ICE MACHINE SERVICE MANUAL

Servend®

ISO 9001:2000
Quality System Certified

Manitowoc Foodservice Group

Manitowoc Beverage Equipment
2100 Future Drive ◆ Sellersburg, IN 47172-1868
Tel: 812.246.7000, 800.367.4233 ◆ Fax: 812.246.9922
www.manitowocbeverage.com

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FOREWORD

Manitowoc Beverage Equipment (MBE) developed this manual as a reference guide for the owner/operator, service agent, and installer of this equipment. Please read this manual before installation or operation of the machine. A qualified service technician should perform installation and start-up of this equipment, consult the *Troubleshooting Guide* within this manual for service assistance.

If you cannot correct the service problem, call your MBE Service Agent or Distributor. Always have your model and serial number available when you call.

Your Service Agent _____

Service Agent Telephone Number _____

Your Local MBE Distributor _____

Distributor Telephone Number _____

Model Number _____

Serial Number _____

Installation Date _____

UNPACKING AND INSPECTION

Note: The unit was thoroughly inspected before leaving the factory. Any damage or irregularities should be noted at the time of delivery.

WARRANTY INFORMATION

Consult your local MBE Distributor for terms and conditions of your warranty. Your warranty specifically excludes all beverage valve brixing, general adjustments, cleaning, accessories and related servicing.

Your warranty card must be returned to Manitowoc Beverage Equipment to activate the warranty on this equipment. If a warranty card is not returned, the warranty period can begin when the equipment leaves the MBE factory.

No equipment may be returned to Manitowoc Beverage Equipment without a written Return Materials Authorization (RMA). Equipment returned without an RMA will be refused at MBE's dock and returned to the sender at the sender's expense.

Please contact your local MBE distributor for return procedures.

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SAFETY

IMPORTANT SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual. Learn how to operate the SV unit properly. Do not allow anyone to operate the unit without proper training and keep it in proper working condition. Unauthorized modifications to the SV may impair function and/or safety and affect the life of the unit.

CARBON DIOXIDE WARNING

DANGER: *Carbon Dioxide (CO_2) displaces oxygen. Exposure to a high concentration of CO_2 gas causes tremors, which are followed rapidly by loss of consciousness and suffocation. If a CO_2 gas leak is suspected, particularly in a small area, immediately ventilate the area before repairing the leak. CO_2 lines and pumps should not be installed in an enclosed space. An enclosed space can be a cooler or small room or closet. This may include convenience stores with glass door self serve coolers. If you suspect CO_2 may build up in an area, venting of the B-I-B pumps and / or CO_2 monitors should be utilized.*

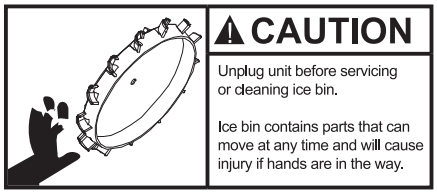
QUALIFIED SERVICE PERSONNEL

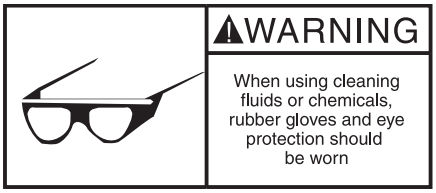
WARNING: *Only trained and certified electrical and plumbing technicians should service this unit. All wiring and plumbing must conform to national and local codes.*

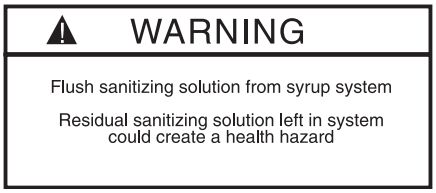
SHIPPING, STORAGE, AND RELOCATION

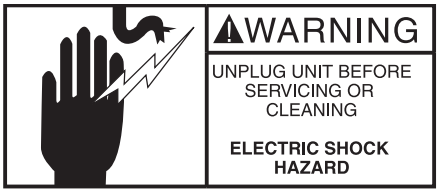
CAUTION: *Before shipping, storing, or relocating this unit, syrup systems must be sanitized. After sanitizing, all liquids (sanitizing solution and water) must be purged from the unit. A freezing environment causes residual sanitizing solution or water remaining inside the unit to freeze, resulting in damage to internal components.*

ADDITIONAL WARNINGS









Installation and start-up of this equipment should be done by a qualified service technician. Operation, maintenance, and cleaning information in this manual are provided for the user/operator of the equipment. **Save these instructions.**

SAFETY

GROUNDING INSTRUCTIONS

***WARNING*:** *Risk of electrical shock. Connect to a properly grounded outlet only.*

This appliance must be grounded. In the event of malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER – Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment grounding conductor. If repair or replacement of the cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal. Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if in doubt as to whether the appliance is properly grounded. Do not modify the plug provided with the appliance – if it will not fit the outlet, have a proper outlet installed by a qualified electrician.

WARNING – When using electric appliances, basic precautions should always be followed, including the following:

a) Read all the instructions before using the appliance.
b) To reduce he risk of injury, close supervision is necessary when an appliance is used near children.
c) Do not contact moving parts.
d) Only use attachments recommended or sold by the manufacturer.
e) Do not use outdoors.
f) For a cord-connected appliance, the following shall be included:
   - Do not unplug by pulling on cord. To unplug, grasp the plug, not the cord.
   - Unplug from outlet when not in use and before servicing or cleaning.
   - Do not operate any appliance with a damaged cord or plug, or after the appliance malfunctions or is dropped or damaged in any manner. Return appliance to the nearest authorized service facility for examination, repair, or electrical or mechanical adjustment.
g) For a permanently connected appliance – Turn the power switch to the off position when the appliance is not in use and before servicing or cleaning.
h) For an appliance with a replaceable lamp – always unplug before replacing the lamp. Replace the bulb with the same type.
i) For a grounded appliance – Connect to a properly grounded outlet only. See Grounding Instructions.

SAVE THESE INSTRUCTIONS

WARRANTY INFORMATION

SERVEND MODEL NUMBERING SYSTEM

Example:

MODEL- C	7 -	A	M	A	S -	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(1) Series of the machine

C = 30" or 48" wide cuber
S = 22" wide cuber
B = Ice Storage Bin

(2) Nominal Capacity per twenty four hours in one hundred pounds

I.E. 7 = Seven Hundred Pounds

(3) Type of Condenser

A = Air Cooled
W = Water Cooled
R = Remote Cooled

(4) Size of Cube

M = Mini Cube (3/8" x 7/8" x 7/8")
F = Full Cube (7/8" x 7/8" x 7/8")
J = Jumbo Cube (7/8" x 7/8" x 1 1/2")

(5) Electric Code

Volts	Cycle	Phase
A = 208/230; 200	60; 50	1
B = 115	60	1
C = 208/230; 200	60; 50	1
D = 220/240	50	1
F = 208/230	60	1
G = 208/230	60	3
H = 220/240	50	3

(6) **S** = Stainless Steel Panels
(Blank) = Painted Panels
P = Painted Panels

(7) Generation Code

A, B, C, etc.....

(8) Unit Configuration

A = Standard Machine
Any Other Letter = Special Machine, call factory for parts or service information.

WARRANTY INFORMATION

SERVEND INTERNATIONAL SERVICE POLICY AND PROCEDURE

DATE ISSUED: AUGUST 12, 1991

DATE EFFECTIVE: AUGUST 12, 1991

NEW SERIAL NUMBER FORMAT

DATE REVISED: MAY 1, 1993

Effective **AUGUST 12.1991** all Servend dispensers, cubers and bins manufactured by Servend International will have new serial number format.

SAMPLE:				
91	H	F	01	0001
Year	Month	Product	Major Change	Unit
Manufactured	Manufactured	Code	Code	S/N

The above serial number is defined as:
Hotel dispenser built in August, 1991 1st unit built under major code #1

Month Manufactured:		**Product Code:**
January	A	A = K Series (obsolete)
February	B	B = KD Series (obsolete)
March	C	C = M Series
April	D	D = MD Series
May	E	E = B Series
June	F	F = H Series
July	G	G = Cubers
August	H	H = Bins
September	J	J = Drop-ins
October	K	7 = Remote Condensers
November	L	
December	M	

**** Alphabet codes will not use the letter "I" to prevent confusion with the number "1".**

**** Unit serial number will roll back to 0001 at the beginning of each new year and/or with each major change code.**

MAJOR CHANGE CODE IS AN ENGINEERING TRACKING CODE FOR SERVEND USE.

INSTALLATION

ICE MACHINE INSTALLATION INSTRUCTIONS

Freight Claim Loss or Damage:

1. The delivery freight company, distributor or dealer is responsible for loss or damage to your merchandise. All claims must be filed with the party that delivers your merchandise.

2. Check the number of containers delivered against the number shown on your receipt. If the total is not correct, have the driver note the shortage on your receipt.

3. Check all cartons for visible damage, open and check the contents of any carton in question before the driver leaves. Be sure the driver notes the type and degree fo damage on your receipt. All damaged merchandise must be inspected within 15 days of delivery, notify your carrier immediately.

4. If concealed damage is found when merchandise in unpacked, place the packing material with the merchandise and request an inspection from the delivering carrier.

5. File your claims for loss or damage at once. Delays in filing will only hinder achieving a satisfactory resolution to your claim.

Installation:

We recommend that installation and start-up be performed by the Dealer Professionals where your ice maker was purchased.

Location:

For best performance, select a location away from all heat sources, such as radiators, ovens, refrigeration equipment, direct sunlight, etc.

Avoid placing air cooled models in kitchens whenever possible as grease, flour or other airborn particles will collect on the condenser and fan blade, requiring increased preventative maintenance and will reduce efficiency.

Discuss the best location with your Dealer Professional. Allow a minimum of 6" (15.24cm) clearance around the ice maker for air circulation (both sides, top, and black). Restricted air circulation will affect the maintenance-free life or your ice maker and its effeciency.

Your ice maker will perform at optimum efficiency in a approximate 70°F (21.1°C) room with 50°F (10°C) water. Increased air or water temperatures will decrease performance. Never operate your machine in rooms with temperatures below 50°F (10°C) or above 100°F (38°C).

If the ice maker is located in an unheated area, it must be protected from freezing temperatures or shut down and winterized.

Set-up of the Storage Bin and Cuber:

1. Remove the bin from the shipping carton. Using the carton for protection against scratching, place the bin on its back.

2. Screw the bin legs (enclosed inside the bin) into the bottom of the ice bin.

3. Place the bin upright in the permanent position.

4. Remove the carton from the ice maker and place the ice maker on the bin. Align the ice maker with the bin back. Install stabilizing bolts through the lower front channel of the ice maker and into the header plate of the bin. These bolts are packed in the plastic bag located in the water pan of the ice maker.

5. Remove the ice maker internal packing. Level the ice maker with a torpedo level on the face of the evaporator. The evaporator MUST be plumb vertically and level horizontally left to right. Level the machine by screwing the feet of the bin either up or down.

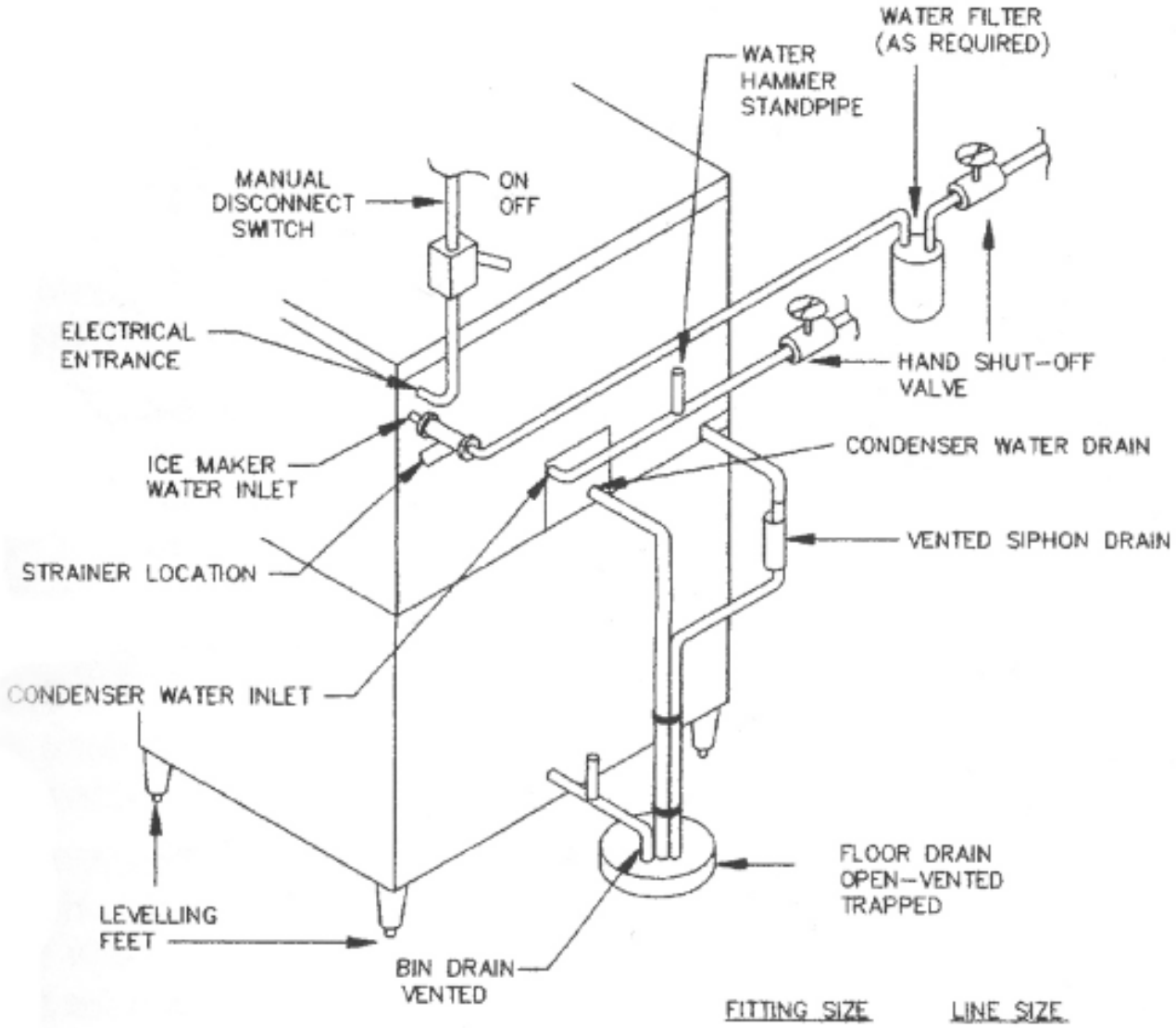
Plumbing Lines and Connections:

All plumbing (water and drain) connnections must conform to local and national codes.

To prevent condensation, insulate all water supply and drain lines. Insulating water lines will increase efficiency as well.

INSTALLATION

SIPHON VENT

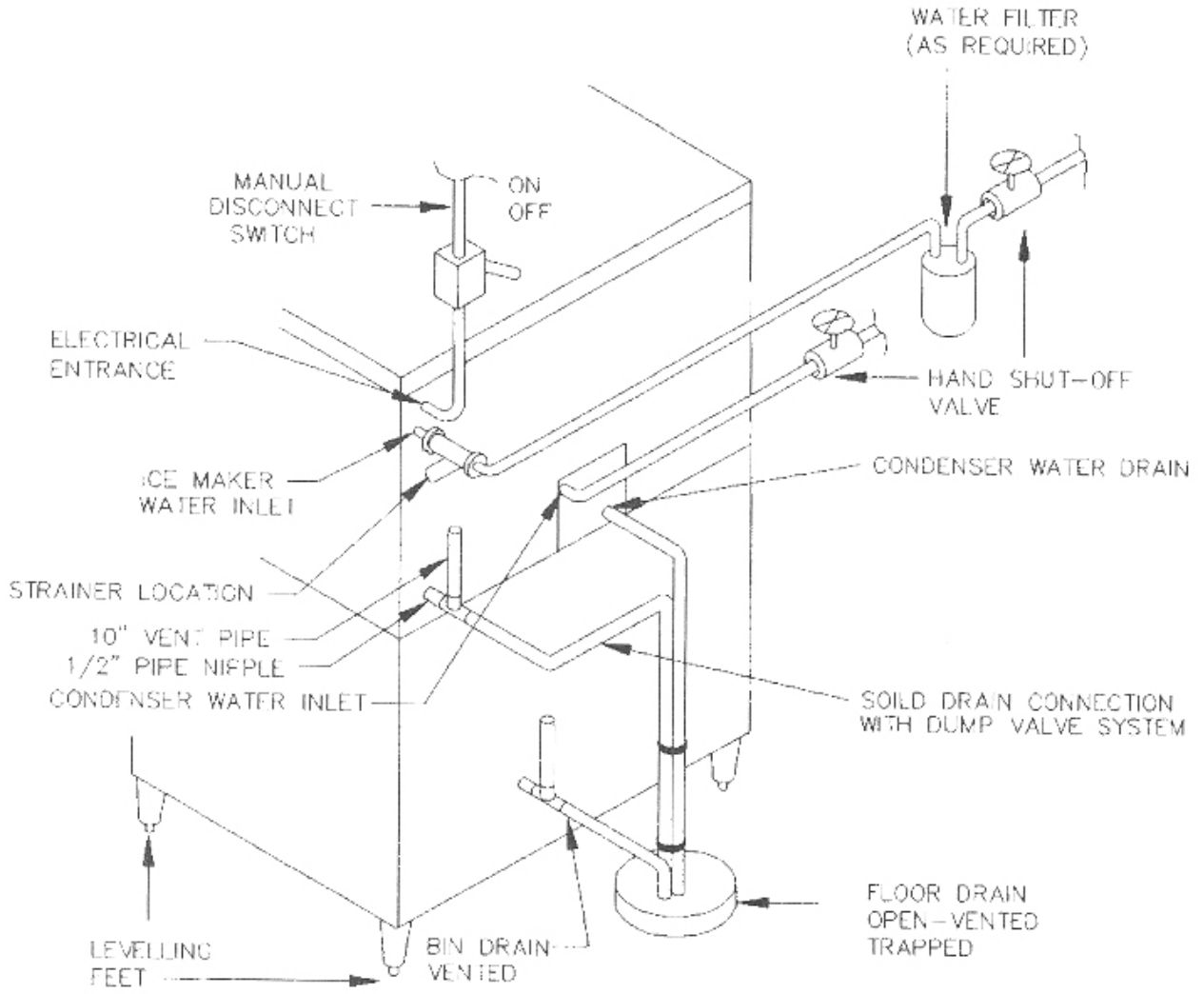


	FITTING SIZE	LINE SIZE
ICE MAKER INLET		
– BRASS	1/2"–14 N.P.T.F. –	3/8" I.D.
– PLASTIC	3/8"–18 N.P.T.F. –	3/8" I.D.
CONDENSER DRAIN	1/2"–14 N.P.T.F. –	1/2" I.D.
CONDENSER INLET	1/2"–14 N.P.T.F. –	1/2" I.D.
SIPHON DRAIN	1" TUBE –	1" I.D.
BIN DRAIN	3/4"–14 N.P.T.F. –	3/4" I.D.

DWG. # 9201128
4/27/95

INSTALLATION

DUMP VALVE



	FITTING SIZE	MINIMUM LINE SIZE
ICE MAKER INLET		
- BRASS	1/2"-14 N.P.T.F. -	3/8" I.D.
- PLASTIC	3/8"-18 N.P.T.F. -	
POTABLE WATER DRAIN	1/2"-14 N.P.T.F. -	3/4" I.D.
CONDENSER DRAIN	1/2"-14 N.P.T.F. -	1/2" I.D.
CONDENSER INLET	1/2"-14 N.P.T.F. -	1/2" I.D.
BIN DRAIN	3/4"-14 N.P.T.F. -	1" I.D.

DWG. # 5002315
9/27/94 SUPERSEDES
2/3/93

INSTALLATION

Shut off valves should be loacted in the water supply lines for ice maker and condenser (water cooled units). The water inlet strainer must be installed in the ice maker water supply (see diagram on water curtain and/or rear of machine). Water supply to water cooled condensers should include a standpipe for the prevention of "water hammer".

It may be necessary to connect water supply to a water treatment system. Consult your local Servend Dealer or Distributor for proper size required. Water treatment may pay for itself through reduced maintenance, higher efficiency, quality of ice, and longer equipment life.

NOTE: Water cooled units connected to recirculation systems or cooling towers etc., must maintain a minimum of 10 psi pressure drop across the condenser when operational.

Drains:

To ensure trouble-free drainage, vent cuber and bin drains to the atmosphere at the cabinet (see sketch).

Drain lines from the cabinet require 1/4" (6mm) drop per foot (30cm) fo run. Lines should terminate over an open trapped and vented floor drain.

Electrical:

All supply wiring and connections must conform to the national and local engineering codes. Size wiring and fuse per nameplate specification. Connect the cuber to a seperately fused circuit. Conduit must be connected to the electrical control box inside the cuber, not the rear panel on a "C" Series machine. Place a manual disconnect in a convenient location between the cuber and fuse box. The cuber must be grounded by the control box ground screw or conduit connection.

Installation Check List:

1. Has cuber evaporator been leveled?

2. Are electrical connections complete per nameplate specifications? Is manual disconnect "ON"?

3. Check water and drain connections:

   A) Has water inlet pressure been checked?

   B) Are water shut-off valves open?

   C) Is water strainer installed?

   D) Is bin drain tube assembled to bin?

   E) When used, is the water cooled condenser drained seperately?

   F) Are drain lines vented?

   G) Are drain lines insulated and sloped to floor drain?

4. Is there 6" (15.24cm) clearance at cuber sides, back, top for air circulation?

5. Is the cuber installed where ambient temperatures will not be bleow 50°F (10°C) or above 100°F (38°C)? Will incoming water temperature be maintained between 45°F (7°C) and 90°F (32°C)? If air temerature drops below 50°F (10°C) shut unit down! Disconnect all water lines to prevent freeze up of unit.

6. Does water curtain move freely?

7. Check float valve and adjust water level as required. Be certain water pan is seated on its support block.

8. Has storage bin and cuber been sanitized?

Air deflection baffles are available for all air cooled equipment. The baffles attach to the side and rear to prevent air from recirculating through the condenser.

Sart-Up Procedure Siphon System:

INSTALLATION

Sart-Up Procedure Siphon System:

1. Place the ON/OFF switch in the water pump position. Only the water pump will start. Permit the sump to fill and the float to shut off. Check for continuous and even water flow over top plastic extrusion and evaporator. Is water flowing from all water distribution tube holes? Check water level in siphon tube.

2. Place switch in "off" position. Water should fill the sump and pan tube starting a siphoning action. The siphon should drain the sump then stop flowing. In not, lower the water level to approximately 3/8" (.95cm) below the siphon clip.

3. Place switch in the ice position, the compressor, condenser fan motor (if air cooled) and water pump and fan motor will stop and the harvest solenoid will open. Swing the water curtain open and hold for a maximum of 15 seconds, the compressor will stop. Release the water curtain and the compressor, fan motor and water pump will start, initiating a new ice making cycle.

4. For optimum life performance of the ice maker, the bridge should be a minimum of 1/8" (.32cm) to a maximum of 3/16" (.475cm) in the center of the ice sheet. Permit the ice maker to drop two (2) complete sheets of ice before making any bridge adjustment.

5. Ice bridge adjustment:

A.If ice size requires adjustment, use fine adjustment only.

Purge Valve System:

1. Open water valve to machine and allow the water pan to fill with water through the float valve. Check the water level in the water pan - adjust if required to have water level equal to the crease in the side of the pan.

2. Engage electric to the machine. Turn the water pump to the "on" position. Check for continuous and even water flow over the top plastic extrusion and evaporator. Is the water flowing from all holes in the distribution tube? If the water seems to "creek" at the top extrusion without having a slow sheet fo water cascading over the top extrusion, clean the top extrusion with Scotch Brite pad or terry cloth.

3. With the toggle switch in the pump postion, check the dump valve. Depress the manual dump switch and hold. This should clean out most of the water in the water pan while allowing the float to refill the pan.

4. Place the switch in the ice position. The compressor, condenser fan (if air cooled), and water pump will operate. Depress the manual harvest switch, the water pump and fan motor will stop and the harvest solenoid will open. Swing the water curtain open and hold for a maximum of thirty (30) seconds. The compressor will then stop. Release the water curtain. The water pump and compressor fan (if air cooled) will start in the ice making cycle.

5. For optimum life and performance fo the ice maker, the bridge should be minimum of 1/8" (.32cm) to a maximum of 3/16" (.475cm) in the center of the ice sheet. Permit the ice maker to drop two (2) complet sheets of ice before making any bridge adjustment.

6. To adjust the bridge thickness of the ice sheet, go to the bottom of the circuit board. There is a bank of eight (8) DIP switches. To make the bridge thicker, turn the next switch to the "on" position. To make the bridge thinner, turn the next switch to the "off" position.

7. If you have any difficulty in the operation of this machine, please call your local Servend service company or dirstributor.

Owner/Operator:

Before leaving, be sure the owner/operator understands the ice maker operation and the value of preventative maintenance.

Does the owner know:

1. Location of the electrical disconnect switch and water shut-off valves?

2. How to start, shut down, clean and sanitize?

3. Bin full operation?

4. Proper method of cleaning condenser and fan blade?

5. To inspect distribution tubes and evaporator for mineral deposits.

6. How to identify when water filter needs replacing?

7. Who to contact for product information or service? We suggest placing the organization's name and phone number on the front panel.

8. Use and location of high pressure reset on water cooled equipment?

INSTALLATION

ADJUSTING PROPER WATER LEVEL

Siphon System:

A) Be sure water pan is properly seated on its support blocks.

B) Adjust float by releasing the bracket screws to raise, or lower, float assembly.

C) Water level should be set 3/8" (.95cm) below the bottom of siphon hose clip.

D) With water level set, turn pump on to circulate the water. Be sure the float will return water level to original setting and stops inlet water.

E) Turn water pump off. The machine should now siphon, the siphon action stops and the float returns the water level to original settings.

F) The flow washer in the float assembly (detail A) will control water pressure from 55/120 PSI (3.79/8.27 Bars) to eliminate float chatter. In low water areas 20 PSI (1.37 Bars) and less, remove the flow washer.

Dump System:

A) Adjust float by disengaging the bracket screws to raise, or lower, float assembly.

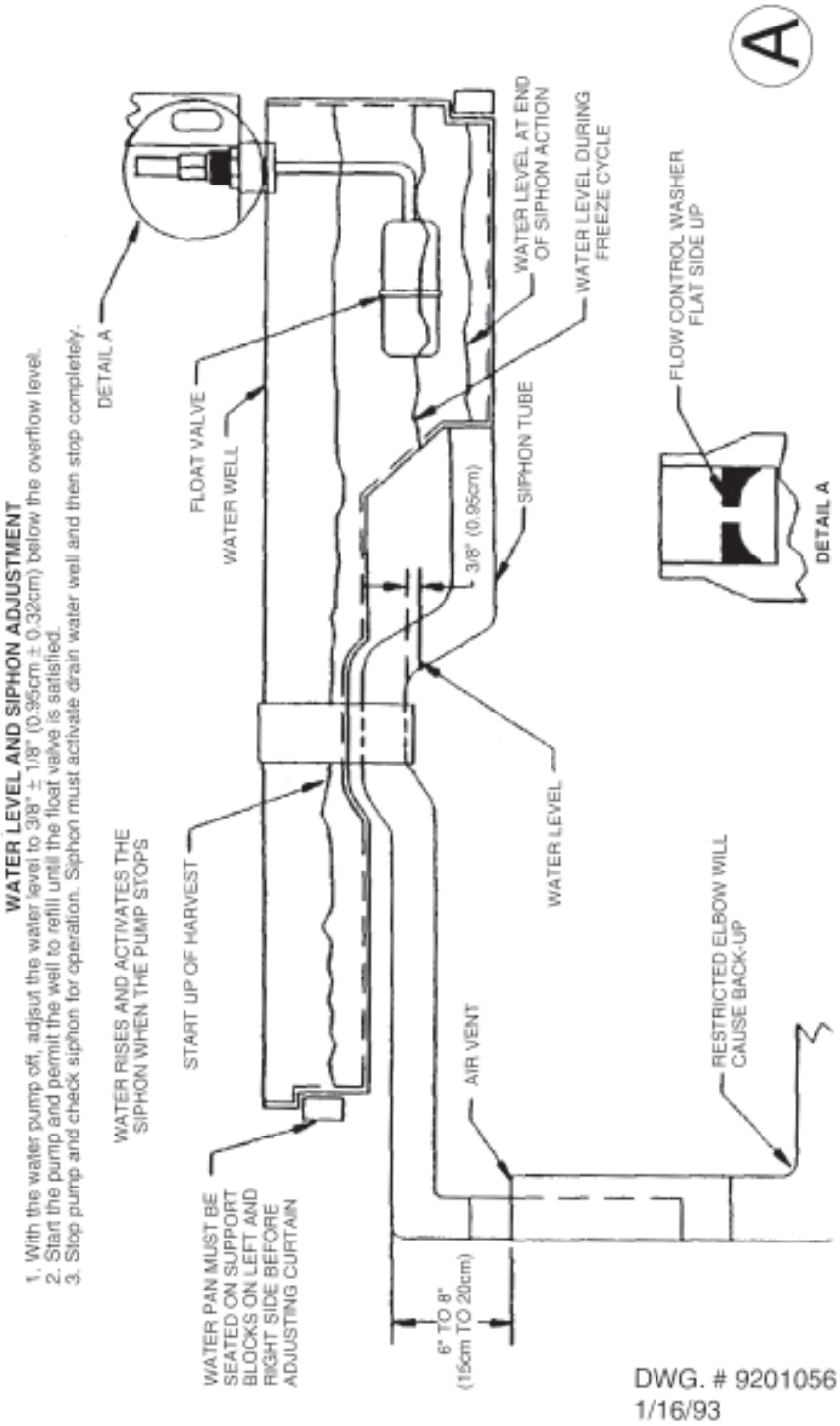
B) Water level to be set at water level mark on water pan (see diagram).

C) With water level set, turn water pump ON to circulate the water. Examine to be sure the float will return water level to original setting and stops inlet water.

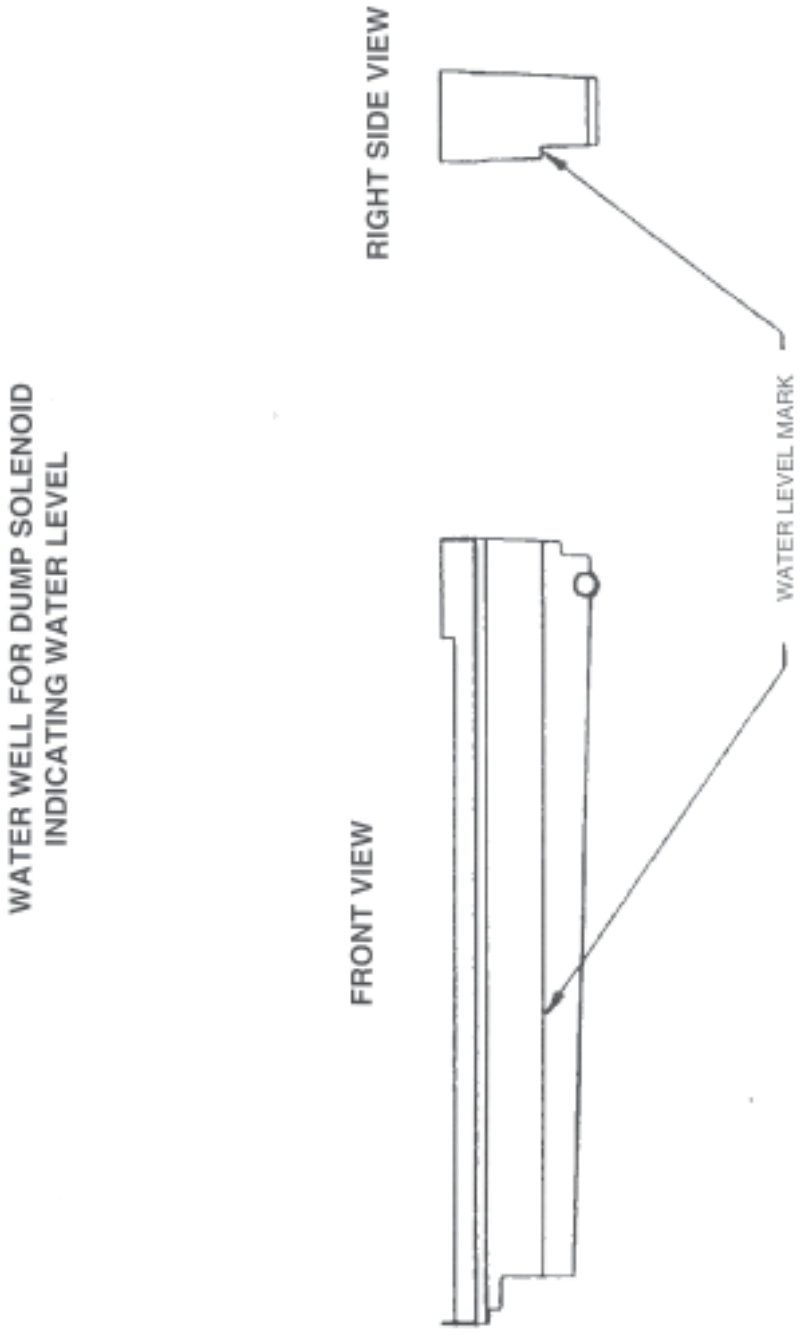
D) Depress and hold the manual dump switch (white button by toggle switch) - allow dump action to empty water pan. This is a momentary switch - you must hold it depressed to complete manual dump cycle.

E) Release the manual dump switch - float should return water to original level.

INSTALLATION



INSTALLATION



INSTALLATION

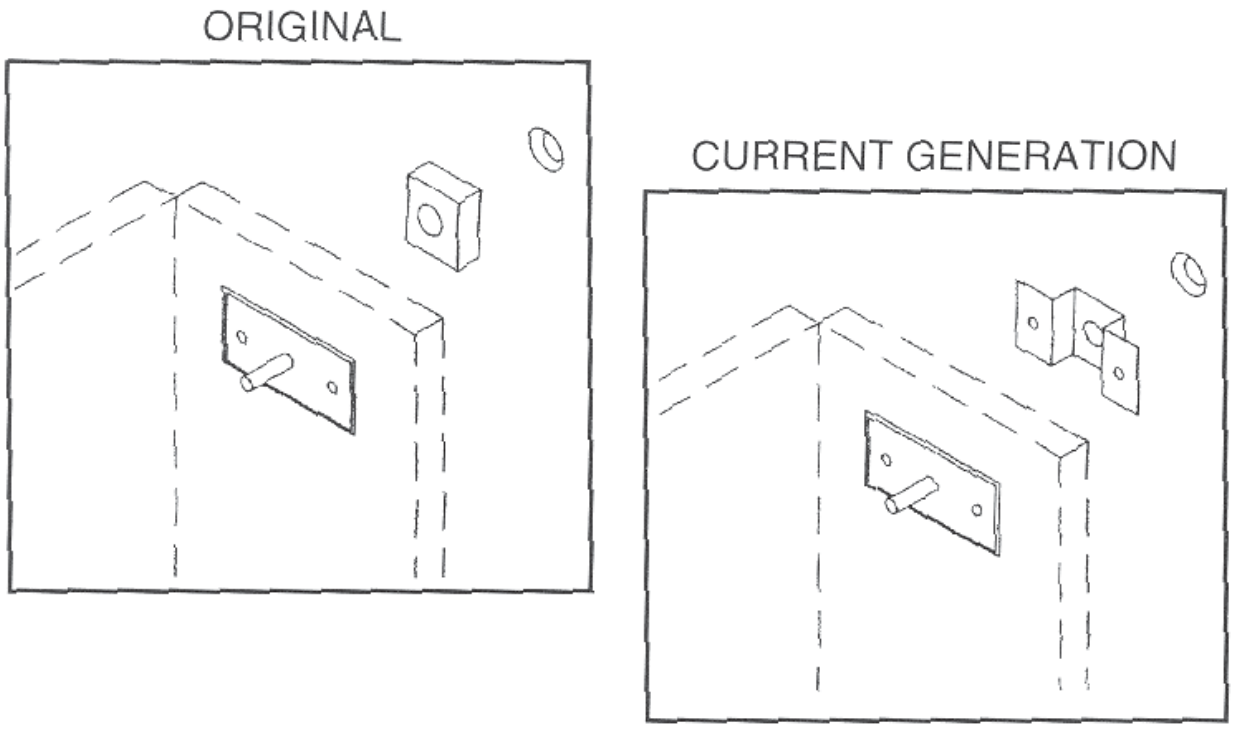
WATER CURTAIN ADJUSTMENT

The water curtain acts as a shield to prevent the water circulated across the evaporator from teh splashing into the bin, resulting in additional make up water being required.

To adjust, the screws holding the curtain bracket and pin assembly must be loosened, left and right side. The bracket assembly will allow the curtain to be adjusted 5/16" (8mm) up or down and front to rear. the bottom edge of the curtain should be set to clear the water pan by a maximum of 1/8" (.32cm). Normal adjustment, front to rear, would be to adjust the curtain in as far as possible.

Adjustment must also observe side to side travel of curtain. Any side to side movement of 1/16" (.16cm) or greater must be shimmed out as this would create erratic operation of proximity and/or Hall switch.

NOTE: Be certain water pan is properly seated on it's support blocks before adjusting water curtain.



INSTALLATION

STACKING KITS

The Servend "C" series ice machines are stackable to double their capacity. When ordering stacking kits, the bottom unit determines the kit required. Any Servend ice machines of the same width. Dual evaporator ice machines will only stack with dual evaporator ice machines.

EXAMPLE: You have a C-7 installed and wish to add a C-9 for additional ice capacity. You would order the K4SK (for the C-7)

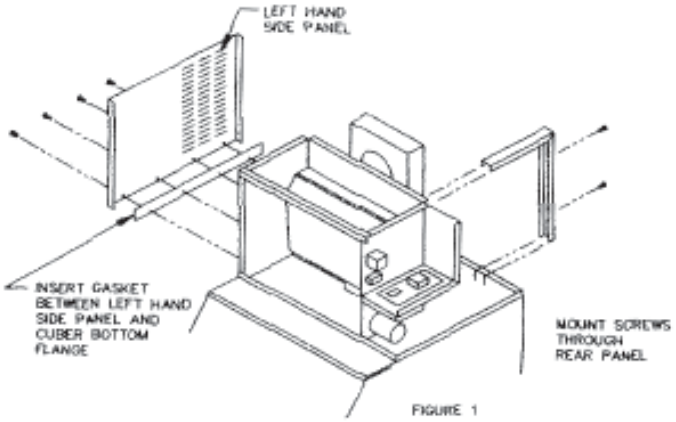


FIGURE 1

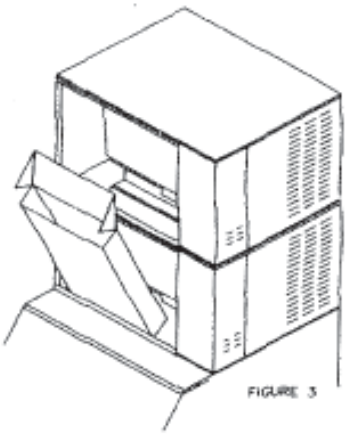


FIGURE 3

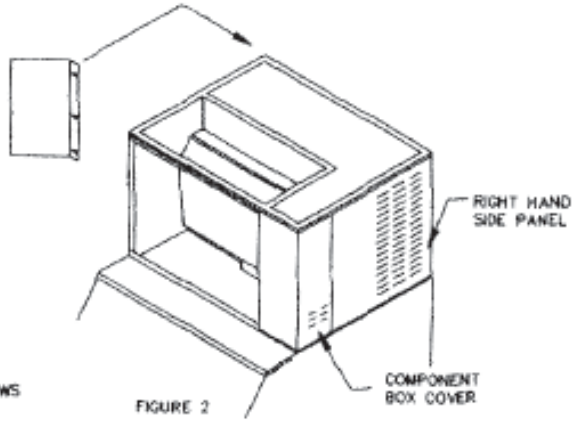


FIGURE 2

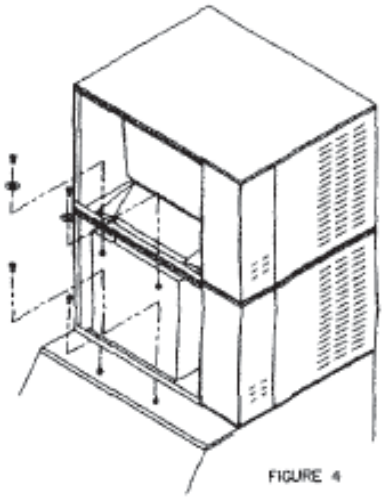


FIGURE 4

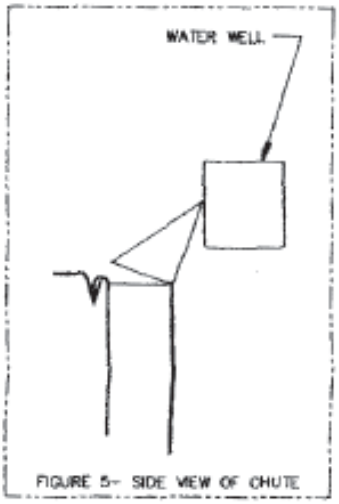


FIGURE 5- SIDE VIEW OF CHUTE

INSTALLATION

ICE MAKER CLEANING PROCEDURE

WARNING: When using cleaing fluids or any chemicals, rubber gloves and eye protection should be worn.

Approved Ice Machine Cleaners:

Lime-A-Way or Calgon Nickel Safe (green color only)

Caution: Before attempting any cleaning of the ice machine, the ice in the bin or dispenser must be removed.

Prep-Clean:

Using full strength ice machine cleaner on a section of coarse surface material (terry cloth) wipe down the inside walls of the food zone, wipe out the water pan, wipe off the water curtain and evaporator plastic extrusions. Should the water distribution tube be heavily scaled, remove and soak in full strength ice machine cleaner while prep-cleaning.

Clean the water system and evaporator:

1. Place toggle switch to pump position to circulate cleaner through water system and across evaporator.

2). Pour 4 ounces of approved cleaner into water pan. (4 ounces (113.39g) is proper amount for all Servend ice machines).

3). Float will bring in additional water during circulation to produce proper cleaning ratio of 4 ounce cleaner to 1/2 gallon (1.89Liters) of water.

4. Place toggle switch in pump position. Allow cleaning solution to circulate for 10 to 15 minutes maximum.

5. Turn toggle switch to OFF position - this will allow cleaning solution to siphon out of machine. On later production models (with manual dump switch), do not turn toggle switch off.

Depress the manual dump switch and hold until cleaner is dumped from system.

6. Fresh water will refill water pan - allow this fresh water to recirculate for approximately 5 minutes to rinse water system. Repeat step #5 twice (2 times).

7. After second rinse cycle, place toggle switch in ice position. Allow product to produce one (1) slab of ice - discard ice.

8. Cleaning cycle is now complete - return ice machine to normal operation.

NOTE: A) Ice machine should only be cleaned when required. Do not clean by a timed schedule of every 60 days, or etc.

B) Required cleaning of more than twice (2) per year may require water treatment. Contact your local Servend distributor.

Sanitize Cycle:

1. Check water level to be at mark on water pan - if required, adjust float to maintain proper level.

2. Add 1/4 ounce (7.08g) unscented laundry bleach (5.25% CI NaO concentration) to water contained in the water pan in order to yield 200 PPM available chlorine. Allow the pump to circulate this solution for 5 minutes (or use a commercial ice machine sanitizer following the directions on the container).

3. Depress the manual dump switch to drain the water pan.

4. To sanitize the bin surface and other contact areas - use 1 ounce of liquid bleach per gallon of water and wipe all surface areas with the solution.

5. Place toggle switch in ice position. Discard the first batch of ice produced.

6. Should you ever have any questions on teh proper procedure, please call you local distributor.

REMOTE CONDENSER INSTALLATION GUIDELINES

REMOTE CONDENSER INSTALLATION INSTRUCTIONS

1. Follow the standard installation supplied with cuber. Do not connect cuber into power source until the remote condenser and line set installation is complete.

2. Assembly of remote condensers:

A) Assemble four (4) legs to base panel. Place leg gussets on legs. Attach support bracket from base panel to legs.

B) Locate the remote condenser in a well ventilated area on the roof away from other condenser discharge air flow.

C) Using the four (4) mounting holes provided to secure the remote to the roof. Seal over heads of bolt or fasteners with tar or pitch to prevent entrance of moisture.

NOTE: Consult your local distributor for other applications.

Installing a Servend remote cuber with other than Servend condenser will void cuber warranty.

3. Each condenser and cuber is connected with two (2) *pre-charged lines.

A) The pre-charged lines are ordered separately from the condenser to suit each individual application.

B) The pre-charged line lengths are 20 feet (6.096 meters), 35 feet (10.66 meters), and 50 feet (15.24 meters).

***(Pre-Charged is defined as a vapor holding charge - not a portion of the system charge).**

4. Installation of line kits

A) Remove the tubing from the carton. Carefully uncoil the lines so the tubing doesn't become kindled.

NOTE: Excess tubing should be cut from the tube sets <u>before</u> connections are made at condenser and ice maker.

B) The refrigerant o-ring fittings on the cuber and remote condenser are to be lubricated with REFRIGERANT OIL BEFORE CONNECTING.

C) Charge ports are provided on each end of line sets. Line sets are non-directional and fittings match either cuber or condenser.

D) Carefully thread (by hand) the female line fittings to the male fittings on the cuber and remote condenser then using the proper sized wrench, tighten unitl fittings bottom out, then turn an additional 1/8" but **DO NOT TURN MORE THAN 1/4.**

NOTE: Once the refrigerant lines are connected, the seal is broken in the fittings. If the lines are removed or loosened from the cuber or remote condenser, the refrigerant charge will be discharged to the atmosphere. DISCHARGING OF <u>ANY</u> REFRIGERANT TO THE ATMOSPHERE IS IN VIOLATION OF THE CLEAN AIR ACT OF JULY 1992.

5. Remote condenser electrical hook-up:

A) Connect remote condenser to power source (208/230 VAC, 60HZ). A disconnect switch must be used.

B) Make sure the electrical connection follows all local and national codes.

NOTE: A) Never wire condenser into cuber section. The condenser is an independent electrical connection.

B) Fan motor will not start until pressure rises to 250 PSIG (16.55 Bars) closing fan cycling switch.

6) Finishing cuber section:

A) Remove left hand side panel of cuber.

B) Turn service valves on receiver tank to open position (fully extended) releasing refrigerant to the balance of the system.

C) Leak check line connections at cuber and condenser.

D) Replace side panel of cuber.

E) Connect cuber to power source.

F) Make sure electrical connections follow all local and national codes.

7) Start Up:

A) Use standard procedures from cuber installation instruction.

B) After the cuber is running, check the remote condenser and verify that condenser fan is running.

NOTE: Fan may cycle off during harvest cycle, this would be normal

REMOTE CONDENSER INSTALLATION GUIDELINES

REMOTE CONDENSERS MAXIMUM LOCATION DISTANCE

(REFRENCES DRAWING C)

Remote condenser installations consist of vertical and horizontal distances to the condenser that, when combined, must fit within approved guidelines.

TOTAL MAXIMUM LINE LENGTH:

This should never exceed 50 feet (15.24 meters) total. The pressure drop, due to the refrigerant flowing through the lines and condenser, will exceed the design limits of the head pressure control.

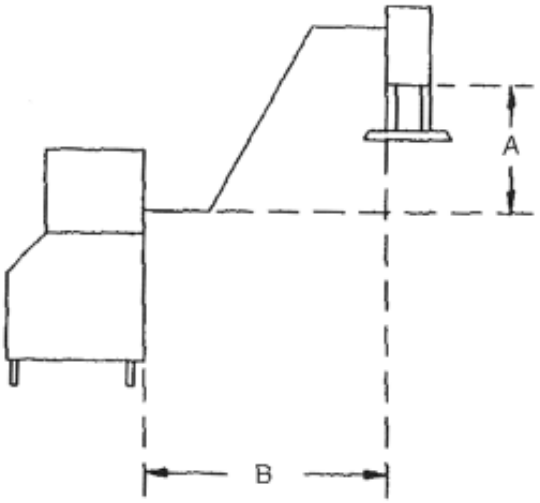
CONDENSER MAXIMUM HEIGHT:

This should never exceed 35 feet (10.66 meters).

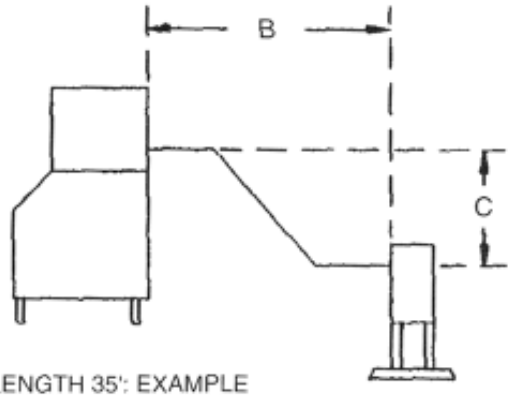
CONDENSER MAXIMUM DROP:

The condenser should never be positioned more than 15 feet (4.57 meters) below the ice machine. the liquid refrigerant pushed from the condenser up to the ice machine will contribute to an overall pressure drop.

DRAWING C



A = (RISE) CONDENSER HIGHER THAN EVAP. MAX 35'
B = LINE LENGTH 15': EXAMPLE



B - LINE LENGTH 35': EXAMPLE
C = (DROP) CONDENSER LOWER THAN EVAP. 15': MAX

NOTE:
HEIGHTH + LENGTH SHOULD NOT EXCEED 50 FEET

COMPONENT DIAGNOSTICS

ICE MACHINE CHECKLIST

PROBLEM	CORRECTIVE ACTION
1. ERRATIC SIPHON ACTION:	
O Water level not correct	Adjust.
O Water pan not seated on blocks	Reseat water pan.
O Float leaking through	A) If float is not round bulb style, replace with #9200377. B) If float is round bulb style, clean.
O Algae build-up in siphon	Pour 1/4 cup household bleach through siphon.
O Siphon tube to copper vent tube too short or kinked at rear of cabinet. Siphon not installed on vertical.	Plastic siphon tube must be 6" (15cm) to 8" (20cm) out rear of cabinet, if not, replace tube - if tube is kinked, reform or replace.
O Too small or restricted drain line for copper vent tube.	Increase drain size and/or remove any restrictions.
O High water pressure.	Is flow washer installed correctly? If yes, install water pressure regulator.

PROBLEM	CORRECTIVE ACTION
2. PUMP CAVITATING (PULLING AIR), or pump air locked:	
O Low water pressure	20 PSI (1.37 Bars) or lower remove flow washer
O Water supply line too small	3/8" (.32cm) minimum water supply
O Water discharge from float directed at pump pick-up tube	Raise shelf area of float bracket 2o
O Pump to distributor tube has air lock	Tube too long and has raise at distribution tube. Shorten tube - be certain tube does not prevent water curtain operation
O Water level set too low	Adjust
O High water pressure agitating water	Is flow washer installed correctly?

COMPONENT DIAGNOSTICS

ICE MACHINE CHECKLIST (CONTINUED)

PROBLEM	CORRECTIVE ACTION
3. POOR ICE FILL ON EVAPORATOR:	
O Float or dump valve leaking through	Replace, or clean, as required.
O Water pan not seated or out of level	Reseat pan on blocks. Level ice machine.
O Water curtain out of adjustment allowing water to splash into bin and/or curtain freezing to evaporator changing flow and freeze pattern over thermistor	Adjust curtain brackets for proper alignment. Curtain brackets are adjustable 3/8" (9.5mm) up down/ front to back. Curtain should be set to just clear top edge of water pan.
O Water flow too fast over evaporator	Check position of water distribution tube. The tube should be spraying toward lower back of extrusion. Be certain required sealing of evaporator upper extrusion area is done.
O Water distributor tube not centered	Water Distribution tube must be centered over top extrusion of evaporator.
O No control of water flow over evaporator (too fast)	Check inner tube of water distribution to be 180o from outer tube. Check restriction plug in water system.

PROBLEM	CORRECTIVE ACTION
4. ICE BRIDGE NOT CORRECT:	
O Slow harvest	
A) Excessive meltage of bridge and cubes	Mineral contamination - clean evaporator
B) Machine not level	Re-Level ice machine.
O Control board out of adjustment	See adjusting bridge thickness for your style of circuit board.
O Thermistor incorrectly mounted	Follow procedure to remount thermistor
O Thermistor sealant defective	Follow procedure to remount thermistor
O Defective thermistor	Replace thermistor

COMPONENT DIAGNOSTICS

DECISION TREE BEFORE REPLACING A THERMISTOR

SERVICE SYMPTOM	COMMON MISDIAGNOSIS	ACTUAL DIAGNOSIS
1.Eratic bridge thickness	Replace thermistor	**Dirty evaporator** **Dirty water system** **Exposed TXV bulb** **Flooding TXV**
2.Freezes for 2-3 minutes then goes into harvest	Replace thermistor	**Slushing** **Ice bridge too thin**
3. Ice frozen to the curtain	Replace thermistor	**Hall switch lost target area and made a second batch of ice** **Flooding TXV**
4. Ice not filling completely before going into harvest	Replace thermistor	**Poor water flow**
5. No ice	Replace thermistor	**Water cavitation** **Premature harvest** **Ice freezing to evaporator**
6. Premature harvest with no water flow or harvest	Replace thermistor	**Pump cavitation**
7. Thick ice at the bottom with thin ice at the top of the slab	Replace thermistor	**Conintuous syphoning of water from machine**
8. Thick ice on bottom of evaporator with no ice on the top	Replace thermistor	**Starving expansion valve** **Flooding expansion valve**
9. Very thick ice bridge	Replace thermistor	**Dirty condenser** **Low refrigerant charge**
10. Will not harvest ice	Replace thermistor	**Dirty condenser**
11.Will not go into harvest	Replace thermistor	**Hall/proximity switch out of alignment**
12. Will not go into harvest	Replace thermistor	**Water dripping into bin** **Ambient air entering into bin**

COMPONENT DIAGNOSTICS

DIAGNOSIS OF SERVEND CUBER THERMISTOR

Erratic Operation (Bridge Thickness Erratic):

1. Check thermistor mounting:

   A) Are the wire leads to the circuit board secure?

   B) Is the tip of the control flush or protrude 1/64" (.4mm) beyond the lower evaporator extrusion? If correctly mounted, you may feel a slight bump.

   C) Is there a heavy film of sealant over the tip of the control? A very slight film is OK. If the tip of the control looks a milky color, the silicone is too thick.

   D) After the machine sets for 24 hours is the first sheet of ice OK? Does each succeeding sheet of ice get thinner? This could be a sealing problem with water in the sensor well.

2. Bridge thickness gets progressively thinner each cycle:

   A) Thermistor not properly sealed in lower evaporator molding or thermistor set too far back into molding.

   B) To Reseal:

      1. Remove water pan

      2. Reach up in back of evaporator and grasp thermistor leads and remove thermistor. Use a 1/16" punch to push thermistor out.

      3. Remove dried silicone adhesive from thermistor and clean out opening in evaporator molding.

      4. If replacing a plastic sleeve thermistor with a metal jacket thermistor hole will have to be reamed to 11/64" (.43cm). Do not use a power drill.

      5. Force G.E. RTV-108* silicone adhesive into front opening of evaporator molding filling the hole until silicone come out the back. Place thumb or finger over opening and reinsert thermistor from rear of opening pushing toward the front of the evaporator modling (this will force silicone around the thermistor as you push thermistor forward giving a positive seal). Allow thermistor to be flush or protrude approximately 1/64" (.4mm) beyond face of evaporator molding with ample amount of silicone ahesive. (1/64" equals a very slight bump).

      6. The G. E. RTV-108 silicone will set, tack-free, in aproximately 15 minutes. **Do not allow water to contact silicone until it is tack free.**

***This is the only silicone recommended for proper sealing of thermistor by Servend International (part #5000881, or purchase locally.**

Check Procedure:

1. Clear the evaporator of any ice. This can be done with the use of the manual harvest switch on the circuit board.

2. Place the machine in the ice mode. Allow the unit to make one sheet of ice.

3. At the end of a regular freeze time, manually harvest the ice.

4. Observe the sheet of ice. Is the bridge thickness even from the top to bottom? Is the bridge thinner at the top than at the bottom?

5. If your sheet of ice is thinner at the top than at the bottom, your machine is suffering from a water loss or refrigeration problem.

6. If you ice has an even bridge from top to bottom, proceed with the OHM meter check.

7. Remove the control wires from the EV terminals on the circuit board. In a dual evaporator machine, only the left control (connected to the EV terminals) determines the thickness of the ice.

8. Attach you OHM meter to the ends of the wires. Do not remove the control from the evaporator extrusion. Your meter should be capable of reading 5,000 to 40,000 OHMs accurately.

9. At room temerature, your control should read **ABOUT** 10,000 to 15,000 OHM resistance.

10. Place an ice cube on the tip of the control. You should obtain a reading in the range of 25,000 to 36,000 OHMs.

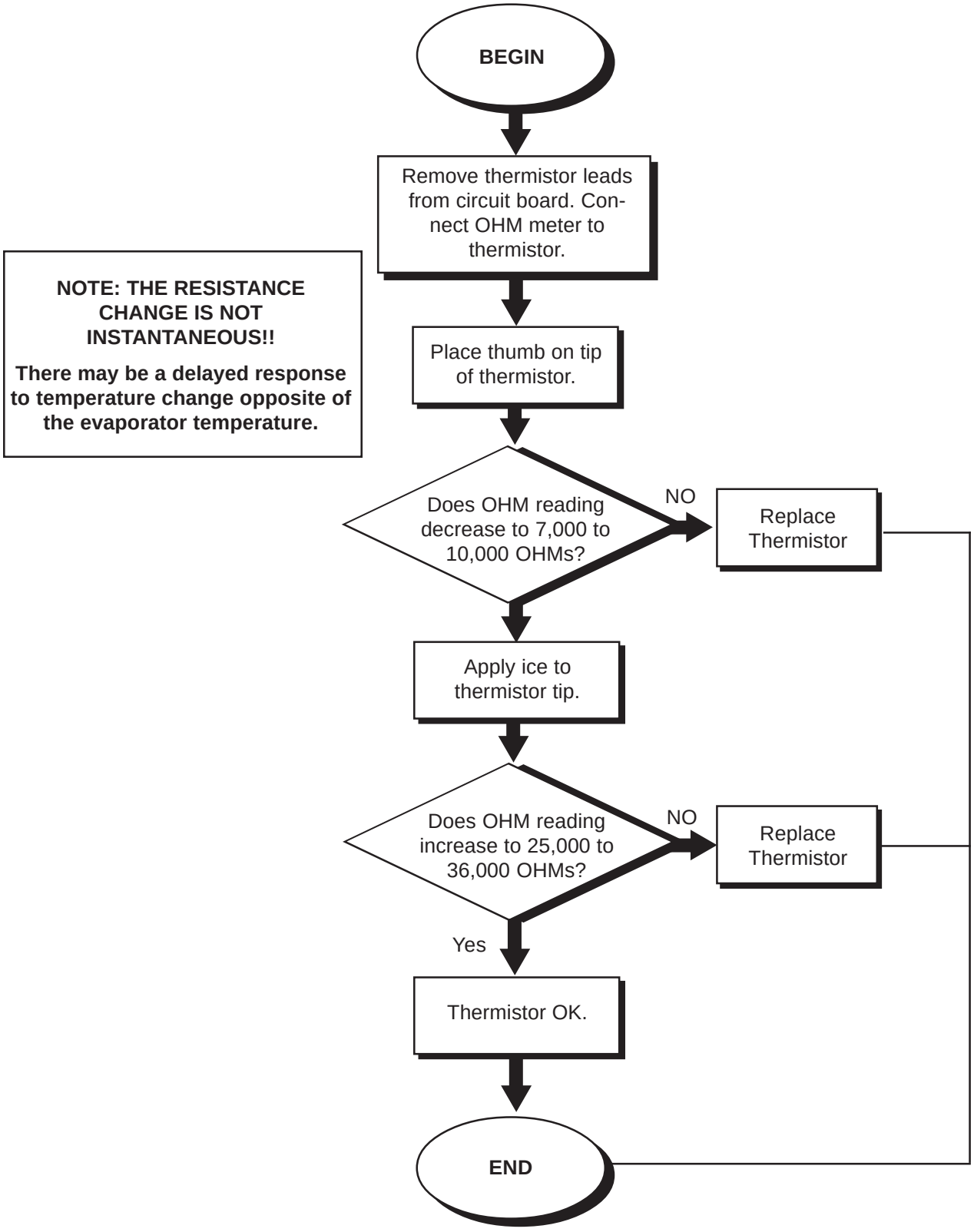
11. These readings are approximate. Do not be concerned if your reading are slightly different.

12. If your control responds comparable to the above readings, this control is good. If your control does not respond, replace the control.

13. If you are working with a 4 relay circuit board and the ice sensing control is "open" or "shorted", the power light on the circuit board will flash. The machine will not operate.

COMPONENT DIAGNOSTICS

FLOWCHART



COMPONENT DIAGNOSTICS

Product Operation:

If the thermistor is "open" the cuber will start in the harvest, or hot gas cycle, on a 3 relay board:

1. Adjusting the potentiometers ("pot") will not put the cuber into a freeze mode.
2. Proximity switch will trip control board red light off and on with water curtain movement, but, product will remain in harvest mode when curtain closes.

If the thermistor is "shorted" the cuber will remain in the freeze cycle on a 3 relay board.

If thermistor passes flowchart test the thermistor is OK - do not replace; check thermistor mounting and Erratic Operation Troubleshooting Guide for bridge thickness.

NOTE: BEFORE REPLACING THERMISTOR PLEASE TEST USING CHECK PROCEDURE OR FLOWCHART.

New generation circuit board (4 relays, remote mounted transformer) - the power on light (LED) will flash if there is a warning mode in the thermistor circuit.

NOTE: EV thermistor - Controls bridge thickness, provides hi-temp safety cut-out on single evaporator units and the left evaporator on dual evaporator models.

High 2 thermistor - Dual evaporator models only - right evaporator thermistor provides high temperature safety shut-down.

ICE THICKNESS CONTROL REPLACEMENT

1. Shut off water and electric supply to the ice maker.
2. Remove the float valve and water pan from the machine. Remove the side panel from the control box side of the machine.
3. Use a 1/16" punch or allen wrench to push the control out of the extrusion. Clean the old silicone out of the hole.
4. Remove the old control from the machine. Thread the new control through the machine from the compressor compartment. Push the control tip through the enclosure to the evaporator.
5. When routing the new control wires to the circuit board be sure the wires do not touch any hot gas lines. Attach the lead wires to the circuit board in the appropriate positions. There is no polarity in the wires of the ice thickness control.
6. If your old control has a plastic jacket, you must redrill the control hole. Use a 5mm (11/64") drill bit for this purpose. Use the drill bit by hand to enlarge the hole to fit the metal jacketed control.
7. Using GE RTV-108 clear silicone only fill the hole with silicone. This silicone is available from your local Servend Distributor.
8. Immediately after filling the hole with silicone, place your thumb over the front of the hole for ice sensing control. Push the new control into the hole from behind the evaporator. This will allow the silicone to encompass outside the contrl jacket. Continue to push the control into the hole until you can feel the conrol hitting your thumb. Never make a sharp bend with the control or allow the wire to loop behind the evaporator. this can produce internal damage to the control.
9. The ice thickness control should be flush or protrude through the hole 1/64" (.4mm). You may feel a slight bump.
10. With your thumb still over the opening, wipe your thumb sideways over and off the control. This will allow a very slight silicone seal to remain on the control tip.
11. Reinstall the side panel, water pan, float valve and restore all utilities to the machine.
12. Wait for 15 minutes before allowing water to run over the evaporator. This will allow the silicone to dry tack free.
13. Check the water level in the water pan. turn the machine to the ICE position.
14. Allow the machine to make one batch of ice. You may check this sheet for proper bridge thickness. If adjustment is necessary, please follow the procedure for your particular machine.

COMPONENT DIAGNOSTICS

SAFETY THERMO-DISC / FAN CYCLE CONTROL

Ice Thickness Control Adjustment

1. Adjustment to the bridge thickness is done at the circuit board. On the bottom (front) of the board you will find either two round black potentiometers or a set of 8 DIP switches. Please follow the instructions below for the particular type of board you have. For optimum ice production and harvest, it is recommended that a 5mm (3/16") bridge thickness be obtained. In any event, you must not have a bridge thickness less than 3mm (1/8").

2. TO ADJUST A BOARD WITH TWO POTENTIOMETERS (3 RELAY):

   If the machine had been running properly prior to failure of the thermistor, run the machine through one complete cycle without making any adjustment in the bridge thickness. If further adjustment is necessary, adjust the FINE (right) potentiometer first. Turn the dial to a higher number for a thinner bridge thickness. Turn the dial to a lower number for a thicker bridge thickness. Always wait for one complete cycle after making any adjustment before readjusting the machine. If further adjustment is necessary beyond that obatinalbe with the fine adjustment, you may utilize that COARSE (left) potentiometer. This dial should only be moved one marked graduation at a time. One mark is equivalent to about 3/4 turn of the fine dial. The coarse dial should be moved one mark then fine tuned with the fine dial.

3. TO ADJUST A BOARD WITH 8 DIP SWITHCES (4 RELAY)

   If the machine had been running properly prior to failure of the thermistor, tun the machine through one complete cycle without making any adjustment in the bridge thickness. If further adjustment is necessary, adjust the DIP swithces. To have a thicker bridge, turn the next (right) switch "on". To have a thinner bridge, turn the next (left) switch "off". It is acceptable to have all the switches either on or off. Follow the wedge above the switch case for thicker or thinner bridge. To turn the swithc "on" push the top of the swithc down. If further adjustment is necessary, you may adjust the potentiometer. This "pot" is located to the left of the 8 DIP switch case. Remember this is a coarse adjustment. Move this pot no more than one (1) graduation at a time. You will then have to adjust the DIP switches for proper thickness.

SAFETY THERMO-DISC

The thermo-disc is a safety control located on the evaporator inlet for 3 relay siphon systems. This disc is insulated to prevent ambient air from effecting the operation. The disc is non-adjustable and set to open at 120°F/49°C (closes at 95°F/35°C) evaporator inlet line temperature. The disc prevents the cuber from over heating if the product should remain in a hot gas harvest cycle for any reason.

On a remote cuber, a thermo-disc(s) is wired in series with the compressor contactor. The thermo-disc will provide a second high temperature safety cut-out device to protect the ice maker during the pump down cycle when the circuit board and thermistor does not control the unit.

To Check the Safety Thermo-Disc

Disconnect the thermo-disc RED leads from the machine. With an OHM meter check for continuity - if ther is none, replace the disc if temperature of disk is below 90°F (32°C).

Should thermo-disc be open becuase of hi-temp safety cut-out, you may reclose the disc by manually holding the contactor closed to run the compressor and cool the evaporator inlet line to be certain the thermo-disc will reclose. Do not hold the contactor in for more than 30 seconds.

FAN CYCLE CONTROL

This is a high side pressure control that cycles the condenser fan motor off at approximately 180 PSI (12.4Bars) and on at 250 PSI (17.2Bars). Its purpose is to maintain a minimum head pressure for proper operation in low ambient conditions.

Remote systems and dual evaporator models utilize fan cycle controls.

To check:

Install a high side gauge to the hi-side service valve. **DO NOT** attach to the receiver valves. Operate the system and observe the pressures the fan motor cycles. If the cycling pressure is more than +/- 10% out of the control range, replace the control - it is nonadjustable.

NOTE: CONCAVED SIDE OF BLADE IS FACING FAN MOTOR ON ALL AIR COOLED SERVEND CUBERS AND REMOTE CONDENSERS.

COMPONENT DIAGNOSTICS

HEAD PRESSURE CONTROL VALVE

(REMOTE CONDENSERS ONLY)

A modulating control to maintain proper receiver operating pressure for correct defrost. At outdoor temperatures above 70°F (21.1°C) the refrigerant flow is from the condenser to receiver. At temperatures below 70°F (21.1°C) the valve will enter a "by-pass mode" and the refrigerant flow will be from discharge line to receiver allowing the compressor discharge vapor to increase the receiver pressure by "by-passing" the condenser. The head pressure control is designed to only operate in by-pass at temperatures below 70°F (21.1°C).

Check Procedure

Install gauge at receiver and monitor pressure. With temperature below 70°F (21.1°C) receiver pressure will be 200 PSI (13.7Bars) to 240 PSI (16.55Bars) +/- 5 PSI (.34Bars).

A head pressure control that stays in by-pass may be the result of a system that is short of refrigerant. Before replacing the head pressure control, check fan cycling control. If it is not cycling, add refrigerant in 2 pound (1Kg) increments and allow product to run 10/15 minutes to determine operation. Do not exceed 4 pounds (2Kg) total during this test. If the addition of refrigerant corrects head master operation you must now locate the leak, correct, and properly recharge the system.

CAUTION: When removing a head pressure control, always snap off the stub line at the dome BEFORE using a torch to heat lines to remove. When reinstalling be sure the dome area has ample heat-sink BEFORE applying heat to valve.

High Pressure Cut-Out

All Servend water cooled and remote condenser products contain a high pressure cut-out. The function of this switch is to turn the ice maker off in the event of excessive pressure developing in the high pressure side of the refrigerant system. This switch will open the power circuit to the circuit board at 450 PSI (31Bars) pressure on current units. It is a manual reset control located beside the power toggle switch. To reset this control, push in the red button.

In the event this control shuts down the machine, please find teh reason for this shut down. Correct any necessary problems before restarting the machine.

Water Regulating Valve

THE WATER REGULATING VALVE IS USED ON WATER COOLED CUBERS ONLY... The valve is mounted in the condenser water line. Its function is to maintain the proper operating head pressure by controlling the amount of water flow through the condenser. The valve is adjustable and factory set to maintain condenser discharge water at 105°/108°F (39°/42°C). Setting the water regulating valve to maintain dishcarge water temperature eliminates the need to enter the sealed refrigerant system. Water temperaute should be taken as close to the condenser discharge as possible. This water temperature will equate to operating head pressures of approximately 230/240 PSI (15.86/16.55 Bars).

Should adjustment be required, the valve has an adjustment stem on the top. After allowing the cuber to operate for 6 minutes into the ice making cycle to balance the system, turning the adjusting stem CW will increase the discharge water temperature and CCW will decrease the discharge water temperature.

The water regulating valve must close off condenser water flow completely during hot gas "harvest" cycle. If the valve fails to close during the harvest mode, the condenser will continue to condense the hot gas needed for the harvest cycle and produce long harvest times.

Leaking water regulating valve are normally the result of scale build-up on the valve diaphragm and the valve should be flushed, not replaced. To flush the valve, open the adjusting stem full open CCW (or force the valve spring up with a screw driver) open and close the water supply to the condenser resulting in the flush action. Should this not correct the problem replacing the valve diaphragms can be done without entering the sealed refrigeration system.

Damage to the water regulating valve may also be caused by water hammer. Water hammer will result from condenser inlet and drain lines being reversed or defective valve stops in the supply line. Proper installation of water cooled equipment should always include a anti-water hammer standpipe or expansion tank in the supply inlet water line as close to the cuber as possible.

COMPONENT DIAGNOSTICS

HOT GAS VALVE / COMPRESSOR CONTACTOR / CHECK PROCEDURE

Hot Gas Valve

Servend employs a hot gas defrost harvest method. When the ice reaches the proper temperature, the ice sensing thermistor initiates the board to open the hot gas bypass valve. This electrically operated solenoid valve will then allow hot discharge refrigerant gas as it leaves the compressor to return to the inlet of the evaporator. The flow of liquid refrigerant out of the expansion valve will then cease. The hot refrigerant warms the evaporator therefore allowing the ice to melt and slide off of the evaporator.

If the hot gas fails to open, check the electric power supply to the coil of the valve. This power supply comes to the coil from the circuit board and should be energized when the red LED is energized. If the coil is envergized but the valve still fails to operate, you have a sticking valve that needs to be replaced.

A leaking valve can cause excessive freeze times, uneven bridge thickness, high suction pressures, etc.

A leaking hot gas valve is difficult to troubleshoot. Several methods to determine if this valve is leaking in the closed mode is as follows:

The hand temperature method - Place your hand on the outlet line of the valve. The outlet line of the valve should feel ambient temperature or a little cooler.

The use of an electronic sight glass - Can be beneficial in the leak detection. Install the probes on the oulet line of the valve, several inches apart. If there is a small leak in the valve, the instument should detect hot gas condensing due to the pressure drop and cooler temperatures of the evaporator section.

Another leak detection method for the hot gas valve is the use of a pinch off tool - By closing the line between the hot gas valve and the evaporator, you should be able to determine if the valve was slightly leaking through.

Compressor Contactor

CAUTION: 230 VOLT MODELS - CONTACTOR BREAKS ONE POWER LEG ONLY - ICE MAKER IS STILL LIVE (HOT).

The contactor serves as the voltage supply switch for the compressor circuit. Voltage to the coil of the contactor is supplied by the control board relay on self-contained models (see diagrams). Remote models are wired directly across the supply line from the toggle switch. The coil receives power through the low pressure cut-out and thermo-disc.

Check Procedure (Single Phase)

Top two (2) screws of contactor should always have line voltage supply present. The lower two (2) screws should have line voltage when the contactor closes.

The contactor coil must receive line voltage from teh control board relay. If the coil will not close the contactor:

A) Check the coil with an OHM meter for continuity.

B) *Check for proper voltage supplied to coil.

***NOTE: High impedance digital meter may show voltage from the control board, but that voltage may not carry a current load. Test light 25W or higher or a low impedance dial type meter should be used when testing output voltage from control board.**

COMPONENT DIAGNOSTICS

COMPRESSOR AND STARTING COMPONENTS CHECK OUT PROCEDURE

When compressors fail to start or run properly, it is normally the external electrical supply or start components that are defective. The over-load protector, start and/or run capacitor, relay, control board, safety controls, etc:

1. With machine in ice position and contactor closed, check voltage at compressor terminals. **NO** voltage will require a back check from compressor to determine where the voltage supply is interrupted. Correct as required. The load voltage, while compressor is trying to start, should not be less than 95% of rating required for product.

   Line voltage and line size effect life expectancy of electrical components, compressor, motor coils, etc. Line voltage should be maintained at 95% of lowest rated voltage.

NOTE: For 50 HZ application on dual rated 50/60 models, load voltage, while compressor is starting must not be less than 95% of 50 HZ rating.

NOTE: Poor line quality voltage will cause many erratic electrical problems. Every electrical product, ice machine, dispenser, walk-in, reach-in, air conditioner, etc. requires proper power supply to operate. Be certain your voltage check is load voltage, not line.

2. A defective capacitor or relay may prevent the compressor from starting. If the compressor attempts to start, but in unable to do so, or if the compressor hums or trips out on the over-load protector, check:

   Relay - Potential type, contacts normally closed. Contacts open by C.E.M.F. from compressor at approximately 80% of operating speed removing start capacitor from circuit. Both start and run winding and run capacitor remain in circuit.

   Capacitors - Any capacitor found to be bulging, leaking or damaged should be replaced.

CAUTION: Before removing leads for testing purposes, short across capacitor with a 10K OHM resistor to discharge capacitor if capacitor does not have bleed resistor installed.

A quick check is to replace suspected capacitors with a known good capacitor. Be sure specified capacities are used.

If capacitor analyzer is not available, an OHM meter may be used to check start capacitors for short, or open, circuits. Set the OHM meter to its highest scale and connect prods to capacitor terminals.

A) With a good capacitor, the indicator should first move to zero (0) and then gradually increase to infinity.

B) If ther is no movement of the OHM meter indicator, an open circuit is indicated.

C) If the OHM meter indicator moves to zero (0) and remains there, or on low resistance reading, a short circuit is indicated.

D) Remember this check does not determine that capacitor will deliver the MFD/UFD rating required, only detects shorted or open plates.

E) Capacitors that show any sign of leakage of electrolyte, or damage of can, should be replaced. **DO NOT TEST!**

CAUTION: Turn power off. Before removing supply leads to compressor, short across both capacitor terminals to discharge capacitors.

1. Using an OHM meter check for continuity from terminals C to R, and C to S. If the compressor is hot, wait one (1) hour for compressor to cool and recheck. the internal over-load protector can cause a lack of continuity. If continuity cannot be established through all motor windings, the compressor must be replaced.

2. Check compressor for ground by means of a continuity check between terminals C, R and S to the compressor shell or copper refrigeration line (be sure to scrape metal surface clean to get good contact). Continuity present, the compressor windings are grounded and the compressor must be replaced.

If compressor starts, but trips, repeatedly on the over-load protector, check:

Operating pressures should be within limitations of normal operating conditions.

Check the amperage drawn while the compressor is operating. Under normal operating condintions, the continuous amperage drawn will seldom exceed 100% of compressor nameplate amperage and should never exceed 120% of nameplate amperage. High amperage can be caused by: **Low Voltage, Undersized Lines, High Head Pressure, High Suction Pressure, Defective Running Capacitors or Starting Relay, Compressor Mechanical Damage.**

COMPONENT DIAGNOSTICS

TOTAL ICE CAPACITY / ICE PRODUCTION CHECK

Thermostatic Expansion Valve(s)

The following suggestions are made with the understanding that:

A) The condenser and fan blade are clean and have proper operating conditions.

B) Water supply to the product is correct and water flow over the evaporator is correct.

C) System charge is correct.

D) TXV bulb is properly located and secured to the line and correctly insulated.

E) Hot gas valve(s) not leaking through.

F) Discharge pressure OK.

Starving Valve - Product Symptoms:

1. Suction pressure lower than normal for the operating conditions.
2. Ice production lower than normal and/or none.
3. Ice pattern on evaporator (if any) thin at top and thick at bottom.

Flooding Valve - Product Symptoms:

1. Ice production lower than normal or none.
2. Suction pressure stabilizes at higher than normal and does not continue to modulate and decline (may start to slowly rise).
3. Ice pattern will be very thick from top to bottom of evaporator - unit may not enter harvest.
4. Frost on the suction line is normal on medium temperature refrigeration equipment. Frost extending onto the compressor shell may not be a problem. Before checking the sealed system, check external conditions such as spacing around poor ventilation, dirty condenser, etc.

CAUTION:

A) On models with the expansion valve bulb clamped to a vertical section of the suction line - capillary tube should point upward. This is done to eliminate the possibility of contaminates from plugging capillary tube. **DO NOT RELOCATE THE BULB.**

B) Superheat settings and bulb charges are designed specifically for Servend ice makers, and vary by model and refrigerant used. Be sure to replace expansion valves by part number and with Servend parts only.

Total Ice Capacity

Ice capacity of any ice maker is affected by many operating conditions, such as water and air temperatures and location factors. Please review the capacity tables in this manual for average 24 hour capacity under various conditions. All printed capacity ratings are +/- 10% except 50 HZ units.

50 HZ units cycle time will increase by approximately 12% and capacity will decrease by approximately 17%.

Ice Production Check

Take air temperature, if air-cooled condenser, at the inlet of condenser, 2" from condenser fins.

Incoming water temperature at the outlet of the float valve.

Cycle time (CT) = Freeze time + harvest time, in minutes.

1440 divided by CT = number cycles per 24 hours.

Weight of ice from one cycle in pounds.

EXAMPLE:

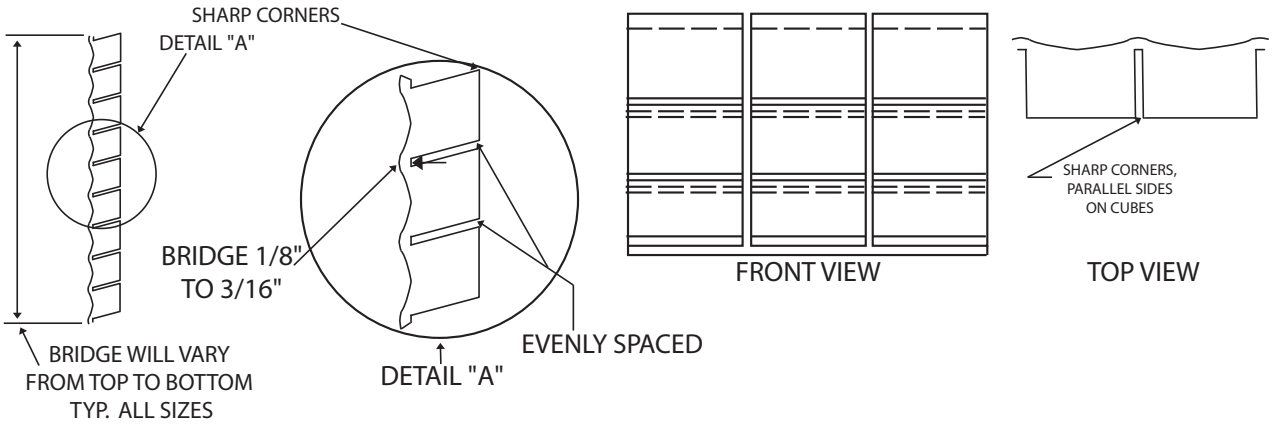
Weight x cycles/day = total production/24 hours

Compare your known facts to the production tables found in the product service manual.

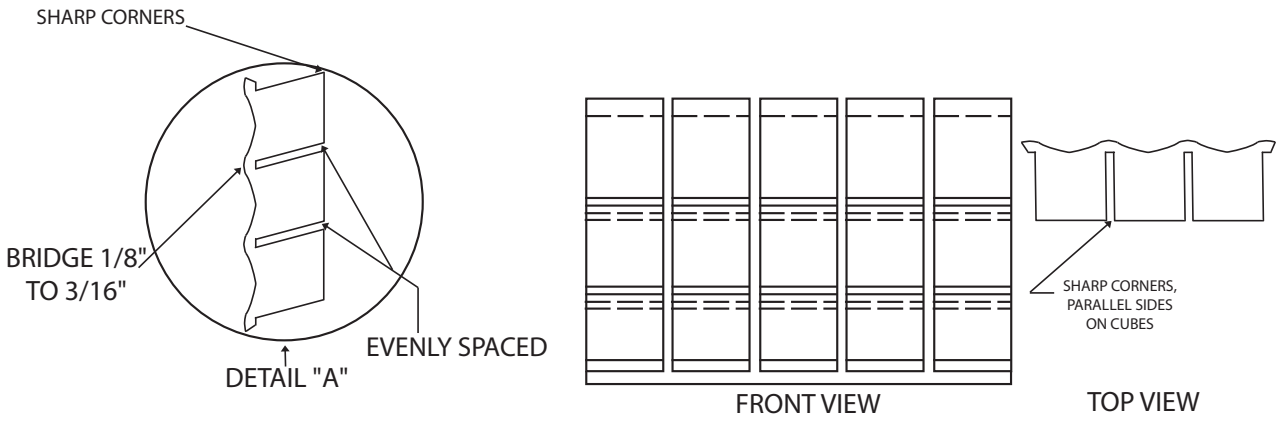
COMPONENT DIAGNOSTICS

ACCEPTABLE ICE

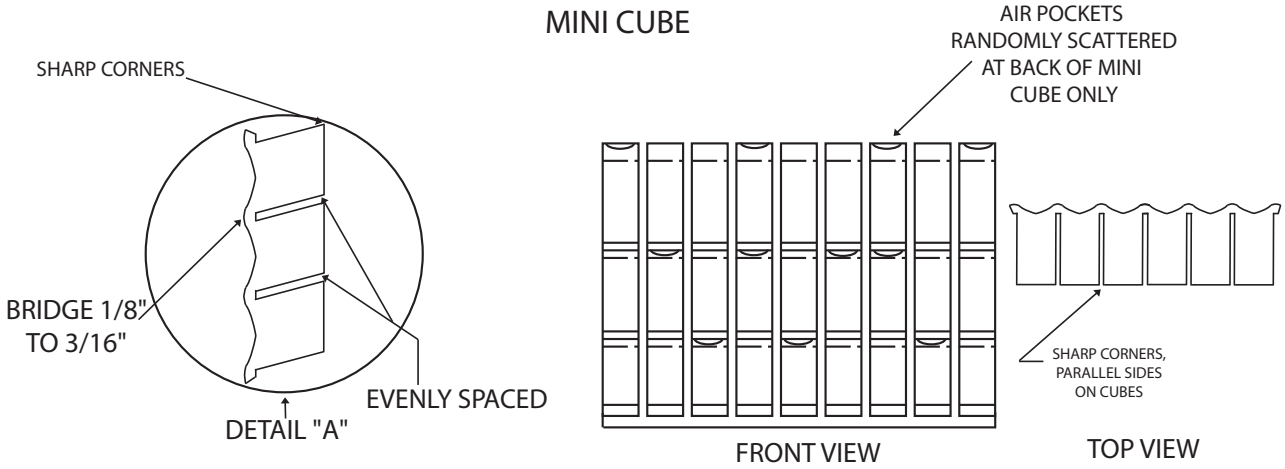
JUMBO CUBE



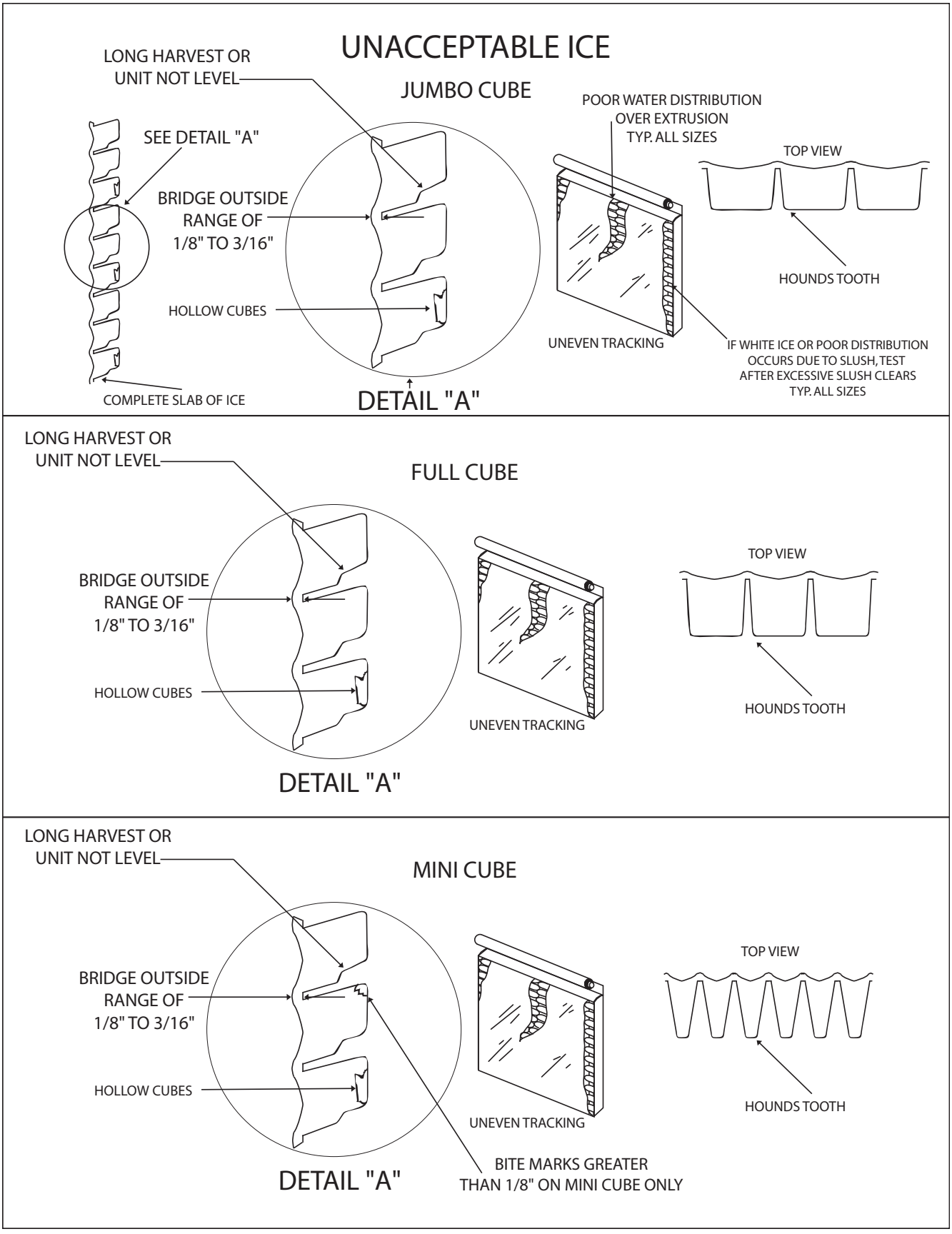
FULL CUBE



MINI CUBE



COMPONENT DIAGNOSTICS



COMPONENT DIAGNOSTICS

3 RELAY CIRCUIT BOARD SEQUENCE OF OPERATION / ADJUSTING BRIDGE THICKNESS / 3 RELAY CIRCUIT BOARD

3 Relay Circuit Board Sequence Of Operation

When the toggle switch is placed in the ice mode, the control board activates the water pump, condenser fan motor (on air cooled units), the compressor contactor.

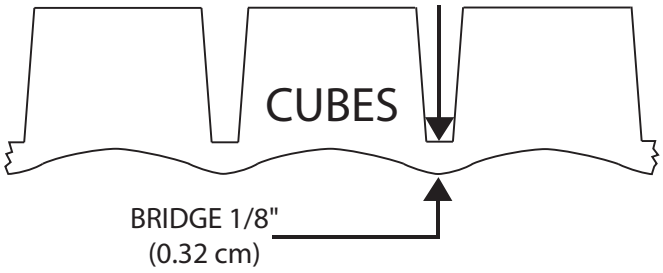
The water pump circulates the water supply across the evaporator. The refrigeration system chills the evaporator removing removing the heat from the water and ice is formed. This process continues until the ice rolls over the evaporator bottom extrusion covering the thermistor sensing tip. At approximate 26°F (-3.3°C) ice temperature the thermistor signals to the control board to start the harvest mode.

The control board shuts down the water pump, condenser fan (on air cooled units) and activates the hot gas valve for the harvest mode. When the water pump stops, the water in circulation returns the water pan increasing the water level and creates the siphon action. The siphon action cleans the water pan. The float assembly allows fresh water to fill the water pan for the next cycle.

With the hot gas valve open the evaporator warms up to allow the ice to move off the evaporator. The ice travle forces the water curtain to open. The opening of the water curtain interrupts the proximity switch circuit, closing the hot gas valve. The ice falls into the storage bin, the curtain closes activating the proximity switch and the next refrigeration cycle begins. This operation is repeated until the ice drop during harvest can not clear the water curtain. The curtain being held open for approximately 15 seconds causes the proximity switch to indicate a full bin, the curtain will close and the ice machine will start in a refrigeration mode. The cycle(s) are repeated until the bin is once again full and the water curtain opens allowing the proximity switch to shut down the ice machine operation.

Adjusting Bridge Thickness

For optimum ice production and maximum cube seperation, the ice connecting the individual cubes should be a minimum of 1/8" (.32cm) thick at the center of the ice waffle.



3 Relay Circuit Board

These five (5) steps must be followed in proper sequence:

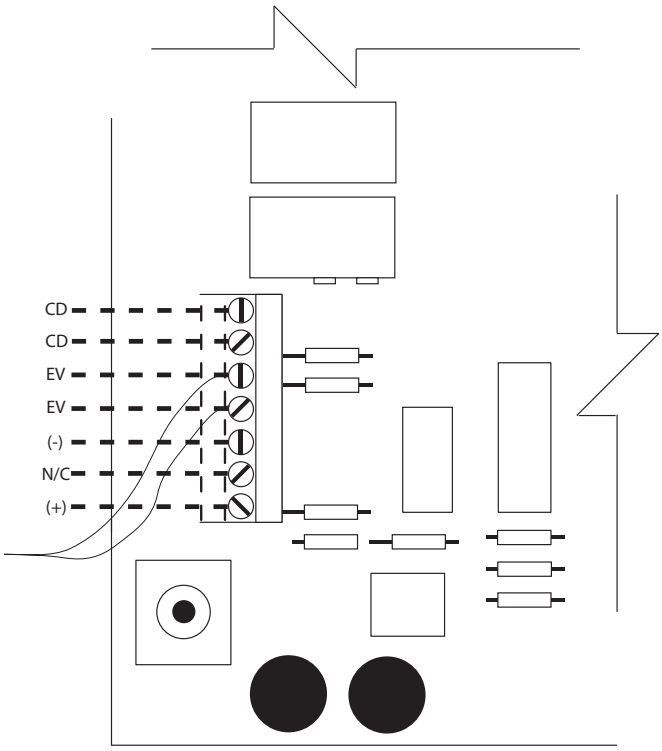
1. Set fine "pot" to 50
2. Set coarse "pot" to 50
3. Allow cuber to build ice until bridge appears to be correct thickness (1/8" to 3/16" (.32 to .49cm) thick
4. With water curtain in place, slowly advance (towards 100) coarse "pot" until harvest mode begins - allow the ice to harvest and check bridge thickness to be 1/8" to 3/16" (.32 to .49cm) thick.
5. Additional adjustments to be made with fine "pot" turning 1/2 to 1 division at a time until 1/8" to 3/16" (.32 to .49cm) bridge is achieved. The lower the number, the thicker the bridge.

NOTE: Too thin of a bridge (less than 1/8" (.32cm) will cause harvest problems.

NOTE: Never judge the thickness from the first batch of ice produced - the first cycle is a machine balance cycle. Always wait for the second cycle before making any adjustments.

COMPONENT DIAGNOSTICS

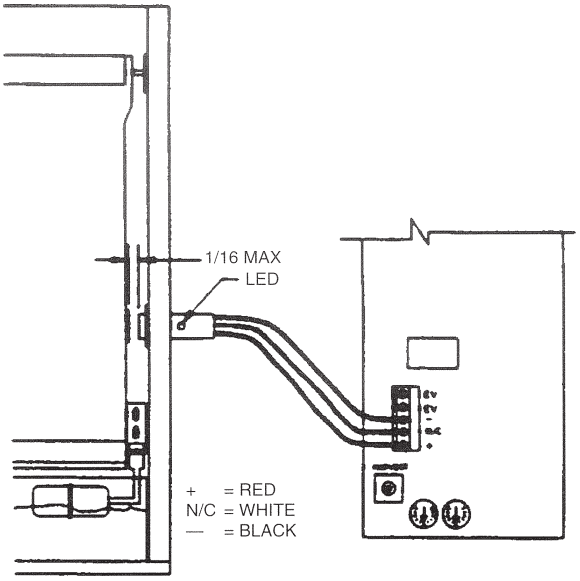
3 RELAY CIRCUIT BOARD PROXIMITY SWITCH CHECK PROCEDURE



Early production 3 relay control boards had a 7 terminal strip connector. Terminals CD must have a jumper for the control board to function correctly.

3 Relay Circuit Board Proximity Switch Check Procedure

To check proximity switch, the switch must be connected to the circuit board with the toggle switch in the ice position.



IF LED OF PROXIMITY SWITCH BLINKS OFF AND ON WITH THE OPENING AND CLOSING OF THE WATER CURTAIN PROCEED:

A) Push manual harvest button on the circuit board - cuber should go into harvest (defrost) mode. Red LED of control board should come on indicating harvest mode. Manually open the water curtain - LED of proximity switch and RED LED of control board should go out indicating the termination of the harvest mode.

B) Manually hold the water curtain in the open position for 15 seconds maximum. The ice machine should shut down. This signals the bin control function of the proximity switch is operational. Closing the water curtain should restart the ice machine in the ice making mode.

FAILURE OF THE PROXIMITY SWITCH TO FUNCTION AS NOTED IN BOTH A AND B ABOVE - PROCEED TO THE DC VOLTAGE CHECK PROCEDURE.

COMPONENT DIAGNOSTICS

PROXIMITY SWITCH VOLTAGE CHECK

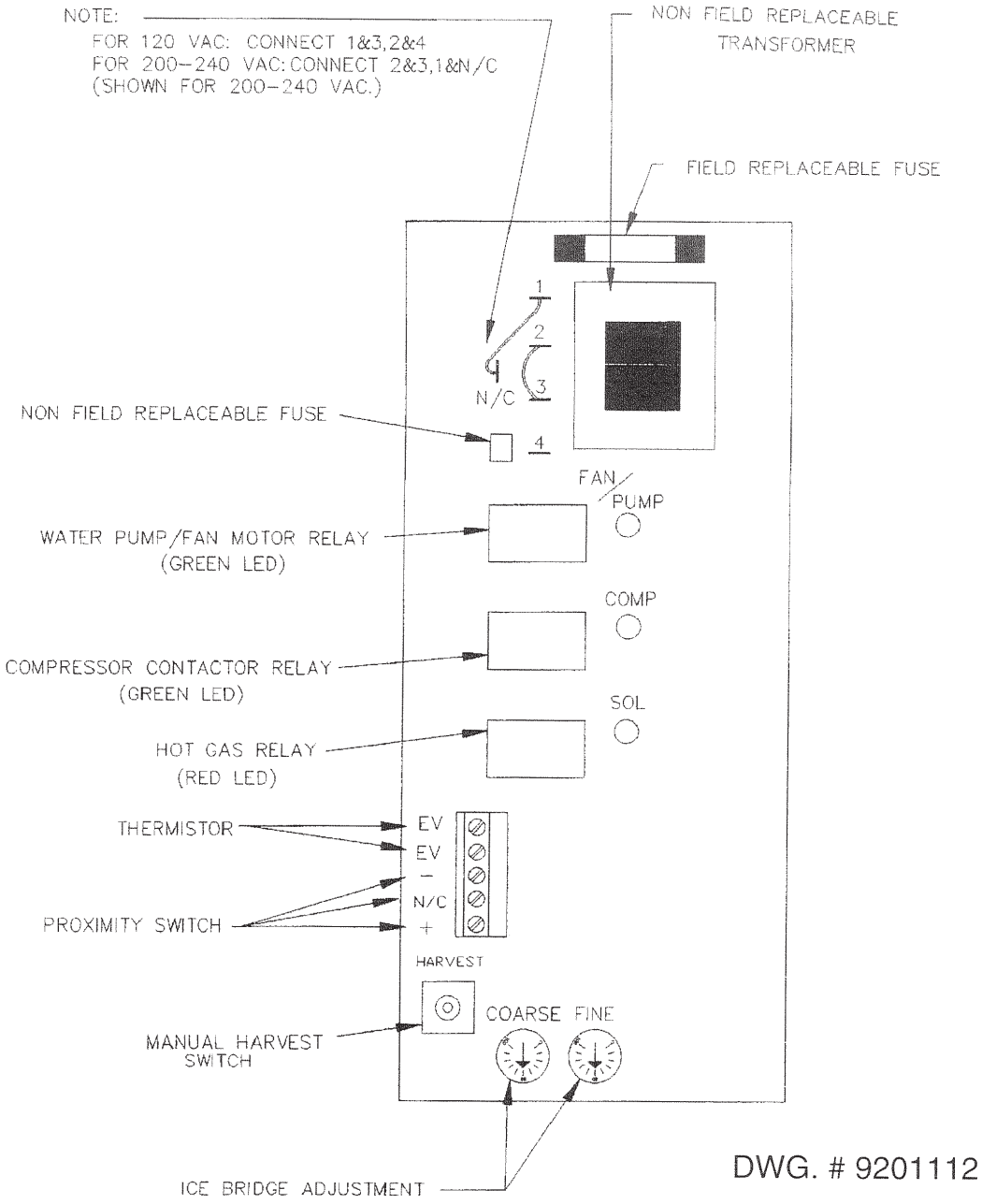
3 Relay Circuit Board Proximity Switch Check Procedure

NOTE: These checks should be done with proper line voltage.

Set the multi-meter to read D.C. voltage - turn the ice machine toggle switch to the center (off) position. Disconnect the Red, White and Black leads of the proximity switch from the control board. Turn the toggle switch to the up position (ice). Check for voltage at the positive and negative terminals on the control board.

NOTE: Voltage above 24 VDC will damage proximity switch - replace both the control board and proximity switch.

Voltage below 13 VDC proximity switch will be intermittent - replace control board.



COMPONENT DIAGNOSTICS

4 RELAY CIRCUIT BOARD SEQUENCE OF OPERATION

4 Relay Circuit Board Sequence of Operation

Place the toggle switch to the ice making mode. This energizes 3 of the 4 control board relays to activate the dump solenoid, compressor contactor (a pump down solenoid on a remote system), fan motor and the water pump. See note "A" for dump switch setting. The dump solenoid relay will de-energize 6 to 9 seconds into the freeze cycle, terminating the dump cycle.

Relay operation and special and special amber signal functions on the control board are indicated by the 7 LEDs (3 Green, 3 Amber and 1 Red):

Green LED: Water pump, fan motor, dump solenoid, compressor contactor and pump down solenoid on remote systems.

Amber LED: Water curtain 1 and/or 2 and power ON signal

Red LED: Hot gas solenoid

The ice forms to its predetermined thickness and rolls over the evaporator bottom extrusion and covers the thermistor tip. The ice increases the thermistors' resistance - this signals the termination of the freeze cycle and the de-energizing of the water pump and fan relay (Green LED). The hot gas solenoid realy (Red LED) is energized. This is accomplished at about 26°F (-3.3°C).

NOTE: The condenser fan on remote models is wired direct to the power line and may operate throughout the harvest cycle. (See wiring diagrams)

As the hot gas warms the evaporator(s), the ice is released. When the ice is released from the evaporator(s) it momentarily moves the water curtain(s) open. This movement removes and returns the magnet to the Hall switch(es), resetting the control board circuit to the next ice making mode. The dump solenoid may be energized at this time if the required number of harvest cycles have occurred. This ice making cycle will repeat until the storage bin is full.

* When the ice fills the bin it will hold the water curtain(s) in the open position. With an open water curtain(s), the Hall switch(es) will signal the control board holding circuit for the de-energizing of the compressor relay (Green LED) shutting down the ice machine after 30 seconds. The power on (Amber LED) is the only LED operational in a "full bin" mode, except on C-12 - one curtain may indicate bin full, 2nd may close, lighting LED. Removal of ice from the bin will allow the water curtain(s) to close completing the Hall switch circuit(s) reactivating the ice making cycle.

NOTE: The cuber can be placed in the harvest mode (hot gas defrost) at any time during the freeze cycle by depressing the manual harvest switch. To terminate the harvest cycle, momentarily open the water curtain(s).

The cuber will not initiate a freeze or harvest cycle with the water curtain(s) open or removed. Once the freeze cycle has been initiated, the water curtain(s) can be open or removed at any time.

* On remote system, the shut-down of the compressor will be through the pump down control. The compressor will continue to operate until the system low side pressure is reduced to 13 PSI (.90 Bars). On start-up the pump down solenoid opens allowing the low side pressure to reach 45 PSI (3.10 Bars) closing the control contacts allowing the compressor to start.

Effective with ice machines shipped from Servend on September 1, 1994 the following changes were incorporated into the 4 relay circuit boards.

1. **There is a delay programed on the board to disregard the thermistor at the start of the ice making cycle.** This delay of eight minutes is to prevent the thermistor from going into the harvest cycle prematurely. Premature harvest may occur because of slushing conditions, water conditions, remote pull down, etc. This delay can be bypassed if you press the manual harvest switch on Solitech circuit boards for the next cycle.
2. **There is a maximum harvest time of nine minutes placed in the circuit.** This will prevent the machine from staying in harvest too long. The unit will automatically reset itself if it is in a long harvest. A situation like this can occur if the ice bridge is set too thin, the evaporator is dirty or the unit is in premature harvest.
3. A change was made to keep the hot gas solenoid valve open until the water curtain closes or 15 seconds elapses with the curtain open if the unit is in a bin full mode. In the past, the hot gas solednoid valve was de-energized when the curtain began to open. In the event the machine

COMPONENT DIAGNOSTICS

4 RELAY CIRCUIT BOARD SEQUENCE OF OPERATION

was not perfectly level, this could cause ice "hang-up". If the curtain is open more than 30 seconds, the machine will shut down on bin full.

4. **The water pump will be de-energized for eight seconds after each dump cycle.** This will allow the water system to clear itself of air. The pump will then start with no water cavitation. The delay follows the normal six second water dump cycle. During the eight second period, the manual harvest switch is inoperative.

NOTE A

Dump Switch/Water Curtain(s)

Dump switch ... The left and middle switch will control number of cycles per dump. Factory setting is to dump every cycle - 1st and 2nd switches in the down position. To program the dump cycle for every 3rd cycle, move the 1st switch to the up position. To program for every 5th cycle, return the 1st switch to the down position and move the 2nd switch to the up position.

Curtain switch (the right switch in the bank) ... In the down position it is set for 1 curtain. In the up position it is set for 2 curtains as noted on the circuit board.

Remote Pump Down Cycle:

With a full bin signal (water curtain remains open), the Hall switch circuit is incomplete. This de-energizes the liquid line (pump down) solenoid. The compressor will continue to operate and pump down the low side of the system. The low pressure cut-out control contacts open de-energizing the ice machine at 13 PSI (.90 Bars).

The ice machine will stay off until sufficient ice is removed from the bin to restore the Hall switch circuit when the water curtain(s) closes. The closed Hall switch circuit energizes the liquid line (pump down) solenoid raising the low side system pressure to 45 PSI (3.10 Bars). This increase in pressure closes the low pressure cut-out control contacts starting the next freeze cycle.

NOTE B

POWER ON LED INDICATOR
(Multi-purpose warning signal)

Steady on indicates power to circuit boar

Flashing light indicates:	**Solitech**	**DFE**
-Hi-temp safety cut-out (CO 115°F (46.8°C)/CI 95°F (35°C)	SR***	SR***
-Shorted thermistor	MR**	MR**
-Open thermistor	MR**	MR**
-Missing thermistor	MR**	MR**
-Mis-wired thermistor	MR**	MR**
-Curtain switch set incorrectly example ... will flash when machine has two thermistors and curtain switch is set for on curtain		
Curtain switch light goes out:		
-Single evaporator machine and curtain switch is set for two curtains	MR**	MR**'

* SR - Self resetting

** MR - Manual resetting. Toggle switch must be turned off and returned to the ON position to manually reset circuit board.

*** If evaporator temperature rises above 140°F (43°C) reset is manual

COMPONENT DIAGNOSTICS

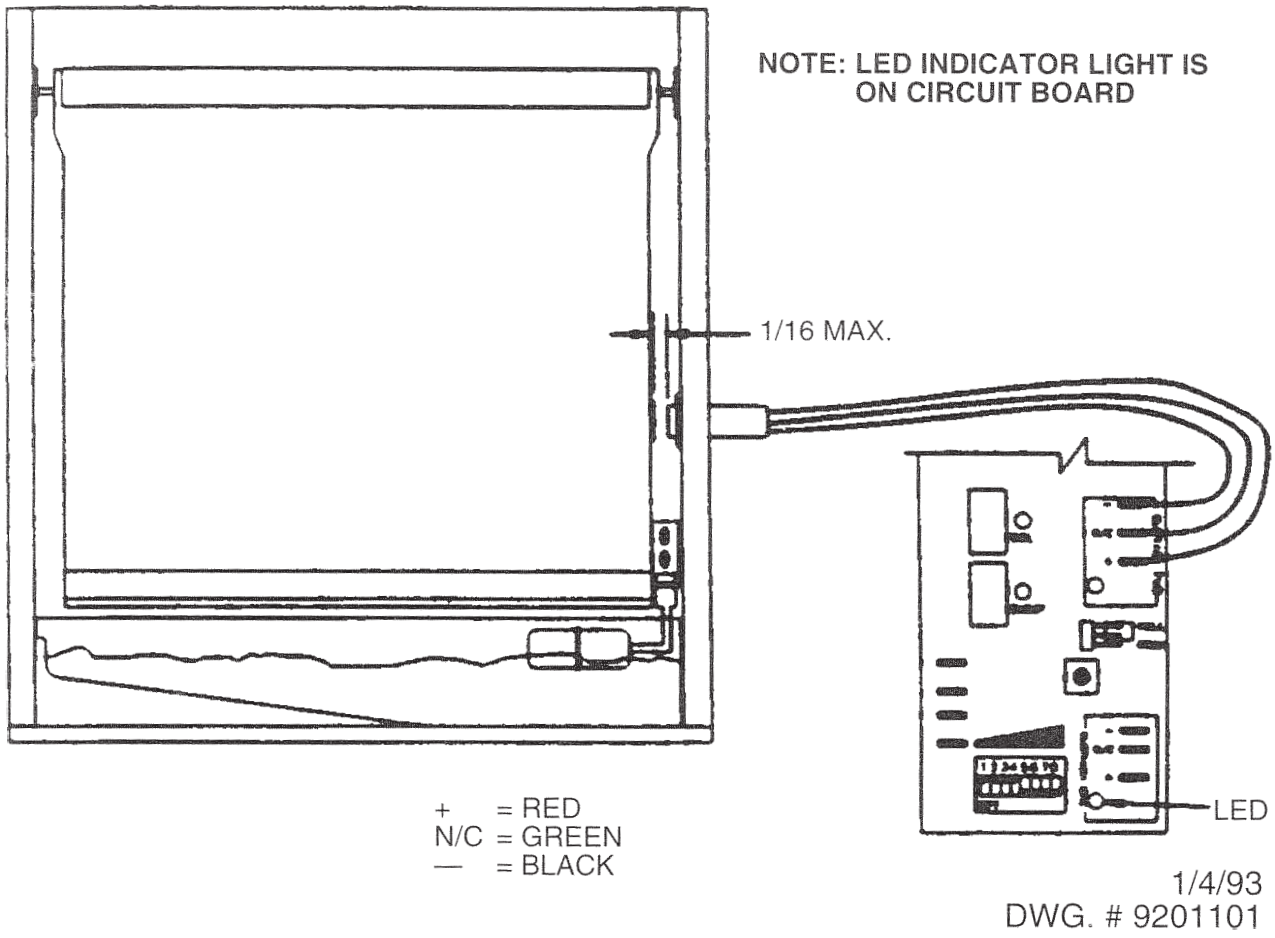
4 RELAY CIRCUIT BOARD SEQUENCE OF OPERATION

NOTE C

Hall Switch/Proximity Switch

This board will function with either a Hall or proximity switch. There is a sleeve jumper on the circuit board that must be positioned for the type of switch used. The circuit board sleeve jumper comes preset for Hall switch operation.

To be able to determine if you have a Hall or proximity switch, look at the body of the switch. The Hall switch has threads the entire length of the switch body while the proximity switch has only about 1/2 the length of the entire body. the proximity switch has an LED light in the side of the body. The Hall switch does not have an LED in the body, it uses the light on the 4 relay circuit board. The Hall switch can only be used on teh 4 relay circuit board.



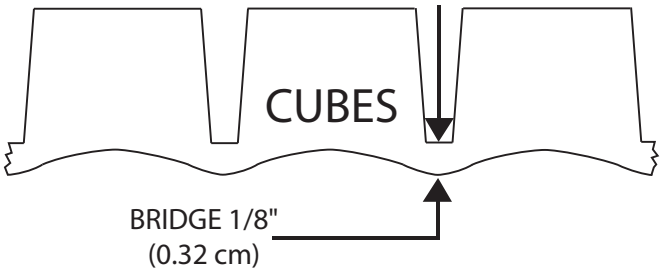
COMPONENT DIAGNOSTICS

ADJUSTING BRIDGE THICKNESS

Adjusting Bridge Thickness

For optimum ice production and maximum cube seperation, the ice connecting the individual cubes should be 1/8" to 3/16" (.32cm to .475cm) thick at the center of the ice waffle.

NOTE: Less than 1/8" (.32cm) may cause harvest problems.



The ice thickness switch bank (a set of 8 DIP switches) is factory set for a normal ice bridge thickness of 1/8" (.32cm).

NOTE: Never judge the thickness from the first batch of ice produced - the first cycle is a balance cycle. Always wait for the second cycle before making any adjustments.

Should a desire be for a different thickness, adjust as follows:

1. **Thinner Bridge -** Move one switch at a time to the OFF position and check the bridge after the harvest cycle.

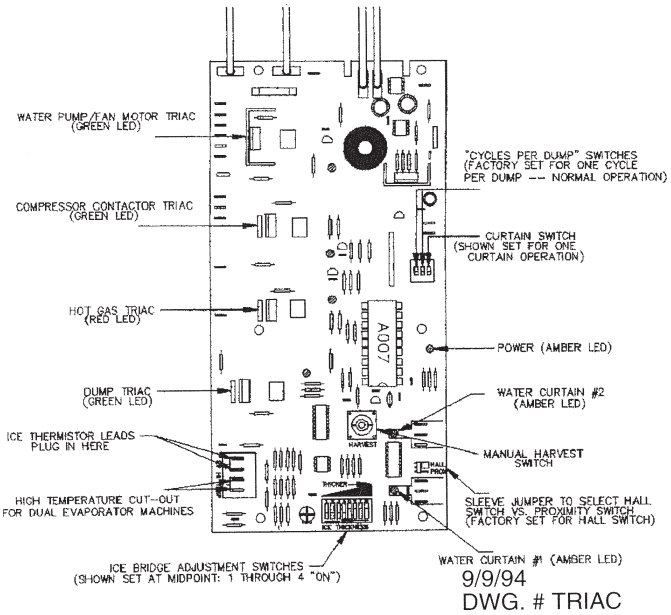
   Example - Switches are set 1 through 4 ON. Place switch #4 to the OFF position - check bridge after harvest. If additional adjustment is required, return switch #3 to the OFF position, etc.

2. **Thicker Bridge** - Move one switch at a time to the ON position and check the bridge after the harvest cycle.

   Example - Switches are set 1 through 4 ON. Move switch #5 to the ON position - check bridge thickness after harvest. If additional adjustment is required for a thicker bridge, move switch #6 to the ON position, etc. until desired bridge thickness is reached.

3. If after adjusting the DIP switches additional adjustment is needed, please use the coarse adjustment. This potentiometer adjustment is to the left of the DIP switches. With a DFE mechanical relay circuit board for thicker ice, please turn this counter clockwise. For thinner ice with a DFE mechanical board, turn the potentiometer clockwise. For all other boards, turn the potentiometer clockwise for thicker ice while turning counter clockwise for thinner ice.

NOTE: Any bridge thickness adjustment during the freeze mode will not take effect until next cycle.



COMPONENT DIAGNOSTICS

HALL SWITCH CHECK PROCEDURE 4 RELAY CIRCUIT BOARD

NOTE: The Hall switch can only be used on a four relay board. When used on a four relay board, the sleeve jumper must be set to Hall operation. Switch damage may result in teh proximity switch position.

The Hall switch will serve the same basic function as the proximity switch on the 3 relay control board, with the following exceptions:

A) No LED in switch - LED (LED is Amber) is located on the circuit board.

B) Switch requires a "S" pole magnet to turn on, not a metal target. The "S" pole magnet is mounted in teh side wall of the water curtain.

NOTE: Opening and closing the water curtain should cause the curtain LED on the control board to be "on" with the curtain closed and "off" with the curtain open. Failure to function as described proceed:

1. Check incoming voltage. Voltage between circuit board terminals L1 and L2 must be within the voltage stated on the machine name plate.
2. Sleeve jumper on control board must be set for Hall switch - see circuit board diagram.
3. Place the power toggle switch in the ice making mode. (Power LED light on)
4. Check to see switch is wired correctly on control board:

   RED =(+)

   GREEN =(N/C)

   BLACK =(-)
5. Disconnect the red, green and black leads of Hall switch from control board.
6. Measure the DC voltage between (+) and (-) on control board:

   A) Voltage must be between 12 - 24 VDC.

   B) If voltage is below 12 VDC, replace control board

   C) If voltage is above 24 VDC, replace both the control board and the Hall switch.
7. Place a jumper across terminals (-) and (N/C). The curtain LED on the control board should turn "on" and the freeze mode should begin. Failure of the LED to turn "on", replace the control board.
8. Remove jumper across terminals (-) and (N/C) and place the jumper across terminals (+) and (N/C) curtain LED should turn "off". Failure of LED to turn off replace control board.
9. If control board has proper voltage (12 - 24 VDC) and functions per #7 and #8 above, replace Hall switch.

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Cuber not operating	Toggle switch in center "off" position	Place switch in "on" position
A) Indicator lights "off" - no power to circuit board	Toggle switch	Test - if bad, replace
	Thermo-disc open	Test - replace if won't reset automatically - determine reason for open switch
	High pressure cut-out open - won't reset	**Depress manual reset - determine cause:** Water supply shut-off, water pressure too low, water valve defective or out of adjustment, water condenser dirty or corroded, unit overcharged, cut-out defective.
B) Indicator lights "off" - power to circuit board	No target on curtain	Replace target
	Target not in proximity switch field	Water curtain drifting out of switch range - reduce clearance between curtain and proximity switch
	No curtain movement	Adjust proximity switch
	Fuse blown on circuit board (8 amp)	Replace fuse
	Faulty proximity switch	Replace proximity switch
	Unit off because bin is full	Remove ice from door - eliminate curtain hang up

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Circuit board indicator lights "on"	Compressor does not run:	
	A) Check circuit board relay	Replace if defective
	B) Check contactor	Replace if defective
	C) Compressor overload open	Permit overload to cool and reset or replace
	D) Check compressor and start components	Replace as required
	Compressor runs, does not cool:	
	A) Low charge	Leak check - recharge
	B) Hot gas solenoid leaking	Replace
	C) Defective expansion valve	Replace
	D) Inefficient compressor	Replace
	E) Internal by-pass open, compressor noisy	Permit pressures to equalize

Problem	Cause	Corrective Action
Cuber remains in freeze cycle	Evaporator Thermistor:	
	A) Check thermistor	Replace - see check out
	Evaporator thermistor shorted:	
	A) Check lead wire connections	Seperate
	B) Check thermistor	Replace
	Ice bridge setting too thick	Adjust per bridge adjustment instructions
	Expansion valve failure - (will not pull down)	Tighten bulb - replace if required - see check out

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Long freeze cycle	Siphon not breaking	
	A) Siphon not vented	Install siphon break tube
	B) Float set too high	Adjust
	C) Float stuck	Clean or replace
	D) Flow control washer missing or upside down (numbers must be facing up)	Replace or install
	Water leaking around pan or curtain	Adjust
	Dirty condenser or fan blade	Clean as required
	Louvers at condenser obstructed	Remove obstruction
	Ambient or water temperature too high	Advise customer
	Condenser discharge air recirculating	Install condenser baffle
	Low charge	Check for leak, correct, evacuate, recharge
	Solenoid hot gas valve leaking (not seated)	Replace
	Water regulator valve set too high or stuck (water units only)	Adjust, clean or replace (settings 108°F (42°C) discharge water temperature

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Cuber remains in harvest cycle	Evaporator thermistor open (starts in harvest)	
	A) Loose connection at circuit board	Tighten
	B) Check thermistor	Replace - see check out
	Proximity switch light "out"	
	A) Loose wire connection at circuit board	Tighten - reattach wire
	B) Proximity switch bad	Replace - see check out
	Proximity switch light "on"	
	A) Circuit board failure	Replace
	B) Ice bridge too then	Adjust bridge per bridge adjustment instructions
	C) Water curtain stuck, curtain check, adjust as required frozen to ice on evaporator. Curtain hung on water pan, proximity switch, water hose	Check, adjust as required

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Long harvest cycle	Ice weight set too then	Adjust bridge per bridge adjustment instructions
	Unit not level	Level
	Water curtain movement restricted or frozen	Remove restriction
	Low head pressure: A) Ambient too low	Minimum ambient temperature 50°F (10°C)
	B) Water valve set too low (water units only) or leaking during harvest	Adjust water regulator valve or replace (108°F (42°C) discharge water temperature)
	Scale build up on evaporator	Clean per instructions
	Solenoid hot gas valve not opening. Slow rise of low side pressure	Replace valve
	Expansion valve leaking	Replace valve

Problem	Cause	Corrective Action
Ice bridge light at top of plate and heavy at bottom	Siphon operating intermittently or continuously leaking. A) Water level set too high	Adjust float
	B) Float stuck open	Replace
	C) Flow control washer missing from float or installed upside down (numbers must be facing up)	Replace or reinstall as required
	D) Siphon not vented	Correct
	E) Water flow rate over evaporator	Check position or distribution tube

TROUBLESHOOTING

PROBLEM ANALYSIS GUIDE - 3 RELAY BOARD

Problem	Cause	Corrective Action
Ice bridge light at top of plate and heavy at bottom (continued)	Water leaking around curtain and pan:	
	A) Curtain frozen	Correct
	Expansion valve starving	Tighten and insulate bulb. Replace as required.
	Condenser are recirculating	Install baffle
	Low charge	Leak check, evacuate and charge
	Solenoid hot gas valve leaking	Replace

Problem	Cause	Corrective Action
Soft white ice or water pump not pumping	Distribution tube or water pump scaled	Disassemble pump impeller and shaft - clean. Clean distribution system as required
	Water temperature too cold	45oF (7oC) minimum
	Inadequate water system: A) Water pressure too low	Correct
	B) Float plugged or damaged	Replace
	Malfunction of water softner	Repair water softner

EVACUATION AND CHARGING

SYSTEM EVACUATION AND CHARGING / ALL REMOTE SYSTEMS DISCHARGE, EVACUATION & RECHARGING PROCEDURES

System Evacuation and Charging

Self-Contained Units

If service work is done on the unit where the refrigeration system is opened for any reason, the system must be evacuated **BEFORE** it is re-charged. **Purging the system is NOT acceptable.** Evacuate system through both high and low side service valves. Be certain both valves are completely open when evacuating and drier has been replaced.

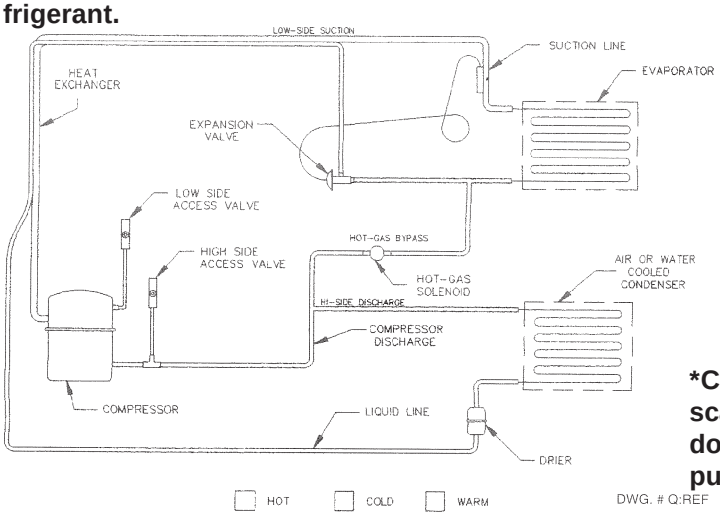
Evacuate the system to approximately 200/250 microns. At this range, ther should be a holding test of five minutes. You may expect a slight loss of vacuum as normal. A rapid rise to normal atmospheric pressure indicates a system leak - while a slower rise to approximately 1500 microns indicates moisture still present in the system. On a "wet" system, it will prove beneficial to use heat lamps to warm the compressor dome and evaporator surface during evacuation.

System Charging

Charging by sight glass, system pressures, amperage or temperature are not acceptable methods for Servend equipment. To assure a properly charged unit (after proper evacuation), the charge should be weighed into the unit using an electronic charging scales or dial-a-charge.

On air and water cooled self-contained units, the charge should be introduced into the high side of the system through the high side service valve.

CAUTION: All aspects of the Clean Air Act of July 1992, MUST be followed in recovery of system refrigerant.



All Remote Systems Discharge, Evacuation & Recharging Procedures

All field repairs to the sealed system must start with a total discharge of the system following the requirements of the Clean Air Act of July 1992.

Proper evacuation of the total system will require three (3) point hook-up:

1. Receiver Inlet Service Valve - This evacuates the area between the condenser check valve, through the liquid line solenoid to the expansion valve.

NOTE: If the receiver valve stem is fully back seated, the gage port is closed.

2. Suction Side at the Compressor or Low Side Service Valve - This evacuates the suction side between the compressor and solenoid valves.

3. Discharge Side at the Quick Connect Service Port - This evacuates the high side between the compressor and the head pressure control. The quick connect service ports are equipped with valve cores. Remove cores with a valve core extractor prior to evacuation and charging.

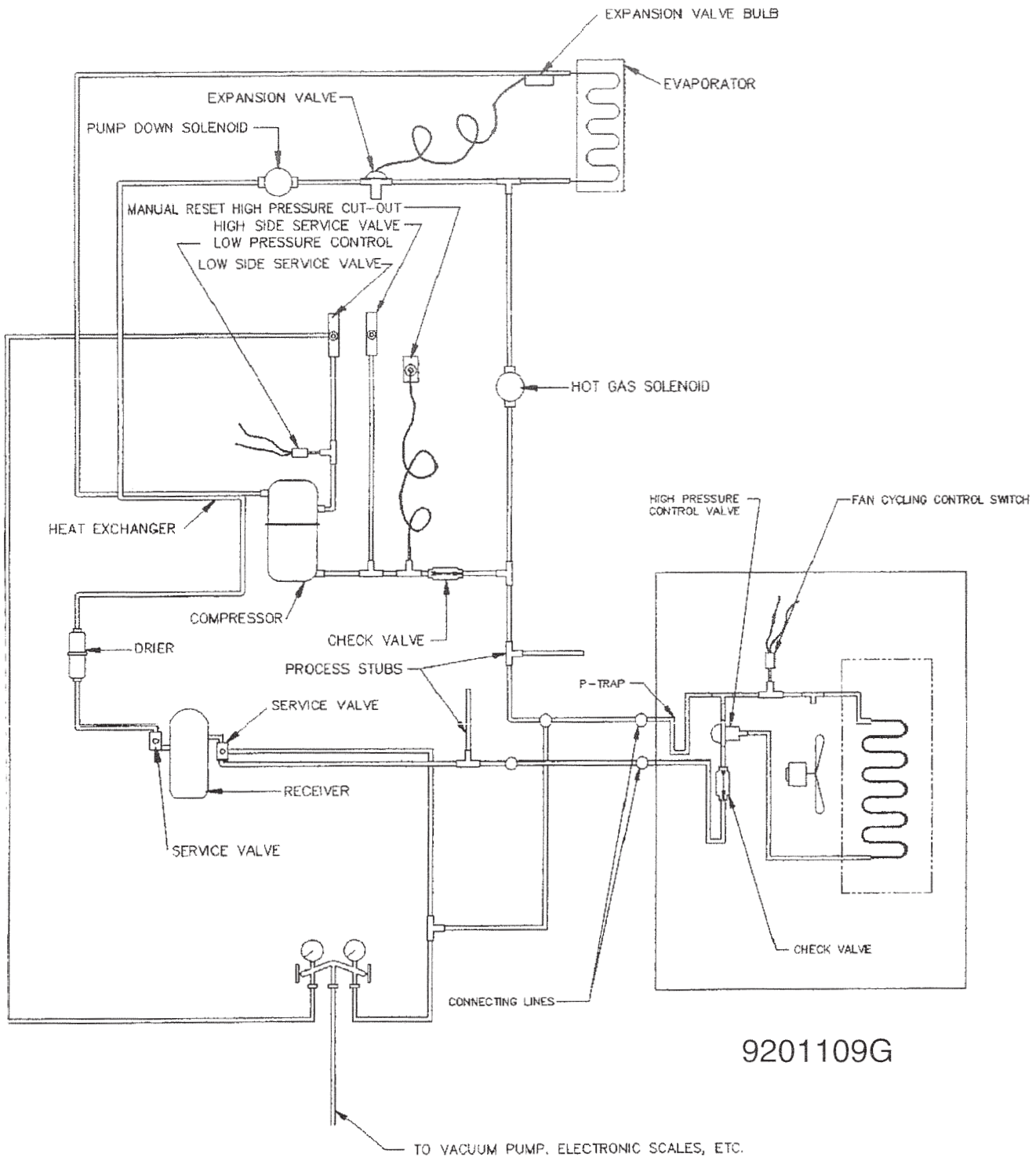
4. Evacuate the system to 13 PSI (.90Bars). This will open the low pressure cut-out, removing power from the compressor pump down circuit. Place the toggle switch in the on position. This opens the liquid line solenoid permitting evacuation of the liquid line between the solenoid and the expansion valve(s).

5. Evacuate system to approximately 200/250 microns. At this range, there should be a holding test of five (5) minutes. You may expect a slight loss of vacuum as normal. A rapid rise to normal atmospheric pressure indicates a system leak - while a slower rise to approximately 1500 microns indicates moisture still present in the system. On "wet" system, it will prove beneficial to use heat lamps to warm the compressor dome and evaporator surface during evacuation.

7. All refrigerant recharging must be weighed into the sytem, utilizing an electronic charging scales. DO NOT attempt to recharge the system by sight glass, system pressures, amperage, frost line or sweat patterns.

***CAUTION: Before programming the electronic scales to "dump" the charge, de-energize the pump-down solenoid, close the shut-off valve on vacuum pump and low side of the manifold set.**

EVACUATION AND CHARGING



OPERATING SPECS AND CHARACTERISTICS

DATA PER ARI STANDARDS

Water & Power Consumption Per 100 lbs. of ICE

MODEL	CONDENSER WATER		PORTABLE WATER		POWER CONSUMPTION	
	GALLONS	LITER	GALLONS	LITER	KWH	KJ
S2A*B/C2A	N/A	N/A	18.1	68.5	8.7	31320
S4A*B/C4A	N/A	N/A	17.9	67.8	6.9	24840
C7A*A	N/A	N/A	19.8	75.0	6.6	23760
C9A*A	N/A	N/A	19.3	73.1	7.2	25920
C12*F	N/A	N/A	15.9	60.0	4.6	16560
S2W*B/C2W	178	674	18.1	68.5	8.2	29520
S4W*B/C4W	138	522	17.9	67.8	6.5	23400
C7W*A	134	507	19.8	75.0	6.2	22320
C9A*A	113	428	19.3	73.1	6.8	24480
C12*F	140	530	15.9	60.2	4.3	15480

At 230 PSI (1586 kPa) head pressure setting.

105°/108°F (41°/44°C) discharge water temperature at condenser outlet

MODEL	COMPRESSOR HORSEPOWER	MAXIMUM FUSE SIZE	REFRIGERANT CHARGE R-502					
			AIR COOLED		WATER COOLED		REMOTE	
			OZ	g	OZ	g	LB	Kg
S2A/w			20	567	14	397	N/A	N/A
S4A/W			24	680	16	454	N/A	N/A
C7A/W/R			30	850	17	482	10	4.53
C9A/W/R			38	1077	18	510	10	4.53
C12A/W/R			65	1843	28	794	10	4.53

Operating Limits:

Air Temperature (Self-Contained)

50°/100°F (10°/38°C)

Air Temperature (Remote Systems)

-20°/+120°F (-29°/49°C)

Water Temperature

45°/90oF (7°/32°C)

Water Pressure

20/120 PSIG (1.37/8.27 Bars)

OPERATING SPECS AND CHARACTERISTICS

AIR MODEL SPECIFICATIONS

(Generation Code "A")

MODEL		**C2/S2**				**C4/S4**		
ELECTRIC CODE		**B**	**C**	**C**	**D**	**B**	**D**	**C**
UNIT	Voltz	115	208/230	200/220	220/240	115	220/240	208/230
	Phase	1	1	1	1	1	1	1
	Hertz	60	60	50	50	60	50	60
	No Wires	2	2	2	2	2	2	2
MIN. CIRCUIT AMPS		12.5	6.3	6.3	6.3	15.4	7.7	7.7
MAX FUSE SIZE		15	10	10	10	20	15	15
COMPRESSOR								
COPELAND	LRA	42	19.6	19.6	22.2	51	26	24.1
	RLA	7.4	3.7	3.7	3.7	9.5	4.8	5.4
TECUMSEH	LRA	N/A	N/A	N/A	N/A	58.8	N/A	31.0
	RLA	N/A	N/A	N/A	N/A	8.8	N/A	4.0
CONDENSER FAN MOTOR								
Amps		0.80	0.41	0.41	0.41	1.1	0.38	0.60
Watts		9	9	9	9	25	18.3	18.3
WATER PUMP Amps		1.05	0.55	0.55	0.55	1.05	0.55	0.55
REFRIGERANT								
Type		R-502	R-502	R-502	R-502	R-502	R-502	R-502
Weight		20 oz.	20 oz.	20 oz.	20 oz.	24oz.	24oz.	24oz.
		567g	567g	567g	567g	680g	680g	680g

OPERATING SPECS AND CHARACTERISTICS

AIR MODEL SPECIFICATIONS

(Generation Code "A")

MODEL		**C7**		**C9**		**C12**			
ELECTRIC CODE		**A**	**D**	**A**	**D**	**A**	**D**	**G**	**H**
UNIT	Voltz	208/230	220/240	208/220	220/220	208/230	220/240	208/230	220/240
	Phase	1	1	1	1	1	1	3	3
	Hertz	60	50	60	50	60	50	60	50
	No Wires	2	2	2	2	2	2	3	3
MIN. CIRCUIT AMPS		12	12	14.6	14.6	19.6	22.9	13.2	N/A
MAX FUSE SIZE		20	20	25	25	30	30	30	30
COMPRESSOR									
COPELAND	LRA	52	45	60	54	97	90.0	70	N/A
	RLA	8.1	8.1	10	10	14.1	17.0	9	N/A
CONDENSER									
FAN MOTOR						(2)	(2)	(2)	(2)
Amps		0.70	0.54	0.85	0.8	0.70	0.54	0.70	0.54
Watts		35	23.2	50	33.2	35	23.2	35	23.2
WATER PUMP Amps		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
REFRIGERANT									
Type		R-502	R-502	R-502	R-502	R-502	R-502	R-502	R-502
Weight		30oz.	30oz.	38oz.	38oz.	65oz.	65oz.	65oz.	65oz.
		850g	850g	1077g	1077g	1853g	1853g	1853g	1853g

OPERATING SPECS AND CHARACTERISTICS

WATER MODEL SPECIFICATIONS

(Generation Code "A")

MODEL		**C2/S2**				**C4/S4**		
ELECTRIC CODE		**B**	**C**	**C**	**D**	**B**	**D**	**F**
UNIT	Voltz	115	208/230	200/220	220/240	115	220/240	208/230
	Phase	1	1	1	1	1	1	1
	Hertz	60	60	50	50	60	50	60
	No Wires	2	2	2	2	2	2	2
MIN. CIRCUIT AMPS		11.7	5.85	5.85	5.85	14.3	7.25	7.25
MAX FUSE SIZE		20	10	10	10	20	15	15
COMPRESSOR								
	LRA	51.0	19.6	19.6	22.2	51	26	21.1
	RLA	9.5	3.7	3.7	3.7	9.5	4.8	5.4
TECUMSEH	LRA	N/A	N/A	N/A	N/A	58.8	N/A	31.0
	RLA	N/A	N/A	N/A	N/A	8.8	N/A	4.0
WATER PUMP Amps		1.05	0.55	0.55	0.55	1.05	0.55	0.55
REFRIGERANT								
Type		R-502	R-502	R-502	R-502	R-502	R-502	R-502
Weight		14oz.	14oz.	14oz.	14oz.	16oz.	16oz.	16oz.
		397g	397g	397g	397g	454g	454g	454g

OPERATING SPECS AND CHARACTERISTICS

WATER MODEL SPECIFICATIONS

(Generation Code "A")

MODEL		**C7**		**C9**		**C12**			
ELECTRIC CODE		**A**	**D**	**A**	**D**	**A**	**D**	**G**	**H**
UNIT	Voltz	208/230	220/240	208/230	220/240	208/230	220/240	208/230	220/240
	Phase	1	1	1	1	1	1	3	3
	Hertz	60	50	60	50	60	50	60	50
	No Wires	2	2	2	2	2	2	3	3
MIN. CIRCUIT AMPS		11.3	11.3	13.8	13.8	18.2	21.8	11.8	N/A
MAX FUSE SIZE		20	20	25	25	30	30	30	30
COMPRESSOR									
	LRA	52	45	60	54	97	90.0	70	N/A
	RLA	8.1	8.1	10	10	14.1	17.0	9	N/A
WATER PUMP Amps		0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
REFRIGERANT									
Type		R-502	R-502	R-502	R-502	R-502	R-502	R-502	R-502
Weight		17oz.	17oz.	18oz.	18oz.	28oz.	28oz.	28oz.	28oz.
		482g	482g	510g	510g	794g	794g	794g	794g

OPERATING SPECS AND CHARACTERISTICS

REMOTE MODEL SPECIFICATIONS

(Generation Code "A")

MODEL	**C7**	**C9**	**C12**				**K9**	**K12**	
ELCTRC CODE	**A**	**A**	**A**	**D**	**G**	**H**	**A**	**A**	**D**
UNIT:									
Voltz	208/230	208/230	208/230	220/240	208/230	220/240	208/230	208/230	208/230
Phase	1	1	1	1	3	3	1	1	1
Hertz	60	60	60	50	60	50	60	60	50
No Wires	2	2	2	2	3	3	2	2	2
MIN. CRCT. AMPS	11.3	13.8	18.3	21.9	11.9	N/A	1	1.7	1.5
MAX FUSE SIZE	20	25	30	30	30	30	15	15	10
COMPRSSR									
LRA	52	60	97	90	70	N/A	N/A	N/A	N/A
RLA	8.1	10	14.1	17.0	9.0	N/A	N/A	N/A	N/A
CONDEN.FAN									
AMPS	N/A	N/A	N/A	N/A	N/A	N/A	0.85	0.85	0.80
WATTS	N/A	N/A	N/A	N/A	N/A	N/A	50	50	33.2
WTR PMP AMPS	0.55	0.55	0.55	0.55	0.55	0.55	N/A	N/A	N/A
REFRIGERANT									
Type	R-502	R-502	R-502	R-502	R-502	R-502	R-502	R-502	R-502
Weight	10lbs	10lbs	10lbs	10lbs	10lbs	10lbs	0	0	0
	4536g	4536g	4536g	4536g	4536g	4536g	0	0	0

OPERATING SPECS AND CHARACTERISTICS

COMPRESSOR SPECIFICATIONS

MODEL	START CAPACITOR	RUN CAPACITOR	COMPRESSOR RELAY NUMBERS	
			OEM	PRODUCTS UNLIMITED
STANDARD C2 (JREI-0033-IAA)	233-280 MFD 110V	N/A	040-0090-06	N/A
EXPORT C2 (JRER-0033-IAV-212)	233-280 MFD 110V	N/A	040-0090-05	N/A
EXPORT C2 (JSES-0051 PAJ-201)	HIGH TORQUE 88/106 MFD 330V	15 MFD 440V	040-0001-17	38-ROO 5 C 3622
STANDARD C4/ S4COPELAND (RSU4-0050 IAA-214)	282/340 MFD 110V	N/A	040-0001-11	38-R094 C 3622
TECUMSEH S4 AK9442E	378-455 MFD 125V	N/A	82498-1	N/A
EXPORT C4 COPELAND (RSU5-0050-IAV-207)	41/53 MFD 220V	N/A	040-0089-03	N/A
EXPORT TECUMSEH S4 AK9442E	72-88 MFD 330V	N/A	820ARR3C29	N/A

OPERATING SPECS AND CHARACTERISTICS

COMPRESSOR SPECIFICATIONS

MODEL	ELECTRIC CODE	VOLTAGE/HZ	OHM VALUE/ START WINDING	OHM VALUE RUN WINDING
EXPORT C4 COPELAND (RSU4-0050-IAZ-205)	D	220/240 VAC/50 HZ IPH	22.8-26.2	2.34-2.70
STANDARD C7 (AW5519E)	A	208/230 VAC/60 HZ IPH 200 VAC/50 HZ IPH	2.72 T.P. MOTOR 3.00 G.E. MOTOR	1.32 T.P. MOTOR 1.31 G.E. MOTOR
EXPORT C7 (AW5519E)	D	220/240 VAC/50 HZ IPH	5.14 T.P. MOTOR 5.24 G.E. MOTOR	1.69 T.P. MOTOR 1.62 G.E. MOTOR
STANDARD C9 (AW5524E)	A	208/230 VAC/60 HZ IPH 200 VAC/50 HZ IPH	2.48 T.P. MOTOR 2.42 G.E. MOTOR	1.09 T.P. MOTOR 1.08 G.E. MOTOR
EXPORT C9 (AW5524E)	D	220/240 VAC/50 HZ IPH	2.98 T.P. MOTOR 2.97 G.E. MOTOR	1.42 T.P. MOTOR 1.39 G.E. MOTOR
C12	A	208/230 VAC/60 HZ IPH NOT RATED 50 HZ	If the 6th digit is a "1" = 1.80 If the 6th digit is a "3" = 2.03	If the 6th digit is a "1" = .601 If the 6th digit is a "3" = .570

MODEL	START CAPACITOR	RUN CAPACITOR	COMPRESSOR RELAY NUMBERS	
			OEM	PRODUCTS UNLIMITED
Export C4 Copeland (RSU4-0050-IAZ-205)	41/53 MFD 320V	N/A	040-0088-03	N/A
Standard C7 (AW5519E)	88/108 MFD 250V 88/108 MFD 250V	25 MFD 370V 25 MFD 370V	82457	38-A150 D2622
Export C7 (AW5519E)	22/108 MFD 330V	25 MFD 370V	820ARR31124	38-A104 D2622
Standard C9 (AW5524E)	88/108 MFD 330 VAC	35 MFD 370V	82457	38-A150
Export C9 (AW5524E)	88/108 MFD 330 VAC	35 MFD 370 VAC	820ARR3G72	38AO74 D2622
C12	145/175 MFD 330 VAC	35 MFD 370 VAC	3ARR3-4A	38-M112 D3622

OPERATING SPECS AND CHARACTERISTICS

COMPONENT SPECIFICATIONS

PART NAME	MODEL NO.	VOLTAGE/HZ	OHM VALUE	WATTAGE
Hot Gas Valve Coil	C2/C4 - S2/S4	120 VAC - 50/60 HZ	1430	N/A
	C7/C9	208/230 VAC 50/60 HZ	545	N/A
	C2/C4 - S2/S4	208/230 VAC	545	N/A
	C12	208/230 VAC - 50/60 HZ	545	N/A
Fan Motor	C2 - S2	110 VAC - 60 HZ	31	9 WATTS
		220/240 VAC - 50 HZ	104	9 WATTS
	C4 - S4	115 VAC - 60 HZ	71	25 WATTS
		220/240 VAC - 50 HZ	16	18.3 WATTS
		208/230 VAC - 60 HZ	16	18.3 WATTS
	C7/C12	208/230 VAC - 60 HZ	47	35 WATTS
		208/230 VAC - 50 HZ	70	35 WATTS
	C9	208/230 VAC - 60 HZ	31	50 WATTS
		208/230 VAC - 50 HZ	55	50 WATTS
Remote Condenser Fan Motors (All Styles)	All Styles	208/230 - 60 HZ	31	50 WATTS
Pump Motor	C2/C4 - S2/S4	110 VAC - 50/60 HZ	19.4 +/- 5%	N/A
	C7/C9/C12	208/230 - 50/60 HZ		

CONTROL	CUT OUT	CUT IN	STANDARD SETTING
Thermo-Disc	120°F (40°C)	95°F (35°C)	
Pump Down Control	13 PSI (.90 Bars)	45 PSI (3.10 Bars)	
Hi Pressure Cut-Out	450 PSI (31.03 Bars)		
Older Units	400 PSI (27.58 Bars)		
Fan Cycling Control			
(Obsolete)	150 PSI (10.34 Bars)	225 PSI (15.51 Bars)	
Current	180 PSI (12.4 Bars)	250 PSI (17.2 Bars)	
Head Master Control	N/A	N/A	180 PSI (12.41 Bars)

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS S-2 A / C-2 A

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 185/165	41/23	11.0/13.0	140/130	120/100	1.0/1.75	N/A	2.4
21/10 C	12.75/11.38 Bars	2.82/1.58 Bars	11.0/13.0	9.65/8.96 Bars	8.27/6.89 Bars	1.0/1.75	1.08	N/A
80/70 F	PSI 215/190	45/24	12.5/14.5	160/150	135/125	1.0/1.5	N/A	2.4
27/21 C	14.82/13.10 Bars	3.10/1.65 Bars	12.5/14.5	11.03/10.34 Bars	9.31/8.62 Bars	1.0/1.5	1.08	N/A
90/70 F	PSI 250/220	47/24	14.0/17.0	180/170	155/145	0.5/1.5	N/A	2.5
32/21 C	17.24/15.17 Bars	3.24/1.65 Bars	14.0/17.0	12.41/11.72 Bars	10.68/10.00 Bars	0.5/1.5	1.13	N/A
100/70 F	PSI 285/250	49/25	20.0/22.0	210/200	160/150	0.5/1.5	N/A	2.55
38/21 C	29.65/17.24 Bars	3.38/1.72 Bars	20.0/22.0	14.48/13.79 Bars	11.03/10.34 Bars	0.5/1.5	1.15	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS S-2 W / C-2 W

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 234/226	45/29	12.5/13.5	140/130	115/105	0.5/1.5	N/A	2.2
21/10 C	13.13/15.58 Bars	3.10/2.00 Bars	12.5/13.5	9.65/8.96 Bars	7.93/7.24 Bars	0.5/1.5	1.00	N/A
70/70 F	PSI 234/226	45/29	13.5/14.5	140/130	115/105	0.5/1.5	N/A	2.2
27/21 C	16.3/15.58 Bars	3.10/2.00 Bars	13.5/14.5	9.65/8.96 Bars	7.93/7.24 Bars	0.5/1.5	1.00	N/A
90/70 F	PSI 234/226	47/29	17.5/18.5	140/130	120/110	0.5/1.5	N/A	2.3
32/21 C	16.13/15.58 Bars	3.24/2.00 Bars	17.5/18.5	9.65/8.96 Bars	8.27/7.58 Bars	0.5/1.5	1.04	N/A
90/90 F	PSI 234/226	47/29	17.5/18.5	150/140	130/120	0.5/1.5	N/A	2.3
32/32 C	16.13/15.58 Bars	3.24/2.00 Bars	17.5/18.5	10.34/9.65 Bars	8.96/8.27 Bars	0.5/1.5	1.04	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS S-4 A / C-4 A

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 210/190	43/30	12.0/13.0	140/130	100/90	1.0/1.75	N/A	4.65
21/10 C	14.48/13.10 Bars	2.96/2.06 Bars	12.0/13.0	9.65/8.96 Bars	6.89/6.20 Bars	1.0/1.75	2.10	N/A
80/70 F	PSI 220/210	45/31	14.5/16.0	155/145	115/105	1.0/1.75	N/A	4.6
27/21 C	15.17/14.48 Bars	3.10/2.13 Bars	14.5/16.0	10.68/10.00 Bars	7.93/7.24 Bars	1.0/1.75	2.08	N/A
90/70 F	PSI 260/245	48/32	19.5/21.0	180/170	135/125	0.5/1.5	N/A	4.5
32/21 C	17.93/16.89 Bars	3.31/2.20 Bars	19.5/21.0	12.41/11.72 Bars	9.31/8.62 Bars	0.5/1.5	2.04	N/A
100/70 F	PSI 295/270	54/32	25.0/26.0	190/180	140/130	0.5/1.5	N/A	4.9
38/21 C	20.34/18.62 Bars	3.72/2.13 Bars	25.0/26.0	13.10/12.41 Bars	9.65/8.96 Bars	0.5/1.5	2.22	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS S-4 W / C-4 W

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 234/226	47/36	13.5/14.5	130/120	95/85	0.5/1.75	N/A	4.5
21/10 C	16.13/15.58 Bars	3.24/2.48 Bars	13.5/14.5	8.96/8.27 Bars	6.55/5.86 Bars	0.5/1.75	2.04	N/A
70/70 F	PSI 234/226	47/36	16.5/17.5	135/125	95/85	0.5/1.5	N/A	4.5
21/21 C	16.13/15.58 Bars	3.24/2.48 Bars	16.5/17.5	9.31/8.62 Bars	6.55/5.86 Bars	0.5/1.5	2.04	N/A
90/70 F	PSI 234/226	48/36	17.5/19.0	140/130	95/85	0.5/1.5	N/A	4.5
32/21 C	16.13/15.58 Bars	3.31/2.48 Bars	17.5/19.0	9.65/8.96 Bars	6.55/5.86 Bars	0.5/1.5	2.04	N/A
90/90 F	PSI 234/226	56/36	19.0/21.0	145/135	110/100	0.5/1.5	N/A	4.5
32/32 C	16.13/15.58 Bars	3.86/2.48 Bars	19.0/21.0	10.00/9.31 Bars	7.58/6.89 Bars	0.5/1.5	2.04	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS C-7 A and R

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 215/200	35/27	9.0/10.0	160/150	80/70	.75/1.5	N/A	4.8
21/10 C	14.82/13.79 Bars	2.41/1.86 Bars	9.0/10.0	11.03/10.34 Bars	5.51/4.82 Bars	.75/1.5	2.17	N/A
80/70 F	PSI 245/215	40/26	12.0/13.0	175/160	90/80	0.5/1.5	N/A	4.8
27/21 C	16.89/14.82 Bars	2.75/1.79 Bars	12.0/13.0	12.06/11.03 Bars	6.20/5.51 Bars	0.5/1.5	2.17	N/A
90/70 F	PSI 280/240	40/26	12.5/13.5	195/185	100/90	0.5/1.6	N/A	4.8
32/21 C	19.31/16.55 Bars	2.75/1.79 Bars	12.5/13.5	13.44/12.75 Bars	6.89/6.20 Bars	0.5/1.6	2.17	N/A
100/70 F	PSI 320/250	40/26	14.5/15.5	220/210	120/110	0.5/1.6	N/A	4.8
38/21 C	22.06/17.24 Bars	2.75/1.79 Bars	14.5/15.5	15.17/14.48 Bars	8.27/7.58 Bars	0.5/1.6	2.17	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODEL C-7 W

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 228/224	36/27	9.0/10.0	160/150	85/75	1.0/1.75	N/A	4.8
21/10 C	15.72/15.44 Bars	2.48/1.86 Bars	9.0/10.0	11.03/10.34 Bars	5.86/5.17 Bars	1.0/1.75	2.17	N/A
70/70 F	PSI 230/224	36/26	11.0/12.0	160/150	85/75	1.0/1.75	N/A	4.8
27/21 C	15.86/15.44 Bars	2.48/1.79 Bars	11.0/12.0	11.03/10.34 Bars	5.86/5.17 Bars	1.0/1.75	2.17	N/A
90/70 F	PSI 230/224	37/26	12.5/13.5	180/170	100/90	0.5/1.5	N/A	4.8
32/21 C	15.86/15.44 Bars	2.55/1.79 Bars	12.5/13.5	12.41/11.72 Bars	6.89/6.20 Bars	0.5/1.5	2.17	N/A
90/90 F	PSI 235/228	39/26	14.5/15.5	180/170	100/90	0.5/1.5	N/A	4.8
32/32 C	16.20/15.72 Bars	2.68/1.79 Bars	14.5/15.5	12.41/11.72 Bars	6.89/6.20 Bars	0.5/1.5	2.17	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS C-9 A and R

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 220/200	37/23	8.0/9.0	155/145	90/80	1.0/1.5	N/A	5.7
21/10 C	15.17/13.79 Bars	2.55/1.58 Bars	8.0/9.0	10.68/10.00 Bars	6.20/5.51 Bars	1.0/1.5	2.58	N/A
80/70 F	PSI 250/225	40/25	9.5/10.5	170/160	95/85	1.0/1.5	N/A	5.7
27/21 C	17.24/15.51 Bars	2.75/1.72 Bars	9.5/10.5	11.72/11.03 Bars	6.55/5.86 Bars	1.0/1.5	2.58	N/A
90/70 F	PSI 285/250	43/25	11.0/12.0	190/180	105/95	0.5/1.5	N/A	5.7
32/21 C	19.65/17.24 Bars	2.96/1.72 Bars	11.0/12.0	13.10/12.41 Bars	7.24/6.55 Bars	0.5/1.5	2.58	N/A
100/90 F	PSI 325/280	45/25	13.5/14.5	215/210	110/105	0.5/1.5	N/A	5.7
38/21 C	22.41/19.31 Bars	3.1/1.72 Bars	13.5/14.5	14.82/14.48 Bars	7.58/7.24 Bars	0.5/1.5	2.58	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODEL C-9 W

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
70/50 F	PSI 232/228	40/27	10.0/11.0	140/130	80/70	1.0/1.75	N/A	5.7
21/10 C	16.00/15.72 Bars	2.75/1.86 Bars	10.0/11.0	9.65/8.96 Bars	5.51/4.82 Bars	1.0/1.75	2.58	N/A
70/70 F	PSI 232/228	40/27	11.0/12.5	145/135	80/70	1.0/1.75	N/A	5.7
21/21 C	16.00/15.72 Bars	2.75/1.86 Bars	11.0/12.5	10.00/9.31 Bars	5.51/4.82 Bars	1.0/1.75	2.58	N/A
90/70 F	PSI 232/228	40/27	12.5/13.5	155/145	90/80	1.0/1.75	N/A	5.7
32/21 C	16.00/15.72 Bars	2.75/1.86 Bars	12.5/13.5	10.68/10.00 Bars	6.20/5.51 Bars	1.0/1.75	2.58	N/A
90/90 F	PSI 235/230	40/27	14.5/15.5	160/150	90/80	1.0/1.75	N/A	5.7
32/32 C	16.20/15.86 Bars	2.75/1.86 Bars	14.5/15.5	11.03/10.34 Bars	6.20/5.51 Bars	1.0/1.75	2.58	N/A

OPERATING SPECS AND CHARACTERISTICS

AVERAGE OPERATING CHARCTERISTICS

MODELS C-12 A and R

AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
50/50 F	PSI 205/175	32/24	9.0/10.5	140/135	75/65	2.0/3.0	N/A	9.5
10/10 C	14.13/12.06 Bars	2.20/1.65 Bars	9.0/10.5	9.65/9.31 Bars	5.17/4.48 Bars	2.0/3.0	4.30	N/A
70/50 F	PSI 219/192	50/30	9.0/11.0	155/145	90/80	0.8/1.5	N/A	9.5
21/10 C	15.10/13.24 Bars	3.44/2.06 Bars	9.0/11.0	10.68/10.00 Bars	6.20/5.51 Bars	0.8/1.5	4.30	N/A
80/70 F	PSI 230/213	55/30	10.5/12.0	170/150	95/85	0.6/1.5	N/A	9.5
27/21 C	15.86/14.68 Bars	3.79/2.06 Bars	10.5/12.0	11.72/10.34 Bars	6.55/5.86 Bars	0.6/1.5	4.30	N/A
90/70 F	PSI 253/230	55/30	11.5/14.0	190/170	105/95	0.5/1.5	N/A	9.5
32/21 C	17.44/15.86 Bars	3.79/2.06 Bars	11.5/14.0	13.10/11.72 Bars	7.24/6.55 Bars	0.5/1.5	4.30	N/A
110/70 F	PSI 340/311	56/32	19.0	230/210	120/105	0.5/1.5	N/A	9.5
45/21 C	23.44/21.44 Bars	3.86/2.20 Bars	19.0	15.86/14.48	8.27/7.24	0.5/1.5	4.30	N/A

OPERATING SPECS AND CHARACTERISTICS

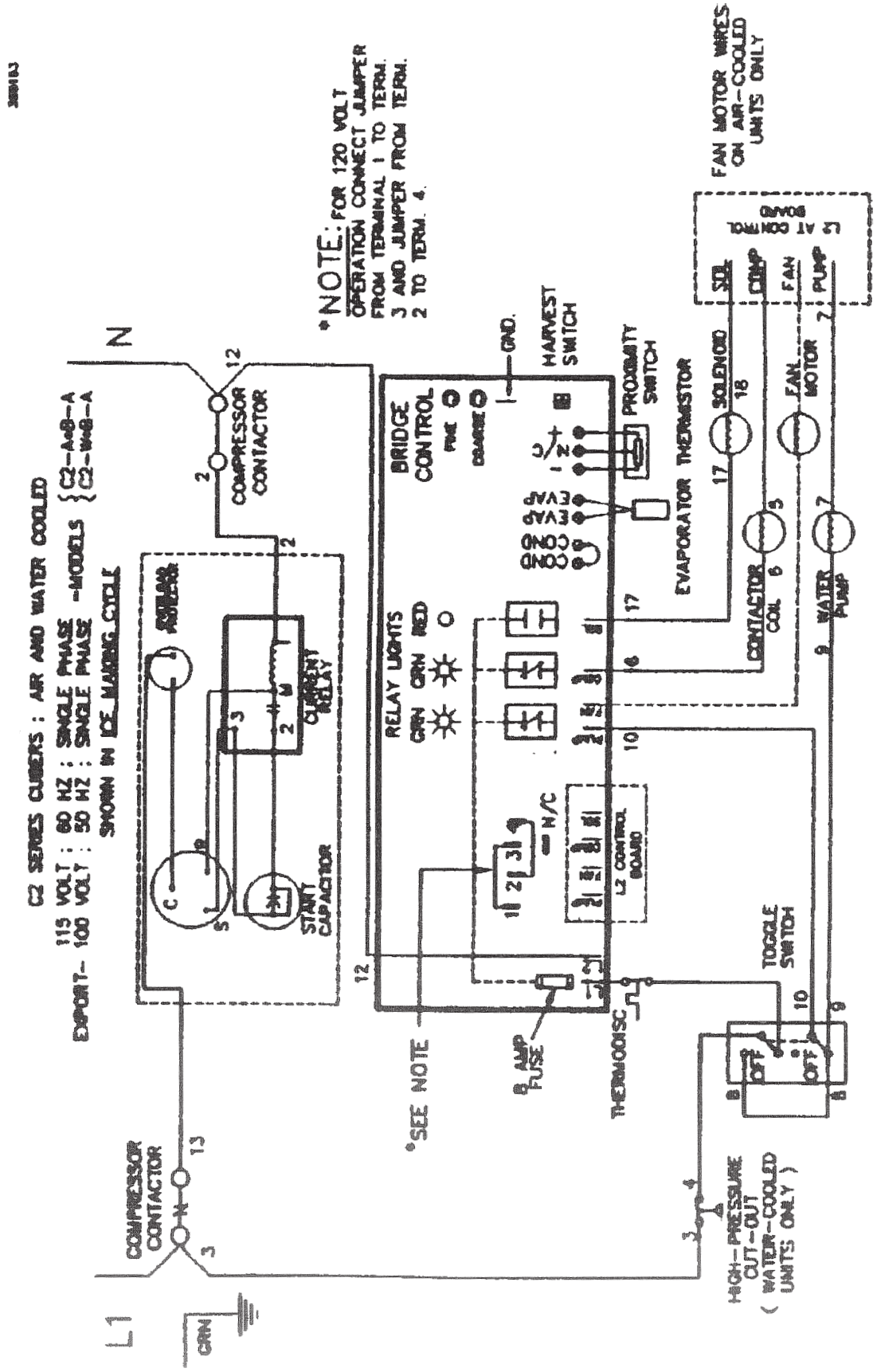
AVERAGE OPERATING CHARCTERISTICS

MODEL C-12 W

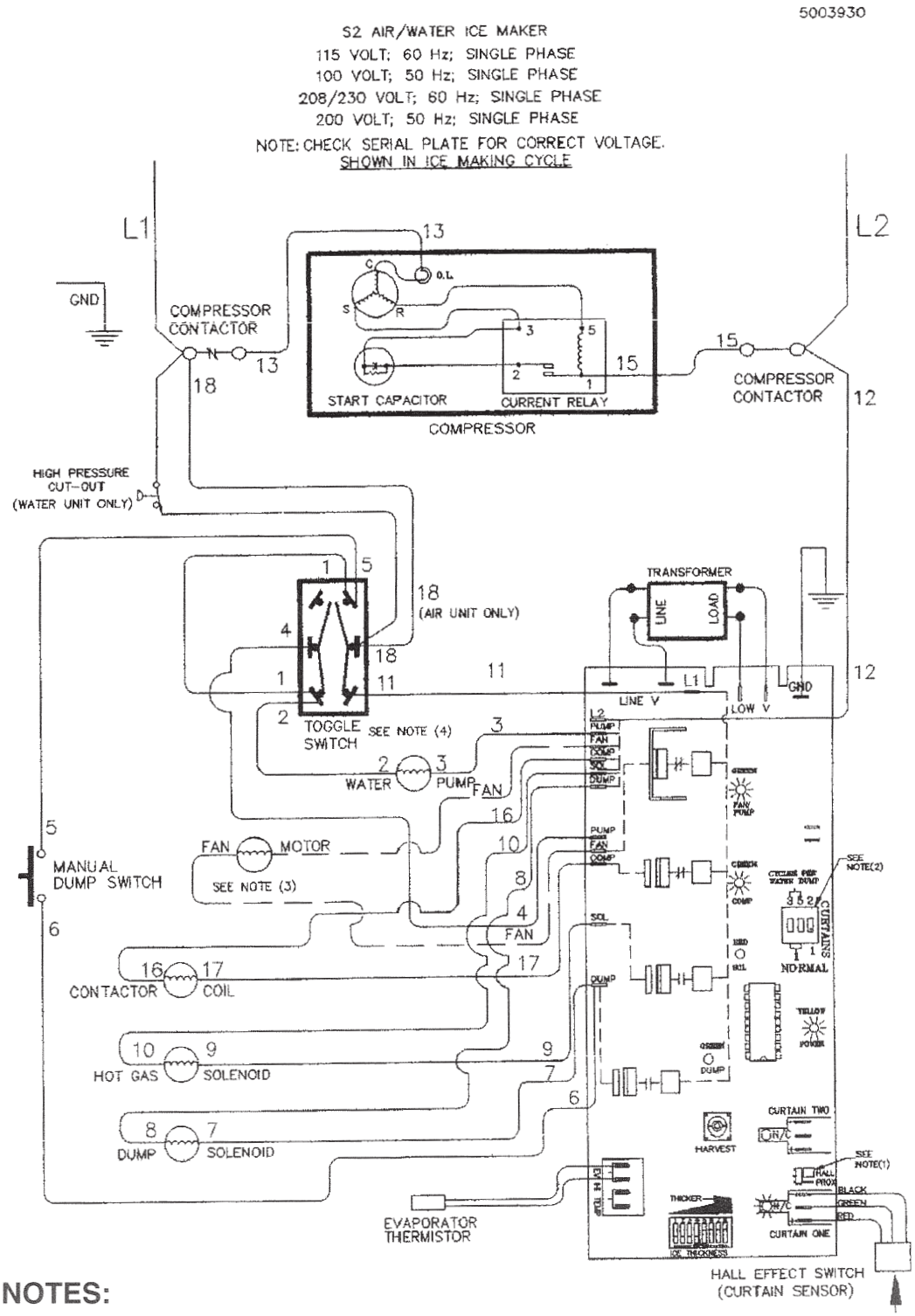
AVERAGE OPERATING CHARACTERISTICS

AMBIENT TEMP. DEGREES	FREEZE CYCLE			HARVEST CYCLE			DESIGNED ICE WEIGHT RANGE	
AIR / WATER	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	HEAD PRESSURE	SUCTION PRESSURE	CYCLE TIME MINUTES	AVERAGE Kg	AVERAGE LB
50/50 F	PSI 231/228	46/33	8.7/10.5	140/130	75/65	1.45/2.5	N/A	9.5
10/10 C	15.93/15.72 Bars	3.17/2.27 Bars	8.7/10.5	9.65/8.96 Bars	5.17/4.48 Bars	1.45/2.5	4.30	N/A
70/50 F	PSI 231/229	46/33	8.8/10.7	140/130	80/70	1.45/2.0	N/A	9.5
21/10 C	15.93/15.79 Bars	3.17/2.27 Bars	8.8/10.7	9.65/8.96 Bars	5.51/4.82 Bars	1.45/2.0	4.30	N/A
80/70 F	PSI 232/228	47/33	10.3/12.0	145/135	85/75	1.20/1.8	N/A	9.5
27/21 C	16.00/15.72 Bars	3.24/2.27 Bars	10.3/12.0	10.00/9.31 Bars	5.86/5.17 Bars	1.20/1.8	4.30	N/A
90/70 F	PSI 232/227	48/33	10.2/12.3	155/145	90/80	1.1/1.7	N/A	9.5
32/21 C	16.00/15.65 Bars	3.31/2.27 Bars	10.2/12.3	10.68/10.00 Bars	6.20/5.51 Bars	1.1/1.7	4.30	N/A
100/90 F	PSI 264/253	52/36	12.6/14.5	175/165	95/85	1.1/1.7	N/A	9.5
38/32 C	18.20/17.44 Bars	3.58/2.48 Bars	12.6/14.5	12.06/11.38	6.55/5.86	1.1/1.7	4.30	N/A

WIRING DIAGRAMS



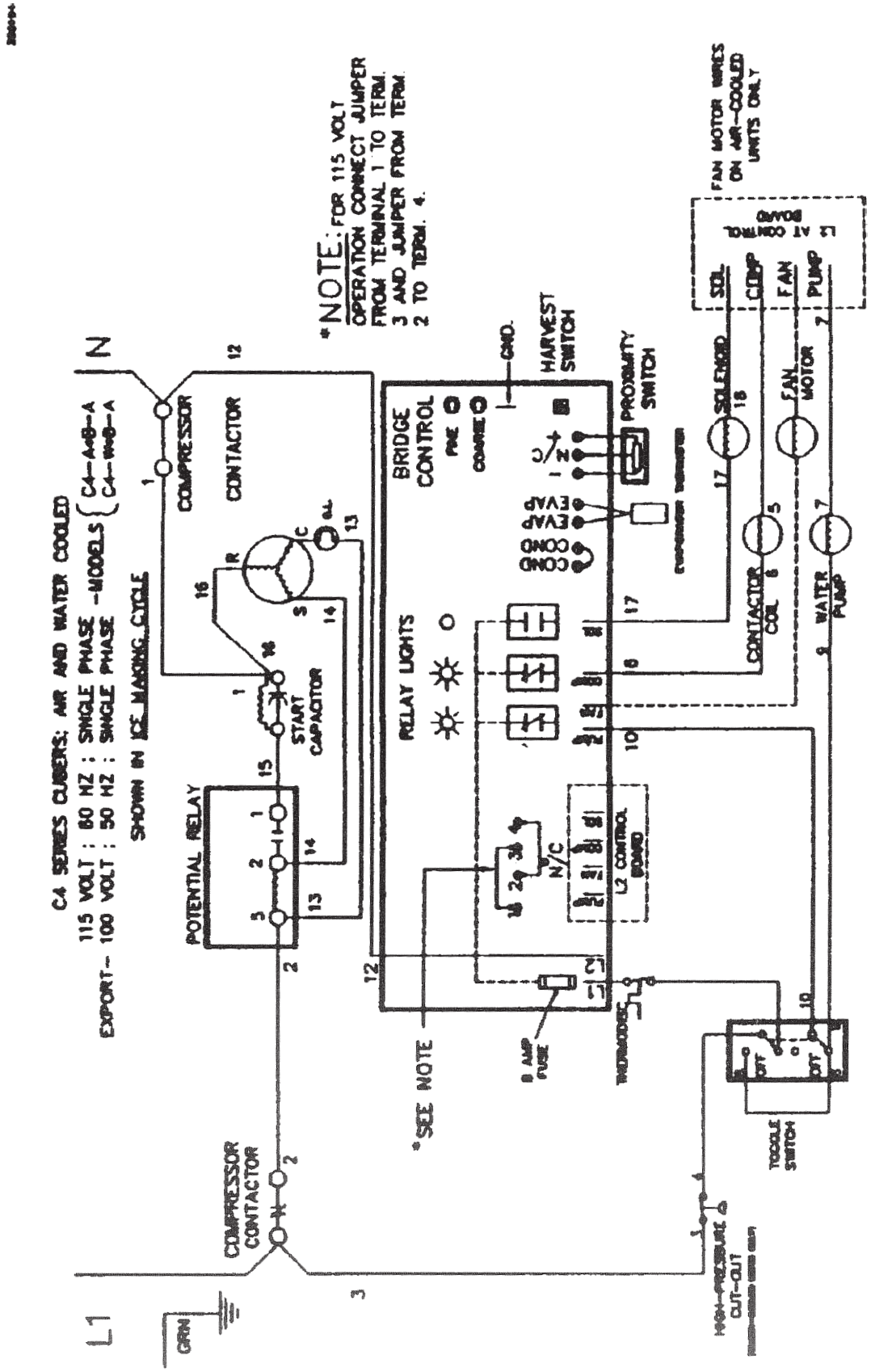
WIRING DIAGRAMS



NOTES:

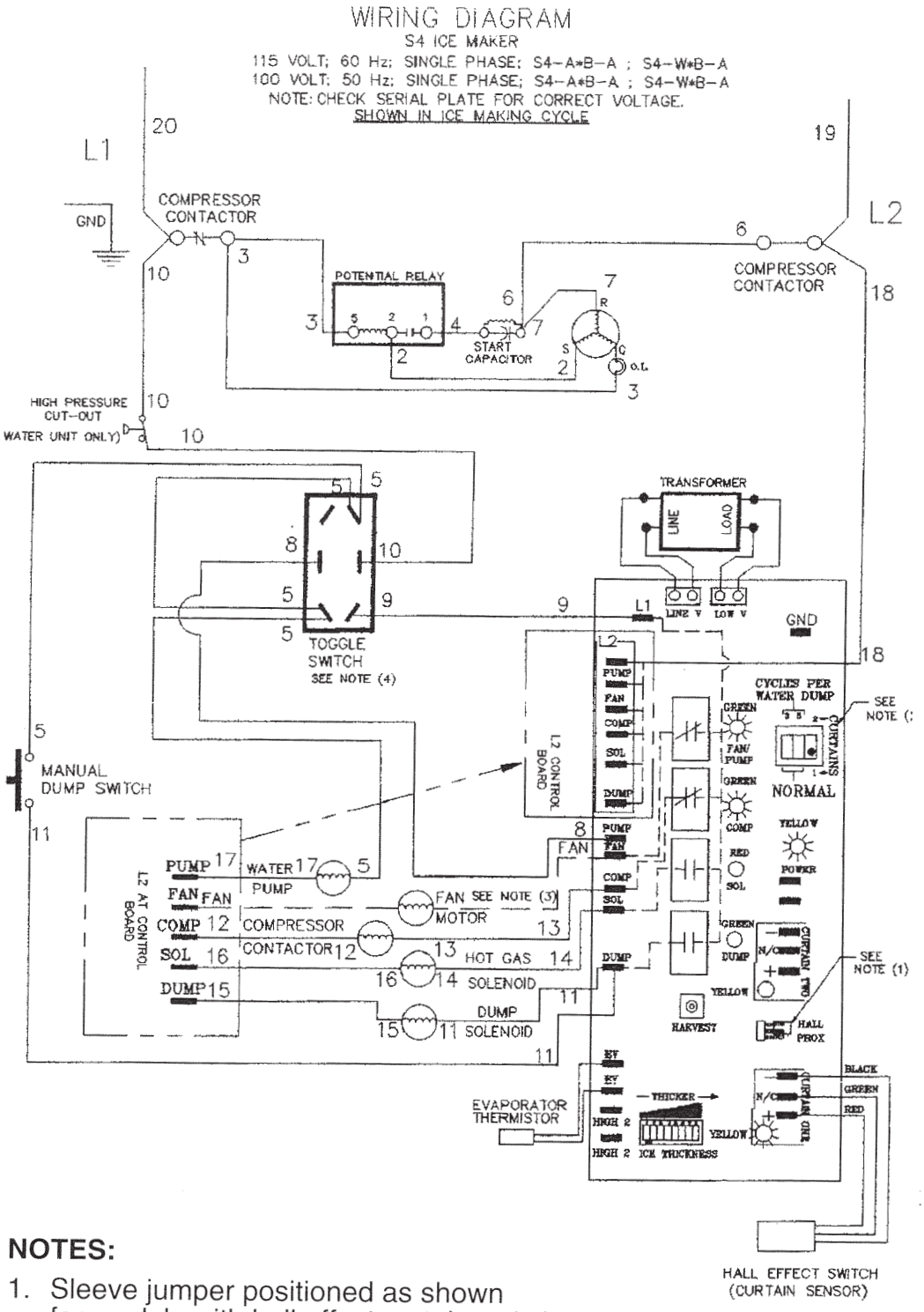
1. Sleeve jumper positioned as shown for models with hall effect curtain switch.
2. DIP switch set as shown for one curtain operation.
3. Fan motor on air-cooled units only. Fan motor wired direct to board.
4. Toggle switch viewed from back of switch.

WIRING DIAGRAMS



WIRING DIAGRAMS

COPELAND COMPRESSORS

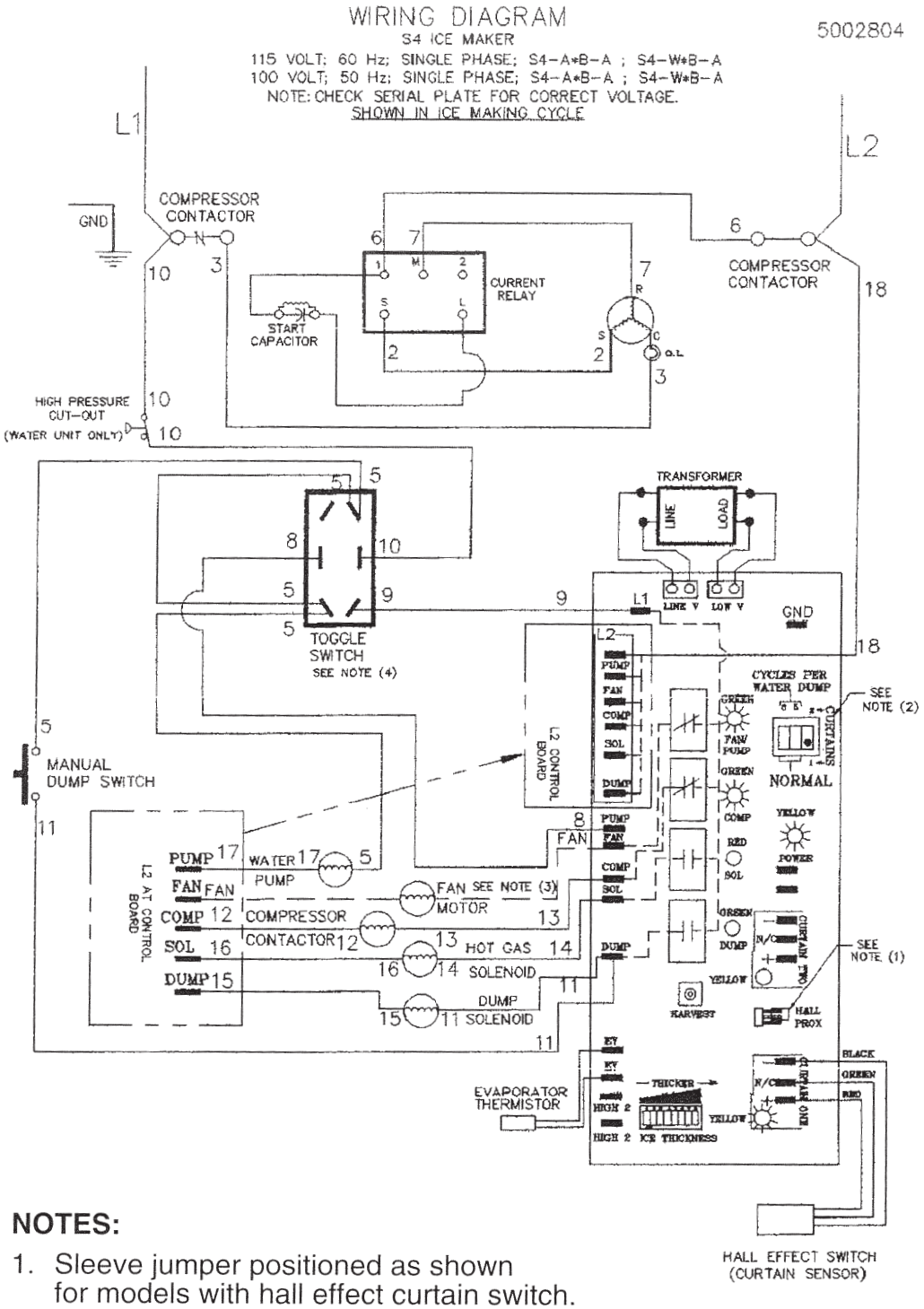


NOTES:

1. Sleeve jumper positioned as shown for models with hall effect curtain switch.
2. DIP switch set as shown for one curtain operation.
3. Fan motor on air-cooled units only. Fan wired direct to board.
4. Toggle switch viewed from back of switch.

WIRING DIAGRAMS

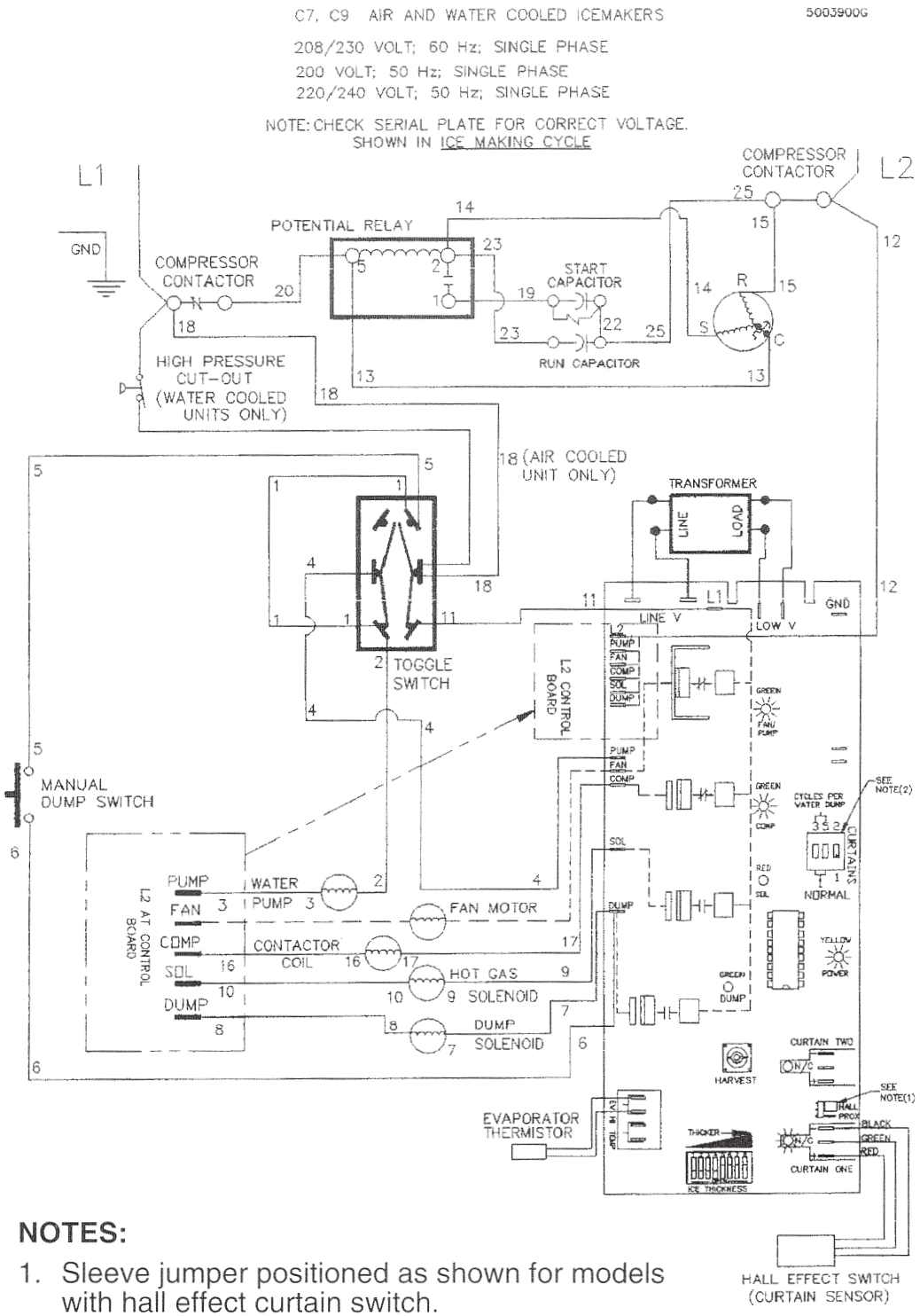
TECUMSEH COMPRESSOR



NOTES:

1. Sleeve jumper positioned as shown for models with hall effect curtain switch.
2. DIP switch set as shown for one curtain operation.
3. Fan motor on air-cooled units only. Fan wired direct to board.
4. Toggle switch viewed from back of switch.

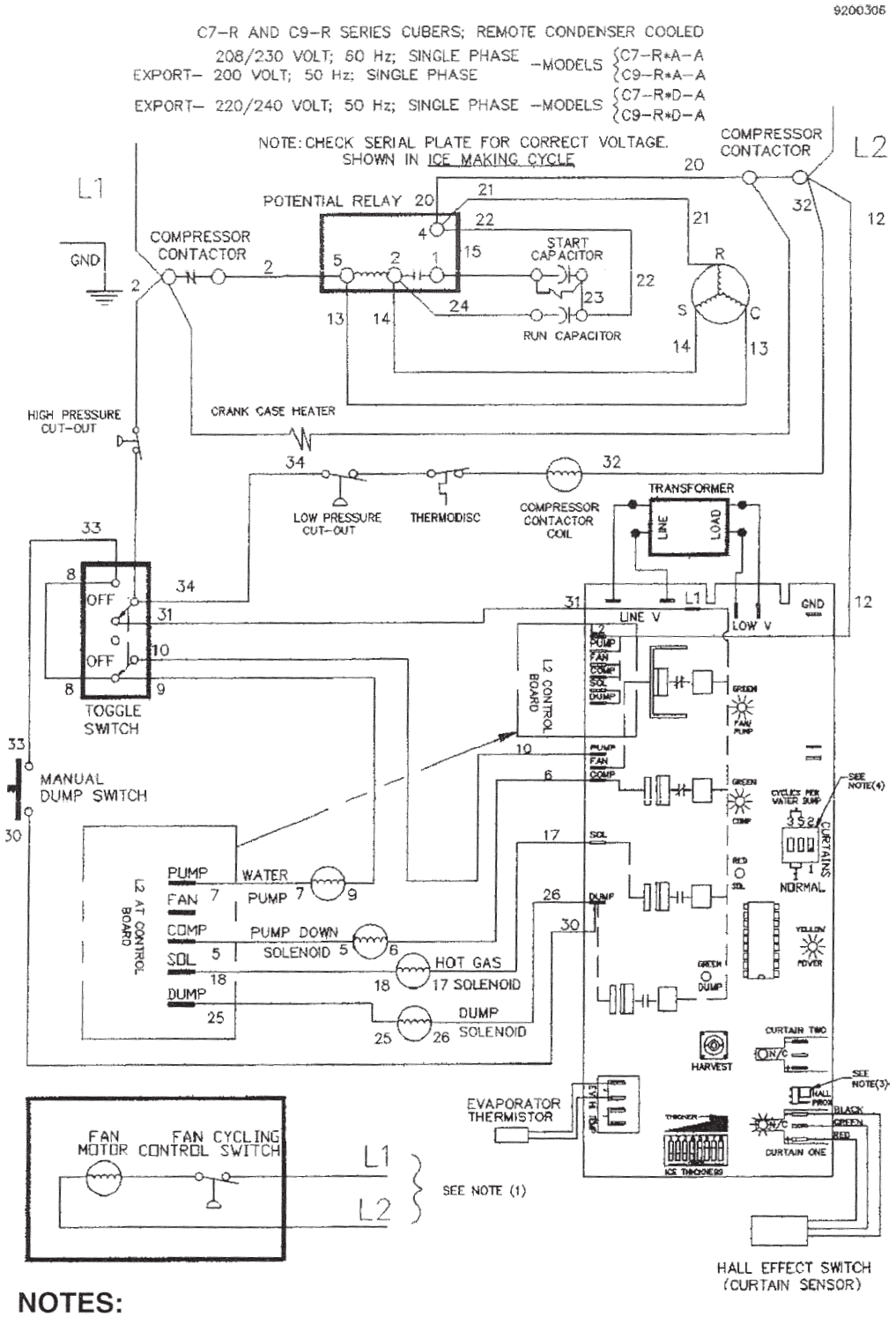
WIRING DIAGRAMS



NOTES:

1. Sleeve jumper positioned as shown for models with hall effect curtain switch.
2. DIP switch set as shown is for one curtain operation.
3. Fan motor on air-cooled units only. Fan wired direct to board.
4. Toggle switch viewed from back of switch.

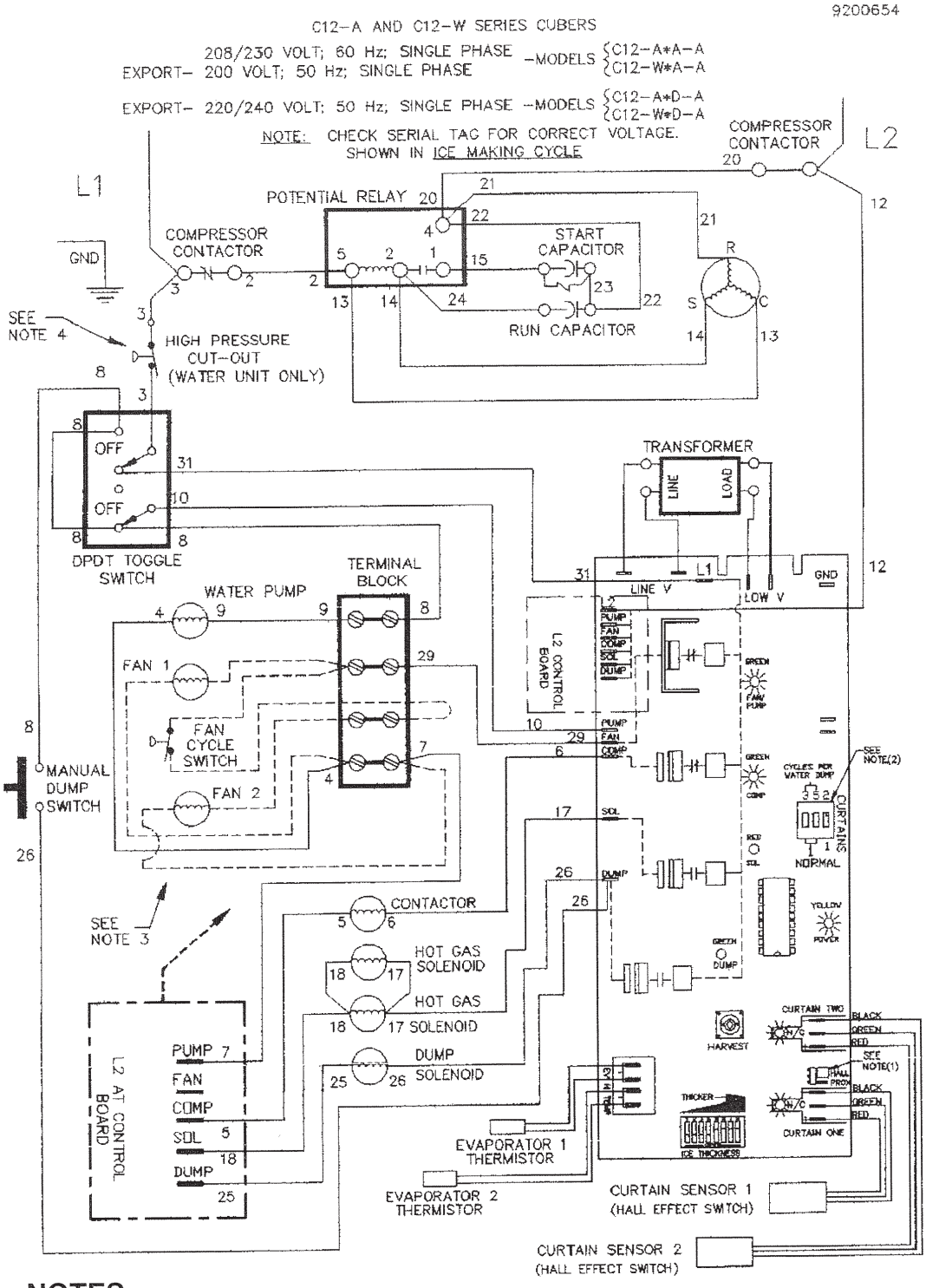
WIRING DIAGRAMS



NOTES:

1. L1 and L2 going to remote condenser will be wired directly to electrical service through a disconnect box.
2. Do not run wires from cuber to remote condenser.
3. Sleeve jumprer positioned as shown for one curtain operation.
4. DIP switch set as shown for one curtain operation.

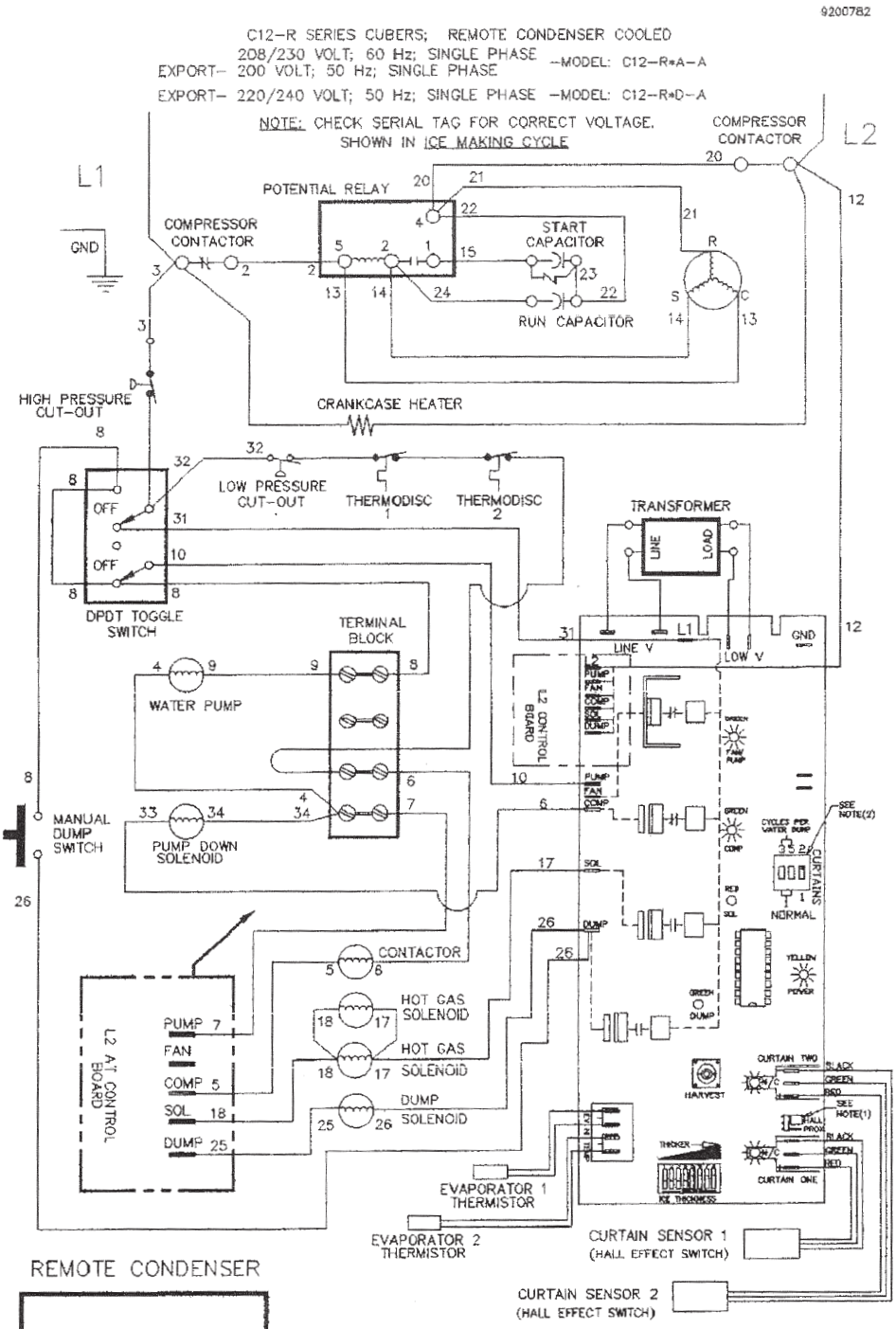
WIRING DIAGRAMS



NOTES:

1. Sleeve jumper positioned as shown is for units equipped with hall effect switches.
2. DIP switch set as shown is for two curtain operation.
3. Fans and fan cycle switch are on air-cooled units only.
4. Wire No. 3 replaces high pressure cut-out switch on air-cooled units only.

WIRING DIAGRAMS



NOTES:

1. Sleeve jumper positioned as shown is for units equipped with hall effect switches.
2. DIP switch set as shown for two curtain operation.
3. L1 and L2 going to remote condenser will be wired directly to electrical service through a disconnect box.

WIRING DIAGRAMS

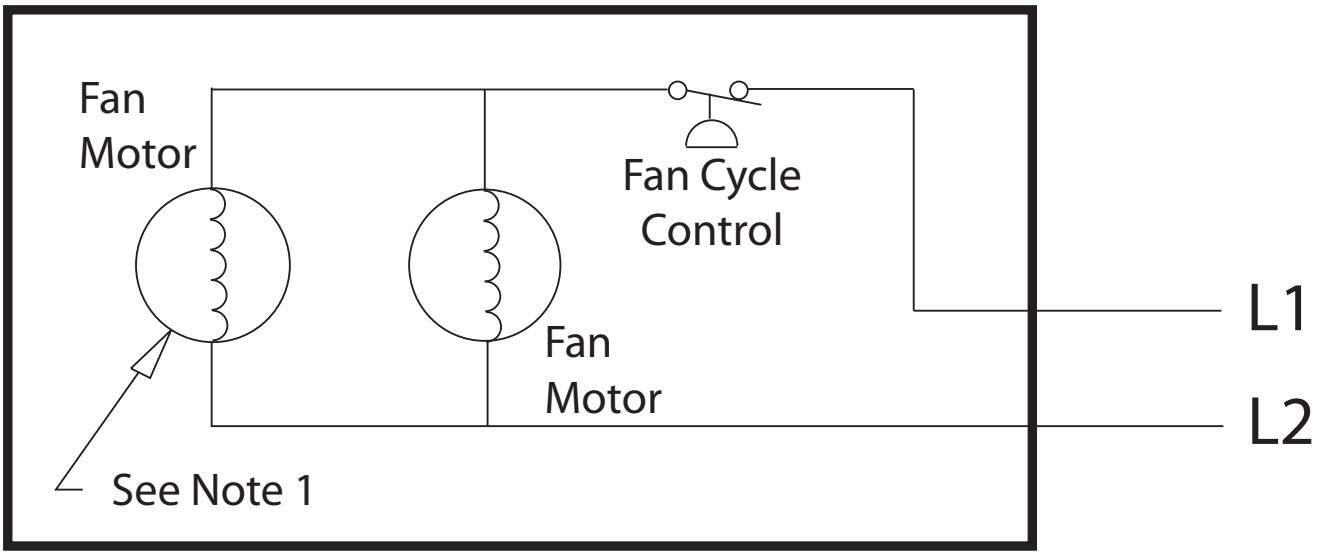
K9-RC, K12-RC, and K18-RC - Remote Condensers

208/230 Volt; 60 HZ Single Phase - MODELS:K9-RCA-A; K12-RCA-A; K18-RCA-A

Export - 200 Volt; 50 HZ; Single Phase - MODELS: (see above)

Export - 220/240 Volt; 50 HZ; Single Phase - MODELS: K9-RCD-A; K12-RCD-A; K18-RCD-A

NOTE: Check Serial Tag for Correct Voltage



NOTES:

1. K9-RC uses only one fan motor.
2. L1 and L2 going to remote condenser will be wired directly to electrical service through a disconnect box.

DO NOT USE

Under Preventative Maintenance

Please post this page in front of dispenser when cleaning system.

INDEX

Manitowoc Beverage Equipment
2100 Future Drive ◆ Sellersburg, IN 47172-1868
Tel: 812.246.7000, 800.367.4233 ◆ Fax: 812.246.9922
www.manitowocbeverage.com

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