Rapid Freeze® Ice Flaker

Installation & Service Manual

For Use with Remote Single Condensing Unit

1000-RLE

2000-RLE

3000-RLE

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Engineering Guidelines

Location Requirements

Howe Rapid Freeze Ice Flakers are designed to operate in ambient room temperatures between 50°F and 100°F.

Minimum Ambient Temperature	Maximum Ambient Temperature
50°F	100°F

The Ice Flaker warranty is void if it is installed in ambient room temperatures below 50°F.

The Ice Flaker must be located above a sanitary sewer floor drain hub or trench drain to ensure proper drainage to the floor. Many designers slope floors to the sanitary sewer inlets to manage these wet areas.

If installing the Ice Flaker with a Howe Ice Bin, ensure that the bin is adequately secured to the floor so as to prevent the assembly from tipping when empty.

Water Supply Requirements

Cold water supply to the Ice Flaker must be totally separate and unaffected by any local hot water supply.

This cold water supply must be within the range of 45°F to 90°F.

Minimum Water Supply Temp.	Maximum Water Supply Temp.
45°F	90°F

The cold water supply pressure must be within a 20 PSIG to 60 PSIG range.

Minimum Water Pressure	Maximum Water Pressure
20 PSIG	60 PSIG

Straight Reverse Osmosis (RO) treated water should never be supplied to the Ice Flaker.

RO system treated water is aggressive toward metals and plated surfaces. In addition RO water will affect the life and integrity of rubber and plastic material Ice Flaker components. If only RO water is available, Post-RO treatment must be provided to raise pH and mineral content.

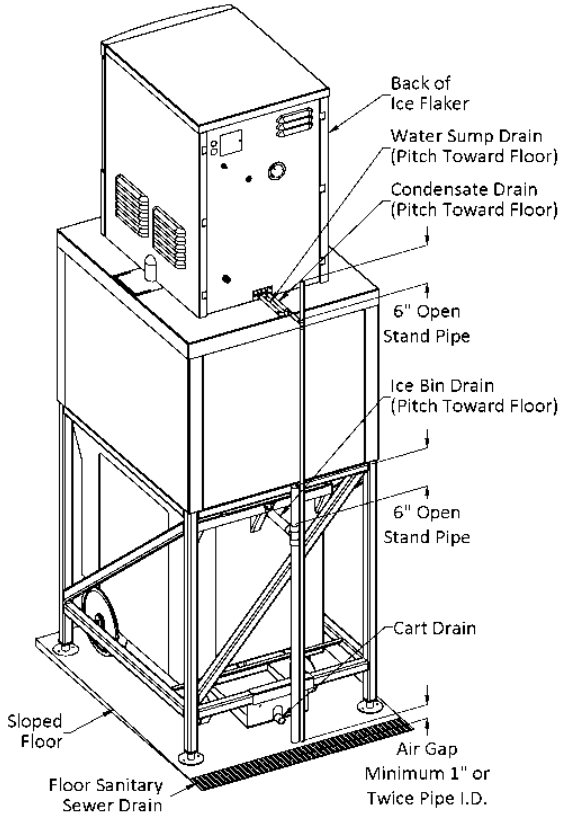
Generally, filtration of cold supply water is recommended. Howe offers a complete line of replaceable core cartridge filter treatment systems designed to improve ice quality and extend the life of the Ice Flaker.

This filtration will also reduce supply water related service problems if changed at least every six months or depending upon local water conditions.

A dedicated 1/2" ODS copper cold water supply should be located within 4 feet of the Ice Flaker complete with hand shut off valve.

A 3/8" OD copper tube should connect the field installed shut off valve with the Ice Flaker water inlet connection located at the rear of the machine.

Drain Water Piping Requirements



The Drain Water Piping figure above illustrates the recommended piping to a floor sanitary sewer hub or trench drain. The two vertical pipe drops should drain water through an indirect water connection with an "Air Gap". Code authorities having jurisdiction may dictate other indirect water connection requirements.

The figure depicts two separate drain lines which are required to ensure the Ice Flaker does not inadvertently flow Water Sump Drain water into the Ice Bin or Carts in the event of a backup or any other malfunction.

Electrical Requirements

A dedicated 15 amp, 2 pole, 208-230 volt power supply from a field furnished and installed disconnect switch is required for each Ice Flaker.

A dedicated 3 pole, 208-230 volt power supply from a field furnished and installed disconnect switch is required for each Remote Condensing Unit. The amperage of the power supply circuit must match the selected Remote Condensing Unit supplied by Howe with respect to Minimum Circuit Amperage (MCA) and Maximum Overcurrent Protection Device (MOPD) nameplate information.

A two conductor control circuit is required to interconnect the Ice Flaker with the Remote Condensing Unit interlocking relay.

Refrigeration Requirements

Model	Refrigeration Requirements*	Optimum Evaporator Temperature
1000-RLE	9,500 BTU/hr	0°F
2000-RLE	18,000 BTU/hr	-5°F
3000-RLE	27,000 BTU/hr	-5°F

*Refrigeration requirements are based on operating the Ice Flaker with 70°F supply water and 90°F ambient air conditions. Refrigeration requirements and/or capacity will vary with temperatures outside these conditions.

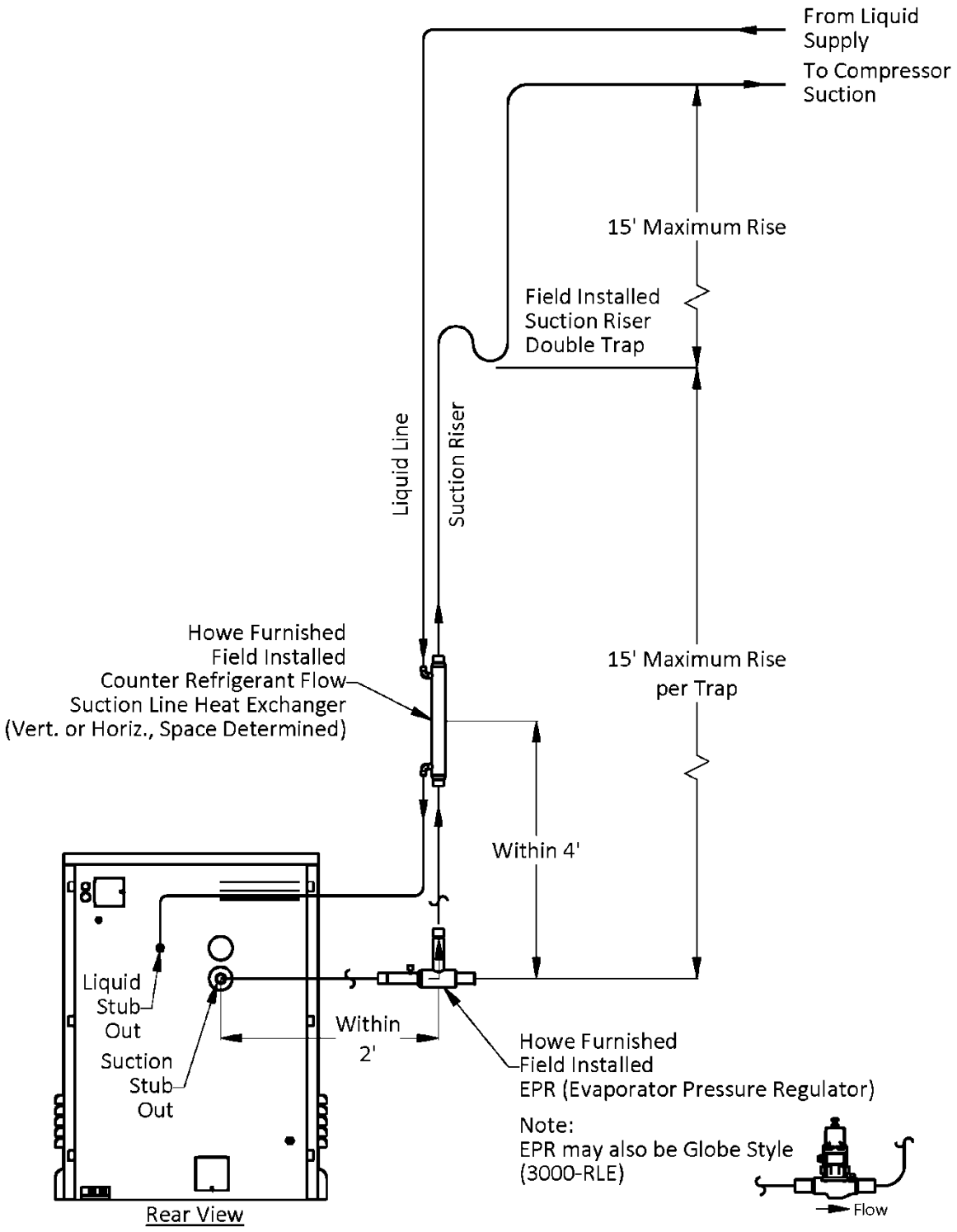
Howe Furnished Condensing Units

Howe furnished condensing units are properly sized for outdoor design ambient temperature and supply water temperature conditions. These condensing units are factory equipped with the following accessories:

- Liquid Line Filter/Drier and Sight Glass
- Suction Filter
- Suction Accumulator
- Oil Separator
- Refrigerant Pump-Down Cycle
- Heated and Insulated Receiver (except for high ambient applications)
- Discus Compressor
- Condenser Fan Cycling control
- Non-Adjustable Head Pressure Control Valve

Field Furnished Condensing Units

Howe is not responsible for the performance of field furnished condensing units. Howe recommends field furnished condensing units be sized with sufficient refrigeration capacity at the local design outdoor ambient temperature including enough system capacity to offset suction line pressure losses. Howe also recommends field furnished condensing units be at least equipped with the accessories outlined in the previous section to ensure successful operation of the Ice Flaker.



SUGGESTED REFRIGERANT PIPING DIAGRAM

Figure 1

Piping Table

Model	Liquid Line*	Suction Line*	Suction Riser*
1000-RLE	3/8” ODS	7/8” ODS	3/4” ODS
2000-RLE	1/2" ODS	1-1/8” ODS	7/8” ODS
3000-RLE	1/2" ODS	1-3/8” ODS	1-1/8” ODS

*For runs up to 150 feet. If longer, use next larger line size.

Refrigerant Pipework

Howe recommends the field refrigerant piping be installed according to the Suggested Refrigerant Piping Diagram shown on previous page. These pipe sizes are for HFC refrigerants and are not applicable to R-744 installations or secondary refrigerant applications.

Howe recommends the use of hard drawn ACR type L tubing with refrigeration grade wrought copper long radius elbows and fittings only. No soft drawn tubing should be used in the refrigerant pipe installation.

No field installed P-type oil trap is required at the base of the suction riser since all Ice Flakers are internally piped with a suction trap at the outlet of the evaporator within the enclosure.

Evaporator Pressure Regulator (EPR) valves must be field installed with the arrow correctly pointing in the direction of flow.

Installation specifications should require all refrigerant piping should be joined with a suitable silver brazing alloy while purging nitrogen through the piping to prevent copper oxidation scale from forming inside the tubing.

For close coupling Ice Flaker to Condensing Unit, use a minimum of ten feet total straight length of pipe. Minimize bends and fittings. Suction Line to include EPR and Heat Exchanger.

Refrigerant Pipework Insulation Requirements

Field refrigerant pipework should be insulated with closed cell flexible elastomeric foam thermal insulation intended for cold applications.

Liquid lines should be covered with 1/2” thick and suction lines with 3/4” thick material.

The insulation material should be moisture vapor resistant when correctly installed according to the manufacturer’s instructions.

The field installed Evaporator Pressure Regulator (EPR) valve and Suction Line Heat Exchanger must likewise be insulated. If these system components are left un-insulated they become “thermal bridges” and unwanted condensation and ice will form and drip.

All butt joints and seams must be properly field fabricated according to the insulation manufacturer’s fusing adhesive instructions.

Self-adhering closed cell foam insulation is also available in rolls and can be used to supplement the conventional tubular materials on irregular shapes, EPR valves, and caps.

Field Installation

Safety Information and Guidelines

Only qualified service technicians should attempt to install, service, or maintain the Ice Flaker.

Make sure all power sources are disconnected before any service work is done to the Ice Flaker.

All field wiring must conform to the requirements of the equipment and all applicable local codes and national codes.

Always refer to the Condensing Unit manufacturer's installation manual for further specification and guidance.

Inspection

Upon receipt, check all items against the bill of lading to make sure all crates and cartons are accounted for.

Any shortage or damages should be reported to the delivering carrier. Damaged material becomes the delivering carrier's responsibility and should not be returned to the manufacturer unless prior approval is given.

Take care not to damage equipment when uncrating.

Condensing Unit Rigging and Mounting

Rigging holes are provided on all units. Caution should be exercised when moving these units. To prevent damage to the unit housing during rigging, cables or chains used must be held apart by spacer bars. The mounting platform or base should be level and located so as to permit free access of supply air.

Ground Mounting

Concrete slab raised six inches above ground level provides a suitable base. Raising the base above ground level provides some protection from ground water and wind-blown matter. Before tightening mounting bolts, recheck level of unit. The unit should in all cases be located with a clear space in all directions that is at a minimum, equal to the height of the unit above the mounting surface. A condensing unit mounted in a corner formed by two walls, may result in discharge air recirculation with resulting loss of capacity.

Roof Mounting

Due to the weight of the units, a structural analysis by a qualified engineer may be required before mounting. Roof mounted units should be installed level on steel channels or an I-beam frame capable of supporting the weight of the unit.

Access

Provide adequate space at the compressor end of the unit for servicing. Provide adequate space on the connection side to permit service of components.

Piping

The Ice Flaker has been thoroughly cleaned and dehydrated at the factory. However, foreign matter may enter the system by way of the piping to the condensing unit. Therefore, care must be used during installation of the piping to prevent entrance of foreign matter.

Install all refrigeration system components in accordance with applicable local and national codes and in conformance with good practice required for the proper operation of the Ice Flaker.

The refrigerant pipe size should be selected from the Piping Table. The interconnecting pipe size is not necessarily the same as the stub-out on the condensing unit or the Ice Flaker.

The following procedures should be followed:

1. Do not leave units or piping open to the atmosphere any longer than is absolutely necessary.
2. Use only refrigeration grade copper tubing, properly sealed against contamination.
3. Suction lines should slope 1/4" per 10 feet towards the compressor.
4. Refer to the Suggested Refrigerant Piping Diagram (p.6) for suitable P-type oil trap locations to enhance oil return to the compressor.
5. When brazing refrigerant lines, Dry Nitrogen should be passed through the line at low pressure to prevent scaling and oxidation inside the tubing.
6. Use only a suitable silver solder alloy on suction and liquid lines.

Leak Testing

After all refrigerant connections are made, the entire system must be leak tested.

The complete system should be pressurized to no more than 150 psig with refrigerant and dry nitrogen (or dry CO_2).

It is recommended that this pressure be held for a minimum of 12 hours and then rechecked. For a satisfactory installation, the system must be leak tight.

Evacuation

Do not use the refrigeration compressor to evacuate the system. Do not start the compressor while it is in a vacuum.

A good, deep vacuum pump should be connected to both the low and high side evacuation valves with copper tube or high vacuum hoses (1/4" ID minimum).

If the compressor has service valves, they should remain closed.

A deep vacuum gauge capable of registering pressure in microns should be attached to the system for pressure readings.

A shut off valve between the gauge connection and vacuum pump should be provided to allow the system pressure to be checked after evacuation.

Do not turn off vacuum pump when connected to an evacuated system before closing shut off valve.

The vacuum pump should be operated until a pressure of 1,500 microns absolute pressure is reached – at which time the vacuum should be broken with the refrigerant to be used in the system through a drier until the system pressure rises above "0" psig.

Refrigerant used during evacuation cannot be vented. Reclaim all used refrigerant.

Repeat this operation a second time.

Open the compressor service valves and evacuate the entire system to 500 microns absolute pressure. Raise the pressure to 2 psig with the refrigerant and remove the vacuum pump.

Field Wiring

All field wiring must be in compliance with local and national codes. Use only copper conductors of the appropriate size.

1. Install disconnect (not supplied by factory).

2. Connect 208-230/1/60 power to the two black wires marked "L1" and "L2" in the junction box on the rear of the Ice Flaker.

3. In the junction box there are two red wires marked "A" and "B". Remove wire nut.

4. Connect the normally-open isolating contacts from the relay mounted in the condensing unit to "A" and "B".

5. Locate and connect Photo Eye sensors to the matching plug inside the Ice Flaker enclosure (see p.24).

Refrigerant Charging Instructions

All Ice Flakers are shipped with a small holding charge of dry nitrogen. Ice flakers must be evacuated before charging.

1. Install a liquid line drier in the refrigerant supply line between the service gauge and the liquid service port of the receiver. This extra drier will ensure that all refrigerant supplied to the system is clean and dry.

2. When initially charging a system that is in a vacuum, liquid refrigerant can be added directly into the receiver tank.

3. The approximate refrigerant charge is listed in the table below. Do not over charge.

Model	System Charge[1]	Piping Charge[2]
1000-RLE	9	3.4
2000-RLE	14	6.4
3000-RLE	20	6.4

[1] System Charge is approximate pounds of R-404a for Ice Flaker and Condensing Unit only.
[2] Piping Charge is approximate additional pounds refrigerant per 100 linear feet of liquid line.

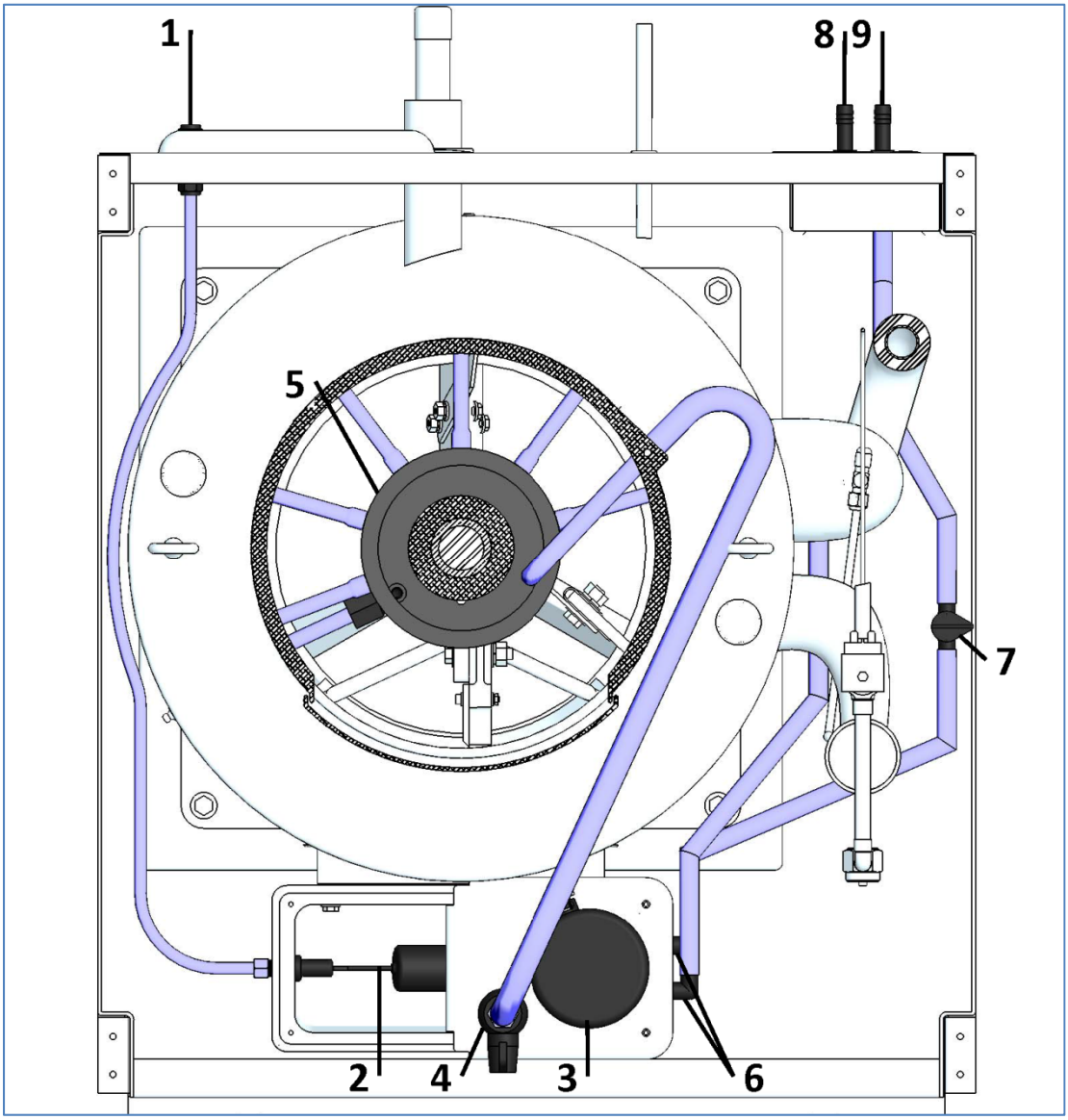
4. Start the system and finish charging until the sight glass indicates a full charge and the proper amount has been weighed in. If refrigerant must be added to the system through the suction side of the compressor, charge in vapor form only.

Installation Checklist

1. **Has the ambient temperature been verified between 50°F – 100°F?**
   (see Location Requirements p.3)
2. **Has the incoming water temperature been verified between 45°F – 90°F?**
   (see Water Supply Requirements p.3)
3. **Has the water supply pressure been verified between 20 PSIG and 60 PSIG?**
   (see Water Supply Requirements p.3)
4. **Has the filtered water supply been verified as not RO water?**
   (see Water Supply Requirements p.3)
5. **Has the Ice Flaker been located near a floor sanitary sewer drain?**
   (see Drain Water Piping Requirements p.4)
6. **Have the EPR and Suction Line Heat Exchanger been installed correctly?**
   (see Suggested Refrigerant Piping Diagram p.6)
7. **Have all the refrigeration lines been sufficiently insulated?**
   (see Refrigerant Pipework Insulation Requirements p.7)
8. **Has the Condensing Unit been mounted properly?**
   (see Condensing Unit Rigging and Mounting p.8)
9. **Has the system been leak tested properly?**
   (see Leak Testing p.9)
10. **Has the system been evacuated properly?**
    (see Evacuation p.10)
11. **Have the Photo Eye sensors been connected?**
    (see Field Wiring p.10)
12. **Has the system been charged properly?**
    (see Refrigerant Charging Instructions p.11)

Start Up and Operation

Water Operation



1. Water Inlet Connection
2. Float Valve
3. Water Pump
4. Water Regulating Valve
5. Water Distribution Pan & Side Spout
6. Sump Connections
7. Stop Valve
8. Condensate Drain Outlet
9. Sump Drain Outlet

Water Inlet

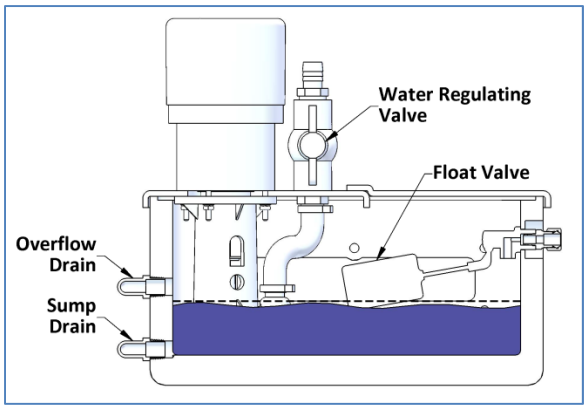
The supply water feed for the Ice Flaker must be connected here. A shut-off valve should be field installed before this connection.

The Ice Flaker requires a minimum water pressure of 20 PSIG and a maximum of 60 PSIG.

Float Valve

The water level in the Water Sump is regulated by the Float Valve.

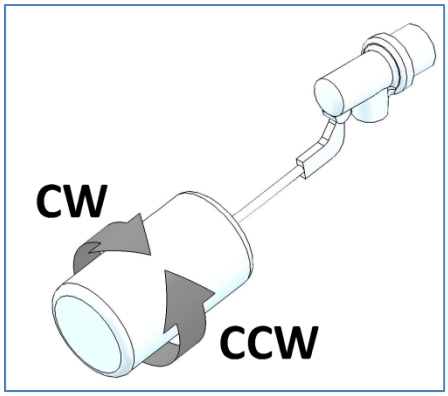
The water level should always be below the opening on the side of the Water Sump.



Section View of Water Sump

Water should never be allowed to flow from the Water Sump back through the opening and into the Bottom Casting.

Adjust the water level by rotating the float end of the Float Valve. Rotate clockwise to raise the water level and counterclockwise to lower the water level.



Water Pump

The Water Pump drives the water in a continuous flow through the system.

The Water Pump inlet should be submerged at all times. Air should never be pulled into the intake.

Overflow Drain

The higher of the two drain connections on the Water Sump is the Overflow Drain.

If water is exiting the Water Sump through the Overflow Drain, the water level is too high and the Float Valve needs to be adjusted.

Sump Drain

The lower of the two is the Sump Drain. It is used to flush the Water Sump of all liquid.

Stop Valve

The stop valve attached to the Sump Drain fitting should always be closed during normal operation.

The stop valve should only be opened during cleaning or emptying of the Water Sump.

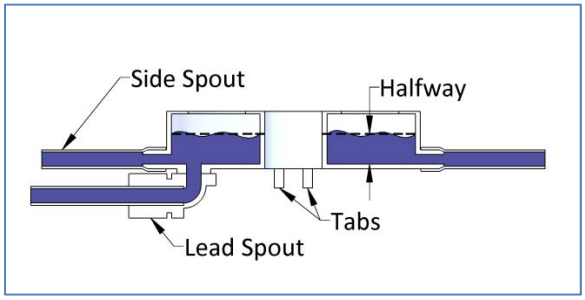
Water Distribution Pan

The Water Distribution Pan circulates the water fed from the Water Pump down the walls of the Evaporator.

There are two small plastic tabs on the bottom of the Water Distribution Pan. These tabs should straddle the wing of the Ice Blade to prevent it from rotating.

The tube exiting the Water Distribution Pan from the bottom is the Lead Spout. It must always be flowing with water during normal operation and pointing perpendicular to the evaporator surface.

Do not plug or cap the bottom Lead Spout.



Section View of Water Distribution Pan

Water level in the Water Distribution Pan should be about halfway full. The Side Spouts should never be starved of water.

Water Regulating Valve

Adjust the water level in the Water Distribution Pan by opening or closing the Water Regulating Valve located directly above the Water Sump.

Only adjust the Water Regulating Valve after the Ice Flaker has been producing ice for at least 10 minutes.

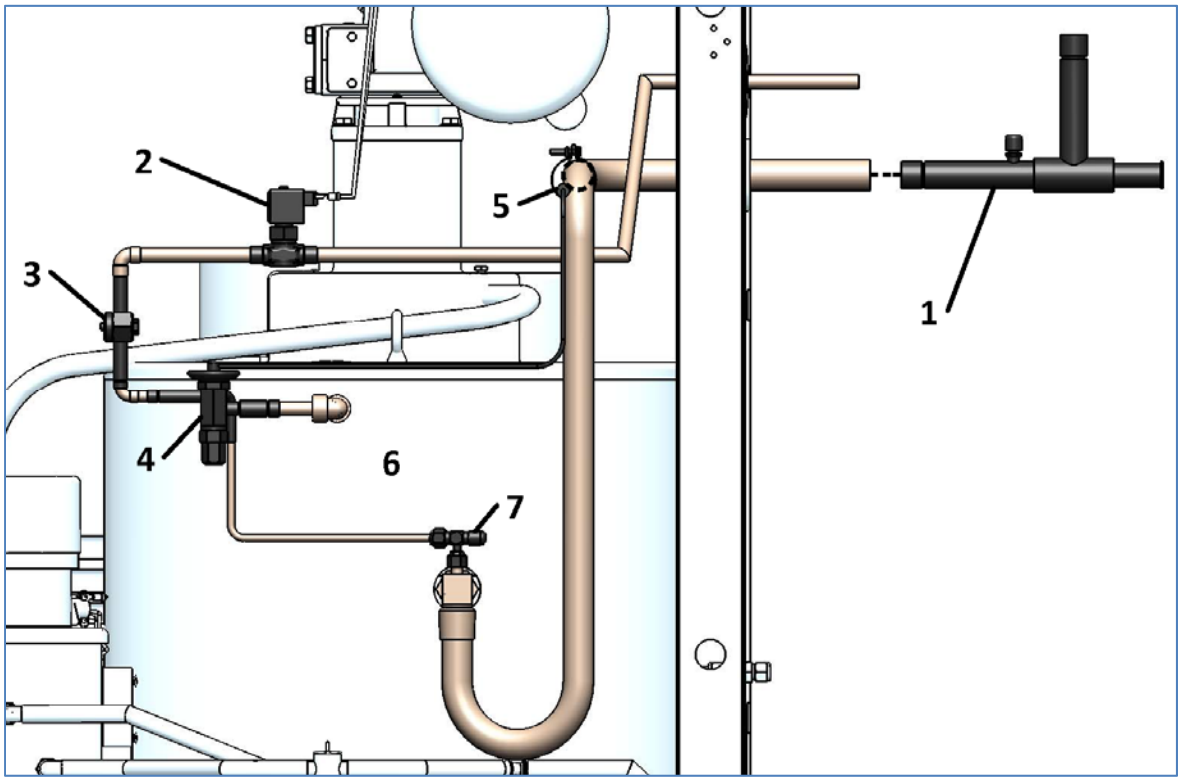
Condensate Drain & Sump Drain Outlets

Any water or moisture that has formed on the Ice Flaker or inside the enclosure will flow out through the Condensate Drain Outlet.

Water exiting the enclosure during cleaning or emptying of the Water Sump will do so through the Sump Drain Outlet.

Both of these drains outlets must connect to a floor drain. Make sure they are clear from restrictions and flows freely.

Refrigeration Operation



*Piping insulation not shown

1. Evaporator Pressure Regulator (EPR)
2. Solenoid Valve
3. Sight Glass
4. Thermostatic Expansion Valve (TXV)
5. TXV Sensing Bulb
6. Evaporator
7. Pressure Tap

Evaporator Pressure Setting

Model	Temperature	R-404A	R-507
1000-RLE	0°F	33 PSI	35 PSI
2000-RLE	-5°F	28 PSI	30 PSI
3000-RLE	-5°F	28 PSI	30 PSI

Evaporator Pressure Regulator (EPR)

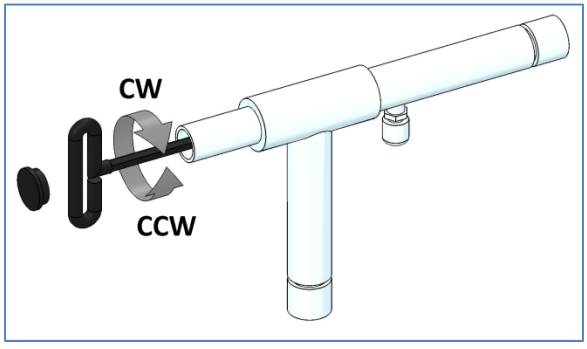
The EPR will hold the suction temperature at the proper level, allowing for minor adjustments to be made using the Thermostatic Expansion Valve (TXV).

Even though the suction temperature at the Evaporator is correct, the TXV may still be underfeeding or overfeeding.

All EPRs are shipped loose and must be field installed. The EPR should ideally be located within 2 feet of the Ice Flaker.

To read EPR setting install service manifold at the Pressure Tap of the Evaporator or at the inlet of the EPR.

For Angle Style EPR, remove end cap and adjust using a 1/4" hex wrench.

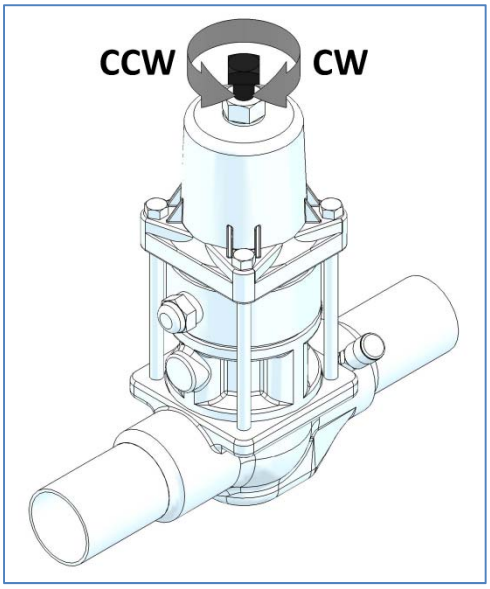


To increase the pressure setting, rotate clockwise.

To decrease the pressure setting, rotate counter-clockwise.

If EPR fails to regulate pressure properly it must be repaired or replaced.

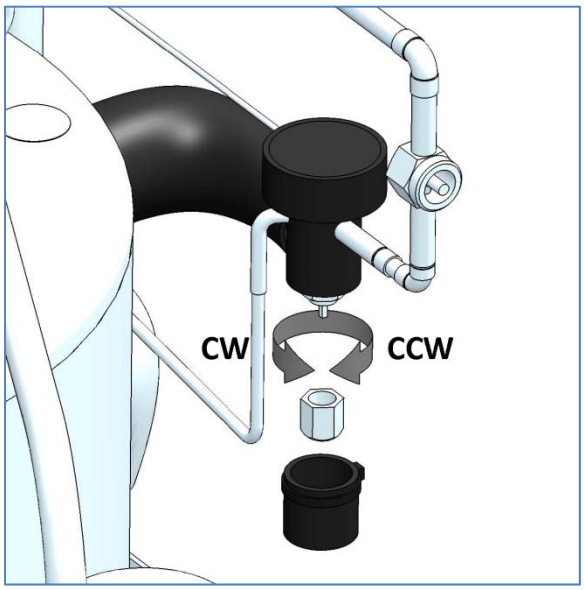
For Globe Style EPR, adjust top stem.



To ensure an accurate setting, it is important to set the EPR when the ambient temperature at the Condensing Unit is 10°F below the maximum rated ambient temperature.

Thermostatic Expansion Valve (TXV)

Always adjust the EPR prior to adjusting the TXV.

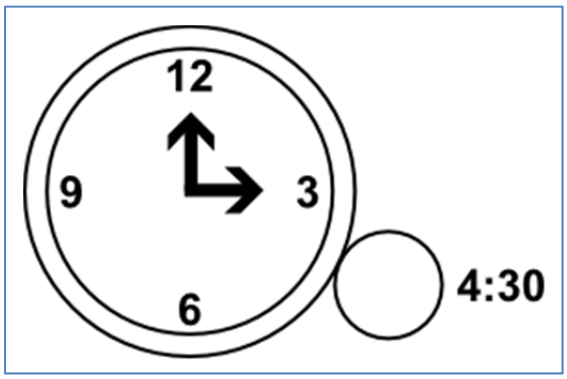


Superheat is not a reliable method of adjusting TXV on Ice Flaker. TXV must be adjusted while visually inspecting the Evaporator's freezing surface.

To increase the refrigerant feed of the TXV, rotate stem counterclockwise.

To decrease the refrigerant feed of the TXV, rotate stem clockwise.

TXV Sensing Bulb



Bulb placement should be at the 4:30 position of a clock on the suction line.

Adjusting Refrigeration to the Ice Flaker

1. Visually inspect the frost pattern on the freezing surface of the Evaporator.

   If the TXV is underfeeding, the top of the frost pattern will be a milky white color and the bottom will be clear, soft, and not harvest properly.

TXV Underfeeding

2. If the TXV is not underfeeding, close the TXV by 1/4 of a turn and wait 5 minutes.

3. Visually inspect the frost pattern of the Evaporator.

4. Repeat steps #2 and #3 until underfeeding can be seen at the very bottom of the Evaporator.

5. Now, open the TXV by 1/4 of a turn and wait 5 minutes.

6. Repeat step #5 until the entire frost pattern of the Evaporator becomes milky white and harvests completely.

7. Confirm correct EPR setting. (see p.17)

Solenoid Valve

The Solenoid Valve controls the flow of liquid refrigerant to the Evaporator.

The Solenoid Valve should energize immediately upon starting the Ice Flaker.

The Solenoid Valve should only de-energize when the Ice Flaker is in Off-Delay Cycle (p.22) or Overload Condition (p.23).

Sight Glass

The Sight Glass provides a quick way to visually check that the Ice Flaker is being provided with constant liquid refrigerant and that there is no moisture in the system.

There should never be bubbles in the Sight Glass. This indicates a flashing or inconsistent liquid feed.

The moisture indicator in the middle of the Sight Glass should always be green.

- Green – Dry
- Yellow – Wet

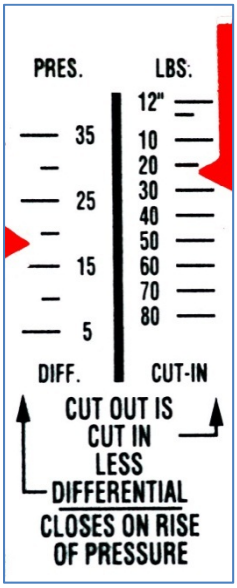
Fan Cycling Control

On Dual-Fan Condensing Units (1000-RLE & 2000-RLE), the lead fan is always on when the Condensing Unit is operating. The Second Fan is controlled by an ambient switch, which should be set at 50°F.

On Single-Fan Condensing Units (3000-RLE), the fan is always on when the Condensing Unit is operating.

Low Pressure Control

All Howe Condensing Units are supplied with a separate Low Pressure Control for continuous pump down.



The left side of the control indicates pressure differential for Cut-Out (compressor off) and the right side indicates pressure for Cut-In (compressor on).

R-404A	
Diff. / Pres.	Cut-In / LBS.
18	23

The table above shows the approximate setting for the Low Pressure Control.

Field Capacity Check

The Ice Flaker is a continuous production machine and makes ice at a steady rate once stabilized.

A Capacity Check confirms the Ice Flaker and refrigeration settings are correct.

1. Choose an appropriately sized container and weigh it while empty.

Container Weight _____ Lbs.

2. Run the Ice Flaker for 10 minutes.
3. Position the container below the opening of the Ice Flaker.
4. Catch the falling ice in the container for exactly 15 minutes. Be sure that the container catches all of the ice.
5. Weigh the ice and the container together in pounds using an accurate scale. Do not drain before weighing.

Measured Weight _____ Lbs.

6. Subtract the weight of the container.

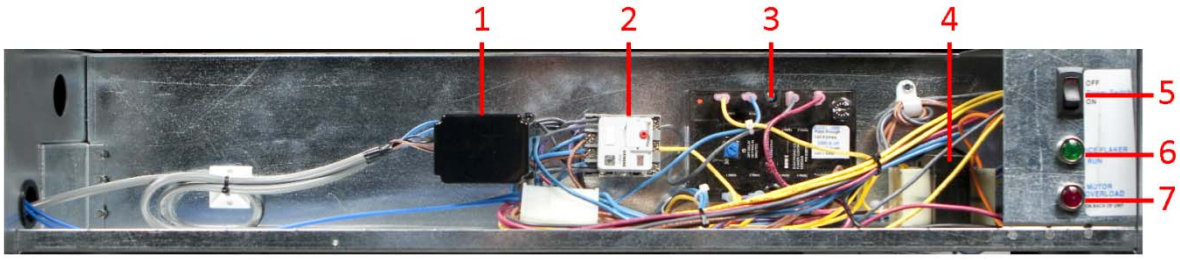
Measured Weight		(from #5)
- Container Weight	-	(from #1)
= Calculated Weight	=	Lbs.

7. Calculate the capacity by multiplying the calculated weight by 96.

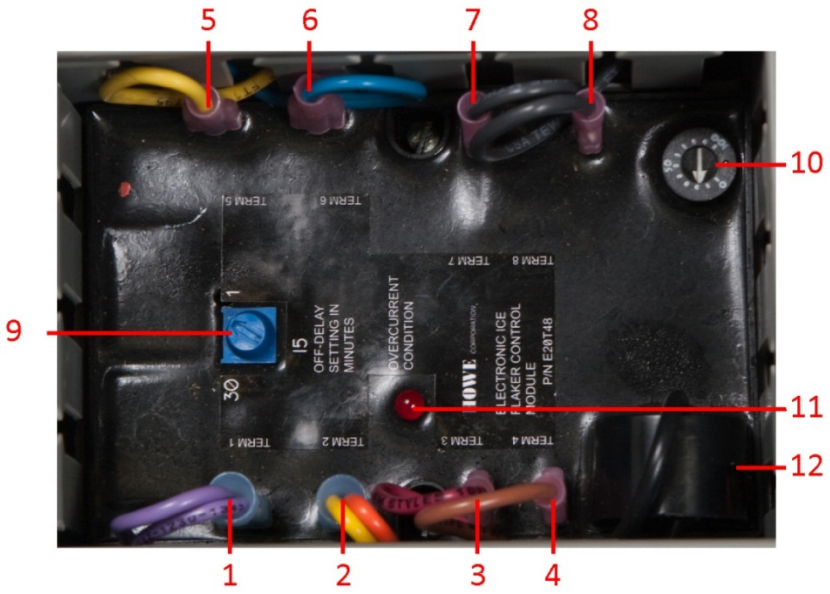
Calculated Weight		(from #6)
x 96	x 96	
= Capacity	=	Lbs. per 24 hrs.

8. Compare the number with the rated capacity of the Ice Flaker. Keep in mind temperatures outside the rated conditions will have an effect on the capacity.

Electrical Operation



1. Level Control Relay (LC1)
2. Motor Relay (R1)
3. Control Module (CM)
4. Transformer (T1)
5. Power Switch
6. Ice Flaker Run Indicator Light
7. Motor Overload Indicator Light



1. Term 1: 24V Input Power
2. Term 2: 24V Input Power
3. Term 3: Control Signal
4. Term 4: Motor Overload Reset
5. Term 5: Motor Overload Switch Leg
6. Term 6: Ice Flaker Run Switch Leg
7. Term 7: Solenoid Valve Contact
8. Term 8: Solenoid Valve Contact
9. Off-Delay Setting
10. Motor Overload Setting
11. Overcurrent Condition Indicator Light
12. Overload Sensing Coil

Level Control Relay (LC1)
This relay processes the signal from the Photo Eyes. It shuts the Ice Flaker off when the Ice Bin is full to prevent damage caused by ice backing up into the evaporator section.

Motor Relay (R1)
This relay provides power to the Drive Motor, the Water Pump, and the Solenoid Valve. It features a manual override button, which when depressed will engage the relay contacts, even when the relay coil is not energized.

Transformer (T1)
This provides 24 volt control power to the Control Module, Motor Relay, and indicating lights.

Ice Flaker Run Indicator Light
This is lit green during Normal Operation.

Motor Overload Indicator Light
This is lit amber when Ice Flaker is in Overload Condition. The Reset Button is located on the rear of the Ice flaker. It is a normally open switch, which resets the circuit after an Overload Condition.

Control Module (CM)
The control Module features eight wire terminals, two adjustable dials, and one indicating light.

It operates in one of three main modes:

- Normal Operation
- Off-Delay Cycle
- Overload Condition

Normal Operation
Normal Operation begins when the Control Module senses voltage at the Control Signal (Term 3).

During Normal Operation voltage is present at Ice Flaker Run Switch Leg (Term 6) and the Solenoid Valve Contacts (Term 7 & 8) are closed.

Off-Delay Cycle
The Off-Delay Cycle begins when voltage is removed from the Control Signal (Term 3).

The length of the Off-Delay Cycle is determined by the blue Off-Delay Setting dial. The increments are in minutes with 1 being the lowest possible setting and 30 being the highest.

During the Off-Delay Cycle voltage is present at Ice Flaker Run Switch Leg (Term 6) until the time setting has been met. The Solenoid Valve Contacts (Term 7 & 8) are opened when the Off-Delay Cycle is initiated.

Off-Delay Setting
Under Normal Operation the Off-Delay Setting should be adjusted to run approximately 2 minutes after the Solenoid Valve shuts off the refrigeration to the Ice Flaker.

For proper adjustment, turn knob counterclockwise until it stops. Then turn clockwise 1/8 turn and stop.

The 30 minute setting is used for Cleaning Procedure only.

Overload Condition

An Overload Condition begins when the Overload Sensing Coil reads amperage from the motor lead passing through it that is higher than the Motor Overload Setting.

During an Overload Condition no voltage is present at Ice Flaker Run Switch Leg (Term 6), the Solenoid Valve Contacts (Term 7 & 8) are open, and the Overcurrent Condition Indicator Light is lit red.

The Motor Overload setting should be adjusted on start-up and anytime changes are made to the Drive Motor or Main Shaft.

Motor Overload Setting

The proper adjustment of Motor Overload Setting will protect the Ice Flaker and help avoid nuisance service calls.

To set the Motor Overload correctly,

1. Mark the location of the setscrew before an adjustment is made, as a point of reference.

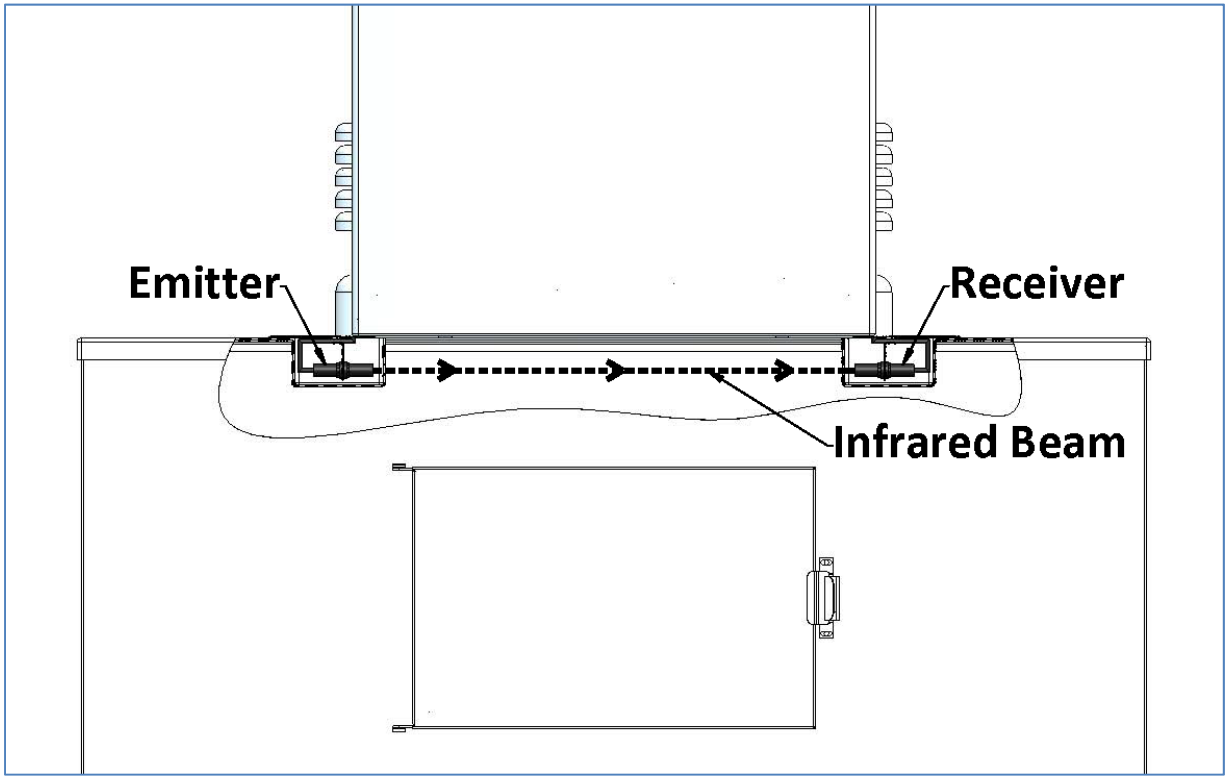
2. Place a small flat blade screwdriver in the adjustment screw while the Ice Flaker is operating.

3. Gently and slowly turn counterclockwise until Overload Condition Indication Light illuminates. Do not force adjustment screw past bottom stop.

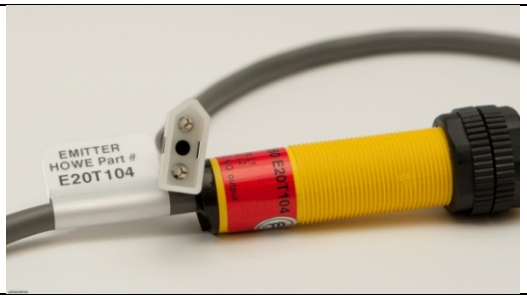
4. Then turn adjustment screw clockwise 1 hash mark and stop.

5. Press the reset button to start the Ice Flaker again.

Photo Eyes (Level Control)

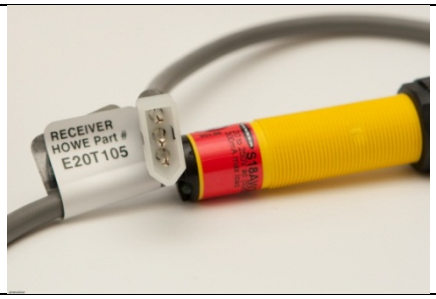


Emitter



Part# E20T104
Two Pins (Blue & Brown)
One LED (Green)

Receiver



Part# E20T105
Three Pins (Blue, Black, & Brown)
Two LEDs (Green & Amber)

The Photoelectric sensors, or Photo Eyes, shoot an infrared beam across the opening of the Ice Flaker.

If this beam in interrupted for more than 15 seconds, the Ice Flaker will begin the Off-Delay Cycle. This prevents ice from filling into the ice making area and damaging internal parts.

The Ice Flaker will return to Normal Operation when the infrared beam is re-established, provided the Off-Delay Cycle has completed.

If the Ice Flaker was purchased without an Ice Bin the Photo Eyes will be shipped loose and need to be properly mounted by the installing contractor. Please contact Howe for further information.

Water or Moisture in Molex Plug

If the Molex plug for either the Emitter or Receiver is wet or has moisture in it, shake water off plug and dry properly.

Molex plug must be re-packed with Di-electric grease every time it is unplugged to maintain water resistance.

Correct Wiring Arrangement

The Emitter should have only the blue & brown wires connected to it. There should not be any pin in the center position on the Molex connector attached to the Emitter.

The Receiver should have the blue, brown & black wires connected.

Correct Voltage

With Level Control Relay plugged in and power to Ice Flaker on, unplug Emitter and Receiver.

Use a voltmeter to verify 24 volts across blue and brown pins. Alternatively you can check terminals #1 and #10 on the Level Control Relay.

If 24 volts is not present, the Level Control Relay has likely failed and needs to be replaced.

Sequence of Operation

There are Light-Emitting Diode (LED) indicators on the rear of both the Emitter & Receiver.

The Emitter has a green LED, which is illuminated whenever the Ice Flaker has power.

The Receiver has two LEDs. The green LED is always illuminated whenever the Ice Flaker has power. The amber LED is illuminated when it "sees" the infrared signal from the Emitter.

During Normal Operation, all LEDs should be lit. The Level Control Relay (LC1) should open the Solenoid Valve, and the Ice Flaker should begin making ice.

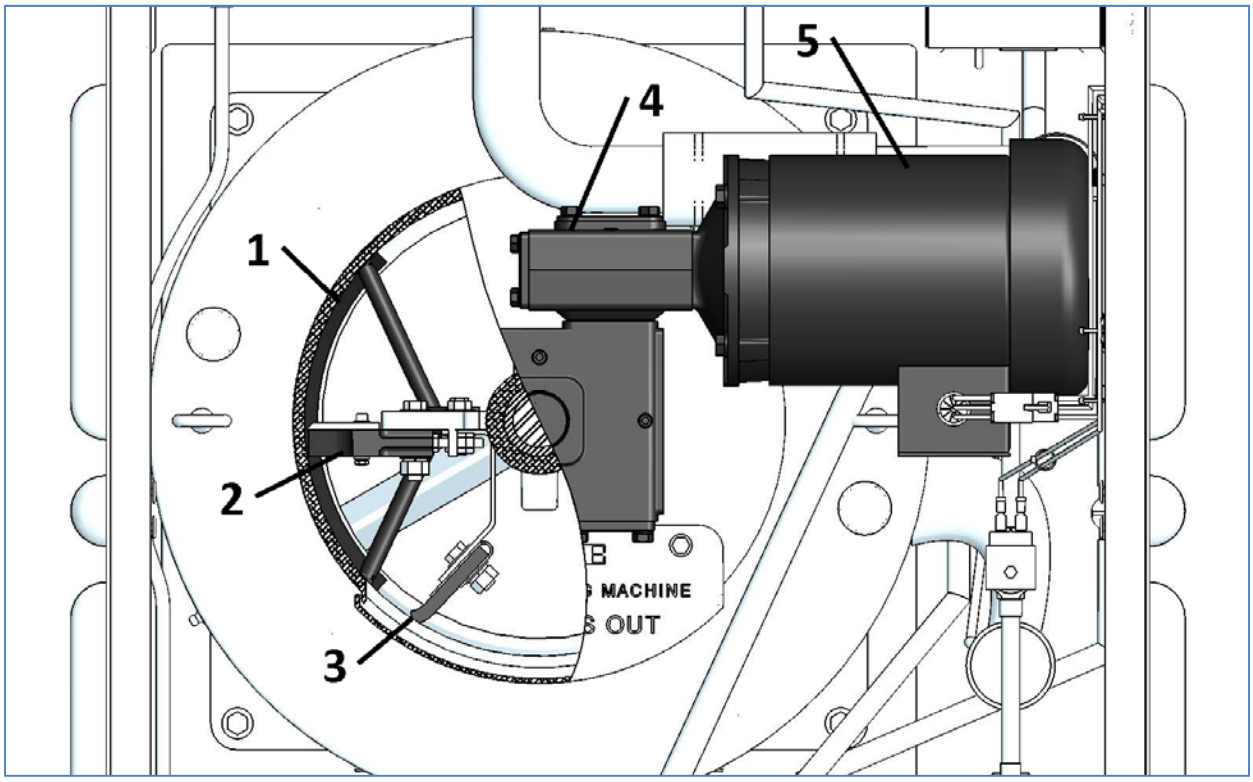
When the infrared beam is blocked, both green LEDs will remain lit. However, the amber LED on the Receiver will go out.

After 15 seconds of the beam being blocked, the Solenoid Valve will de-energize and the Off-Delay Cycle will begin.

Depending upon the adjustment of the Off-Delay Setting, the Driver Motor and Water Pump will continue to operate for between 2 – 30 minutes.

If the Photo Eyes do not operate in this fashion, please consult the Troubleshooting section.

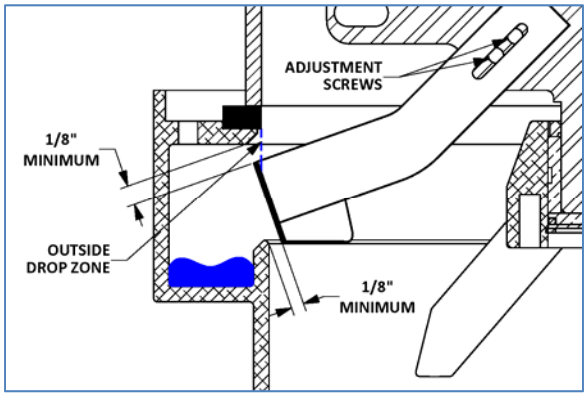
Mechanical Operation



1. Ice Deflector
2. Ice Blade
3. Squeegee
4. Speed Reducer
5. Drive Motor

Ice Deflector

The Ice Deflector prevents ice from dropping into the water return trough.

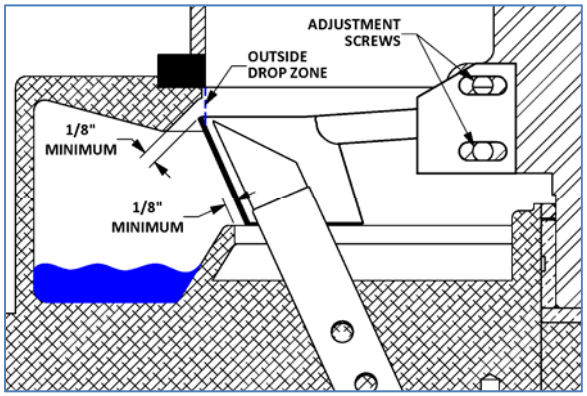


(1000-RLE)

A properly installed Ice Deflector should have the top outer edge positioned outside of the ice drop zone to ensure all falling ice will hit the Ice Deflector.

There should be a minimum 1/8” clearance between the top of the Ice Deflector and the aluminum lip of the Bottom Casting under the Evaporator.

There should also be a minimum 1/8” clearance between the outer edge of the Ice Deflector and the Bottom Casting.



(2000-RLE & 3000-RLE)

The 2000-RLE and 3000-RLE also feature an Ice Deflector Scraper. This plastic arm clears any excess buildup of ice on the Ice Deflector as it passes by the Ice Deflector Scraper.

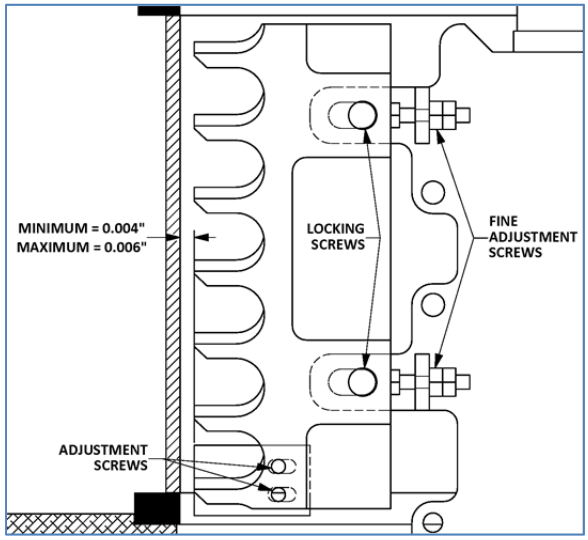
The Ice Deflector should never touch the Ice Deflector Scraper or the Bottom Casting.

Ice Blade

The Ice Blade shatters the ice formed on the Evaporator freezing surface as the Main Shaft rotates.

Ice harvesting problems are often caused by improper refrigeration settings. Adjusting the Ice Blade should be a last resort after all other means have been expended.

The clearance between the outermost tip of the Ice Blade and the Evaporator freezing surface must be between 0.004” and 0.006”.



A set of feeler gauges should be used to determine the distance between the Ice Blade and the Evaporator.

Always check the clearance at a minimum of 6 points on the circumference of the Evaporator.

The Auxiliary Ice Scrapers located at the top and bottom (2000-RLE bottom only) of the Ice Blade remove any ice forming in those areas.

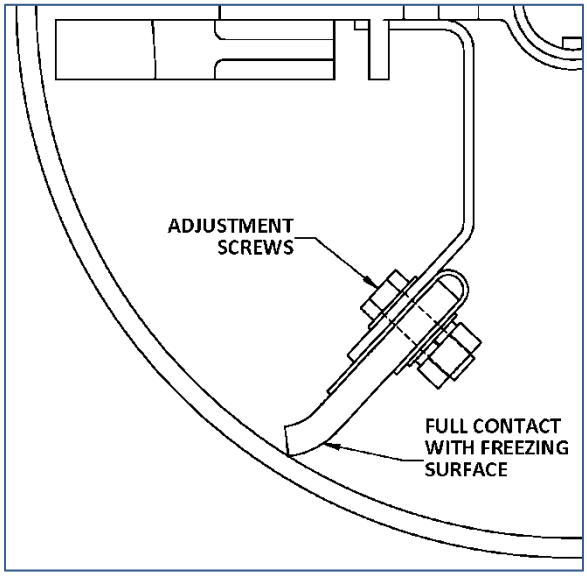
The clearance of the Auxiliary Ice Scraper should be the same or slightly greater than the Ice Blade.

Squeegee

The Squeegee wipes excess water from the freezing surface so that the ice is dry upon production.

The Squeegee must be in full contact with the evaporator freezing surface.

Having a Squeegee not in contact with the freezing surface will create wet ice which causes drag on the Ice Blade. This puts greater stress on the Sleeve Bearings and causes them to wear faster than normal.



The 1000-RLE does not feature a Squeegee. However it has a longer drying time between Ice Blade passes.

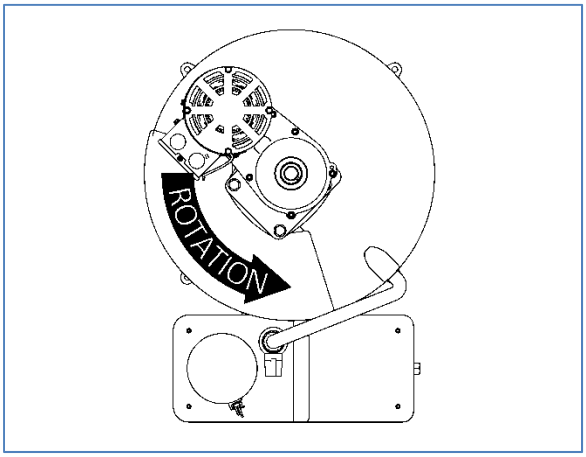
With normal usage, the Squeegee can wear over time. Worn Squeegees need to be trimmed or replaced.

Gear Motor (1000-RLE)

The Gear Motor is a drive motor and speed reducer combined in one single unit.

You should never try to remove the motor or open the housing of the Gear Motor.

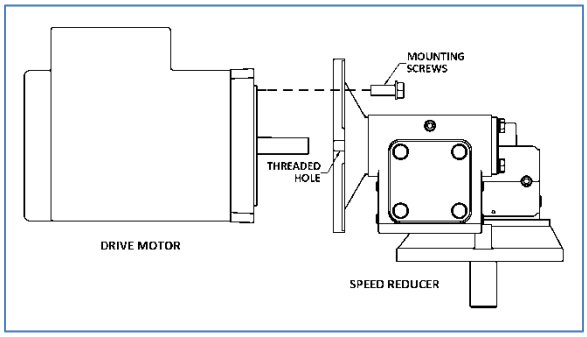
One motor power lead for the Gear Motor should pass through the Overload Sensing Coil on the Control Module no less than (4) times.



The Gear Motor will only fit in the enclosure in the orientation shown above.

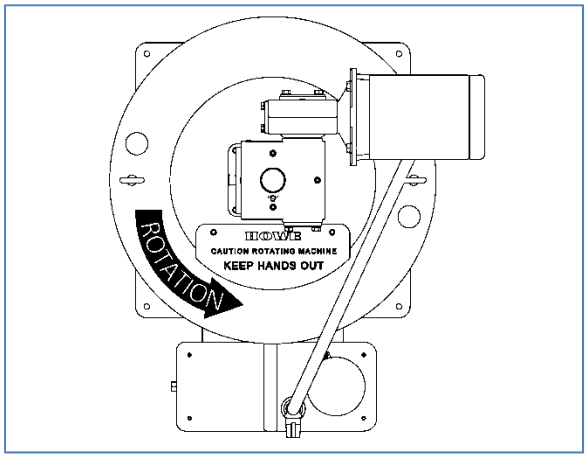
Drive Motor and Speed Reducer (2000-RLE & 3000-RLE)

The Drive Motor is attached to the Speed Reducer by (4) mounting screws. There are no other screws or pins holding the Drive Motor in place.



Drive Motors may provide a good deal of resistance when being removed. There are (2) threaded holes on the face of the Speed Reducer in which the mounting screws can be inserted to help push the Drive Motor away.

One motor power lead for the Drive Motor should pass through the Overload Sensing Coil on the Control Module (1) time.



The Drive Motor and Speed Reducer will only fit in the enclosure in the orientation shown above.

Sleeve Bearings

Ice Flakers have two Sleeve Bearings on the Main Shaft located in the Top Casting and the Bottom Casting.

Over time, normal usage can cause these bearings to wear.

Worn bearings can result in ice harvesting problems and even damage to the Evaporator.

Improper refrigeration setting and lack of maintenance can cause the Sleeve Bearings to wear faster than normal.

Please contact Howe to receive the Sleeve Bearing Replacement Instructions for your model Ice Flaker.

Howe is proud to offer our Factory Rebuild Program as an alternative to replacing parts such as the Sleeve Bearings in the field.

Start-Up Checklist

1. **Is the operating water level in the Water Sump correct?**
   (see Float Valve p.14)
2. **Is the operating water level in the Water Distribution Pan correct?**
   (see Water Distribution Pan p.14)
3. **Is the Stop Valve on Sump Drain connection closed?**
   (see Stop Valve p.14)
4. **Is the Suction Temperature at the Evaporator correct?**
   (see Evaporator Pressure Setting p.17)
5. **Have you visually inspected the freezing surface of the Evaporator?**
   (see Adjusting Refrigeration to the Ice Flaker p.18)
6. **Have you set the Fan Cycling Control (1000-RLE & 2000-RLE only)?**
   (see Fan Cycling Control p.19)
7. **Have you set the Low Pressure Control on the Condensing Unit?**
   (see Low Pressure Control p.19)
8. **Have you run a Field Capacity Check?**
   (see Field Capacity Check p.20)
9. **Have you set the Off-Delay Setting on the Control Module?**
   (see Off-Delay Setting p.22)
10. **Have you set the Motor Overload Setting on the Control Module?**
    (see Motor Overload Setting p.23)
11. **Have you verified proper Sequence of Operation by the Photo Eye sensors?**
    (see Sequence of Operation p.25)
12. **Have you verified proper rotation by the Gear Motor or Drive Motor?**
    (see Gear Motor (1000-RLE) p.28)
    (see Drive Motor and Speed Reducer (2000-RLE & 3000-RLE) p.29)
13. **Have you completed and returned the Ice Flaker warranty registration?**

Maintenance

Preventative Maintenance Schedule

	Page Number	Every 3 Months	Every 6 Months	Every 12 Months
Lubricate Sleeve Bearings	34	•		
Ensure Float Valve is unclogged and flowing freely	14		•	
Verify correct Sequence of Operation of Photo Eye sensors	25		•	
Clean and Sanitize Ice Flaker	32		•	
Replace Water Filter Cartridge	36		•	
Run a Field Capacity Check	19			•
Verify Ice Blade Clearance	27			•
Check Squeegee for excessive and uneven wear	28			•
Check Main Shaft for movement and Sleeve Bearing wear	29			•

Cleaning Procedure

To keep the evaporator in peak performance, the Ice Flaker should be cleaned every 6 months or more often if water conditions dictate.

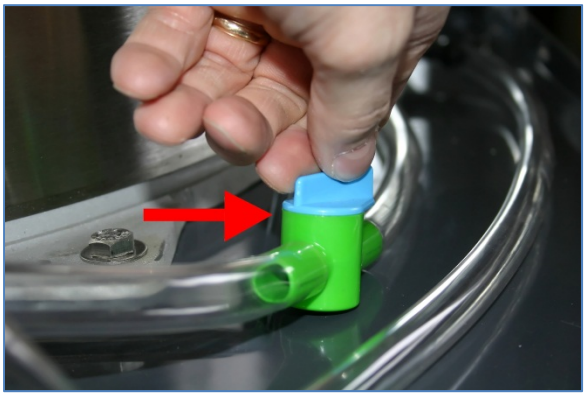
Only use cleaning solutions that are labeled as "Nickel-Safe".

1. Turn the Power Switch "Off" at the Ice Flaker Control Panel.

2. Open Ice Flaker Control Panel and turn Off-Delay timer knob fully clockwise to 30 minutes run time.

3. Remove all ice from Ice Bin.

4. Close water supply at shut-off valve.



5. Open Ice Flaker Stop Valve to allow water to exit from Water Sump. Afterwards close Stop Valve to prevent loss of solution.

6. Prepare approved cleaning solution by following manufacturer's instructions.

7. Pour cleaning solution into Water Sump to a level just below the side opening.

8. Turn Power Switch “On” for 2-3 seconds and then “Off” again at Ice Flaker Control Panel. This will allow cleaning solution to circulate for 30 minutes. It may require several 30 minute cycles to fully clean the Ice Flaker.

9. After cleaning, drain solution as shown in Step 5 except keep Stop Valve open.

10. Fill Water Sump with fresh water. Turn Power Switch “on” for 2-3 seconds and then “Off” again at Ice Flaker Control Panel. This will flush cleaning solution from Ice Flaker while it is being drained.

11. Continue filling Water Sump with fresh water until all cleaning solution is flushed out.

Sanitizing Procedure

1. Mix 16 oz. of household bleach with 2 gallons of warm water (90°F – 115°F).

2. Pour solution into the Water Sump to the normal operating level, then re-circulated the sanitizing solution for approximately 20 minutes by turning on Drive Motor and Water Pump.

3. Drain solution and rinse thoroughly with fresh water at least twice, following the technique described in Cleaning Procedure #10.

4. After the Ice Flaker is thoroughly rinsed, return to normal operation by opening water supply valve, re-adjusting Off-Delay Setting, and restoring refrigeration by turning the Power Switch back to “On”.

Alternate Method: Substitute an approved sanitizer designed for general use in food dispensing equipment in step #1. Mix sanitizing solution according to instructions on the bottle.

Lubrication

Gear Motor Lubrication

The Gear Motor is permanently lubricated and does not normally require re-lubrication.

Speed Reducer Lubrication

All speed reducers are to be filled with Mobil Glygoyle 460 Lubricant only.

When adding or changing oil for any reason, it should be remembered that oils of various types are not compatible with Mobil Glygoyle 460.

Proper oil level is maintained to the Allen head setscrew on the horizontal center line of the Speed Reducer. Oil should drain out when setscrew is removed.

Add oil through top Allen head screw opening until oil seeps out of centered screw opening.

Do not overfill.

Sleeve Bearing Lubrication

The bearings should be greased annually using USDA approved food grade edible grease.

Typically, only one squirt of the grease gun is required or until you feel resistance on the pump.

Use caution to ensure the bearings is not over-greased.

Over-greasing may “pop” the seal out of its normal position.

If over-greased and the seal is popped out of position, the excess grease will need to be removed prior to re-installing the seal.

If seal is damaged due to over-greasing it may need to be replaced.

Water Filtration

The purpose of water filtration is to keep the Ice Flaker clean and operating efficiently.

The value to the user is reduced operating cost due to less maintenance, improved performance and a greater return on investment as result of extended asset life.

There are three primary categories of contaminants that damage and cause the Ice Flaker to operate inefficiently. They are listed here in order of importance with regard to impact.

1. Scale
2. Sediment
3. Chlorine

Scale

Scale or fouling is the accumulation of unwanted material on solid surfaces to the detriment of function. Scale is primarily made up of calcium and magnesium hardness compounds.

It's estimated that scale is responsible for 70% of unscheduled maintenance, inefficient operation, and down time.

Scale forms on wetted surfaces, accumulates in tubing and fittings and interferes with operation.

Sediment

The formation of scale from dissolved minerals is made worse by sediment.

Sediment is suspended particles of dirt, silt and other fine particulate matter that act as a catalyst for scale to form.

Sediment can be detrimental to the condition and performance of the Ice Flaker. Particulates cause added wear on parts and can clog valves and impede flow.

The effects of scale and sediment can be very destructive to the Ice Flaker.

Chlorine

Chlorine is the most common disinfectant used to kill pathogenic organisms in order to make our water safe to drink. However, residual free chlorine in water can contribute to pitting, rust and corrosion of stainless steel.

If not removed from water, chlorine mixes with moisture in the Ice Flaker and Ice bin to form a mild hydrochloric acid. This acid can cause surface rust to form on stainless steel surfaces in one to two years.

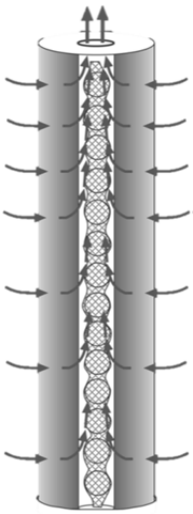
Howe Water Filters

Howe offers a complete line of water treatment systems designed to extend the life and performance of the Ice Flaker.

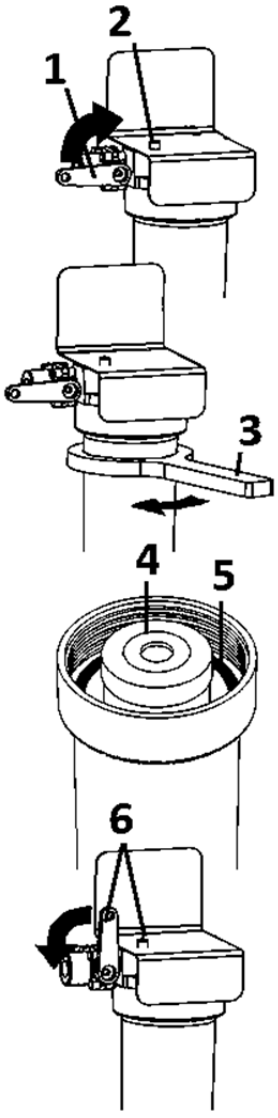
Howe Water Filters inhibit the formation of scale and provides additional corrosion protection.

They remove 95% of all dirt, rust, and sediment larger than 5 microns.

They reduce chlorine to less than 2 PPM to guard against corrosion and improve ice quality.



Water Filter Cartridge Replacement



1. Turn off water filtration system by closing ball valve.
2. Press the red button to release pressure.
3. Remove housing(s) – use filter wrench if necessary. Clean housings with warm water. If desired, disinfect housings using 1/2 teaspoon of household bleach in a bowl of water. Let stand 5 minutes, and then discard.
4. Insert new cartridges into filter housings. Match cartridge model numbers to model numbers on bracket.
5. Make certain the O-ring is properly positioned and reinstall filter housing (hand tighten only).
6. Slightly open the inlet ball valve; push the red pressure relief button to release trapped air until a small amount of water comes out – release the red button and fully open the ball valve.
7. Turn connected equipment back on.

Troubleshooting

(Note: All wire colors are subject to change)

Problem	Possible Cause	Possible Solution
Ice Flaker will not run	1. Unplugged or defective Photo Eye(s).	1. Ensure Molex plugs are properly and securely connected. Place a wire jumper between terminals #10 (blue) and #11(black) at the Level Control Relay (LC1). If Ice Flaker starts, Photo Eyes may be defective and need to be replaced.
	2. Defective Level Control Relay (LC1).	2. Place a wire jumper between terminals #5 (red) and #6 (red) at the Level Control Relay (LC1). If Ice Flaker starts, Level Control Relay (LC1) may be defective and need to be replaced.
	3. No control power from Transformer (T1).	3. Check voltage across Term 1 (purple) and Term 2 (yellow/orange) at Control Module (CM). If 24 VAC not present, Transformer (T1) may be defective and need to be replaced.
	4. Open switch or loose wiring.	4. Place a wire jumper between Term 2 (yellow/orange) and Term 3 (red) at Control Module (CM). If Ice Flaker starts, trace voltage from Term 3. Check all wire terminals and tighten as necessary.
	5. Defective Control Module (CM).	5. Place a wire jumper between Term 2 (yellow/orange) and Term 3 (red) at Control Module (CM). If Ice Flaker does not start, Control Module (CM) may be defective and need to be replaced.
Ice Flaker does not shut down when Ice Bin is full	1. Defective Emitter Photo Eye.	1. Unplug Emitter Photo Eye and wait longer than Off-Delay setting. If Ice Flaker stops, Emitter Photo Eye may be defective and need to be replaced.
	2. Defective Receiver Photo Eye.	2. Unplug Receiver Photo Eye and wait longer than Off-Delay setting. If Ice Flaker stops, Receiver Photo Eye may be defective and need to be replaced.
	3. Level Control Relay (LC1) is jumped out.	3. Check for a wire jumper between terminals #5 (red) and #6 (blue) at Level Control Relay (LC1). If present remove wire jumper.
	4. Defective Control Module (CM).	4. Remove wire from Term 3 (red) at Control Module (CM) and wait longer than Off-Delay setting. If Ice Flaker does not stop, Control Module (CM) may be defective and need to be replaced.
Solenoid Valve will not open	1. Defective Control Module (CM).	1. Verify 24 VAC present across Term 1 (purple) and Term 3 (red) at Control Module (CM). Remove wires and check for continuity between Term 7 (black) and Term 8 (red). If the contacts remain open, Control Module (CM) may be defective and need to be replaced.
	2. Defective Solenoid Valve.	2. Verify control voltage at Solenoid Valve wire leads. If voltage is present, Solenoid Valve may be defective and need to be replaced.
	3. Defective Motor Relay (R1).	3. Place a wire jumper between terminals #6 (yellow) and #7 (black) at Motor Relay (R1). If Solenoid Valve opens, Motor Relay (R1) may be defective and need to be replaced.
	4. Loose wiring.	4. Check all wire terminals and tighten as necessary.

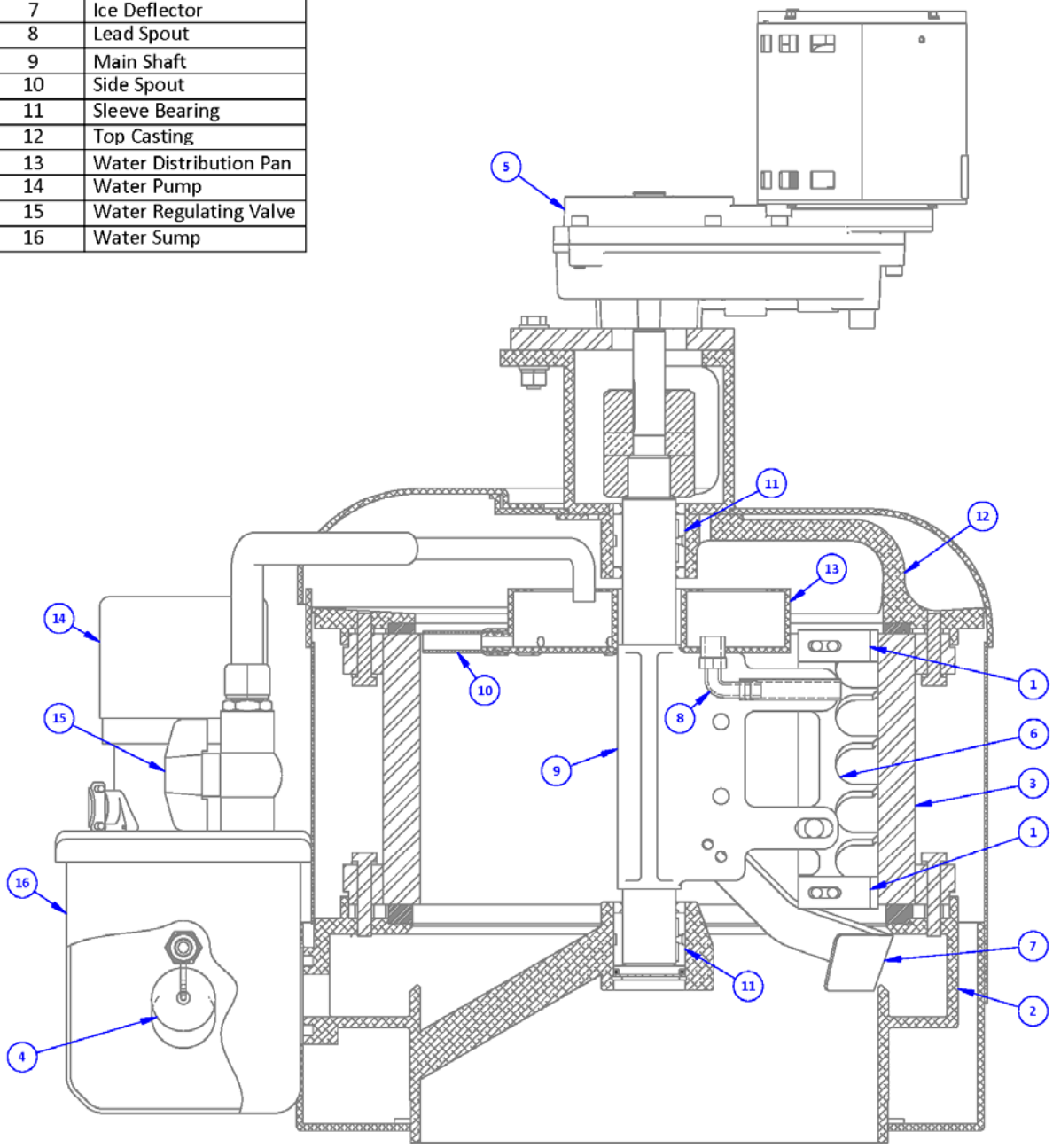
Problem	Possible Cause	Possible Solution
Drive Motor will not run or Ice Flaker in Overload Condition	1. Defective Control Module (CM).	1. Verify 24 VAC present across Term 1 (purple) and Term 3 (red) at Control Module (CM). Check voltage between Term 1 and Term 6 (blue). If no voltage present, Control Module (CM) may be defective and need to be replaced.
	2. Defective Drive Motor.	2. Verify control voltage at Drive Motor wire leads. If voltage is present, Drive Motor may be defective and need to be replaced.
	3. Defective Motor Relay (R1).	3. Place two wire jumpers between terminals #9 (black) and #11 (blue/brown) and terminals #1 (blue/brown) and #3 (black) at Motor Relay (R1). If Drive Motor stars, Motor Relay (R1) may be defective and need to be replaced.
	4. Sleeve Bearings are seized.	4. Remove the Gear Motor from the Mounting Hub or the Speed Reducer from Top Casting and try to push the Ice Blade by hand. If the Ice Blade will not move, the Sleeve Bearings may be seized and need to be replaced.
	5. Gear Motor or Speed Reducer is seized.	5. Remove Gear Motor or Speed Reducer and bring voltage to the motor. If the output shaft cannot turn while not attached to the Ice Flaker, it may be seized and need to be replaced.
	6. Motor Overload setting is too low.	6. Raise the Motor Overload setting at the Control Module (CM). Verify the amperage draw is in correspondence with the nameplate.
	7. Loose wiring.	7. Check all wire terminals and tighten as necessary.
Water Pump will not run	1. Defective Control Module (CM).	1. Verify 24 VAC present across Term 1 (purple) and Term 3 (red) at Control Module (CM). Check voltage between Term 1 and Term 6 (blue). If no voltage present, Control Module (CM) may be defective and need to be replaced.
	2. Defective Water Pump.	2. Verify control voltage at Water Pump wire leads. If voltage is present, Water Pump may be defective and need to be replaced.
	3. Defective Motor Relay (R1).	3. Place two wire jumpers between terminals #9 (black) and #11 (blue/brown) and terminals #1 (blue/brown) and #3 (black) at Motor Relay (R1). If Water Pump starts, Motor Relay (R1) may be defective and need to be replaced.
	4. Loose wiring.	4. Check all wire terminals and tighten as necessary.
Ice does not harvest at the bottom of Evaporator	1. TXV is underfeeding.	1. Adjust refrigeration to Ice Flaker.
	2. System is short of refrigerant.	2. Check for bubbles in the Sight Glass. If present, charge system as needed.
	3. Improper location of TXV sensing bulb.	3. Relocated bulb to 4:30 clock position as originally set by factory.
Ice does not harvest on one side or angular section of Evaporator	1. Sleeve Bearings are worn.	1. Remove Speed Reducer or Gear Motor and check for “play” in Sleeve Bearings. Replace if worn.
	2. Ice Blade clearance is too high.	2. Adjust Ice Blade clearance to proper setting.
Ice accumulates on the ribs of Bottom Casting	1. Ambient Temperature is too low.	1. If ambient temperature is below 50°F, relocate Ice Flaker to a warmer area. Contact Howe about Low Ambient Kit.

Problem	Possible Cause	Possible Solution
Ice Blade is frozen in-place	1. Motor Overload setting is too high. 2. Ice is freezing too thick or too hard. 3. Drive Motor has stopped. 4. Flex Coupling is broken.	1. Adjust the Motor Overload setting at the Control Module (CM). 2. Adjust refrigeration to Ice Flaker. 3. See “Drive Motor will not start” above. 4. Check and replace Flex Coupling as necessary.
Ice Flaker not meeting rated capacity	Run Field Capacity Check before making any adjustments (see p.20).	
	1. Incorrect Evaporator Temperature. 2. Supply water temperature is outside mandatory range. 3. Ambient temperature is outside mandatory range.	1. Adjust refrigeration to Ice Flaker. 2. Adjust supply water to between 45°F and 90°F. For temperatures below range, contact Howe about Low Temperature Mixing Valve. 3. Adjust ambient temperature to between 50°F and 100°F. In unable to adjust, relocate the Ice Flaker. For temperatures below range, contact Howe about Low Ambient Kit.
Ice freezes together in the Ice Bin	1. Water Distribution Pan is overflowing. 2. Water from Side Spouts or Lead Spout is not reaching freezing surface of Evaporator. 3. Water is “ramping” off rings of ice formed on Evaporator. 4. Ice Bin is not draining properly. 5. Ice turnover is low and Ice Bin inventory has become stale and clumped by lengthy storage time.	1. Adjust Water Regulating Valve so the Water Distribution Pan is halfway full. 2. Clean spouts of any debris or blockages. Make sure all spouts are perpendicular to and within reasonable distance from surface of Evaporator. 3. Adjust refrigeration to the Ice Flaker. 4. Check that all drains are flowing freely and pitched away from Ice Bin. 5. Use or discard ice within a reasonable time of producing it. Contact Howe about Energy Saver Ice Production Management System.
Condensing Unit is in Low Suction Pressure Pump Down	1. Lack of refrigerant. 2. Insufficient water supply. 3. Refrigeration line blockage.	1. Check for leaks and repair. Add refrigerant. 2. Replace Water Filter. Check for clogged tubes or valves. 3. Check filter drier, TXV, EPR and replace as necessary.
Condensing Unit is off on Low Oil Pressure Failure	1. Lack of refrigerant. 2. Refrigerant flood back. 3. Improper piping or traps.	1. Check for leaks and repair. Add refrigerant. 2. Adjust refrigeration to Ice Flaker. 3. Correct piping.
Condensing Unit is off on High Discharge Pressure Failure	1. Non-condensables in the system. 2. System is overcharged with refrigerant. 3. Fan is not running.	1. Remove the non-condensables. 2. Remove excess refrigerant. 3. Check Fan Cycling Control and adjust as necessary.

Appendix

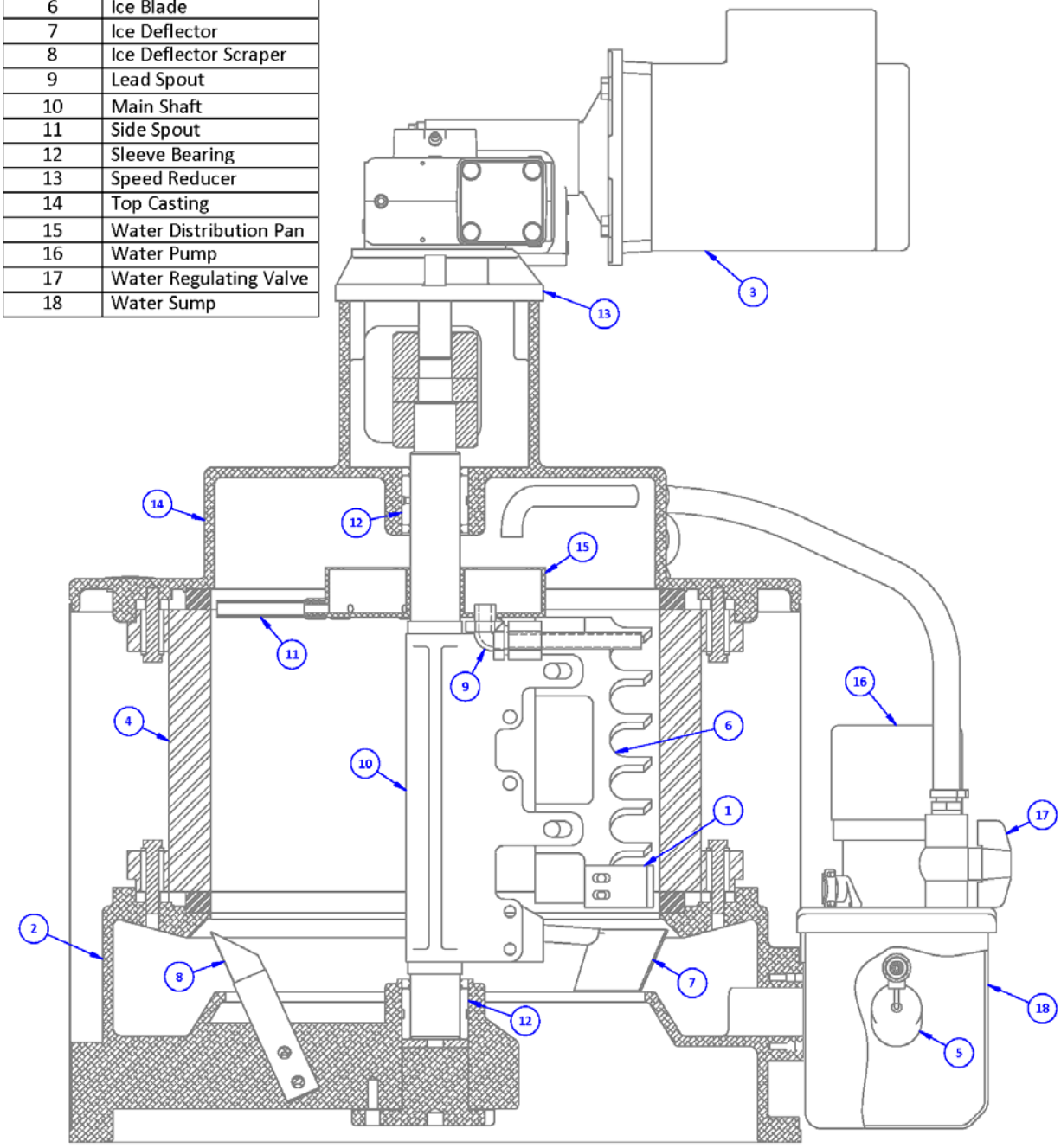
Cut View – 1000-RLE

Item No.	Part Description
1	Auxiliary Ice Scraper
2	Bottom Casting
3	Evaporator
4	Float Valve
5	Gear Motor
6	Ice Blade
7	Ice Deflector
8	Lead Spout
9	Main Shaft
10	Side Spout
11	Sleeve Bearing
12	Top Casting
13	Water Distribution Pan
14	Water Pump
15	Water Regulating Valve
16	Water Sump

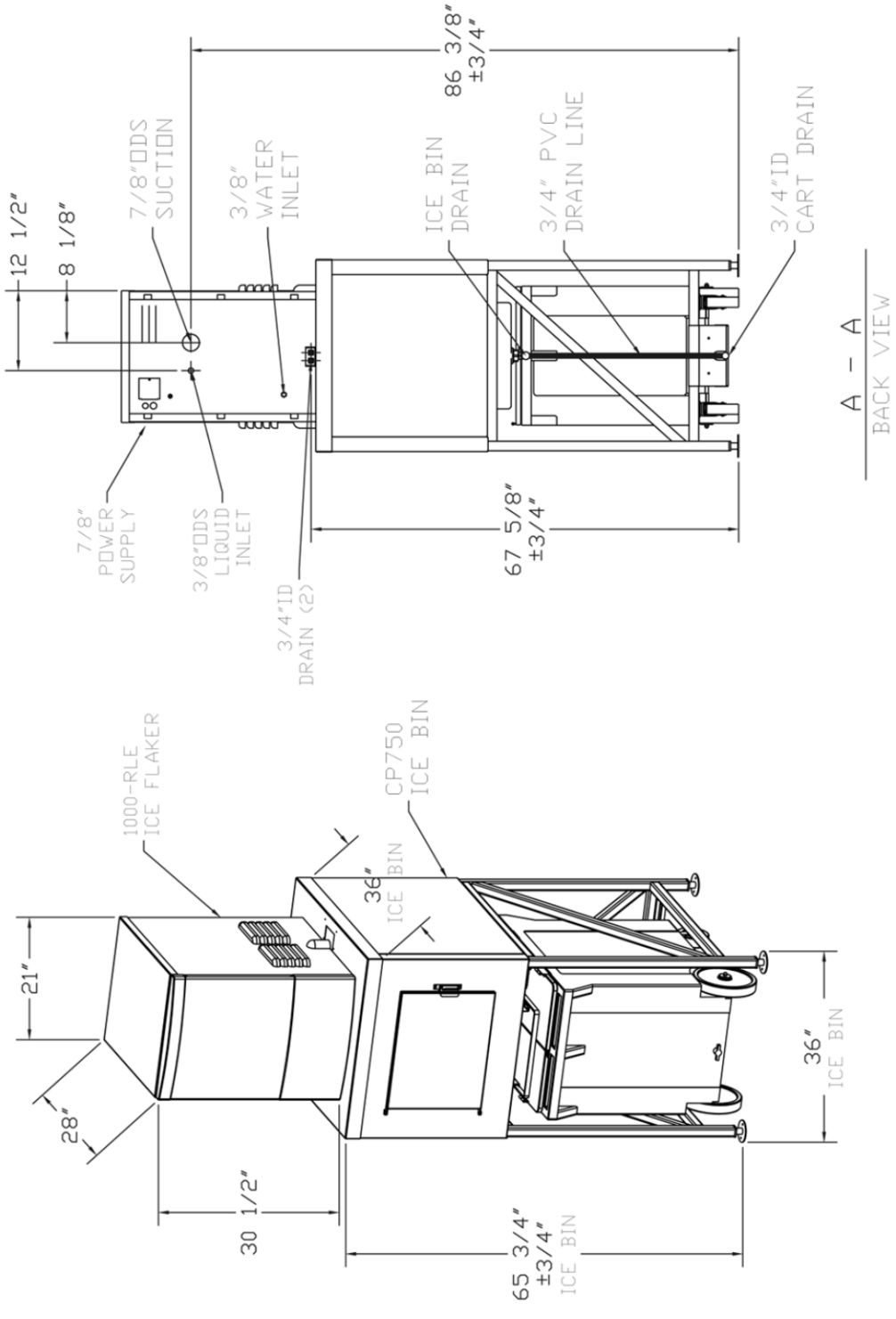


Cut View – 2000-RLE & 3000-RLE

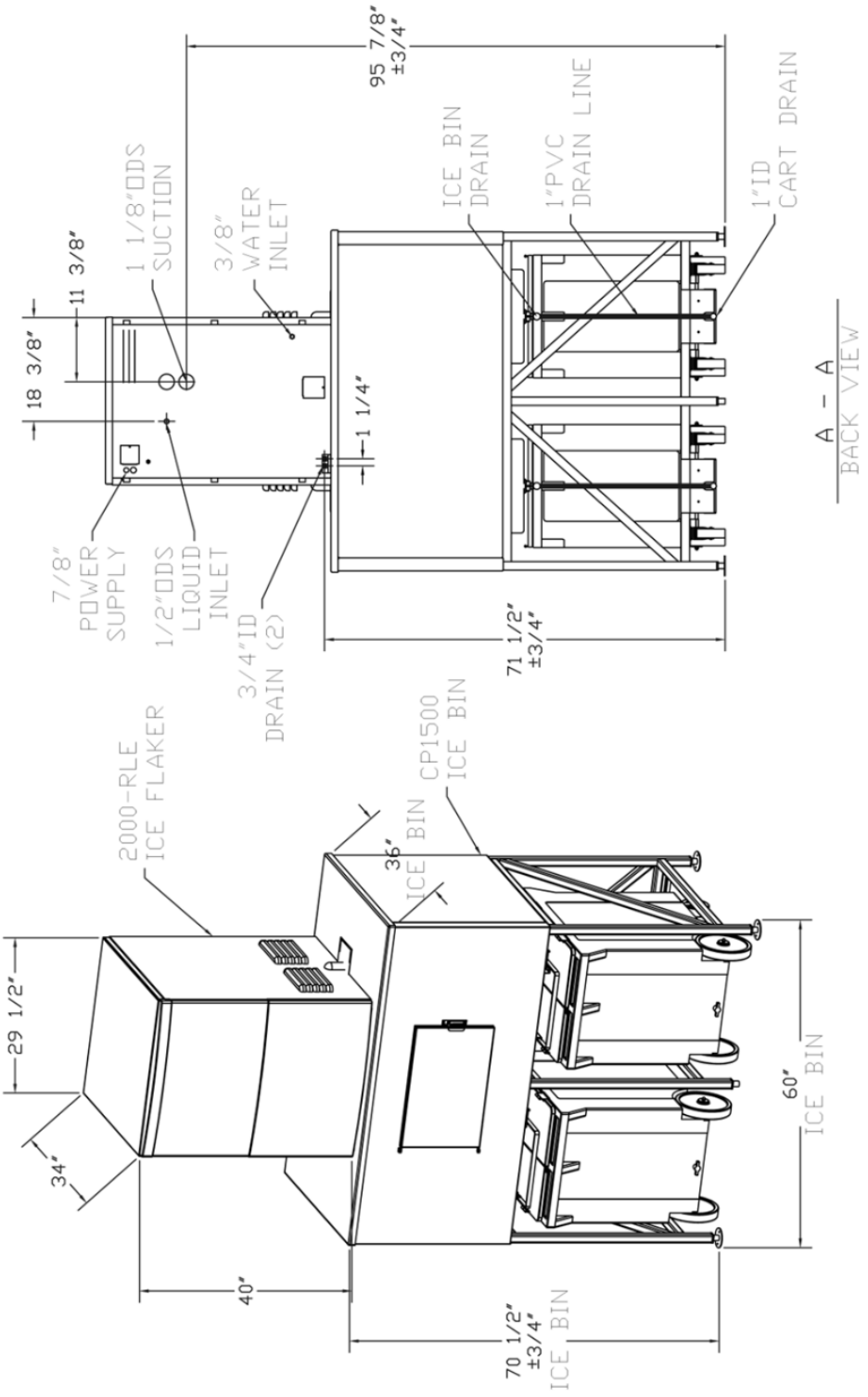
Item No.	Part Description
1	Auxiliary Ice Scraper
2	Bottom Casting
3	Drive Motor
4	Evaporator
5	Float Valve
6	Ice Blade
7	Ice Deflector
8	Ice Deflector Scraper
9	Lead Spout
10	Main Shaft
11	Side Spout
12	Sleeve Bearing
13	Speed Reducer
14	Top Casting
15	Water Distribution Pan
16	Water Pump
17	Water Regulating Valve
18	Water Sump



Assembly Drawing – 1000-RLE Ice Flaker & CP750 Mobile Express Ice Bin

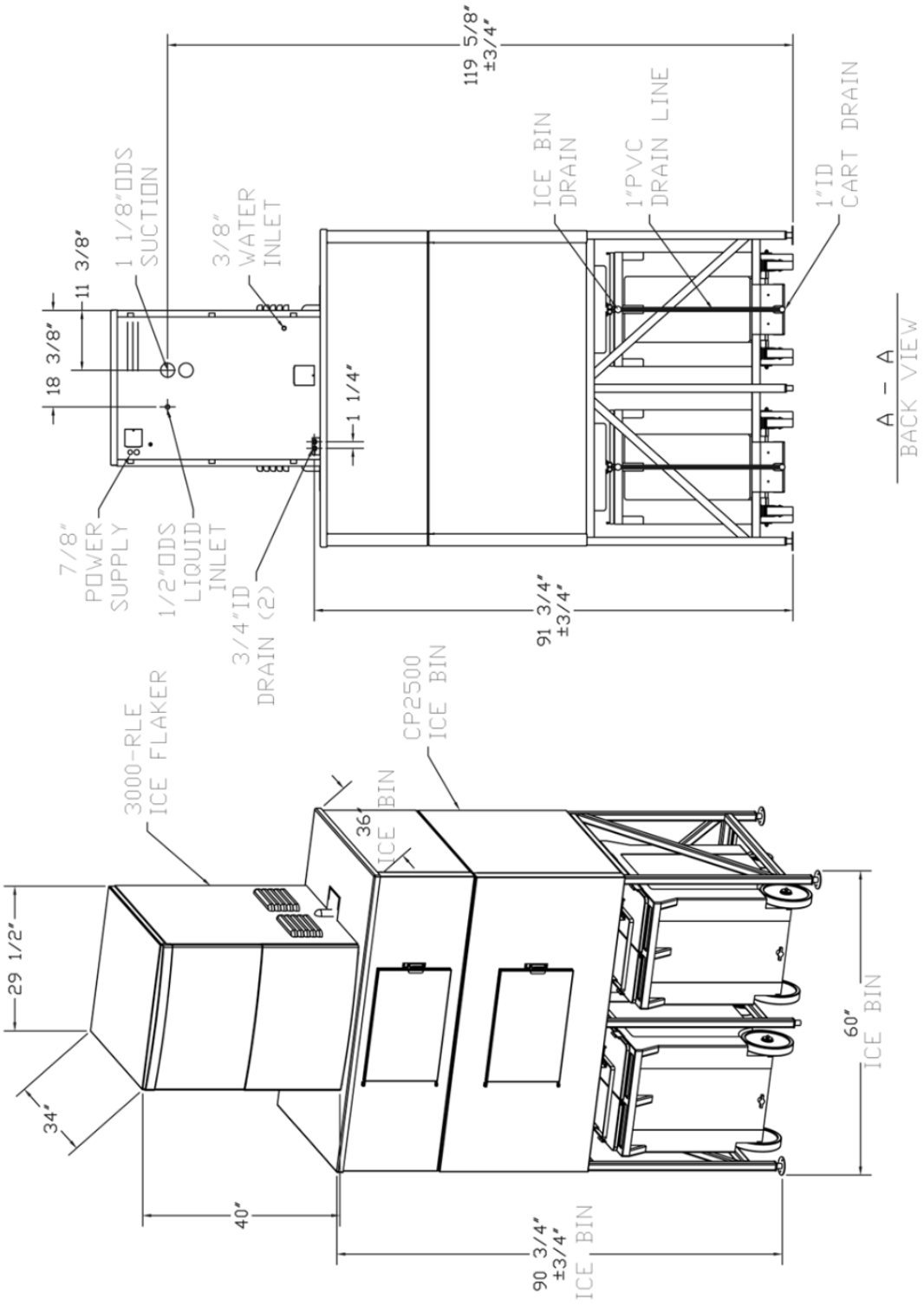


Assembly Drawing – 2000-RLE Ice Flaker & CP1500 Mobile Express Ice Bin



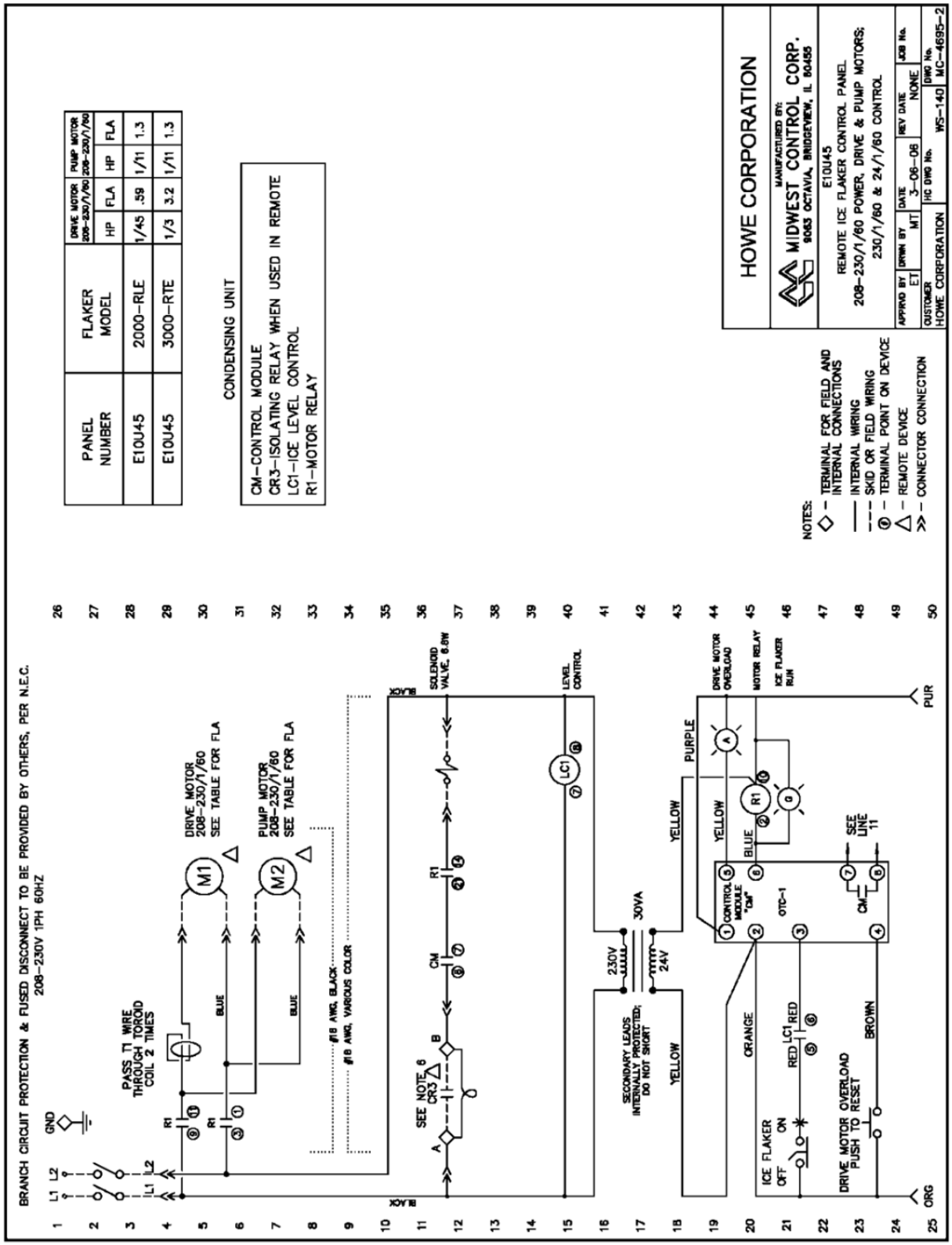
Appendix

Assembly Drawing – 3000-RLE Ice Flaker & CP2500 Mobile Express Ice Bin



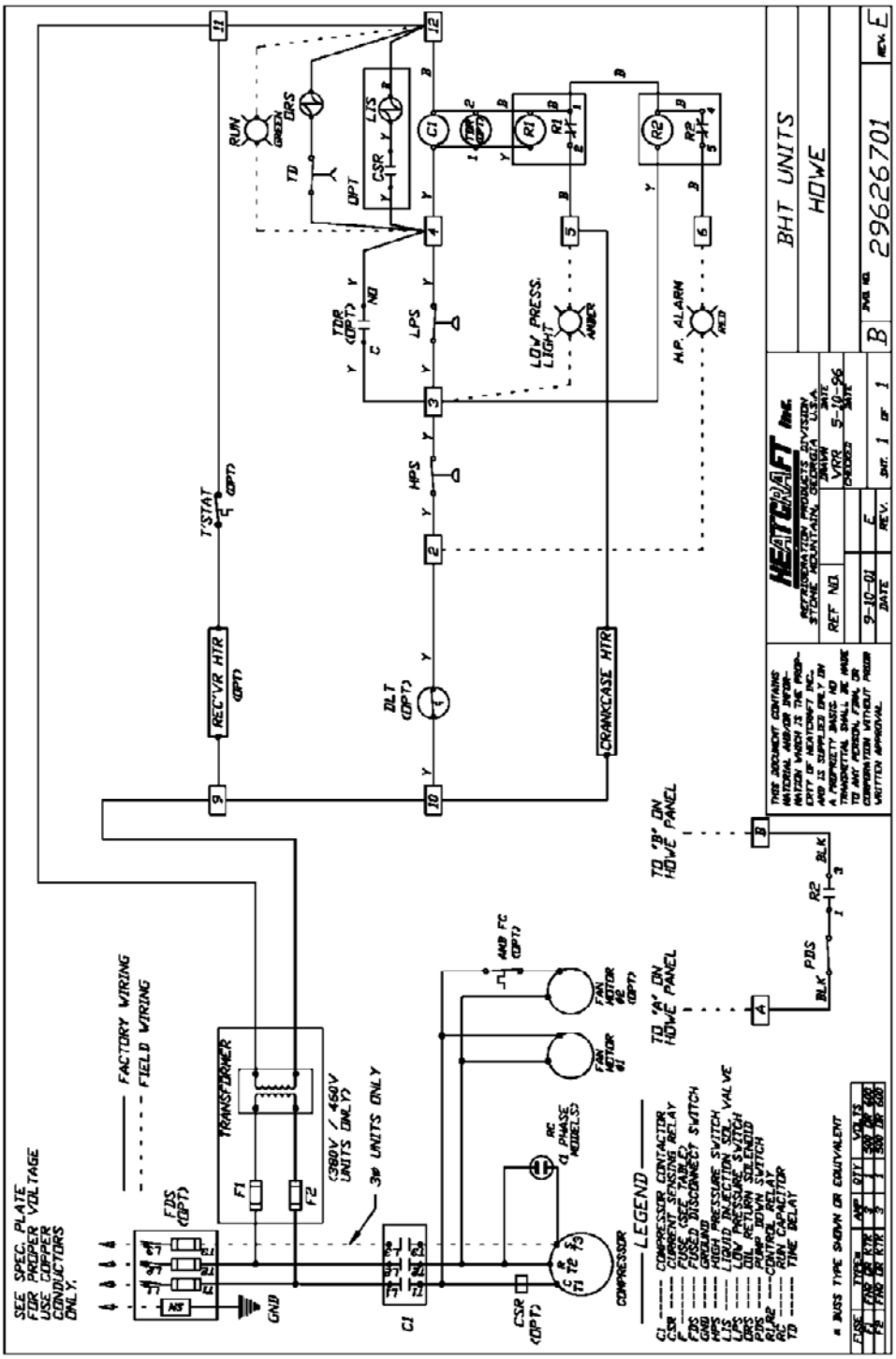
Appendix

Wiring Diagram – Ice Flaker

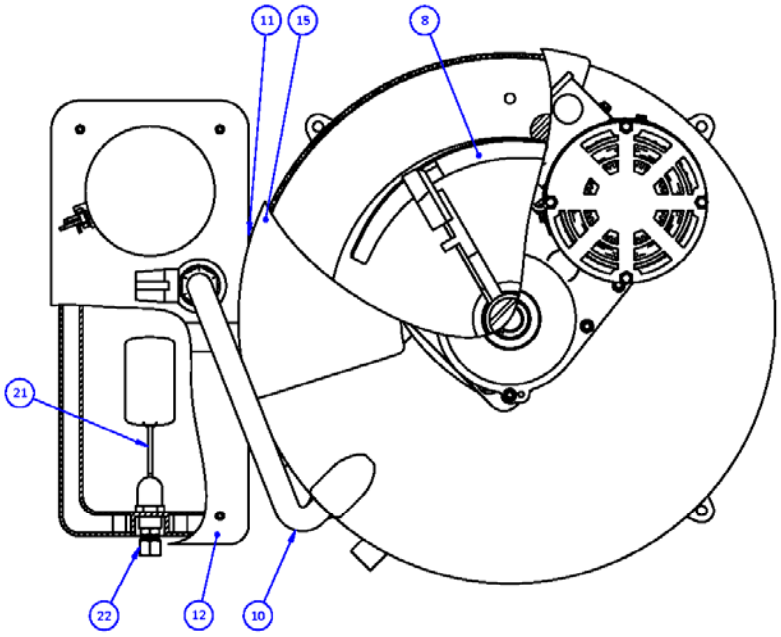


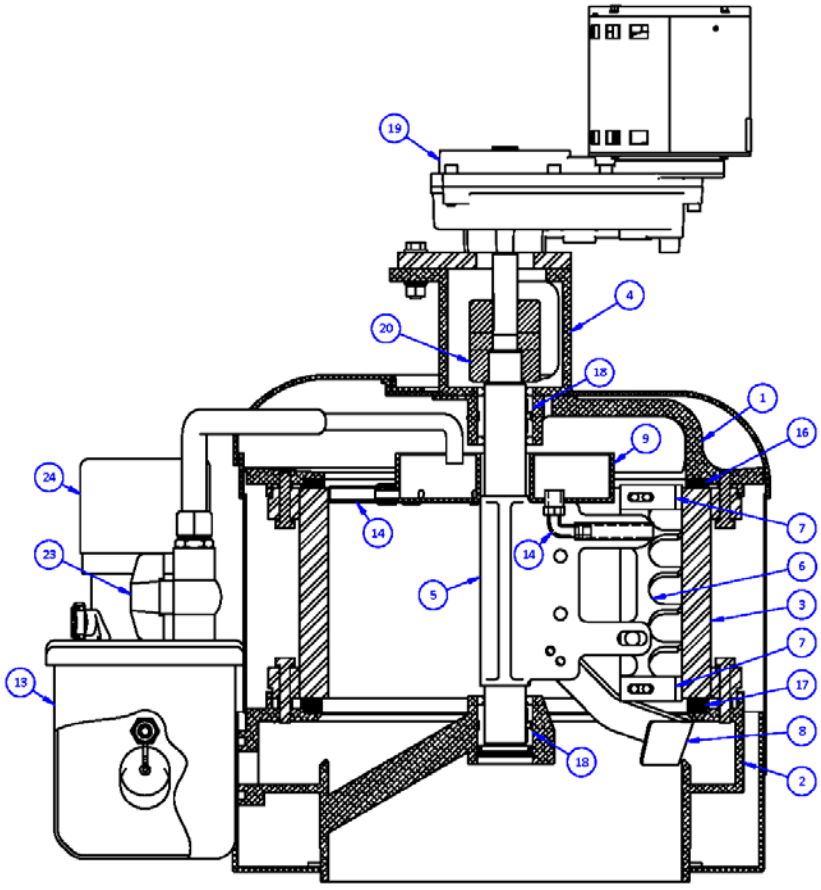
Wiring Diagram – 230/3/60 Air-Cooled Condensing Unit supplied by Howe Corporation

For other voltages please have a serial number and contact Howe Corporation for the correct wiring diagram. If condensing unit was not supplied by Howe Corporation – contact condensing unit manufacturer for the correct wiring diagram



Parts List (1000-RLE)



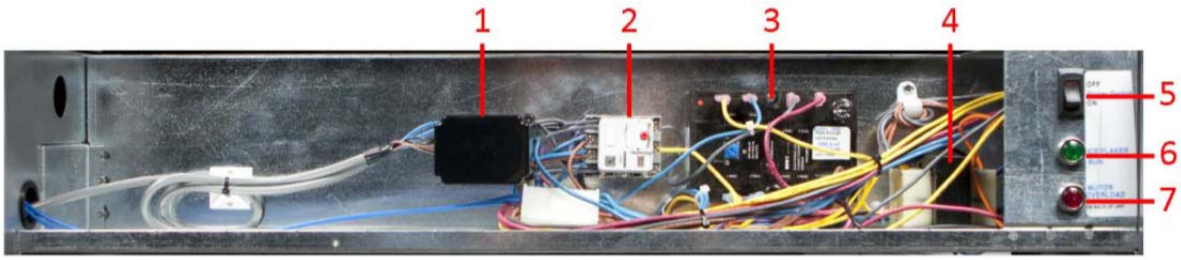


Non-Replaceable Parts		
Item No.	**Description**	**Part No.**

1	Top Casting	F5A4
2	Bottom Casting	F5B10
3	Evaporator	F5C13

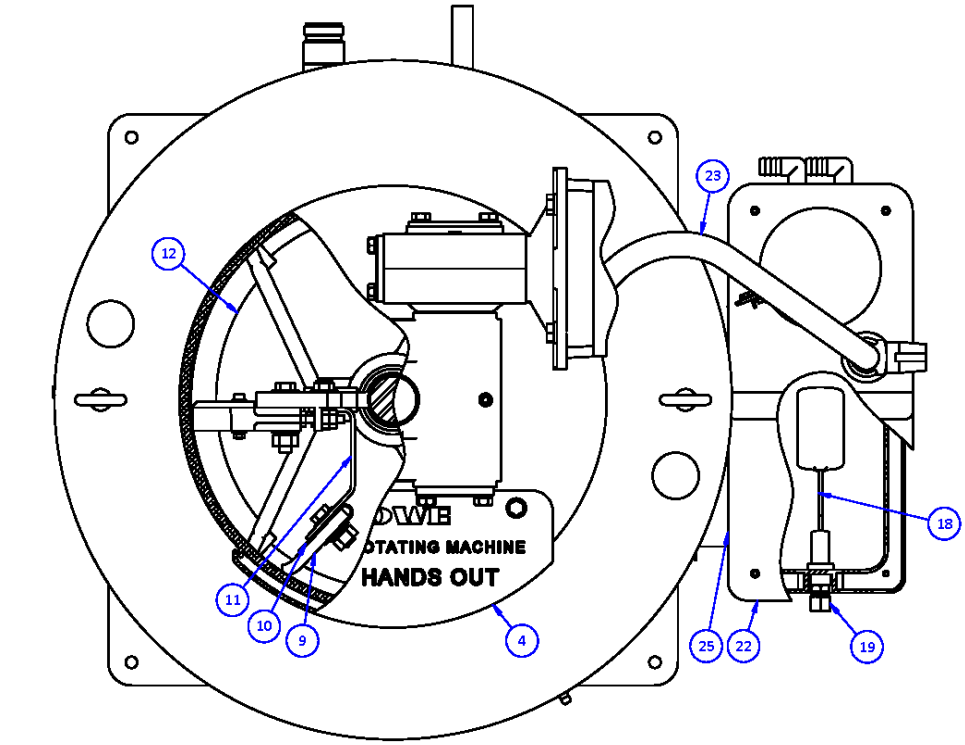
Replacement Parts			
Item No.	**Description**	**Includes**	**Part No.**
4	Coupling Hub Kit	Coupling Hub Hardware	F5A6-KT
5	Main Shaft		F5D2
6	Ice Blade		F5E1
	Ice Blade Adjustment Gauge Kit	Set of 7 Gauges	E10E15
7	Auxiliary Ice Scraper		F5E2
8	Ice Deflector		F5G1
9	Water Distribution Pan Kit	Lead Spout Side Spouts Water Distribution Pan	F5H5
	Water Distribution Pan Side Spout		F5H6
	Water Distribution Pan Lead Spout		F5H30
10	Water Tube Kit	Compression Fitting Copper Water Tube Insulation Water Regulating Valve	F5H11-KT
11	Water Sump Gasket		F5H18
12	Water Sump Cover		F5H25-4
13	Water Sump Kit	Float Valve Water Pump Water Regulating Valve Water Sump Gasket Water Sump Water Sump Covers	F5H26-P
14	Water Distribution Spout Kit	Lead Spout Side Spouts	F5H30-KT
15	Handhole Cover		F5I2
16	Top Insulating Ring		F5J4
17	Bottom Insulating Ring		F5J8
18	Bearing Kit	Oil Seals Sleeve Bearings Bearing Thrust Plate Bottom Bearing Disc Lock Ring O-Ring	F5K7
19	Gear Motor Kit	Adapter Plate Gear Motor Flexible Coupling Hardware	F5M1-KT
20	Flex Coupling		F5N1
21	Float Valve		E10H79
23	Water Regulating Valve		E10H59
24	Water Pump		E10Q7-P

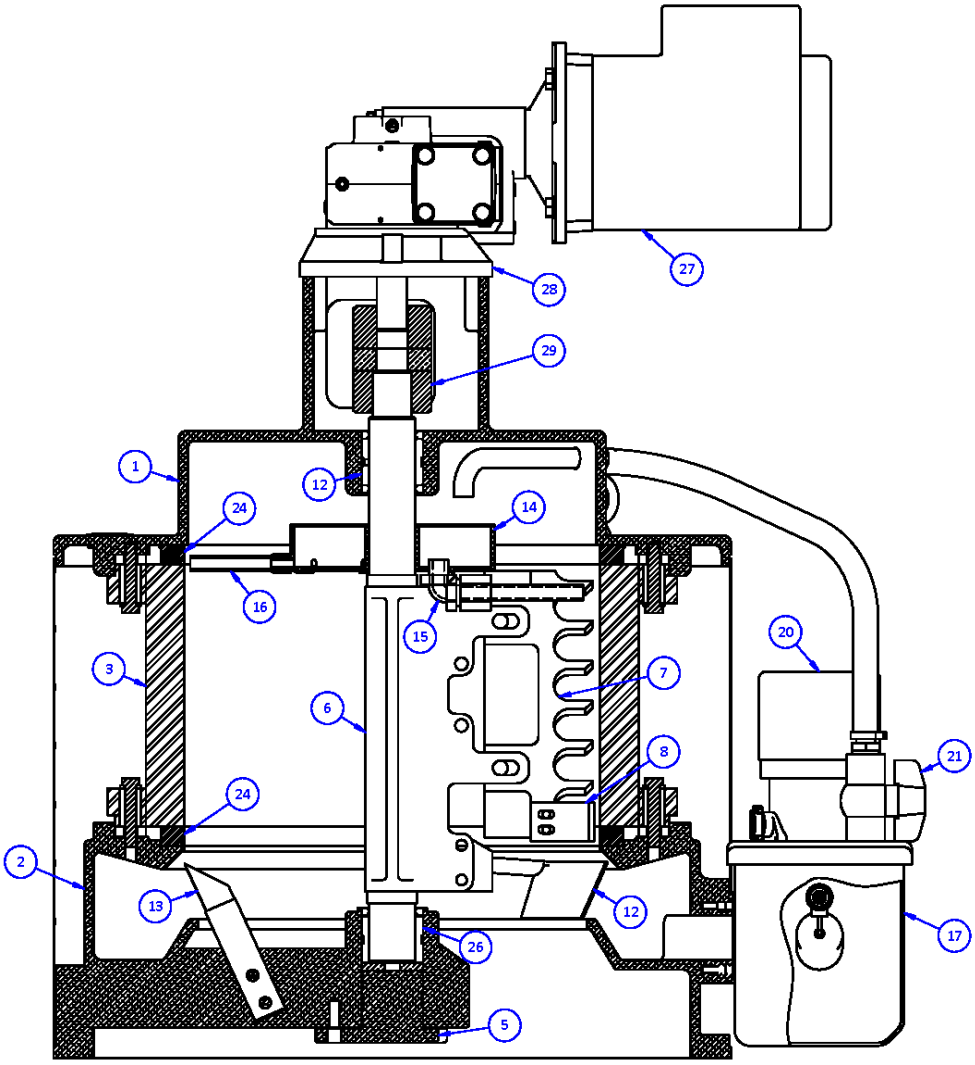
Parts List (Control Panel & Miscellaneous)



Replacement Parts		
Item No.	**Description**	**Part No.**
1	Ice Level Control Relay	E20T68
2	Motor Relay	F5T2
3	Control Module	E20T48
4	Transformer	E20T31
5	Power Switch	E20T24
6	Ice Faker Run Indicator Light	LGX-24
7	Motor Overload Indicator Light	LRN-24
	Overload Reset Button (N.O.)	E20T23
	Ice Level Control Emitter	E20T104
	Ice Level Control Receiver	E20T105
	Replacement Filter Cartridge	E10H56
	Replacement O-Ring	E10H74
	Filter Wrench	SW-1
	R-404A / R-507 Balance Port TXV Valve	F5V20-KT
	R-404A / R-507 Standard TXV Valve	F5V18-KT
	R-22 / R-407 Balance Port TXV Valve	F5V17-KT
	R-22 / R-407 Standard TXC Valve	F5V19-KT
	Solenoid Valve	B6S1-038
	Ice Machine Cleaner (Nickel Safe)	E10V1
	Ice Machine Sanitizer	E10V31
	USDA Bearing Lubricant	E20K6

Parts List (2000-RLE & 3000-RLE)



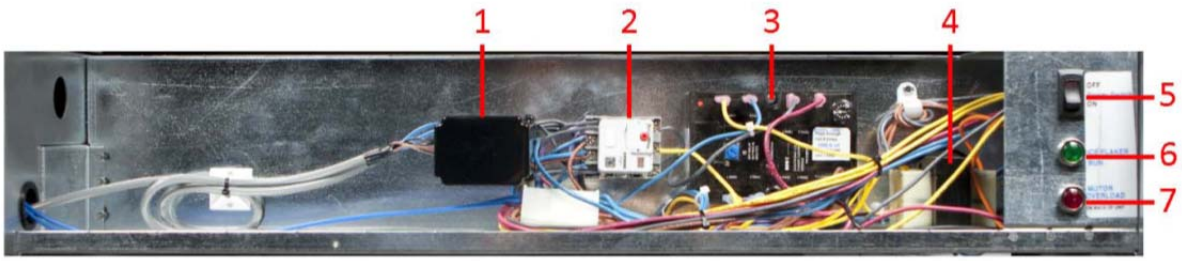


Non-Replaceable Parts			
Item No.	Description	Part No.	
		2000-RLE	3000-RLE
1	Top Casting	E10A2	
2	Bottom Casting	E10B2	
3	Evaporator	E10C1	E15C1

Replacement Parts				
Item No.	Description	Includes	Part No.	
			2000-RLE	3000-RLE
4	Handhole Cover		E10A5	
5	Bottom Bearing Cover		E10B8	
6	Main Shaft		E10D2	E15D2
7	Ice Blade		E10E2	E20E2
	Feeler Gauge Kit	Set of 7 gauges	E10E15	
8	Auxiliary Ice Scraper		E20E4	
9	Squeegee		E10F4	E20F4
10	Squeegee Wrapper		E10F9	E20F9
11	Squeegee Bracket		E10F11	E15F6
	Ice Deflector Kit	Ice Deflector Scraper Scraper Backing Plate	E10G6-KT	
12	Ice Deflector		E10G1	
13	Ice Deflector Scraper Kit	Scraper Scraper Backing Plate	E20G9-KT	
14	Water Distribution Pan Kit	Lead Spout Side Spouts Water Distribution Pan	E10H51	
15	Water Distribution Bottom Spout		E10H17	
16	Water Distribution Side Spout	6 Required	E10H73	
17	Water Sump Kit	Float Valve Water Pump Water Regulating Valve Water Sump Water Sump Covers Water Sump Gasket	E10H61-P	
18	Water Float Valve		E10H79	
20	Water Pump		E10Q7-P	
21	Water Regulating Valve		E10H59	
22	Water Sump Cover		F5H25-4	
23	Water Tube Kit	Compression Fitting Copper Water Tube Insulation Water Regulating Valve	E10H67-KT	
24	Insulating Ring	2 Required Top & Bottom	E10J1	
25	Water Sump Gasket		E20J2	
26	Bearing Kit	Oil Seals Sleeve Bearings Bottom Bearing Disc Gasket	E20K4	
	Bearing Removal Tool Kit		E10T1	
27	Drive Motor; 208-230/1/60 TEFC		E20M3-P	

Replacement Parts				
Item No.	Description	Includes	Part No.	
			2000-RLE	3000-RLE
	Drive Motor; 220/1/50 ODP		E20M10	
28	Speed Reducer; 60 hz		E10R5	E10R6
	Speed Reducer, 50 hz		E10R5	
29	Flex Coupling		E10N4	
	Heater Elements	3 Required	HT150X240-037X50	
	Speed Reducer Oil (Synthetic)		SR-OIL-SYN	
	R-404A / R-507 Balance Port TXV Valve	TXV Strainer	E10V25-KT	E15V7-KT
	R-404A / R-507 Standard TXV Valve	TXV Strainer	E10V23-KT	E15V6-KT
	R-22 / R-407 Balance Port TXV Valve	TXV Strainer	E10V24-KT	
	R-22 / R-407 Standard TXV Valve	TXV Strainer	E10V22-KT	E15V5-KT
	Solenoid Valve		B6S1-050	

Parts List (Control Panel & Miscellaneous)



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	Ice Level Control Emitter	E20T104
	Ice Level Control Receiver	E20T105
	Replacement Filter Cartridge	E10H57
	Replacement O-Ring	E10H63
	Filter Wrench	SW-4
	Ice Machine Cleaner (Nickel Safe)	E10V1
	Ice Machine Sanitizer	E10V31
	USDA Bearing Lubricant	E20K6