minusforty

30 Armstrong Ave.
Georgetown. Ont,
L7G 4R9, Canada
Tel: 800 800 5706
or 905 702 1441
Fax: 905 702 1442
www.minusforty.com

TECHNICAL SERVICE BULLETIN

		TSB-MFT-0028
SUBJECT:	**Repairs Best Practices – R290 Freezers and Refrigerators**	Effective Date: March 5, 2018
MODELS:	**07-CSG, 09/10/12/13-USG, 11/11M-CSGF, 15-UDG, 19/22-USG, 43/44-UDG**	Revision: 01

- **! DANGER - Risk of fire or explosion. Flammable refrigerant R290 (propane) used.**
- **! DANGER - Do not puncture refrigeration tubing and components.**
- **! DANGER – Do not use mechanical devices to defrost freezer/refrigerator.**
- **! DANGER – Do not use open flames, hot surface tools, ignition or sparking sources during service or repair.**
- **! DANGER – To be repaired only by factory authorized trained service personnel.**
- **! DANGER - Presence of electrical live parts and/or live wires.**
- **! CAUTION - Place in well ventilated area to prevent accumulation of refrigerant during service or repair.**
- **! CAUTION – Consult owner's manual before attempting to service this unit. All safety precautions must be followed.**
- **! CAUTION – Follow handling instructions carefully.**
- **! CAUTION – Dispose of properly in accordance with federal or local regulations.**

A. Safe Handling of Units with Flammable R290 (Propane) Refrigerant

Freezer and refrigerators that use flammable refrigerants are marked with this specific triangle symbol that notifies the servicer of the presence of flammable refrigerants. The symbol is located on the compressor and unit nameplate.

Additionally, units' service ports (compressor process port and liquid line port at the drier) have red markings to indicate the presence of flammable refrigerants in the system.

A service provider should review these markings and follow all instructions provided herein and in the owner's manual.

Pre-service Safety Check:

1. Check the unit for the type of refrigerant used: markings on the compressor, nameplate, and red colored process tubing will indicate whether flammable refrigerant is used.
2. Use a combustible gas leak detector rated and certified for R290 (propane) refrigerant to perform a background check around the unit and inside the refrigerated compartment. To avoid risk of injury, do not use leak detectors with an arc or spark module to check for leaks in and around units that use flammable refrigerants. Service personnel must be trained on proper device use, and the device must be certified for use with the specific refrigerant class being serviced. If flammable refrigerant is detected, immediately ventilate the room, evacuate the area, and notify the owner or customer. Recheck the area with a combustible gas leak detector and wait until the detection device reads a safe level before conducting the service.
3. Use proper protective gloves, eyewear, and appropriate PPE for arms. Flammable refrigerants and compressor oils may cause frostbite and may cause chemical burns.
4. Ensure a dry-powder fire extinguisher rated for Class B fires is accessible on site. Technicians should be trained in the use of these fire extinguishers.

5. Utilize a tubing cutter, not a torch or other heated surface tools, due to flammable refrigerants when access to the sealed refrigeration system is needed.
6. Conduct all servicing in a well-ventilated area. Whenever possible, open a window, door or other means to ventilate the area. Take extra care if the repair work is done in a confined space, including providing enhanced ventilation to prevent formation of flammable mixtures in the ambient air.

Steps to ensure that no ignition sources are present while the service work is done:

1. Check the area for obvious sources of sparking or open flames. The area should be free of open flame or burning materials, including cigarettes, candles, or similar materials.
2. Do not operate appliances that utilize open flames or have hot surfaces (for example: electric or gas ranges, electric or gas dryers, toasters, and other small appliances) while servicing the appliance. Inform the homeowner/consumer that no open ignition sources should be present in or near the area, including cigarette smoking materials.
3. Check the area and the unit for any signs of ignition that might have occurred prior to the service call. If there are signs of ignition, stop the service work and contact our customer care department for further instructions.
4. Maintain a safe zone around the unit during service work to prevent the introduction of ignition sources or entry by the customers.
5. If the unit is being moved to a service center, take care to prevent damage to the unit.
6. Utilize vacuum pumps, recovery equipment, and other tools that are rated and certified for use with flammable refrigerants.

Leak Detection and Repairs:

7. Use a combustible gas leak detector rated and certified for R290 (propane) refrigerant to perform a background check around the unit. Escaped refrigerant usually disperses fast into the ambient air and by the time the service personnel arrive to the site, there should be no detectable flammable refrigerant around or inside the unit. However, if flammable refrigerant is detected, immediately ventilate the room, evacuate the area, and notify the owner or customer. Recheck with a combustible gas leak detector and wait until the detection device reads a safe level.
8. Check for any of these three indirect signs of escaped refrigerant:
   - Compressor runs at lower current draws than in normal operation (see the Table 1 below for compressors typical current draws).
   - Little or no heat coming out of the compressor into the discharge line. If refrigerant has leaked out, the compressor discharge line would be at about the same temperature as the surrounding ambient air and would feel cool when touched by hand.
   - Presence of compressor oil around leak spots.

9. If a refrigerant leak is found or is suspected to be present in the system, DO NOT ATTEMPT TO REPAIR THE LEAK OR TAP INTO THE SEALED SYSTEM. Contact our customer care department to arrange a shipment of the unit to our factory for repair. Due to safety and liability concerns, all flammable refrigerant leak repairs and/or compressor replacements must be done at our factory.

B. Compressor Failure Diagnosis and Replacement

Compressors typically fail because something in the refrigeration system changes externally, which adversely affects the compressor performance. The most common root causes of compressor failures are: dirty or blocked condenser, condenser motor failure, evaporator motor failure, power supply out of range, refrigerant leak, faulty compressor electricals (capacitors, relays, and overload protector), incorrect installation…

List of items to check for compressor diagnosis:

1. Thoroughly check all potential external root causes for compressor failures. If any of those causes are found in the system or installation, repair and correct them first (except refrigeration leaks) and then proceed with compressor diagnosis as follows.
2. Check compressor amperage and compare to the relevant amps in Table 1. The measured stable current draw should be about 60% to 85% of the listed RLA amp.
3. Check compressor winding resistance and compare to the relevant resistances in Table 1. If windings are open, the compressor must be replaced at our factory.
4. Check continuity between compressor terminal pins and ground. If windings are shorted to ground, the compressor must be replaced at our factory.
5. Check capacitance of capacitors (microfarad). Start capacitors have bleed resistors and they need to be temporarily removed for checking capacitances. If capacitors are found to be out of spec., replace faulty capacitors.
6. Check compressors external relay and/or overload protector for continuity and if found defective, replace them.
7. If the compressor trips the overload protector repeatedly and capacitors are within the specs, the compressor piston may be locked (stalled). The compressor must be replaced at our factory.
8. If the compressor produces noticeable loud internal noise, the compressor must be replaced at our factory.
9. Whenever the compressor is found to be, or is suspected to be faulty, DO NOT ATTEMPT TO REPAIR OR TAP INTO THE SEALED SYSTEM. Contact our customer care department to arrange for shipment of the unit to our factory for repair. Due to safety and liability concerns, **all flammable refrigerant leak repairs and/or compressor replacements must be done at our factory.**

Table 1: Relevant data for compressor diagnosis

			Current		Winding Resistance (ohms) at 77°CF (25 °C)		Capacitors (microfarad)	
Freezer Model	Compressor Model	Volts	RLA	LRA	C-S	C-R	Start	Run
07-CSGF, 09/10-USGF, 11-CSGF, 11M-CSGF	EM2X1125U	115	3.36	20.01	3.55	2.82	161-193	20
11M-CSGF	EM2X1121U	115	3.1	17.23	3.18	3.06	124-149	20
13-USGF	FFU160UAX	115	8.5	41.5	3.75	1.1	378-454	-
15-UDGF, 19/22-USGF, 22-UDGH	NEU2155U	115	6.8	40	5.99	1.1	189-227	20
43/44-UDGF	NT2180UV	115	9.6	54.5	2.66	0.43	243-292	20

			Current		Winding Resistance (ohms) at 77°CF (25 °C)		Capacitors (microFarad)	
Refrigerator Model	Compressor Model	Volts	RLA	LRA	C-S	C-R	Start	Run
07-CSGR, 09/10/13-USGR, 15-UDGR	EMI50EUR	115	1.62	12.7	28.18	4.96	145-175	-
19/22-USGR	EM2X3121U	115	3.87	15.90	5.27	3.04	-	20
43/44-UDGR	EM2X3125U	115	4.20	18.4	6.40	2.74	-	12

C. Controller Diagnosis and Replacement

First, locate the controller model number printed on the controller faceplate just below the temperature display. It should be one of these two models:

Y39

At the left side of the controller display are the following LED indicators:

1. Indicates compressor status:
   Light on - Compressor cooling on
   Light off - Compressor cooling off
   Light flashing - Start-up delay in progress
2. Indicates defrost status:
   Light on - Defrost in progress
   Light flashing - Freezer in dripping mode
3. Indicates fan status:
   Light on - Cabinet fan ON
   Light off - Cabinet fan OFF
   Light flashing - Start-up delay in progress after defrost.
4. Indicates the alarm status:
   Light on - Alarm is on
   Light off - Alarm is off
   Light flashing - Alarm silenced or memorized

X34

At the left side of the controller display are the following LED indicators:

1. Indicates compressor status:
   Light on - Compressor cooling on
   Light off - Compressor cooling off
   Light flashing - Start-up delay in progress
2. Indicates defrost status:
   Light on - Defrost in progress
   Light flashing - Refrigerator in dripping mode
3. Indicates fan status:
   Light on - Cabinet fan ON
   Light off - Cabinet fan OFF
   Light flashing - Start-up delay in progress after defrost.
4. Indicates internal clock is running.
   Flashing slowly - clock error (ie:clock chip not working).
   Flashing rapidly - the clock battery is drained.
5. Indicates the alarm status:
   Light on - Alarm is on
   Light off - Alarm is off
   Light flashing - Alarm silenced or memorized

Some controller failures/malfunctions may include the following behaviours:

1. Controller displays EPr or Err.
   Action: This message means the controller has an internal failure and must be replaced.
2. Controller displays "Pr1 diSC".
   Action: This message means that probe 1 (cabinet probe) is open (disconnected, broken, or damaged).
   - Check the probe connections at the controller
   - Check the probe resistance when disconnected from controller. The resistance should be 10kOhm at 77 °F
   - Check the probe along its length for damage, piercing, etc.,

   If needed, replace the probe, or fix and insulate the broken spot.
3. Controller displays "Pr1 Short CC".
   Action: This message means that probe 1 (cabinet probe) is short-circuited.
   a. Check the probe connections at the controller
   b. Check the probe resistance when disconnected from controller. The resistance should be 10kOhm at 77 °F
   c. Check the probe along its length for damage, piercing, etc.

   If needed, replace the probe, or fix and insulate the broken spot.
4. Controller displays "Pr2 diSC".
   Action: In this case probe 2 (evaporator/defrost probe) is open. Use the same troubleshooting steps as described for probe 1 in section 2.
5. Controller displays "Pr2 Short CC".
   Action: In this case probe 2 (evaporator/defrost probe) is short-circuited. Use the same troubleshooting steps as described for probe 1 in section 3.
6. Controller displays "HI °F" or "HI °C".
   Action: This message means the temperature inside the cabinet is too high. First, check other potential external causes: refrigerant leak, dirty/blocked condenser, power supply, extension cord use, ice build-up on the evaporator, excessive door openings, cabinet installation and environment, compressor faults, condenser or evaporator fan faults.
   If all external potential causes are okay, then the controller and/or probes may be malfunctioning.
   - Use a separate thermometer and place your thermometer's probe on the tip of the cabinet probe, close the cabinet door, and wait for two to three minutes for the temperature to stabilize. Compare the two readings. The deviations should not be more than ±5°F. If you see larger deviations in temperature readings, completely disconnect probe 1 from the controller, the controller should flash "Pr1 diSC". If you do not see these signals flashing and the controller displays temperature readings instead, the controller must be replaced.
   - Check the probe along its length for damage, piercing, etc.
   - Check the probe resistance when disconnected from the controller. The resistance should be 10kOhm at 77 °F
   - If needed check probe 2 (evaporator/defrost probe) using the same procedure as above. To get probe 2 reading on the display, press and release U button. The controller will flash Pr2 followed by its actual temperature reading. When probe 2 is disconnected from the controller, the controller should flash "Pr2 diSC".

   Notes:
   With controller cabinet probe (Pr 1) reading failure, the most common symptoms are:
   - Cabinet probe reading outside the typical expected range, usually around 170F.
   - Products inside freezer are satisfactory, or even too cold, but the controller displays too warm temperature. The buzzer may be going off too.
   - Products are warm or melting.

   With controller evaporator probe (Pr 2) reading failure, the most common symptoms are:
   - Evaporator probe reading outside expected range, usually around 170F.
   - Controller displays temperature around 20 °F to 45 °F with evaporator fans off.

- Products are warm or melting.
- Ice/frost build up on evaporator.

7. Controller displays "Lo °F" or "Lo °C" .
   Action: This message means the temperature of the evaporator coil is too low. First, check other potential external causes: cabinet set point too low, compressor relays stuck in closed position, and ice buildup on the evaporator. If all external potential causes are okay, then the controller and/or probes may be malfunctioning.
   - Use a separate thermometer and place your thermometer's probe on the tip of the cabinet probe, close the cabinet door, and wait two to three minutes for the temperature to stabilize. Compare the two readings. The deviations should not be more than ±5°F.
   - If you see larger deviations in temperature readings, completely disconnect probe 1 from the controller, the controller should flash "Pr1 diSC". If you do not see these signals flashing and the controller displays temperature readings instead, the controller must be replaced.
   - Check the probe along its length for damage, piercing, etc.
   - Check the probe resistance when disconnected from the controller. The resistance should be 10kOhm at 77 °F
   - If needed check probe 2 (evaporator/defrost probe) using the same procedure as above. To get probe 2 reading on the display, press and release U button. The controller will flash Pr2 followed by its actual temperature reading. When probe 2 is disconnected from the controller, the controller should flash "Pr2 diSC".
8. Compressor runs continuously even though the freezer temperature is below the set temperature.
   Action: Check the cooling/compressor relay on the controller and the external compressor SSR relay. The relay(s) may be stuck in the closed position. The controller cooling relay can be checked by placing voltmeter probes on terminals 7 and 2 on Y39, terminal 18 on X34 and neutral screw on the compressor SSR relay. The voltmeter should read about 115V when the controller calls for the compressor to run, and 0V when the controller shuts off the compressor. When the compressor is in ON mode, the symbol "Comp" on Y39 and X34 is lit up. If the controller does not call for cooling and the relay is in the closed position, replace the controller. If the compressor external SSR relay is stuck in closed position, then replace the SSR relay.
9. Compressor never turns ON even though the freezer temperature is high.
   Action:
   - Check the compressor wiring
   - Check the cooling/compressor relay on the controller and the external compressor SSR relay. The relay(s) may be stuck in open position. The controller cooling relay can be checked by placing voltmeter probes on terminals 7 and 2 on Y39, terminal 18 on X34 and neutral screw on the compressor SSR relay. The voltmeter should read about 115V when the controller calls for the compressor to run, and 0V when the controller shuts off the compressor. When the compressor is in ON mode, the symbol "Comp" on Y39 and X34 is lit up. If the controller calls for cooling and the cooling relay is stuck in open position, replace the controller. If the compressor SSR relay is stuck in open position, then replace the SSR relay.
10. Defrost heater turned on continuously.
    Action: Check the defrost relay on the controller as it may be stuck in the closed position. The controller defrost relay can be checked by placing voltmeter probes on terminals 7 and 4 on Y39, terminal 21 on X34 and neutral screw on the compressor SSR relay.
    The voltmeter should read about 115V when the controller calls for defrost, and 0V when the controller shuts off defrost. When the freezer is in defrost mode, the symbol "Def" is lit up. If the controller does not call for defrost and the defrost relay is stuck in closed position, replace the controller.

11. The freezer never goes into defrost or defrost does not appear to be functioning correctly.
    Action:
    - Check the defrost heater wiring for broken or damaged wire, disconnected wire…

- Run a manual defrost by pressing and holding the defrost button (arrow UP button) on the controller for about 10 seconds. The compressor and evaporator fan(s) should stop, defrost heater should be energized, and the defrost symbol on the controller is lit.
- Check the defrost relay on the controller as it may be stuck in the open position. The controller defrost relay can be checked by placing voltmeter probes on terminals 7 and 4 on Y39, terminal 21 on X34 and neutral screw on the compressor SSR relay. The voltmeter should read about 115V when the controller calls for defrost, and 0V when the controller shuts off defrost. When the freezer is in defrost mode, the symbol "Def" is lit up. If the controller calls for defrost and the defrost relay is stuck in the open position, replace the controller.

12. Controller displays "door oPEn" on Y39 and X34. "door oPEn" message indicates door open status.
    Action:
    - Make sure the door closes properly. Ensure the metal bracket, mounted on the door frame, presses the door switch down.
    - If the door is closed, and one of the messages listed above is active, then the door switch or controller may be faulty. Disconnect the door switch blue wires from the controller and check for continuity through the switch with an ohmmeter. With the door button pressed in (door closed), there should be no continuity (open circuit). Replace the door switch if needed. If the door switch is okay, then replace the controller.

13. Controller displays "HAC" on X34
    Action:
    - "HAC" message means controller has recorded an alarm (high temperature or power loss). If you need to review the time of occurrence and duration, refer to the owner's manual. To clear this alarm, press and hold the arrow down button on the controller for 5 seconds until the message clears.

D. Defrost Diagnosis and Replacement

Excessive ice/frost build up adversely affects freezer performance. It restricts the air flow through the evaporator and reduces cooling performance. Inspect the evaporator coil through evaporator fan openings. If the front of the coil is covered with ice/frost, the freezer may have a defrost problem. Follow these steps to troubleshoot:

1. Check the freezer power supply. The voltage should be within ±10% of the nominal voltage. Make sure an extension cord is not used.
2. Run a manual defrost by pressing and holding the defrost button (arrow UP button) on the controller for about 10 seconds. The compressor and evaporator fans should stop, defrost and drain tube heaters should energize, and the defrost symbol "Def" on the controller should be lit.
   Note: The drain tube heater runs in defrost mode only - it is not running continuously like on some other OEM's freezers on the market.
3. Remove the narrow cover at the back of the freezer and place an amp meter around the grey (defrost) wire. The grey wire feeds the power to the heaters.
4. Compare the measured current reading to the relevant amps in table 2 and allow ±10% variations for manufacturing tolerances, voltage variations, and measuring inaccuracies.
5. If the amp meter reads zero (current is not present), then:
   - Check wiring from the controller to the heaters for open circuit (broken or damaged wire, disconnected wire…)
   - Disconnect defrost heaters and check resistances and compare to the relevant data in table 2.
   - Check the defrost relay on the controller as it may be stuck in the open position. The controller defrost relay can be checked by placing voltmeter probes on terminals 7 and 4 on Y39, terminal 21 on X34 and neutral screw on the compressor SSR relay. The voltmeter should read about 115V when the controller calls for defrost, and 0V when the controller shuts off defrost. When the freezer is in defrost mode, the symbol "Def" is lit on the controller display. If the controller calls for defrost and the defrost relay is stuck in the open position, replace the controller.
6. In a case when ice accumulates on the back inner wall and runs all the way down to the freezer bottom, check the drain heater for resistance. If the drain heater resistance is out of specs, replace the drain heater. If in the drain heater is in good condition, please contact Minus Forty for further instructions and possible repair kit.
7. Once the defrost malfunction cause is found and repaired, the evaporator and drain tubes must be completely free of ice and clean. If excessive ice is left on the evaporator and/or in drain tube, the defrost system will not be able to clear this excessive ice accumulation.

Table 2: Relevant data for defrost and drain tube heaters diagnosis

Freezer Model	Heater Function	Volts	Current(amps)	Resistance (ohms) at 77°F(25 °C)
07-CSGF	Defrost	120	4.2	28.8
09/10/13-USG	Defrost	120	3.3	36
11/11M-CSGF	Defrost	120	4.2	28.8
15-UDGF	Defrost	120	5.0	24
19/20/22-USGF	Defrost	120	4.3	27.7
43/44-UDGF	Defrost	120	7.5	16
All models	Drain Tube	120	0.10	1200

E. Evaporator Fan(s) Diagnosis

The evaporator fan(s) control and operation is briefly summarized as follows:
Freezers: The evaporator fan(s) are controlled by the evaporator/defrost probe, the door switch, and the controller. The fan(s) stops when the door is open. When the evaporator probe temperature is at or above 25 °F, the controller shuts off the evaporator fan(s). When the evaporator probe temperature is below 25 °F, the evaporator fan(s) can either on or off as further explained in the troubleshooting section below.
Refrigerators: The evaporator fans are controlled by the door switch and the controller, and run continuously except when the door(s) is open. The evaporator/defrost probe has no impact on the evaporator fan operation. Some refrigerator models in specialty pharmaceutical applications have the evaporator fan(s) programmed to be off during compressor off time.
Freezers and Refrigerators: When the controller calls for fans to run, the "Fan" symbol is lit on the controller display. To obtain evaporator probe reading, press and release U on the controller, then "Pr2" will be flashing followed by the evaporator probe actual temperature.

The procedure below describes the troubleshooting process for freezers and can also be applied to refrigerators with the exception of the noted evaporator probe impact**.** There are three distinct temperature ranges of the evaporator probe readings that impact the evaporator fan status in freezer models:

1. The evaporator probe temperature is at or above 25 °F. The controller shuts off the fan(s).
2. The evaporator probe temperature is below 20 °F. The fans run continuously when the compressor is running. During compressor off time, the evaporator fan(s) run intermittently (5 seconds on, 55 seconds off) on some freezer models to save energy. Watch for "Fan" symbol status (lit or non-lit) on the controller display to find out whether the controller calls for fan(s) to run.
3. The evaporator probe temperature is in the range 20 °F to 25 °F. The evaporator fan(s) can be either on or off.

If the freezer has been unplugged for some time, plug in the freezer and allow at least 30 minutes for evaporator probe to reach temperatures around or below 20 °F. **Ensure the compressor is running** and follow troubleshooting guides as follows to identify the cause for fan(s) malfunctioning:

1. Evaporator probe temperature is below 20°F, but the fan(s) are not running
   Both freezers and refrigerators:
   - Check the "Fan" symbol on the controller display - it should be lit at this time. If the symbol is not lit, replace the controller.
   - Checker whether the door is closed and the door switch button is pushed in by the door bracket. When the door opens, the fans are stopped.
   - Check the wiring from the controller to the fans.
   - Check the voltage at fans wiring ends. It should read about 115V when controller calls for fans and the door is closed.
   - Check the fan relay on the controller. The fan relay may be stuck in open position. The fan relay can be checked by placing voltmeter probes on terminals 7 and 5 on Y39, terminal 23 on X34 and neutral screw on the compressor SSR relay. The voltmeter should read about 115V when the controller calls for fans to run, and 0V when the controller shuts off the fan(s). When fan(s) is on, the symbol "Fan" is lit up. If the controller calls for fans and the fan relay is stuck in the open position, replace the controller.
   - If 115V is present at fan(s) terminals but the fan(s) do not run, then check the fan(s) and replace if found faulty.

2. Evaporator probe temperature is above 25°F
   - Check the "Fan" symbol on the controller display.
     Freezers: The symbol should not be lit at this time and the fans should not be running. Otherwise, replace the controller.
     Refrigerators: The symbol should be lit at this time and the fans should be running. Otherwise, replace the controller.
3. Evaporator probe fluctuating in the range 20°F to 25°F
   - Refrigerators: The "Fan" symbol should be lit at this time and the fans should be running. If symbol is lit and fans are not running, replace the controller.
   - Freezers: Wait until the evaporator temperature stabilizes either below 20°F or above 25°F, and then proceed as per scenario 1 or 2 above. If the temperature does not stabilize in one of those two regions (above 25°F or below 20°F), then look for other external malfunction causes such as: refrigerant leaks, door open, gasket leaks, etc.…

F. Condenser Fan(s) Diagnosis

The condenser fan(s) are controlled by the controller and are wired in parallel with the compressor to run concurrently. Condenser fan(s) and compressor do not run during the 6-minute start-up delay when the controller is repowered ("StArt dELAy" message scrolled on the controller). If the controller calls for the compressor ("Comp" symbol lit on the controller) and the compressor runs but the condenser fan(s) does not run, then:

- Check the condenser fan wiring and voltage at the fan connection points. If you see about 115V and the fan does not run, then replace the fan
- If the fan blade appears to spin slowly, check the rpm (revolution per minute) by using a suitable tachometer. The fan blade should run between 1400 and 1600rpm. If not, replace the fan motor.

If both the compressor and the condenser fan do not run when the controller calls for it, check the controller cooling relay and the compressor external SSR relay (refer to Section C above).

G. Door Heated Glass Diagnosis

Note: Our doors are energy-free (non-heated) on both freezers and refrigerator models.
Our energy-free glass doors are designed to operate moisture/fog free in ambient conditions of up 86°F, 55% relative humidity. If you notice excessive moisture formations on the outer glass pane or between glass panes, follow these guidelines to troubleshoot the problems.

1. Condensation is forming between the glass panes inside the insulated glass unit.
   - This is irreparable and the door should be replaced.
2. The condensation is forming on the outer surface of the door.
   - Check whether ambient conditions exceed recommended 86°F, 55% relative humidity and if so, some level of condensation is normal under these conditions.
     Note: An economizer may be installed as part of the ambient HVAC system. Economizers may bring in a humid outdoor air casing humidity spikes or continuous high humidity levels. This is to be considered when measuring ambient conditions.
   - If ambient conditions are stable and below 86°F, 55% relative humidity, and fog or condensation forms on most of the front glass area, then replace the door.
     If a minor strip of non-running condensation is formed along the bottom of the glass, it may be caused by humidity fluctuations and should cause no problems. The door usually does not need to be replaced.

H. Perimeter (Anti-sweat) Heater Diagnosis

Perimeter heater(s) are located around the cabinet door opening in a groove just behind the front face. Their purpose is to reduce and eliminate cabinet condensation formation (sweating) on freezers. If the condensation is observed on the cabinet around the external perimeter of the door gaskets, then:

- Check whether ambient conditions exceed recommended 86°F, 55% relative humidity and if so, some level of condensation is normal in these conditions.
  Note: An economizer may be installed as part of the ambient HVAC system. Economizers may bring in a humid outdoor air causing humidity spikes or continuous high humidity levels. This is to be considered when measuring ambient conditions.
- If ambient conditions are stable and below 86°F, 55% relative humidity, then check the current and resistance of perimeter heater(s) as per Table 4. If the resistance is out of spec by more than ±10%, replace the perimeter heater(s).

Table 4: Relevant data for perimeter heaters

Freezer Model	Resistance (ohms)	Current (amps) @120VAC
07-CSGF	591	0.20
09M/09-CSGF	512	0.23
10-USGF	488	0.25
11-CSGF	478	0.25
11M-CSGF	600	0.20
13-USGF	468	0.26
13-USGF-F*	423	0.28
15-UDGF	497	0.24
19-USGF	395	0.30
19-USGF-F*	356	0.34
22-USGF	377	0.32
22-USGF-F*	341	0.35
43-UDGF	363	0.33
43-UDGF-F*	324	0.37
44-UDGF	357	0.34
44-UDGF-F*	319	0.38

I. LED Lights and Driver

All LED light strips are powered by the LED driver located near electrical (controller) box in the refrigeration compartment. The LED driver receives 115V on the input side via the light switch mounted on the controller box. On the output side the LED driver delivers 12VDC and up to 5Amps. Use these guidelines to troubleshoot light problems.

1. All light strips are not working.
    - Ensure the power and light switches are in ON position
    - Install at least one new working LED strip to verify whether all strips are faulty. Verify and replace all three strips if needed.
    - Check the voltage (115V) on the LED driver input side, brown and blue wires. If 115V is not present, check the light switch and continuity through the light switch wires.
    - Check the voltage (12VDC) on the LED driver output side, red and black wires. If 12V is not present, replace LED driver.
    - Check continuity through wires that are feeding the 12VDC power to inner lights. Check for short(s) between those wires and cabinet metal parts.
2. One or two LED strips are not working, and at least one LED strip works.
    - Replace non-working LED strip.
    - If still not working, check continuity through LED wires and check for short(s) between those wires and cabinet metal parts. The red and the black wires are polarity sensitive, therefore observe wiring polarity.