

# Service Manual

# Moffat

## ELECTRONIC POLAR WITH EXTERIOR DISPLAY



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## SECURITY

### GENERAL INFORMATION

The new line of no frost refrigerators identified as MOFFAT 2001 in the capacities of 11, 13, 14, 16 cubic feet, are manufactured in the refrigerator plant of "ASTRAL" located in the city of Querétaro, Mexico.

The standard no frost refrigerators use electromechanical controls, the deluxe models use electronic systems to control temperatures and defrost cycles, some models have the "QUICK FREEZE" options (quick cooling) and a "VACATION" mode feature.

All models use 2 fan motors, one for the condenser and one for the evaporator  
The new air tower for the internal air distribution has "TURBO PLUS COOLING SYSTEM" that assures the appropriate temperatures for each refrigerated areas.

### RESPONSIBILITY

The information provided in this technical manual are designed for qualified service technicians who have knowledge in electricity, electronics and mechanics, it is intended to guide the qualified personnel to carry out repairs in the refrigerators with automatic defrost, any type of personal accident or to the property is the technician's responsibility so " MABE " or " SERVIPLUS " can not accept responsibility for the use of this manual.

### SECURITY

For your own security disconnect the power to the refrigerator before carrying out any repair, if it is necessary to perform voltage measures, amperage, etc., reconnect the power only the necessary time to carry out the test.

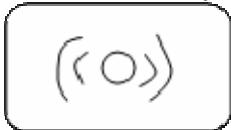
The complete assemblies of the electronic cards and the modules (elements) are very sensitive to the electric discharges, special procedures are required for their handling as the use of bracelets or antistatic gloves. DO NOT TOUCH NOR HANDLE THE CARD IF YOU DON'T HAVE THE APPROPRIATE EQUIPMENT.



## FEATURES

### ALARM

It is activated or disabled by pressing the ALARM pad. You will then hear a tone and the screen will display the letter “A” and the superior part of the button will be illuminated.

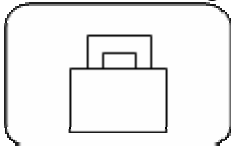


### VACATION

To activate press the “VACATION” pad.

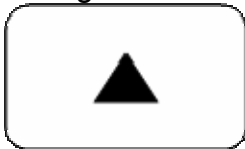
There are two ways to disabled the “VACATION” mode

1-By pressing the “VACATION” pad or 2- By opening the refrigerator door you will then hear a tone and the superior part of the button will be illuminated, besides the led indicator you will see that the digit in the display will advance slowly until disabling the function.



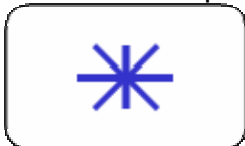
### COOLING LEVEL

Press this pad to change the settings of the refrigerator, the setting can be increase from 1 through 9. 9 being the coldest.



### TURBO

Besides the led indicator you will notice that with this feature the refrigerator will cool quicker. The digit of the screen will advance quickly for one hour. At the end of this period it will return to its normal operation.



### LOCK CONTROL

This function is to prevent any involuntarily settings changes. To activate or disable, push and hold simultaneously the ALARM and VACATION pads for 3 seconds; the letter L will be displayed for a short period and then revert to the refrigerator settings.



## 1- FAN BLADE ADJUSTMENT ON MOTOR ASSEMBLY “POLAR”



A CILINDRICAL GAUGE IS NEEDED FOR THE POSITIONING OF FAN BLADE.  
SEE SPECIFICATION BELOW:

For models the 11',12',13'y 14' we have to use a depth of (11 mm.) marked CD.  
For models the 15',16' 18' we have to use a depth of ( 6 mm.) marked CA.

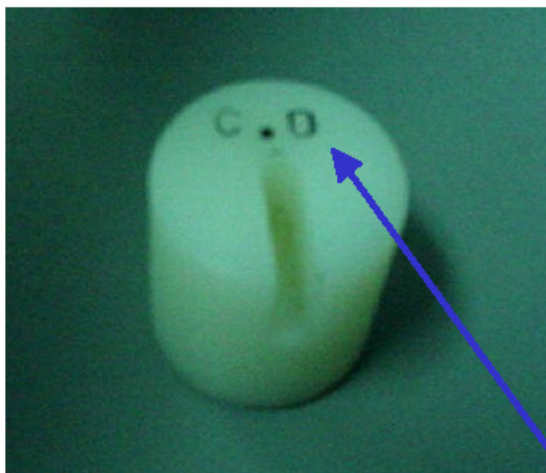


Figure 1.- Cilindrical Gauge

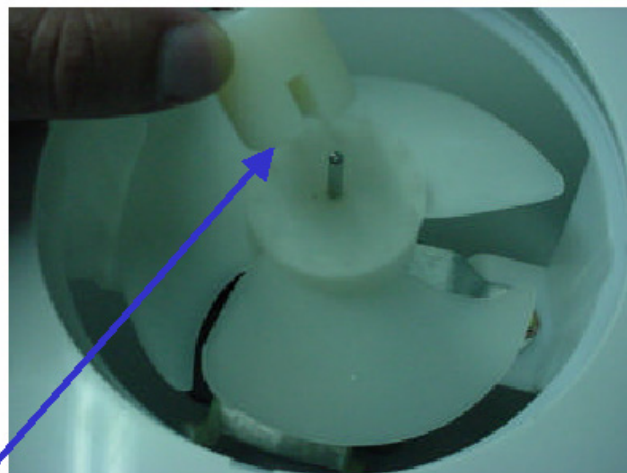
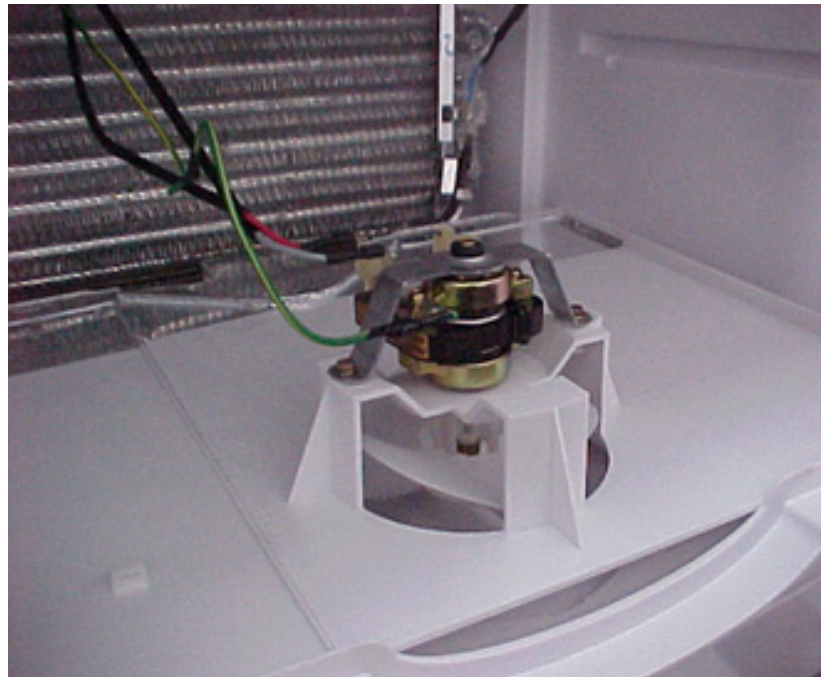
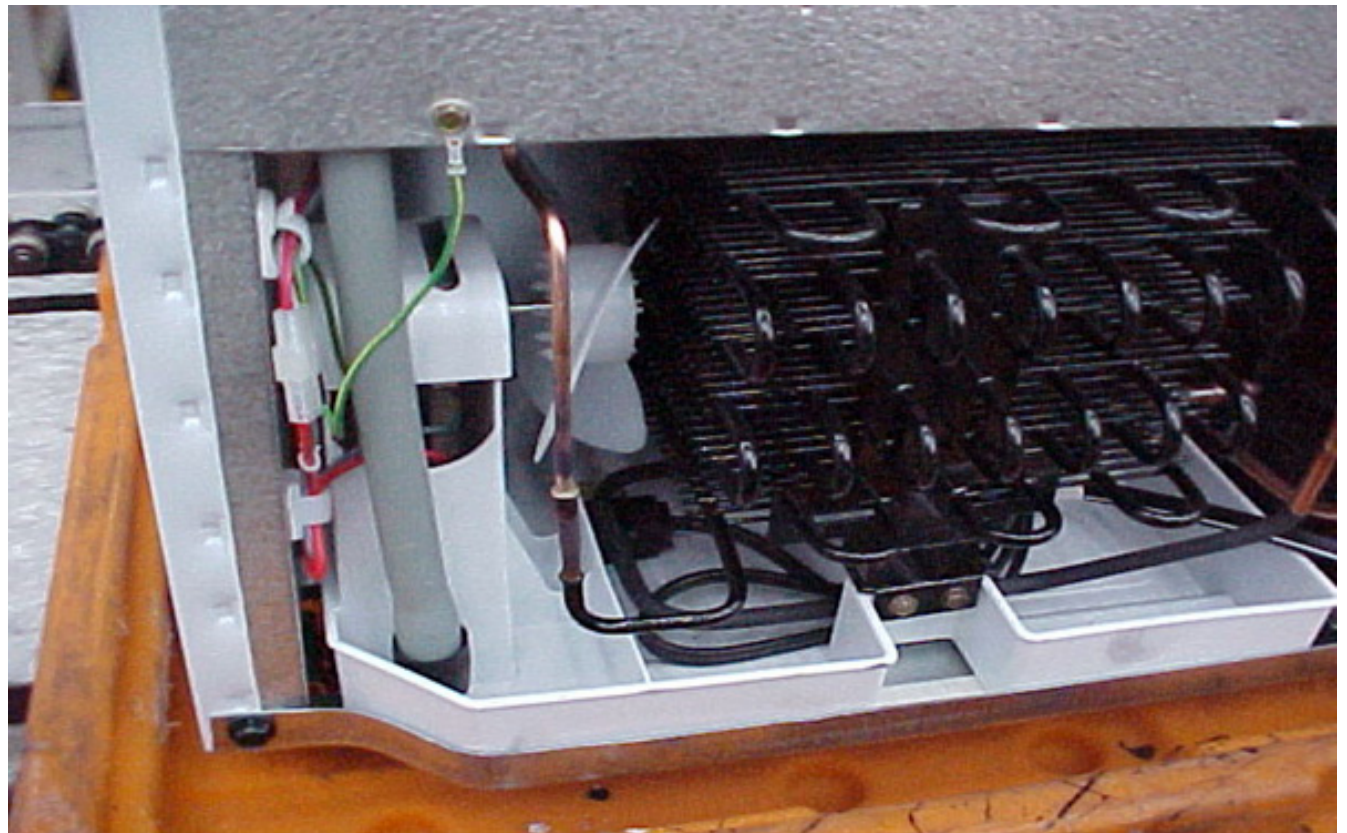


Figure 2.- Depth Fan Blade

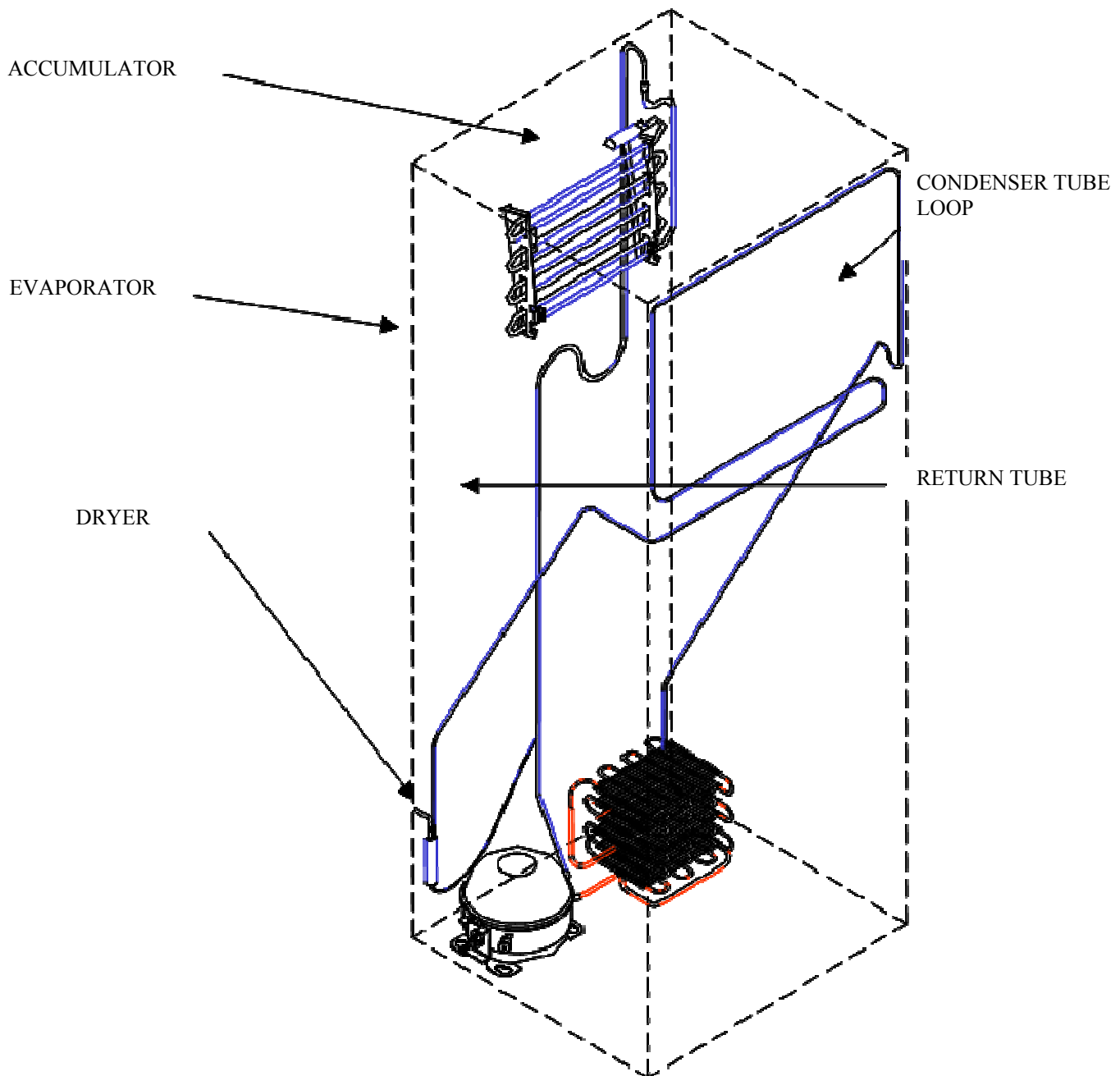
## EVAPORATOR FAN MOTOR



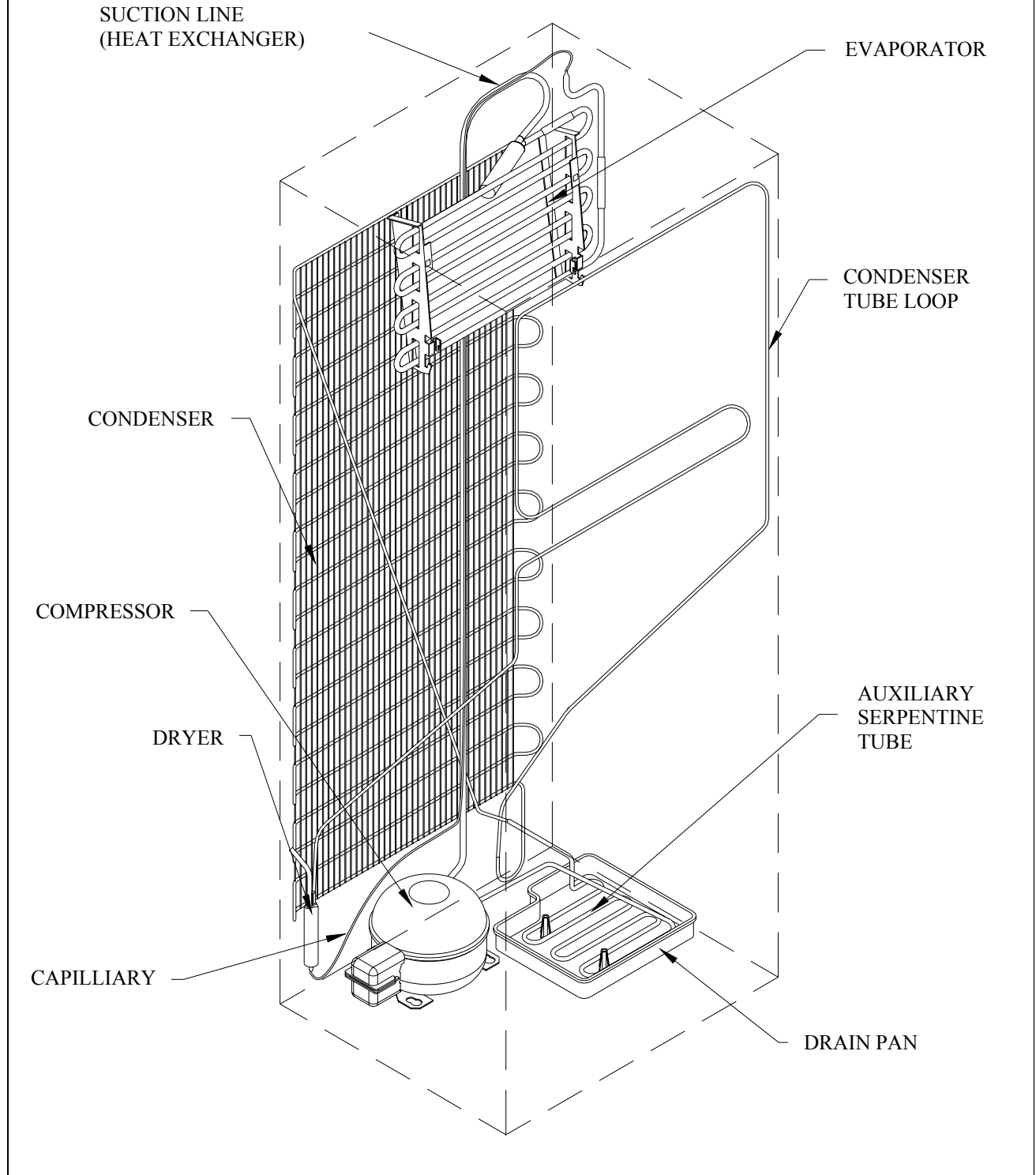
## CONDENSER FAN MOTOR ASSEMBLY



## FAN FORCED COOLING UNIT



## STATIC CONDENSER SYSTEM REFRIGERANT UNIT





If it is required to replace the display or the card, follow the steps shown in the figure.



Press the display and slide to the right as the arrow indicates.

### ODOR FILTER INSTRUCTIONS

To install

- 1.- Remove the filter from the bag
- 2.- Clean the plastic surface of the cartridge with a dry rag, this to clean the dust.
- 3.- Place the filter at the top of the cooling tower, as shown in figure A, this filter is attached by clips located in the back of the cartridge.

It is important to make sure that the cartridge has been correctly installed.

To replace the filter

- 1.- Pull the filter towards you.
- 2.- Install the new filter.

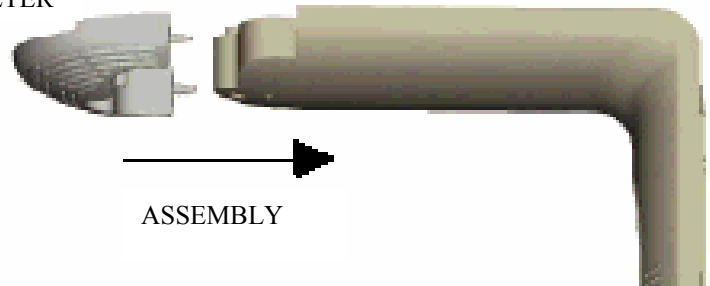
### Interior display for models (y)



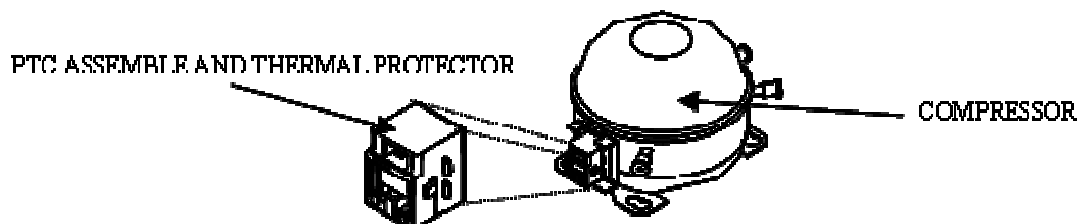
FIGURE A

COOLING TOWER

FILTER



This compressor uses a solid state (P.T.C.) relay.



## SECURITY

Before connecting the refrigerator to the power source, make sure that all electric connections are isolated, all harnesses are connected and are away from any sharp edges of the cabinet and that all the internal and external electrical grounds of the product are connected.

## ELECTRIC SYSTEM

### PTC (POSITIVE TEMPERATURE COEFFICIENT)

Contrary to the electromechanical relay, the PTC doesn't have a coil neither mobile contacts.

A PTC is a thermistor, in other words, it is a resistance sensitive to the heat, which increases its resistance in Ohms as the temperature increases.

The element of work of the PTC is basically a board of Titanium of Barium of high purity with an aluminum covering.

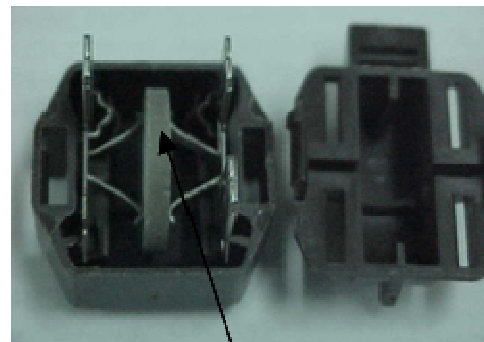
When the PTC receives a voltage, initially high power circulates through it, elevating its temperature and its resistance, by increasing the resistance the power that supplies the start winding of the of the compressor falls considerably.

This capacity of the PTC makes it act as a substitute of the work carried out by the contacts of the electromechanical relay.

PTC



BARIUM

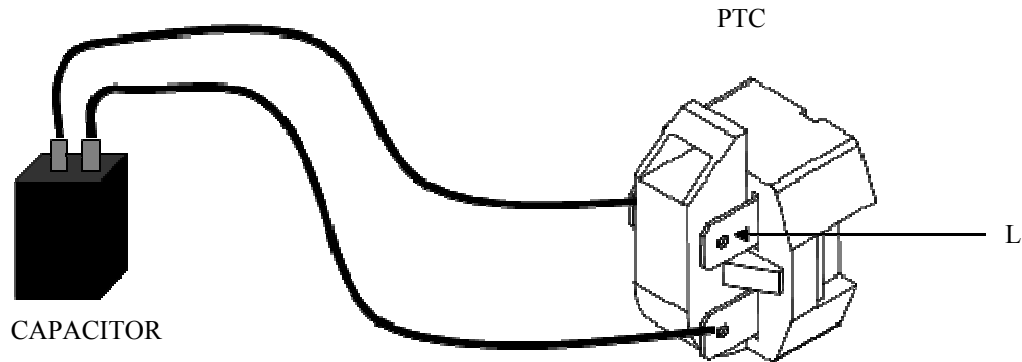


TITANUM TABLET

### CAPACITOR OF CONTINUOUS LOAD (WORK) (RUN CAPACITOR)

Some models of refrigerators have integrated a capacitor of continuous load or Work of 12mf. A 200 A.C.V. that is connected in a circuit parallel to the connections

## CONNECTION OF THE CAPACITOR TO THE PTC



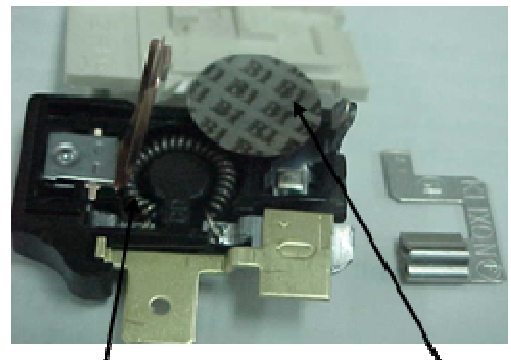
## THERMAL PROTECTOR

This component (which is placed in the body of the compressor), quickly detects any abnormal rise of temperature or excess amperage draw caused by a mechanical or electric problem or an inappropriate application.

This element of the compressor consists on a bimetallic disk, which, when overheated due to the warming of the integrated resistance caused by an increase of the amperage the bimetallic disk bend and disconnect the compressor, after the disk has cool down it will reestablishes the electrical contact.



THERMAL PROTECTION



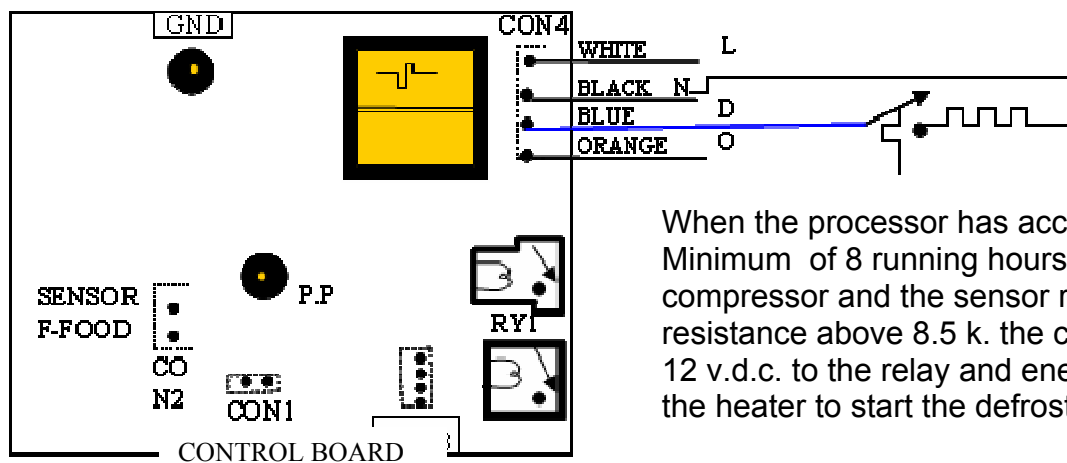
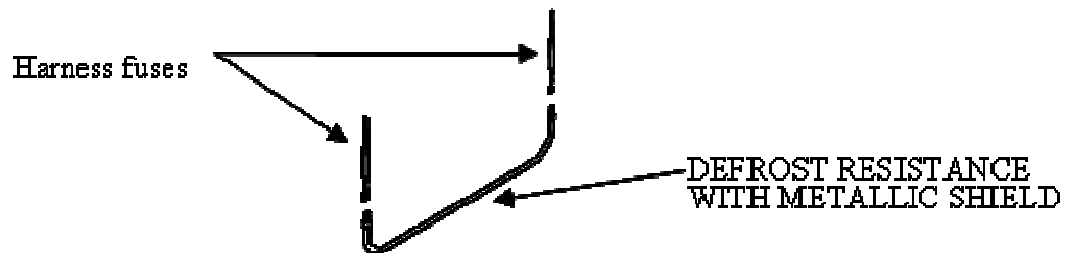
RESISTANCE

BIMETALLIC DISK

In this refrigerator the Thermal Protector and the PTC are contained inside a box, in which the 2 component are connected together in the compressor.

## DEFROST CIRCUIT

The defrost circuit components are: control card, defrost sensor, relay num. 2 on card, output connector “con 4”, defrost thermostat, fuses and resistance (heater).



When the processor has accumulated a Minimum of 8 running hours of the compressor and the sensor registers a high resistance above 8.5 k. the card sends 12 v.d.c. to the relay and energize the heater to start the defrost cycle.

## FAN MOTORS

The refrigerator has two fans motors, one in the freezer section and another for the condenser and operate with 127 volts a. c.

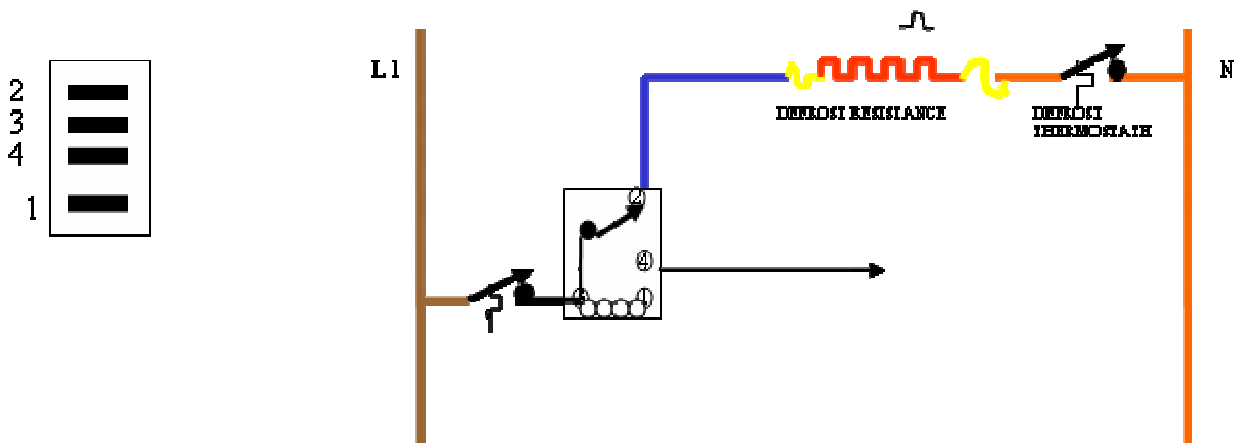
The evaporator fan motor circulate the warm air through the evaporator and returns cold air to the freezer and refrigerator fresh food section.

The condenser motor dissipate the heat generated by the condenser unit due to the refrigerant circulating through the tubing.

## ELECTROMECHANICAL DEFROST SYSTEM

There is also an electromechanical defrost system that consists on a timer that controls the time of the cooling and defrost cycles (10 accumulated-working hours of the compressor and 35 minutes for the defrost cycle).

DEFROST CYCLE CIRCUIT



PHYSICAL COMPONENTS; DEFROST TIMER, THERMOSTAT (KLIXÓN) AND HEATER.



## ELECTRONIC DEFROST SYSTEM

If the resistance (heater) is connected 20 minutes in the defrost cycle, the next defrost cycle will be increase by 2 hours, if it is connected 30 minutes it will remain as it is, if heater stays energize for 40 minutes it will decrease the next defrost cycle by 2 hours, this way it programs the defrosting within ranges of 8 hours minimum to 12 hours maximum, increasing or diminishing 2 hours, it never carries out the change from 8 to 12 hours or from 12 to 8 hours.

When the refrigerator is already working and it is disconnected for a short time or if there is an interruption in the electric power supply, it loses the memory stored in the card, with respect to the time that the heater remained connected in the last defrost cycle, when it reaches the cut temperature indicated by the potentiometer and the sensor of the refrigerator, it turns off the compressor and carries out a defrost to obtain the registration of the time that the heater will be connected and to program the next defrost.

## DEFROST SENSOR

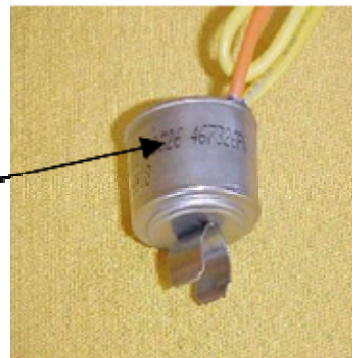
The function of the defrost sensor is to disconnect the heater once frost has melted of the evaporator. When the temperature reaches the specification range of the sensor, then the circuit opens, and heater is de-energize.

## DEFROST THERMOSTAT

The defrost thermostat consists of a single pole switch, a bimetallic disk and a pressure pin; these elements are inside a metallic cylinder filled with epoxy paste. Two connection cables come out from the cylinder which are soldered to the internal terminals.

If after a maximum of 40 minutes the defrost sensor didn't disable the heater and the thermostat shut off temperature is reached, the bimetallic disk (defrost thermostat) will then disconnect the circuit to the heater. When the temperature of the evaporator lowers enough (depending on the specifications of the thermostat), the bimetallic disk recovers its form and it reconnects the terminals again, this way the bimetallic thermostat acts as a safety to avoid that the temperature increases higher than 22 °C.

BIMETALLIC SECURITY  
THERMOSTAT

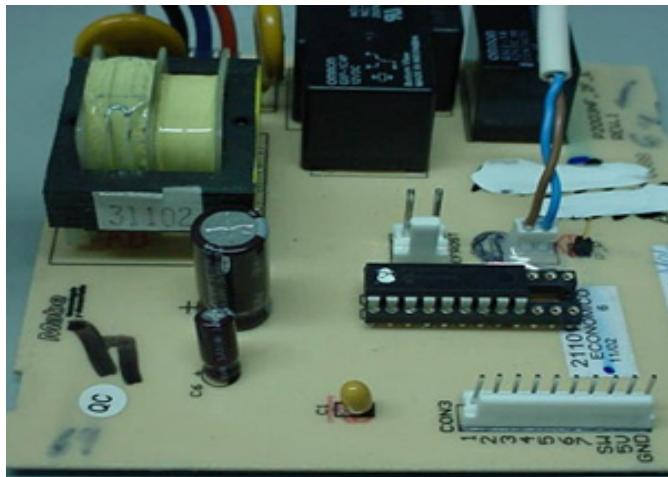


## ELECTRONIC CARDS

There are 2 different types of electronic cards for these models, one for the deluxe models (y) with internal display and another for super luxury models (z) with external display (see pictures 1 and 2), the following is the way to diagnose if the electronic card is working correctly.

1. First make sure that there is not any false contact in none of the elements of the electric system.
2. It will be necessary the use of anti-static protection before handling the electronic card (bracelet or gloves).

### CARD DELUXE VERSION (MODEL Y):



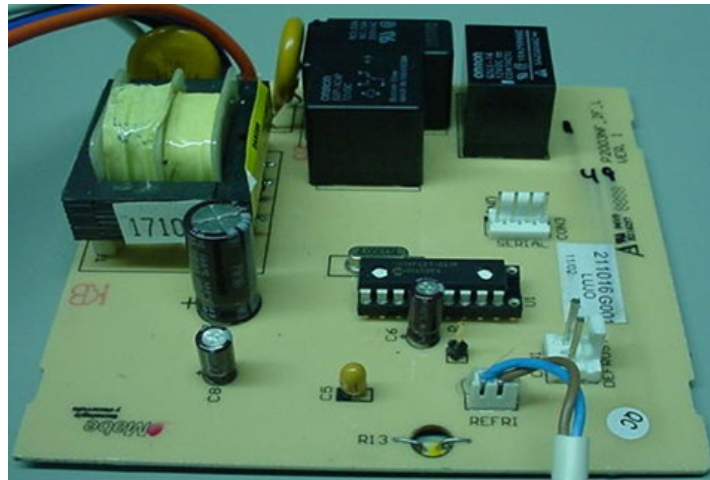
Verification of normal and defrost operation.

- a) **Disconnect the cabinet (disconnect power supply cord).**
- b) **Disconnect the harness of the freezer sensor CON1.**
- c) **Disconnect the harness display from connector CON3.**
- d) **Connect the cabinet (connect power supply cord).**
- e) **Approx. 4 seconds later the compressor comes on.**
- f) **Carry out a bridge between GND T\_P (test point).**
- g) **The compressor will turn off in a maximum time of 5 seconds and 5 seconds later the defrost resistance will turn on.**
- h) **Carry out a bridge between the pins CON1.**
- i) **The defrost resistance must go off in a maximum time of 10 seconds.**
- j) **Disconnect the cabinet (disconnect power supply cord).**
- k) **Connect the refrigerator sensor CON1.**

- l) Connect the harness display to connector **CON3**.
- m) Assemble the tower again.
- n) Energize the cabinet (connect power supply cord).

## CARD VERSION SUPERLUXURY (MODEL Z)

### DELUXE MOFFAT CARD



## CARD VERSION SUPERLUXURY (MODEL Z):

Verification of normal and defrost operation.

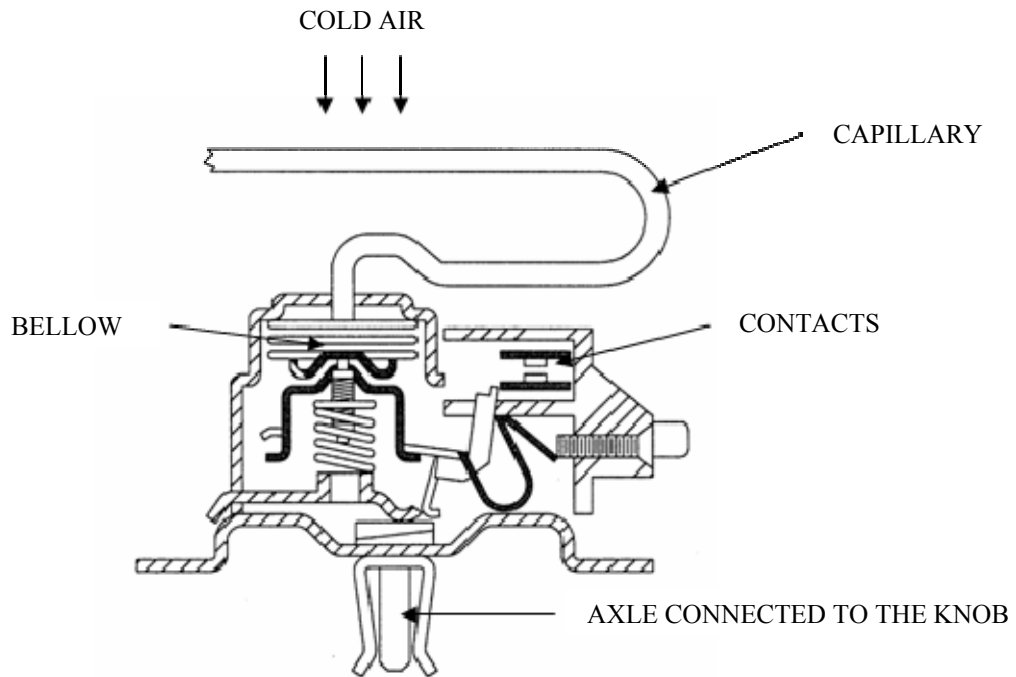
- a) Disconnect the cabinet (disconnect power supply cord).
- b) Disconnects the harness of the freezer sensor **CON1**.
- c) Disconnect the harness display of the connector **CON3**. [Option 2 leave connected.](#)
- d) Energize the cabinet (connect power supply cord).
- e) Approx. 4 seconds later turn the compressor on.
- f) Carry out a bridge between **T\_P** and **GND** (**be careful do not touch the marked pin as v12 of the CON3**). [Use connector 1 pin type.](#)
- g) The compressor will go off at a maximum time of 5 seconds and 5 seconds later the resistor of thaw will come on.
- h) Carry out a bridge among the pins the **CON1**.
- i) The resistance of thaw will be turned off at a maximum time of 10 seconds.
- j) Disconnect the cabinet (disconnect power supply cord).
- k) Connect the sensor of the freezer **CON1**.
- l) Connect the harness display to the connector con3 and position external display in the number that was originally (this is because when being connected again it will put automatically in position 1).
- m) Assemble the tower again.
- n) Energize the cabinet (connect power supply cord).



## TEMPERATURE CONTROL (ELECTROMECHANICAL)

This component controls the temperature of the refrigerator maintaining it within the preset limits. The electromechanical control is able to control the temperature through a sensitive hollow bulb (capillary) full with refrigerant, which contracts or expands according to the temperature that is measuring.

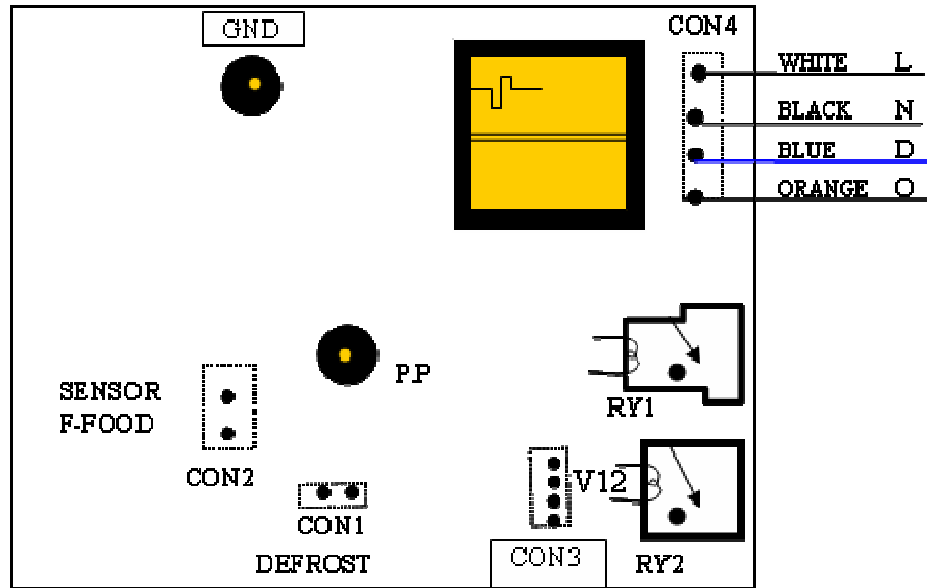
Those temperatures at which the control starts or stops the compressor are called respectively "cut temperature" and "start temperature" and they are the ones that should be revised with a thermometer to see if the control is well calibrated or not.



### DIRECT TEST FOR THE ELECTRONIC CARD

#### TEST OF THE REGULATED VOLTAGE OF THE CARD

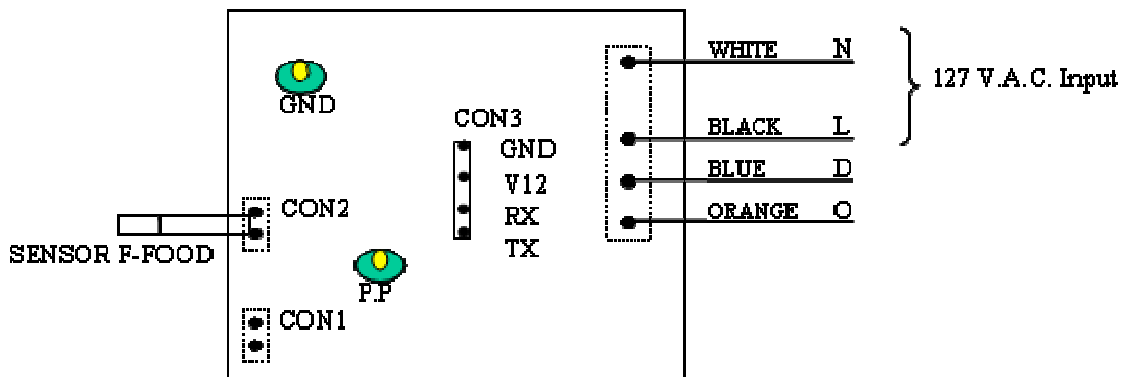
The tests that are indicated should be carried out through the sensor located in the fresh foods compartment and the potentiometer (temperature control) integrated to the card, whenever some of these components are damaged the complete assembly should be changed, since each card is calibrated with these components.



ELECTRONIC CONTROL TABLET

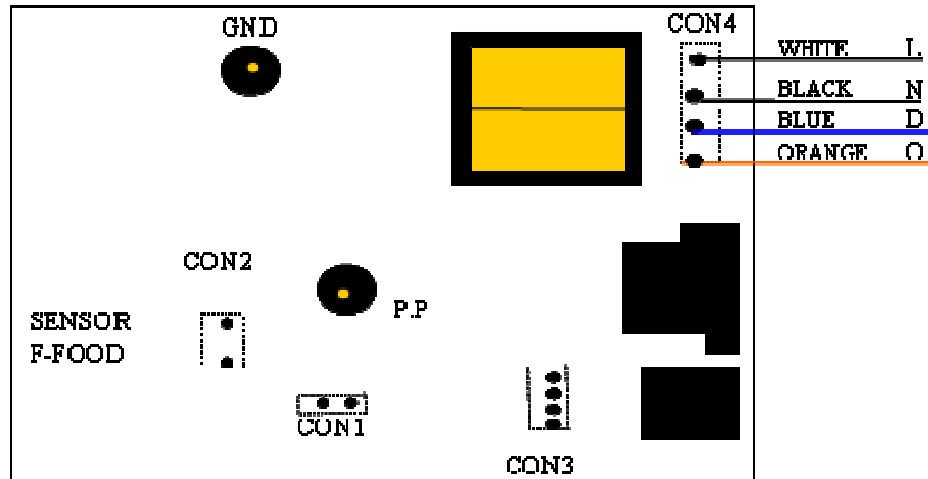
When applying 127 A.C.V. in the white and black cables the card is energized, if the internal operation is correct, it should measure 12 v.c.d. between the test points GND and V12.

#### OPERATION OF THE COMPRESSOR



ELECTRONIC CONTROL TABLET

## DEFROST OPERATION



ELECTRONIC CONTROL TABLET

When voltage is applied between the white and black cables the card is energized, after 10 seconds it sends the signal to start the compressor, in that moment a bridge should be connected between the test points GND y T\_P, the compressor will then go off, three seconds later it will send the signal to start the Defrost cycle, you should measure 127 V.A.C. between the white and blue cables.

**NOTE:** If the freezer sensor is connected and does not register temperature, the signal to initiate the defrost cycle will not be sent by the card.

## THERMISTORS TEST

The thermistors varies their resistance according to the temperature that they detect, at ambient temperature they have little resistance, when diminishing the temperature the value of the resistance is increased, the approximate readings are shown according to a scale of temperatures in the chart, in fact the important thing in the thermistors is that they should not measure a resistance with infinite value (open) or zero resistance (closed), and when warming or cooling down they should vary the value of the resistance.

The thermistors located in the freezer and the fresh food have the same characteristics and the values are same, the difference is the connector type and the temperature to which they send the signal to the card.

TEMPERATURE	RESISTANCE	TEMPERATURE	RESISTANCE
40 °C.	3,000 Ω	5 °C.	10,700 Ω
35 °C.	3,500 Ω	0 °C.	12,800 Ω
30 °C.	4,100 Ω	-5 °C.	16,000 Ω
25 °C.	5,000 Ω	-10 °C.	24,000 Ω
20 °C.	6,000 Ω	-15 °C.	34,000 Ω
15 °C.	7,800 Ω	-20 °C.	45,000 Ω
10 °C.	9,300 Ω		

NOTE: the values between the readings are variable, since the thermometer measures the temperature faster than the thermistor because it is encapsulated, if the thermistor maintains to a constant temperature the value of the resistance will be higher, since it will stabilize the temperature of the thermometer and the thermistor.

## COMPRESSOR CYCLE

When the electronic card sends the signal to activate the compressor cycle, the potentiometer and the temperature sensor start working to precisely regulate the compressor cycle and to maintain the foods in the selected temperature.

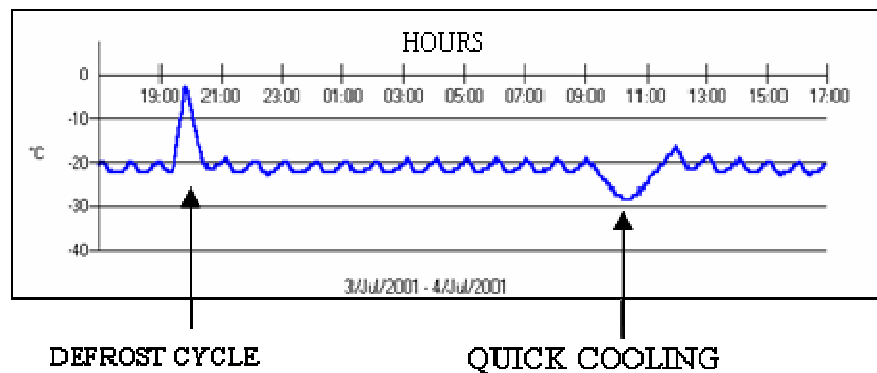
The range of temperatures at which the compartment of fresh foods should be maintained is indicated to the sensor by rotating the knob of the potentiometer, based on these ranges, it sends a signal to the compressor to control the on and off cycles.

## SPECIAL FEATURES

### FEATURE SUPER COOLING (QUICK COOLING)

When selecting this option the LED2 will come on indicating that the signal is being sent to the card, when the cut temperature indicated by the thermistor and the potentiometer is reached, the card does not send the cut signal to the compressor, it continues working for one more hour without stopping, the LED will go off when the compressor turns off; the time of additional work and how it diminishes the temperature is reflected in the graph.

REGISTRATION OF TEMPERATURES IN THE EVAPORATOR



### VACATION FEATURE

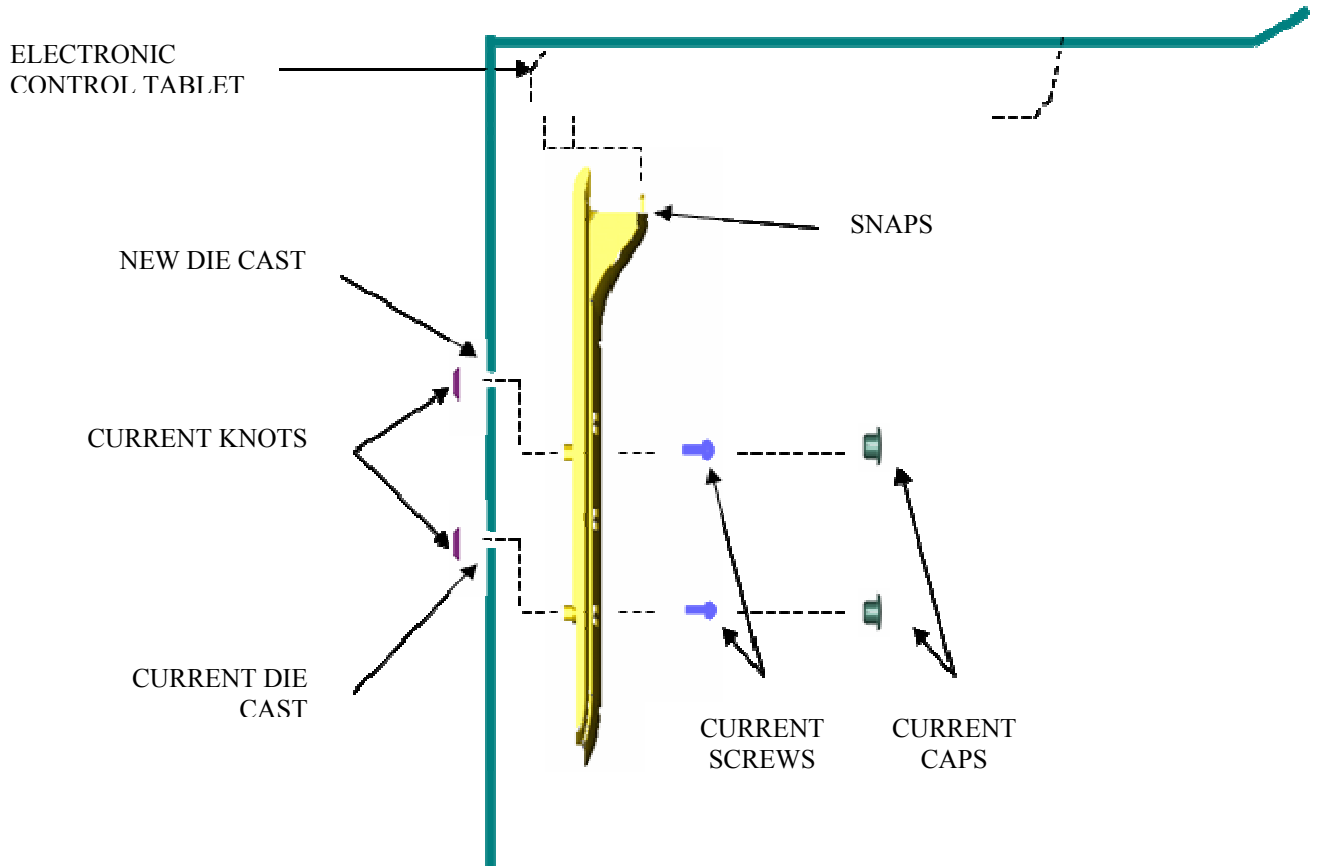
When selecting this function the “LED1” comes on indicating that the signal is being sent to the card, the defrost cycle will activate according to the time stored in the memory, the following defrost will be carried out at the 48 hours of accumulated time of work of the compressor, the function fades when opening the refrigerator's fresh food door through the photocell integrated in the card.

### OPERATION TEST

Select the vacation feature, the “LED1” must come on, cover the orifice that is in the superior front part of the air tower on the roof of the refrigerator to the right side of the screw that fastens the air tower, wait for a moment and uncover the orifice, in that moment the “LED1” must go off disabling the function.

When the refrigerator is energized, approximately 10 seconds after the electronic card sends the signal to activate the compressor cycle, the potentiometer and the temperature sensor in the refrigerator are now in operation.

### COOLING TOWER FOR MODELS (W)



## GENERAL CHARACTERISTICS

Error!

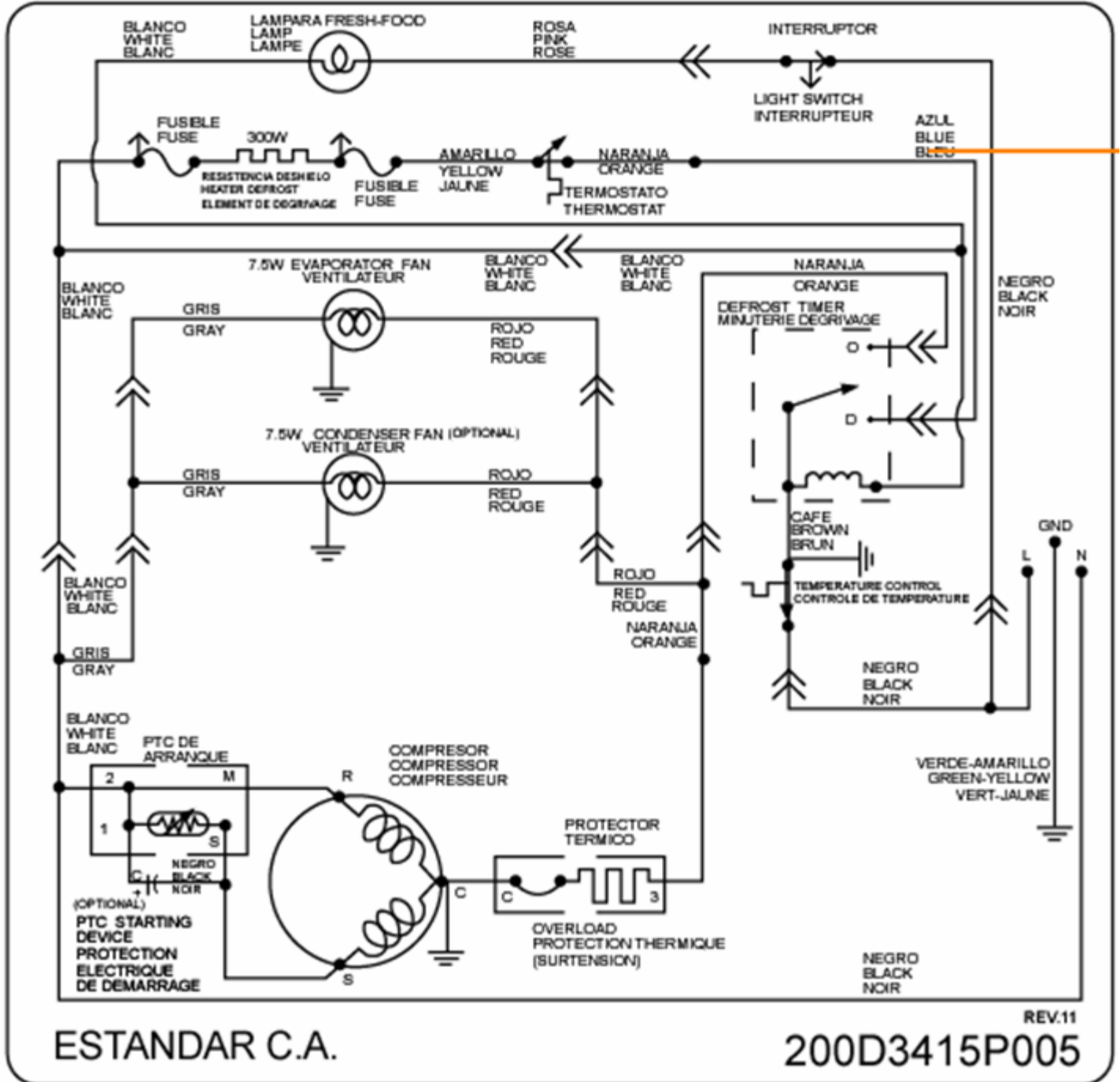
<b>ELECTRONIC CARD</b>	
Defrost Cycles	Every 8, 10, 12 hours of work of the compressor
Work range	95 a 155 A.C.V.
Vacation Feature	Defrost cycle at 48 hours work compressor
Quick Freeze Feature	It works one hour more non stop
<b>LAMPS</b>	
Refrigerator Compartment	120 A.C.V, 40 W
<b>THERMOSTAT OF Defrost</b>	
Temperature of Connection	- 2.22 +/- 3.89 °C (28 +/- 7 °F)
Temperature of disconnection	22.22 +/- 2.78 °C (72 +/- 5 °F)
<b>RESISTOR OF Defrost</b>	
Watts	280 W (+5 %, -7 %)
RESISTANCE READING IN COLD	→ 46.91 a 52.96 Ohm
RESISTANCE READING IN WARM	→ 48.97 a 55.29 Ohm
Fuses (2)	5 Amp.
Voltage	127 A.C.V. +_ 10 %
<b>MOTOR FAN</b>	
Watts	4.83 W
RPM	2500
Voltage	127 VOLTS A.C.V.
<b>COMPRESSOR</b>	
Manufacturer	Mabe Sanyo Compressors
Model	CBZN142L7G
Application	115 - 127 A.C.V / 60 Hz.
Range of voltage of work	103 - 139 A.C.V.
Electric motor	1/5 HP
Cooling capacity	663 BTU'S / Hr.
Type of oil	Polyester
Oil Load	320 ml. +/- 10 ml.
Watts	120 W
PTC	8EA903 / 8EA9B3 (Alternate 100MD)
Thermal Protector	408RHBYY-53 / 4TM314RHBYY-53
<b>ELECTRIC CHARACTERISTIC</b>	
Operation voltage	115 - 127 A.C.V.
Cycles	60 Hz.
Amps	3 A
Watts	335 W
<b>REFRIGERANT SYSTEM</b>	

Refrigerant : R 134- A

Refrigerator Polar 12': 120.5 grs. +/- 3.54 grs.

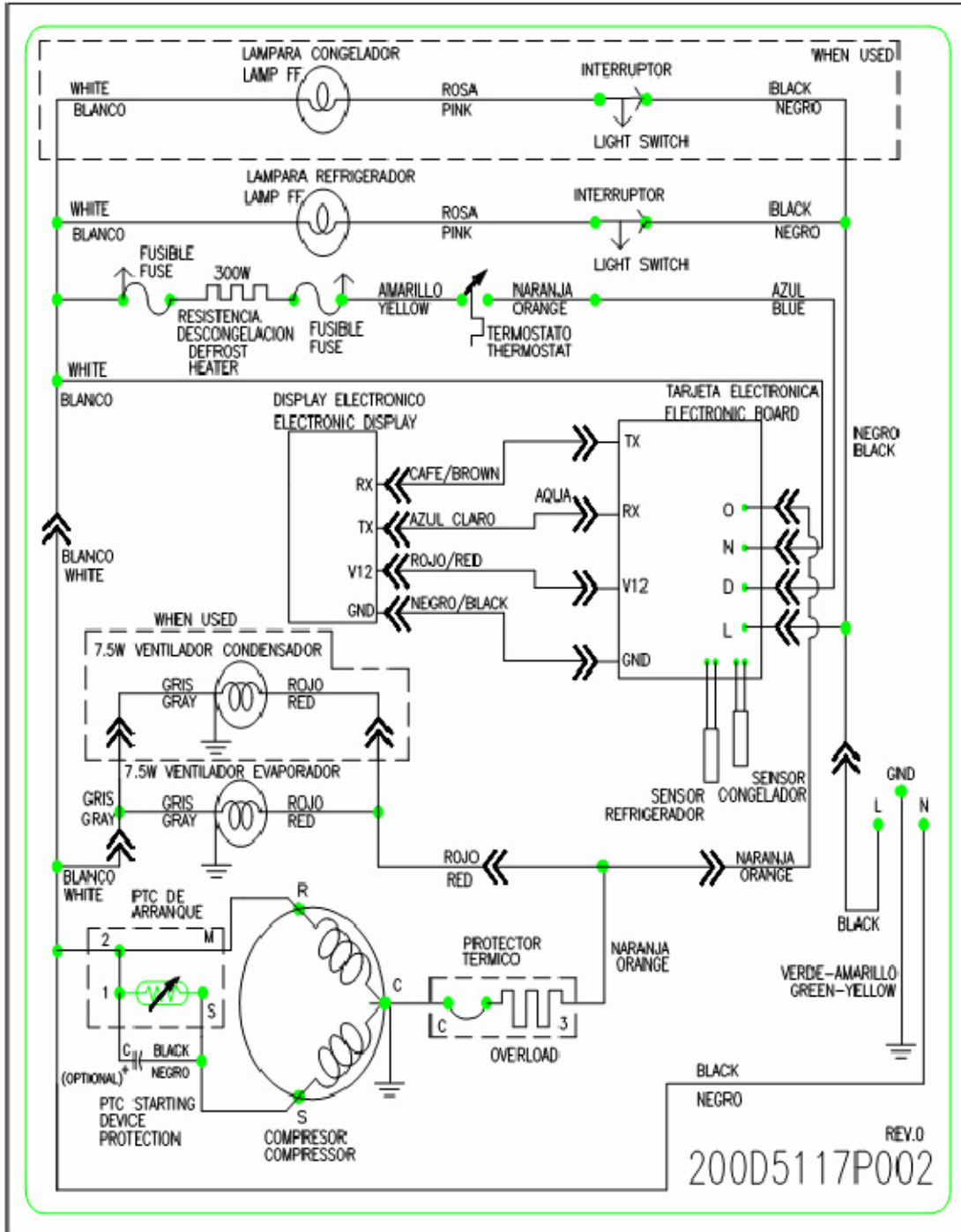
Refrigerator Polar 18': 100.00 grs.+/- 3.54 grs.

## ELECTRIC DIAGRAM FOR MECHANICAL MODELS

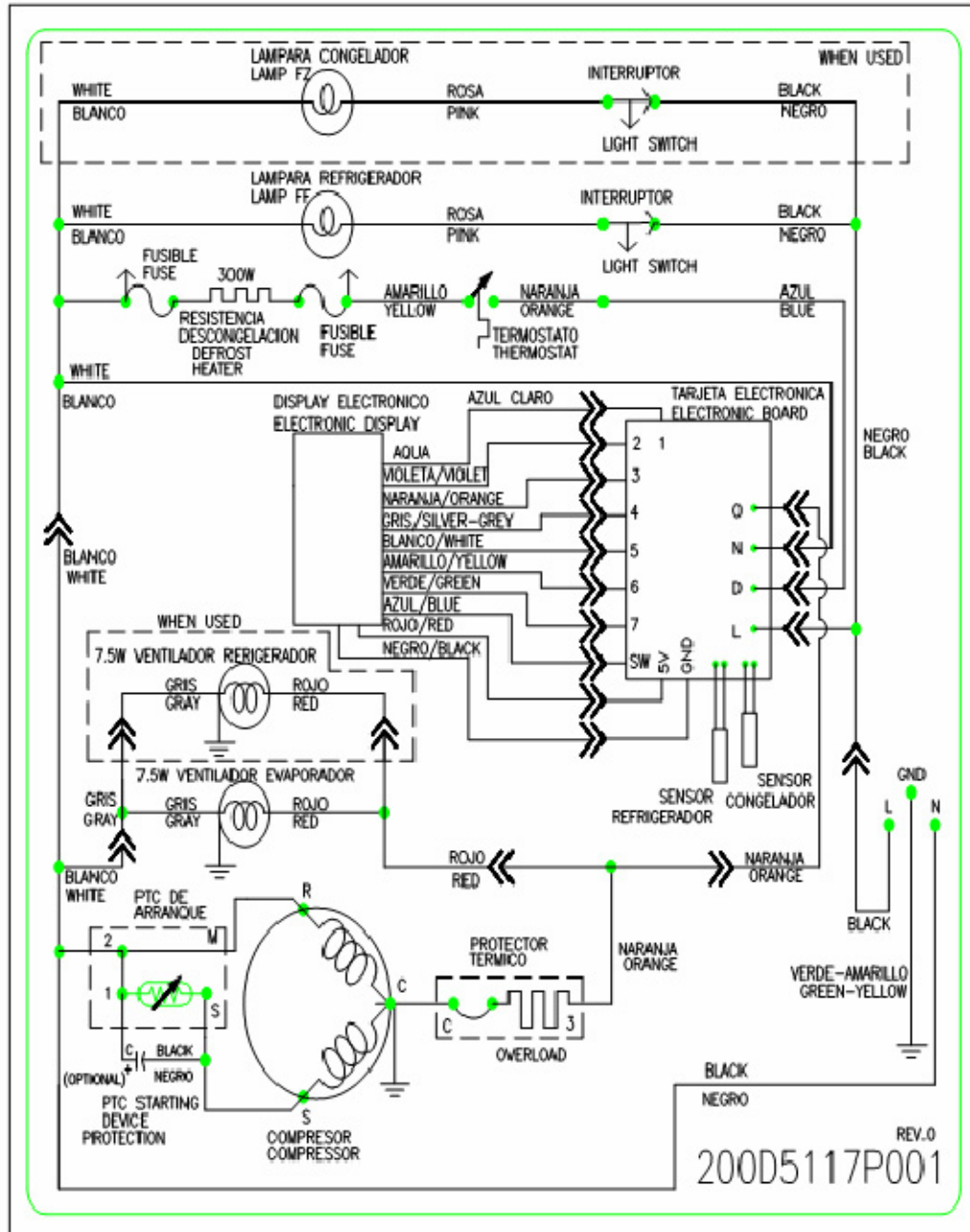




### ELECTRIC DIAGRAM FOR ELECTRONIC MODEL



### ELECTRIC DIAGRAM FOR ELECTRONIC MODEL



PROBLEM	FAILURE	CORRECTION
1.- The refrigerator does not cool ( the compressor and light bulb do not work)	No power at outlet	Check outlet
	Harness unplugged or false contact.	Plug or replace harness
2.- The refrigerator does not cool (the compressor does not work and the light bulb does).	Potentiometer knob (temperature Control ) to position 0.	Adjust the knob to position different than 0.
	Electronic card does not send signal to the compressor.	Check the correct operation of the Card.
	Refrigerator in Defrost cycle.	Check cycle and wait until its finished
	PTC defective.	Replace PTC.
	Thermal Protector open	Replace thermal protector.
	Harness connection with open circuit	Check the continuity of the harness and connections
3.- The refrigerator does not cool (compressor and light bulb do work)	Compressor (burned out or forced)	Check and replace
	Refrigerant leaking	Search for and repair the leak
	Refrigerant failure restriction	Search and repair restriction
	Compressor	Change the compressor
4.- The refrigerator does not cool enough ( the bulb illuminates an the compressor works excessively).	Temperature control knob in low Position	Increase the position of the knob.
	Electronic card does not send signal for the Defrost (evaporator blocked with ice)	Check the correct operation of the Card.
	Defrost heater with open circuit (evaporator blocked with ice)	Change defrost heater and melt ice
	Defrost thermostat with open circuit (evaporator blocked with ice)	Change defrost thermostat and melt ice.
	Defrost sensor in short circuit.	Change or review the harness sensor.
5.- Refrigerator (freezes food in fresh food compartment), excessive compressor operation.	Fan Motor defective ( burned out or jammed).	Change the fan
	Refrigerant Leaking	Search and repair the leak
	Magnetic seal does not seal.	Repair or change the magnetic seal.
	Door does not close well.	Adjust the door
	Switch light bulb defective (bulb on with door closed).	Connect or change the switch or adjust the door to make it work.
	Temperature control knob in high Position	Adjust the knob to a lower number.
6.- Excessive refrigerator operation	Temperature Sensor out of position.	Verify the correct position of the sensor.
	Temperature Control Knob in high position	Adjust the knob to a lower number.

## TECHNICAL SHEETS

### C-BE121L2G 1-PH 60Hz/115V (50Hz/100V)

#### 1.-APPLICATION

EVAPORATING (°C)	-35~-5
REFRIGERANT	R-134A
COMPRESSOR COOLING METHOD	NATURAL CONVECTION

#### 2.-RATED PERFORMANCE

CAPACITY KCAL/H (BTU/H)	162 (643) ±5%
INPUT (W)	121 ±5%
CURRENT (A)	1.07±5%
EER KCAL/W-HR (BTU/W-HR)	1.34 (5.30)
NOISE dB(A)	44 MAX
STARTABILITY 6Kg/cm² EQ. PRESS	97 (V) MIN

#### RATING CONDITIONS

EVAPORATING TEMP (°C)	-23.3
CONDENSING TEMP (°C)	54.4
SUCTION GAS TEMP (°C)	32.2
LIQUID TEMP (°C)	32.2
AMBIENT TEMP (°C)	32.2

#### 4.-MOTOR

TYPE	1 PH-2 POLE INDUCTION MOTOR (PTCS-CR)	
POWER SOURCE	1-PH 60Hz/115V (50Hz/100V)	
VOLTAGE RANGE	97-127	
LRA	13.8	
WINDING RESISTANCE AT 25 °C MAIN (Ω)	4.291±5%	
WINDING RESISTANCE AT 25 °C AUX (Ω)	7.982±5%	

#### 5.-ELECTRIC ACCESORIES

CODE 5SP	5SP09B317RH 5SP16B317RH
STARTING RELAY	PTC 8EA9B3 PTC 8EA16C3
OVERLOAD PROTECTOR	(41M) 317RHBYY-53
RUNNING CAPACITOR	12mF/200 VAC

#### DIMENSIONAL SKETCH

THE COMPRESOR USE IN SEDNA (ESTILO) REFRIGERATOR IS:

COMPRESSOR **CBE121L2G** DOE/FIDE FOR SEDNA 17' Y 19' THE SAME FORM FOR POLAR 16" AND 18" IS 3.8 AMPERES.

Compressor CBZN100L2 PARA SEDNA 13' Y 15' THE SAME FORM FOR POLAR 12' AND 14' IS 3.8 AMPERES.

OPERATING PRESSURES: LOW SIDE AND HIGH SIDE :

De acuerdo al plano estos son los valores para el SEDNA

According to the Label these are the values for sedna (Estilo) is the following.

(Low Side) 0 , 97 Mpa

(High Side) 2, 31 MPa

High Side 335 PSI

Low side 140 PSI