E240-600 SED/JUL 90
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Dist: 1, 1a, 1b, 1c, 4, 4b, 4c

FRICK ICE

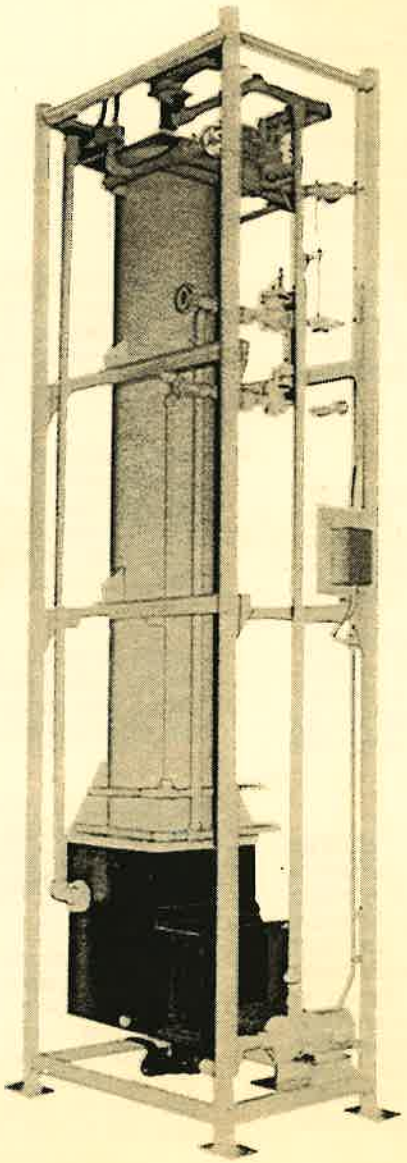
Specifications - Engineering data - Dimensions

TIM - TUBULAR ICE MAKERS

Models: F20 through F36

WITH

MICROPROCESSOR CONTROL



VALVES: All required valves are furnished and installed. Valves are grouped into liquid, suction, safety valve(s) and hot gas assemblies.

The **liquid line valve group** includes a hand expansion valve, check valve (liquid recirculation only), liquid feed solenoid valve, and two stop valves. The **suction valve group** includes a back pressure regulator, suction solenoid control valve, and two stop valves. The **hot gas valve group** is made up of a check valve, outlet pressure regulator, hot gas solenoid valve, and two stop valves.

CUTTER: The cutter assembly consists of a solid 304 stainless steel shaft, a 304 stainless steel cutter bar table, a 304 stainless steel perforated ice slinger table, and a 304 stainless steel ice retainer ring.

CUTTER MOTOR ASSEMBLY: The cutter motor is TEFC, 1800 RPM, ranging in size from 3/4 HP to 2 HP. A gear reducer drives the cutter shaft at the desired speed.

WATER DISTRIBUTION SYSTEM

WATER DISTRIBUTION BOX: The water distribution system is constructed of 12 gauge 304 stainless steel and TIG welded to the shell tubesheet. Nylon dispersion nozzles feed water to individual tubes. A clear Lexan cover prevents foreign matter from entering the water distribution system and allows checking of the water distribution box during unit operation. A close coupled TEFC pump delivers water from the tub reservoir to the top of the unit.

TUB RESERVOIR: The basin of the reservoir is constructed of 12 gauge 304 stainless steel. Overflow and drain couplings are made of 304 stainless steel. Water make-up is controlled by a water float valve which opens or closes the make-up line as the tub level changes.

CONTROL ASSEMBLY

CONTROL PANEL: A NEMA 4 microprocessor control panel, in addition to housing the microprocessor, includes the pump and cutter motor starters, 120 V control transformer, control and motor power terminal strip, and contacts for the power input. The control terminal strip has spare contacts for on/off control of the handling system (supplied by others). A jam control input, for customer supplied sensors, controls power on/off switch and all necessary overloads and fuses are contained in the panel.

PANEL FACE: The control panel face contains the panel of the microprocessor. The display screen and key pad are the major components of the microprocessor panel.

MICROPROCESSOR CONTROL: The microprocessor panel is supplied with a single display with a minimum rated life of 100,000 hours. The display is backlit for ease of reading in all lighting conditions. The main operating conditions are continuously shown on the microprocessor display. The adjustable and fixed settings are shown on succeeding displays, as are the current hourly and daily cycle count totals. The adjustable setpoints bay be easily changed even while the TIM is continuing to operate.

JUNCTION BOX: An NEMA 4X electrical junction box mounted on the Tubular Ice Maker accepts power and control wiring from the microprocessor control panel for the pump motor starter, cutter bar motor starter, control valves, and float switches (flooded units only). Connection points on the junction box are numbered to match those on the control panel for easy installation.

FLOODED FEED OPTION

Instead of the liquid recirculated arrangement for refrigerant feed to the shell, a flooded feed arrangement is optionally available. The flooded feed package consists of a surge drum, a transfer drum, flanged liquid and suction connections, a float column with high and operating level switches, hand expansion valve, two bypass valves, liquid feed solenoid valve, liquid line strainer, relief valve, drain valve, and vent. The flooded feed assembly is shipped completely mounted to the unit.

DISCHARGE BACKPRESSURE REGULATOR

Installation of a backpressure regulator in a screw compressor package discharge line is recommended if the discharge pressure is expected to drop rapidly during the ice maker harvest cycle.

SEQUENCE OF OPERATION

CONTROLS: The entire ice making process is fully automated by the microprocessor control. A pressure switch senses the suction pressure at the unit. When the setpoint is reached, the pressure switch closes and starts the ice making sequence. The microprocessor times each pre-programmed cycle within the ice making process. The ice making cycle may be changed at any time, even while the TIM is in operation. The pressure switch, as well as the starters for the water pump and cutter bar motor drive are prewired in the electrical junction box, mounted on the unit and only need to be wired to the microprocessor control.

CYCLES: In the **PREFREEZE CYCLE** the cold liquid refrigerant flows through the evaporator prechilling the stainless tubes.

During the **FREEZE CYCLE** the cold liquid refrigerant continues to flow through the evaporator. The water pump is turned on and supplies water to the water pan at the top of the evaporator. Specially designed nozzles direct the flow of water down each tube. As the water flows down the tube it begins to freeze gradually growing in ice thickness as the cycle continues.

When the harvest cycle times out the **PUMPDOWN CYCLE** is started. In the pumpdown cycle the liquid refrigerant flow is stopped. During this cycle if the water is selected to be left on, the ice will have a better clarity when it is harvested. Should the selection be for the water to turned off, the ice will be harder, colder and drier.

After the pumpdown cycle the unit will go int the **PREHARVEST CYCLE**. Hot gas is introduced into the evaporator, the water pump is turned off and the suction valve is closed. The liquid refrigerant in the evaporator begins to warm.

The **HARVEST CYCLE** begins when a fixed pressure setpoint has been reached in the preharvest cycle. The cutter bar motor is turned on and the ice starts to slide down the stainless steel tubes to a fixed table under the tubes. As the ice falls a cutter blade rotates, cutting the ice to specific lengths and pushing the ice down the ice discharge chute.

At the end of the timed harvest cycle, the **HARVEST TERMINATION CYCLE** begins. The hot gas valve is turned off and the water pump is turned on. The flow of water through the stainless steel tubes flushes the tubes of any ice fragments.. When this timed cycle ends the unit begins the prefreeze cycle again.

EQUIPMENT SELECTION

The following information is required for final unit selection:

Capacity Required: Tons of Ice Per Day

Refrigerant: R-717 (Ammonia) or R-22

Refrigerant Feed Method: Liquid Recirculation (Standard)
Flooded (Optional)

Suction Pressure (PSIG):
R-717: 15, 20, 25, 30, 35
R-22: 25, 30, 35, 40, 45

Entering Make-up Water Temperature (EMWT):
85°F to 35°F

Type of Ice: Tubular or Shell

Desired Ice Size: 7/8", 1-1/8", or 1-3/8" diameter

STANDARD CONDITIONS

Standard capacity ratings are based on tubular ice, ammonia refrigerant (R-717), 20°F (33.5 psig) saturated suction pressure, liquid recirculation and 65°F entering make-up water temperature.

ICE MAKER SELECTION PROCEDURE

The first step in equipment selection is to identify the operating conditions for the Tubular Ice Maker. Fill in the known operating conditions below:

Tons of Ice Required: _____

Refrigerant: _____

Type of Refrigerant Feed: _____

Suction Pressure: _____

Entering Make-up Water Temperature: _____

Type of Ice: _____

Use the appropriate selection chart, from pages 7 through 12, based on refrigerant, type of feed, and tubular ice. Then read the chart for suction pressure, and entering make-up water temperature and select the unit which equals or exceeds the daily tons of ice required, for the desired ice diameter.

Unit selected: _____

MATCHING COMPRESSOR SELECTION PROCEDURE

To determine the compressor TR required for these particular conditions, refer to the Compressor TR and Refrigerant Pump GPM Table on page 13. Locate the Tubular Ice Maker selected above. Read across the top for the design suction pressure. The corrected TR for these design conditions is located in the square where these TIM unit selected and the design suction pressure intersect. When selecting a compressor motor it is necessary to compensate for high suction pressures during the harvest cycle by choosing a motor with additional horsepower than needed for normal operation.

Unit TR: _____

SYSTEM DESIGN DATA

LOCATION: The FRICK Tubular Ice Maker should be maintained in ambient conditions of between 45°F and 70°F. Temperatures below this range may cause erratic operation, while temperatures above this range will reduce capacity. Units located outdoors must be capacity derated for summer operation (consult FRICK Company for further details).

LIQUID RECIRCULATION: R-717 (Ammonia) or R-22 refrigerant is fed into the shell by a pump. Note: the pump is NOT included with the ice maker. Using the Compressor TR and Refrigerant Pump GPM Table on page 13, read across the top for the design suction temperature, then read down that column locating the Tubular Ice Maker unit selected earlier, find the refrigerant pump gpm required in the square where the two factors intersect.

Refrigerant Pump GPM: _____

FLOODED: Ammonia or R-22 refrigerant is fed to the surge drum, which feeds the ice maker. Level is controlled inside the surge drum.

CONDENSER PRESSURE CONTROL: Condensing pressure should not fall below 110 PSIG on R-22 systems or 100 PSIG on ammonia systems. This ensures an adequate supply of hot gas during the harvest cycle.

CONDENSER SELECTION: Add 3 PSIG to the suction pressure available at the TIM to select the condenser.

HIGH PRESSURE RECEIVER: The high pressure receiver should be used as the source of hot gas for the Tubular Ice Maker unit. To defrost properly, the high pressure receiver must be sized to allow a rapid removal of hot gas. Refer to the High Pressure Receiver and Hot Gas Line Sizing Table, page 13, for suggested receiver sizing.

High Pressure Receiver Size: _____

LOCATION OF HOT GAS LINE: The hot gas line must be piped from the high pressure receiver to the TIM harvest valve control group. If FRICK Company is providing the receiver, a hot gas connection will be provided on request. See the High Pressure Receiver and Hot Gas Line Sizing Table, page 13, for the recommended hot gas defrost line sizing.

Hot Gas Line Size: _____

MULTIPLE ICE MAKERS

INSTALLATION ON A COMMON SUCTION LINE: Each unit requires a water recirculating pump. Expect a slight decrease in capacity if the ice makers are most of the load, since the suction line pressure increases when the units harvest. The use of the microprocessor inputs prevent the units from harvesting at the same time.

INSTALLATION IN EXISTING SYSTEMS: If the TIM is sharing a suction line, the impact of increasing suction pressure on the system should be considered. The effect may be significant if the Tubular Ice Makers constitute the majority of the refrigeration load. For this reason, individual suction lines should be used when practical.

WATER REQUIREMENTS

Water is frozen into ice by the Tubular Ice Maker. To replenish the water consumed during each cycle, water must be added to the tub of the TIM. The water left over from the freeze cycle is comparatively high in minerals.

MAKE-UP WATER RATE: Make-up water is the amount which is supplied to the TIM unit. It is the sum of the water frozen to produce ice plus the bleed rate. The make-up rate is controlled by a float in the tub. Be generous when sizing make-up lines to the unit. It is always better to have too much water than not enough. The table below gives the suggested water make-up rates and supply line sizes.

WATER BLEED RATE: The water bleed rate is the percentage of water required to be replaced in order to maintain the ice quality. Because of the capacity losses caused by water with high mineral content, the water bleed rate will also help maintain the ice building capacity required. To understand what effects the bleed rate, it is necessary to understand what is happening to the water. Water is circulated in greater quantities than is necessary for the amount of ice being produced. This is necessary in order to provide sufficient water to the freezing surface for efficient operation. As this excess water flows through the tubes, it collects some of the minerals from the water being frozen, thus increasing the total mineral content (calcium ions) of the excess water. The higher the calcium ions in the water, the lower the suction temperature required for the water to be frozen. Without bleeding off any water, the amount of calcium ions in the circulated water constantly increases. To reduce this build up of calcium ions, a portion of the water is bled off from the water pan, and an equal amount is added to maintain the total water required for the freeze cycle. A calcium ion test of the water should be completed to determine the water bleed rate. The amount of water required to be bled off can be determined using the Make-up Water table when the results of the calcium ion concentration are known. Use the table below to locate the calcium ion concentration equal to or higher than the test results. Find the corrected gpm rate under the ppm of calcium ions column, present in the water, for the specific TIM unit by installed. If the water test indicates a calcium ion content below 25 ppm, the nominal water gpm rate can be used.

To reduce the bleed rate, use water treatments such as water filtration or water softening. Both of these forms of water treatment decrease the calcium ion concentration of the supply water.

MAKE-UP WATER (gallons per minute)

MODEL NUMBER	WATER LINE SIZE	NOMINAL GPM	CALCIUM IONS (parts per million)							
			25	50	75	100	150	200	250	300
F20N	3/4	4.5	5.4	6.4	7.3	8.3	10.1	12.0	13.9	15.8
F20D	3/4	3.5	4.2	5.0	5.7	6.4	7.9	9.3	10.8	12.3
F24N	3/4	7.0	8.5	9.9	11.4	12.8	15.8	18.7	21.6	24.5
F24D	3/4	6.0	7.3	8.5	9.8	11.0	13.5	16.0	18.5	21.0
F24X	3/4	5.0	6.0	7.1	8.1	9.2	11.3	13.3	15.4	17.5
F30N	1	11.0	13.3	15.6	17.9	20.2	24.8	29.3	33.9	38.5
F30D	1	10.0	12.1	14.2	16.3	18.3	22.5	26.7	30.8	35.0
F30X	1	8.5	10.3	12.0	13.8	15.6	19.1	22.7	26.2	29.8
F36N	1	15.0	18.1	21.3	24.4	27.5	33.8	40.0	46.3	52.5
F36D	1	13.5	16.3	19.1	21.9	24.8	30.4	36.0	41.6	47.3
F36X	1	11.0	13.3	15.6	17.9	20.2	24.8	29.3	33.9	38.5

7/8" O.D. ICE
R-717 REFRIGERANT

RECIRCULATED FEED SELECTION TABLES

MODEL F20N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	26.0	27.8	30.7	33.3	35.9
85	10.9	12.6	15.6	17.4	18.6
75	11.5	13.8	17.4	18.4	19.6
65	12.4	14.3	17.8	19.9	21.2
55	13.1	15.1	18.7	21.0	22.3

MODEL F24N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	40.0	42.8	47.2	51.2	55.2
85	16.7	19.4	24.0	26.8	28.5
75	17.7	21.3	26.8	28.3	30.2
65	19.1	22.1	27.4	30.6	32.6
55	20.2	23.2	28.9	32.2	34.3

MODEL F30N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	66.0	70.6	77.9	84.5	91.1
85	27.6	31.9	39.7	44.3	47.1
75	29.3	35.1	44.3	46.7	49.7
65	31.6	36.4	45.2	50.5	53.6
55	33.2	38.3	47.6	53.1	56.5

MODEL F36N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	88.0	94.2	103.8	112.6	121.4
85	36.9	42.6	52.9	59.1	62.8
75	38.9	46.8	59.0	62.3	66.2
65	42.1	48.5	60.4	67.3	71.6
55	44.3	51.0	63.5	70.9	75.3

FLOODED FEED SELECTION TABLES

MODEL F20N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	26.0	27.8	30.7	33.3	35.9
85	9.3	10.7	13.2	14.8	15.7
75	9.8	11.7	14.8	15.6	16.6
65	10.5	12.2	15.1	16.8	18.0
55	11.1	12.8	15.9	17.7	18.9

MODEL F24N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	40.0	42.8	47.2	51.2	55.2
85	14.3	16.4	20.4	22.8	24.2
75	15.0	18.0	22.7	24.0	25.5
65	16.1	18.7	23.3	26.0	27.5
55	17.0	19.7	24.5	27.3	29.1

MODEL F30N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	66.0	70.6	77.9	84.5	91.1
85	23.4	27.0	33.7	37.5	39.9
75	24.8	29.8	37.5	39.6	42.2
65	26.8	30.8	38.3	42.8	45.5
55	28.1	32.4	40.4	45.1	47.9

MODEL F36N

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	88.0	94.2	103.8	112.6	121.4
85	31.3	36.1	44.8	50.0	53.2
75	33.0	39.7	50.0	52.8	56.2
65	35.7	41.1	51.1	57.1	60.6
55	37.6	43.3	53.8	60.1	63.8

EMWT - Entering Make-up Water Temperature.

PRESSURE - TEMPERATURE CONVERSION TABLE

PSIG	TEMPERATURE	PSIG	TEMPERATURE
35	21.4°F	20	5.5°F
30	16.6°F	15	-1.0°F
25	11.3°F		

WATER REQUIREMENTS

Water is frozen into ice by the Tubular Ice Maker. To replenish the water consumed during each cycle, water must be added to the tub of the TIM. The water left over from the freeze cycle is comparatively high in minerals.

MAKE-UP WATER RATE: Make-up water is the amount which is supplied to the TIM unit. It is the sum of the water frozen to produce ice plus the bleed rate. The make-up rate is controlled by a float in the tub. Be generous when sizing make-up lines to the unit. It is always better to have too much water than not enough. The table below gives the suggested water make-up rates and supply line sizes.

WATER BLEED RATE: The water bleed rate is the percentage of water required to be replaced in order to maintain the ice quality. Because of the capacity losses caused by water with high mineral content, the water bleed rate will also help maintain the ice building capacity required. To understand what effects the bleed rate, it is necessary to understand what is happening to the water. Water is circulated in greater quantities than is necessary for the amount of ice being produced. This is necessary in order to provide sufficient water to the freezing surface for efficient operation. As this excess water flows through the tubes, it collects some of the minerals from the water being frozen, thus increasing the total mineral content (calcium ions) of the excess water. The higher the calcium ions in the water, the lower the suction temperature required for the water to be frozen. Without bleeding off any water, the amount of calcium ions in the circulated water constantly increases. To reduce this build up of calcium ions, a portion of the water is bled off from the water pan, and an equal amount is added to maintain the total water required for the freeze cycle. A calcium ion test of the water should be completed to determine the water bleed rate. The amount of water required to be bled off can be determined using the Make-up Water table when the results of the calcium ion concentration are known. Use the table below to locate the calcium ion concentration equal to or higher than the test results. Find the corrected gpm rate under the ppm of calcium ions column, present in the water, for the specific TIM unit by installed. If the water test indicates a calcium ion content below 25 ppm, the nominal water gpm rate can be used.

To reduce the bleed rate, use water treatments such as water filtration or water softening. Both of these forms of water treatment decrease the calcium ion concentration of the supply water.

MAKE-UP WATER (gallons per minute)

MODEL NUMBER	WATER LINE SIZE	NOMINAL GPM	CALCIUM IONS (parts per million)							
			25	50	75	100	150	200	250	300
F20N	3/4	4.5	5.4	6.4	7.3	8.3	10.1	12.0	13.9	15.8
F20D	3/4	3.5	4.2	5.0	5.7	6.4	7.9	9.3	10.8	12.3
F24N	3/4	7.0	8.5	9.9	11.4	12.8	15.8	18.7	21.6	24.5
F24D	3/4	6.0	7.3	8.5	9.8	11.0	13.5	16.0	18.5	21.0
F24X	3/4	5.0	6.0	7.1	8.1	9.2	11.3	13.3	15.4	17.5
F30N	1	11.0	13.3	15.6	17.9	20.2	24.8	29.3	33.9	38.5
F30D	1	10.0	12.1	14.2	16.3	18.3	22.5	26.7	30.8	35.0
F30X	1	8.5	10.3	12.0	13.8	15.6	19.1	22.7	26.2	29.8
F36N	1	15.0	18.1	21.3	24.4	27.5	33.8	40.0	46.3	52.5
F36D	1	13.5	16.3	19.1	21.9	24.8	30.4	36.0	41.6	47.3
F36X	1	11.0	13.3	15.6	17.9	20.2	24.8	29.3	33.9	38.5

1-1/8" O.D. ICE
R-717 REFRIGERANT

RECIRCULATED FEED SELECTION TABLES

MODEL F20D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	21.0	22.5	24.8	26.9	29.0
85	8.8	10.2	12.6	14.1	15.0
75	9.3	11.2	14.1	14.9	15.8
65	10.0	11.6	14.4	16.1	17.0
55	10.6	12.2	15.1	16.9	17.9

MODEL F24D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	36.0	38.5	42.5	46.1	49.7
85	15.1	17.4	21.6	24.2	25.7
75	16.0	19.2	24.2	25.5	27.1
65	17.2	19.9	24.7	27.5	29.2
55	18.0	20.9	26.0	28.9	30.9

MODEL F30D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	60.0	64.2	70.8	76.8	82.8
85	25.2	29.0	36.0	40.3	42.7
75	26.6	31.9	40.3	42.5	45.2
65	28.7	33.1	41.2	45.9	48.8
55	30.2	34.8	43.3	48.3	51.3

MODEL F36D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	80.0	85.6	94.4	102.4	110.4
85	33.6	38.7	48.1	53.7	57.1
75	35.4	42.6	53.7	56.7	60.2
65	38.2	44.1	54.9	61.2	65.0
55	40.2	46.4	57.7	64.4	68.5

FLOODED FEED SELECTION TABLES

MODEL F20D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	20.1	22.5	24.8	26.9	29.0
85	7.4	8.6	10.7	11.9	12.7
75	7.8	9.5	11.9	12.6	13.4
65	8.5	9.8	12.2	13.6	14.5
55	9.0	10.4	12.9	14.3	15.2

MODEL F24D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	36.0	38.5	42.5	46.1	49.7
85	12.8	14.8	18.4	20.5	21.8
75	13.5	16.2	20.5	21.6	23.0
65	14.7	16.8	20.9	23.4	24.8
55	15.4	17.7	22.0	24.6	26.1

MODEL F30D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	60.0	64.2	70.8	76.8	82.8
85	21.3	24.6	30.6	34.1	36.3
75	22.4	27.1	34.1	36.0	38.3
65	24.3	28.0	34.8	38.9	41.3
55	25.6	29.5	36.7	41.0	43.6

MODEL F36D

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	80.0	85.6	94.4	102.4	110.4
85	28.4	32.8	40.8	45.5	48.4
75	30.0	36.1	45.5	48.0	51.0
65	32.4	37.4	46.5	51.9	55.1
55	34.1	39.3	48.9	54.6	58.1

EMWT - Entering Make-up Water Temperature.

PRESSURE - TEMPERATURE CONVERSION TABLE

PSIG	TEMPERATURE	PSIG	TEMPERATURE
35	21.4°F	20	5.5°F
30	16.6°F	15	-1.0°F
25	11.3°F		

1-3/8" O.D. ICE
R-717 REFRIGERANT

RECIRCULATED FEED SELECTION TABLES

MODEL 24X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	29.0	31.0	34.2	37.1	40.0
85	12.1	14.0	17.4	19.5	20.7
75	12.8	15.4	19.5	20.6	21.9
65	13.9	16.0	19.9	22.2	23.6
55	14.7	16.8	20.9	23.4	24.8

MODEL F30X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	50.0	53.5	59.0	64.0	69.0
85	20.9	24.2	30.1	33.5	35.7
75	22.1	26.6	33.5	35.4	37.6
65	23.9	27.5	34.2	38.3	40.6
55	25.2	29.0	36.0	40.3	42.7

MODEL F36X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	66.0	70.6	77.9	84.5	91.1
85	27.6	31.9	39.7	44.3	47.1
75	29.3	35.1	44.3	46.7	49.7
65	31.6	36.4	45.2	50.5	53.6
55	33.2	38.3	47.6	53.1	56.5

FLOODED FEED SELECTION TABLES

MODEL F24X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	29.0	31.0	34.2	37.1	40.0
85	10.3	11.9	14.8	16.5	17.5
75	10.9	13.1	16.5	17.4	18.6
65	11.8	13.5	16.8	18.8	20.0
55	12.3	14.3	17.7	19.8	21.1

MODEL F30X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	50.0	53.5	59.0	64.0	69.0
85	17.8	20.5	25.5	28.4	30.3
75	18.7	22.5	28.4	30.0	31.9
65	20.3	23.4	29.1	32.4	34.5
55	21.3	24.6	30.6	34.1	36.3

MODEL F36X

EMWT	SUCTION PRESSURE (PSIG)				
	35	30	25	20	15
TR	66.0	70.6	77.9	84.5	91.1
85	23.4	27.0	33.7	37.5	39.9
75	24.8	29.8	37.5	39.6	42.2
65	26.8	30.8	38.3	42.8	45.5
55	28.1	32.4	40.4	45.1	47.9

EMWT - Entering Make-up Water Temperature.

PRESSURE - TEMPERATURE CONVERSION TABLE

PSIG	TEMPERATURE	PSIG	TEMPERATURE
35	21.4°F	20	5.5°F
30	16.6°F	15	-1.0°F
25	11.3°F		

MOTOR HORSEPOWER AND FUSE SIZE TABLES

‡ MOTOR SIZES

UNIT SIZE	WATER PUMP	CUTTER BAR
F20	3/4 HP	3/4 HP
F24	2 HP	1-1/2 HP
F30	3 HP	2 HP
F36	3 HP	2 HP

MOTOR FUSE SIZES

LINE VOLTAGE	3/4 HP	1-1/2 HP	2 HP	3 HP
208	6 A	10 A	15 A	20 A
230	6 A	10 A	10 A	15 A
460	3 A	6 A	6 A	10 A

COMPRESSOR TR and LIQUID RECIRCULATION REFRIGERANT PUMP GPM TABLE

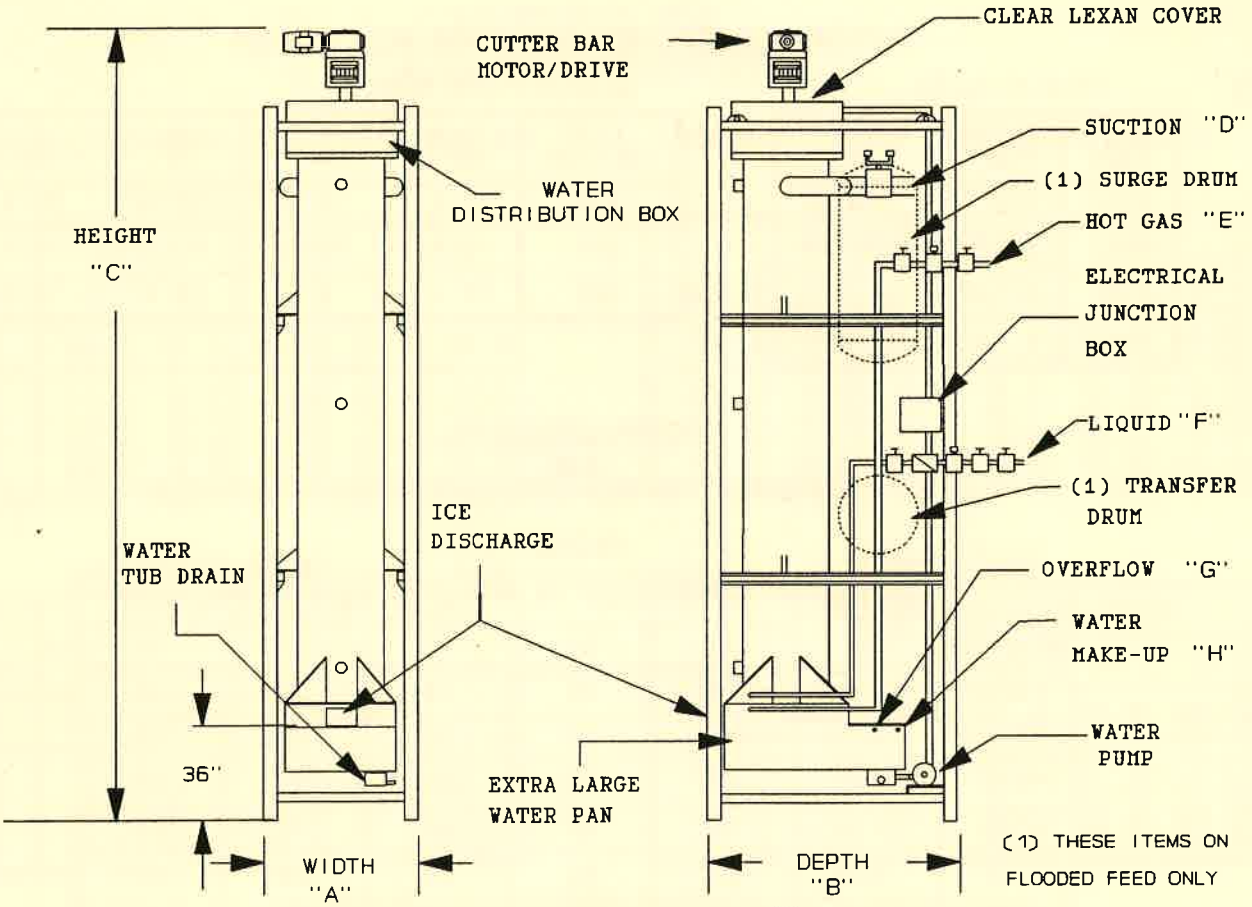
R-717

MODEL NUMBER	REFRIG. PUMP GPM	REFRIGERANT TR REQ'D BY SUCTION PRESSURE				
		35	30	25	20	15
F20N	3.5	26	28	31	34	36
F20D	2.8	21	23	25	27	29
F24N	5.3	40	43	48	52	56
F24D	4.8	36	39	43	47	50
F24X	3.9	29	31	35	38	40
F30N	8.8	66	71	78	85	92
F30D	8.8	60	65	71	77	83
F30X	6.7	50	54	59	64	69
F36N	11.8	88	95	104	113	122
F36D	10.7	80	86	95	103	111
F36X	8.8	66	71	78	85	92

HIGH PRESSURE RECEIVER AND HOT GAS LINE SIZING TABLE

UNIT	HIGH PRESSURE RECEIVER (D X L)	HOT GAS LINE (IN.)
F20N	16" X 15'0"	1-1/4"
F20D	16" X 15'0"	1-1/4"
F24N	20" X 15'0"	1-1/2"
F24D	20" X 15'0"	1-1/2"
F24X	20" X 15'0"	1-1/2"
F30N	24" X 15'0"	1-1/2"
F30D	24" X 15'0"	1-1/2"
F30X	24" X 15'0"	1-1/2"
F36N	30" X 15'0"	1-1/2"
F36D	30" X 15'0"	1-1/2"
F36X	30" X 15'0"	1-1/2"

TIM - TUBULAR ICE MAKERS
DIMENSIONAL DATA



CAPACITY AND DIMENSIONAL DATA

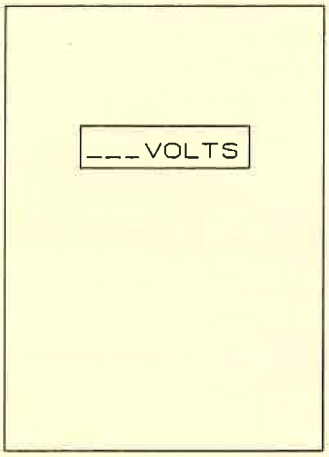
	MODEL NUMBER										
	F20-		F24-			F30-			F36-		
	N	D	N	D	X	N	D	X	N	D	X
ICE SIZE (DIA INCH)	7/8	1-1/8	7/8	1-1/8	1-3/8	7/8	1-1/8	1-3/8	7/8	1-1/8	1-3/8
CAPACITY(TONS/24hrs)(2)	13.0	10.5	20.0	18.0	14.5	33.0	30.0	25.0	44.0	40.0	33.0
HEIGHT (C)	15'-4"		16'-7"			16'-7"			16'-7"		
DEPTH (B)	5'-1"		5'-7"			6'-6"			7'-3"		
WIDTH (A)	3'-1"		3'-11"			4'-7"			5'-3"		
WATER MAKEUP CONN (H)	3/4"		3/4"			3/4"			3/4"		
WATER OVERFLOW CONN (G)	1-1/2"		1-1/2"			1-1/2"			1-1/2"		
REFRIG SUCTION CONN (D)	2"		2-1/2"			3"			3"		
REFRIG LIQUID CONN (F)	3/4"		3/4"			1"			1"		
REFRIG HOT GAS CONN (E)	1-1/4"		1-1/2"			2"			2		
C/L SUCTION CONN. (3)	13'-0"		13'-4"			13'-4"			13'-4"		
C/L LIQUID CONN. (3)	9'-10-1/2"		10'-2-1/2"			9'-11-3/4"			9'-11-3/4"		
C/L HOT GAS CONN. (3)	11'-1"		11'-5"			11'-5"			11'-5"		
WATER PUMP MOTOR HP	3/4		2			3			3		
CUTTER BAR MOTOR HP	3/4		1-1/2			2			2		
SHIPPING WEIGHT	3,200 LBS		4,230 LBS			6,200 LBS			8,300 LBS		
OPERATING WEIGHT	4,500 LBS		5,915 LBS			9,100 LBS			12,500 LBS		
ELECTRIC REQUIRED	230 OR 460 VOLTS, 3 PHASE, 60 HERTZ (WHOLE MACHINE)										

(1) Liquid recirculation feed is standard. A flooded feed system option, also available, includes a surge drum and a transfer drum.

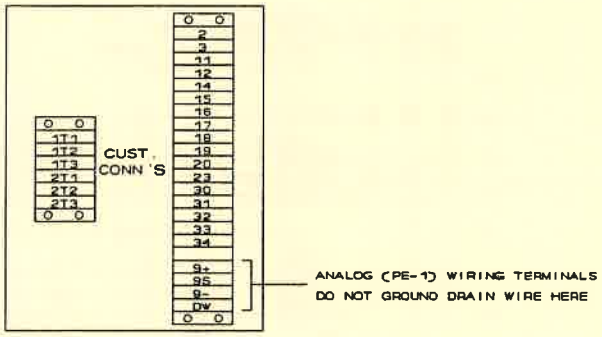
(2) Standard capacity ratings are based on tubular ice, ammonia refrigerant (R-717), 20°F (33.5 PSIG) saturated suction temperature, liquid recirculation and 65°F entering make-up water temperature. Refer to the selection portion of this publication for selections based upon other suction temperatures, make-up water temperatures, R-22 refrigerant, flooded feed system.

(3) Dimensions are from the floor to the center of the connection.

JUNCTION BOX

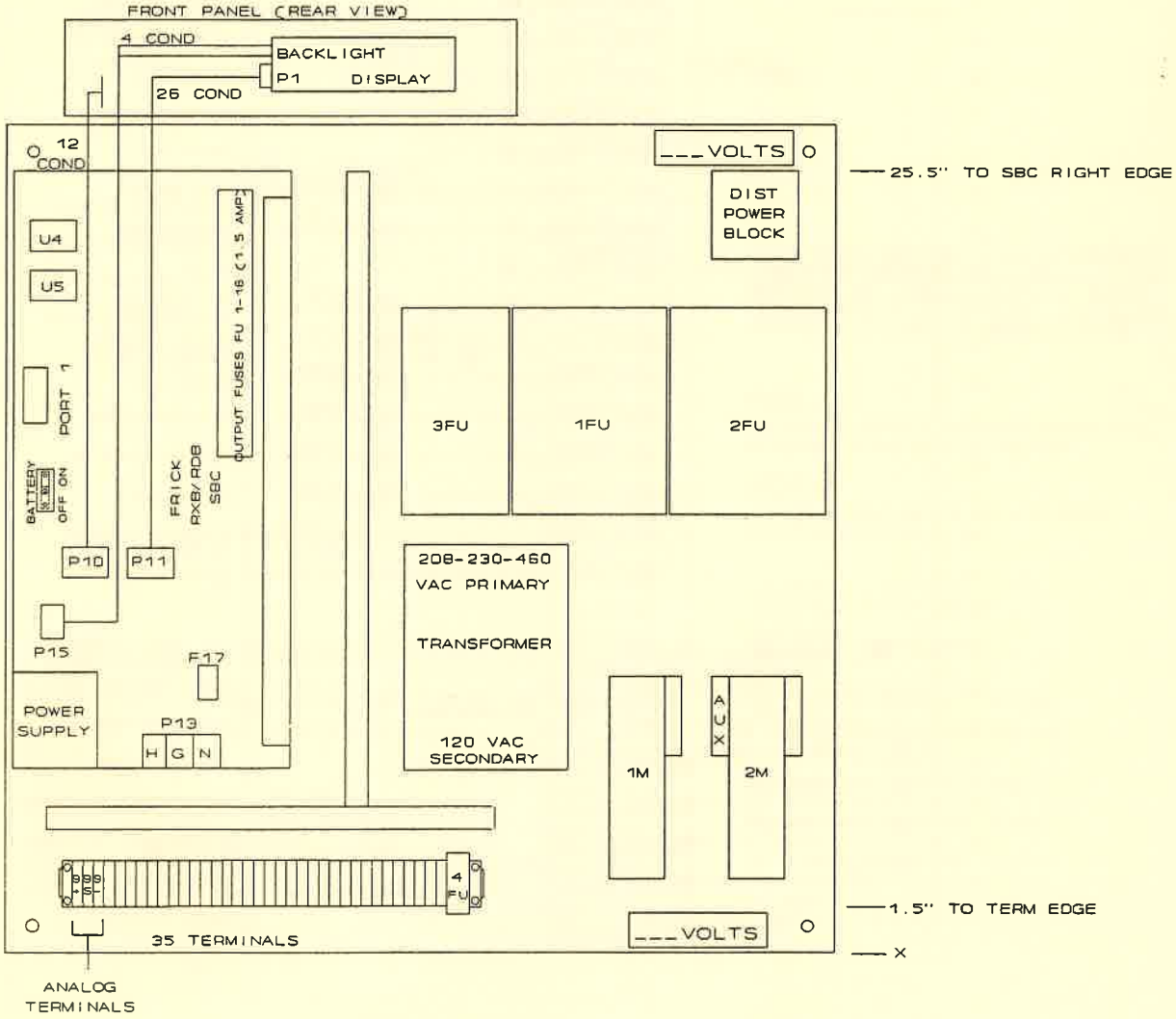


UNIT JUNCTION BOX



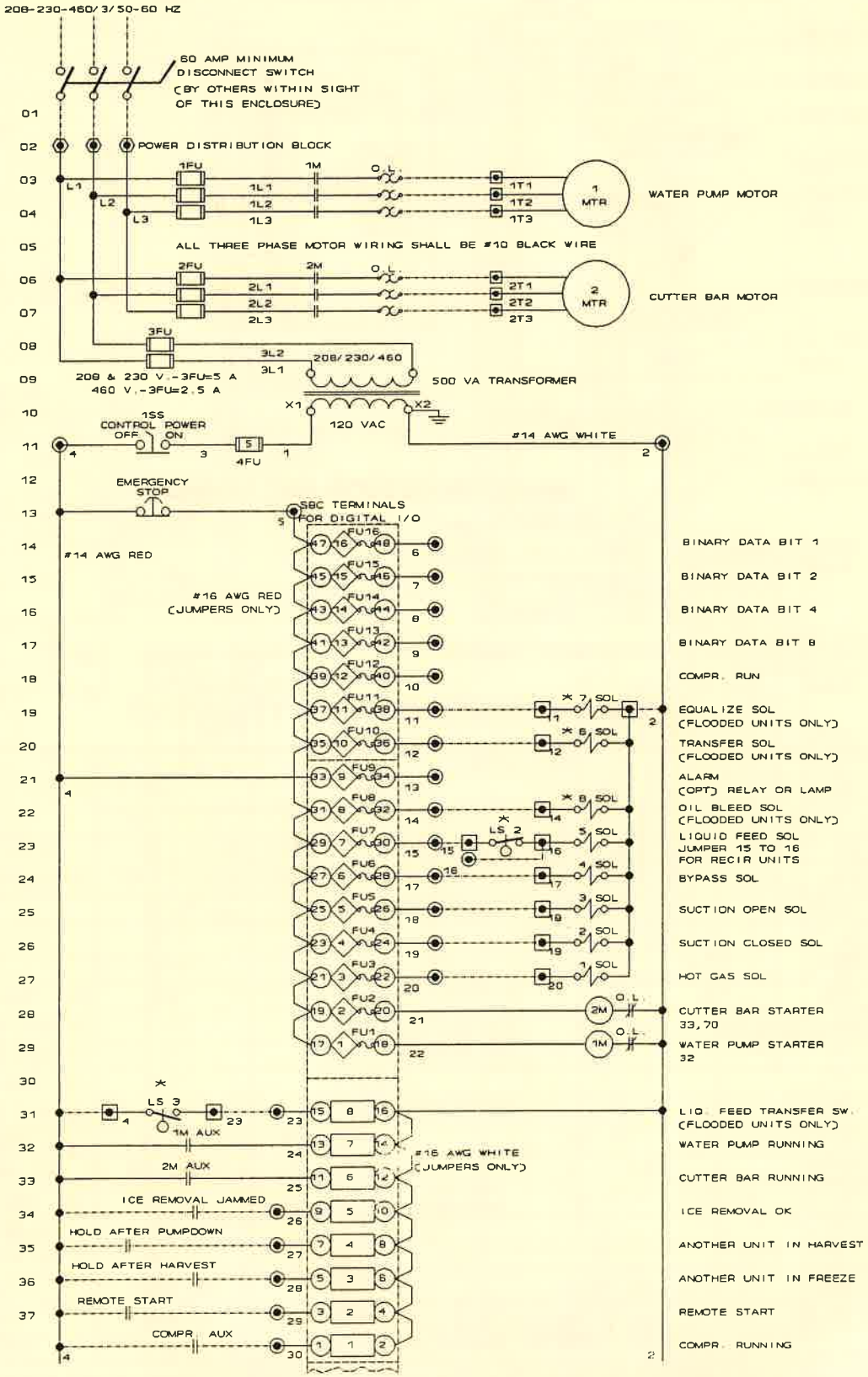
UNIT J.B. PANEL

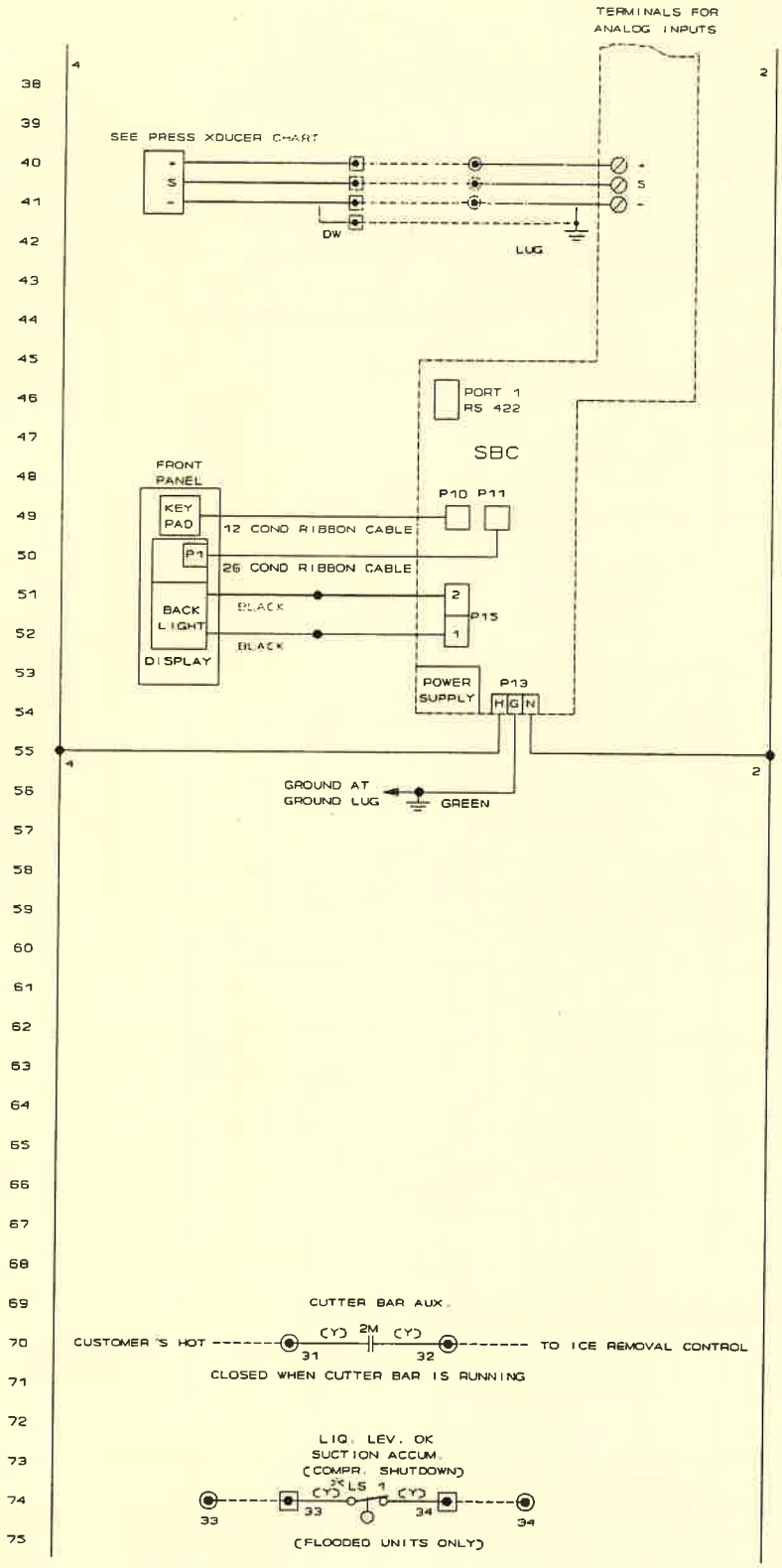
MICROPROCESSOR SBC BOARD



PANEL-27" x 27"

TIM - TUBULAR ICE MAKERS
WIRING DIAGRAM - MICROPROCESSOR





CHANNELS 1 TO 8
NOT REQUIRED

CHANNEL 9
SUCTION PRESS

PE-1 WIRING MUST BE RUN IN SEPARATE CONDUIT FROM ALL OTHER WIRING

CHANNELS 10-12
NOT REQUIRED

PRESS XDUCER CROSS REF	POSITIVE(+) COLOR OR #	SIGNAL(S) COLOR OR #	COMMON(-) COLOR OR #
BARKSDALE 304	RED	WHITE	BLACK
BARKDALE CDV	# 1	# 3	# 2
ASHCROFT	RED	GREEN	WHITE

CUTTER BAR AUX.

CUSTOMER'S HOT ------- (Y) 2M (Y) ------- TO ICE REMOVAL CONTROL
31 32

CLOSED WHEN CUTTER BAR IS RUNNING

LIQ. LEV. OK
SUCTION ACCUM.
(COMPR. SHUTDOWN)

33 (Y) 2K LS 1 (Y) 34

(FLOODED UNITS ONLY)

NOTE A:

THE CONTROL CENTER & DISCONNECT SWITCH SHALL BE MOUNTED WITHIN SIGHT OF THE UNIT

NOTE B:

ALL WIRING SHALL BE #14 AWG WIRE UNLESS SPECIFIED OTHERWISE

FUSE

DIGITAL OUTPUT

DIGITAL INPUT

(Y) INDICATES YELLOW #14 AWG WIRE

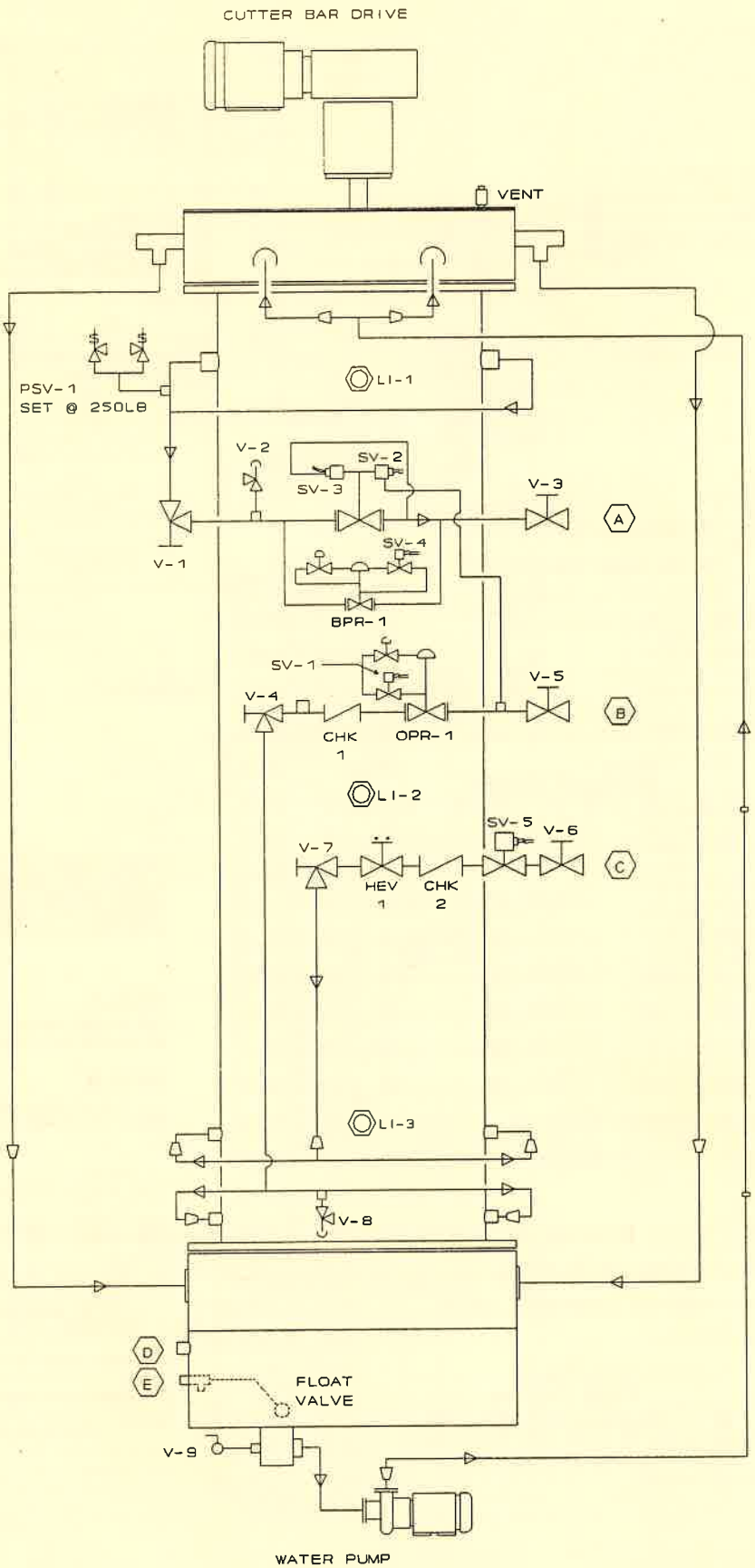
* INDICATES SUPPLIED OR IS OPTIONAL ON FLOODED UNITS ONLY

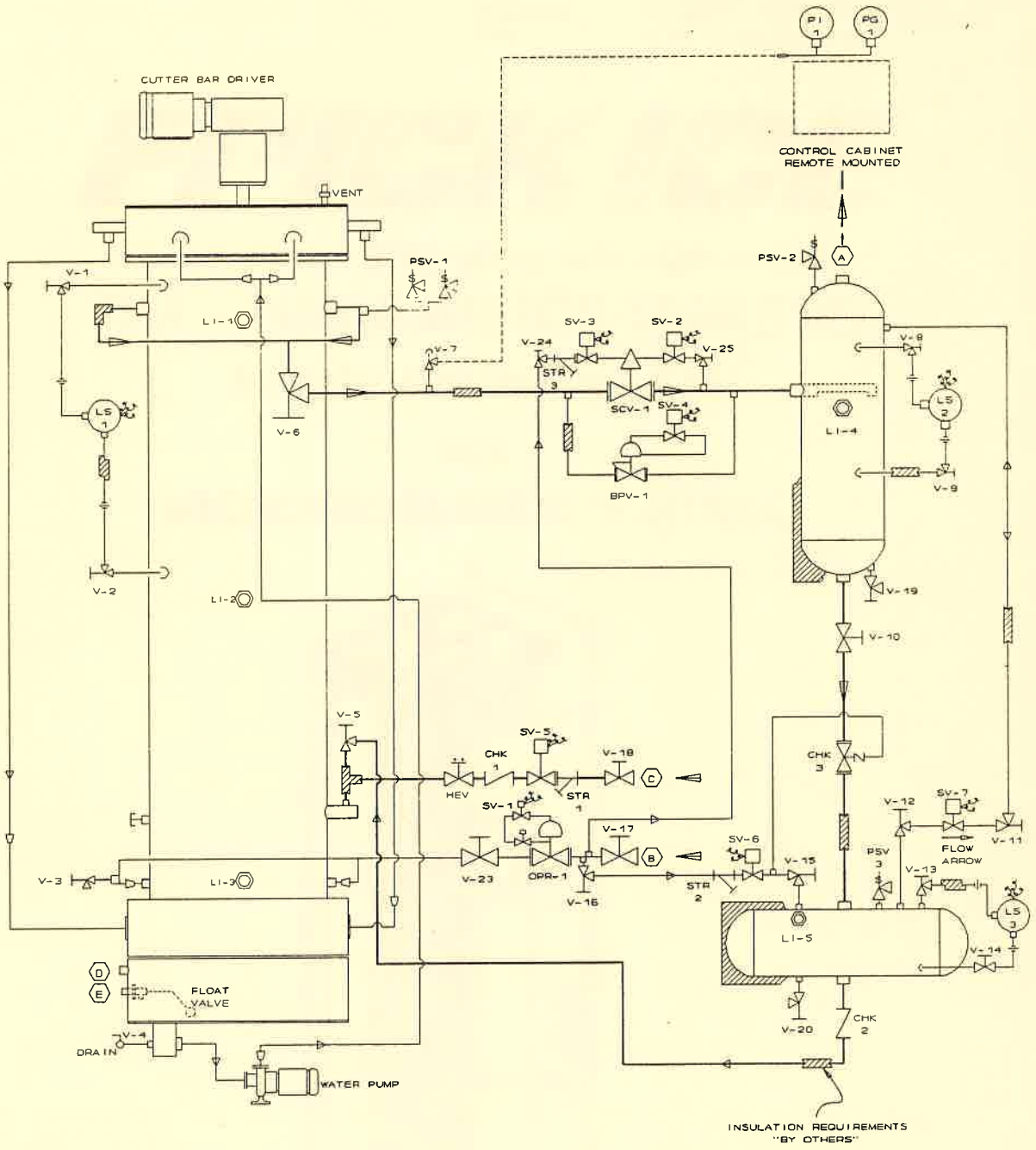
TERMINALS IN JUNCTION BOX ON UNIT

TERMINALS IN CONTROL CENTER

-------- WIRING BY OTHERS

TIM - TUBULAR ICE MAKERS
P & I DIAGRAMS - LIQUID RECIRCULATED DESIGN





LEGEND			
BPR	BACK PRESSURE REGULATOR	OPR	OUTLET PRESSURE REGULATOR
CHK	CHECK VALVE	PSV	HIGH PRESSURE SAFETY VALVE
HEV	HAND EXPANSION VALVE	SCV	SUCTION CONTROL VALVE
LI	LEVEL INDICATOR (SIGHT GLASS)	STR	STRAINER
LS	LEVEL SWITCH	SV	SOLENOID VALVE
		V	VALVE