



HOSHIZAKI

Service Manual

Steelheart Series
Refrigerated Kitchen Equipment

Models
Refrigerated Prep Table with Raised Rail
Refrigerated Equipment Stand



hoshizakiamerica.com

Number: 73236
Issued: 1-7-2019

⚠ WARNING

Only qualified service technicians should install and service the appliance. To obtain the name and phone number of your local Hoshizaki Certified Service Representative, visit www.hoshizaki.com. No service should be undertaken until the technician has thoroughly read this Service Manual. Failure to service and maintain the appliance in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage. Proper installation is the responsibility of the installer. Product failure or property damage due to improper installation is not covered under warranty.

Hoshizaki provides this manual primarily to assist qualified service technicians in the service of the appliance.

Should the reader have any questions or concerns which have not been satisfactorily addressed, please call, send an e-mail message, or write to the Hoshizaki Technical Support Department for assistance.

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Attn: Hoshizaki Technical Support Department

Web Site: www.hoshizaki.com

NOTE: To expedite assistance, all correspondence/communication **MUST** include the following information:

- Model Number _____
- Serial Number _____
- Complete and detailed explanation of the problem.

IMPORTANT

This manual should be read carefully before the appliance is serviced. Read the warnings and guidelines contained in this booklet carefully as they provide essential information for the continued safe use, service, and maintenance of the appliance. Retain this booklet for any further reference that may be necessary.

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Important Safety Information

Throughout this manual, notices appear to bring your attention to situations which could result in death, serious injury, damage to the appliance, or damage to property.

⚠ DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
NOTICE	Indicates a situation that, if not avoided, could result in damage to the appliance or property.
IMPORTANT	Indicates important information about the use and care of the appliance.

⚠ DANGER

Risk of Fire or Explosion

Flammable Refrigerant Used

- Follow handling instructions carefully in compliance with U.S. government regulations.
- Do not use mechanical devices to defrost.
- Do not puncture refrigerant tubing. Risk of fire or explosion due to puncture of refrigerant tubing; follow handling instructions carefully.
- Component parts shall be replaced with like components.
- Servicing shall be done by factory authorized service personnel to minimize the risk of possible ignition due to incorrect parts or improper service.
- Consult instruction manual / service manual before attempting to install or service this product. All safety precautions must be followed.
- Dispose of properly in accordance with federal or local regulations.
- Do not place any potential ignition sources in or near the appliance.

Risque De Feu Ou D'Explosion

Le Frigorigène Est Inflammable

- Suivre attentivement les instructions de manipulation conformément à la réglementation gouvernementale.
- Ne pas utiliser d'appareils mécaniques pour dégivrer le réfrigérateur.
- Ne pas perforer la tubulure contenant le frigorigène. Risque de feu ou d'explosion si la tubulure contenant le frigorigène est perforée; suivre les instructions de manutention avec soin.
- Les pièces des composants doivent être remplacées par des pièces et accessoires équivalents.
- L'entretien doit être effectué par le personnel de service autorisé par le fabricant afin de minimiser les risques d'inflammation attribuables à l'installation d'une pièce inadéquate ou à la mauvaise exécution du service.
- Consulter le manuel du propriétaire/ guide de réparation avant de tenter une réparation. Toutes les mesures de sécurité doivent être respectées.
- Éliminer conformément aux règlements fédéraux ou locaux.
- Ne placez aucune source d'inflammation potentielle dans ou près de l'appareil.


⚠ WARNING

The appliance should be destined only to the use for which it has been expressly conceived. Any other use should be considered improper and therefore dangerous. The manufacturer cannot be held responsible for injury or damage resulting from improper, incorrect, and unreasonable use. Failure to install, operate, and maintain the appliance in accordance with this manual will adversely affect safety, performance, component life, and warranty coverage.

To reduce the risk of death, electric shock, serious injury, or fire, follow basic precautions including the following:

- Only qualified service technicians should install and service the appliance.
- Wear appropriate personal protective equipment (PPE) when servicing the appliance.
- The appliance must be installed in accordance with applicable national, state, and local codes and regulations.
- Appliance is heavy. Use care when lifting or positioning. Work in pairs when needed to prevent injury or damage. Do not lift using the top section or the doors/drawers.
- To reduce the risk of electric shock, do not touch the plug with damp hands.
- Unplug the appliance before servicing.
- The appliance requires an independent power supply of proper capacity. See the nameplate for electrical specifications. Failure to use an independent power supply of proper capacity can result in a tripped breaker, blown fuse, damage to existing wiring, or component failure. This could lead to heat generation or fire.

• THE APPLIANCE MUST BE

GROUNDING. The appliance is equipped with a NEMA 5-15 three-prong grounding plug  to reduce the risk of potential shock hazards. It must be plugged into a properly grounded, independent 3-prong wall outlet. If the outlet is a 2-prong outlet, it is your personal responsibility to have a qualified electrician replace it with a properly grounded, independent 3-prong wall outlet. Do not remove the ground prong from the power cord and do not use an adapter plug. Failure to follow these instructions may result in death, electric shock, or fire.

- Do not use an extension cord.
- Do not use an appliance with a damaged power cord. The power cord should not be altered, jerked, bundled, weighed down, pinched, or tangled. Such actions could result in electric shock or fire. To unplug the appliance, be sure to pull the plug, not the cord, and do not jerk the cord.
- The GREEN ground wire in the factory-installed power cord is connected to the appliance. If it becomes necessary to remove or replace the power cord, be sure to connect the power cord's ground wire.
- Do not splash, pour, or spray water directly onto or into the appliance. This might cause short circuit, electric shock, corrosion, or failure.
- Do not make any alterations to the appliance. Alterations could result in electric shock, injury, fire, or damage to the appliance.
- The appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

⚠ WARNING, continued

- Children should be properly supervised around the appliance.
- Do not climb, stand, or hang on the appliance or doors/drawers or allow children or animals to do so. Do not climb into the appliance or allow children or animals to do so. Death or serious injury could occur or the appliance could be damaged.
- Be careful not to pinch fingers when opening and closing the doors/drawers or rail cover (prep table models) or when handling food pans. Be careful when opening and closing the doors/drawers or rail cover when children are in the area.
- Open and close the doors/drawers and rail cover (prep table models) with care. Opening the doors/drawers or rail cover too quickly or forcefully may cause injury or damage to the appliance or surrounding equipment.
- Do not use combustible spray or place volatile or flammable substances in or near the appliance. They might catch fire.
- Keep the area around the appliance clean. Dirt, dust, or insects in the appliance could cause harm to individuals or damage to the equipment.
- Do not throw anything onto the shelves or load any single shelf with more than 120 lb. (54.5 kg) of product. They might fall off and cause injury.
- Do not load any single drawer with more than 75 lb. (34 kg) of product. Depending on the weight of product in the drawers, secure the unit as necessary to prevent it from overturning. Do not open more than one drawer at a time.
- The appliance is designed only for temporary storage of food. Employ sanitary methods. Use for any other purposes (for example, storage of chemicals or medical supplies such as vaccine and serum) could cause deterioration of stored items.

- Do not block air inlets or outlets, otherwise cooling performance may be reduced.
- Do not tightly pack the cabinet. Allow some space between items to ensure good air flow. Also allow space between items and interior surfaces.
- Do not put warm or hot foods in the cabinet. Let them cool first, or they will raise the cabinet temperature and could deteriorate other foods in the cabinet or overload the appliance.
- Food storage and handling must comply with applicable codes and regulations.
- All foods should be wrapped in plastic film or stored in sealed containers. Otherwise foods may dry up, pass their smells onto other foods, cause frost to develop, result in poor appliance performance, or increase the likelihood of cross-contamination. Certain dressings and food ingredients, if not stored in sealed containers, may accelerate corrosion of the evaporator, resulting in failure.
- Do not store items near air outlets. Otherwise, items may freeze up and crack or break causing a risk of injury or contamination of other food.

⚠ WARNING, continued

Additional Warnings for Prep Table Models

- Do not throw anything onto the shelves or load any single shelf with more than 120 lb. (54.5 kg) of product. They might fall off and cause injury.
- Do not load any single drawer with more than 150 lb. (68 kg) of product. Depending on the weight of product in the drawers, secure the unit as necessary to prevent it from overturning. Do not open more than one drawer at a time.
- The entire rail must always be covered by rail dividers and pans. Otherwise, the appliance will not cool properly. Use only pans up to 6" (15 cm) deep. Do not use damaged rail dividers or pans.
- Ingredients must be pre-chilled to 37°F (3°C) or less before placing in rail.
- Keep the rail cover closed when not actively preparing food.
- The rail is for keeping ingredients cool while preparing food. If not actively preparing food for a long period such as overnight, seal pans with plastic wrap in addition to closing the rail cover. Depending on conditions, the cabinet temperature setting may need to be adjusted to prevent items from freezing. Alternatively, seal ingredients and store them in a refrigerator or freezer.
- For PR46(-D) models, the anti-tip bracket must be properly installed and adjusted. Otherwise, the unit may tip, resulting in injury or damage.

⚠ WARNING, continued

Additional Warnings for Prep Table Models

- A minimum of 4" (11 cm) clearance is required between the bottom of the cooking equipment heating element and the appliance top. When setting up cooking equipment, follow the cooking equipment manufacturer's setup procedure. Temperature at the appliance top must not exceed 180°F (82°C). For optimum performance, installation of a heat shield (supplied by others) is recommended.
- For cooking equipment on the cabinet, do not exceed the total maximum weight listed for your model.

Total Maximum Weight for Cooking Equipment on the Cabinet	
CR36A CR49A CR60A	700 lb. (318 kg)
CR72A CR85A	1,200 lb. (544 kg)
CR98A CR110A	1,500 lb. (680 kg)

- Do not load any single drawer with more than 75 lb. (34 kg) of product. Depending on the weight of product in the drawers, secure the unit as necessary to prevent it from overturning. Do not open more than one drawer at a time.
- All casters on the appliance are lockable. After positioning the appliance in its final location, lock all casters.
- Before servicing or cleaning the appliance, disconnect any cooking equipment on the appliance top and allow to cool.

NOTICE

- Protect the floor when moving the appliance to prevent damage to the floor.
- Keep ventilation openings, in the appliance enclosure or in the built-in structure, clear of obstruction. Do not place anything on top of the appliance in an undercounter installation. There must be at least 1.5" (4 cm) overhead clearance for proper ventilation. The factory-installed rear bumpers must be in place to ensure proper rear clearance. Blockage of airflow could negatively affect performance and damage the appliance.
- To prevent deformation or cracks, do not spray insecticide onto the plastic parts or let them come into contact with oil.
- To avoid damage to the gasket, use only the door/drawer handle when opening and closing.
- Do not leave the doors/drawers open.
- To avoid damage to the top seal, do not lift the appliance by the top panel or remove the top panel.

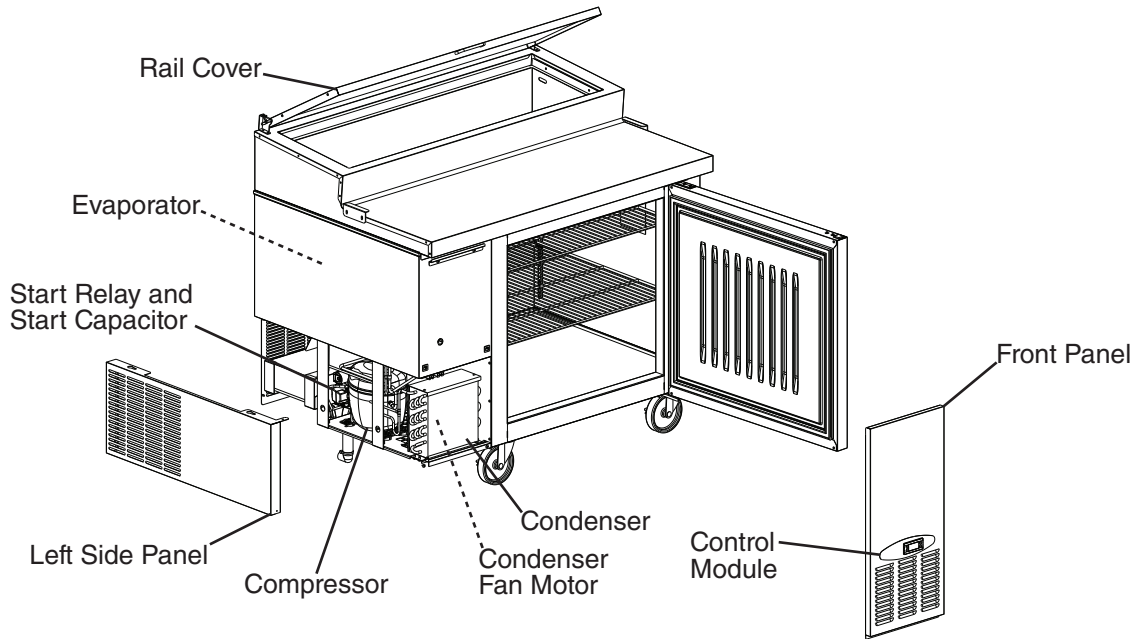
Additional Notice for PR Models

- Do not allow the appliance to bear any outside weight.
- Do not place anything on top of the rail hood or rail cover and do not lift the appliance by the rail hood or rail cover. The rail hood and rail cover are not designed to bear any outside weight.
- Do not place anything on the air duct panels beneath the pans in the rail. The air duct panels are not load-bearing.

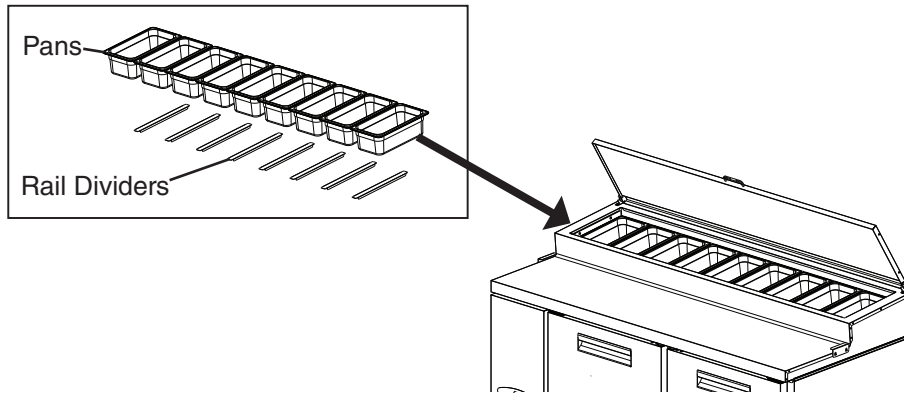
I. Construction and Refrigeration Circuit Diagram

A. Construction

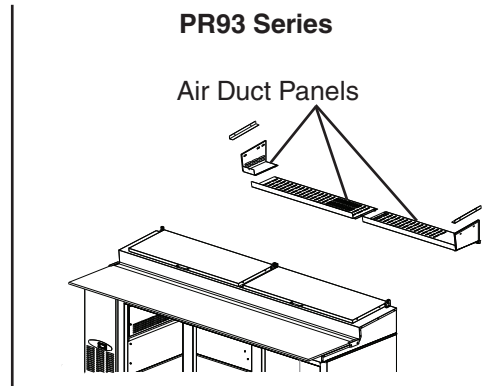
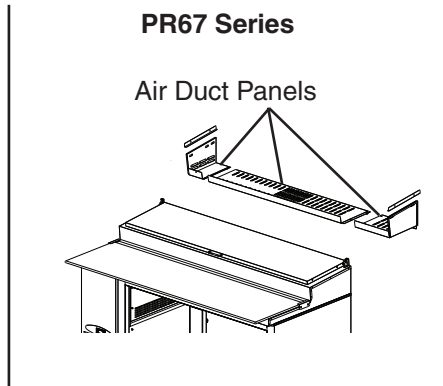
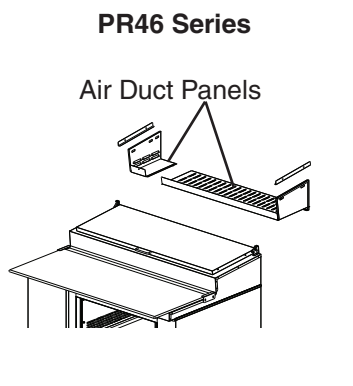
1. Refrigerated Prep Table with Raised Rail (PR)



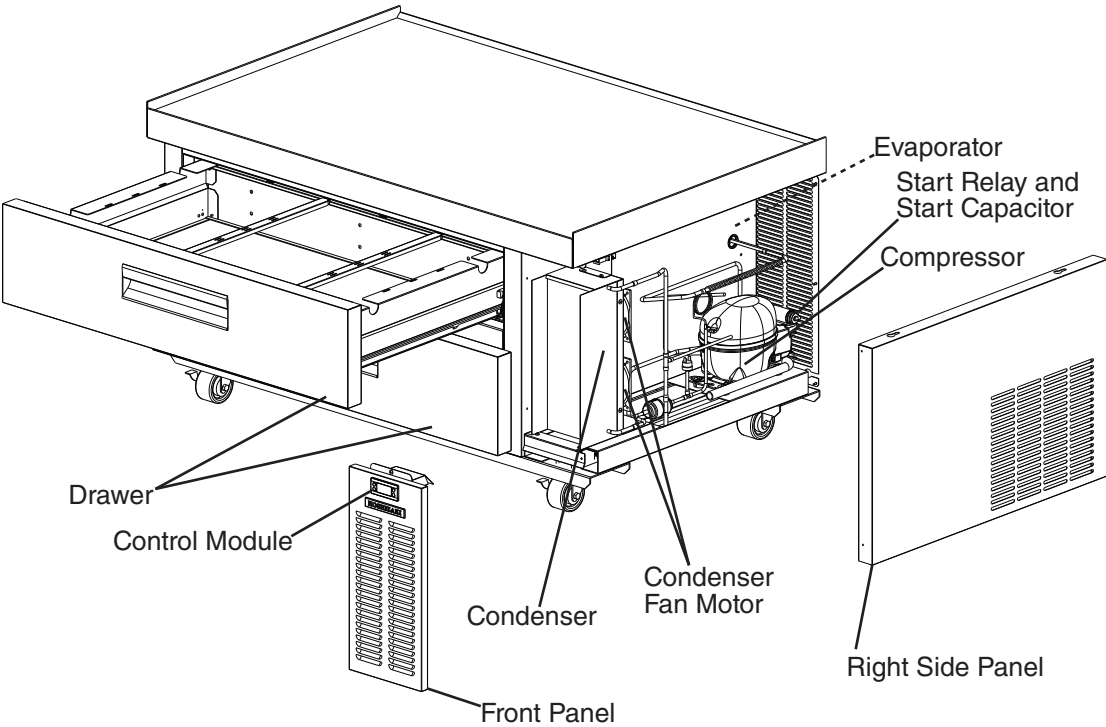
Model Shown: PR46



Model Shown: PR67



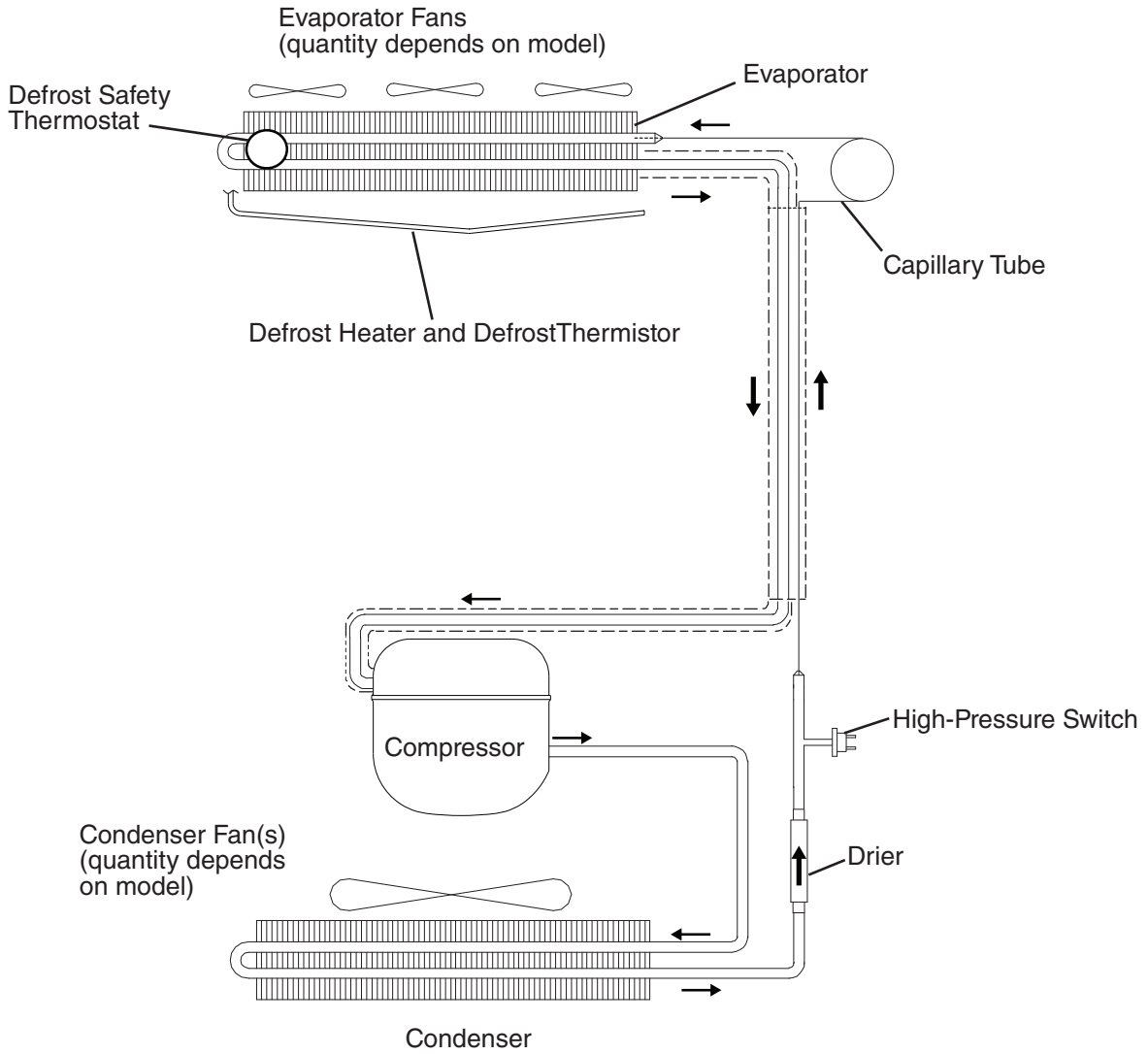
2. Refrigerated Equipment Stand (CR)



Model Shown: CR49

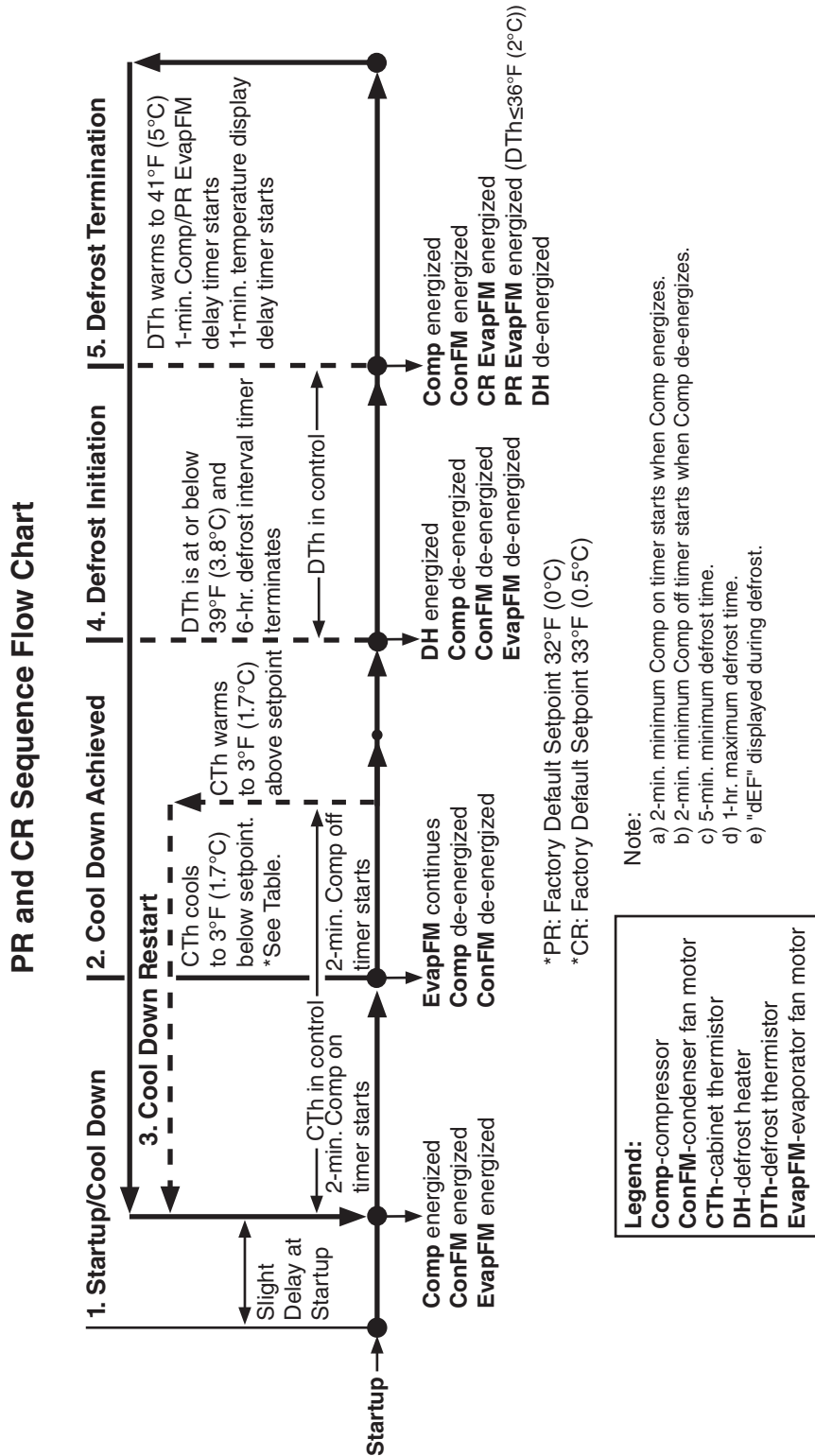
B. Refrigeration Circuit Diagram

1. PR and CR Models



II. Sequence of Operation and Service Diagnosis

A. Sequence of Operation Flow Chart



B. Service Diagnosis

DANGER

Risk of Fire or Explosion

Flammable Refrigerant Used

- Follow handling instructions carefully in compliance with U.S. government regulations.
- Do not use mechanical devices to defrost.
- Do not puncture refrigerant tubing. Risk of fire or explosion due to puncture of refrigerant tubing; follow handling instructions carefully.
- Component parts shall be replaced with like components.
- Servicing shall be done by factory authorized service personnel to minimize the risk of possible ignition due to incorrect parts or improper service.
- Consult instruction manual/service manual before attempting to install or service this product. All safety precautions must be followed.
- Dispose of properly in accordance with federal or local regulations.
- Do not place any potential ignition sources in or near the appliance.

Risque De Feu Ou D'Explosion

Le Frigorigène Est Inflammable

- Suivre attentivement les instructions de manipulation conformément à la réglementation gouvernementale.
- Ne pas utiliser d'appareils mécaniques pour dégivrer le réfrigérateur.
- Ne pas perforer la tubulure contenant le frigorigène. Risque de feu ou d'explosion si la tubulure contenant le frigorigène est perforée; suivre les instructions de manutention avec soin.
- Les pièces des composants doivent être remplacées par des pièces et accessoires équivalents.
- L'entretien doit être effectué par le personnel de service autorisé par le fabricant afin de minimiser les risques d'inflammation attribuables à l'installation d'une pièce inadéquate ou à la mauvaise exécution du service.
- Consulter le manuel du propriétaire/ guide de réparation avant de tenter une réparation. Toutes les mesures de sécurité doivent être respectées.
- Éliminer conformément aux règlements fédéraux ou locaux.
- Ne placez aucune source d'inflammation potentielle dans ou près de l'appareil.

⚠ WARNING

- The appliance should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- Wear appropriate personal protective equipment (PPE) when servicing the appliance.
- Risk of electric shock. Use extreme caution and exercise safe electrical practices.
- Moving parts (e.g., fan blade) can crush and cut. Keep hands clear.
- Appliance is heavy. Use care when lifting or positioning. Work in pairs when needed to prevent injury or damage.
- Make sure all food zones are clean after the appliance is serviced.
- **CR: WARNING! A minimum of 4" (11 cm) clearance is required between the bottom of the cooking equipment heating element and the appliance top.**
- **CR: WARNING! Temperature at the appliance top must not exceed 180°F (82°C). For optimum performance, installation of a heat shield (supplied by others) is recommended.**
- **WARNING! For cooking equipment on the cabinet, do not exceed the total maximum weight listed for your model.**

Total Maximum Weight for Cooking Equipment on the Cabinet		
CR36, CR49, CR60	CR72, CR85	CR98, CR110
700 lb. (318 kg)	1,200 lb. (544 kg)	1,500 lb. (680 kg)

NOTICE

- The appliance is not intended for outdoor use.
- The appliance must not be located in a corrosive environment.
- Normal operating ambient temperature must be within:
PR 45°F to 86°F (7°C to 30°C)
CR 45°F to 100°F (7°C to 37.8°C)
- The appliance must not be located next to ovens, grills, or other high heat producing equipment.
- The appliance must be a minimum of 1" (3 cm) from side walls.
- The factory-installed rear bumpers must be in place to ensure proper rear clearance.
- PR: A minimum of 10" (25 cm) clearance above the rail must be provided to allow the rail cover to open.

The diagnostic procedure is a sequence check that allows you to diagnose the electrical system and components. Before proceeding, check for correct installation and proper voltage per nameplate. If the display is in alarm, see "III.D. Alarm Safeties."

Note: When checking voltage (115VAC), always choose a white (W) neutral wire to establish a good neutral connection.

PR Factory Default Temperature Settings:

- a) Setpoint: 32°F (0°C).
- b) Display Scale: °F.

CR Factory Default Temperature Settings:

- a) Setpoint: 33°F (0.5°C).
- b) Display Scale: °F.

For further details, see "III. Controls and Adjustments."

Note: There is a minimum 2-min. Comp on time and 2-min. Comp off time.

- 1) Unplug the appliance from the electrical outlet.
- 2) Remove the front panel.
- 3) Plug the appliance back into the electrical outlet.
- 4) Confirm 115VAC at CM L2 (BK or BR) to neutral (W).
- 5) **Startup/Cool Down**—There is a slight delay, cabinet temperature appears on display and Comp and EvapFM icons turn on. Comp, ConFM, and EvapFM energize.
 - a) **CM Diagnosis:** Cabinet temperature appears on display. If not, check for 115VAC at CM L2 (BK or BR) to CM N3 neutral (W). If 115VAC is not present, check power cord connections and breaker/fuse. Confirm wiring connections are secure for both CM L2 (BK or BR) (power supply) and CM N3 (W) (neutral). If 115VAC is present and display is off, replace CM.
 - b) **Comp/ConFM Diagnosis:** Confirm Comp and ConFM energize. If not, check for 115VAC at CM C1 (BR or BK) to neutral (W). If 115VAC is not present at CM C1 (BR or BK) to neutral (W), check CTh status. See "II.C. Thermistor Check." If CTh ohm reading is in proper range, replace CM. If 115VAC is present at CM C1 (BR or BK) to neutral (W), check continuity of HPS (if applicable). If open, allow time for HPS to reset. If HPS does not reset, see "d) HPS Activation" below. If ConFM is energized but Comp is not, check for 115VAC from both sides of Comp external protector to neutral (W). If 115VAC is present on one side and not the other, allow time for Comp external protector to cool and reset. If Comp external protector does not reset, replace Comp external protector. If 115VAC is present on both Comp external protector wires, check Comp start capacitor, start relay, and Comp motor windings. If ConFM is not energized, check ConFM fan blades for binding and motor winding continuity.

If Comp and ConFM are energized and the cabinet does not cool down, check for a restriction in the refrigeration circuit and correct refrigerant charge.
 - c) **EvapFM Diagnosis:**
 1. **PR:** Confirm EvapFM energizes. If not, check for 115VAC at CM F5 (DBU) to neutral (W). If 115VAC is not present, replace CM. If 115VAC is present, check EvapFM blades for binding and EvapFM continuity.
 2. **CR:** Confirm EvapFM energizes when Comp energizes. If not, check for 115VAC at CM C1 (BR) to neutral (W). If 115VAC is not present, replace CM. If 115VAC is present, check for a loose wire, EvapFM blades binding, and EvapFM continuity.

d) **HPS Activation:** Confirm ConFM is energized and fan blade turns freely. Confirm condenser coil is not clogged or restricted. Confirm there are no restrictions in the refrigeration circuit (drier). Let refrigeration circuit pressures equalize. If HPS does not reset and pressures are equalized, replace HPS. If pressures are not equalized, reclaim refrigerant and diagnose refrigeration circuit restriction.

6) **Cool Down Achieved**—CTh cools to 3°F (1.7°C) below setpoint. EvapFM continues. Comp and ConFM de-energize. **Diagnosis:** Confirm Comp and ConFM de-energize. If not, and Comp and ConFM were energized longer than 2 min., check CTh status. See "II.C. Thermistor Check." If CTh ohm reading is in range and Comp and ConFM were energized longer than 2 min., check for 115VAC at CM C1 (BR or BK) to neutral (W). If 115VAC is present, replace CM.

7) **Defrost**—6-hr. defrost timer terminates and DTh is at or lower than 39°F (3.8°C), defrost starts. If on, Comp and EvapFM icons turn off. Comp, ConFM, and EvapFM de-energize. The defrost icon turns on and "dEF" is displayed. DH energizes. There is a 5-min. minimum defrost time, 1-hr. maximum defrost time, 6-hr. minimum defrost interval, and 8-hr. maximum defrost interval.

1a) **Time-Initiation:** 6-hr. defrost interval timer terminates. Control module checks DTh. If DTh is at or lower than 39°F (3.8°C), defrost starts. If on, Comp and EvapFM icons turn off. Comp, ConFM, and EvapFM de-energize. Defrost icon turns on and "dEF" is displayed. DH energizes. If DTh is greater than 39°F (3.8°C), defrost is delayed for 2 hrs. (8-hr. defrost interval timer). Once the 8-hr. defrost interval timer terminates, defrost starts regardless of evaporator temperature.

1b) **Manual-Initiation:** To initiate a manual defrost, press and release the manual defrost button on display. If on, Comp and EvapFM icons turn off. Comp, ConFM, and EvapFM de-energize. Defrost icon turns on and "dEF" is displayed. DH energizes.

2) **Defrost-Termination:**

(1) DTh warms to 41°F (5°C). DH de-energizes. 1-min. Comp/EvapFM delay timer and 11-min. temperature display delay timer start. Defrost icon and "dEF" display continue.

(2) 1-min. Comp/EvapFM delay timer terminates. Defrost icon turns off. Comp icon turns on. Comp and ConFM energize. EvapFM on CR energizes. If DTh is at 36°F (2°C) or lower, EvapFM icon turns on and EvapFM on PR energizes. "dEF" display continues. 6-hr. defrost interval timer resets.

Note: If DTh is 37°F (3°C) or higher when 1-min. Comp/EvapFM delay timer terminates, PR EvapFM remains off until evaporator temperature is 36°F (2°C) or lower.

(3) 11-min. temperature display delay timer terminates. Cabinet temperature replaces "dEF."

Defrost Diagnosis:

- 1) **Time-Initiation:** Has 6-hr. defrost timer terminated? Before proceeding, confirm DTh status. See "II.C. Thermistor Check." **Manual-Initiation:** Press and release the defrost button.

Check the following:

- (1) **CM Diagnosis:** Confirm defrost icon turns on, Comp and EvapFM icons turn off, and "dEF" replaces cabinet temperature on display. If not, replace CM.
 - (2) **DH Diagnosis:** Confirm DH energizes. If not, check for 115VAC at CM H4 (R) to neutral (W). If 115VAC is not present, replace CM. If 115VAC is present, check DST continuity. If open, let cool and reset. If DST does not close, replace DST. If DST is closed, check DH amp draw and continuity.
 - (3) **Comp/ConFM/CR EvapFM Diagnosis:** Confirm Comp, ConFM, and EvapFM de-energize. If not, check for 115VAC at CM C1 (BR or BK) to neutral (W). If 115VAC is present, replace CM.
 - (4) **PR EvapFM Diagnosis:** Confirm EvapFM de-energizes. If not, check for 115VAC at CM F5 (DBU) to neutral (W). If 115VAC is present, replace CM.
- 2) **Defrost-Termination:** There is a 5 min. minimum defrost time and a 1 hr. maximum defrost time. Has 5-min. minimum defrost timer terminated? Confirm DTh status. See "II.C. Thermistor Check."
 - (1) **CM, DTh, and DH Diagnosis:** If 5-min. minimum defrost timer has terminated, has DTh warmed to 41°F (5°C)? If DTh has not warmed to 41°F (5°C), check DST and DH continuity. Next, check DH amp draw. If DTh is in proper range, DH de-energizes. If not, replace CM. Once DH de-energizes, 1-min. Comp/ EvapFM delay timer and 11-min. temperature display delay timer start. Defrost icon and "dEF" display continue. If not, replace CM. If 41°F (5°C) is not achieved within 1 hr., CM terminates defrost.
 - (2) **Comp/ConFM/CR EvapFM Diagnosis:** 1-min. Comp/EvapFM delay timer terminates. Comp icon turns on and Comp, ConFM, and CR EvapFM energize. If not, confirm CTh is warm enough for Comp, ConFM, and CR EvapFM operation. Next, check for 115VAC at CM C1 (BR or BK) to neutral (W). If 115VAC is not present, check CTh status. "II.C. Thermistor Check." If CTh ohm reading is in proper range, and Comp, ConFM, and CR EvapFM do not energize, replace CM. If 115VAC is present at CM C1 (BR or BK), check that CR EvapFM energize. If not, check for loose wiring, fan blades binding, and CR EvapFM winding continuity. Replace as needed. Next, check for closed HPS. If closed, check Comp start components, Comp external protector, and Comp motor winding continuity. If ConFM is not energized, check ConFM fan blades for binding and motor winding continuity.

- (3) **PR EvapFM Diagnosis:** 1-min. Comp/EvapFM delay timer terminates. If DTh is at 36°F (2°C) or lower, EvapFM icon turns on and PR EvapFM energizes. If not, confirm that DTh is at 36°F (2°C) or lower. If not, confirm Comp is on and cooling. See "II.B.5)b) Comp/ConFM Diagnosis" and "II.C. Thermistor Check." Once 36°F (2°C) or lower is achieved, check for 115VAC at CM F5 (DBU) to neutral (W). If 115VAC is not present, replace CM. If 115VAC is present, and PR EvapFM is not energized, check PR EvapFM blades for binding and PR EvapFM winding continuity.
- (4) **11-min. temperature display delay timer terminates:** "dEF" is replaced by cabinet temperature on display. If not, replace CM.

Legend: **CM**—control module; **Comp**—compressor; **ConFM**—condenser fan motor;
CTh—cabinet thermistor; **DH**—defrost heater; **DST**—defrost safety thermostat;
DTh—defrost thermistor; **EvapFM**—evaporator fan motors;
HPS—high-pressure switch

C. Thermistor Check

The cabinet thermistor is used for cabinet temperature control and the defrost thermistor is used for defrost cycle initiation (39°F (3.8°C)), defrost termination (41°F (5°C)), and EvapFM initiation after defrost (36°F (2°C) or lower). Thermistor resistance varies depending on temperature. The control module monitors the thermistors to control system operation.

No adjustment is required.

To check thermistor resistance, follow the steps below.

- 1) Unplug the appliance.
- 2) Remove the front panel.
- 3) Disconnect and remove the thermistor in question.
- 4) Immerse the thermistor sensor portion in a glass containing ice and water for 2 to 3 min.
- 5) Check the resistance between the wires at the thermistor connector. Normal reading is within 16.0 to 16.7 kΩ. If outside the normal reading, replace the thermistor.
- 6) Reconnect and replace the thermistor in its correct position. See "IV.B. Component Service Information."
- 7) Plug the appliance back in.

D. Diagnostic Table

Check for correct appliance installation per the instruction manual and proper voltage per appliance nameplate.

1. Appliance Not Cooling

Appliance Not Cooling - Possible Cause	
1. Power Supply	a) Unplugged, blown fuse, or tripped or defective circuit breaker.
	b) Loose connection.
	c) Not within specifications.
2. Power Cord and Plug	a) Loose connection.
	b) Defective.
3. Wiring	a) Loose connection or open.
	b) Faulty.
4. Control Module See "III.D. Alarm Safeties."	a) In alarm or "- - -" shown on display module on models with remote display module.
	b) Defective.
5. Compressor External Protector	a) Dirty condenser.
	b) Condenser fan not operating.
	c) Defective.
	d) Start relay defective.
	e) Low charge.
	f) Start capacitor (if applicable) defective.
6. Compressor	a) Defective.
7. Condenser	a) Dirty.
8. Evaporator Fan	a) Defective.
	b) Fan blade binding.
9. Evaporator	a) Dirty or frozen up. See "II.D.2. Evaporator is Frozen Up."
10. Refrigerant/Refrigerant Lines	a) Gas leak.
	b) Refrigerant lines or components restricted.
11. High-Pressure Switch	a) Dirty condenser.
	b) Ambient temperature too warm.
	c) Condenser fan not operating.
	d) Refrigerant overcharge.
	e) Refrigerant lines or components restricted.
	f) Defective.
12. Defrost Heater	a) Control module defective.
13. Rail Air Duct Panels PR Models	a) Misaligned.
	b) Missing.

2. Evaporator is Frozen Up

Evaporator is Frozen Up - Possible Cause	
1. Evaporator	a) Dirty.
2. Evaporator Fan Motor	a) Defective.
	b) Fan blade binding.
	c) Defrost thermistor defective.
	d) Control module defective.
3. Defrost Thermistor	a) Out of position or defective.
4. Control Module	a) Defective.
5. Refrigerant Charge/Refrigerant Lines	a) Low.
	b) Component restriction (cap tube, drier).
6. Defrost Heater	a) Defective.
7. Defrost Safety Thermostat	a) Defective.

3. Defrost Fails to Initiate or Terminate

Defrost Fails to Initiate - Possible Cause	
1. Defrost Thermistor (Confirm DTh status. See "II.C. Thermistor Check.")	a) Evaporator temperature 39°F (3.8°C) or lower not achieved. See "II.D.1. Appliance Not Cooling."
	b) Out of position or defective.
2. Control Module	a) Defective.
Defrost Fails to Terminate - Possible Cause	
1. Defrost Thermistor (Confirm DTh status. See "II.C. Thermistor Check.")	a) Evaporator temperature 41°F (5°C) not achieved.
	b) Defective.
2. Defrost Heater	a) Defrost safety thermostat defective.
	b) Defective.
3. Control Module	a) Defective.

III. Controls and Adjustments

A. Control Module





When the power cord is plugged in there is a slight delay, then the current cabinet temperature is displayed. From the control module, the cabinet setpoint and temperature display scale can be changed.

All models are pretested and factory set.

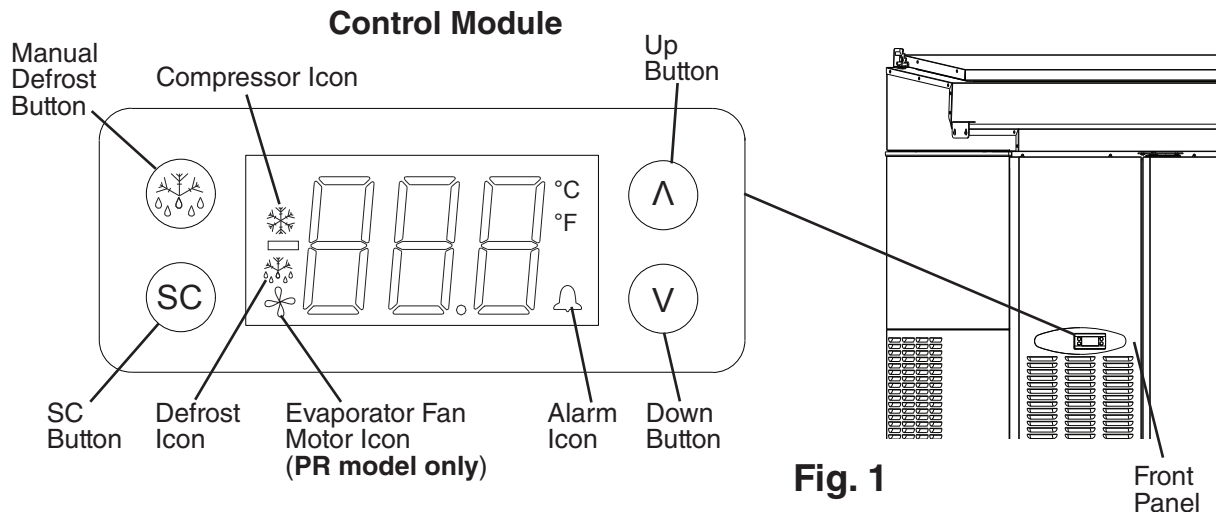
NOTICE

- The control module is fragile, handle very carefully.
- Do not change wiring and connections. Never misconnect terminals.
- Do not short out power supply to test for voltage.

1. Control Module Display Icons

Control Module Icons	
Icon	Meaning
	Compressor, condenser fan motor, and CR evaporator fan motor Compressor running.
	Defrost Appliance is in defrost cycle. See "II.B. Service Diagnosis" for details.
	Evaporator Fan Motor (PR model only) Evaporator fan motor is running. Evaporator fan motor de-energizes when appliance is in defrost.
	Alarm Appliance is in alarm. See "III.D. Alarm Safeties" for details.

2. Control Module Display Layout



3. Control Module Rear Layout

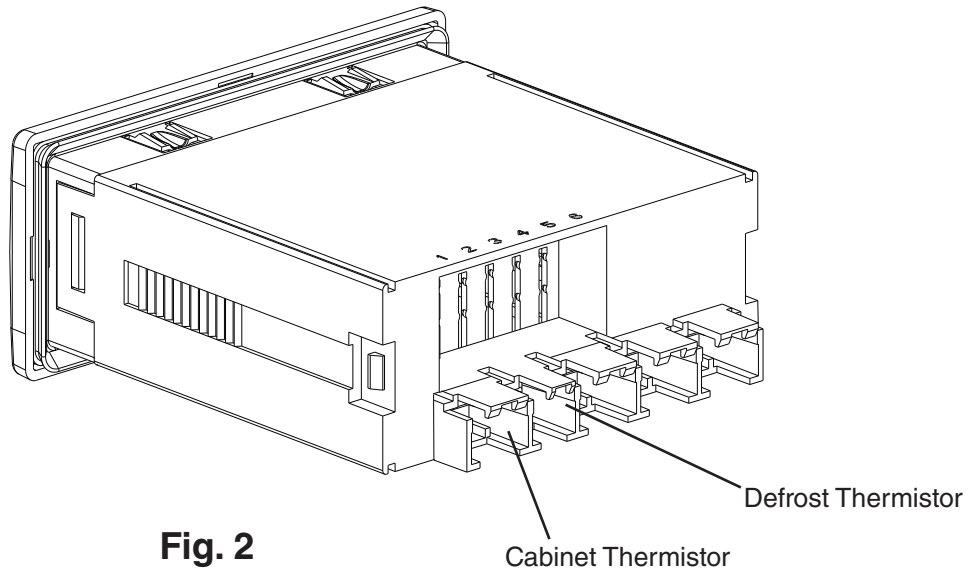
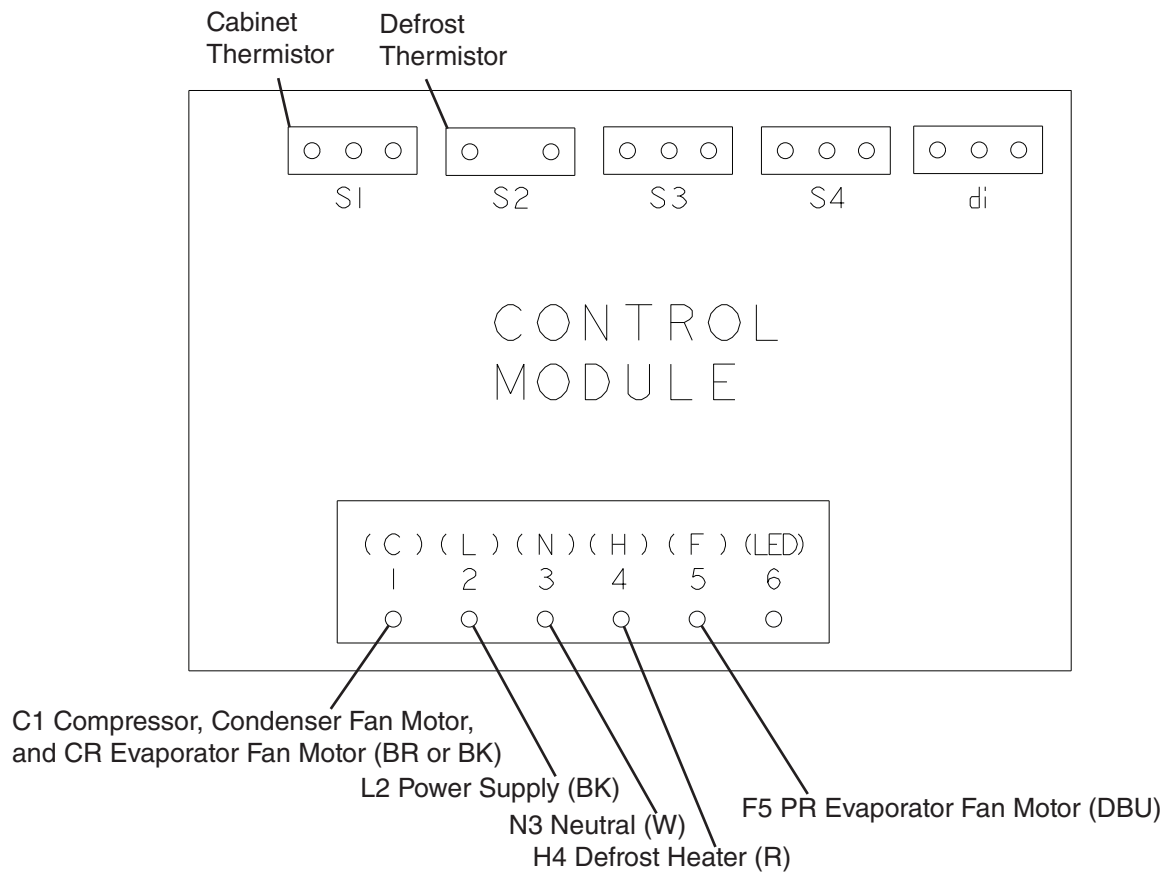


Fig. 2

4. Control Module Electrical Layout



B. Temperature

The default temperature scale is °F, but it can be changed to read °C. To change, see "III.B.3. Changing the Temperature Display Scale (°F or °C)."

1. Default Temperature Settings

- a) PR Setpoint: 32°F (0°C).
- b) CR Setpoint: 35°F (2°C).
- c) Temperature Display Scale: °F.

2. Temperature Setpoint

The temperature setpoint is the value for the average cabinet temperature. The temperature differential for the compressor to turn on and off is $\pm 3^{\circ}\text{F}$ ($\pm 1.7^{\circ}\text{C}$) of the temperature setpoint. For example, for a temperature setpoint of 32°F (0°C), the compressor comes on at 35°F (2°C), and the compressor goes off at 29°F (-2°C).

If necessary, adjust the temperature setpoint as follows:

- 1) Press and hold the up button briefly, then release. The current temperature setpoint appears.
- 2) Press the up or down button until the desired value is displayed. After a few sec., the display returns to the current cabinet temperature and the temperature setpoint is saved.

Model	Adjustable Temperature Setpoint
PR	14° to 45°F (-10° to 7°C)
CR	28° to 45°F (-2° to 7°C)

NOTICE! Do not adjust the temperature setpoint more than 2°F (1°C) at a time. Allow the temperature to stabilize for a minimum of 8 hrs. before making further temperature setpoint adjustments.

3. Adjusting the Temperature Setpoint and Rail and Cabinet Cooling (PR Models)

The temperature setpoint and air baffle control are used to adjust the amount of cooling for both the cabinet and the rail.

- 1) To change the temperature setpoint, press and hold the up button briefly and then release. The current temperature setpoint appears. Press the up or down button until the desired value is displayed. After a few seconds, the display returns to the current cabinet temperature and the temperature setpoint is saved.
- 2) To adjust the air flow balance between the rail and cabinet, slightly unscrew the air baffle control knob located inside the cabinet. See Fig. 3. Move the air baffle control clockwise to direct more air flow to the rail or counter-clockwise to direct more air flow to the cabinet. Once the desired position of the air baffle is attained, re-tighten the air baffle control knob to prevent inadvertent movement of the baffle during operation of the appliance.

Air Baffle Control Range: 0 (Colder Rail) to 3 (Colder Cabinet)

Factory Default: 1.5

Note for Extreme Conditions

For extreme conditions where more rail cooling is needed, follow the adjustments in the table below. The adjustments are listed from less extreme to more extreme.

NOTICE! The settings below are for use only when the rail is in active use in extreme conditions. Settings must be returned to factory defaults when the rail is not in active use. Otherwise, performance issues may occur.

Setpoint	Air Baffle Control Setting
23°F (-x°C) to 26°F (-3°C)	2
17°F (-x°C) to 22°F (x°C)	1
14°F (-10°C) to 16°F (-x°C)	0

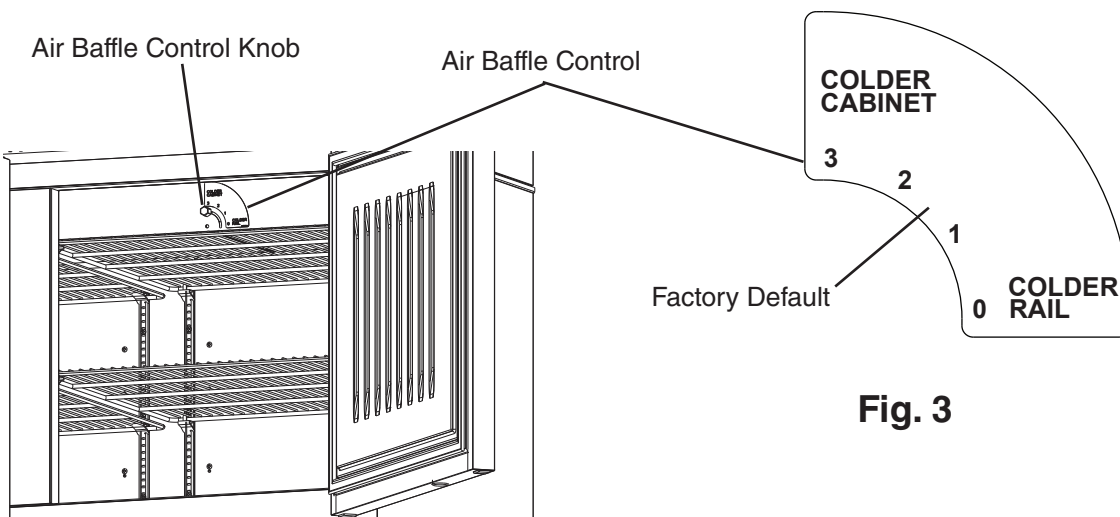


Fig. 3

4. Changing the Temperature Display Scale (°F or °C)

To change the temperature display scale, follow the steps below.

- 1) Press and hold both the up and down buttons for 5 sec. "PAS" appears briefly in the display, then "000" appears.
- 2) Press the up button to change the display to "001".
- 3) Press the SC button. "EHE" appears in the display. Press the up or down button until "diS" is displayed.
- 4) Press the SC button. "CFu" appears in the display. Press the SC button again. The current temperature display scale setting appears.
- 5) Press the up or down button to change the temperature display scale.
- 6) Press the SC button to save the setting. Wait 1 min. or press the manual defrost button twice to return to the temperature display.

C. Manual Defrost

To initiate a manual defrost, press and release the manual defrost button. The defrost icon and "dEF" appear in the display.

D. Alarm Safeties

Alarm signals are designed to protect the appliance and food product. These alarms give information or warnings in the event the appliance is operating out of acceptable parameters. Should one of the alarms occur, follow the instructions in the table below to address the alarm. The alarm code flashes once every second with audible alarm. To silence the alarm, press and release the upper button.

Alarm Signals		
Alarm Code	Problem	Corrective Action/Reset Details
E01	Cabinet Thermistor Malfunction Alarm Cabinet thermistor has failed.	Beeps for 10 sec., then silent for 50 sec. To silence the alarm, press and release the up button.
E02	Defrost Thermistor Malfunction Alarm Defrost thermistor has failed.	Beeps for 10 sec., then silent for 50 sec. To silence the alarm, press and release the up button. Appliance cycles on and off with cabinet thermistor.
Hi	High Temperature Alarm Cabinet temperature has remained above 57°F (13.9°C) for more than 2 hr.	Beeps for 10 sec., then silent for 50 sec. To silence the alarm and clear "Hi" from the display, press and release the up button. The alarm icon stays on. Automatically resets when temperature returns to normal.
Lo	Low Temperature Alarm Cabinet temperature has remained below 20°F (-6.5°C) for more than 2 hr.	Beeps for 10 sec., then silent for 50 sec. To silence the alarm and clear "Lo" from the display, press and release the up button. The alarm icon stays on. Automatically resets when temperature returns to normal.
UHi	High-Voltage Alarm (135VAC±5% or more)	The compressor de-energizes if voltage protection operates. The voltage safeties automatically reset when voltage is corrected.
ULo	Low-Voltage Alarm (96VAC±5% or less)	

E. Safety Devices

1. Compressor External or Internal Protector

If combined temperature/amperage value is above the limit specified by the compressor manufacturer, the compressor protector operates independently to turn off the compressor. The compressor protector de-energizes the compressor until the temperature/amperage value returns to an acceptable level.

2. High-Pressure Switch

If pressure on the high-side of the appliance exceeds Hoshizaki specifications, the high-pressure switch activates and interrupts the compressor circuit, de-energizing the compressor until the pressure returns to an acceptable level.

If both the compressor and condenser fan motor are off, it is most likely the appliance is off or the high-pressure switch has opened. See "VIII.B. Wiring Diagrams."

IV. Refrigeration Circuit and Component Service Information

DANGER

Risk of Fire or Explosion Flammable Refrigerant Used

- Follow handling instructions carefully in compliance with U.S. government regulations.
- Do not use mechanical devices to defrost.
- Do not puncture refrigerant tubing. Risk of fire or explosion due to puncture of refrigerant tubing; follow handling instructions carefully.
- Component parts shall be replaced with like components.
- Servicing shall be done by factory authorized service personnel to minimize the risk of possible ignition due to incorrect parts or improper service.
- Consult instruction manual/service manual before attempting to install or service this product.
- Dispose of properly in accordance with federal or local regulations.
- Do not place any potential ignition sources in or near the appliance.

Risque De Feu Ou D'Explosion Le Frigorigène Est Inflammable

- Suivre attentivement les instructions de manipulation conformément à la réglementation gouvernementale.
- Ne pas utiliser d'appareils mécaniques pour dégivrer le réfrigérateur.
- Ne pas perforer la tubulure contenant le frigorigène. Risque de feu ou d'explosion si la tubulure contenant le frigorigène est perforée; suivre les instructions de manutention avec soin.
- Les pièces des composants doivent être remplacées par des pièces et accessoires équivalents.
- L'entretien doit être effectué par le personnel de service autorisé par le fabricant afin de minimiser les risques d'inflammation attribuables à l'installation d'une pièce inadéquate ou à la mauvaise exécution du service.
- Consulter le manuel du propriétaire/guide de réparation avant de tenter une réparation. Toutes les mesures de sécurité doivent être respectées.
- Éliminer conformément aux règlements fédéraux ou locaux.
- Ne placez aucune source d'inflammation potentielle dans ou près de l'appareil.

⚠ WARNING

- Wear appropriate personal protective equipment (PPE) when servicing the appliance.
- Technician must utilize a combustible gas leak detector at all times.
- Notify everyone in the immediate area that you are working with flammable refrigerant.
- Do not work on appliance in a confined space. Confirm area is well ventilated.
- Identify and eliminate all possible ignition points in a 10 ft. (3 m) area around service area.
- Do not use mechanical devices to defrost.
- Use non-sparking tools.
- Class B dry chemical fire extinguisher or equivalent must be available.
- Do not pressurize system above 200 PSIG during leak check procedure or prior to evacuating refrigeration system.
- This appliance should be diagnosed and repaired only by qualified service personnel to reduce the risk of death, electric shock, serious injury, or fire.
- To reduce the risk of electric shock, do not touch the plug with damp hands.
- Unplug the appliance from the electrical outlet before servicing.
- Make sure all food zones in the appliance are clean after the appliance is serviced.

A. Refrigeration Circuit Service Information

WARNING

- Repairs requiring the refrigeration circuit to be opened must be performed by properly trained and EPA-certified service personnel.
- Use an electronic leak detector or soap bubbles to check for leaks. Add a trace of refrigerant to the system (if using an electronic leak detector), and then raise the pressure using nitrogen gas (140 PSIG). Do not use R-290 as a mixture with pressurized air for leak testing.

NOTICE

- Always recover the refrigerant and store it in an approved container. Do not discharge the refrigerant into the atmosphere.
- Do not leave the system open for longer than 15 min. when replacing or servicing parts. The Polyol Ester (POE) oils used in R-290 appliances can absorb moisture quickly. Therefore it is important to prevent moisture from entering the system when replacing or servicing parts.
- Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until all other repair or replacement has been made. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
- When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

Refrigerant leaks must be repaired as soon as they are discovered. If not, refrigerant charge should be recovered from the system until the leak can be repaired.

When repairing a leak:

- Repair the leak properly – Remove the refrigerant, examine the leak source, determine the reason for the leak, and carry out the proper course of action.
- Before repairing the leak, ensure that the refrigerant has been recovered and the system purged with nitrogen when brazing.
- Be sure to remove piercing valves attached to the system after repairs are made.

1. Refrigerant Recovery

Using proper refrigerant practices, place piercing valves toward the end (crimped area) of the high and low-side process tubes, then recover the refrigerant into an approved container or device.

2. Brazing

⚠ DANGER

Risk of Fire or Explosion Flammable Refrigerant Used

- Servicing shall be done by factory authorized service personnel to minimize the risk of possible ignition due to incorrect parts or improper service.

Risque De Feu Ou D'Explosion Le Frigorigène Est Inflammable

- L'entretien doit être effectué par le personnel de service autorisé par le fabricant afin de minimiser les risques d'inflammation attribuables à l'installation d'une pièce inadéquate ou à la mauvaise exécution du service.

⚠ WARNING

- Wear appropriate personal protective equipment (PPE) when servicing the appliance.
- You must have a combustible gas leak detector in the immediate work area at all times.
- You must have a Class B chemical fire extinguisher available at all times.
- Notify all persons in the immediate area that you are working with a flammable refrigerant.
- Do not use silver alloy or copper alloy containing arsenic.
- Be sure the area is clear of refrigerant vapor before brazing.

- 1) Braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 4 PSIG.
- 2) Purge with nitrogen gas for 2 min. Then braze all fittings while purging with nitrogen gas flowing at a pressure of 3 to 5 PSIG.

NOTICE

- Always install a new drier every time the sealed refrigeration system is opened. Do not replace the drier until after all other repair or replacement has been made. Install the new drier with the arrow on the drier in the direction of the refrigerant flow.
- When brazing, protect the drier by using a wet cloth to prevent the drier from overheating. Do not allow the drier to exceed 250°F (121°C).

- 3) Use soap bubbles to check for leaks. Raise the pressure using nitrogen gas (190 PSIG). Do not use any refrigerant as a mixture with pressurized air for leak testing.
- 4) Once leak checking is complete, release the nitrogen gas from the system.

3. Evacuation

- 1) Attach a vacuum pump to the system. Be sure the high-side charging hose is connected to the field-installed high-side access valve (PR) or factory installed high-side access valve (CR).

IMPORTANT

The vacuum level and vacuum pump may be the same as those for current refrigerants. However, the rubber hose and gauge manifold to be used for evacuation and refrigerant charge should be exclusively for POE oils.
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- 2) Turn on the vacuum pump, then open the high-side valve on the gauge manifold. Never allow the oil in the vacuum pump to flow backwards.
- 3) Allow the vacuum pump to pull down to a 29.9" Hg vacuum. Evacuating period depends on pump capacity.
- 4) Close the high-side valve on the gauge manifold.
- 5) Disconnect the gauge manifold hose from the vacuum pump and attach it to a refrigerant service cylinder. Remember to loosen the connection and purge the air from the hose. See the nameplate for the required refrigerant charge. Hoshizaki recommends only virgin refrigerant or reclaimed refrigerant which meets the requirements of ARI Standard 700 (latest edition) be used.

4. Recharge

- 6) R-290 can be charged in either the liquid or vapor state.
Liquid charge is preferred. If refrigerant charging is done in the liquid state, place the service cylinder on the scales; **if the service cylinder is not equipped with a dip tube, invert the service cylinder, then place it on the scales.** Open the high-side valve on the gauge manifold.
- 7) Allow the system to charge with liquid until the proper charge weight is met.
- 8) Close the high-side valve on the gauge manifold. If charging is complete, skip to step 10.
- 9) If necessary, add any remaining charge to the system through the low-side.
NOTICE! To prevent compressor damage, use a throttling valve or liquid dispensing device to add the remaining liquid charge through the low-side refrigerant access valve with the compressor running. Close the refrigerant cylinder valve and let the low-side refrigerant equalize to the system, then close the low-side manifold gauge. Move the power switch to the "OFF" position (if applicable) or unplug the appliance from the electrical outlet.
- 10) Pinch off (crimp down) the process tubes just below the piercing valves.
- 11) Remove the piercing valves. Cut the process tubes to remove the piercing valve holes then braze the process tubes closed. Note: Be sure there is no refrigerant leak before brazing.
- 12) Use a combustible gas leak detector or soap bubbles to check for leaks again.
- 13) Place red sleeves over the process tubes.
- 14) Plug the appliance back into the electrical outlet.

B. Component Service Information

NOTICE
When replacing a component listed below, see the notes to help ensure proper operation.

Component	Notes
Compressor	Install a new start relay and compressor external protector. WARNING! To reduce the risk of electric shock, be sure to reconnect the compressor's ground wire.

V. Maintenance

The maintenance schedule below is a guideline. More frequent maintenance may be required depending on the appliance's environment, and local sanitation regulations.

⚠ WARNING

- Unplug the appliance before performing maintenance to prevent electric shock or injury by moving parts. To reduce the risk of electric shock, do not touch the plug with damp hands.
- Before servicing: Move all foods into another clean refrigerator or freezer.
- CR: Before performing maintenance, disconnect any cooking equipment on the appliance top and allow to cool.

Maintenance Schedule

Frequency	Area	Task
Twice a Year	CR Condenser	Inspect. Clean if necessary by using a brush or vacuum cleaner. More frequent cleaning may be required depending on location.
Yearly	PR Condenser	

Power Supply Connection

If the plug or power cord is damaged, contact your local Hoshizaki service representative or local Hoshizaki distributor immediately and ask for repairs.

VI. Preparing the Appliance for Periods of Non-Use

When shutting down the appliance for more than one week, follow the instructions below.

⚠ WARNING

When preparing the appliance for long storage, prevent the doors/drawers from closing to reduce the risk of children getting trapped.

<i>NOTICE</i>

When preparing the appliance for long storage, clean the appliance. See the instruction manual for cleaning details.
--

- 1) Before shutting down the appliance, move all foods into another clean refrigerator or freezer.
- 2) Unplug the appliance. **WARNING! To reduce the risk of electric shock, do not touch the plug with damp hands.**

VII. Disposal

DANGER

Risk of Fire or Explosion Flammable Refrigerant Used

- Follow handling instructions carefully in compliance with U.S. government regulations.
- Do not puncture refrigerant tubing. Risk of fire or explosion due to puncture of refrigerant tubing; follow handling instructions carefully.
- Dispose of properly in accordance with federal or local regulations.

Risque De Feu Ou D'Explosion Le Frigorigène Est Inflammable

- Suivre attentivement les instructions de manipulation conformément à la réglementation gouvernementale.
- Ne pas perforer la tubulure contenant le frigorigène. Risque de feu ou d'explosion si la tubulure contenant le frigorigène est perforée; suivre les instructions de manutention avec soin.
- Éliminer conformément aux règlements fédéraux ou locaux.

WARNING

When preparing the appliance for disposal, remove the doors/drawers to reduce the risk of children getting trapped. Leave any shelves in place so that children may not easily climb inside.

The appliance contains refrigerant and must be disposed of in accordance with applicable national, state, and local codes and regulations. Refrigerant must be recovered by properly certified service personnel.

VIII. Technical Information

A. Electrical and Refrigerant Data

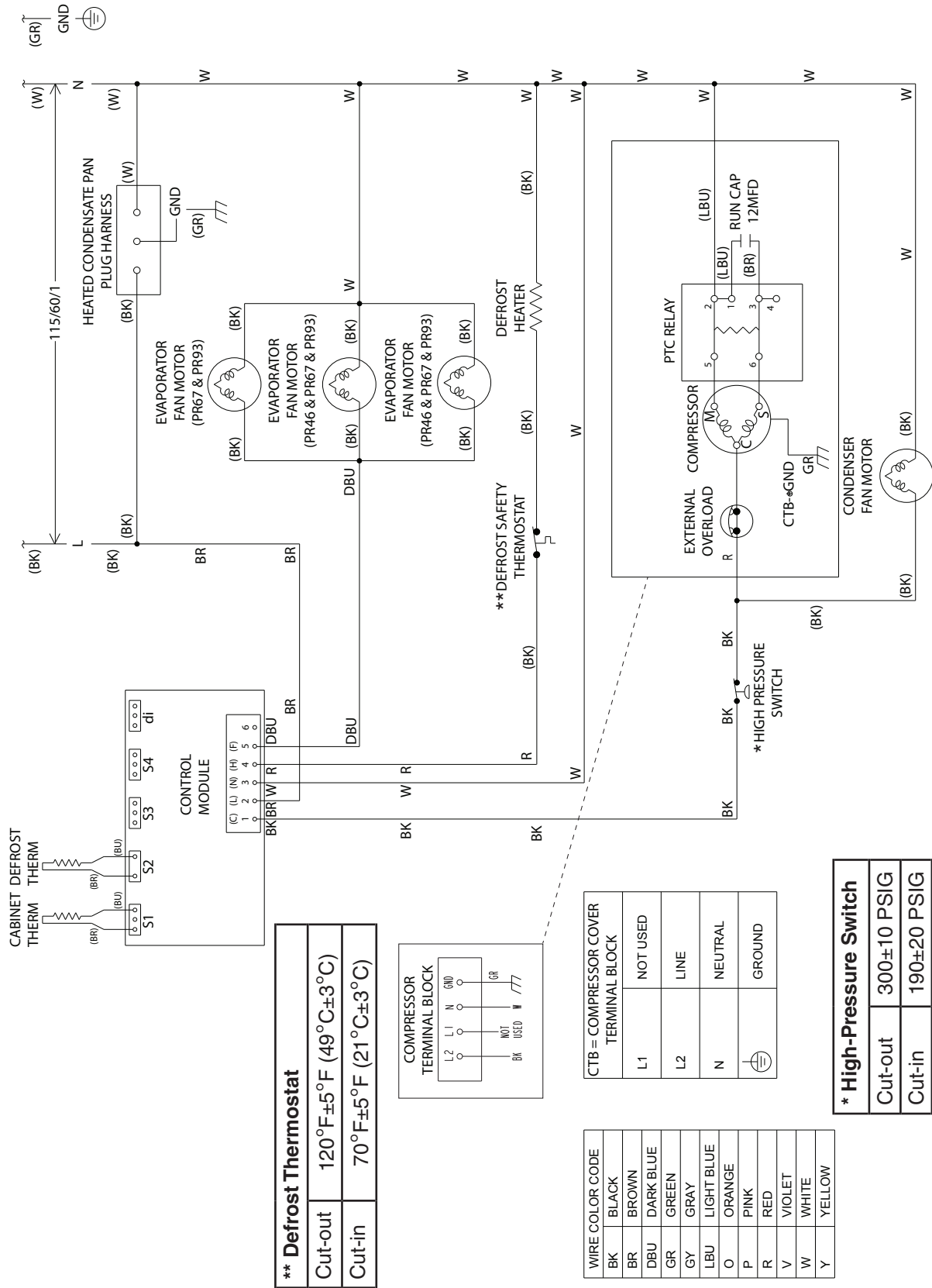
Model	AC Supply Voltage	Amperes	Design Pressure (PSIG)		Refrigerant (oz.)
			HIGH	LOW	R-290
PR46(-D)	115/60/1	6.0	360	190	3.2
PR67(-D2)(-D4)	115/60/1	6.0	360	190	3.2
PR93(-D2)(-D4)(-D6)	115/60/1	6.5	360	190	3.6
CR36	115/60/1	2.2	360	190	3.5
CR49	115/60/1	2.7	360	190	3.5
CR60	115/60/1	2.7	360	190	3.5
CR72	115/60/1	3.0	360	190	4.2
CR85	115/60/1	3.0	360	190	4.2
CR98	115/60/1	3.0	360	190	4.2
CR110	115/60/1	3.0	360	190	4.2

See the nameplate for electrical and refrigeration specifications. The nameplate is located inside the cabinet.

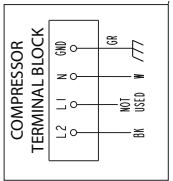
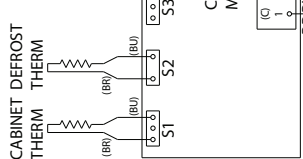
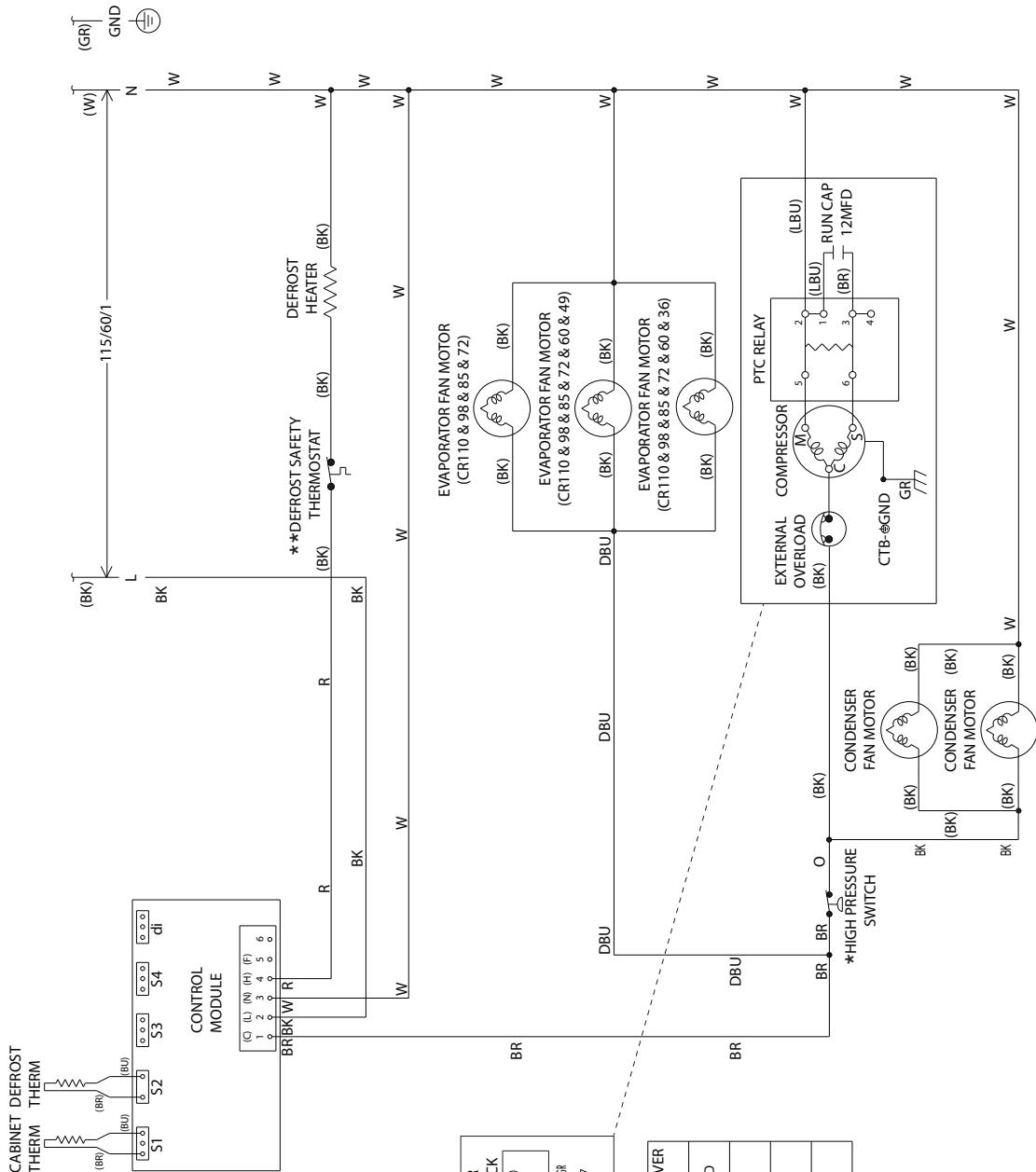
We reserve the right to make changes in specifications and design without prior notice.

B. Wiring Diagrams

1. PR46(-D), PR67(-D), PR93(-D)



2. CR36, CR49, CR60, CR72, CR85, CR98, CR110



CTB = COMPRESSOR COVER TERMINAL BLOCK	
L1	NOT USED
L2	LINE
N	NEUTRAL
⊕	GROUND

WIRE COLOR CODE	
BK	BLACK
BR	BROWN
DBU	DARK BLUE
GR	GREEN
GY	GRAY
LBU	LIGHT BLUE
O	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW

* High-Pressure Switch	
Cut-out	300±10 PSIG
Cut-in	190±20 PSIG

** Defrost Safety Thermostat	
Cut-out	120°F±5°F (49°C±3°C)
Cut-in	70°F±5°F (21°C±3°C)