

LG TRAINING MANUAL

LSC27990ST Refrigerator Info Center - Fall 2007



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IMPORTANT SAFETY NOTICE

This manual was prepared for use only by properly trained audio-visual service technicians. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. All components should be replaced only with types identical to those in the original circuit and their physical location, wiring, and lead dress must conform to original layout upon completion of repairs. If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it only with the factory specified fuse type and rating. When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1W), keep the resistor 10mm away from PCB. Always keep wires away from high voltage or high temperature parts. Do not attempt to modify this product in any way.

Special components are also used to prevent shock and fire hazard and are required to maintain safe performance. No deviations are allowed without prior approval by LG Electronics. Service work should be performed only after you are thoroughly familiar with these safety checks and servicing guidelines. Circuit diagrams may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

GENERAL SAFETY GUIDANCE

An Isolation Transformer should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating to protect against personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation. Before returning the receiver to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc. If the exposed metallic part has a return path to the chassis, the measured resistance should be between $1M\Omega$ and $5.2M\Omega$. When the exposed metal has no return path to the chassis the reading must be infinite. Any other abnormality that exists must be corrected before the receiver is returned to the customer.

ELECTROSTATICALLY SENSITIVE DEVICES

Some semiconductor (solid-state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on the body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as an ESD mat, to prevent electrostatic charge buildup or exposure of the assembly. Use only a grounded-tip soldering iron to solder or unsolder ES devices. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices. Do not use freon-propelled chemicals which can generate electrical charge sufficient to damage ES devices. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. Minimize bodily motions when handling unpackaged replacement ES devices (Otherwise, seemingly harmless motion, such as the brushing together of your clothing or the lifting of your foot from a carpeted floor, can generate static electricity sufficient to damage an ES device).

REGULATORY INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

The responsible party for this device's compliance is:

LG Electronics of Alabama, Inc.
201 James Record Road
Huntsville, AL 35813, USA

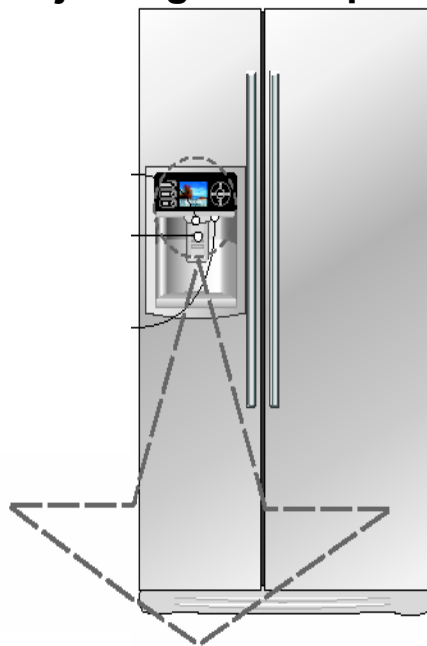
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INTRODUCTION

This portion of some of our refrigerators allows the customer to view the weather present and forecasts for the next five days. It also stores images and recipes for a variety of foods, has a calendar that can be programmed for a variety of reminders such as birthday and anniversaries. It also allows the refrigerator and freezer temperature to be set by the customer without opening the door. This device also displays an error code in case of a failure within the product. In this manual you will find the functionality and operation of this display as well as troubleshooting for this option as well as for some other options.

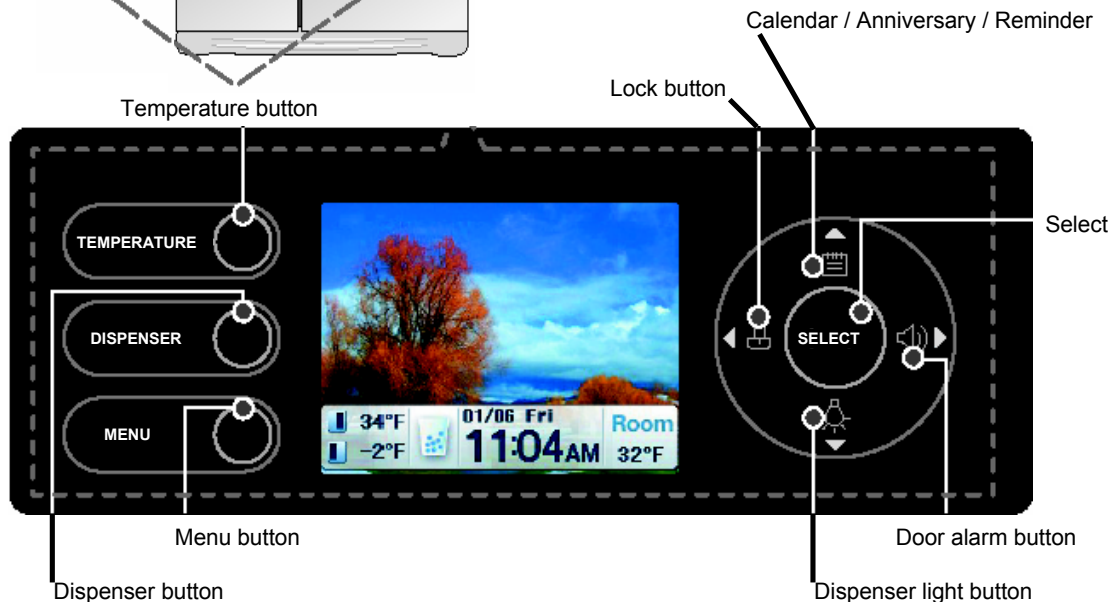
OPERATION

Adjusting the temperatures and functions



About defective pixels

This LCD display contains hundreds of thousands of individual pixels. LCD displays typically contain a small number of pixels that do not function normally. Your display has been inspected and is in compliance with manufacturer's specifications, indicating that any pixel defects do not affect the operation or use of your display. On a display of this size, 4 or fewer defective pixels are considered to be normal and are not grounds for exchange or refund.



Temperature

You can adjust the freezer and refrigerator temperature.

1. Press the TEMPERATURE button.
2. Using the up or down button, select the desired adjustment.
3. Select the temperature using the left or right buttons.
Refrigerator temperature options: 46, 41, 37, 34, or 32°F
Freezer temperature options: 7, 1, -2, -5, or -8°F
4. Press the SELECT button.
5. Return to the standby screen.



IcePlus

- For quick freezing.
- The standby screen is shown during **IcePlus** operation.

1. Press the TEMPERATURE button.
 2. Using the up or down button, select **IcePlus**
 3. Using the right or left button, select **Use**.
 4. Press the SELECT button.
 5. Return to the standby screen.
- NOTE:* The display will indicate (Processing IcePlus)

-The indicated set temperature is not the actual temperature within the refrigerator but the target temperature. The actual internal temperature can differ, especially if the door is opened and warm food was recently stored.

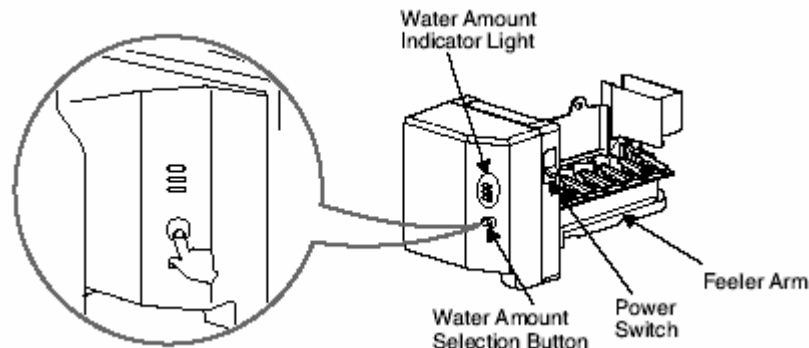
Dispenser

- You can select from Crush, Water or Cube options.
- When the dispenser is in use, the active option is indicated in the standby screen.
- Crush , Water , Cube.

1. Press the **DISPENSER** button.
2. Using the right or left button, select **Crush , Water , Cube**.
3. Press the SELECT button.
4. The unit will indicate that you have successfully changed the dispenser setting.
5. Return to the standby screen.

NOTE: The display will indicate (Processing IcePlus)

Automatic icemaker



- The automatic icemaker can automatically make 6 cubes at a time, 70~120 pieces per day. This quantity may vary by circumstance, including ambient temperature, door opening, freezer load. etc.
- Ice making stops when the ice storage bin is full.
- If you don't want to use the automatic icemaker, turn the icemaker switch to OFF.
- If you want to use automatic icemaker again, change the switch to ON.
- The water amount will vary depending on the water amount selection button. Setting, as well as the water pressure of the connected water line.

NOTE:

It is normal that a noise is produced when ice drops into the ice storage bin. Hold your cup in place for a couple of seconds after dispensing ice or water so the last few drops go in to your cup instead of the floor.

Ice is lumped together

- If the ice lumps together, take it out, break it apart, and put it back into the storage bin.
- When the icemaker produces too small or lumped together ice, the amount of water supplied to the ice maker needs to be adjusted. Contact the service center.
- If ice is not used frequently, it may lump together.

Power failure

- Water may drip from the refrigerator. Take the ice storage bin out and discard all the ice then dry it and place it back. After the power is restored, the refrigerator defaults to crushed ice.

The unit is newly installed

- It takes about 12 hours for a newly installed refrigerator to make ice.

CAUTION

Throw away the first few batches of ice. The first ice and water may include particles or odor from the water supply line or the water tank.

This is also necessary if the refrigerator has not been used for a long time.

Never store beverage cans or other foods in ice storage bin for the purpose of rapid cooling. It may damage the automatic ice maker.

Shake the bin occasionally to settle the ice in the bin.

Ice may pile up just around the icemaker causing the icemaker to think that the ice storage bin is full.

If discolored ice is dispensed, contact an Authorized Service Center immediately.

Do not use the ice or water until the problem is corrected.

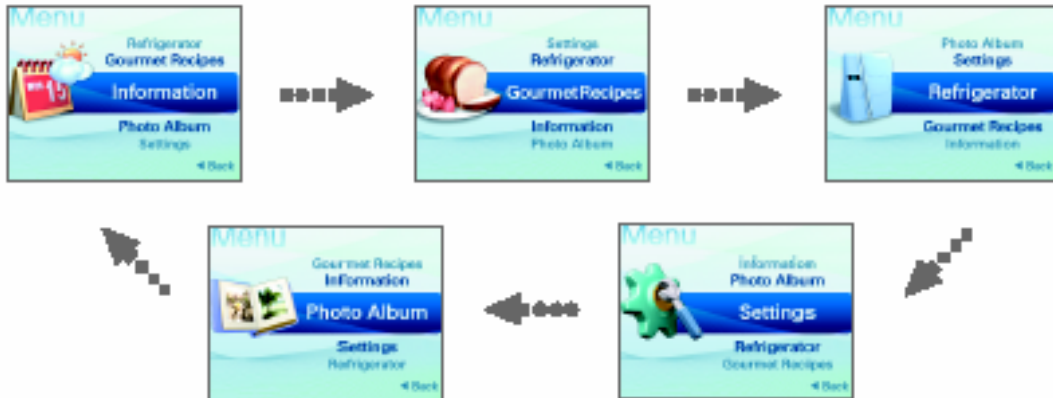
Warning

Do not place your hands into the water & ice dispenser opening. Doing so can result in amputation or cuts.

Menu

You can select from Information, Gourmet Recipes, Refrigerator, Settings, and Photo Album function.

1. Press the **MENU** button.
2. Select the menu using the up and down buttons.



3. Press the **SELECT** button.
4. You will see the detail menu.

Weather Forecast

- You can select from Weather Forecast, Anniversary Reminder, Date and Time Setting, or Timer function.
- Receives and displays the weather and temperature for 5 days, including the current day.
- Reception of weather forecast information received and displayed on the screen may vary depending on your region and the location of the refrigerator. Therefore, LG does not guarantee and will not be held responsible for accuracy of the weather information.
- Check your zip code in the owner's manual or www.ambientdevices.com/cat/device/coverage.html.
- Weather forecast information is only available in U.S.A.



Use the up or down buttons to select WEATHER FORECAST

Use the right or left buttons to select ON/OFF

Use the right or left buttons to select ON

Use the right or left buttons to select region

Anniversary Reminder

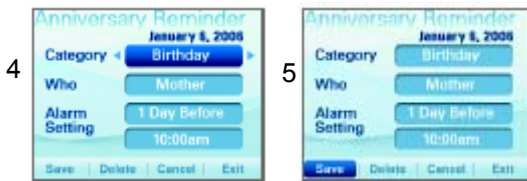
- Register the anniversary date.
- Select the Anniversary reminder using the button.



Press the up or down button to select **Anniversary Reminder**.

Select the month using the up or down button.

Press the down button and then select the date using the right or left button.



Select the menu using the up or down button.

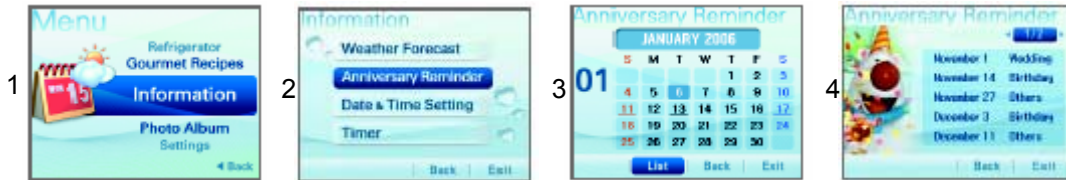
Press the down button to select Save.

Select the advance time using the right or left button.

NOTE:

The alarm will go off at the set date and time, and the anniversary will be displayed in the screen.

View the anniversary list



Press the up or down button to select **Anniversary Reminder**.

Press the up or down button to select list

You can check the detail menu using the right or left button.

Date & Time setting



Press the up or down button to select **Data & Time Setting**.

Select the menu using the up or down button
Select the value using the right or left button

Press the down button to select Save.

Timer

To set the alarm.



Press the up or down button to select **Timer**

Select time using right or left button

Press the down button to select **Save**.

- The alarm will go off at the set time, and the timer image will be displayed in the screen.

Gourmet Recipes

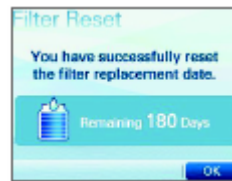
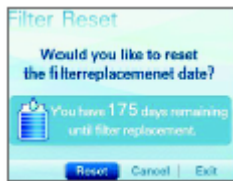
There are 10 classifications of recipes under this menu

1. Use the up or down button to select the type of recipe
2. Use the right or left button to select the specific recipe image
3. With MORE highlighted press the Select button to view the recipe



Filter Reset

You can select from Filter reset, Door alarm, Dispenser light, Manual, and Service Call functions. Filter Reset also reminds you when to replace the filter.



Press the up or down button to select **Filter Reset**

Press the right or left button to select **Reset**

Press the **Select** button

Door Alarm

This is the function of notifying you every 30 seconds that the refrigerator door is open for more than 1 minute.

- You can turn the door alarm on or off.

1. Press the Menu button
2. Use the up or down button to select the Door Alarm
3. Use the right or left to select Use or Not to Use.

Dispenser Light

This function controls the LED lamp located on the dispenser.

- Press this icon turn the dispenser light on or off.

1. Press the Menu button
2. Use the up or down button to select the Dispenser Light
3. Use the right or left to select ON or OFF.
4. Press the down button to save.

Owner's Manual

You can select from Key Guide, Tem. Adjustment, Child Lock, Weather Forecast, Proper Food Storage, Fridge Maintenance Guide, Freezer Maintenance Guide or Elimination of Odor function.

1. Press the Menu button
2. Use the up or down button to select the Owner's Manual
3. Use the right or left to select from the topics.
4. Press the select button to open the topic.
5. Use the right or left button to select the detail menu.
6. Press the down button to select list.



Service Call info.

This will show the phone number to call for service in the US and Canada.

1. Press the Menu button
2. Use the up or down button to select the Service Call info.

Settings

You can select from Display Image, Display Theme, Power Saver, Screen Backlight/Button Sound, or °C/°F Setting function.

1. Press the Menu button
2. Use the up or down button to select the Settings.
3. Use the up or down buttons to select the setting you wish to view or alter.
4. Select Save to keep the changes that have been made.

Display Image

You can select the standby screen setting.

1. From the Settings menu. Select Display Image.
2. Use the right or left button to select the image.
3. Select Preview to preview the image full screen. You can still use right or left to scroll thru the images.
4. Select Save to keep the image you selected.

Display Theme

You can select the screen theme setting.

1. From the Settings menu. Select Display Theme.
2. Use the right or left button to select the Theme. Character or Motion.
3. Use the down button to select Save.

Power Saver

When selecting [Use of Power Saver], the LCD screen backlight turns off after eclipse of designated time.

1. From the Settings menu. Select Power Saver.
2. Use the right or left button to select the Use or Not to Use
 1. If Use is selected use the down button to access the time setting.
 2. Use the right or left to select how long the screen will remain lit, 1,3,5 minuets.
3. Use the down button to select Save.

NOTE:

- When you select the **Photo**, the pictures saved in the photo album will be shown in slideshow.
- When selecting **Not in Use**, the current standby screen is saved as Screen Saver.

Screen Backlight/Button Sound

- You can adjust the screen brightness.
- When selecting the button sound, you can turn the button sound on or off.

1. From the Settings menu. Select Screen Backlight/Button Sound.
2. Use the right or left button to select the brightness.
3. Use the down button to select the Button Sound.
4. Use the right or left button to set turn it on or off.
5. Use the down button to select Save.

C/F Setting

1. From the Settings menu. Select C/F Setting.
2. Use the right or left button to select Centigrade or Fahrenheit.
3. Use the down button to select Save.

Photo Album

1. From the Settings menu. Select Photo Album.
2. Use the right or left button to select a photo.
3. Press the down button to display the image. The Right or left button will preview other photos.
 - a. Here you have the option to set the photo as a background.
4. Select Save to keep the photo you selected.

Deleting Photos

1. From the Settings menu. Select Photo Album.
2. Use the right or left button to select a photo.
3. Press the down button to select delete the image.
 - a. Here you can select Delete All then select yes or no.
4. Use the right or left button to select yes or no.
5. Select Save to keep the photo you selected.

Adding Photos

1. From the Settings menu. Select Photo Album.
2. When selecting Photo Album and then connecting a USB memory stick, import is automatically activated.
3. After setting up the desired photo from the data read, select import. Downloading will appear on the screen.

NOTE:

The Avatar Display applied to this refrigerator uses O/S (Windows CE), which recognition depends on the kind of USB Memory Stick. If USB which was recognized before, is not recognized currently. Power the unit off the back on.

Lock

Lock can be used to disable the buttons and prevent tampering with the settings.

- Select Lock using the buttons.
- Lock or unlock buttons and dispenser by pressing down the button for 3 seconds.
- When lock is selected, the dispenser and buttons will be locked and will not operate.
- When lock is selected, the lock icon will appear on the screen.

1. Press the Lock button.
2. When you see this message, "press the **Lock** button for 3 seconds". Press the lock button for 3 seconds.
3. This will lock the buttons.

NOTE:

Repeat the above steps to unlock the buttons.

MICROCONTROLLER

Door Alarm Buzzer Mute Mode

Press door alarm button to turn the buzzer on or off.

Demo Mode

Demo mode is available for displaying the refrigerator in a sales setting or similar condition. It allows the display, dispenser, lights, and fan to operate without running the compressor. To enter the DEMO mode, press the TEMPERATURE and the LOCK button simultaneously and hold for 5 seconds until the Ding sounds. You will see the letters DEMO on the top left side of the screen with a ding sound. To exit the DEMO mode and return to normal operation, press the TEMPERATURE and the LOCK button and hold simultaneously for 5 seconds until the Ding sounds again.

NOTE:

The refrigerator will default to the NORMAL mode (DEMO mode OFF) if the power fails.

LCD Check Mode

Press the TEMPERATURE and DOOR ALARM buttons simultaneously for 1 second in the locked state.

Communication Data Check Mode

Press MENU and insert icon (lamp and down arrow) button simultaneously for 6 seconds in the lock status

Temperature Selection Function

Division	Power Initially On	1st Press	2st Press	3th Press	4th Press
Setting Temperature	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●
Temperature Control	COLD	COLDER	COLDEST	COOL	COOLER
Freezer Control	-2 °F	-5 °F	-8 °F	7 °F	1 °F
Refrigeration Control	37 °F	34 °F	32 °F	46 °F	41 °F

NOTE:

The temperature can vary $\pm 5^{\circ}\text{F}$ ($\pm 3^{\circ}\text{C}$) depending on the load condition.

- The actual inner temperature varies depending on the food status, as the indicated setting temperature is a target temperature, not actual temperature within refrigerator.

Outside Temperature Display Function

1. The ambient temperature sensor is located under the upper right hinge cover. This sensor reads the temperature of the room and displays it in the upper right corner of the display.
2. The ambient temperature is displayed between 16 °F and 120 °F. Outside of that range, the display will show **Er**.
3. Since the ambient temperature sensor is located at the hinge, its reading may differ from other thermometers in the room.

Lock Function

1. To lock the display, the dispenser, and the control panel, push on the LOCK button more than 3 seconds. Lock icon is appears at the right of display when locked.
2. The buzzer sound, control panel, and dispenser functions do not work when the lock is set.
3. To release the lock, press the lock button and hold until the lock icon disappears (about 3 seconds).

Filter condition display function

1. There is a replacement indicator light for the water filter cartridge on the dispenser.
2. Water filter needs replacement about every six months.
3. You will see a reminder pop-up window in the LCD screen 2 weeks before / 1 week before / due date to replace the filter to notify you that the filter needs to be replaced.
4. If you want to reset the filter, use the Menu Refrigerator Filter Reset menu.

Dispenser use selection

You can select water or ice.

Select WATER, CRUSHED ICE, or CUBED ICE by pressing the DISPENSER button as you desire. Use your cup to press lightly on the actuator.

- Each graphic is indicated on the display for the selected function.
- You'll hear a CLICK when the ice door closes 5 seconds after ice is dispensed.

NOTE: Hold your cup in the dispenser for a few seconds after dispensing ice or water to catch the last few drops or pieces of ice.

ICE PLUS Freezing

Select this function to expedite freezing.

- Turn on/off the IcePlus function using the IcePlus button within the Temperature function.
- The "IcePlus" icon remains at the ON status after animation when selecting Special Refrigeration IcePlus FRZ
- ICE PLUS freezer function automatically turns off after a set time.

ICE PLUS freezing

1. ICE PLUS freezing is a function to increase the cooling speed of the freezer compartment by running both the compressor and the fan simultaneously.
2. ICE PLUS is cancelled and the refrigerator returns to its default setting in the event of a power interruption.
3. Selecting ICE PLUS changes only the speed of the cooling without affecting the set temperature.
4. The temperature can be adjusted even when ICE PLUS has been selected and is in progress.
5. The freezer operates at whatever temperature was set at the time ICE PLUS was selected.
6. If you select ICE PLUS, the compressor and fan will run until it is deselected or the cycle time has elapsed. (3 hours : compressor and fan run / 3 ~ 24 hours : COLDEST operation)
7. If a defrost cycle occurs while an ICE PLUS is already running, ICE PLUS runs for its remaining cycle time after the defrost cycle is completed. If the defrost cycle takes longer than 30 minutes, ICE PLUS will run for only 2 hours at the end of the defrost cycle.
8. If you press ICE PLUS during a defrost cycle, the ICE PLUS indicator will illuminate but the compressor will not operate until the defrost cycle is complete.
9. If you press ICE PLUS within 7 minutes of compressor cut-off, the compressor will not operate until the 7-minute delay has passed.
10. The freezer fan motor runs at high speed during the ICE PLUS cycle.

OptiFresh Function

1. The OptiFresh bin is positioned at the bottom of the refrigerator compartment and has a separate temperature control to allow perfect storage of fruits and vegetables.
2. OptiFresh comprises of OptiFresh sensor at the rear of OptiFresh and a damper between OptiFresh and Freezer compartment and a temperature adjusting display at the top of it.
3. When powered on, the initial NOTCH of OptiFresh display will be on OptiFresh Crisper. If only the refrigerator door is opened, the OptiFresh LED will be ON.
4. The OptiFresh sensor opens and closes the damper based on the temperature.
5. The OptiFresh damper will cycle every hour to prevent icing up.

Control of variable type freezing fan

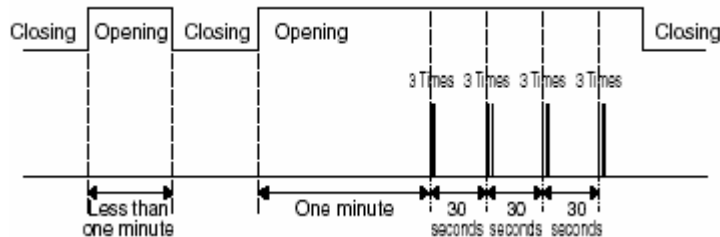
1. To increase cooling speed and response to load, the MICOM will vary the speed of the freezer fan between low and high.
2. The MICOM runs the fan at high speed only at power-up and for ICE PLUS cycles, and runs at low speed for all other settings.
3. If you open the freezer door, the refrigerator door, or the home bar door, and the freezer fan was running at high speed, it will reduce to low speed. If it was running at low speed when a door was opened, it will turn off.
4. If the MICOM determines the BLDC fan motor is locked up, (no signal for 115 seconds) it will show a failure code on the display and cut power to the fan. To power the fan again, unplug the refrigerator for a few seconds and plug it in again.

Control of cooling fan motor

1. The cooling fan motor performs ON/OFF control by linking with the COMPRESSOR.
2. It controls at the single RPM without varying RPM.
3. Failure sensing method is same as in fan motor of freezing fan motor (refer to failure diagnosis function table for failure display).

Door opening alarm

1. The buzzer sounds when any door is held open for more than one minute.
2. After any door has been open for one minute, the buzzer sounds three times for second each, then it sounds three times for second each every thirty seconds until the door is closed.
3. When all open doors have been closed, the buzzer stops.



Audible warning operation, manual frost defrost buzzer

1. The buzzer sounds briefly when the test button on the main PCB is pressed.
2. If you select manual operation, the buzzer sounds three times for 2/10 second each, then it sounds three times for 2/10 second each every thirty seconds until the door is closed.
3. If you select manual defrost, the buzzer sounds three times for 2/10 second each, then it sounds three times for 2/10 second each every thirty seconds until the door is closed.

Defrost function

1. Defrost is cycled whenever the compressor's runtime reaches 7 hours.
2. In providing initial power (or after a power failure), defrost starts whenever total operation time of compressor reaches 4 hours.
3. Defrost is completed when the temperature of the defrost sensor reaches 41°F (5°C) after starting defrost. Defrost ends after 2 hours even if the sensor does not detect 41°F (5°C).
4. No defrost cycle is run if the defrost sensor fails.

Refrigerator room lamp automatic off

- Refrigerator room lamp turns on and off by refrigerator door switch.
- If refrigerator door is open for 7 minutes, the refrigerator room lamp turns off automatically.

Sequential operation of components

Component products such as compressor, frost removal heater, freezing room fan, cooling fan, and step motor damper are sequentially started as follows to reduce noise and prevent part damage occurred due to starting of many parts during initial power and self test.

Function	Load Operation Sequence	Remark
In applying Initial power	<p>When temperature of a frost removal sensor becomes more than 45°C (At purchase, shipping)</p> <pre> graph LR A[POWER ON] -- 0.3 SEC --> B[COMP ON] B -- 0.3 SEC --> C[F-FAN & C-FAN ON] C -- 0.3 SEC --> D[R-STEP MOTOR DAMPER ON] D -- 0.3 SEC --> E[OPTICHILL STEP DAMPER MOTOR ON] </pre>	<p>If error occurs during operation, initial operation is not done.</p> <p>■ Sequence of load operation when closing FREEZER and REFRIGERATOR.</p>
	<p>When temperature of a frost removal sensor becomes less than 45°C (In power failure, service)</p> <pre> graph LR A[POWER ON] -- 0.3 SEC --> B[FROST REMOVAL HEATER ON] B -- 0.3 SEC --> C[FROST REMOVAL HEATER OFF] C -- 6.0 SEC --> D[DAMPER & DUCT DOOR & OPTICHILL HEATER ON] D -- 0.3 SEC --> E[DAMPER & DUCT DOOR & OPTICHILL HEATER OFF] </pre> <pre> graph LR A[PIPE & DISP' HEATER ON] -- 0.3 SEC --> B[PIPE & DISP' HEATER OFF] B -- 0.3 SEC --> C[COMP ON] C -- 0.3 SEC --> D[F-FAN & C-FAN ON] D -- 0.3 SEC --> E[R-STEP MOTOR DAMPER ON] E -- 0.3 SEC --> F[OPTICHILL STEP DAMPER MOTOR ON] </pre>	
TEST MODE	<p>Test mode 1 (Manual function)</p> <pre> graph LR A[TEST SWITCH PRESS Once] --> B[OTHER LOAD OFF] B -- 0.3 SEC --> C[COMP ON] C -- 0.3 SEC --> D[F-FAN & C-FAN ON] D -- 0.3 SEC --> E[R-STEP MOTOR DAMPER ON] E -- 0.3 SEC --> F[OPTICHILL STEP DAMPER MOTOR CLOSE] </pre>	<p>If you press the switch in the again test mode 2 or temperature of a frost removal sensor is more than 5°C, it immediately returns to the test mode for initial operation (COMPRESSOR operates after 7 minutes).</p>
	<p>Test mode 2 (Manual frost removal)</p> <pre> graph LR A[TEST SWITCH PRESS 2 Times] --> B[COMP OFF] B -- 0.3 SEC --> C[F-FAN & C-FAN OFF] C -- 0.3 SEC --> D[FROST REMOVAL HEATER ON] D -- 0.3 SEC --> E[R-STEP MOTOR DAMPER CLOSE] </pre>	

TROUBLESHOOTING

Test Function

1. The test function assists in diagnosing the PWB and determining the exact mode of failure.
2. The test button is on the main PCB. When test mode is engaged, it will complete its test cycle and default to normal operation after 2 hours.
3. The buttons are disabled while the test mode is in effect.
4. When you have finished running test mode, unplug the refrigerator to reset it to normal operation.
5. If a failure is detected during test mode, release the test mode to display the failure code.
6. If a failure code is displayed, the test mode cannot be started.

Mode	Operation	Contents	Remarks
Test 1	Press test button once (strong cold mode)	<ol style="list-style-type: none"> 1. Continuous operation of compressor 2. Continuous operation of freezing BLDC motor (high-speed RPM) and cooling BLDC motor 3. Defrost heater turns off 4. Stepping motor damper is completely opened (baffle is closed) 5. OptiFresh stepping motor damper is completely closed. 6. All display LCD graphics turn on. 	Freezer fan turns off when door is opened.
Test 2	Press test button once at the test mode 1 status (forced defrost mode)	<ol style="list-style-type: none"> 1. Compressor OFF 2. Freezing BLDC motor and cooling BLDC motor turn off 3. Defrost heater turns on 4. Stepping motor damper is completely closed (baffle is closed) 5. OptiFresh stepping motor damper is completely closed. 	Return to the normal mode when the defrost sensor is above +5°C (+41°F)
Normal Status	Press test button once at the test mode 2 status	Return to the initial status.	Compressor will operate after delay for 7 minutes

Failure Diagnosis Function

Failure diagnosis facilitates service when a failure code shows during product operation. When a failure is detected, the buttons are deactivated. If a failure code is released, the MICOM resets and normal operation continues. The failure code is displayed on the display screen. All display graphics that are not part of the failure code are turned off.

NO	ITEM	FAILURE CODE INDICATION		Contents of Failure	PRODUCT OPERATION STATUS IN FAILURE				
		Freezer room notch	Refrigerator room notch		Compressor	Freezer BLDC	Cooling	Defrost	Stepping motor
1	Abnormal freezer sensor	Er	Fs	Freezer sensor short	On for 15 minutes and off for 15 minutes	Standard RPM	O	O	O
2	Abnormal refrigerator sensor (R1) (Upper area in refrigerator)	Er	rS	Refrigerator sensor (R1) short	O	Standard RPM	O	O	Full opening for 10 minutes. Full closing for 15 minutes
3	Abnormal refrigerator sensor (R2) (Lower area in refrigerator)	Normal display (Note 2)		Refrigerator sensor (R2) short	O	Standard RPM	O	O	O
4	Abnormal defrost sensor	Er	dS	Abnormal short circuit	O	Standard RPM	O	No defrost	O
5	Failed defrosting	Er	dH	Defrost circuit open	O	Standard RPM	O	O	O
6	Abnormal freezing BLDC motor	Er	FF	Open or short circuit or motor defect in BLDC circuit.	O	Off	O	O	O
7	Abnormal cooling BLDC motor	Er	CF		O	Standard RPM	O	O	O
8	Abnormal communication	Er	CO	Shorted or open lead wire between main and display PCB.	O	Standard RPM	O	O	O
9	Abnormal ambient sensor	Normal display (Note 1)		Ambient sensor short circuit	O	O	O	O	O
10	Abnormal water tank sensor	Normal display (Note 2)		Water tank sensor short circuit	O	O	O	O	O
11	Abnormal optichill sensor	Normal display (Note 2)		Optichill sensor short circuit	O	O	O	O	O

All display parts turn off other than the freezer room and refrigerator temperature display (Failure code indicator). Refer to Notes 1, 2 for error display differences.

NOTE 1: If there is an error code displayed it will only be seen in the ambient temperature display area. This will still scroll between the ambient and outside temperature.

NOTE 2: It is possible for the R2-Sensor, water tank and optichill sensor not to display an error except while the unit is in the test mode.

Accessing the test mode

1. Press and hold the lock button down for three seconds.
2. Press the sound and temperature buttons simultaneously for 1 second.

R2 sensor (middle room)	Normal	Date and clock area of the display is on.	Other areas of the display are on
	Abnormal	Date and clock area of the display is off.	
Water tank sensor	Normal	The dispenser state area of the display is on.	
	Abnormal	The dispenser state area of the display is off.	
Optifresh sensor	Normal	Ambient temperature area of the display is on	
	Abnormal	Ambient temperature area of the display is off	

Main PCB test key operation

MODE	OPERATION	CONTENTS	REMARKS
TEST 1	Press the test button once (Strong cold mode)	<ol style="list-style-type: none"> 1. Continuous operation of the compressor. 2. Continuous operation of freezing and cooling BLDC motor (High speed RPM). 3. Defrost heater turns off. 4. Main stepping motor is completely open. 5. All display graphics turn on. 	Freezing fan turns off when the door is opened.
TEST 2	Press the test button once while in test mode 1 (Forced defrost mode)	<ol style="list-style-type: none"> 1. Compressor off. 2. Freezing and cooling BLDC motor turn off. 3. Defrost heater turns on. 4. Main stepping motor is completely closed. 5. All display graphics turn off (Only the failure area turns on). 	Returns to normal mode when the defrost sensor is above +5 degrees C
NORMAL STATUS	Press the test button once while in test mode 2	Returning to normal status	Compressor will operate after a seven minute delay.

CIRCUIT DESCRIPTIONS

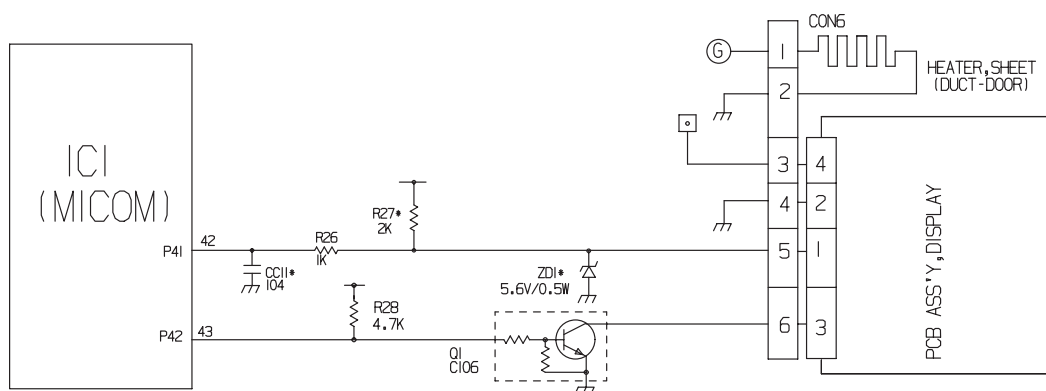
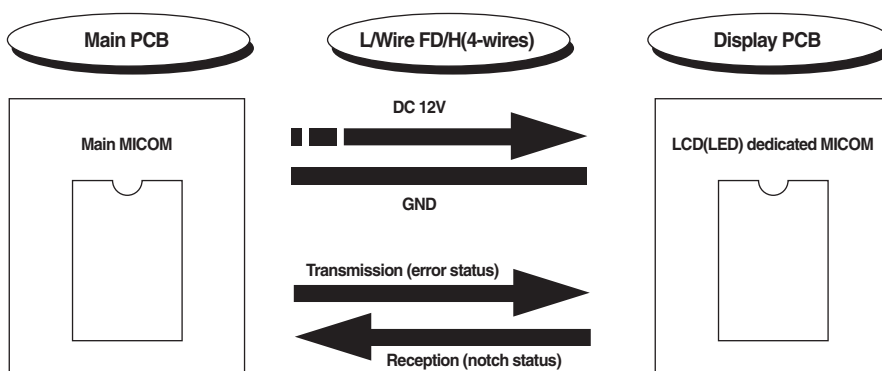
EXPLANATION FOR MICOM CIRCUIT

1-13. Communication circuit and connection L/Wire between main PCB and display PCB

The following communication circuit is used for exchanging information between the main MICOM of the Main PCB and the dedicated MICOM of the LCD Display PCB.

A bi-directional lead wire assembly between the two boards is required for the display to function properly.

Poor communication occurs if a continuous information exchange fail to continue for more than 2 minutes between main MICOM of main PCB and LCD dedicated MICOM for LCD control of display PCB.



Measuring Temperature (°C)	Freezing Sensor	Refrigerator sensor 1&2 Defrost sensor, Ambient sensor
-20 °C	22.3 kΩ	77 kΩ
-15 °C	16.9 kΩ	60 kΩ
-15 °C	13.0 kΩ	47.3 kΩ
-5 °C	10.1 kΩ	38.4 kΩ
0 °C	7.8 kΩ	30 kΩ
+5 °C	6.2 kΩ	24.1 kΩ
+10 °C	4.9 kΩ	19.5 kΩ
+15 °C	3.9 kΩ	15.9 kΩ
+20 °C	3.1 kΩ	13 kΩ
+25 °C	2.5 kΩ	11 kΩ
+30 °C	2.0 kΩ	8.9 kΩ
+40 °C	1.4 kΩ	6.2 kΩ
+50 °C	0.8 kΩ	4.3 kΩ

- ▶ Resistance value allowance of sensor is $\pm 5\%$.
- ▶ When measuring the resistance value of the sensor, allow the temperature of that sensor to stabilize for at least 3 minutes before measuring. This delay is necessary because of the sense speed relationship.
- ▶ Use a digital tester to measure the resistance. An analog tester has to great a margin of error.
- ▶ Resistance of the cold storage sensor 1 and 2 shall be measured with a digital tester after separating CON8 of the PWB ASSEMBLY and the MAIN part.
- ▶ Resistance of the freezing sensor shall be measured with a digital tester after separating CON7 of the PWB ASSEMBLY and the MAIN part.

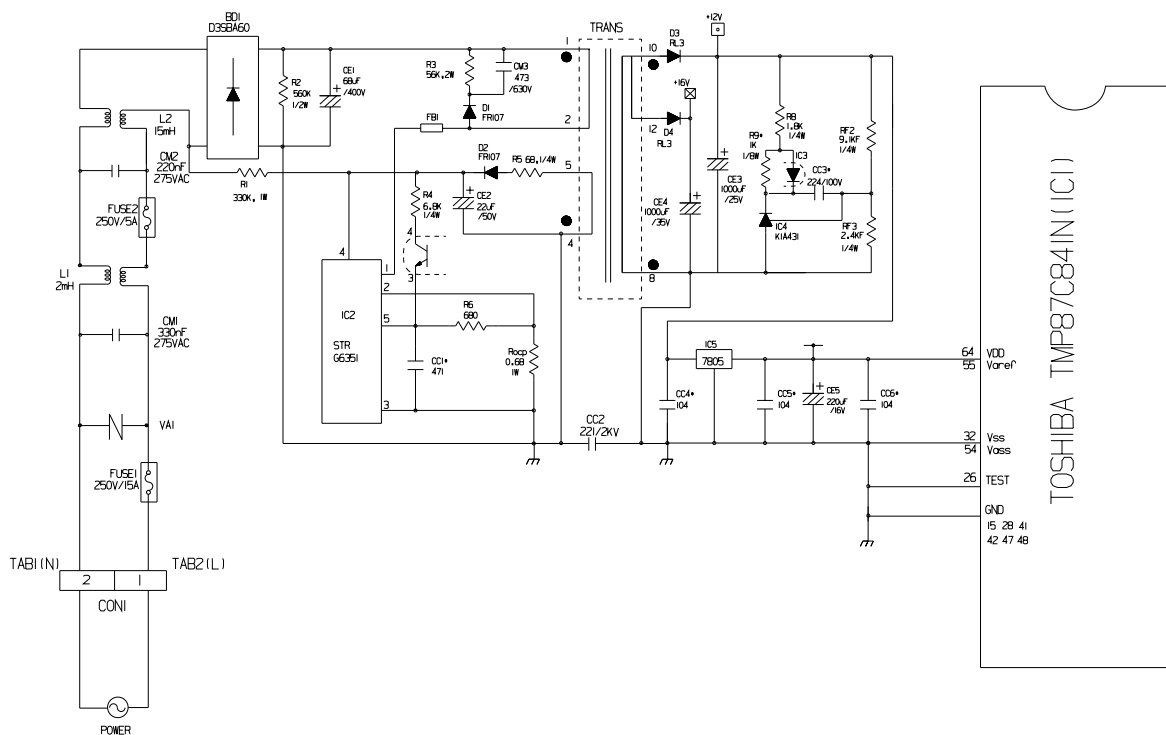
Power circuit

The power circuit includes a Switched Mode Power Supply (SMPS). It consists of a rectifier (BD1 and CE1) converting AC to DC, a switch (IC2) switching the DC voltage, a transformer, and a feedback circuit (IC3 and IC4).

Caution : Since high voltage (160 Vdc) is maintained at the power terminal, wait at least 3 minutes after unplugging the appliance to check the voltages to allow the current to dissipate.

Voltage of every part is as follows:

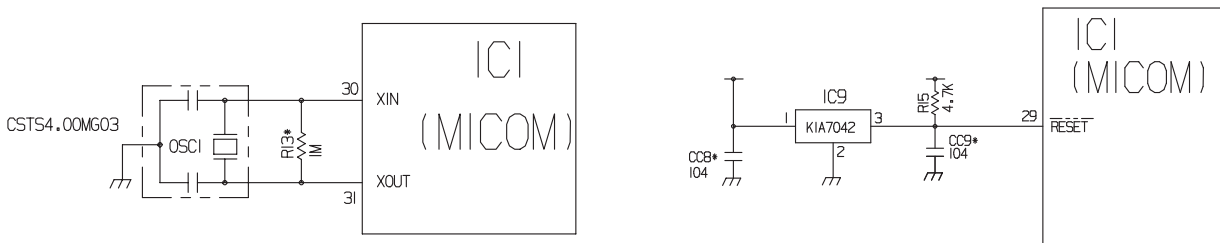
Part	VA1	CE1	CE2	CE3	CE4	CE5
Voltage	120 Vac	160 Vdc	14 Vdc	12 Vdc	15.5 Vdc	5 Vdc



Oscillation circuit

Figure 1

The oscillation circuit generates a basic clock signal for synchronization and time calculation related to the transmission of data and calculations made by the MICOM (IC1). The oscillator (OSC1) must always be replaced with an exact replacement part. If this specification is changed, the change will affect the time calculations of the MICOM and it might not work at all.



Reset circuit

Figure 2

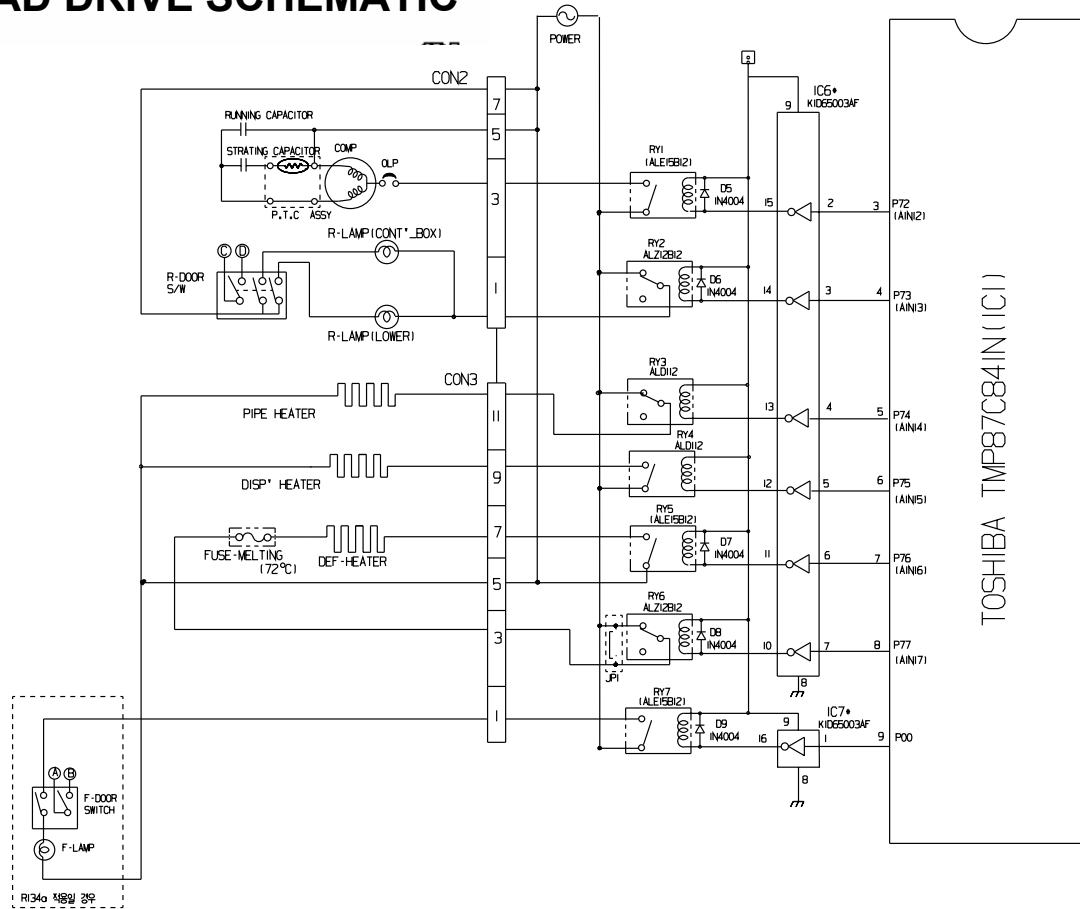
The RESET circuit allows various parts of the MICOM, such as RAM, defrosting, etc., to be restarted from the initial state when power is interrupted or restored. A LOW signal applied to the reset terminal for 10 ms causes the MICOM to reset itself. During normal operation, the voltage at the reset terminal is 5 Vdc. If the reset fails, the MICOM will not operate.

LOAD DRIVING CIRCUIT

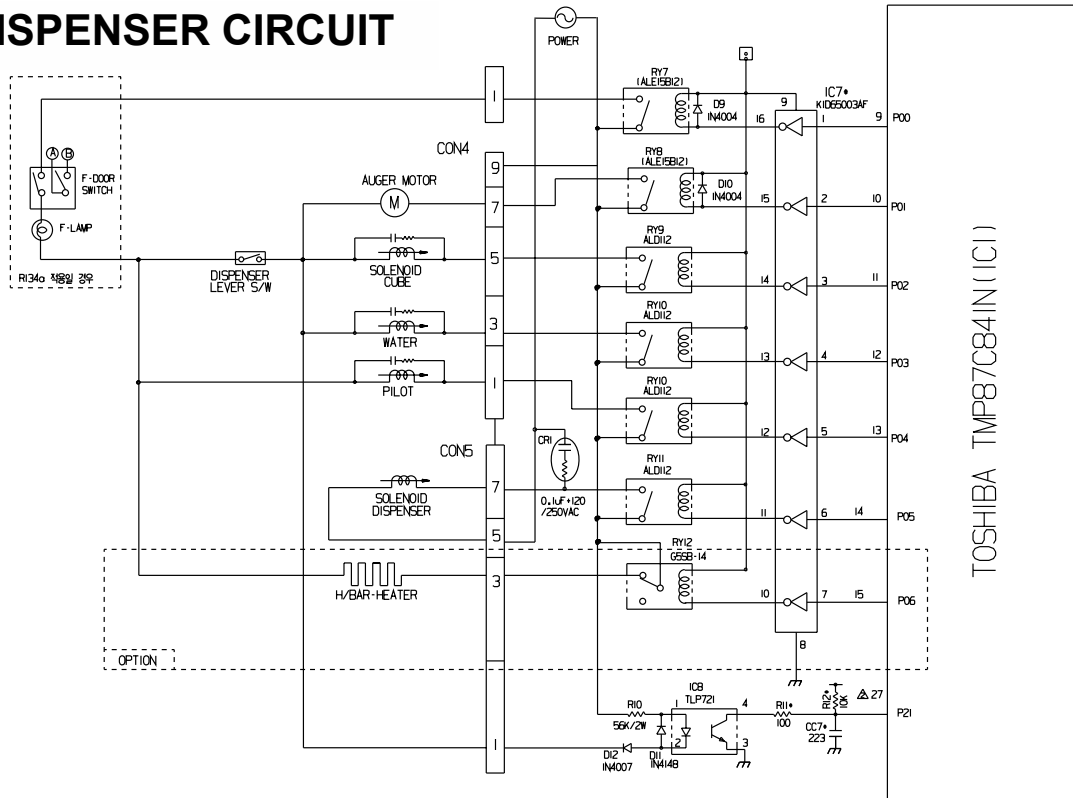
- The fan operates at the regular speed even if the door of the refrigerator or freezer is opened. When the doors are closed, the fan reverts to its original speed.
- (A), (B), (C), and (D) of door switch for the freezer or refrigerator are connected to the door open sensing circuit in parallel toward both ends of switch to determine door open at MICOM.
- In the TEST mode, the fan will stop if any door is opened. It will resume operation when the door is closed.

Type of Load	Compressor	Defrost Heater	AC Converting Relay	Refrigerator LAMP	Dispenser Heater
Measuring part (IC6)	IC6-16	IC6-13	IC6-12	IC6-15	IC6-14
Status	ON	Within 1 V			
	OFF	12 V			

LOAD DRIVE SCHEMATIC



DISPENSER CIRCUIT



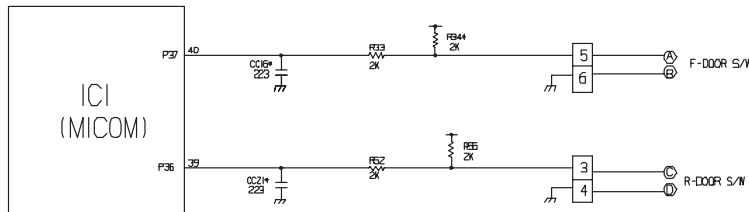
1) Check load driving status

Type of Load	GEARED MOTOR	SOLENOID CUBE	WATER VALVE	PILOT VALVE	SOLENOID DISPENSER
			WATER		
Measuring part	IC7-15	IC7-14	IC7-13	IC7-12	IC7-11
Status	ON	Within 1 V			
	OFF	12 V			

2) Lever Switch sensing circuit

Measuring part	IC1(Micom) (No. 16)	
Lever S/W		
On		
OFF	5V	

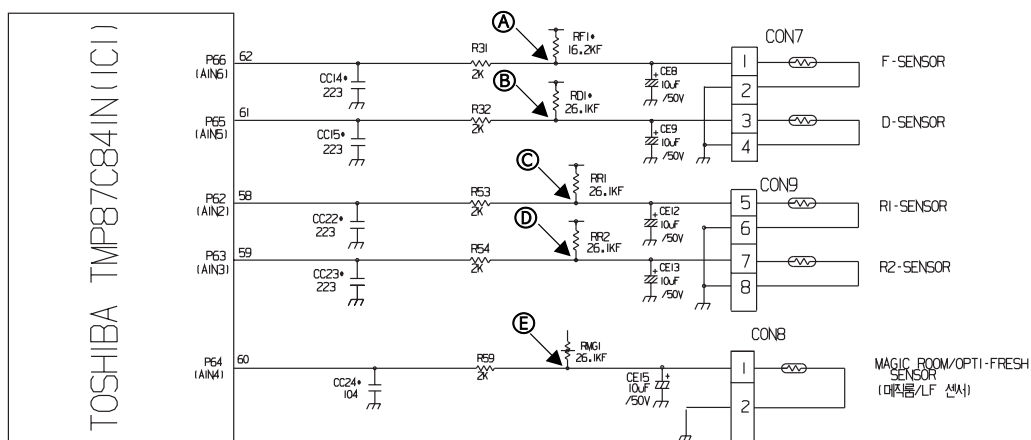
DOOR OPEN CIRCUIT



Measuring part	IC1 (MICOM) No. (44, 45) / (45, 46) / (47, 48) Pin
Door of Freezer and Refrigerator	
Closing	5 V (A) - (B), (C) - (D) . Switch at both ends are at Off status)
Opening	0 V (A) - (B), (C) - (D) . Switch at both ends are at On status)

- * Since door switches (A) and (B) are interconnected, if either fails, the other will not respond properly.
- * If either switch fails, the light will not come on.

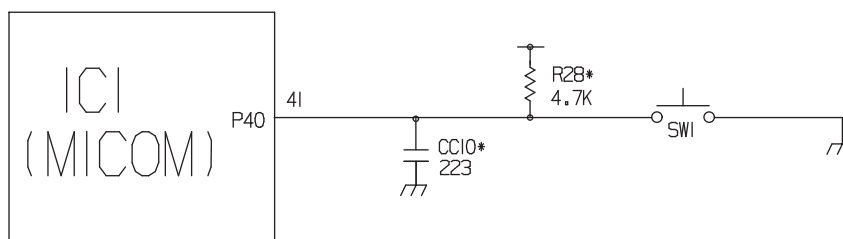
Temperature sensing circuit



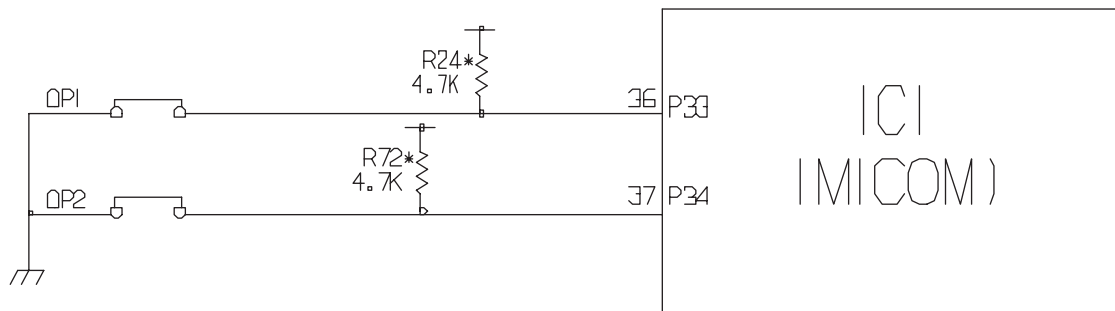
The circuits involving the freezer and refrigerator sensors control the temperature in both the freezer and the refrigerator. The icemaker sensor detects when ice is made. The defrost sensor determines both the need for defrosting and the efficiency of the defrost operation. See the table below for voltages and checkpoints.

SENSOR	CHECK POINT	NORMAL(-22 °F ~ 122 °F)	IN SHORT	IN OPEN
Freezing sensor	POINT (A) Voltage	0.5 V~4.5 V	0 V	5 V
Defrost sensor	POINT (B) Voltage			
Refrigerator sensor 1	POINT (C) Voltage			
Refrigerator sensor 2	POINT (D) Voltage			
Magic room/ Opti Fresh Sensor	POINT (E) Voltage			

Switch entry circuit



Option designation circuit (model separation function)



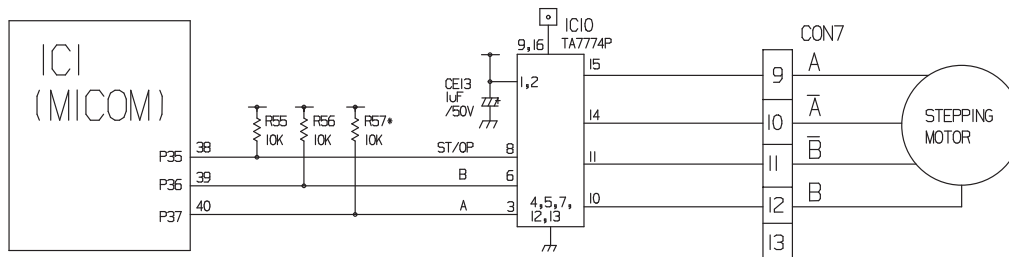
» circuits shown above vary according to which features are included on your particular model.

Separation	Connection Status	Application Standard
OP1	Connection	OptiFresh exist
	OUT	OptiFresh don't exist

These circuits are preset at the factory and cannot be altered.

Stepping motor operation circuit

The motor is driven by magnetism formed in the areas of the coils and the stator. Rotation begins when a HIGH signal is applied to MICOM Pin 33 of IC10 (TA7774F). This causes an output of HIGH and LOW signals on MICOM pins 34 and 35.



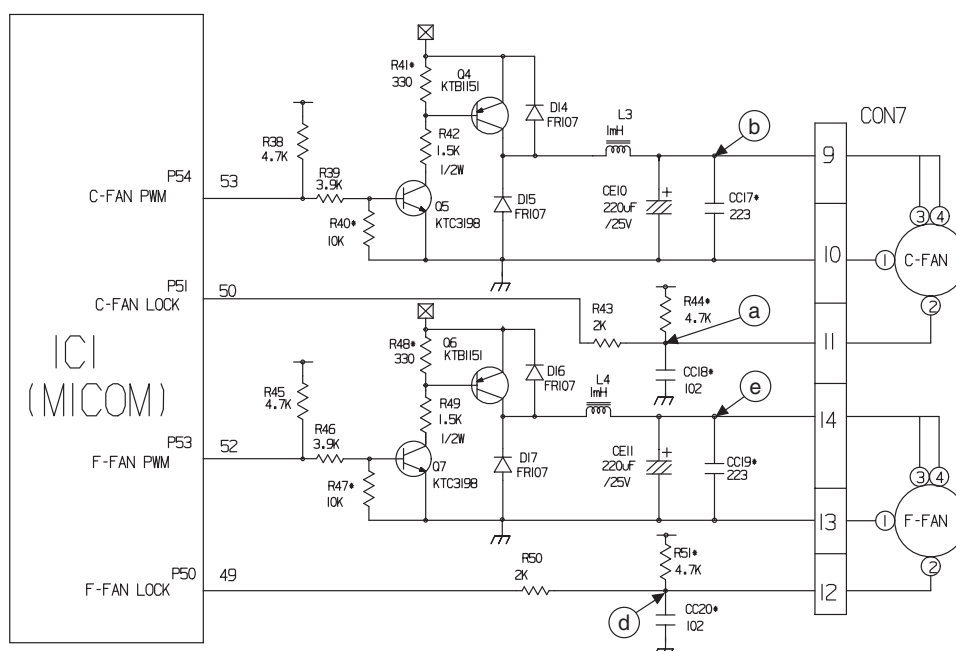
Explanation:

The stepping motor is driven by sending signals of 3.33 mSEC via MICOM pins 33, 34, and 35, as shown in the chart below. These signals are output via terminals 10, 11, 14, and 15 via input terminals 3, 6, and 8 of IC10 (TA7774F), the motor drive chip. The output signals allow the coils wound on each phase of the stator to form a magnetic field, which causes rotation. Input to the terminals INA and INB of IC10 as shown in the chart below drives the motor.

Fan motor drive circuit

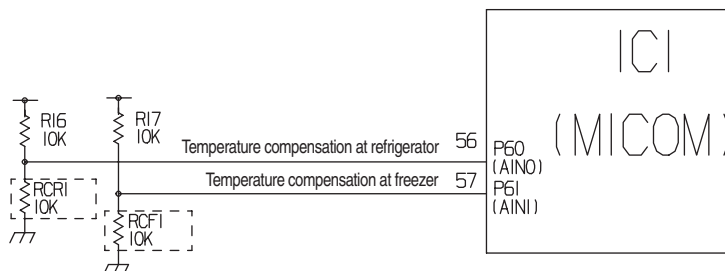
1. The circuit cuts all power to the fan drive IC, resulting in a standby mode.
2. This circuit changes the speed of the fan motor by varying the DC voltage between 7.5 Vdc and 16 Vdc.
3. This circuit stops the fan motor by cutting off power to the fan when it senses a lock-up condition.

	Ⓐ, Ⓓ part	Ⓑ part	Ⓔ part
Motor OFF	5V	2V or less	2V or less
Motor ON	2 ~ 3V	12 ~ 14V	8 ~ 16V



Temperature compensation and temperature compensation circuit

Temperature compensation in freezer and refrigerator



Freezer		Refrigerator		Remarks
Resistance value (RCF1)	Temperature compensation	Resistance value (RCR1)	Temperature compensation	
180 kΩ	+5 °C [+9°F]	180 kΩ	+2.5 °C [+4.5°F]	Warmer ↑
56 kΩ	+4 °C [+7.2°F]	56 kΩ	+2.0 °C [+3.6°F]	
33 kΩ	+3 °C [+5.4°F]	33 kΩ	+1.5 °C [+2.7°F]	
18 kΩ	+2 °C [+3.6°F]	18 kΩ	+1.0 °C [+1.8°F]	
12 kΩ	+1 °C [+1.8°F]	12 kΩ	+0.5 °C [+0.9°F]	
10 kΩ	0 °C [0°F]	10 kΩ	0 °C [0°F]	Reference temperature
8.2 kΩ	-1 °C [-1.8°F]	8.2 kΩ	-0.5 °C [-0.9°F]	↓ Cooler
5.6 kΩ	-2 °C [-3.6°F]	5.6 kΩ	-1.0 °C [-1.8°F]	
3.3 kΩ	-3 °C [-5.4°F]	3.3 kΩ	-1.5 °C [-2.7°F]	
2 kΩ	-4 °C [-7.2°F]	2 kΩ	-2.0 °C [-3.6°F]	
470 Ω	-5 °C [-9°F]	470 Ω	-2.5 °C [-4.5°F]	

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

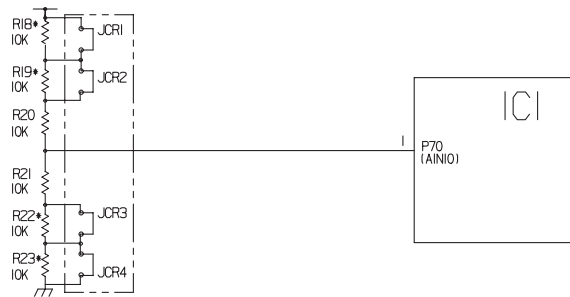
Ex) If you change compensation resistance at a refrigerator (RCR1) from 10 kΩ (current resistance) to 18 kΩ (modified resistance), the temperature at the refrigerator will increase by +1°C[+1.8°F].

Temperature compensation table at the refrigerator is as follows:

	Modification resistance Current resistance	470 Ω	2 kΩ	3.3 kΩ	5.6 kΩ	8.2 kΩ	10 kΩ	12 kΩ	18 kΩ	33 kΩ	56 kΩ	180 kΩ	
		Refrigerator (RCR1)	470Ω	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up	3 °C [5.4 °F] Up	3.5 °C [6.3 °F] Up	4 °C [7.2 °F] Up	4.5 °C [8.1 °F] Up
2 kΩ	0.5 °C [0.9 °F] Down		No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up	3 °C [5.4 °F] Up	3.5 °C [6.3 °F] Up	4 °C [7.2 °F] Up	4.5 °C [8.1 °F] Up	
3.3 kΩ	1 °C [1.8 °F] Down		0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up	3 °C [5.4 °F] Up	3.5 °C [6.3 °F] Up	4 °C [7.2 °F] Up	
5.6 kΩ	1.5 °C [2.7 °F] Down		1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up	3 °C [5.4 °F] Up	3.5 °C [6.3 °F] Up	
8.2 kΩ	2 °C [3.6 °F] Down		1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Drop	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up	3 °C [5.4 °F] Up	
10 kΩ	2.5 °C [4.5 °F] Down		2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	2.5 °C [3.6 °F] Up	2.5 °C [4.5 °F] Up
12 kΩ	3 °C [5.4 °F] Down		2.5 °C [4.5 °F] Down	2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	2 °C [3.6 °F] Up	
18 kΩ	3.5 °C [6.3 °F] Down		3 °C [5.4 °F] Down	2.5 °C [4.5 °F] Down	2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	1.5 °C [2.7 °F] Up	
33 kΩ	4 °C [7.2 °F] Down		3.5 °C [6.3 °F] Down	3 °C [5.4 °F] Down	2.5 °C [4.5 °F] Down	2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	1 °C [1.8 °F] Up	
56 kΩ	4.5 °C [8.1 °F] Down		4 °C [7.2 °F] Down	3.5 °C [6.3 °F] Down	3 °C [5.4 °F] Down	2.5 °C [4.5 °F] Down	2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change	0.5 °C [0.9 °F] Up	
180 kΩ	5 °C [9 °F] Down	4.5 °C [8.1 °F] Down	4 °C [7.2 °F] Down	3.5 °C [6.3 °F] Down	3 °C [5.4 °F] Down	2.5 °C [4.5 °F] Down	2 °C [3.6 °F] Down	1.5 °C [2.7 °F] Down	1 °C [1.8 °F] Down	0.5 °C [0.9 °F] Down	No change		

- Temperature compensation at the freezer is performed the same as at the refrigerator. The value for the freezer is twice that of the refrigerator.
- This circuit enters the necessary level of temperature compensation for adjusting the appliance. The method is the same for every model in this appliance family.

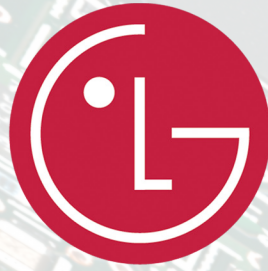
Compensation circuit for temperature at freezer



Temperature compensation in CUT		
JCR1	+1 °C [+1.8 °F]	+2 °C [+3.6 °F]
JCR2	+1 °C [+1.8 °F]	
JCR3	-1 °C [-1.8 °F]	-2 °C [-3.6 °F]
JCR4	-1 °C [-1.8 °F]	

Compensation for too warm		Compensation for too cold		Temperature compensation value at refrigerator	Remarks
JCR3	JCR4	JCR1	JCR2		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0 °C (In shipment from factory)	
CUT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-1 °C [-1.8 °F]	
<input type="checkbox"/>	CUT	<input type="checkbox"/>	<input type="checkbox"/>	-1 °C [-1.8 °F]	
<input type="checkbox"/>	<input type="checkbox"/>	CUT	<input type="checkbox"/>	+1 °C [+1.8 °F]	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CUT	+1 °C [+1.8 °F]	
CUT	CUT	<input type="checkbox"/>	<input type="checkbox"/>	-2 °C [-3.6 °F]	
<input type="checkbox"/>	<input type="checkbox"/>	CUT	CUT	+2 °C [+3.6 °F]	
CUT	<input type="checkbox"/>	CUT	<input type="checkbox"/>	0 °C [0 °F]	
CUT	<input type="checkbox"/>	<input type="checkbox"/>	CUT	0 °C [0 °F]	
<input type="checkbox"/>	CUT	CUT	<input type="checkbox"/>	0 °C [0 °F]	
<input type="checkbox"/>	CUT	<input type="checkbox"/>	CUT	0 °C [0 °F]	
CUT	CUT	CUT	<input type="checkbox"/>	-1 °C [-1.8 °F]	
<input type="checkbox"/>	CUT	CUT	CUT	+1 °C [+1.8 °F]	
CUT	CUT	CUT	CUT	0 °C [0 °F]	

**Life's
Good**



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