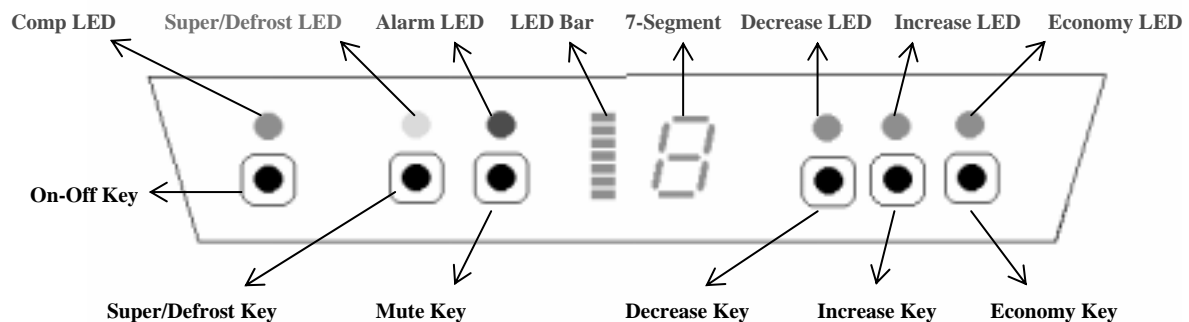


## Multi-Function Refrigerator Controller

### General Description:

**M**ulti-**F**unction **R**efrigerator **C**ontroller (**MRC**) is a digital electronic controller that is used to control and display temperature of Refrigerator , Freezer and Refrigerator-Freezer. It is to simplify operation and deliver greater accuracy than mechanical controllers. Changing mode of control between Refrigerator, Refrigerator-Freezer and Freezer can be done by jumper settings on the board. Control panel of **MRC** consist of the following elements.



- 1- **Comp LED** : This LED, Display On-Off Status of compressor and **MRC**. Color of this LED is Green.
- 2- **On-Off Key** : This Key is used for turning on and off the **MRC**.
- 3- **Super/Defrost LED** : If **MRC** is in the Refrigerator or Refrigerator-Freezer mode , this LED display defrost mode. In Freezer mode, this LED display super mode. Color of this LED is Yellow.
- 4- **Super/Defrost Key** : This Key is used to selecting defrost mode in Refrigerator and super mode in Freezer.



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- 5- **Alarm LED** : This LED is used to display fault status. Color of this LED is Red.
- 6- **Mute Key** : This key is used to switching off the alarm signal.
- 7- **LED Bar** : This LED Bar consist of seven 2x5 LED with green color for schematic display of temperature.
- 8- **One Digit 7-Segment** : For indicating the mode of control . Mode of control is a number between 1-7 and E for economy mode. This 7-Segment has green color.
- 9- **Decreasing LED** : This LED is used to displaying the status of Decreasing button. Color of this LED is Green.
  - 10- **Decreasing key** : This key is used to decrease the temperature mode from 7-1.
  - 11- **Increasing LED** : This LED is used to displaying the status of Increasing button. Color of this LED is Green.
  - 12- **Increasing key** : This key is used to Increase the temperature mode from 1-7.
  - 13- **Economy LED** : This LED is used to displaying economy mode “E” . Color of this LED is Green.
  - 14- **Economy Key** : This key is used to selecting Economy mode “E”.

### Technical Spec. :

- **Operating Voltage Range** : 170-250 V – 50 Hz AC
- **Low Voltage Detection** : The MRC is switch off if the line voltage is lower than 170V and automatically switched on when line voltage is reached to 180V.
- **Temperature Sensing Range** : -40 to +40 °C
- **Temperature Sensor** : High Accuracy NTC . This sensor is used to measure temperature of refrigerator evaporator and must constructed by water-proof materials. The cover of sensor must causes no delay in sensing the temperature. Installation place of the sensor, is the surface of refrigerator evaporator by a screw.

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- **Temperature Accuracy** :  $\pm 0.5^{\circ}\text{C}$

Features :

- **On-Off Key** : The **MRC** is switched off by pressing and holding this key for 3 seconds. The **MRC** is switched on immediately by pressing this button.
- **Comp. Led** : This Led lights up when compressor is on and flash when **MRC** is switched off.
- **Super/Defrost Key** :
  - 1- **Freezer** : This button is used for switching the fast freezer function on or off . by pressing it, then compressor is switched on and remain active for 6 hours. if the super button is pressed while the freezer is in the super mode, the fast freeze function will be stopped and the **MRC** will return to its previous mode. the Super Led lights up when the super mode is selected.
  - 2- **Refrigerator** : This button is used for defrosting the refrigerator. by pressing it, if the temperature of refrigerator evaporator is less than  $+6^{\circ}\text{C}$ , the compressor is switched off and it remains inactive until the temperature reaches to  $+6^{\circ}\text{C}$ . if the Defrost button is pressed while the freezer is in the Defrost mode, the Defrost function will be stopped and the **MRC** will return to its previous mode. The Defrost Led lights up when the Defrost mode is selected.
  - 3- **Refrigerator-Freezer** : This button is inactive and have no action. The Defrost Led lights up when the Compressor is switched off.
- **Mute Key** : If one of the following faults is occurred, the **MRC** send an alarm signal:
  - 1- If the door left open more than 45 seconds.
  - 2- If the temperature is greater than alarm temperature. For refrigerator In defrost mode, this alarm is inactivated.

Operation Mode	Alarm Temperature
<i>Refrigerator</i>	$-4^{\circ}\text{C}$
<i>Freezer</i>	$-5^{\circ}\text{C}$
<i>Refrigerator-Freezer</i>	$+10^{\circ}\text{C}$



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3- If the Temperature sensor is disconnected. When the sensor is disconnected, Seven Segment flash with this pattern , Alarm Signal is send and alarm Led is light on. In this situation the compressor will be turned on for 10 Minutes and turned off for 15 minutes consequently. The alarm signal is send only one minute in each on-off cycle of compressor.

by pressing the mute button, the alarm signal switched off, but the Alarm LED remain on, until the fault is corrected.

- **Alarm LED :** This LED is light up when an alarms occurred and will be light off until the fault is corrected.
- **LED Bar :**
  1. *Refrigerator* : With decreasing of the refrigerator temperature, the first LED turned off at 0 °C, the second at -4 °C and other LEDs turn off respectively, so the sixth, turns off at -20 °C and the seventh LED always remains on.
  2. *Freezer* : With decreasing of the Freezer temperature, the first LED turned off at -6 °C, the second at -10 °C and other LEDs turn off respectively, so the sixth, turns off at -26 °C and the seventh LED always remains on.
  3. *Refrigerator-Freezer* : With decreasing of the refrigerator-Freezer temperature, the first LED turned off at 0 °C, the second at -4 °C and other LEDs turn off respectively, so the sixth, turn off at -20 °C and the seventh LED always remains on. when the temperature become increase at switching on temperature ( -4 °C ) 5 LED are light up.
- **Decreasing Key :** This button is used for decreasing the mode of control. by pressing this key the mode of control decrease from 7 to 1. when The control mode reached to 1, it will be fixed on 1 until increase button is pressed.
- **Decreasing LED :** This LED is lights up when Decrease Key is pressed.
- **Increasing Key :** This button is used for increasing the mode of control. by pressing this key the mode of control increase from 1 to 7. when The control mode reached to 7, it will be fixed on 7 until decrease button is pressed.
- **Increasing LED :** This LED is lights up when Increase Key is pressed.



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- When the MRC is connected to line voltage, at the start up the default mode of control is **mode 3**.
- **Economy Key** : By pressing this button, the most energy efficient mode ( **Economy mode**) is selected and letter **E** is displayed in 7-Segment. if the Economy mode is pressed again, the MRC return to its previous mode of control.
- **Economy LED** : This LED lights up when the economy mode is selected and remains on until the economy mode is inactivated.
- **Interior light** : The interior light is switched on when the door is open. if the door is left open for more than 45 seconds, the **MRC** send an alarm signal and Alarm led lights up. if the door is open for more than 2 minutes, the interior light and Alarm signal is switched off, but the Alarm LED remains on, until the door is closed.
- **Compressor protection** : In order to protect the compressor from electrical damages and overload, it should be a 4 minutes delay between consecutive switching the compressor on and off. This delay time should not be at the first switching on of the **MRC**.
- **Temperature Settings** : The compressor will be switched on and off following below tables.

#### Freezer on-off temperature settings

Control Mode	Switching Off Temperature	Switching On Temperature
<b>1</b>	-21	-10
<b>2</b>	-22	-10
<b>3</b>	-23	-11
<b>4</b>	-24	-11
<b>5</b>	-25	-12
<b>6</b>	-26	-13
<b>7</b>	-27	-13
Economy <b>“E”</b>	-25	-12



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#### Refrigerator on-off temperature settings

Control Mode	Switching Off Temperature	Switching On Temperature
1	-16	-8
2	-17	-9
3	-18	-10
4	-19	-10
5	-20	-11
6	-21	-11
7	-23	-12
Economy "E"	-19	-10

#### Refrigerator-Freezer on-off temperature settings

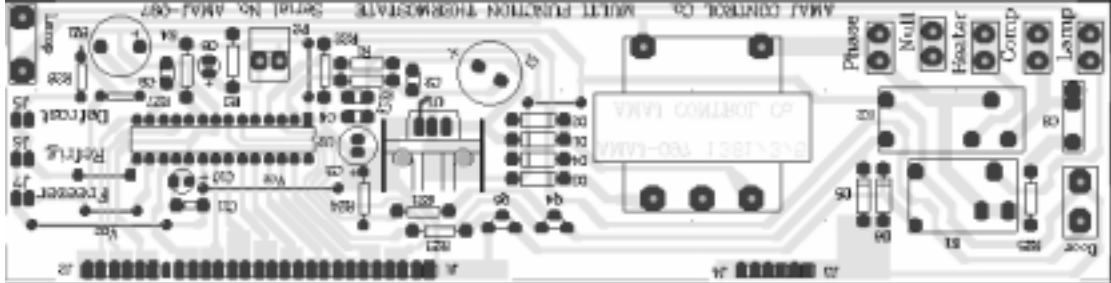
Control Mode	Switching Off Temperature	Switching On Temperature
1	-16	4
2	-17	4
3	-18	4
4	-19	4
5	-20	4
6	-21	4
7	-23	4
Economy "E"	-19	4

- The sequence and place of power terminals must be exactly as our sample :
  - 1- Phase
  - 2- Null
  - 3- Heater
  - 4- Compressor
  - 5- Interior Lamp

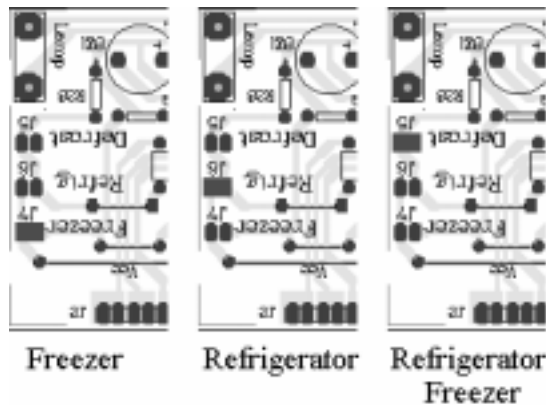
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- There is a NC (Normally Close) switch that acts as door sensor. This switch is connected to MRC with 2 green wires with 15cm length. The place of these wires must be same as our sample and above figure.
- Whenever a key is pressed, a buzzer must send a signal to indicate the key is pressed.
- Interior Lamp has this specifications : 220 V AC 50 Hz , 15 Watt
- The compressor of Refrigerator has this specifications : 1/3 HP, 220V AC , 50 Hz
- For switching on and off the interior lamp or compressor, both solid state and mechanical relay can be used. but waveform of compressor must have no any distortion.
- For changing operation mode of **MRC** between Freezer , Refrigerator and refrigerator-Freezer three jumper must be used. By connecting Each of them at start up, the operation mode of **MRC** is changed. The sequence and place of these jumpers must be exactly as our sample.





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