HOWE®

Rapid Freeze ICE FLAKERS
INSTALLATION & SERVICE MANUAL
and parts catalog
General Purpose Flake Ice Machines
1000,2000, & 3000

- **Remote Low side Series (RLE)**
- **Remote High Side Condensing units (RHS)**
- **Mobile Express Storage bins (CP)**

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Notice

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The information contained herein is applicable to the specified models current at the time of publication. Some information in this manual will be of use to owners of older model machines. The reader is cautioned that use of this manual with older equipment is at the user's risk. Howe Corporation makes no warranty or guarantee, explicit or implicit with regard to the use of this manual with equipment models outside the scope of this manual. If in doubt of the scope of this manual, contact Howe Corporation.

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Introduction

Howe Rapid Freeze flakers are available world-wide in over 2000 Howe locations.

The Howe Rapid Freeze Flaker is backed by over 50 years of proven performance and innovation. Long known for durability and reliability, our flake ice equipment is unsurpassed in energy efficiency and low maintenance.

Available in a wide variety of sizes and configurations, the rugged Rapid Freeze Flaker can be found in diverse applications from supermarkets and food processors to remote fishing villages.

Rapid Freeze Energy Efficiency

The Rapid Freeze Flaker Ice Machine enjoys a world renowned reputation for having one of the highest energy efficiency rating (EER) of any ice maker on the market. With energy usage of 30 - 40% below that of many competitors' models, the Rapid Freeze ice machine offers an outstanding value.

In addition to high energy efficiency, the Rapid Freeze Flaker is extremely dependable with very low maintenance cost. Overall, the cost of owning and operating a Howe Rapid Freeze Flaker is one of the lowest in the industry.

Important Safety Information

The Information found in this manual is intended for use by individuals possessing adequate backgrounds of electrical, refrigeration and mechanical experience. Any attempt to repair or make alterations to this equipment may result in personal injury or property damage. The manufacturer or seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

Special Precautions To Be Observed When Charging Refrigeration Systems

Only technically-Qualified persons, trained and Certified in the handling of refrigerant and operation of refrigeration systems, should perform the operations described in this manual.

If a refrigeration system is being charged from refrigerant cylinders, disconnect each cylinder when empty or when system is fully charged. A gauge should be installed in the charging line to indicate the refrigerant cylinder pressure. The cylinder may be considered empty of liquid R-22 refrigerant when the gauge pressure is 25 pounds or less and there is no frost on the cylinder. Close the refrigerant charging valve and cylinder valve before disconnecting the cylinder. Loosen the union in the refrigerant line, SLOWLY and CAREFULLY, to relieve refrigerant pressure in the charging hose.

***** WARNING *****

Never open charging valve allowing refrigerant to vent directly to atmosphere. Refrigerant must be reclaimed through a recovery system.

***** WARNING *****

Always store cylinders containing refrigerant in a cool place. They should never be exposed to temperatures higher than 125ºF and should be stored and secured in a manor to prevent abnormal mechanical shocks.

Safety Symbols & What They Mean

Please read and understand this manual prior to installing or operating this Rapid Freeze7 Ice Flaker. You must be completely familiar with the start-up, operation and service of this Flaker BEFORE you attempt to start, operate or adjust this piece of equipment.

These safety symbols will alert you to any special precautions throughout this manual.

***** DANGER *****

BEWARE OF HAZARDS WHICH CAN RESULT IN PERSONAL INJURY

***** DANGER *****

***** WARNING *****

"DO IT RIGHT" OR RISK SEVERE PERSONAL INJURY.

FOLLOW INSTRUCTIONS.

***** WARNING *****

***** CAUTION *****

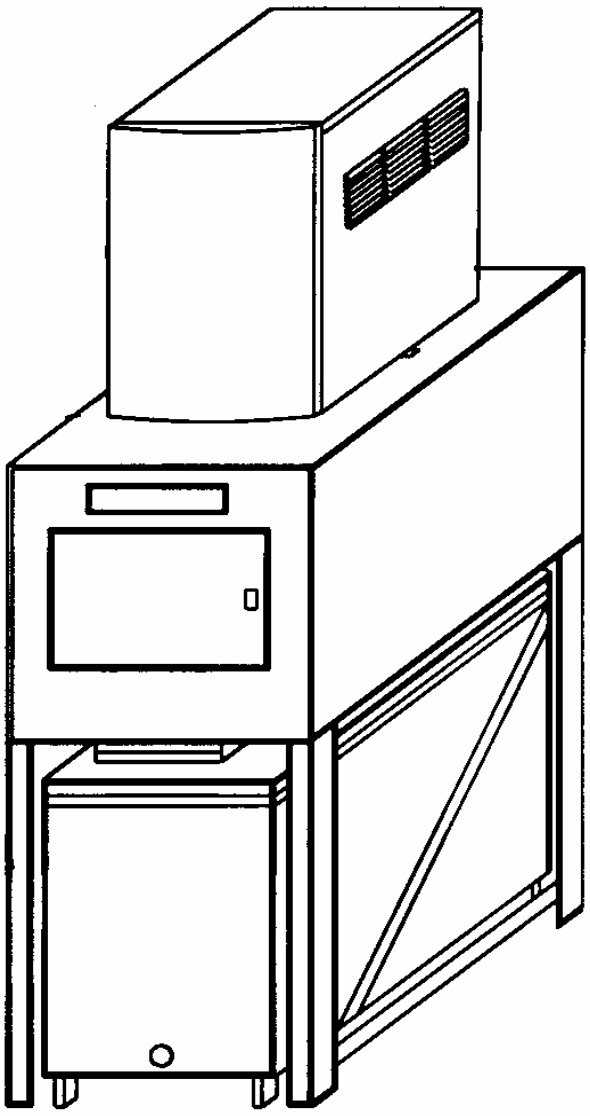
BE CAREFUL NOT TO HURT YOURSELF OR TO DAMAGE THE EQUIPMENT.

FOLLOW INSTRUCTIONS.

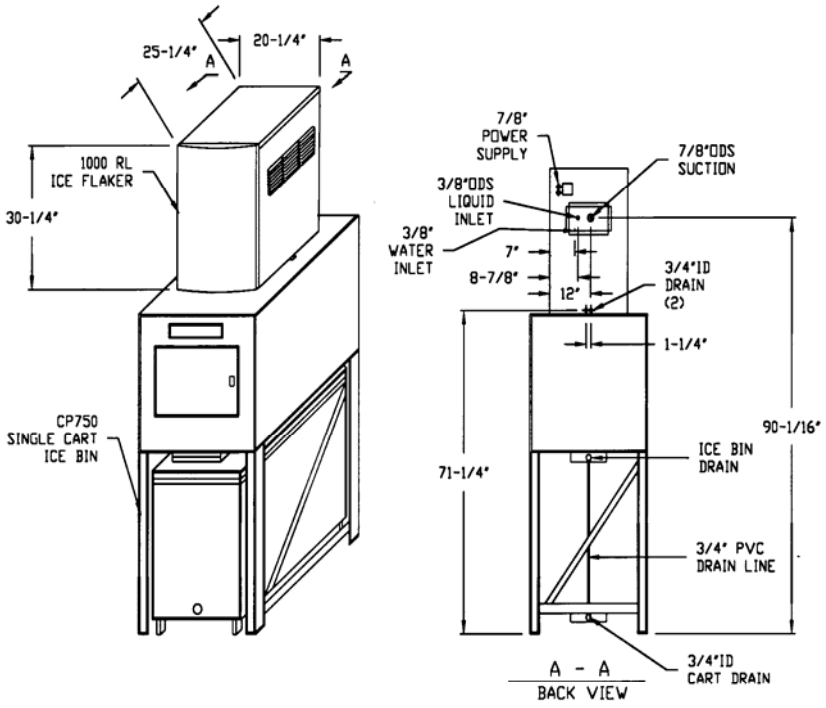
***** CAUTION *****

TYPICAL INSTALLATION DRAWING
(Exhibit 1)

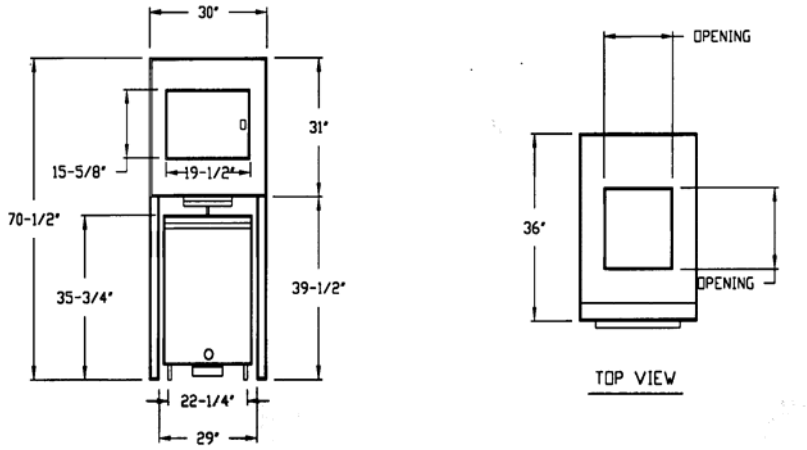
1)



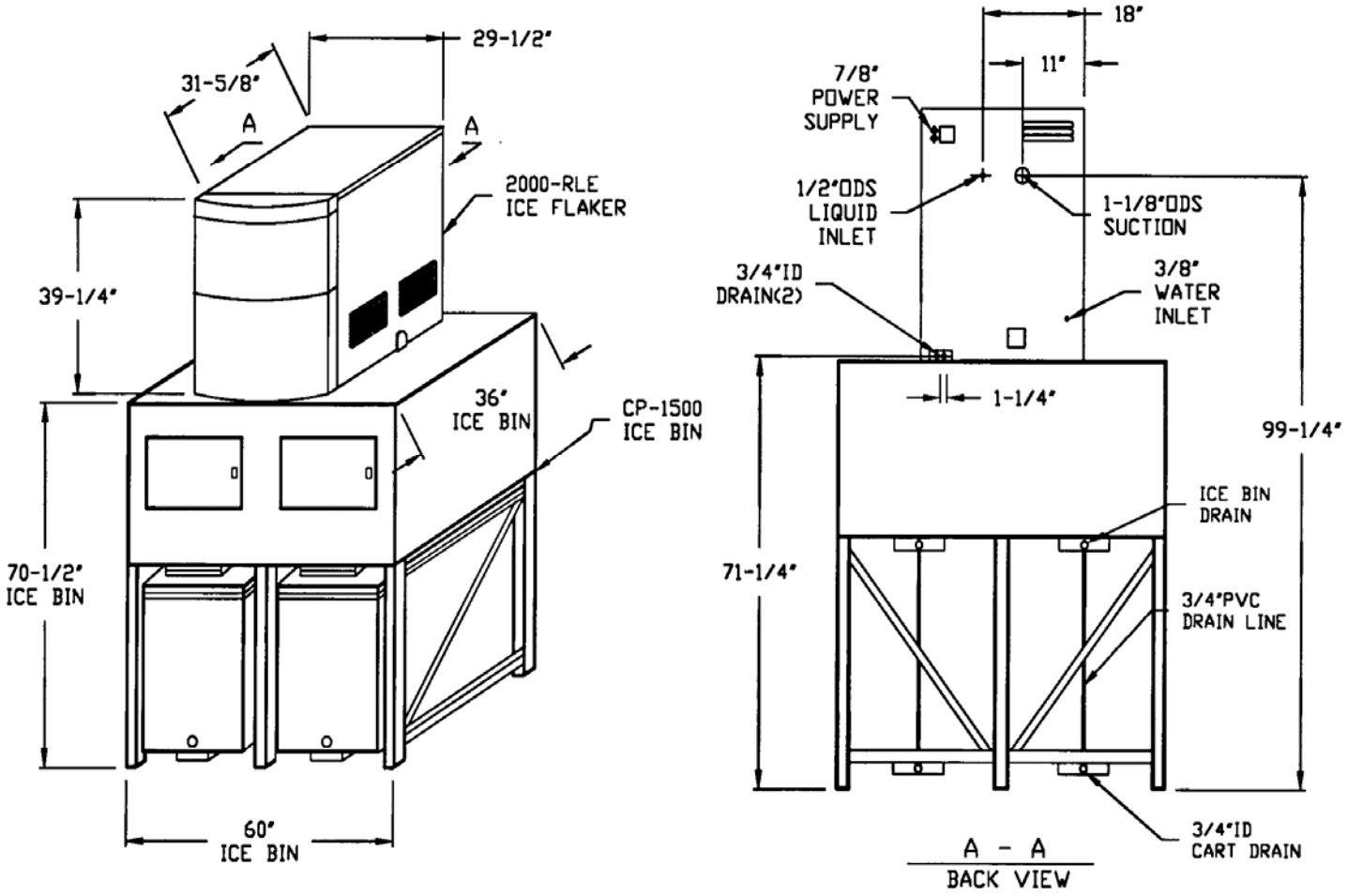
ASSEMBLY DRAWING 1000RLB
1000-RLE Flaker & CP750 Mobile Express Bin
(EXHIBIT 2)



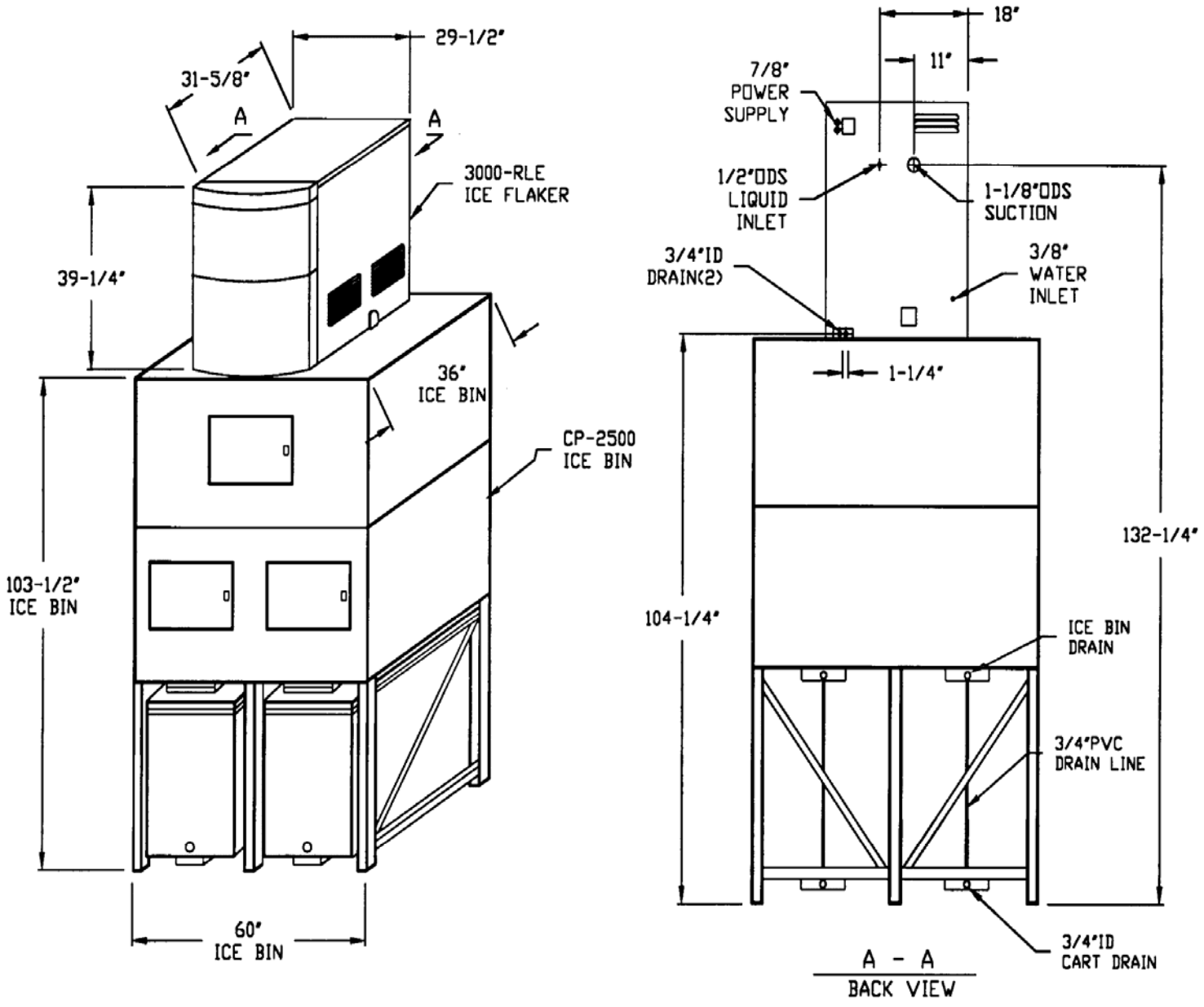
CP750 SINGLE CART ICE BIN



Assembly Drawing 2000RLB
(2000-RLE Flaker & CP1500 Mobile Express Bin)
(Exhibit 3)



Assembly Drawing 3000-RLB
(3000 RLE Flaker & CP2500 Mobile Express Bin)
(Exhibit 4)



Receiving & Inspection of Equipment

***** CAUTION *****

Only service personnel experienced in refrigeration and qualified to work with high voltage electrical equipment should be allowed to install or service this Rapid Freeze Ice Flaker.

***** CAUTION *****

Upon receipt of your Rapid Freeze Ice Flaker, you should first inspect the carton very carefully to determine if any damage may have occurred during shipment. If you suspect any damage has occurred, it should be noted immediately on the freight bill. In addition, a separate written notice must be sent to the agent representing the freight carrier. The written notice should request an inspection by the agent to verify damage during shipment. If the damage was noticed after uncrating of the carton, it is necessary to keep the original shipping container so the carrier's agent can investigate the damage claim thoroughly.

If a repair is necessary for the Rapid Freeze machine, you must first obtain written permission from the factory before beginning any repairs. Unauthorized work on your Rapid Freeze Ice Flaker could result in voiding the machine's warranty.

Remote low side (RLE) units are shipped with a holding charge of dry nitrogen to insure the evaporator is kept clean and moisture free. They must be pumped down and evacuated after they are connected to the rack system, before the entire rack system is charged with it's refrigerant charge.

Immediately upon receipt of equipment, before placement or installation of equipment, verify the electrical, and refrigerant configuration are correct as ordered. If any discrepancies are found, notify Howe Corporation immediately prior to any installation.

Installing the Rapid Freeze Flaker

Installation Conditions

Rapid Freeze Ice Flakers are designed to operate in ambient temperatures warmer than 50°F. Do not install ice Flaker(s) in refrigerated cold rooms or in areas where the ambient temperature is lower than 50°F (10°C). If installed in cold ambient conditions, it is advisable to supply the ice Flaker with warmer water through a water mixing valve, around 60°F (15°C).

When a combination of cold water and cold air temperature exists, the water mixing valve must be used. Failure to do so will cause the lower water collecting trough and sump to plug up with ice to the extent that the water may overflow into the ice storage bin in addition to blocking the water inlet to the pump.

***** CAUTION *****

NEVER install an ice flaker in a COLD room 50°F (10°C) or lower. The ice flaker warranty is void if the ice flaker is installed in a cold room or outside where the ambient temperature may drop below freezing.

***** CAUTION *****

Optimum surrounding air temperature range.....60°F (15°C) to 95°F 35°C)
Minimum air temperature.....50°F (10°C)
Maximum air temperature.....100°F (38°C)
Optimum water temperature range.....60°F (10°C) to 80°F (25°C)
Minimum water temperature (without water mixing valve).....45°F 8°C)
Minimum water temperature (water mixing valve must be used).....36°F (4°C)
Maximum water temperature.....90°F (32°C)

Refrigeration Requirements

Flaker Model	Refrigeration Requirements*	Optimum Evaporator Temp
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 may change with temperatures outside these conditions.**

Drain Systems

All drains are of the gravity type, and must have a minimum of 1/4" per foot pitch towards the building floor drain. The use of a vent at the top of the drain line will ensure that the system will drain properly.

Installation on Ice Storage Bins

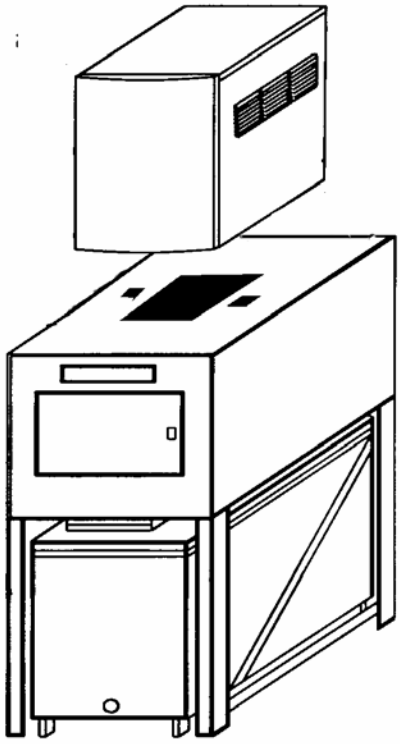
Rapid Freeze7 Ice Flakers are designed to run smoothly and without vibration. Howe Mobile Express ice storage systems are designed to handle the weight of a RLE model ice flaker without any additional bracing. ***It is recommended that the installer contact manufacturer before any other ice flaker is placed on top of a bin.***

Allow for a MINIMUM OF 6" clearance on top of the ice flaker for removal of the speed reducer, and sufficient space around the unit (approximately 3 feet) for inspection and service.

Recommended Installation Procedure of Ice Machine, Ice Level Control and Drain lines

Locate and set the bin on a solid surface. If the surface is uneven you can level the system by extending the feet until the bin is leveled. Once the bin is set in place and leveled, the rapid freeze ice flaker can be placed on top of the storage bin.

When location and placement of the ice machine and storage bin are considered, a floor drain should be located near or under the units to adequately remove any water from the floor caused by cleaning the equipment, or spillage of ice while emptying or transferring ice from the bin



Installing the Rapid Freeze Flaker

1) Remove front panel of ice flaker by lifting up and away from unit and place aside until all connection and adjustments are made.

2) Remove top cover by lifting straight up and set aside with front cover**.**

3) With two people or forklift, position ice flaker on to storage bin. Be careful to locate bottom frame of flaker over raised portion of ice bin drop zone so ice machine is centered correctly and not on cables for ice level controls.

4) Locate cables for ice level controls (one on the left and right side of ice machine) and route under protrusions on sides of flaker enclosure. Reach into the front of flaker and pull cables to front of unit.

5) Notice that cables have a spaded plug connection. Locate similar cables with spaded plug connection, which protrude from channel of enclosure frame and attach respective plugs from each cable together. ***See note on next page regarding Di-electric grease)*** When power is provided and flaker is turned on, ice machine and ice level control will be operational. *(refrigeration must be piped, and charged for flaker to make ice).*

(EXHIBIT 7)

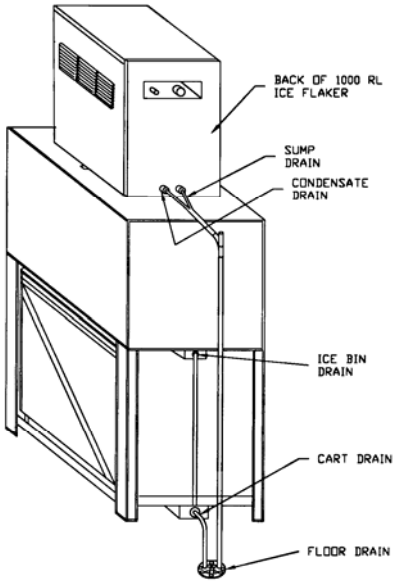
6) Re-install side panels (if removed) and top cover

7) Install lower drain pan on rear cross member of bin stand. This is behind mobile ice cart.

8) Install drain line from upper (horizontal slide door) and lower (mobile ice cart) drain pans.

9) Install drain line from flaker condensate and overflow connections located on rear panel of ice machine. Be sure to follow local plumbing codes to prevent back flow.

10) Run all drain lines in rear of ice bin to floor drain.



E20T69 and E20T70 Photo Eye Moisture Prevention Instructions

1. Pack Molex plug(s) with dielectric grease prior to installation.
2. Re-pack any time Photo Eye is unplugged to maintain moisture resistance.
3. Use dielectric grease only.
4. Hold connectors to connect / disconnect. **DO NOT PULL BY CABLE.**

REMOTE LOW SIDE (RLE) MODEL INSTALLATION

*** CAUTION ***

Electrical wiring should be performed by qualified technicians following Local Electrical codes.

*** CAUTION ***

WIRING & ELECTRICAL CONNECTIONS

The electric controls are mounted inside the enclosure (under the metal cover) for easy access to controls.

1) Install disconnect (not supplied by factory) and connect power lines 230/1/60 to the two black wires marked L1 and L2 in the electric junction box on the rear of the flaker.

2) In the electric wiring junction box on the rear of the flaker there are two red wires, which are wire-nutted together. This will enable the liquid line solenoid on the ice flaker to operate properly. When connecting to a dedicated condensing unit, an interlocking relay may be used. Remove the wirenut/jumper and connect the normally open isolating contacts from a relay mounted in the condensing unit to these two wires. The coil of the isolating relay should be wired to the load side of the high-pressure switch and line 1 side of the compressor contactor coil.

When connecting to a rack system leave these wires tied together.

3) When connecting to nominal 208/1/60 power, it may be necessary to install a buck / boost transformer to boost the power to 230/1/60 for proper operation. (This may be necessary if the power drops below 200 VAC.)
4) If not connected in previous section, locate & connect the photo eye sensors to the matching plug in the ice flaker.

PIPING

The ice flaker as supplied by Howe Corporation was thoroughly cleaned and dehydrated at the factory. Foreign matter may enter the system by way of the field piping. 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 in conformance with good practice required for the proper operation of the system.

The following procedures should be followed:

a. Do not leave dehydrated equipment or lines open to atmosphere any longer that is absolutely necessary.
b. Use only clean new refrigeration grade copper tubing.
c. Suction lines should be sloped ¼" per 10 feet towards the compressor.
d. Suitable P-types oil traps should be located at the base of each suction riser of four (4) feet or more to enhance oil return to the compressor.
e. When brazing refrigerant lines, an inert gas should be passed through the line at low pressure to prevent scaling and oxidation inside the tube. Dry nitrogen is preferred.
f. Use only a suitable silver solder alloy on suction and liquid lines.
g. Limit the soldering paste or flux to the minimum required to prevent contamination of the solder joint internally. Flux only the male portion of the connection, never the female. After brazing, remove the excess flux.

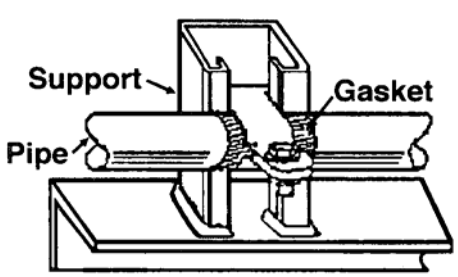
The size of the suction and liquid line should be the same as the connection size on the ice flaker provided that the runs are not longer than 150 feet. (Refer to table below for line sizing)

TABLE 1

MODEL	SUCTION LINE	LIQUID LINE
1000-RLE	f ODS	d ODS
2000BRLE	1-1/8 ODS	2 ODS
3000-RLE	1-3/8 ODS	2 ODS

REFRIGERANT PIPING SUPPORT

Example of Pipe Support



1. Normally, any piping straight run of tubing must be supported in at least two locations near each end of the run. Long runs require additional supports. The refrigerant lines should be supported and fastened properly. As a guide, 3/8 to 7/8 should be supported every 5 feet; 1-1/8 and 1-3/8 every 7 feet; 1-5/8 and 2-1/8 every 9-10 feet.
2. When changing directions in a run of tubing, no corner should be left unsupported. Supports should be placed a maximum of 2 feet in each direction from the corner.
3. Piping attached to a vibrating object (such as a compressor or compressor base) must be supported in such a manner that will not restrict the movement of the vibrating object. Ridged mounting will fatigue the copper tubing.
4. Do not use short radius ells. Short radius elbows have points of excessive stress concentration and are subject to breakage at these points.
5. Thoroughly inspect all piping after the equipment is in operation and add supports wherever line vibration is significantly greater than most of the other piping. Extra supports are relatively inexpensive as compared to refrigerant loss.

***** IMPORTANT NOTICE*****

When piping ice flaker to a central refrigeration rack, liquid line must be connected to the receiver side of any defrost solenoid/control valve to insure uninterrupted liquid feed/supply during normal defrost cycles of the rack.

***** IMPORTANT NOTICE*****

Liquid Line: For longer runs, good refrigeration practice dictates that the liquid line be sized one size larger to prevent flashing due to excessive pressure drop. If the system is fully charged, the presence of bubbles in the sight glass at the ice flaker is a visible indication that flashing is occurring. Using sub-cooled liquid, or a low pressure "floating head" rack system may

effect the refrigeration capacity of the standard TXV valves selected. If connecting to a "floating head" rack system, contact Howe Corporation regarding the possibility of needing to change the TXV valve for proper operation of the ice flaker. It may not be possible to adjust the thermostatic expansion valve properly when these conditions exist. Note - Flashing may also occur if the liquid line is run through hot areas of the building such as boiler rooms or smoke rooms. If this is the case, the liquid line should be insulated.

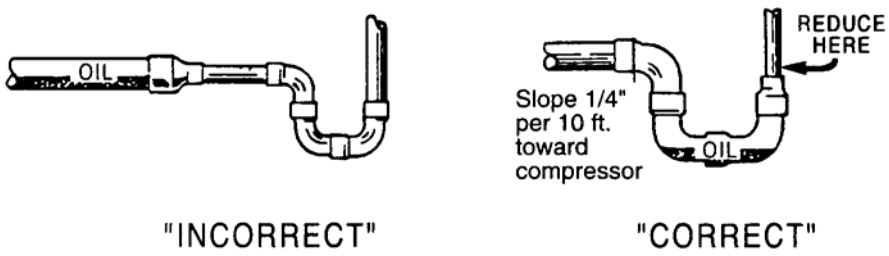
***** IMPORTANT NOTICE*****

When connecting to a low temperature rack (below -10°F) you must provide and install a suction pressure regulator (EPR Valve) to control suction pressure at the ice flaker at approximately -5°F (28 PSIG R-404A, 20 PSIG R-22). (1000-RLE should be operated at 0°F) (33 PSIG R-404A, 24 PSIG R-22).

***** IMPORTANT NOTICE*****

Suction Line: For longer than 150 foot run, the next size suction line may be used for horizontal runs and slightly pitched (¼" per 10') towards the compressor. Vertical risers should be the same size as the ice flaker connection size to maintain proper velocity for oil return. If the vertical riser is more than 4 feet, it is necessary to install a P-trap at the bottom of the riser. Install an additional trap for each 15ft of riser to facilitate oil lift. Suction line should always be insulated.

Suction P-Traps.



EPR VALVE

When connecting to a refrigeration rack system, the ice flaker should be connected to a low temp rack. An EPR (evaporator pressure regulator) valve must also be installed on the suction line, preferably near the ice flaker. EPR Valves are included with (shipped loose) all split systems supplied by Howe. EPR valves are available, shipped loose as an option with Howe remote low side flakers. See pricelist for pricing.

Flaker Model	R-404A EPR Model	R-22 EPR Model	Connection sizes
1000-RLE	F5C21	F5C21	7/8" ODS
2000-RLE	E10V9	E10V9	1-1/8" ODS
3000-RLE	E20V9	E15V9	1-1/8" ODS

SUCTION STRAINER

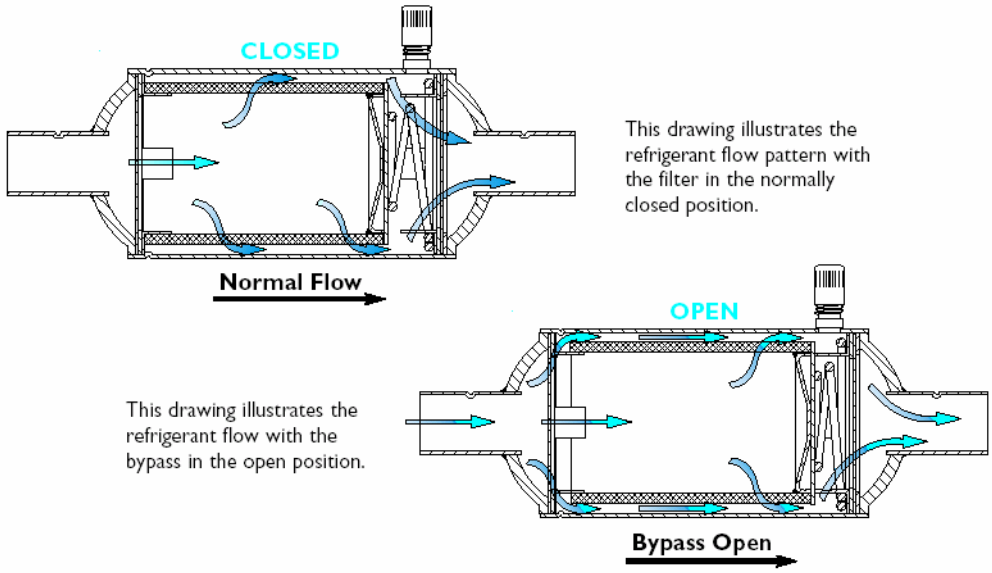
Howe strongly recommends installing a suction strainer between the ice flaker evaporator & the EPR valve when connecting to a rack system. Suction strainers offer the following benefits; Protects the compressor from dirt, a relief device opens if the filter plugs, full flow design for low pressure drop. The following suction strainer is recommended for your Rapid Freeze ice flaker.

Flaker Model	Suction Strainer Model	Connection sizes
1000-RLE	F5C22	7/8" ODS
2000-RLE	E10C24	1-1/8" ODS
3000-RLE	E15C5	1-3/8" ODS

Install the strainer with flow in direction of the arrow on the top of the strainer. By-pass feature will be operational and pressure port is at outlet.

Install strainer in horizontal lines only. Suction strainers are available, shipped loose as an option with Howe flakers. See Price list for pricing.

Suction Strainer

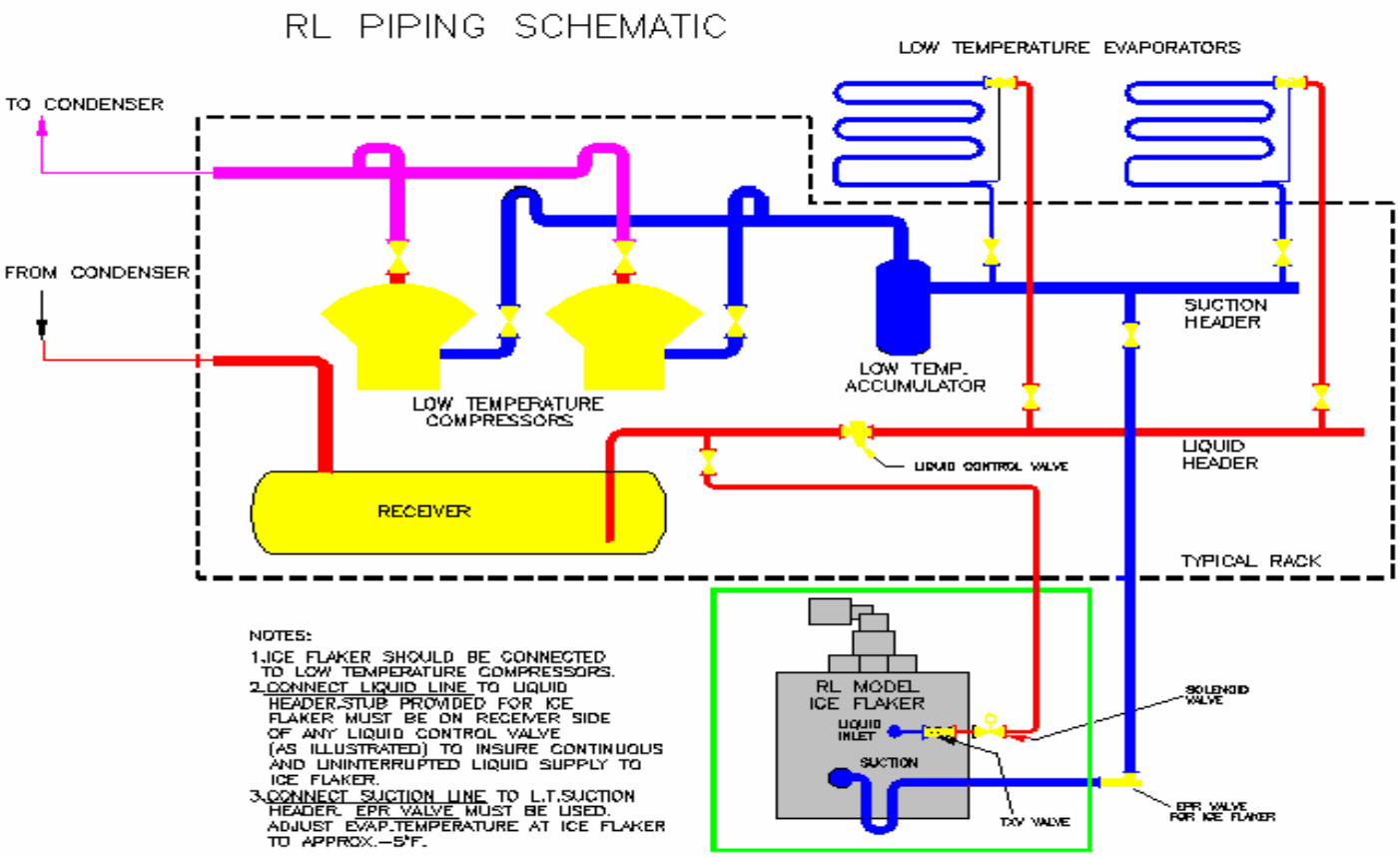


"Bi-directional" means the Suction Filter can be installed in **either one flow direction or the other** — it does not mean the Suction Filter is suitable for **reversible** flow.

LINE INSULATION

After the final leak test, refrigerant lines should be insulated to reduce heat pick-up and prevent the formation of flash gas in the liquid lines. Suction lines should insulated with ¾" wall Armstrong "Armaflex" or equal. Liquid lines should be insulated with ½" wall insulation or better. The insulation located in outdoor environments should be protected from UV exposure to prevent deterioration of insulating value.

RLE PIPING SCHEMATIC
(EXHIBIT 8)

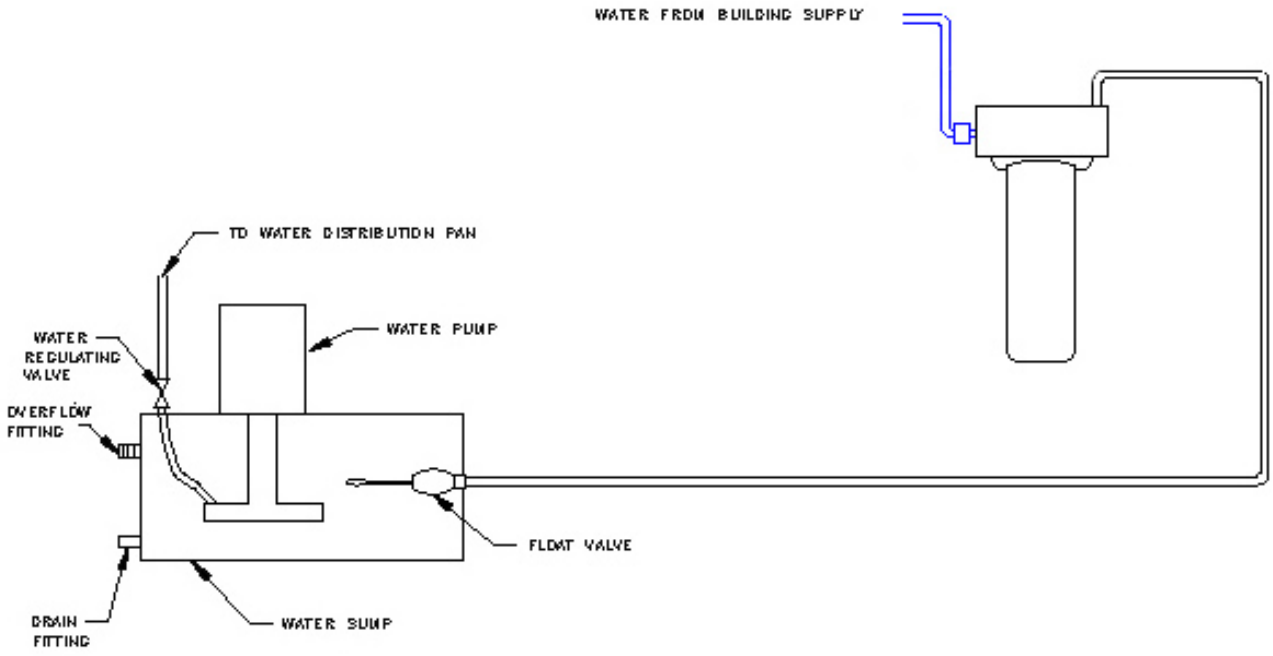


WATER LINE: Connect a 2" galvanized or 2" ODS COPPER water pipe from the closest convenient water line to within 2 to 4 feet of the rear of the ice flaker. Install a water line shutoff valve near the ice flaker. Use d@ OD copper tubing between the field supplied water valve & water inlet connection located on the rear of the flaker. This line should be as short as possible to avoid pressure drop.

If water supply has silt or sand in it, a coarse water filter is recommended.

*** IMPORTANT NOTICE ***
A MINIMUM WATER PRESSURE OF 30 PSIG IS REQUIRED AT THE ICE FLAKER FLOAT VALVE TO INSURE ADEQUATE WATER FLOW. MAXIMUM WATER PRESSURE TO THE FLOAT VALVE IS 60 PSIG.
*** IMPORTANT NOTICE ***

WATER SUPPLY & FILTER CONNECTIONS
(EXHIBIT 9)



REFRIGERANT CHARGING

*** CAUTION ***

Service/Installation personnel MUST have knowledge of refrigeration systems to properly charge this ice flaker.

*** CAUTION ***

Verify that thermostatic expansion valve supplied and installed on ice flaker matches the refrigerant for the rack system or condensing unit.

*** WARNING ***

All Rapid Freeze RL model ice flakers are shipped with a small holding charge of dry Nitrogen.

SYSTEM MUST BE EVACUATED PRIOR TO CHARGING REFRIGERANT.

*** WARNING ***

Follow accepted practice and procedures to charge refrigerant into the system briefly outlined as follows.

1) Pressurize and test the system checking all refrigerant connections & fittings (ice flaker & condensing units) for leaks.

2) Use a large displacement (8scfm) vacuum pump capable of at least 500 microns absolute to evacuate the system. Make sure all shut-off valves are OPEN so that the entire system is evacuated. Allow vacuum pump to run for several hours until you reach 1500 microns.

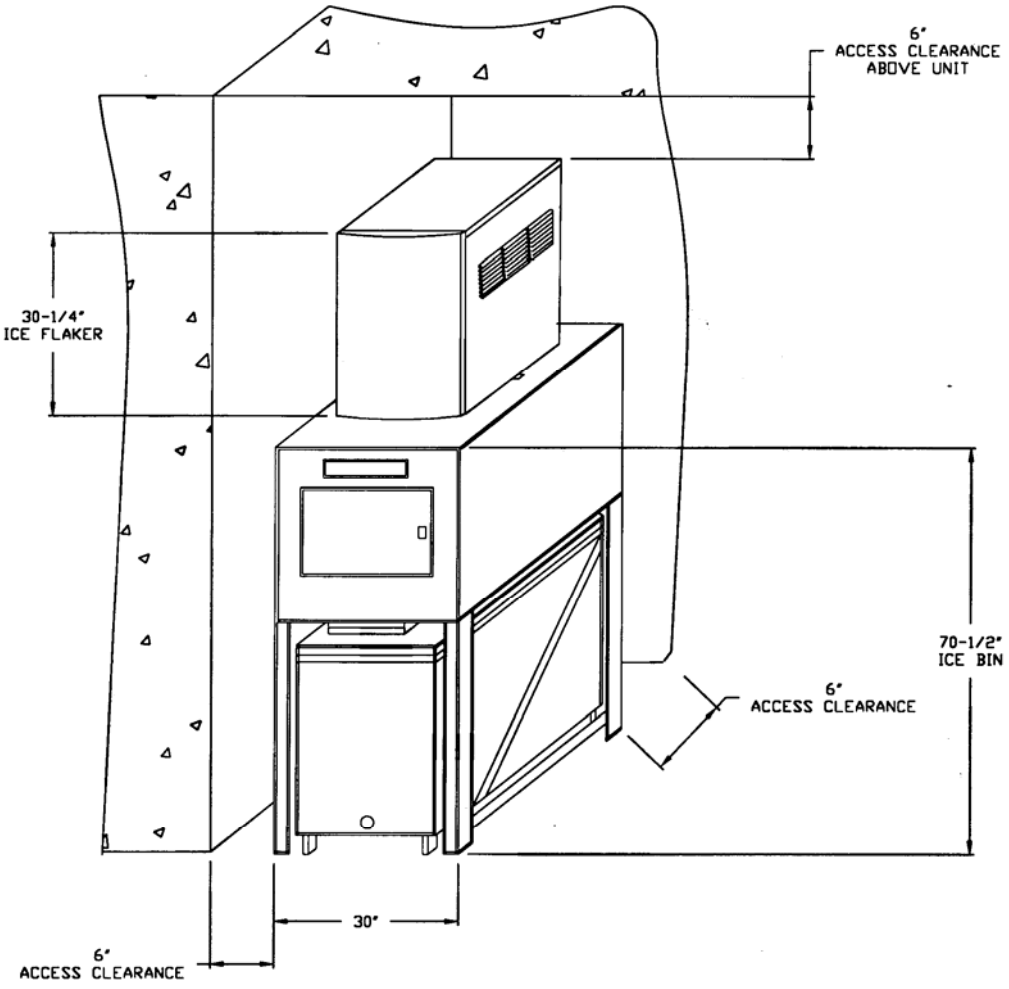
3) Allow to stand for 20 minutes, if system pressure rises, re-check for leaks. Break vacuum with 2 PSIG refrigerant and evacuate again.

4) Repeat step 3, this is called "triple evacuation". It insures that all air and moisture has been removed from the system. Failure to do so may result in compressor burn-out.

5) After the third evacuation to 500 microns, allow the system to stand for a minimum of six hours, if no pressure changes are observed, proceed with charging or unit. Notice that the "eye" in the liquid indicator is green, indicating that the system is clean and dry. Then continue to charge the system (using gas not liquid).

Above is a brief outline for charging the system. Consult the rack or condensing unit manufacturer for full details.

LOCATION DRAWING FOR RLB MODEL
(EXHIBIT 10)



Installing the Rapid Freeze Condensing unit

CONDENSING UNIT INSTALLATION

After inspecting for damage & correct voltage & refrigerant, locate and install condensing unit in a location accessible for service.
Rigging holes have been provided on all condensing units. Caution should be exercised when moving these units. To prevent damage to the unit housing during rigging, cables and 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. Vibration absorbing pads or springs should be installed between the condensing unit legs or frame and the roof mounting assembly.

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.

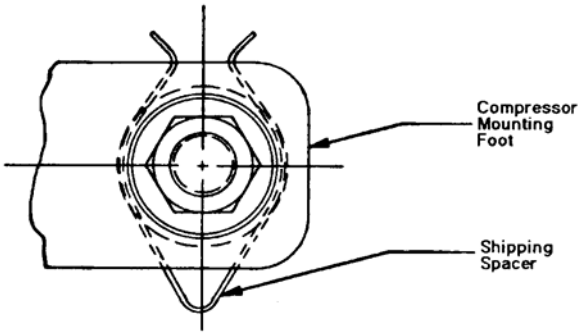
SPRING MOUNTED COMPRESSOR
Compressors are secured to make sure there is no transit damage. Before operating the unit, it is necessary to follow these steps:

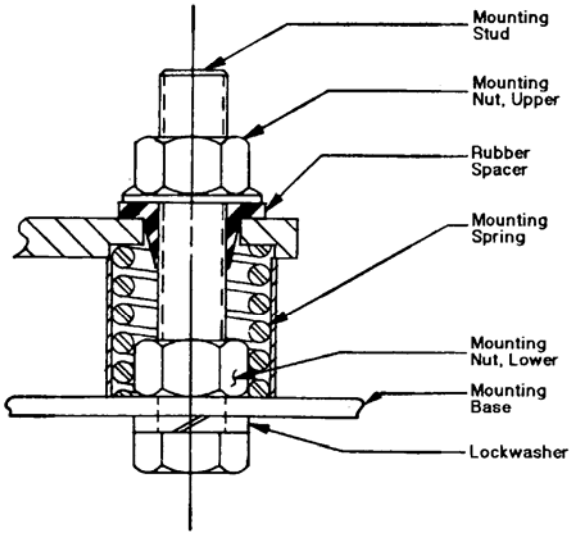
a. Remove upper nuts & washers.
b. Discard the shipping spacers.
c. Install the neoprene spacers. (Spacers located in the electrical panel, or tied to compressor)
d. Replace the upper mounting nuts and washers.
e. Allow 1/16 inch space between the mounting nut/washer and the neoprene spacer.

RIGID MOUNTED COMPRESSOR

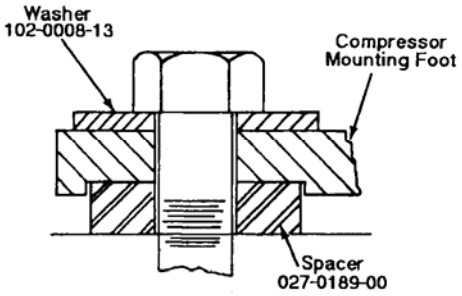
Some condensing units use rigid mounted compressors. Check the compressor mounting bolts to insure they have not vibrated loose during shipment.

Spring Mount

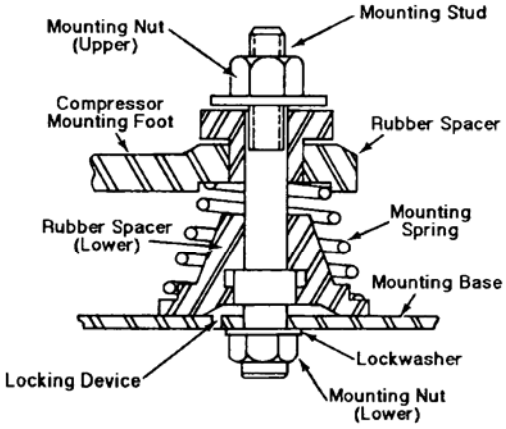




Solid Mount for Mobile or Deep Sump Application.



Spring Mount



Mount is shown in properly adjusted position.

Installing the Rapid Freeze Condensing unit

ELECTRICAL
Follow local applicable wiring codes to wire main electrical power from building distribution center to main power terminals in condensing unit panel.

Install wiring race (conduit) between ice flaker junction box on rear of flaker, and condensing unit control panel.

The two Red wires in the flaker junction box will be connected to terminals marked “A” & “B” in the Howe condensing unit.

REFRIGERANT PIPING

If the ice machine is less than 20 running feet from the condensing unit, good refrigeration piping practice dictates that you field install a heat exchanger (not supplied by factory) next to the ice machine.

Ice flaker model	Suction line size	Liquid Line size
1000-RLE	7/8 ODS	d ODS
2000-RLE	1c ODS	2 ODS
3000-RLE	1d ODS	2 ODS

Install the suction accumulator near the condensing unit (some model condensing units have suction accumulator installed).

Check all electrical and refrigerant connections. Be sure they are tight and leak free.

ADJUST LOW PRESSURE SWITCH

All Rapid Freeze Remote Condensing units have a Low pressure Operating (pump down) switch. To Adjust the Low Pressure switch turn the adjustment stem clockwise to raise the cut in setting, counterclockwise to lower the cut in setting. The cut in (right adjustment stem) setting should be set at 23 PSIG for R-404A, 16 PSIG for R-22. The differential setting (cut out)(left adjustment stem) should be set at 18 PSIG for R-404A, 11 PSIG for R-22.

FAN CYCLING

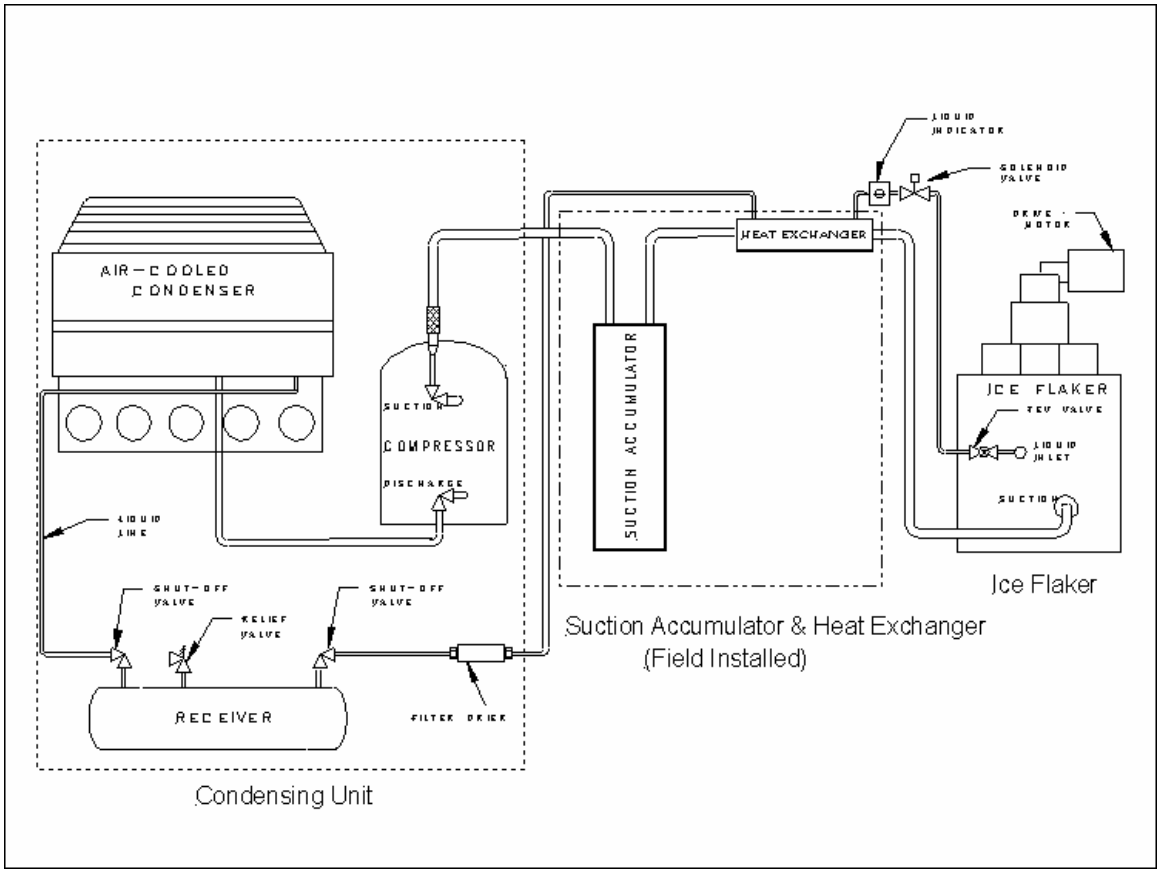
The 1000 & 2000 RHS Condensing units have two condenser fans, the lead fan is always on, (when the compressor is running), the second fan is controlled by an ambient switch, to be set at 50F(second fan is off when ambient temp is under 50F). The 3000 RHS condensing unit has a single condenser fan, which is always on when the compressor is running.

*** IMPORTANT NOTICE ***

DO NOT ATTEMT TO ADJUST ICE FLAKER SPLIT SYSTEM FOR EVAPORATOR SUPERHEAT

REFER TO START & ADJUST SECTION OF THIS MANUAL FOR PROPER ADJUSTMENT OF EPR AND TXV VALVE ON ALL HOWE ICE FLAKERS

*** IMPORTANT NOTICE ***



Suction accumulator and heat exchanger to be field mounted. The Suction accumulator should be mounted near the condensing unit, the heat exchanger, (when required) should be near the ice flaker. The heat exchanger is typically needed only when the condensing unit is mounted close to the ice flaker.

The Howe Rapid Freeze ice flakers operate on a continuous pump-down refrigeration system.

How the Rapid Freeze Flaker operates

When set up as a split system, remote low side ice flaker, & remote high side condensing unit, the system is set up to operate as follows. The main power is to be on at all times for the ice flaker control panel, and the condensing unit. When the ice level control calls for ice, the drive motor, water pump and solenoid valve are all energized simultaneously, , as the ice level in the storage bin raises & blocks the signal from the emitter to the receiver, the solenoid valve will de-energize, initiating the pump-down sequence. The drive motor & water pump will continue to run until the off delay cycle time expires, once the preset time expires, the drive motor & water pump will shut off. The time delay period is typically adjusted to approximately 1-2 minutes after the flaker stops making ice. This allows the evaporator to warm up, so when the blade stops, it will not run the risk of freezing to the evaporator if ice is still on the evaporator. With a continuous pump-down system it is normal for the compressor to cycle periodically while the ice machine is not making ice (turned off). This ensures the liquid cannot migrate to the suction valves of the compressor, so when the ice machine is stared, liquid is not slugged into the compressor.

WHY ICE BIN THERMOSTATS ARE NOT USED.

The use of a bin thermostat is not recommended and not permitted. The Rapid freeze ice flaker is designed so that the freezing drum (operating @ 0°**F** / B5°F) is located directly over the ice drop opening in the bin. This large opening permits cold air to cascade off the evaporator down into the bin. Since the air temperature in the bin is equal to or lower than the ice temperature, the set point of the thermostat cannot be adjusted to where it can reliably distinguish temperature difference upon contact with ice.

In most cases when deflector damage is reported, investigation has shown that a thermostat was used as a bin level control device. The photo eye ice level control physically sense the presence of ice rather than sensing temperature.

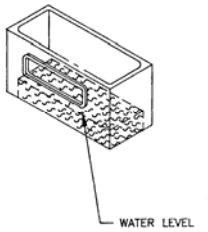
Start & Adjust

Once installation has been completed, and the ice Flaker has been properly evacuated, and charged with the Freon identified on the ice flaker label, you may proceed with the check and adjust section.

Checklist

1)_____ Before power is turned on, open inlet water valve, (field supplied & installed near the back of the Ice Flaker), and check water level in sump. The water level in the sump is the same as the return trough, it should be about half full. (See below)

(EXHIBIT 19)



2)_____ Make sure the On-Off switch is in the Off position, then turn on the main disconnect.

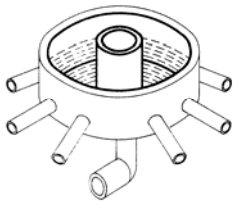
3)_____ Check voltage between line 1 and line 2, verify that it is within nameplate ratings.

4)_____ Turn the On-Off switch ON. Solenoid valve will click loudly, and motor & pump will start .

5)_____ As the drive motor & water pump are energized, water is delivered to the distribution pan located inside the evaporator.

6)_____ Looking down inside the evaporator through the hand hole access cover, verify that the distribution pan water level is maintained at the half full point. If it is too low then the water regulating valve needs to be opened slightly. If the water level is too high, then the regulating valve must be closed accordingly. Continue opening or closing the adjustment valve until the water level is maintained at the proper level. (see below)

(EXHIBIT 20)



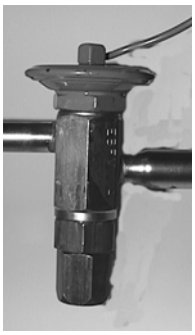
7)_____ After a few minutes, the ice maker will begin to freeze the water circulating over the evaporator into ice.

8)_____ Allow 10-15 minutes to let the ice flaker come down to temperature and balance out.

9)_____ Looking down into the evaporator, through the hand hole cover, check to make sure the ice is being frozen and harvested over the entire surface of the evaporator. If it is not,
9a)_____check for bubbles in the sight glass, (located on the rear of the flaker).
9b)_____check the suction pressure @ the ice machine. (Connect low pressure gauge to the charging valve located on the suction line @ the rear of the ice flaker. Suction temperature must be maintained @ -5°F / 0°F (depending in model & water conditions) at all times.

10)_____ Liquid line must have unrestricted flow at all times for proper performance of ice flaker. On ice flakers connected to a rack system, liquid line should be connected directly to the receiver, before any defrost restricting valves.

11)_____ If suction temperature is 0°F(for 1000RLE, -5°F for 2&3000-RLE) and there are no bubbles in the sight glass, and ice is not being frozen and harvested on the entire surface of the evaporator, then the expansion valve must be adjusted. **DO NOT ADJUST EPR or TXV for EVAPORTATOR SUPERHEAT.**



12)_____ Remove the adjustment stem cover and turn the adjustment stem 1/8 to 1/4 turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve if the evaporator was not freezing ice on its entire length). Wait 10-15 minutes between each adjustment to allow the valve and machine balance out. Repeat this step until ice is produced and harvested all the way down to the bottom of the evaporator.

13)_____ When the ice maker is adjusted and operating properly, turn off the on-off switch, or block the electric eye beam path. (The electric eye control has a 15 second delay before it's output opens). When the output opens, or when the on-off switch is opened the shutdown sequence is initiated. (de-energize the solenoid valve, and start the off delay cycle for the drive motor & water pump).

14)_____ Ice flaker is pumped down, (solenoid valve is de-energized) drive motor & water pump continue to run until the off delay cycle opens. Field adjustable between 1-30 minutes, normally set at approximately 5-10 minutes.

15)_____ Electronic overload set point is factory set to trip within seconds when the motor reaches an overloaded condition.

16)_____ Ice maker is adjusted and producing dry flakes of ice.

17)_____ Water is NOT dripping into the bin. If it is, locate the dripping point and correct it. (i.e.: distribution pan overflowing, water recovery trough overflowing, or distribution tubes broken or misaligned.)

SUPERHEAT SETTING

DO NOT USE SUPERHEAT to adjust ice evaporator pressure settings. EPR valve should be adjusted to obtain evaporator temperature of -5F (2000 & 3000 models, +3°F for 1000 models)..

EPR set too low

OPTIMUM EVAPORATOR PRESSURE SETTINGS

1000 models R-404A 36PSI (+3F)

2000 & 3000 R-404A 28 PSI (-5°F)

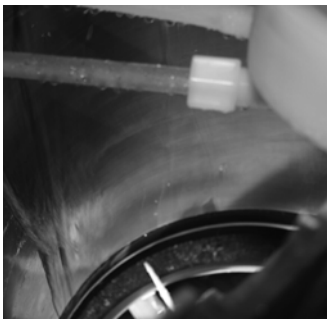
1000 models R-22 26.5 PSI (+3°F)

2000 & 3000 R-22 20 PSI (-5°F)

EPR set properly

ADJUSTING TXV

IMPROPERLY ADJUSTED TXV



PROPERLY ADJUSTED TXV

Once the EPR is set so the evaporator is at -5°F (2000 & 3000 models, +3°F for 1000 models), then the TXV valve may be adjusted for optimum ice production.

If ice freezes on entire length of evaporator (top to bottom) but harvests only the upper portion with each revolution of the shaft ***and*** there are no bubbles in the sight glass, then the expansion valve must be adjusted. (Opened, to feed more refrigerant). On the other hand, frost on the compressor body indicates that the valve is overfeeding.

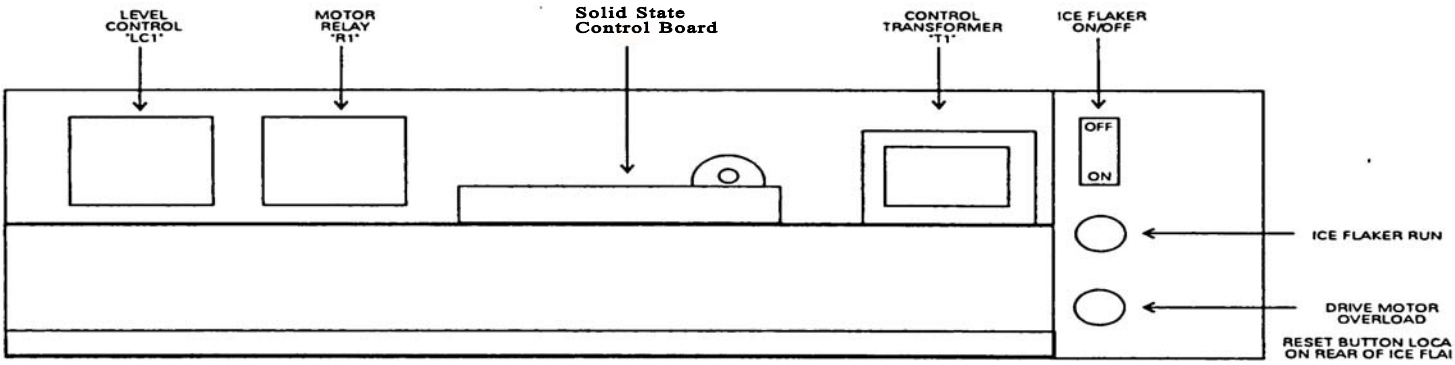
Remove the adjustment stem cover and turn the adjustment stem 1/8 to 1/4 turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve if the evaporator was not harvesting ice on its entire length.) Wait 10-15 minutes between each adjustment to allow the valve to stabilize. Repeat this step until ice is produced ***and harvested*** all the way down to the bottom of the evaporator. Note: ***Balanced Port Expansion Valves are more sensitive than normal TXV's, so adjustment of the stem should be limited to between 1/16 to ⊂ turn at a time.***

Electrical Controls

Components & functions

Electrical Controls for Ice Maker

(EXHIBIT 22)



1) Drive Motor Contactor / Relay
Provides power to the drive motor & water pump. Energized during freezing and pumpdown cycle, then timed off for shut down. Auxiliary contact provides power to the liquid solenoid valve when contactor is energized.

2) Control Transformer
Provides 24 Volt control power to control panel components, Solid State Control Board, motor contactor, and indicating lights.

3) Solid State Control Board (E20T48)
Main control processor, incorporates motor overload, operating circuit, off- delay circuit. Controls motor contactor and solenoid valve power.

4) Photo Eye control relay
processes signals from electronic eye level control, has built in time delays. Shuts machine off when ice bin is full to prevent damage to the flaker from ice backing up into the evaporator section.

Panel MOUNTED ITEMS

1) Ice Flaker run light.
Green light is on whenever the contactor and drive motor is energized.

2) Motor overload light
Amber light is on whenever the electronic overload opens, to stop the drive motor & pump.

3) Overload reset button.
Located on Rear of Ice Flaker.
Normally open reset button, resets overload circuit following overload condition.

4) On-Off Switch

Main on-off switch for control circuit. Wired in series with Photo Eye Ice level control.

E20T48 Solid State Control Board

The E20T48 Solid State Control Board is the main processor for the ice Flaker control panel. It incorporates the timer functions, control relay functions, and overload relay functions

Terminals 1 & 2:

24 VAC input power.

Terminal 3:

Ice Flaker Run input signal (all on-off switches, ice level controls and any special controls installed must be in this circuit.)

Terminal 4:

Overload reset input (Normally Open, momentary contact)

Terminal 5:

Motor overload output (for overload indicating light) energized upon overload condition, stays on until overload is manually reset.

Terminal 6:

Ice Flaker contactor output (Output is energized when input signal is present, & control is not in overload condition.)

When input signal is removed (switch or ice level control open) timer circuit is started, output will stay energized until timing circuit releases output.

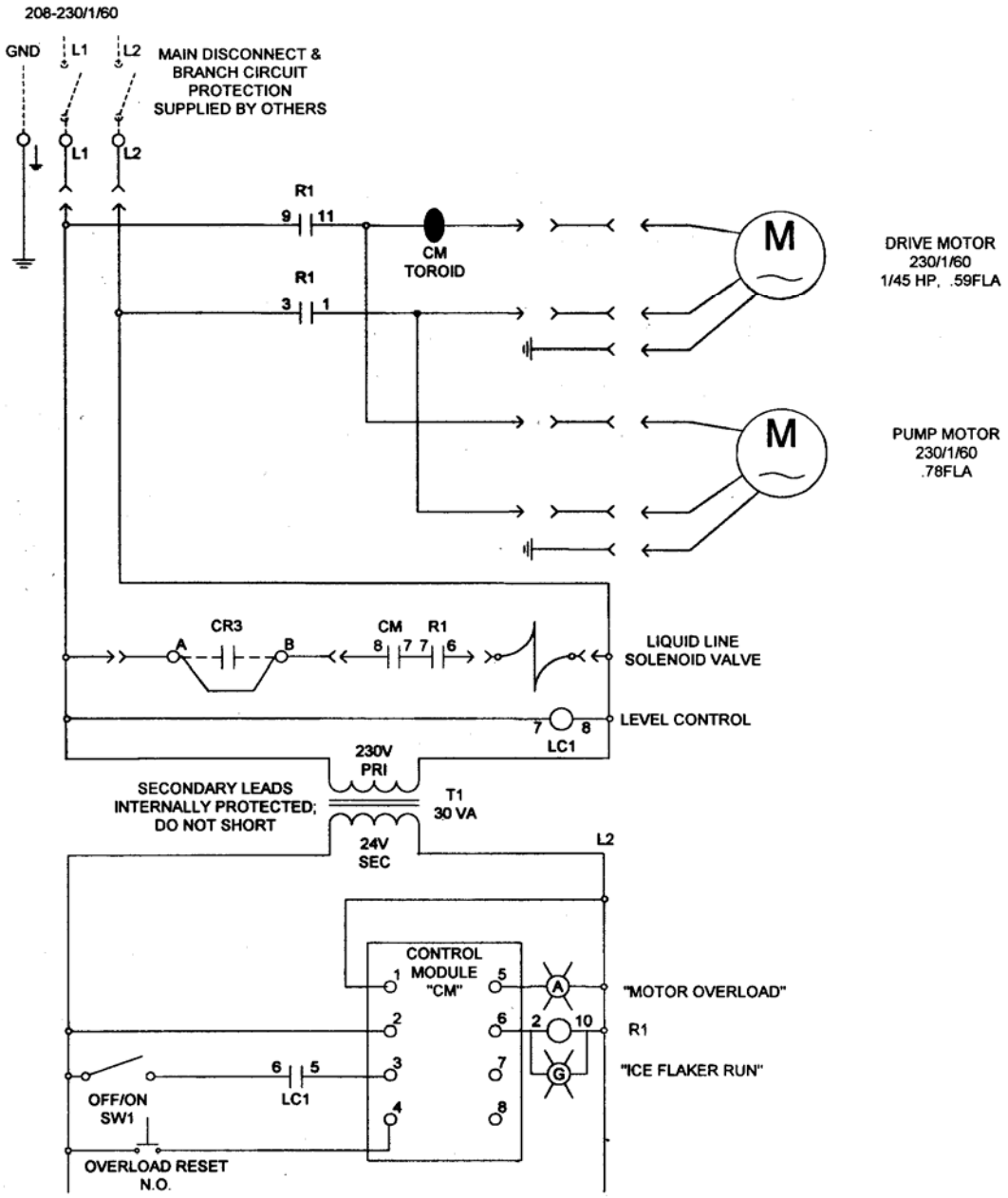
Output is de-energized immediately upon overload condition

Terminals 7 & 8:

Isolated output contacts for liquid solenoid valve. (Normally Open)

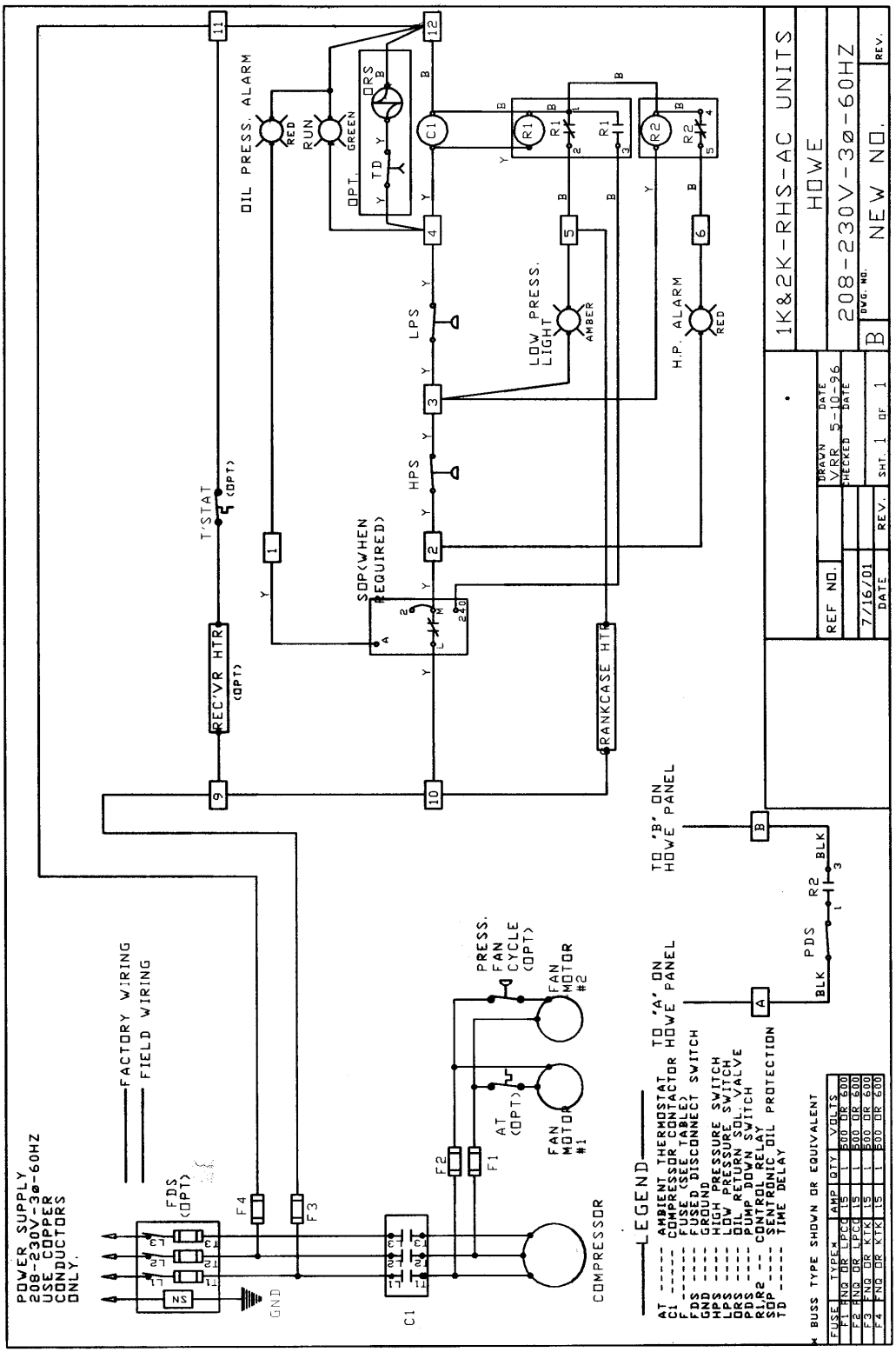
Contacts close immediately upon input signal (#3), stay closed until input # 3 signal is removed. Contacts open when input signal (#3) is removed, or when overload condition exists.

Wiring Schematic # WS-140
(Exhibit 23)



CM = Solid State Control Board
LC1 = Level Control
R1 = Drive motor & Water pump Relay/contactor
CR3 = Isolating relay when used in remote condensing unit.
* When connecting to a rack system, A& B wires are to remain wire-nutted together. (A & B wires are located in the power junction box on the rear of the flaker).

Condensing Unit Wiring Diagram
Model 1000-RHS
Model 2000-RHS



Condensing Unit Wiring Diagram
Model 3000-RHS

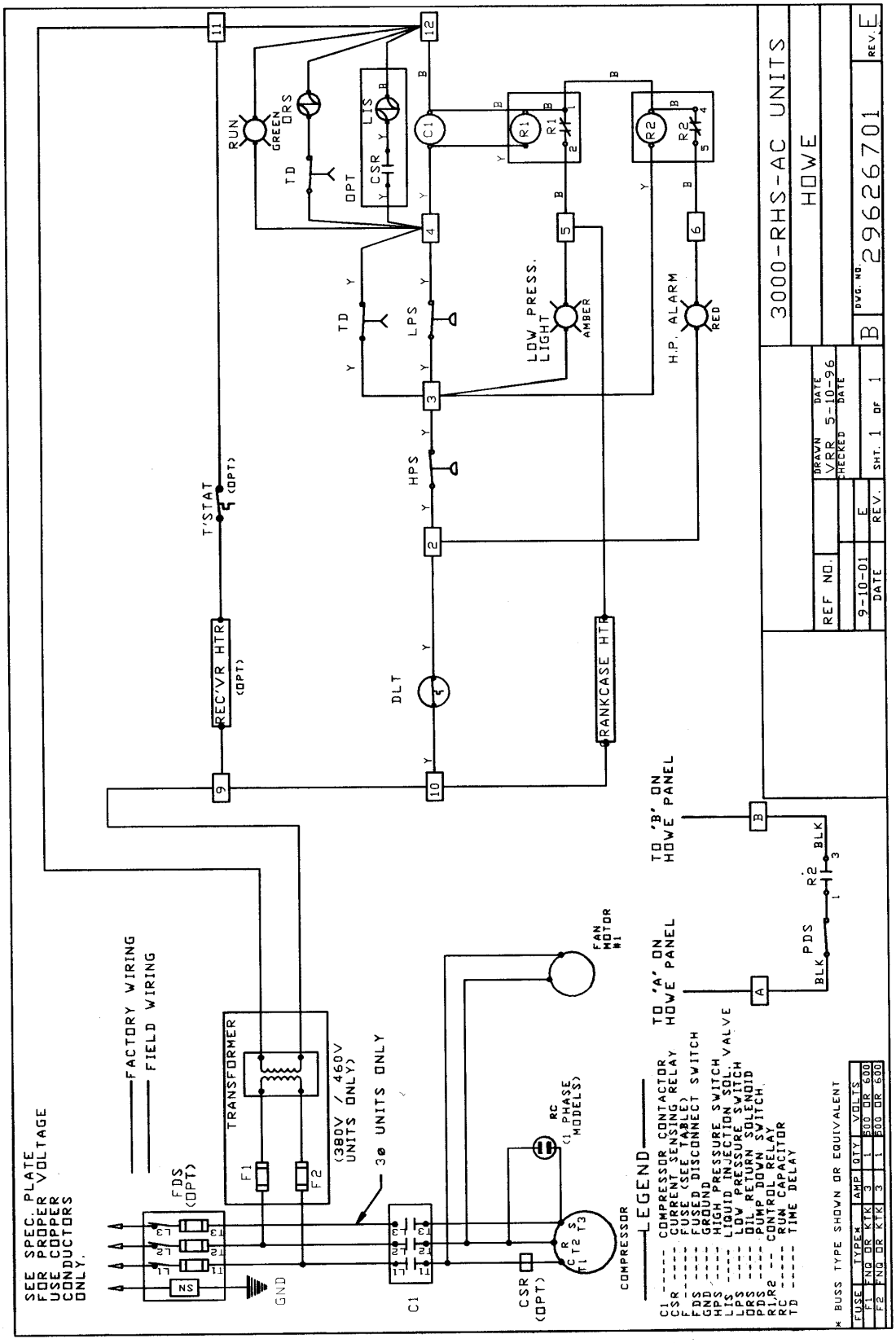
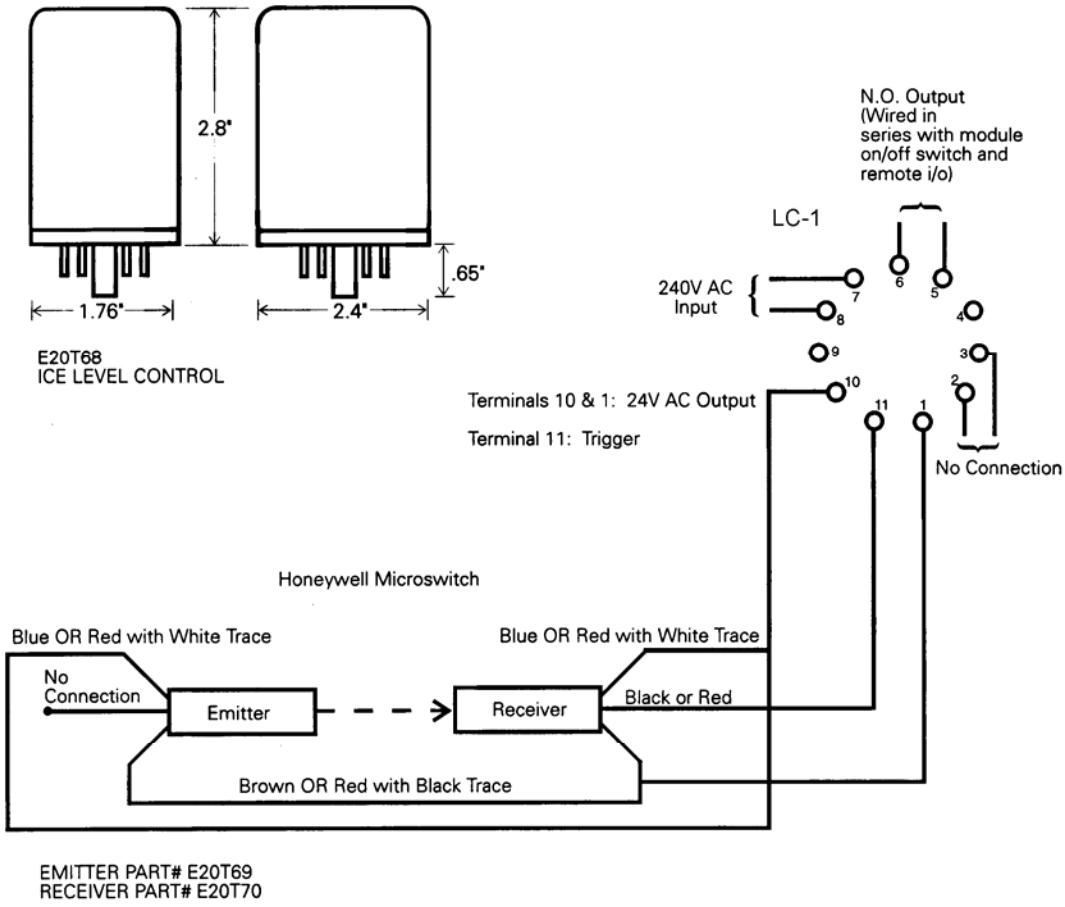


Photo Eye Sensor Connections

Photo Eye Control Wiring
(Exhibit 24)



Important!

It is important to ensure that there is a “drip loop” on the cables near the rear of the photo eye sensors, to allow any moisture to travel to the bottom of the drip loop to drip off, thereby not accumulating at the rear of the sensors.

Maintenance

Evaporator

To keep the evaporator in peak performance, the ice maker should be cleaned with an approved ice machine cleaner at least twice a year, more often if water conditions cause mineral build up, using an approved food grade ice machine cleaner. The water pump is used to circulate ice machine cleaner through the system. Refer to cleaning instructions for complete cleaning instructions.

Ice Machine Cleaning Instructions

An important part of ice flaker maintenance is to clean it frequently so that the water passages are not clogged and the freezing surface is clear and free of scale caused by calcium and iron deposits.

Frequency of cleaning depends upon the quality of water. In extreme hard water areas, it may be necessary to clean the flaker as often as every 2 months whereas in normal or "soft" water areas twice a year may be sufficient.

When cleaning is necessary, proceed as follows:

*** CAUTION ***
ICE MACHINE CLEANERS CONTAIN ACIDS AND MAY CAUSE BURNS. HANDLE WITH CARE IN CASE OF EXTERNAL CONTACT, FLUSH WITH WATER. IF SWALLOWED, DO NOT INDUCE VOMITING. GIVE LARGE AMOUNT OF MILK OR WATER. RINSE MOUTH WITH WATER ● SEEK IMMEDIATE MEDICAL ATTENTION!.
USE APPROVED ICE MACHINE CLEANER ONLY. MIX SOLUTIONS PER MANUFACTURERS INSTRUCTION.
*** CAUTION ***

1. Turn off refrigeration compressor. If flaker is connected to a compressor rack, close the liquid line shut off valve, turn off the ice flaker switch. Adjust the off delay time adjustment fully clockwise.
2. Remove all ice in storage bin.
3. Close water supply shut off valve.
4. Drain water from drain connection in water sump. Some models are equipped with a drain valve, others have a drain plug, located below the water float valve connection.
5. Prepare the cleaning solution: Mix 8 oz. of Howe ice machine cleaner (Howe part # E10V1) with 3 quarts of hot water. Water should be between 90-115°F. If using an alternate ice machine cleaner (such as Virginia cat no.418) follow instructions on bottle. Mix 8 oz. of Virginia ice machine cleaner with 2 gallons of water.
6. Pour solution of ice machine cleaner into sump, to normal operating level. Do not overfill because it may overflow into bin.

7. Start the ice flaker drive motor and water pump by turning the switch on, then immediately off. This will allow the gear motor & water pump to run for approximately 30 minutes with out refrigeration, to circulate cleaning solution over the freezing surface and all water passages. Operate until all scale is removed. This may require from half hour up to about 2 hours if scale build up is heavy.
8. When system is clean, drain cleaning solution and rinse with 2 or more complete rinses to insure that cleaning solution is flushed away thoroughly. At each rinse, fill sump with fresh water and run drive motor and water pump for 10 minutes, then drain.

TO SANITIZE:

9. Mix a solution of approved sanitizer or mix 16 oz. of household bleach with 2 gallons of warm water, 90-115°F.

10. Pour solution into sump, to normal operating level (as in #6), then recirculate sanitizing solution for approximately 20 minutes, by turning on drive motor & pump.

11. Drain solution and rinse thoroughly with fresh water at least twice, following procedure described in No.8.

12. After ice flaker is thoroughly rinsed, return machine to normal operation by opening water supply valve, readjusting off delay timer setting to previous set point, and restoring refrigeration by turning the machine back to ON.

Water Distribution Tubes

Water distribution tubes should be kept clean and free of any mineral buildup. When they do accumulate mineral deposits, the flaker must be thoroughly cleaned. Remove each tube and clean with cleaning solution and small tubing brush. Carefully inspect each distribution tube and fitting for leaks or crack. Replace defective tubes when necessary.

Water Sump

Water sump and pump should be kept clean and free of any mineral buildup. When mineral deposits accumulate the machine must be thoroughly cleaned. The water sump will be cleaned when you normally clean the equipment by circulating the ice machine cleaner through the water system, upon completion of cleaning process, open water sump drain valve and flush out the sump assembly. After flushing & Sanitizing, close drain valve to resume normal operating conditions. In extreme cases of mineral or slime buildup, shut off the main power and remove the top covers from the sump, using the ice machine cleaner and a scrub brush clean the plastic sump body until the deposits are loosened and flushed out through the sump drain fitting as described above.

Ice Machine Condensate Drip Pan

The ice machine condensate drip pan should be cleaned each time the ice flaker is cleaned. The pan should be wiped clean to remove any mineral or slime deposits. The drain line should also be flushed to allow condensate to drain freely from the drip pan.

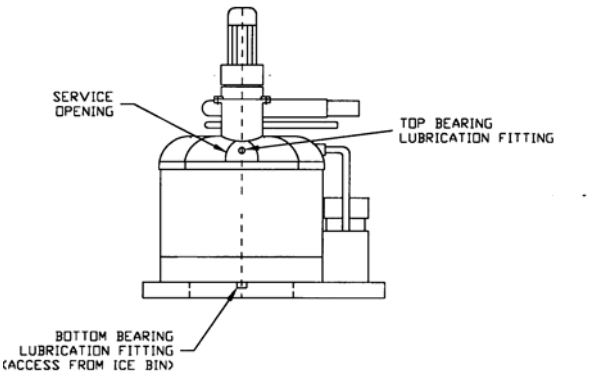
Lubrication

Bearings & Seals

Main Bearings on the Ice Flaker are oilite and have grease fittings for both top & bottom bearings. The top bearing is accessed through the hand-hole cover, the bottom bearing is greased via a grease fitting located on the center hub accessed from the ice bin. The main bearings should be greased annually using a U.S.D.A. approved food grade edible grease.

Use caution to ensure the bearing is not over-greased. Typically only one squirt of the grease gun is required, (or until you feel resistance on the pump) to grease the bearing(s). Over-greasing may "pop" the seal out of its normal position. If over-greased and the seal is poped out of position, the excess grease will need to be removed prior to re-installing the seal. If seal is damaged dew to over-greasing, the seal may need to be replaced.

1000 series



2000 & 3000 series

Gear motor Lubrication

The motor ball bearings are grease lubricated and do not normally require re-lubrication or replacement. Gearmotor gearing and bearings are supplied with sufficient grease to last the A design life@ of the gearmotors.

Preventative Maintenance

Preventative maintenance means that the store or department manager (or a delegated employee) make a daily visual check of the ice flaker.

Check for...

Bin doors are working (closing) properly
Bin doors are kept closed
Photo eyes and brackets are in proper alignment
Ice Quality (Size of flakes)
Ice Quantity (Normal amounts of ice produced)
Bubbles in sight glass
Overall cleanliness of the flaker
Any unusual noises.

When these items are checked on a daily basis, any change will be easily detected prior to any service call for a malfunction of the machine.

Preventative Maintenance Schedule

	6 Month	12 Month	24 Month	36 Month	48 Month	60 Month
Replace water filter cartridge*	●	●	●	●	●	●
Grease main bearings**		●	●	●	●	●
Clean & sanitize ice machine (as required***)		●	●	●	●	●
Check if flaker is harvesting properly		●	●	●	●	●
Check for bubbles in sight glass		●	●	●	●	●
Clean electric eyes / check alignment		●	●	●	●	●
Inspect flaker for damaged parts ****		●	●	●	●	●
check bearing wear		●	●	●	●	●
check cutter blade clearances		●	●	●	●	●

* Replace water filter every 6 months.

** Use Caution to not over grease which may “pop” the grease seal.

*** Typically every 12 months, in areas with poor water quality, possibly as often as every few months. With good quality water, cleaning may be required only once a year.

**** Parts to check for damage are: ice deflector, ice deflector scraper, squeegee & wrapper, water distribution tubes and float valve.

Troubleshooting Procedure for Operation of E20T73 Photo Eye Ice Level Control

For Photo Eye Level Control sensors supplied with RLE Flaker Models with integral control panels – attached with cables using Molex connectors.

When checking Molex plugs

Hold connectors to connect / disconnect. **DO NOT PULL BY CABLE.**

Step 1 –CHECK FOR 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. Pack the Molex plug(s) with Di-electric grease, re-connect & test unit. **Note: IF Molex plug is unplugged, plug must be re-packed with Di-electric grease (each time it is un-plugged) to maintain water resistance.**

Step 2 – CHECK FOR LOOSE OR SLOPPY PIN IN MOLEX PLUG. If the Molex plug is connected / dis-connected multiple times, it may cause the female pin to open slightly. Check the Female pins in the Molex plug (Ice Machine wiring harness), to ensure the pins are not opened up too much, causing a sloppy or loose connection. If pin appears to be opened too much gently close the female pin to ensure a tight fit for the male pin.

Step 3 - CHECK FOR CORRECT WIRING ARRANGEMENT. First, unplug the emitter from the wiring harness, if the plug on the emitter has three pins, then do the following. Check wiring of the **EMITTER** cable (E20T69 - about 3" long) in the control panel. This should have only the **Blue & Brown** wires connected to the **RELAY BASE** (5V013) in the control panel. **Blue** is connected to **terminal #10** and **Brown** is connected to **terminal #1**. If the **Black** wire is connected to **terminal # 11** (lightly marked the side terminal tab) of the **RELAY BASE**, this wire should be removed and isolated so it does not come into contact with any other terminal. If the emitter has only two pins in the Molex plug, the black wire does not need to be removed, provided the Molex plug is packed with Di-electric grease. Next, check wiring of the **RECEIVER** cable, (E20T70 - about 3-3/4" long) in the control panel. This should have the **Blue, Brown & Black** wires connected to the **RELAY BASE** in the control panel. **Blue** is connected to **terminal #10** and **Brown** is connected to **terminal #1**. **Black** is connected to **terminal # 11**. If not, connect as described

Step 4 - CHECK FOR CORRECT VOLTAGE. With **POWER SUPPLY RELAY** (E20T68) plugged in and power to Flaker on, check with volt meter to verify there is 24 volts across Molex spade connectors - attached to **Blue & Brown** wire for both the **EMITTER** and **RECEIVER**. Alternatively you can check **terminals #1 and # 10** on the **RELAY BASE.** If you don't have 24 volts, it is likely the **POWER SUPPLY RELAY** has failed and must be replaced.

Step 5 - CHECK FOR CORRECT OPERATION. Place a wire jumper across **Blue** and **Black** spades of the Molex plug on **RECEIVER** cable, which is attached at other end directly to **POWER SUPPLY RELAY** in control panel. The **POWER SUPPLY RELAY** should open the solenoid valve, turn the machine on and begin making ice. When the wire jumper is removed, the solenoid should close

approximately 15 seconds later. Depending upon the adjustment of the off-delay timer, the driver motor and water pump will continue to operate for between 2 – 30 minutes.

A) If the machine works as described above, it is likely the switch has failed to operate properly and the **RECEIVER** must be replaced.
B) If the machine does NOT work as described above, it is likely the **POWER SUPPLY RELAY** has failed to operate properly and must be replaced.
C) If the machine works as described above, and the LED light on the back of the **EMITTER** is out or dimly illuminated, it is likely that the **EMITTER** has failed to operate properly and must be replaced.

SEQUENCE OF OPERATION. There are LED indicators on the rear of both the **EMITTER & RECEIVER.** The **EMITTER** LED is illuminated whenever the ice machine has power. The **RECEIVER** LED is illuminated when it "sees" the infrared signal from the **EMITTER**, i.e. when no ice, blocks the signal. The signal to the **RECEIVER** must to be "blocked" for 15 seconds in order for the **POWER SUPPLY RELAY** to close the solenoid valve. When the solenoid valve de-energizes, the adjustable off-delay timer keeps the drive motor & water pump running for between 2 – 30 minutes, to clear any residual ice off the evaporator.

Trouble Shooting Main Control Board

Verify 24 VAC (+ - 4 VAC) between terminal 1 & 2
If ok, proceed, if not, check transformer in control panel for proper operation.

Checking Operation
Place wire jumper between terminal 2 & 3 to initiate unit start up,
Terminal 6 should energize, immediately, energizing drive motor contactor.
Terminal 7 & 8 should close immediately, allowing Solenoid Valve to energize.

Remove Jumper,
Terminal 6 should be remain energized for off delay time period (1-30 minutes)
Terminal 7 & 8 should open immediately, de-energizing solenoid valve.

Checking Overload Condition
With machine operating in normal condition, slowly turn current sensing overload set-point down (counterclockwise) until red LED illuminates, continue slowly turning CCW until set point trips. Tripping the overload set point does the following:
De-energizes output contact # 6, (de-energizes motor contactor).
Opens contacts # 7 & 8, (de-energizing solenoid valve).

Turn set point CW to point prior to trip point, rest overload and check for operation. If red LED is illuminated (and motor amps are not above normal load) turn Slightly CW until LED goes out.

If control board checks out as described above, it is not defective, & does not need to be replaced. If any steps above do not operate as described, board may be defective, contact Howe for further tests if necessary.

TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
Solid State Control Board		
1) Ice flaker is not running.	**1) No control power from control transformer. (Secondary 24 VAC)**	**Using a digital voltmeter set @ AC Voltage, check voltage between 1 & 2 on Solid State Control Board, voltage reading should be 24 VAC. If 24 VAC is not present, control transformer may be defective, check & replace.**
	2) Control switch(s) open Check voltage between terminals # 1 & 3, To test: Place a jumper between Terminal 2 & 3 (this will simulate ice level switch & on off switch are closed) ice machine should run normally.(NOTE: Unit will NOT shut off while jumper is in place)	**Check switches and ice level control for proper operation Close switch(es), or replace (switch) if defective.** **a) Switch(es) open, voltage should be 0 VAC** **b) Switches closed, voltage should be 24 VAC.**
2) Drive motor contactor is not energized. (NOTE: there must be power to terminal # 3 for the out put # 6 to energize. Ensure the input signal is present before condemning Solid State control board as defective). (the easiest way to check this is place a jumper between terminal 2 & 3, *all wires need to remain connected with jumper in place*).	**Solid State Control Board output is defective, or, contactor coil burnt, or, open wire in circuit.**	**Check voltage between 1 & 6**
		0 VAC present, output defective, replace module. *(input signal power must be present at terminal# 3 for out put terminal # 6 to be energized).*
		24 VAC present, module output (#6) OK, check wiring or contactor coil.
3) Solenoid valve not energized. Drive motor contactor is energized.	**Solid State Control Board isolated contacts will not close, (provided all switches are closed), or, two red wires in junction box on rear of flaker are not wired together, or solenoid coil defective.**	**Remove wires from 7 & 8, set meter to Ohms, check for continuity between terminals 7 & 8, (while module is energized, all switches in the on *closed* position.)**
		Contacts open, output

PROBLEM	PROBABLE CAUSE	REMEDY
		defective, replace module.
		Contacts closed, Module output OK, **Check jumper or CR_3 contacts wired between two red wires in junction box on rear of flaker (see wiring diagram)** **Check wiring or solenoid coil.**
4) Drive motor always stays on.	**Power is maintained to input # 3.** ***on-off switch(s) and or ice level control (is) are not shutting off.***	**Check on-off switch(s) and ice level control for proper operation,** **replace if defective.**
5) Liquid line solenoid valve energized always.	**Solid State Control Board isolated contacts will not open.** **(assuming no power to terminal #3)**	**Replace defective Solid State Control Board.**

ICE STORAGE & REMOVAL

Ice Flakes Frozen together into a hard block of ice in storage bin.	**1) Lead tube splashing water off the ice deflector, into the storage bin.**	**Adjust lead tube, so that it doesn't splash water over the ice deflector.**
	2) Drip pan leaking into storage bin.	**Repair or replace drip pan.**
	3) Humidity level in bin too high because:	
	a) Bin not sealed properly.	**Reseal or replace bin.**
	b) Bin door left open.	**Keep bin door closed when not removing ice.**
	4) Ice left in storage bin Too long because ice usage too small.	**Remove All ice out of bin daily, or,** **Install clock timer to limit the time the flaker produces ice.** **Match daily ice production with daily ice consumption.**

FREEZING

I Ice freezes on the	**1) System short of**	**Charge with refrigerant until**

TroubleShooting Chart

PROBLEM	PROBABLE CAUSE	REMEDY
entire length of the freezing drum but harvests only on the upper half. Ice remains on the lower half of the drum. Ice blade teeth cut grooves in the soft ice but cannot remove it.	**refrigerant. (Bubbles in sight glass).**	**bubbles in sight glass disappear. (Suction accumulator must be empty of liquid.)**
	2) TXV superheat setting is too high.	**Decrease superheat setting (open valve) 2 turn at a time until ice is *harvested* down to bottom of drum.**
	3) Improper location of TXV bulb. (located at ice flaker suction outlet).	**Relocate bulb approximately 6" from inlet side of suction line heat exchanger (if equipped) or on the horizontal section of the suction line, at approximately 5 O-clock position. Clamp securely and insulate.**
II Ice freezes and harvests top to bottom of drum, but on one side only. Opposite side does not harvest.	**1) Ice blade clearance too high.**	**Adjust ice blade clearance. (see instructions in Section 11, Service & Adjustment).**
	2) Main bearings worn.	**Replace worn bearings, inspect and repair/replace shaft if worn.**
	3) Mis-assembled top casting, after bearing replacement.	**See (section 11 Service & adjustments) bearing replacement procedure, and re-align/assemble top casting.**
III Ice freezes soft on entire length of drum, ice flaker drive motor cuts out on overload a few minutes after start-up.	**Almost entire refrigerant charge in accumulator, little or no liquid in receiver.**	**Pump out accumulator, restart system. Adjust TXV if necessary.**
IV Ice freezing hard on entire length of drum, but harvesting poorly and at random, with no specific pattern.	**1) Water quality not suitable (hard water).**	**Install Howe Phosphate Filters.**
	2) Freezing surface coated with hard water deposits.	**Clean evaporator with ice machine cleaner to remove**

TroubleShooting Chart

PROBLEM		PROBABLE CAUSE	REMEDY
	Leaves strips of ice at upper end of drum, some at lower end, etc.		**deposits.**
V	**No ice freezing on drum and compressor short cycles.**	**1) Loss of refrigerant charge.**	**Inspect for and repair leaks, charge to proper refrigerant levels.**
		2) Dead power element on TXV.	**Replace power element.**
VI	**Ice flaker makes ice intermittently and compressor short cycles.**	**Insufficient water supply to ice flaker because:**	
		a) Water supply line undersized.	**Install water supply line of proper size.**
		b) Water supply less than 30 PSIG.	**Consult factory.**
		c) water filters clogged.	**Replace filters every 6 months or sooner if necessary. (Back flushing filter may temporarily work until replacement filters arrive.)**
VII	**Ice flakes too thin.**	**1) Evaporating Temp. too high because:**	
		a) TXV overfeeding, compressor frosted.	**Pinch down TXV (close 2 turn at a time).**
		b) EPR set too high.	**Adjust EPR for evaporating temp. 0°F (Model 1000), -5°F for model 2000 & 3000.**
		2) Condensing unit not producing rated capacity because:	
		a) Compression valves broken.	**Repair/service compressor/condensing unit.**

TroubleShooting Chart

PROBLEM		PROBABLE CAUSE	REMEDY
		b) Condenser dirty. (head press. too high)	**Clean fin coil (air cooled unit) Clean tubes (water cooled units).**
		c) Head pressure controls defective.	**Replace defective head pressure control. (Headmaster Control)**
		3) Condensing unit undersized.	**Replace unit with properly sized condensing unit.**
VIII	**Ice flakes too small and too "powdery"**	**1) Evaporating temp. too low because condensing unit is oversized.**	**Adjust EPR for evaporating temperature to (0°F. For 1000-RLE) (-5°F. For 2000 & 3000-RLE)**
IX	**Ice flaker "chatters" excessively, does not run smoothly.**	**1) Excessive ice blade clearance.**	**Inspect and adjust ice blade clearances. (see section 11, service & adjustment).**
		2) Worn main bearings and/or shaft.	**Replace bearings and/or shaft (if worn) (see section 11, service & adjustment).**
X	**Too much ice accumulation in bottom water collecting trough.**	**Ice deflector not properly positioned.**	**Reposition ice deflector. (see section 11, service & adjustment).**
XI	**Too much ice accumulation in bottom water collecting trough and in water sump, and excessive ice build up on bottom 3 "ribs"**	**1) Ambient temperature too cold.**	**Ice flaker must be moved to warmer area where ambient temperatures above 50°F.**
		2) Water temperature too cold.	**Water temperature must be above 40°F. Install water mixing valve to supply 60°F (ideally) water to ice flaker.**
XII	**Ice in storage bin too wet. (water dripping**	**1) Water level in sump set too high**	**Adjust water float valve to maintain water level 2 full in**

PROBLEM		PROBABLE CAUSE	REMEDY
	into bin with ice).	**Water sump overflow plugged, (water overflowing collecting trough)**	**the sump & water return trough.** **Clear overflow drain line.**
		2) Water overflowing top water distribution pan because:	
		a) Water distributing tubes plugged.	**Unplug all distribution tubes.**
		b) Water pump delivering too much water to pan.	**Adjust water regulating valve (ball valve located near water pump)**
		3) One or more water distribution tubes broken.	**Replace all defective water distribution tubes.**
		4) Ice flaker not harvesting down to bottom of freezing drum.	**See problem I.**
DRIVE MOTOR			
I	**Motor amps too high, reach a peak reading at a certain position on the drum.**	**1) Broken gear tooth in speed reducer.**	**Repair or replace speed reducer.**
		2) Ice blade adjusted closer than .003 clearance at that position.	**Readjust ice blade clearance. (see section 11, Service & adjustment).**
II	**Motor does not start when system is turned on.**	**a) Defective off delay timer circuit**	**Replace Solid State Control Board.**
		b) Defective Bin level control	**See Photo Eye problems page 61.**
III	**Motor does not shut off when system is turned off. (after normal time delay period).**	**Defective off delay timer circuit**	**Replace Solid State Control Board.**

TroubleShooting Chart

PROBLEM		PROBABLE CAUSE	REMEDY
IV	**Motor cuts out on overload, but amps do not exceed nameplate F.L.A.**	**1) Electronic overload set too low.**	**Consult factory**
VI	**Motor burnt out, speed reducer output shaft broken.**	**1) Electronic overload setting too high.**	**Consult factory**
VII	**Motor burnt out or off on overload, ice deflector broken or bent out of shape.**	**Ice storage bin was full of ice and flaker continued to operate. No ice level control, or defective ice level control.**	**Install suitable ice level control. Photo Electric Eye**
VIII	**Gearmotor stops turning during normal operation**	**Ice flaker voltage dropped below 200 VAC**	**Install Buck / Boost transformer to boost voltage to ice flaker, so it doesn't drop below 200 VAC. (220/230 optimum voltage)**

*** IMPORTANT SAFETY NOTICE ***

The information in this manual is intended for use by individuals possessing adequate background in electrical, refrigeration and mechanical experience. Any attempt to repair major equipment may result in personal injury and / or property damage. The manufacturer or seller cannot be responsible for the interpretation of this information, nor can it assume any liability in connection with its use.

*** IMPORTANT SAFETY NOTICE ***

*** DANGER ***

The control panel on this ice flaker may be powered by TWO SEPARATE power sources. Disconnect BOTH SOURCES prior to servicing this piece of equipment. Failure to do this may potentially cause a electrocution hazard.!!

*** DANGER ***

*** WARNING ***

Only technically qualified persons, experienced and knowledgeable in the handling of refrigerants and operation of refrigeration systems, should perform the operations described in this manual.

*** WARNING ***

REPLACEMENT & ADJUSTMENT OF ICE DEFLECTOR

To properly install, the upper edge of the deflector should be positioned approximately 1/8" BELOW the aluminum lip under the evaporator.

The ice deflector should be centered beneath the ice cutter blade so that as the ice is removed from the evaporator, it will be deflected into the ice bin opening, away from the water collecting trough. The ice deflector prevents ice from dropping into the water collecting trough.

TO REPLACE ICE DEFLECTOR PROCEED AS FOLLOWS:

Shut off ice flaker and allow machine to "pump down" (de-ice) once the machine is clear of ice , then you should disconnect the main power to the ice flaker and LOCK THE DISCONNECT SWITCH IN THE OFF POSITION (to prevent accidental start up).

Remove the service access cover on the top casting.

Reaching up from the bin into the freezing chamber, loosen and remove the two 10-24 bolts holding the existing ice deflector in place.

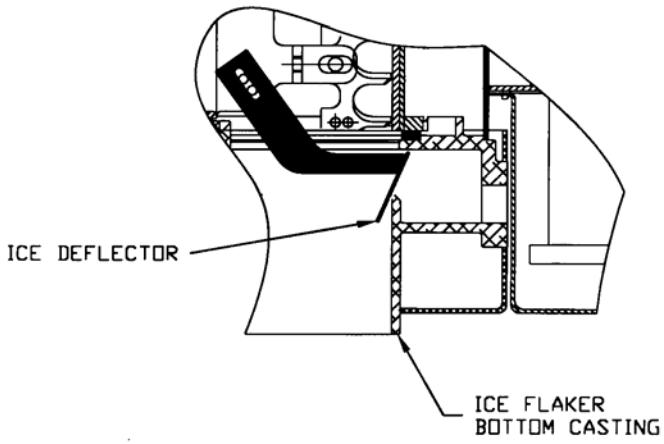
Remove the damaged ice deflector through the bottom opening.

Position and bolt the new ice deflector to the shaft. Tighten the bolts with the deflector adjusted to within 1/8" but NOT touching the evaporator surface or aluminum casting.
.
Remove all tools from inside the machine and re-attach the service access cover.

Remove lock-out devise from the main power disconnect and turn on the main power.

Turn on the ice flaker switch, and check the deflector to insure that it does not touch the evaporator or aluminum casting.

If the deflector makes contact with the evaporator surface or aluminum casting at any point, then shut down the machine and repeat the above steps to readjust the deflector.



REPLACEMENT & ADJUSTMENT OF ICE DEFLECTOR SCRAPER. (2& 3000-RLE)

The ice deflector scraper is mounted on one of the three bottom ribs using two 3-20 stainless bolts

and nuts. The scraper's primary purpose is to clear any buildup of ice on the ice deflector as the deflector passes by the scraper. When properly positioned, the scraper will be approximately ⊂ above the deflector blade. When replacing the scraper, it may be necessary to cut the angled edge down to the proper size. This may be cut with either aviation snips or a razor knife.

REPLACEMENT & ADJUSTMENT of the SQUEEGEE & SQUEEGEE WRAPPER (2000 & 3000-RLE Only)

Shut off ice flaker and allow machine to "pump down" (de-ice). Once the machine is clear of ice , then disconnect the main power to the ice flaker and **LOCK THE DISCONNECT SWITCH IN THE OFF POSITION** (to prevent accidental start up).

Remove the service access cover on the top casting.

Remove 2 or 3 water distribution tubes for easier access.

Reaching down into the freezing chamber, loosen and remove the two 5/16" bolts holding the existing squeegee & squeegee wrapper in place.

Remove the squeegee & wrapper assembly through the service opening. If the squeegee wrapper is not bent out of shape or pitted with rust, then you can remove the rubber squeegee from the wrapper and install a new squeegee in your existing wrapper.

Reinstall the squeegee & wrapper assembly onto the mounting bracket in the freezing chamber, hand tighten the nuts with the squeegee touching the evaporator surface, then move the squeegee assembly approximately 1/16" to 1/8" closer to put a little pressure on the squeegee causing it to bend **slightly** so that it will drag on the evaporator surface.

Do not install the squeegee assembly so close to the evaporator so that the squeegee bends excessively. (this may cause premature squeegee wear and increase load on the gearbox and drive motor).

Tighten down the nuts and bolts only till the lock washers lock, **do not over tighten bolts**, this may cause distortion of the squeegee wrapper and possibly cause premature squeegee wear.

Re-install water distribution tubes.

Remove all tools from inside the machine and re-attach the service access cover.

Remove lock-out devise from the main power disconnect and turn on the main power.

Turn on the ice flaker switch, (you may need to press the overload reset button) and check the squeegee to insure that it touches the evaporator on the entire circumference of the freezing chamber.

If the squeegee looses contact with the evaporator surface at any point, then shut down the machine repeating the above steps to readjust the squeegee a little closer.

REPLACEMENT & ADJUSTMENT of the WATER DISTRIBUTION TUBES

Adjust lead tube (bottom spout with 90° Elbow), so that the water is dispersed over the evaporator and it doesn't splash water over the ice deflector. If it is adjusted too far forward, the water may cascade down onto the ice deflector and "dribble" onto the ice in the storage bin. If water is running onto the ice deflector, turn the lead tube away from the ice blade, so water does not run onto the ice deflector.

The side spouts are positioned so the ends of the tubes are approximately 3" away from the surface, along the top edge of the evaporator, pointed slightly down towards away from the distribution pan. Ensure that the water level is at least ½ full in the distribution pan, but not overflowing the top. Inadequate water level may cause water to "dribble" out of the distribution tube(s) down onto the ice in the bin, & not on the evaporator.

REPLACEMENT OF VERTICAL STYLE GEAR MOTOR WITH OFFSET STYLE GEARMOTOR

Disconnect main power to the ice flaker. Remove electric wiring cover on the drive motor. Unplug the power leads from machine. The gear motor (Figure 1) is attached to the mounting hub with (4) ¼" bolts, through the motor mounting plate. Remove the (4) bolts. The gear motor may be removed by pulling it straight up from the mounting hub. The flexible coupling will separate; half stays on the flaker shaft, with the bronze star, the other half is attached to the gear motor. The motor shaft fits directly into the top half of the flexible coupling with a ¼" key.

When installing the new offset style gear motor (Figure 2), attach the motor to the adapter plate using the (6) ¼" screws through the bottom of the plate. Place the ¼" key on the shaft, lightly grease the surface of the motor shaft, and insert in the hole on the flexible coupling, keeping the keyway aligned with the key. When the motor is in place, rotate it (CCW ONLY) until the (4) holes on the adapter plate are aligned with the (4) mounting holes on the mounting hub on the flaker. Insert a bolt in each hole and tighten. You may need to loosen and readjust the flexible coupling to ensure the gear motor seats firmly to the mounting hub.

Figure 1 Vertical Style Gearmotor

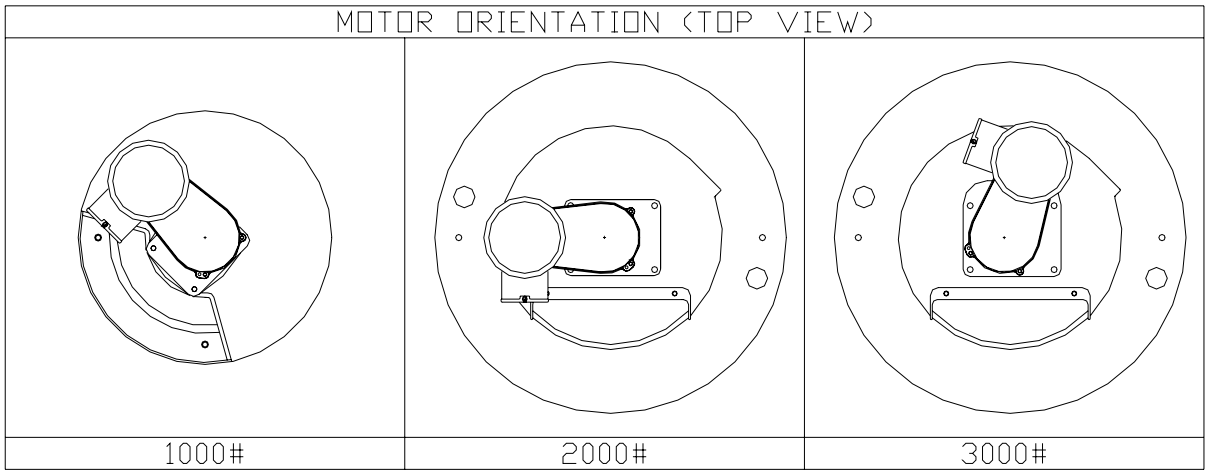
Figure 2 Offset Style Gearmotor

Motor Overload Wiring: To ensure proper motor overload circuit performance when replacing a vertical style motor with an offset style, the motor power lead needs to be looped through the current sensing module located on the control board (E20T48). To do this, disconnect the wire from the motor contactor mounted in the control panel and loop the loose end through the current sensor a total of (3) times. Reattach loose end of the lead to the motor contactor.

Reattach the power plug to motor connections, check to insure the motor is wired for the correct power (115V or 230V) and for the correct rotation (CCW). Refer to wiring connections on the motor

nameplate for the correct connections. Motors come wired standard 230V from the factory.

When the motor is reattached and connected, turn on power and check operation. Place an ammeter on the power line and check to insure the motor is drawing within the nameplate FLA. Reset the motor overload per instructions in the Start & Adjust section of this manual.



REPLACEMENT OF DRIVE MOTOR

Disconnect main power to the ice flaker. Remove electric wiring cover on the drive motor. Remove the power leads attached to terminals marked L_1 and L_2.
The drive motor is attached to the gearbox with (4) d bolts, through the motor mounting plate. Remove the (4) bolts., The motor may be removed by pulling it away from the gearbox. There are no set screws or couplings, the motor shaft fits directly into the hollow high speed input shaft on the speed reducer with a 3" key. If the old motor cannot be removed easily, then locate two threaded holes on the motor mounting plate. They will be on the horizontal center-line, one on each side of the input shaft. Insert one of the mounting bolts into each threaded hole so they push against the drive motor (you may have to rotate the motor housing so the bolts can press against the mounting lugs on the motor, making sure the bolts do not thread into the mounting lugs.) Turn in both bolts until they are hand tight, then turn in each bolt 2 turn at a time, alternately until the motor if free enough to remove by hand.

When installing the new motor, place the 3 key on the shaft, lightly grease the surface of the motor shaft, and insert in the hole on the high speed input shaft, keeping the keyway aligned with the key. When the motor is in place, rotate it until the mounting lugs are aligned with the (4) mounting holes on the motor mounting plate on the speed reducer. Insert a bolt in each hole and tighten.

Reattach the flexible power cable to the motor, connect the power leads to terminals marked L_1 and L_2, and check to insure the motor is wired for the correct power (115 or 230) and for the correct rotation (CCW). Refer to wiring connections on the motor nameplate for the correct connections.

When the motor is reattached and connected, turn on power and check operation. Place an ammeter on the power line and check to insure the motor is drawing within the nameplate FLA.

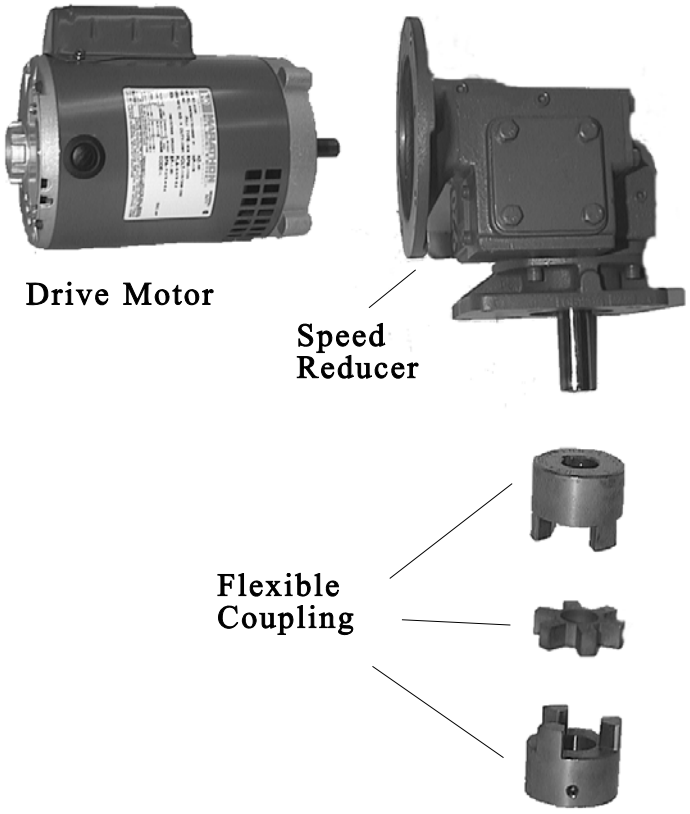
REPLACEMENT OF SPEED REDUCER & FLEXIBLE COUPLING

Disconnect main power to the ice flaker. Remove the drive motor as described above, remove (4) mounting bolts attaching the gearbox to the top aluminum casting. The gearbox can then be lifted straight up, the top part of the flexible coupling will lift off with the gearbox, the bronze star and bottom part of the coupling will stay attached to the main shaft.

Loosen the setscrew on the top part of the coupling to remove it from the gearbox. Care should be taken to avoid oil from seeping out the relief vent (located on the top if the gearbox in a set screw) if the gearbox is turned on its side or up side down. The bottom part of the flex coupling is attached to the shaft with a setscrew. Loosen the setscrew, then lift the coupling off the shaft. The use of a gear puller may be required to assist in removing either part of the coupling.

Install the new (or existing if it is not damaged) flex coupling to the shaft and speed reducer, lining up the keyways with the key. Re-tighten the setscrews in both parts. Place the bronze star on the bottom part of the coupling. Install the gearbox (with top coupling attached) onto the top casting, over the bottom part of the flex coupling. If the gearbox does not sit on the top casting properly, you may need to loosen one or both of the setscrews on the flex coupling to allow the gearbox to seat on the machined surface of the casting. There should also be a 1/16" gap between the top coupling half and the bronze star. Rotate the gearbox COUNTERCLOCKWISE ONLY until the mounting holes line up. Once aligned re-install the mounting bolts. Re-position coupling halves with required clearance and re-tighten.

Drive Motor & Speed Reducer
(3000-RLE only)



REPLACEMENT OF ELECTRIC EYE SENSOR(s)

1. Remove front panel of ice flaker by lifting up and away from unit and place aside until finished**.**

2. Locate cables from ice level sensors (one on the left and right side of ice machine) and disconnect from wiring harness

3. Remove photo eye mounting bracket from bin carefully pulling cable from flaker enclosure.

4. Using two open-end wrenches, placing one on the back nut, one on the forward nut, loosen the nut and remove.

5. Then attach new eye in place of the old one.

6. Tighten the lock nuts, taking care not to over-tighten as this could damage the sensor. Use a maximum torque of 13 lb-in. Carefully route the cable(s) into the ice flaker wiring trough so they are not damaged, re-attach to the wiring harness, packing Molex plug with Di-electric grease to prevent moisture from possible temporarily "shorting" the trigger signal should the plug get wet. Secure the cable(s) so they cannot be damaged by accident. Ensure there is a "Drip loop" on the cable near the sensor so any moisture accumulating on the cable, will travel to the bottom of the drip loop & drip off, rather than running into the rear of the sensor(s).

7. Turn power on and check alignment of the eyes. When the eyes are proper alignment, the receiver sensor LED will light up. When the signal is blocked, the LED will go out, then after a 15 second delay the solenoid valve will de-energize, and the machine will go into pump down. When the receiver Asees@ the signal after the path is cleared of obstructions, the solenoid will again energize and the machine will start making ice again. *Note: the* LED *on the Emitter will be on whenever there is power applied to the emitter.*

8. Re-install side panels (if removed), top cover, and front panel.

REPLACEMENT OF WATER PUMP

1. Turn off the main power to the flaker, remove screws holding the stationary sump cover, loosen and remove water tube fitting (Nylon compression fitting), unplug the Nyloc electric plug from the wiring harness. Lift the water pump (with cover attached) off the sump.

2. Installing the new pump simply reverse the above procedure. Use caution when routing the new cable to insure they are secured to avoid accidental damage.

REPLACEMENT & ADJUSTMENT OF WATER FLOAT VALVE

Turn off main power to flaker.
Shut off the water supply to the ice flaker and drain the supply line. Remove water pump & cover as described above. Loosen and remove the compression fitting at the float valve. While holding the float valve body with a pliers or crescent wrench, remove the water float valve fitting from the valve body. Using a 13/16" socket (a spark plug wrench works great), remove the locking nut from the valve body, (you will need to hold the valve body from turning). Remove the old valve and fibre washer. Install new valve (with fibre washer on the inside of the water sump), tighten the locking nut with the socket. The valve body should be held in place with the discharge port facing straight down. Re-install the float valve fitting, Reattach water supply line. Turn on water shut off valve and check for leaks at the compression fitting and at the float valve fitting. The water level should be maintained to the point just below the water return trough from the evaporator while the flaker is operating. To adjust the operating level, hold the float in one hand, and rotate the plastic float clockwise to lower the water level, counterclockwise to raise the water level (depending on whether the water level is too high or too low.) Care should be used to avoid unscrewing the float body from the shaft. Watch the operation for a while to verify the water level. If the water level is still not where it should be, re-adjust the float.

REPLACEMENT OF EXPANSION VALVE

Pump down the ice flaker and evacuate refrigerant from the liquid line. Carefully cut back the insulation on the suction line and remove the remote bulb. The bulb is secured to the suction line with two straps. Remove insulation from liquid line and expansion valve, cut out or de-solder expansion valve from liquid line and remove the old valve. Install and solder the new valve into the liquid line. Pressure test your connections for leaks. Re-attach the bulb to the suction line at approximately 5 O-Clock position. Secure the bulb using two straps. Re-insulate the suction & liquid lines. Using a high quality vacuum pump, evacuate the liquid line to remove any moisture that may have entered the system while the line was open to atmosphere.

ADJUSTMENT OF EXPANSION VALVE

Note: When the ice flaker is in a cold ambient location, and / or the machine is supplied with cold water, the standard TXV valves may appear to overfeed, however when properly adjusted, they should feed properly. In extreme cases of cold ambient and / or cold water temperature, the next smaller sized expansion valve may need to be installed.

Always adjust EPR valve prior to attempting to adjust TXV valve.
If ice freezes on entire length of evaporator (top to bottom) but harvests only the upper portion with each revolution of the shaft ***and*** there are no bubbles in the sight-glass, then the expansion valve must be adjusted.(Opened, to feed more refrigerant). On the other hand, frost on the compressor body indicates that the valve is overfeeding.

Remove the adjustment stem cover and turn the adjustment stem 1/8 to 1/4 turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve if the evaporator was not harvesting ice on its entire length.) Wait 10-15 minutes between each adjustment to allow the valve to stabilize. Repeat this step until ice is produced ***and harvested*** all the way down to the bottom of the evaporator. Note: *Balanced Port Expansion Valves Are more sensitive than normal TXV's, so adjustment of the stem should be limited to between 1/16 to ⊂ turn at a time.*

REPLACEMENT OF SOLENOID VALVE

***** SPECIAL NOTE *****

On RL flakers that are connected to a central refrigeration rack system, the two red wires in the main power junction box on the rear of the flaker must be wired together This jumper will allow the solenoid valve to energize when the operating circuit is energized.

***** SPECIAL NOTE *****

Pump down the ice flaker and evacuate refrigerant from the liquid line. Turn off main power to ice flaker, disconnect wires leads from solenoid valve. Cut out or de-solder the solenoid valve from the liquid line and remove the old valve. Install and solder the new valve into the liquid line, pressure test your connections for leaks.

***** CAUTION *****

ARROW ON SOLENOID VALE MUST POINT IN THE DIRECTION OF FLOW TOWARDS ICE FLAKER.

***** CAUTION *****

Using a high quality vacuum pump, evacuate the liquid line to remove any moisture that may have entered the system while the line was open to atmosphere. Re-connect solenoid coil wires. Turn on main power, turn ice flaker switch on and check operation of solenoid valve.

EVAPORATOR PRESSURE REGULATOR (EPR) ADJUSTMENT.

Model 1000-RLE,
EPR valve is located inside the enclosure behind the flaker to facilitate ease of adjustment of the valve. EPR valves should be adjusted to maintain between 0°F and +5°F (depending on ambient & water conditions) suction temperature at the ice flaker suction line.
EPR valves on 2 & 3000-RLE are available as an option. When supplied, they are shipped loose, to be installed on the suction line behind the flaker, secured to the building wall.

The manufacturers setting for the ORIT EPR valve is 30 PSIG. Howe doesn=t re-adjust valve to suit application. It must be field adjusted to a pressure equivalent to (0°F. for 1000-RLE, -5°F. for 2 & 3000-RLE). This pressure setting will vary depending on the refrigerant used in your system. (e.g.: For R-404A the setting is 28 PSIG). To adjust the ORIT EPR valve, remove the cap and turn the adjustment screw using a 1/4" hex wrench. A clockwise rotation increases the valve setting, while a counter clockwise rotation decreases the setting. To obtain the desired setting, a pressure gauge should be utilized on the inlet side of the valve so the effects of any adjustments can be observed. The ORIT valve has a access valve on the inlet fitting for this purpose. Small adjustments and adequate time between adjustments are recommended to allow the system to balance at the new

setting. ** Average PSI change per rotation of the adjustment screw is 6 psi.*
Service note : since these valves are hermetic and cannot be disassembled for inspection and cleaning, they usually must be replaced if they become inoperative. However, if an ORIT fails to open, close properly, or wont adjust, it is probably due to solder or other foreign materials lodged in the port. It is sometimes possible to dislodge these materials by turning the adjustment nut all the way out with the system running. If the ORIT develops a refrigerant leak around the spring housing, it probably has been overheated during installation or the bellows has failed due to severe compressor pulsations. When this occurs, the ORIT will close until the inlet pressure becomes greater than the outlet and spring pressures. Then the valve will open and close like a pressure differential valve.

ICE BLADE ADJUSTMENT

Ice blade adjustment is not normally required, typically the only time this is needed is after bearing replacement. If you suspect the blade needs adjustment because of excessive clearance, it is typically caused by excessive bearing wear, not the blade going out of adjustment. Do not try to adjust the blade clearance without checking for and correcting worn bearings. When checking tolerances, do NOT use automotive Asparkplug@ type feeler gauges, you MUST use industrial machine tool type feeler gauges (these are about 2" wide by 12A long). The Automotive type are to short, and not flexible enough to give a true reading. These machine tool type feeler gauges are available from the factory if you cannot locate them locally.

BLADE SETTING CLEARANCE BETWEEN EXTREME OUTBOARD TIP OF ICE BLADE AND EVAPORATOR FREEZING SURFACE MUST BE .004" TO .006" WITH EVAPORATOR AT ROOM TEMPERATURE.

ADJUSTMENT PROCEDURE:

With the ice machine turned and locked off, and the evaporator at room temperature, locate exact position on evaporator freezing surface where the clearance between the tip of ice blade and freezing surface is the least. This is accomplished with the use of a feeler gauge. Check clearance top and bottom of blade, rotate blade 60 degrees and recheck clearance. Repeat this operation at a minimum of six points on the circumference of the evaporator in order to determine the point of least clearance accurately.

With the ice blade rotated to the point of least clearance, set gap between ice blade and evaporator freezing surface to between 4 and 6 mil at the top and the bottom of the blade. Tighten the blade mounting bolts and recheck clearance.

BEARING REPLACEMENT

1) Remove gearmotor by taking out the 4 - cap screws, from the top aluminum casting. & Remove the lower half of the flexible coupling.

2) Remove rivets which retain the outer jacket around the ice flaker. Pull the jacket away from the body of the ice flaker.

3) Cut away at the upper 3 inches of insulation uncovering 4 - 3/8" cap screws which bolt the upper aluminum casting to the evaporator. Remove these 4 bolts. If spacers are found between evaporator lugs, they should be marked and re-used in the same position. These

are required to obtain proper alignment.

4) Using a rubber mallet, gently tap the aluminum casting from below (upwards) to free it from the evaporator. Adhesive is used to retain the rubber insulating ring in place.

5) Lift up on the aluminum casting and slide it off the shaft.

6) Loosen rubber squeegee mounting bolts and push squeegee away from the evaporator surface.

7) Lift the shaft assembly out of the evaporator. Be careful to avoid scratching evaporator freezing surface with the ice blade.

8) Examine shaft journals for wear, if worn, repair or replace shaft.

9) Remove old oil seals in upper casting.

10) Press out bearing in upper casting, using a drift pin or properly sized wood block. Note: To avoid distortion of casting it should be supported near the bearing area and not on the outer edge.

11) Press new bearing into position. Then press the new oil seals into position.

12) To remove the bottom bearing, first remove the bottom bearing cover, and the old bearing plate.

13) Now follow the same steps as were done for the top bearing. (steps 10-12)

14) Install new bottom bearing plate, replace bottom bearing cover.

15) Insert the new or repaired shaft. Running clearance between shaft and new bearing must be about .001". Shaft must rotate freely in bearing.

16) Re-position rubber insulating ring - use adhesive if possible. Re-install top casting. Make sure that the evaporator lugs are properly seated against shoulders machined in casting. Tighten down the four mounting bolts evenly.

17) Shaft must rotate freely by hand. If shaft is tight, it indicates that the top casting is off center.

18) Install ice blade and adjust clearance to approximately .003" at closest point. Refer to blade adjustment instructions.

19) Re-install bottom half of the flexible coupling.

20) Re-install gearmotor.

21) Re-install insulation and plastic jacket**.**

Replacement Parts Listing

Replacement parts for

Rapid Freeze ®

Ice Flakers

Effective June 2006

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MODELS 1000-RL, RC, SCW, & SCA
FRESH WATER ICE FLAKER
CROSS-SECTION

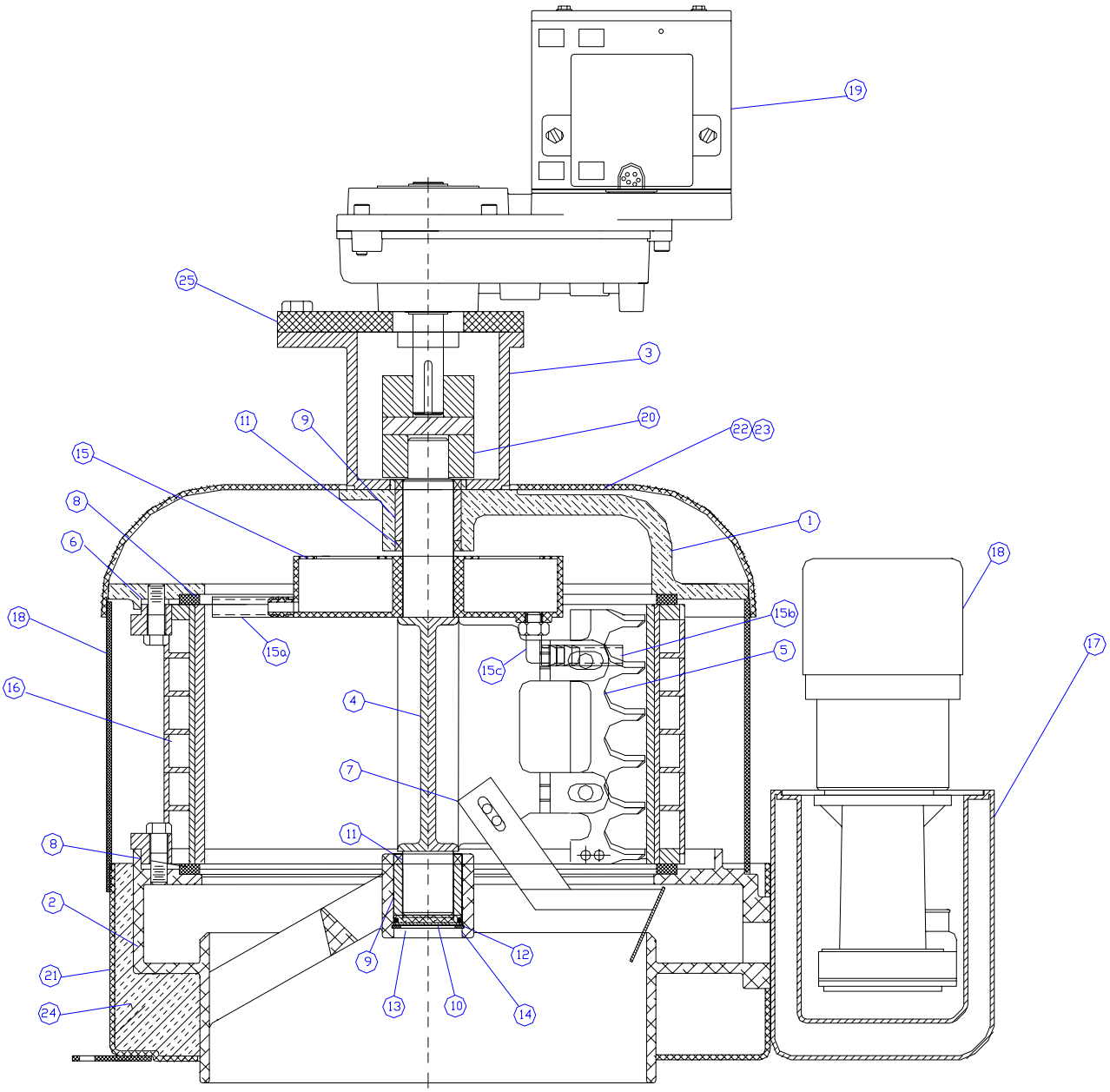

TABLE 1: REPLACEMENT PARTS		1000-RLE, SCA, SCW
Item No.	PART DESCRIPTION	PART No./ LIST PRICE EA
3	Gearmotor Mount	F5A6
4	Main shaft	F5D2
5	Ice harvesting blade	F5E1
5a	Nuts, bolts & washers (Ice blade)	F5E5
6	Insulating lug spacer	F5J5
7	Ice deflector	F5G1
7a	Nuts, bolts & washers (Ice deflector)	F5G2
8	Insulating ring (2)	F5J4
9	Main bearing (2)	F5K1
10	Bearing plate	F5K2
11	Main bearing oil seals (3)	F5K3
12	O-Ring for bearing plate	F5K4
13	Bottom bearing disc, SS	F5K5
14	Bottom bearing disc lock ring	F5K6
14a	Bearing replacement kit (includes items 9 - 14)	F5K7
15	Water distribution pan	F5H5
15a	Water distribution side spout tube (6)	F5H6
15b	Water distribution bottom spout tube	F5H7
15c	Water distribution bottom spout fitting	F5H8
17	Water sump assembly with pump (Old) - see p. 64	F5H16
	Water sump assembly with pump (New) – see p.64	F5H26
17a	Water sump gasket	E5H18
18	Replacement water pump assembly for flakers with removable water sump (Old) – see p.64	F5H24
	Replacement water pump assembly for flakers with removable water sump (New) – see p.64	F5Q4
	Water pump regulating valve (Old)	E20H24
	Water pump regulating valve (New)	E10H59

TABLE 1: REPLACEMENT PARTS		1000-RLE, SCA, SCW
Item No.	PART DESCRIPTION	PART No./ LIST PRICE EA
	Water pump discharge tube (Old)	F5Q2
	Water pump discharge tube (New)	F5H11
	Water pump discharge elbow fitting (Old)	F5Q3
	Water float valve (Old)	F5P1
	Water float valve (New)	E10H29
	Water float valve fitting	CNB-BR02/06
	Copper water tube	F5H10
	Water tube insulation	F5H14
	Water tube fitting	CNM-NY-08/08
19	Drive Motor 115-230/1/60 1/12 HP	F5M1
	Gearmotor 230/1/60 1/45 HP	F5M2
	Gearmotor 220-240/1/50 1/45 HP	F5M3
	Gearmotor 230/1/60 1/20 HP	F5M10
20	Flexible coupling (complete)	F5N1
22	Handhole cover (removable)	F5I2
25	Gearmotor mounting plate (1/20 HP Motor)	F5A7

TABLE 2: ACCESSORIES		100-RLE, SCA, SCW
Item No.	PART DESCRIPTION	PART No./ LIST PRICE EA
	Thermostatic expansion valve R-404A (RC, SCA & SCW units)	F5V18
	Thermostatic expansion valve R-22 (RC, SCA & SCW units)	F5V17
	Balanced port expansion valve R-404A (RL units)	F5V20
	Balanced port expansion valve R-22 (RL units)	F5V19
	Liquid line solenoid valve d@ ODS,	E6S130-S

TABLE 3: ELECTRIC PANEL & PARTS	1000-RLE, SCA, SCW

Item No.	PART DESCRIPTION	PART No./ LIST PRICE EA
	Control board, 24VAC, SSAC	E20T48
	Overload reset button (N.O.)	E20T23
	Snap-in On-off rocker switch	E20T24
	24 Volt control transformer	E20T31
	3-Pole relay for motor contactor, (24 volt coil)	F5T2
	3-Pole relay mounting base	5V013
	Power module for infrared ice level control	E20T68
	Infrared ice level control emitter	E20T69
	Infrared ice level control receiver	E20T70

To help determine which ice flaker water sump & pump you need, use the following tables:

Flaker Manufacture Date		Replacement water sump for Freshwater ice flakers
Start Date	End Date	1000 Pound Models
07/86	07/06	F5H16
07/06	Present	F5H26

Flaker Manufacture Date		Replacement water pump for Freshwater ice flakers
Start Date	End Date	1000 Pound Models
07/86	07/06	F5H24
07/06	Present	F5Q4

Items labeled “Old” represent parts used prior to 07/06. Items labeled “New” represent parts used from 07/06 until the present. For more detailed information, contact Howe customer service department with ice flaker serial number.

Models 2000, 10EA, 10EAR, 11ES, 11ESS, 3000, 15EA, 15EAR
16ES, 16ESS, 4000, 20EA, 20EAR, 21ES, 21ESS, 6000, 30EA
30EAR, 31ES, 31ESS ICE FLAKERS
CROSS-SECTION

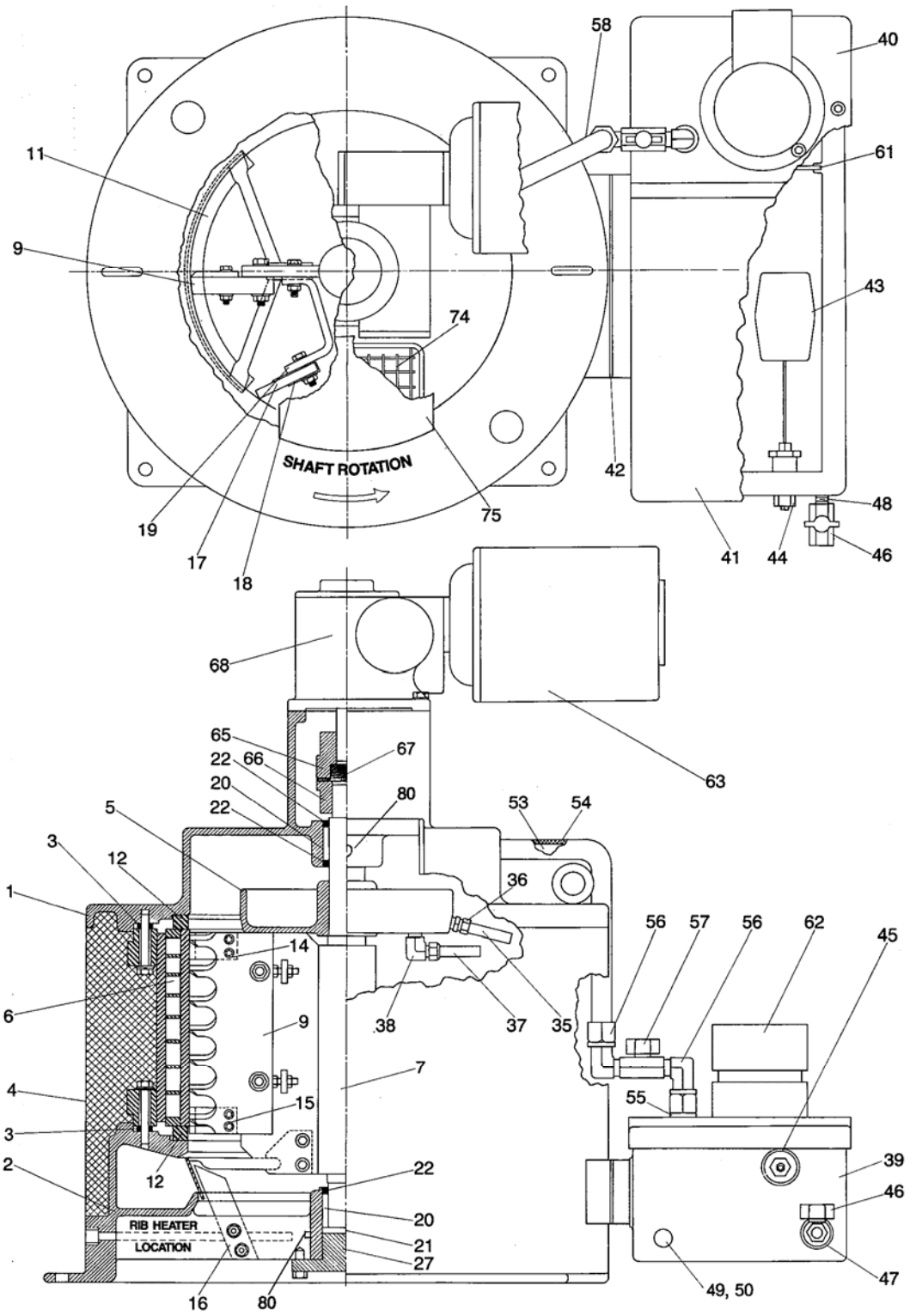

TABLE 4: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	Part Description	Part No. And Suggested List Price (EACH)			
3	Insulated lug spacers (8)	E20J4			
7	Main shaft	E10D2	E15D2	E20D2	E30D4
9	Ice blade 8½"L, 12½"L, 20½"L	E10E2	E20E2		E30E3
9a	Nuts, bolts & washers (Ice blade)	E10E5	E20E6		E30E5
	Ice blade adjustment gauge kit Set of (5) feeler gauges for ice blade adjustment	E10E15			
11	Ice deflector	E10G1		E20G2	
11a	Ice deflector, scraper & backer plate kit	E10G6-KT		E20G8-KT	
11b	Nuts, bolts & washers (Ice deflector)	E20G5			
12	Insulating ring (2)	E10J1		E20J1	
14 & 15	Top & bottom auxiliary ice scraper	E20E4			
15a	Nuts, bolts & washers (Aux. ice scraper)	E20E7			
16	Ice deflector scraper (Only)	E20G4			
16a	Ice deflector scraper backer plate (Only)	E20G7			
16b	Ice deflector scraper & backer plate kit	E20G9			
17	Squeegee 8½"L, 12½"L, 20½"L	E10F4	E20F4		E30F3
18	Squeegee wrapper	E10F9	E20F9		E30F8
18a	Nuts, bolts & washers (Squeegee wrapper)	E10F8	E20F8		E30F22
19	Squeegee bracket	E10F11	E15F6	E20F11	E30F7
19a	Squeegee bracket (Seawater)	E10F7	E15F7	E20F21	E30F21
20	Main shaft bearings (2)	E20K1			
21	Bottom bearing thrust plate	E20K2			
22	Main bearing grease seals (3)	E20K3			
22a	Bearing replacement kit (2 bearings, 1 plate & 3 seals)	E20K4			
22b	Bearing removal / replacement tool kit	E10T1			
27	Bottom bearing cover	E10B8		E20B8	
35 & 36	Water distribution side spout & fitting (6)	E10H18	E20H39		E30H8

TABLE 4: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	Part Description	Part No. And Suggested List Price (EACH)			
	Water distribution side spout & fitting (6) ***(For use on plastic distribution pan)***	E10H18-P	E20H39-P		N/A
36a	Water distribution pan assembly (Includes dist. Tubes/fittings) ***Aluminum pan / copper tubes***	-			E30H9
36a	Water distribution pan assembly (Includes dist. tubes/fittings)	E10H51		E20H44	-
37 & 38	Water distribution bottom spout / fitting	E10H17		E20H38	
	Water distribution bottom spout / fitting ***(For use on plastic distribution pan)***	E10H17-P		E20H38-P	
39	Water sump assembly with water pump (Old)	E10H31			E30H7
	Water sump assembly with water pump (New)	E10H60			N/A
40	Water sump bolt-down cover (Old)	E10H20			E20H9
	Water sump bolt-down cover (New)	F5H25-2			N/A
41	Water sump removable cover (Old)	E10H21			E20H10
	Water sump removable cover (New)	F5H25-3			N/A
42	Water sump gasket	E20J2			
	Water sump silicone adhesive	E20J6			
43	Water float valve E10H29 (Round float) 6" arm E50H18 (Rectangular float) 11" arm – see p.70	E10H29			E50H18
43a	Water float valve circular - 5" arm (Old) – see p.70	E20P1			
44	Water float valve fitting	CNB-BR02/06			CNBHF-SG-BR08
53	Water tube	E10H7		E20H30	E30H3
54	Water tube insulation	E10H9		E20H14	E30H4
55	Water tube grommet	E20H19			
56	Water tube fitting (2)	ELM-CT-NY10/08			
57	Water tube regulating valve	E20H24			
	Water tube sleeve	E20H12			
61	Water sump screen	-			E20H13
62	Water pump 115-230/1/60 – see p.70	E30Q1			E30Q1
	Water pump 230/1/60 – see p.70	E10Q1			-
	Water pump 230/1/60 – see p.70	E10H32			-

TABLE 4: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	Part Description	Part No. And Suggested List Price (EACH)			
	Water pump 230/1/60 – see p.70	F5Q4			-
62a	Water pump retrofit kit Replaces old style side mounted 230/1/60	E10H31			E30H7
62b	Water pump - seawater 115-230/1/50-60	E20Q5			
	Gearmotor 230/1/60 1/45 HP (Used on RLE models – Old)	F5M2	-	-	-
	Gearmotor 220-240/1/50 1/45 HP (Used on RLE models – Old)	F5M3	-	-	-
	Gearmotor 115-230/1/50-60 1/20 HP (Used on RLE models – New)	F5M10	F5M10	-	-
	Gearmotor shaft (1/20HP)	E10M2	E15M2	-	-
63	Drive motor 115-230/1/60, 1/3HP, 1/2HP	E20M1			E30M1
	Drive motor 110-220/1/50, 1/3HP, 1/2HP	E20M10			E30M3
	Drive motor 208-230-460/3/50-60, 1/2HP	E20M2			
	Drive motor 230/1/60, 1/2HP, TEFC (For seawater)	E20M3			E30M2
	Drive motor 380/3/50, 1/3HP, TEFC (For seawater)	E20M5			
63a	Drive motor key	E20M8			
65,66,67	Flexible coupling – complete (For speed reducer)	E10N4		E20N9	
65a, 66a, 67a	Flexible coupling (For gearmotor)	E10N5	-		
	Adaptor plate for gearmotor (Old)	E10A6	-	-	
	Adaptor plate for gearmotor (New)	E10A7	E15A1	-	
67a	Flexible coupling key for shaft.	E20N10			
68	Speed reducer for 60cy. 920 MDVD 750:1	E10R6		-	
	Speed reducer for 50cy. 920 MDVD 600:1	E10R5		-	
	Speed reducer for 60cy. 926MDVD 600:1	-		E20R4	
	Speed reducer for 50cy. 926MDVD 450:1	-		E20R3	
75	Handhole cover (Removable)	E10A3			
75a	Handhole cover (Bolt-down)	E10A5		E20A6	
	Thermostatic exp. valve R-502, R-404A (Soldered)	E10V23	E15V6	E20V11	E30V6
	Thermostatic exp. valve R-22 (Soldered)	E10V22	E15V5	E20V10	E30V5
	Liquid line solenoid valve (Soldered)	B6S1-1/2			B14S2

TABLE 4: Replacement Parts for Models Listed to Right		2000,10E, 11E 10EA, 10EAR, 11ES, 11ESS	3000, 15E, 16E 15EA, 15EAR 16ES, 16ESS	4000, 20E, 21E 20EA, 20EAR 21ES, 21ESS	6000, 30E, 31E 30EA, 30EAR 31ES, 31ESS
Item No.	Part Description	Part No. And Suggested List Price (EACH)			
	Balanced port expansion valve R-22	E10V24		E20V12	
	Balanced port expansion valve R-502, R-404A	E10V25		E15V7	E30V7
	Electric control panel 230/1/60 (2 light for RL)		E20T40-RL		
	Electric control panel 230/1/60 (6 light for RC, SCA, SCW)		E20T40-SCA		
	Replacement rib heater element (3)	HT150/240-037/50 $110.00			
	Speed reducer oil (Natural)	SR-OIL			
	Speed reducer oil (Synthetic)	SR-OIL-SYN			

To help determine which ice flaker water pump & float valve you need, use the following tables:

Flaker Manufacture Date		Replacement water pumps for Freshwater ice flakers			
Start Date	End Date	2000 Pound Models	3000 Pound Models	4000 Pound Models	6000 Pound Models
-0-	07/86	E10H31*	E10H31*	E10H31*	E10H31*
07/86	01/91	E30Q1	E30Q1	E30Q1	E30Q1
01/91	07/94	E10Q1	E10Q1	E10Q1	E30Q1
07/94	07/06	E10H32	E10H32	E10H32	E30Q1
07/06	Present	F5Q4	F5Q4	F5Q4	E30Q1
2000-RLE & 3000-RLE use replacement pump part # E10H32-P. Pump with Molex plug installed.					

*Replacement sump assembly.

Flaker Manufacture Date		Replacement water float valves Freshwater ice flakers			
Start Date	End Date	2000 Pound Models	3000 Pound Models	4000 Pound Models	6000 Pound Models
-0-	07/86	E20P1	E20P1	E20P1	E20P1
07/86	01/91	E50H18	E50H18	E50H18	E50H18
01/91	Present	E10H29	E10H29	E10H29	E50H18

For more detailed information, contact Howe customer service department with ice flaker serial number.

Speed reducer field replacement parts are no longer available. Speed reducers can be sent to factory to be rebuilt. See our website http://www.howecorp.com/speed_reducer.htm, or contact Howe for information on rebuilding reducers.