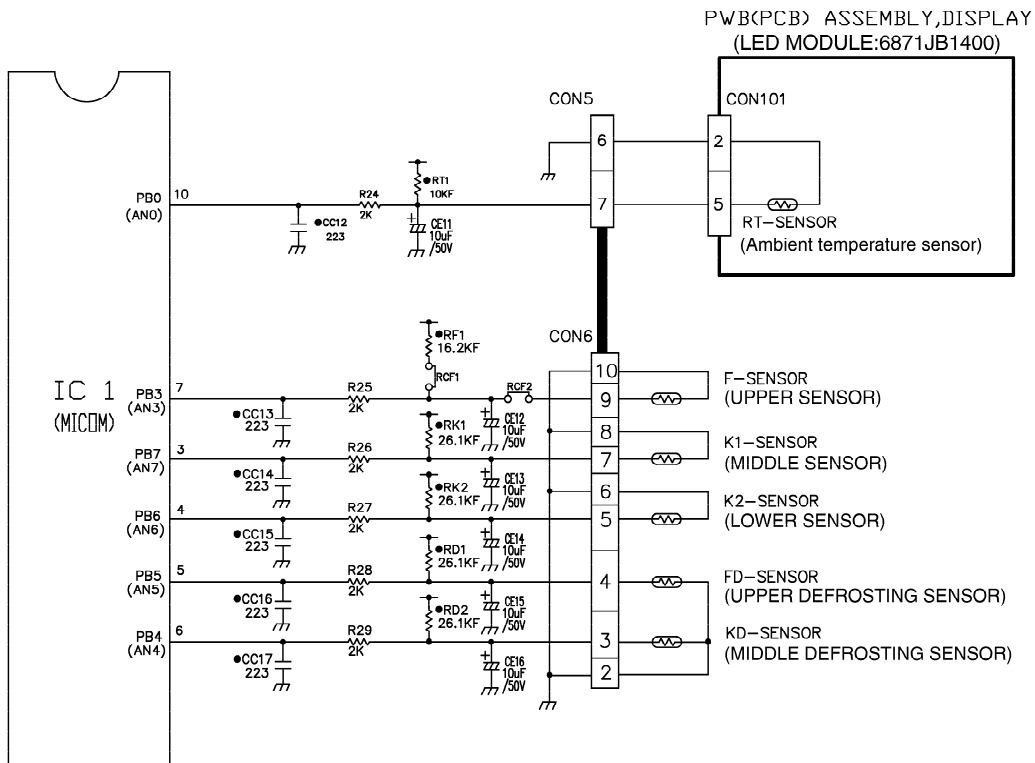
DC12V for driving the display PCB, transmit/receive circuits are required.

Poor communication occurs where continuing information change between the main MICOM of the main PCB and the MICOM for LED control of the display PCB is not done for more than 30 seconds.



### 3-3. SENSOR RESISTANCE CHARACTERISTICS TABLE

Measuring Temperature(°C)	Upper/Middle/Lower sensors, RT sensor, Upper/Middle defrosting sensors
-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

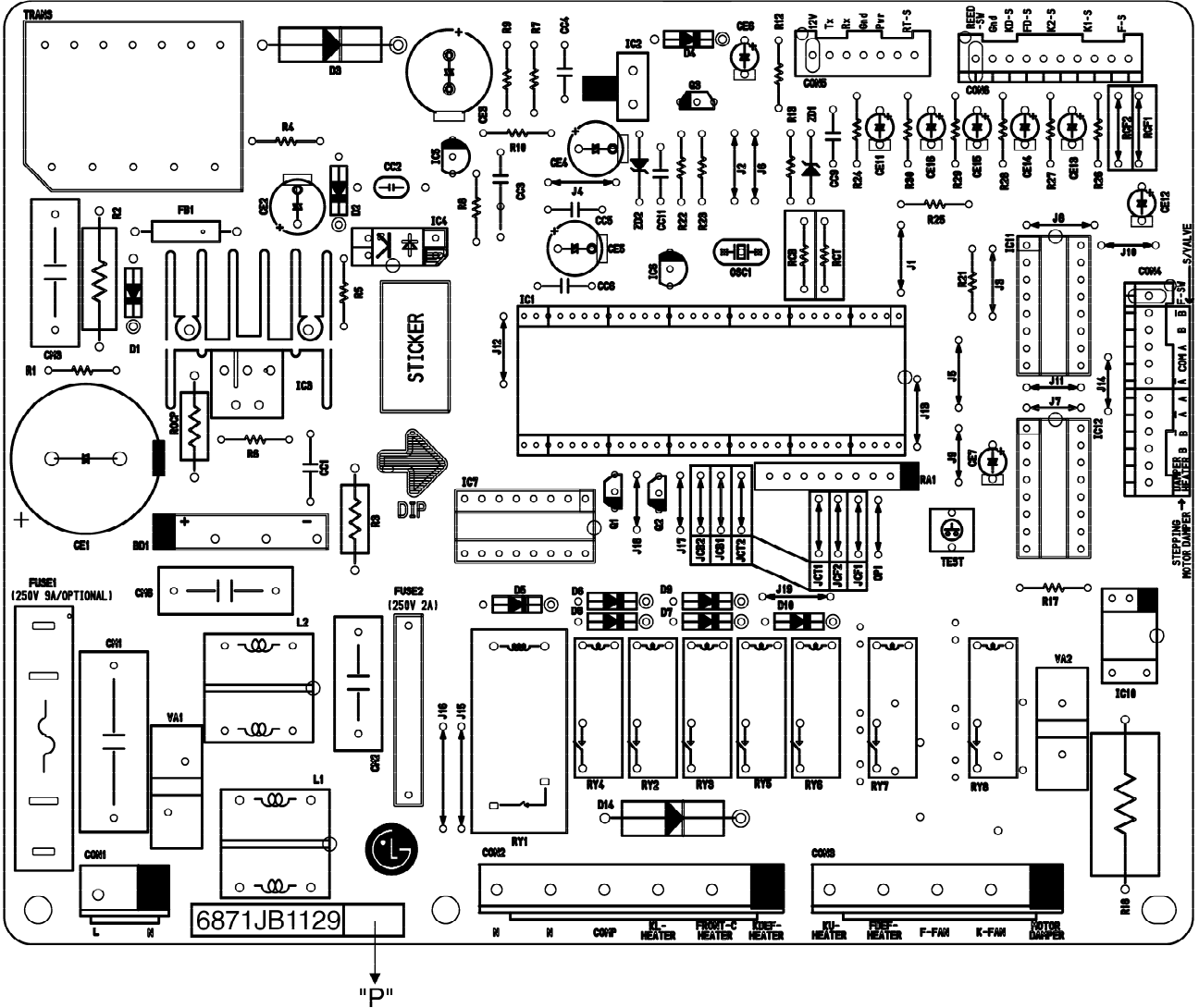


- ▶ Allowance of sensor resistance is 3%.
- ▶ Measure resistance value of sensor after leaving it for more than 3 minutes (delay is required due to sensing speed).
- ▶ Always use a digital tester! Analog testers have too great a margin of error.
- ▶ Measure resistance after separating PWB (PCB) assembly, the CON6 on the main part since the upper compartment sensor and the middle compartment sensor have no connector. Measure resistance at both ends of No.6, 7 of the CON5 for the RT-sensor. However, measure resistance at both ends of the sensor after separating barrier assembly between the middle compartment and the lower compartment for the lower compartment sensor.

### 3-4. PCB PARTS DIAGRAM AND LIST

#### 3-4-1. PWB(PCB) ASSEMBLY, MAIN(LED MODULE TYPE)

##### (1) Parts diagram



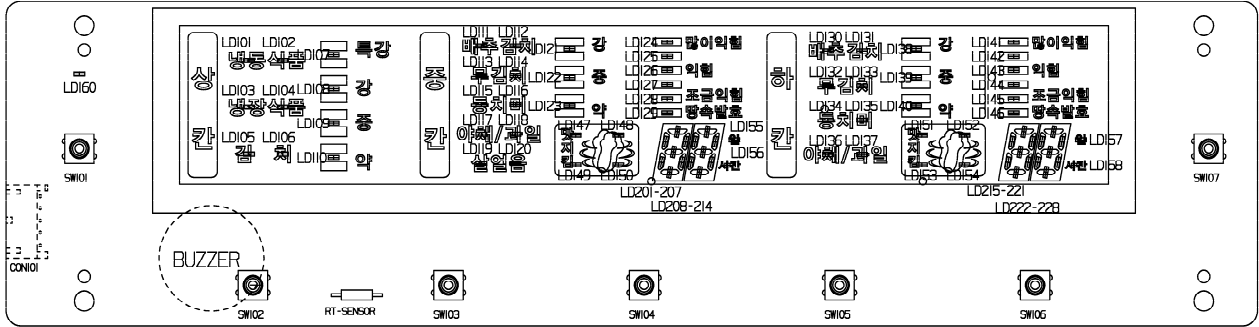
(2) Parts List

Qty	No	P/NO	DESCRIPTION	SPEC	MAKER	REMARK
1	1	6170JB2010A	TRANSFORMER,SMPSCCOIL	A3-PJT 12.5V 1A	한영전자	TRANS
1	2	6870JB8020C	PWB(PCB)	GS-PJT MAIN VER3	DOOSAN	FR1,1,6T
1	3	6630JB8001A	CONNECTOR (CIRC),WAFE	JE202-1T-02(3P-2)	JAE EUN	CON1
1	4	6630JB8001E	CONNECTOR (CIRC),WAFE	JE202-1T-06(11P-2,4,6,	JAE EUN	CON2
1	5	6630JB8001D	CONNECTOR (CIRC),WAFE	JE202- 1T-05 JAE EUN 5	JAE EUN	CON3
1	6	6630JB8007L	CONNECTOR (CIRC),WAFE	917790-1 AMP 12PIN 2.5	AMP	CON4
1	7	6630JB8007F	CONNECTOR (CIRC),WAFE	917785-1 AMP 7PIN 2.5M	AMP	CON5
1	8	6630JB8007J	CONNECTOR (CIRC),WAFE	917788-1 AMP 10PIN 2.5	AMP	CON6
1	9	0IKE780500W	IC,KEC	KIA7805PI - - - -	KEC	IC2
1	10	0IKE704200A	IC,KEC	KIA7042P 3P BK RESET	KEC	IC6
1	11	0IKE650030B	IC,KEC	KID65003AP *18P,SDIP*	KEC	IC7
1	12	0ITD623080C	IC,DRAWING	62308 16PIN,SDIP BK DR	TOSHIBA	IC11
1	13	0ITD777400A	IC,TOSHIBA	TA7774AP 16,SDIP BK DR	TOSHIBA	IC12
1	14	0IKE431000A	IC,KEC-	IC,KEC	KEC	IC5
1	15	0IPMGNE001A	IC,POWER MANAGEMENT	PS2561-1 NEC4P,DIP BK=TL	NEC	IC4
1	16	0ITD762000A	IC,TOSHIBA	TLP762JF 6P,DIP(LF2) B	TOSHIBA	IC10
1	17	6212AQ9002B	RESONATOR,CERAMIC	CST-4.00MGW,MURATA	MURATA	OSC1
1	18	6102JB8001B	VARISTOR	INR14D621 ILJIN 620V 1	IL JIN	VA1
-	19	6102W5V006A	VARISTOR	SVC271D-14A SAMWHA UL/	IL JIN	VA1
1	20	6102AQ9075E	VARISTOR	INR10D471K	IL JIN	VA2
1	21	6920000001A	RELAY	ALE15B12 MATSUSHITA 250V	MATSUSHITA	RY1
3	22	6920JB2003A	RELAY	G5N-1A OMRON (JAPAN)DC	OMRON	RY3,4,6
1	23	0ISK655100A	IC,SANKEN	STR-G6551 5PIN BK SMP5	SANKEN	IC3
3	24	0TR106009AF	TRANSISTOR	KRC 106M KEC	KEC	Q1,2,3
2	25	6920JB2003B	RELAY	ALD112 MATSUSHITA 250V	NAIS	RY7,8
1	25	0DB360000AA	DIODE,BRIDGE	D3SBA60 BK SHINDENGEN	SHINDENGEN	BD1
1	26	0DRDE00024A	DIODE,RECTIFIERS	FR304 DELTA TP52 D0201A-	DELTA	D3
1	26	0DR107009AA	DIODE,RECTIFIER	FR107 TP DELTA D041 10	DELTA	D1
1	27	0DR154080AA	DIODE,RECTIFIER	1N5408 BK DELTA D0201A	DELTA	D14
1	27	0DD400409AC	DIODE,RECTIFIER	RECT1N4004 TP	DELTA	D5
6	28	0DD414809AD	DIODE	1N4148 PNOVEC TP52 DON	ROHM	D2,6,7,8,9,10
1	28	0DZMR00029A	DIODE,ZENERS	1N5232B MOTORORA TP DO	DELTA	ZD2
-	29	0IPMGSK001A	IC,POWER MANAGEMENT	STR-G6351L SANKEN 5PIN	SANKEN	IC3
1	30	0CE4762V6E0	CAPACITOR,FIXED ELECT	47UF HE 450V 20% BULK	SAM HWA	CE1
1	31	0CE687YH6E0	CAPACITOR,FIXED ELECT	680UF RX 25V 20% BULK	SAM HWA	CE3
2	32	0CE2276F638	CAPACITOR,FIXED ELECT	220UF SMS,SG 16V 20% F	RUBICON,SAMHWA	CE4,5
-	32	0CE226ZK638	CAPACITOR,FIXED ELECT	22UF YXA 50V 20% FM5 TP	RUBICON,SAMHWA	CE2
1	33	0CE4766K638	CAPACITOR,FIXED ELECT	47UF SMS,SG 50V 20% FM	RUBICON,SAMHWA	CE2
1	34	0CE1056K638	CAPACITOR,FIXED ELECT	1UF SMS,SG 50V 20% FM5	RUBICON,SAMHWA	CE7
6	35	0CE106AK638	CAPACITOR,AL.ELECTROL	10UF KM TYPE 50V M FM5	RUBICON,SAMHWA	CE11~16
1	36	0CQ47418670	CAPACITOR,POLYESTER	0.47UF D 275V M M/PP N	PILKO	CM1
1	35	0CQ22418670	CAPACITOR,FIXED FILM	0.22UF D 275V M M/PP N	PILKO	CM2
1	36	0CQ4732Y430	CAPACITOR,POLYESTER	47000PF S 630V J M/PE	SAM HWA	CM3
1	37	0CQ22418670	CAPACITOR,FIXED FILM	0.22UF D 275V M M/PP N	SAM HWA	CM6
8	38	0CK223DK96A	CAPACITOR,FIXED CERAM	22NF 2012 50V 80%,-20%	MURATA	CC10,CC12~18
1	39	0CK22102510	CAPACITOR,CERAMIC CHI	220P 2KV K B S	TAE YANG	CC2
3	40	0CK1040K949	CAPACITOR,FIXED CERAM	0.1UF D 50V 80%,-20% F	TAE YANG	CC5,6,11
1	41	0CK2230H908	CAPACITOR,CERAMIC CHI	22000PF D 25V 80%,-20%	TAE YANG	CC4
2	42	0CK104DK94A	CAPACITOR,FIXED CERAM	100NF 2012 50V 80%,-20	MURATA	CC7,8
1	43	0CK4710K519	CAPACITOR,CERAMIC CHI	470PF 50V K B TA52	TAE YANG	CC1
1	44	6104JB8001B	RESISTOR,DRAWING	RA 1/4W 9A 10K J	-	RA1
1	45	0CK1040K949	CAPACITOR,FIXED CERAM	0.1UF D 50V 80%,-20% F	SAM HWA	CC3
1	46	0RM1202N661	RESISTOR,FIXED CEMENT	12K OHM 5 W 5.00% A -	C.Y.OHM	R18
-	47	0RS3303J609	RESISTOR,FIXED METAL	330K OHM 1 W 5% TA52	SMART	R3
1	48	0RS5602K641	RESISTOR,FIXED METAL	56K OHM 2 W 5.00% F20	SMART	R2
1	49	0RS1503J609	RESISTOR,FIXED METAL	150K OHM 1 W 5.00% TA5	SMART	R3
-	50	-	-	-	-	-
1	51	0RS0121J609	RESISTOR,FIXED METAL	1.2 OHM 1 W 5% TA52	SMART	RDCP
1	52	0RN9101G409	RESISTOR,FIXED METAL	9.1K OHM 1/4 W 1.00% T	SMART	R9
1	53	0RN2201G409	RESISTOR,FIXED METAL	2.2K OHM 1/4 W 1.00% T	SMART	R10
1	54	0RD1002G609	RESISTOR,FIXED CARBON	10K OHM 1/4 W 5.00% TA	SMART	RCT
1	55	0RD1002G609	RESISTOR,FIXED CARBON	10K OHM 1/4 W 5.00% TA	SMART	RCB
-	56	0RD1000G609	RESISTOR,FIXED CARBON	100 OHM 1/4 W 5% TA52	SMART	R4
1	57	0RD0332G609	RESISTOR,FIXED CARBON	33 OHM 1/4 W 5.00% TA5	SMART	R4
1	58	0RD6200G609	RESISTOR,FIXED CARBON	620 OHM 1/4 W 5.00% TA	SMART	R17
1	59	0RD6800G609	RESISTOR,FIXED CARBON	680 OHM 1/4 W 5.00% TA	SMART	R6
1	60	0RD1001G609	RESISTOR,FIXED CARBON	1K OHM 1/4 W 5.00% TA5	SMART	R8

1	61	ORD1801G609	RESISTOR, FIXED CARBON	1.8K OHM 1/4 W 5.00% T	SMART	R7
9	62	ORD2001G609	RESISTOR, FIXED CARBON	2K OHM 1/4 W 5.00% TA5	SMART	R21,23~30
2	63	ORD4701G609	RESISTOR, FIXED CARBON	4.7K OHM 1/4 W 5.00% T	SMART	R5,22 (L, M, P, R5, R5, R5)
1	64	ORD1004G609	RESISTOR, FIXED CARBON	1M OHM 1/4 W 5.00% TA5	SMART	R1
-	65	ORD6801G609	RESISTOR, FIXED CARBON	6.8K OHM 1/4 W 5.00% TA52	SMART	R5
-	66	ORD1501G609	RESISTOR, FIXED CARBON	1.5K OHM 1/4 W 5% TA52	SMART	R7
2	67	ORD2001E672	RESISTOR, FIXED CARBON	2K OHM 1/8 W 5% 2012 R	SMART, ROHM	R20,31
1	68	ORD4701E672	RESISTOR, FIXED CARBON	4.7K OHM 1/8 W 5% 2012	SMART, ROHM	R11
2	69	ORD1002E672	RESISTOR, FIXED CARBON	10K OHM 1/8 W 5% 2012	SMART, ROHM	R32,33
1	70	ORD1004E672	RESISTOR, FIXED CARBON	1M OHM 1/8 W 5% 2012 R	SMART, ROHM	R19
1	71	ORD1002E472	RESISTOR, FIXED CARBON	10K OHM 1/8 W 1% 2012	SMART, ROHM	RT1
4	72	ORD2612E472	RESISTOR, FIXED CARBON	26.1K OHM 1/8 W 1% 201	SMART, ROHM	RK1,2, RD1,2
1	73	ORD2612E472	RESISTOR, FIXED CARBON	26.1K OHM 1/8 W 1% 201	SMART, ROHM	RF1
-	74	ORD1501G609	RESISTOR, FIXED CARBON	1.5K OHM 1/4 W 5% TA52	SMART	R8
1	75	6210JB8001A	CORE (CIRC), BEAD	BFS3510A0 SAMWHA 35X10	SAM HWA	FB1
1	76	6600RRT001W	SWITCH, TACT	THVV502GAA POSTECH 12V	POSTEC	TEST
1	77	6200JB8003A	FILTER (CIRC), NOISE	3A 3MH 250V CV430030 A	TNC	L1
1	78	6200JB8007X	FILTER (CIRC), NOISE	UV11-05320 TNC BK 0.5A 32	TNC	L2
1	79	0FM9001B621	FUSE, NON TIME DELAY 1	9000MA 250 V 6.3X31.8	SAMJU	FUSE1
2	80	6901JB8001A	FUSE ASSY, HOLDER	KORE-PJT N/S	SAMJU	FUSE HOLDER
1	81	0FZZJB3001A	FUSE	250V 2A SLOW-BLOW LIT	SAMJU	FUSE2
-	82	6170JB2010B	TRANSFORMER, SMPSC COIL	A3-PJT 12.5V 1A	한영전자	TRANS
10	83	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	10MM	J1~6,8,12,13,20
1	84	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	10MM	RCF1
1	85	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	10MM	RCF2
7	86	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	8MM	J7,9,10,11,14,17,18
6	87	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	8MM	JCF1,2, JCT1,2, JCB1,2
1	88	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	8MM	DP1
2	89	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	15MM	J15,16
-	90	43607015	WIRE, JUMP	GC10 WHITE T0.6 L10 FO	25MM	R18
1	91	4920JB3007A	HEAT SINK	23.3*17*25 DRIVE IC ST	TAE SUNG	STR
2	92	1SBF0302418	SCREW TAP TITE (S), BIN	+ D3.0 L8.0 MSWR3/FZY	-	SRT ASSEM
300	93	49111001	SOLDER, SOLDERING	SOLDER (RDSIN WIRE) RSO	HUISUNG, DAEJIN	-
250	94	49111004	SOLDER, SOLDERING	H63A	-	-
150	95	59333105	FLUX	SGJ0.825-0.830 KOREA F	KDKI	-
1	96	0IZZJB2039E	IC, DRAWING	HD6473644P 64P, SIDP BK	HITACHI	IC1
-	97	0IZZJB2039F	IC, DRAWING	HD6473644P 64P, SIDP BK	HITACHI	IC1
-	98	0IZZJB2039G	IC, DRAWING	HD6473644P 64P, SIDP BK	HITACHI	IC1
-	99	0IZZJB2039H	IC, DRAWING	HD6473644P 64P, SIDP BK	HITACHI	IC1

### 3-4-2. PWB(PCB) ASSEMBLY, DISPLAY [STANDARD]

#### (1) Parts diagram

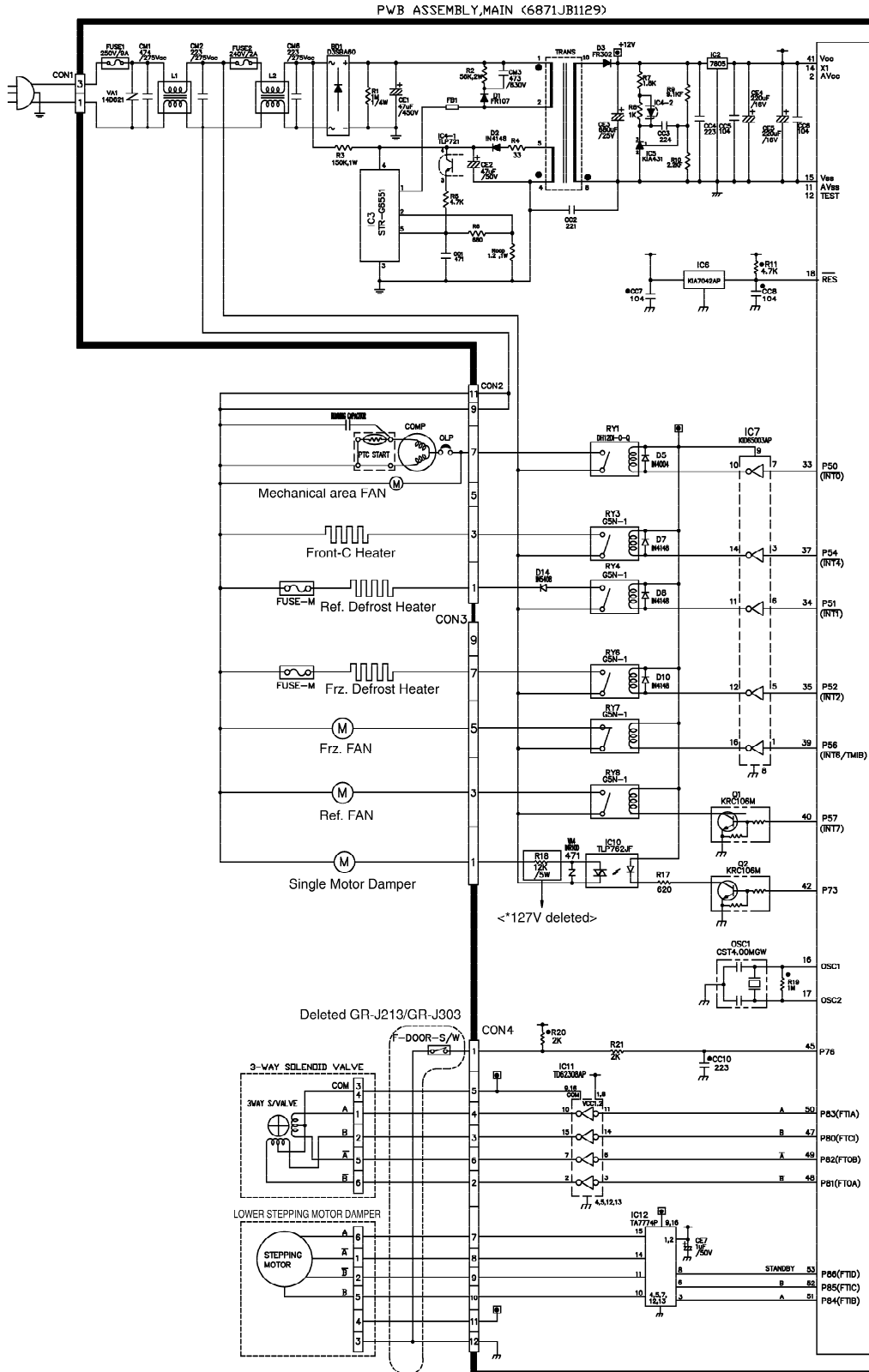


#### (2) Parts List

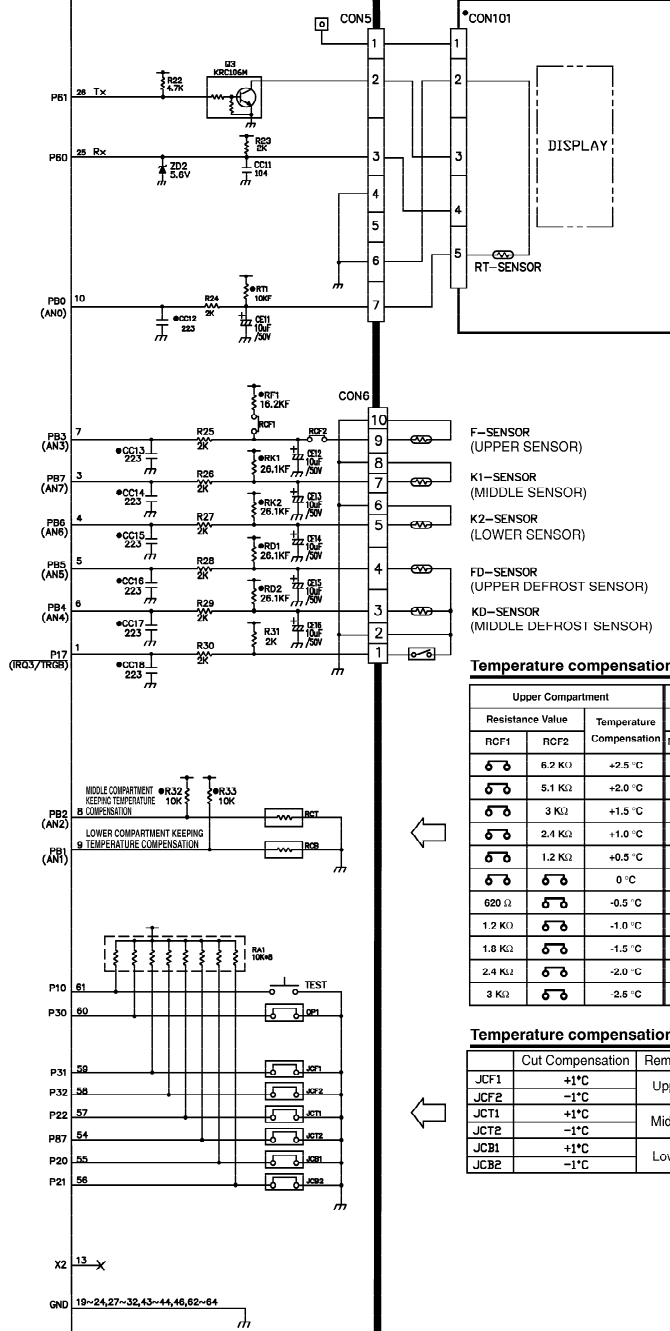
Qty	No	P/N/O	DESCRIPTION	SPEC	MAKER	REMARK
1	1	6870_BB222B	PWB(PCB)	*05 DIOS KIMCHI STANDARD	DAEDUCK/SG COM	STH
1	2	-----	REFLECTOR	NOYL	IL SAN	-
1	3	4140_BI054C	NAME PLATE,P(H)	*05 DIOS KIMCHI STANDARD	IL SAN	투과율70%
1	4	6630A09159D	CONNECTOR (CIRC),WAFER	SMAW250-05G (ANGLE TYPE)	YEON HO	CON101
1	5	01ZZ_R2063L	IC,DRAWING	TMP86PM47U 44P QFP TRAY MASK VIVA3 HW STD* MD	TOSHIBA	IC101
1	6	01STLKE002A	IC,STANDARD LOGIC	K1A78L05F KEC SOT-89 TP REGULATOR	KEC	IC102
1	7	01STLKE003A	IC,STANDARD LOGIC	K1A7042AF KEC SOT-89 TP RESET IC	KEC	IC103
1	8	01RH1934600D	IC,ROHM	BR93LC46FF-W 8PIN 50P BK EEPROM	ROHM	IC104
2	9	01STLM1001A	IC,STANDARD LOGIC	M54563AF MITSUBISHI 20 R/TP CONVERT	MITSUBISHI	IC105,107
2	10	01KE650030C	IC,KEC	K1D65003AF 16SOP BK 7CH DRIVER	KEC	IC106,108
1	11	01STL00065A	IC,STANDARD LOGIC	ULN2003A TOSHIBA 16PINSOP TAPPING NPN TRARRAY	TOSHIBA	
1	11	01STLKE004A	IC,STANDARD LOGIC	KRA106S KEC SOT-23 TP TRANSISTOR	KEC	Q102
3	12	01STLKE005A	IC,STANDARD LOGIC	DTA143ZCA SOT-23 KRC106S KEC SOT-23 TP TRANSISTOR DTC143ZCA SOT-23	CHANGJIANG KEC CHANGJIANG	Q101,103,104
1	13	6212BB3245A	RESONATOR,CERAMIC	CSTCR1M00653-R0 MURATA 4.0MHZ +/- 0.5% T/R SMD	MURATA	OSC101
1	14	0CE107V6DC	CAPACITOR,FIXED ELECT	100UF MV 16V 20% R/TP(SMD) SMD	SAM-WA,RUBYCO, G-LUXON	CE102
1	15	0CE476V6DC	CAPACITOR,FIXED ELECT	47UF MV 25V 20% R/TP(SMD) SMD	SAM-WA,RUBYCO, G-LUXON	CE103
8	16	0CK104DX94A	CAPACITOR,FIXED CERAMI	100NF 2012 50V 60%, -20% R/TP F(Y5V)	MURATA	CC101-108
2	17	0CK102DX96A	CAPACITOR,FIXED CERAMI	1NF 2012 50V 80%, -20% R/TP X7R	MURATA	CC109,110
2	18	0RH1000L62Z	RESISTOR,METAL GLAZED I	100 OHM 1 / 8 W 2012 5.00% D	SMART,ROHM	RI19,120
1	19	0RD2200E67Z	RESISTOR,FIXED CARBON	220 OHM 1/8 W 5% 2012 R/TP	SMART,ROHM	RI06
2	20	0RD1001E67Z	RESISTOR,FIXED CARBON	1K OHM 1/8 W 5% 2012 R/TP	SMART,ROHM	RI02,107
3	21	0RD2001E67Z	RESISTOR,FIXED CARBON	2K OHM 1/8 W 5% 2012 R/TP	SMART,ROHM	RI01,117,118
13	22	0RD4701E67Z	RESISTOR,FIXED CARBON	4.7K OHM 1/8 W 5% 2012 R/TP	SMART,ROHM	RI03,104,108,109,115,116,121-127
1	23	0RD1004E67Z	RESISTOR,FIXED CARBON	1M OHM 1/8 W 5% 2012 R/TP	SMART,ROHM	RI05
3	24	-----	RESISTOR,METAL GLAZED I	180 OHM 1 / 2 W 5025 5.00% D	SMART,ROHM	RI10-112
9	25	-----	RESISTOR,METAL GLAZED I	240 OHM 1 / 2 W 5025 5.00% D	SMART,ROHM	RI13-114,128-134
1	26	-----	RESISTOR,METAL GLAZED I	68 OHM 1 / 4 W 3216 5.00% D	SMART,ROHM	RI36
7	27	0DSR00068A	DIODE,SWITCHING	RLS4148 ROHM R/TP LLDS(LL-34) 75V 45	ROHM	D101-107
7	28	6600FR1002J 6600FR1005A	SWITCH,TACT	JTPI138A JFIL 12V DC 50MA SMD KPS-1105AM KYUNG IN(HK) 12VDC 50MA SMD	NAMEF KYUNG IN	SW101-107
1	29	0DZHM00189A	DIODE,ZENERS	RLZ ROHM R/TP LLDS(LL-34) 500MW 5.6V 20MA .PF	DELTA,ROHM	ZD101
58	30	0DLLE0038AA	LED	LEDTECH ELECTRONICS LT8832-UR-191T R/TP AMBER	LEDTECH	LD101-158
28	31	0DLLE0038AA	LED	LEDTECH ELECTRONICS LT8832-UR-191T R/TP AMBER	LEDTECH	LD201-228
1	32	0DLLE0038AA	LED	LEDTECH ELECTRONICS LT8832-UR-191T R/TP AMBER	LEDTECH	LD160
-	33	0DLLE0038AA	LED	LEDTECH ELECTRONICS LT8832-UR-191T R/TP AMBER	LEDTECH	
1	34	6908_BB003A 6908_BB002G	BUZZER,PIEZO CERAMIC	BM-20B BUJEON PIEZO 4KHZ 85DB CBZ2240BP DAE YOUNG PIEZO 4KHZ 90DB(CHINA)	BUJEON DAE YOUNG	BUZZER
1	36	6500_BB3001A	SENSOR,TEMPERATURE	RT-SENSOR JAMES-TEC COMBI PCB	JAMES TECH	RT-SENSOR
29	36	SS0000008AA	SOLDER,SOLDERING	SOLDER(ROSIN WIRE)RSO SR-34 PB FREE, LFM-48	HEESUNG	-
59	37	SS0000019AA	METAL CREAM	LFM-48W TM-TS PB FREE HEESUNG METAL CREAM SNAAGU SNF-3.0AG+0.5CUZ	HEESUNG	

3-5. PCB CIRCUIT DIAGRAM – PCB CIRCUIT DIAGRAM MAY CHANGE DEPENDING ON SITUATION.

3-5-1. PWB (PCB) ASSEMBLY, MAIN CIRCUIT DIAGRAM (LED MODULE TYPE)



PWB(PCB) ASSEMBLY DISPLAY  
(LED MODULE:6871JB1308)



Temperature compensation 1 (replacement of resistance)

Upper Compartment		Middle/Lower Compartment		Remarks
Resistance Value	Temperature Compensation	Resistance Value	Temperature Compensation	
RCF1		RCF2		warmer ↑ Standard temperature ↓ Cooler
6.2 KΩ	+2.5 °C	180 KΩ	+2.5 °C	
5.1 KΩ	+2.0 °C	56 KΩ	+2.0 °C	
3 KΩ	+1.5 °C	33 KΩ	+1.5 °C	
2.4 KΩ	+1.0 °C	18 KΩ	+1.0 °C	
1.2 KΩ	+0.5 °C	12 KΩ	+0.5 °C	
620 Ω	0 °C	10 KΩ	0 °C	
1.2 KΩ	-0.5 °C	8.2 KΩ	-0.5 °C	
1.8 KΩ	-1.0 °C	5.6 KΩ	-1.0 °C	
2.4 KΩ	-1.5 °C	3.3 KΩ	-1.5 °C	
3 KΩ	-2.0 °C	2 KΩ	-2.0 °C	
3 KΩ	-2.5 °C	470 Ω	-2.5 °C	

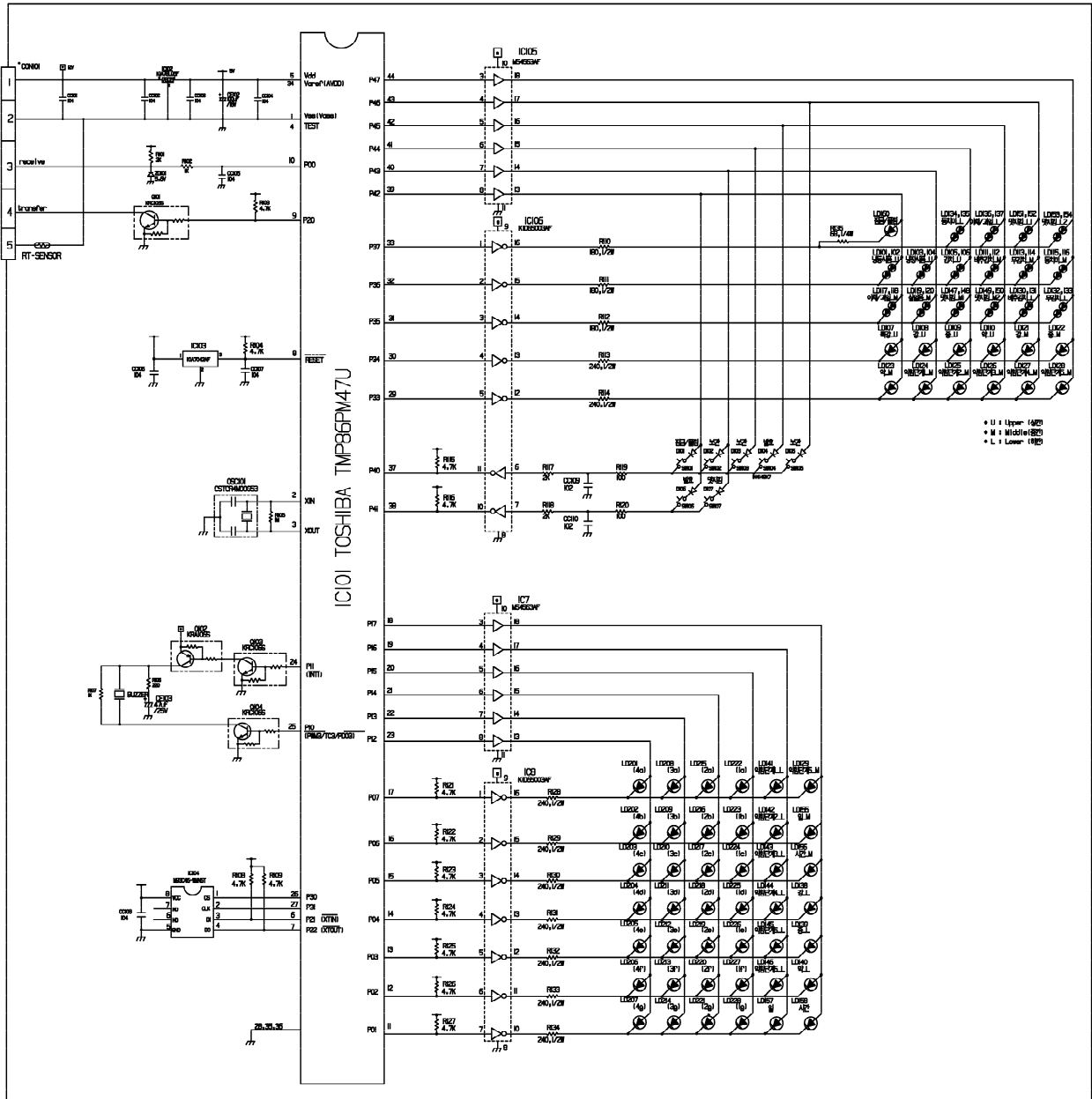
Temperature compensation 2 (JUMP WIRE CUT)

Cut Compensation	Remarks
JCF1	+1°C Upper
JCF2	-1°C Upper
JCT1	+1°C Middle
JCT2	-1°C Middle
JCB1	+1°C Lower
JCB2	-1°C Lower

•:Parts of SMD

### 3-5-2. PWB (PCB) ASSEMBLY, DISPLAY CIRCUIT DIAGRAM

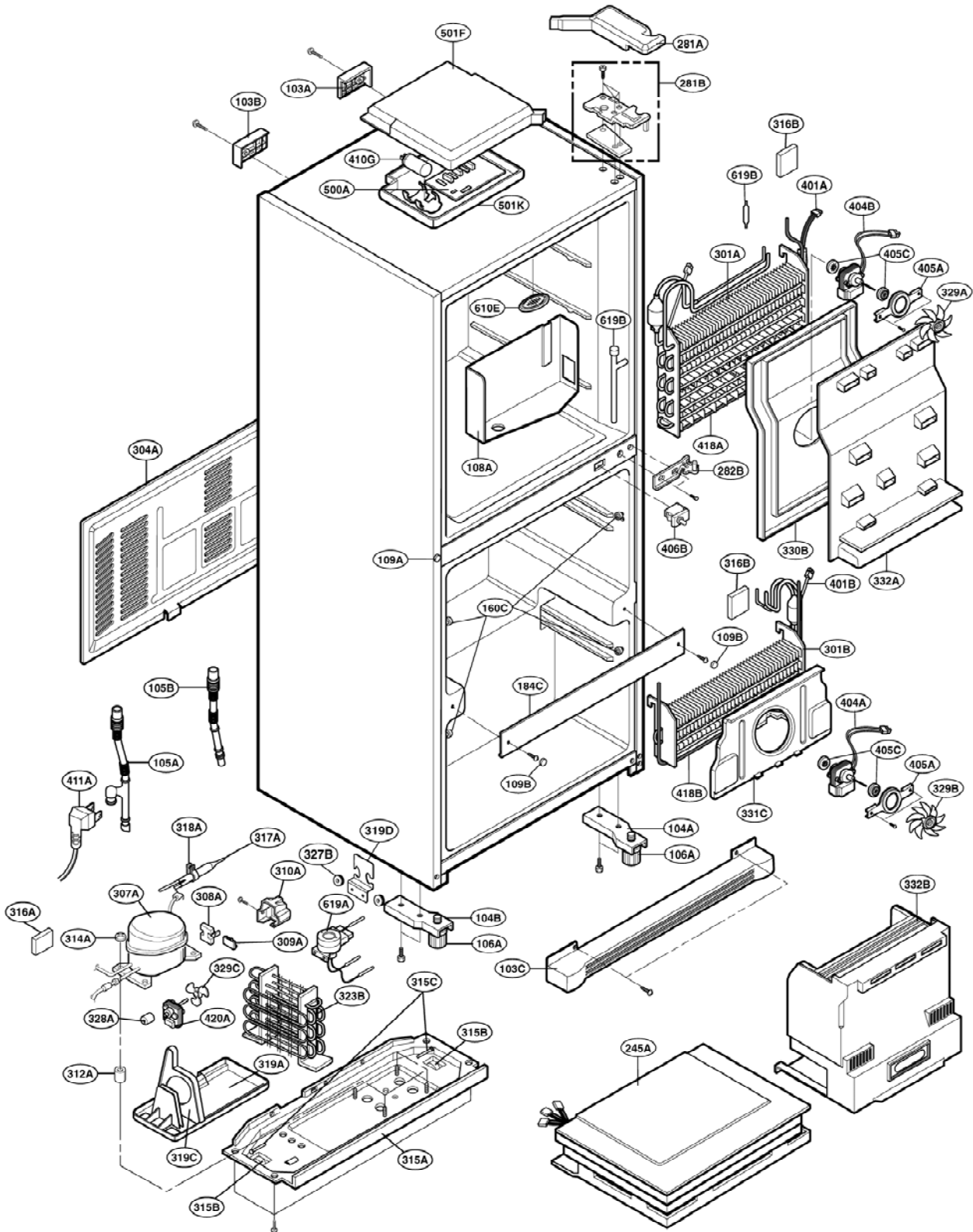
PWB (PCB) ASSEMBLY, DISPLAY (687J.B1400)



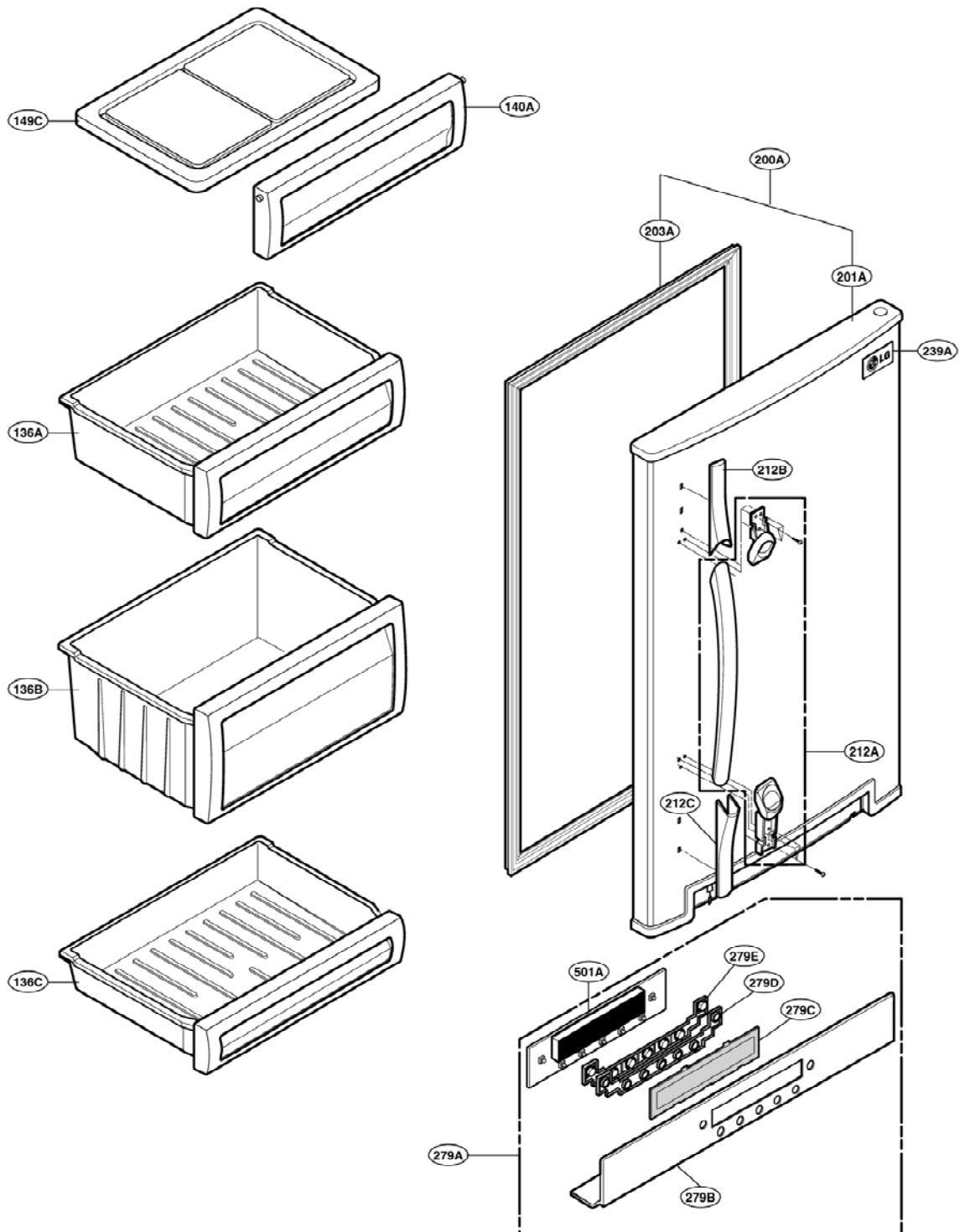
# 4. EXPLODED VIEW AND SERVICE PARTS LIST

## 4-1. EXPLODED VIEW

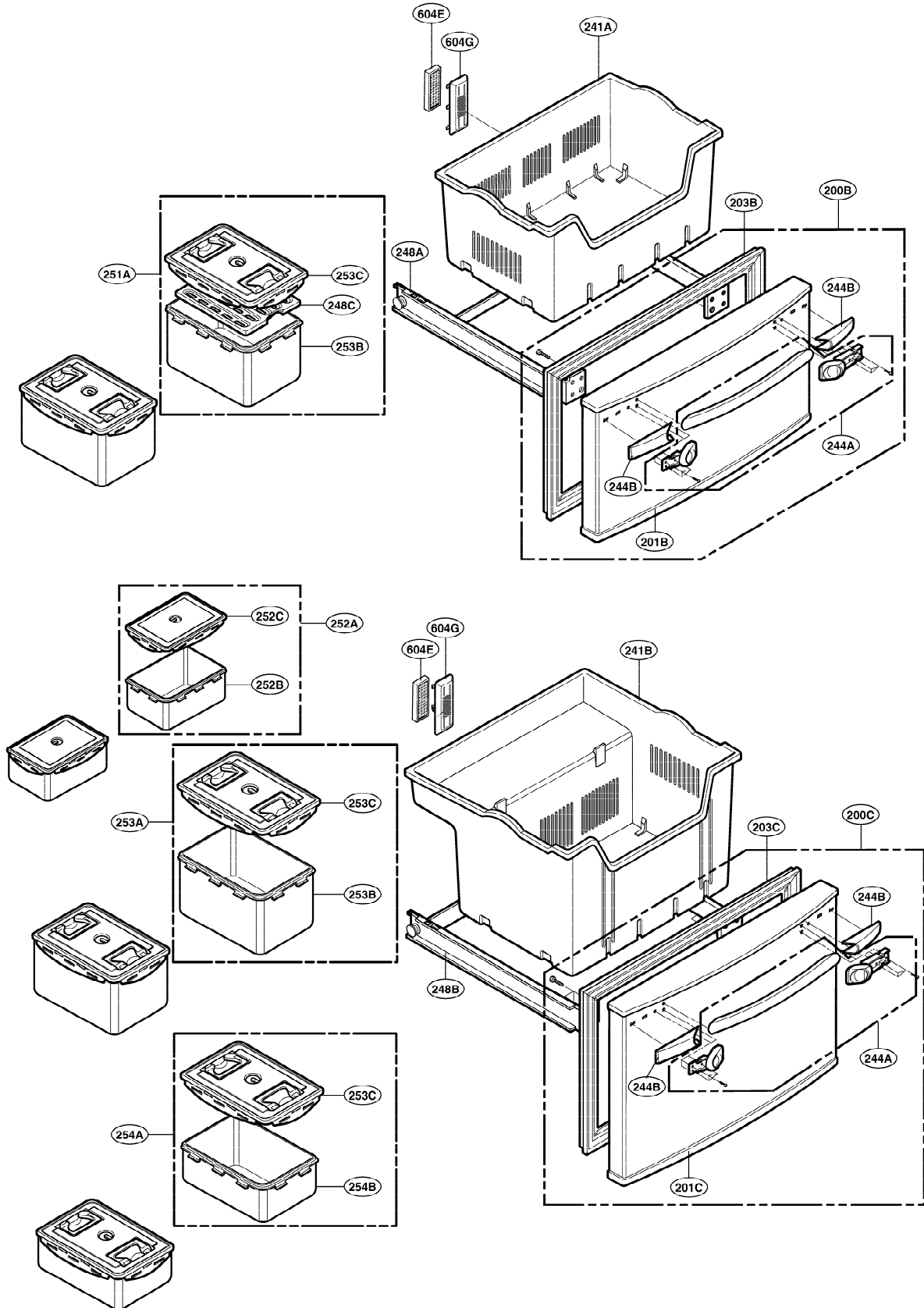
► GR-K30\*\*



► GR-K30\*\*



► GR-K30\*\*





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