



NDA/NDE 1402

AUTOMATIC DEFROST
ERROR CODE CAPABILITY
TEMPERATURE DISPLAY

Discussion Topics

- Proper Operation of Units
- Proper Testing of Gas/AC/DC components
- Properly Diagnosing and testing Cooling Units
- **SAVE TIME DIAGNOSING!!!**

Home Refrigerators vs. RV Refrigerators

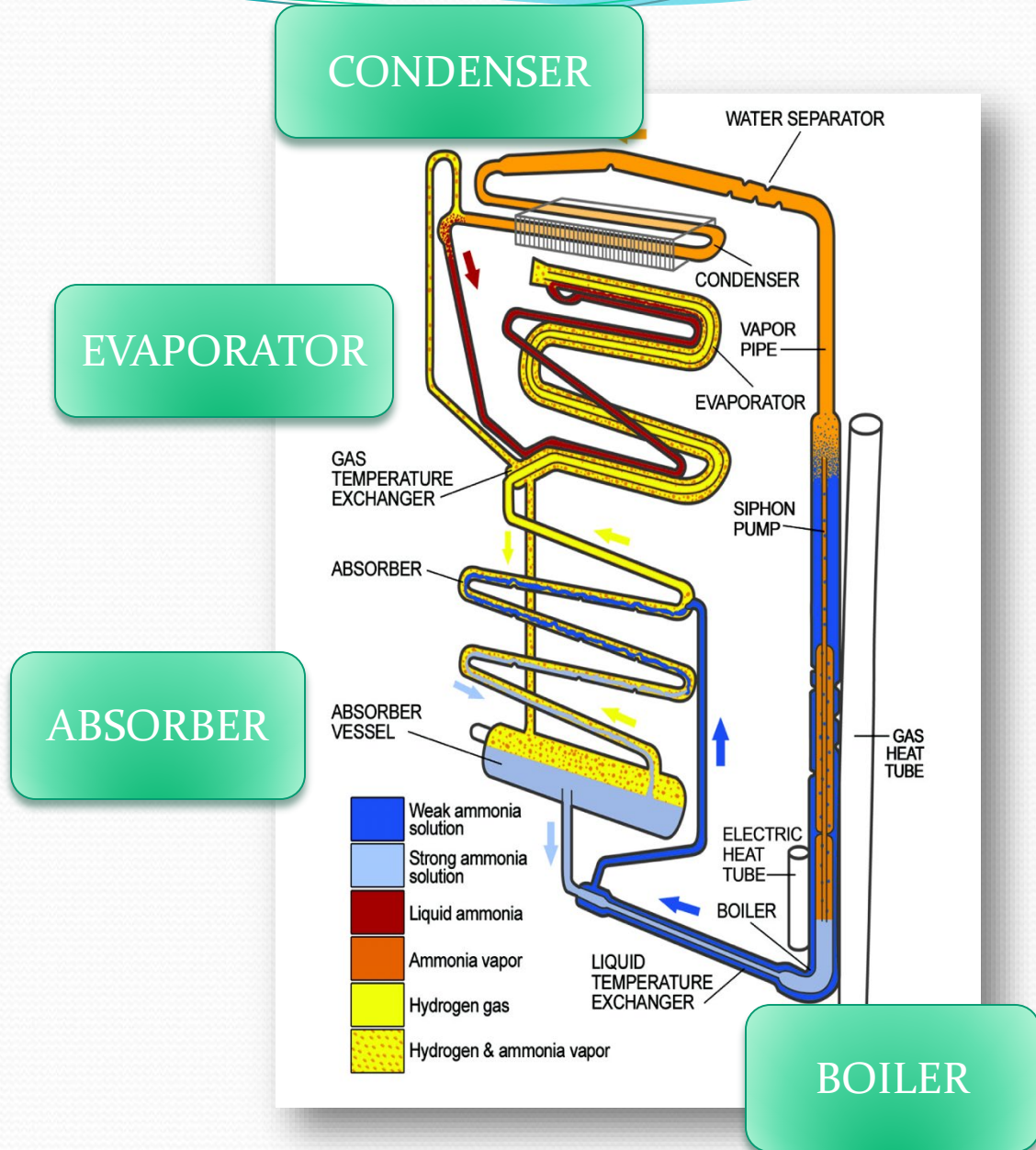
- Controlled vs. Changing Environment
- Compressor vs. Absorption
- Recovery Time: 1 -2 hrs vs. 30-45 minutes



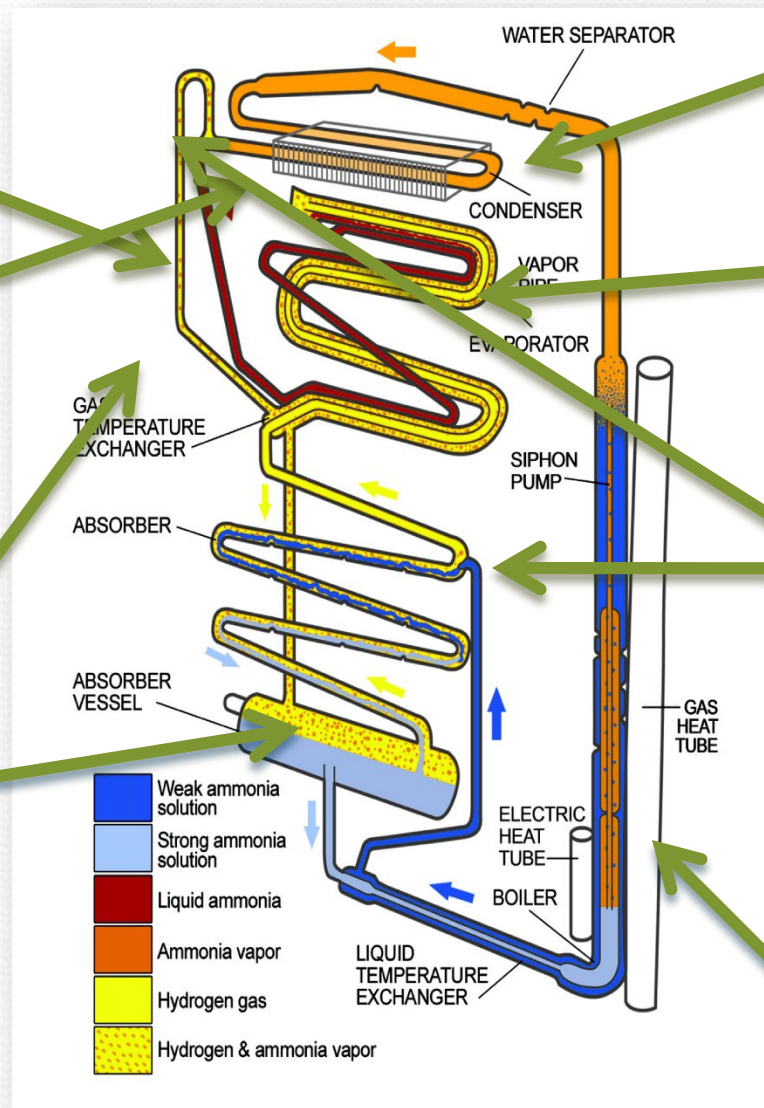
The Absorption System

**SOLUTION IS
MADE UP OF:**

- AMMONIA
- WATER
- HYDROGEN
- RUST INHIBITOR



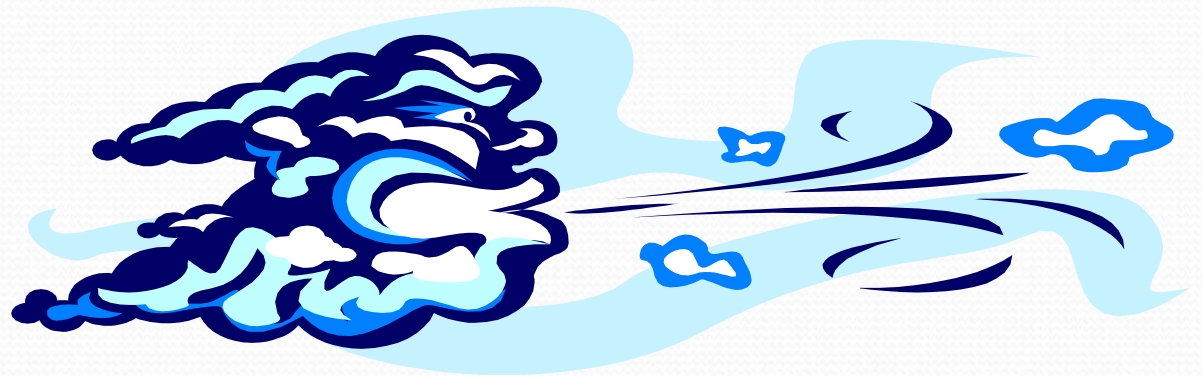
Weak ammonia solution flows into the tube. Air circulating over the fins of the condenser cools down the vapor, extracting heat from it. Strong ammonia solution flows from the evaporator, which in turn extracts heat from the food storage space. Heat is then moved to the boiler.



Ammonia vapor passes into the condenser. The mixture of hydrogen and ammonia flows through the evaporator, where it extracts heat from the food storage space. The ammonia vapor solution is then heated in the boiler, making it evaporate. Bubbles of ammonia gas rise from the pump.

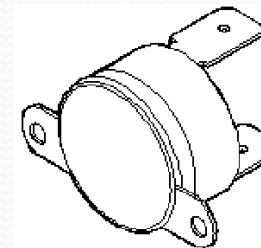
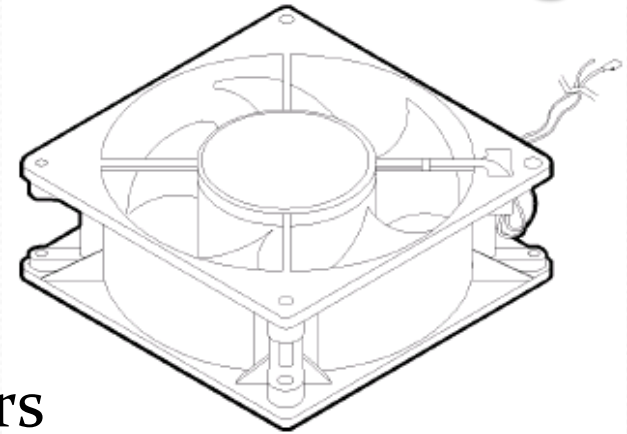
Before Testing a Cooling Unit

- Make sure you check Ventilation and Air Flow
 - o clearance on the sides and top
 - No more than 1 to 1 ½" from back of CU to sidewall. (A baffle may need to be installed to help direct air across coils)
 - Check that the auxiliary fans are working properly.

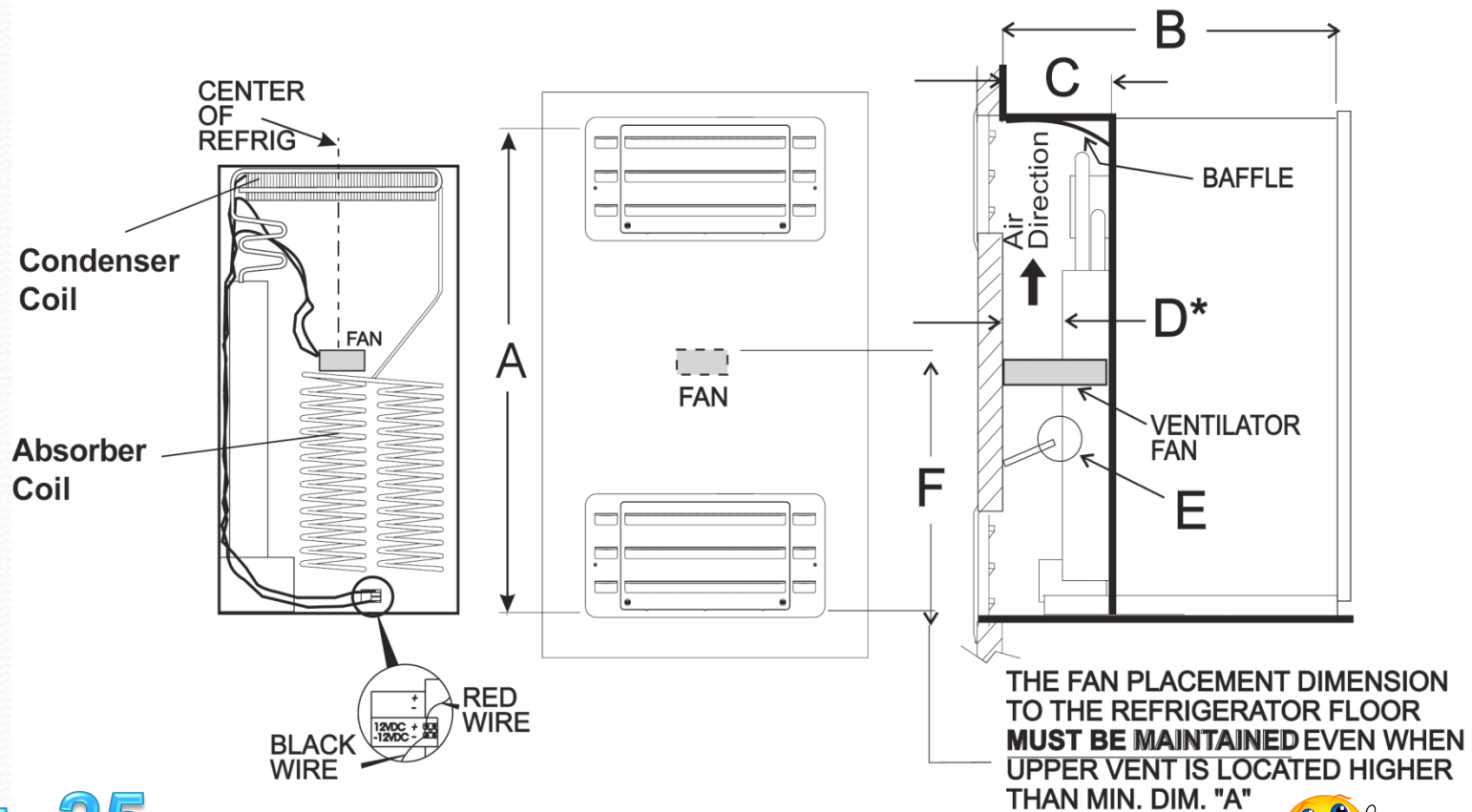


AUXILIARY FANS

- Helps with air flow.
- 3108705.744 for Double Door refers
Fan limit switch will close at 150°F and open at 130° +/- 10%.
- Limit switch for Single Door is 3104133.016. Switch will close at 105°F and open at 90°F +/- 10%.
- Will draw only .5 amps each.
- In-line fuse to protect circuit
- Small Fan # 3851183016

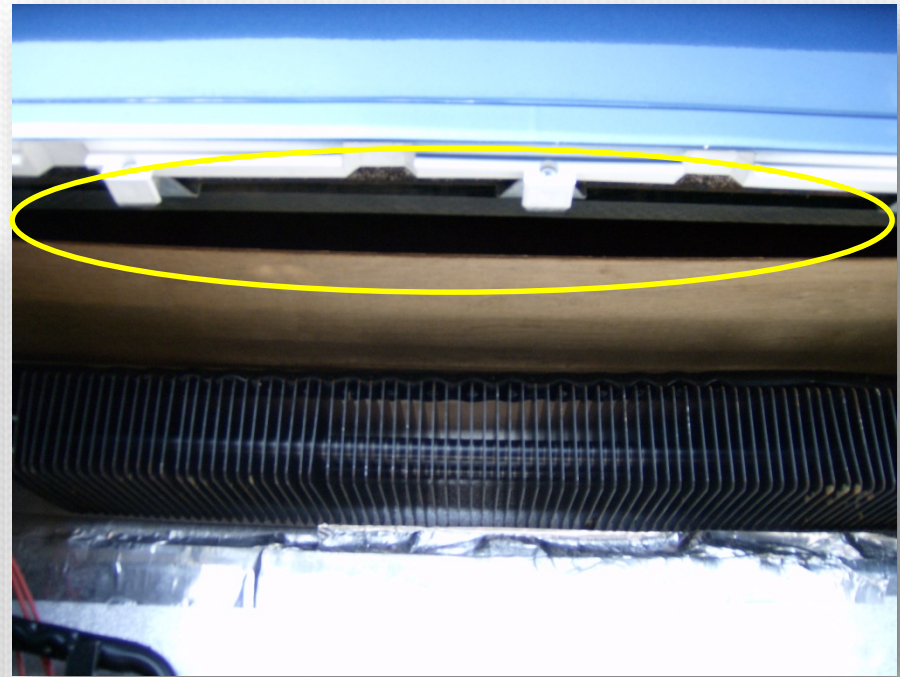
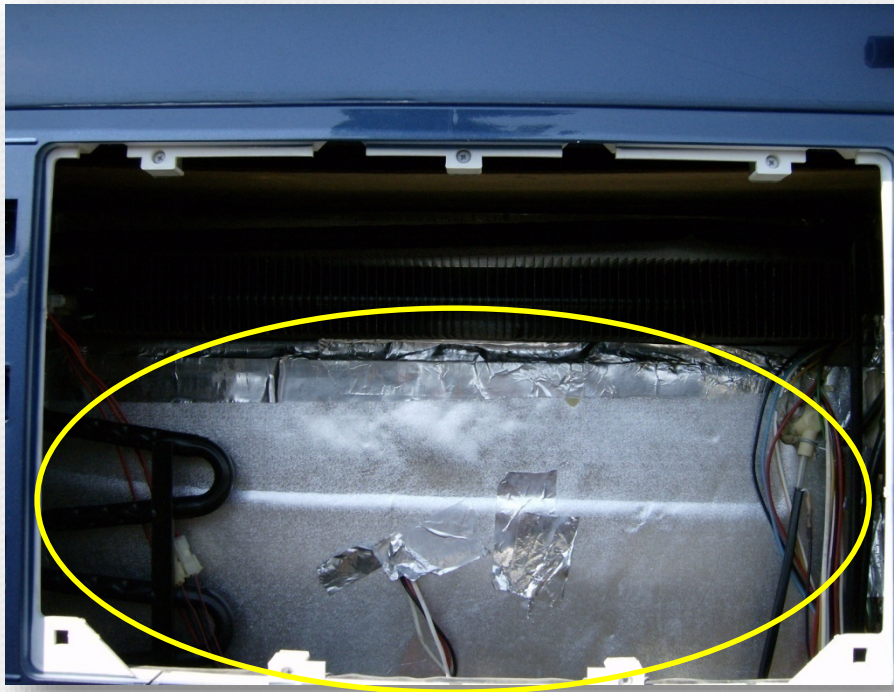


Typical Side by Side Installation in Slide Out/2 Sidewall Vents



Symptom: Not Cooling

Air is not being forced across top condenser coil – too much space!



Warm air is being trapped around the refrigerator from poor installation.

Does the Unit have to be level?



Yes! The unit should be level to have a better cooling capacity.

Does the unit have to be level during travel?



It is not critical to level the refrigerator while the vehicle is moving. The rolling and pitching movement of the RV helps keep the refrigerator operating efficiently!

Before Testing the Cooling Unit

- When testing a cooling unit, test on the AC side.
There are too many variables when testing on LP.
- Do an Ohms Resistance of the Heating element.
- Never OVER or UNDER size your heat source!



AC Heating Element

In Series

- 420 Watts
- 34.3 Ohms
- 3.5 Amps



* Supplies a specific amount of BTU's to the Boiler *

To Test a Cooling Unit

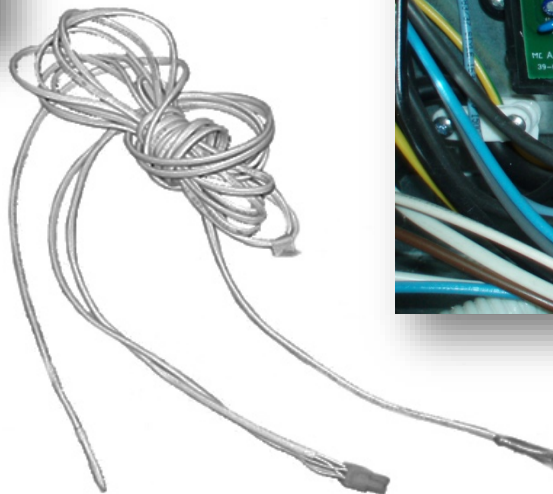
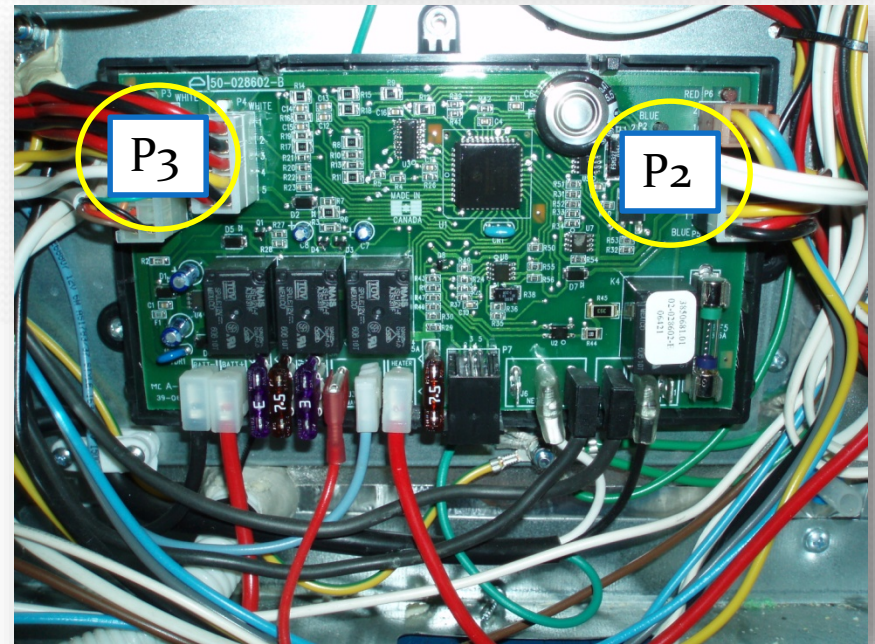
- Disconnect the Thermisters from Control Board (with the thermisters unplugged no temperature is sensed, therefore, it will run continuously).
- Unplug P2 and P3 Connections
- Place a glass of water in the refrigerator along with a thermometer.
- Plug unit in to 110 VAC and allow to run “wide open” for approximately 12 hours.
- **DO NOT DIRECT WIRE HEATING ELEMENT!**

To Test a Cooling Unit

Water/Thermometer



UNPLUG at P₃ and P₂ Terminal



Upper Display Panel (NDA/NDE)

- The LED panel displays temperatures in the refrigerator and freezer, current modes of operation and other useful status messages.



- Real Time Clock
- Thermostat Setting

- Manual Defrost
- Service Mode

Real Time Clock

- The clock runs even if refrigerator is turned off
- If 12VDC is disconnected – the system will maintain its memory for approximately 3 weeks. The clock must be set again.
- (----) is display when clock needs to be reset.
- Reset clock when entering into different time zones.
- Auto Defrost will occur every 24 hours at 1 AM 36 hours after the initial start up.



TEMP SET & RANGE



- The freezer setting is pre-set (can not be changed) to be approx. 0°F (-18°C) to 7°F when running on AC.

If running on GAS the pre-set temperature is approx. 7°F (-14°C) to 10°F.

- The fresh food compartment can be set in 5 different positions (1-5) where 5 is the coldest setting which gives a fresh food temperature of approx. 33°F (0°C). Setting 3 gives a temperature of approx. 39°F (3°C).

Possible Error Codes

- Defrost heater for Freezer plate is faulty “Er 11”
- Defrost heater for the Fresh Food cooling flange is faulty “Er 12”
- Defrost Heater for the Drain Tube/Tray is faulty “Er 13”
- Fan in Freezer compartment is faulty “Er 14”
- Fan in Fresh Food compartment is faulty “Er 15”
- Air temperature sensor in the Freezer compartment is faulty “Er 16”
- Air temperature sensor in the Fresh Food compartment is faulty “Er 17”
- Surface temperature sensor in the Freezer compartment is faulty “Er 18”
- Surface temperature sensor in the Fresh Food compartment is faulty “Er 19”

NEA1402



NDA1402



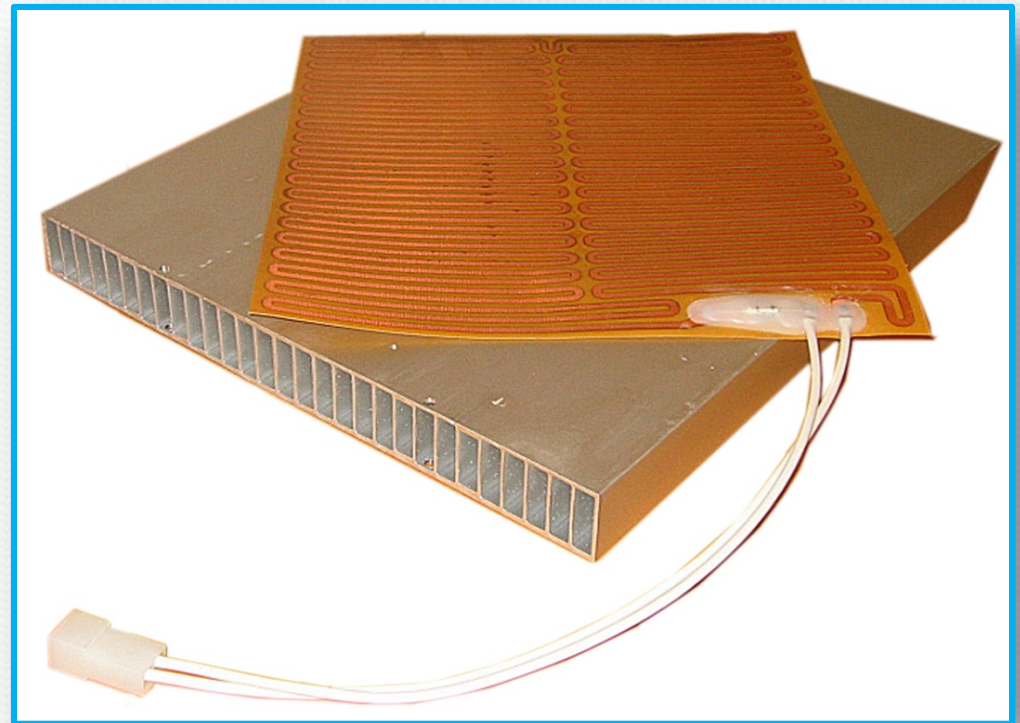
Cooling Flange in Freezer

Measure Resistance between:
Red wire on J5 to Ground

Ohms 2 +/- 10%

- Unit should be defrosted before tests.

ERROR CODE
11



• Heating Element

Note: Frost/Ice build up could conduct current which can hide an open circuit.

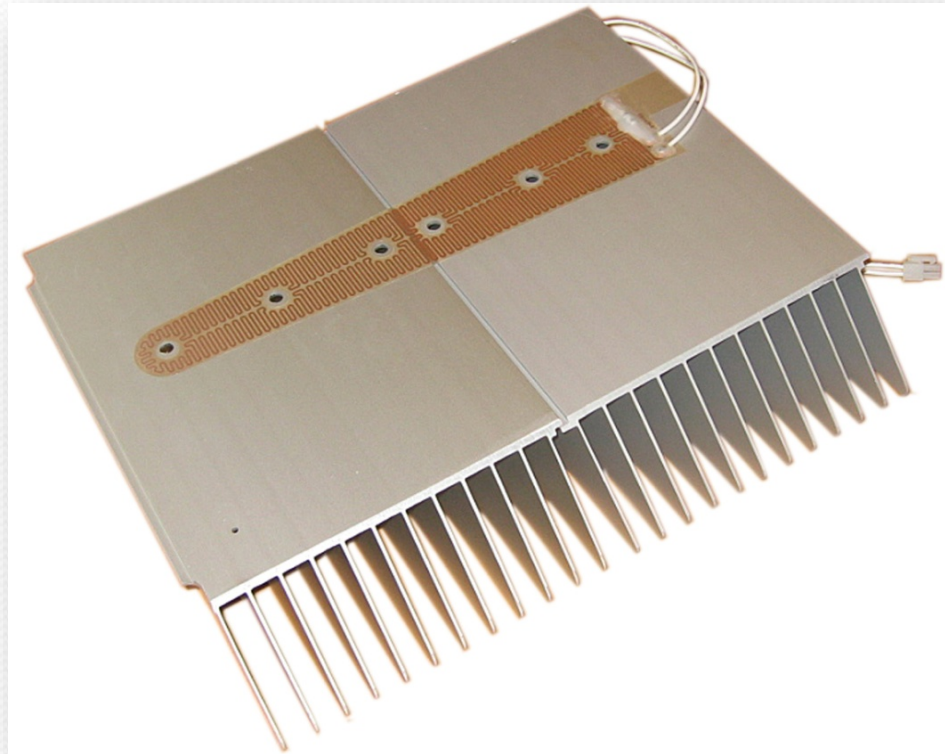
Cooling Flange in Refrigerator

Measure between:
Pin 6 (Red) and
Pin 3 (Black)
On P5 plug

3.6 Ohms +/- 10%

- Unit should be defrosted before tests

ERROR CODE
12



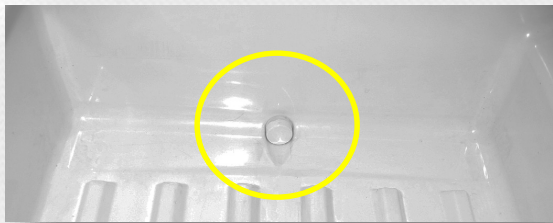
• Heating Element

Note: Frost/Ice build up could conduct current which can hide an open circuit.

If the Flange Heater is good:

Other Possible Causes:

- Air Leaks
- Drain Plugs:
interior/exterior
- High Humidity



Note: This is called a “Frost Free” unit, however, in certain atmospheric conditions the auto defrost cycle may not be able to completely defrost the unit.

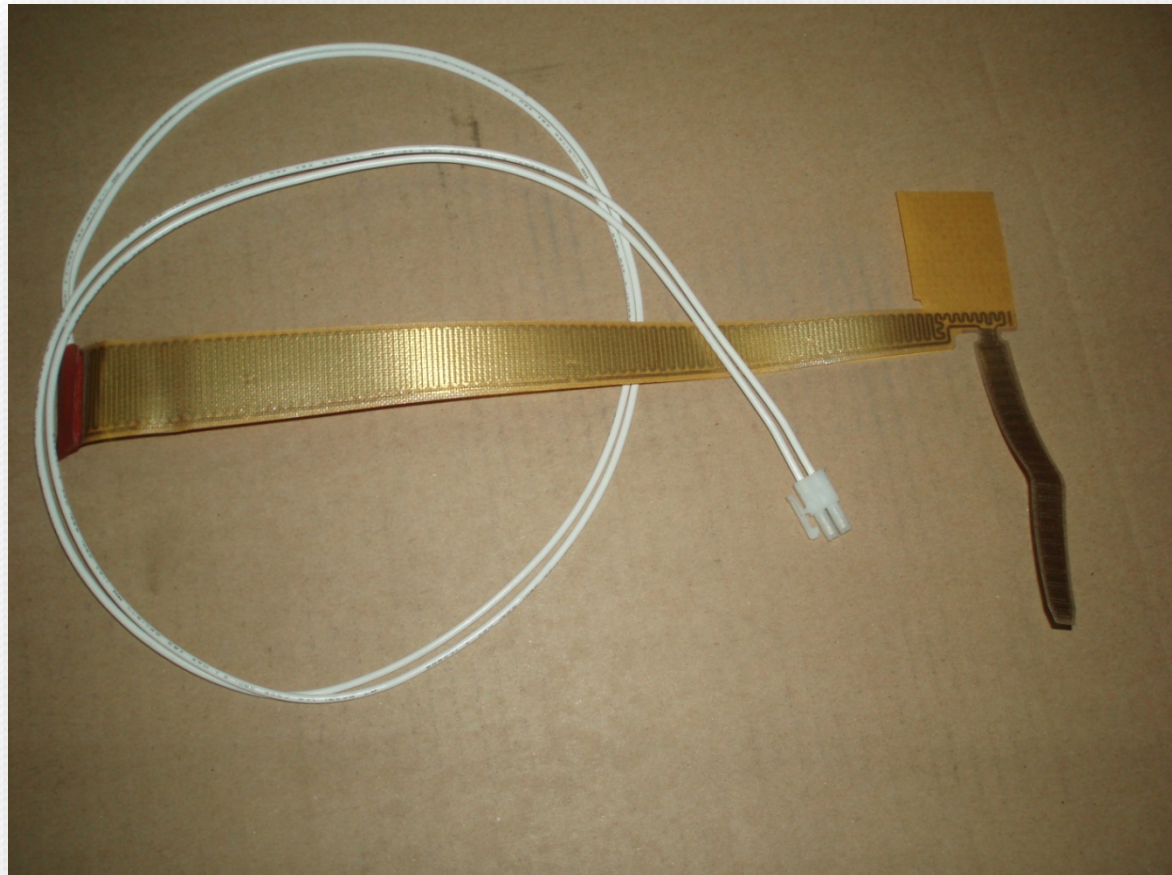
☺ Discuss

Drain Line Heating Element

Measure between:
Pin 5 (white) and
Pin 2 (yellow)- P5
Harness

13.3 Ohms +/- 10%

- Unit should be defrosted before tests



ERROR CODE
13

Note: Frost/Ice build up could conduct current which can hide an open circuit.

Cover With Drip Pan

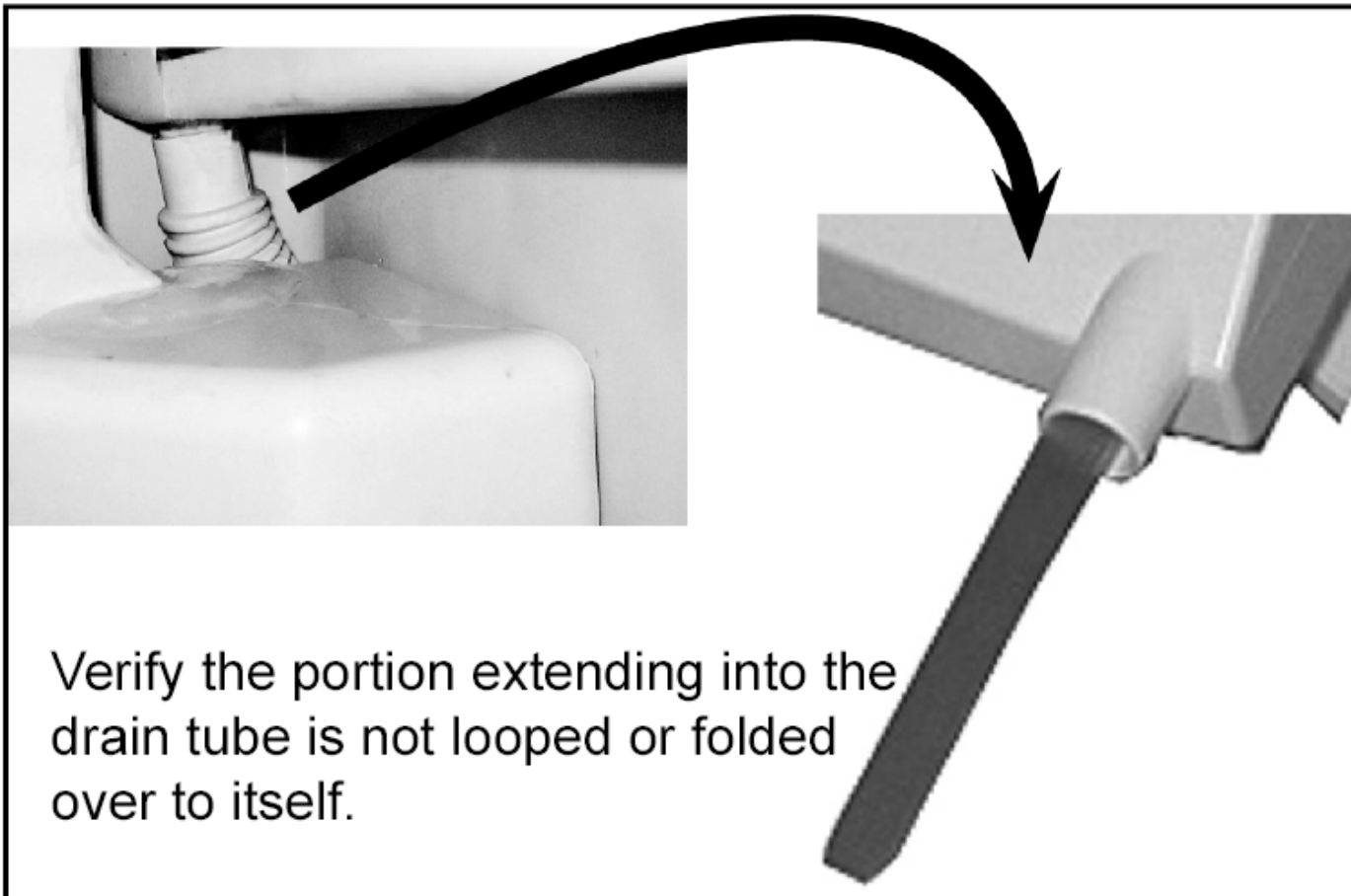


- Drain Line Heating Element

- Drainage Tube



Drain Line Heater



To bypass Error Code 13

- You can also jump the Yellow and White wire to the Drain Line Heater from the interconnection box.



MANUAL DEFROST



- Switch the refrigerator “off” with the ON/OFF button
- Press and hold the AUTO button (NEA 1402) – AUTO/STORE button (NDA 1402). Then, press the ON/OFF button; “dE Fr” is displayed. However, if the freezer door is open during this initiation, the “dry” function will be started instead.
- A manually initiated defrost cycle is identical to an automatically initiated defrost cycle with the exception that the defrosting sequence starts immediately with the "relaxing period", that is without any initial temperature "pull down" period.
- A manually initiated defrosting may be cancelled at any time just by switching the refrigerator OFF and ON by means of the ON/OFF button. However, a loss of 12VDC for a short period of time will not cancel the defrosting (up to an hour).

Auto Defrost not working

- ✓ In first 24 hour period of cooling.
- ✓ DC volts are below 10.5 –
DC volts **MUST** be at or
above 10.5 in order to
complete a full defrost.
- ✓ Freezer temperature is
HIGHER than 18°F – **MUST**
be lower than 18°F
- ✓ Error Code in display



Automatic Defrost

- The start of an automatic defrost may be delayed for up to 3 hours based on 2 criteria.
 - If the battery voltage is lower than 10.5 VDC
 - No cooling source (i.e., Gas or Electric)

If these 2 conditions are met, the defrost will be started and will complete as normal. If these two conditions are not met within 3 hours, the defrost for this 24 hours period will be skipped and recorded as incomplete.

- Discuss other possible error codes (Pg.33)



AUTO DEFROST SEQUENCE OF EVENTS

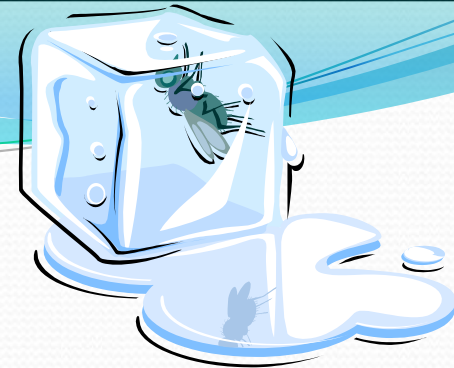
Temperature “PULL DOWN”

When the defrost is initiated, the first thing that happens is that the refrigerator pulls down the compartment temperatures to thermostat "cut out" levels. If these levels are not reached within one hour, the defrosting sequence starts anyway.

Cooling unit “RELAX TIME”

After the temperature pull down period, the real defrosting sequence is started. The cooling unit is now switched OFF, but nothing more happens for 10 minutes to let the cooling unit relax.

Heating in the Freezer



- Heating Element in Freezer and Drain Line Turn “ON”
- Fan in Freezer is turned “Off” to prevent frozen food from thawing.
- Heat will stop to the Cooling Flange Heater when surface temperatures have reached 41°F OR when 75 minutes have been elapsed.

Note: If heating has stopped due to the elapsed time, it is treated as an incomplete. **Extreme Ice or Low Voltage can also cause an incomplete defrost.**

- If 2 incomplete defrost cycles occur – an Error Code “01” will be displayed.

Heating in the Refrigerator



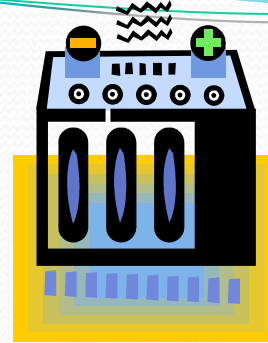
- Starts **AFTER** the freezer defrost cycle.
- Heating Element in refrigerator is turned “ON”
- Fan in refrigerator is turned “OFF”

Remember: The Drain Line is still on throughout both cycles of the defrosting.

- The defrosting Stops when surface temperatures have reached 41°F Or when 20 minutes have elapsed.
- Normal operation will resume after defrost.

Note: The Drain Line heater may still be turned on after the defrost cycle is completed. The drain line heater is switched “OFF” 30 minutes AFTER the start of the refrigerator defrost.

Power Breaks



- If +12V DC is removed shortly after the defrost cycle has been initiated or if the refrigerator is switched OFF and then ON again during the defrost, the defrosting will continue from the point where it was interrupted.
- However, if power has been OFF for more than one hour, the remaining part of the defrosting is skipped.

To cancel the Auto Defrost

- If for some reason an automatically initiated defrost needs to be cancelled, immediately enter the "Service mode".
- Once in the "Service Mode" switch refrigerator OFF and then ON again.

Note: This cancellation will not work immediately after the defrost cycle is initiated at 1.00 AM. Wait at least three minutes before trying to cancel the defrost cycle.



Drying Function for storage

- Doors should be left open to allow all compartments to dry
- To initiate the “Drying Function” to help dry the unit
 - Press and hold down the Auto/Store button with the Freezer door open.
 - The drying period could take up to 3 hours or more depending if it goes through the defrost cycle.

The Drying function can be terminated by turning the refrigerator “Off” or by closing the Freezer door.

Remember: A minimum of 10.5 VDC to use defrost function

Lock Out Feature

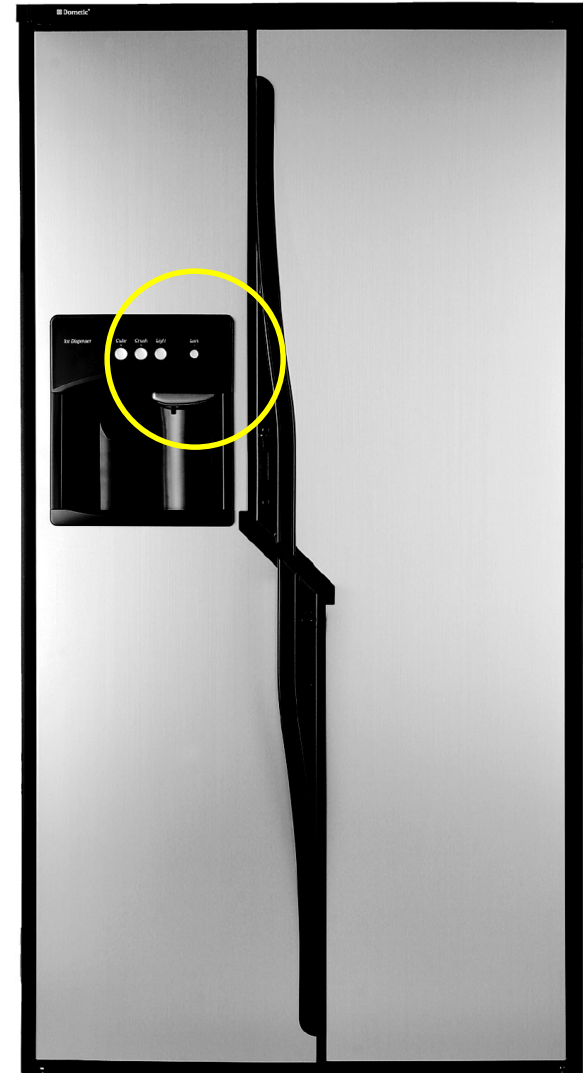
The ice dispensing system can be locked out to prevent unwanted use.

To lock out:

1. Press and hold the “Lock: pad for 5 seconds until the RED light above the padlock comes “ON”.

To unlock:

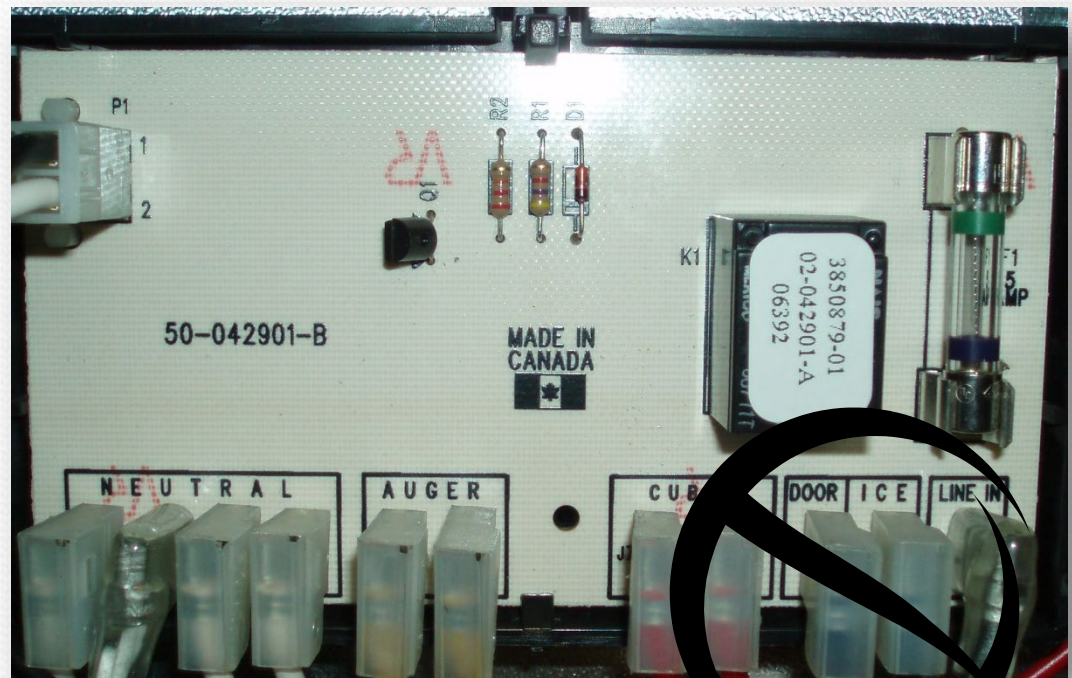
1. Press and hold the “Lock” pad for 5 seconds until the RED light above the pad goes out.



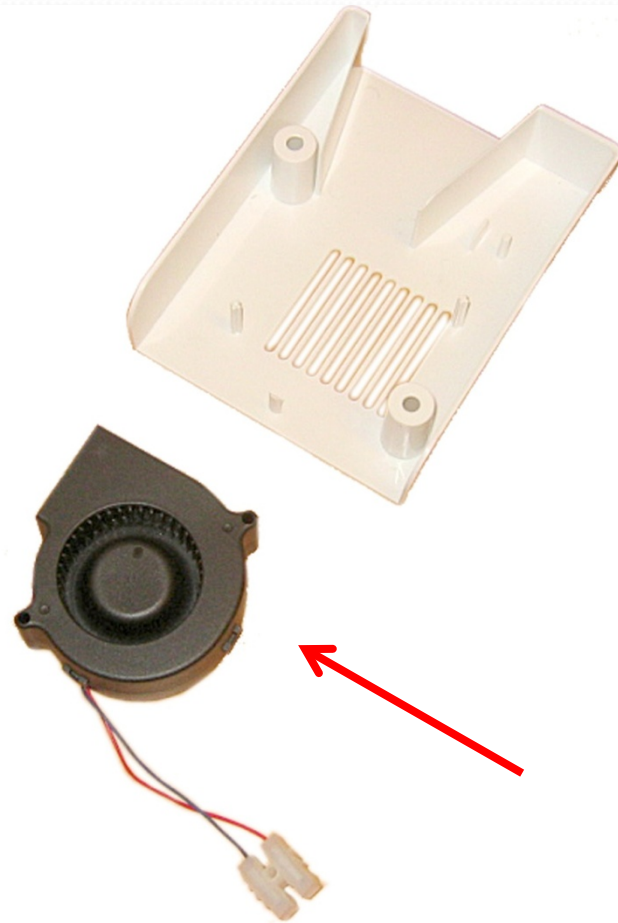
Automatic Power Shutdown

- For safety reasons, when the freezer door is opened the icemaker, auger, and water dispenser are deactivated.
- Closing the freezer door or depressing the door switch will allow the icemaker and door functions to resume operation.

Note: No voltage will be present on J9 (Door switch) or J10 (Icemaker) when door is open on interface module.



Interior Fans



- Used to help distribute the temperature evenly throughout unit.
- DC Operated
- Can apply DC directly to fan to verify operation.

Location: P4 Connection for Refer Fan and P5 for Freezer Fan
– Black and + Red wires.

ERROR CODE
14 or 15

2 Separate Temperature Sensors

Both sides have 2 separate temperature sensors:

- Surface and Air

Ohms: 5,500 Ohms in a glass of Ice Water.

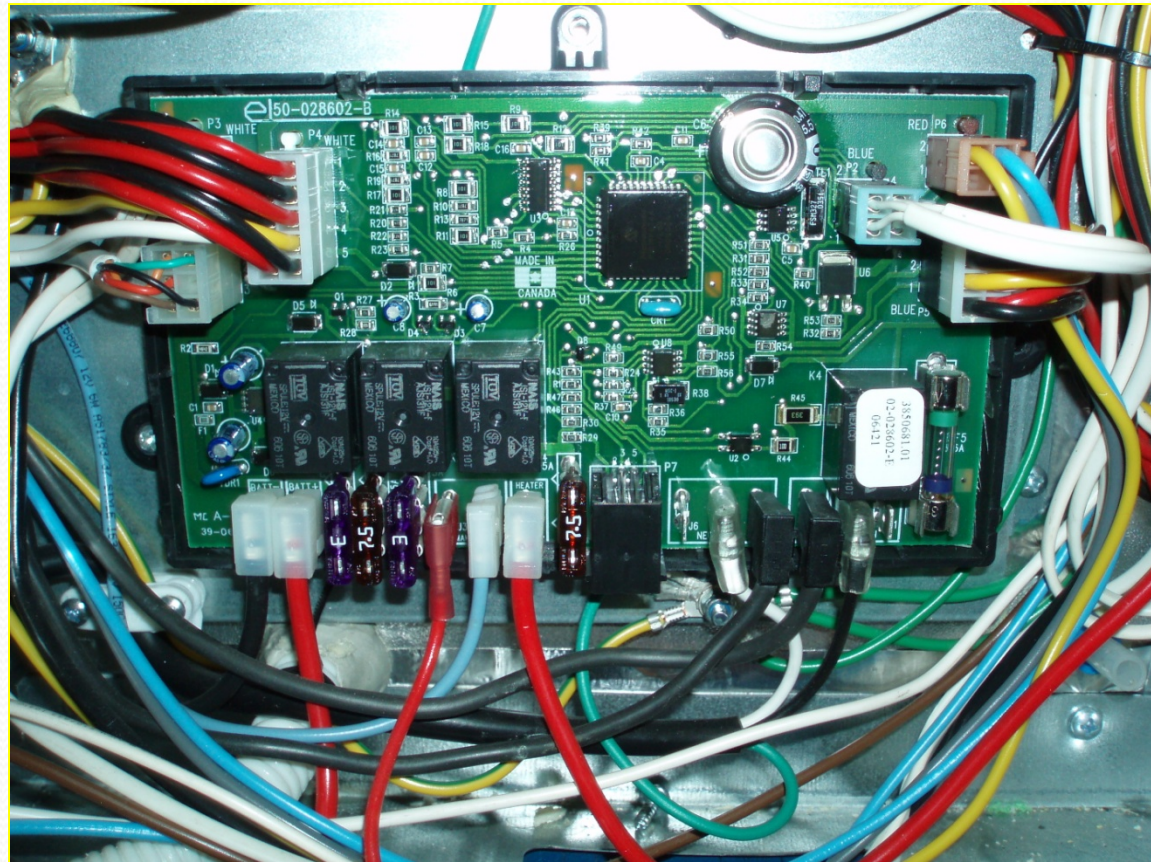
Location: 4 pin harness at P3 for Refrigerator and P2 for Freezer.



Refrigerator: Error Code 17 Air – Error Code 19 Surface
Freezer: Error Code 16 Air – Error Code 18 Surface

Lower Power Module

- 8.5 VDC minimum
- 18 VDC maximum
- 108 VAC minimum
- 132 VAC maximum



All tests are to be done while in the cooling mode – Unplug both thermistors from the control board to assure it is calling for cooling.

Lower Power Module



- J1 – Ground
- J2 - + 12VDC
- J3 and J4 - +12 to door frame heater and anti-freezing system for the icemaker water supply line.
- J5 – DC voltage output to the defrosting element in the freezer.
- J6 – 120 VAC Neutral connection for the Ice Maker
- J7 – 120 VAC Main Supply Neutral connection
- J8 and J9– 120 VAC Neutral Connection for the AC Heaters in the Cooling Unit.
- J10 – 120 VAC main Supply line connection
- J11 – 120 VAC line voltage to the Interface Module is using single power cord.
- **Note: in most cases, the icemaker is supplied with a separate power source – J6 and J11 will not be used**

Fuses

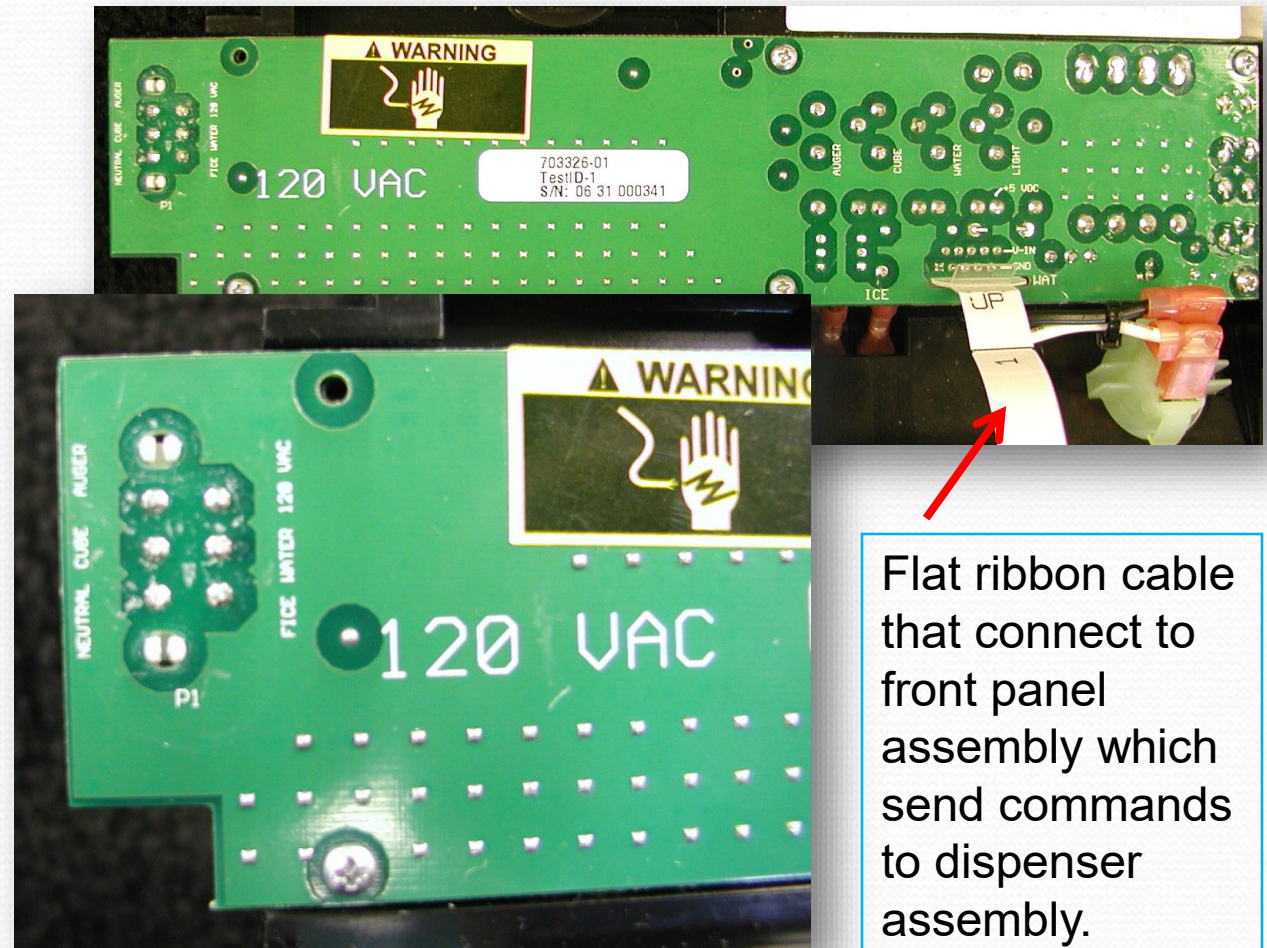


- 4 DC Fuses (3 amp, 3 amp, 7.5 amp, 7.5 amp)
- 1 AC Fuse (5 amp)
- If a fuse blows, don't replace it until the problem has been found. If the fuse has blown – there is a short or component that has created the problem.
- If any Error Codes are on the display – Check the fuse that supplies that component before replacing or testing.

Door Mechanism & Display Panel

Using an insulated jumper wire – jump between 120 VAC and:

- Water – water should be dispensed.
- Auger – Auger should rotate.
- Cube – Solenoid should be activated.
- Fice – this connection is NOT used



Flat ribbon cable that connect to front panel assembly which send commands to dispenser assembly.

Air Flow



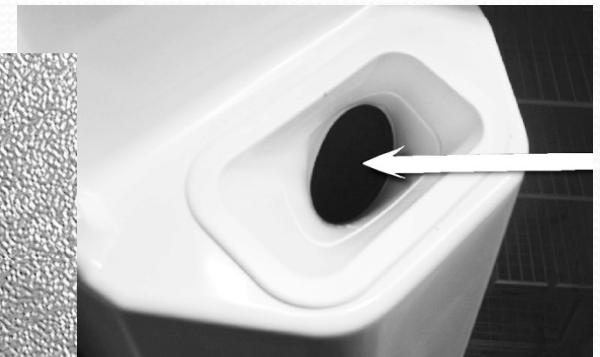
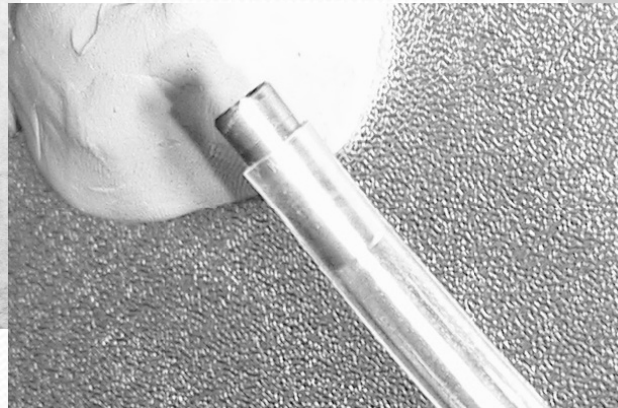
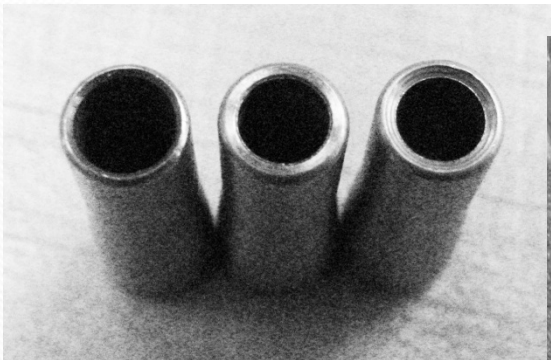
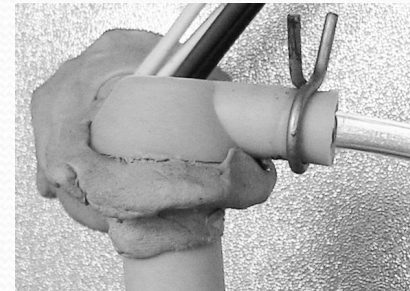
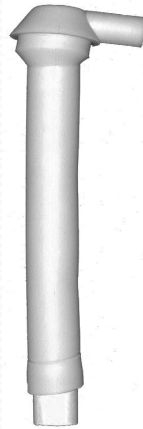
Serial # 706xxxxxx and Older



Frost vs. Ice

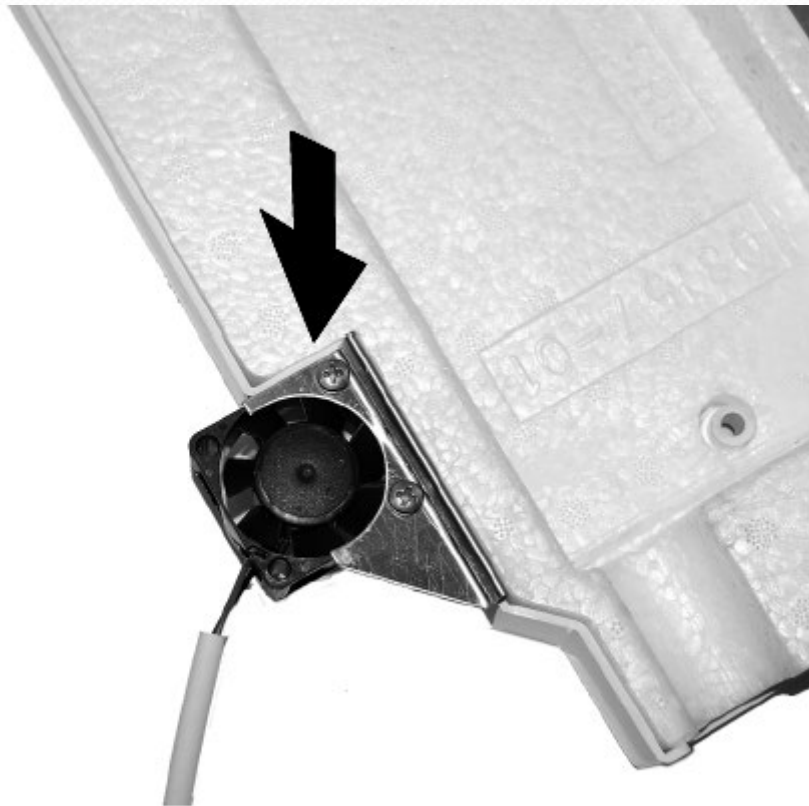


Things to check: See Bulletin R82-7A



Fan Kit – Pre Serial# 706xxxxx

The Fan Kit is designed to help circulate fresh air from the bottom section to the top section – Helping with the defrost process.

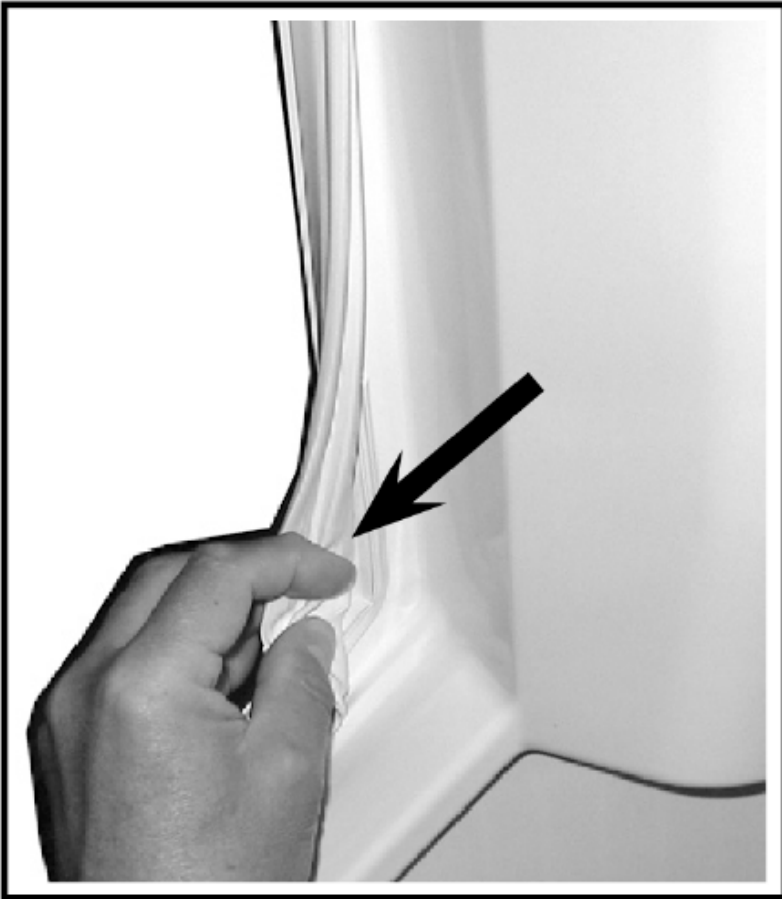


Only install the Fan Kit if Frost Build up is the issue – the kit will not help with ICE issues.

See Bulletin
R82-7A

Part # 385130901 – warranty ONLY!

Supplied with Fan Kit



Fan in Freezer Compartment

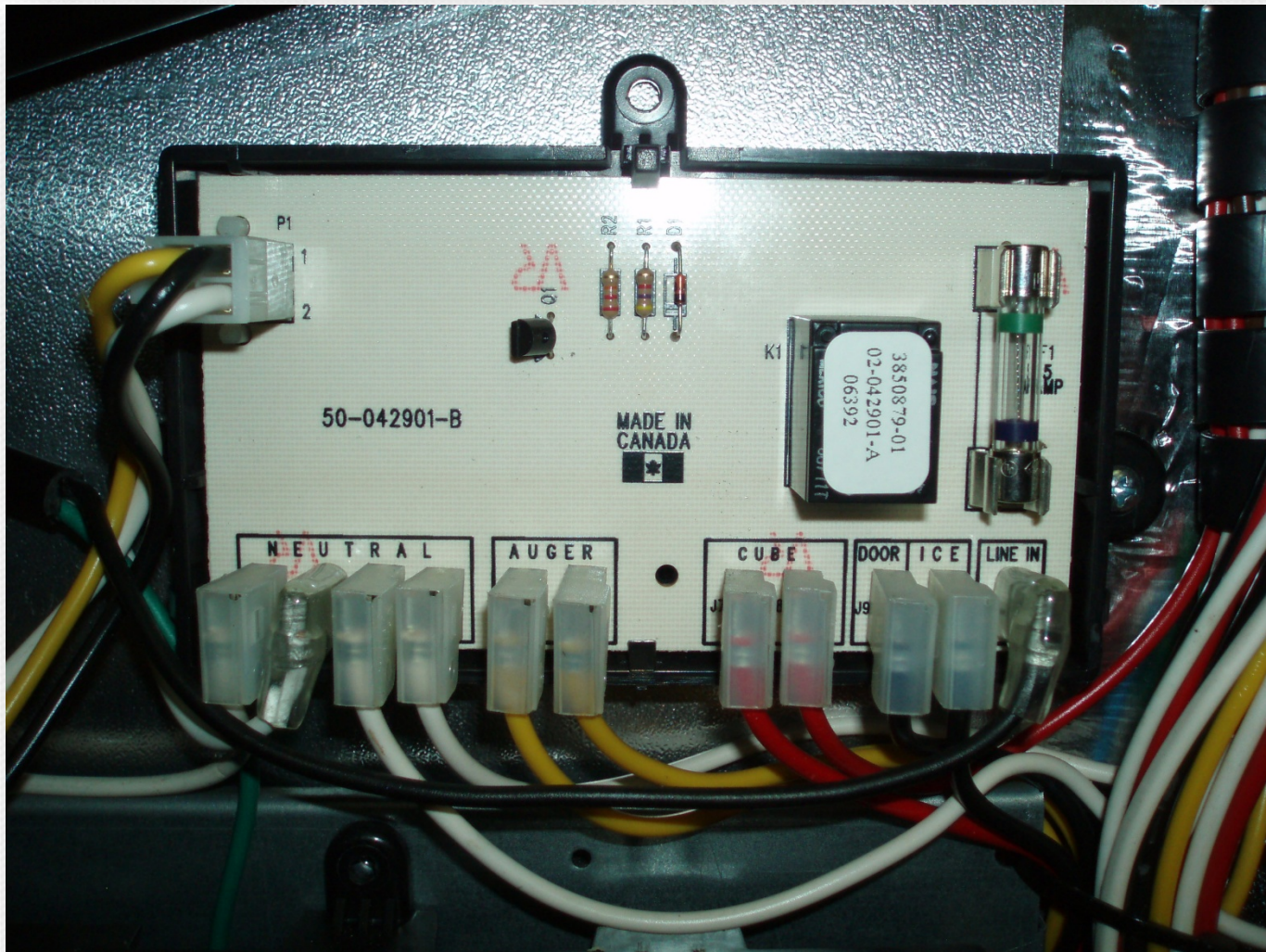


- Suction Channel

Air Distributor



Icemaker Power Module



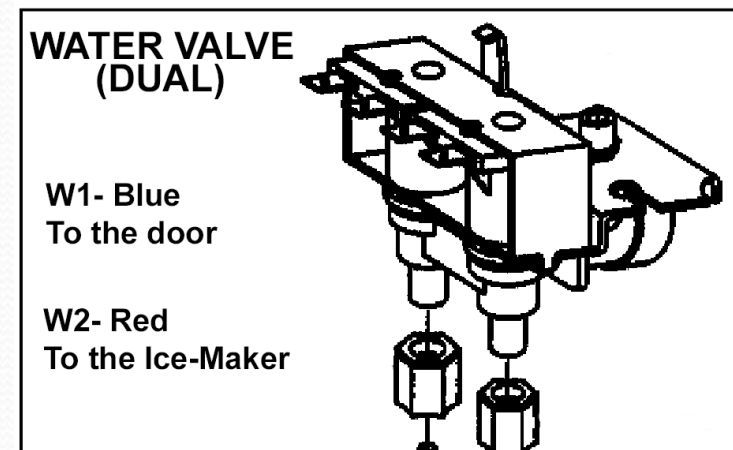
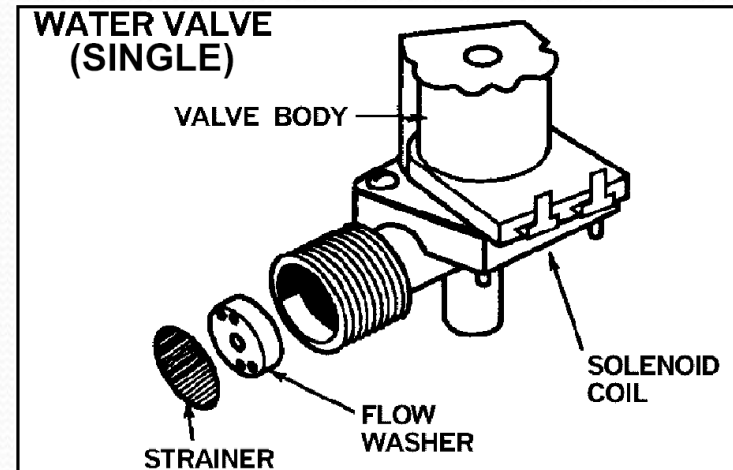
Single and Dual Water Valve

- 120 VAC
- 10-15 Watts to Energize
- 200 – 500 Ohms + /- 10%
- When mold heater is activated – voltage will drop to about 105 VAC

Note: Dual Coils are both 120 VAC and can be tested by measuring the resistance.

W1 (blue) 400 Ohms + /- 10%

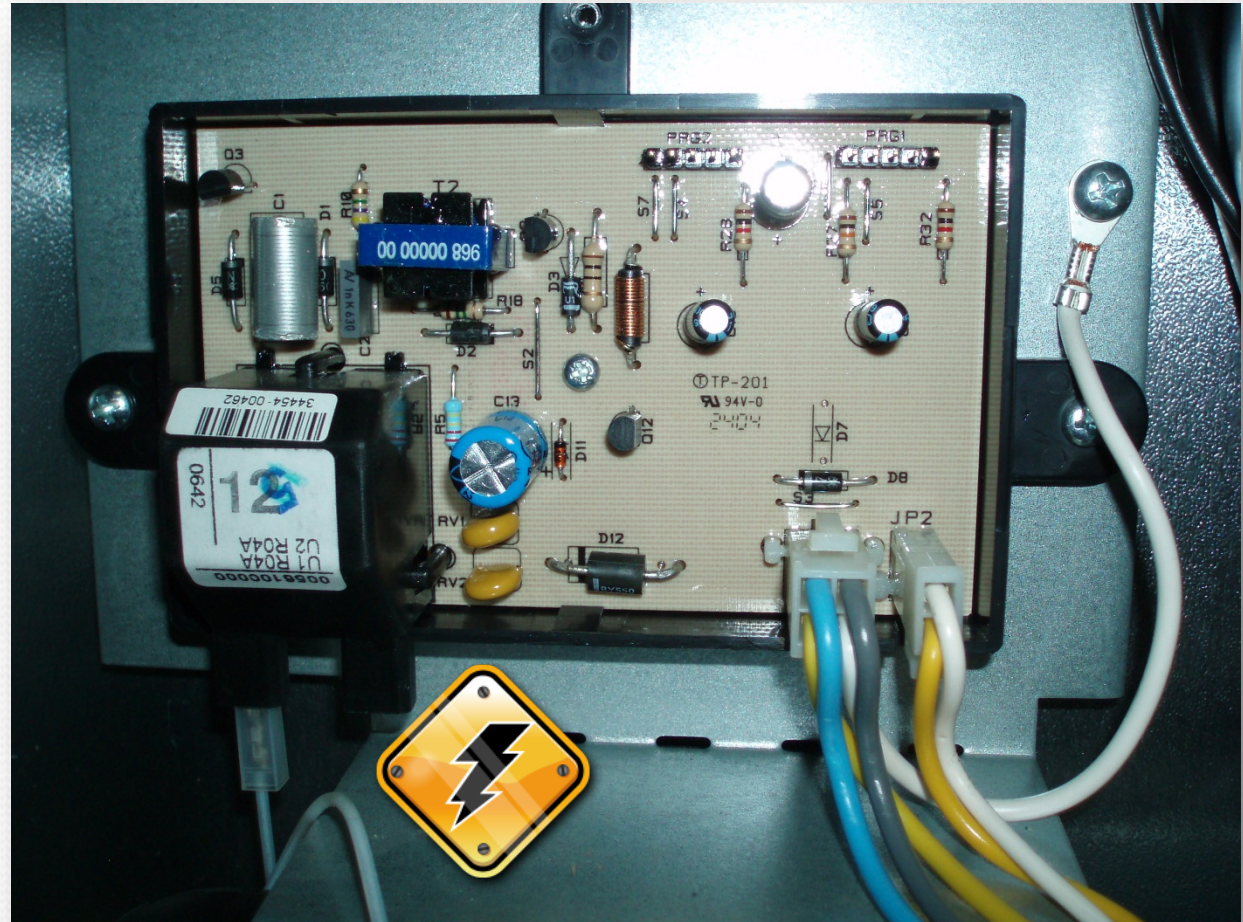
W2 (red) 200 Ohms + /- 10%



Ignition Power Module

Harnesses from
Right to Left:

- JP2 – Gas Solenoid (yellow and white)
- 4-wire Harness – to Main Control Board
- Ignition Cable to Burner.



Display Messages/Error Codes.

LED Display Panel	Status Message	Steady Display	Flashing- (Alternates between temp. & Message)
"dE Fr"	Defrost has been initiated.	X	
"drY"	Drying phase has been initiated.	X	
"x" (1-5)	Thermostat range set point. (1-5)	X	
"ch LP"	Gas operation fault. [1] (NDA 1402 only)		X
"ch AC"	A/C operation fault. [2] (NDE 1402 only)		X
"Lo dc"	Voltage is too low to start defrosting. [3]		X
"-- --"	Real time clock needs to be set. [4]		X
"Er 01"	Defrosting problem; (Two incomplete defrost attempts failed consecutively). [5]		X
"Er 02"	The fan in the frozen food compartment is blocked. [6]		X
"Er 03"	Freezer plate is above 95° F. [7]		X
"hi"	Temperature is above measurement range. [8]	X	
"Lo"	Temperature is below measurement range. [9]	X	
"CA LL" and a error code	Component failure. [10]		X

Icemaker

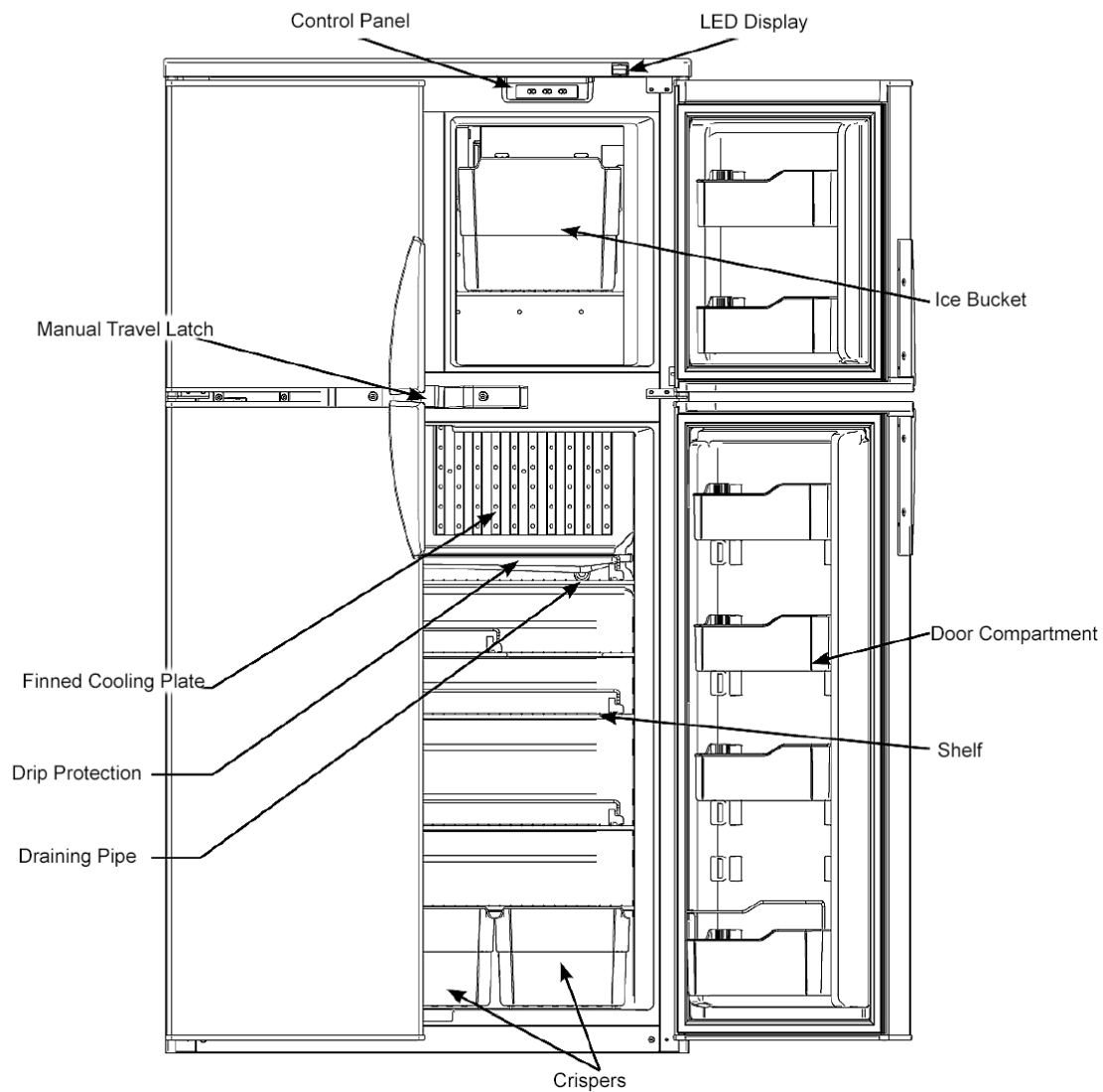
- If the ambient temperatures are expected to reach or drop below 0°F (-18°F C) the ice maker must be drained.
- Temperatures around Ice Mold should be approximately 15°F +/- 5 degrees.
- Within 24 hr period – $\frac{3}{4}$ of a bucket.
- Verify that the Bail Arm is in “Down” position.

RM 1350 4-Door

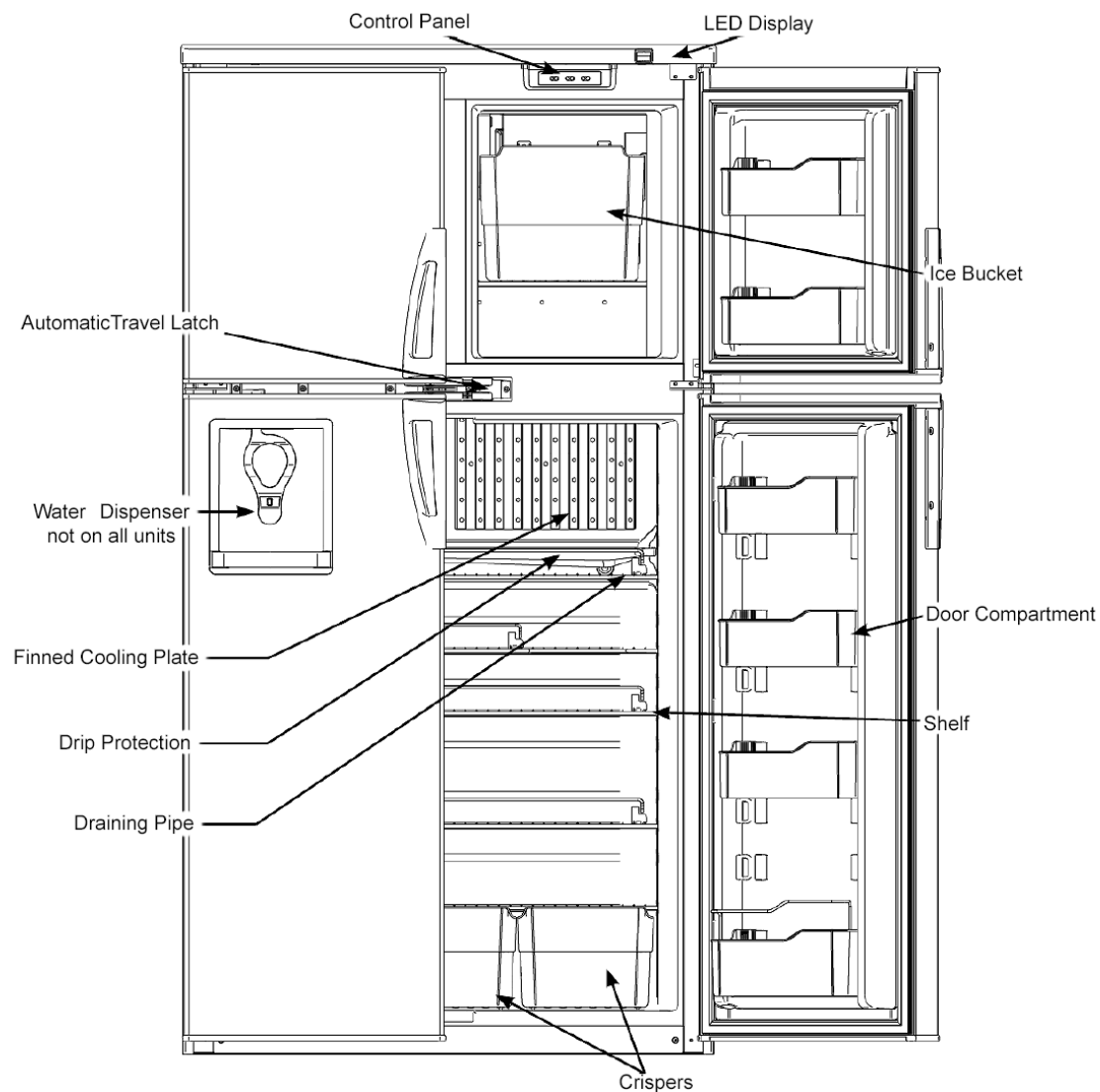
- Displays temperature of the food in the fresh food cabinet.
- Status messages
- Alarm conditions
- Same control system as the RM3762 and RM3962 series.



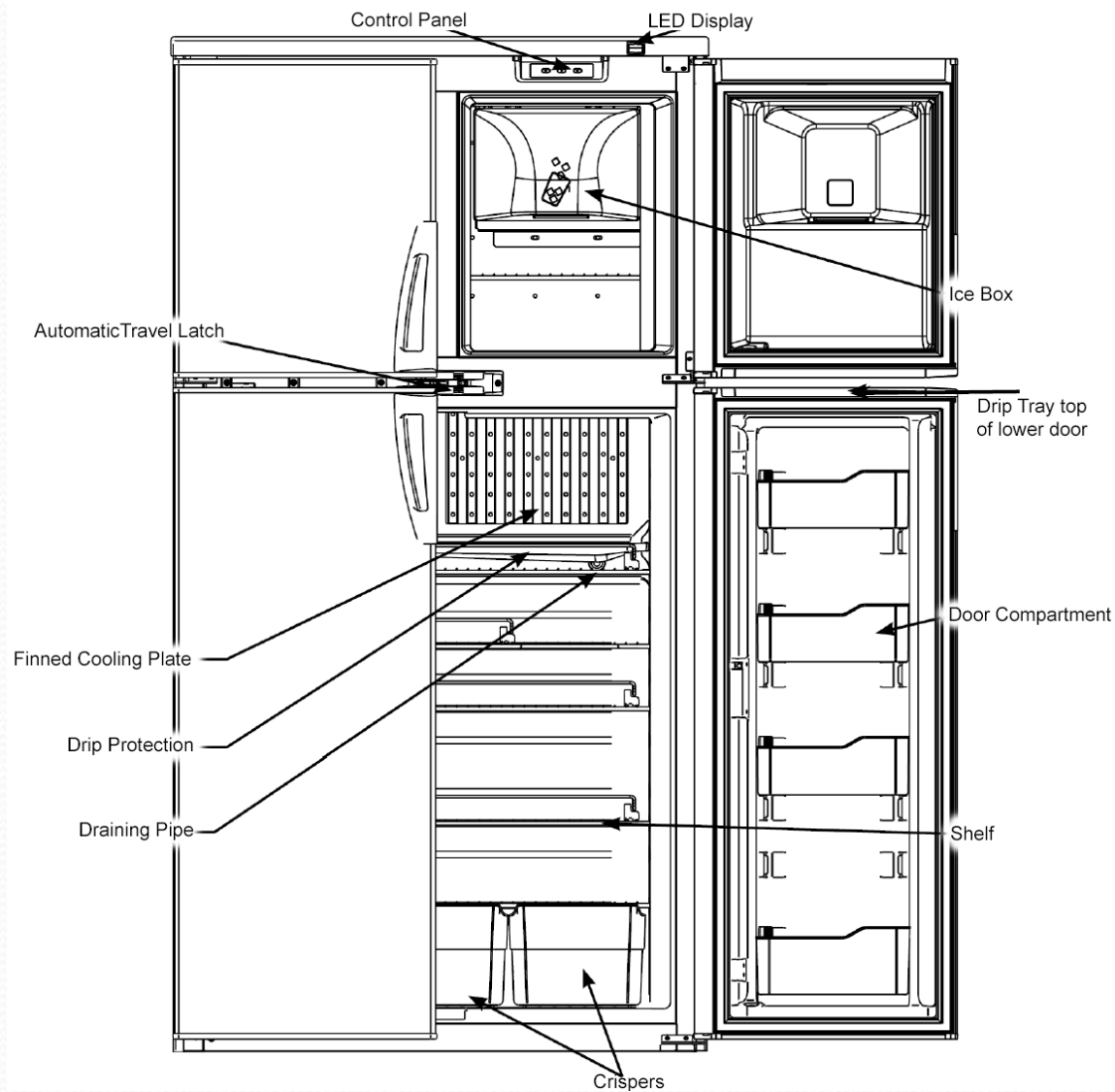
MODELS WITH MANUAL DOOR LOCKING SYSTEMS



MODELS WITH THE AUTOMATIC DOOR LOCKING SYSTEM
AND EQUIPPED WITH WATER DISPENSER



MODELS WITH THE AUTOMATIC DOOR LOCKING SYSTEM AND EQUIPPED WITH ICE AND WATER DISPENSER



Automatic Frost Reduction

The refrigerator has been design with an automatic cooling unit cycling system that helps reduce frost build up in the fresh food compartment. The first automatic frost reduction cooling unit cycle begins 60 hours after turning “on” the refrigerator (for best operational results the refrigerator should be turned on anytime between 4 and 10 PM), and will last for approximately 120 minutes. Thereafter, the cycle will automatically repeat every 48 hours as long as the refrigerator continues to run.

Internal Water Bladder

- Optional Chilled Water through the Door
- Can hold up to 1 qt.
- Drain plug located on bladder, left hand side
- Must be drained when testing the cooling unit due to possible over freezing.
- 12VDC water valve

If customer is not getting water through door, supply 12VDC water valve with a separate 12V source to verify that the valve is opening. Also check supply.

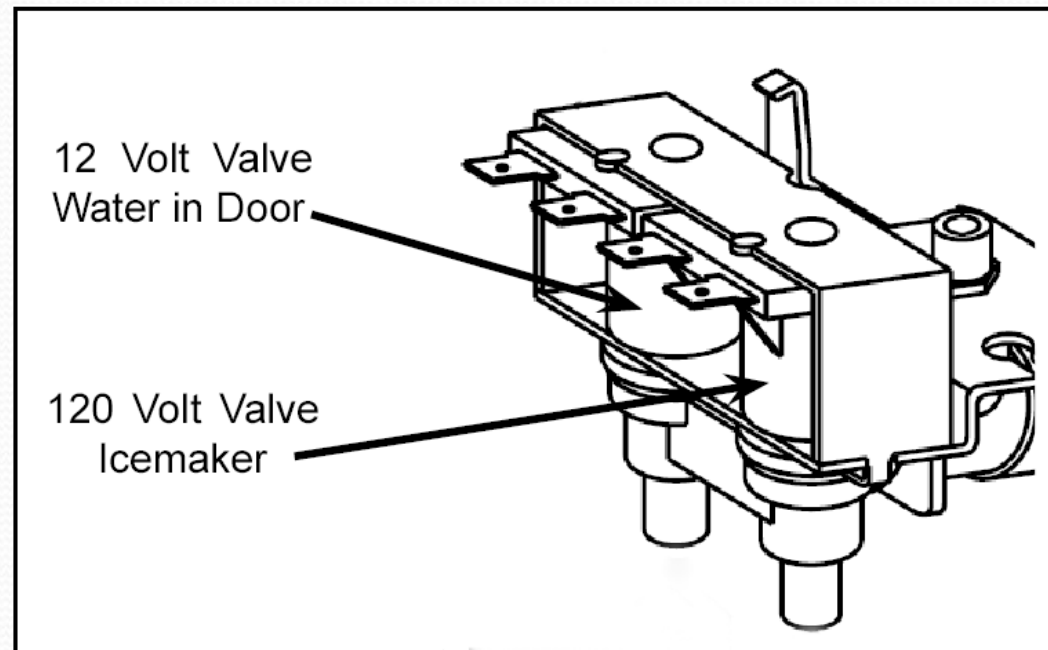
Solenoid Valve

ATTENTION!

This solenoid Valve is **NOT** the same as the NDA/NDE 1402 solenoid!

12 VDC for water dispenser.

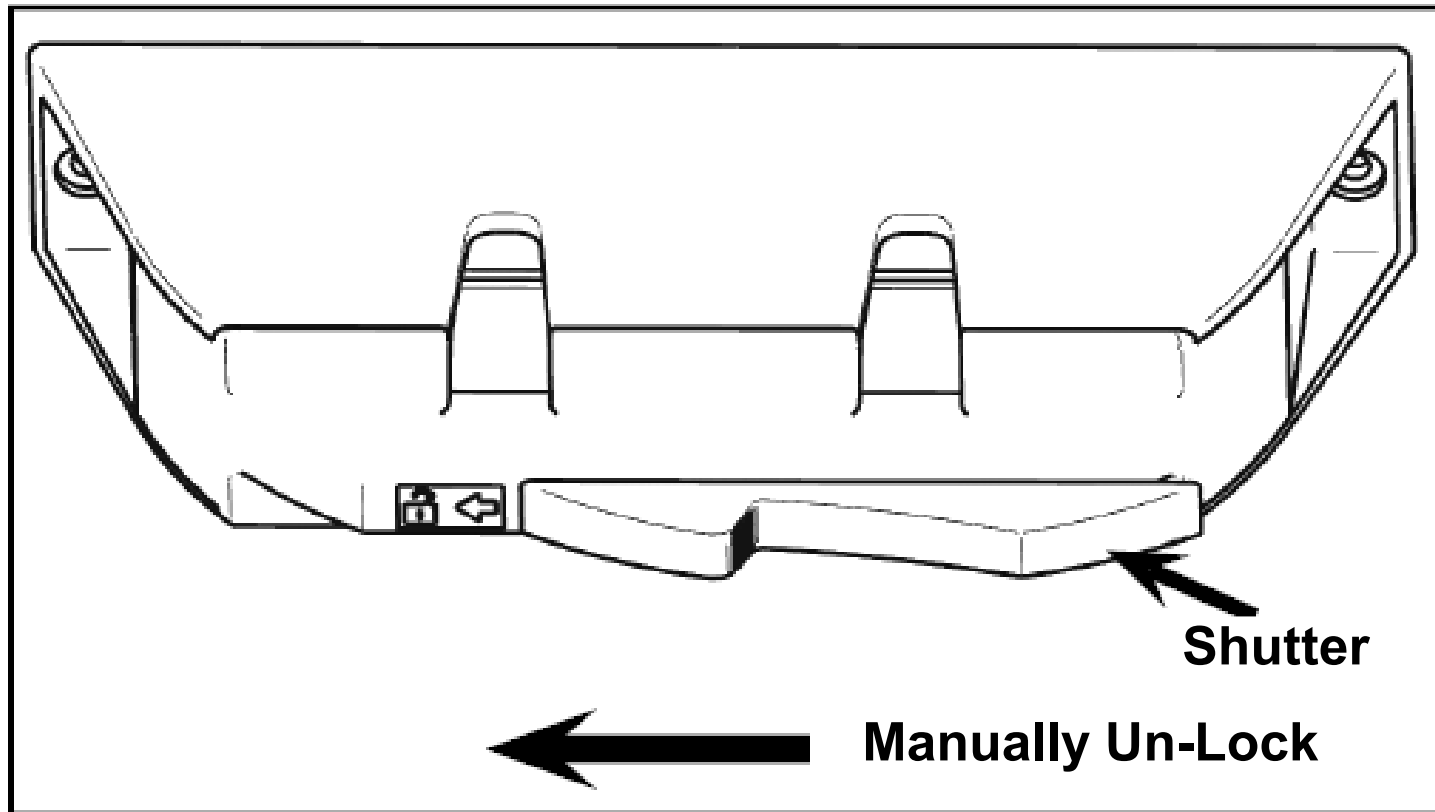
120 VAC for
Icemaker



Temporary Gas Lockout

- In the Auto Mode the gas operation will automatically be locked out for a period of 15 minutes when the engine is switched “OFF” (D+ Terminal) -- This will prevent gas operation.
- Dangers: When parking close to a gasoline pump all LP gas appliances vented to the outside of a vehicle must be turned off. Otherwise gasoline fumes from gasoline pumps might enter LP gas appliances. This can then ignite from the burner flame and cause a fire or an explosion.
- **Note: The temporary gas lockout feature does not work when the AUTO mode is turned off!**

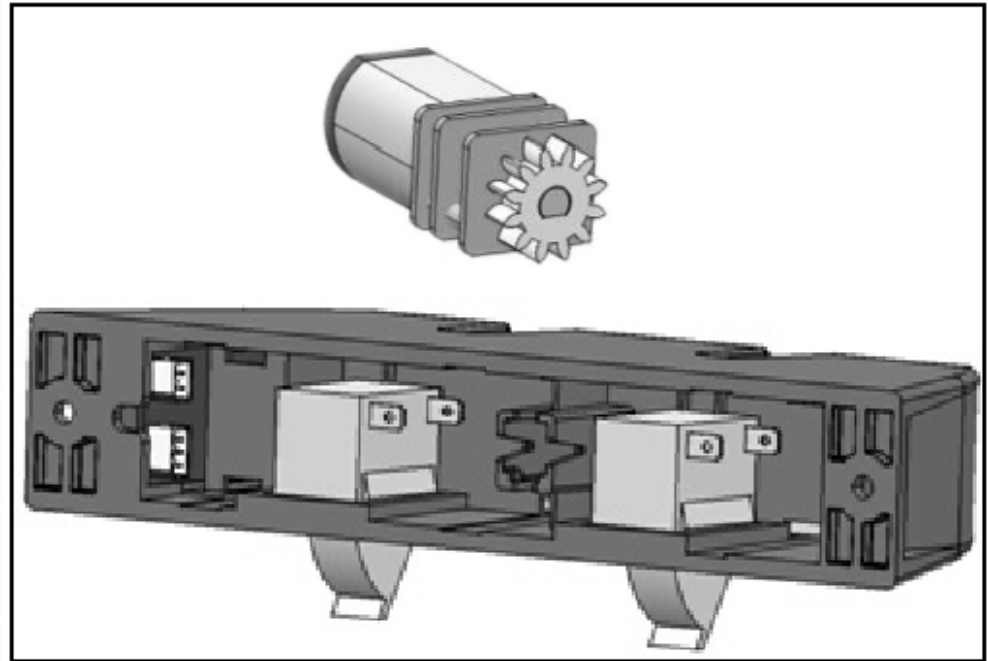
Manual Door Lock



Automatic Door Lock

Three wires to the automatic door lock:

1. Black to Chassis Ground
2. White from D+ terminal (signal to lock doors.
3. Red from J3 lower control board (refrigerator on

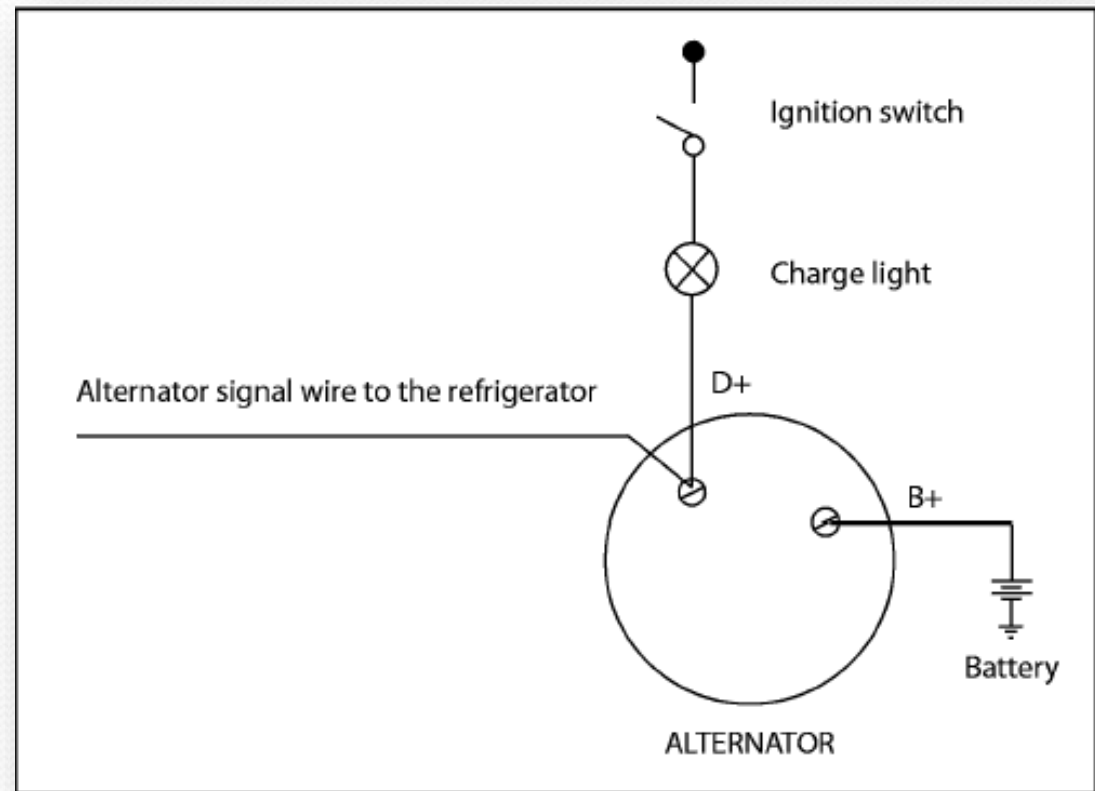


- Unlocks when engine is started and unlocks when the engine is stopped.
- If unlocked while engine is running, the lock will be activated after a short delay.
- If the lock is actuated when a door is open, it will still permit the door to close and then will lock afterwards.

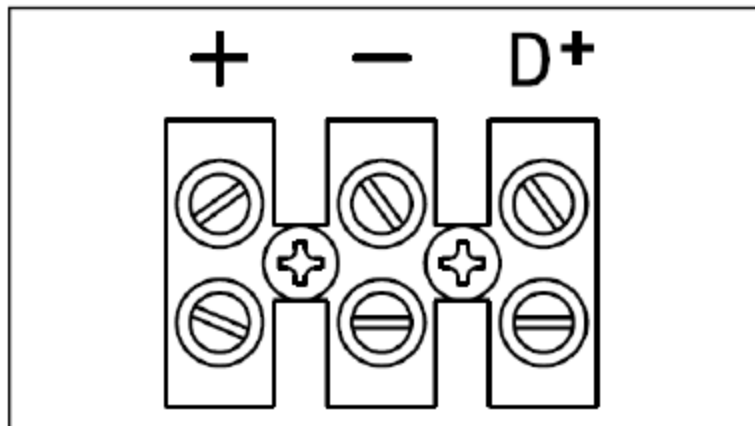
Automatic Door Lock

- Locking Piston
- Locking Pin when activated or de-activated
- Pins are spring actuated to permit closing of a door AFTER the lock is activated
- Activated when the D+ terminal has +12VDC

Note: Some manufacturers do not use the automatic feature. If the doors open during transit, check to see that the D+ terminal has 12VDC – if it does not, then the refrigerator has to be manually locked and unlocked.

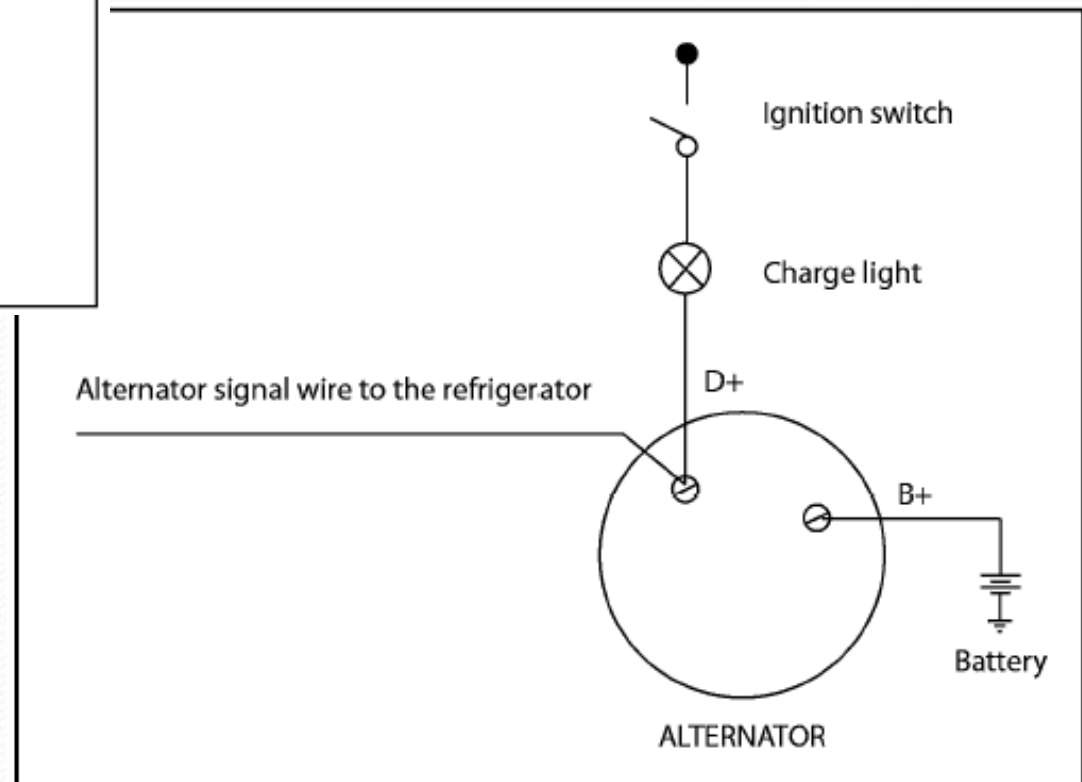


Automatic Door Lock



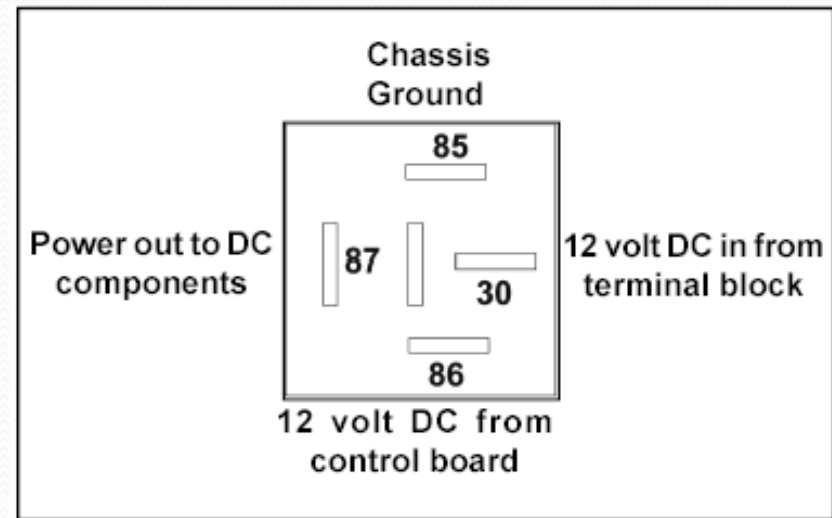
The refrigerator requires the connection of a signal wire from the alternator (D+) in order to maintain the automatic door travel latch and temporary gas lock out function.

The vehicles alternator (D+) is connected to the D+ on the terminal Block



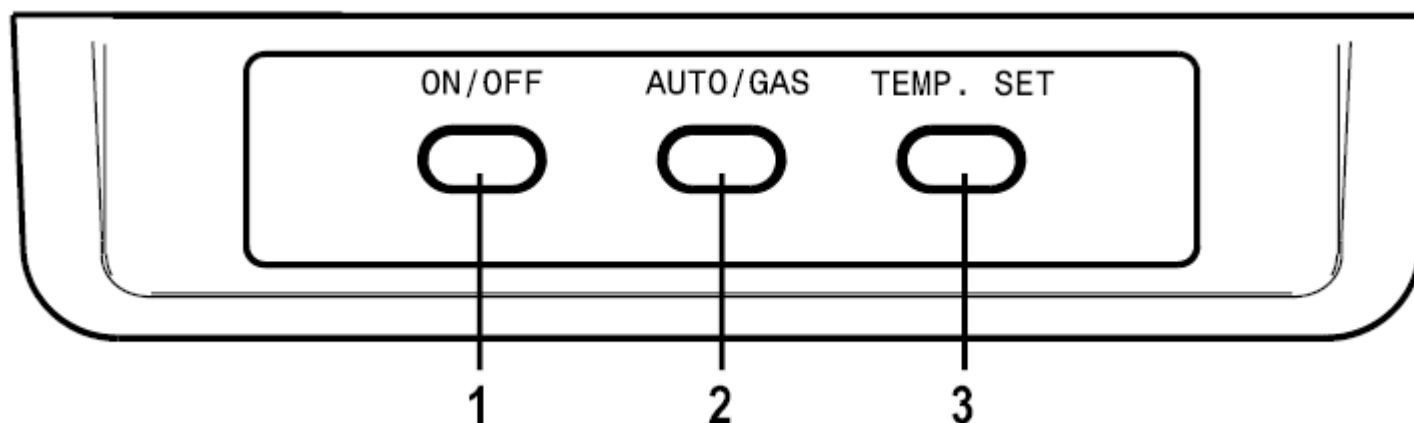
DC Relay

- Relay controls DC circuits. For example:
 - Ventilator Fans
 - 12V Water Line Heater
 - Thermostats
 - Icemaker Water Line Heater
- J3 “Switch” Terminal



- Terminal 86 – 12VDC IN from J3
- Terminal 85 – Chassis Ground
- Terminal 30 – 12VDC IN from Supply
- Terminal 87 – 12VDC OUT to components

Control Panel



- ON/OFF button (Main Power)

Press the button to turn the refrigerator On or OFF

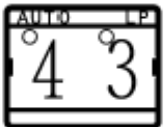
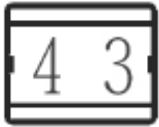
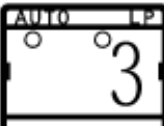
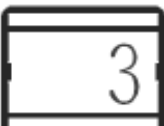
- AUTO/GAS mode selector button

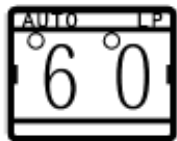

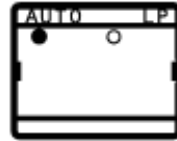
Press the button to turn the AUTO mode ON or OFF

- TEMP. SET button

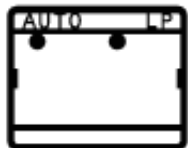
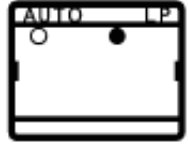

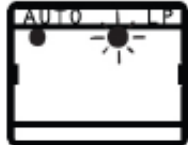
The thermostat has 5 settings where 1 indicates the warmest and 5 is the coldest temperature setting. Press the button repeatedly until the desired setting – The value will display for approximately 5 seconds and then the temperature is displayed again.

Status Information

RM1350M, RM1350IM & RM1350WID	RME1350WIM	
		Fresh food temperature
		Thermostat range setting indication (1-5). Temporary during setting. The thermostat settings are stored automatically after 5 sec. of inactivity

		60 is displayed. Indicates that the temperature is above measurement range
	---	AUTO mode is lit. Indicates AUTO mode and AC operation

Status Information cont.

	----	AUTO and LP mode lamps are lit. Indicates AUTO mode and GAS operation
	----	LP mode lamp is lit. Indicates manual gas operation mode
	----	LP is flashing (message alternates between LP and the temperature). Indicates gas operation lockout. Check gas
	----	AUTO mode lamp is lit and LP mode lamp is flashing. Indicates temporary gas operation lockout

Error Codes - Warnings

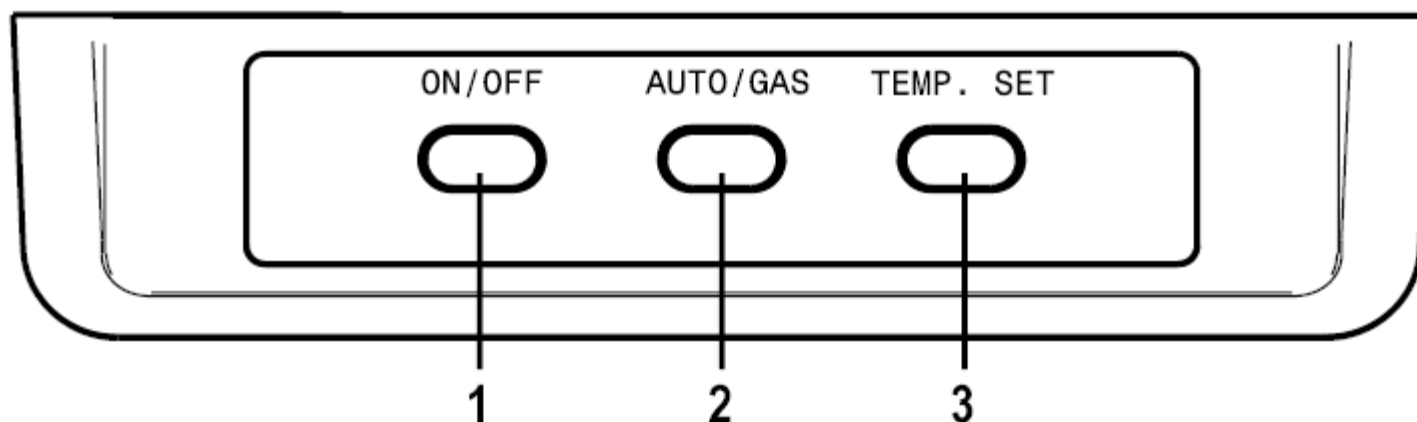
WARNINGS	INFORMATION
LP	Gas ignition failed. Gas bottle empty, the manual valve(s) are closed or burner jet clogged.

ERROR CODE	INFORMATION
E0	No communication between display and power modules. The temperature setting will be maintained at the mid positions. The power module will continually attempt to reestablish operation of the display module. The control system will revert to full automatic operation selecting the best energy source available with AC, GAS priority.
E1	Hardware fault in the gas operation system.
E2	A failure of the temperature sensor device or associated electronic circuitry has occurred

The error codes will ***FLASH*** - alternating between temperature and message.

Diagnostic Test

- Turn the refrigerator off
- Press and hold the TEMP. SET button and then press the ON/OFF button.
- Release the TEMP. SET button. Press it again to toggle the list of functions step by step.



Test Indications/Results

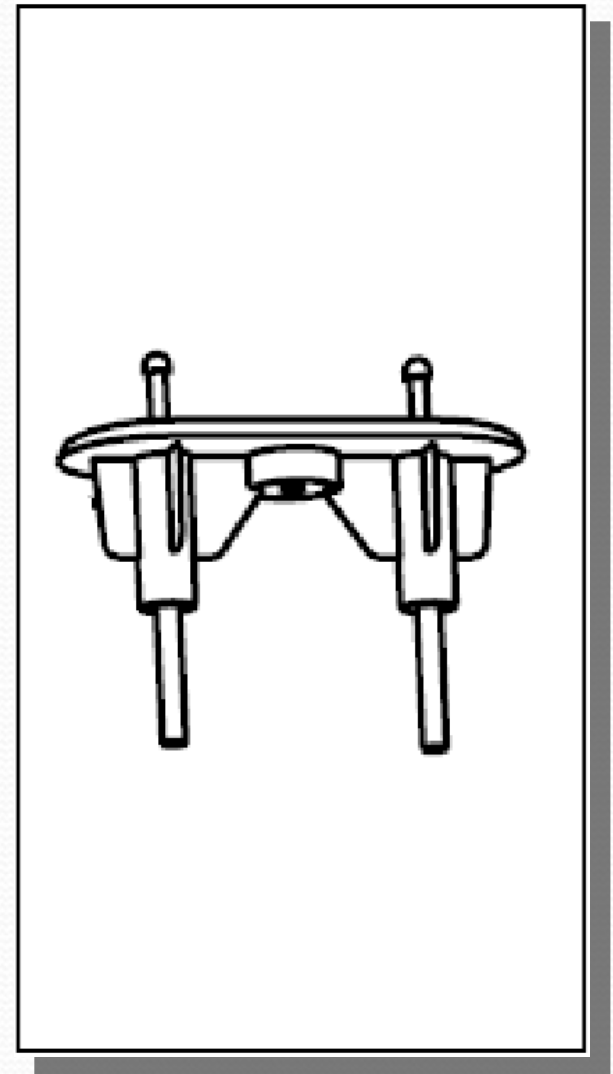
NO	TEST FUNCTION	TEST INDICATION	TEST RESULT INDICATION
1	All outputs off	F	E0 → Communication fault E2 → Temperature sensor fault The actual temperature at the sensor (°F).
2	Turn LAC (Low Ambient Control) heater on	LH	E0 → Communication fault ON → LAC heater on Press the lamp switch. The lamp should still be on.
3	Turn AC heater on	AC	E0 → Communication fault ON → AC heater on “ ” → AC heater off, AC not available
4	D+ status Alternator voltage	DP	E0 → Communication fault ON → D+ > 2V - ≤14 V “ ” → D+ < 2V
5	Run gas (one attempt only)	LP	E0 → Communication fault E1 → Igniter and valve off, gas hardware fault ON → Igniter and valve on FL → Igniter off and valve on, flame detected “ ” → Igniter and valve off, gas problem (check gas) (If flame is not ignited within 45 seconds)

Low Ambient Temp Switch

- If the temperature in the refrigerator has satisfied the thermostat setting, and the Cut-Out threshold has been reached, the refrigerator cycles off. If the temperature remains at LOWER than the Cut-In threshold for 35 minutes or longer, the LAC output will be activated.
- The interior light will turn on, warming the inside – once the Cut-In threshold has been reached, the cooling will begin. The LAC output will be deactivated and the light inside will turn off.
- The LAC process will initiate if Cut-In temperatures are not reached within 35 minutes – repeat.

Flap Heater Wire

- Helps to reduce sweating between the doors during periods of high humidity.
- The heater is on any time the refrigerator is turned on.
- Heater is located on the flap of the left hand refrigerator door.
- Ohms 29 +/- 10% at 2 pin connection at bottom right side of left hand refrigerator door.



Testing an RM 1350 Cooling Unit

- DO NOT disconnect thermistor. The unit will not run continuously like other models. Due to water tank in refrigerator – unit will turn off if thermistor is removed or is reading “open”. **NO LIMP MODE**
 - Take Ohms value of thermistor – Should be approximately 8,000 to 10,000. If tests good:
 - Test Heating element for proper resistance (34.3 Ohms)
 - Hang thermistor out side of compartment in warm temperatures for 4-6 hours – take liquid temperature.
- ☺ Discuss other options for testing