Rapid Freeze ICE FLAKERS

INSTALLATION & SERVICE MANUAL

and parts catalog

Selective Purpose Flake Ice Machines

2,000 – 40,000-lb/day capacity

- **Flooded Ammonia series (RLA)**
- **Recirculated Ammonia series (RLR)**

TECHNICAL ASSISTANCE LINE

1-773-235-0200

Howe Corporation

1650 North Elston Avenue

Chicago, IL 60622

www.howecorp.com

e-mail: howeinfo@howecorp.com

Notice

This manual and all information contained herein are provided "**as is**" and are subject to change without notice. **Howe Corporation makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.** Howe Corporation shall not be liable for any errors or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual.

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.

Howe Corporation
1650 North Elston Avenue
Chicago, IL 60622
Phone: (773) 235-0200
Fax: (773) 235-0269
e-mail: howeinfo@howecorp.com
web: www.howecorp.com

Revision date: October, 2005

TABLE OF CONTENTS

2. Introduction

2.Introduction

The Rapid Freeze by Howe ice 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.

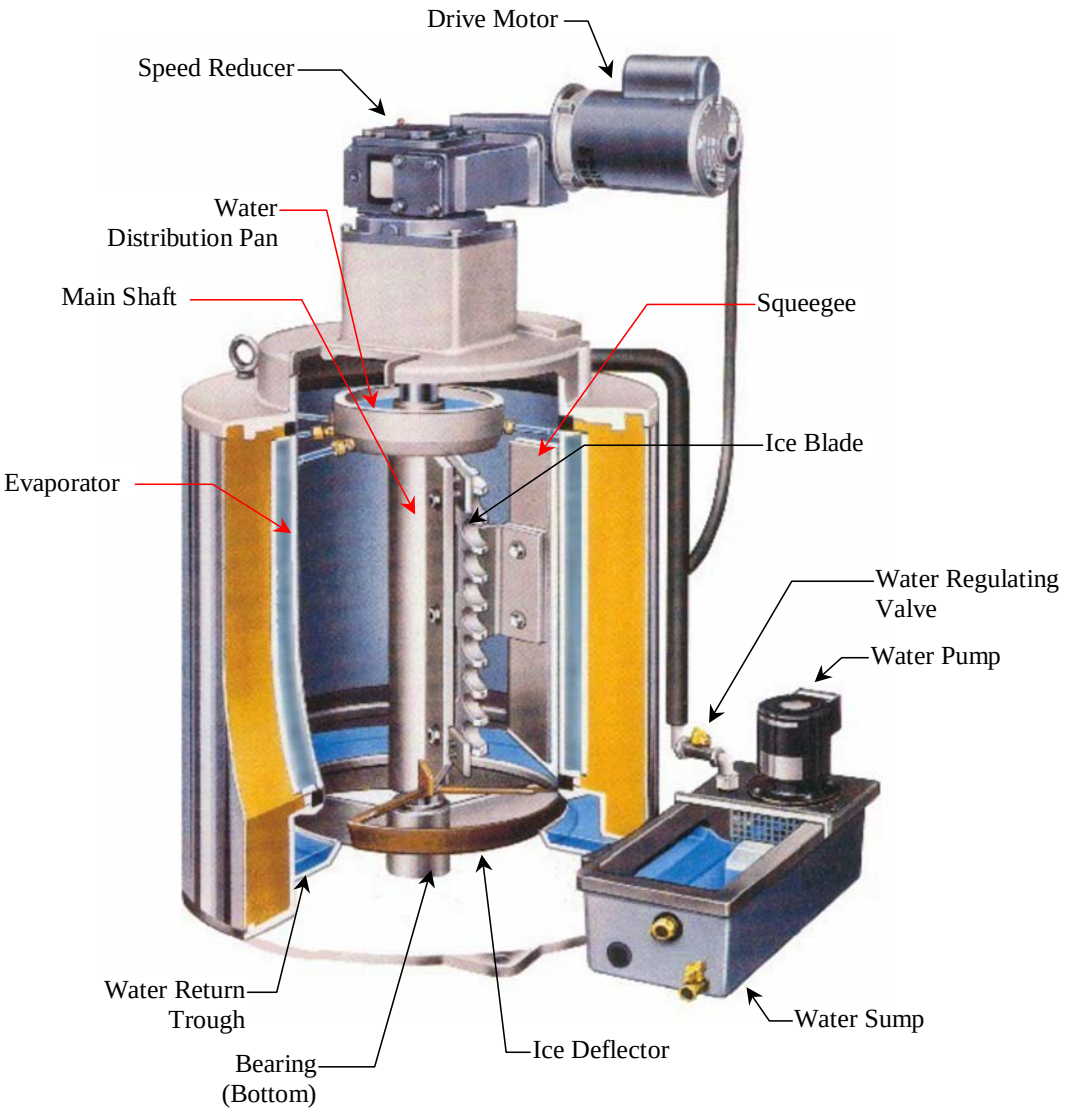
Introduction to the *Rapid Freeze*® Ice Flaker

Refer to Figure 1 for a guide to the major components of the Howe ice flaker. Among the key features are:

- Evaporator: The heart of the Howe ice flaker is the carbon steel, flooded evaporator. The carbon steel construction provides exceptional heat transfer properties, while the hard chrome lining provides a clean, sanitary, corrosion-resistant freezing surface.
- Ice Blade: An investment-cast stainless steel ice blade removes the ice from the freezing surface. The material and method of fabrication mean that the blade will never need re-sharpening.
- Squeegee: Made of USDA-approved material, the squeegee removes excess water from the surface of the ice, guaranteeing that the ice produced by the flaker is dry and sub-cooled.
- Ice Deflector: Mounted underneath the ice blade, the deflector directs the harvested ice toward the center of the drop zone.
- Water Distribution Pan: The water distribution pan and tubes provide a continuous flow of water over the evaporator surface. Ice production is rapid and continuous, with no interruption in production.
- Water Sump: Collects water that was not frozen on the evaporator, and re-circulates it to the water distribution pan. The incoming water supply is connected here, through a float valve that maintains a constant water level in the sump.
- Bearings: Oversized bronze bearings ensure a long service life.
- Control Panel: The “brains” of the ice flaker, the control panel governs all of the functions of the ice flaker. Available in a NEMA4 weatherproof enclosure for harsh environments or frequent washdown applications.
- Drive Motor: Open, drip-proof drive motor. Totally enclosed, fan-cooled motor available for harsh environments or frequent washdown applications.

2.Introduction

Figure 1
Howe *Rapid Freeze*® Ice Flaker
Major Components



2.Introduction

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.

Safety Symbols and What They Mean

Please read and understand this manual prior to installing or operating this Rapid Freeze 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.

The following safety symbols will alert you to any special precautions throughout this manual:

DANGER
BEWARE OF HAZARDS THAT CAN RESULT IN PERSONAL INJURY
DANGER

WARNING
"DO IT RIGHT" OR RISK SEVERE PERSONAL INJURY. FOLLOW INSTRUCTIONS CAREFULLY
WARNING

CAUTION
RISK OF PERSONAL INJURY OR DAMAGE TO EQUIPMENT FOLLOW INSTRUCTIONS CAREFULLY
CAUTION

3. Receiving and Inspection of Equipment

3.Receiving and Inspection of Equipment

Upon receipt of your Rapid Freeze ice flaker, you should first inspect the carton very carefully, to determine if any damage might have occurred during shipment. If you suspect any damage has occurred, it should be noted immediately on the freight bill. In addition, a 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 un-crating of the carton, it is necessary to keep the original shipping container so that 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.

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.

4. Installation of the Rapid Freeze Flaker

4.Accessories

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 it is unavoidable, ice flakers may be installed in areas down to 45°F (7°C) provided that three (3) electric rib heaters (available from the factory) are installed to heat the bottom casting to prevent ice buildup on the three supporting ribs for the bottom bearing. 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 mixing valve and rib heaters 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.** Also, it is advisable to direct air blowers and fans away from the ice flaker, as air velocity over the ice flaker will reduce the effectiveness of the heaters.

*****CAUTION*****

<u>NEVER</u> INSTALL AN ICE FLAKER IN A COLD ROOM 45°F (7°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 (without heater)	50°F (10°C)
Minimum air temperature (with heater)	45°F (7°C)
Maximum air temperature	100°F (38°C)
Optimum water temperature range	60°F (15°C) to 80°F (25°C)
Minimum water temperature (without water mixing valve)	45°F (7°C)
Minimum water temperature (water mixing valve must be used)	36°F (2°C)
Maximum water temperature	90°F (32°C)

Installation without ice bin

Rapid Freeze Ice Flakers may be installed under certain conditions without a typical ice bin. When the flaker is installed without a bin, it must have a drainable condensate pan located under the machine. The flaker must also be mounted high enough off the floor so there is no chance that somebody may reach into the evaporator from below either with a pole, or their arm, while the flaker is operating.

Refrigerating the ice storage bin is not normally necessary nor is it recommended. However, in those cases where ice is to be discharged into an existing freezer room then, as a minimum, electric heaters should be installed on the bottom casting and the sump regardless of the actual ambient temperature of the air surrounding the ice flaker. Air from the freezer room should be directed away from the ice flaker opening otherwise, the effectiveness of the heaters will be reduced. If the storage area is held at 28°F (-8°C) or colder, it is advisable to install the ice flaker 1 to 2 feet above the freezer and use a duct section to direct the ice into the storage bin.

4.Accessories

Installation on Ice Storage Bins

Rapid Freeze® Ice Flakers are designed to run smoothly and without vibration. The machines are usually mounted directly on top of an insulated ice storage bin. The storage bin must have an insulated top, with a drip pan that is an integral part of the top designed specifically for the Rapid Freeze Ice Flaker model installed on it. The ice bin should be designed to support the weight of the flaker, and the ice stored inside the bin. Most ice storage bins can handle the weight of a 2000, 3000, 4000 or 6000 pound capacity ice flaker without any additional bracing. ***It is recommended that the bin manufacturer be consulted before any ice flaker is placed on top of a bin.*** The weight of each ice flaker machine, along with the diameter of the hole required for ice entry into the bin, is given on the specification sheet for that particular model.

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 Method on Ice Bin

Refer to bin manufacturer's installation instructions for proper assembly and set up procedures. Locate and set the bin on a solid level footing. Once the bin is set in place and leveled, the Rapid Freeze ice flaker can be placed inside the drip pan.

Exhibit 2 illustrates the forklift and block method of placing the ice flaker on the bin.

Forklift & Block Method

You will need:

- ✓ Forklift truck with adequate load and height capacities
- ✓ (8) 2 X 4 wood blocks approximately 6-8" long
- ✓ (2) 2 X 4 's approximately 36" long
- ✓ Pry Bars

Step 1. Position ice flaker on forks.

Step 2. Stack two wood blocks in each corner of the drip pan on the ice bin.

Step 3. Lift ice flaker over the wood blocks, position ice drop zone over the bin top opening, then set the flaker on the blocks.

Step 4. Remove forklift.

Step 5. Stack the two 36" long 2 X 4's on the side of the bin beside the drip pan, overlapping the front and back of the bin.

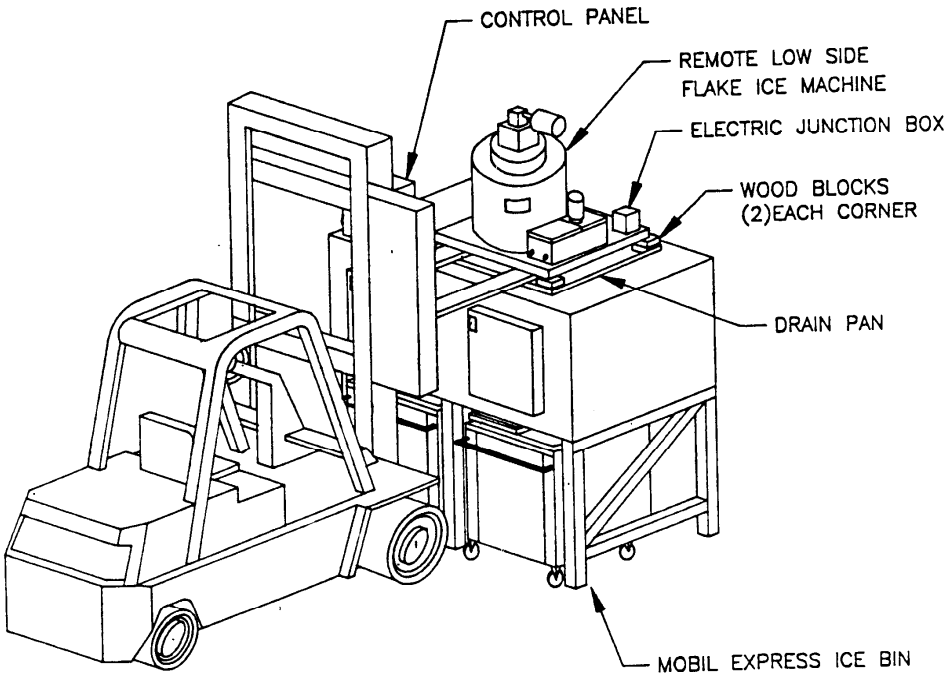
Step 6. Using a pry bar as a lever on the 2 X 4's raise the side of the flaker and remove the **TOP** blocks only.

Step 7. Repeat steps 5 & 6 on the other side.

Step 8. With the flaker sitting on one (1) block under each corner, repeat steps 5, 6 & 7 removing the remaining blocks. Drip pan flanges ***MAY*** bend slightly.

Step 9. Straighten the drip pan flanges (if necessary)

Figure 2
Ice Flaker Installation



Water Supply & Filter Connections

WATER LINE: Connect a 1/2" galvanized or 1/2" ODS COPPER water pipe from the closest convenient water line to within 2 to 4 feet of the ice flaker water sump. Install a water line shutoff valve near the ice flaker. Use copper tubing between water valve & water inlet connection located on water sump.

Refer to the engineering sheet for the line size connection from the ice flaker sump to the water supply line. If water supply has silt or sand in it, a coarse water filter is recommended.

4.Accessories

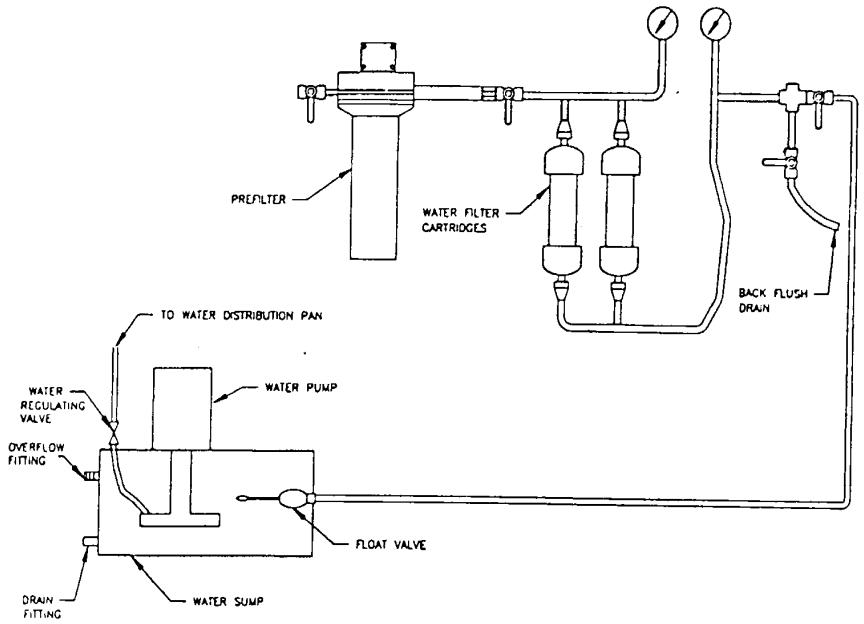
*****CAUTION*****

MINIMUM WATER PRESSURE OF 30 PSIG IS REQUIRED AT THE ICE FLAKER FOAT VALVE TO INSURE ADEQUATE WATER FLOW.

MAXIMUM ALLLOWABLE WATER PRESSURE TO THE FLOAT VALVE IS 60 PSIG.

*****CAUTION*****

Figure 3
Water Supply & Filter Connections



*****WARNING*****

NEVER OPEN CHARGING VALVE, ALLOWING REFRIGERANT TO VENT DIRECTLY TO THE ATMOSPHERE. REFRIGERANT MUST BE RECLAIMED THROUGH A RECOVERY SYSTEM.

*****WARNING*****

4.Accessories

*****CAUTION*****

SERVICE/INSTALLATION PERSONNEL MUST HAVE KNOWLEDGE OF REFRIGERATION SYSTEMS TO PROPERLY CHARGE THIS FLAKER.

*****CAUTION*****

*****WARNING*****

ALL RAPID FREEZE REMOTE MODEL ICE FLAKERS ARE SHIPPED WITH A SMALL HOLDING CHARGE OF DRY NITROGEN.

SYSTEM MUST BE EVACUATED PRIOR TO CONNECTING TO THE AMMONIA SYSTEM.

*****WARNING*****

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

1) Pressurize and test the system checking for leaks.
2) Use a good quality vacuum pump 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.
3) Break vacuum with refrigerant and evacuate again.
4) Repeat step 3. This is called "triple evacuation". It ensures that all air and moisture has been removed from the system. Failure to do so may result in compressor burnout.

4.Accessories

Wiring & Electrical Connections

CAUTION
ELECTRICAL WIRING SHOULD BE PERFORMED BY QUALIFIED TECHNICIANS FOLLOWING LOCAL ELECTRICAL CODES.
CAUTION

The electrical control panel is supplied with remote low side (-RLA or RLR) machines, but is shipped loose to be mounted on the wall (near the bin) for easy access to controls. To install control panel:

1) Install disconnect (not supplied by factory), and connect main power to terminals marked L1 and L2 in the ice flaker control panel.
2) Install optional on-off switch to the two terminals designated "On-Off switch". Remove wire jumper on these terminals if you are installing a remote switch.
3) A jumper is installed between terminal marked “Line A” and terminal marked "Line B". This will enable the liquid line solenoid on the ice flaker to operate properly.
4) Following local applicable electric codes, wire the remote panel to the components (drive motor, water pump, and solenoid valve) on the flaker. The drive motor and water pump should be wired to terminals T_1, T_2, and T_3 respectively, in the control panel. The solenoid valve, and dual pressure regulator are wired to terminals marked, “solenoid valve” in the flaker control panel.
5) If the flaker has factory installed/supplied photo eye ice level controls, connect the long cables from the ice flaker to the relay base (or terminal strip) in the control panel. The wires are color-coded and must be connected to the proper terminals. The BLUE leads from both the emitter and receiver cables connect to terminal # 10 (Blue terminal), the BLACK lead from the receiver only, connects to terminal # 11 (Black Terminal), and the BROWN leads from both the emitter & receiver connect to terminal # 1 (Brown Terminal). Refer to Figure 15 on page 68 for electric eye wiring diagram.

WARNING
THE SENSOR LEADS FOR THE ICE LEVEL CONTROLS MUST NOT BE RUN IN THE SAME CONDUIT AS THE MOTOR AND SOLENOID WIRES. SENSOR WIRES MUST BE RUN IN SEPARATE CONDUIT.
WARNING

Piping Connections

When installing the ice flaker, it is important that the flaker is properly piped as indicated below. When connecting to a AMMONIA refrigeration system, a dual pressure regulator valve must also be provided and installed on the suction line to regulate the evaporator suction temperature to between –5°F and -10°F (-20.4°C to -23.2°C).

4.Accessories

Table 1
Flooded Ammonia Piping Connection Sizes

MODEL	Approximate Ammonia Charge (lbs.)	Liquid	Suction
2000-RLA	15	½”	1”
3000-RLA	18	½”	1”
4000-RLA	22	½”	1 ¼"
6000-RLA	35	½”	1 ¼"
50-RLA	130	½”	1 ½”
75-RLA	190	½”	2”
100-RLA	240	½”	2”
200-RLA			

Re-Circulated Ammonia Piping Connection sizes

MODEL	Approximate Ammonia Charge (lbs.)	Liquid	Suction
2000-RLR	8	½”	1”
3000-RLR	12	½”	1”
4000-RLR	15	½”	1 ¼"
6000-RLR	22	¾”	1 ½"
50-RLR	75	¾”	2”
75-RLR	125	¾”	2”
100-RLR	150	1”	2 ½”
200-RLR	280	1”	3”

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.

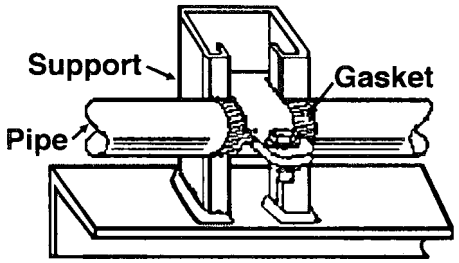
b. Suction lines should be sloped ¼” per 10 feet towards the compressor.

c. Pipes sized for normal runs (up to 100 FT)

d. Avoid excessive number of elbows/bends in all refrigerant lines, especially suction lines.

e. Use SCH 80 steel pipe for all ammonia lines except suction lines 1-1/4” and larger may be SCH 40.

Figure 4
Refrigerant Piping Support



1. Ensure that refrigerant lines are supported and fastened properly. See Figure 4 for an example.
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. Do not use short radius ells. Short radius elbows have points of excessive stress concentration and are subject to breakage at these points.
4. Thoroughly inspect all piping after the equipment is in operation and add supports wherever line vibration is significant. Extra supports are relatively inexpensive as compared to refrigerant loss.

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. Insulation located in outdoor environments should be protected from UV exposure to prevent deterioration of the insulation.

4. Accessories

Electric Eye Ice Level Control

The use of a suitable ice level control to shut off the ice flaker when the storage bin fills is mandatory. Failure to use the proper ice level control will cause the ice to build within the ice flaker evaporator after the bin is full to capacity. Operating the flaker with a full bin will cause the ice deflector to bend or break as it "churns" the ice. In extreme cases it may result in damage to the speed reducer and/or the electric drive motor and flexible coupling.

The proper and approved bin level control is the photoelectric eye. When ordered with the machine, the eyes are mounted on brackets that will attach to the bin top or wall. The cables are routed through the bottom casting of the ice flaker. The power module is mounted inside the ice flaker control panel.

Figure 5
Electric Eye Ice Level Control

Installation Instructions for Photoeye Ice Level Controls

1) Turn off the ice flaker at the control panel and at the main shut-off disconnect. Cover or remove any ice that may be present in the ice storage bin.
2) Open the front cover of the flaker control panel. Locate the 11-pin mounting base for the photoeye control module. If the control module is installed in the base, unplug the control module.
3) Mount the photoeye emitter. If the storage bin top was supplied by Howe, there will be recessed pockets in the bin top for placement of the photoeye elements. If pockets are not present, mount the emitter securely to the top or side wall of the bin, and align the emitter so that it projects its beam directly across the ice drop opening.
4) Locate the photoeye receiver. Again, if the storage bin top was supplied by Howe, there will be recessed pockets in the bin top for placement of the photoeye elements. If pockets are not

present, mount the emitter securely to the top or side wall of the bin, and align the receiver so that it is directly across the ice drop opening from the emitter. **DO NOT** permanently affix the receiver. Leave enough adjustment to ensure proper alignment with the emitter.

5) Run the long cables through one of the knockouts furnished on the side of the control panel.
6) Connect the wires to the control module base as shown in Figure XX. NOTE: If a wire jumper is installed between terminals 5 & 6, it must be removed for the photoeye controls to operate properly.
7) Plug the control module into the base.
8) Check to ensure that the control panel ON/OFF switch is in the *Off* position. Turn *on* the main power disconnect.
9) Align the photoeye receiver. This alignment is critical to the proper operation of the level controls.
    a. Check the LED on the emitter. With the disconnect switch *ON*, the red LED on the emitter should be glowing. If the light does not come on, check the Molex plug and the connections on the base until the LED lights.
    b. Move the receiver until the LED on the receiver lights. When proper alignment has been achieved, secure the receiver.
    c. Check once more that the LEDs on both the emitter and receiver are lit. Realign or tighten loose connections as necessary to keep both LEDs lit.
10) Reroute and fasten cables as necessary. If the photoeye elements are installed in the ice bin (as opposed to in recessed housings in the bin tops), leave enough slack in the cables to provide for "drip loops" in the cables, so that condensation will travel down the cables and drip into the bin, and not onto the emitter or receiver. DO NOT run the photoeye cables close to high-voltage wires. High-voltage wires will interfere with the low voltage control signals, and may cause the ice flaker to shut down.
11) Turn on the control panel ON/OFF switch. The flaker should begin making ice within minutes.

Ice Bin Thermostats

The use of a bin thermostat ***is not recommended and is not permitted***. The Rapid Freeze ice flaker is designed so that the freezing drum (operating at –5°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 with sufficient accuracy to distinguish temperature difference upon contact with the ice. Use of a bin thermostat for level control will void the product warranty.

Rib Heating Elements

Rapid Freeze ice flakers are designed to operate in ambient temperatures between 50°F (10°C) and 100°F (38°C). When operating in ambient temperatures between 50°F (10°C) and 45°F (7°C), rib heaters ***must*** be installed on the ice flaker. Under no circumstances is the machine to be allowed to operate in ambient conditions below 45°F (7°C).

4.Accessories

Factory installed rib heaters are available on all sizes and configurations when ordered with the ice machine. These heaters are installed in the three ribs on the bottom casting, inside the evaporator section of the ice flaker. These heaters warm the ribs and water return trough to prevent the accumulation of ice inside the evaporator.

General Purpose ice flakers (1,000 – 6,000-lb/day) ***cannot*** be retrofitted with rib heaters if they were not installed at the factory. Carefully consider the installation conditions prior to ordering the ice flaker, to ensure that all necessary equipment is furnished.

5. Start & Adjust

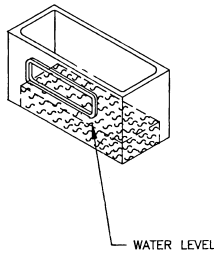
5. Maintenance

Once installation has been completed, 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 Figure 6 below).

Figure 6
Sump Water Level



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, and verify that it is within nameplate ratings.

4) _____ Turn the ON/OFF switch ON.

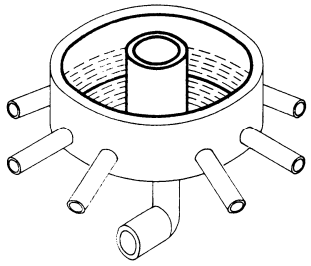
5) _____ Verify that the solenoid valve has opened (the valve will click loudly).

6) _____ Verify that the drive motor and water pump start.

7) _____ Verify that water is delivered to the distribution pan located inside the evaporator.

8) _____ Verify that the distribution pan water level is maintained at the half full point. Open or close the water adjustment valve until the water level is maintained at the proper level (see Figure 7 below)(20 ton model ice flakers have a distribution ring).

Figure 7
Water Distribution Pan Water Level



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

10) _____ Verify that ice is being frozen and harvested over the entire surface of the evaporator. If it is, skip to step 14) below. If it is not, continue to the next step.

11) _____ Check the suction pressure at the ice machine Suction temperature must be maintained between -5°F & -20°F (depending on model flaker) at all times.

12) _____ Adjust Dual Pressure Regulator, Low range (operating) to 9-12PSIG (-5 to -10°F), 3-6 PSIG (-20°F for 20 ton) High Range (relief) to 65-75 PSIG.

13) _____ Recirculated ammonia suction temperature is -5°F, Adjust the hand expansion valve(s). Adjust the hand expansion valves to meter the correct amount of Liquid to fill each circuit. Adjust the adjustment stem 1/8 to 1/4 turn at a time (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.

14) _____ When the ice maker is adjusted and operating properly, turn ON/OFF switch OFF, and verify that the solenoid valve closes (the valve will click loudly).

15) _____ Verify that the off-delay is set correctly. After the ice flaker is turned OFF, the drive motor and water pump will continue to operate for a period of time. This should be adjusted to allow the drum to be cleared of residual ice after the solenoid valve is de-energized. This ensures that, when the drive motor and water pump stop, the evaporator will be free of ice. If necessary, adjust the off-delay (see page 28 for location).

16) _____ Turn the ON/OFF switch ON.

17) _____ Verify operation of the photoeye level controls. Block the path of the infrared beam. After a built-in 15 second delay, the shutdown cycle will begin. If the ice flaker does not begin shutdown, adjust the photoeyes per instructions of page 16.

18) _____ Unblock the photoeye beam, and verify that the ice flaker re-starts immediately.

19) _____ Adjust the electronic overload setting (see page 28 for location). Slowly turn the overload setting counterclockwise, just to the point that the flaker shuts down on overload. Turn the overload adjustment ¼ turn clockwise, reset the overload device, and re-start the flaker. This will insure that the drive motor is adequately protected, but will not cause nuisance shutdowns.

20) _____ Verify that the ice flaker is adjusted and producing dry flake of ice.

21) _____ Verify that 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).

5. Electrical Systems

Controls for Ammonia Ice Flaker

During operation

While the ice flaker is in operation, the liquid line solenoid valve will be energized, allowing liquid to enter the surge drum through the ammonia lp float valve.

The dual pressure regulator solenoid (*mounted on the suction line*) will also be energized. When this solenoid valve is energized, the evaporator pressure is regulated @ 12-9 psig, assuming the suction pressure on the system side of the regulator is lower.

During shut-down

When the ice flaker is shut-down, both the liquid line solenoid, and the dual pressure regulator solenoid are de-energized. The liquid line solenoid positively stops liquid from entering the surge drum and evaporator, while the dual pressure reg. will switch to the higher setting which is 75 psig.

Pressure in the surge drum and ice flaker will rise as the ice flaker warms up. When pressure reaches 75 psig, the dual pressure regulator opens, relieving pressure into the suction line. Even in the event of a power failure, the dual pressure regulator will act as an internal relief valve, burping into the main suction line whenever the ice flaker surge drum and evaporator pressure builds to 75 psig.

Dual Pressure Regulator for ammonia ice flakers

The dual pressure regulator has two settings for pressure regulation. The first setting, is for normal operating conditions, will be set for approximately 12-9 psig allowing the evaporator to operate at -5°F to -10°F(depending on the model of the ice flaker). The evaporator will operate at this temperature when the solenoid valve on the dual pressure regulator is energized.

The second setting, (*which actually acts as an internal relief valve*) is set at 75 psig, which will burp excess pressure in the evaporator and surge drum into the suction line so the internal pressure of the evaporator will never exceed 75 psig.

The safety relief valve set @ 150 psig *to atmosphere* is ultimate safety required by code.

5. Maintenance

Electric Control Panel Operation (Ammonia)

"Start" Sequence

When "on-off" selector switch is manually turned the "on" position the following events occur to start the ice flaker system (provided the "optional" photo electric eye is calling for ice).

1) Relay #1 is energized causing contacts 8 & 6 (R1) to close, and contacts 3 & 1 (R1) to close.

2) Closing of contacts 21 & 24 (R1) causes off-delay timer to reset and will close contacts TR1 (N.O.T.O.)

3) Ice flaker contactor is energized and drive motor and water pump start (provided overload holding contacts (M1-MP, M2-MP) are closed indicating overload condition does not exist) and ice flaker "run" light (green) will light.

4) When ice flaker contactors are energized auxillary contacts (M1, M2, R1) close, thereby energizing liquid line solenoid valves. (Liquid line & Dual Pressure regulator)

"Stop" Sequence

When selector switch is manually turned to "off" position (or if the ice level control is satisfied) the following events occur to stop the system.

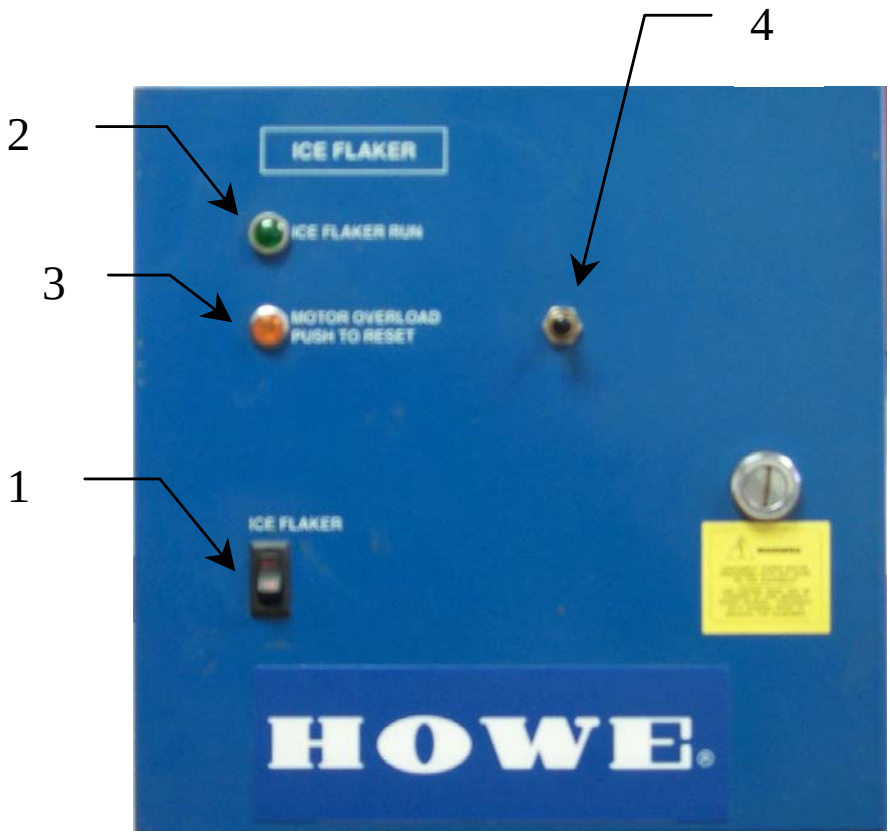
1) Relay #R1 is de-energized causing contacts 21 & 24 (R1). To open which initiates the off delay time period.

2) Opening of contacts (R1) causes liquid line solenoid valve to de-energize and close.

56) After set time, (20 minutes) contacts TR1 open, de-energizing ice flaker contactor. Ice flaker is off and flaker "run" light (green) is off.

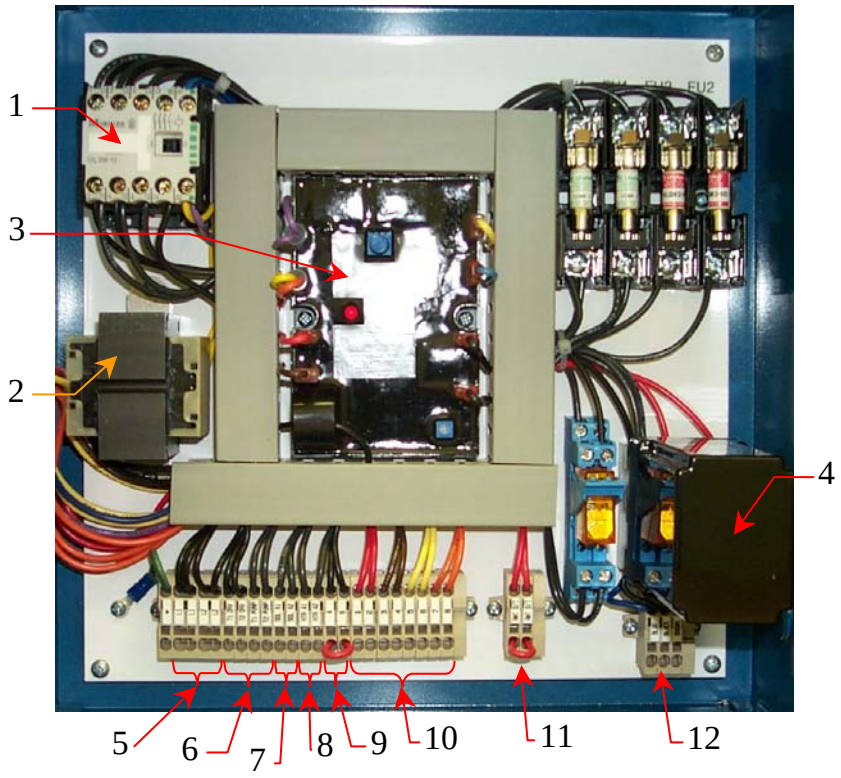
Control Panel Layout

Figure 8
E20T40-RL Exterior Panel Layout
Remote Low Side Ice Flakers



1) **On/Off Switch:** Main On/Off switch for the control circuit. This switch is wired in series with the (optional) field-installed switch and the photoeye ice level control.
2) **Ice Flaker Run Light:** Green light is on whenever the contactor and drive motor are energized.
3) **Motor Overload Light:** Amber light is on whenever the electronic overload opens, stopping the drive motor and water pump.
4) **Overload Reset Button:** Normally-open reset button, resets overload circuit following overload condition.

Figure 9
Ice flaker Control Panel Interior Layout



1) **Motor Contactor:** Provides power to the drive motor and water pump. Energized during freezing and pump down cycle, then timed off for shut down. Auxiliary contact provides power to the liquid solenoid valve when the contactor is energized.
2) **Control Transformer:** Provides 24V control power to the control panel components, control module, motor contactor, and indicating lights.
3) **Control Module:** Main control processor. Incorporates motor overload, operating circuit, and off-delay circuit. Controls motor contactor and solenoid valve power.
4) **Photoeye Power Module:** Processes signals from electronic eye level control, with built in time delay. Shuts machine off when ice bin is full, to prevent damage to the flaker due to ice backing up into the evaporator.
5) **L1, L2, L3 Terminals:** Main power terminals for field-wiring electric power to control panel. Single-phase (standard) power is wired to L1 and L2. Three-phase power is wired to L1, L2, and L3.
6) **T1, T2, Motor/Pump Terminals:** Terminals for wiring drive motor and water pump. May be factory- or field-wired.
7) **Solenoid A1, A2 Terminals:** Terminals for field-wiring liquid solenoid valve wires.
8) **Heater A1, A2 Terminals:** terminals for field-wiring electric rib heater wires.

9) **A, B Terminals:** Terminals for providing Line 2 power to solenoid valve. On models with condensing units, wired through compressor safety switches (high discharge pressure and high oil pressure) to assure liquid solenoid valve will de-energize if the compressor shuts down on a safety failure. When connected to a refrigeration rack, or ammonia system, a wire jumper is placed between line "A" and line "B" in the flaker control panel.

10) **Terminals 1-8:** Terminals for field-wiring condensing unit indicator lights. (not applicalble for ammonia ice flakers

11) **On/Off Switch Terminals:** Terminals for installing a remote On/Off switch or auxiliary control such as a 7-day clock timer, or remote modem. These auxiliary controls ***must*** be wired in series with the panel-mounted On/Off switch, and factory-wired photoeye ice level control, so that all three switches must be closed to start the machine, but opening ***any*** switch will shut the machine off.

12) **Photoeye Terminals:** Terminals for installing photoeye level control emitter and receiver.

Control Module
The E20T48 control module is the main processor for the ice flaker control panel. It incorporates the timer functions, control relay functions, and overload relay functions:

Motor Overload Adjustment: Adjusts the sensitivity of the motor overload protection device. Set at factory. Adjust ***only*** if the motor shuts off on overload and there is nothing preventing the motor from turning (i.e., ice collecting in the evaporator, very soft ice, seized bearings, etc.).

Off-delay Timer Adjustment: Sets the delay between turning the flaker off (closing the solenoid valve) and shutoff of the motor and water pump. Factory set. Adjust only if ice is still present in the evaporator when the motor and water pump shut off, or if the motor and water pump operate for an excessive period of time after the evaporator stops freezing the feed water.

Terminal Number	Description
1,2	24 VAC input power.
3	Ice Flaker run input signal (all ON/OFF switches, ice level controls, and any special controls must be in this circuit).
4	Overload reset input (normally open, momentary contact).
5	Motor overload output (for overload indicating light). Energized upon overload condition, stays on until overload is manually reset. Red LED on control module indicates overload condition. This LED will glow prior to actual shutdown of drive contactor.
6	Ice flaker contactor output (output is energized when input signal is present and 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.
7,8	Isolated output contacts for liquid solenoid valve (normally open). Contacts close immediately upon input signal (#3), stay closed until input signal is removed. Contacts open when input signal is removed, or when overload condition exists.

5. Maintenance

5. Maintenance

Evaporator

To keep the evaporator in peak performance, the ice flaker 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 below 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:

1. Turn off refrigeration compressor. If flaker is connected to a compressor rack, close the liquid line shut off valve.
2. Turn off the ice flaker switch, and adjust the off delay time adjustment fully clockwise.
3. Remove all ice in storage bin.
4. Close water supply shut off valve.
5. Drain water from the 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.
6. Prepare the cleaning solution, following the instructions on the bottle.

*****CAUTION*****

USE APPROVED ICE MACHINE CLEANERS ONLY. MIX SOLUTIONS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

ICE MACHINES CLEANERS CONTAIN ACIDS, WHICH MAY CAUSE BURNS. HANDLE WITH CARE. IN CASE OF EXTERNAL CONTACT, FOLLOW FIRST AID INSTRUCTIONS ON THE BOTTLE. IF SWALLOWED, SEEK IMMEDIATE MEDICAL ATTENTION

*****CAUTION*****

7. Pour solution of ice machine cleaner into sump, to normal operating level. Do not overfill, as the water may overflow into the ice storage bin.
8. 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 2 hours if scale build up is heavy.
9. 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:

10. Mix a solution of approved sanitizer, or mix 16 oz. of household bleach with 2 gallons of warm water, 90-115°F.
11. Pour solution into sump, to normal operating level (as in #7 above), then re-circulate sanitizing solution for approximately 20 minutes, by turning on drive motor & water pump.
12. Drain solution and rinse thoroughly with fresh water at least twice, following procedure described in #9 above.
13. 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, restoring refrigeration, and 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 cracks. 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. In extreme cases of mineral or slime buildup, shut off the main power and remove the top covers from the sump, and using the ice machine cleaner and a scrub brush clean the aluminum sump body until the deposits are removed.

Water Filter Back Flushing

A unique feature of the Howe water filter system is the cartridge back flush capability. The unique omni-directional cartridge design permits back flushing of the cartridge in the event of a premature plugging before the 6-month life has occurred. In most cases, this will not be necessary, however when there are large accumulations of sediment and dirt caused by line interruptions (construction and heavy rain conditions), back flushing will permit the cartridges to be used for their rated life.

To back flush the cartridges, perform the following functions:

1. Close shut-off valve on outlet of manifold.
2. Close shut-off valve on inlet of manifold.
3. Release bottom manifold from quick disconnect fittings on filters.
4. Reverse direction of filters on manifold system.
5. Re-attach bottom manifold to filters.
6. Open flush valve on bottom manifold and put flush hose into bucket or drain.
7. Open shut-off valve on inlet of manifold and accumulated dirt will be flushed out of filter.

8. Close shut-off valve on flush hose and open outlet valve on manifold. The pressure in the system should now be operational for use.
   Note: If pressure does not return to normal zone on gauges, reverse the filters and re-perform functions 5 through 8.

When the pre filter element in the clear pre filter housing becomes discolored, this is the indication that it needs to be replaced.

Lubrication

Bearings & Seals

Main bearings on the ice flaker should be greased every three months using FDA-approved food grade edible grease. The grease fittings are easily accessible from the front of the flaker; the top bearing is lubricated through a grease fitting accessible through the inspection (service) opening, the bottom bearing is lubricated through a grease fitting on the outer edge of the bottom casting. **NOTE**: One pump of a grease gun is normally adequate to grease the bearings. Do not over-grease, as this may damage the grease seals at the bearings.

Speed reducer

Some speed reducers are equipped with a grease fitting to lubricate the bearing on the top slow-speed gear. This bearing must be lubricated (greased) every six months with standard bearing grease (not food grade).

The oil in a new speed reducer should be changed at the end of 250 hours of operation. Under normal conditions, after the initial oil change the oil should be changed after every 2,500 hours, or every six months, whichever occurs first. Periodic examination of oil samples taken from the unit will help establish the appropriate interval.

When operating the ice flaker in low ambient temperatures (colder than 50°F), synthetic oil should be used in the speed reducer.

Rotary Ice Harvesting Blade (20 ton models)
The rotary ice blades must be greased every 3 months, The grease fitting is located on the bottom of each blade assembly. Use food grade grease, add grease until it starts to come out of the vent on the blade near the top.

Preventative Maintenance

The ice flaker should be visually checked daily by a designated employee. This inspection should ensure that:

- Photo eyes and brackets are in proper alignment,
- Ice quality (size of ice flakes) appears normal,
- Ice quantity appears normal,
- No bubbles are visible in the sight glass,
- The flaker is clean,
- No unusual noises are present.

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

	3 months	6 months	9 months	12 months
Clean ice machine *				X
Check ice harvesting	X	X	X	X
Clean electric eyes & check alignment	X	X	X	X
Inspect flaker for damaged parts **	X	X	X	X
Inspect squeegee	X	X	X	X
Inspect water float valve	X	X	X	X
Inspect deflector scraper	X	X	X	X
Grease top & bottom bearings	X	X	X	X
Grease bearings on rotary Harvest blade (20 ton models)	X	X	X	X
Check and replace speed reducer oil (standard oil) ***	X	X	X	X
Check and replace speed reducer oil (synthetic oil) ***		X		X
Grease speed reducer bearings †		X		X
Sanitize ice machine *				X
Check bearing wear ††				X
Check cutting blade clearance ‡				X
Check oil level in oil pot and drain ‡‡				
Check rib heaters for proper operation (if furnished)				X
Replace squeegee	As necessary			
Replace deflector scraper	As necessary			
Replace water float valve	As necessary			

* Clean and sanitize at least annually, more frequently if necessary.

** Inspection should include, at a minimum, the following parts: ice deflector, deflector scraper, squeegee, squeegee wrapper, water distribution tubes, and float valve.

*** Speed reducer oil should be changed every 2,500 hours of operation (5,000 hours with synthetic oil), or every six months, whichever occurs first. The above chart assumes continuous operation of the ice flaker.

† Only required on speed reducers equipped with grease fittings at the bearings. Use food-grade grease such as Chevron FM or equal.

†† Use an industrial feeler gauge. If wear is greater than 0.007", bearings may be wearing excessively. Contact factory for guidance.

‡ Use an industrial feeler gauge. Check blade at top and bottom, in at least four locations around the evaporator (quarter points). Clearance should be 0.004" - 0.006" in all locations. If clearance is not within these parameters, contact factory for guidance.

‡‡ Oil pot should not be insulated. Frost line on oil pot will indicate oil level. When pot is nearly full, drain oil.

5. Maintenance

6. Troubleshooting

6. Troubleshooting

Problem	Possible Cause	Remedy
Operation		
1. Ice flaker will not start.	a. ON/OF switch is open.	Turn all power switches "ON".
	b. Control transformer is defective.	Check voltage between terminals 1 and 2 on the flaker control module (part E20T48). Normal reading is 24 VAC. If 24VAC is not present, replace the transformer.
	c. Control switches are open.	Check voltage between terminals 1 and 3 on the flaker control module. With all control switches open, normal reading is 0 VAC. With all control switches closed, normal reading is 24 VAC.
	d. Photoeye emitter is defective.	Check LED on emitter. If LED is lit, emitter is functioning properly. If LED is *not* lit, check to see that power is turned on, and that all connections between the emitter and control panel are secure. If LED still is not lit, replace emitter.
	e. Photoeye receiver is defective.	Check LED on receiver. If LED is lit, receiver is functioning properly. If LED is *not* lit, check to see that power is turned on, and that all connections between the emitter and control panel are secure. Check alignment of sensors. If possible, remove sensors form their housings, and hold them a few inches apart. If LED still is not lit, replace receiver.
	f. Photoeye control module is defective.	If both sensors are operating properly (see d. and e. above), replace control module.
2. Solenoid valve energizes, drive motor contactor does *not* energize.	a. Control module is defective	Check voltage between terminals 2 and 6 on control module. If voltage reads 24VAC, replace the control module.
	b. Contactor coil is defective.	Check voltage between terminals 2 and 6 on control module. If voltage reads 0VAC, check wiring and contactor coil for defects.
3. Solenoid valve does *not* energize, drive motor contactor energizes.	a. Control module is defective.	Close all switches; remove wires from terminals 7 and 8 on the control module. With voltmeter set to "ohms," check for continuity between terminals 7 and 8. If contacts are open, replace the control module.

Problem	Possible Cause	Remedy
	b. There is a wiring defect.	Close all switches; remove wires from terminals 7 and 8 on the control module. With voltmeter set to "ohms," check for continuity between terminals 7 and 8. If contacts are closed, check the line "A" jumper, CR_3contacts, wiring, and solenoid coil.
4. Drive motor is always on.	a. ON/OFF switch is defective.	Replace ON/OFF switch.
	b. Photoeye controls are defective.	Check per 1.d-1.f above.
5. Solenoid valve is always energized.	a. Control module is defective.	Replace control module.
6. Ice maker does *not* shut off when bin is full.	a. Photoeyes are not installed.	Install photoeyes per instructions on page 16.
	b. Photoeyes are defective.	Check per 1.d-1.f above.
7. Drive motor cuts out on overload.	a. A speed reducer gear is worn or broken.	Repair or replace the speed reducer.
	b. Electronic overload is set too low.	Check amp draw on drive motor. If amps do not exceed the nameplate rating, adjust the potentiometer on the control module clockwise until flaker operates properly. Turn potentiometer *counter*-clockwise just to the point that the overload trips then turn potentiometer clockwise 1/8 turn.
	c. Thermal overloads may be improperly sized.	Check ratings and install properly sized overloads if necessary.
	d. Ice blade is "dragging" on the drum.	Readjust the clearance on the ice blade as specified on page 49.
8. Drive motor runs, but main shaft only turns when there is no ice on the drum.	a. The woodruff key on the slow speed output shaft of the speed reducer has sheared.	Repair or replace the speed reducer.
Freezing and Refrigeration		
1. Ice freezes along entire length of drum, but harvests only on the upper half.	a. System is short of refrigerant.	Charge system until there are no bubbles in the sight glass.
	b. Superheat setting is too high.	Open the hand expansion valve 1/4 turn at a time until ice is harvested over entire evaporator. Wait 10-15 minutes between adjustments to allow the system to balance.

Problem	Possible Cause	Remedy
	d. Head pressure is too low.	Adjust or replace head pressure controls as necessary.
	e. The liquid line filter/drier is dirty.	Replace the filter/drier.
2. Ice freezes *and* harvests entire height of evaporator, but harvests on only one side of the drum.	a. Main bearings are worn.	Replace worn bearings. Repair or replace main shaft is excessive wear is detected.
	b. Ice blade clearance is too high.	Check and adjust blade clearance as necessary
	c. Top casting was misassembled after bearing replacement.	Re-align and reassemble the top casting. Contact factory for assistance.
3. Ice freezes *and* harvests entire height of evaporator, but harvests poorly or at random.	a. Feed water is too hard	Install a water softening system.
	b. Freezing surface is coated with hard water deposits.	Clean the evaporator surface with ice machine cleaner.
5. No ice freezes on the evaporator, and compressor short cycles.	a. Loss of refrigerant charge.	Inspect refrigeration system for leaks. Repair as necessary, and recharge system.
6. Flaker makes ice intermittently, and compressor short cycles.	a. Undersized water line.	Install properly sized water line.
	b. Low water pressure (under 20 psi).	Contact factory for guidance.
	c. Water filters are clogged.	Replace water filters.
7. Ice flakes are too thin.	a. Evaporator temperature is too high.	• Check and adjust Dual Pressure regulator (if equipped). regulator should be set between –5°F and –10°F (-20 for 20 ton) during operating cycle. • Close the hand expansion valve ¼ - ½ turn at a time until ice quality is acceptable. Wait 10-15 minutes between adjustments to allow the system to balance.
8. Ice flakes are too small, with an excessive amount of "snow".	a. Evaporator temperature is too low.	• Check and adjust hand expansion valve (if equipped). valve should be set between –5°F and –10°F (-20 for 20 ton).

6. Troubleshooting

Problem	Possible Cause	Remedy
9. Ice flaker "chatters" and does not run smoothly.	a. Ice blade clearance is too high.	Check clearance and adjust as necessary.
	b. Main bearings are worn.	Replace worn bearings. Repair or replace main shaft is excessive wear is detected.
10. Ice accumulates in the water return trough.	a. Ice deflector is not positioned properly.	Adjust ice deflector position as specified on page 43.
11. Ice accumulates in the water return trough, sump, and on the "ribs" in the bottom casting.	a. Ambient temperature is too low.	• If ambient temperature is between 45°F and 50°F, install rib heaters. • If ambient temperature is below 45°F relocate the flaker to a warmer area. See Installation conditions on page 8.
Ice Storage and Removal		
1. Ice flakes are frozen together in a hard block.	a. Ice has been left in the storage bin too long.	• Remove ice from the storage bin daily. • Install a clock timer to limit the ice flaker production.
	b. Water level in the sump is too high, causing water to overflow the return trough.	Adjust the water float valve to maintain water level approximately ¼" below the return trough.
	c. Water is overflowing the distribution pan.	• Distribution tubes may be plugged. Clean or replace tubes as necessary. • Level in distribution pan may be too high. Adjust the water-regulating valve to set level in the distribution pan to half-full.
	d. One or more water distribution tubes is missing or broken.	Replace as necessary.
	e. The lead water tube may be splashing water into the bin.	Adjust lead water tube as necessary.
	f. Condensate drip pan is leaking into the storage bin.	Repair or replace drip pan.
	g. Humidity level in storage bin is too high.	• Check and repair bin insulation as necessary. • Check and repair seals on the bin. • Bin door has been left open too long. Close door when not removing ice.

Problem	Possible Cause	Remedy
2. Ice in storage bin is too wet.	a. Water level in the sump is too high, causing water to overflow the return trough.	Adjust the water float valve to maintain water level approximately ¼" below the return trough.
	b. Water is overflowing the distribution pan.	• Distribution tubes may be plugged. Clean or replace tubes as necessary. • Level in distribution pan may be too high. Adjust the water-regulating valve to set level in the distribution pan to half-full.
	c. One or more water distribution tubes is missing or broken.	Replace as necessary.
Speed Reducer		
1. Oil is leaking between the front of the motor and the motor mounting flange.	a. High-speed oil seal in the speed reducer is worn.	Replace seal.
2. Oil leaking is evident on the top of the flexible coupling.	a. Slow-speed oil seal in the speed reducer is worn.	Replace seal.

7. Service & Adjustment

7. Service & Adjustment

*****CAUTION*****

THIS INFORMATION IS INTENDED FOR USE BY INDIVIDUALS POSSESSING ADEQUATE BACKGROUND IN ELECTRICAL, REFRIGERATION, AND MECHANICAL SERVICE. ANY ATTEMPT TO REPAIR MAJOR EQUIPMENT MAY RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE. THE MANUFACTURER OR SELLER IS NOT RESPONSIBLE FOR THE INTERPRETATION OF THIS INFORMATION, NOR WILL THEY ASSUME ANY LIABLITY IN CONNECTION WITH ITS USE,

*****CAUTION*****

*****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 SO MAY RESULT IN AN ELECTROCULTION HAZARD.

*****DANGER*****

*****WARNING*****

ONLY TECHNICALLY QUALIFIED PERSONS, EXPERIENCED IN THE HANDLING OF REFRIGERANTS AND THE OPERATION OF REFRIGERATION SYSTEMS, SHOULD PERFORM THE OPERATIONS DESCRIBED IN THIS MANUAL.

*****WARNING*****

Replacement of Photoeye Ice Level Controls

1. Turn off the main power and remove the 11-pin power module.
2. Locate the sensor to be replaced, and remove the sensor housing cover (if present).
3. Using two open-ended wrenches, placing one on the back nut and one on the forward nut, remove the sensor.
4. Disconnect the old sensor wires from the terminal strip.
5. Connect the new sensors wires to the terminal strip.
6. Install the sensor in the mounting bracket, and tighten the locknuts, taking care not to over-tighten as this could damage the sensor, use a maximum torque of 13 lbs-in.
7. Re-install the power module into the base.
8. Turn on main power.
9. Check alignment of the sensors. When proper alignment is achieved, the LED on the receiver will light. Adjust the mounting brackets as necessary to ensure that the sensors are properly aligned.
10. Reinstall the sensor housing covers.

Replacement and 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.

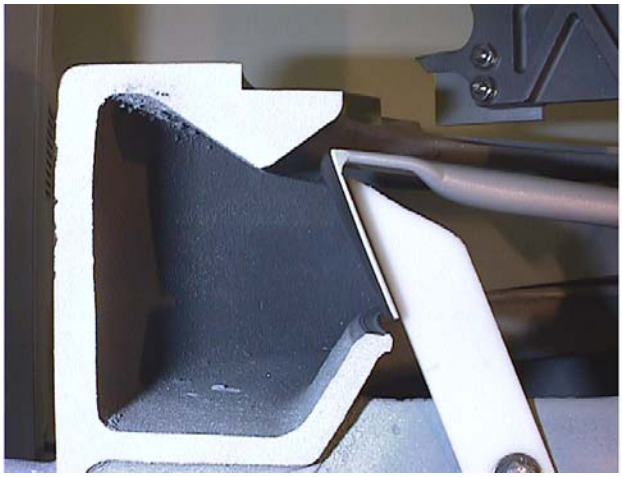
The ice deflector should be centered beneath the ice cutter blade so that as the ice is removed from the evaporator, it will be deflected into the ice bin opening, away from the water-collecting trough. The ice deflector prevents ice from dropping into the water-collecting trough.

TO REPLACE ICE DEFLECTOR PROCEED AS FOLLOWS:

1. Shut off ice flaker and allow machine to "pump down" (de-ice). Once the machine is clear of ice, disconnect the main power to the ice flaker and LOCK THE DISCONNECT SWITCH IN THE OFF POSITION (to prevent accidental start up).
2. (larger capacity models may be better serviced form below.)
3. Remove the service access cover on the top casting.
4. Remove 2 or 3 water distribution tubes (if necessary).
5. Reaching up from the bin into the freezing chamber (or down from the top), loosen and remove the two bolts holding the existing ice deflector in place.
6. Remove the damaged ice deflector through the bottom opening.
7. 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 (see Figure 10 below).
8. Re-install the water distribution tubes (if necessary).
9. Remove all tools from inside the machine and re-attach the service access cover.

10. Remove lockout device from the main power disconnect and turn on the main power.
11. Turn on the ice flaker switch (you may need to press the overload reset button), and check the deflector to insure that it does not touch the evaporator or aluminum casting.
12. 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.

Figure 10
Ice Deflector and Scraper Adjustment



Replacement and Adjustment of the Ice Deflector Scraper

The ice deflector scraper is mounted on one of the three bottom ribs using two stainless steel bolts and nuts. The scraper's purpose is to clear any buildup of ice from the ice deflector, as the deflector passes the scraper. When properly positioned, the scraper will be approximately 1/8" above the deflector blade (see Figure 10 above). When replacing the scraper, it may be necessary to cut the angled edge to the proper size and angle. This may be accomplished with either aviation snips or a razor knife.

Replacement and Adjustment Of The Squeegee & Squeegee Wrapper
(20 ton model does NOT have squeegee installed)

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

1. Remove the service access cover on the top casting.
2. Remove 2 or 3 water distribution tubes for easier access.
3. Reaching into the freezing chamber, loosen and remove the two bolts holding the existing squeegee and squeegee wrapper in place.
4. Remove the squeegee and 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 the existing wrapper.
5. Reinstall the squeegee and 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 pressure on the squeegee causing it to bend **slightly** so that it will drag on the evaporator surface.

6. Do not install the squeegee assembly so close to the evaporator that the squeegee bends excessively. This may cause premature squeegee wear and increase load on the gearbox and drive motor.
7. Tighten the nuts and bolts only till the lock washers lock. **Do not over tighten bolts**, as this may cause distortion of the squeegee wrapper and possibly cause premature squeegee wear.
8. Re-install the water distribution tubes.
9. Remove all tools from inside the machine and re-attach the service access cover.
10. Remove lockout device from the main power disconnect and turn on the main power.
11. 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.
12. 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 Of Water Pump

1. Turn off the main power to the flaker.
2. Remove the screws securing the stationary sump cover.
3. Loosen and remove water tube fitting (Nylon compression fitting).
4. Remove the cover from the electrical junction box, ad disconnect the water pump wires from the terminal strip.
5. Lift the water pump (with cover attached) off the sump.
6. Remove the water tube hose and clamp.
7. Loosen and remove the four nuts holding the water pump onto the sump cover. Remove the pump from the cover.
8. To install the new pump, simply reverse the above procedure. Use caution when routing the new cables to insure they are secured to avoid accidental damage.

Replacement Of Drive Motor

1. 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.
2. Refer to Figure 11. The drive motor is attached to the gearbox with (4) 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 setscrews or couplings; the motor shaft fits directly into the hollow high-speed input shaft on the speed reducer with a ¼" 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 centerline, 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

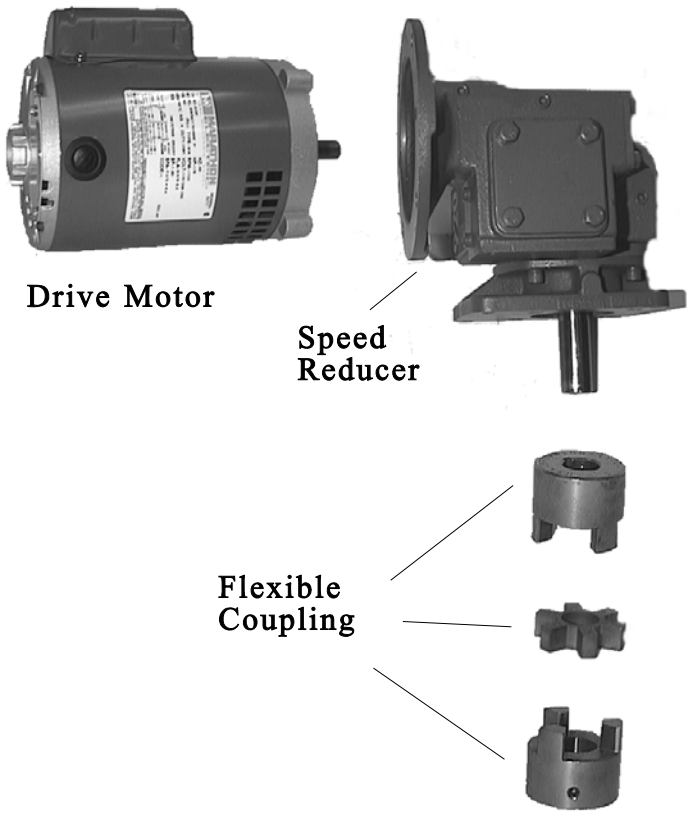
motor, making sure the bolts do not thread into the mounting lugs). Turn both bolts until they are hand tight, and then turn each bolt alternately 1/2 turn at a time, until the motor is free enough to remove by hand.

3. When installing the new motor, place the ¼" 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.
4. Re attach the flexible power cable to the motor, connect the power leads to terminals marked L_1 and L_2, 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.
5. 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 and Flexible Coupling

1. Disconnect main power to the ice flaker.
2. Remove the drive motor as described above.
3. Remove the (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.
4. 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 of the relief vent (located on the top of the gearbox in a set screw) if the gearbox is turned on its side or up side down.
5. The bottom part of the flexible coupling is attached to the shaft with a setscrew. Loosen the setscrew, and 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.
6. Install the new (or existing if it is not damaged) flexible coupling to the shaft and speed reducer, lining up the keyways with the key. Re-tighten the setscrews in both parts.
7. Place the bronze star on the bottom part of the coupling.
8. Install the gearbox (with top coupling attached) onto the top casting, over the bottom part of the flexible 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 flexible coupling to allow the gearbox to seat on the machined surface of the casting. There should be a 1/16" gap between the top coupling half and the bronze star.
9. Rotate the gearbox COUNTERCLOCKWISE ONLY until the mounting holes line up. Once aligned re-install the mounting bolts. Re-position the coupling halves with required clearance and re-tighten.

Figure 11
Drive Motor and Speed Reducer Disassembly



Replacement and Adjustment Of Water Float Valve

1. Shut off the water supply to the ice flaker and drain the supply line.
2. Loosen and remove the compression fitting at the float valve.
3. While holding the float valve body with pliers or a crescent wrench, remove the water float valve fitting from the valve body.
4. Using a 13/16" socket (a spark plug wrench works well), remove the locking nut from the valve body (you may need to hold the valve body to keep it from turning).
5. Remove the old valve and fiber washer. Install new valve (with fiber washer on the inside of the water sump) and tighten the locking nut with the socket. The valve body should be held in place with the discharge port facing straight down.
6. Re-install the float valve fitting and reattach the water supply line.
7. 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 lower edge of the water return trough while the flaker is operating. To adjust the operating level, hold the float in one hand, and push or pull on the brass shaft (depending on whether the water

level is too high or too low.) 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 Solenoid Valve

*****CAUTION*****

ON ICE FLAKERS THAT ARE CONNECTED TO A CENTRAL REFRIGERATION RACK, A JUMPER WIRE MUST BE PLACED BETWEEN TERMINAL "A" AND TERMINAL "B" ON THE TERMINAL STRIP AT THE BOTTOM OF THE CONTROL PANEL. THIS JUMPER WILL ALLOW THE SOLENOID VALVE TO ENERGIZE WHEN THE OPERATING CIRCUIT IS ENERGIZED.

*****CAUTION*****

1. Pump down the ice flaker and evacuate refrigerant from the liquid line.
2. Turn off main power to ice flaker, and disconnect wires leads from the solenoid valve and remove the armored cable.
3. Remove the solenoid valve from the liquid line.
4. Install the new valve into the liquid line.
5. 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 the atmosphere.
6. Re-connect armored cable and solenoid wires.
7. Turn on main power, turn on ice flaker switch, and check operation of the solenoid valve.

*****CAUTION*****

THE ARROW MARKED ON THE SOLENOID VALVE *MUST* POINT IN THE DIRECTION OF REFRIGERANT FLOW (TOWARD THE ICE FLAKER).

*****CAUTION*****

Replacement and Adjustment of the Hand Expansion Valve

1. Pump down the ice flaker and evacuate refrigerant from the liquid line.
2. Remove the old expansion valve.
3. Install the new valve.
4. Re-insulate the suction line.
5. 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 the atmosphere.
6. Restart the ice flaker, and adjust the hand expansion valve as necessary.
7. To adjust the hand expansion valve, turn the adjustment handle 1/8 to ¼ turn at a time (clockwise to close the valve if it was overfeeding, counterclockwise to open the valve).

Wait 5-10 minutes to allow the system to stabilize. Repeat this step until ice is produced and harvested all the way to the bottom of the evaporator.

Replacement and Adjustment of Ice Blade

Ice blade adjustment is not normally required (except after bearing replacement). If you suspect the blade needs adjustment because of excessive clearance, it is more likely that the bearings have worn. **Do not** try to adjust the blade clearance without checking for and correcting worn bearings. When checking tolerances, do NOT use automotive-type feeler gauges. Automotive types are too short, and not flexible enough to give a true reading. You **MUST** use industrial machine tool feeler gauges (these are about 2" wide by 12" long). These machine tool feeler gauges are available from the factory if you cannot locate them locally.

Clearance between the ice blade and the evaporator freezing surface must be between 0.004" and 0.006" with the evaporator at room temperature. If it is determined that the ice blade clearance must be adjusted:

1. Locate the exact position on the evaporator freezing surface where the clearance between the tip of the ice blade and freezing surface is the least. Check clearance at the top and bottom of the blade(s), rotate the blade 60 degrees and check clearance again. Repeat this operation at a minimum of six points around the evaporator to accurately determine the point of least clearance.
2. With the ice blade rotated to the point of least clearance, set the gap between the ice blade and evaporator surface to between 0.004" and 0.006" at the top and bottom of the blade. Tighten the blade mounting bolts and re-check clearance.

Bearing Replacement (Small Capacity models 2000-6000 pound)

1. Turn the ice flaker off and pump down until all ice is removed from the evaporator.
2. Shut off main disconnect and lock out power.
3. Remove the speed reducer and drive motor from the machine (refer to instructions on page 46).
4. Remove the bottom half of the flexible coupling.
5. Remove the rivets that retain the outer stainless steel insulation jacket around the ice flaker. Remove the stainless steel jacket.
6. Cut away the upper 3" of insulation from the evaporator, uncovering (4) cap screws that bolt the upper aluminum casting to the evaporator (through four lugs welded to the evaporator).
7. Remove the (4) cap screws.
8. Using a rubber mallet, gently tap the aluminum casting from below (upward) to free it from the evaporator.
9. Lift up the aluminum casting and slide it off the main shaft.

*****CAUTION*****

RETAIN ANY SHIMS THAT MAY BE FOUND BETWEEN THE TOP CASTING AND THE BOLTING LUGS. THESE SHIMS ENSURE THAT THE TOP CASTING IS PROPERLY ALIGNED ON THE EVAPORATOR. WHEN RE-ASSEMBLING THE TOP CASTING, THESE SHIMS MUST BE PLACED BACK IN THE SAME LOCATION AS WHERE THEY WERE ORIGINALLY INSTALLED. FAILURE TO DO SO WILL RESULT IN THE MAIN SHAFT BEING MISALIGNED, AND MAY RESULT IN EXCESSIVE BEARING WEAR.

*****CAUTION*****

10. Loosen the squeegee mounting bolts, and push the squeegee away from the evaporator surface.
11. Lift the shaft assembly out of the evaporator, being careful to avoid scratching the evaporator surface with the ice blade.
12. Examine shaft journals for wear. If worn, repair or replace shaft.
13. Remove the old oil seals from the upper casting.
14. Drive the upper bearing out of the top casting, using a drift pin or properly sized wood block. **Note:** to avoid distortion of the top casting, it should be supported near the bearing, and not along the outer edge.
15. Drive the new bearing into place, centering it in the retainer.
16. Press the new oil seals in place.
17. To remove the bottom bearing, remove the bottom bearing cover, and the bearing plate.
18. Repeat steps 12-16 above for the bottom bearing.
19. Install the new bottom bearing plate, and then replace the bottom bearing cover.
20. Install the main shaft assembly.
21. Reposition the rubber insulating ring on top of the evaporator, using adhesive if possible.
22. Reinstall the top casting, making sure to reinstall shims in their former locations. Make sure that the evaporator lugs are properly seated against the shoulders machined into the top casting. When the casting is repositioned correctly, tighten the four mounting bolts evenly.
23. Rotate the shaft to check for proper clearances before re-installing the drive assembly.
24. Check the clearance on the ice blade (see page 49 for details). If the ice blade clearances cannot be adjusted to within specifications, contact the factory.
25. Re-install the flexible coupling, speed reducer, and drive motor.
26. Remove power lockout and turn the flaker on. Check rotation and amp draw prior to opening the liquid solenoid valve.
27. Energize the liquid solenoid valve and allow the machine to begin making ice.
28. Discard the first half-bin of ice. Clean and sanitize the storage bin prior to using ice for consumable products

Bearing Replacement (Large Capacity models 10,000-40,000 pound models)

Bearing replacement on large capacity machines is accomplished without removing the shaft from the flaker.

1 Turn ice flaker off and pump down until all ice is removed from the evaporator.

2 Shut main disconnect off and lock out power.

3 Remove speed reducer and drive motor from machine (leave flexible coupling on until later). The flexible coupling will help to keep the shaft from dropping when the bottom bearing retainer is removed.

4 The bottom bearing retainer and bottom bearing cover are attached to the bottom casting via (4) 5/16" bolts. Remove the (4) bolts from the cover & retainer. Once the bearing cover is removed, you will see the bottom bearing retainer and the end of the shaft. There are two threaded holes on the retainer, install two of the removed bolts into these threaded holes, turning each one an equal amount to Ajack@ the retainer out of its normal position on the bottom casting.

5 When the retainer is removed, the old bearing can be pressed out of the aluminum retainer.

6 There is a stainless steel shaft sleeve between the shaft and the bearing, the shaft sleeve will probably come off the shaft with the bearing and retainer. If it did not, then remove the sleeve from the shaft (it is kept in place with only a keyway, there is no set screw. It will slide freely, but rotate with the shaft).

7 Press the new bearing into place, it should be centered in the retainer.

8 The new seals can then be pressed into place, the auxiliary seal is placed inside the main seal.

9 Place the new shaft sleeve on the shaft and install the bearing retainer (with new bearing & oil seals installed) and bottom bearing cover. Align the bolt holes with the threaded hole in the casting and re-install the (4) mounting bolts, taking care to tighten them equally so the retainer goes in straight.

10 Remove the flexible coupling from the flaker shaft, then remove the (4) 5/16" bolts holding the top bearing retainer in place.

11 Repeat steps 4-9 for the top bearing & retainer removal, the only difference is there is no bearing plate on the top bearing, instead, there are seals on the top, and on the bottom of the bearing all seal are to be installed with the seals positioned to keep the grease ibn the bearing area.

12 Rotate the shaft to check for clearance before re-installing the drive assembly.

13 Re-install the flexible coupling, gearbox and drive motor.

14 Remove power lockout and turn flaker on. Check rotation and amp draw prior to opening the liquid solenoid valve.

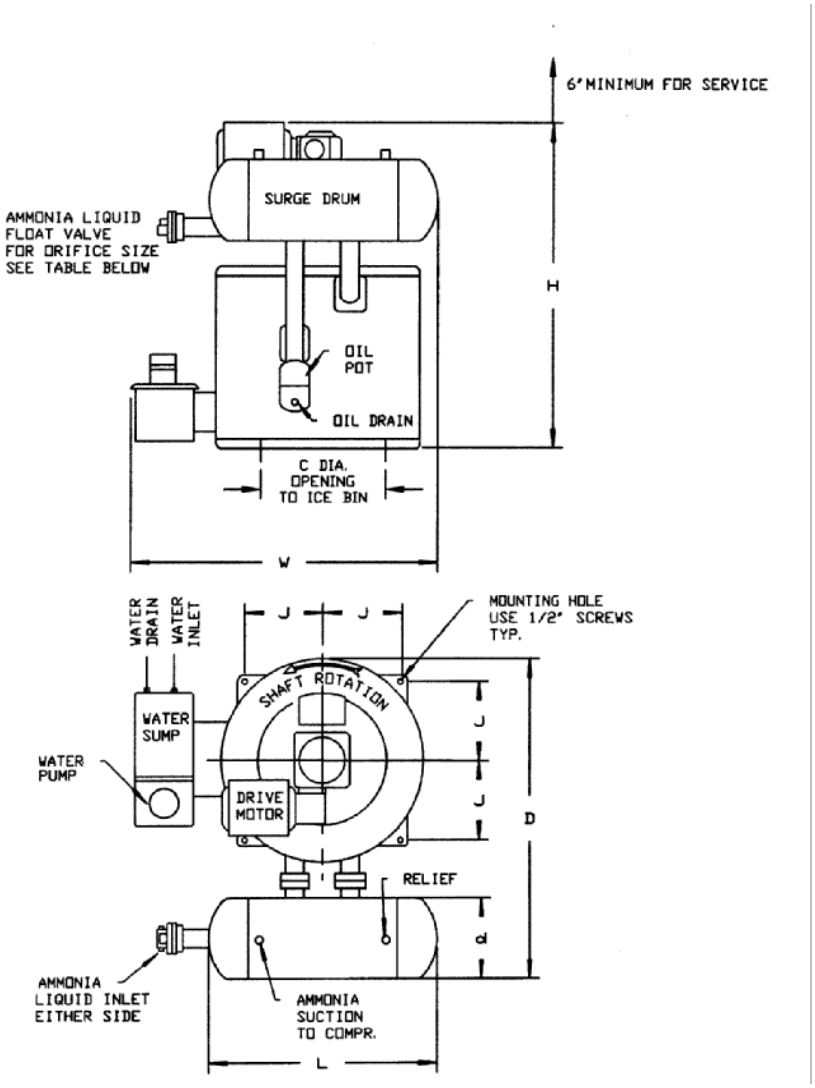
15 If all seems to be in order, open (energize) the liquid solenoid valve and allow the machine to start making ice.

16 Discard the first bin 2 bin of ice and clean & sanitize the bin prior to using ice for consumable products.

8. Appendix A
Ice Flaker Drawings

8. Ice Flaker Unit Drawings

Figure 12
Assembly Drawing: 2000, 3000, & 4000-RLA

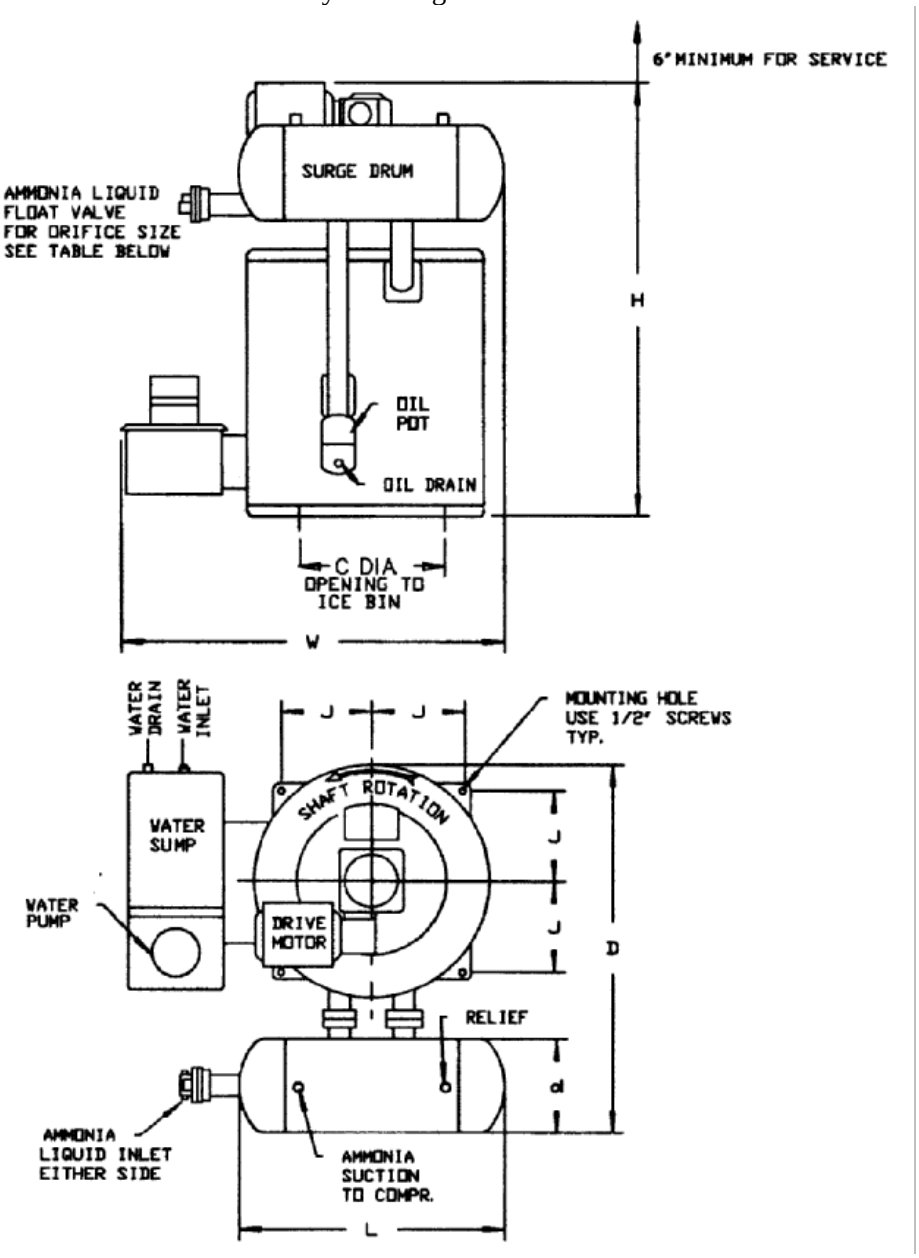


Ice Flaker Information

	Dimensions					Surge Drum	Float Valve Orifice	Connection Sizes Inches					Refrigeration Requirement
	C	D	H	J	W	D x L		Suction	Liquid	Oil Drain	Relief	Water Inlet	@-5 F
	INCHES							FPT	FPT	FPT	FPT	OD	BTU/HR
2000-RLA	14	41	34	8 ½	29 ½	8-5/8 x 24	3/32	1	1/2	½	1/2	3/8	18,000
3000-RLA	14	41	38 ½	8 ½	29 ½	8-5/8 x 24	3/32	1	½	½	½	3/8	27,000
4000-RLA	18	45	43	10 ¼	31 ½	8-5/8 x 24	3/32	1 1/4	½	1/2	½	3/8	36,000

8. Ice Flaker Unit Drawings

Assembly Drawing: 6000-RLA

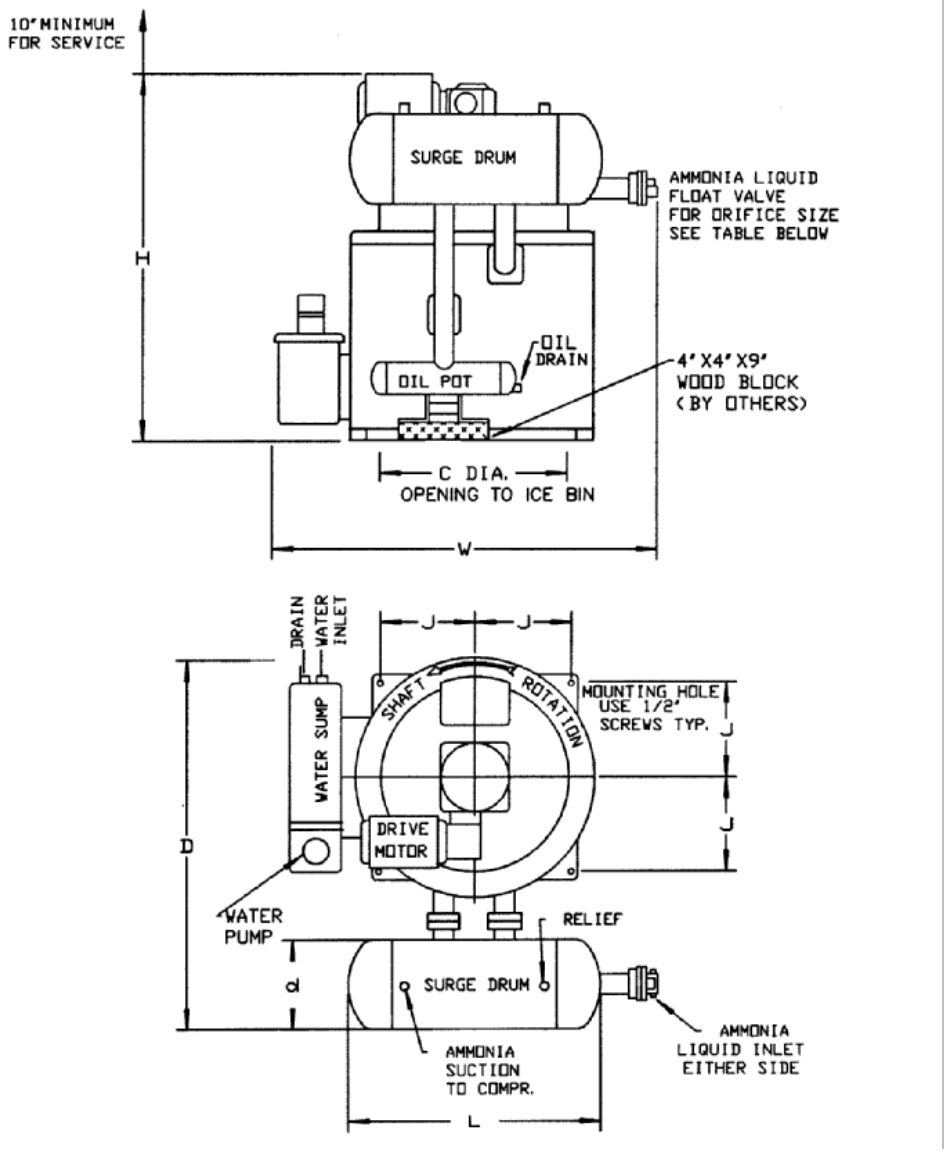


Ice Flaker Information

	Dimensions					Surge Drum	Float Valve Orifice	Connection Sizes Inches					Refrigeration Requirement
	C	D	H	J	W	D x L		Suction	Liquid	Oil Drain	Relief	Water Inlet	@-5 F
	INCHES							FPT	FPT	FPT	FPT	OD	BTU/HR
6000-RLA	18	47	50	10 ¼	35 ½	10-¾ x 24	3/32	1 1/4	1/2	½	1/2	3/8	54,000

8. Ice Flaker Unit Drawings

Assembly Drawing
50-RLA, 75-RLA, & 100-RLA

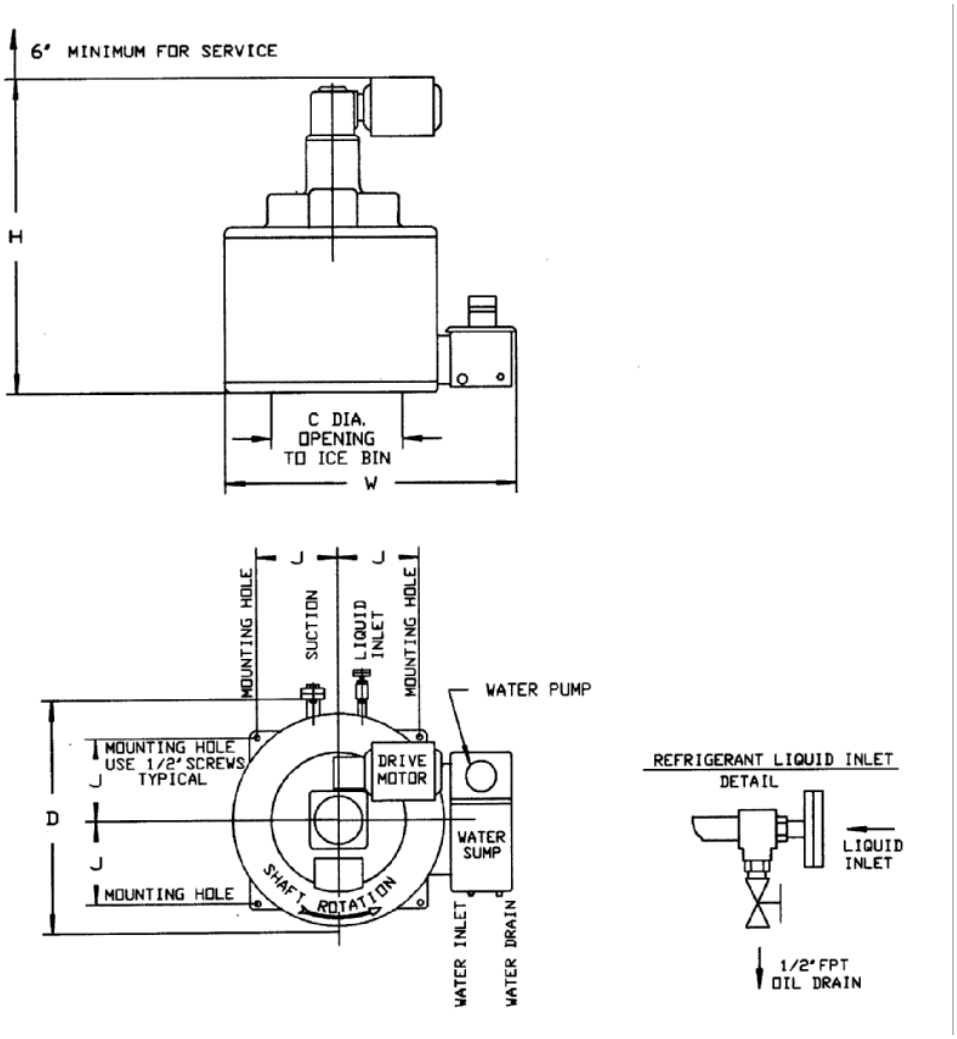


Ice Flaker Information

	Dimensions					Surge Drum	Float Valve Orifice	Connection Sizes Inches					Refrigeration Requirement
	C	D	H	J	W	D x L		Suction	Liquid	Oil Drain	Relief	Water Inlet	@-5 F
	INCHES							FPT	FPT	FPT	FPT	OD	BTU/HR
50-RLA	30	63	58	16 ¼	60	18 x 40	7/64	1 1/2	1/2	½	1/2	3/8	90,000
75-RLA	30	64	74	16 ¼	60	20 x 40	9/64	2	1/2	½	1/2	3/8	135,000
100-RLA	30	68	81	16 ¼	60	24 x 40	9/64	2	1/2	½	1/2	3/8	180,000

8. Ice Flaker Unit Drawings

Assembly Drawing
2000-RLR, 3000-RLR, 4000-RLR, & 6000-RLR

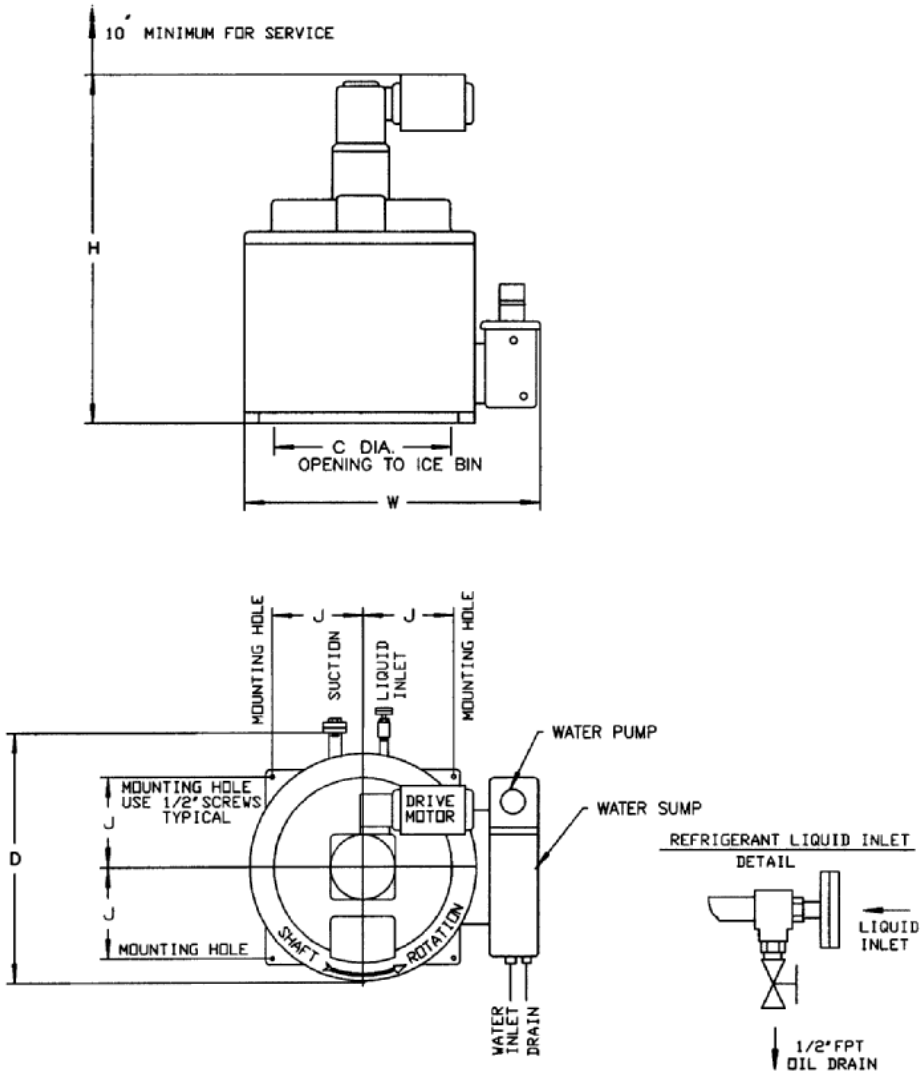


Ice Flaker Information

	DIMENSIONS					Connection Sizes			Refrigerant Requiremnt @ -5 F Evap.
	C	D	H	J	W	Suction	Liquid	Water Inlet	
	INCHES					FPT	FPT	OD	BTU/HR
2000-RLR	14	23	34	8 ½	28 ½	1	½	3/8	18,000
3000-RLR	14	23	38 ½	8 ½	28 ½	1	½	3/8	27,000
4000-RLR	18	27 1/2	43	10 ¼	32 ½	1 ¼	½	3/8	36,000
6000-RLR	18	27 ½	50	10 ¼	36 ½	1 ½	¾	3/8	54,000

8. Ice Flaker Unit Drawings

Assembly Drawing
50-RLR, 75-RLR, & 100-RLR

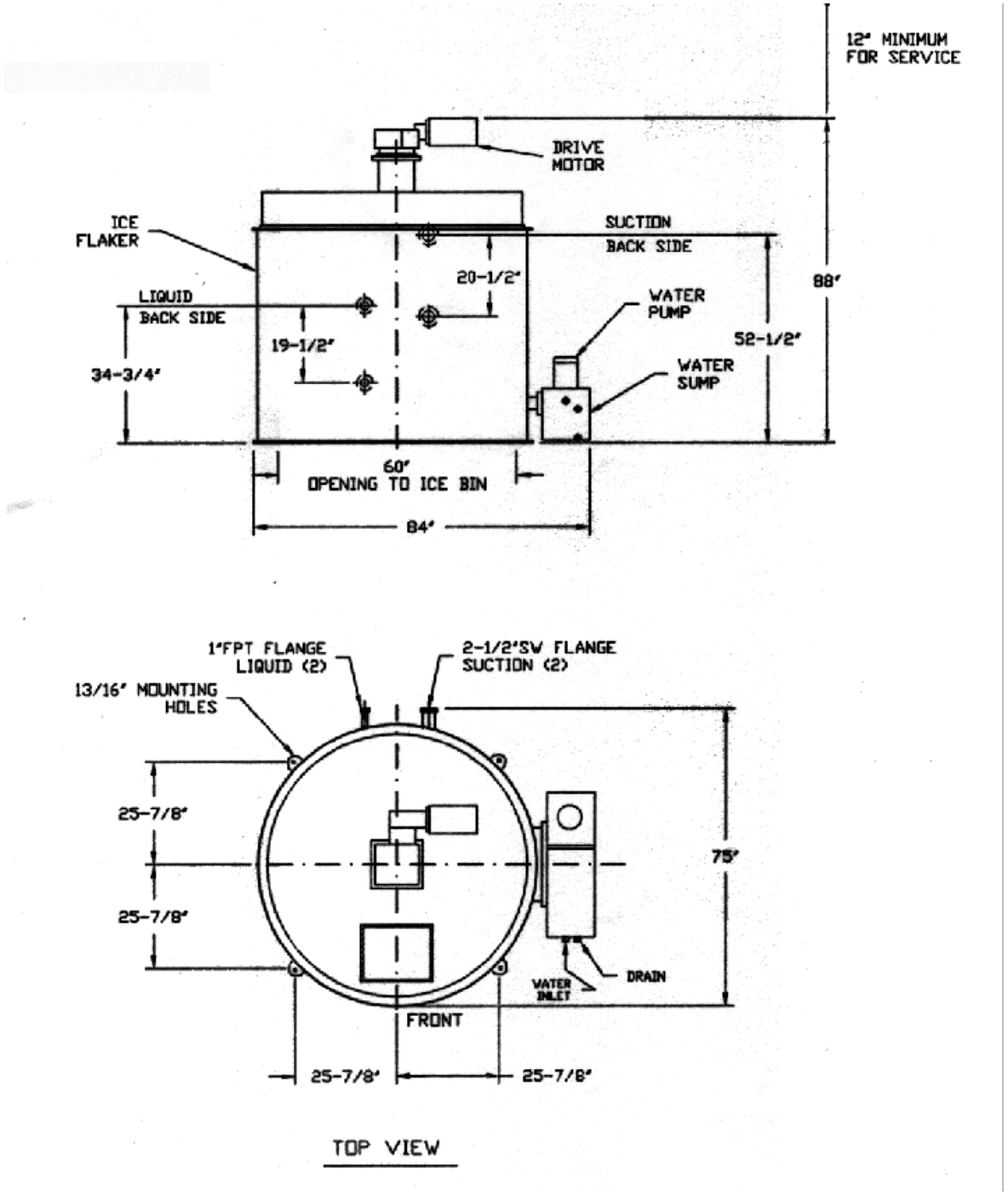


Ice Flaker Information

	DIMENSIONS					Connection Sizes			Refrigerant Requiremnt @ -5 F Evap.
	C	D	H	J	W	Suction	Liquid	Water Inlet	
	INCHES					FPT	FPT	OD	BTU/HR
50-RLR	30	42	58	16 ¼	53 ½	2	3/4	1/2	90,000
75-RLR	30	43	74	16 ¼	53 ½	2	3/4	½	135,000
100-RLR	30	43	81	16 ¼	53 ½	2 1/2	1	½	180,000

8. Ice Flaker Unit Drawings

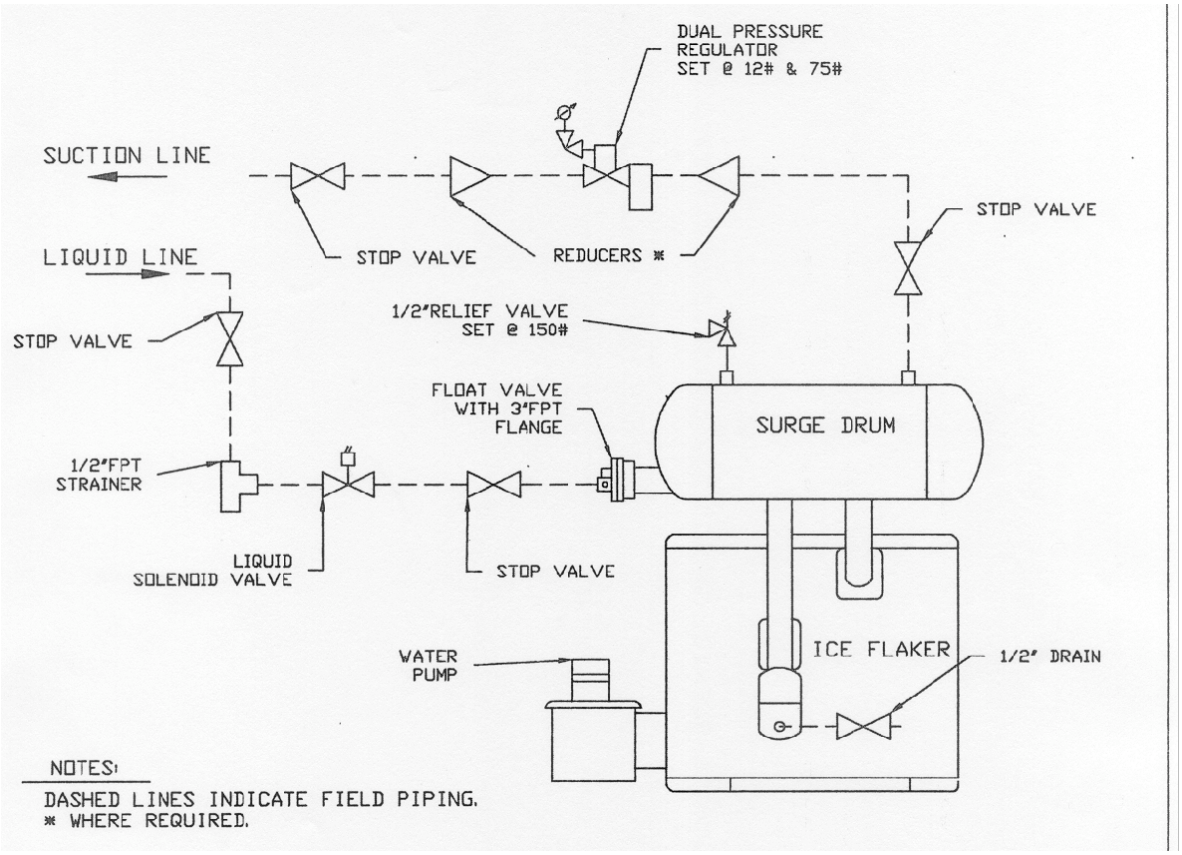
Assembly Drawing
Model 200-RLR



8. Ice Flaker Unit Drawings

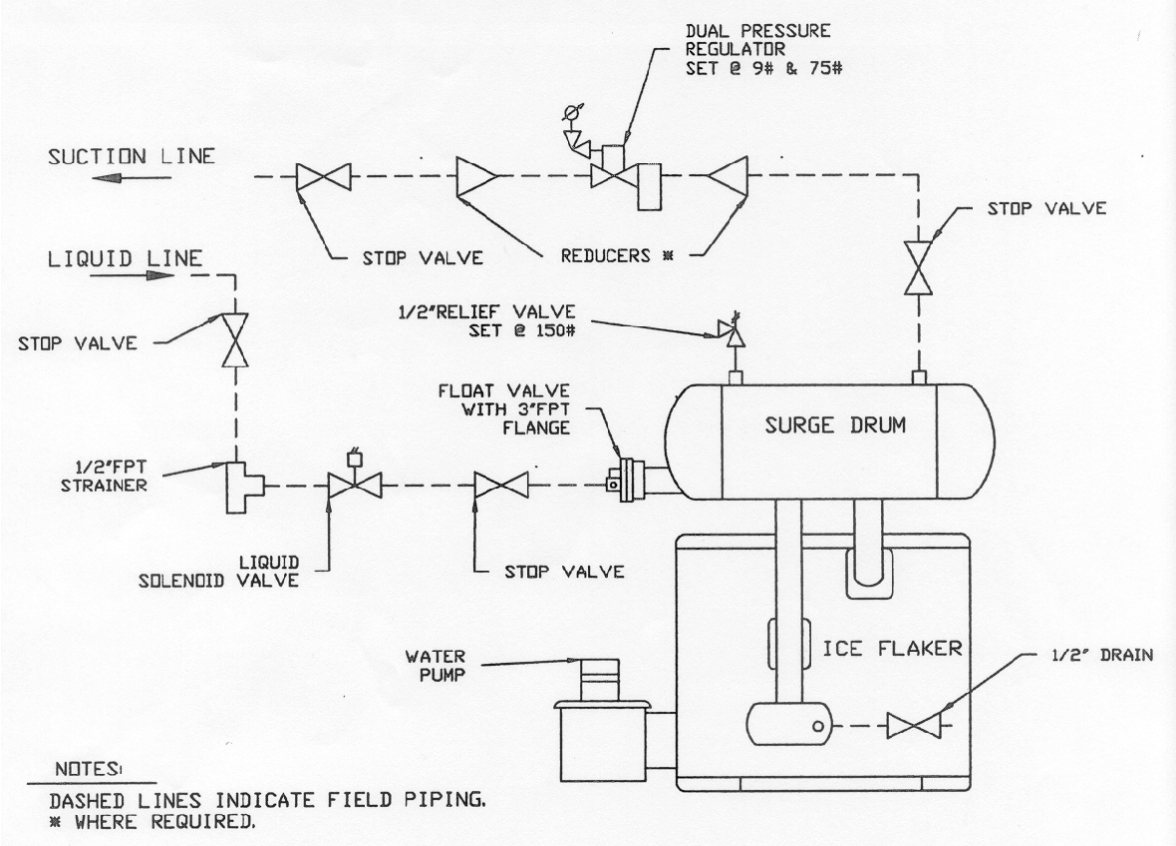
Piping Schematic

Models 2000-RLA, 3000-RLA, 4000-RLA & 6000-RLA



Models	Suction Line Dual Pressure Regulator	Suction Line Stop Valves	Liquid Line Stop valves	Float Valve Orifice
2000-RLA	¾" Port 50% Plug ¾" FPT Flanges	1" FPT	½" FPT	3/32"
3000-RLA	¾" Port 50% Plug ¾" FPT Flanges	1" FPT	½" FPT	3/32"
4000-RLA	¾" Port 1" FPT Flanges	1-1/4" FPT	½" FPT	3/32"
6000-RLA	¾" Port 1" FPT Flanges	1-1/4" FPT	½" FPT	3/32"

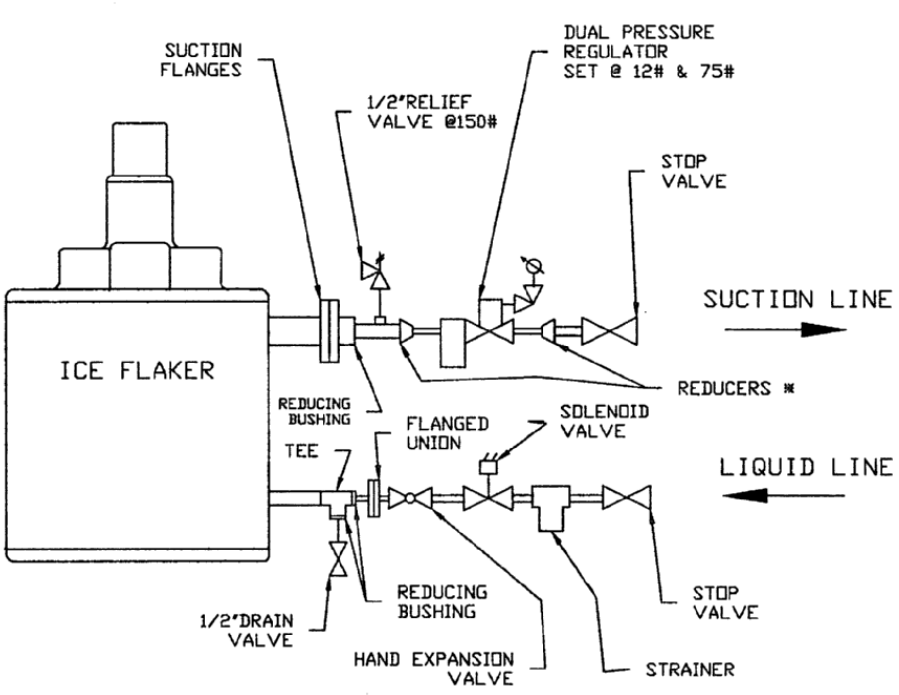
8. Ice Flaker Unit Drawings



Models	Suction Line Dual Pressure Regulator	Suction Line Stop Valves	Liquid Line Valves	Float Valve Orifice
50-RLA	1” Port 1-1/4” Flanges	1-1/2” FPT	½” FPT	7/64”
75-RLA	1-1/4” Port 1-1/2” Flanges	2” SW	½” FPT	1/8”
100-RLA	1-1/4” Port 1-1/2” Flanges	2” SW	½” FPT	9/64”

8. Ice Flaker Unit Drawings

Piping Schematic
2000-RLR, 3000-RLR, 4000-RLR, & 6000-RLR



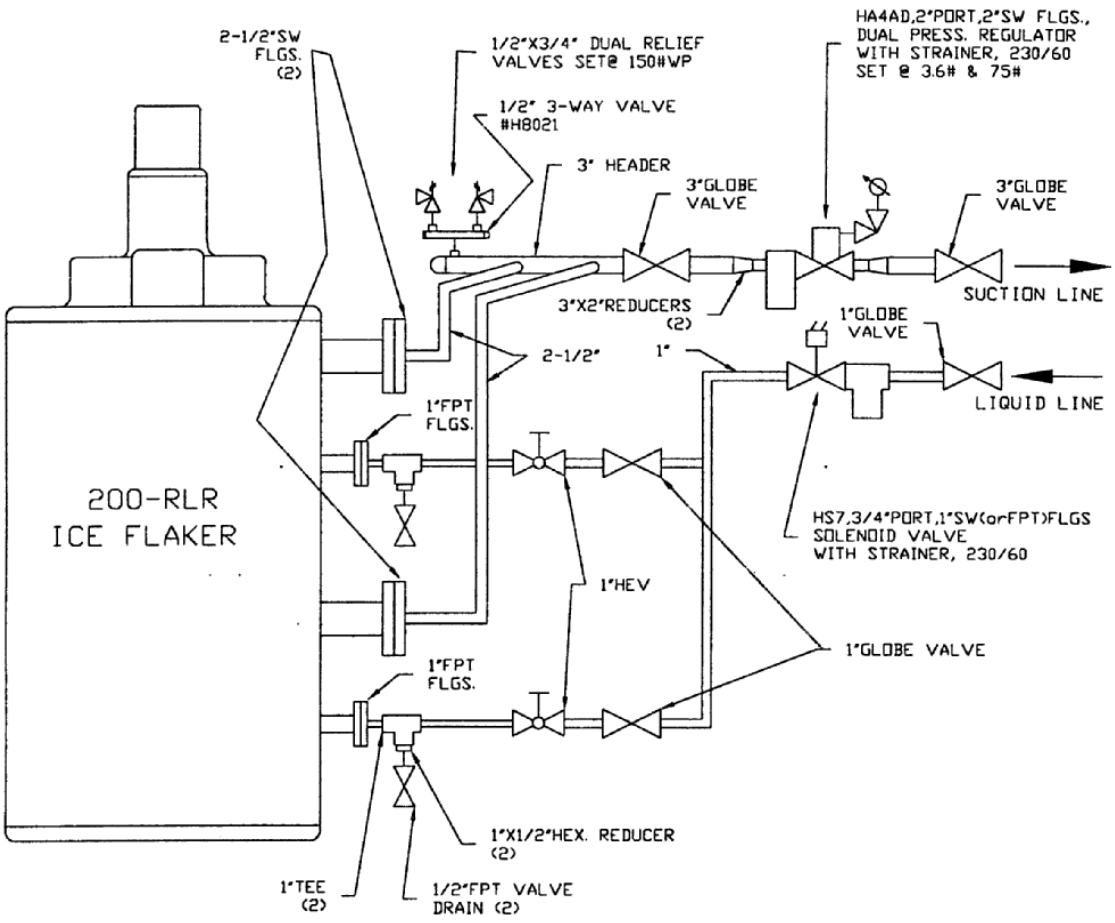
NOTES:

* WHERE REQUIRED.

Models	Suction Line Dual Pressure Regulator	Suction Line Stop Valves	Liquid Line Valves	TEE	Suction Flanges
2000-RLR	¾" Port 50% Plug ¾" FPT Flanges	1" FPT	½" FPT	1-1/4"FPT	1-1/2"FPT
300-RLR	¾" Port 50% Plug ¾" FPT Flanges	1" FPT	½" FPT	1-1/4"FPT	1-1/2"FPT
4000-RLR	¾" Port 1" FPT Flanges	1-1/4" FPT	½" FPT	1-1/2"FPT	2" FPT
6000-RLR	¾" Port 1" FPT Flanges	1-1/4" FPT	½" FPT	1-1/2"FPT	2" FPT

8. Ice Flaker Unit Drawings

Piping Schematic
Model 200-RLR



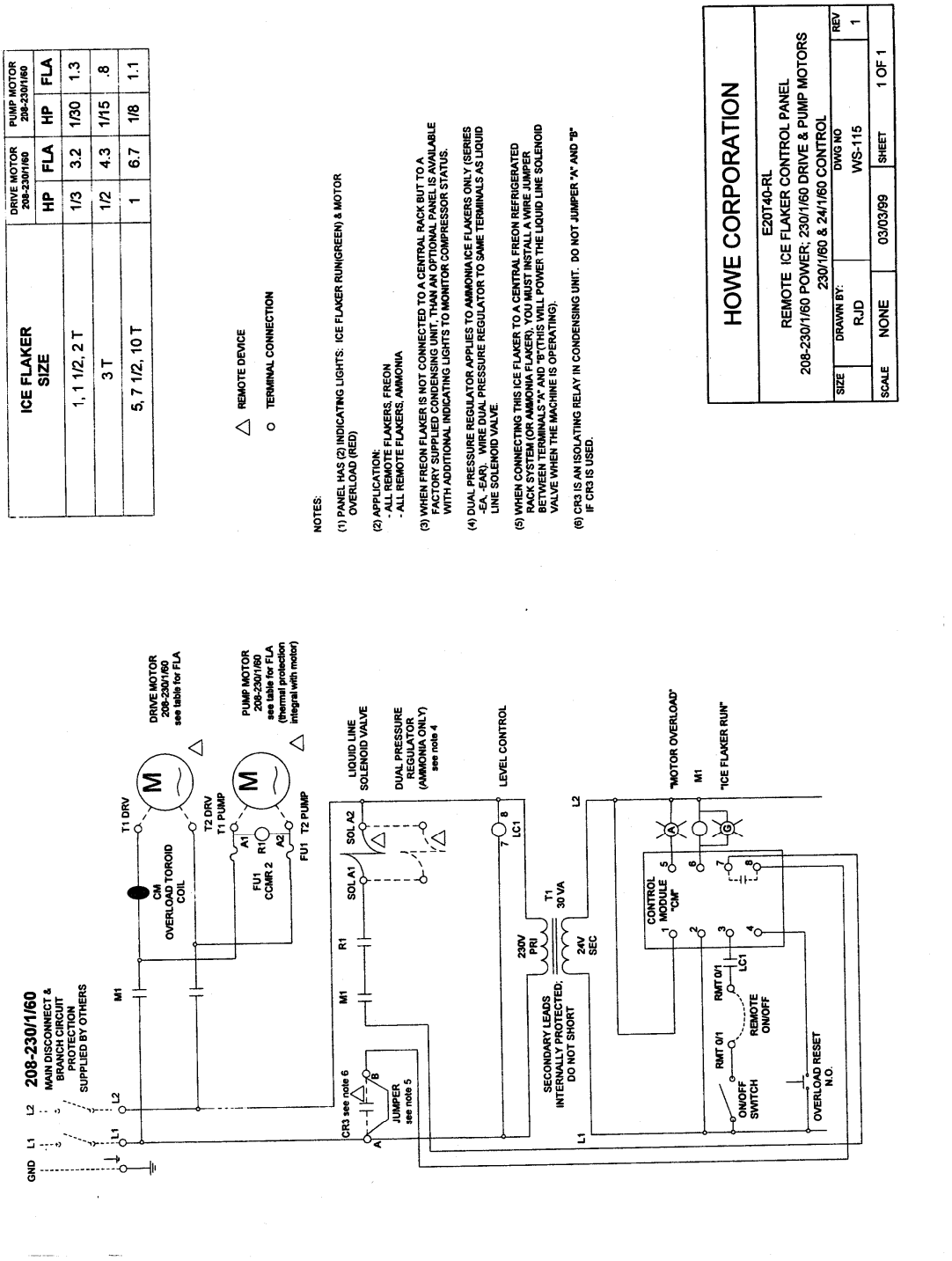
Notes: 1. Required Refrigeration Capacity: 30 TR @ -20 F Evap. Temp.
3:1 Ratio (4:1 Max.)

2. All pipe, fittings, valves & controls beyond suction & liquid flanges to be supplied by others for field piping.

9. Appendix B Wiring Diagrams

9. Wiring Diagrams

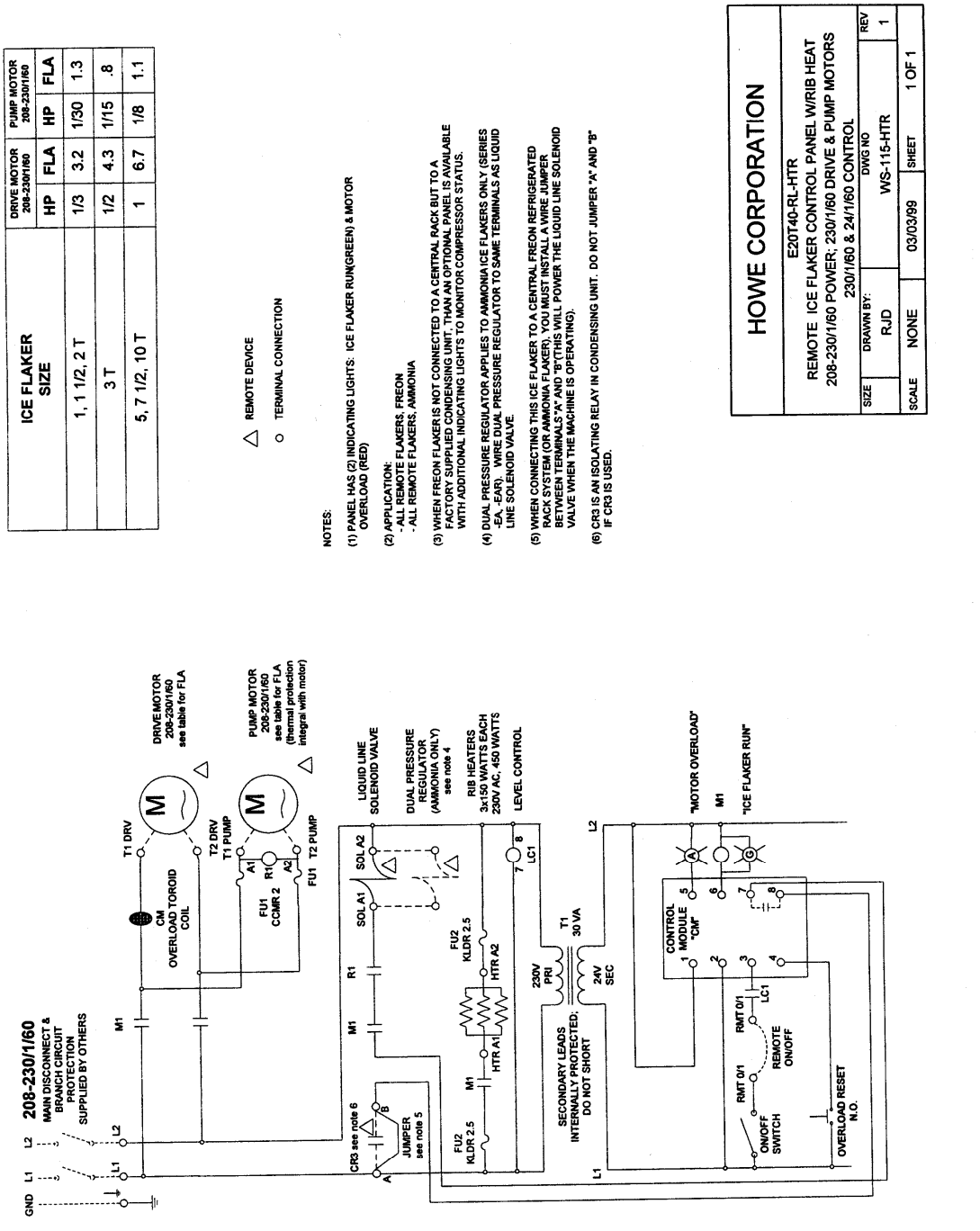
Figure 13
Ice Flaker Electrical Schematic
230/1/60



208-230V/1/60 shown, other voltages available.

9. Wiring Diagrams

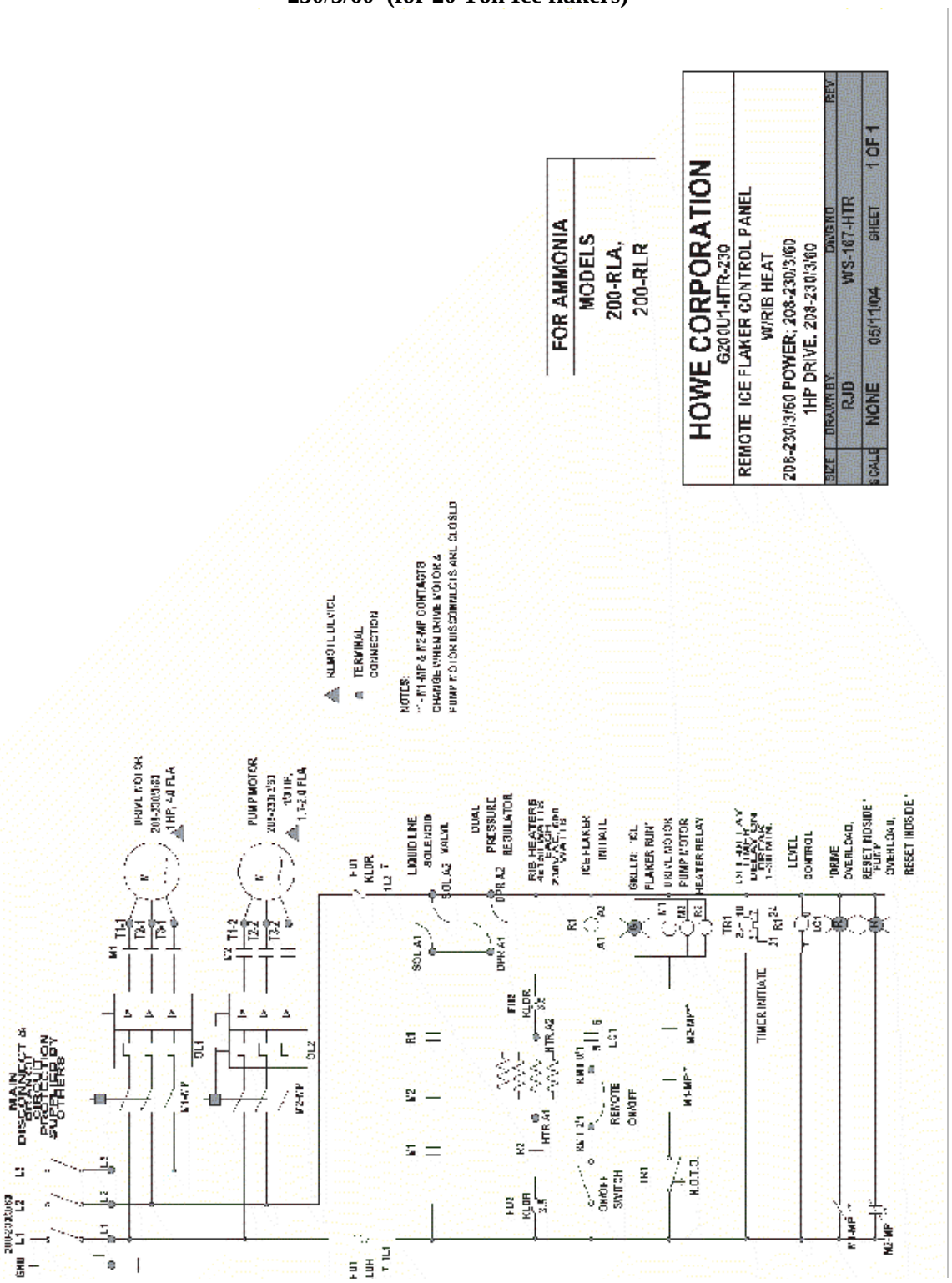
Figure 14
Ice Flaker Electrical Schematic
230/1/60 (Remote Low Side w/ rib heaters)



208-230V/1/60 shown, other voltages available.

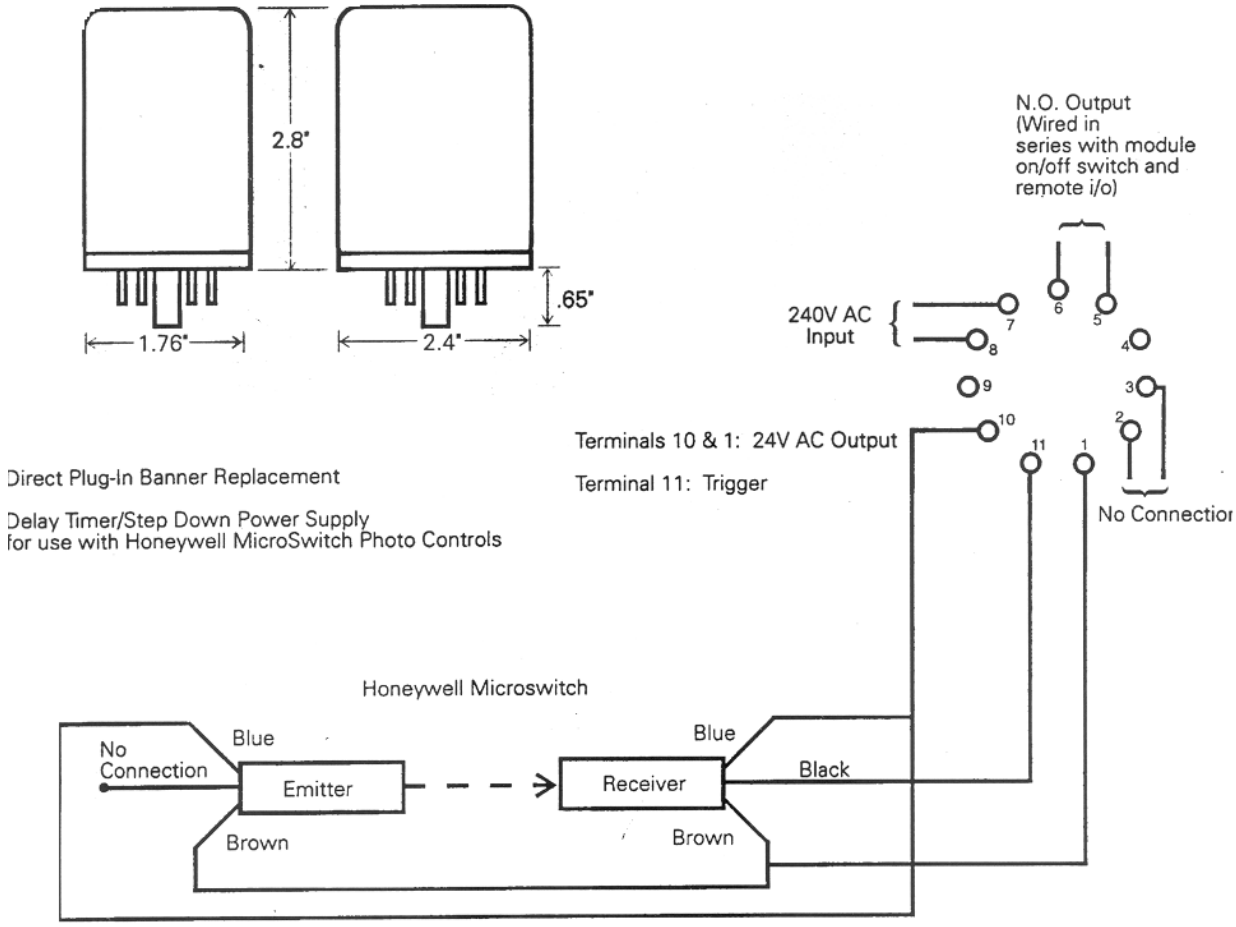
9. Wiring Diagrams

Ice Flaker Wiring Diagram
230/3/60 (for 20 Ton Ice flakers)



9. Wiring Diagrams

Figure 15
Photoeye Ice Level Controls



9. Wiring Diagrams

10. Appendix C
Parts List

Number in parentheses indicates quantities if more than one is required.

HOWE®

Replacement Parts for

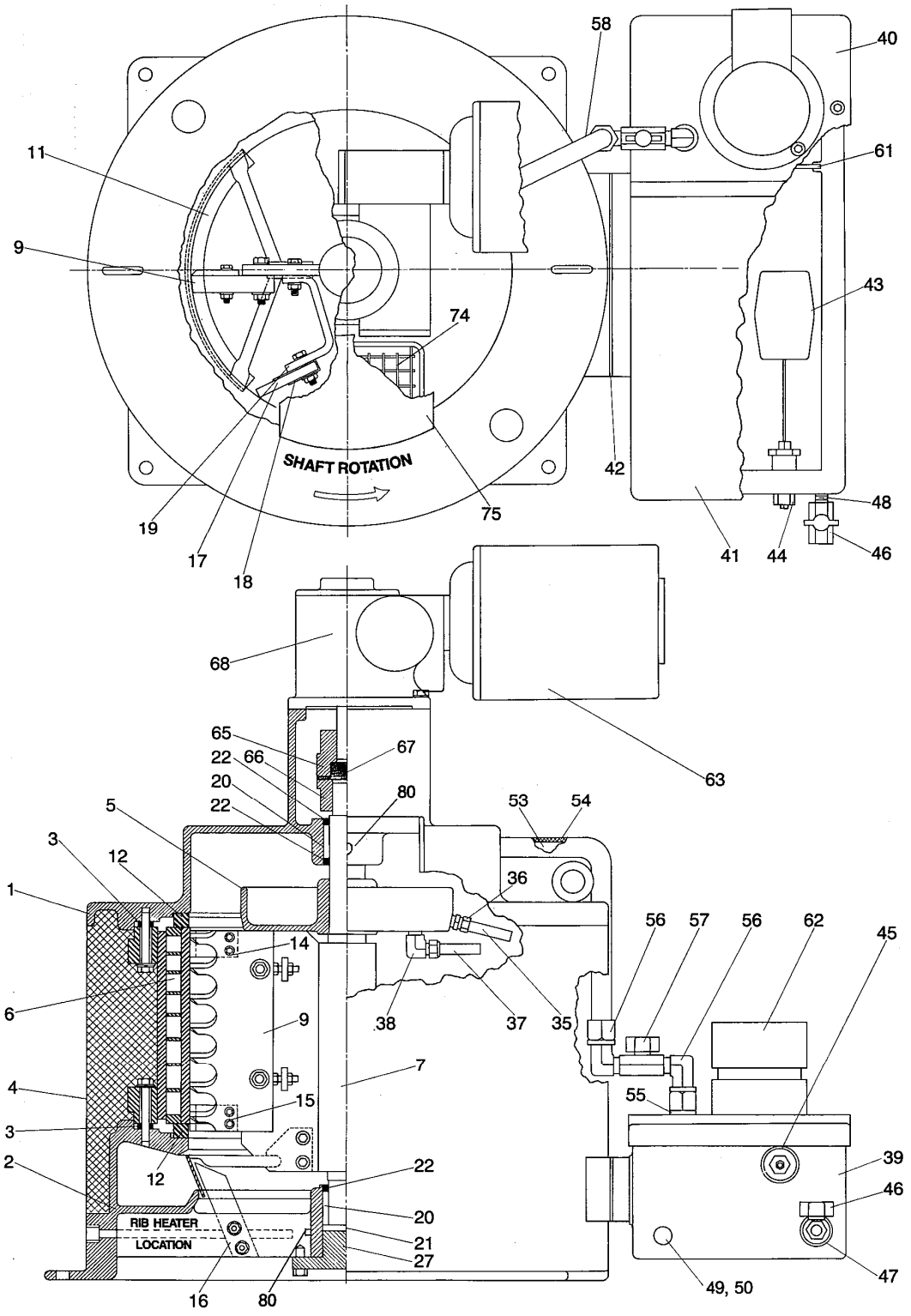
Rapid Freeze® Ice Flakers

Effective January 1, 2002

Number in parentheses indicates quantities if more than one is required.

10. Parts List

Figure 16
Ice Flaker Cross-Section
Models 4000-RL, 6000-RL



Number in parentheses indicates quantities if more than one is required.

10. Parts List

Table 2 Replacement parts for 4000-6000 pound ice flakers

		4000-RL	6000-RL
Item No.	**Part Description**	**Part Number**	
3	Insulated lug spacers (8)	E20J4	
7	Main shaft	E20D2	E30D4
9	Ice blade: 12 ½" L, 20 ½" L	E20E2	E30E3
9a	Nuts, bolts, and washers (Ice blade)	E20E6	E30E5
11	Ice deflector blade	E20G2	
11a	Nuts, bolts, and washers (ice deflector)	E20G5	
12	Insulating ring (2)	E20J1	
12a	Insulating ring adhesive - 1/2 pint	7V033	
14, 15	Auxiliary ice scraper (2)	E20E4	
15a	Nuts, bolts, and washers (auxiliary ice scraper)	E20E7	
16	Ice deflector scraper	E20G4	
17	Squeegee: 12 ½" L, 20 ½" L	E20F4	E30F3
18	Squeegee wrapper	E20F9	E30F8
18a	Nuts, bolts, and washers (squeegee wrapper)	E20F8	E30F22
19	Squeegee bracket	E20F11	E30F7
20	Main shaft bearings (2)	E20K1	
21	Bottom bearing thrust plate	E20K2	
22	Main bearing grease seal (3)	E20K3	
22a	Bearing replacement kit (includes 2 bearings, 1 bearing plate, and 3 seals)	E20K4	
22b	Bearing removal/replacement tool kit	E10T1	
27	Bottom bearing cover	E20B8	
35, 36	Water distribution side spout and fitting (6) (plastic)	E20H39-P	--
	Water distribution side spout and fitting (6) (metal)	--	E30H8
36a	Water distribution pan assembly (includes distribution tubes and fittings, plastic)	E20H40	--
	Water distribution pan assembly (includes distribution tubes and fittings, metal)	--	E30H9
37, 38	Water distribution bottom spout and fitting (for plastic pan)	E20H38-P	--
	Water distribution bottom spout and fitting (for aluminum pan)	--	E20H38
39a	Water sump assembly (includes water pump)	E10H31	E30H7
42	Water sump gasket	E20J2	
	Water sump silicone adhesive	E20J6	

Number in parentheses indicates quantities if more than one is required.

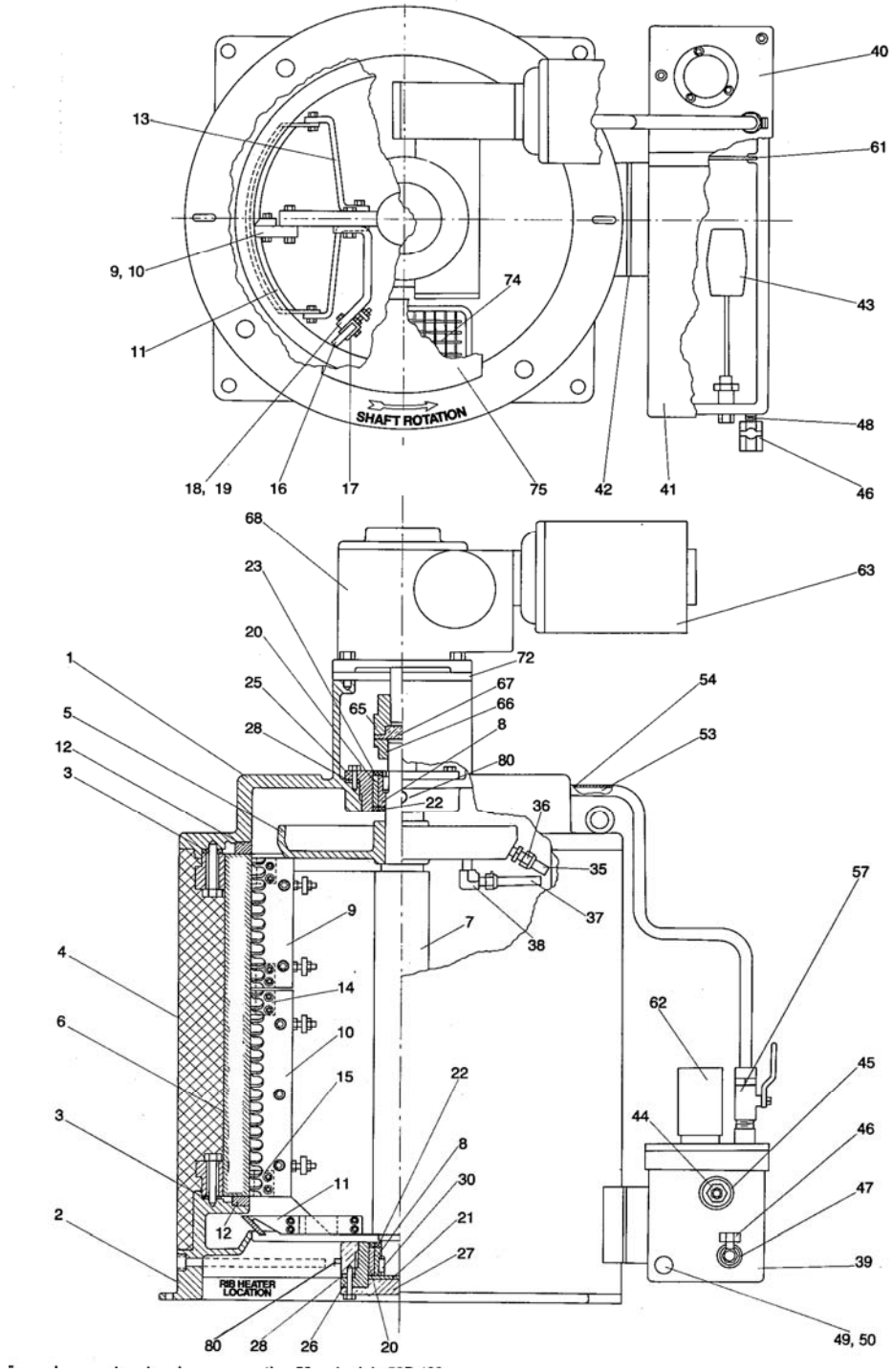
10. Parts List

		4000-RL	6000-RL
Item No.	**Part Description**	**Part Number**	
43	Water float valve	E10H29	E50H18
44	Water float valve fitting	CNB-BR02/06	CNBHF-SG-BR08
53	Water tube	E20H30	E30H3
54	Water tube insulation	E20H14	E30H4
55	Water tube grommet	E20H19	
56	Water tube fitting (2)	ELM-CT-NY10/08	
57	Water tube regulating valve	E20H24	
60	Water tube sleeve	E20H12	
61	Water sump screen	--	E20H13
62	Water pump 230/1/60	E10H32	--
	Water pump 115-230/1/60	--	E30Q1
63	Drive motor 115-230/1/60, 1/3HP, 1/2HP, ODP	E20M1	E30M1
	Drive motor 110-220/1/50, 1/2HP, ODP	E30M3	
	Drive motor 208-230-460/3/50-60, 1/2HP	E20M2	
	Drive motor 230/1/60, 1/2HP, TEFC	E30M2	
	Drive motor 380/3/50, 1/3HP, TEFC	E20M5	
63A	Drive motor key	E20M8	
65, 66, 67	Flexible coupling – complete	E20N9	
67A	Flexible coupling key for shaft	E20N10	
68	Speed reducer, 60-cycle, 926MDVD, 600:1	E20R4	
	Speed reducer, 50-cycle, 926MDVD, 450:1	E20R3	
75	Handhole cover (removable)	E10A3	
75a	Handhole cover (boltdown)	E10A5	
	Thermostatic expansion valve – R-502, R-404a	SRE-4-C	SSE-6-C
	Thermostatic expansion valve (balanced port) – R-502, R-404a	BFRE-C-Z	BSRE-7 ½
	Thermostatic expansion valve – R-22	SVE-4-C	SVE-5-C
	Thermostatic expansion valve (balanced port) – R-22	BFVE-B-Z	BFVE-C-Z
	Liquid line solenoid valve	B6S1-1/2	B14S2
	Control panel 230/1/60 (2-light)	E20T40-RL	
	Control panel 230/1/60 (6-light)	E20T40-SCA	
	Replacement rib heater element (3)	HT150/240-037/50	

Number in parentheses indicates quantities if more than one is required.

10. Parts List

Cross Section Drawing 5-10 ton flaker



Number in parentheses indicates quantities if more than one is required.

10. Parts List

TABLE 4: Replacement Parts for Models Listed to Right		50E, 51E 50EA, 50EAR	75E, 76E 75EA, 75EAR	100E, 101E 100EA, 100EAR
Item No.	PART DESCRIPTION	PART NUMBER		
3	Insulated lug spacers (8)	E50J2		
7	Main shaft	E50D1	E75D1	E100D1
8	Shaft sleeve	E50D2		
9	Top ice blade 202@ L, 122@L, 202@L	E30E3	E20E2	E30E3
9a	Nuts, Bolts & washers (top ice blade)	E30E5	E20E6	E30E5
10	Bottom ice blade	-	E30E3	
10a	Nuts, Bolts & washers (bottom ice blade)	-	E30E5	
	Ice Blade Adjustment Gauge kit. Set of five feeler gauges for ice blade adjustment.	E10T15		
11	Ice deflector blade	E50G5		
11a	Nuts, Bolts & washers (ice deflector)	E50G8		
12	Insulating ring (2)	E50J1		
12a	Insulating ring adhesive - 2 pint	7V033		
13	Ice deflector bracket (2)	E50G9		
14 or 15	Top & Bottom auxiliary ice scraper (2)	E20E4		
15a	Nuts, Bolts & washers (aux. Ice scraper)	E20E7		
16	Squeegee	E30F3	E75F3	E100F3
17	Squeegee wrapper	E30F8	E75F4	E100F4
17a	Nuts, Bolts & washers (squeegee wrapper)	E30F22	E75F8	E100F8
18	Top squeegee bracket	E50F1	E75F1	E50F1
19	Bottom squeegee bracket	-	E50F1	
20	Main shaft bearings (2)	E50K1		
21	Bottom bearing thrust plate	E50K2		
22 & 23	Main bearing grease seal (3)	E50K13		
25	Top main bearing retainer	E50K3		
25a	Top bearing replacement kit (includes bearing, 2-seals, shaft sleeve.	E50K10		
26	Bottom main bearing retainer	E50K4		
26a	Bottom bearing replacement kit (includes bearing, 1-seal, shaft sleeve.	E50K11		
27	Bottom bearing cover	E50K5		
28	Main bearing pull-out washer (2)	E50K6		
35 & 36	Water distribution side spout & fitting (11)	E50H19		

Number in parentheses indicates quantities if more than one is required.

10. Parts List

TABLE 4: Replacement Parts for Models Listed to Right		50E, 51E 50EA, 50EAR	75E, 76E 75EA, 75EAR	100E, 101E 100EA, 100EAR
Item No.	PART DESCRIPTION	PART NUMBER		
37 & 38	Water distribution bottom spout & fitting	E50H31		
40	Water sump bolt down cover	E50H11		
41	***Water sump removable cover***	E50H15		
42	Water sump gasket	E50J3		
43	Water float valve	E50H18		
44	Water float valve fitting	CNBHF-SG-BR08/08		
53	Water tube	E50H22	E75H4	E100H1
54	Water tube insulation	E50H32	E75H2	E100H2
55	Water tube valve brass nipple	NPBR-075/CL		
56	Water tube fitting	CNM-SG-BR14/12		
57	Water tube regulating valve	E50H24		
	Water pump 230-460/3/50-60	E50Q1		
	Water pump 220-230/1/50-60	E50Q2		
62	Water pump 575/3/60	E50Q9		
	Drive motor 208-230-460/3/50-60 1 HP O.D.P.	E50M1		
	Drive motor 115-230/1/50-60 ： HP, 1 HP O.D.P.	E50M2		
	Drive motor 208-230-460/3/50-60 1 HP TEFC	E50M4		
	Drive motor 220/-380/3/50 TEFC	E50M5		
	Drive Motor 208-230/1/60 1 HP, TEFC	E50M6		
	Drive Motor 110/200-220/1/50 1 HP, TEFC	E50M7		
63	Drive motor 220/-380/3/50 O.D.P.	E50M9		
63A	Drive motor key	E50M8		
65,66,67	Flexible coupling - complete	E50N1		
	Speed reducer 60 cycle	E50R1-935		
68	Speed Reducer 50 Cycle	E50R2-935		
75	Handhole cover removable	E50A2		

Number in parentheses indicates quantities if more than one is required.

10. Parts List

Table 3 Electric Panel Parts

Part Description	Part Number
Parts for E20T40 Control Panels	
Control transformer, 230VAC primary, 24VAC secondary	E20T31
Solid-state control module	E20T48
Overload reset button, normally-open	E20T23
ON/OFF rocker switch	E20T24
4-pole contactor 24VAC coil for drive motor	E20T44
230VAC single-pole, double-throw relay	E20T45
Relay base/socket for E20T45 relay	E20T46
Parts for E20T42 Control Panels (380V/3/50, CE mark)	
Disconnect switch (DSC1)	E20T53
Drive motor starter with overload (M1/M1-DSC)	E20T54
Pump motor starter with overload (M2/M2-DSC)	E20T55
10 Amp single pole circuit breaker (CB1)	E20T56
Red oil tight indicating lamp (2) (LP1, LP2)	E20T57
Green Oil tight indicating lamp (LP3)	E20T58
Oil light On/Off switch (SW1)	E20T59
Off delay timer (TMR1)	E20T61
DPDT Mini Relay (R1)	E20T62
Relay Socket Base for Timer/Relay	E20T63
Relay socket base for Mini Relay	E20T64
Parts for E20T47 Control Panels (480V/3/60)	
Drive motor starter with overload	E20T54
Water Pump Contactor	E20T72
Control Transformer 480v Pri, 240v Sec. 300VA	E20T74
Ice Flaker initiate relay	E20T62
Water pump run relay	E20T62
Mini relay base	E20T46
Off delay timer	5V012
Timer base	5V013
3 amp fuse (600V)	CCMR-3
2 amp fuse (600 V)	CCMR-2
2 Amp fuse (250V)	KLDR-2

Number in parentheses indicates quantities if more than one is required.

10. Parts List

Replacement Neon Indicating Lights	
Green, 230VAC	LGX-2
Amber, 230VAC	LAN-2
Red, 230VAC	LRN-2
Green, 24VAC	LGX-24
Amber, 24VAC	LAN-24
Parts for E20T73 Photoeye Level Controls	
Power module/relay	E20T68
Sensor, emitter (with Molex plug)	E20T69
Sensor, receiver (with Molex plug)	E20T70
Sensor, emitter (with 15’ lead, no plug)	E20T69-15NP
Sensor, receiver (with 15’ lead, no plug)	E20T70-15NP
11-pin socket base for photoeye power module	5V013
Photoeye sensor mounting brackets (pair)	E10U44

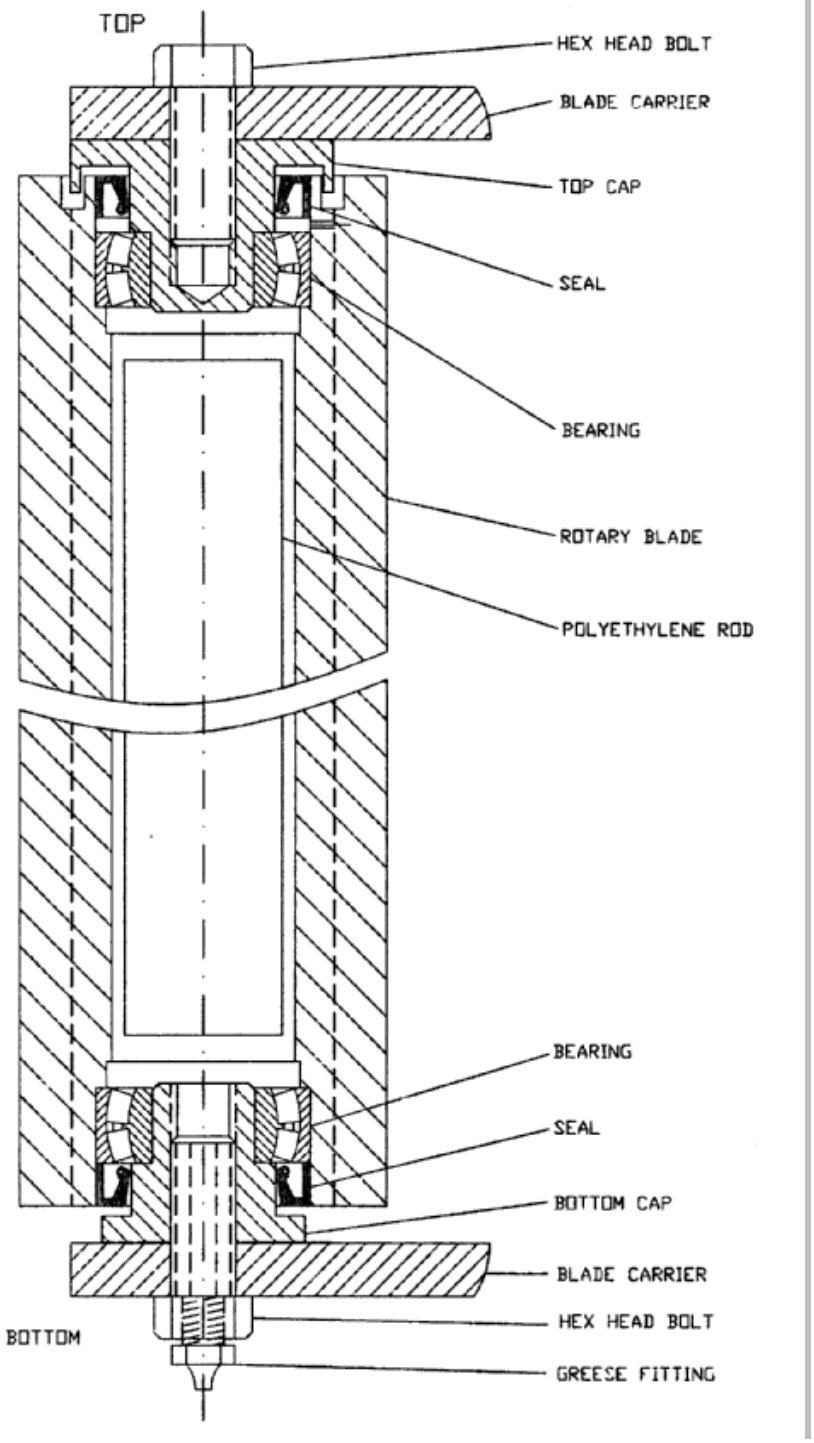
Table 4 Miscellaneous Accessories and Parts

Part Description	Part Number
USDA-approved bearing grease	E20K6
Speed reducer oil (natural)	SR-OIL
Speed reducer oil (synthetic)	SR-OIL-SYN
Replacement 20-micron water filter cartridge	E10H43
Replacement 20” water filter pre-filter core	E10H46
Replacement 20” water filter pre-filter housing cover (blue)	E10H45
Ice machine cleaner	E10V1

Number in parentheses indicates quantities if more than one is required.

10. Parts List

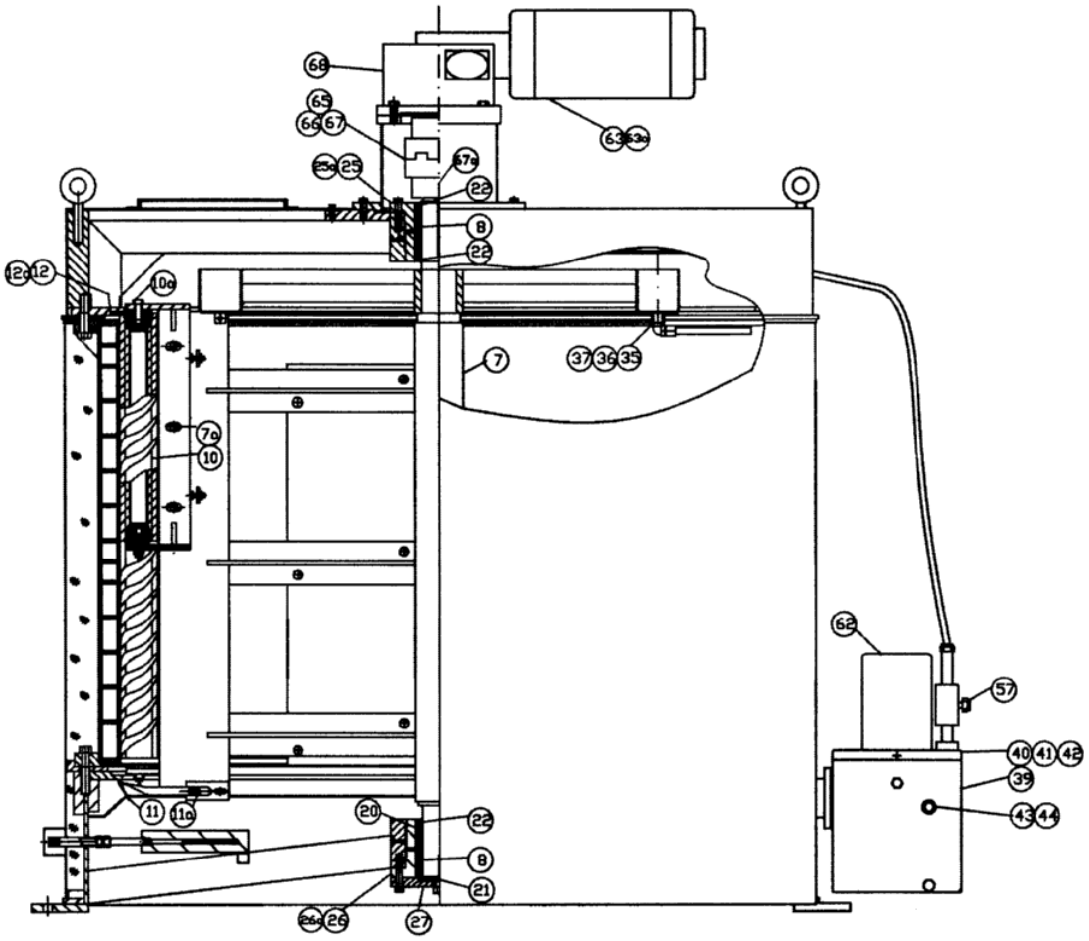
Rotary Blade Cross Section for 20 Ton Flaker



Number in parentheses indicates quantities if more than one is required.

10. Parts List

Cross Section Drawing for 20 ton ice flaker



Number in parentheses indicates quantities if more than one is required.

10. Parts List

TABLE 5: Replacement Parts for Models Listed to Right		Model 200G, 201G
Item No.	Part Description	Part No.
7	Main shaft	G200D3
7a	Nuts, bolts, & washers (shaft/blade mount)	G200D4
8	Shaft sleeve	G200D2
10	Rotary ice blade	G200E1
10a	Nuts, bolts & washers (top or bottom ice blade)	G200E
11	Ice deflector blade	G200G2
11a	Nuts, bolts & washers (ice deflector)	G200G3
12	Insulating ring (2)	G200J1
12a	Insulating ring adhesive - 4 pint	7V033
20	Main shaft bearings (2)	G200K1
21	Bottom bearing thrust plate	G200K2
22 & 23	Main bearing grease seal (3)	G200K4
25	Top main bearing retainer	G200K3
25a	Top bearing replacement kit (includes bearing, 2-seals, shaft sleeve).	G200K6
26	Bottom main bearing retainer	G200K3
26a	Bottom bearing replacement kit (includes bearing, 1-seal, shaft sleeve.	G200K7
27	Bottom bearing cover	G200K5
35 & 36	Water distribution spout & fitting	G200H5
37	Water distribution plug	G200H6
39	Water sump tank	G200H2
40	Water sump bolt down cover	G200H3
41	Water sump removable cover	G200H4
42	Water sump gasket	G200H7
43	Water float valve	G200P1
44	Water float valve fitting	G200P2
57	Water tube regulating valve (2)	G200P3
62	Water pump 230-460/3/50-60	G200Q1

Number in parentheses indicates quantities if more than one is required.

10. Parts List

TABLE 5: Replacement Parts for Models Listed to Right		Model 200G, 201G
Item No.	Part Description	Part No.
63	Drive motor 220-380/3/50 TEFC	G200M2
63a	Drive motor key	G200M3
65,66,67	Flexible coupling - complete	G200N1
67a	Flexible coupling key for shaft	G200N2
68	Speed reducer 60 cycle	G200R1

Number in parentheses indicates quantities if more than one is required.