VOGT TUBE ICE, LLC
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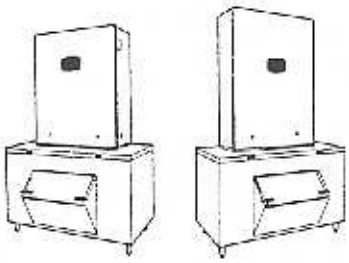
Vogt®

SERVICE MANUAL

and parts catalogue

MODELS 1500 THRU 4000

Tube-Ice® MACHINE



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TUBE-ICE MACHINES

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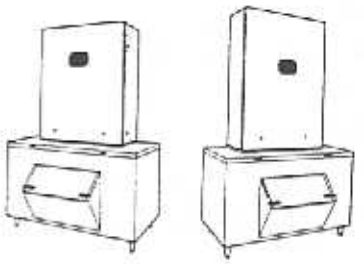
MODELS 1500 THRU 4000



CONTENTS (Continued)

THE HENRY VOGT MACHINE CO.

HAS BEEN BUILDING QUALITY REFRIGERATING EQUIPMENT SINCE 1880. ALL THE SKILL IN ENGINEERING AND FABRICATION THAT NEARLY A CENTURY OF EXPERIENCE HAS TAUGHT IS REFLECTED IN THIS UNIT. SINCE ITS INCEPTION IN 1938, THE TUBE-ICE PROCESS HAS BEEN WIDELY RECOGNIZED AS THE ONLY MODERN MEANS OF PRODUCING SIZED ICE. THE MANY VARIED TYPES OF INSTALLATIONS HAVE PROVEN THE MACHINE'S ECONOMIC AND RELIABLE OPERATION.

FURNISHED WITH EACH MACHINE IS ITS "CERTIFICATE OF TEST" - A SAMPLE SET OF OPERATING DATA WHICH IS A RECORD OF THE UNITS SATISFACTORY OPERATION ON OUR FACTORY TEST FLOOR. IT IS EVIDENCE OF OUR DESIRE TO DELIVER TO YOU THE "FINEST ICE MAKING UNIT EVER MADE".

THIS MANUAL HAS BEEN DESIGNED TO ASSIST YOU IN THE SETTING, STARTING AND MAINTENANCE OF THE UNIT. YOUR TUBE-ICE MACHINE WILL GIVE A LIFETIME OF SERVICE IF REASONABLE INSPECTION AND ATTENTION IS PROVIDED AND THE SUGGESTIONS IN THIS MANUAL ARE CAREFULLY READ AND FOLLOWED.

PRINCIPLE OF OPERATION

The operation of the machine is controlled by the on-off/thaw switch (10) located in the control panel of the freezing unit. The operation is also controlled by the Ice Bin Thermostats which will automatically stop and start the Freezing Unit by the level of the ice in the Storage Bin (NOTE - See "ERECTION" for instructions on installation of the Control Bulb of the Ice Bin Thermostats). The type ice produced (cylinder or crushed)is determined by the position of the Ice Selector Switch (9) located inside the Control Panel. The Control Panel is arranged so that the unit will stop only upon the completion of a thawing period whether by action of the "ON-OFF/THAW" Switch or the Ice Bin Thermostats.

The "Ice-Clean" Toggle Switch (99) must always be set on the "ICE" position during normal ice-making operation. It is set on the "CLEAN" position only when the equipment is to be cleaned as outlined in the "Cleaning Procedure" instructions attached to the machine.

If it should become necessary to instantly stop the machine, either the external disconnect switch or one of the circuit breaker switches (#62 or #63) in the Control Panel may be turned "off".

Figure 1 illustrates the piping diagram of the refrigerant and water system of the Tube-Ice Machine, with numbers for easy reference. (Page 4)

The Freezer (2) is a shell and tube type vessel. During the freezing period, water is constantly recirculated through the vertical tubes of the freezer by a Centrifugal Pump (6). Makeup water is maintained by a Float Valve (12) in the Water Pan (7). Solenoid Valve (20) is open and Solenoid Valve (18) is closed.

Refrigerant gas from the top of the freezer passes through the Heat Exchanger (13) to the Compressor (3) which discharges it into the Condenser-Receiver (15 or 15R). Liquid refrigerant from the Condenser-Receiver flows through the Thawing Chamber (16) of the Freezer, the Drier (46), the Heat Exchanger (13), the Expansion Valve (17) and into the Freezer, thereby completing the freezing circuit.

At the completion of the freezing period, thawing is started by action of the Pressure Switch (56) in the Control Panel and Solenoid Valve (18) is opened. The Water Pump (6) is stopped and the Ice Cutter (21) is started. Hot gas from the condensing system is discharged into the freezer through valve (18), thereby slightly thawing the ice which drops on the Rotating Cutter for sizing.

Cylinder Ice will be discharged through the right half-section of the Ice Discharge Chute when viewing the Tube-Ice Machine from the front (Control Panel). Crushed Ice will be discharged through the left half-section of the Ice Discharge Chute.

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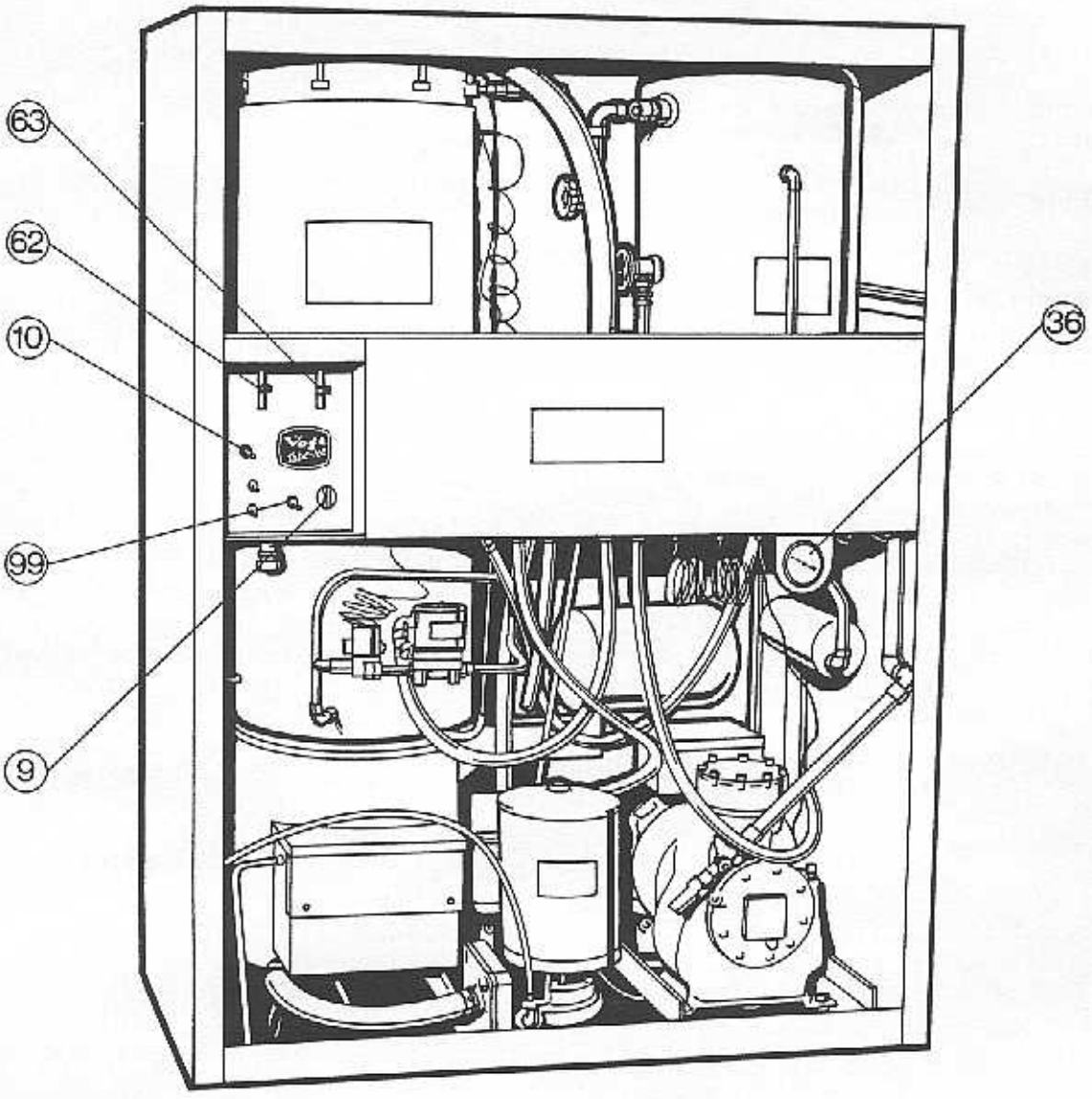
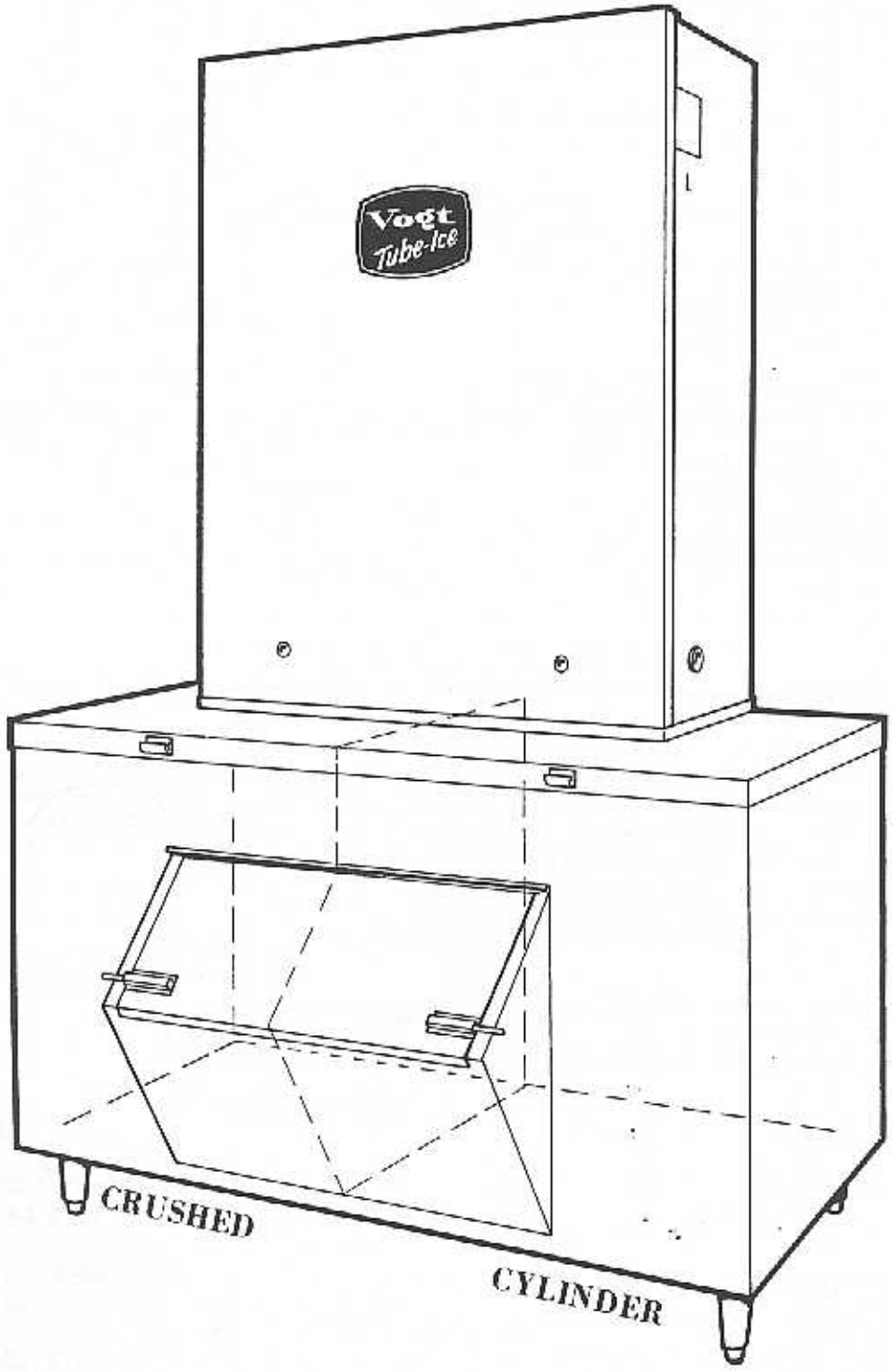


SHOWN WITH FRONT PANEL REMOVED

(9) Ice Selector Switch (Crushed/Auto/Cylinder)
(10) On-Off/Thaw Switch
(36) Condenser Pressure Gauge
(62) Circuit Breaker Switch (for Cutter Motor)
(63) Circuit Breaker Switch (for Pump Motor)
(99) Ice/Clean Switch

Vogt®

Tube-Ice® MACHINE

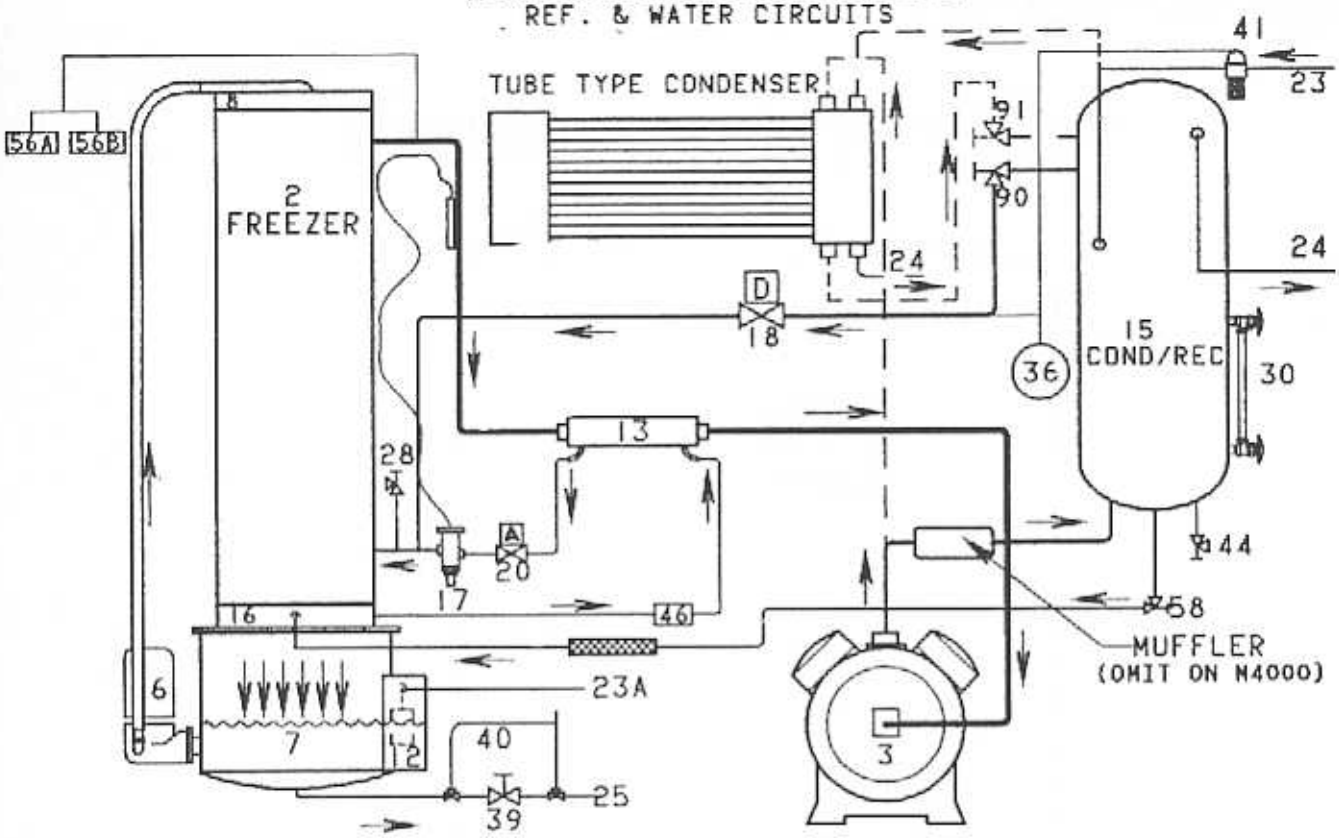


SHOWN ON TYPICAL ICE STORAGE BIN

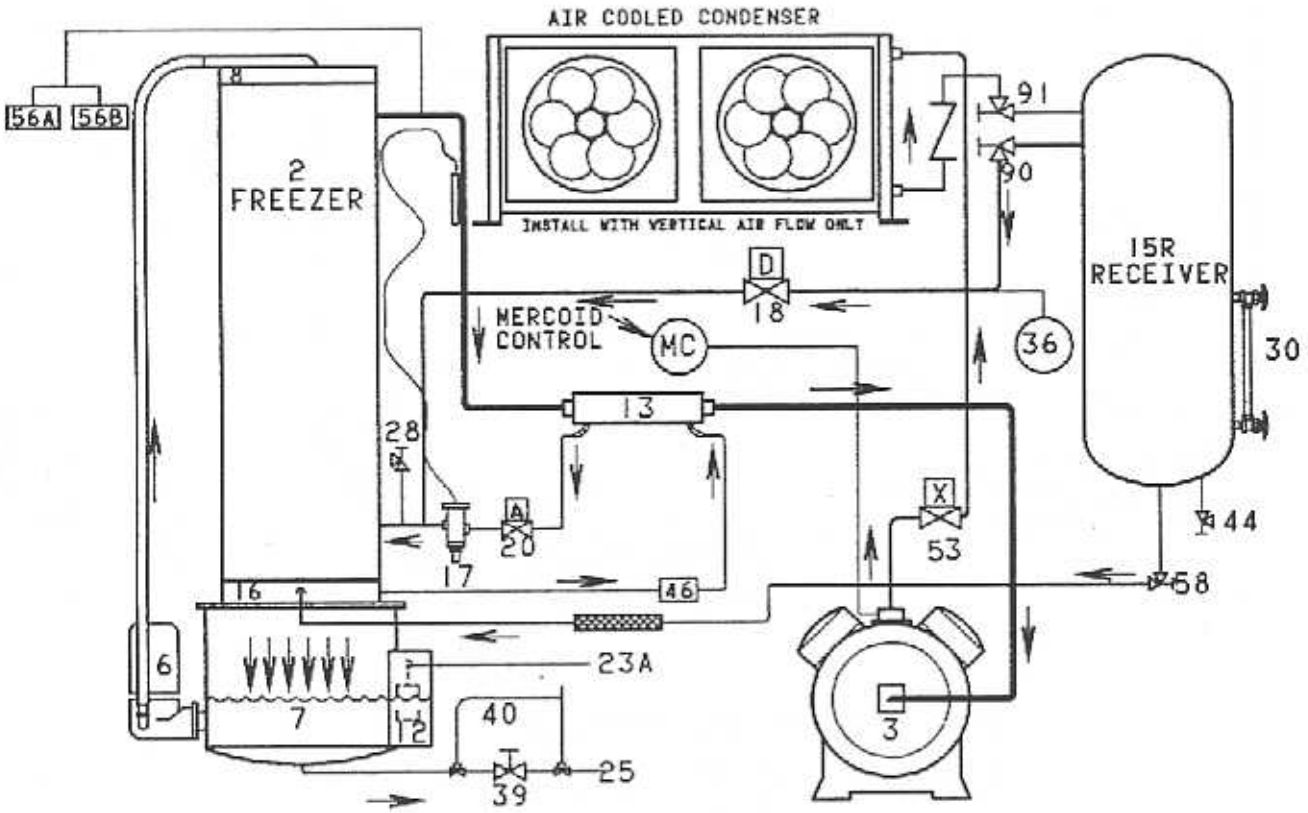
See page 54 for location thermostat bulbs.
See page 16 for adjustment of thermostats.

PIPING DIAGRAMS

REF. & WATER CIRCUITS



WATER COOLED



AIR COOLED

FIGS. 1

ADJUSTING & STARTING MACHINE

ERECTION

General Installation instructions are shipped attached to the front of each unit and are duplicated in this manual between pages 5 and 7.

A chart on Page 10 has been provided that includes shipping weights, operating weights, refrigerant charge, etc., for each size machine.

A level solid footing should be provided on which to set the machine. Four feet for the Ice Storage Bin, which have been removed for shipping purposes and placedinside the bin, should be screwed into the bottom of the bin. These feet may be used as leveling screws if the necessary adjustment is minor.

The Ice Storage Bin should be positioned at its ultimate location and the Freezing Unit elevated and placed inside the ledge formed by the top of the bin. The ice discharge chute and the opening into the storage bin must be sealed against entrance of any contamination. The top of the bin also serves as a drip pan to collect and drain any condensate that accumulates during normal operation of the equipment. The condensate drain connection is located at the rear top of the bin.

Two opposed top corners of the freezing unit are provided with 9/16" holes and eyebolts are provided for handling the machine during erection.

There are two thermal shut-off switches (or Ice Bin Thermostats) located inside the Control Panel of the Freezing Unit. The Control Bulb of each switch should be snapped into the bracket in the Storage Bin before starting the unit. These switches will stop the machine (upon completion of the thawing period) when the bin is full of ice and automatically start it again when ice is removed from the bin. Refer to the section ICE BIN THERMOSTATS for detailed instructions and adjusting these switches.

AIR-COOLED UNITS

The Freezer Unit and the Air-Cooled Condenser are shipped separately and it is necessary to complete the refrigerant piping and electrical wiring between the two after installing them at their ultimate location.

The Air-Cooled Condenser may be mounted as shown in drawing depicted on Page 9 and placed at the nearest convenient location having adequate air supply for condensing purposes. Remove the blind flanges on the Compressor Discharge and Liquid Lines of the freezing unit and pipe these lines to the connections on the Air-Cooled Condenser (Max. Distance 50 ft.)

Open the stop valve in the Liquid Line between the Receiver and the Air-Cooled Condenser. This applies refrigerant pressure to the lines connecting the Air-Cooled Condenser to the freezing unit. If all connections are checked and found tight, close the stop valve at the Receiver and release the test pressure thru the gage port on the Compressor Discharge Service Valve (45).

With stem of Compressor Discharge Service Valve at half-open position, connect a vacuum pump at the gage port and evacuate air from the Air-Cooled Condenser after which the Compressor Valve should be back seated and the vacuum pump removed.

The electrical leads of the Air-Cooled condenser Fan Motor are to be connecting to Terminals 27 and 29 in the Control Panel of the freezing unit.

INSTALLATION INSTRUCTIONS

VOGT TUBE-ICE MACHINES MODELS 1500, 1800, 2500, 3000 & 4000

Having removed shipping carton and shipping braces, read instructions carefully before installing Tube-Ice Machine.

I. Set ice storage bin in proper location and level, except when using installation method "B" listed below.

II. Remove the four (2) bolts securing unit to shipping skid.

III. Set unit in position on ice storage bin. The following are four suggested methods

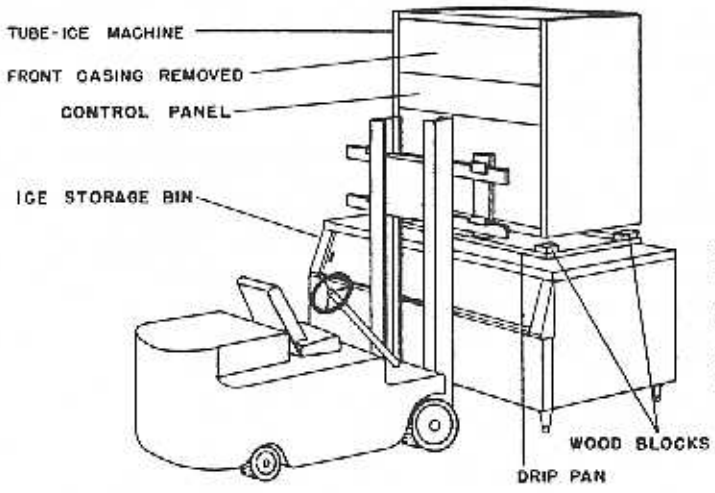


FIGURE 2

A. Method "A" requires the following materials:

1 - Forklift truck with adequate load and height capacities.
8 - Wood blocks 2" thk. (4" sq. recommended).
2 - Wood 2" x 4" x 3'-0" lg.
2 - Pry bars.

1. Position Tube-Ice Machine on forks, exercise caution with this procedure and keep in mind that unit is somewhat top heavy to the front.

2. Stack two (2) blocks of wood in each of the four (4) drip pan corners.

3. Set the Tube-Ice Machine directly above drip pan on wood blocks.

4. Remove fork truck.

5. Stack 2 x 4's beside drip pan overlapping front and back of bin.

6. Using pry bar with fulcrum on 2 x 4's, raise side of machine enough to remove top wood blocks. (Don't remove top and bottom blocks at same time).

7. Repeat steps 5 and 6 on other side.

8. With machine sitting on one (1) block under each corner, repeat steps 5, 6, and 7.

9. Last step will bend drip pan flanges which will require straightening.

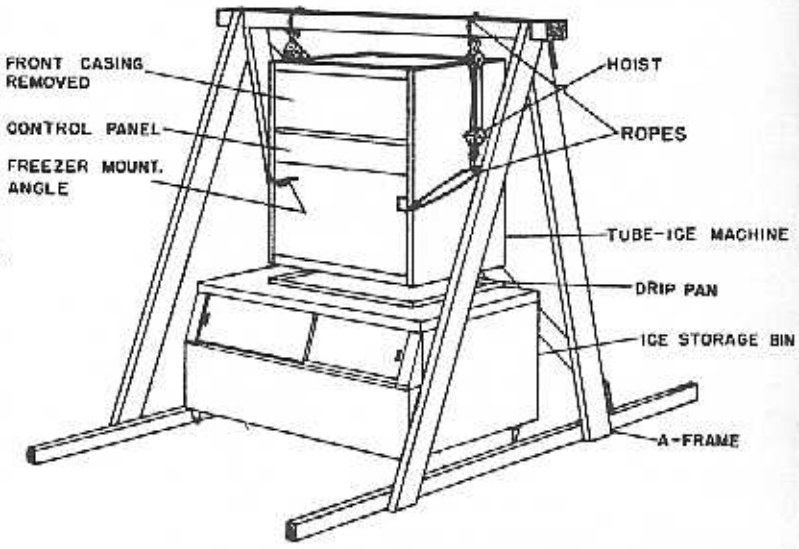


FIGURE 3

B. Method "B" requires the following materials:

(One)-"A" frame with adequate load and height capacities.
(Two)-Hoists having adequate lift capacity and method of attaching to "A" frame.
(Two)-Nylon slings or ropes long enough to fasten around side casing.

1. Position machine in proper location.

2. Hoist machine high enough to slide bin under it.

3. Position and level bin under machine.

4. Slowly lower machine on bin.

5. Remove "A" frame and slings.

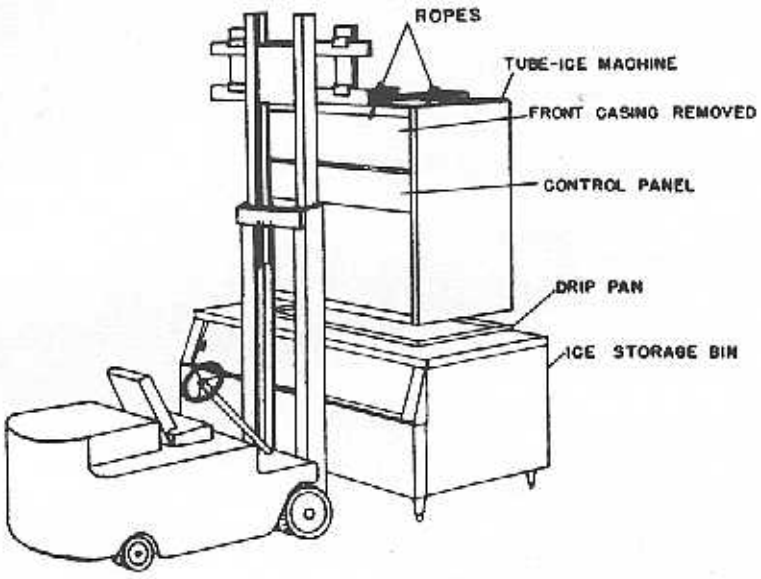


FIGURE 3

C. Method "C" requires the following materials:

1 - Forklift truck with adequate load and height capacities.
4 - Ropes to bind forks to top angles.

1. Set bin in proper location and level.

2. Position fork truck so that forks are resting flat on top angles of Tube-Ice Machine.

3. Using the rope, securely bind forks to the top angles.

4. Set Tube-Ice Machine into drip pan of bin.

5. Remove rope and fork truck.

D. In top diagonal corners of the machine we have provided holes for attaching lifting devices when a crane or other overhead lifts can be used.

IV. Connect water supply lines (see drawing E-48506 attached).

A. 3/8" I.P.S. make-up water inlet.

B. 1/2" I.P.S. condenser water inlet. (Water cooled units only)

V. Connect drain lines (see page for location.

A. 1/2" I.P.S. water tank overflow and drain.

B. 1/2" I.P.S. condenser water outlet. (Water Cooled units only)

C. Separate lines are required to open sewer.

VI. Connect ice bin drains (see Bin Instructions).

VII. Install the two (2) ice bin thermostat bulbs (coiled under Control Panel with instruction tags attached) into the brackets provided in the bin.

VIII. Connect proper electrical current.

IX. Position Air-Cooled Condenser at the proper location. (Air-Cooled Units only)

X. Connect discharge and liquid return lines between the machine and the condenser. (Air-Cooled Units only)

XI. Apply adequate vacuum on condenser and interconnecting piping to effect proper dehydration. (Air-Cooled Units only)

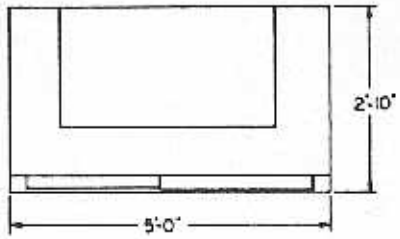
XII. Connect electrical wiring to condenser as required. (Air-Cooled Units only)

XIII. Position remote panel and connect wiring to machine control panel (Remote Control Units Only)

XIV. Refer to Page 13 for start-up procedure.

E-48506

REVISION RECORD					
NO.		DATE	FROM	TO	BY
1	A	3-3-76	REDRAWN		

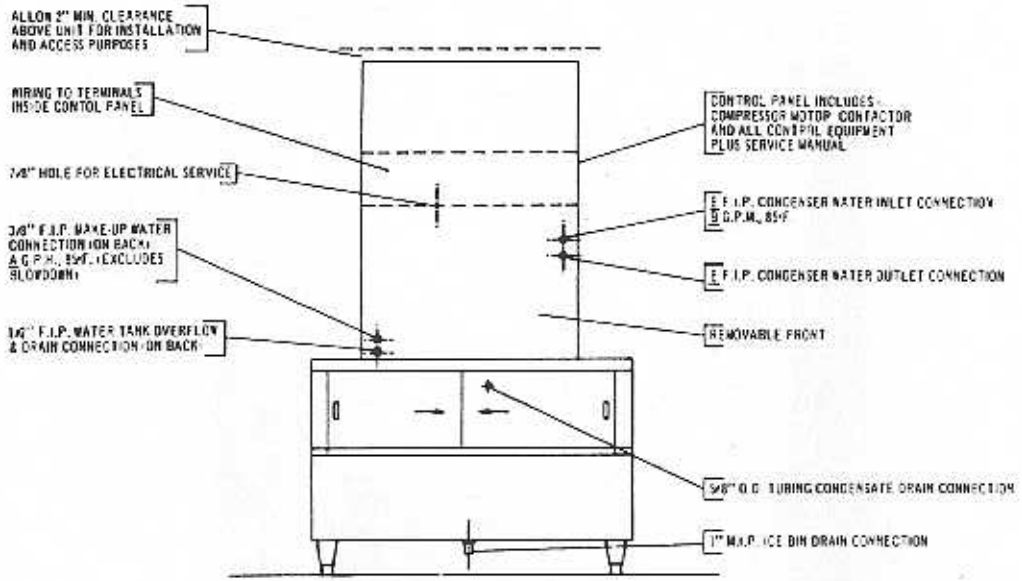


PLAN

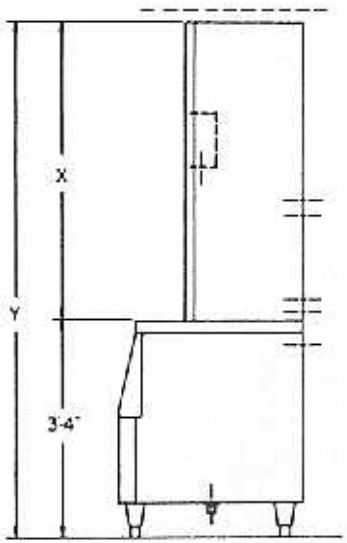
	MODEL 1500	MODEL 1500	MODEL 2500	MODEL 3000	MODEL 4000
X	3'-5"	4'-5"	5'-6"	6'-6"	8'-5"
Y	1'-10"	2'-10"	3'-10"	3'-10"	5'-10"
Z	7.0	8.0	11.0	13.2	16.0
W	4.2	5.1	6.5	8.0	11.8
K	1½"	1½"	1½"	1½"	3/4"

PLUMBING NOTE:
INDIVIDUAL LINES TO OPEN SEWER ARE REQUIRED FOR CONDENSER WATER OUTLET & DRAINS.

ELECTRICAL NOTE:
FUSED SWITCH BOX (OR BOXES) SHOULD BE MOUNTED ON WALL NEAR TUBE-ICE MACHINE.



FRONT



SIDE

HENRY VOGT MACHINE CO.
LOUISVILLE, KY.

SPACE DIAGRAM
VOGT TUBE-ICE MACHINES
WITH
TYPICAL ICE STORAGE BIN

DRAWN BY
CHECKED BY
CHIEF ENG.
DATE: DEC. 19 1972
SCALE: NONE

E-48506 | REV. NO. | 3-3-76 | E-48506

WATER COOLED UNITS

E-49659

REVISION RECORD					
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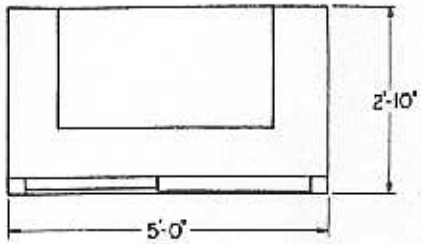
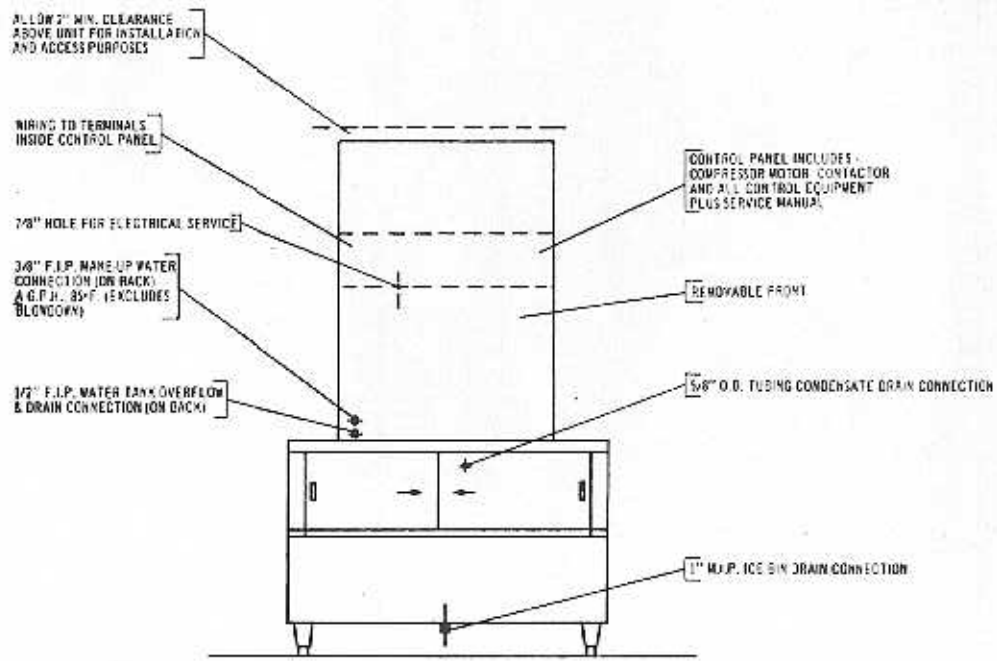


PLAN

	MODEL 1500	MODEL 2500	MODEL 2500	MODEL 3020	MODEL 4500
X	4'-2"	4'-5"	5'-5"	4'-6"	5'-6"
Y	7'-10"	7'-10"	8'-1"	7'-10"	8'-10"
C	7/8	7/8	1 1/8	1 3/8	1 5/8
* C	5/8"	5/8"	7/8"	1 1/8"	1 1/8"
* O	5/8"	5/8"	7/8"	1 1/8"	1 1/8"

ELECTRICAL NOTE:
FUSED SWITCH (MOTOR BOXES) SHOULD BE MOUNTED ON WALL NEAR TUBE-ICE MACHINE.

* REFRIGERANT PIPING NOTE:
IF DISTANCE FROM TUBE-ICE MACHINE TO A-F AIR-COOLED CONDENSER EXCEEDS 50 FEET CONTACT TUBE-ICE ENGINEERING DEPARTMENT FOR SPECIAL LINE SIZING



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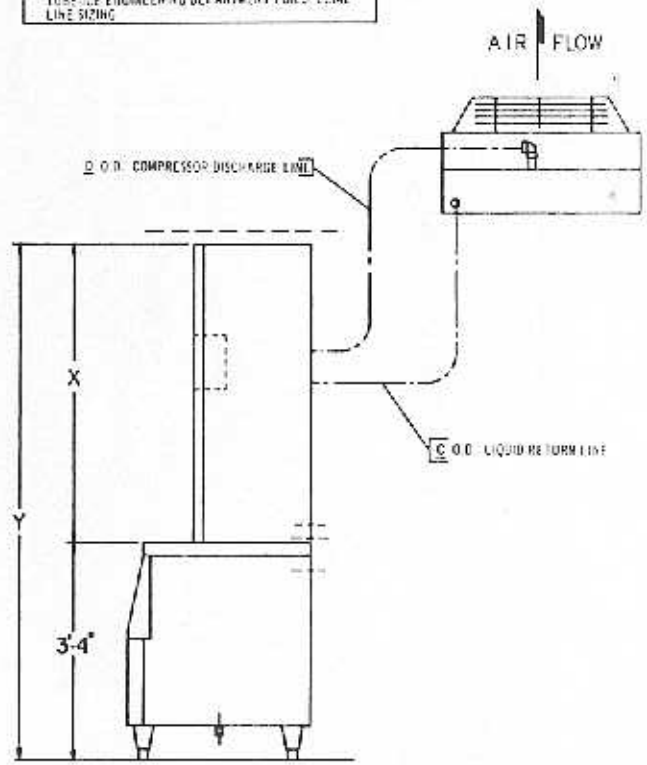


SIDE

HENRY Vogt MACHINE CO.
LOUISVILLE, KY.

SPACE DIAGRAM
VOGT TUBE-ICE MACHINES
WITH
TYPICAL ICE STORAGE BIN

DRAWN BY: [illegible]
CHECKED BY:
CHIEF ENG.:
DATE: MAR. 4, 36
SCALE: NONE

E-49659 | REV. NO. | E-49659

AIR COOLED UNITS

VARIOUS WEIGHTS IN LBS.

		1500	1800	2500	3000	4000	#800 BIN
MACHINE (with R-12)	W/C	1060	1105	1270	1195	1480	325
	A/C	1070	1115	1280	1205	1490	--
CRATE	Domestic	65	65	65	65	65	75
	Export	115	115	135	115	135	205
R-12 Charge	W/C	70	70	85	70	85	--
	A/C	80	80	95	80	95	--
OPERATING WEIGHT	W/C	2275	2322	2375	2402	2710	Incl.
	A/C	2175	2222	2275	2302	2610	Incl.
CONDENSER	A/C	125	125	185	185	310	--

FIG. 15

NOTE:
Installations with remote air cooled condensers require an additional R-12 charge. The amount to be added varies proportionately to the actual distance from the machine to the condenser. Add only enough volume to be contained in the additional liquid line.

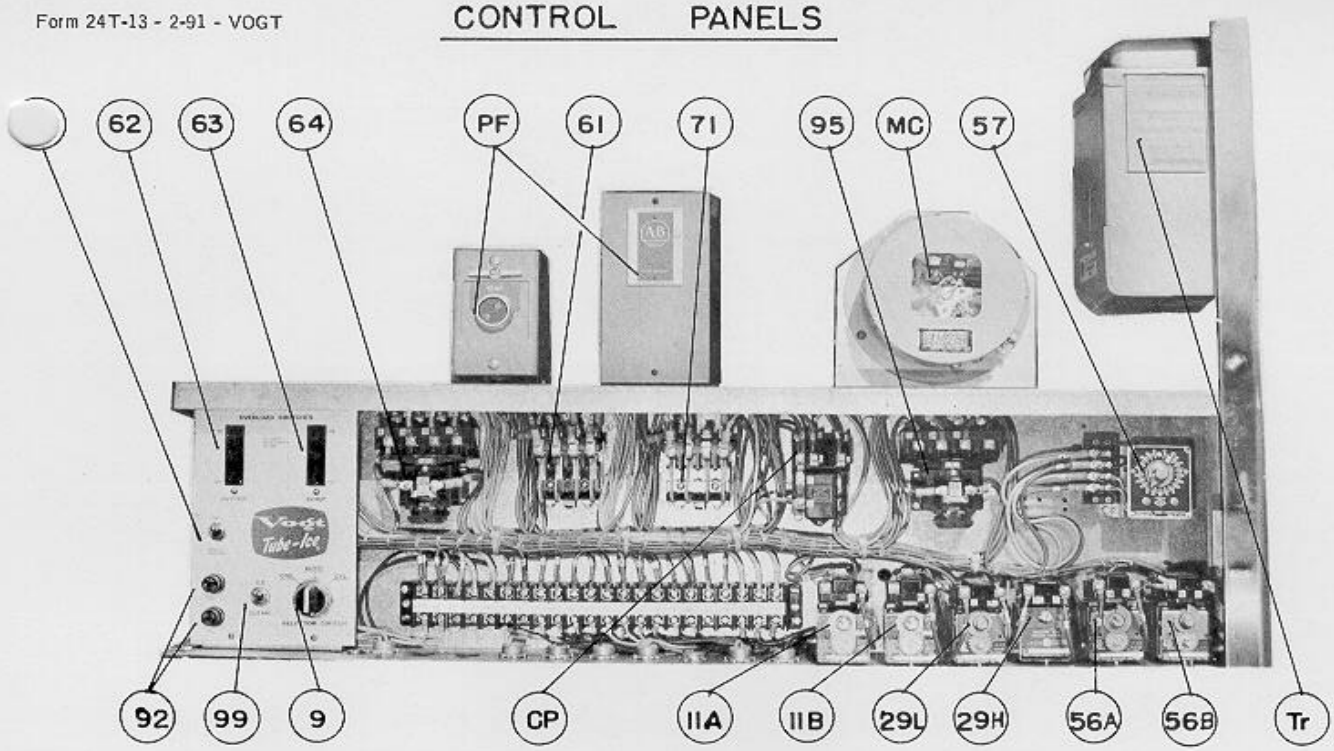
EQUIVALENT FEET DUE TO VALVE AND FITTING FRICTION								
NOMINAL PIPE SIZE COPPER TUBE; O.D., Type "L"		1/2	1/2 5/8	3/4 7/8	1 1-1/8	1-1/4 1-3/8	1-1/2 1-5/8	2 2-1/8
Globe Valve (Open)		14	16	22	28	36	42	57
Angle Valve (Open)		7	9	12	15	18	21	28
Close Return Bend		2	4	5	6	9	10	13
90° Turn Through Tee		3	4	5	6	8	9	12
Tee (Straight Through) or Sweep Elbow		.75	1	1.5	2	2.5	3	3.5
90° Elbow or Reducing Tee (Straight Through)		1	2	2	3	4	4	5

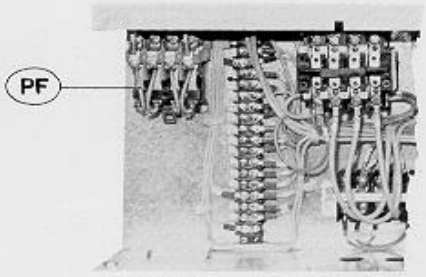
The sum of the actual feet distance and the equivalent feet may not exceed 50 feet.

M1500 thru 4000 Control Panel Layout

Form 24T-13 - 2-91 - VOGT

CONTROL PANELS





MACHINE PANEL FOR REMOTE CONTROLS

REMOTE CONTROLS

9) Selector Switch for production of either cylinder or crushed ice.

10) On-Off/Thaw Toggle Switch for manually starting, stopping and thawing machine.

11) Ice Bin Thermostat, for automatically stopping and starting the machine from the ice level in the storage bin (11A - Crushed Ice, 11B - Cylinder Ice.) For adjustment, see Service Manual.

29) Safety Pressure Switches, to shut machine down in the event of unusual pressure condition (29L - Low Pressure Switch. 29H - High Pressure Switch.) For adjustment, see Service Manual.

56) Freezer Pressure Switch, for regulating freezing period (56A - Crushed Ice, 56B - Cylinder Ice). For adjustment, see Service Manual.

57) Thawing Timer (T), for regulating thawing period.

61) Relay (CR) for making and breaking various circuits concerned with freezing and thawing.

62) Circuit Breaker (S1), for cutter motor.

63) Circuit Breaker (S2), for water pump motor.

64) Compressor Motor Contactor (C).

71) Reversing Relay (R) for making and breaking various circuits concerned with freezing cylinder and crushed ice.

92) Fuses for compressor crankcase heater and various operating coils - Buss AGC glass type, 1 amp., 250v., or equal.

95) Control Circuit Contactor (CC) for making and breaking control circuit.

99) Ice-Clean Toggle Switch for manually setting controls for ice-making or equipment cleaning operation. Set switch to "ICE" position for normal ice-making. See "Cleaning Procedure" for equipment cleaning instructions.

MC) Mercoid Control for condenser fan (air cooled machines only).

CP) Condenser Fan Motor Contactor (air cooled machines only).

PF) Power Failure Relay (when supplied).

TR) Transformer (when required).

WATER AND DRAINS

There are four water connections on the freezing unit of water cooled machines and two water connections on air-cooled machines. All connections are located at the rear of the unit and consist of the following:

On Freezing Unit (Rear Left Corner) The 3/8" FPT connection (23A) is the water inlet for ice making.

The 1/2" FPT connection (25) is the Water Pan Drain and includes the overflow and automatic blow-down connection (40).

On Freezing Unit (Rear Right) Water Cooled Machines Only.

The lower connection (24) is the condenser water outlet.

The top connection (23) is the water inlet for the condenser. These connections are 3/4" FPT on M4000 and are 1/2" FPT on the other units.

(Exterior shutoff valves must be provided in the water inlet lines. The minimum inlet water pressure for satisfactory operation of the machine is 30 psi).

On Storage Bin - (Typical) Top 5/8" O.D. PVC tubing connection is the condensate drain.

Bottom 1" MPT connection is bin drain.

The Condenser Water Outlet, Water Pan Drain, Condensate Drain and Ice Storage Bin Drain connection must be extended to a floor drain or sump and arranged for visible discharge. These lines must NOT be connected into a pressure tight common header due to the possibility that warm condenser water may back up into either the water pan or the Ice Storage Bin.

REFRIGERANT CHARGE

Included with the machine is the required charge of Refrigerant-12 which has been isolated in the Condenser-Receiver (#15 or 15R) (See CHART ON PAGE 10). Before shipment, the compressor service valves #34 and #45, the Hand Stop Valve #90 in the thawing gas line, and the Hand Stop Valve #58 in the Liquid Line from the Condenser-Receiver have been closed. These four (4) valves are tagged with instructions to open valves prior to start-up of machine. Also Valve #91 in the thawing gas line of Air-Cooled Machines must be opened.

Before opening these valves it is advisable to check all joints for leaks which may have developed during shipment. If no leaks are present the "HIGH SIDE" pressure gage #36, located below the Control Panel, should indicate a pressure corresponding to the ambient temperature. If it should ever become necessary to add refrigerant to the system, charging valve #28 is provided for the purpose.

The refrigerant level should be checked after the machine has operated for a few cycles. It should be slightly above the operating level, as indicated on the Condenser-Receiver, a few minutes prior to start of a thawing period. If this level is low at this time, sufficient refrigerant should be added to the system to raise the level above this point. Add only a small quantity (5# or less) at a time and operate the machine several cycles to check the level before adding additional refrigerant.

When charging refrigerant into the unit it is important that no air or other non-condensible gases enter the system. The charging line should be purged by "cracking" the flare connection at charging valve #28 to allow a small amount of refrigerant from the refrigerant shipping cylinder to escape through the charging line. Tighten flare nut, open charging valve and charge unit as required.

When adding refrigerant to the system, it may also be necessary to add lubricating oil. See - LUBRICATION - COMPRESSOR.

In order to check the total charge in the system, it is necessary to transfer all of the refrigerant to the Condenser-Receiver. The following procedure should be followed-

1. Open electrical disconnect switch after all ice has been cleared

from freezer.

2. Remove Control Panel Cover and carefully insert a piece of paper between the contacts of the Cylinder Ice Freezer Pressure Switch #56B. This keeps controls from changing to a thawing period during the pumpdown procedure. Set the Ice Selector Switch #9 to the "CYL." Position.

3. Close the Hand Stop Valve #58 in the liquid line.

4. Start the machine and let operate until Low Pressure Switch (29L) opens, which will stop the machine.

5. Note the refrigerant level in the Condenser-Receiver. (See the chart on page 29 for proper level). If the level is low add refrigerant to bring the level up to, or slightly above the indicated point.

6. Open Disconnect Switch, remove paper from contacts of Freezer Pressure Switch and replace the Control Panel Cover. When the machine is again started, it will remain off until the pressure builds up and closes the Low Pressure Switch.

INITIAL START

1. See that water inlet-connections are attached to the proper couplings on machine-condenser water inlet coupling #23 (water-cooled units) Water for ice making #23A. The water inlet shutoff valves should be open. The water level in the water pan (7) should be at a height where the makeup water float valve will be closed.

2. See that the cutter motor gear box is lubricated (See instructions "LUBRICATION" Section.

3. See that compressor crankcase oil level is at proper height (See instructions "LUBRICATION" Section).

4. See that Circuit Breakers #62 and #63 in the Control Panel are "ON".

5. See that the "ON-OFF-THAW" toggle switch #10 is "OFF".

6. See that the "ICE-CLEAN Toggle Switch #99 is set to "ICE" position.

7. Open compressor service valves #34 and #45, the Hand Stop Valve #90 in the thawing gas line and the Hand Stop Valve #58 in the liquid line. Also open valve #91 in the thawing gas line of air-cooled machines. These valves were tagged to indicate that they were closed for shipping purposes.

8. See that all other stop valves in the various refrigerant lines are open except charging valve (28), Drain Valve (44).

9. Close exterior disconnect switch to energize crankcase heater. (2 hrs. min.)

10. Place "ON-OFF-THAW" toggle switch #10 in "ON" position. The machine may not operate immediately until pressure raises sufficiently to close pressure switch #29L.

    It may be desirable to manually open the Solenoid Valve #20 (liquid line) to admit refrigerant to the "LOW SIDE" to close switch #29L. Be sure to return the "MANUAL OPENING STEM" to the closed position (screwed-in) after the machine starts.

11. When machine starts, check water level in water pan #7 to determine whether or not water pump #6 is pumping water. It may be necessary to stop and start the machine several times to expel air from the water pump impeller housing. (Use one of the circuit breakers #62 or #63, to stop - for approximately 10 seconds - and start the machine, if necessary to prime the pump).

EXPANSION VALVE

The expansion valve (17) has been adjusted before shipment and it is RARELY necessary to alter this setting! The amount of cylinder ice and crushed ice which the machine should produce is included in the charts on page 26.

If considerably less ice is being

produced per discharge, it may be necessary to open the expansion valve by turning adjusting screw counter-clockwise 1/2 turn at a time. Allow machine to make several cycles after each adjustment. Keep in mind that it is RARELY necessary to change the factory adjusted expansion valve.

The Expansion Valve should not be opened to the extent that frost will appear on the suction line between the Heat Exchanger and the Compressor. If this part of the suction line does frost, close expansion valve as required or compressor damage will result.

FREEZER PRESSURE SWITCHES

The freezing time period for the production of cylinder ice is controlled by the freezer pressure, through one (56B) of the two freezer pressure switches located inside the Control Panel. The freezing time period for crushed ice is controlled likewise - by the second switch (56A).

These switches were set, at the factory, to produce ice of recommended thickness. A sample set of pressure readings, with corresponding time periods and water temperatures, has been recorded on the "Certificate of Test" which is furnished with the machine. Do not make any adjustments until several ice discharging cycles have been made.

A black bakelite cap, which snaps in place over the electrical contacts, may be removed to observe action of the switches (56). These pressure switches have been set so that the contacts close respectively between 15 to 20 PSIG for cylinder ice and 19 to 23 PSIG for crushed ice. The normal closing setting for the various models is shown in the chart below:

MODEL	CYL.	CRU.
1500	15	19
1800	20	23
2500	15	19
3000	20	23
4000	18	21

Each switch contact should open again at approximately 28 PSIG which pressure is produced by the entrance of thawing gas into the freezer. (NOTE - The pressure referred to above is taken at the gauge port of the Compressor Suction Service Valve #34. Backseat the valve to install a test gauge at this point.) The range adjustment screw (which varies both the closing and opening settings) has been set at the factory so that the electrical contact opens at approximately 28 PSIG removable rubber cap has been placed over this screw indicating that the setting is not to be changed.

To vary the thickness of ice, when and if required, turn the "Differential Adjustment Screw" counter-clockwise for thicker ice and clockwise for thinner ice. Turning the "Differential Adjustment Screw" counter-clockwise rotates the "Differential Indicating Dial" clockwise, thereby lowering the closing pressure setting of the switch. resulting in the production of thicker ice. If required, make only a minor adjustment (one division or less on the "Differential Indicating Dial) and allow the unit to complete several cycles after each adjustment before making further adjustments.

The freezing time can be such that the greater percentage of the ice is frozen solid. If so, some ice from the top and bottom of the freezer, should have a small hole in the center to insure that the freezing time has not been extended to where a loss in capacity would result.

It is preferable that the freezing cycle be such that a small diameter hole remain in the center of the ice cylinder. (1/16" dia. for M1800, M3000 and M4000 3/16" dia. for M1500 and M2500). This insures that the freezing cycle is not extended unnecessarily and eliminates a possible core in the center of the ice.

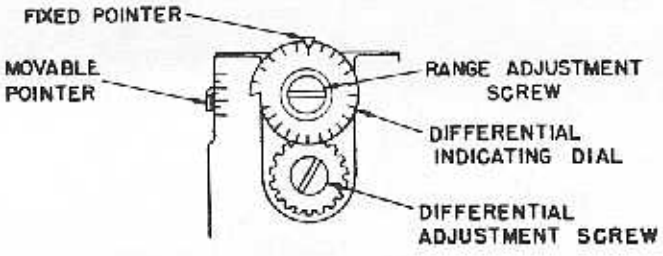
When crushed ice is produced, the freezer pressure switch (56A) should be set to produce ice having a wall thickness of approximately 3/16"-1/4".

The following procedure is recommended for initially setting a freezer pressure switch which has not been previously adjusted.

1. Set "Cut-Out" pressure (contact opens) for approximately 28PSIG. Turning "Range Adjustment Screw"

clockwise raises both the "Cut-In" and "Cut-Out" pressures approximately 3.6 PSIG for each turn - one turn is approximately one-fourth of a scale division. The "Movable-Pointer" will be set approximately in the center of the scale as illustrated.

2. Set "Cut-In" pressures (contact closes) for cylinder ice production for approximately 15 PSIG (18 PSIG on M4000) and for crushed ice production for approximately 19PSIG(21 PSIG on M4000). Turning "Differential Adjustment Screw" counter-clockwise rotates the "Differential Indicating Dial" clockwise and lowers the cut-in pressure, thus producing thicker ice. One division of the "Differential Indicating Dial" represents approximately 2 PSIG.



FREEZER PRESSURE SWITCH

FIGURE 6

SAFETY PRESSURE SWITCHES

The safety pressure switches (29) located inside the Control Panel protect the machine from abnormal pressure during operation and thus prevent possible damage to the unit.

The "Low Pressure Switch" (29L) will stop the machine if the suction pressure of the compressor drops below 10 PSIGand will start it again when this pressure rises to approximately 30 PSIG. Refer to instructions below for initially setting a Low Pressure Switch if it should be necessary to set a switch that has not been previously adjusted or to make any change in the factory setting.

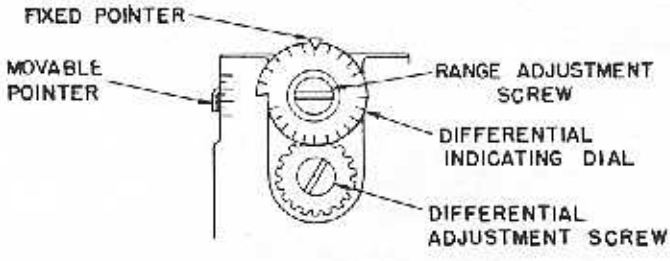
The "High Pressure Switch" (29L) will stop the machine if the discharge pressure of the compressor rises above 180 PSIG. The cut-out pressure setting was set at the factory and the adjusting screw "locked" in position. Refer to instructions below for initially setting a high pressure switch if it should be necessary to set a switch that has not been previously adjusted or to make any change in the factory setting. (NOTE- the locking pin must be removed before factory setting can be changed).

These switches have been set at the factory and a removable rubber cap placed over the adjusting screws to indicate that no further adjustment should be necessary.

The following procedure should be followed for initially setting a Low Pressure Switch which has not been previously adjusted;

1. Set "Cut-In" pressure (contact closes) for approximately 30 PSI by turning the "Range Adjustment Screw". One turn of this screw varies both "Cut-In" and "Cut-Out" pressure settings approximately 4 PSIG. To lower both settings, turn the screw in a counter-clockwise direction.

2. Set "Cut-Out" pressure (contact opens) for approximately 10 PSI To lower the "Cut-Out" pressure only, turn the "Differential Adjustment Screw" counter-clockwise which will rotate the "Differential Indicating Dial" clockwise. One division of the "Differential Indicating Dial" changes the "Cut-Out" pressure approximately 2 PSIG.



—LOW PRESSURE SWITCH—

FIGURE 7

The following procedure should be followed for initially setting a high pressure switch which has not been previously adjusted.

Set "Cut-Out" pressure (contact opens) for approximately 180 PSIG. To lower the "Cut-In" and "Cut-Out" pressure, turn the Range adjustment screw counter-clockwise. One-fourth turn of the screw changes both pressures approximately 10 PSIG.

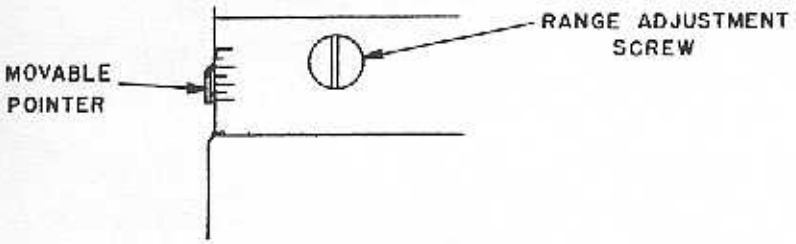


FIGURE 8

ICE BIN THERMOSTATS

The two ice bin thermostats (11) are mounted in the Control Panel and their action will stop the machine (upon completion of the thawing period) when the storage bin is filled with ice and will automatically start it again when the ice is removed from the bin. When both cylinder and crushed ice are produced and separately stored, install the control bulb of thermostat #11A in the crushed ice section of the storage bin and the control bulb of thermostat #11B in the cylinder ice section.

When only one type of ice is produced (cylinder or crushed), either the control bulb of each bin thermostat must be installed in a bracket, positioned so that ice will contact both bulbs when the bin is full or the wiring revised for one thermostat control as per detail shown in the schematic wiring diagram.

The control bulb of the ice bin thermostat must be located so that ice will contact it, when the bin is full (See Pg. 54), to assure proper protection for the machine. The control bulb when placed in the bin, should be positioned so as to allow space for the machine to make an additional discharge of ice (after the ice contacts the bulb) without the ice building up into the discharge opening of chute. The Control Panel is electrically arranged so that the bin thermostats will stop the machine only upon the completion of a discharge period.

The ice bin thermostats are set prior to shipment; however, a minor adjustment may be required due to local conditions after installation. The following procedure should be followed for initially setting or making adjustments to the ice bin thermostat.

1. Turn "Differential Adjustment Screw"clockwise until fixed pointer is at valley of "Differential Indiating Dial".

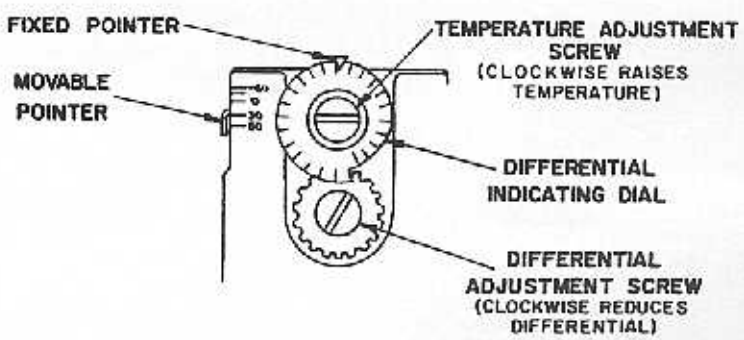
2. With bulb covered with ice, turn Temperature Adjustment Screw" counter-clockwise until contacts on top of thermostat (between back and front right terminal) close.

3. Then turn "Temperature Adjustment Screw" in opposite (clockwise) direction, slowly, until the said contacts just open. Then continue turning screw in same direction 2 complete turns.

4. Remove ice from bulb. Warm bulb by holding in hand until contacts close. Turn "Differential Adjustment Screw" counter-clockwise until "Fixed Pointer" is at high part of dial.

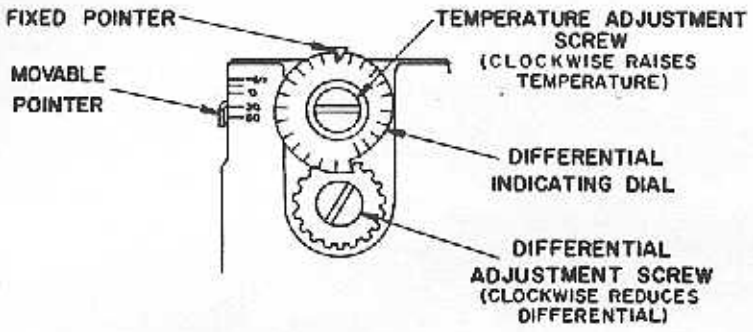
5. Then, with bulb again covered with ice, turn "Differential Adjustment Screw", clockwise, slowly, until contacts just open. Continue same direction, two (2) additional divisions of cam dial.

6. Check the temperature around the bulb to assure that contacts close at 42-44°F.



ICE BIN THERMOSTAT

FIGURE 9



ICE BIN THERMOSTAT
FIGURE 9 (Repeated)

To raise the temperature setting at which the machine will start up, turn "Temperature Adjustment Screw" clockwise. This means that more ice will have to be removed from the bin before the machine will start. NOTE - This adjustment will also raise the shut-off temperature which means that the machine will shut off with a lower ice level in the bin.

To raise only the temperature setting at which the machine will shut off, turn "Differential Adjustment Screw" clockwise. This rotates the "Differential Indicating Dial" counter-clockwise. Change setting only one division of the dial at a time.

THAWING TIMER

The thawing timer (57) which governs the ice discharging period is located inside the control panel and is started by action of one or the other of the Freezer Pressure Switches (56). This timer is set for a 3 minute(or otherwise labeled) period prior to shipment.

The thawing period should be set for at least 30 seconds longer than the time required to harvest the entire discharge of ice. If it should become necessary to change the setting of the timer, move the time indicating pointer "STOP" by hand to the required setting.

ICE SELECTOR SWITCH

The control panel is provided with a 3-position rotary type selector switch by means of which operation of the machine may be controlled to produce (and store) cylinder and crushed ice consecutively, or to produce continously either type of ice exclusively. The switch positions are identified by the marking "CRU-AUTO-CYL".

DESCRIPTION OF OPERATION

WITH ICE SEPARATELY STORED

If the selector switch is placed on "AUTO", the machine will produce automatically cylinder ice until that (cylinder ice) bin is filled, which action will open the thermostat switch (in the cylinder ice bin) and (again automatically) change the machine over to crushed ice production PROVIDED the crushed ice bin is not full and its thermostat switch therefore exposed (and consequently closed). When the crushed ice bin is filled, its thermostat switch opens and stops the machine upon completion of the thawing period.

If, however, CYLINDER ice is removed, at any time during the freezing period of the crushed ice operation, and the cylinder ice bin thermostat switch closes, the machine will REVERT IMMEDIATELY TO CYLINDER ICE PRODUCTION and will continue so until that bin is again full, at which time the change to CRUSHED ICE will again occur.

If when producing CYLINDER ICE, the thermostat switch (in the cylinder ice bin should open (by contact with ice in any manner), the machine will complete one cylinder ice operation before (automatically) changing to crushed ice. If the selector switch should be changed to crushed (CRU) during cylinder ice production, the same procedure will occur.

The machine will never stop during any freezing operation - it will always complete the evacuation and discharge all of the ice regardless of the causes which open either thermostat switch.

DESCRIPTION OF OPERATION WITH ICE NOT SEPARATELY STORED

With the selector switch set on either "AUTO" or "CYL", the machine will produce cylinder ice until the bin is filled (and the two thermostat switches open) and will shut down at the completion of the thawing period.

If the selector switch is changed to "CRU", after the unit has started a cylinder ice freeze, the unit will complete the freeze and evacuation of the cylinder ice before changing to the production of crushed ice.

With the selector switch set on "CRU" the machine will produce crushed ice until the bin is filled (and the two thermostat switches open). It will then shut down at the completion of the thawing period. If the switch is change to "AUTO" or"CYL" after the machine has started a crushed ice freeze, it will revert immediately to the production of cylinder ice.

DESCRIPTION OF OPERATION WHEN ICE BIN THERMOSTATS ARE NOT USED

With the selector switch set on either "AUTO" or "CYL", the machine will produce cylinder ice. If the switch is changed to "CRU" while the unit is producing cylinder ice, it will complete the freeze and evacuation of the cylinder ice before changing to the production of crushed ice.

With the switch set on "CRU" the machine will produce crushed ice. If the switch is changed to "AUTO" or "CYL" the unit will revert immediately to the production of cylinder ice.

ADJUSTABLE BLOWDOWN (During Freezing)

A pet cock is installed on the water pump to provide means for obtaining blowdown from the water pan during the freezing period. This supplements the blowdown that is discharged during the thawing period through the overflow piping connected to the drain of the water pan.

The pet cock was set at the factory to discharge approximately one (1) gallon of water in fifteen (15) minutes. After installation it should be adjusted to the minimum rate required to maintain production of quality ice.

AUTOMATIC BLOWDOWN (During Thawing)

A patented feature of this machine is the automatic blowdown (40) which is provided to eliminate or reduce the necessity for frequent flushing or cleaning of the water pan (7) to remove accumulated salts or solids in the water as a result of the freezing action.

A principle of operation of the blowdown arrangement is a syphoning effect which is initiated during each thawing period when the water pump is stopped and the water in the freezer tubes returns to the water pan, thereby raising the water level and causing a portion of the water to overflow from the bottom of the pan.

The water level (controlled by the Float Valve #12) regulates the quantity of "overflow" during the thawing period.

FLOAT VALVE (Makeup Water)

The makeup water float valve (12) maintains the proper pumping level in the water pan for ice making. The valve should be set to maintain a water level in the water pan during the freezing period, so that there will be a quantity of "overflow" or blowdown only during the thawing period. The water level during the freezing period should always be below the "overflow" connection to prevent excessive waste of cold water, resulting in loss of ice capacity.

If it should become necessary to clean the float valve, close the stop valve in the makeup water line to the machine and remove float valve. After valve has been cleaned and reinstalled, check to ascertain if the proper water level is being maintained.

It is advisable to install a large area strainer in the water supply line if there is any amount of dirt or solids in the water which would necessitate frequent cleaning of the float valve. A strainer of 40 mesh screen is usually satisfactory.

CONDENSER WATER REGULATOR
Water-Cooled Units

The condenser water regulating valve (41) should be set to maintain a condensing pressure of approximately 120 PSIGduring the freezing period. The condenser pressure gage (36) is located beneath the control panel near the front right hand side of the machine.

If it should be necessary to adjust the regulating valve to obtain the correct condensing pressure of 120 PSIG during the freezing period, turn adjusting cover clockwise to increase the pressure and counter-clockwise to decrease the pressure. When making adjustments, allow the regulator suffi-

cient time to adjust itself to the new setting.

CONDENSER PRESSURE REGULATOR - Air-Cooled Units

The condenser pressure should be maintained at approximately 120 PSIG during the freezing period. The condenser pressure gage (36) is located beneath the control panel near the front right hand side of the machine.

A Mercoid Pressure Switch is used to regulate the condenser pressure by controlling the operation of the fan motor of the air-cooled condenser. The switch is set to start the fan motor when the condenser pressure rises to approximately 126 PSIG and will stop it when the pressure drops to approximately 114 PSIG.

COMPRESSOR CRANKCASE HEATER

An electric crankcase heater is installed on the compressor to reduce refrigerant migration to the crankcase during off periods. Accumulation of liquid refrigerant in the compressor crankcase causes slugging and loss of oil during start-ups.

The machine is wired so that the heater is energized when electrical current is supplied to the main terminals (L1, L2 and L3) of the Control Panel. THE HEATER SHOULD BE ENERGIZED FOR AT LEAST TWO HOURS BEFORE STARTING THE MACHINE IF THERE SHOULD BE AN INTERRUPTION IN THE ELECTRICAL SERVICE TO THE MACHINE. This may be done by setting the on-off toggle switch to the "OFF" position.

The compressor crankcase heater and the various electrical control equipment, such as relays, coils, timer, etc., are protected by two (2) fuses located in the control panel. Buss AGC, glass type, 1 amp., 250 volt fuses, or equal, are recommended for this service.

SERVICE OPERATIONS

CONDENSER CLEANING (Water Cooled Units)

The water coil or tubing in the condenser may require occasional cleaning due to scale deposits of calcium or magnesium salts from the cooling water.

SHELL AND COIL CONDENSER

To clean, stop the machine. Close the stop valve in the water line to the condenser. Remove the condenser water regulating valve (41). Connect to the condenser water inlet and outlet, two lengths of 5/8" O.D. copper tubing, bent so that the open end of each extends above the condenser. Prepare a gallon of solution consisting of twenty per cent of commercial muratic (Hydrochloric) acid and eighty percent water (by volume) in an enameled bucket or earthen crock - do not use a galvanized container. When mixing, be certain to pour the acid into the water. Care should be exercised due to the injurious nature of this solution.

Fill the condenser coil with the acid solution and leave this for about thirty minutes or until the CO_2 gas involved is no longer evident. Drain out solution and immediately flush the coil with fresh water for five minutes or more.

Occasionally so-called "LIME" deposits are of such mineral content that the muratic acid solution will not dissolve them, in which case the deposits should be analyzed by competent chemists to determine the proper cleaning solution to remove the deposit and still not be detrimental to the copper coil. The local water supply company may be able to provide the necessary information.

If, after cleaning the condenser coil, the condensing pressure continues to be abnormally high, other sources of trouble should be investigated. See "SYMPTOMS AND PROCEDURES."

AIR-COOLED CONDENSER

Visual inspection will indicate if dirt is accumulating and clogging the fin face of the condenser. A vacuum cleaner, compressor air or a brush may be used to remove any accumulation of dirt from the fin section of the condenser.

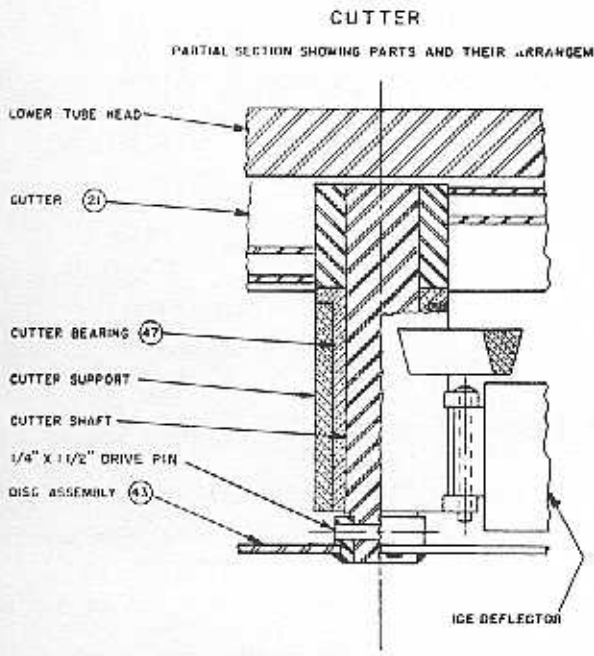


FIGURE 10

CUTTER AND GEAR DRIVE

To remove the ice cutter (21) when and if necessary, proceed as follows -

Stop the machine. Close stop valve in Makeup Water Line to water pan.

Disconnect the Makeup Water Line and drain line at the water pan.

Separate motor from the cutter drive reducer by removing four (4) cap screws. Watch for shaft key when separating unit which must be installed in motor keyway when unit is re-assembled. It is not necessary to remove the reducer from its mounting plate of the water pan.

Remove the water pump which is attached to the base angle by two (2) bolts and nuts. Remove ice discharge chute which is attached to the water pan by four (4) hex nuts.

Remove the water pan, which contains the Cutter, by removing nut from the three (3) studs welded to the top edge of the pan. Assembly may then be taken to a work bench for removal of cutter, which is held in place by three 1/4" cap screws holding cutter support to side of the water pan. Before loosening these cap screws, remove the ice deflector and the cutter disc assembly.(Pg. 51)

If a new bearing is required, it should be pressed into the bearing support after removing old bearing. When the new bearing is in place it must be drilled (3/16" Dia.) to receive the locking pin. Do not insert the pin beyond the inner surface of the bearing.

The parts should be re-assembled, reversing the procedure described for removal.

PUMPING DOWN FREEZER

If it should become necessary to pump the refrigerant out of the freezer only, sufficient vapor should be retained to hold one pound pressure in the freezer so that air will not enter if the system is opened.

The following procedure should be followed to pump the refrigerant out of the freezer -

1. Open electrical disconnect switch after all ice has been cleared from freezer.

2. Remove control panel cover and carefully insert a piece of paper between the contacts of the cylinder ice freezer pressure switch #56B. This keeps controls from changing to a thawing period during the pumpdown procedure. Set the Ice Selector Switch #9 to the "CYL" position.

3. Close the Hand Stop Valve #58 in the liquid line.

4. Start the machine and let operate until Low Pressure Switch (#29L) opens, which will stop the machine. Warm water in the pumping tank will assure complete removal of refrigerant from the freezer.

   The Low Pressure Switch will open at approximately 10 PSI. To then reduce the freezer pressure below this setting, connect a jumper across the switch terminals and control the starting and stopping of the compressor with either circuit breaker #62 or #63 located in the upper left-hand corner of the control panel.

After pumping out the freezer, close

the Compressor Service Valves #34 and #45 and the Hand Stop Valve #90 in the Thawing Gas Line. This will confine the refrigerant charge to the Condenser-Receiver the same as when the machine was originally shipped.

REMOVAL OF REFRIGERANT FROM MACHINE

To transfer the refrigerant charge from the machine into a separate container, proceed as instructed above under "PUMPING DOWN FREEZER". This will isolate the refrigerant in the Condenser-Receiver.

Then connect a length of 1/4" O.D. copper tubing or a charging hose to Condenser-Receiver Drain Valve #44. The tubing or hose should be long enough to reach to the floor to connect to a storage container. Purge tubing or hose of air by allowing a small amount of refrigerant to escape.

Pack the storage container in ice and be sure that the container has a storage capacity in excess of the amount (weight) of refrigerant in the system. Open the Condenser-Receiver Drain Valve and the Storage Container Valve. When the pressure in the Condenser-Receiver is reduced to approximately 30 PSI, close the drain valve (44). It may be necessary to apply heat to the lower portion of the Condenser Receiver to assist in removing the refrigerant. Close storage container valve.

REFRIGERANT LEAKS

In addition to testing the machine for leaks as instructed under "Refrigerant Charge", it is advisable to again make a leak test after the unit has been in operation approximately one week. Any noticeable change in operating conditions, other than shown on the "Certificate of Test" may indicate a loss of refrigerant due to a leak. Always release the refrigerant pressure from the vessel or tubing before repairing leak.

NON-CONDENSIBLE GASES

Satisfactory operation of the machine is not possible if non-condensible gases (usually air) are present in the system. Excessive condensing pressure is an indication of such gases. Excessive condensing pressure in water cooled condensers may also be due to the accumulation of scale in the cooling coil, or due to insufficient cooling water or excessive water temperature.

Non-condensible gases may be purged from the condenser-receiver by "cracking" the flare nut at the condenser pressure gage (36). Purging should be done after the machine has been shut down for several hours. Purging water cooled machines may begin when the condenser reaches room temperature. Purging should be done intermittently by loosening and tightening the flare nut at the pressure gage. Intermittent purging prevents the excessive loss of refrigerant.

COMPRESSOR MOTOR BURNOUT

There are several causes of compressor motor burnout. Several of these are described below.

1. Low Line Voltage - A Compressor Motor is designed to operate within the range of plus or minus 10% of its nameplate voltage. Low voltage requires the motor windings to carry more current at the same compressor load. When this current gets too high or is applied for an extended period, the motor windings overheat, resulting in a failure or burnout.

2. Loss of Refrigerant - The hermetic compressor motor is maintained at proper operating temperature by passing the cool suction gas over the motor windings. A loss of refrigerant will cause the winding to overheat, resulting in a failure or burnout.

3. High Head Pressure - The system is designed to operate at 120 PSI. Excessive head pressure adds refrigerating load on the compressor which can cause the windings to overheat and result in a failureor burnout.

4. Moisture - Moisture in contact with refrigerant and oil in the presence of heat will form pure hydrochloric or hydrofluoric acid. The acid will destroy the insulation on the motor winding, causing a short circuit which can increase motor temperature in excess of 3000°F. This extreme temperature will also create a sludge or black residue in the system.

Whenever there is a compressor failure due to a motor burnout, it is

important that the system be thoroughly cleaned before replacing the damaged compressor, otherwise the new compressor may also be damaged.

SOLENOID VALVES

The solenoid valves (18 and 20) are pilot-operated with "floating" type diaphragm. For satisfactory operation be sure that the "Manual Opening Stem", which is located in the valve bonnet, on the outlet side of the valve, is in the "all in" or closed position.

These valves will operate on voltages within 10% of rating, but dirt or sludge will affect the operation.

WATER DISTRIBUTORS

The water distributors are located in the distributing head (8) at the top of the freezer. There are 78 distributors used in the Models 1800, 3000 and 4000; 36 distributors are used in the other units. These may require occasional or periodical cleaning to remove suspended solids and foreign particles accumulated from the make-up water. The frequency of this cleaning operation will depend on the characteristics of the water supply.

The cleaning operation is indicated when the inside diameter of a large proportion of the ice becomes irregular (due to channeling of the water), or if some of the ice is opaque, or if there is a noticeable decrease in quantity.

To clean distributors, stop the unit and remove the distributing head (8) on top of the freezer. The Water Distributors may then be removed for cleaning.

WATER PAN

The production of opaque ice usually indicates that the water in the water pan contains a concentrated amount of solids or salts.

Remove cover plate, open Drain Valve (39) and clean pan thoroughly by flushing out with a hose and scrubbing with a stiff brush.

When restarting the machine after filling the water pan, be sure that the water pump is circulating water. It is possible that air may have collected in the pump impeller housing and the unit may have to be stopped and started several times to expel the air.

CLEANING INSTRUCTIONS

ICE MAKING SECTION

The ice making section of the Tube-Ice Machine should be cleaned twice a year using Calgon Ice Machine Cleaner (a food grade liquid phosphoric acid) or equivalent. The water pump is used to circulate the cleaner through the system by setting the "ICE-CLEAN" toggle switch (99) to the "CLEAN" position and starting and stopping the pump by the "ON-OFF" toggle switch (10).

For complete instructions, refer to the"CLEANING PROCEDURE" attached to the equipment and duplicated here.

CLEANING PROCEDURE

1. Set toggle switch (10) to "OFF" position. (If the machine is running it will shut down on completion of ice harvesting period).

2. Remove ice from storage area or cover opening into it.

3. Shut off water supply and drain tank (7). Remove any loose sediment from the tank.

4. Close drain valve and fill tank with 4-1/2 gallons hot water. On units equipped with a petcock on the water pump, set the petcock to wide open position and insert the discharge end of its plastic tubing into the water tank.

5. Add 1-1/2 bottles (approximately 18 oz.) of Calgon Ice Machine Cleaner (a food grade liquid phosphoric acid) to water tank during the refill period.

6. To run pump only, set the "ICE-CLEAN" switchto the "CLEAN" position. The pump is then started and stopped by the "ON-OFF" toggle switch (10). If necessary to purge air from pump, return switch (10) to "OFF" position for a few seconds, then back to "ON" position.

7. Circulate cleaning solution for 30 minutes or until desposits are dissolved.

8. Set switch (10) to "OFF" position to stop pump, then drain and flush

water tank with fresh water. Open water supply to machine.

9. Replace petcock plastic tubing to drain connection and start pump again by setting switch (10) to "ON". Operate for 15 minutes, then stop pump by returning switch (10) to "OFF". Drain and flush tank and then refill with fresh water. Return the "ICE-CLEAN" toggle switch to the "ICE" position for normal ice making operation.

10. Clean inside of ice storage area and remove any solution that entered during the cleaning process. Remove cover if one was installed over opening into storage area.

11. Start ice making cycle by setting switch (10) to "ON" position.

12. Adjust setting of pump petcock per instructions in the service manual.

ELECTRICAL FUSES

The control circuit of the machine is protected with two (2) fuses (Buss, AGC, or equal, glass type, 1 amp., 250 volt.)

If one of the fuses should open, the machine will immediately stop. Before replacing the fuse, open the disconnect switch and set the on-off toggle switch to the "OFF" position. If the machine was off for a period of several hours due to fuse failure, refrigerant may have condensed in the crankcase of the compressor. If this condition occurs, the crankcase heater should be energized for a time period of at least one hour before again turning the toggle switch to the "ON" position to start the machine.

Should one of the fuses open while there is still ice in the freezer, the ice should be cleared before resuming operation. This may be done by depressing the on-off-manual harvest switch (10) to the "Manual Harvest" position then immediately back to the "ON" position. (IF the switch is left in the "OFF" position, it will shut down upon completion of the harvest period). After all ice is discharged the machine may be returned to a freezing period by stopping and starting it again by use of either of the circuit breakers, 62 or 63, in the control panel - or the machine will automatically return to the freezing period upon completion of the time setting of the thawing timer.

LUBRICATION

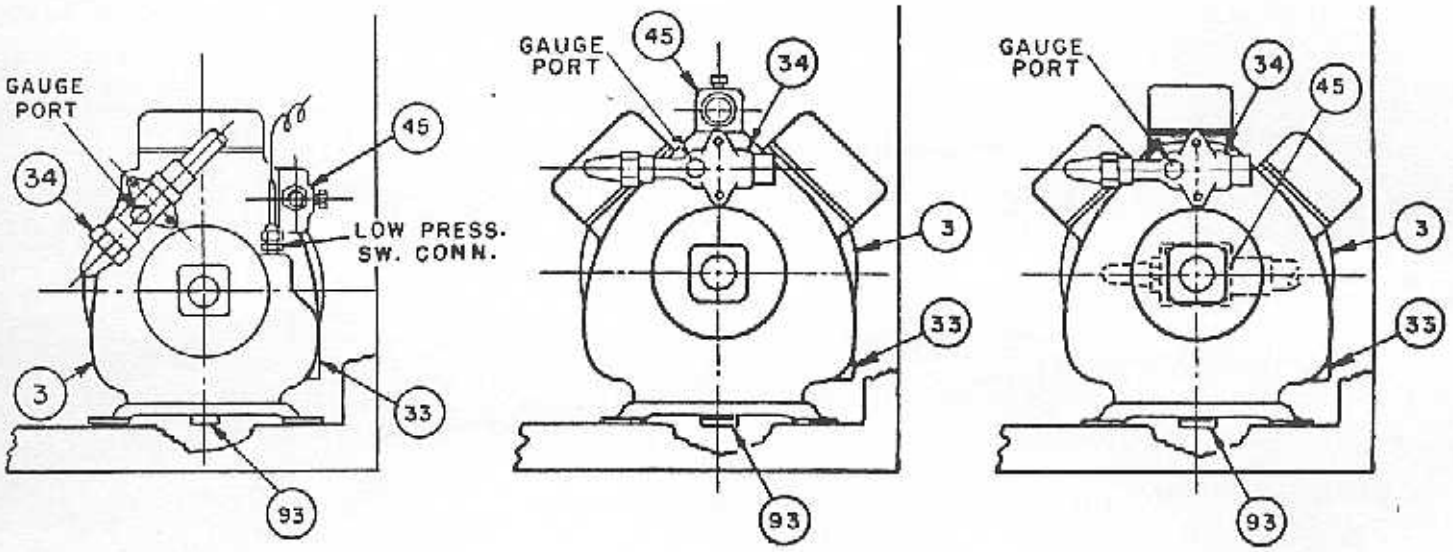
COMPRESSOR

In starting and charging the unit the oil Sight Glass (33) in the crankcase of the compressor should be watched carefully for the first hour to make certain the proper lubrication is being maintained. The compressor oil pressure relief valve line is directed to discharge oil against the bull's eye. If oil is discharged from the relief valve, pressure is adequate. When oil does not discharge from this line, it may be an indication of low oil charge. (The oil may become low in the crankcase on an initial startup, after a prolonged shutdown period, if the electrical current is interrupted to the machine, thus de-energizing the compressor crankcase heater. Before starting the machine again, the heater should be energized for a time period of at least one hour, to evaporate refrigerant that may have condensed in the crankcase during the shutdown period. If level is low after startup, it should begin to return after a short period of operation.)

The oil level should be checked frequently, particularly during the startup operation, to see that a sufficient amount of oil remains in the crankcase. While it is important to observe the oil splash during operation, the true level can be obtained only after operating the compressor at least one hour, after which it should be stopped by opening either switch #62 or the Exterior Disconnect Switch. With the compressor idle, the oil level should be at a height of 1/3 to 2/3 of the sight glass, but not out of sight above it.

Although the machine was shipped with the oil charge which was originally added for the test operation, it may be found necessary to add some oil when or if new refrigerant is added to the system.

An oil pump should be used to force any oil that may be required into the system. Oil may be added to the compressor through the gauge port of the compressor suction service valve. The Compressor Suction Service Valve should be "backseated" to shut off pressure to the gauge port when connecting the oil pump. Air should be purged from the oil pump



MODELS 1500 & 1800 MODELS 2500 & 3000 MODEL 4000

FIGURE 11

discharge line, by forcing some oil through the line before tightening the charging connection.

Use "Dual Inhibited Sunisco 3GS" (Visosity 150), as manufactured by Sun Oil Company,or equal.

CUTTER GEAR MOTOR

The reducer manufactured by Bond is pre-lubricated with a special synthetic lubricant. Do no change or add any other lubricant or oil.

The oil level for any other make reducer should be checked before starting the machine. It should be level with the plugged opening in the side of the gear housing. Use Mobile 600W cylinder oil or equal. Change oil once a year.

The motor bearings are pre-lubricated and require no further lubrication. For additional information, refer to manufacturer's instructions.

CUTTER BEARING

The cutter bearing is of the sleeve type and is made of Rulon, requiring no lubrication. If necessary to replace this bearing, follow instructions under heading "Cutter and Gear Drive".

CIRCULATING WATER PUMP MOTOR

The motor bearings are pre-lubricated and require no further lubrication for two years. Pump should operate with the water level above the impeller housing. Refer to manufacturer's instructions.

The pump is equipped with a mechanical seal which is self-adjusting and requires no lubrication. However, the pump should not be operated unless circulating water. The pump manufacturer recommends that a spare mechanical seal be kept as a spare. When ordering a seal, specify pump size, type, serial number and manufacturer's name as indicated on the nameplate.

TYPICAL WIRING DIAGRAMS

ELECTRICAL (FUSED)
SERVICE CONNECTIONS

DIAGRAM 1
See Table A

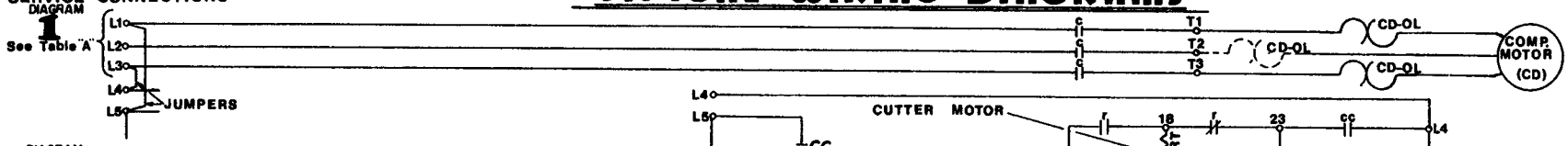


DIAGRAM 2
See Table A

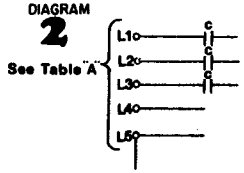


DIAGRAM 3
See Table A

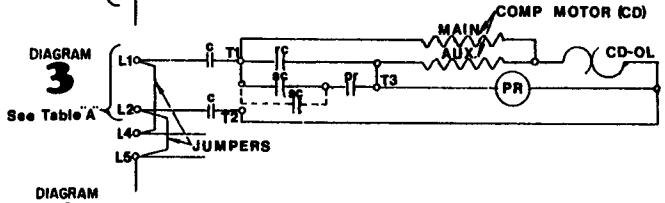
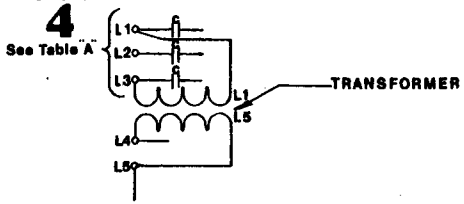
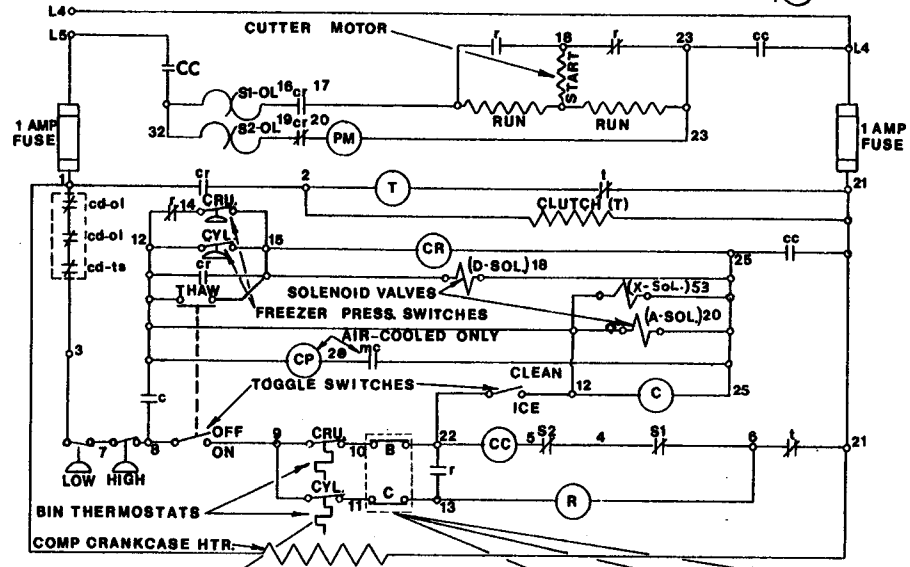
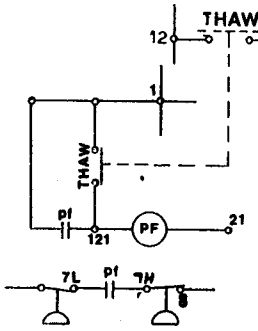


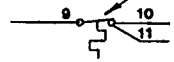
DIAGRAM 4
See Table A



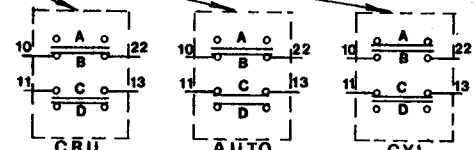




UNITS WITH POWER FAILURE FEATURE



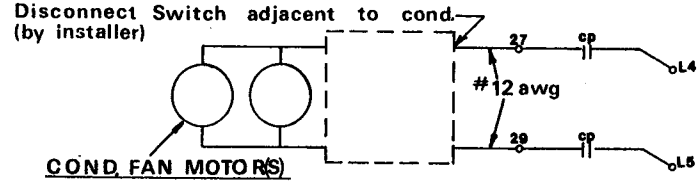
DETAIL FOR ONE THERMOSTAT WIRING (cyl. or cru.)



SELECTOR SWITCH

NOMENCLATURE

Sym	Part
C	Comp. Motor Contactor
CR	Control Relay
T	Thawing Timer
S1	Overload Switch for Cutter Motor
S2	Overload Switch for Pump Motor
CD	Internal Protection for Compressor Motor
R	Reversing Relay
CC	Control Circuit Contactor
MC	Mercoid Control
CP	Contactor for Condenser Fan Motor
PF	Power Failure Relay
SC	Start Capacitor
PR	Potential Relay
RC	Run Capacitor
PM	Pump Motor



AIR COOLED UNITS ONLY

TABLE "A"

	MODEL	CURRENT	TERMINALS	DIAGRAM NUMBER	MFA	MCA
SERIES 1500	B1CA236B8	208,3,60	L1,L2,L3	1	20	14
	D1CA236B	230,3,60	L1,L2,L3	1	15	13
	B1CA235B0	200,3,50	L1,L2,L3	1	20	12
	D1CA235B	230,3,50	L1,L2,L3	1	20	12.2
	B1CA236B8AC	208,3,60	L1,L2,L3	1	20	16
	D1CA236BAC	230,3,60	L1,L2,L3	1	20	15
	B1CA235B0AC	200,3,50	L1,L2,L3	1	25	17.1
	D1CA235BAC	230,3,50	L1,L2,L3	1	25	17.1
	B1CA216B	230,1,60	L1,L2	3	30	19
	B1CA216BAC	230,1,60	L1,L2	3	35	21
	D1CA436B	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	4.8 4.8
	D1CA436BAC	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	4.8 6.8
	D1CA335B	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15	4.7 5
	D1CA335BAC	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15	4.7 7
	D1CA436BT	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	7.2
	D1CA436BACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	7.8
SERIES 1800	A1BCA2368	208,3,60	L1,L2,L3	1	20	14
	A1BCA236	230,3,60	L1,L2,L3	1	15	13
	A1BCA2350	200,3,50	L1,L2,L3	1	20	14.6
	A1BCA235	230,3,50	L1,L2,L3	1	20	13.1
	A1BCA2368AC	208,3,60	L1,L2,L3	1	20	16
	A1BCA236AC	230,3,60	L1,L2,L3	1	20	15
	A1BCA2350AC	200,3,50	L1,L2,L3	1	25	17.1
	A1BCA235AC	230,3,50	L1,L2,L3	1	25	17.1
	A1BCA216	230,1,60	L1,L2	1	30	19
	A1BCA216AC	230,1,60	L1,L2	1	35	21
	A1BCA436	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	4.8 4.8
	A1BCA436AC	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	4.8 6.8
	A1BCA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	7.2
	A1BCA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	7.8
	A1BCA335	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15	5 7.8
	A1BCA335AC	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15	5 9.5

	MODEL	CURRENT	TERMINALS	DIAGRAM NUMBER	MFA	MCA
SERIES 2500	B2CA2368	208,3,60	L1,L2,L3	1	30	19.7
	C2CA2368	208,3,60	L1,L2,L3	1	40	26.6
	D2CA236	230,3,60	L1,L2,L3	1	25	18.7
	E2CA236	230,3,60	L1,L2,L3	1	35	25.5
	C2CA2350	200,3,50	L1,L2,L3	1	20	20
	C2CA2350	200,3,50	L1,L2,L3	1	40	25.9
	D2CA235	230,3,50	L1,L2,L3	1	20	16
	E2CA235	230,3,50	L1,L2,L3	1	35	15
	B2CA2368AC	208,3,60	L1,L2,L3	1	35	23
	C2CA2368AC	208,3,60	L1,L2,L3	1	45	30.3
	D2CA236AC	230,3,60	L1,L2,L3	1	30	21.2
	E2CA236AC	230,3,60	L1,L2,L3	1	40	28
	B2CA2350AC	200,3,50	L1,L2,L3	1	25	20.5
	C2CA2350AC	200,3,50	L1,L2,L3	1	45	29.1
	D2CA235AC	230,3,50	L1,L2,L3	1	25	18.5
	E2CA235AC	230,3,50	L1,L2,L3	1	40	25.6
	A2CA216	230,1,60	L1,L2	3	30	26.1
	B2CA216	230,1,60	L1,L2	3	35	31.6
	A2CA216AC	230,1,60	L1,L2	3	30	28.6
	B2CA216AC	230,1,60	L1,L2	3	50	34.1
	D2CA436 E2CA436	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15 15 15	5.0 4.7 9.5 4.7
	D2CA436AC E2CA436AC	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15 15 15	5.0 7.8 10 7.2
	D2CA335 E2CA335	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15 15 15	7.4 6.1 10.3 6.1
	D2CA335AC E2CA335AC	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15 15 15	7.4 8.6 10.8 8.6
	D2CA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	8.0
	E2CA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	12.5
	D2CA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	14.3
	E2CA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	13.1
SERIES 3000	A30CA2368	208,3,60	L1,L2,L3	1	30	19.7
	B30CA2368	208,3,60	L1,L2,L3	1	40	26.6
	A30CA236	230,3,60	L1,L2,L3	1	25	18.7
	B30CA236	230,3,60	L1,L2,L3	1	35	25.5
	A30CA2350	200,3,50	L1,L2,L3	1	20	20
	B30CA2350	200,3,50	L1,L2,L3	1	40	25.6
	A30CA235	230,3,50	L1,L2,L3	1	20	16
	B30CA235	230,3,50	L1,L2,L3	1	35	15
	A30CA2368AC	208,3,60	L1,L2,L3	1	35	23
	B30CA2368AC	208,3,60	L1,L2,L3	1	45	30.8
	A30CA236AC	230,3,60	L1,L2,L3	1	30	21.8
	B30CA236AC	230,3,60	L1,L2,L3	1	40	28

	MODEL	CURRENT	TERMINALS	DIAGRAM NUMBER	MFA	MCA
SERIES 3000	A30CA2350AC	200,3,50	L1,L2,L3	1	25	20.5
	B30CA2350AC	200,3,50	L1,L2,L3	1	45	29.1
	A30CA235AC	230,3,50	L1,L2,L3	1	25	18.5
	B30CA235AC	230,3,50	L1,L2,L3	1	40	25.6
	A30CA216	230,1,60	L1,L2,	3	30	26.1
	B30CA216	230,1,60	L1,L2,	3	35	31.6
	A30CA216AC	230,1,60	L1,L2,	3	30	28.6
	B30CA216AC	230,1,60	L1,L2,	3	50	34.1
	A30CA436 B30CA436	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15 15 15	5.0 4.7 9.5 4.7
	A30CA436AC B30CA436AC	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15 15 15	5.0 7.2 10 7.2
	A30CA335 B30CA335	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15 20 15	7.4 6.1 9.5 6.1
	A30CA335AC B30CA335AC	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	15 15 20 15	7.4 8.6 9.5 7.5
	A30CA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	10.6
	B30CA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	15	13.1
	A30CA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	8.0
	B30CA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	15	12.5
SERIES 4000	A40CA2368	208,3,60	L1,L2,L3	1	45	29.6
	B40CA2368	208/230,3,60	L1,L2,L3	1	45	27.6
	A40CA236	230,3,60	L1,L2,L3	1	50	30.2
	A40CA2350	200,3,50	L1,L2,L3	1	55	31
	A40CA235	230,3,50	L1,L2,L3	1	50	25.8
	A40CA2368AC	208,3,60	L1,L2,L3	1	55	33.6
	B40CA2368AC	208/230,3,60	L1,L2,L3	1	50	31.6
	A40CA236AC	230,3,60	L1,L2,L3	1	55	38.2
	A40CA2350AC	200,3,50	L1,L2,L3	1	60	36.4
	A40CA235AC	230,3,50	L1,L2,L3	1	55	31.3
	A40CA436	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	12.5 4.7
	A40CA436AC	POWER- 460,3,60 CONTROL- 230,1,60	L1,L2,L3 L4,L5	2	15 15	12.5 10
	A40CA335	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	25 15	13.4 6.1
	A40CA335AC	POWER- 400,3,50 CONTROL- 230,1,50	L1,L2,L3 L4,L5	2	25 15	14 14
	A40CA436T	460,3,60	L1,L2,L3, 1 KVA TRANS	4	25	15.5
	A40CA436ACT	460,3,60	L1,L2,L3, 1.5 KVA TRANS	4	35	19.3

MFA = MAXIMUM FUSE AMPERAGE MCA = MINIMUM CIRCUIT AMPACITY (SIZE WIRING FOR THIS LOAD AS A MINIMUM)-RECOMMEND BUSS LOW PEAK FUSES FOR SER. CONN.

ELECTRICAL DATA – COMPRESSOR

SERIES 1500 & 1800

MODEL	COMPRESSOR	VOLTAGE	RLA
B1CA2368B	06DR1090GA040C	200 RANGE, 180-230	8.8
B1CA2368BAC			
A18CA236B			
A18CA236BAC			
D1CA236B	06DR1090GA050C	230 RANGE, 198-264	7.6
D1CA236BAC			
A18CA236			
A18CA236AC			
B1CA2353O	06DR1090GA050C	200 RANGE, 165-220	7.6
B1CA2353OAC			
A18CA2350			
A18CA2350AC			
D1CA436B	06DR1090GA060C	460 RANGE, 414-529	3.8
D1CA436BAC			
A18CA436			
A18CA436AC			
D1CA436BT			
D1CA436BACT			
A18CA436T			
A18CA436ACT			
D1CA335B	06DR1090GA060C	400 RANGE, 342-457	3.8
D1CA335BAC			
A18CA335			
A18CA335AC			
D1CA235B	06DR1090GA080C	230 RANGE, 198-264	6.4
D1CA235BAC			
A18CA235			
A18CA235AC			
B1CA216B	06DR1090GA030C	230 RANGE, 198-264	12.5
B1CA216BAC			
A18CA216			
A18CA216AC			

SERIES 4000

A4DCA2368	06DR7240DA040C	200 RANGE, 180-230	20.5
A4DCA2368AC			
A40CA236	06DR7240DA050C	230 RANGE, 198-264	21.0
A40CA236AC			
A40CA2350	06DR7240DA050C	200 RANGE, 180-230	21.0
A40CA2350AC			
A40CA436	06DR7240DA060C	460 RANGE, 414-529	10.0
A40CA436AC			
A40CA436T			
A40CA436ACT			
A40CA335	06DR7240DA060C	400 RANGE, 342-457	10.0
A40CA335AC			
A40CA235	06DR7240DA080C	230 RANGE, 198-264	17.8
A40CA235AC			
B40CA236B	06DR7240DA120C	208/230 RANGE, 180-264	18.9
B40CA2368AC			

SERIES 2500 & 3000

MODEL	COMPRESSOR	VOLTAGE	RLA
B2CA2368	06DA0160FA040C	200 RANGE, 180-230	12.6
B2CA2368AC			13.2
A30CA2368			12.6
A30CA2368AC			13.2
C2CA2368	06DR3160FA041C		18.1
C2CA2368AC			19.0
B30CA2368			18.1
B2CA2368AC			19.0
D2CA236	06DA0160FA050C	230 RANGE, 198-264	11.8
D2CA236AC			
A30CA236			
A30CA236AC			
E2CA236	06DR3160FA051C		16.4
E2CA236AC			17.2
B30CA236			16.4
B30CA236AC			17.2
B2CA2350	06DA0160FA050C	200 RANGE, 165-200	11.8
B2CA2350AC			
A30CA2350			
A30CA2350AC			
C2CA2350	06DR3160FA051C		16.4
C2CA2350AC			17.2
B30CA2350			16.4
B30CA2350AC			17.2
D2CA436	06DA0160FA060C	460 RANGE, 414-529	4.0
D2CA436AC			
A30CA436			
A30CA436AC			
D2CA436T			
D2CA436ACT			
A30CA436T			
A30CA436ACT			
E2CA436	06DR3160FA061C		7.6
E2CA436AC			8.0
B30CA436			7.6
B30CA436AC			8.0
E2CA436T			7.6
E2CA436ACT			8.0
B30CA436T			7.6
B30CA436ACT			8.0
D2CA335	06DA0160FA090C	400 RANGE, 342-457	5.9
D2CA335AC			
A30CA335			
A30CA335AC			
E2CA335	06DR3160FA061C		7.6
E2CA335AC			8.0
B30CA335			7.6
B30CA335AC			8.0
A2CA216	06DA0160FA030C	230 RANGE, 198-264	18.0
A2CA216AC			
A30CA216			
A30CA216AC			
B2CA216	06DA3166FA030C		28.0
B2CA216AC			
B30CA216			
B30CA216AC			
D2CA235	06DA0160FA080C	230 RANGE, 198-264	9.9
D2CA235AC			
A30CA235			
A30CA235AC			
E2CA235	06DR3160FA081C		13.7
E2CA235AC			14.4
B30CA235			13.7
B30CA235AC			14.4

CAPACITY TABLE

MODEL	WATER TEMP. °F	POUNDS PER 24 HR.		CONDENSER WATER GPM (WATER COOLED)		KW PER 100# ICE	
		CYLINDER	CRUSHED	COIL TYPE	TUBE TYPE	CYLINDER	CRUSHED
M 1500	85	1200	1200	4.20	4.10	3.60	4.00
	75	1300	1300	2.10	2.10	3.50	3.90
	65	1400	1400	1.40	1.40	3.40	3.80
	55	1450	1450	1.00	1.30	3.25	3.65
M 1800	85	1350	1350	5.10	4.40	3.60	4.00
	75	1450	1450	2.50	2.30	3.50	3.90
	65	1550	1550	1.70	1.50	3.40	3.80
	55	1650	1650	1.2	1.50	3.25	3.65
M 2500	85	2050	2050	6.40	7.10	3.60	4.00
	75	2200	2200	3.20	3.70	3.50	3.90
	65	2350	2350	2.14	2.50	3.40	3.80
	55	2500	2500	1.60	2.30	3.25	3.65
M 3000	85	2350	2350	8.00	7.70	3.70	4.10
	75	2525	2525	4.00	4.00	3.50	3.90
	65	2650	2650	2.60	2.70	3.40	3.80
	55	2850	2850	2.00	2.50	3.35	3.75
M 4000	85	3200	3200	11.80	11.30	3.60	4.00
	75	3400	3400	5.90	5.90	3.50	3.90
	65	3600	3600	3.80	3.90	3.40	3.80
	55	3800	3800	3.00	3.70	3.25	3.65

FIG 13

ICE CAPACITIES BASED ON 60 HZ. OPERATING CURRENT AND AN AMBIENT TEMPERATURE NOT EXCEEDING 85° F. REDUCE CAPACITY 17% FOR 50 HZ. OPERATION.

NORMAL OPERATING VITALS

(65° to 75°)	MODEL SERIES									
	CYLINDER					CRUSHED				
	1500	1800	2500	3000	4000	1500	1800	2500	3000	4000
SUCTION PRESS. END OF FREEZE (psig)	15	20	15	20	18	19	23	19	23	21
COND. PRESS. DURING FREEZE (psig)	120	120	120	120	120	120	120	120	120	120
FREEZE TIME (min.)	45	37	33	20	18	28	28	19	13	12
SUCTION PRESS. END OF THAW (psig)	45	45	43	45	41	50	50	50	49	43
COND. PRESS. END OF THAW (psig)	59	56	53	54	55	60	59	63	64	59
ICE RELEASE TIME (sec.)	25	15	23	14	20	23	12	15	11	11
ICE OUT TIME (min.)	1:57	2:10	2:03	2:10	2:28	1:50	2:00	1:55	2:00	1:58
MINIMUM TIMER SETTING	3	3	3	3	3	3	3	3	3	3
PUMP DOWN R-12 LEVEL (CTR. BOTTOM COCK)*	11 3/4"	11 3/4"	14 1/4"	11 3/4"	14 1/4"	11 3/4"	11 3/4"	14 1/4"	11 3/4"	14 1/4"
LBS. OF ICE PER CYCLE	45	42	57	42	52	29	32	35	29	36

ALL VALUES IN THE ABOVE CHART ARE APPROXIMATIONS INTENDED AS A GENERAL GUIDE ONLY.

FIG. 14

*NOTE: EACH INCH OF R-12 LIQUID LEVEL IS EQUAL TO APPROXIMATLY 5 LBS.

SYMPTOMS & PROCEDURE

If the machine fails to operate satisfactorily, the following tables, which list causes and procedures under major symptoms, may be used for analyzing and correcting any difficulty.

TABLE A

FREEZE-UP DUE TO EXTENDED FREEZING PERIOD

	CAUSE	PROCEDURE
1.	Freezing time set too long.	See FREEZER PRESSURE SWITCHES.
2.	Makeup water temperature varies between day and night operation.	See FREEZER PRESSURE SWITCHES.
3.	Expansion valve (17) overfeeding.	See EXPANSION VALVE.
4.	Warm condenser water entering water pan (7) thru overflow connection (40). (Water cooled units)	Pipe Water Outlet (24) and drain (25) separately to floor drain.
5.	Drain Valve (39) from water pan open or leaking.	Close Valve.
6.	Solenoid Valve (18) may be by-passing hot refrigerant gas into freezer (2) during the freezing period.	Clean or replace solenoid valve. Check Manual opening stem which should be at "ALL IN" position.
7.	Makeup water float valve (12) stuck open.	Check operation of Float Valve and replace, if necessary. See FLOAT VALVE (Makeup Water).
8.	Low Refrigerant Charge.	See REFRIGERANT CHARGE. Check system for leaks before adding refrigerant.

TABLE B

FREEZE-UP DUE TO ICE FAILING TO DISCHARGE

CAUSE	PROCEDURE
1. Low condensing pressure during freezing resulting in insufficient heat for thawing.	See Condenser Water Regulator (water cooled) or See Condenser Press. Regulator air cooled).
2. Thawing Timer (57) setting too short to allow all ice to clear freezer.	See THAWING TIMER.
3. Insufficient heat for thawing due to low refrigerant charge.	Check Item 8, Table A.
4. Non-Condensible Gases (Usually Air) in system.	See NON-CONDENSIBLE GASES.
5. Cutter does not turn.	Check Cutter Drive for proper operation. See that Drive Gear is tight on Cutter Motor Shaft. Check circuit breaker #62. Replace breaker, if defective.
6. Ice backs up into cutter, jamming it.	If machine discharges into an ice chute check angle of chute (30° minimum angle for cylinder ice - 45° for crushed ice). Ice may not contact bin thermostat control bulb to stop machine when bin is filled. See ICE BIN THERMOSTAT.
7. Ice fails to discharge from cutter area properly.	Ice mushy due to concentration of solids in water pan. Drain and clean water pan. Check "blowdown" during thawing. See FLOAT VALVE (Makeup Water).
8. Extended freezing period.	See Table A.
9. Inadequate flow of refrigerant through thawing chamber (16) to provide sufficient heat to prevent ice freezing at lower freezer tube head.	Irregular operation of expansion valve (Liquid line should stay frosted on outlet side during freezing). Clean or replace expansion valve. Check item 1, Table B. Check for restriction in liquid line at Drier (46) or solenoid valve (20).

TABLE C

LOW ICE CAPACITY

CAUSE	PROCEDURE
1. Low Refrigerant charge in freezer.	Check setting of expansion valve (17) See EXPANSION VALVE. Check for restriction in liquid line at expansion valve (17), Drier (46) or solenoid valve (20).
2. Low Refrigerant charge in Machine.	See Item 8, Table A.
3. Expansion Valve overfeeding.	See Item 3, Table A.
4. Restriction in Liquid Line.	Check for obstruction at expansion valve (17), Drier (46) or solenoid valve (20).
5. Solenoid Valve (18) may be leaking hot refrigerant gas into freezer (2) during the freezing period.	Clean or replace solenoid valve. Check manual opening stem which should be at "ALL-IN" position.
6. Water Distributors at top of freezer may be stopped up.	See WATER DISTRIBUTORS.
7. Makeup Water Float Valve (12) provides inadequate quantity of water for ice making.	See FLOAT VALVE (Makeup Water). Check water pressure at machine (30 PSI minimum recommended).
8. Warm makeup water for ice making.	Rated capacity of machine is based on temperature of 75°F. Warmer water will reduce the ice making capacity. (See capacity table, Page).
9. Makeup water float valve (12) stuck open.	See Item 7, Table A. See FLOAT VALVE (makeup water)
10. Drain valve (39), from water pan, open or leaking.	Close valve.
11. Warm condenser water entering water pan (7) through overflow connection (40).	See Item 4, Table A.
12. Controls for regulating freezing and thawing periods improperly set.	See FREEZER PRESSURE SWITCH AND THAWING TIMER.

Continued (over)

TABLE C (continued)

CAUSE	PROCEDURE
13. Excessive condenser pressure.	WATER COOLED: Check water inlet pressure and temperature and adjustment of condenser water regulator valve (41). Water flow through valve may be restricted due to dirt or other foreign material on valve seat. See CONDENSER WATER REGULATOR. There may be non-condensible gases present in the system. See NON-CONDENSIBLE GASES. Flow of water through condenser coil may be restricted due to scale deposits. See CONDENSER CLEANING. Excessive refrigerant charge submerging cooling coil in condenser. See CHARGING. AIR-COOLED: Check pressure setting of Mercoid Pressure Switch used for controlling the operation of the fan motor of the air-cooled condenser - See CONDENSER PRESSURE REGULATOR. There may be non-condensible gases present in the system. See REMOVAL OF NON-CONDENSIBLE GASES. Air circulation through condenser may be restricted due to dirt clogging fin section - See CONDENSER CLEANING.
14. Extended thawing period.	Check setting of thawing timer (57). See THAWING TIMER. Check timer motor. Replace timer, if necessary. Relay (61) may be sluggish in operation, resulting in a partial resetting of the thawing timer at completion of normal thawing period. Clean or replace relay. The electrical contact of the freezer pressure switch (56) may not be opening during the normal thawing period, resulting in a partial resetting of the thawing timer. See FREEZER PRESSURE SWITCH.

TABLE D

SAFETY PRESSURE SWITCHES STOP MACHINE

CAUSE	PROCEDURE
1. Low Pressure Switch (29L) opens.	Compressor suction service valve (34) may be either closed or partially closed. Open valve wide. Check switch for improper setting (too high opening pressure).
2. High Pressure Switch (29H) opens.	Compressor Discharge Service Valve (45) closed or partially closed. Open valve wide. Check Item 13, Table C.

TABLE E

MOTOR OVERLOAD PROTECTORS STOP MACHINE

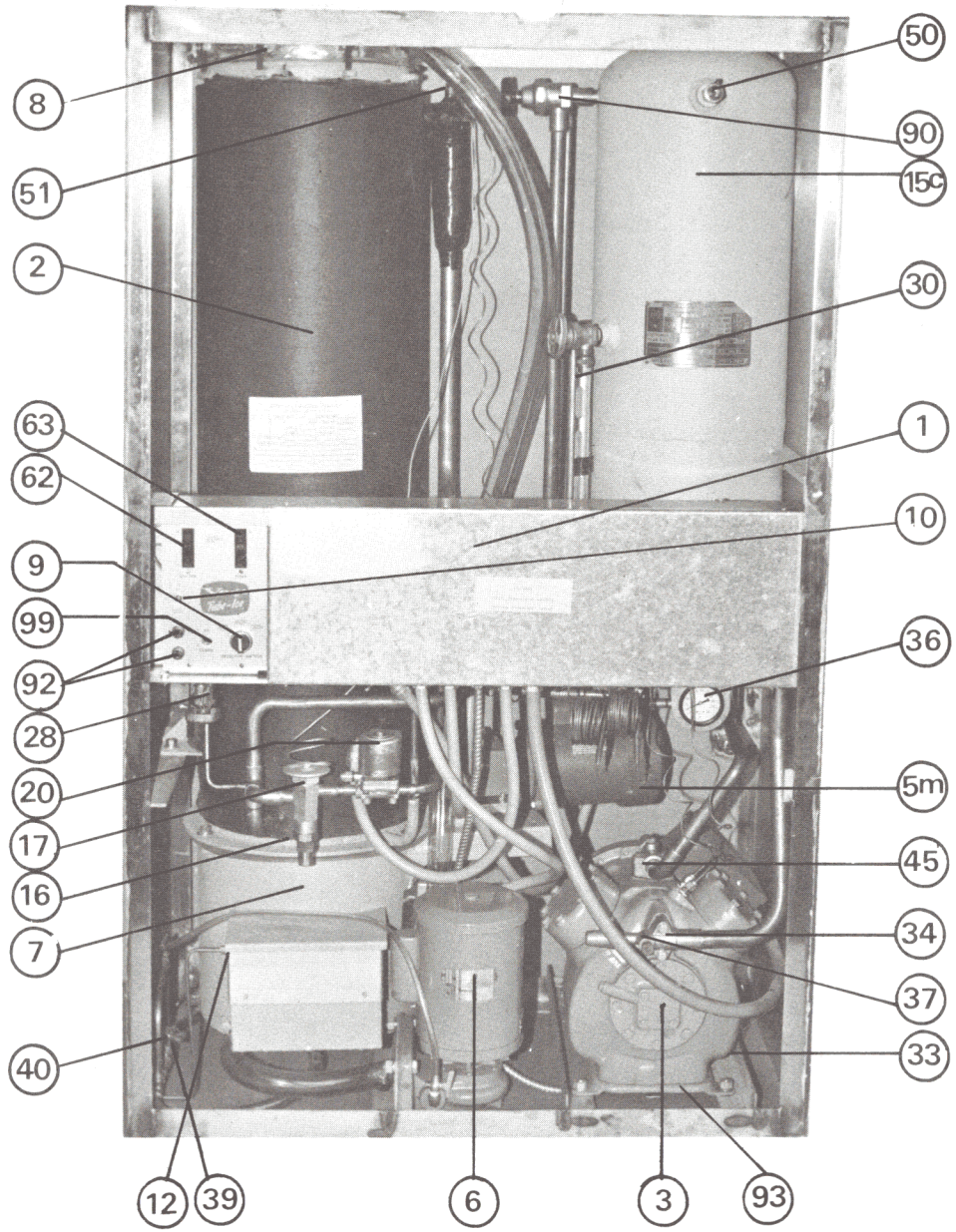
	PROCEDURE
1. Compressor motor overload stops machine. (Note - Overloads are automatic reset type, located in junction box of compressor motor).	Motor overloaded due to excessive condensing pressure - see Item 13, Table C. Motor overloaded, due to a high suction pressure(gage 35), warm water in water pan and warm inlet water to condenser during startup after a prolonged shutdown period. Machine should operate satisfactorily after temperature of water in water pan is reduced sufficiently so that the suction pressure is less than 30 PSI. Check Items 3, 4, 5, 6 and 7, Table A. Compressor binding, or stuck-repair or replace compressor. Check fuses in disconnect switch - one fuse may be burnt out, resulting in single phasing compressor motor.
2. Compressor internal temperature thermal switch (CD-TS) stops machine.	Excessive temperature may be caused by gas leakage between suction and discharge valves of compressor valve plate. Check for broken valve plate gaskets or valves.
3. Cutter Motor Circuit Breaker (62) or pump motor circuit breaker (63) stops machine.	Crushed ice too thick, overloading cutter motor - check setting of Freezer Pressure Switch (56A) - see FREEZER PRESSURE SWITCHES. Crushed ice mushy, fails to discharge properly, overloading cutter motor - see Item 7, Table B. Cutter bearing tight in cutter hub, overloading cutter motor - replace bearing, if defective. Cutter drive worn or binding, overloading cutter motor - install new cutter drive, if necessary. Pump fails to rotate due to dirt or rust in impeller housing - dismantle and clean pump.
4. One of the 1 amp. fuses in control circuit stops machine.	Check Compressor Crankcase Heater, Coils of Relays, coils of Solenoid Valves and Thawing Timer for a ground. Repair or replace defective part.

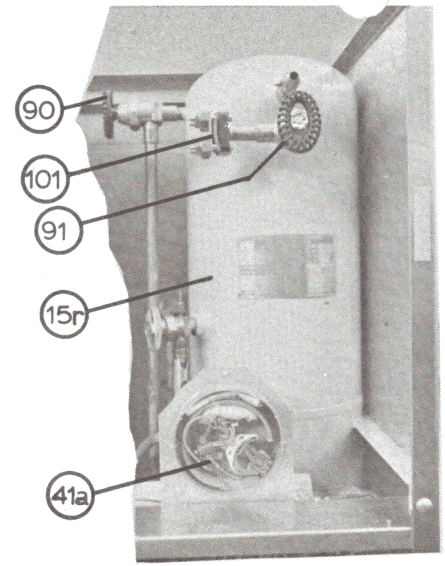
Parts List for Vogt Models 1500, 1800, 3000 & 4000

Tube Ice Parts Telephone Number	800-853-8648 or 502-635-3235
Tube Ice Parts-Fax Numbers	800-770-8648 or 502-635-3024
Web Site Address	www.tubeice.com

Visa and Mastercard Accepted

1. Control Pa.
2. Freezer
3. Compressor
5. Cutter Motor-Reducer
   5M-Motor
   5R-Reducer
6. Water Pump
7. Water Tank
8. Water Distributing Chamber
9. Ice Selector Switch
10. On-Off/Thaw Toggle Switch
12. Make-up Water Float Valve
15C. Condenser
15R. Receiver
16. Thawing Chamber
17. Expansion Valve
20. Solenoid Valve (A)
28. Charging Valve
30. Receiver Sight Glass
33. Compressor Sight Glass
34. Compressor Suction Valve
36. Condenser Pressure Gage
37. Oil Charging Connection
39. Water Tank Drain Valve
40. Automatic Blowdown
41A. Air Pressure Control
45. Compressor Discharge Valve
50. Condenser Relief Valve
51. Freezer Relief Valve
62. Cutter Motor Overload Switch
63. Water Pump Overload Switch
90. Thawing Gas Stop Valve
91. Stop Valve
92. 1-Amp. Fuses - Crankcase Heater and Coils
93. Compressor Crankcase Heater
99. Ice-Clean Toggle Switch
101. Conn. to A.C. Condenser Outlet
102. Conn. To A.C. Condenser Inlet



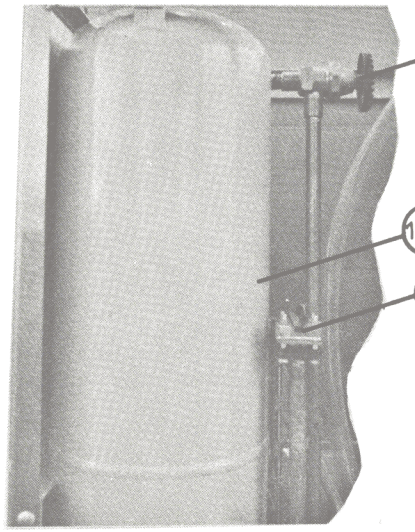


AIR COOLED UNITS

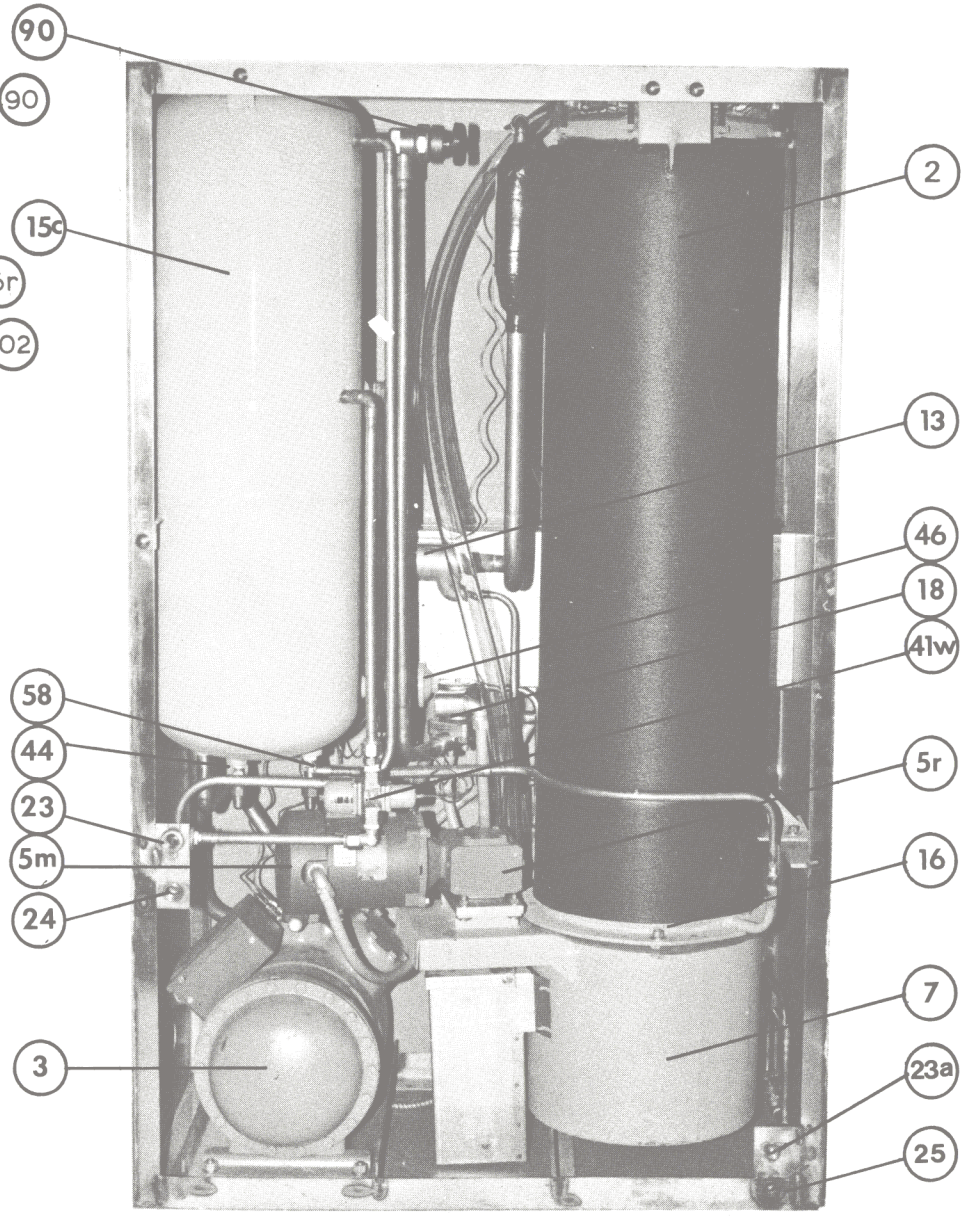
NOMENCLATURE
(front)

APPENDIX M

Form 24T-14 - 2-91 - VOGT



AIR COOLED UNITS

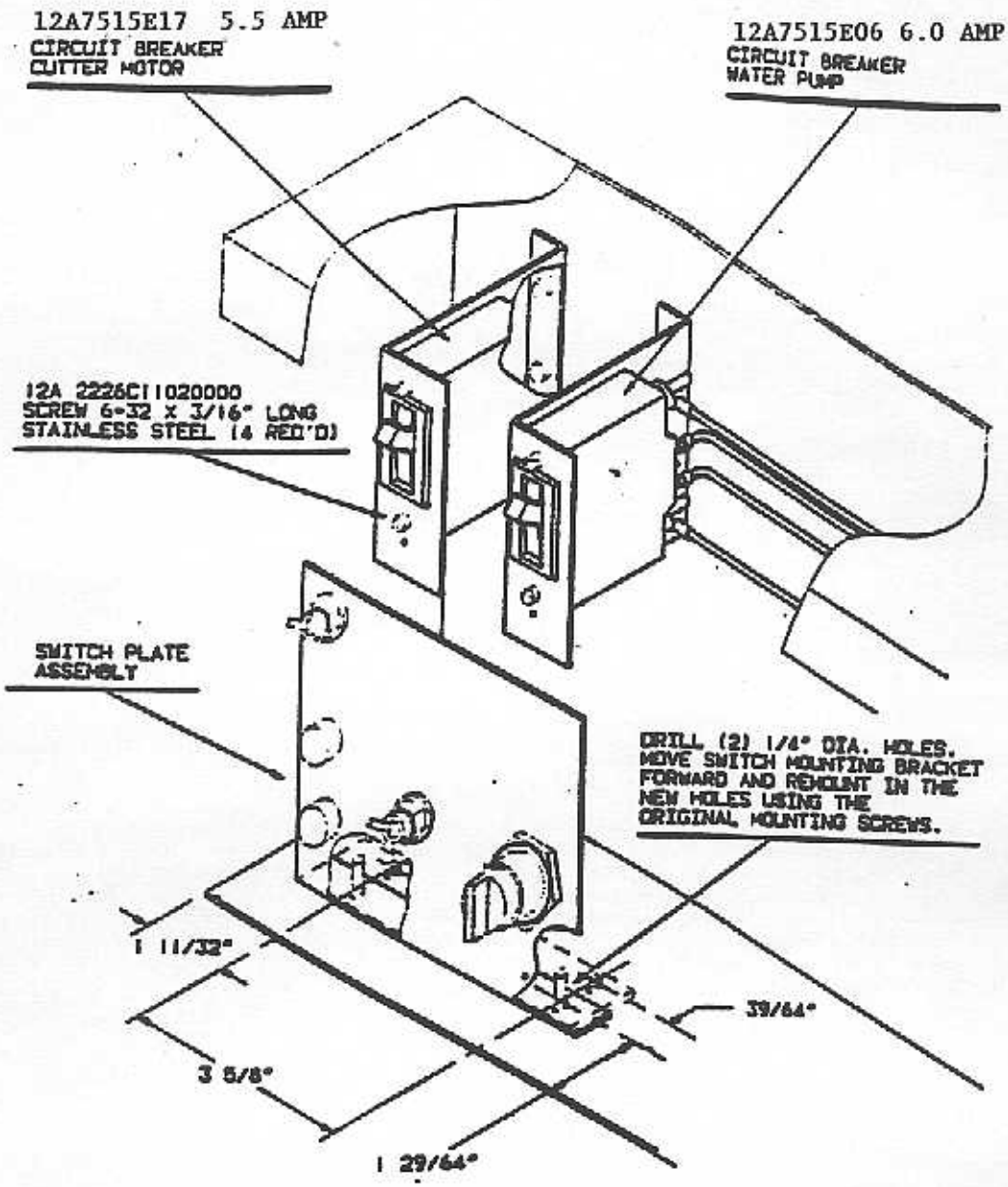


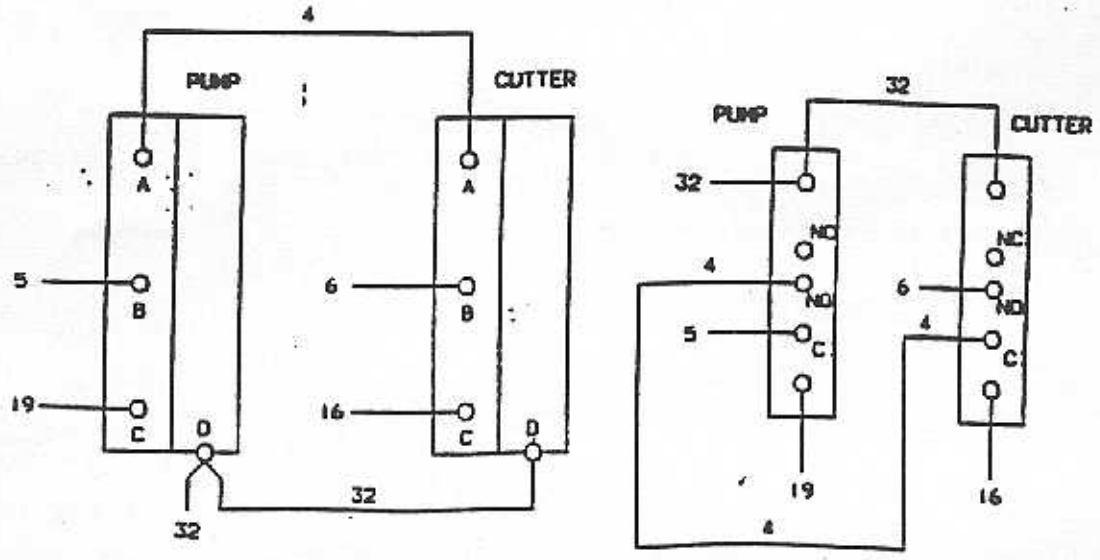
2. FREEZER
3. COMPRESSOR
5M. CUTTER MOTOR
5R. CUTTER REDUCER
7. WATER TANK
13. HEAT EXCHANGER
15C. CONDENSER
15R. RECEIVER
16. THAWING CHAMBER
18. SOLENOID VALVE (D)
23. CONDENSER WATER INLET, ½" FPT.
23A. MAKEUP WATER INLET, 3/8" FPT.
24. CONDENSER WATER OUTLET, ½" FPT.
25. WATER TANK DRAIN, ½" FPT.
30. RECEIVER SIGHT GLASS
41W. CONDENSER WATER REGULATOR
44. RECEIVER DRAIN VALVE
46. DRIER
58. CONDENSER LIQUID OUTLET VALVE
90. THAWING GAS STOP VALVE
101. CONN. TO A.C. CONDENSER (OUTLET)
102. CONN. TO A.C. CONDENSER (INLET)

NOMENCLATURE
(rear)

APPENDIX M

CIRCUIT BREAKER CONVERSION





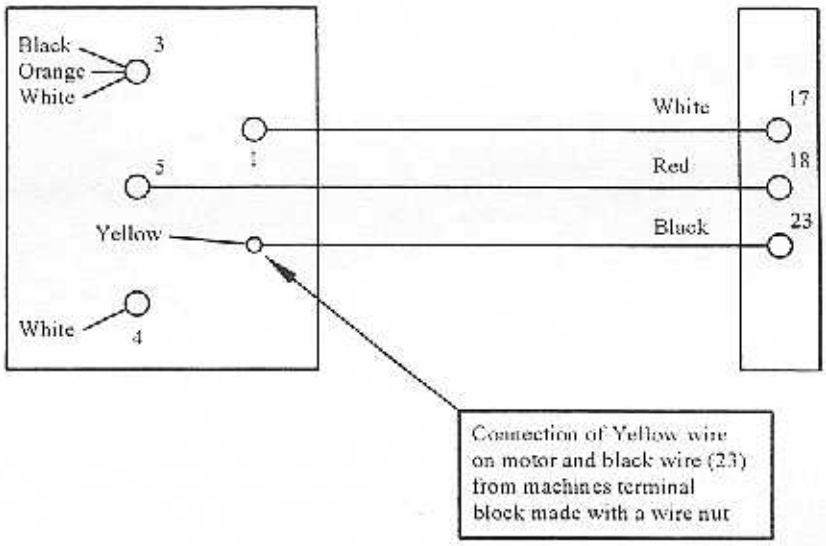
OLD BREAKERS (VIEWED FROM REAR) NEW BREAKERS

The new US Motor has the following specifications:

Manufacturer's Model #	CA55CWP-1851
Horse Power	1/2 HP
Service Factor	1.25
Frequency Rating	60 / 50 hz
Voltage	208-230 V / 200-220 V
FLA	4.1A / 5.1A

The drawing below shows the wiring of the new ½ HP US Motor (12A2900m0507)

Wiring Diagram for M1000 through M4000 (1/2 HP US Motor)



VOGT HAS TESTED MP39 (R401A) AS AN ALTERNATE REFRIGERANT FOR R-12 AND RECOMMENDS THE FOLLOWING GUIDELINES FOR CHANGEOUT IN THE MODELS 1500 THRU 4000.

All of Dupont's guidelines should be followed with the following modifications:

1. Drain as much oil from the evaporator as possible.

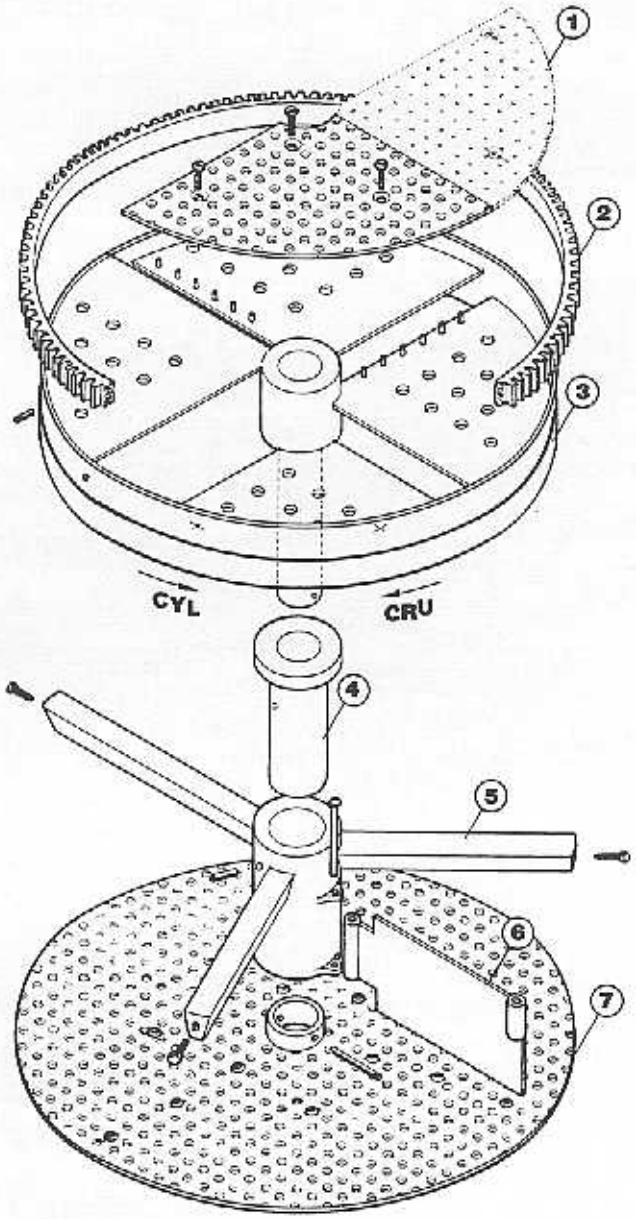
2. Charge the system as per Vogt instructions. **DO NOT** reduce the charge as Dupont recommends. Vogt machines need the full charge to defrost properly.

3. Reset the head pressure to 130 PSIG.

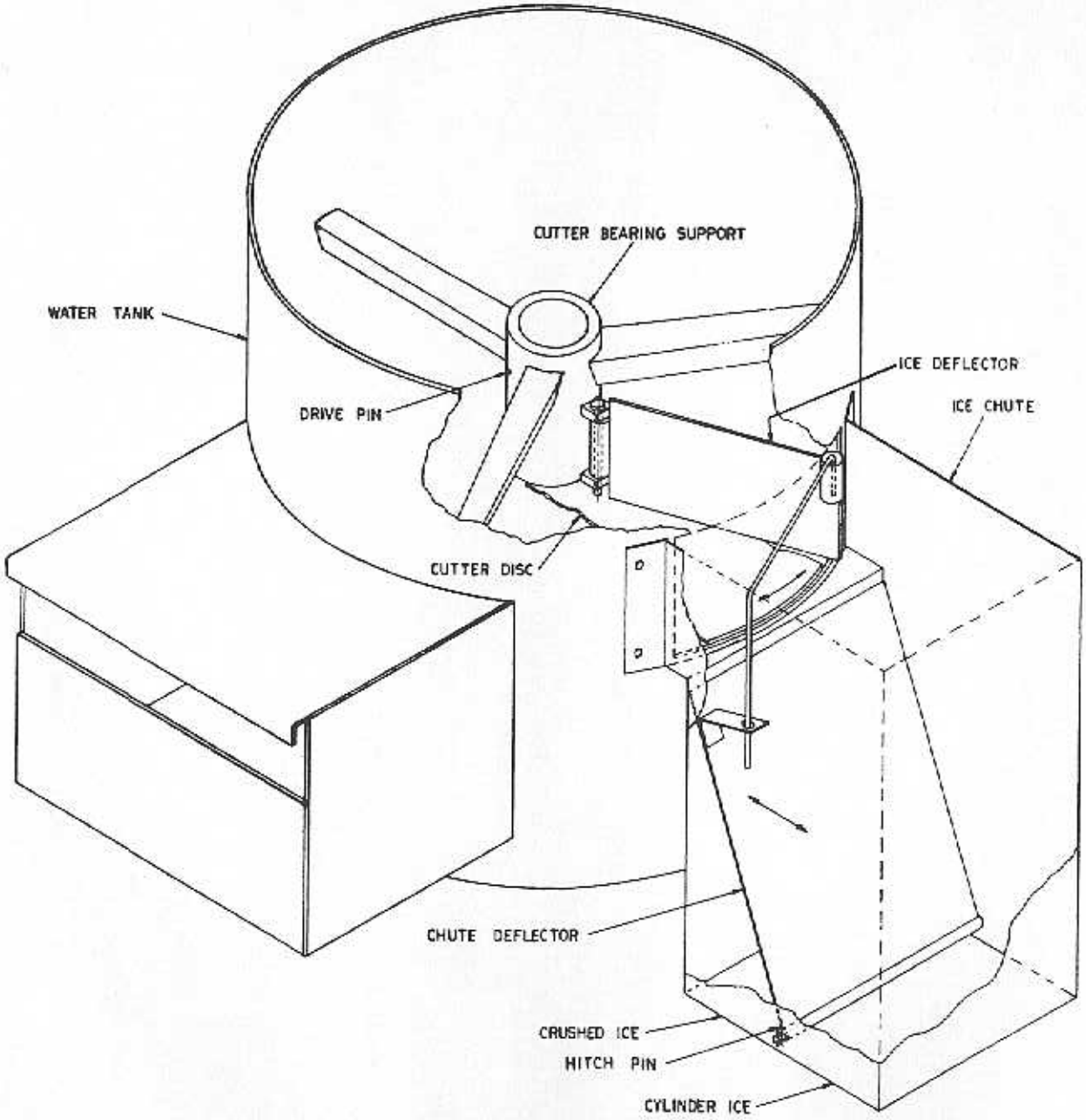
4. Check the frost pattern and adjust the expansion valve so that the frost line comes up just to the inlet of the heat exchanger.

5. Perform periodic oil tests to check the concentration of alkybenzene oil. A concentration of 90 to 95% is acceptable. Drain and fill as needed to achieve the desired concentration.

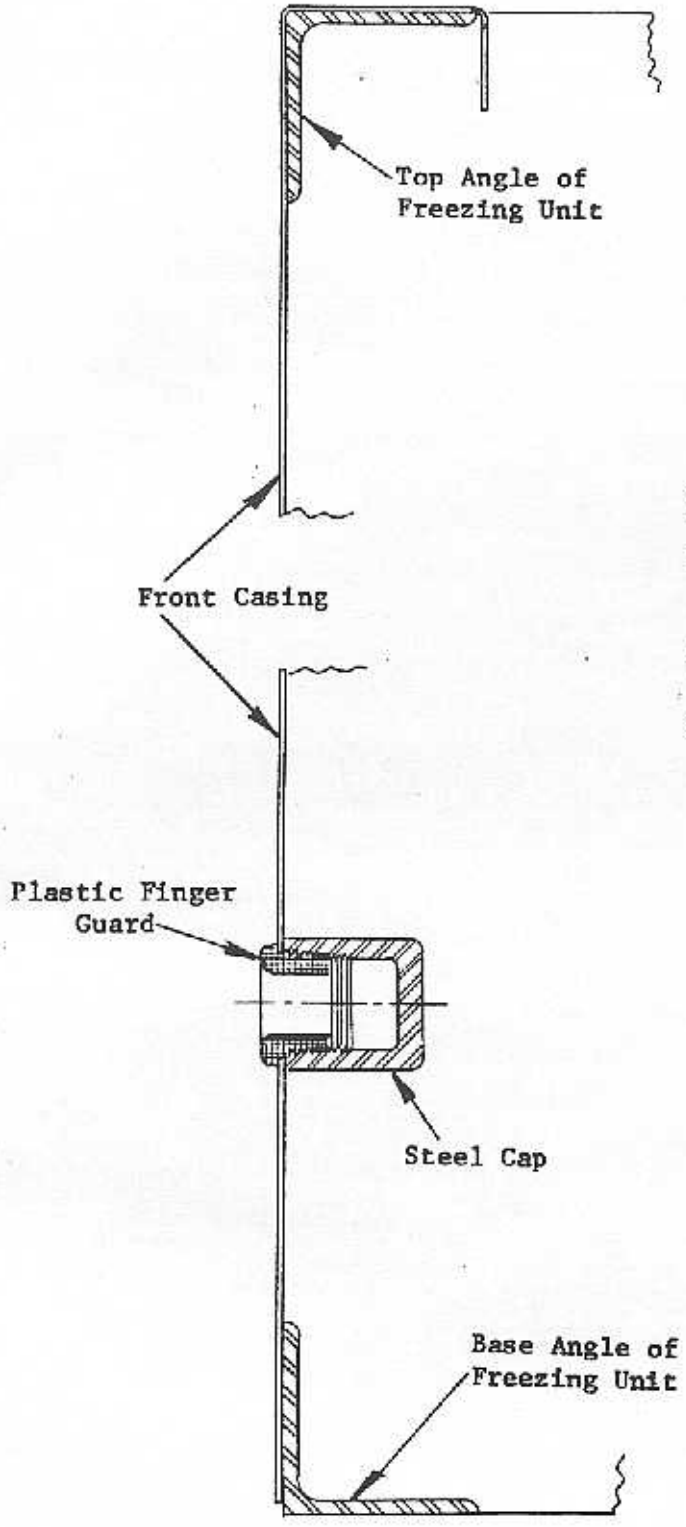
CUTTER ASSEMBLY



1. Adaptor Plate - M-1500 and M-2500, 1/4 section for 1" long ice (#12-7021)
   M-1800, M-3000 and M-4000, 1/2 section for 3/4" long ice (#12-7021–1)
   All models less adaptor plate, 1 1/2" long ice
2. Ringgear - All models part # 12-6639
3. Cutter - All models, part #12-6411 (includes ringgear)
4. Cutter Bearing - All models, part #12-6030-24
5. Bearing Support - All models, part #12-6077
6. Deflector - All models, part #12-6431
7. Disc - All models, part #12-6479



ICE DISCHARGE ARRANGEMENT

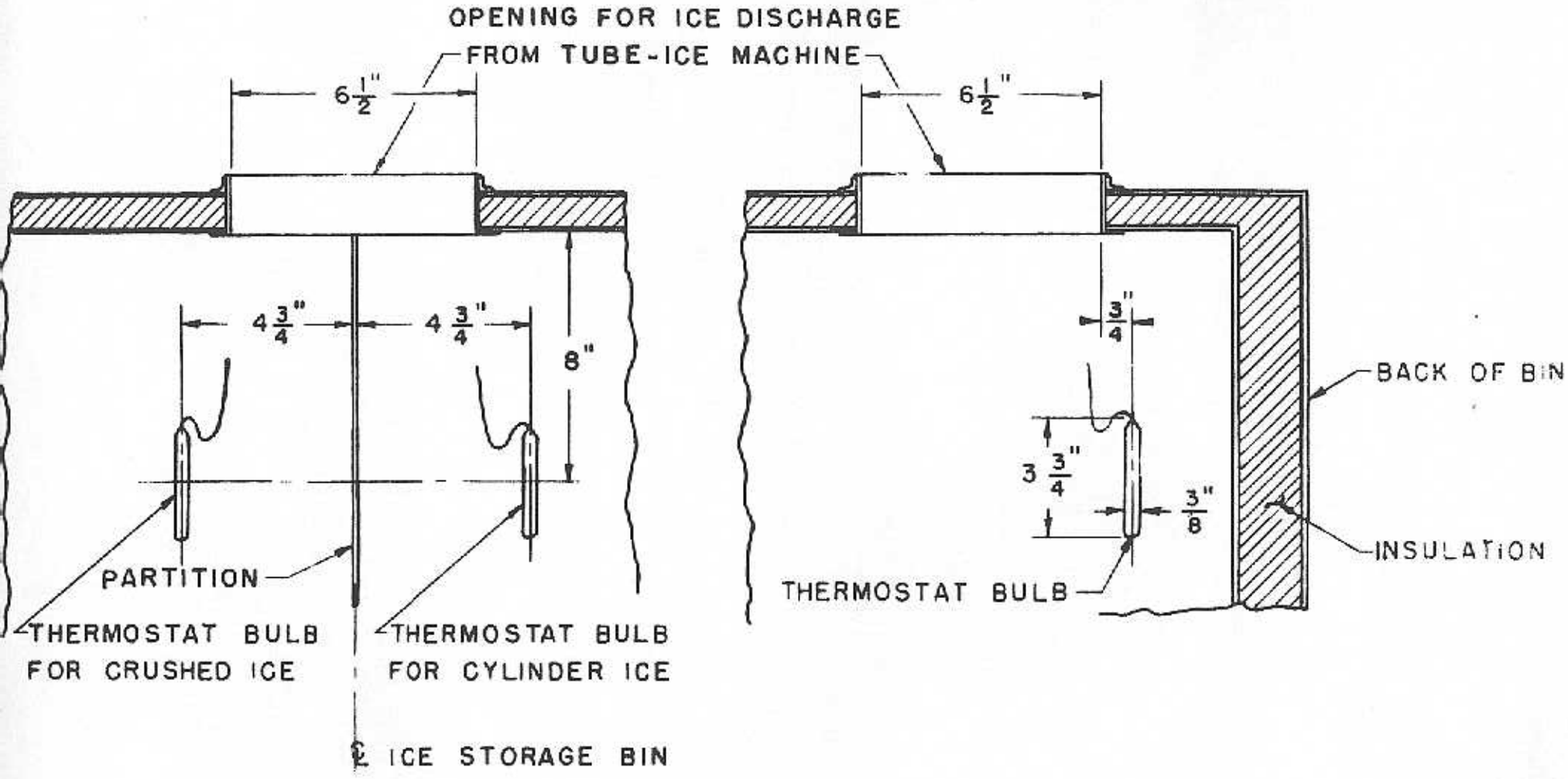


SECTIONAL ASSEMBLY

FRONT CASING INSTALLATION

1. Insert two (2) plastic finger guards in 1-1/16" diameter holes.
2. Tighten steel cap on each guard.
3. Front casing hooks over top angle.

Henry Vogt Machine Co.
Louisville, Kentucky
7-23-73



FRONT VIEW

SIDE VIEW

LOCATION OF THERMOSTAT BULBS
FOR ICE STORAGE BIN

FORM 4T-14-R1 - 500 - 4-80 - VOGT

FINAL CHECK LIST

FOR INITIAL START—UP OF

Vogt TUBE-ICE MACHINES

1. **check** ALL WATER SUPPLY AND DRAIN CONNECTIONS FOR CONFORMITY TO REQUIREMENTS STIPULATED IN MANUAL FURNISHED WITH MACHINE.

2. **check** ELECTRICAL SUPPLY FOR PROPER SIZE OF FUSES AND/OR CIRCUIT BREAKERS AND FOR COMPLIANCE TO LOCAL AND NATIONAL CODES.

3. **check** ALL FIELD INSTALLED EQUIPMENT (AIR COOLED COND., ICE STORAGE BIN, CONVEYORS ..... ETC.) FOR PROPER INSTALLATION.

4. **check** REFRIGERANT LEVEL SHOWN IN GAUGE GLASS ON CONDENSER/RECEIVER (GAUGE COCKS MUST BE OPEN WHEN CHECKING LEVEL).. OPEN VALVES TAGGED TO BE OPENED.

5. **check** OIL IN COMPRESSOR (CTR.. OF GLASS-MIN..). CRANKCASE HEATER HAS BEEN ENERGIZED AT LEAST 2 HRS.

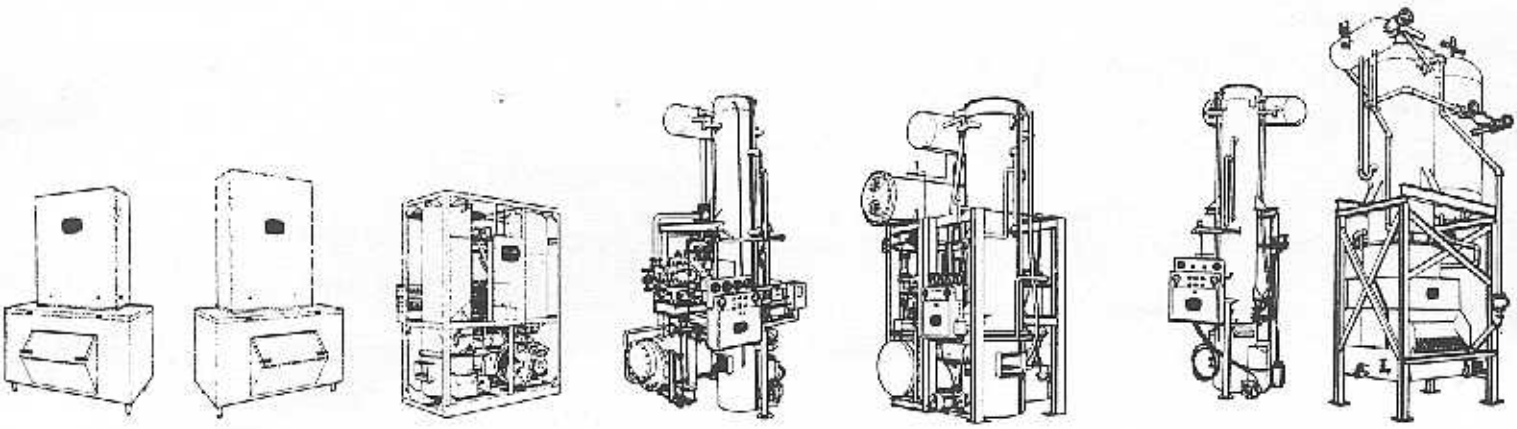
6. **check** ICE BIN THERMOSTAT LOCATION AND ATTACHMENT IN STORAGE BIN.

7. **check** ICE CHUTE ALIGNMENT WITH BIN OPENING.

8. **check** WATER LEVEL IN PUMPING TANK.

9. **START MACHINE**

10. **check** AT LEAST THREE COMPLETE CYCLES.



Vogt TUBE-ICE MACHINES

Vogt® revolutionized the commercial ice-making industry in 1937 when it built the first Tube-Ice Machine.® For the prior 50 years, throughout the world, all ice was made in cans. The process usually took 24 hours to freeze a block of ice, required an elaborate brine system, lots of labor, huge amounts of floor space and produced ice that was partially clear and partially opaque. In addition, the large blocks required cutters, crushers or cubers to get the ice into usable form and waste was high.

Vogt engineers met the challenge of producing hard, clear ice by freezing water on the inside surface of vertical tubes. Direct expansion of the refrigerant in the shell that surrounds the tubes quickly freezes the falling film of water in each tube. The constant flow of water over the ice during the freezing period assures that the ice will be clear and sparkling—free of impurities.

Then Vogt automated the entire process with simple, trouble-free controls to thaw the ice from the tubes and automatically size it with a cutter into usable short cylinders or crushed ice when desired.

Vogt's complete line of automatic Tube-Ice Machines has revolutionized the ice making industry.

Often referred to as the "Iceman's Icemaker", today's Vogt Tube-Ice Machine is engineered and quality constructed of stainless steel and other high quality materials to perform dependably over decades of continuous service.

The low cost per ton of Tube-Ice ice is possible because of the space-saving design, a very low power requirement, the highest quality components and minimum labor and maintenance costs with extremely long service life.

Today's automatic Vogt Tube-Ice Machines are realizing energy savings of from 30% to 50% over all other hard ice machines.