16JT
Double-Effect Hermetic Absorption Liquid Chillers With PIC Controls Units 810-880, 080-150, 080L-150L

Start-Up, Operation, and Maintenance Instructions

SAFETY CONSIDERATIONS

Absorption liquid chillers provide safe and reliable service when operated within design specifications. When operating this equipment, use good judgment and safety precautions to avoid damage to equipment and property or injury to personnel.

Be sure you understand and follow the procedures and safety precautions contained in the chiller instructions as well as those listed in this guide.

⚠ DANGER

DO NOT USE OXYGEN or air to purge lines, leak test, or pressurize a chiller. Use dry nitrogen.

NEVER EXCEED specified test pressures. For the 16JT chiller, the maximum pressure is 12 psig (83 kPa).

WEAR goggles and suitable protective clothing when handling lithium bromide, octyl alcohol, inhibitor, lithium hydroxide, and hydrobromic acid. IMMEDIATELY wash any spills from the skin with soap and water. IMMEDIATELY FLUSH EYES with water and consult a physician.

⚠ WARNING

DO NOT USE eyebolts or eyebolt holes to rig chiller sections or the entire assembly.

DO NOT work on high-voltage equipment unless you are a qualified electrician.

DO NOT WORK ON electrical components, including control panels or switches, until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid-state components.

LOCK OPEN AND TAG electrical circuits during servicing. IF WORK IS INTERRUPTED, confirm that all circuits are deenergized before resuming work.

NEVER DISCONNECT safety devices or bypass electric interlocks and operate the chiller. Also, never operate the chiller when any safety devices are not adjusted and functioning normally.

DO NOT syphon lithium bromide or any other chemical by mouth.

BE SURE all hydrogen has been exhausted before cutting into purge chambers. Hydrogen mixed with air can explode when ignited.

WHEN FLAMECUTTING OR WELDING on an absorption chiller, some noxious fumes may be produced. Ventilate the area thoroughly to avoid breathing concentrated fumes.

DO NOT perform any welding or flamecutting to a chiller while it is under a vacuum or pressurized condition.

NEVER APPLY an open flame or live steam to a refrigerant cylinder. Dangerous overpressure can result. When necessary to heat a cylinder, use only warm (110 F [43 C]) water.

DO NOT REUSE disposable (nonreturnable) cylinders or attempt to refill them. It is DANGEROUS AND ILLEGAL. When cylinder is emptied, evacuate remaining gas pressure, loosen the collar and unscrew and discard the valve stem. DO NOT INCINERATE.

DO NOT ATTEMPT TO REMOVE fittings, covers, etc., while chiller is under pressure, vacuum or while chiller is running.

⚠ CAUTION

→ CONNECT THE ABSORPTION CHILLER to an emergency power source to ensure that a constant power supply is maintained to the unit in the event that the main electrical power source is interrupted or temporarily lost. Failure to provide an emergency power source to the chiller could result in crystallization of the lithium bromide solution inside the machine, rendering it temporarily inoperative. A potentially lengthy decrystallization process might be required to return the chiller to normal operation depending on the severity of the crystallization and/or the length of time the machine was without power.

→ PROVIDE AN EMERGENCY POWER SOURCE to the chilled water and condenser water pumps to prevent the possibility of an evaporator freeze-up. Failure to provide emergency power to these pumps could result in machine operation with no flow of water through the tubeside of the evaporator, absorber and condenser sections thereby allowing the water inside the evaporator tubes to freeze. Further, a frozen evaporator tube can burst causing contamination of the lithium bromide solution and the inside of the chiller. A freeze-up in the evaporator will also result in a long period of chiller down time due to the extensive repairs required to bring the chiller and the lithium bromide solution back to its original condition.

DO NOT climb over a chiller. Use platform, catwalk or staging. Follow safe practices when using ladders.

DO NOT STEP ON chiller piping. It might break or bend and cause personal injury.

USE MECHANICAL EQUIPMENT (crane, hoist, etc.) to lift or move inspection covers or other heavy components. Even if components are light, use such equipment when there is a risk of slipping or losing your balance.

VALVE OFF AND TAG steam, water or brine lines before opening them.

DO NOT LOOSEN waterbox cover bolts until the waterbox has been completely drained.

DO NOT VENT OR DRAIN waterboxes containing industrial brines, liquid, gases, or semisolids without permission of your process control group.

BE AWARE that certain automatic start arrangements can engage starters. Open the disconnects ahead of the starters in addition to shutting off the chiller or pump.

USE only repaired or replacement parts that meet the code requirements of the original equipment.

DO NOT ALLOW UNAUTHORIZED PERSONS to tamper with chiller safeties or to make major repairs.

PERIODICALLY INSPECT all valves, fittings, piping, and relief devices for corrosion, rust, leaks, or damage.

PROVIDE A DRAIN connection in the vent line near each pressure relief device to prevent a build-up of condensate or rain water.

IMMEDIATELY wipe or flush the floor if lithium bromide or octyl alcohol is spilled on it.

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INTRODUCTION

Everyone involved in the start-up, operation, and maintenance of the 16JT chiller should be thoroughly familiar with the following instructions and other necessary job data before initial start-up and before operating the chiller and its control system or performing chiller maintenance. Procedures are arranged in the sequence required for proper chiller start-up and operation.

ABBREVIATIONS AND EXPLANATIONS

CCN — Carrier Comfort Network
ECW — Entering Chilled Water
G1 — High-Stage Generator
G2 — Low-Stage Generator
HX — Heat Exchanger
HX1 — High-Temperature Heat Exchanger
HX2 — Low-Temperature Heat Exchanger
LCD — Level Control Device
LCW — Leaving Chilled Water
LID — Local Interface Device
PIC — Product Integrated Control
PSIO — Processor/Sensor Input/Output Module
RLA — Rated Load Amps
SI — International System of Units (metric)

Words printed in all capital letters can be viewed on the LID (e.g., LOCAL, CCN, RUNNING, ALARM, etc).

Words printed both in all capital letters and italics can also be viewed on the LID and are parameters (*CONTROL MODE, COOLING SETPOINT, TARGET CAPACITY VALVE,* etc.) with associated values (e.g., modes, temperatures, percentages, pressures, on, off, etc.).

Words printed in all capital letters and in a box represent softkeys on the LID control panel (e.g.; [ENTER], [EXIT]).

Factory installed additional components are referred to as options in this manual; factory supplied but field installed additional components are referred to as accessories.

CHILLER DESCRIPTION

Chiller Information and Nameplate — The chiller nameplate includes model and serial number information (Fig. 1). See Fig. 2 and 3 for the location of the nameplate on the chiller.

Basic Absorption Cycle — The 16JT absorption chiller uses water as the refrigerant in vessels maintained under a deep vacuum. The chiller operates on the simple principle that under low absolute pressure (vacuum), water takes up heat and vaporizes (boils) at a low temperature. For example, at the very deep vacuum of 0.3 in. (6.4 mm) of mercury absolute pressure, water boils at the relatively cool temperature of only 40 F (4 C). To obtain the energy required for this boiling, it takes heat from, and therefore chills, another fluid (usually water). The chilled fluid then can be used for cooling purposes.

To make the cooling process continuous, the refrigerant vapor must be removed as it is produced. For this, a solution of lithium bromide (LiBr) salt in water is used to absorb the water vapor. Lithium bromide has a high affinity for water, and will absorb it in large quantities under the right conditions. The removal of the refrigerant vapor by absorption keeps the chiller pressure low enough for the cooling vaporization to continue. However, this process dilutes the solution and reduces its absorption capacity. Therefore the diluted lithium bromide solution is pumped to separate vessels where it is heated to release (boil off) the previously absorbed water. Relatively cool condensing water from a cooling tower or other source removes enough heat from this vapor to condense it again into liquid for reuse in the cooling cycle. The reconcentrated lithium bromide solution is returned to the original vessel to continue the absorption process.

Double-Effect Reconcentration — The 16JT reconcentrates solution in 2 stages to improve the operating efficiency. Approximately half of the diluted solution is pumped to a high-temperature vessel (high stage) where it is heated directly by high-pressure steam for reconcentration. The other half of the solution flows to a low-temperature vessel (low stage) where it is heated for reconcentration by hot water vapor released in the high-temperature vessel. The low stage acts as the condenser for the high stage, so the heat energy first applied in the high-stage vessel is used again in the low-stage vessel. This cuts the heat input to almost half of that required for an absorption chiller with a single reconcentrator.

Chiller Components — The major sections of the chiller are contained in several vessels (Fig. 2 and 3, and Table 1).

The large lower shell contains the evaporator and absorber sections. The evaporator and absorber are positioned side by side in units 16JT810-880, but the evaporator is positioned above the absorber in units 16JT080-150, 080L-150L. In the evaporator section, the refrigerant water vaporizes and cools the chilled water for the air conditioning or cooling process. In the absorber, vaporized water from the evaporator is absorbed by lithium bromide solution.

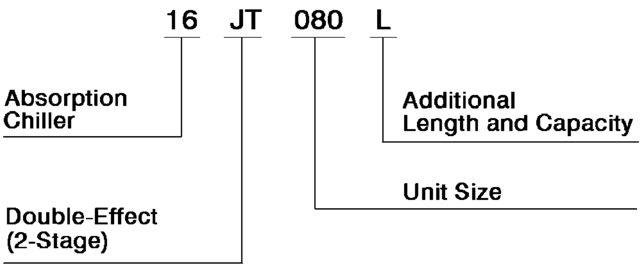


Fig. 1 — Model Number Nomenclature

The smaller vessel above the evaporator/absorber assembly is the high-stage generator. Here, approximately half of the diluted solution from the absorber is heated and reconcentrated to recover slightly over half of the water previously absorbed.

The other shell above the evaporator/absorber assembly contains the low-stage generator and condenser. The other half of the diluted solution is heated and reconcentrated in the low-stage generator by high temperature water vapor from the high-stage generator. The water vapor released from the solution in this process is condensed to liquid in the condenser section.

The 16JT chiller also has two solution heat exchangers and a steam condensate heat exchanger to improve operating economy; an external purge system to maintain chiller vacuum by the removal of noncondensables; hermetic pumps to circulate the solution and refrigerant; and various operational, capacity, and safety devices to provide automatic, reliable chiller performance.

Table 1 — 16JT Description

UNIT 16JT	ABSORBER/ EVAPORATOR CONFIGURATION	SOLUTION PUMPS	PURGE POINTS AND EDUCTORS
810-854	Side-by-side	1	1
857,865	Side-by-side	1	2
873,880	Side-by-side	2	2
080-120	Over-and-under	2	4
135, 150	Over-and-under	3	4
080L-120L	Over-and-under	2	4
135L,150L	Over-and-under	3	4

Flow Circuits — Figures 4 and 5 illustrate the basic flow circuits of the 16JT absorption chiller.

The liquid to be chilled is passed through the evaporator tube bundle and is cooled by the evaporation of refrigerant water sprayed over the outer surface of the tubes by the recirculating refrigerant pump. The refrigerant vapors are drawn into the absorber section and are absorbed by the lithium bromide-water solution sprayed over the absorber tubes. The heat picked up from the chilled liquid is transferred from the absorbed vapor to the cooling water flowing through the absorber tubes.

The solution in the absorber becomes diluted as it absorbs water and loses its ability to continue the absorption process. It is then transferred by the solution pump to the generator sections to be reconcentrated. Approximately half of the weak (diluted) solution goes to the shell side of the high-stage generator where it is heated by high-pressure steam. This boils out its absorbed water. This high-temperature refrigerant water vapor passes to the low-stage generator tubes. In the shell side of the low-stage generator, the rest of the weak solution is heated by the high-temperature refrigerant water vapor from the high-stage generator. This boils out its absorbed water.

The refrigerant water vapor boiled from the low-stage generator solution passes into the condenser section and condenses on tubes containing cooling water. This is the same cooling water which had just flowed through the absorber tubes. On the tube side of the low-stage generator, the condensed high-temperature refrigerant water passes into the condenser, where it is cooled to the condenser temperature. The combined condensed refrigerant water from the two generators now flows back to the evaporator to begin a new refrigerant cycle.

The strong (reconcentrated) solution flows from the two generators back to the absorber spray headers to begin a new solution cycle. On the way, it passes through solution heat exchangers where heat is transferred from the hot, strong solution to the cooler, weak solution being pumped to the generators. Solution to and from the high-stage generator passes through both a high-temperature heat exchanger and low-temperature heat exchanger. Solution to and from the low-stage generator passes through only the low-temperature heat exchanger. This heat transfer improves solution cycle efficiency by preheating the relatively cool, weak solution before it enters the generators and precooling the hotter, strong solution before it enters the absorber. The efficiency is further improved by transferring heat from the hot steam condensate to the cooler, weak solution in the condensate drain heat exchanger and trap.

The weak solution flowing to the generators passes through a flow control valve which is positioned by a float in the high-stage generator overflow box. The purpose of the valve is to automatically maintain optimum solution flow to the two generators at all operating conditions for maximum efficiency.

During high load operation, some abnormal conditions can cause the lithium bromide concentration to increase above normal, with the strong solution concentration close to crystallization (see Equilibrium Diagram and Chiller Solution Cycle, Fig. 6). If, for some reason, the chiller controls do not prevent strong solution crystallization during abnormal operating conditions and flow blockage does occur, the strong-solution overflow pipe will reverse or limit the crystallization until the cause can be corrected. The overflow pipe is located between the low-stage generator discharge box and the absorber, bypassing the low-temperature heat exchanger, as shown in Fig. 4 and 5.

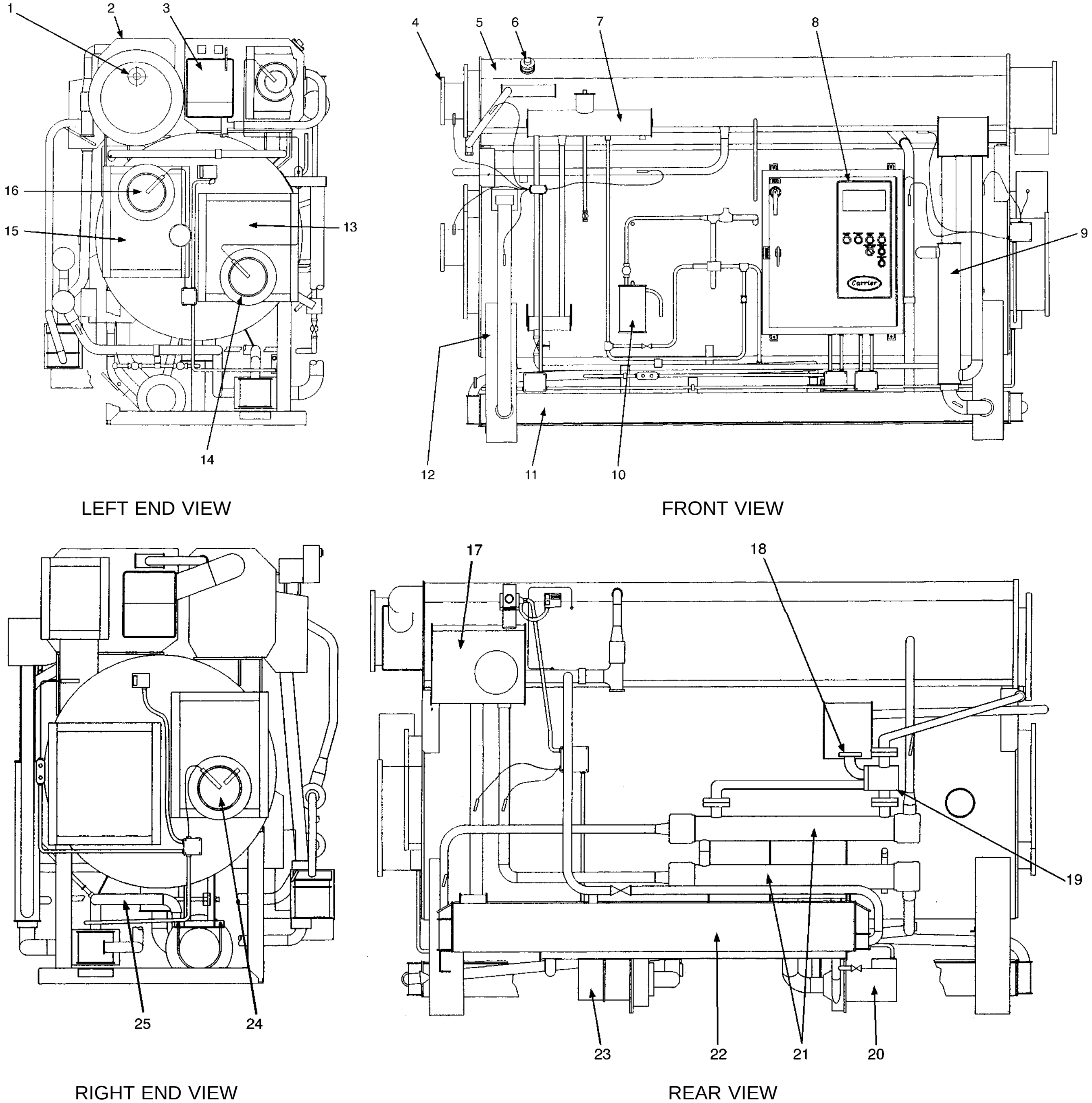
If crystallization occurs, it generally takes place in the shell side of the low-temperature heat exchanger, blocking the flow of strong solution from the generators. The strong solution then backs up in the discharge box and spills over into the overflow pipe, which returns it directly to the absorber sump. The solution pump then returns the hot solution through the heat exchanger tubes, automatically heating and decrystallizing the shell side.

Equilibrium Diagram and Chiller Solution Cycle — A sample solution cycle can be illustrated by plotting it on a basic equilibrium diagram for lithium bromide in solution with water (Fig. 6). The diagram is also used for performance analyses and troubleshooting. Figure 7 may be used to plot the solution cycle for your 16JT chiller.

The left scale on the diagram indicates solution and water vapor pressures at equilibrium conditions. The right scale indicates the corresponding saturation (boiling or condensing) temperatures for both the refrigerant (water) and the solution.

The bottom scale represents solution concentration, expressed as percentage of lithium bromide by weight in solution with water. For example, a lithium bromide concentration of 60% means 60% lithium bromide and 40% water by weight.

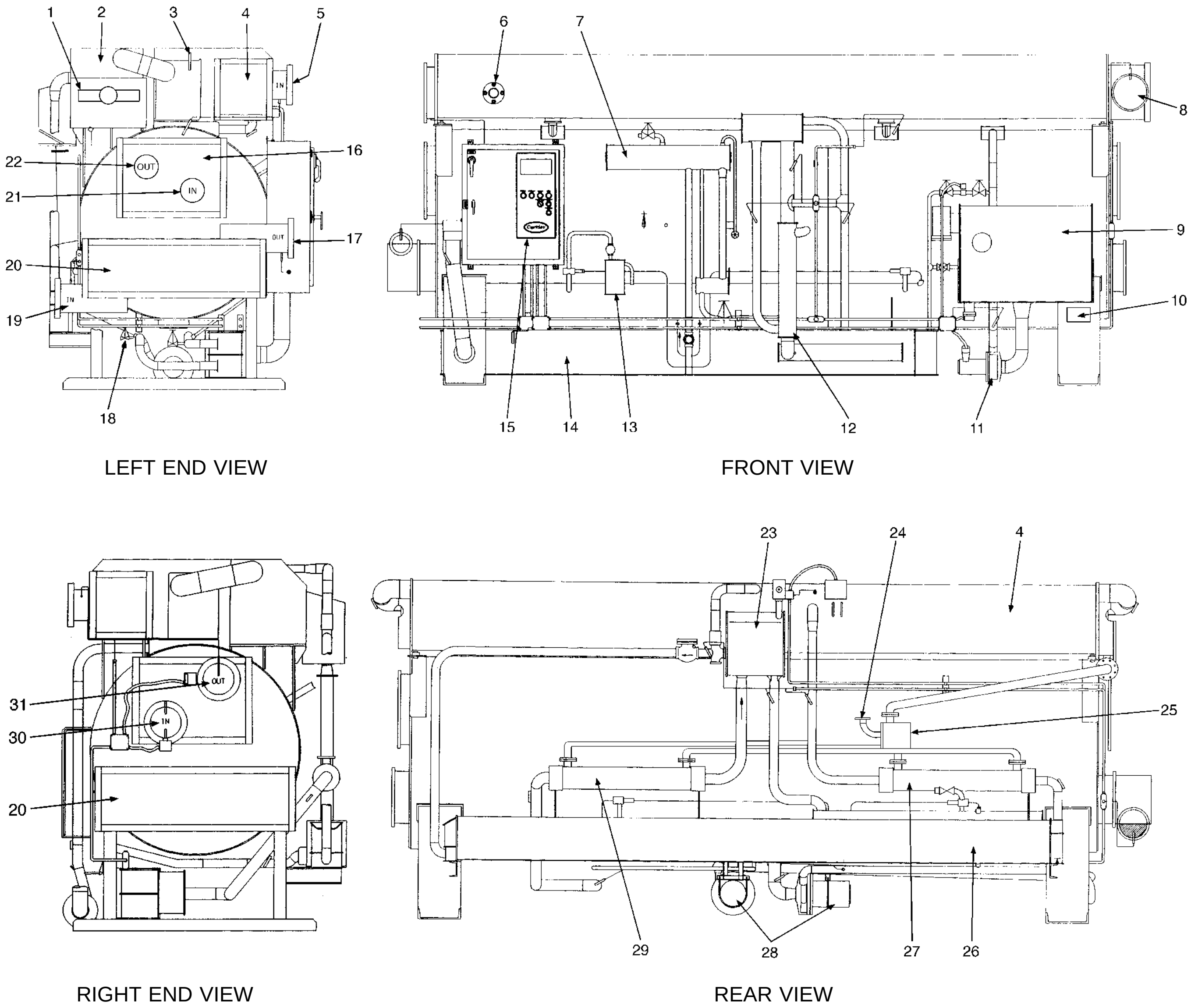
The curved lines running diagonally left to right are solution temperature lines (not to be confused with the horizontal saturation temperature lines). The single curved line at the lower right represents the crystallization line. The solution becomes saturated at any combination of temperature and concentration to the right of this line, and it will begin to crystallize (solidify) and restrict flow.



LEGEND

1 — Steam Inlet	**14** — Cooling Water Inlet
2 — High-Stage Generator (G1)	**15** — Evaporator
3 — Low-Stage Generator (G2)	**16** — Chilled Water Outlet
4 — Cooling Water Outlet	**17** — LCD (Level Control Device) Box
5 — Condenser	**18** — Steam Condensate Outlet
6 — Rupture Disc	**19** — Steam Trap
7 — Purge Storage Chamber	**20** — Refrigerant Pump
8 — Control Center	**21** — Drain Heat Exchangers (Second One is Optional)
9 — Generator Overflow (GO) Loop Heat Exchanger	**22** — High Temperature Heat Exchanger (HX1)
10 — Knockout Chamber	**23** — Solution Pump
11 — Low-Temperature Heat Exchanger (HX2)	**24** — Chilled Water Inlet
12 — Name Plate	**25** — Solution Pump Service Valve
13 — Absorber	

Fig. 2 — 16JT810-880 Typical External Schematic

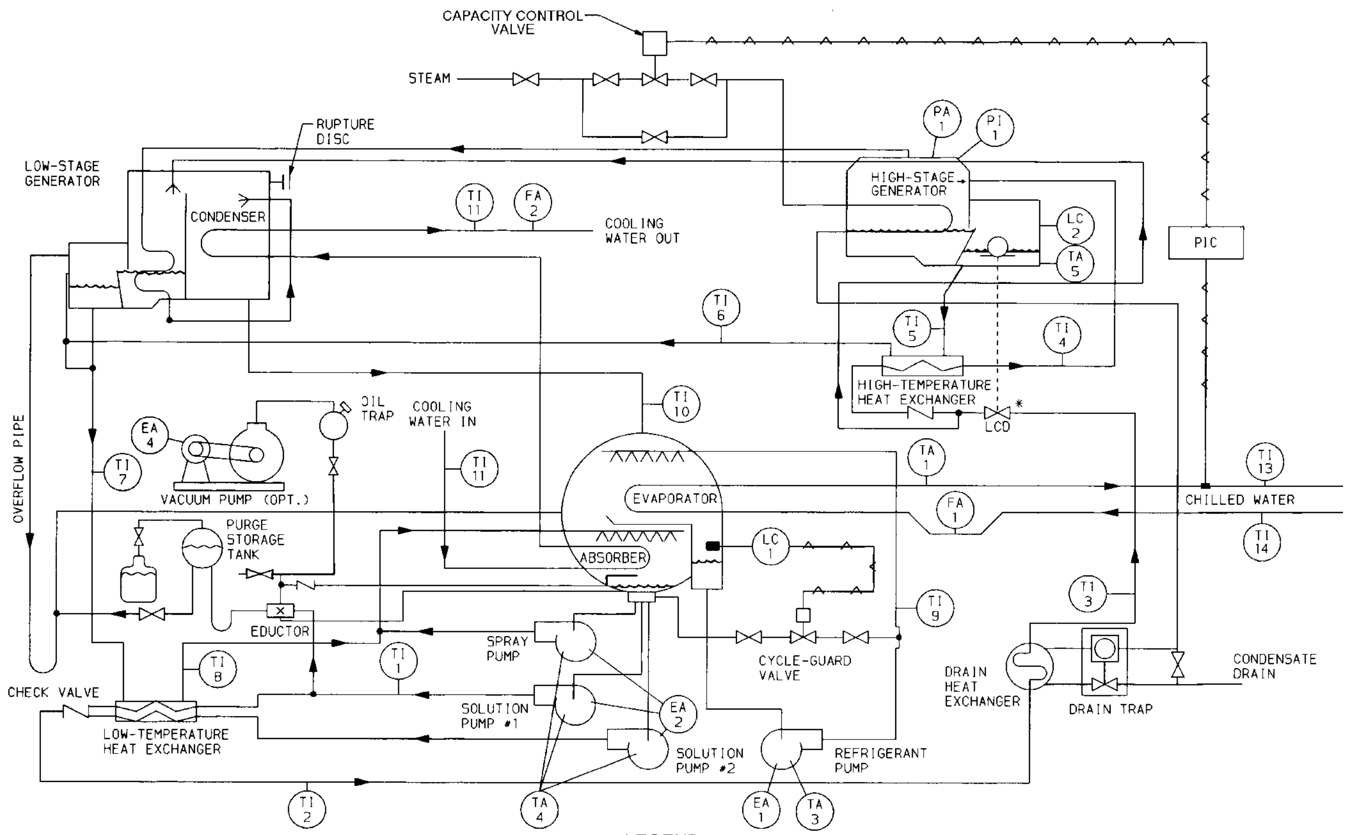


LEGEND

1	— Steam Inlet	**16**	— Evaporator
2	— High-Stage Generator (G1)	**17**	— Cooling Water Absorber Outlet
3	— Low-Stage Generator (G2)	**18**	— Solution Pump Service Valve
4	— Condenser	**19**	— Cooling Water Inlet
5	— Cooling Water Condenser Inlet	**20**	— Absorber
6	— Rupture Disc	**21**	— Chilled Water Inlet
7	— Purge Storage Chamber	**22**	— Chilled Water Outlet
8	— Cooling Water Condenser Outlet	**23**	— LCD (Level Control Device) Box
9	— Refrigerant Chamber	**24**	— Steam Condensate Outlet
10	— Name Plate	**25**	— Steam Trap*
11	— Refrigerant Pump	**26**	— High Temperature Heat Exchanger (HX1)
12	— Generator Overflow (GO) Loop Heat Exchanger	**27**	— Drain Heat Exchanger
13	— Knockout Chamber	**28**	— Solution Pump(s)
14	— Low-Temperature Heat Exchanger (HX2)	**29**	— Second Drain Heat Exchanger (Optional)
15	— Control Center	**30**	— Chilled Water Inlet (Optional Location)
		31	— Chilled Water Outlet (Optional Location)

*If optional drain heat exchanger is used, locate the steam trap on Item 29 vs. Item 27.

Fig. 3 — 16JT080-150, 080L-150L: Typical External Schematic



LEGEND

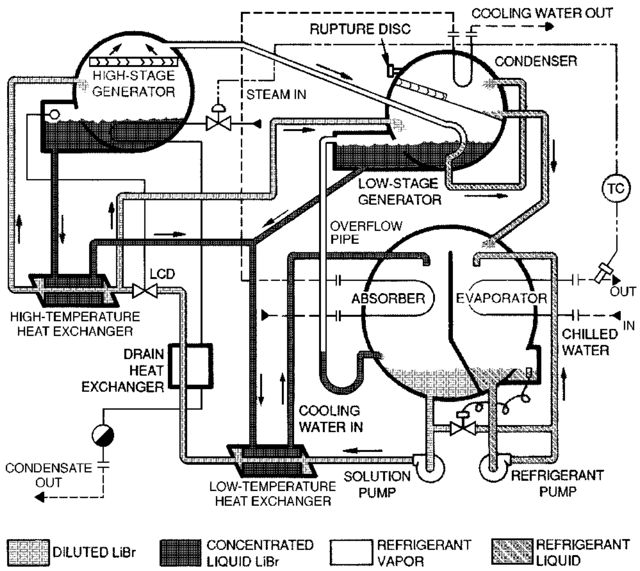
EA1 — Refrigerant Pump Overload Cutout
EA2 — Solution Pump Overload Cutout
EA4 — Vacuum Pump Motor Overload
FA1 — Chilled Water Low-Flow Cutout
FA2 — Cooling Water Low-Flow Cutout
LCD — Level Control Device
LC — Refrigerant Level Switches
PA1 — High-Pressure Switch (High-Stage Generator)
PI1 — Compound Gage (High-Temperature Generator)
PIC — Product Integrated Control
TA1 — Chilled-Water Low-Temperature Cutout
TA3 — Refrigerant Pump Motor High-Temperature Cutout
TA4 — Solution Pump Motor High-Temperature Cutout
TA5 — Solution High-Temperature Cutout
TI 1-4 — Weak Solution Thermocouples
TI 5-8 — Strong Solution Thermocouples
TI 9-10 — Refrigerant Thermocouples
TI 11-12 — Cooling Water Thermocouples
TI 13-14 — Chilled Water Thermocouples

Control Wiring
Piping Connections
Valve

NOTES:
1. Spray pump and second solution pump are located on large sizes only.
2. Vacuum pump is optional.
3. Electric capacity control is shown. (Pneumatic is optional.)

*The LCD valve is physically located with the float in the high stage generator overflow box, not where it is schematically shown in the illustration.

Fig. 4 — Typical Flow Circuits, with Data Points, Shown for 16JT080-150,080L-150L Arrangements



LCD — Level Control Device
TC — Temperature Control (Capacity Control)

Fig. 5 — Typical Flow Circuits, (Simplified) Arrangement Shown for 16JT810-880

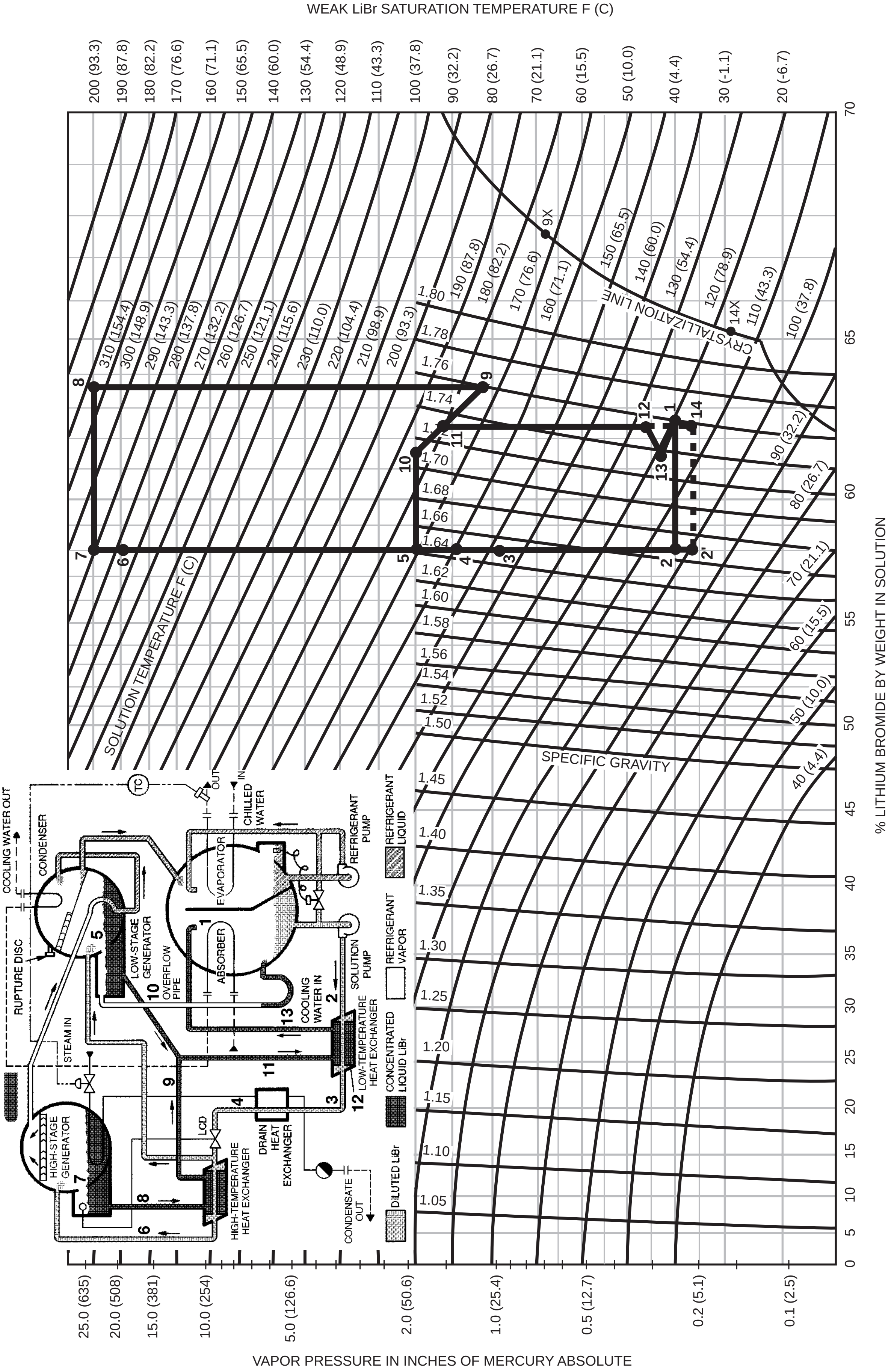


Fig. 6 — Equilibrium Diagram and Chiller Solution Cycle Example

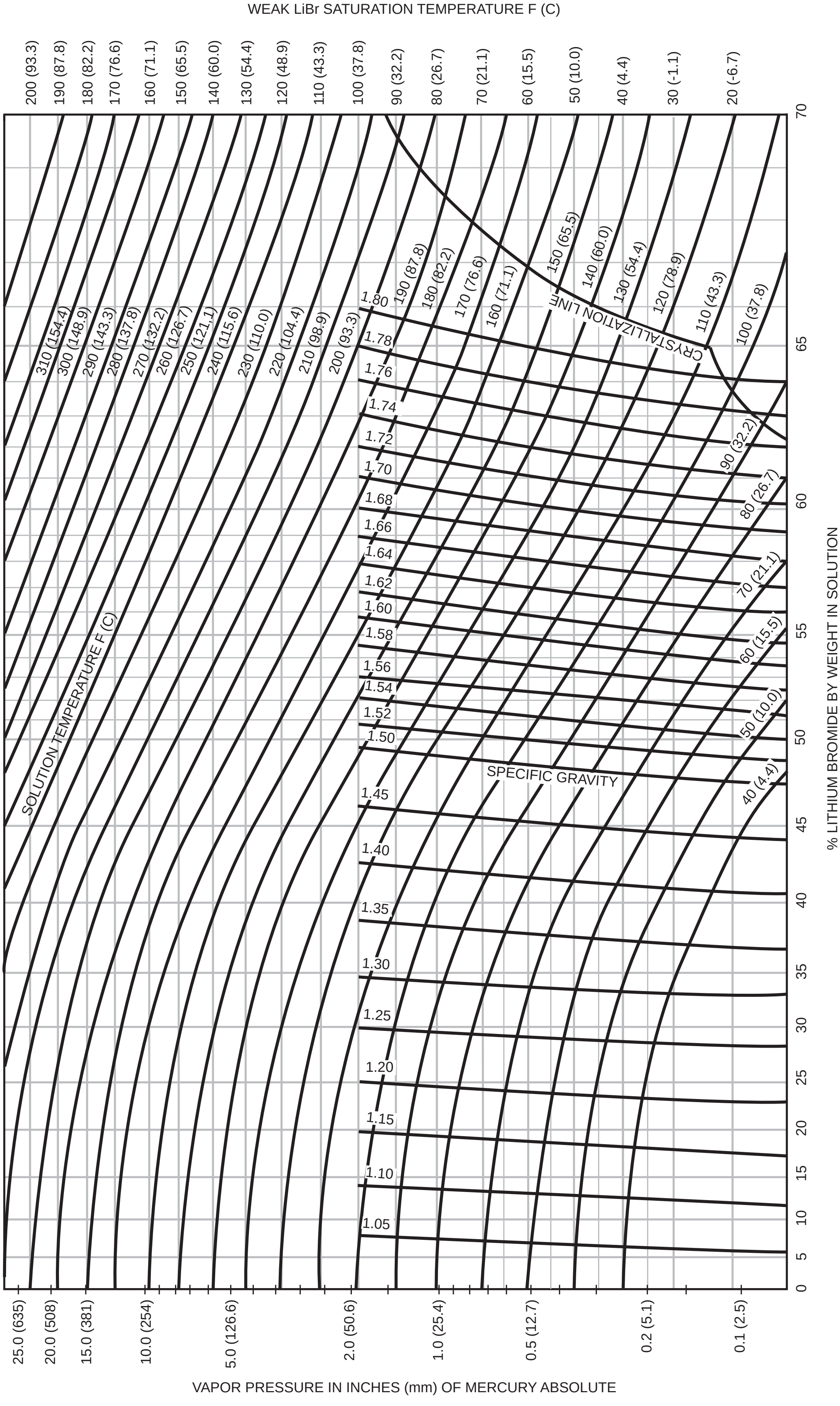


Fig. 7 — Equilibrium Diagram for Plotting 16JT Solution Cycle

The slightly sloped vertical lines extending from the bottom of the diagram are solution specific gravity lines. The concentration of a lithium bromide solution sample can be determined by measuring its specific gravity with a hydrometer and reading its temperature. Plotting the intersection point for these 2 values and reading straight down to the percent lithium bromide scale will give the concentration. The corresponding vapor pressure can also be determined by reading the scale straight to the left of the point, and its saturation temperature can be read on the scale straight to the right.

PLOTTING THE SOLUTION CYCLE — An absorption solution cycle at typical full load conditions is plotted in Fig. 6 from Points 1 through 14X. The corresponding values for these typical points are listed in Table 2. Note that these values will vary with different loads and operating conditions.

Point 1 represents the strong solution in the absorber as it begins to absorb water vapor after being sprayed from the absorber nozzles. This condition is internal and cannot be measured.

Point 2 represents the diluted (weak) solution after it leaves the absorber and before it enters the low-temperature heat exchanger. This includes the weak solution's flow through the solution pump. Point 2 is also used to calculate absorber loss.

Point 2′ represents the theoretical point calculated by refrigerant temperature and the concentration measured by the refrigerant level. Point 2′ is used to calculate absorber loss and can be measured with a solution sample from the pump discharge. The Product Integrated Control (PIC) monitors Point 2′ via the refrigerant temperature and calculates solution concentration based on the refrigerant level. For more information on the PIC, see the Controls section, page 13.

Point 3 represents the weak solution leaving the low-temperature heat exchanger. The solution is at the same concentration as at Point 2, but at a higher temperature after gaining heat from the strong solution. This temperature is measured by the PIC controller.

Point 4 represents the weak solution leaving the drain heat exchanger. It is at the same concentration as Point 3, but at a higher temperature after gaining heat from the steam condensate. Its temperature can be measured manually at a well provided for this purpose. At this point, the weak solution first flows through the level control device (LCD) valve and is then split, with approximately half going to the low-stage generator and the rest going on to the high-temperature heat exchanger.

Point 5 represents the weak solution in the low-stage generator after being preheated to the boiling temperature. The solution will boil at temperatures and concentrations corresponding to a saturation temperature established by the refrigerant vapor condensing temperature in the condenser. This condition is internal and cannot be measured.

Point 6 represents the weak solution leaving the high-temperature heat exchanger and entering the high-stage generator. It is at the same concentration as Point 4 but at a higher temperature after gaining heat from the strong solution. This temperature is measured by the PIC controller.

Point 7 represents the weak solution in the high-stage generator after being preheated to the boiling temperature. The solution will boil at temperatures and concentrations corresponding to the saturation temperature established by the refrigerant vapor condensing temperature in the low-stage generator tubes. The concentration is the same as Point 6 but at a higher temperature; this temperature is measured by the PIC controller which measures the condensed refrigerant vapor leaving the low-stage generator tubes.

Point 8 represents the strong solution leaving the high-stage generator and entering the high-temperature heat exchanger after being reconcentrated by boiling out refrigerant water. It can be plotted by measuring the temperatures of the leaving strong solution and the condensed refrigerant vapor leaving the low-stage generator tubes (saturation temperature). These two temperatures are measured by the PIC controller and used to calculate the strong solution concentration.

Point 9 represents the strong solution from the high-temperature heat exchanger as it flows between the two heat exchangers. It is the same concentration as Point 8 but at a cooler temperature after giving up heat to the weak solution. The temperature is measured by the PIC controller.

Point 9X represents the point on the crystallization line that corresponds to the conditions at Point 9 if the solution were cooled. This point is calculated by the PIC using the temperature and concentration at Point 9 as a reference.

Table 2 — Typical Full Load Cycle Equilibrium Data

POINT	SOLUTION TEMPERATURE		VAPOR PRESSURE		SOLUTION PERCENTAGE	SATURATED TEMPERATURE	
	F	C	in. Hg	mm Hg	%	F	C
1	120	49	0.3	6	62.6	40	4.4
2	103	39	0.3	6	58.0	40	4.4
2′	100	38	0.2	5	58.0	36	2.2
3	149	65	1.0	25	58.0	79	26.0
4	160	71	1.4	35	58.0	90	32.0
5	171	77	1.9	48	58.0	100	38.0
6	279	137	18.0	156	58.0	190	88.0
7	290	143	24.0	608	58.0	200	93.0
8	318	159	24.0	608	63.8	200	93.0
9	175	79	1.1	28	63.8	82	28.0
9X	175	79	0.7	18	67.5	68	20.0
10	186	86	1.9	48	61.5	100	38.0
11	182	83	1.6	41	62.6	93	34.0
12	126	52	0.3	8	62.6	45	7.2
13	120	49	0.3	7	61.5	43	6.1
14	118	48	0.2	6	62.2	38	3.3
14X	118	48	0.2	4	65.0	29	−1.7

Point 10 represents the strong solution leaving the low-stage generator and entering the low-temperature heat exchanger. It is at a weaker concentration than the solution from the high-stage generator and can be plotted. The PIC controller measures the temperatures of the leaving strong solution and refrigerant vapor condensate (saturation temperature). The concentration of the solution is calculated by the PIC controller.

Point 11 represents the mixture of strong solution from the high-temperature heat exchanger and strong solution from the low-stage generator as they both enter the low-temperature heat exchanger. The temperature is measured by the PIC controller. The concentration is calculated using Points 9 and 10.

Point 12 represents the combined strong solution before it leaves the low-temperature heat exchanger after giving up heat to the weak solution. This condition is internal and cannot be measured. The concentration is the same as Point 11.

Point 13 represents the strong solution leaving the low-temperature heat exchanger and entering the absorber spray nozzles, after being mixed with some weak solution inside the heat exchanger. The temperature is measured by the PIC controller, but the concentration cannot be sampled. After leaving the spray nozzles, the solution is somewhat cooled and concentrated as it flashes to the lower pressure of the absorber, at Point 1.

Point 14 represents a theoretical point calculated by using the concentration at Point 12 and the solution saturation temperature at Point 2. It is used to determine how close the chiller is to the crystallization line.

Point 14X represents the point on the crystallization line that corresponds to the conditions at Point 14 if the solution were cooled. Point 14X is calculated by the PIC using the temperature and concentration at Point 14 as a reference.

Purge System — Figures 8 and 9 show the basic components and flow circuits of the motorless purge.

The purge system automatically removes noncondensables from the chiller and transfers them to a storage chamber where they cannot affect chiller operation. Noncondensables are gases such as N_2, O_2, and H_2 that will not condense at the normal chiller operating temperatures and pressures and, because they reduce the chiller vacuum, they reduce the chiller capacity.

Some hydrogen (H_2) gas is liberated within the chiller during normal operation and its rate of generation is controlled by the solution inhibitor. The presence of most other gases in the chiller would occur either through a leak (the chiller is under a deep vacuum) or by entrainment in the refrigerant and solution at initial charging. During operation, noncondensables accumulate in the absorber, which is the lowest pressure area of the chiller.

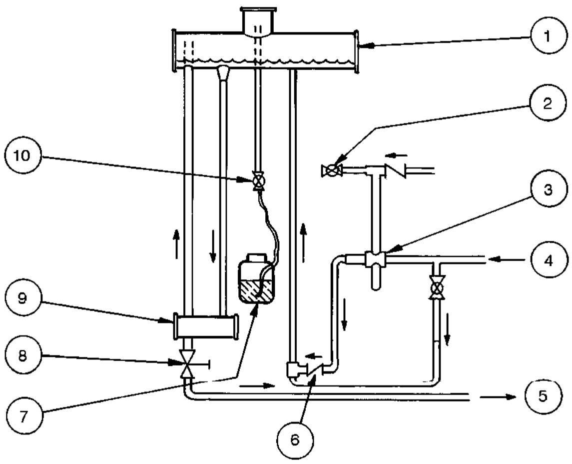
For purging, the gases are continuously drawn from the absorber into the lower pressure of eductors, where they are entrained in solution flowing from the solution pump. The mixture then continues on to the purge storage tank. The noncondensables are released in a separator and the solution flows back to the absorber by way of the generator overflow pipe.

Noncondensables accumulate in the purge storage tank where they are isolated from the rest of the chiller. The storage chamber is initially filled with solution that is displaced as the chamber gradually fills with noncondensables. These gases then must be periodically exhausted from the storage chamber by a manual procedure. This is begun by closing a solution return valve to force solution from the pump into the storage chamber to compress the noncondensables to above atmospheric pressure. Then the exhaust valve is opened to bleed the noncondensables to the atmosphere through solution in the exhaust bottle. This operation is described in the Maintenance Procedures, Purge Manual Exhaust Procedure section, page 79.

Some chillers also have an optional, permanently installed vacuum pump system (as shown in Fig. 4) that removes noncondensables directly from the absorber to evacuate the chiller at initial start-up and after service work.

NOTE: This vacuum pump system does not take the place of the purge system.

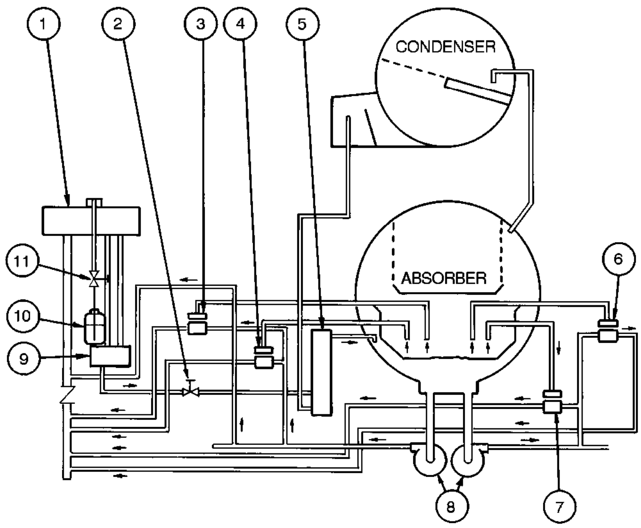
The pump is wired into the chiller control circuit for power.



LEGEND

1 — Storage Chamber
2 — Auxiliary Valve
3 — Eductor
4 — Solution from Solution Pump
5 — Solution Returning to Absorber
6 — Check Valve
7 — Exhaust Bottle (Liquid Seal)
8 — Solution Return Valve
9 — Separation Chamber
10 — Exhaust Valve

Fig. 8 — Purge System, 16JT810-880



LEGEND

1 — Storage Chamber
2 — Solution Return Valve
3 — Eductor
4 — Eductor
5 — GO-Loop Box
6 — Eductor
7 — Eductor
8 — Solution Pumps
9 — Separation Chamber
10 — Exhaust Bottle (Liquid Seal)
11 — Exhaust Valve

NOTE: Number of eductors varies from one on smaller sizes to 4 on larger sizes.

Fig. 9 — Purge System, 16JT080-150, 080L-150L

CONTROLS

Definitions

ANALOG SIGNAL — An *analog signal* varies in proportion to the monitored source. It quantifies values between operating limits. For example, a temperature sensor is an analog device because its resistance changes in proportion to the temperature and it detects many values.

DIGITAL SIGNAL — A *digital (discrete) signal* is a two-position representation of the value of a monitored source. For example, a switch is a digital device because it only indicates whether a value is above or below a set point or boundary by generating an on/off, high/low, or open/closed signal.

Overview — The 16JT absorption liquid chiller contains a microprocessor-based control center that monitors and controls all operations of the chiller. The microprocessor control system matches the cooling capacity of the chiller to the cooling load while providing state-of-the-art chiller protection. The system controls cooling capacity within the set point plus the deadband by sensing the leaving or entering chilled water temperature and regulating the steam valve via a mechanically-linked actuator. Movement of the valve causes the steam rate to increase or decrease, thereby increasing or decreasing the chiller's capacity. The processor protects the chiller by monitoring the digital and analog inputs and executes capacity overrides or safety shutdowns, if required.

PIC System Components — The Product Integrated Control (PIC) is the chiller's control system. The PIC controls the operation of the chiller by monitoring all operating conditions. The PIC can also diagnose a problem with the chiller. It positions the steam valve to maintain leaving chilled water temperature. The PIC can also interface with auxiliary equipment such as pumps and cooling tower fans so that they turn on only when required. The PIC checks all safeties to prevent any unsafe operating conditions.

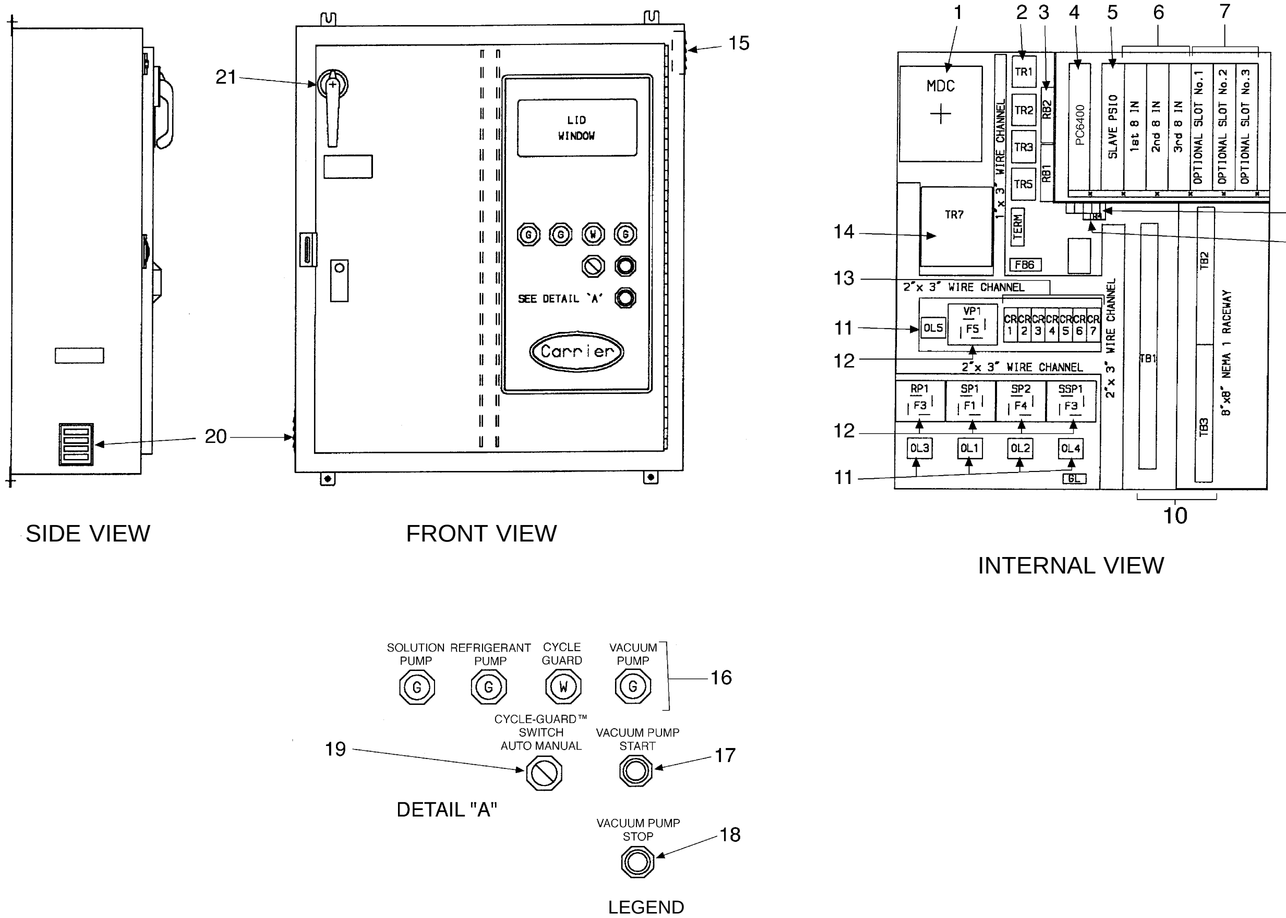
The PIC can interface with the Carrier Comfort Network (CCN), if desired and can communicate with other PIC-equipped chillers and other CCN devices.

The PIC system consists of five modules housed inside the control center (Fig. 10):

- Master Comfort Controller (PC6400)
- Processor/Sensor Input/Output (Slave PSIO) Module
- First 8-Input Module
- Second 8-Input Module
- Third 8-Input Module

The PIC system also includes the following components:

- LID
- Six-Pack Relay Boards
- Temperature Sensors
- Pressure Transducers



LEGEND

1 — Fused Disconnect	**12** — Pump Fuse Blocks (5)	**LID** — Local Interface Device
2 — Low Voltage Transformers (TR1, TR2, TR3, TR5)	**13** — Control Relays (7)	**MDC** — Main Disconnect
3 — 6-Pack Relay Boards (2)	**14** — Primary Power Transformer (TR7)	**NEMA** — National Electrical Manufacturer's Association
4 — PC6400 (Master Comfort Controller)	**15** — Cooling Fan	**OL** — Overload
5 — Slave PSIO (Processor/Sensor Input/Output Module)	**16** — Indicator Lights	**PSIO** — Processor/Sensor Input/Output Module
6 — 8-Input Modules (3)	**17** — Vacuum Pump Start Button	**RB** — Relay Board
7 — Location for Spare Modules (3)	**18** — Vacuum Pump Stop Button	**RP** — Refrigerant Pump Contactor
8 — Circuit Breakers (4)	**19** — Cycle-Guard™ Auto/Manual Switch	**SP** — Solution Pump Contactor
9 — Low Voltage Transformer, TR4	**20** — Panel Vent	**SSP** — Solution Spray Pump Contactor
10 — Terminal Blocks (3)	**21** — Panel Door Handle	**TB** — Terminal Block
11 — Pump Motor Overloads (5)	**8-IN** — 8 Input Module	**TR** — Transformer
	CR — Control Relay	**VP** — Vacuum Pump Contactor
	FB — Fuse Block	
	GL — Ground Lug	

Fig. 10 — Typical 16JT Chiller PIC Control Center

The control center is divided into two areas. The control voltages contained in each area of the control center are:

- upper right side: all extra-low voltage wiring (24 v or less)
- left side: 115 vac control voltage and chiller high power wiring

Figure 11 is a schematic representation of the PIC control system.

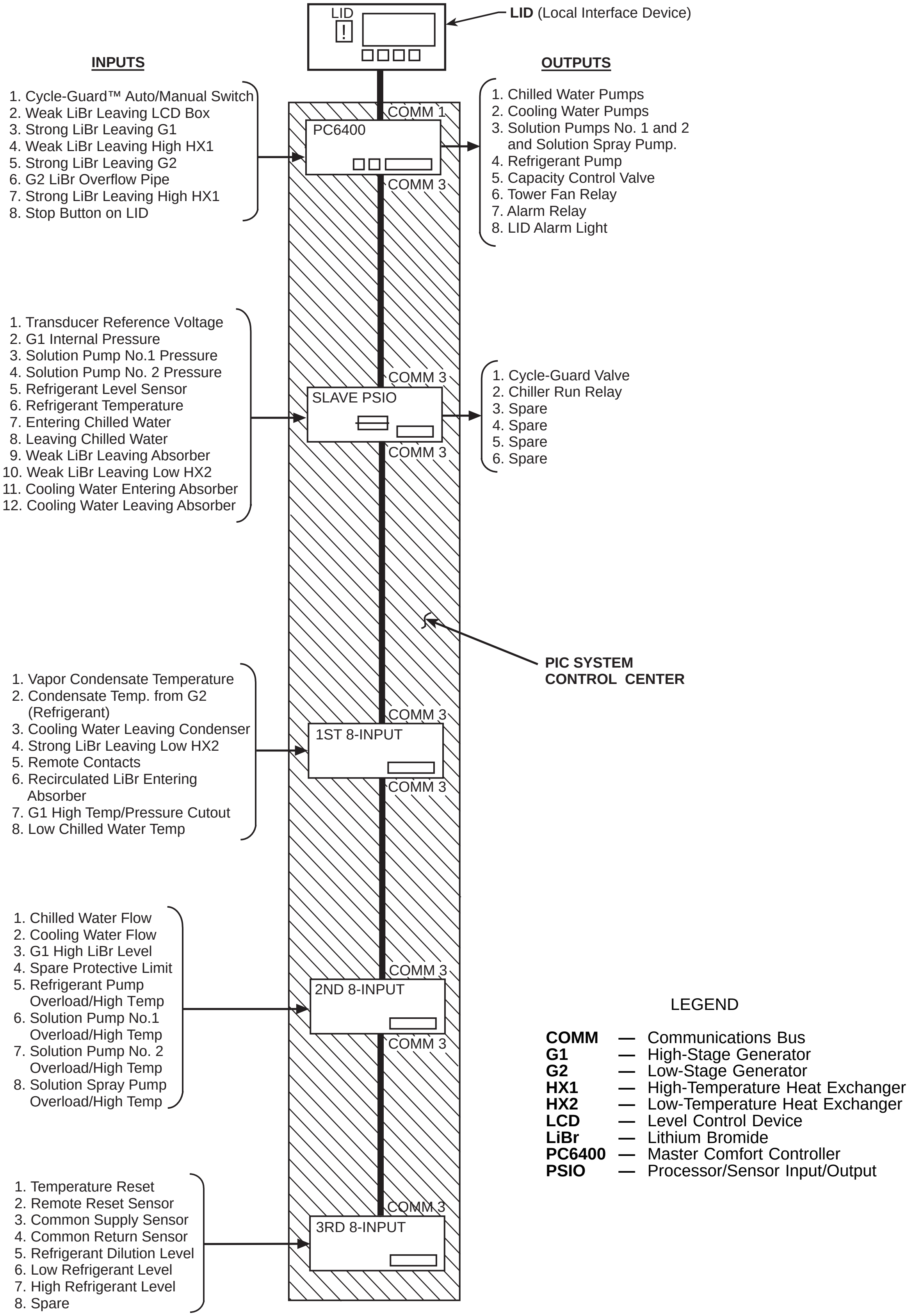


Fig. 11 — Schematic Representation of the 16JT PIC Control System

MASTER COMFORT CONTROLLER (PC6400) MODULE — The PC6400 module contains all the operating software needed to control the chiller. To sense pressures and temperatures, the 16JT uses:

- 2 or 3 pressure transducers
- 1 refrigerant level sensor
- 5 high-temperature thermistors
- 13 temperature thermistors
- 3 level probes

The PC6400 module has inputs from the Cycle-Guard™ auto/manual switch, five 100K ohm, high-temperature thermistors, one temperature thermistor (5K ohm), and the LID STOP switch. The 100K ohm thermistors measure the temperature of the weak LiBr leaving LCD (level control device) box, the strong LiBr leaving G1 (high-stage generator), the weak LiBr leaving HX1 (high-temperature heat exchanger), the strong LiBr leaving G2 (low-stage generator), and the strong LiBr leaving HX1. The 5K ohm thermistor measures the temperature of the G2 LiBr overflow pipe. The module has outputs to the chilled water pump, cooling water pump, solution pump(s), solution spray pump, refrigerant pump, capacity control valve, tower fan relay, alarm relay, and LID alarm light.

The PC6400 communicates with the Slave PSIO and the 8-input modules through a sensor bus, COMM3; it communicates with the LID for user interface and chiller control through the CCN (Carrier Comfort Network) bus, COMM1.

PROCESSOR/SENSOR INPUT/OUTPUT MODULE (Slave PSIO) — This module operates as a slave to the PC6400 module. The slave PSIO has a total of 12 inputs, including inputs for the pressure transducer voltage reference, G1 internal pressure, solution pump no. 1 pressure, solution pump no. 2 pressure, and refrigerant level sensor. (Some chiller models do not come with a second solution pump or a spray pump.) The slave PSIO has temperature inputs from the refrigerant, entering chilled water, leaving chilled water, weak LiBr leaving the absorber, weak LiBr leaving the low temperature heat exchanger (HX2), cooling water entering the absorber, and cooling water leaving the absorber.

The slave PSIO has one output to the Cycle-Guard valve and one for the chiller run relay; the other 4 outputs are spares.

FIRST 8-INPUT MODULE — This module has 5 temperature inputs: vapor condensate temperature, condensed vapor temperature from G2, cooling water leaving condenser, strong LiBr leaving low HX2, and recirculated LiBr entering sprays. The first 8-input module also has discrete inputs for remote contacts, G1 generator high temperature/pressure, and low chilled water temperature.

SECOND 8-INPUT MODULE — This module has 8 dry contacts: chilled water flow, cooling water flow, G1 high LiBr level, spare protective limit input, refrigerant pump overload/high temperature, solution pump no. 1 overload/high temperature, solution pump no. 2 overload/high temperature, and solution spray pump overload/high temperature.

THIRD 8-INPUT MODULE — This module has one 4 to 20 mA input for the temperature reset 4 to 20 mA and 3 temperature inputs: the remote reset sensor, common supply sensor, and common return sensor. The third 8-input module has 3 dry contacts: the refrigerant dilution level switch, refrigerant low level switch, and refrigerant high level switch. This module has one spare input.

LOCAL INTERFACE DEVICE (LID) — The LID is the primary user interface. It is mounted in the control panel and communicates with the PC6400 module. The LID is the input center for all local chiller set points, schedule, setup functions, and options. It has a stop button, an alarm light, 4 buttons (softkeys) for logic inputs, and a display screen.

SIX-PACK RELAY BOARDS — There are two 6-pack relay boards located in the control center. Each is a cluster of 6 pilot relays energized by the PC6400 and the slave PSIO. One board is used for the chilled water pump relay, cooling water pump relay, solution pump relay, refrigerant pump relay, and remote tower fan relay. The second relay board is used for the Cycle-Guard relay and the chiller run relay.

TEMPERATURE SENSORS (Fig. 12) — Located throughout the chiller, the temperature sensors sense the temperature of LiBr, condensate, refrigerant, and water. The temperatures are read by the PIC. There are 2 temperature sensor sizes:

1. The 5K ohm sensor has a range of −40 to 245 F (−40 to 118.3 C).
2. The 100K ohm sensor has a range of 77 to 442 F (25 to 228 C). The 100K ohm sensor is marked with a red band.

PRESSURE TRANSDUCERS (Fig. 13) — Also located throughout the chiller, the pressure transducers sense the pressure of the high-stage generator (G1) and LiBr solution pumps' discharge. The pressures are read by the PIC. There are 2 pressure ranges:

1. 0.0 to 20.5 psia (0.0 to 141.3 kPa)
2. −6.7 to 420 psig (−46.2 to 2896 kPa)

The 2 ranges are distinguished from one another by part numbers only.

LEVEL PROBES — Located throughout the chiller, the level probes sense the liquid level in the high-stage generator (G1) and the refrigerant level in the evaporator.

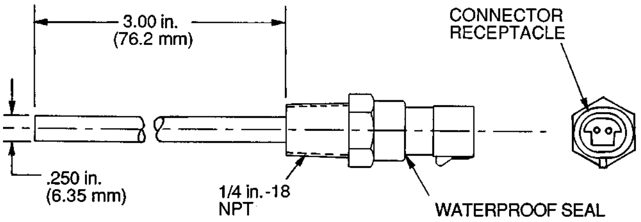


Fig. 12 — Control Sensors (Temperature)

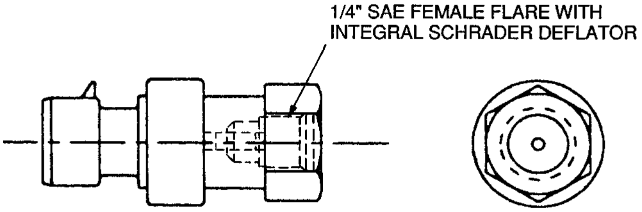


Fig. 13 — Control Sensors (Pressure Transducer, Typical)

LID Operation and Menus

OVERVIEW

- The LID display automatically reverts to the default screen (Fig. 14) after 15 minutes if no softkey activity takes place. If the LID is backlit, the backlighting turns off. The backlit LID lights up again when a softkey is pressed.
- If a screen other than the default screen is displayed on the LID, the name of that screen is in the upper right corner (Fig. 15).
- The LID may be set to display either English or SI units. Use the LID configuration screen (accessed from the Service menu) to change the units. See the Service Operation section, page 51.
- Local Operation — The PIC can be placed in Local Operating mode by pressing the [LOCAL] softkey. The PIC will accept commands from the LID only. The PIC will use the local time schedule to determine start and stop times.

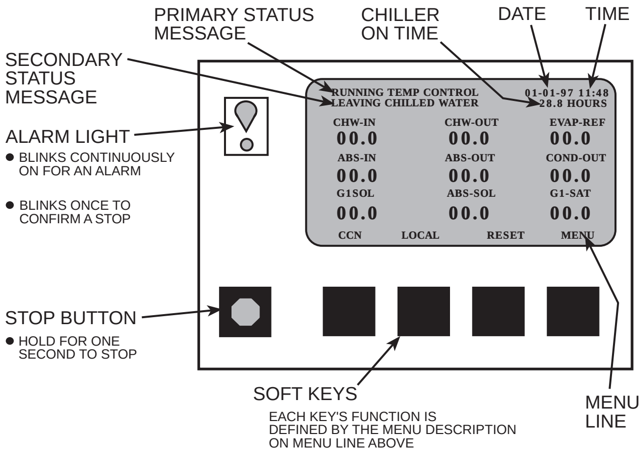


Fig. 14 — LID Default Screen

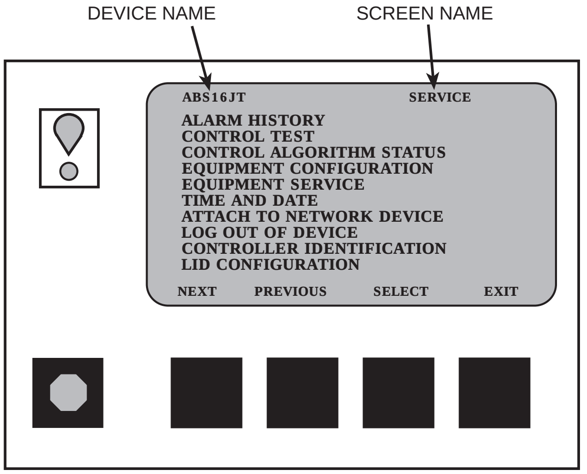


Fig. 15 — LID Service Screen

- CCN (Carrier Comfort Network) Operation — The PIC can be placed in CCN Operating mode by pressing the [CCN] softkey. The control will then accept modifications from any CCN interface or module with the proper authority, as well as from the LID. The PIC will use the CCN time schedule to determine start and stop times.
- The LID ‘‘freezes’’ when a shutdown alarm is sensed, allowing the operator to view conditions at the time of the alarm. The LID reverts to a display of current conditions after the alarm is cleared.

Figures 16 and 17 show the LID menu structure.

ALARMS AND ALERTS — An alarm shuts down the chiller. An alert does not shut down the chiller, but it notifies the operator that an unusual condition has occurred.

NOTE: When the chiller is in an alarm state, the remote alarm relay is energized, and the alarm light on the control panel (Fig. 14) flashes on and off continually, indicating that the chiller has shut down because of the alarm. If an operator turns off the chiller using the Stop button, the alarm light on the control panel lights temporarily.

NOTE: When the chiller is in an alarm state, the default LID display ‘‘freezes,’’ that is, it stops updating. The first line of the LID default screen displays a primary alarm message; the second line displays a secondary alarm message.

The LID default screen freezes, enabling the operator to see the conditions of the chiller *at the time of the alarm*. If the value in alarm is one normally displayed on the default screen, it flashes between normal and reverse print. The LID default screen remains frozen until the condition that caused the alarm is cleared by the operator.

Troubleshooting information is recorded in the alarm history. Access the ALARM HISTORY screen from the Service Menu (Fig. 17). You may also access the status screen associated with the value in alarm. The value will be highlighted on the status screen by an asterisk in the far right field.

To determine what caused the alarm, the operator should read both the primary and secondary messages, as well as the alarm history. The primary message indicates the most recent alarm condition. The secondary message gives more detail on the alarm condition. Since there may be more than one alarm condition, another alarm message may appear after the first condition is cleared. Check the ALARM HISTORY screen for additional help in determining the reasons for the alarms. Once all the alarm conditions have been cleared and the LID [RESET] softkey has been pressed, the LID screen will return to normal and the chiller can be restarted.

When the chiller is in an alert state, the default LID screen does not freeze. However, if the value in alert is on the default screen, that value flashes on and off. For more information on the value in alert, access its associated status screen. The value will be highlighted on the status screen by an exclamation point in the far right field.

See the Troubleshooting Guide, page 92, for more details on alarm messages.

LID MENU ITEMS — To perform any of the operations described below, the PIC must be powered up and have successfully completed its self test. The self test takes place automatically, after power-up.

Press the [MENU] softkey to view the following four menu structures: STATUS, SCHEDULE, SETPOINT, and SERVICE.

- The STATUS menu allows viewing and limited calibration or modification of control points and sensors, relays and contacts.
- The SCHEDULE menu allows viewing and modification of the Local and CCN time schedules.
- The SETPOINT menu allows set point adjustments, such as the entering chilled water and leaving chilled water setpoints.
- The SERVICE menu (Fig. 15) can be used to view or modify information on the Alarm History, Control Test, Control Algorithm Status, Equipment Configuration, Equipment Service, Time and Date, Attach to Network Device, Log Out of Device, Controller Identification, and LID Configuration.

For more information on the menu structures, refer to Fig. 16 and 17.

Press the softkey that corresponds to the menu structure you want to view: [STATUS], [SCHEDULE], [SETPOINT], or [SERVICE]. To view or change parameters within any of these menu structures, use the [NEXT] and [PREVIOUS] softkeys to scroll down to the desired item or table. Use the [SELECT] softkey to select that item. The softkey choices that then appear depend on the table or menu you select. The softkey choices and their functions are listed on page 20.

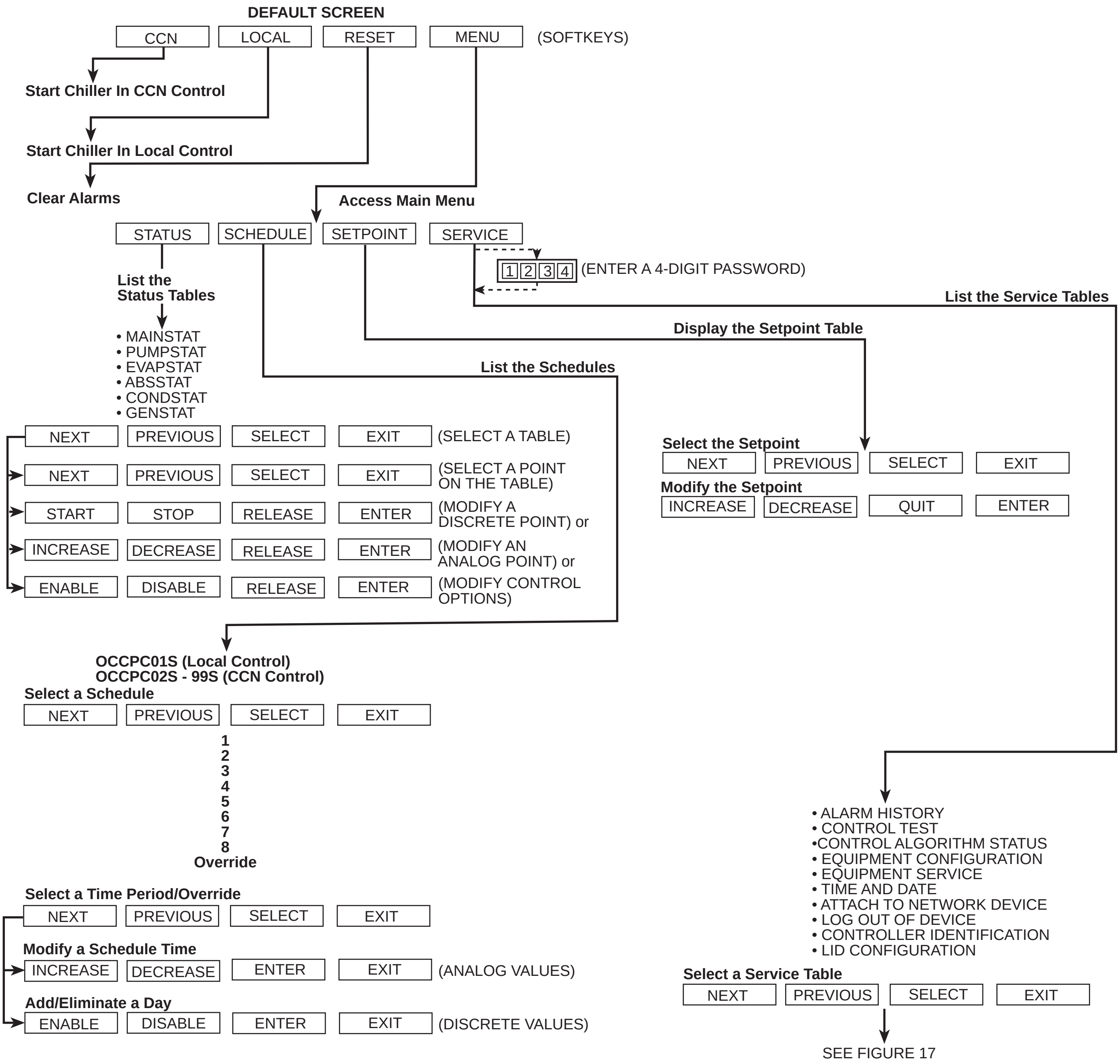


Fig. 16 — 16JT LID Menu Structure

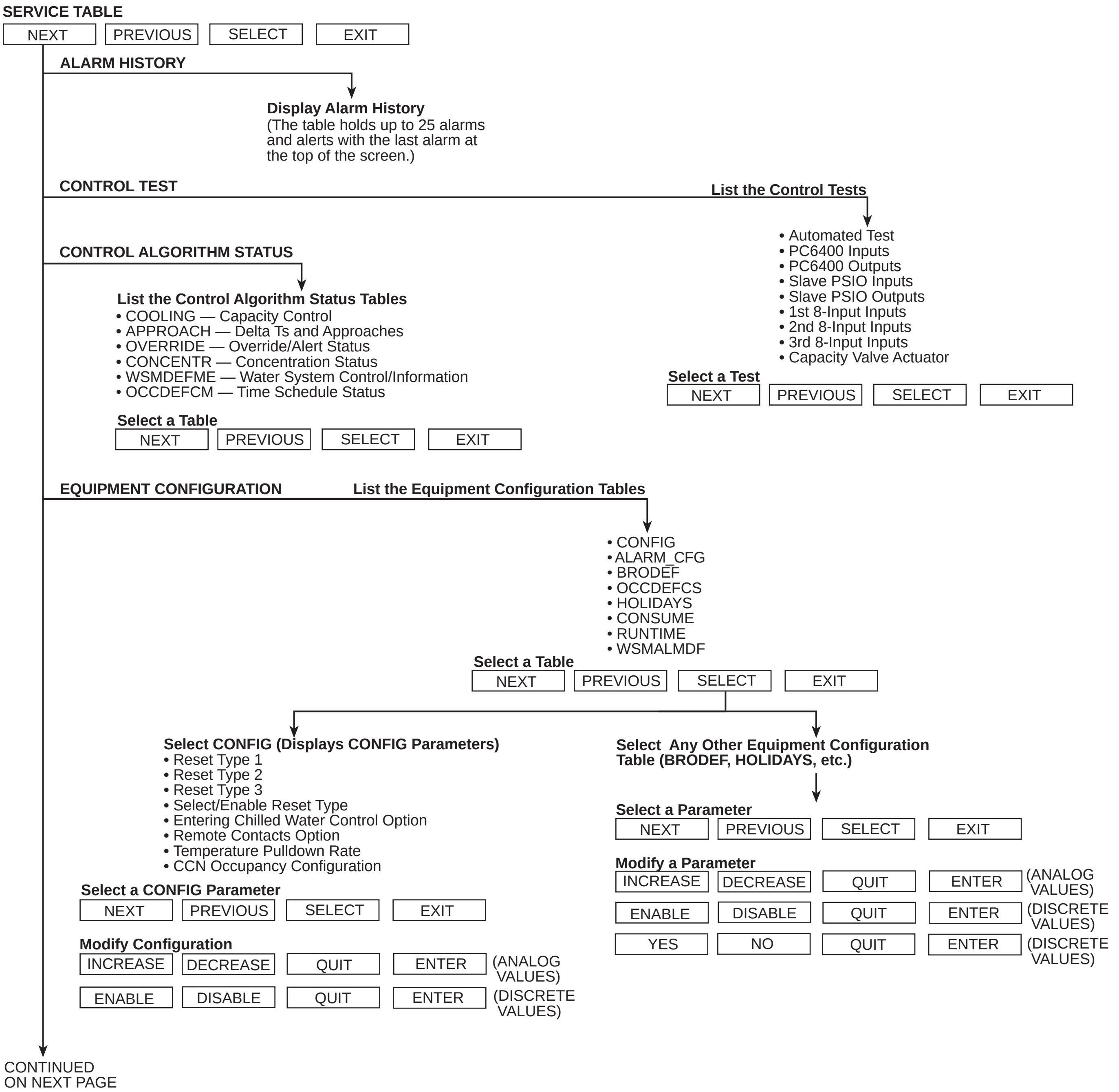
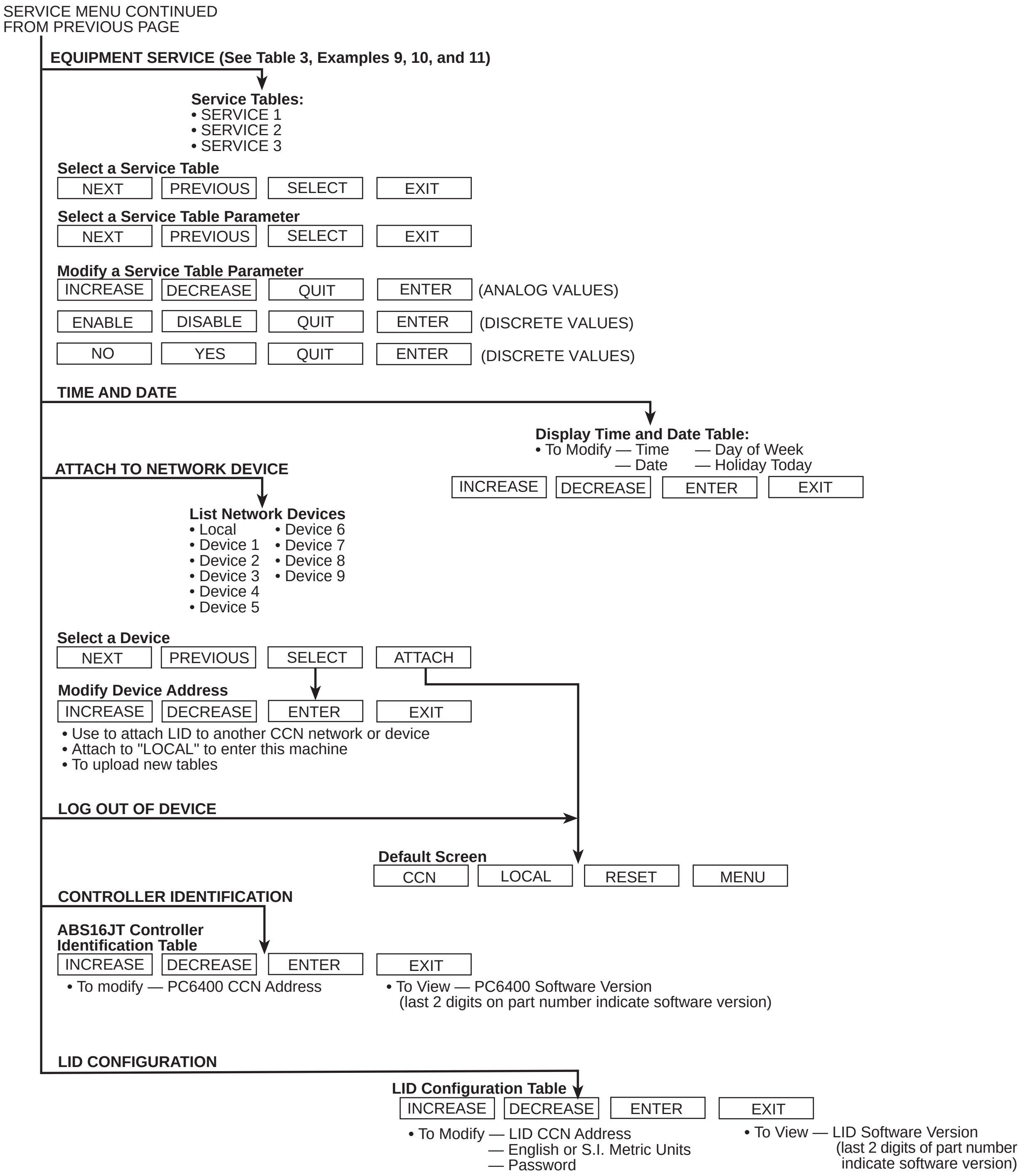


Fig. 17 — 16JT PIC Service Menu Structure



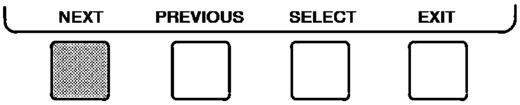
LEGEND

CCN — Carrier Comfort Network
LID — Local Interface Device

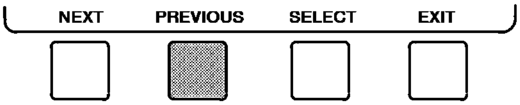
Fig. 17 — 16JT PIC Service Menu Structure (cont)

BASIC LID OPERATIONS (Using the Softkeys) — To perform any of the operations described below, the PIC must be powered up and have successfully completed its self test.

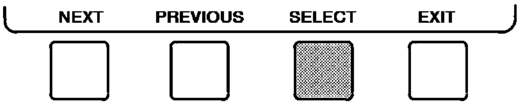
- Press NEXT to scroll the cursor bar down in order to highlight a point or to view more points below the current screen.



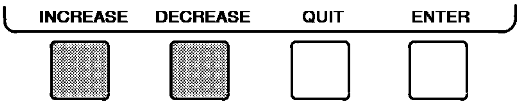
- Press PREVIOUS to scroll the cursor bar up in order to highlight a point or to view points above the current screen.



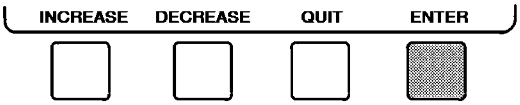
- Press SELECT to view the next screen level (highlighted with the cursor bar) or to override (if allowable) the highlighted point value.



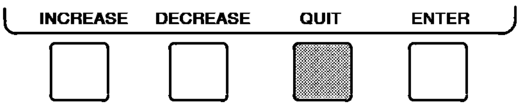
- Press INCREASE or DECREASE to change the highlighted point value.



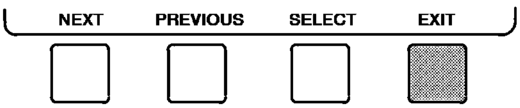
- Press ENTER to leave the selected decision or field and save changes.



- Press QUIT to leave the selected decision or field without saving any changes.

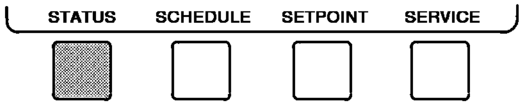


- Press EXIT to return to the previous screen level.

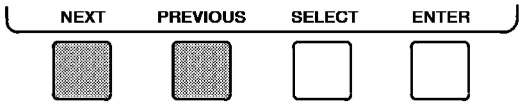


TO VIEW POINT STATUS (Fig. 18) — Point status is the actual value of all of the temperatures, pressures, relays, and actuators sensed and controlled by the PIC.

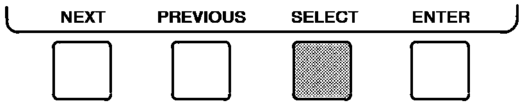
1. On the MENU screen, press STATUS to view the list of Point Status tables.



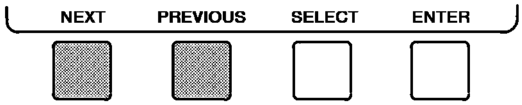
2. Press NEXT or PREVIOUS to highlight the desired status table. The list of tables includes:
   - MAINSTAT — Status of control points and sensors
   - PUMPSTAT — Status of pumps
   - EVAPSTAT — Status of evaporator
   - ABSSTAT — Status of the absorber
   - CONDSTAT — Status of the condenser
   - GENSTAT — Status of the generator



3. Press SELECT to view the desired Point Status table.



4. On the selected table, press NEXT or PREVIOUS until desired point is displayed on the screen.



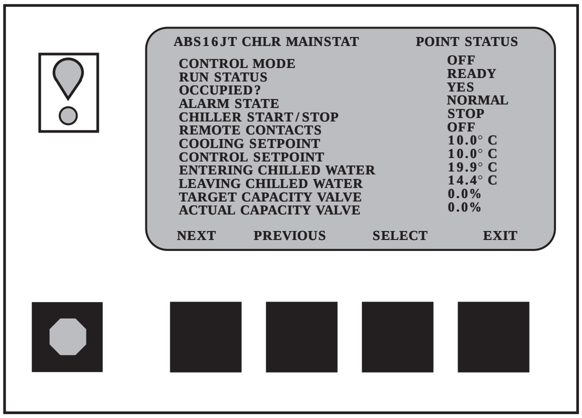
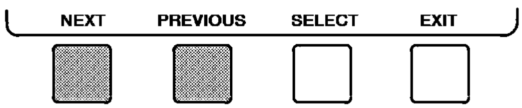


Fig. 18 — Example of Point Status Screen (MAINSTAT)

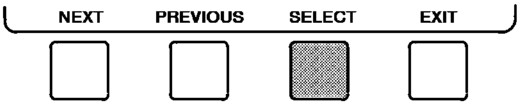
OVERRIDE OPERATIONS

<u>To Override a Value or Status</u>

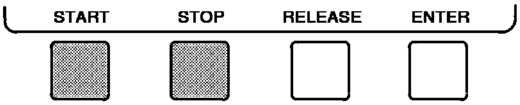
1. From any STATUS screen, press NEXT or PREVIOUS to highlight the desired point.



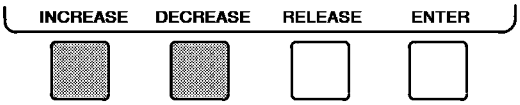
2. Press SELECT to select the highlighted point.



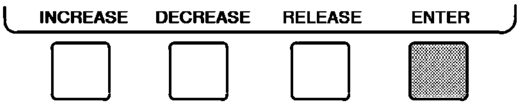
For Discrete Points — Press START or STOP to select the desired state.



For Analog Points — Press INCREASE or DECREASE to select the desired value.



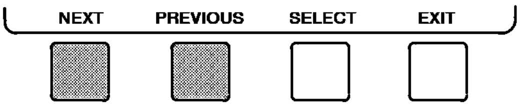
3. Press ENTER to register new value.



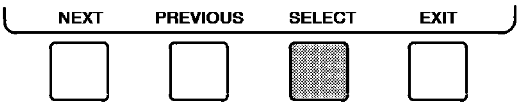
NOTE: When overriding or changing metric values, it is necessary to hold the softkey down for a few seconds in order to see a value change, especially on kilopascal values.

To Remove an Override

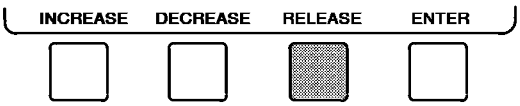
1. From any STATUS screen, press NEXT or PREVIOUS to highlight the desired point.



2. Press SELECT to access the highlighted point.



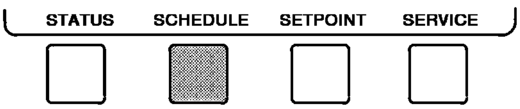
3. Press RELEASE to remove the override and return the point to the PIC's automatic control.



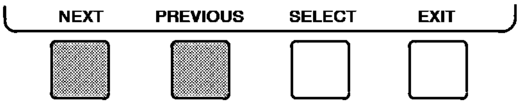
Override Indication — An override value is indicated by SUPVSR, SERVC, or BEST flashing next to the point value on the STATUS table.

TIME SCHEDULE OPERATION (Fig. 19)

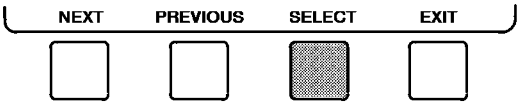
1. On the MENU screen, press SCHEDULE .



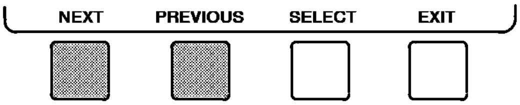
2. Press NEXT or PREVIOUS to highlight the desired schedule. When using PC6400 software, OCCPC01S is the LOCAL Time Schedule and OCCPC02S is the first CCN Time Schedule. The actual CCN Occupied Schedule number is defined on the CONFIG table. The CCN schedule number can change to any value from 02 to 99.



3. Press SELECT to access and view the time schedule.

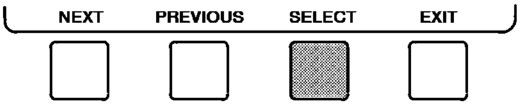


4. Press NEXT or PREVIOUS to highlight the desired period or override that you wish to change.

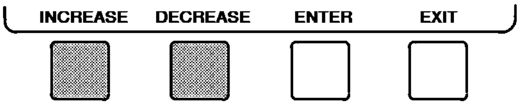


NOTE: A schedule override is a temporary on period that overrides the current schedule.

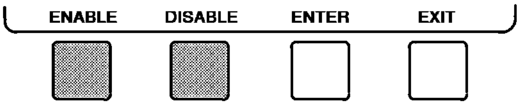
5. Press SELECT to access the highlighted period or override.



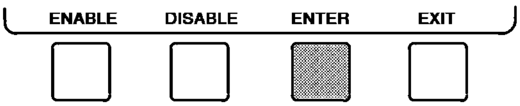
6. a. Press INCREASE or DECREASE to change the time values. Override values are in one-hour increments, up to 4 hours.



b. Press ENABLE to select days in the day-of-week fields. Press DISABLE to eliminate days from the period.



7. Press ENTER to register the values and to move horizontally (left to right) within a period.



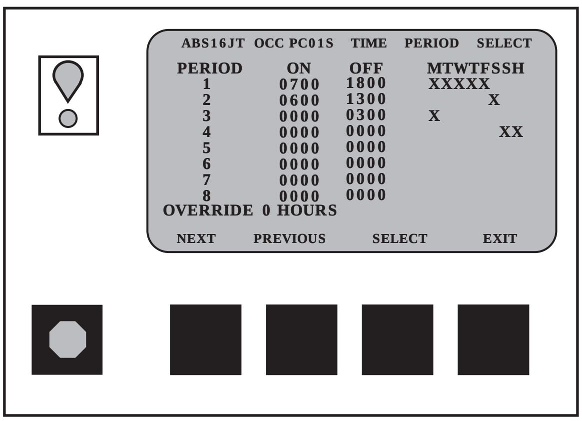
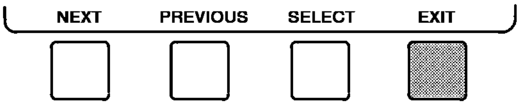
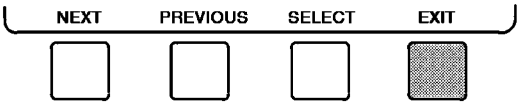


Fig. 19 — Example of Time Schedule Operation Screen

8. Press EXIT to leave the period or override.



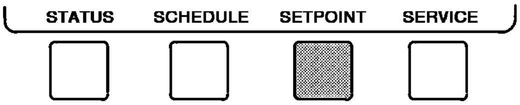
9. Either return to Step 4 to select another period or override or press EXIT again to leave the current time schedule screen and save the changes.



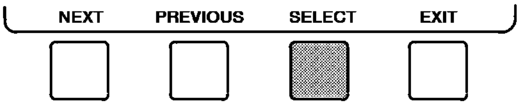
NOTE: Information on setting holiday designations may be found in the Service Operation section beginning on page 51.

TO VIEW AND CHANGE SET POINTS (Table 3, Example 7, and Fig. 20)

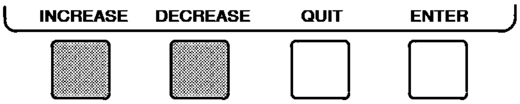
1. To view the SETPOINT screen, at the MENU screen press SETPOINT .



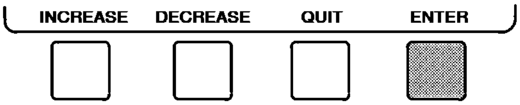
2. Press SELECT to modify the highlighted set point.



3. Press INCREASE or DECREASE to change the selected set point value.



4. Press ENTER to save the changes and return to the previous screen.



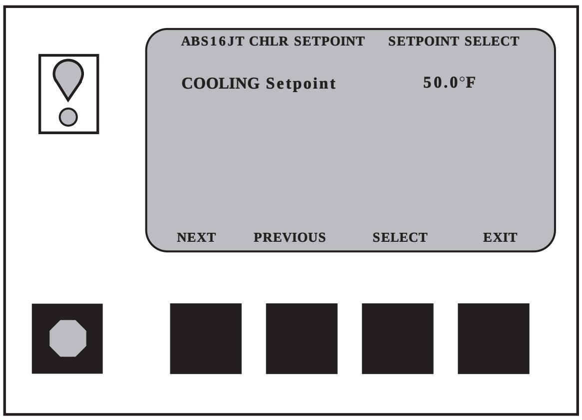


Fig. 20 — Example of Set Point Screen

TO ACCESS THE SERVICE MENU TABLES — Information on accessing the SERVICE menu table may be found in the Service Operation section, page 51.

LID DISPLAY SCREENS — For more details on the information available on the LID display screens, see Table 3.

PIC System Functions

NOTE: Words not part of paragraph headings and printed in all capital letters can be viewed on the LID (e.g., LOCAL, CCN, RUNNING, ALARM, etc.). Words printed both in all capital letters and italics can also be viewed on the LID and are parameters (*CONTROL MODE, COOLING SETPOINT, TARGET CAPACITY VALVE,* etc.) with associated values (e.g., modes, temperatures, pressures, percentages, on, off, etc.). Words printed in all capital letters and in a box represent softkeys on the LID control panel (e.g., ENTER and EXIT). See Table 3 for examples of the information that can appear on the LID screens. Figures 16-20 give an overview of LID operation and menus.

CAPACITY CONTROL — The PIC controls the chiller capacity by modulating the capacity valve in response to chiller water temperature changes away from the *CONTROL POINT.* The *CONTROL POINT* may be changed by a CCN network device or is determined when the PIC adds any active chilled water reset to the *COOLING SETPOINT*. The PIC uses the *PROPORTIONAL INC (Increase) BAND, PROPORTIONAL DEC (Decrease) BAND*, the *PROPORTIONAL ECW (Entering Chiller Water) GAIN,* and the *G1 SOLUTION TEMP BIAS* to determine how fast or slow to respond. *CONTROL POINT* may be viewed and/or overridden from the STATUS table on the MAINSTAT screen. *CONTROL POINT* may also be viewed from the CONTROL ALGORITHM STATUS table on the COOLING screen. See the section on Warm-Up, page 71, for more information on these parameters.

ENTERING CHILLED WATER CONTROL — If this option is enabled, the PIC uses the *ENTERING CHILLED WATER* temperature to modulate the capacity valve instead of the *LEAVING CHILLED WATER* temperature. *ENTERING CHILLER WATER* control options may be viewed and/or modified from the EQUIPMENT CONFIGURATION table shown on the CONFIG screen.

CONTROL POINT DEADBAND — This is the tolerance on the chilled water temperature *CONTROL POINT.* If the water temperature goes outside the *CONTROL POINT DEADBAND*, the PIC opens or closes the capacity valve in response until it is within tolerance. The PIC may be configured with a 0.5 to 2 F (0.3 to 1.1 C) *CONTROL POINT DEADBAND. CONTROL POINT DEADBAND* may be viewed on the COOLING screen from the CONTROL ALGORITHM STATUS table; it may be viewed and/or modified on the SERVICE3 screen (SERVICE menu).

For example, a 1° F (0.6° C) deadband setting controls the water temperature within ±0.5 F (0.3 C) of the control point. This may cause frequent capacity valve movement if the chilled water load fluctuates frequently. The default setting is 1° F (0.6 C).

PROPORTIONAL BANDS AND GAIN — Proportional band is the rate at which the capacity valve position is corrected in proportion to how far the CHILLED WATER temperature is from the control point. Proportional gain determines how quickly the capacity valve reacts to how quickly the temperature is moving from the *CONTROL POINT.* The proportional bands and gain may be viewed on the COOLING screen from the CONTROL ALGORITHM STATUS table; they may be viewed and/or modified on the SERVICE3 screen (SERVICE menu).

Table 3 — 16JT LID Display Data

> IMPORTANT: The following notes apply to all Table 3 examples.

1. Only 12 lines of information appear on the LID screen at any one time. Press the NEXT or PREVIOUS softkey to highlight a point or to view items below or above the current screen. If you have a chiller with a backlit LID, press the NEXT softkey twice to page forward; press the PREVIOUS softkey twice to page back.
2. To access the information shown in Examples 8 through 15, enter your 4-digit password after pressing the SERVICE softkey. If no softkeys are pressed for 15 minutes, the LID automatically logs off (to prevent unrestricted access to PIC controls) and reverts to the default screen. If this happens, you must reenter your password to access the tables shown in Examples 8 through 15.
3. Terms in the Description column of these tables are listed as they appear on the LID screen.
4. The LID may be configured in English or Metric (SI) units using the LID CONFIGURATION screen. See the Service Operation section, page 51, for instructions on making this change.
5. The items in the Reference Point Name column *do not appear on the LID screen*. They are data or variable names used in CCN or Building Supervisor (BS) software. They are listed in these tables as a convenience to the operator if it is necessary to cross reference CCN/BS documentation or use CCN/BS programs. For more information, see the 16JT CCN Supplement.
6. Reference Point Names shown in these tables in all capital letters can be read by CCN and BS software. Of these capitalized names, those preceded by an asterisk can also be changed (that is, written to) by the CCN, BS, and the LID. Capitalized Reference Point Names preceded by two asterisks can be changed only from the LID. Reference Point Names in lower case type can be viewed by CCN or BS only by viewing the whole table.
7. Alarms and Alerts: An asterisk *in the far right field of a LID status screen* indicates that the chiller is in an alarm state; an exclamation point in the far right field of the LID screen indicates an alert state. The asterisk (or exclamation point) indicates that the value on that line has exceeded (or is approaching) a limit. For more information on alarms and alerts, see the Alarms and Alerts section, page 16.

LEGEND

Abs — Absorber
Absorb — Absorber
Cal — Calibration
CCN — Carrier Comfort Network
CHW — Chilled Water
CHWR — Chilled Water Return
CHWS — Chilled Water Supply
Conc — Concentration
Cond — Condenser
Dec — Decrease
Ent — Entering
G1 — High-Stage Generator
G2 — Low-Stage Generator
HX1 — High-Temperature Heat Exchanger
HX2 — Low-Temperature Heat Exchanger
Inc — Increase
LCD — Level Control Device
LiBr — Lithium Bromide
Lvg — Leaving
Ma — Milliamps
Overld — Overload
Prot — Protective
Recirc — Recirculated
Ref — Refrigerant
Refrig — Refrigerant
Sol — Solution
Temp — Temperature

EXAMPLE 1 — MAINSTAT SCREEN (STATUS TABLE)

To access this information from the LID default screen:

1. Press MENU.
2. Press STATUS (MAINSTAT will be highlighted).
3. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Control Mode	Reset, Off, Local, CCN		MODE
Run Status	Ready, Recycle, Startup, Warmup, Ramping, Running, Cntrl Test, Override, Tripout, Abnormal, Desolid, Dilution		STATUS
Occupied?	0/1	NO/YES	OCC
Alarm State	0/1	NORMAL/ALARM	ALM
***Chiller Start/Stop**	0/1	STOP/START	*CHIL_S_S
Remote Contacts	0/1	OFF/ON	*REMCON
Cooling Setpoint	41-65 (5-18.3)	DEG F (DEG C)	SP
***Control Point**	41-65 (5-18.3)	DEG F (DEG C)	*LCW_STPT
Entering Chilled Water	−40-245 (−40-118.3)	DEG F (DEG C)	CHW_IN
Leaving Chilled Water	−40-245 (−40-118.3)	DEG F (DEG C)	CHW_OUT
****Target Capacity Valve**	0-100	%	**CV_TRG
Actual Capacity Valve	0-100	%	CV_ACT
Startup Pulldown Failure	0/1	DSABLE/ENABLE	PULLFAIL
Chiller Run Relay	0/1	OFF/ON	CHILLRUN
Spare Prot Limit Input	0/1	ALARM/NORMAL	SPR_PL
***Temp Reset 4-20 mA**	4 to 20	MA	*RES_OPT
***Remote Reset Sensor**	−40-245 (−40-118.3)	DEG F (DEG C)	*R_RESET
***Common Supply Sensor**	−40-245 (−40-118.3)	DEG F (DEG C)	*CHWS
***Common Return Sensor**	−40-245 (−40-118.3)	DEG F (DEG C)	*CHWR

NOTE: Values preceded by an asterisk (*) can be forced (changed by an operator) from the LID screen or from another control device (such as a Carrier Comfort Network [CCN] terminal). Values preceded by 2 asterisks (**) can be forced (changed by an operator) *only* from the LID screen. Other devices, such as a CCN terminal, cannot change the value.

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 2 — PUMPSTAT SCREEN (STATUS TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight PUMPSTAT.
4. Press SELECT.

DESCRIPTION	RANGE/STATUS	UNITS	REFERENCE POINT NAME
Desolidification Mode	0/1	DSABLE/ENABLE	DESOLMD
Time Left	15-240	MIN	deso_tim
****Chilled Water Pump**	0/1	OFF/ON	**CHWP
Chilled Water Flow	0/1	NO/YES	CHWFLOW
****Cooling Water Pump**	0/1	OFF/ON	**COOLPMP
Cooling Water Flow	0/1	NO/YES	COOLFLOW
****Refrigerant Pump**	0/1	OFF/ON	**REFPUMP
Ref Pump Overld/HiTemp	0/1	ALARM/NORMAL	RFPMPFLT
****Solution and Spray Pumps**	0/1	OFF/ON	**SOLPUMP
Solution Pump 1 Pressure	−6.7-420 (−46.2-2896)	PSI (kPa)	SOLPRS1
Solution Pump 2 Pressure	−6.7-420 (−46.2-2896)	PSI (kPa)	SOLPRS2
Sol Pump 1 Overld/HiTemp	0/1	ALARM/NORMAL	SPMP1FLT
Sol Pump 2 Overld/HiTemp	0/1	ALARM/NORMAL	SPMP2FLT
Spray Pump Overld/HiTemp	0/1	ALARM/NORMAL	SPRAYFLT
Solution Pump Ontime	0-500,000	HOURS	SP_HRS
****Service Ontime**	0-32,767	HOURS	**S_HRS
Solution Pump Starts	0-65,535		SP_START
G1 Hi Level Starts-Last Hr	0-12		SP_HR
Cycle Guard Auto/Manual	0/1	MAN/AUTO	CGAUTO
Cycle Guard Valve	0/1	CLOSE/OPEN	CGDVLV
Cycle Guard Counts	0-65,535		CG_COUNT

NOTE: Values preceded by an asterisk (*) can be forced (changed by an operator) from the LID screen or from another control device (such as a Carrier Comfort Network [CCN] terminal). Values preceded by 2 asterisks (**) can be forced (changed by an operator) *only* from the LID screen. Other devices, such as a CCN terminal, cannot change the value.

EXAMPLE 3 − EVAPSTAT SCREEN (STATUS TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight EVAPSTAT.
4. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Entering Chilled Water	−40-245 (−40-245)	DEG F (DEG C)	CHW_IN
CHW_IN Pulldown Deg/Min	−10-10 (−5.6-5.6)	^ F (^ C)	CHW_INP
Leaving Chilled Water	−40-245 (−40-118.3)	DEG F (DEG C)	CHW_OUT
CHW_OUT Pulldown Deg/Min	−10-10 (−5.6-5.6)	^ F (^ C)	CHW_OUTP
Refrigerant Temp	−40-245 (−40-118.3)	DEG F (DEG C)	EVAP_REF
****Chilled Water Pump**	0/1	OFF/ON	**CHWP
Chilled Water Flow	0/1	NO/YES	CHWFLOW
****Refrigerant Pump**	0/1	OFF/ON	**REFPUMP
Ref Pump Overld/HiTemp	0/1	ALARM/NORMAL	RFPMPFLT
Cycle Guard Auto/Manual	0/1	MANUAL/AUTO	CGAUTO
****Cycle Guard Valve**	0/1	CLOSE/OPEN	**CGDVLV
Refrigerant Level Sensor	0-5	VOLTS	CONLEV_V
Concentration Level	40-70	%	CONLEV
Refrigerant Level:			
Low Level Switch	0/1	OPEN/CLOSE	REFLOW
Cycle Guard Level Switch	0/1	OPEN/CLOSE	REFCG
Dilution Level Switch	0/1	OPEN/CLOSE	REFDILEV
High Level Switch	0/1	OPEN/CLOSE	REFHIGH
Low Chilled Water Temp	0/1	ALARM/NORMAL	LOWCHWT

NOTE: Values preceded by 2 asterisks (**) can be forced (changed by an operator) *only* from the LID screen. Other devices, such as a CCN terminal, cannot change the value.

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 4 — ABSSTAT SCREEN (STATUS TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight ABSSTAT.
4. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Solution Pump 1 Pressure	−6.7-420 (−46.2-2896)	PSI (kPa)	SOLPRS1
Solution Pump 2 Pressure	−6.7-420 (−46.2-2896)	PSI (kPa)	SOLPRS2
Cooling Water Ent Absorb	−40-245 (−40-118.3)	DEG F (DEG C)	ABS_IN
CLW Pulldown Deg/Min	−10-10 (−5.6-5.6)	^ F (^ C)	CLWPULL
Cooling Water Lvg Absorb	−40-245 (−40-118.3)	DEG F (DEG C)	ABS_OUT
Recirc LiBr Ent Sprays	−40-245 (−40-118.3)	DEG F (DEG C)	RECRCLB
Weak LiBr Lvg Absorb	−40 to 245 (−40-118.3)	DEG F (DEG C)	ABS_SOL
Weak LiBr Lvg Low HX2	−40-245 (−40-118.3)	DEG F (DEG C)	WLBLLOHX
Weak LiBr Lvg High HX1	77-442 (25-228)	DEG F (DEG C)	WLBLHIHX
G2 LiBr Overflow Pipe	−40-245 (−40-118.3)	DEG F (DEG C)	G2OVFLOW
****Solution and Spray Pumps**	0/1	OFF/ON	**SOLPUMP
Sol Pump1 Overld/HiTemp	0/1	ALARM/NORMAL	SPMP1FLT
Sol Pump2 Overld/HiTemp	0/1	ALARM/NORMAL	SPMP2FLT
Spray Pump Overld/HiTemp	0/1	ALARM/NORMAL	SPRAYFLT

NOTE: Values preceded by 2 asterisks (**) can be forced (changed by an operator) *only* from the LID screen. Other devices, such as a CCN terminal, cannot change the value.

EXAMPLE 5 — CONDSTAT SCREEN (STATUS TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight CONDSTAT.
4. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Cooling Water Lvg Absorb	−40-245 (−40-118.3)	DEG F (DEG C)	ABS_OUT
Cooling Water Lvg Cond	−40-245 (−40-118.3)	DEG F (DEG C)	COND_OUT
Vapor Condensate Temp	−40-245 (−40-118.3)	DEG F (DEG C)	VAPORCD
****Cooling Water Pump**	0/1	OFF/ON	**COOLPMP
Cooling Water Flow	0/1	NO/YES	COOLFLOW
****Tower Fan Relay**	0/1	OFF/ON	**TOWERFAN

NOTES:
Values preceded by 2 asterisks (**) can be forced (changed by an operator) *only* from the LID screen. Other devices, such as a CCN terminal, cannot change the value.
All Reference Point Names on this screen and their associated values can be read by CCN and/or Building Supervisor (BS) software.

EXAMPLE 6 − GENSTAT SCREEN (STATUS TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight GENSTAT.
4. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
G1 Internal Pressure	0.0-20.5 (0.0-141.3)	PSI (kPa)	G1PRS
Strong LiBr Leaving G1	77-442 (25-228)	DEG F (DEG C)	G1_SOL
Weak LiBr Lvg LCD Box	77-442 (25-228)	DEG F (DEG C)	WLBLLCD
Strong LiBr Lvg High HX1	77-442 (25-228)	DEG F (DEG C)	SLBLHIHX
Strong LiBr Lvg G2	77-442 (25-228)	DEG F (DEG C)	SLBLG2
Strong LiBr Lvg Low HX2	−40-245 (−40-118.3)	DEG F (DEG C)	SLBLLOHX
Condensate Temp From G2	−40-245 (−40-118.3)	DEG F (DEG C)	G1_SAT
G1 High LiBr Level	0/1	OPEN/CLOSE	G1HILEV
****Actual Capacity Valve**	0-100	%	**CV_ACT
Generator Hi Temp/Press	0/1	ALARM/NORMAL	GENHITP

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 7 — SETPOINT DISPLAY SCREEN

To access this display from the LID default screen:

1. Press MENU.
2. Press SETPOINT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME	DEFAULT
Cooling Setpoint	41-65 (5-18.3)	DEG F (DEG C)	cool_sp	50.0 (10.00)

EXAMPLE 8 — CONFIG DISPLAY SCREEN (EQUIPMENT CONFIGURATION TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press STATUS.
3. Scroll down to highlight EQUIPMENT CONFIGURATION.
4. Press SELECT.
5. Scroll down to CONFIG.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME	DEFAULT
RESET TYPE 1				
Degrees Reset at 20 mA	−15-15 (−8.3-8.3)	DEG F (DEG C)	deg_20ma	10 (5.6)
RESET TYPE 2				
Remote Temp (No Reset)	−40-245 (−40-118.3)	DEG F (DEG C)	res_rt1	65 (18.3)
Remote Temp (Full Reset)	−40-245 (−40-118.3)	DEG F (DEG C)	res_rt2	85 (29.4)
Degrees Reset	−15-15 (−8.3-8.3)	DEG F (DEG C)	deg_rt	10 (5.6)
RESET TYPE 3				
CHW Delta T (No Reset)	0-15 (0-8.3)	^ F (^ C)	restd_1	10 (5.6)
CHW Delta T (Full Reset)	0-15 (0-8.3)	^ F (^ C)	restd_2	0 (0)
Degrees Reset	−15-15 (−8.3-8.3)	DEG F (DEG C)	deg_chw	5 (2.8)
Select/Enable Reset Type	0-3		res_sel	0
CHW_IN CONTROL OPTION	0/1	DSABLE/ENABLE	cwi_opt	DSABLE
Remote Contacts Option	0/1	DSABLE/ENABLE	r_contct	DSABLE
Temp Pulldown Deg/Min	2-10 (1.1-5.6)	DEG F DEG C)/MIN	tmp_ramp	3 (1.7)
CCN Occupancy Config:				
Schedule Number	2-99		occpcxxe	2
Broadcast Option	0/1	DSABLE/ENABLE	occbrcst	DSABLE

EXAMPLE 9 — SERVICE1 DISPLAY SCREEN (EQUIPMENT SERVICE TABLE)

To access this display from the LID default screen:1. Press MENU.

2. Press SERVICE.
3. Scroll down to highlight EQUIPMENT SERVICE.
4. Press SELECT.
5. Scroll down to highlight SERVICE1.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME	DEFAULT
Refrigerant Trippoint	37-42 (2.8-5.5)	DEG F (DEG C)	reftrip	38 (3.3)
Refrig Override Delta T	2-5 (1.1-2.8)	^ F (^ C)	refdelta	2 (1.1)
Water Flow Verify Time	0.5-5	MIN	wflow_t	0.5
Recycle Restart Delta T	2.0-10.0 (1.1-5.6)	^ F (^ C)	rcyc_dt	5 (2.8)
Weak LiBr Lvg Abs Alert	100-150 (37.8-65.6)	DEG F (DEG C)	wlblabal	110 (43.3)
G2 Condensate Override	199-204 (92.8-95.5)	DEG F (DEG C)	condg2ov	199 (92.8)
G1 Strong LiBr Override	311-320 (155-160)	DEG F (DEG C)	g1slbov	311 (155)
G2 Overflow Alarm	150-240 (65.6-115.6)	DEG F (DEG C)	g2ovalm	175 (79.4)
Desolidification Time	15-240	MIN	desoltim	60
Concentration Sensor Cal:				
Conc at Low Level	50-60	%	lowlev	55
Volts at Low Level	0.0-5.0	VOLTS	lowvolt	4.5
Conc at High Level	50-60	%	highlev	60
Volts at High Level	0.0-5.0	VOLTS	highvolt	3.0
Cycle Guard Level Adjust	0-15	VOLTS	cgmidlev	8.0
Select: 0=Low, 10=High				
Line Frequency	0/1		freq	0
Select: 0=60 Hz, 1=50 Hz				

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 10 — SERVICE2 DISPLAY SCREEN (EQUIPMENT SERVICE TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press SERVICE.
3. Scroll down to highlight EQUIPMENT SERVICE.
4. Press SELECT.
5. Scroll down to highlight SERVICE2.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME	DEFAULT
SENSOR ALERT ENABLE				
Disable = 0, Low = 1, High = 2				
Temp = Alert Threshold				
CHWS Temp Enable	0-2		chws_en	0
CHWS Temp Alert	−40, 245 (−40, 118.3)	DEG F (DEG C)	chws_al	245 (118.3)
CHWR Temp Enable	0-2		chwr_en	0
CHWR Temp Alert	−40, 245 (−40, 118.3)	DEG F (DEG C)	chwr_al	245 (118.3)
Reset Temp Enable	0-2		rres_en	0
Reset Temp Alert	−40, 245 (−40, 118.3)	DEG F (DEG C)	rres_al	245 (118.30

NOTE: CHWS Temp Alert, CHWR Temp Alert, and Reset Temp Alert are temperatures set by the operator based on local operating requirements.
For each sensor (CHWS, CHWR, Reset Temp), the operator must set the temperature that activates the alert (Temp = Alert Threshold). In addition, for each sensor, the operator must also choose to disable the alert (Disable = 0), set the alert to activate when the actual temperature is lower than or equal to the threshold temperature (Low = 1), or set the alert to activate when the actual temperature is higher than or equal to the threshold temperature (High = 2).
For example, if the operator wants the CHWS alert to activate when the CHWS temperature is at or below 60 F (15.5 C), the CHWS Temp Alert is set to 60 F (15.5 C), and the CHWS Temp Enable is set to 1.

EXAMPLE 11 — SERVICE3 DISPLAY SCREEN (EQUIPMENT SERVICE TABLE)

To access this display from the LID default screen:

1. Press MENU.
2. Press SERVICE.
3. Scroll down to highlight EQUIPMENT SERVICE.
4. Press SELECT.
5. Scroll down to highlight SERVICE3.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME	DEFAULT
Control Point Deadband	0.5-2.0 (0.3-1.1)	DEG F (DEG C)	cp_db	1.0 (0.56)
Proportional Inc Band	2-10		cv_inc	6.5
Proportional Dec Band	2-10		cv_dec	6.0
Proportional CHW_IN Gain	1-3		cv_cwi	2.0
G1 Solution Temp Bias	1-10		g1_bias	5.0
Valve Setup				
Warmup Travel Limit	15-80	%	warm_lim	65
Running Travel Limit	15-100	%	run_lim	100
Linear Valve Type	0/1	NO/YES	lin_cv	NO
Pneumatic Valve type	0/1	NO/YES	pn_cv	NO
Spray Pump Fault	0/1	DSABLE/ENABLE	spray_en	ENABLE
Solution Pump 2 Fault	0/1	DSABLE/ENABLE	solp2_en	ENABLE
Solution Pump:				
Ontime	0-500000	Hours	sol_time	0
Starts	0-65534		sol_strt	0

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 12 — COOLING SCREEN (CONTROL ALGORITHM STATUS TABLE)

The data displayed on this screen is read-only data; that is, it cannot be changed from this screen. The chiller operator or maintenance technician can view this data to determine what information is being used by the PIC to calculate the algorithms that control the chiller operations.

To access this display from the LID default screen:

1. Press MENU.
2. Press SERVICE.
3. Scroll down to highlight CONTROL ALGORITHM STATUS.
4. Press SELECT.
5. Scroll down to highlight COOLING.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
CAPACITY CONTROL			
Control Point	41-65 (5-18.3)	DEG F (DEG C)	ctrlpt
Leaving Chilled Water	−40-245 (−40-118.3)	DEG F (DEG C)	CHW_OUT
Entering Chilled Water	−40-245 (−40-118.3)	DEG F (DEG C)	CHW_IN
Control Point Error	−99-99 (72.8-37.2)	DEG F (DEG C)	cperr
CHW_IN Delta T	−99-99 (−55.0-55.5)	^F (^C)	cwidt
CHW_IN Reset	−99-99 (−72.8-37.2)	DEG F (DEG C)	cwires
CHW_OUT Reset	−99-99 (−72.8-37.2)	DEG F (DEG C)	cwores
Total Error + Resets	−99-99 (−72.8-37.2)	DEG F (DEG C)	error
Capacity Valve Delta	−2-2	%	cvd
Target Capacity Valve	0-100	%	CV_TRG
Actual Capacity Valve	0-100	%	CV_ACT
Proportional Inc Band	2-10		cv_inc
Proportional Dec Band	2-10		cv_dec
Proportional CHW_IN Gain	1-3		cv_cwi
Control Point Deadband	0.5-2 (0.3-1.1)	DEG F (DEG C)	cp_db

EXAMPLE 13 — CONTROL ALGORITHM STATUS (APPROACH) DISPLAY SCREEN

The data displayed on this screen is read-only data; that is, it cannot be changed from this screen. The chiller operator or maintenance technician can view this data to determine what information is being used by the PIC to calculate the algorithms that control the chiller operations. To access this display from the LID default screen:

1. Press MENU.
2. Press SERVICE.
3. Scroll down to highlight CONTROL ALGORITHM STATUS.
4. Press SELECT.
5. Scroll down to highlight APPROACH.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Chilled Water Delta T	0-50 (0-27.8)	^F (^C)	CHWDT
Absorber Water Delta T	0-50 (0-27.8)	^F (^C)	ABSWDT
Condenser Water Delta T	0-50 (0-27.8)	^F (^C)	CONDWDT
Absorber Approach	0-50 (0-27.8)	^F (^C)	ABSAPP
Absorber Loss	0-50 (0-27.8)	^F (^C)	ABSLOSS
Condenser Approach	0-50 (0-27.8)	^F (^C)	CONDAPP
Evaporator Approach	0-50 (0-27.8)	^F (^C)	EVAPAPP

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 14 — OVERRIDE SCREEN (CONTROL ALGORITHM STATUS TABLE)

The data displayed on this screen is read-only data; that is, it cannot be changed from this screen. The chiller operator or maintenance technician can view this data to determine what information is being used by the PIC to calculate the algorithms that control the chiller operations.
To access this display from the LID default screen:

1. Press [MENU].
2. Press [SERVICE].
3. Scroll down to highlight CONTROL ALGORITHM STATUS.
4. Press [SELECT].
5. Scroll down to highlight OVERRIDE.
6. Press [SELECT].

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
OVERRIDE/ALERT STATUS:			
Strong LiBr Leaving G1	77-442 (25-228)	DEG F (DEG C)	G1_SOL
G1 Strong LiBr Override	311-320 (155-160)	DEG F (DEG C)	g1slbov
Condensate Temp From G2	−40-245 (−40-118.3)	DEG F (DEG C)	G1_SAT
G2 Condensate Override	199-204 (92.8-95.5)	DEG F (DEG C)	condg2ov

NOTES:
1. None of the variables shown on this screen can be forced.
2. An asterisk (or exclamation point) in the far right field of the LID screen indicates that the value is in alarm (or alert) status.

Table 3 — 16JT LID Display Data (cont)

EXAMPLE 15 − CONCENTR SCREEN (CONTROL ALGORITHM STATUS TABLE)

The data displayed on this screen is read-only data; that is, it cannot be changed from this screen. The chiller operator or maintenance technician can view this data to determine what information is being used by the PIC to calculate the algorithms that control the chiller operations.

To access this display from the LID default screen:

1. Press MENU.
2. Press SERVICE.
3. Scroll down to highlight CONTROL ALGORITHM STATUS.
4. Press SELECT.
5. Scroll down to highlight CONCENTR.
6. Press SELECT.

DESCRIPTION	STATUS/RANGE	UNITS	REFERENCE POINT NAME
Point 2:			
Weak LiBr Leaving Absorb	−40-245 (−40-118.3)	DEG F (DEG C)	ABS_SOL
Saturation Temp 2	−40-245 (−40-118.3)	DEG F (DEG C)	TSAT_2
LiBr Concentration	50-70	%	CONC_2
Point 8:			
Strong LiBr Leaving G1	77-442 (25-228)	DEG F (DEG C)	G1_SOL
Condensate Temp From G2	−40-245 (−40-181.3)	DEG F (DEG C)	G1_SAT
LiBr Concentration	50-70	%	CONC_8
Point 9:			
Strong LiBr Lvg High HX1	77-442 (25-228)	DEG F (DEG C)	LBLHIHX
LiBr Conc (G1 Strong)	50-70	%	CONC_9
Crystallization Conc	50-70	%	CONC_9X
LiBr Temp at Crystal	0-245 (−17.8-118.3)	DEG F (DEG C)	TSOL_9S
Point 14:			
Mixed Strong Conc	50-70	%	CONC_14
Crystallization Conc	50-70	%	CONC_14X
LiBr Temp at Crystal	0-245 (−17.8-118.3)	DEG F (DEG C)	TSOL_13S
Point 3:			
Weak LiBr Lvg Low HX2	−40-245 (−40-118.3)	DEG F (DEG C)	WLBLLOHX
LiBr Concentration	50-70	%	CONC_3
Point 6:			
Weak LiBr Lvg High HX1	77-442 (25-228)	DEG F (DEG C)	WLBLHIHX
LiBr Concentration	50-70	%	CONC_6
Point 10:			
Strong LiBr Leaving G2	77-442 (25-228)	DEG F (DEG C)	SLBLG2
Vapor Condensate Temp	−40-420 (−40-118.3)	DEG F (DEG C)	VAPORCD
LiBr Concentration	50-70	%	CONC_10

NOTES:
1. None of the variables shown on this screen can be forced.
2. An asterisk (or exclamation point) in the far right field of the LID screen indicates that the value is in alarm (or alert) status.

Proportional Band — There are two response modes: one for the temperature response above the control point; the other for response below the control point.

The temperature response above the control point is called *PROPORTIONAL INC BAND*, and it can slow or quicken capacity valve response to chilled water temperature above *DEADBAND*. The *PROPORTIONAL INC BAND* can be adjusted from a setting of 2 to 10; the default setting is 6.5.

The response below the control point is called the *PROPORTIONAL DEC BAND*, and it can slow or quicken capacity valve response to chilled water temperature below the control point plus deadband. The *PROPORTIONAL DEC BAND* can be adjusted on the LID from a setting of 2 to 10; the default setting is 6.0.

NOTE: Increasing either the *PROPORTIONAL INC BAND* or the *PROPORTIONAL DEC BAND* will cause the capacity valve to respond more slowly than it would at a lower setting.

PROPORTIONAL ECW GAIN — This parameter can be adjusted at the LID for values of 1, 2, or 3; the default setting is 2. Increase this setting to increase capacity valve response to a change in entering cooling water temperature.

CHILLER TIMERS — The PIC maintains 2 runtime clocks, known as *SOLUTION PUMP ONTIME* and *SERVICE ONTIME*. *SOLUTION PUMP ONTIME* indicates the total lifetime solution pump run hours. This timer can register up to 500,000 hours before the clock turns back to zero. The *SERVICE ONTIME* is a resettable timer that can be used to indicate the hours since the last service visit or any other designated reason. The time can be changed from the LID to whatever value is desired. This timer can register up to 32,767 hours before it rolls over to zero.

OCCUPANCY SCHEDULE — The chiller schedule, described in the Time Schedule Operation section (page 21), determines when the chiller can run. Each schedule consists of from 1 to 8 occupied/unoccupied time periods, set by the operator. These time periods can be enabled (or not enabled) on each day of the week and for holidays. The day begins with 0000 hours and ends with 2400 hours. The chiller is in an occupied state unless an unoccupied time period is in effect.

NOTE: To determine whether or not the chiller is in an occupied state and can be started, access the MAINSTAT screen and scroll to *OCCUPIED ?*. If the value in the right column is YES, the chiller is in an occupied state and can be started.

Figure 19 shows a typical office building time schedule with a 3-hour, off-peak cool down period from midnight to 3 a.m., following a weekend shutdown. For example, holiday periods are set to be unoccupied for 24 hours per day. The building operates Monday through Friday, 7:00 a.m. to 6:00 p.m., with a Saturday schedule of 6:00 a.m. to 1:00 p.m. and includes the Monday midnight to 3:00 a.m. weekend cooldown schedule.

NOTE: This example is used only as an illustration and is not intended as a recommendation for chiller operation.

The SCHEDULE function works in conjunction with the CCN OCCUPANCY CONFIG and *SCHEDULE NUMBER* configured by the operator on the CONFIG screen. See Example 8 of Table 3. The CCN schedule number can be changed to any value from 02 to 99. If this number is changed from the CONFIG screen, the operator must use the ATTACH TO NETWORK DEVICE table to upload the new number into the SCHEDULE screen.

The LOCAL schedule number (effective when the chiller is in the LOCAL mode) is 01 (PCOCC01S on the SCHEDULE screen). The CCN schedule number, effective when the chiller is in the CCN mode, can be any number from 02 to 99 (PCOCC02S-99S on the SCHEDULE screen).

The schedule can be bypassed by setting (‘‘forcing’’) *CHILLER START/STOP* to START on the MAINSTAT screen. For more information on forced starts, see Local Start-Up, page 68. The schedule can also be overridden to keep the chiller in an occupied state for up to 4 hours, on a one-time basis.

PIC Control Tests — These instructions involve using the LID menu. See the LID Operation and Menus section, page 15 for information on using the LID.

The PIC has built-in control tests. Starting from the LID default screen menu, press the [MENU] and [SERVICE] softkeys. Use the [NEXT] softkey to highlight CONTROL TEST and press the [SELECT] softkey to access the CONTROL TEST menu. Choose the test you want to run by pressing the [NEXT], [PREVIOUS], [SELECT], or [EXIT] softkeys. The CONTROL TEST menu has the following options.

- Automated Test
- PC6400 Inputs
- PC6400 Outputs
- Slave PSIO Inputs
- Slave PSIO Outputs
- First 8-Input Inputs
- Second 8-Input Inputs
- Third 8-Input Inputs
- Capacity Valve Actuator

Use the [NEXT] and [PREVIOUS] softkeys to scroll through the menu.

Use the [SELECT] softkey to activate the test.

Use the [EXIT] softkey to end either a manual or the automated test and to exit the CONTROL TEST menu screen when the CONTROL TEST menu is displayed.

AUTOMATED TEST — Before running this test, be sure the manual steam shutoff valve is closed and the pump fuses are pulled, if the machine is not charged, or if you do not want the pumps to run. When this test is selected, the PIC starts with the PC6400 Inputs test and procedes through the Third 8-Input test. There is no automated test for the Second 8-Input. As each test is executed, the LID display shows which one is running as well as other pertinent data. At the end of each test, the user is asked whether to continue the test. Appropriate responses are presented below, where each test is described in more detail.

When the entire automated test is complete, the LID display reads, AUTOMATED TEST COMPLETE.

The tests described below can be run both as part of the automated test sequence (automated mode) or manually (manual mode). To run them manually, use the selection procedure and softkeys described above. At the end of each test, press the [EXIT] softkey to return to the CONTROL TEST menu. to the CONTROL TEST menu.

PC6400 INPUTS TEST

Manual Mode — When the PC6400 Inputs Test is selected from the CONTROL TEST menu, the following 8 inputs are displayed on the LID.

- Cycle-Guard Auto/Manual
- Weak LiBr Lvg (leaving) LCD (Level Control Device) Box (100K ohm)
- Strong LiBr Leaving G1 (high-stage generator) (100K ohm)
- Weak LiBr Lvg High HX1 (high-temperature heat exchanger) (100K ohm)
- Strong LiBr Leaving G2 (low-stage generator) (100K ohm)
- G2 LiBr Overflow Pipe (5K ohm)
- Strong LiBr Lvg High HX1 (100K ohm)
- LID Off Switch

Each input is followed by an appropriate value. For example, Weak LiBr Lvg LCD Box is followed by a temperature. Any reading out of the valid range of −40 F to 245 F (−4 C to 118 C) for 5K ohm thermistors or 77 to 442 F (25 to 228 C) for 100K ohm thermistors will display the minimum or maximum temperature followed by an asterisk. If this occurs, see the Troubleshooting Guide, page 92. If a communication failure occurs, a C displays after the input name. To exit the manual test, press the EXIT softkey at the end of any display.

Automated Mode — While in automated mode, the LID displays the following message, PC6400 THERMISTOR TEST IN PROGRESS. If any thermistor fails, the name of the thermistor, along with the phrase, OUT OF RANGE, will display on the LID.

When the test ends, the LID prompts, OK TO CONTINUE? Pressing the YES softkey lets the automated test continue. Pressing the EXIT softkey terminates the automated test, and the LID displays the CONTROL TEST menu.

PC6400 OUTPUTS TEST — This test activates 7 outputs, not including the capacity valve actuator.

Manual Mode — The LID first prompts with the message, PC6400 OUTPUTS TEST IN PROGRESS. As the outputs are activated, the following LID displays appear as listed below. To end the manual test, press the EXIT softkey after any of the output checks.

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Chilled Water Pump — ON
Chilled Water Flow — YES
NEXT                                    EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Cooling Water Pump — ON
Cooling Water Flow — YES
NEXT             PREVIOUS               EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Solution and Spray Pumps — ON
Solution Pump 1 Pressure — 32.0 psia (220.6 kPa)
Solution Pump 2 Pressure — 35.6 psia (245.5 kPa)
NEXT             PREVIOUS               EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Refrigerant Pump — ON
NEXT             PREVIOUS               EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Tower Fan Relay — ON
NEXT             PREVIOUS               EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
Alarm Relay — ON
NEXT             PREVIOUS               EXIT
```

```
ABS16JT — CONTROL TEST
PC6400 OUTPUT TEST IN PROGRESS
LID Alarm Light — ON
NEXT             PREVIOUS               EXIT
```

Automated Mode — At the end of the automated test, the LID prompts, OK TO CONTINUE? Pressing the YES softkey lets the automated test continue. Pressing the EXIT softkey terminates the automated test, and the LID displays the CONTROL TEST menu.

SLAVE PSIO INPUTS TEST

Manual Mode — This test displays 12 inputs. They are:

- Transducer Voltage Ref (reference)
- G1 Internal Pressure
- Solution Pump 1 Pressure
- Solution Pump 2 Pressure
- Refrigerant Level Sensor
- Refrigerant Temp
- Entering Chilled Water
- Leaving Chilled Water
- Weak LiBr Leaving Absorb
- Weak LiBr Lvg Low HX2 (low-temperature heat exchanger)
- Cooling Water Ent Absorb (entering absorber)
- Cooling Water Lvg Absorb (leaving absorber)

Each input is followed by an appropriate value. For example, G1 Internal Pressure is followed by a pressure reading. Any transducer or thermistor reading out of the valid range will display the maximum or minimum limit of that transducer or thermistor, followed by an asterisk. If this occurs, refer to the Troubleshooting Guide, page 92. If a communication failure occurs, a C displays after the input name. Note that the G1 internal pressure is out of range whenever the chiller is not on.

Automated Mode — During the transducer part of the test, the LID displays the following message, PSIO TRANSDUCER TEST IN PROGRESS. If all transducers test OK, the LID displays, ALL TRANSDUCERS OK. If any transducer fails, the name of the transducer, along with the message, OUT OF RANGE is displayed on the LID.

When the test ends, the LID prompts, OK TO CONTINUE? Selecting EXIT terminates the automated test, and the LID displays the CONTROL TEST menu. Presssing the YES softkey lets the automated test continue on to the thermistor part of the Slave PSIO inputs test.

During the thermistor part of this test, the LID displays the following message, PSIO THERMISTOR TEST IN PROGRESS. If all thermistors test OK, the LID displays, ALL THERMISTORS OK. If any thermistor fails, the name of the thermistor, along with the phrase, OUT OF RANGE, displays on the LID.

When the test ends, the LID prompts, OK TO CONTINUE? Pressing YES lets the automated test continue. Pressing EXIT terminates the test, and the LID displays the CONTROL TEST menu.

SLAVE PSIO OUTPUTS TEST — This test activates 2 outputs: one for the Cycle Guard™ valve and the other for the chiller run relay.

Manual Mode — During the Slave PSIO outputs test, the LID displays the following messages:

```
ABS16JT — CONTROL TEST
PSIO OUTPUTS TEST IN PROGRESS
Cycle Guard Valve — OPEN
NEXT                                    EXIT
```

```
ABS16JT — CONTROL TEST
PSIO OUTPUTS TEST IN PROGRESS
Chiller Run Relay — ON
PREVIOUS                                EXIT
```

Automated Mode — When in automated mode, the Slave PSIO outputs test displays the same 2 outputs as in manual mode. When the automated test is finished, the LID prompts, OK TO CONTINUE? Pressing YES lets the automated test continue. Pressing EXIT terminates the automated test, and the LID displays the CONTROL TEST menu.

FIRST 8-INPUT MODULE INPUTS TEST

Manual Mode — The LID displays the following 8 inputs:

- Vapor Condensate Temp (temperature)
- Condensate Temp From G2
- Cooling Water Lvg Cond.
- Strong LiBr Lvg Low HX2
- Remote Contacts
- Recirc LiBr Ent (entering) Sprays
- Generator Hi Temp/Press (high temperature/pressure)
- Low Chiller Water Temp

Each input is followed by an appropriate value. For example, Vapor Condensate Temp is followed by a temperature. Any thermistor reading out of the valid range of −40 F to 245 F (−40 C to 118 C) for the 5K ohm thermistors will display the minimum or maximum temperature followed by an asterisk. If a communication failure occurs, a C displays after the input name.

Automated Mode — While in automated mode, the LID displays, FIRST 8-INPUT MODULE THERMISTOR TEST IN PROGRESS. If all thermistors test OK, the LID displays, ALL THERMISTORS OK. If any thermistor fails, the name of the thermistor with the phrase, OUT OF RANGE, displays on the LID screen.

When the automated test ends, the LID prompts, OK TO CONTINUE? Pressing YES lets the automated test continue. Pressing EXIT terminates the automated test, and the LID displays the CONTROL TEST menu.

SECOND 8-INPUT MODULE INPUTS TEST

Manual Mode — When the second 8-input module inputs test is selected from the CONTROL TEST menu, the LID displays the following 8 inputs:

- Chilled Water Flow
- Cooling Water Flow
- G1 High LiBr Level
- Spare Prot (protective) Limit Input
- Ref (refrigerant) Pump Overld/HiTemp (overload/high temperature)
- Sol (solution) Pump1 Overld/HiTemp
- Sol Pump2 Overld/HiTemp
- Spray Pump Overld/HiTemp

Each input is followed by an appropriate value. For example, Chilled Water Flow can be followed by NO or YES. If a communication failure occurs, a C displays after that sensor.

Automated Mode — There is no automated test for the second 8-input module inputs test.

THIRD 8-INPUT MODULE INPUTS TEST

Manual Mode — When the third 8-input module inputs test is selected from the CONTROL TEST menu, the LID displays the following 8 inputs:

- Temp Reset
- Remote Reset Sensor
- Common Supply Sensor
- Common Return Sensor
- Dilution Level Switch
- Low Level Switch
- High Level Switch

Each input is followed by an appropriate value. For example, Remote Reset Sensor is followed by a temperature. Any thermistor that reads out of the valid range of −40 F to 245 F (−40 C to 118 C) displays the minimum or maximum temperature followed by an asterisk. If a communication failure occurs, a C is displayed after that sensor.

Automated Mode — While in automated mode, the LID displays, THIRD 8-INPUT MODULE THERMISTOR TEST IN PROGRESS. If all thermistors test OK, the LID displays, ALL THERMISTORS OK. If any thermistor fails, the name of the thermistor displays with the phrase, OUT OF RANGE.

When the automated test ends, the LID prompts, OK TO CONTINUE? Pressing YES lets the automated test continue. Pressing EXIT terminates the automated test, and the LID displays the CONTROL TEST menu.

CAPACITY VALVE ACTUATOR TEST

Manual Mode — Close the manual steam valve for this test. When the capacity valve actuator test is selected from the CONTROL TEST menu, the LID displays the following:

```
ABS16JT — CONTROL TEST
CAPACITY VALVE TEST IN PROGRESS
Capacity Valve Position
HOLDING: XX.X%
INCREASE      DECREASE      HOLD      EXIT
```

Pressing the INCREASE softkey causes the valve to ramp open, pressing the DECREASE softkey causes the valve to ramp closed, and pressing the HOLD softkey causes the valve to stop moving. The *ACTUAL CAPACITY VALVE* will increase to the capacity valve *RUNNING TRAVEL LIMIT* until the DECREASE or EXIT softkey is pressed. If the EXIT softkey is pressed, the test returns to the CONTROL TEST menu.

Automated Mode — There is no automatic test for the capacity valve actuator.

Ramp Loading Control — The ramp loading control slows down the rate at which the chiller loads up. This control can prevent the chiller from loading up during the short period of time when the chilled water loop has to be brought down to normal design conditions and helps reduce steam demand by slowly bringing the chiller water to the control point. However, the total steam draw during this period remains almost unchanged.

Ramp loading is based on chilled water temperature. During the ramp loading mode, the *LEAVING CHILLED WATER* or *ENTERING CHILLED WATER* temperature change is limited to the *TEMP PULLDOWN DEG/MIN*. This is the rate that the controlled temperature is changed to reach the set point. The default rate is 3 F (1.7 C) degrees per minute. The control valve is allowed full travel to obtain this goal unless an inhibit or close signal is received by the PIC based on another algorithm.

To set or change the temperature pulldown rate, press the MENU and SERVICE softkeys. Enter your 4-digit password. Access the EQUIPMENT CONFIGURATION screen. Press the SELECT softkey to view the CONFIG table. From there, scroll to *TEMP PULLDOWN DEG/MIN* and press the SELECT softkey. Using the INCREASE and DECREASE softkeys, adjust the setting to the desired value. To store the value, press the ENTER softkey. To exit this screen and keep the last value, press the QUIT softkey.

For more information on ramp loading, see the Ramp Loading Mode section on page 71.

Solution Concentration Control — Capacity Overrides can prevent premature safety shutdowns caused by solution crystallization which, in turn, can happen when the PIC determines that the solution is too concentrated or when temperatures or pressures have exceeded safe limits of operation. The capacity override function allows the operator to set one or more of the override values that determine where the capacity valve control occurs. The 3 possible stages of capacity valve control are:

FIRST STAGE — The PIC inhibits the capacity control valve from opening further. The status line on the LID displays a reason for the override.

SECOND STAGE — The PIC closes the capacity control valve until the condition decreases below the override termination temperature or concentration. The override termination temperature or concentration is the point at which the override function is no longer in control and the chiller returns to normal run mode.

THIRD STAGE — When the solution temperature or concentration is too high, the capacity valve is closed and the PIC switches to a STOP mode.

CAPACITY OVERRIDES (Table 4) — The operator can configure 3 capacity valve overrides from the LID:

- Refrigerant Low Temperature Override (*REFRIGERANT TRIPPOINT* and *REFRIGERANT OVERRIDE DELTA T*)
- G1 High Saturation Temperature Override (*G2 CONDENSATE OVERRIDE*)
- G1 High Solution Temperature Override (*G1 STRONG LiBr OVERRIDE)*

The parameters in parentheses are accessed from the SERVICE1 screen. See Table 3, Example 9.

Refrigerant Low Temperature Override — The refrigerant low temperature override algorithm inhibits the capacity valve from opening or closes the capacity valve to prevent freezing. The operator can establish the setpoints at which this occurs by changing the values for the *REFRIGERANT TRIPPOINT* and *REFRIGERANT OVERRIDE DELTA T*. The PIC monitors the *REFRIGERANT TEMP* and compares it to the *REFRIGERANT TRIPPOINT* plus the *REFRIGERANT OVERRIDE DELTA T*. The two override stages are:

1. First stage — occurs if the *REFRIGERANT TEMP* is below the *REFRIGERANT TRIPPOINT* plus the *REFRIGERANT OVERRIDE DELTA T.* The capacity valve is inhibited from opening.
2. Second stage — occurs when the *REFRIGERANT TEMP* is less than the *REFRIGERANT TRIPPOINT* plus the *REFRIGERANT OVERRIDE DELTA T* minus 1 F (0.56 C). The capacity valve closes.

This capacity override ends (or returns to normal control) when the temperature increases to 2 F (1.1 C) above the trippoint plus override set point. When the capacity valve is inhibited or closing, the LID displays, RUN CAPACITY LIMITED, LOW REFRIGERANT TEMP.

G1 High Saturation Temperature Override — When the chiller is in a RUN mode and the *CONDENSATE TEMP FROM G2* increases above the override threshold, the capacity valve is inhibited or closed to prevent an increase in the heat input to the generator. The two override stages are established when the operator changes the setpoint for *G2 CONDENSATE OVERRIDE*.

1. First stage — occurs if the *G2 CONDENSATE OVERRIDE* is exceeded. The capacity valve is inhibited from opening.

Table 4 — Capacity Overrides

CAPACITY OVERRIDE	LID TABLE ACCESS	CONFIGURABLE SETPOINT	SETPOINT DEFAULT	SETPOINT RANGE	FIRST STAGE TRIPPOINT (Inhibit Capacity Valve)	SECOND STAGE TRIPPOINT (Close Capacity Valve)	THIRD STAGE TRIPPOINT (Non-Recyclable Shutdown)	OVERRIDE TERMINATION (Return to Normal Operation)
Refrigerant Low Temperature Override	Equipment SERVICE1	Refrigerant Trippoint	38 F (3.3 C)	37 - 42 F (2.8 - 55 C)	<Trippoint +Override Delta T	<Trippoint + Override Delta T − 1 F(0.56 C)	N/A	>Tripppoint + Override Delta T + 2 F(1.1 C)
		Refrigerant Override Delta T	2 F (1.1 C)	2 - 5 F (1.1 - 2.8 C)				
G1 High Saturation Temperature Override	Equipment SERVICE1	G2 Condensate Override	199 F (93 C)	199 - 204 F (93 - 96 C)	>G2 Condensate Override	>G2 Condensate Override + 1 F (0.56 C)	N/A	<G2 Condensate Override − 2 F(1.1 C)
G1 High Solution Temperature Override	Equipment SERVICE1	G1 Strong LiBr Override	311 F (155 C)	311 - 320 F (155 - 160 C)	>G1 Strong LiBr Override	>G1 Strong LiBr Override + 4 F(2.2 C)	>G1 Strong LiBr Override + 27 F(15 C)	<G1 Strong LiBr Override − 2 F(1.1 C)
Manual Capacity	MAINSTAT	Target Capacity Valve	N/A	0-100%	N/A	N/A	N/A	Release
High Concentration	Not Configurable by Operator	N/A	N/A	N/A	Concentration: 9X: 1.5% or 14X: 1.5%	Concentration: 9X: 1.0% or 14X: 1.0%	Concentration: 9X: 0.5% or 14X: 0.5%	Concentration: 9X: 2.0% or 14X: 2.0%

2. Second stage — occurs if the *G2 CONDENSATE OVERRIDE* is exceeded by 1° F (0.56 C). The capacity valve is closed.

This capacity override ends when the *CONDENSATE TEMP FROM G2* is 2 F (1.1 C) below the *G2 CONDENSATE OVERRIDE*.

G1 High Solution Temperature Override — When the chiller is in the RUN mode and the *STRONG LiBr LEAVING G1* increases above the override threshold, the capacity valve is inhibited from opening or forced to close or the chiller is forced to the STOP mode to prevent an increase in the heat input to the generator. The override set points are established when the operator changes the value for *G1 STRONG LiBr OVERRIDE*. There are three override stages.

1. First stage — occurs when the *STRONG LiBr LEAVING G1* is greater than the *G1 STRONG LiBr OVERRIDE* but less than the override plus 4 F (2.2 C). This level prohibits the capacity valve from opening.
2. Second stage — occurs at the temperature between the *G1 STRONG LiBr OVERRIDE* plus 4 F (2.2 C) and *G1 STRONG LiBr OVERRIDE* plus 18 F (10 C). This level causes an ALERT condition and closes the capacity valve.
3. The third stage occurs when the temperature is greater than the override plus 27 F (15 C). This level causes an ALARM condition, and the chiller controller initiates a non-recycle shutdown with dilution cycle. The capacity valve is closed, the chiller is in a ''high strong solution temperature'' fault condition, and the LID display reads, PROTECTIVE LIMIT, STRONG LiBr LEAVING G1.

   The condition will return to normal when the *STRONG LiBr LEAVING G1* is 2 F (1.1 C) below the *G1 STRONG LiBr OVERRIDE*. Press the [RESET] softkey to restart the chiller.

MANUAL CAPACITY VALVE CONTROL — When the chiller is under manual capacity valve control, the operator has full control of the capacity control valve and should continuously monitor the chiller temperatures and concentrations. Based on these observations, the operator should take the following actions:

NOTE: The refrigerant pump must be on.

- Open the Cycle-Guard™ valve if the *STRONG LVG LOW HX2* is less than 118 F (48 C) and the *REFRIGERANT LEVEL SENSOR* voltage is below the *CYCLE-GUARD LEVEL ADJUST* + 0.5 volts.
- Open the Cycle-Guard valve if the *STRONG LIBR LVG LOW HX2* is greater than 118 F (48 C) and the refrigerant level is below the high level switch.

The capacity control valve closes when any overrides require it to. It will open only to the value entered.

PIC CONCENTRATION CONTROLS (Solution High Concentration) — The PIC calculates and measures the concentration at Points 9 and 14 of the chiller solution cycle. It also calculates Points 9X and 14X, which are on the crystallization line. There are three thresholds between Points 9 and 9X and another three thresholds between Points 14 and 14X. The thresholds are referred to as the:

- Inhibit threshold — When the LiBr solution concentration exceeds the inhibit threshold, the capacity valve is prohibited from opening. The solution concentration is 1.5% weaker than at Point 14X.
- Close threshold — When the LiBr solution concentration exceeds the close threshold, the Capacity Valve is closed. The solution concentration is 1.0% weaker than at Points 9X or 14X.
- Safety shutdown — If the LiBr solution concentration exceeds the safety shutdown, then a non-recycle shutdown with dilution cycle is initiated. The solution concentration is 0.5% weaker than at Points 9X and 14X.

Points 9, 9X, 14, and 14X can be calculated by the operator with the help of Fig. 7 (Equilibrium Diagram for Plotting 16JT Solution Cycle). Also, Points 9, 9X, 14, and 14X can be read from the CONCENTR screen on the LID as follows. Press the [MENU] and [SERVICE] softkeys. Scroll down to highlight CONTROL ALGORITHM STATUS. Press the [SELECT] softkey. Scroll down to highlight CONCENTR. Press the [SELECT] softkey.

Scroll to the lists under POINT 9 and POINT 14. The variable names for the points are as follows:

- Point 9 — *LiBr CONC (G1 STRONG), LiBr TEMP AT CRYSTAL*
- Point 9X — *CRYSTALLIZATION CONC*
- Point 14 — *MIXED STRONG CONC, LiBr TEMP AT CRYSTAL*
- Point 14X — *CRYSTALLIZATION CONC*

Each override stage is released when the calculated concentration is 0.5% less than the corresponding threshold value.

Remote Start/Stop Controls — A remote device that uses a set of contacts, such as a timeclock, may be used to start and stop the chiller. However, the chiller should not be programmed, via a remote device or locally from the LID, to start and stop in excess of 2 or 3 times every 12 hours.

The contacts for the remote start are wired into the control panel at terminal strip TB1, terminals 508 and 509. See the certified drawings for further details on contact ratings. The contacts must be dry (no power).

⚠ WARNING

Disconnect all primary power when wiring electrical connections. Lock and tag all disconnect switches.

Tower Fan Relay — The chiller must be in the RUNNING mode before the *TOWER FAN RELAY* algorithm is enabled. The following conditions must also be true:

- The *COOLING WATER PUMP* is energized, *COOLING WATER FLOW* is confirmed, and the *WEAK LiBr LEAVING ABSORB* is greater than 86 F (30 C).
- The *TOWER FAN RELAY* will be deenergized if any of the following conditions occurs: the chiller is not in a run state, the *COOLING WATER PUMP* is deenergized, the *COOLING WATER FLOW* indication is lost, or *WEAK LiBr LEAVING ABSORB* is less than 77 F (25 C).

⚠ CAUTION

The tower fan relay control is not a substitute for a jobsite condenser water temperature control. When used with a water temperature control system, the tower fan relay control can be used to help prevent low cooling water temperatures.

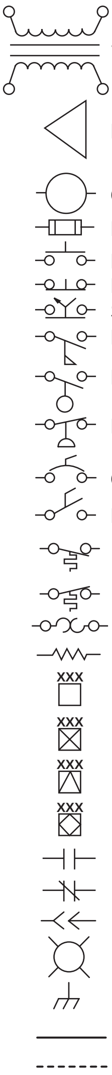
Control Wiring — See Fig. 21-34 for typical wiring schematics and component identification.

NOTE: These schematics do not show all the options or variations that are available.

LEGEND AND NOTES FOR FIG. 21-34

LEGEND

51RP — Refrigerant Pump Overload
51SP1 — Solution Pump No. 1 Overload
51SP2 — Solution Pump No. 2 Overload
51SSP — Solution Spray Pump Overload
51VP — Vacuum Pump Overload
8-IN — 8-Input
88RP — Refrigerant Pump Contactor
88SP-1 — Solution Pump No. 1 Contactor
88SP-2 — Solution Pump No. 2 Contactor
88SSP — Solution Spray Pump Contactor
88VP — Vacuum Pump Contactor
CB — Circuit Breaker
CCN — Carrier Comfort Network
COM — Communication
COMM — Communications
CR1 — Chilled Water Pump Relay
CR2 — Cooling Water Pump Relay
CR3 — Solution Pump No. 1 Relay, Solution Pump No. 2 Relay and Solution Spray Pump Relay (see Notes 1 and 2.)
CR4 — Refrigerant Pump Relay
CR5 — Alarm Relay
CR6 — Cycle-Guard™ Relay
CR7 — Tower Fan Relay
DEC — Decimal
FB-1 — Solution Pump No. 1 Fuse Block
FB-2 — Solution Pump No. 2 Fuse Block
FB-3 — Refrigerant Pump Fuse Block
FB-4 — Solution Spray Pump Fuse block
FB-5 — Vacuum Pump Fuse Block
FB-6 — 115V Power Fuse Block
FDC — Fused Disconnect
G — Ground
G1 — High-Stage Generator
G2 — Low-Stage Generator
Hx1 — High-Temperature Heat Exchanger
Hx2 — Low-Temperature Heat Exchanger
J — Connector
K — Relay
L — Line Terminal
LCD — Level Control Device
LiBr — Lithium Bromide
LID — Local Interface Device
M — Motor
mA — Milliampere
NC — Normally Closed
NO — Normally Open
PB — Pushbutton
PC6400 — Master Comfort Controller
PL — Indicator Light
PSIO — Processor/Sensor Input/Output
PWR — Power
R — Identifies One Phase of a 3-Phase Circuit
RB1, RB2 — 6-Pack Relay Board
RO — Return 115 VAC, Single-Phase, 60 Hz Power
RP — Refrigerant Pump
S — A Switch or One Phase of a 3-Phase Circuit
SO — Supply 115 VAC, Single-Phase, 60 Hz Power
SP — Solution Pump
SS1 — Cycle-Guard Auto/Manual Switch
SW — A Switch or One Phase of a 3-Phase Circuit
T — Terminal
t* — Thermistor
TB — Terminal Block
TR1, TR2, TR3 — 115 VAC to 21 VAC Transformer
TR4 — 21 VAC to 5 VDC Transformer
TR5 — 115 VAC to 24 VAC PC6400 Power Transformer
TR7 — 575/480/230 to 115 VAC Primary Transformer
U — Identifies One Phase of a 3-Phase Circuit
V — Identifies One Phase of a 3-Phase Circuit
VP — Vacuum Pump
W — Identifies One Phase of a 3-Phase Circuit



Transformer
Pressure Transducer
Coil **CR** — Control Relay, **M** — Motor Starter
Fuse
Push Button — Normally Open
Push Button — Normally Closed
Selector Switch
Flow Switch — Normally Open
Level Switch — Normally Open
Pressure Switch — Normally Closed
Circuit Breaker
Disconnect Switch
Temperature Switch — Normally Open Held Closed
Temperature Switch — Normally Closed
Overloads
Resistor/Thermistor
Terminal Block No. 1
Terminal Block No. 2
Terminal Block No. 3
Terminal Block No. 4
Contact — Normally Open
Contact — Normally Closed
Connectors
Indicator Light
Ground
Factory Wiring
Field Wiring

NOTES:
1. Solution spray pump used on models 16JT135, 16JT150, 16JT135L, and 16JT150L.
2. Second solution pump used on 16JT873 and larger.
3. Channel No. 1 is the pressure transducer reference voltage.
4. TB4 and LID are door mounted.
5. Float is normally open. Refrigerant level closes contact for normal run mode.
6. Optional repeater module is field installed and wired.
7. All fuse blocks require 3 fuses except FB6, which requires 1 fuse.
8. Three heater elements are required for each heater block (overload).
9. All fuses are rated for 600 VAC.
10. The coils for the chilled water and condensing water pump starters (or other auxiliary equipment) are wired into the machine control circuit so that the auxiliary equipment operates whenever the machine operates. The starter contacts and starter overloads remain in the external pump circuits. The flow interlocks for each pump are also wired into the machine control circuit and must be closed in order for the machine to operate.

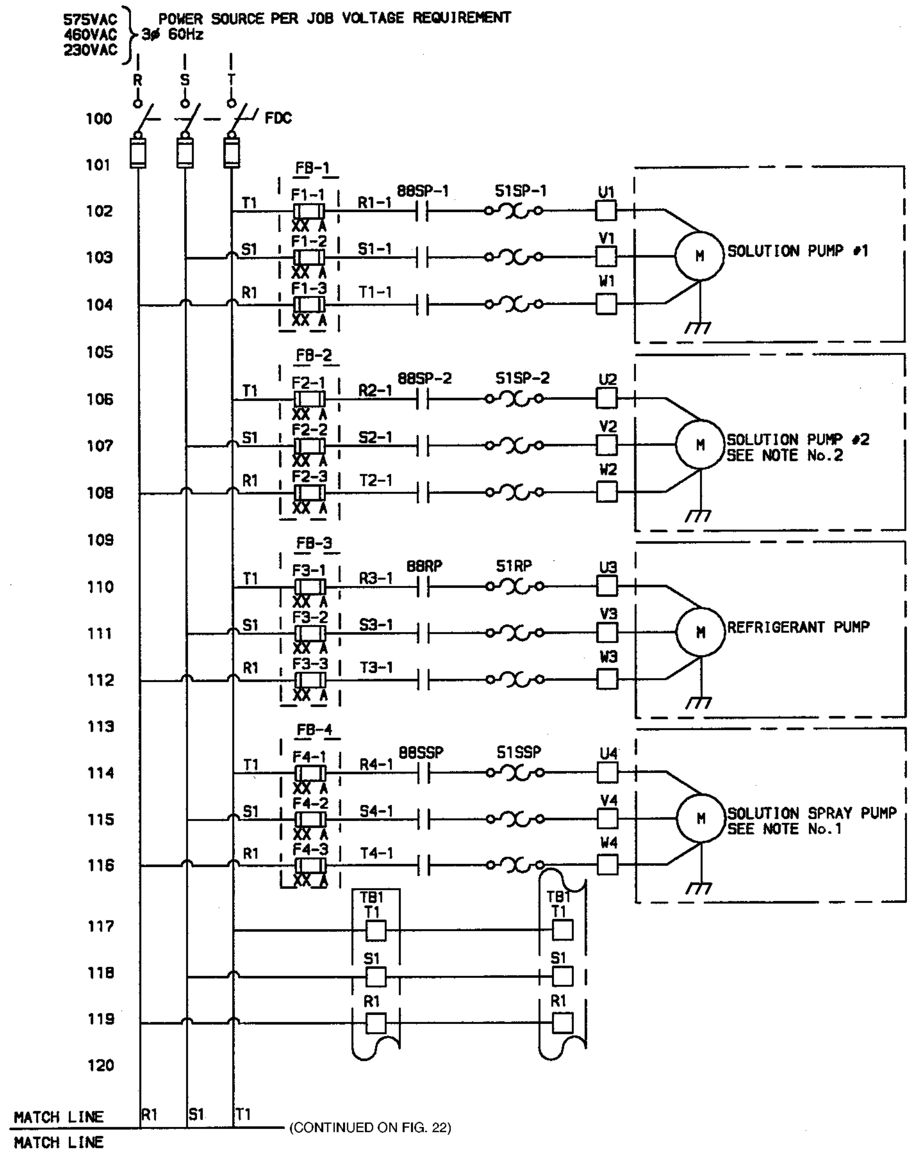


Fig. 21 — 16JT PIC Absorption Chiller Electrical Schematic (High Voltage)

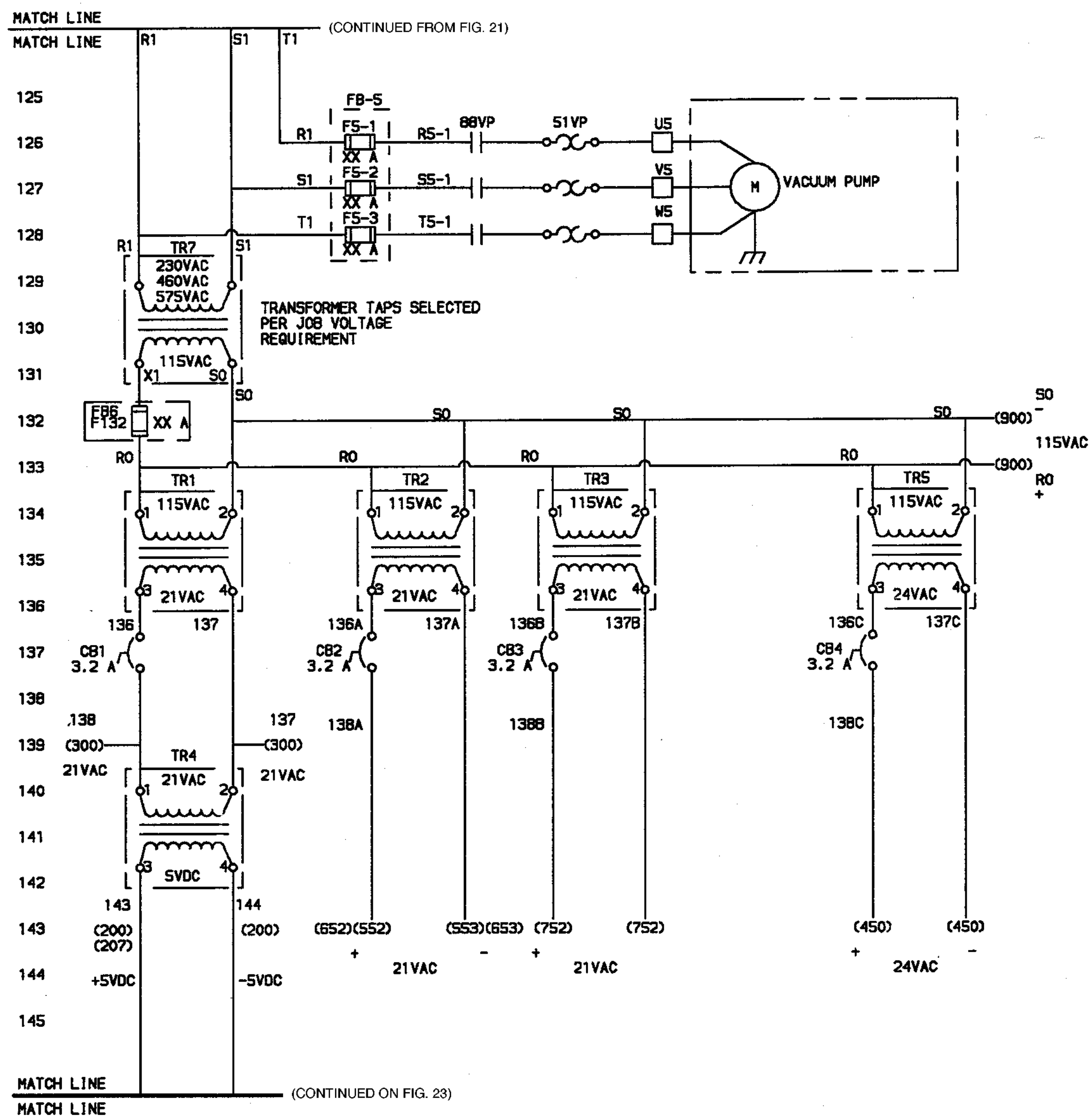


Fig. 22 — 16JT PIC Absorption Chiller Electrical Schematic (Low Voltage)

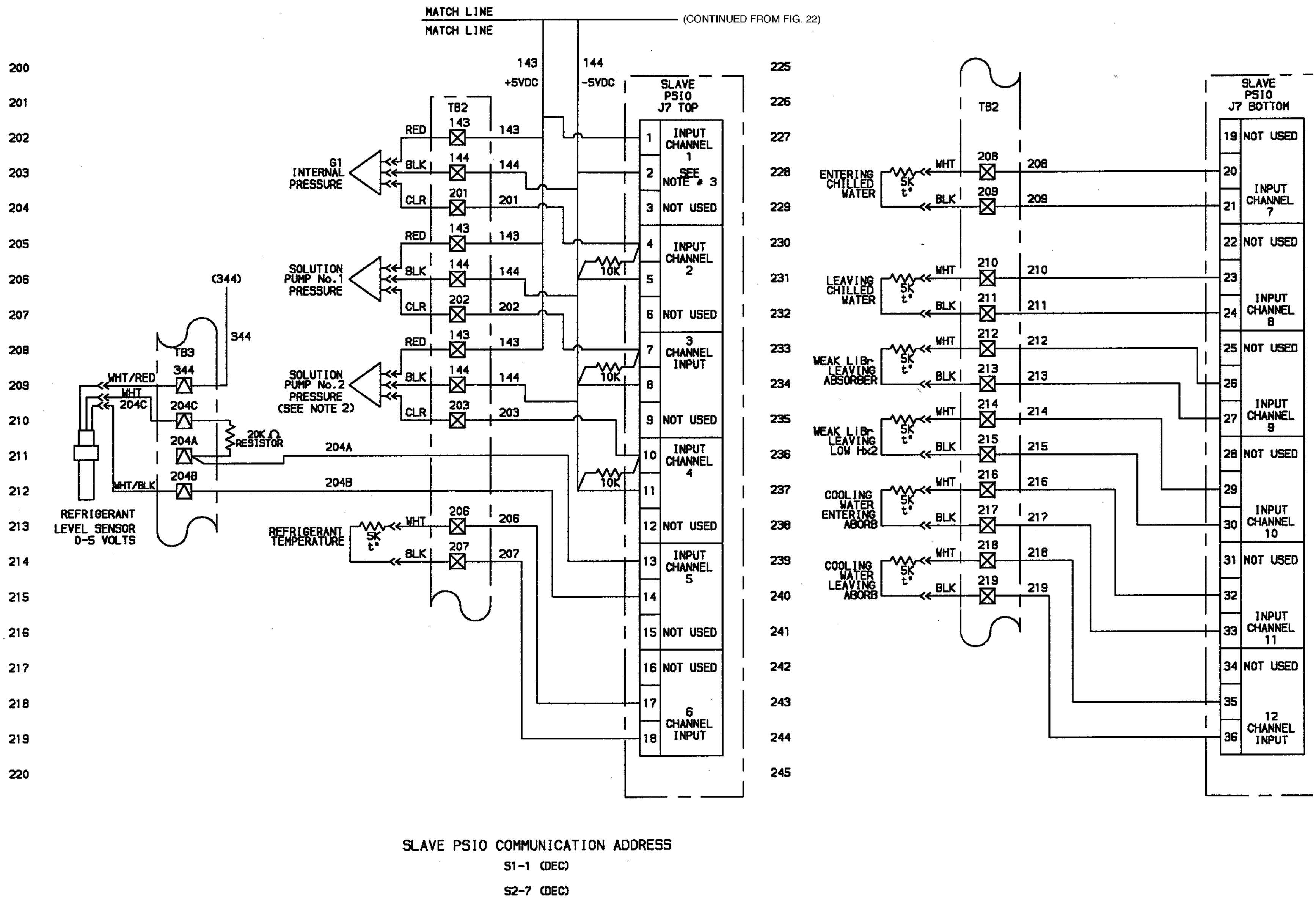


Fig. 23 — 16JT PIC Absorption Chiller Electrical Schematic (Slave PSIO Input)

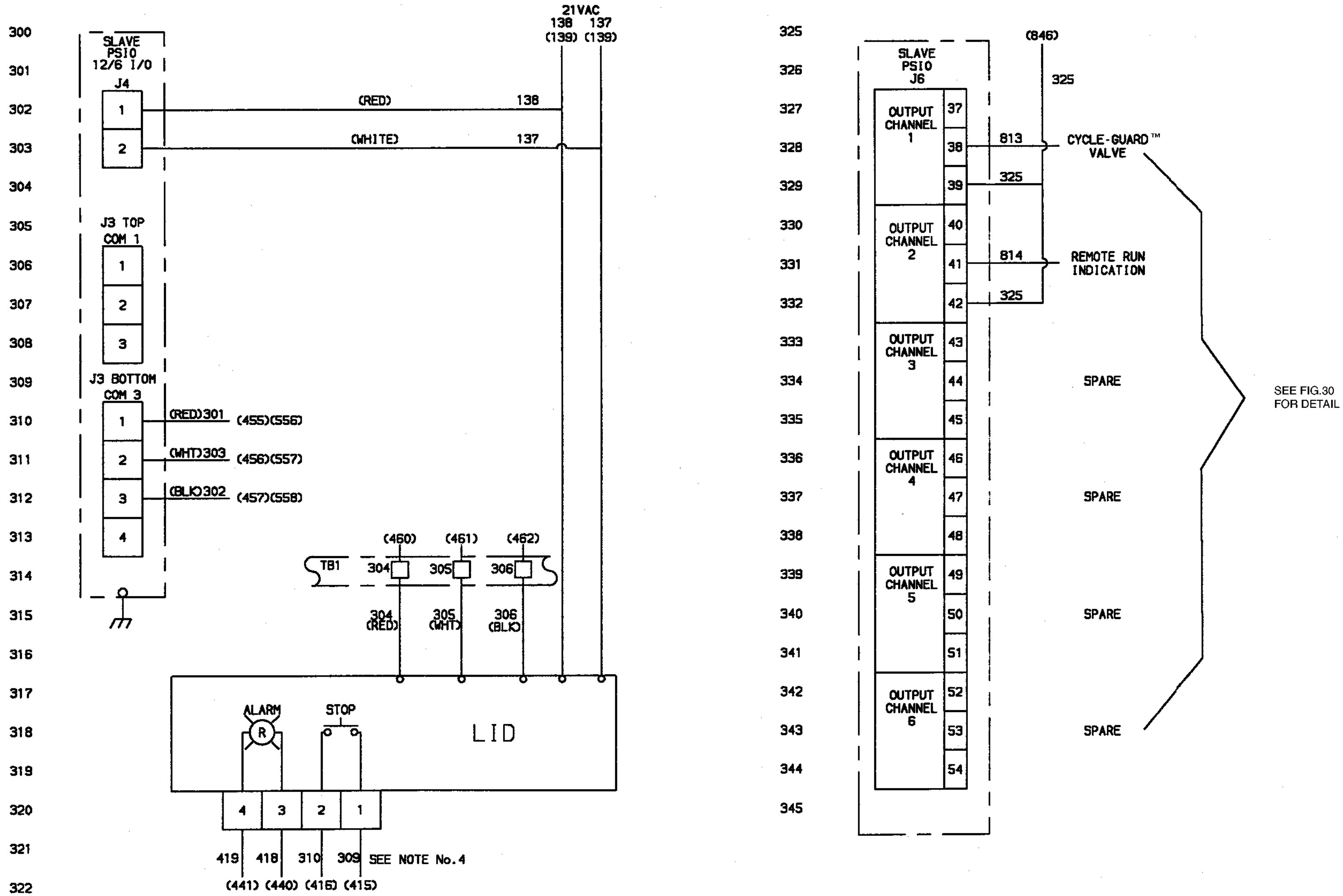


Fig. 24 — 16JT PIC Absorption Chiller Electrical Schematic (Slave PSIO Output)

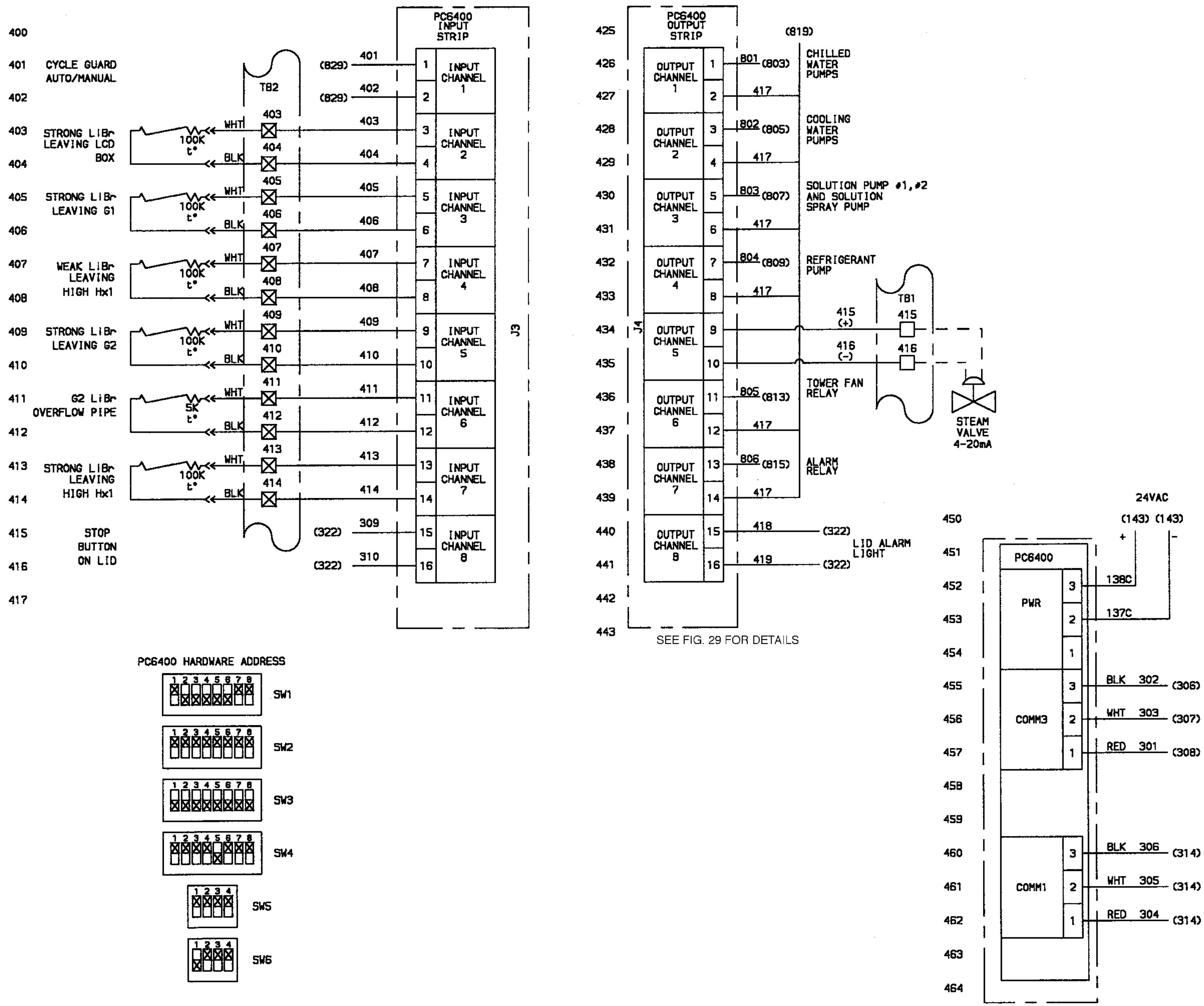


Fig. 25 — 16JT PIC Absorption Chiller Electrical Schematic (PC6400 Module)

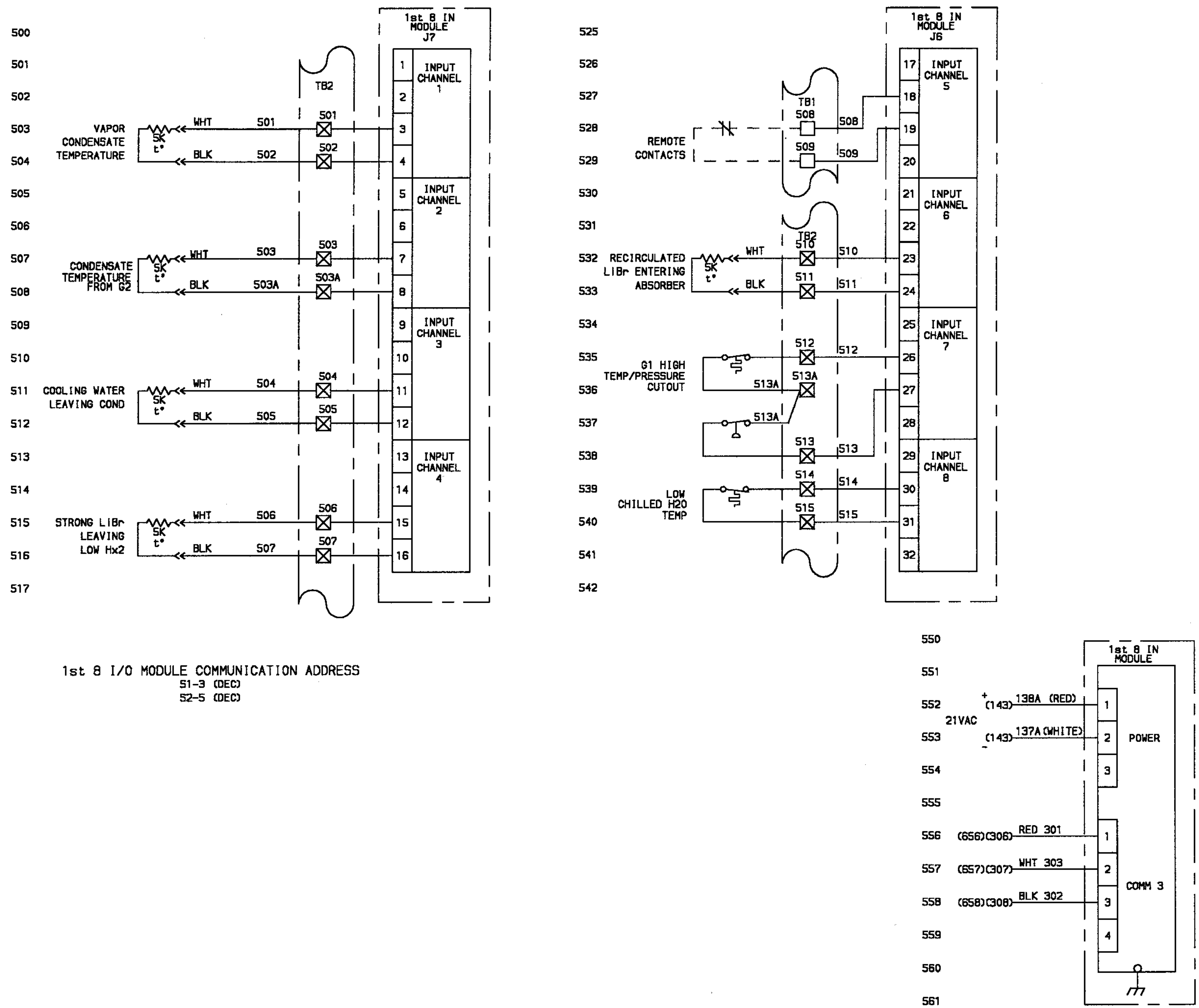


Fig. 26 — 16JT PIC Absorption Chiller Electrical Schematic (First 8-Input Module)

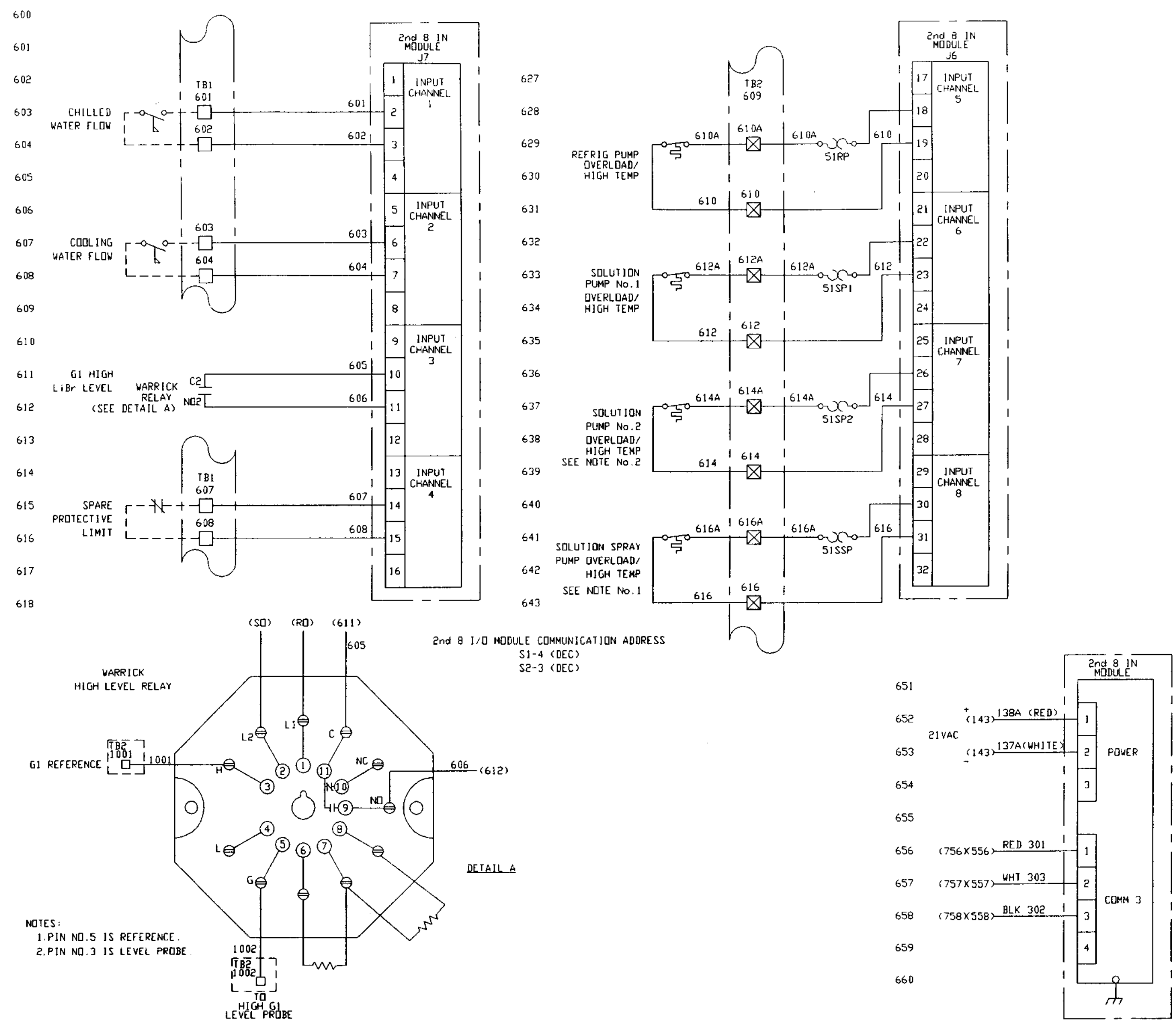


Fig. 27 — 16JT PIC Absorption Chiller Electrical Schematic (Second 8-Input Module)

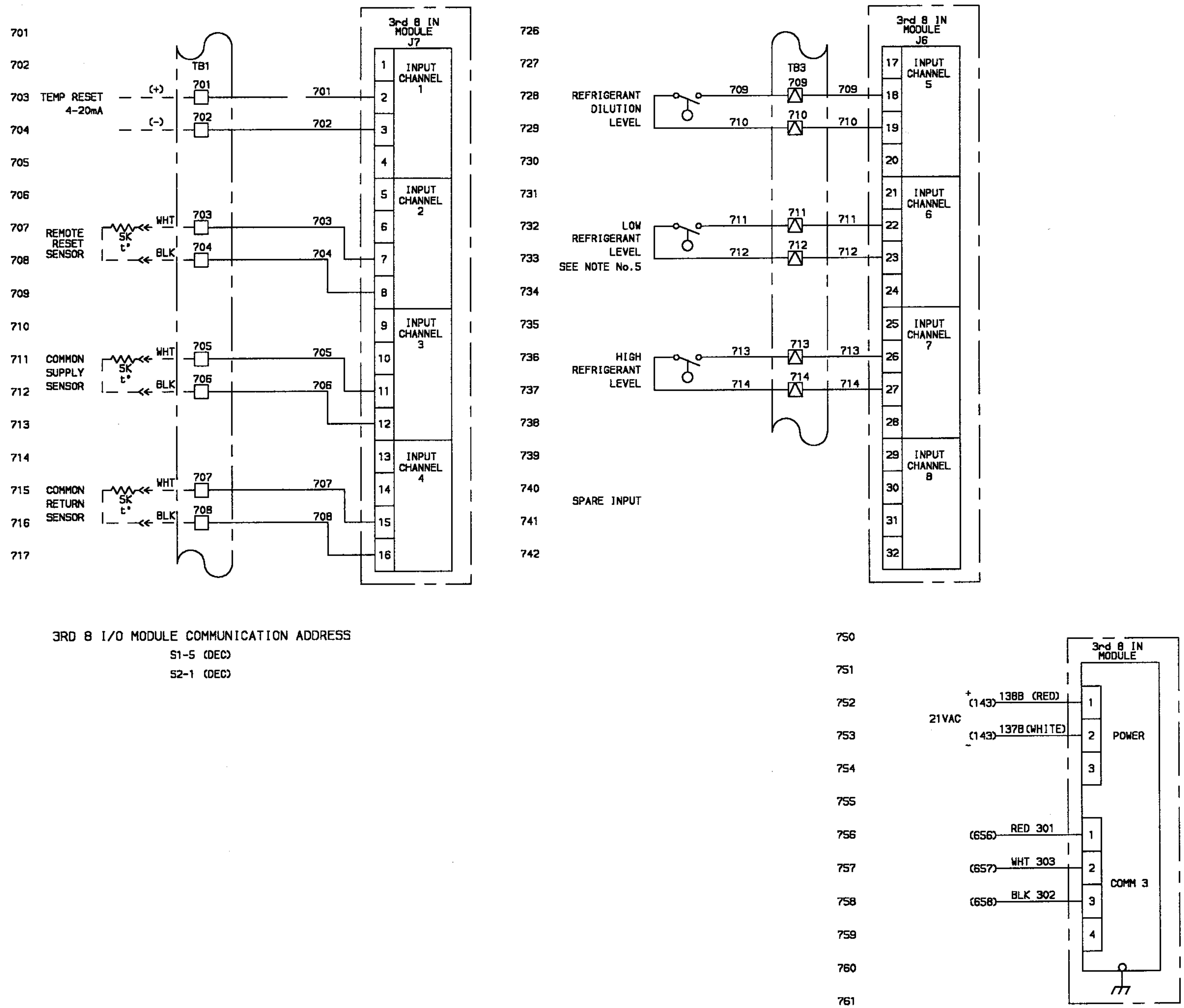


Fig. 28 — 16JT PIC Absorption Chiller Electrical Schematic (Third 8-Input Module)

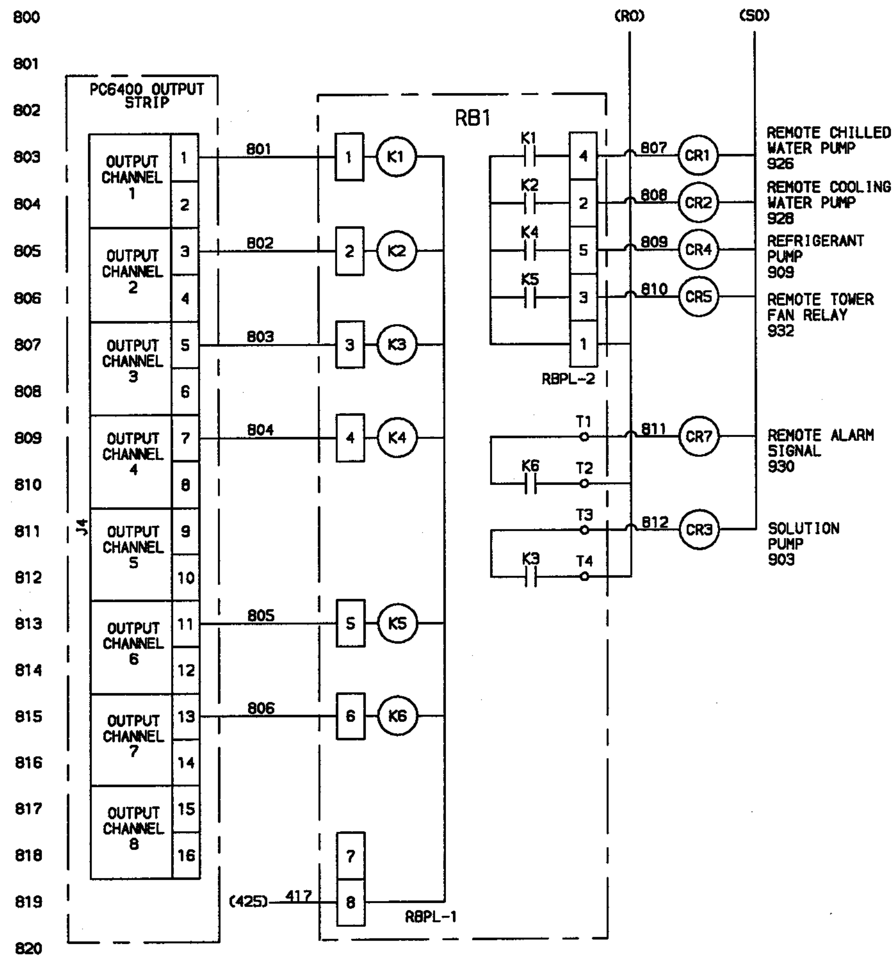


Fig. 29 — 16JT PIC Absorption Chiller Electrical Schematic (Six-Pack Relay Board 1)

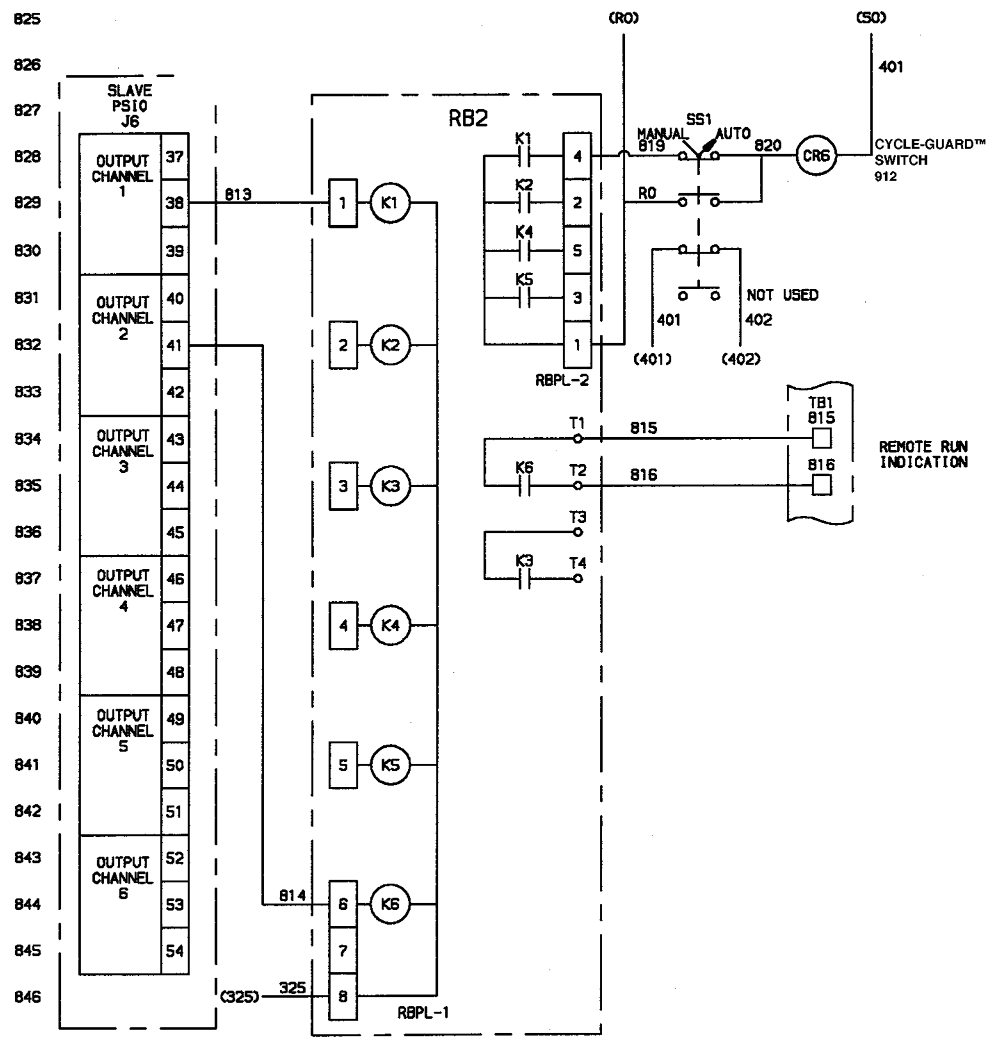


Fig. 30 — 16JT PIC Absorption Chiller Electrical Schematic (Six-Pack Relay Board 2)

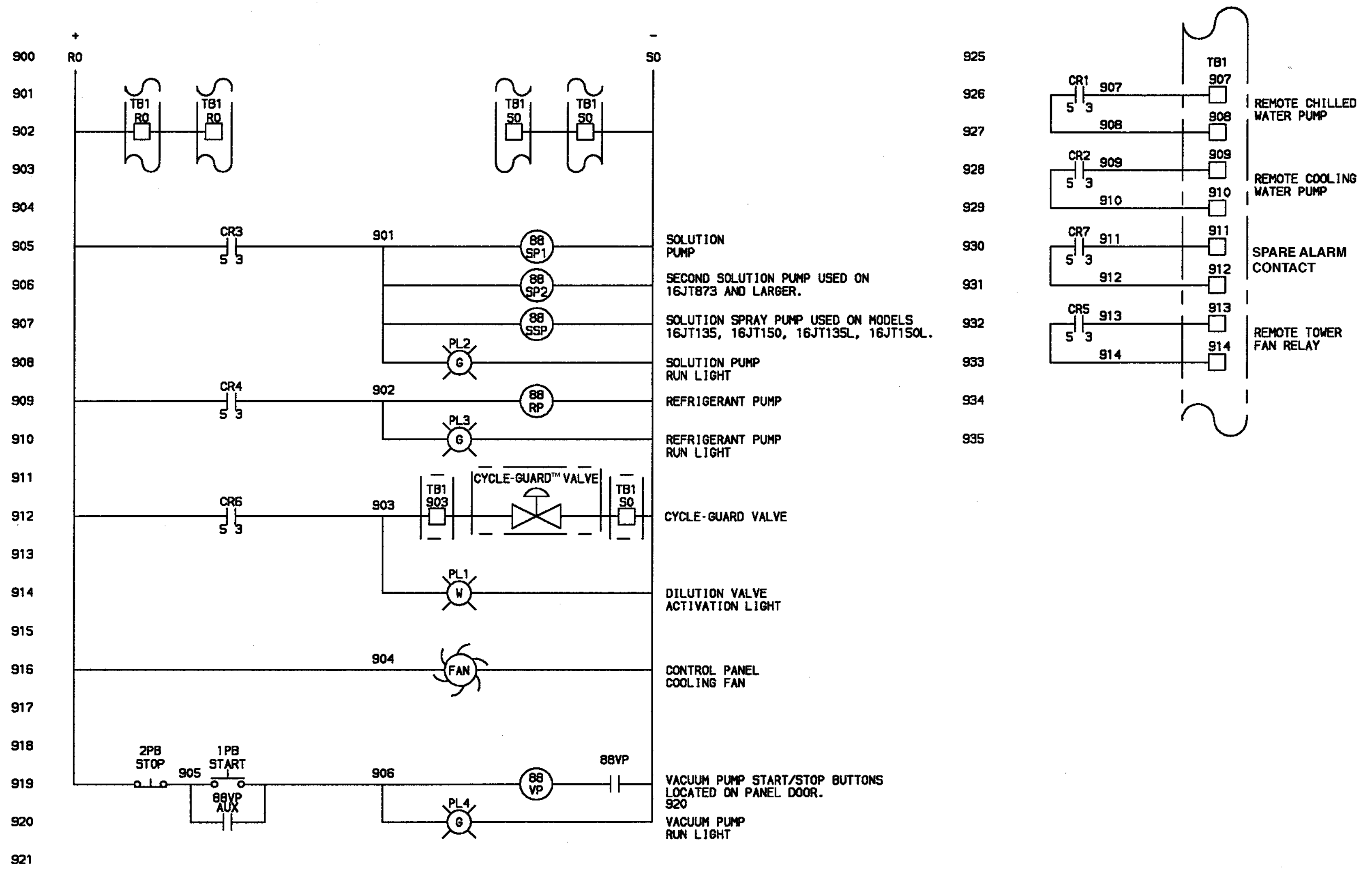


Fig. 31 — 16JT PIC Absorption Chiller Electrical Schematic (Wiring Diagram for 120 V Circuit)

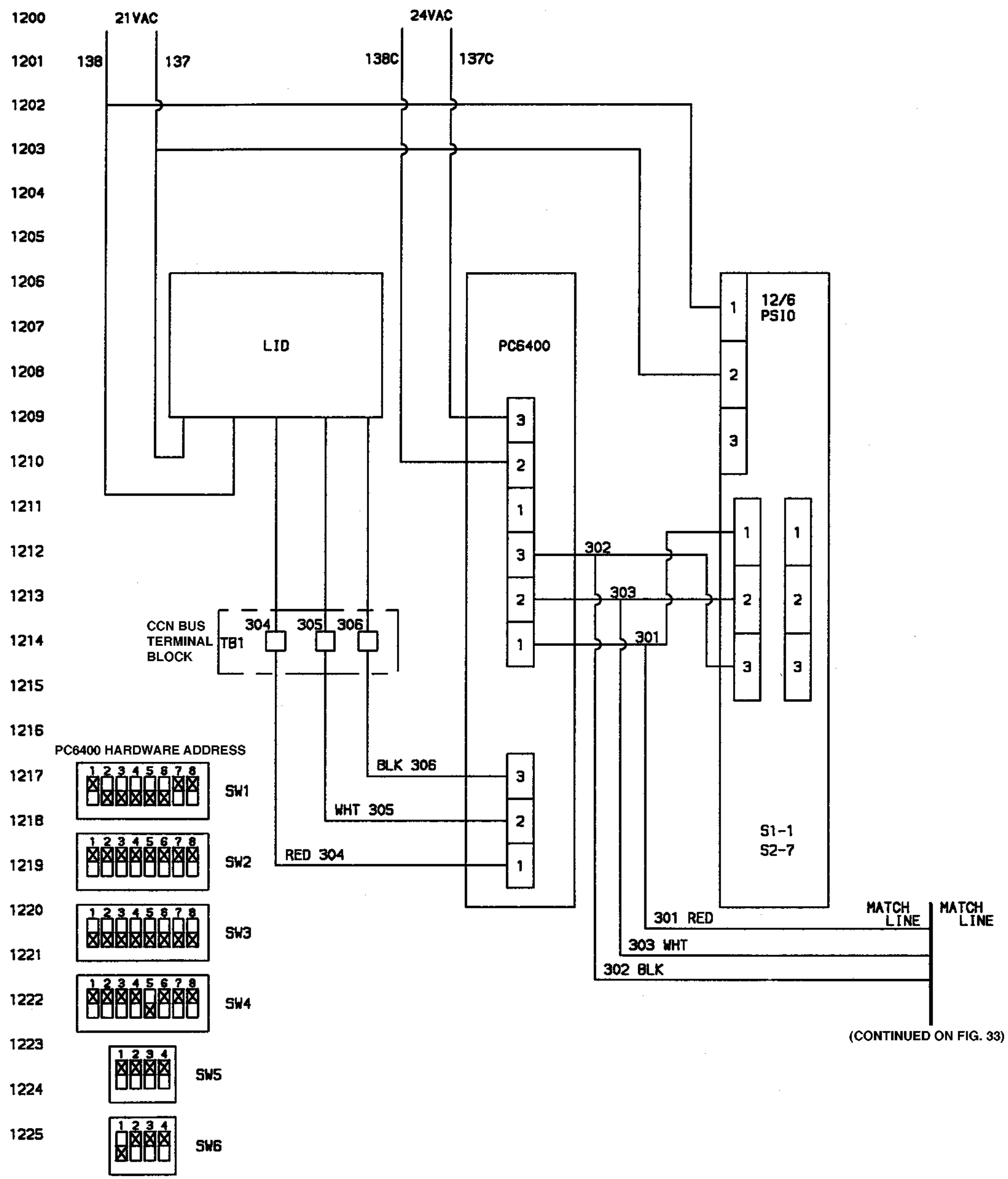


Fig. 32 — 16JT PIC Absorption Chiller Electrical Schematic (Communication Detail)

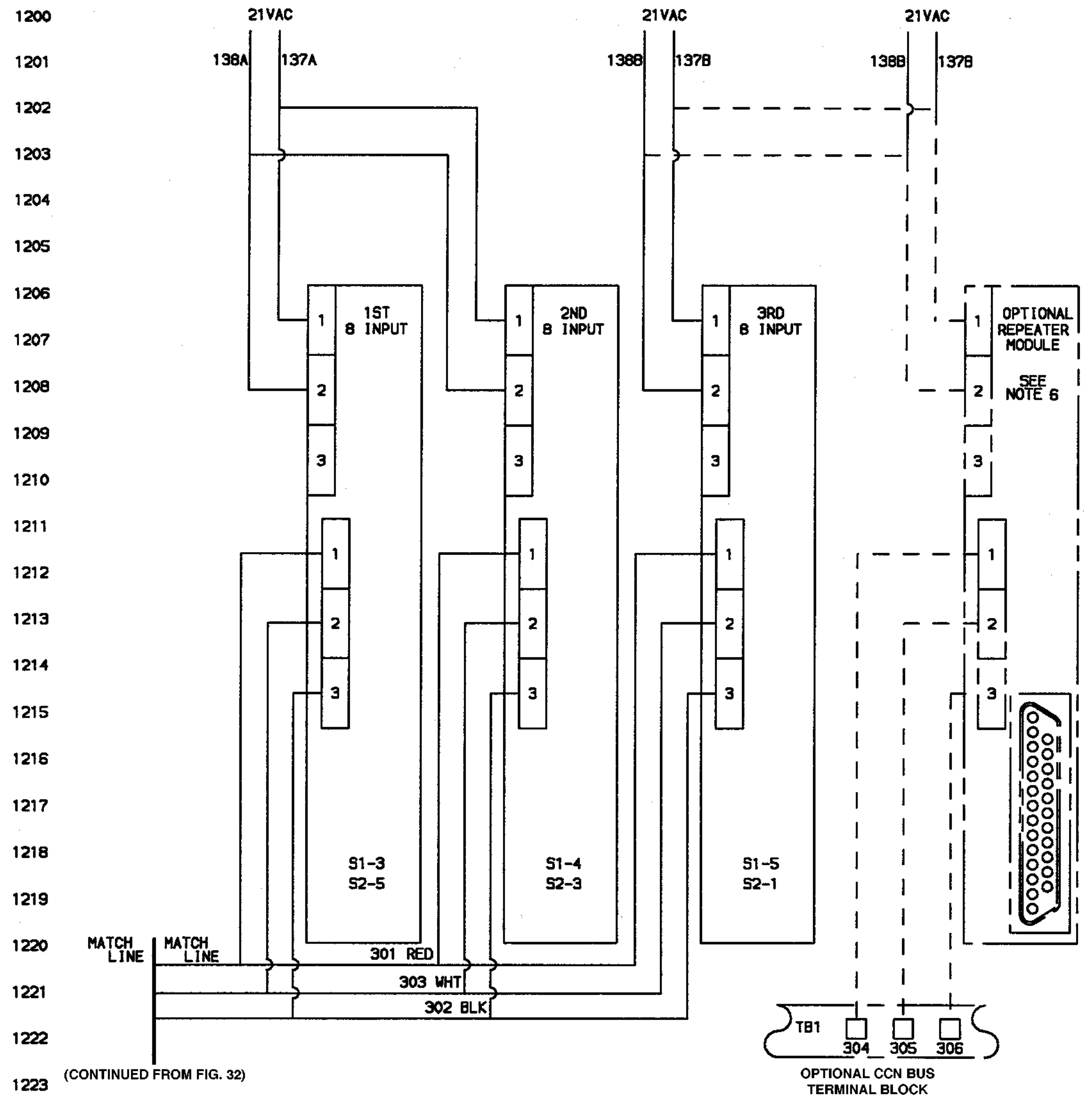


Fig. 33 — 16JT PIC Absorption Chiller Electrical Schematic (Communication Detail, cont)

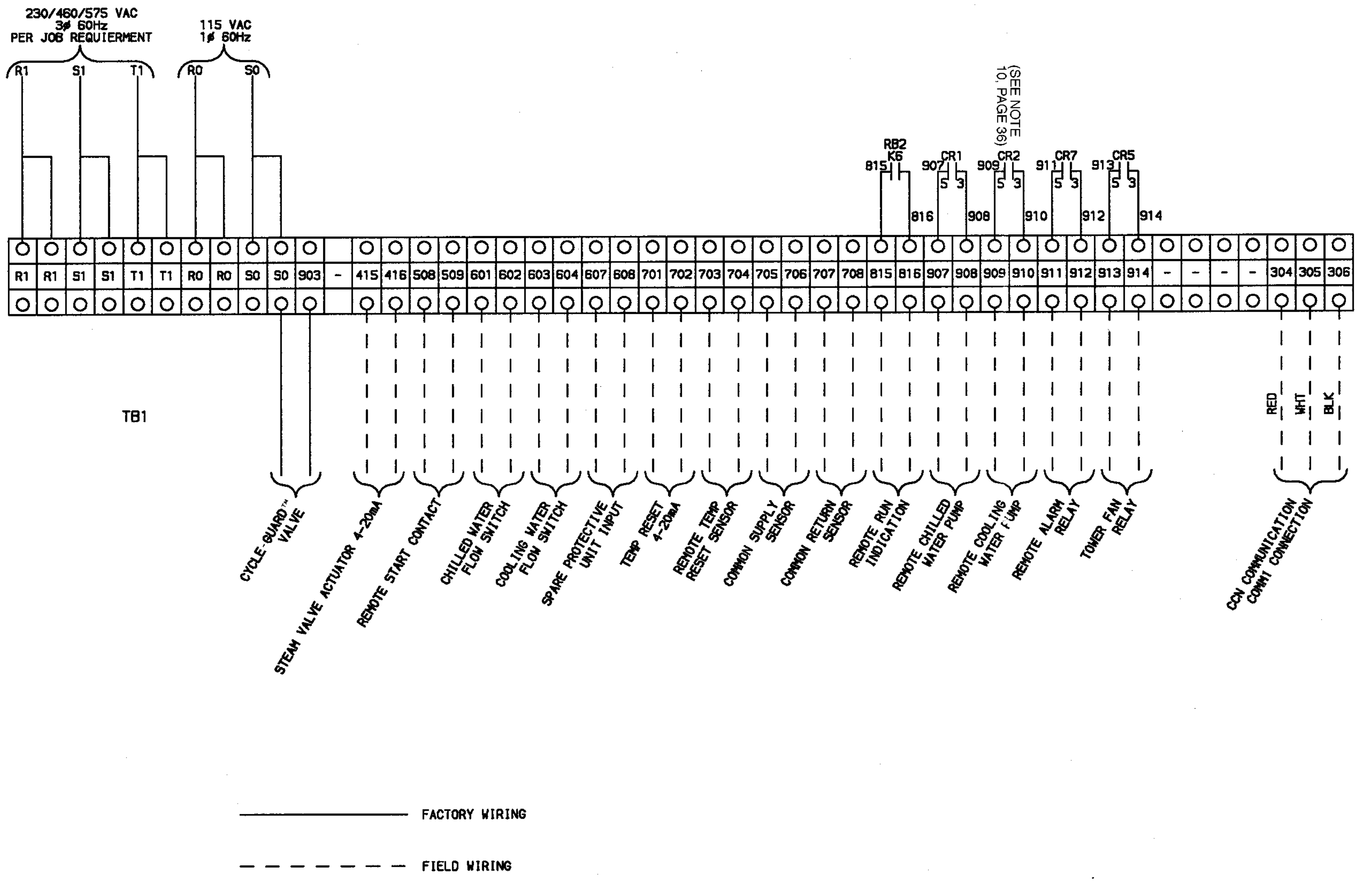


Fig. 34 — 16JT PIC Absorption Chiller Electrical Schematic (Terminal board Layout)

Water/Brine Reset — Three chilled water or brine temperature reset types are available and can be viewed or modified on CONFIG screen under the EQUIPMENT CONFIGURATION menu on the PIC. (See Table 3, Example 8.) The default screen status message indicates when a chilled water reset is active. The *CONTROL POINT* on the MAINSTAT table (see Table 3, Example 1) indicates the chiller's reset temperature. The chilled water reset range is 41 to 65 F (5 to 18 C).

To activate a reset type, input all configuration information for that reset type in the CONFIG screen under the EQUIPMENT CONFIGURATION menu. Then, input the reset type number in the SELECT/ENABLE Reset Type input line.

RESET TYPE 1 — Reset Type 1 is an automatic chilled water temperature reset based on a 4 to 20 mA input signal. The value for Reset Type 1 is user configurable; it is a temperature that corresponds to a 20 mA signal. (4 mA corresponds to 0° F [0° C]; 20 mA corresponds to the temperature entered by the operator.)

Reset Type 1 permits up to ±15 F (±8.3 C) of automatic reset to the chilled water or brine temperature set point, based on the input from a 4 to 20 mA signal. This signal is hardwired into TB1 terminals, 701 (+) and 702 (−). The 4 to 20 mA signal is externally powered; Reset Type 1 does not support an internally powered signal.

RESET TYPE 2 — Reset Type 2 is an automatic chilled water temperature reset based on a remote temperature sensor input. Reset Type 2 permits ±15 F (±8.3 C) of automatic reset to the set point based on a temperature sensor wired to the third 8-input module. The temperature sensor must be wired to TB1 terminals 703 and 704.

To configure Reset Type 2, enter the temperature of the remote sensor at the point where no temperature reset (*REMOTE TEMP [NO RESET]*) will occur. Next, enter the temperature at which the full amount of reset will occur (*REMOTE TEMP [FULL RESET]*). Then, enter the maximum amount of reset required at the second temperature to operate the chiller (*DEGREES RESET*). Reset Type 2 can now be activated.

RESET TYPE 3 — Reset Type 3 is an automatic chilled water temperature reset based on cooler temperature difference. This type of reset will add ±15 F (±8.3 C) based on the temperature difference between entering and leaving chilled water temperature. No wiring is required for this type of reset, since it already uses the chilled water sensors.

To configure Reset Type 3, enter the chilled water temperature difference (the difference between entering and leaving chilled water) at which no temperature reset occurs (*CHW DELTA T [NO RESET]*). This chilled water temperature difference is usually the full design load temperature difference. On the next input line, enter the difference in chilled water temperature at which the full amount of reset will occur (*CHW DELTA T [FULL RESET]*). Next, enter the amount of reset (*DEGREES RESET*). Reset Type 3 can now be activated.

Spare Safety Inputs — Normally closed discrete inputs for additional field-supplied safeties may be wired to the spare protective limits input channel in place of the factory-installed jumper. (Wire multiple inputs in series.)

⚠ WARNING

Disconnect all primary power when wiring electrical connections. Lock and tag all disconnect switches.

Wire these limits between 607 and 608 on TB1. The opening of any contact will result in a safety shutdown and the LID will display, SPARE SAFETY DEVICE.

SPARE ALARM CONTACT — One spare set of alarm contacts is provided in the control panel. The contact ratings are provided in the certified drawings. The contacts are located on terminal strip TB1, terminals 911 and 912. See Fig. 31.

Safety Controls — The PIC monitors all safety control inputs and, if required, shuts down the chiller, limits the capacity valve, or opens the Cycle-Guard™ valve to protect the chiller from possible damage.

If the controller initiates a safety shutdown, it displays a primary and a secondary alarm message on the LID. It also energizes an alarm relay in the control box and blinks the alarm light on the control center. The alarm information is stored in memory and can be viewed on the LID from the PIC ALARM HISTORY table along with a troubleshooting message. To view the alarm information, press the [MENU] and [SERVICE] softkeys, and enter your 4-digit password (to access the SERVICE table). ALARM HISTORY will be highlighted. Press the [SELECT] softkey.

To give a more specific operating condition warning, the operator can also define alert limits on various monitored inputs. Safety contact and alert limits are defined in Table 5. Alarm and alert messages are listed in the Troubleshooting Guide section, page 92.

Service Operation — Fig. 17 shows an overview of the service menus.

TO ACCESS THE SERVICE SCREENS — You must enter a password whenever you access the SERVICE screens.

1. From the MENU screen, press the [SERVICE] softkey.
   The softkeys now correspond to the numerals 1, 2, 3, and 4.
2. Press the four digits of your password, one at a time. As you enter each digit, an asterisk appears.

NOTE: The initial factory-set password is 1 - 1 - 1 - 1.

If the password is incorrect, an error message is displayed. If this occurs, return to Step 1 and try to access the SERVICE screens again. If the password is correct, the softkey labels change to [NEXT], [PREVIOUS], [SELECT], and [EXIT], and the LID screen displays the following SERVICE tables:

- Alarm History
- Control Test
- Control Algorithm Status
- Equipment Configuration
- Equipment Service
- Time and Date
- Attach to Network Device
- Log Out of Network Device
- Controller Identification
- LID Configuration

See Fig. 17 for additional screens and tables available from the SERVICE screens listed above. Use the [EXIT] softkey to return to the MENU screen.

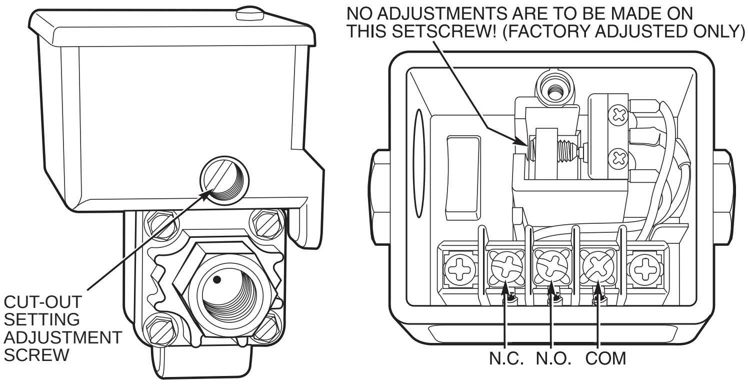
NOTE: To prevent unauthorized persons from accesssing the LID service screens, the LID automatically signs off and password-protects itself if a key has not been pressed for 15 minutes. The sequence is as follows. Fifteen minutes after the last key is pressed, the default screen displays, the LID screen light goes out (analogous to a screen-saver), the LID logs out of the password-protected SERVICE menu. Other screens and menus, such as the STATUS screen can be accessed without the password by pressing the appropriate softkeys.

Table 5 — Safety Contacts and Alert Limits

MONITORED PARAMETER	LIMIT	APPLICABLE COMMENTS
TEMPERATURE SENSORS OUT OF RANGE: 5K OHM	−40-245 F (−40-118.3 C)	Must be outside range for 3 seconds.
TEMPERATURE SENSORS OUT OF RANGE: 100K OHM	−77-422 F (−25-216.7 C)	Must be outside range for 3 seconds.
PRESSURE TRANSDUCERS OUT OF RANGE (LOW)	Ratio = 0.020-0.98	Must be outside range for 3 seconds. Ratio = Input Voltage/Voltage Reference
PRESSURE TRANSDUCERS OUT OF RANGE (HIGH)	Ratio = 0.060-0.98	Must be outside range for 3 seconds. Ratio = Input Voltage/Voltage Reference
TRANSDUCER VOLTAGE	<4.5 vdc and >5.5 vdc	Must be outside range for 3 seconds. Preset, Not Configurable.
G1 HIGH SOLUTION TEMP	G1 Strong LiBr Override. Range 311-320 F (155-160 C)	Configurable on MAINTENANCE, OVERRIDE, or SERVICE1 screen. See Table 4 for more details.
G1 HIGH SATURATION TEMP	G2 Condensate Override. Range 199-204 F (93-96 C)	Configurable on MAINTENANCE, OVERRIDE, or SERVICE1 screen. See Table 4 for more details.
G2 OVERFLOW ALARM	G2 Overflow Alarm, Range 150-240 F (66-115.6 C)	Configurable on SERVICE1 screen.
(EVAPORATOR) LOW REFRIGERANT TEMP	Refrigerant Trippoint, Range 37-42 F (2.8-5.5 C) Override Delta T, Range 2-5 F (1.1-2.8 C)	Configurable on SERVICE1 screen. See Table 4 for more details.
WEAK LIBR LEAVING ABSORBER	Weak LiBr Lvg Abs Alert, Range 100-150 F (38-66 C)	Configurable on SERVICE1 screen.
CYCLE GUARD	Cycle Guard Level Adjust, Range 0-10.	Sets the refrigerant level so that the Cycle-Guard™ valve opens when the Strong LiBr temperature leaving the low HX2 is less than 118 F (47.8 C).
CHWS SENSOR ALERT	Disable, Low, or High.	Configurable on SERVICE2 screen. Default is disabled.
CHWS TEMP ALERT SETTING	−40-245 F (−40-118 C)	Configurable on SERVICE2 screen. Default is 245 F (118 C).
CHWR SENSOR ALERT	Disable, Low, or High.	Configurable on SERVICE2 screen. Default is disabled.
CHWR TEMP ALERT SETTING	−40-245 F (−40-118 C)	Configurable on SERVICE2 screen. Default is 245 F (118 C).
RESET TEMP SENSOR ALERT	Disable, Low, or High.	Configurable on SERVICE2 screen. Default is disabled.
RESET TEMP ALERT SETTING	−40-245 F (−4-118 C)	Configurable on SERVICE2 screen. Default is 245 F (118 C).
LEAVING CHILLED WATER	9 F (5 C) below design set point; minimum of 36 F (2 C)	Manually set; see LID Operation and Menus section, page 15. Can be viewed on the LID display (EVAPSTAT screen).

Differential Water Flow Switch (Field Supplied)

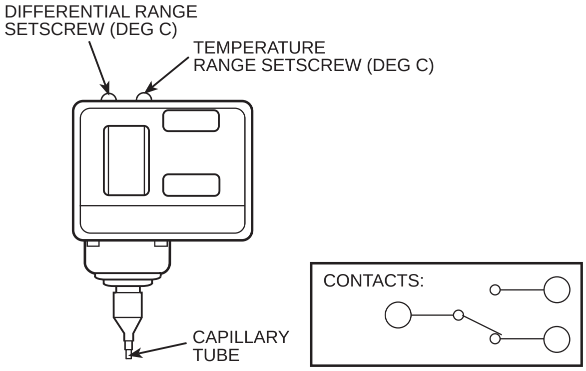
Operate water pumps with chiller off. Manually reduce water flow and observe switch for proper cutout. Safety shutdown occurs when cutout time exceeds 3 seconds.



EXTERIOR VIEW

INTERIOR VIEW

Leaving Chilled Water Cutout Switch



EXTERIOR

INTERIOR WIRING

LEGEND

CHWR — Chilled Water Return
CHWS — Chilled Water Supply
COM — Communication
N.C. — Normally Closed
N.O. — Normally Open

TO CHANGE THE PASSWORD — The password may be changed from the LID CONFIG screen.

1. Press the MENU and SERVICE softkeys. Enter your password and highlight LID CONFIGURATION. Press the SELECT softkey. Only the last 5 entries on the LID CONFIGURATION screen can be changed: BUS # (number), *ADDRESS #*, *BAUD RATE*, *US IMP/METRIC*, and *PASSWORD*.
2. Use the ENTER softkey to scroll to *PASSWORD*. The first digit of the password is highlighted on the LID screen.
3. To change the digit, press the INCREASE or DECREASE softkey. When you see the digit you want, press the ENTER softkey.
4. The next digit is highlighted. Change it and the third and fourth digits in the same way you changed the first digit.
5. After the last digit is changed, the LID goes to the BUS variable. Press the EXIT softkey to leave that screen and return to the SERVICE menu.

TO CHANGE THE LID DISPLAY FROM ENGLISH TO METRIC UNITS — By default, the LID displays information in English units. To change to metric units, access the LID CONFIG screen:

1. Press the MENU and SERVICE softkeys. Enter your password and highlight LID CONFIGURATION. Press the SELECT softkey.
2. Use the ENTER softkey to scroll to *US IMP/METRIC*.
3. Press the softkeys that corresponds to the units you want displayed on the LID (e.g., US or METRIC).

TO SCHEDULE HOLIDAYS (Fig. 35) — The time schedules may be configured for special operation during a holiday period. When modifying a time period, an ‘‘H’’ at the end of the days of the week field signifies that the period is a holiday. (See Fig. 19.)

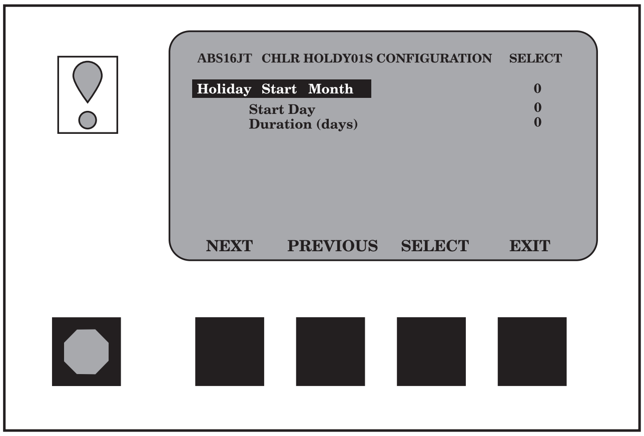
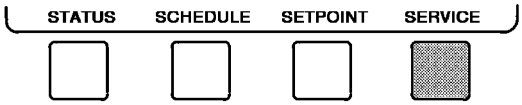


Fig. 35 — Example of Holiday Period Screen

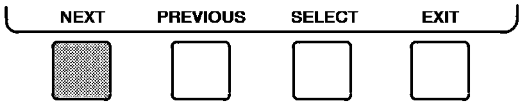
The CCN broadcast function must be activated for the holidays configured in the HOLIDAY table to work properly. Access the BRODEF table from the EQUIPMENT CONFIGURATION screen and press ENABLE to activate the holiday schedule. If the chiller is connected to a CCN network, only one chiller or CCN device can be configured as the broadcast device. The device configured as the broadcaster is responsible for transmitting holiday, time, and daylight-savings dates throughout the network. For more information on CCN operations, see the 16JT CCN supplement.

To view or change the holiday periods for up to 18 different holidays, do the following:

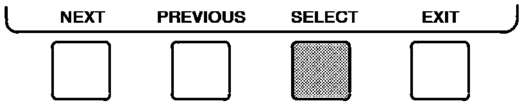
1. At the MENU screen, press SERVICE to access the SERVICE menu.



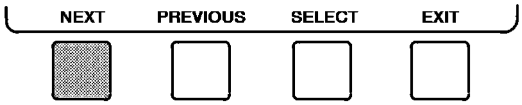
2. If not logged on, follow the instructions for entering your password. See the section, To Access the Service Screens, page 51. Once logged on, press NEXT until EQUIPMENT CONFIGURATION is highlighted.



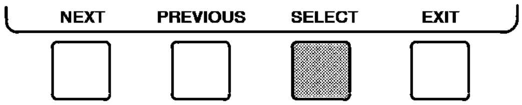
3. Press SELECT to access the EQUIPMENT CONFIGURATION screen.



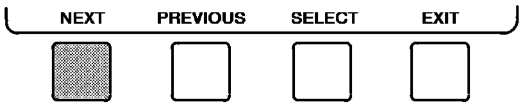
4. Press NEXT until HOLIDAYS is highlighted. This is the screen that allows you to define holidays.



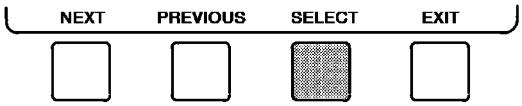
5. Press SELECT to view a screen that lists 18 holiday periods.



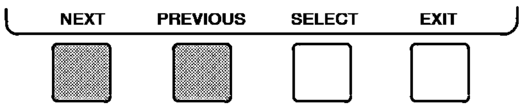
6. Press NEXT to highlight the holiday period you wish to view or change. Each period represents one holiday, starting on a specific date and lasting up to 99 days.



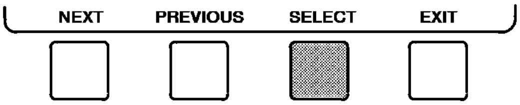
7. Press SELECT to access the holiday period. The screen now shows the holiday start month and day, and how many days the holiday period will last.



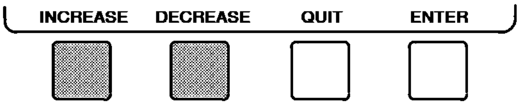
8. Press NEXT or PREVIOUS to highlight the month, day, or duration.



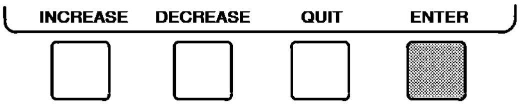
9. Press [SELECT] to select the month, day, or duration you wish to modify.



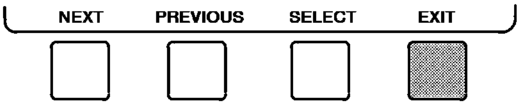
10. Press [INCREASE] or [DECREASE] to change the selected item.



11. Press [ENTER] to save the changes.



12. Press [EXIT] to return to the previous menu.



Carrier Comfort Network (CCN) Interface — The Carrier Comfort Network (CCN) communication bus wiring is supplied and installed by the electrical contractor. It consists of shielded, 3-conductor cable with a drain wire. See Fig. 32 and 33 for a typical wiring schematic.

⚠ WARNING

Disconnect all primary power when wiring electrical connections. Lock and tag all disconnect switches.

The system elements are connected to the communication bus in a daisy chain arrangement. The positive pin of each system element communication connector must be wired to the positive pin of the system element on either side of it; the negative pins must be wired to the negative pins; and the signal ground pins must be wired to signal ground pins.

To attach the CCN communication bus wiring, refer to the certified prints and wiring diagrams. The wire is inserted into the CCN (COMM1) connections (terminals 304, 305, and 306) on terminal block TB1 in the control panel.

NOTE: Conductors and drain wire must be 20 AWG (American Wire Gage) minimum stranded, tinned copper. Individual conductors must be insulated with PVC, PVC/nylon, vinyl, Teflon™, or polyethylene. An aluminum/polyester 100% foil shield and an outer jacket of PVC, PVC/nylon, chrome vinyl, or Teflon, with a minimum operating temperature range of −4 F to 140 F (−20 C to 60 C)is required. See the following table for cables that meet the requirements.

MANUFACTURER	CABLE NO.
Alpha	2413 or 5463
American	A22503
Belden	8772
Columbia	02525

When connecting the CCN communication bus to a system element, a color code system for the entire network is recommended to simplify installation and checkout. The following color code is recommended:

SIGNAL TYPE	CCN BUS CONDUCTOR INSULATION COLOR	CCN (COMM1) CONNECTION ON TB1
+	RED	Terminal 304
Ground	WHITE	Terminal 305
−	BLACK	Terminal 306

Attach to Network Device Control — One of the selections on the Service menu is ATTACH TO NETWORK DEVICE. It serves the following purposes:

- uploads the occupancy schedule number (if changed), as defined on the CONFIG screen.
- attaches the LID to any CCN device if the chiller has been connected to a CCN network. This may include other PIC-controlled chillers.
- uploads changes from a new PC6400, LID module, or uploads tables.

Figure 35 illustrates the ATTACH TO NETWORK DEVICE LID screen. The LOCAL description is always the PC6400 module address of the chiller the LID is mounted on. Whenever the controller identification of the PC6400 is changed, the change is automatically reflected on the bus and address for LOCAL device on the ATTACH TO NETWORK DEVICE screen.

Whenever the ATTACH TO NETWORK DEVICE table is accessed, no information can be read from the LID on any device until you attach one of the devices listed on the display. The LID erases information about the module to which it was attached to make room for information on another device. Therefore, a CCN module must be attached when this screen is entered.

To attach to a device, highlight it using the [SELECT] softkey and then press the [ATTACH] softkey. The message UPLOADING TABLES, PLEASE WAIT flashes. The LID then uploads the highlighted device or module. If the module address cannot be found, the message COMMUNICATION FAILURE appears. The LID then reverts to the ATTACH TO NETWORK DEVICE screen. Try another device or check the address of the device that did not attach. The upload process time for each CCN module is different. In general, the uploading process takes 3 to 5 minutes.

NOTE: Before leaving the ATTACH TO NETWORK DEVICE screen, select the LOCAL device. Otherwise the LID will be unable to display information on the local chiller.

ATTACHING OTHER CCN MODULES — If the chiller controller (PC6400) and LID have been connected to a CCN network or other PIC-controlled chillers through CCN wiring, the LID can be used to view or change parameters on the other controllers. If desired, another PIC-controlled machine can be viewed and set points changed (if the other unit is in CCN control mode) from this particular LID module.

To view other devices, access the ATTACH TO NETWORK DEVICE table. Highlight the desired device number. Press the SELECT softkey to change the bus number and address of the module to be viewed. Press the EXIT softkey to move back to the ATTACH TO NETWORK DEVICE table. If the module number is not valid, the COMMUNICATION FAILURE message will display. Enter a new address number or check the wiring. If the module is communicating properly after the ATTACH softkey is pressed, the UPLOAD IN PROGRESS message will display, and information on the new module can now be viewed.

Whenever there is a question regarding which module is currently being shown on the LID, check the device name descriptor on the upper left corner of the LID screen. See Fig. 36.

Once the CCN device has been viewed, use the ATTACH TO NETWORK DEVICE table to attach to the PIC that is on the chiller. Access the ATTACH TO NETWORK DEVICE table, scroll to LOCAL, and press the ATTACH softkey to upload the LOCAL device. The PC6400 controller for the 16JT will now be uploaded.

NOTE: The LID will not automatically re-attach to the PC6400 controller module on the 16JT chiller. Access the ATTACH TO NETWORK DEVICE screen. Press the ATTACH softkey to attach the LOCAL device and view information on the local chiller.

LOG OUT OF NETWORK DEVICE —To access this screen and log out of a network device, from the default LID screen, press the MENU and SERVICE softkeys. Scroll to highlight LOG OUT OF NETWORK DEVICE and press the SELECT softkey.

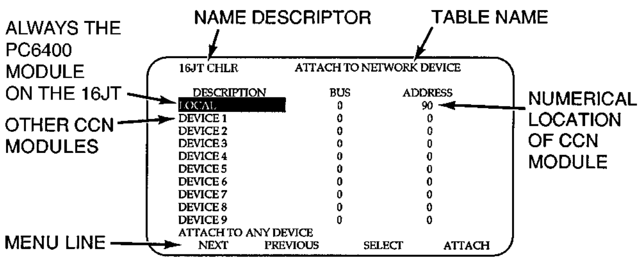


Fig. 36 — Example of Attach to Network Device Screen

Power-Up — The LID goes through a self-diagnostic test and then displays the default screen. After the chiller is RESET, the PIC reads the *ACTUAL CAPACITY VALVE* and starts driving it to the fully closed position by setting the *TARGET CAPACITY VALVE* to 0. Before starting the chiller, reset any alarms and return any fault conditions to a normal range. The *ALARM STATE* must indicate NORMAL.

BEFORE INITIAL START-UP

Job Data and Tools Required

1. Job specifications and job sheets, including a list of applicable design temperatures and pressures
2. Chiller assembly and field layout drawings
3. Controls and wiring drawings
4. 16JT Installation Instructions
5. Mechanic’s hand tools
6. Absolute pressure gage or water-filled wet-bulb vacuum indicator graduated with 0.1-in. (2 mm) of mercury increments. *Do not use manometer or gage containing mercury.*
7. Auxiliary evacuation pump, 5 cfm (2.5 l/s) or greater, with oil trap, flexible connecting hose, and connection fittings
8. Compound pressure gage, 30-in. vacuum to 30 psig (75 cm vacuum to 200 kPa)
9. Digital volt-ohmmeter and clamp-on ammeter
10. Liquid charging hose consisting of flexible ¾-in. (20-mm) hose connected to a 3-ft (1-m) long x ½-in. (15-mm) pipe trimmed at a 45-degree angle at one end, with a ½-in. MPT connector at the opposite end
11. Leak detector
12. Hydrometer and insertion thermometer

Inspect Field Piping — Refer to the field piping diagrams for your specific installation, and see the typical piping schematic shown in Fig. 37. Inspect the chilled water and cooling water piping.

1. Verify that the location and flow direction of the water lines are as specified on the drawings and as marked on the chiller.
2. Check that all water lines are vented and properly supported to prevent stress on waterbox covers or nozzles.
3. Make sure all waterbox drains are installed.
4. Ensure that the water flow through the evaporator and condenser meet job requirements. Measure the pressure drops across both cooler and condenser.
5. Make sure the chilled water temperature sensors are installed in the leaving chilled water piping. Also check that appropriate thermometers or temperature wells and pressure gage taps have been installed in both entering and leaving sides of the evaporator, absorber, and condenser water piping.

Inspect Field Wiring — Refer to the field and chiller wiring diagrams and inspect the wiring for both power supply and connections to other system equipment (cooling tower, water supply pumps, auto. start if used, etc.)

⚠ WARNING

Do not work on electrical components, including control panels or switches, until you are sure that all power is off and no residual voltage can leak from capacitors or solid-state components.

⚠ WARNING

Lock open and tag electrical circuits during servicing. If work is interrupted, confirm that all circuits are deenergized before resuming work.

⚠ CAUTION

Do not apply power to hermetic pumps or attempt to start the chiller until it has been charged with lithium bromide solution and refrigerant. The pumps will be severely damaged if rotated without the full liquid charge.

1. Examine the wiring for conformance to job wiring diagrams and applicable electrical codes.
2. Check the pump and motor nameplates and control panel for agreement with supply voltage and frequency (Hz).

3. Verify the correct overload and fuse sizes for all motors. Refer to the 16JT Product Data and Installation Instructions manuals for current draw and motor sizes.
4. Check that electrical equipment and controls are properly grounded in accordance with applicable electrical codes.
5. Make sure the customer/contractor has verified proper operation of water pumps, cooling tower fan, and associated auxiliary equipment. This includes ensuring that motors are properly lubricated and have proper electrical supply and proper rotation.

Standing Vacuum Test — Before the chiller is energized or placed in operation, check for air leaks with a standing vacuum test. Examine the 2 test procedures described below and select the one that applies to your job application.

LONG INTERVAL TEST — Use this test procedure if an absolute pressure reading has been recorded at least 4 weeks previously and the reading was not more than 1 in. (25 mm) of mercury.

1. Connect an absolute pressure gage to the auxiliary evacuation valve and record the pressure reading. The original reading is listed on a tag that comes with the chiller. (Do not use a mercury gage.)
2. If the pressure has increased by more than 0.1 in. (2.5 mm) of mercury since the initial reading, an air leak is indicated. Leak test the chiller as described in the Maintenance Procedures section, page 78, then perform the short interval test which follows.

SHORT INTERVAL TEST — Use this test procedure if:

1. No previous absolute pressure readings have been recorded, OR
2. The previous absolute pressure reading was made less than 4 weeks ago, OR
3. The reading indicated a chiller pressure of more than 1 in. (25 mm) of mercury, OR
4. The chiller had to be leak tested after the long interval test.

<u>Procedure</u>

1. Connect the absolute pressure gage to the auxiliary evacuation valve and record the pressure reading.
2. If the reading is more than 1 in. (25 mm) of mercury absolute, evacuate the chiller as described in the Maintenance Procedures section, page 78.
3. Record the absolute pressure reading and the ambient temperature.
4. Let chiller stand for at least 24 hours.
5. Note the absolute pressure reading when the ambient temperature is within 15° F (8° C) of the ambient temperature recorded in Step 3.
6. If there is any noticeable increase in pressure, an air leak is indicated. Leak test the chiller as described in the Maintenance Procedures section, then repeat the short interval vacuum test to ensure leak free results.

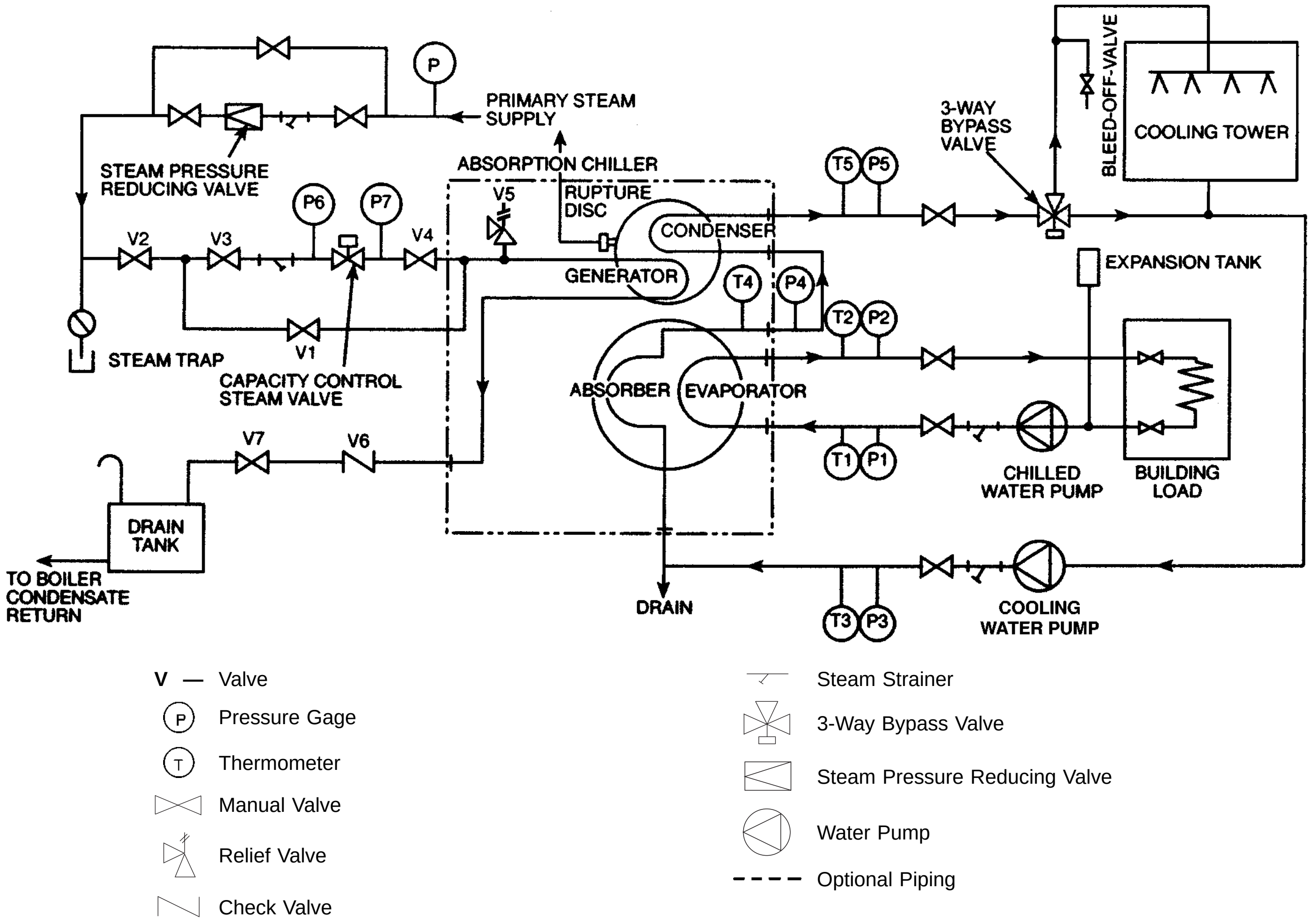


Fig. 37 — Typical Piping Schematic

Chiller Evacuation — When the chiller's absolute pressure is greater than 1 in. (25 mm) of mercury absolute, the chiller must be evacuated as described in Maintenance Procedures section, page 78.

Set Up Chiller Control Configuration

> **⚠ WARNING**
>
> Do not operate the chiller before the control configurations have been checked and a control test has been satisfactorily completed. Protection by safety controls cannot be assumed until all control configurations have been confirmed.

While you are configuring the 16JT chiller, write down all configuration settings. A log, such as the one shown on pages CL-1 to CL-8, is a convenient way to list configuration values.

Input the Design Set Points — To modify the set points, access the SETPOINT menu. (Press the [MENU] and [SETPOINT] softkeys.) The PIC can control a set point according to either the leaving or entering chilled water temperature. To change the type of control, access the CONFIG table on the LID. Scroll down to highlight *CHW_IN CONTROL OPTION*. To control the set point according to the leaving chilled water, press the [DISABLE] softkey; to control the set point according to the entering chilled water, press the [ENABLE] softkey.

Input the Local Occupied Schedule (OCCPC01S) — To set up the occupied time schedule according to the site requirements, access the SCHEDULE screen on the LID. If no schedule is available, set it for 24 hours occupied per day, 7 days per week including holidays. This is the default setting. For more information on how to set up a time schedule see the section on Time Schedule Operation, page 21.

If a CCN system is being installed or if a secondary time schedule is required, configure the CCN occupancy schedule (OCCPC02S - OCCPC99S). This task is normally done using a CCN Building Supervisor terminal, but it can also be done at the LID. For more information on CCN functions, see the 16JT CCN Supplement. Also, see the section on Occupancy Schedule, page 31.

NOTE: When the chiller is under CCN control, it should not be allowed to start until the initial start-up procedures have been completed. Refer to Initial Start-Up, Preliminary Check, on page 61.

Input the Service Configuration — The following configurations are done from the SERVICE menu on the LID:

- password
- equipment configuration
- equipment service (service parameters)
- time and date
- attach to network device
- log out of device
- controller identification
- LID configuration

PASSWORD — You must enter a password whenever you access the SERVICE screens. The default, factory-set password is 1 - 1 - 1- 1. The password may be changed from the LID CONFIGURATION screen. See the Service Operation section, page 51, for instructions on how to change the password.

INPUT TIME AND DATE — Access the TIME AND DATE screen from the SERVICE menu. Input the present time of day, date, and day of the week. *HOLIDAY TODAY* should be set to YES only if the present day is a holiday.

CHANGE THE LID CONFIGURATION, IF NECESSARY — From the LID CONFIGURATION screen, the LID CCN address, units (English or metric), and password can be changed. For instructions on changing the password and units, see the Service Operation section, page 51. For more information on the CCN address, refer to the 16JT CCN Supplement. The default CCN address is Bus 0, Address 250.

MODIFY CONTROLLER IDENTIFICATION, IF NECESSARY — From the CONTROLLER IDENTIFICATION screen, you can change the PC6400 module address. If there is more than one chiller at the site, change the controller address for each chiller. Write the new address on the PC6400 module for future reference. The default address is Bus 0, Address 1.

If there is more than one chiller at the site, change the LID CCN address, as well. The LID address is changed from the LID CONFIGURATION screen.

INPUT THE EQUIPMENT SERVICE PARAMETERS, AS NECESSARY — The EQUIPMENT SERVICE menu has 3 tables: SERVICE1, SERVICE2, and SERVICE3.

Access the SERVICE1 table to modify or view the following site parameters.

Refrigerant Trip Point	Usually 3 F (1.7 C) below design refrigerant temperature
Line Frequency	50 or 60 Hz
Refrigerant Override Delta T	Usually 2 F (1.8 C)
Water Flow Verify Time	Used for chiller pumps and system pumps
Concentration Sensor Calculation	Set after charge is trimmed

NOTE: Other values are left at the default settings. These may be changed by the operator as required. The SERVICE2 and SERVICE3 tables can be modified by the owner or operator as needed.

MODIFY EQUIPMENT CONFIGURATION, AS NECESSARY — The EQUIPMENT CONFIGURATION screen includes the CONFIG table. Carrier provides certified drawings with the configuration values required for the site. Modify these tables only if requested to do so. Possible modifications include

- chilled water reset (types 1, 2, and 3)
- entering chilled water control (enable or disable)
- remote contact option (enable or disable)
- temperature pulldown (degrees per minute)
- CCN occupancy configuration (schedule number and broadcast option)

NOTE: The following section is included for reference only. For detailed information on CCN operations, consult the 16JT CCN Supplement.

In addition to the CONFIG table, the EQUIPMENT CONFIGURATION screen includes the CCN screens and tables described below.

<u>OCCDEFCS</u> — The OCCDEFCS tables contain the local and CCN time schedules.

<u>HOLIDAYS</u> — From the HOLIDAYS tables, you can configure the days of the year that holidays are in effect. See the LID Operation and Menus section that begins on page 15 for more details on this function.

BRODEF — From the BRODEF screen, you can:

- Configure the outside air temperature and humidity sensors, if installed.
- Define the start and end of daylight savings time. Enter the dates for the start and end of daylight savings, if required for your location.
- Activate the CCN broadcast function which allows the holiday periods defined in the HOLIDAYS table to take effect.

Other Tables — The ALRM_CFG, CONSUME, RUNTIME, and WSMALMDF tables are used only in a CCN networked system. These tables can only be modified using CCN Building Supervisor (BS) software.

Charge the Chiller with Solution and Refrigerant

HANDLING LITHIUM BROMIDE (LiBr) SOLUTION

⚠ WARNING

Lithium bromide and its lithium chromate or lithium molybdate inhibitor can irritate the skin and eyes. Wash off any solution with soap and water. If any solution enters the eye, wash the eye with fresh water and consult a physician immediately. Lithium bromide is a strong salt solution; do not syphon by mouth.

Liquid materials that are added to lithium bromide solution such as lithium hydroxide, hydrobromic acid, octyl alcohol, and inhibitors are classified as hazardous materials. These materials, and any lithium bromide solution they are in, must be handled in accordance with current Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations.

Solutions of lithium bromide and water are nontoxic, nonflammable, nonexplosive, and can be handled easily in open containers. The solution is chemically stable and does not undergo any appreciable change in properties even after years of use in the absorption chiller. Its general chemical properties are similar to those of table salt.

Because lithium bromide salt can corrode metal in the presence of air, wipe off any solution spilled on metal parts or tools and rinse the part with fresh water as soon as possible. After rinsing, coat the tools with a light film of oil to prevent rust. After emptying metal containers of solution, rinse the container with fresh water to prevent corrosion. Immediately wipe or flush the floor if lithium bromide or octyl alcohol is spilled on it. Refer to the appropriate Material Safety Data Sheet (MSDS) for information on leak or spill disposal.

Lithium bromide should be stored only in the original container or in a completely clean container. Used lithium bromide solution should be disposed of by a reputable chemical disposal company.

CHARGING SOLUTION — Solution is drawn into the absorber through the solution pump service valve while the pump is off. To minimize the chance of air entering the chiller, the solution should *not* be drawn in directly from a small container. A vacuum pump should be in operation while the solution is being charged into the chiller to remove entrained noncondensables.

1. Connect a flexible hose to a ½-in. MPT adapter and a ½-in. (15-mm) pipe. Fill both pipe and hose with deionized water to minimize any air entry into the chiller.
2. Insert the ½-in. (15-mm) pipe into the container (be sure it goes to the bottom), and connect the flexible hose to the solution pump service valve (Fig. 38). The lithium bromide container must be marked with the name of the inhibitor being used for your chiller. A 55% concentration solution must be used.
3. Open the service valve. Continue charging until the solution level is near the bottom of the container. *Do not allow air to be drawn into chiller.*
4. Either transfer the rest of the solution from a full container to this container or repeat the procedure from Step 1 until the amount specified in Table 6 has been charged into the chiller.

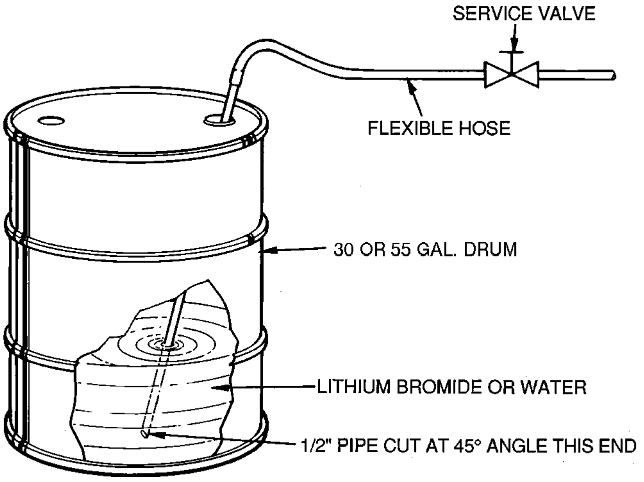


Fig. 38 — Charging Solution and Refrigerant

CHARGING SOLUTION FOR CONDITIONS OTHER THAN NOMINAL — The solution quantity can be adjusted to compensate for other than nominal values for the design chilled water temperature, cooling water temperature, or flows.

⚠ CAUTION

The solution should not be added to the chiller more than 24 hours before the chiller is ready to start. If the chiller is charged prematurely, the corrosion inhibitors lose their effectiveness, since they need heat to form the initial layer of corrosion protection.

The solution quantity can be increased or decreased by up to 10% of the nominal charge listed in Table 6. Adjust the quantity as follows:

1. Increase (or decrease) the nominal solution charge by 1% for each degree F (0.56° C) that the design chilled water temperature is below (or above) 44 F (7 C).
2. Increase (or decrease) the nominal solution charge by 1% for each 2° F (1.1° C) that the design cooling water temperature is above (or below) 85 F (29 C).
3. Increase the nominal solution charge by 1% for each 10% reduction in design cooling water flow below nominal 100%.
4. Do not adjust nominal charge for changes in steam pressure.

INITIAL REFRIGERANT CHARGING — The refrigerant charge must be de-ionized water that meets Carrier Specification No. RW01-19. *Do not use tap water.* Use Carrier Part No. PV30DB021, de-ionized water, which may be purchased from approved Carrier vendors. See Service Bulletin No. A9503 for additional information on refrigerant for the 16JT chiller.

Charge the water through the refrigerant pump service valve, following the appropriate steps in the Charging Solution section, page 58.

Charge at least the amount listed in Table 6 under Initial Refrigerant amount. This charge must be adjusted after start-up to achieve optimal Cycle-Guard™ control conditions to limit the maximum solution concentration (which prevents solution crystallization). However, any extra refrigerant should be limited because the normal refrigerant pump discharge pressure is below atmospheric pressure, and a vacuum bottle is required to remove refrigerant (see Final Refrigerant Charge Adjustment section, page 62).

Table 6 — Nominal Chiller Charges*

UNIT 16JT	LiBr SOLUTION		INITIAL REFRIGERANT	
	Gal	Kg	Gal	Kg
810,812,814	137	840	87	330
816,818,821	200	1225	106	400
824	246	1505	92	350
828	257	1575	92	350
832	309	1890	114	430
836	314	1925	114	430
841	366	2240	137	520
847	400	2450	137	520
854	440	2695	165	625
857	463	2835	165	625
865	514	3150	203	770
873	560	3430	232	880
880	623	3815	285	1080
080	754	4620	177	670
090	846	5180	201	760
100	903	5530	215	815
110	1017	6230	202	765
120	1097	6720	206	780
135	1264	7740	238	900
150	1377	8435	271	1025
080L	823	5040	197	745
090L	922	5650	211	800
100L	1006	6160	225	850
110L	1114	6825	219	830
120L	1200	7350	238	900
135L	1380	8450	277	1050
150L	1504	9210	304	1150

*Based on 55% concentration of solution, 44 F (7 C) leaving chilled water, 85 F (29 C) entering condensing water.

INITIAL CONTROL CHECKOUT AND ADJUSTMENT

Perform an Automated Control Test — The procedures in this section check the PIC control systems. The purpose of this checkout is to ensure that control circuits have not been affected by shipping or installation damage or altered in the process of making field wiring connections.

⚠ CAUTION

Follow the checkout sequence in detail. The chiller must be charged with solution and refrigerant before starting the checkout. Chilled water and condensing water circuits must be filled and operative, but the manual steam or hot water valve must remain closed.

⚠ CAUTION

Do not rotate hermetic pumps until the chiller is charged with lithium bromide-water solution and refrigerant.

Pull the fuses to determine which contactors are energized without actually running a motor, pump, or other device. The PIC checks most devices to verify their operation. Pulling the fuses may generate an alarm.

Check the safety controls status by performing an automated control test. The automated control test also checks whether all outputs and inputs are functioning, including:

- PC6400 inputs
- PC6400 outputs
- slave PSIO inputs
- slave PSIO outputs
- first 8-input module inputs
- second 8-input module inputs
- third 8-input module inputs
- capacity valve actuator

The chiller must be in the OFF mode in order to perform the automated control test. To place the chiller in OFF mode, press the STOP button located to the left of the LID softkeys. Close the manual steam supply valve before running the capacity valve actuator.

For information on how to access the CONTROL TEST menu and perform the test, refer to the PIC Control Tests section on page 31. The PIC Control Tests section also has a detailed description of the each of the functions checked by the automated controls test. Table 7 summarizes the devices and functions checked by the control tests.

Once the automated control test begins, the LID will ask the operator to confirm that each specific function or operation is occurring and whether or not to continue the test. If an error occurs, the operator has the choice of attempting to address the problem while the test is being run or to note the problem and proceed to the next part of the test.

When the automated control test is complete or if the [EXIT] softkey is pressed, the test will stop and the CONTROL TEST table will display on the LID. If a specific automated test procedure has not completed, access that procedure to test the function when you are ready to proceed with the Control Test process.

To Prevent Accidental Start-Up — The PIC can be configured so that chiller start-up is more difficult than just pressing the [LOCAL] or [CCN] softkeys during chiller service or other times when necessary. Access the MAINSTAT screen and highlight *CHILLER START/STOP*. Override the current START value by pressing the [SELECT] softkey and then the [STOP] and [ENTER] softkeys. The word SUPVSR will display on the LID.

Now, when attempting to restart the chiller, remember to remove the STOP override setting. Access the MAINSTAT screen and highlight *CHILLER START/STOP*. The 3 softkeys represent 3 choices:

- START − forces the chiller ON
- STOP − forces the chiller OFF
- RELEASE − puts the chiller under remote or schedule control

To return the chiller to normal control, press the [RELEASE] softkey; then, press the [ENTER] softkey. For additional information, see Local Start-Up, page 68.

The default LID screen message line indicates which command is in effect.

Table 7 — 16JT Functions and Devices Tested by the PIC Control Test

TEST	FUNCTION/DEVICE TESTED
1. Automated Control Test	Performs tests 2 thru 8
2. PC6400 Inputs	Cycle-Guard™ Auto/Manual valve. Weak LiBr leaving LCD (level control device box) Strong LiBr leaving G1 (high-stage generator) Weak LiBr leaving HX1 (high-temperature heat exchanger) Strong LiBr leaving G2 (low-stage generator) G2 LiBr overflow pipe Strong LiBr leaving HX1 LID OFF switch STOP button on LID
3. PC6400 Outputs	Chilled water pump Cooling water pump Solution and spray pumps Refrigerant pump Tower fan relay Alarm relay LID alarm light
4. Slave PSIO Inputs	Transducer voltage reference G1 internal pressure Solution pump 1 pressure Solution pump 2 pressure Refrigerant level sensor Refrigerant temperature Entering chiller water temperature Leaving chilled water temperature Weak LiBr leaving absorber temperature Weak LiBr leaving HX2 (low-temperature heat exchanger) temperature Cooling water entering absorber temperature Cooling water leaving absorber temperature
5. Slave PSIO Outputs	Cycle-Guard valve Chiller run relay
6. First 8-Input Module Inputs	Vapor condensate temperature Condensate temperature from G2 (refrigerant) Cooling water leaving condenser temperature Strong LiBr leaving low HX2 temperature Remote contacts Recirculating LiBr entering sprays Generator high temperature/pressure Low chilled water temperature
7. Second 8-Input Module Inputs	Chilled water flow Cooling water flow G1 high LiBr level Spare protective limit input Refrigerant pump overload/high temperature Solution pump 1 overload/high temperature Solution pump 2 overload/high temperature Spray pump overload/high temperature
8. Third 8-Input Module Inputs	Temperature reset (4 to 20 mA) Remote reset sensor Common supply sensor Common return sensor Dilution level switch Low level switch High level switch One spare input
9. Capacity Valve Actuator	Capacity valve position (a PC6400 output)

NOTE: During any test that is not automated, if any transducer or thermistor reading is out of the valid range, the maximum or minimum limit of that range (followed by an asterisk) and a message will display on the LID.

INITIAL START-UP

The following start-up procedures are used for absorption chillers with PIC control systems. During initial start-up, there is a period of time when initial inhibiting occurs in absorption chillers and large amounts of gas are generated. This break-in period may take up to 400 hours of run time to complete.

Preliminary Check — Check the operation of the auxiliary equipment and the status of the system before starting the 16JT chiller. Set up the chiller configuration and perform the control tests as described in the Set Up Chiller Control Configuration beginning on page 57 and Perform an Automated Control Test, page 59.

PREPARATION

1. Supply power to the control panel, chilled water, and cooling water pumps. Open the manual steam supply valves, chilled water valves, and cooling water valves.
2. Make sure the pumps are rotating in the proper direction. To do this, place a 30-in. (762 mm), 30 psi (207 kPa) gage on the discharge of each pump. Access the PUMPSTAT screen on the LID and turn on each pump from the LID. Read the pressure on each pump gage. The solution and spray pumps should read approximately 28 psi (193 kPa). If a pump pressure is 30 in., the pump is rotating in the wrong direction. The refrigerant pump pressure should read from 5 to 11 in. (127 mm to 279 mm). If it is less than 5 in., the pump is rotating in the wrong direction. If a pump is rotating in the wrong direction, it must be corrected. To correct rotation, switch any 2 wires on the pump overload blocks (Fig. 10, Item 11) in the control panel.

⚠ WARNING

Do not work on electrical components, including control panels or switches, until you are sure that all power is off and no residual voltage can leak from capacitors or solid-state circuits. Lock open and tag electrical circuits during servicing. If work is interrupted, confirm that all circuits are deenergized before resuming work.

3. Access the MAINSTAT screen to disable the *STARTUP PULLDOWN FAILURE* by pressing the [DISABLE] and then the [ENTER] softkeys.

   NOTE: When the following 2 conditions are met: the G1 solution temperature is greater than 160 F (71 C) and the leaving chilled water temperature is decreasing, then the *STARTUP PULLDOWN FAILURE* is automatically set to ENABLE.
4. Place the Cycle-Guard™ switch in the AUTO. position. Depress the [LOCAL] softkey. The chiller will begin the start-up procedure.
5. When the chiller has reached the RAMPING mode in the start-up cycle (as indicated in the primary and secondary messages on the LID) and the solution is warm, press the [MENU], [STATUS], [MAINSTAT], and [SELECT] softkeys on the LID. Scroll down to *TARGET CAPACITY VALVE*. Press the [SELECT] softkey; then press the [ENTER] softkey. This puts a supervisory hold on the capacity valve and limits its opening to the current value.
6. Determine the chiller absorber loss as described in Maintenance Procedures, Absorber Loss Determination section, page 80.

   If the absorber loss is greater than 12° F (4.4° C), evacuate the chiller (see Maintenance Procedures, Chiller Evacuation section, page 81) to remove any noncondensables that might prevent normal operation. As an alternate procedure, limit steam pressure to keep the strong solution temperature under 140 F (60 C) and allow the purge to remove the noncondensables.
   Once the absorber loss has been reduced to below 12 F (6.7 C) by either of the above procedures, the purge will evacuate the chiller to the normal absorber loss of 8 F (4.4 C) or less.
7. Add the amount of octyl alcohol specified in Table 8 through the solution pump service valve. (Refer to Maintenance Procedures, Adding Octyl Alcohol section, page 82.) Do not allow air to be drawn into chiller. The addition of octyl alcohol should be postponed until most of this break-in period has elapsed or the accumulation rate of noncondensables has decreased.

After the absorber loss has been reduced to below 12° F (6.7° C) by either of the above procedures (Step 6), place the chiller in automatic operation, with the capacity control released and steam pressure normal. The purge will evacuate the chiller to the normal absorber loss of 8° F (4.4° C) or less.

Table 8 — Octyl Alcohol Initial Charge

16JT	OCTYL ALCOHOL	
	Gal	L
810,812,814	1	3.8
816,818,821,824	2	7.6
828,832,836	2	7.6
841,847,854	3	11.4
857,865,873	4	15.2
880	5	19.0
080	6	22.7
080L,090	7	26.5
090L,100	8	30.3
100L,110	10	37.9
110L,120	12	45.5
120L,135	14	53.1
135L,150	16	60.6
150L	18	68.2

Final Adjustment of Capacity Controls — Allow the chiller to operate long enough with a fairly stable load for the system to reach equilibrium. Verify that the chilled water temperature is close to the set point and the system is stable (with little capacity control valve cycling or searching).

The controller tuning parameters have been factory-configured for control stability with typical applications. However, if necessary, the parameters can be adjusted from the LID by accessing the SERVICE3 display screen, selecting the parameter that needs fine tuning, and making the appropriate changes. See Capacity Overrides section, page 34, and PIC System Functions, page 22.

Final Refrigerant Charge Adjustment — The adjustment should be made after:

1. Chiller is operating with stable temperatures at 40 to 100% of full load.
2. Absorber loss is 12° F (6.6° C) or less.
3. Refrigerant specific gravity is 1.02 or less.

The refrigerant charge is adjusted so that the Cycle-Guard™ system can limit maximum solution concentration and avoid solution crystallization. Proceed as follows:

1. *Place Cycle-Guard Switch on the control panel in the AUTO. position. Then, if the Cycle-Guard valve remains off at least 10 minutes, proceed to Step 2.* If not, gradually reduce the load on the chiller (to reduce the solution concentration) until the Cycle-Guard valve remains off. The valve will be energized when the refrigerant *HIGH LEVEL SWITCH*, is closed (CLOSE on the EVAPSTAT display screen).
2. Remove a solution sample from the solution pump service valve and measure the specific gravity and temperature.
3. Locate the intersection point of the specific gravity and temperature values on the equilibrium diagram (Fig. 40 or 41). Read down from this point to the solution concentration scale to determine the percent lithium bromide by weight in the weak solution.
4. Determine the approximate percent of full load on the chiller by comparing the chilled water temperature spread and flow in relation to design. Refer to this percent load in Table 9 and find the corresponding weak solution concentrations required to make the refrigerant charge adjustment. The refrigerant level charge can be adjusted at either refrigerant level.

Table 9 — Weak Solution Concentrations for Adjusting Refrigerant Charge

REFRIGERANT LEVEL	PERCENT LOAD ON CHILLER						
	100	90	80	70	60	50	40
	Weak Solution Concentration (%)						
High	56.6	57.0	57.4	57.8	58.2	58.5	58.8
Mid	54.2	54.6	54.9	55.2	55.5	55.9	56.2

NOTE: Concentrations listed in this table are for nominal design conditions. For special design conditions, obtain the special concentration settings from the factory.

5. Adjust chiller operating conditions until the chiller operates *with stable temperatures* at either of the weak solution concentrations (±0.1%) listed in Table 10 under the selected percent load.
6. To increase the concentration:
   a. Increase the load.
   b. Lower chilled water temperature from the LID by accessing the SETPOINT screen (press the MENU and SETPOINT softkeys), selecting the *CHW_IN SETPOINT*, and use the softkeys to make the appropriate adjustment.
   c. Raise the cooling water temperature (or throttle cooling water flow).

   After adjusting these conditions, repeat Steps 2 and 3 to verify the solution concentration.
7. Calibrate the refrigerant level device in the refrigerant chamber to ensure proper control of the solution concentrations. The refrigerant level device must be calibrated at the 2 points described below.

   Calibration Point 1: The chiller is operating at high load and the solution concentration is taken at high refrigerant level. The chiller should be running close to its maximum capacity, and the condenser water temperature should be between 80 and 90 F (27 and 32 C). Take a solution sample at the solution pump service valve. Determine and record its concentration. From the LID, press MENU and STATUS. Scroll to EVAPSTAT. From the EVAPSTAT table, scroll to *REFRIGERANT LEVEL SENSOR* and record the voltage; it should be between 0 and 5 vac. Next, adjust the solution concentration and voltage. At the LID, press MENU and SERVICE. After entering your password, scroll to and select the EQUIPMENT SERVICE table. Select the SERVICE1 table and scroll to *CONC AT HIGH LEVEL.* Press the INCREASE or DECREASE softkeys to adjust to the concentration (XX.X%) recorded above. Press ENTER. Scroll to *VOLTS AT HIGH LEVEL* and press the INCREASE or DECREASE softkeys to adjust the voltage (X.X) to match the voltage recorded above. Press ENTER.

   Calibration Point 2: The chiller is operating at low load and the solution concentration is taken at low refrigerant level. The chiller should be running at 50% load and allowed to stabilize at this load for at least one hour. Take a solution sample and voltage reading as described for Calibration Point 1. Record the solution concentration and voltage readings as described for Calibration Point 1. Access the SERVICE1 table as described above and adjust the *CONC AT LOW LEVEL* and *VOLTS AT LOW LEVEL* to match the recorded data.
8. Check the status of the Cycle-Guard valve. If it is open, gradually remove water from the refrigerant pump service valve until the Cycle-Guard valve closes. (See Solution or Refrigerant Sampling section, page 81.) If the Cycle-Guard valve is closed, add small quantities of water to the chiller until the Cycle-Guard valve opens. Water can be drawn into the chiller through the refrigerant pump service valve. Fill the charging hose with water before opening the pump service valve. *Do not allow any air to be drawn into the chiller.*

   The Cycle-Guard valve cannot be energized while the pump is off.

   Add or remove water to change the solution concentration as needed. *When adding or removing water, allow approximately 10 minutes for the temperatures and concentrations to stabilize. Periodically check the weak solution concentration while adjusting the refrigerant charge. Re-adjust chiller conditions, if necessary, to maintain controlled concentration.*
9. If the solution charge has been increased (or decreased) for design conditions other than nominal, decrease (or increase) the refrigerant charge by an equal amount. (Refer to the Charge Chiller with Solution and Refrigerant, Charging for Conditions Other than Nominal, page 58.)

Check Chiller Operating Conditions — Check to be sure that the chiller temperatures, pressures, water flows, and solution and refrigerant levels indicate that the system is functioning properly. Keep a log of the chiller's operating parameters using the LID status and maintenance screens as a source of data and a log sheet, such as the sample log sheet shown in Fig. 39.

Check Chiller Shutdown — Depress the Stop button. The capacity control valve closes and the Cycle-Guard valve opens to dilute the solution. When the solution has been sufficiently diluted, the chiller shuts down.

Depending on the solution concentration before shutdown, the shutdown can take up to 20 minutes. If the chiller does not shut down correctly, check the operation of capacity controls, refrigerant level switches, Cycle-Guard valve, and chiller wiring.

JOB NAME: ______________________________ LOCATION: ______________________________

CHILLER MODEL NO: ______________________________ S/N: ______________________________

OPERATION HOURS: ______________________________ TAKEN BY: ______________________________

DATE: ______________________________ JOB NO.: ______________________________

ITEM NO.	DATA ITEM*	RECORD 1	RECORD 2	RECORD 3	RECORD 4	REOORD 5	RECORD 6	RECORD 7	RECORD 8
	EVAPORATOR:								
1	Entering Chilled Water Temperature								
2	Leaving Chilled Water Temperature								
3	Refrigerant Temperature								
4	Specific Gravity of Refrigerant Sample								
5	Cycle-Guard™ Valve Status								
6	Chilled Water PD								
7	Refrigerant Pump Pressure								
8	Refrigerant Level Sensor								
	ABSORBER:								
9	Cooling Water In Temperature								
10	Cooling Water Out Temperature								
11	Weak LiBr Leaving Absorber Temperature								
12	Specific Gravity of Weak LiBr Sample								
13	Weak LiBr Sample Temperature								
14	Weak LiBr Leaving High HX2 Temperature								
15	Weak LiBr Leaving Drain HX Temperature								
16	Weak LiBr Leaving HX1 Temperature								
17	Solution to Sprays Temperature (Recirc LiBr Entering Sprays)								
18	Cooling Water PD								
19	Pump Pressures(s) (Solution Pump 1 & 2 Pressures)								
20	Solution Level LCD								
	CONDENSER:								
21	Cooling Water Out Temperature								
22	Vapor Condensate Temperature								
23	Cooling Water PD								

Fig. 39 — Sample Log for 16JT Chiller

ITEM NO.	DATA ITEM*	RECORD 1	RECORD 2	RECORD 3	RECORD 4	REOORD 5	RECORD 6	RECORD 7	RECORD 8
	GENERATOR:								
24	Strong LiBr Leaving G1 Temperature								
25	Strong LiBr Leaving HX1								
26	Strong LiBr Leaving G2 Temperature (Strong LiBr Lvg G2)								
27	Strong LiBr Lvg Low HX2								
28	Condensate Temperature From G2								
29	G1 Internal Pressure								
30	Steam Supply Pressure								
31	Steam Pressure to Chiller								
32	Actual Capacity Valve % of Opening								
	ADDITIONAL DATA ITEMS:								
33	Chilled Water GPM								
34	Absorber Water GPM								
35	Condenser Water GPM								
36	Refrigerant Saturation Temperature								
37	Weak LiBr Concentration								
38	Weak LiBr Saturation Temperature								
39	Strong LiBr Concentration, G1								
40	Strong LiBr Concentration, G2								
41	Absorber Loss								
42	Evaporator Approach								
43	Absorber Approach								
44	Condenser Approach								

LEGEND

G1 — High-Stage Generator
G2 — Low-Stage Generator
GPM — Gallons Per Minute
HX — Heat Exchanger
HX1 — High-Temperature Heat Exchanger
HX2 — Low-Temperature Heat Exchanger
LCD — Level Control Device
LiBr — Lithium Bromide
PD — Pressure Differential
SG — Specific Gravity

*See Table 10 for information on how to obtain data for this log.

Fig. 39 — Sample Log for 16JT Chiller (cont)

Table 10 — How to Obtain Data for Log (Fig. 38)

ITEM NO.	HOW OBTAINED	UNITS
1	Default screen (CHW_IN) or EVAPSTAT screen	DEG F (DEG C)
2	Default screen (CHW_OUT) or EVAPSTAT screen	DEG F (DEG C)
3	Default screen (EVAP_REF) or EVAPSTAT screen	DEG F (DEG C)
4	Measured by operator	SG (Specific Gravity)
5	Light on control box or read on EVAPSTAT screen	ON/OFFMANUAL/AUTO
6	Gage reading by operator	psid (kPad)
7	Measured by Operator	psig (kPa)
8	EVAPSTAT screen	Volts
9	Default screen (ABS_IN) or or ABSSTAT screen	DEG F (DEG C)
10	Default screen (ABS_OUT) or ABSSTAT screen	DEG F (DEG C)
11	Default (ABS_SOL) screen or ABSSTAT screen	DEG F (DEG C)
12	Measured by operator	SG
13	Measured by operator	DEG F (DEG C)
14	ABSSTAT screen	DEG F (DEG C)
15	Measured by operator	DEG F (DEG C)
16	ABSSTAT screen	DEG G (DEG C)
17	ABSSTAT screen	DEG G (DEG C)
18	Gage reading	psig (kPa)
19	ABSSTAT screen	psig (kPa)
20	View sightglass	—
21	Default or CONDSTAT screen (COND_OUT)	DEG F (DEG C)
22	CONDSTAT screen	DEG F (DEG C)
23	Measured by operator	psid (kPad)
24	Default or GENSTAT screen (G1_SOL)	DEG F (DEG C)
25	GENSTAT screen	DEG F (DEG C)
26	GENSTAT screen	DEG F (DEG C)
27	GENSTAT screen	DEG F (DEG C)
28	Default screen or GENSTAT (G1_SAT) screen	DEG F (DEG C)
29	GENSTAT screen	psi (kPa)
30	Measured by operator	psig (kPa)
31	Measured by operator	psig (kPa)
32	GENSTAT screen	%
33	Chilled Water PD [6] X (2.31) ± (dh)*	ft H_2O (mH_2O)
34	Cooling Water PD [18] X (2.31) ± (dh)*	ft H_2O (mH_2O)
35	Cooling Water PD [23] X (2.31) ± (dh)*	ft H_2O (mH_2O)
36	Use equilibrium chart, (Fig. 39): Refrigerant Temperature [3], and Refrigerant Sample specific gravity (SG) [4].	DEG F (DEG C)
37	Use equilibrium chart (Fig. 40), Weak LiBr Sample Temperature [12], and Weak LiBr Sample SG [13].	%
38	Use equilibrium chart (Fig. 40), Weak Solution concentration [37], and Weak LiBr Leaving Absorb [11].	DEG F (DEG C)
39	Use equilibrium chart (Fig. 7), Strong LiBr Leaving G1 [24], and Condensate Temperature from G2 [28].	%
40	Use equilibrium chart (Fig. 7), Vapor Condensate Temperature [22], and Strong LiBr Leaving G2 [26].	%
41	[41] = [36] − [37], where 0 to 8 is normal; 8 to 12 requires action; and more than 12 is out of range. Or, see *ABSORBER LOSS* on the APPROACH screen.	DEG F (DEG C)
42	[42] + [2] − [3], where 0 to 3 is normal; 4 to 5 requires action; and more than 5 is out of range. Or, see *EVAPORATOR APPROACH* on the APPROACH sereen.	DEG F (DEG C)
43	[43] = [11] − [10], where 4 to 8 is normal; 8 to 12 requires action; and more than 12 is out of range. Or, see *ABSORBER APPROACH* on the APPROACH screen.	DEG F (DEG C)
44	[44] = [22] − [21], where 4 to 8 is normal; 8 to 12 requires action; and more than 12 is out of range. Or, see *CONDENSER APPROACH* on the APPROACH screen.	DEG F (DEG C)

*d/h is the difference in height (ft) between 2 pressure gages. If the inlet pressure gage is higher than the outlet pressure gage, use +dh; if the inlet pressure gage is lower than the outlet pressure gage, use −dh.

NOTE: Numbers in [ ] refer to item numbers in Fig. 39.

Consult the PD tables for PD at 6 GPM. Data is in the 16JT Product Data manual. Use:

$$GPM_2 = GPM_1 \left(\frac{PD_2}{PD_1} \right)^{.55}$$

where 1 is the design condition.

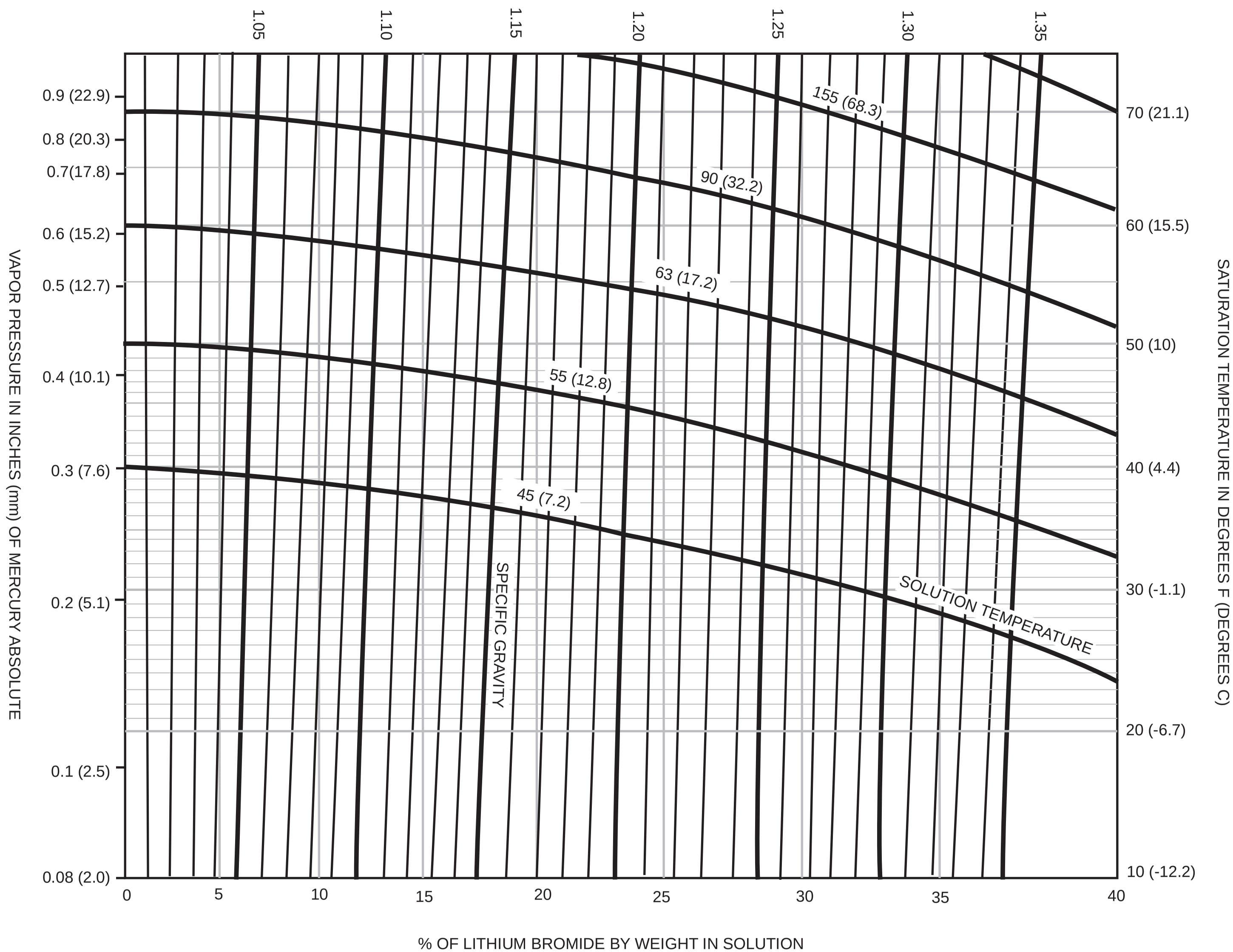


Fig. 40 — Partial Equilibrium Diagram of Weak LiBr Solution Concentration (Used to Help Calculate Absorber Loss)

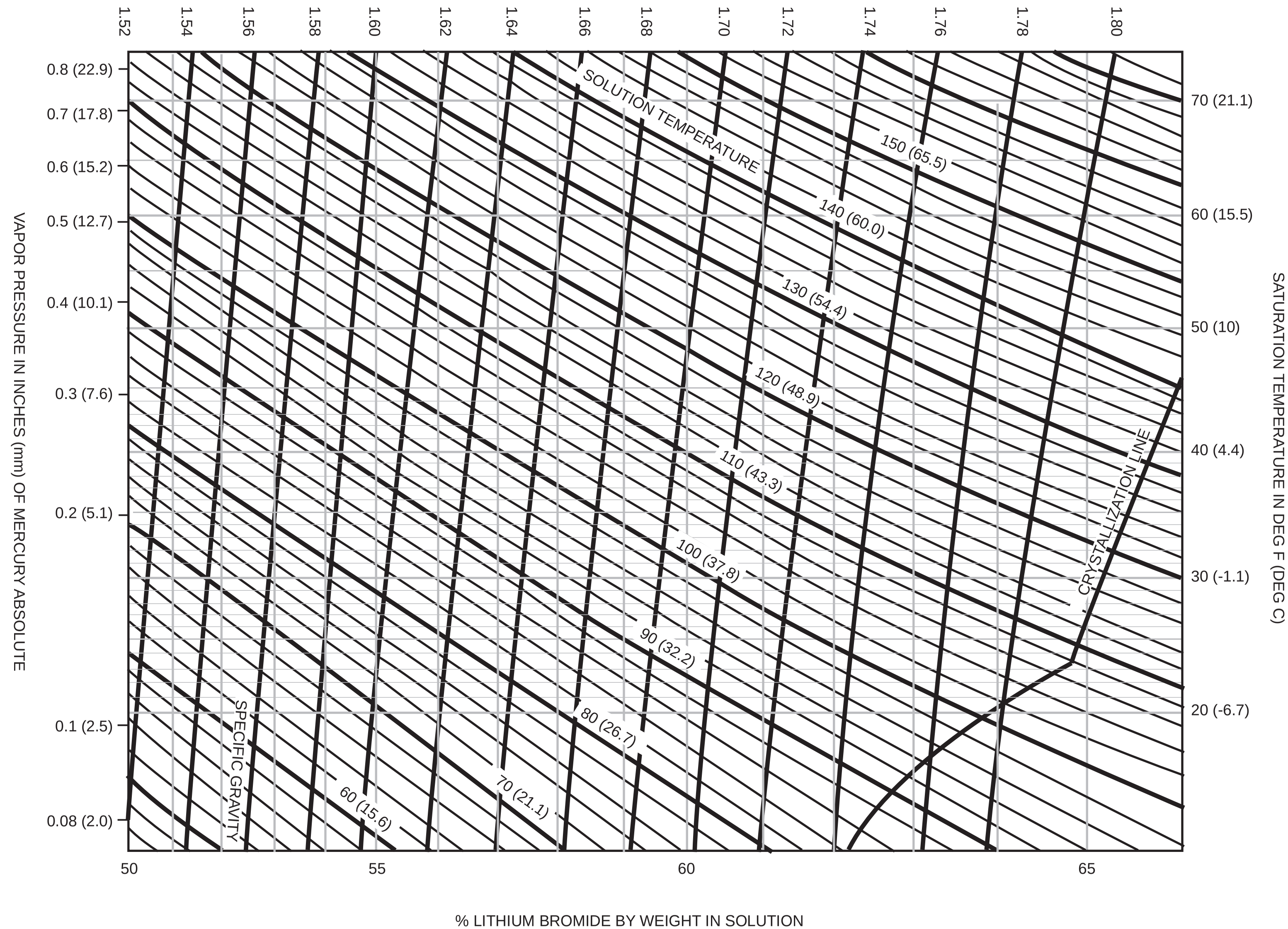


Fig. 41 — Partial Equilibrium Diagram of Strong LiBr Solution Concentration (Used to Determine Percent of LiBr by Weight in the Weak Solution and Absorber Saturation Temperature)

Check Low Refrigerant Level Operation — *After the chiller has completed a normal shutdown:*

1. From the LID, access the PUMPSTAT display screen by pressing the MENU and STATUS softkeys. From the PUMPSTAT screen, select *REFRIGERANT PUMP*, and press the ON softkey to turn it on.
2. From the PUMPSTAT screen, scroll to *CYCLE GUARD AUTO/MANUAL* and press the MANUAL softkey to set it to manual, or set the Cycle-Guard™ Auto/Manual switch on the front of the control box to manual. This transfers refrigerant from the evaporator and lowers the refrigerant level until it reaches the low-level switch. *LOW LEVEL SWITCH* on the EVAPSTAT screen should read OPEN and the pump should stop. If the pump becomes noisy, it may be caused by cavitation (which, in turn, is caused by lack of refrigerant). Do NOT allow the pump to remain in operation under this condition. Release the refrigerant pump by accessing the PUMPSTAT screen, scrolling to *REFRIGERANT PUMP*, and pressing the SELECT and RELEASE softkeys.
3. Release the Cycle-Guard switch and the refrigerant pump (if not already released in Step 2) for normal operation. To release the Cycle-Guard switch, set the Cycle-Guard on the control panel to AUTO. Or, access the PUMPSTAT screen on the LID and release the Cycle-Guard switch by scrolling to *REFRIGERANT PUMP* and pressing the RELEASE softkey. Then scroll to *CYCLE GUARD AUTO/MANUAL* and press the AUTO softkey.

   When enough refrigerant has been recovered from the solution to raise the evaporation level above the low-level switch, the refrigerant pump will run.

Determine Noncondensable Accumulation Rate — After approximately 400 hours of chiller operation, the rate of noncondensable accumulation in the purge should be measured to be sure that the chiller does not have an air leak. If a leak is indicated, it must be corrected as soon as possible to minimize internal corrosion damage. Refer to Maintenance Procedures, Noncondensable Accumulation Rate section on page 80 for checking procedures.

Instruct the Operator — Check to be sure that the operator(s) understands all operating and maintenance procedures. Point out the various chiller parts and explain their functions as part of the complete system:

- evaporator
- absorber
- generators (high- and low-stage)
- high- and low-temperature heat exchangers
- condenser
- relief devices
- refrigerant and solution charging valve
- temperature sensor locations
- pressure transducer locations
- Schrader fittings
- waterboxes
- tubes
- vents
- drains

In addition, review the following systems and equipment.

PURGE SYSTEM — Closing and opening the valves as well as the purge rate.

CONTROL SYSTEM — CCN and LOCAL start, reset, menus, softkey functions, LID operation, occupancy schedule, set points, safety controls, and auxiliary and optional controls.

AUXILIARY EQUIPMENT — Starts and disconnects, separate electrical sources, pumps, and the cooling tower.

CHILLER CYCLES — Describe solution concentration and purge cycles.

MAINTENANCE — Review scheduled, routine, and extended shutdowns; the importance of maintaining log sheets, solution analysis, water treatment, tube cleaning; and the importance of maintaining a leak-free chiller.

SAFETY DEVICES AND PROCEDURES — Electrical disconnects, relief device inspection, and solution handling.

OPERATIONS KNOWLEDGE — Check the operator's understanding of the following: start, stop, and shutdown procedures; safety and operating controls; solution sampling; and job safety.

START-UP, OPERATION, AND MAINTENANCE MANUALS — Review these documents with the operator(s).

START-UP/SHUTDOWN/RECYCLE SEQUENCE (Fig. 42)

Figure 42 summarizes the start-up/shutdown/recycle sequence.

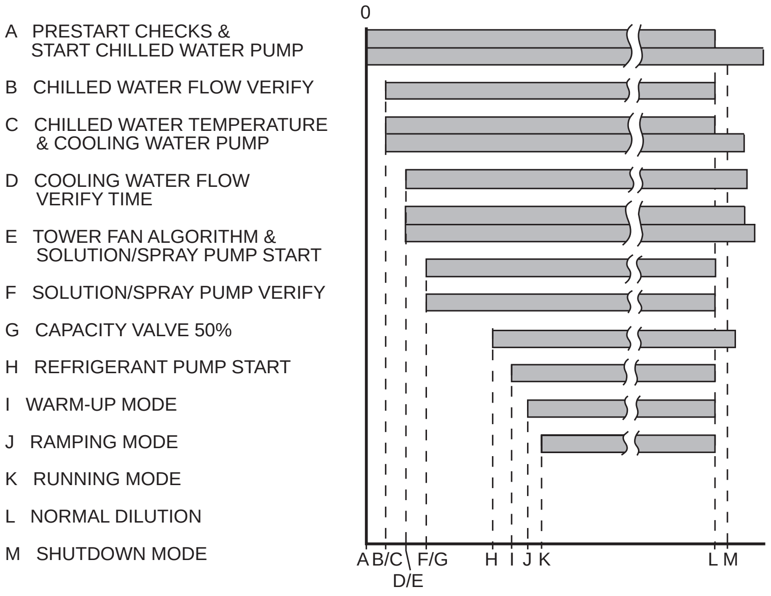
Local Start-Up — Local start-up (or a manual start-up) is initiated by pressing the LOCAL softkey, which is on the default LID screen. Local start-up can proceed if the chiller schedule indicates that the current time and date has been established as a run time and date. This condition is referred to as ''occupied.'' See the sections on Time Schedule Operation (page 21), Occupancy Schedule (page 31), To Prevent Accidental Start-Up (page 59) and Fig. 19.

If the current time and date is not established as a run time, the chiller can be forced to start as follows. From the default LID screen, press the MENU and STATUS softkeys. Scroll to highlight MAINSTAT. Press the SELECT softkey. Scroll to highlight *CHILLER START/STOP*. Press the START softkey to override the schedule and start the chiller.

NOTE: The chiller will continue to run until this forced start is released, regardless of the programmed schedule. To release the forced start, highlight *CHILLER START/STOP* from the MAINSTAT screen and press the RELEASE softkey. This action returns the chiller to the start and stop times established by the schedule.

NOTE: The chiller may also be started by overriding the time schedule. From the default screen, press the MENU and SCHEDULE softkeys. Scroll down and select the current schedule. Select OVERRIDE, and set the desired override time.

Another condition for local start-up must be met for chillers that have the *REMOTE CONTACTS OPTION* on the EQUIPMENT CONFIGURATION screen set to ENABLE. For these chillers, the *REMOTE CONTACTS* parameter on the MAINSTAT screen must be ON. From the LID default screen, press the MENU and STATUS softkeys. Scroll to highlight MAINSTAT and press the SELECT softkey. Scroll down the MAINSTAT screen to highlight *REMOTE CONTACTS* and press the SELECT softkey. Then, press the ON softkey. To end the override, select *REMOTE CONTACTS* and press the RELEASE softkey.



A. **Prestart Checks and Chilled Water Pump**. After the start-up command, the chiller performs PRESTART checks and starts the chilled water pumps.

B. **Chilled Water Flow.** Twenty seconds after the *CHILLED WATER PUMP* is set to ON, the PIC checks to see that *CHILLED WATER FLOW* is verified. It continues to check the *CHILLED WATER FLOW* up to the *WATER FLOW VERIFY TIME.*

C. **Chilled Water Temperature and Cooling Water Pump**. The chilled water temperature is measured. If it is above the *CONTROL POINT* plus the *CONTROL POINT DEADBAND*, then the cooling water pump is energized.

D. **Cooling Water Flow Verification.** Twenty seconds after the cooling water pump is energized, the PIC checks that *COOLING WATER FLOW* is verified. It continues to check cooling water flow up to the *WATER FLOW VERIFY TIME*.

E. **Tower Fan Algorithm and Solution/Spray Pump.** The PIC starts the tower fan algorithm and the *SOLUTION AND SPRAY PUMPS* are energized (ON).

F. **Solution and Spray Pump Verification.** Twenty seconds after the *SOLUTION AND SPRAY PUMPS* are energized, their discharge pressure is measured to verify that the pumps are on.

G. **Capacity Valve.** The PIC sets the *ACTUAL CAPACITY VALVE* to 50% open.

H. **Refrigerant Pump.** Five minutes after the capacity valve is signalled to open, the *REFRIGERANT PUMP* is energized (ON).

I. **Warm-Up Mode.** The chiller is now in the WARMUP mode. The capacity valve is opened 1/3 of the way (from 50% to the capacity valve *WARMUP TRAVEL LIMIT*) every 5 minutes.

J. **Ramping Mode.** When the WARMUP mode is complete, RAMPING mode begins, and the chilled water temperature is brought to the set point within the ramping parameters.

K. **Running Mode**. The chiller is in normal RUN mode. Schedules and overrides are in effect.

L. **Normal Shutdown With Dilution.** If there is chilled water flow and there is no low chilled water temperature and if *SOL PUMP1 OVERLD/HITEMP, SOL PUMP2 OVERLD/HITEMP,* and *REF PUMP OVERLD/HITEMP* are NORMAL, then a dilution cycle is completed. In the dilution cycle, the *SOLUTION AND SPRAY PUMPS* and *REFRIGERANT PUMP* are energized (ON), and the *CYCLE GUARD VALVE* is OPENed for 15 minutes or until the *DILUTION LEVEL SWITCH* is OPENed.

M. **Shutdown Mode.** The capacity valve is closed, refrigerant pump is deenergized, Cycle-Guard™ valve is closed, cooling water pump and tower fan are deenergized, and solution and spray pumps are deenergized. If it is a RECYCLE shutdown, the chilled water pump remains energized; otherwise, it is deenergized.

Fig. 42 — Start-Up/Shutdown/Recycle Sequence

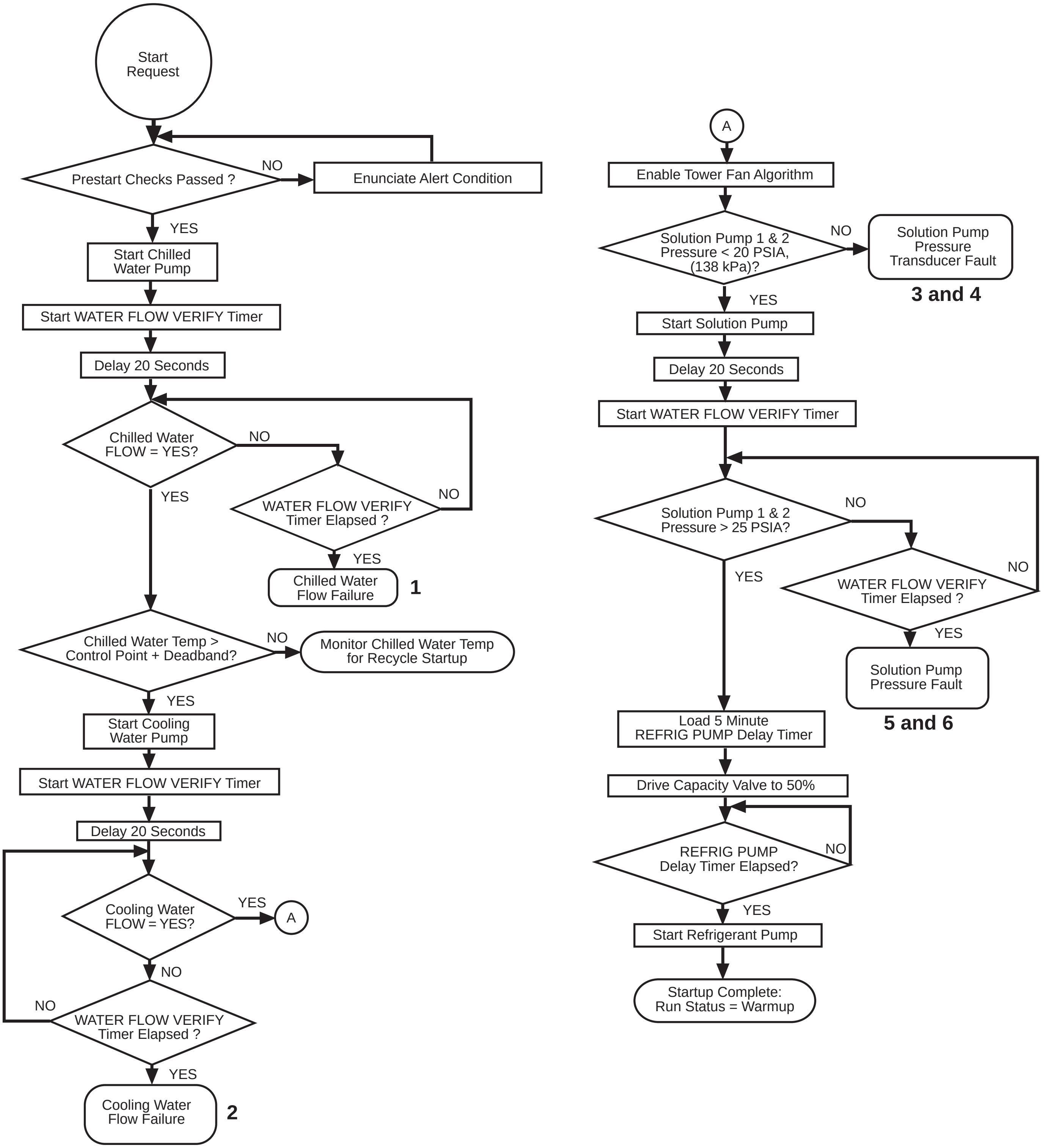
Pre-Start — Once these conditions are met, the PIC then performs a series of pre-start checks to verify that all pre-start alerts and safeties are within the limits shown in Table 5 (Safety Contacts and Alert Limits). The pre-start checks include:

- *STRONG LiBr LEAVING G1* <230 F (110 C)
- *REFRIGERANT TEMP* is greater than *REFRIGERANT TRIPPOINT + REFRIGERANT OVERRIDE DELTA T*
- *G1 INTERNAL PRESSURE* is less than or equal to 2 psi for non-recycle starts, less than or equal to 5 psi for recycle starts
- *WEAK LiBr LVG ABSORB* is less than *WEAK LiBr LVG ABS ALERT*
- *LOW LEVEL SWITCH* is closed (set to CLOSE)

The run status line on the LID reads STARTING. See Fig. 43, a flowchart of the start-up procedure. If the checks are successful, the chilled water/pump relay will be energized.

Twenty seconds later, the PIC begins to monitor several chiller functions which, if they fail, will abort the start-up sequence. These functions are listed below and have corresponding numbers in Fig. 43.

1. *CHILLED WATER FLOW* not confirmed within the *WATER FLOW VERIFY TIME* period (operator configurable; default time, 5 minutes)
2. *COOLING WATER FLOW* not confirmed within the *WATER FLOW VERIFY TIME* period
3. *SOLUTION AND SPRAY PUMPS* are OFF, *SOLUTION PUMP 1 PRESSURE* < 20 psia (138 kPa), and *SOLUTION PUMP 2 PRESSURE* < 20 psia (138 kPa)
4. *SOLUTION AND SPRAY PUMPS* are ON
5. *SOLUTION PUMP 1 PRESSURE* > 25 psia (172 kPa)
6. *SOLUTION PUMP 2 PRESSURE* > 25 psia (172 kPa)



NOTE: The numbered boxes represent the chiller functions which, if they fail, will abort the start-up sequence.

Fig. 43 — 16JT Chiller Start-Up Flowchart

If a function fails, an alarm displays on the LID with a message specific to the type of failure. To re-start the start-up sequence, find the cause of the alarm, remedy the problem, press the RESET softkey on the control panel, and re-initiate the start-up sequence.

NOTE: *SOLUTION PUMP 2 FAULT* will not occur if it is set to DSABLE. See the SERVICE3 menu, Table 3, Example 11.

After the *CHILLED WATER FLOW* is verified, the PIC compares the chilled water temperature to *CONTROL POINT* plus *CONTROL POINT DEADBAND*. If the chilled water temperature is less than or equal to the *CONTROL POINT* plus *CONTROL POINT DEADBAND*, the PIC goes into the RECYCLE mode.

If the temperature is greater than the *CONTROL POINT* plus *CONTROL POINT DEADBAND*, then the *COOLING WATER PUMP* is energized.

After 20 seconds, the PIC verifies the *COOLING WATER FLOW*. The PIC waits up to the *WATER FLOW VERIFY TIME* to confirm flow.

After the *COOLING WATER FLOW* has been verified, the *TOWER FAN CONTROL* algorithm is enabled. Then, the PIC monitors the *SOLUTION PUMP 1 PRESSURE* and the *SOLUTION PUMP 2 PRESSURE*. If both pressures are less than 20 psia (138 kPa), the PIC energizes the *SOLUTION AND SPRAY PUMPS*.

Twenty seconds later, the PIC monitors the *SOLUTION PUMP 1 PRESSURE* and the *SOLUTION PUMP 2 PRESSURE* to be sure they are both greater than 25 psia (172 kPa). If they are, the capacity control valve is set to 50%.

After 5 minutes, the *REFRIGERANT PUMP* is energized, and the PIC control starts the warm-up mode.

Warm-Up — At the start of the warm-up period, the capacity valve is set to 50% of its fully open position. During warm-up, for a period of 20 minutes, the capacity valve continues to open to its *WARMUP TRAVEL LIMIT* (an operator-configurable value) in three 5-minute stages. At each 5-minute interval, the valve opens 1/3 of the way between its initial 50% and the *WARMUP TRAVEL LIMIT*.

During each 5-minute interval, the chiller must pass 2 warm-up fault tests for 15 seconds before it can proceed to the next 5-minute interval. If the warm-up tests are not passed or if 20 minutes of warm-up time have elapsed without the tests being passed, an alarm is set and a non-recycle shutdown begins.

CONCENTRATION PROTECTION DURING START-UP/PULLDOWN FAILURES (Check Method 1) —During the warm-up period, the PIC checks the *STRONG LiBr LEAVING G1* temperature to see that it is increasing. The PIC also monitors the *LEAVING CHILLED WATER* temperature to see that it is decreasing. If both these conditions are met, then the override and fault protection is enabled.

After five minutes, if the *LEAVING CHILLED WATER* temperature is decreasing, the warm-up period continues. After an additional 5 minutes, if the *LEAVING CHILLED WATER* temperature is still decreasing, the start-up is complete and the ramp loading sequence begins. If a non-recycle shutdown is begun, the LID displays, PROTECTIVE LIMIT, SLOW PULLDOWN: LCHW.

Fifteen minutes after start-up is complete, the PIC monitors the *STRONG LiBr LEAVING G1*. If it is less than 158 F (70 C), then a non-recycle shutdown is initiated. The LID displays, PROTECTIVE LIMIT, STRONG LIBR LEAVING G1. The *LEAVING CHILLED WATER* temperature is also monitored.

WARM-UP FAILURES — A failure occurs during the warm-up period under the following conditions:

If the *REFRIGERANT PUMP* has been ON for 15 minutes and the *STARTUP PULLDOWN FAILURE* is ENABLED (see the MAINSTAT screen on the LID), *and*

1. The *CHW_OUT PULLDOWN DEG/MIN* is less than or equal to 0, and CHW_OUT is not decreasing.
2. The *STRONG LIBr LEAVING G1*is less than 158 F (70 C).

Ramp Loading Mode — Ramp loading slows down the rate at which the chiller loads up. This feature can prevent the chiller from loading up during the short period of time when the chilled water loop has to be brought down to normal design conditions and helps to reduce steam demand by slowly bringing the chiller water to the control point. However, the total steam draw during ramp loading remains almost unchanged.

After start-up and warm-up, the PIC switches to the ramp loading mode (RAMPING on the MAINSTAT screen). During the ramp loading mode, the *LEAVING CHILLED WATER* or *ENTERING CHILLED WATER* temperature change is limited to the *TEMP PULLDOWN DEG/MIN*. This is the rate that the controlled temperature is changed to reach the set point. The default rate is 3 F (1.7 C) per minute. The control valve is allowed full travel to obtain this goal unless an inhibit or close signal is received by the PIC based on another algorithm.

To set or change the temperature pulldown rate, refer to the Ramp Loading Control section, page 33.

Normal Run Mode — Under normal run mode, the PIC controls the capacity valve position in response to the monitored chilled water temperature with resets. The control algorithm uses the *CONTROL POINT DEADBAND*, *PROPORTIONAL INCR BAND*, *PROPORTIONAL DEC BAND*, *PROPORTIONAL CHW_IN GAIN*, and *G1 SOLUTION TEMP BIAS* to position the valve. These variables are found on the SERVICE3 screen. There may be other overrides limiting the capacity valve's position, such a the *RUNNING TRAVEL LIMIT*.

CONTROL POINT DEADBAND is a defined tolerance around the *CONTROL POINT*. *PROPORTIONAL INC BAND* is the divisor used when the chilled water temperature is above the *CONTROL POINT*. *PROPORTIONAL DEC BAND* is the divisor used when the chilled water temperature is below the *CONTROL POINT*. *PROPORTIONAL CHW-IN GAIN* is a multiplier used on the rate of change of the entering chilled water. It is a way to react to the building load. *G1 SOLUTION TEMP BIAS* limits the valve opening based on the rate of change of the strong solution leaving the generator. A high value, such as 5.5, has no affect. A lower value slows the response of the valve when the solution temperature is above 240 F (115.5 C).

CYCLE-GUARD™ CONCENTRATION CONTROL — During high-load operation, some abnormal conditions can cause the concentration of the lithium bromide solution to increase above normal. When this happens, the Cycle-Guard valve opens to transfer a small amount of refrigerant into the solution circuit to limit the concentration. This keeps the strong solution from crystallizing. For more information on controlling the Cycle-Guard valve, see the section, Capacity Overrides, page 34. See Fig. 44 for a flowchart of the Cycle-Guard valve operation.

The Cycle-Guard Auto/Manual switch on the control panel (See Item 19 in Fig. 10) can be set to MANUAL to operate the Cycle-Guard valve manually and independently of the PIC control. When the Cycle-Guard Auto/Manual switch is set to AUTO. the PIC controls the Cycle-Guard™ valve. The *REFRIGERANT PUMP* must be ON in order for the *CYCLE GUARD VALVE* to be OPEN. To view the status of the refrigerant pump and Cycle-Guard valve, access the PUMPSTAT screen on the LID.

CONTROL OVERRIDE AND FAULT PROTECTION (Check Method 2) — The *REFRIGERANT LEVEL SENSOR* voltage should be calibrated the first time the chiller is started up. Failure to do so causes inaccuracies between the refrigerant level and the concentration of the LiBr solution.

The *REFRIGERANT LEVEL SENSOR* is calibrated by taking a solution concentration reading at low and high concentration levels and entering these readings and their associated *REFRIGERANT LEVEL SENSOR* voltages in the SERVICE1 screen.

If the *STRONG LiBr LVG LOW HX2* temperature is greater than 118 F (47.8 C) and the *HIGH LEVEL SWITCH* is closed, the *CYCLE GUARD VALVE* opens. See Fig. 44. It closes when the *HIGH LEVEL SWITCH* is opened and after the *REFRIGERANT LEVEL SENSOR* has been reduced by an additional 0.5 vdc.

The *CYCLE GUARD LEVEL ADJUST* (see the SERVICE1 screen on the LID.) has a default value of 8, which represents the equivalent of 2.5 vdc from the *REFRIGERANT LEVEL SENSOR*. Zero (0) represents 4 vdc and 15 represents 1 vdc. The voltage is inversely proportional to the refrigerant level. This value sets the level that the PIC uses for opening and closing the Cycle-Guard valve when the *STRONG LIBR LVG LOW HX2* is less than 118 F (47.8 C).

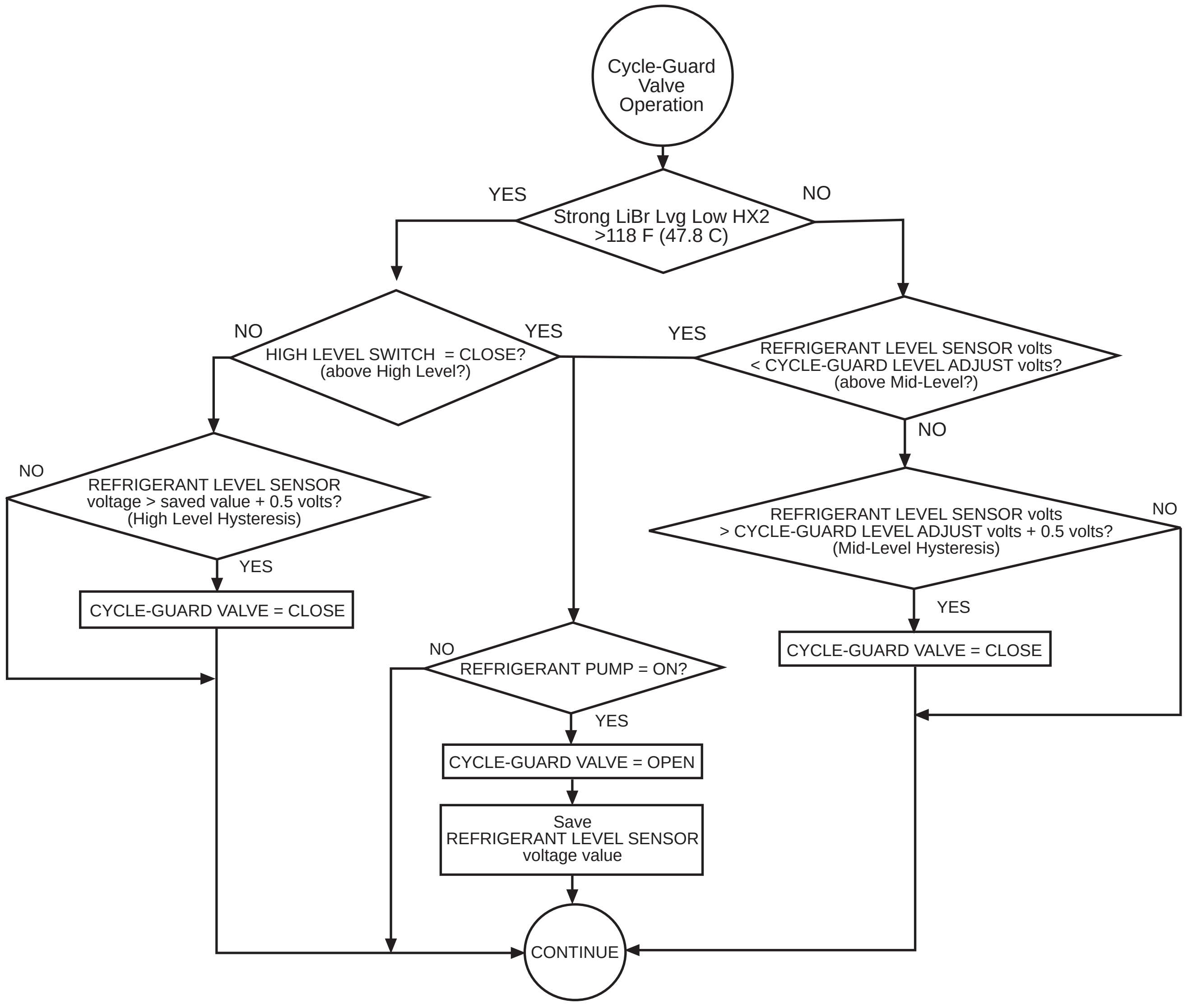


Fig. 44 — 16JT Chiller Cycle-Guard Operation Flowchart

If the *STRONG LiBr LVG LOW HX2* temperature is less than or equal to 118 F (47.8 C) and the *REFRIGERANT LEVEL SENSOR* is greater than the *CYCLE GUARD LEVEL ADJUST*, the *CYCLE GUARD VALVE* opens. The valve closes when the *REFRIGERANT LEVEL SENSOR* is 0.5 vdc less than the *CYCLE GUARD ADJUST*.

The *CYCLE GUARD COUNT* is incremented by one each time the *CYCLE GUARD VALVE* opens. When the *CYCLE GUARD VALVE* is opened, the LID display reads RUN CAPACITY LIMITED, CYCLE GUARD OPERATION.

REFRIGERATION PUMP CAVITATION PROTECTION (Low Concentration Limit) — During low-load operation with low condensing water temperature, the normal dilution of the solution lowers the refrigerant level in the evaporator. Before the level becomes low enough to cause pump cavitation and damage to the hermetic pump motor, the *LOW LEVEL SWITCH* opens and the *REFRIGERANT PUMP* is deenergized. After the *LOW LEVEL SWITCH* closes, a 5 minute delay occurs before the *REFRIGERANT PUMP* is re-energized.

G1 HIGH SOLUTION LEVEL CONTROL (Fig. 45) — An immersion electrode monitors the level of the high-stage generator solution. When the level is too high, the electrode energizes the Warrick high-level relay. If that condition persists for 30 seconds, the *SOLUTION AND SPRAY PUMPS* are turned OFF. The *STRONG LiBr TEMP LVG G1* is monitored and, if it is less than 212 F (100 C), the *SOLUTION/SPRAY PUMPS* are re-energized after 60 seconds. If the temperature is 212 F (100 C) or higher, the pumps are restarted after 30 seconds.

If the solution level remains too high for 5.5 minutes and was not corrected by stopping the pump(s), an alarm for ‘‘electrode fault’’ will be initiated, and a normal dilution cycle shutdown will occur. The *SOLUTION AND SPRAY PUMPS* will continue to operate through the shutdown sequence.

Each time the *G1 HIGH LiBr LEVEL* control is run, the *SOLUTION PUMP STARTS* count is incremented. See the PUMPSTAT screen on the LID. If this count exceeds 15 in one hour, the electrode fault alarm initiates a shutdown with dilution cycle.

Desolidification Mode (DESOLID) — The DESOLID (desolidification) mode is not a normal run mode but is a mode of operation initiated by the operator to desolidify LiBr that has crystallized. To put the chiller in DESOLID mode, do the following:

1. Be sure the chiller *CONTROL MODE* is set to OFF by checking the MAINSTAT screen on the LID (see Table 3, Example 1).
2. From the SERVICE1 screen (see Table 3, Example 9), set the *DESOLIDIFICATION TIME* to a minimum of 4 hours.
3. From the PUMPSTAT screen (see Table 3, Example 2), ENABLE the *DESOLIDIFICATION MODE*.
4. Manually control the pumps and the capacity control valve.

For more information on the DESOLID mode, see the section in Maintenance Procedures on Solution Decrystallization, page 91.

Shutdown Sequence (Fig. 46) — The chiller will shut down if any of the following occurs:

- the STOP button on the control panel is pressed for at least one second (the alarm light will blink once to confirm the stop command)
- a recycle condition is present (see Chilled Water Recycle Mode section)
- the *OCCUPIED* parameter on the MAINSTAT screen indicates NO; that is, the chiller is not scheduled to run at the current time and date.
- the chiller’s protective limits have been reached and the chiller is in an alarm state
- the start/stop status has been overridden to STOP from the CCN network or the LID

Normal shutdown begins by setting the *TARGET CAPACITY VALVE* to 0% (CLOSE) and starting a 15 minute solution pump timer. The PIC checks the following conditions to verify a dilution cycle shutdown: *CHILLED WATER FLOW* is verified; the *LOW CHILLED WATER TEMP* has not been exceeded; and *SOL PUMP 1 OVERLD/HITEMP*, *SOL PUMP 2 OVERLD/HITEMP*, and *REF PUMP OVERLD/HITEMP* are all not tripped.

The PIC control monitors the *DILUTION LEVEL SWITCH*. The *CYCLE GUARD VALVE* is set to OPEN until the *DILUTION LEVEL SWITCH* is closed or the solution pump timer reaches 15 minutes. Then, the *CYCLE GUARD VALVE* is closed and the *REFRIGERANT PUMP*, *COOLING WATER PUMP*, *SOLUTION AND SPRAY PUMPS*, and the *TOWER FAN RELAY* are all deenergized. If the shutdown is a non-recycle shutdown (not due to low CHILLED WATER temperature initiated by the RECYCLE *CONTROL MODE*), the *CHILLED WATER PUMP* is deenergized. If the chiller is in a recycle shutdown *CONTROL MODE*, the *CHILLED WATER PUMP* remains energized and the *CONTROL MODE* stays in RECYCLE.

Chilled Water Recycle Mode — When the chiller is running in a lightly loaded condition, it may cycle off and wait until the load increases before restarting. This cycling is normal and is known as a recycle shutdown. A recycle shutdown is initiated when any of the following conditions occur:

- when the chiller is operating under the control of leaving chilled water temperature (that is, when the *CHW_IN CONTROL OPTION* on the CONFIGURATION display screen is DISABLEd) and the *LEAVING CHILLED WATER* temperature is more than 3 F (1.7 C) below the *CONTROL POINT* for 3 seconds, and the *CONTROL POINT* has not increased by 1° F (0.56° C) in the last 5 minutes. Both *LEAVING CHILLED WATER* and *CONTROL POINT* values may be read from the MAINSTAT display screen on the LID.
- when the chiller is operating under the control of entering chilled water temperature (that is, when the *CHW_IN CONTROL OPTION* on the CONFIGURATION display screen is ENABLEd) and the *ENTERING CHILLED WATER* temperature is 3 F (1.7 C) below the *CONTROL POINT*, and the *CONTROL POINT* has not increased in the last 10 minutes. The *ENTERING CHILLED WATER* temperature may be read from the MAINSTAT display screen on the LID.
- when the *LEAVING CHILLED WATER* temperature is within 3 F (1.7 C) of the *REFRIGERANT TRIPPOINT* for 5 seconds. The *REFRIGERANT TRIPPOINT* may be viewed form the SERVICE1 screen.

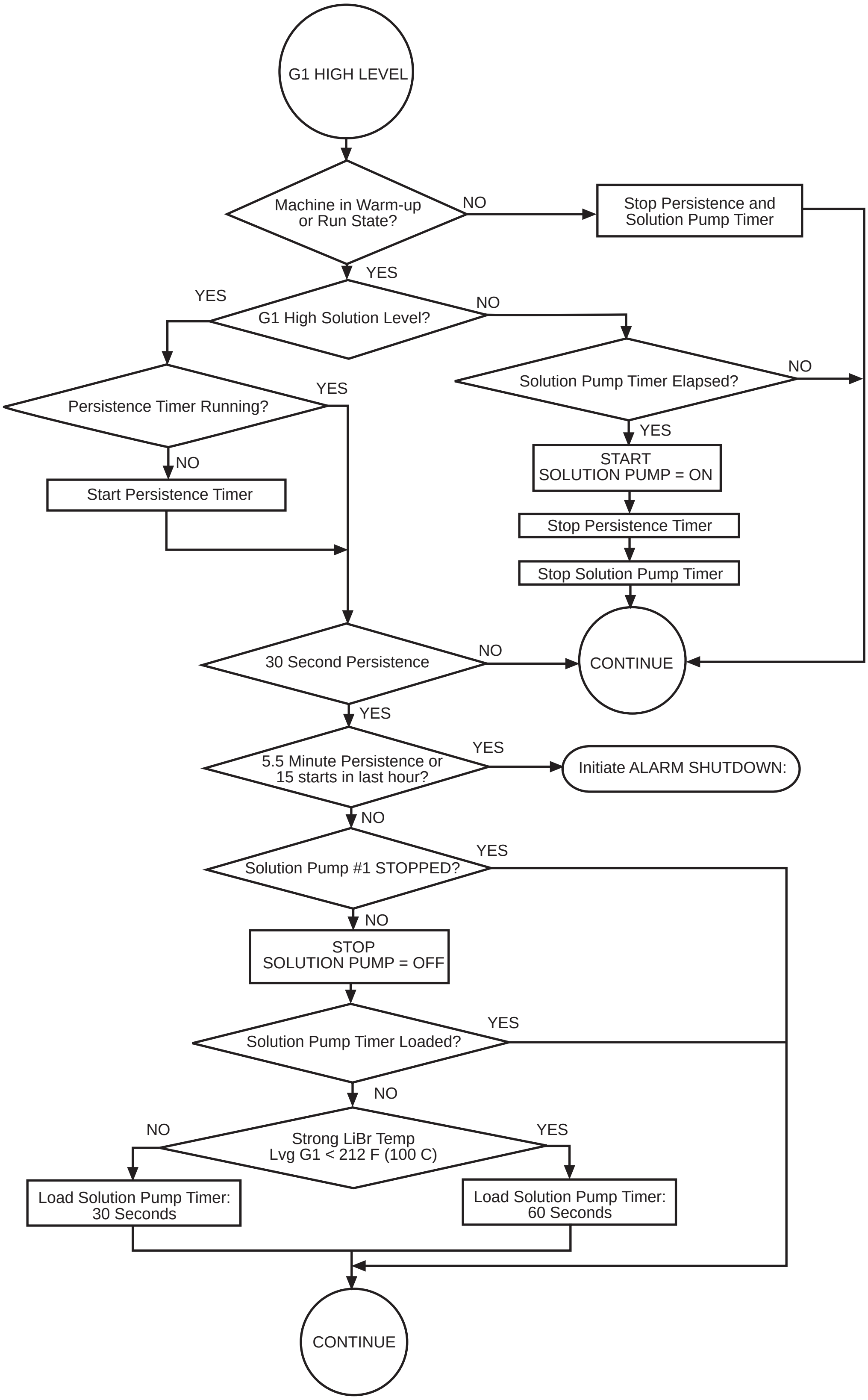


Fig. 45 — 16JT Chiller G1 High Solution Level Control Flowchart

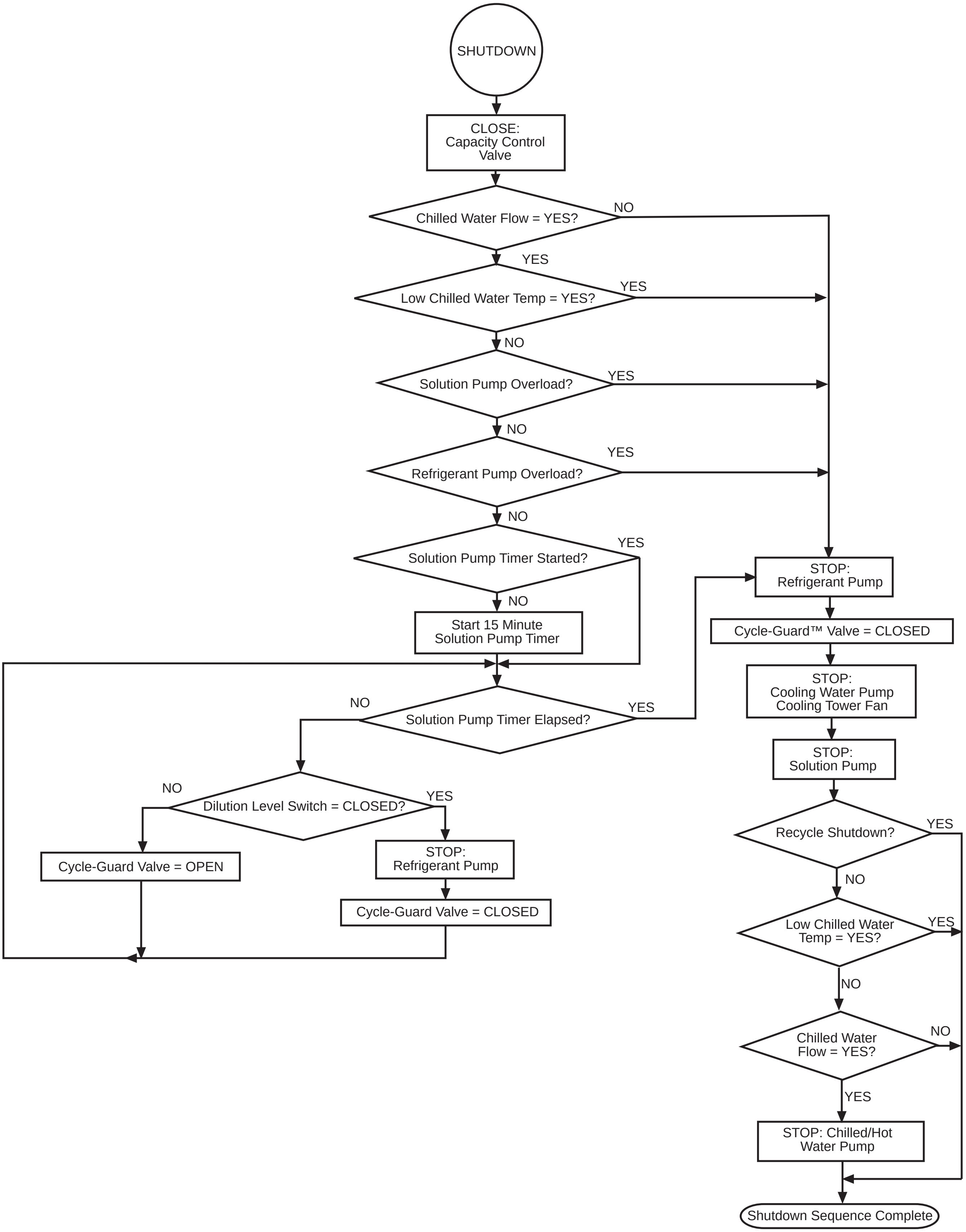


Fig. 46 — 16JT Chiller Shutdown Sequence Flowchart

When the chiller is in RECYCLE mode, the chilled water pump relay stays energized so that the chilled water temperature can be monitored for increasing load. The recycle control uses *RECYCLE RESTART DELTA T* to check when the chiller should be restarted. *RECYCLE RESTART DELTA T* is an operator-configured function that defaults to 5 F (2.8 C). This value is viewed and/or modified on the SERVICE1 screen. The chiller will restart when:

- the chiller is operating in leaving chilled water control and the *LEAVING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *RECYCLE RESTART DELTA T* for 5 seconds; or
- the chiller is operating in entering chilled water control and the *ENTERING CHILLED WATER* temperature is greater than the *CONTROL POINT* plus the *RECYCLE RESTART DELTA T* for 5 seconds.

Once these conditions are met, the chiller will begin a start-up with a normal start-up sequence.

Safety Shutdown — A safety shutdown is identical to a manual shutdown with the exception that the LID will display the reason for the shutdown, the alarm light will blink continuously, the default screen display will freeze, and the spare alarm contacts will be energized. A safety shutdown requires that the [RESET] softkey be pressed to clear the alarm. Before pressing the [RESET] softkey, record the default screen values. If the alarm is still present, the alarm light will continue to blink. Once the alarm is cleared (by fixing the problem and pressing the [RESET] softkey), the operator must press the [CCN] or [LOCAL] softkey to restart the chiller.

Power Loss Dilution Cycle — While the chiller is running, the PIC control records the concentration and temperatures at Points 9 and 14. See the Equilibrium Diagram and Chiller Solution Cycle section on page 5. At power-up, the chiller checks these points and compares them to the current conditions and the crystallization line. If the current conditions are less than the saved values plus a buffer, the LID displays MACHINE CRYSTALLIZATION and RUN DESOLIDIFICATION. If the current conditions are close to the crystallization line, the chiller enters a dilution cycle and the LID displays, DILUTION MODE XX MIN TIL COMPLETION.

OPERATING INSTRUCTIONS

Operator Duties

1. Become familiar with the absorption chiller and related equipment before operating. See Introduction and Chiller Description sections, pages 4-12.
2. Start and stop the chiller as required.
3. Inspect equipment; make routine adjustments; maintain chiller vacuum and proper refrigerant level; exhaust purge as required.
4. Keep a log of operating conditions and recognize abnormal readings.
5. Protect the system against damage during shutdown.

Before Starting the Chiller — Be sure that:

1. Power is on to the cooling water and the chilled water pump starters, the cooling tower fan, and the absorption chiller control panel.
2. Cooling tower has proper water level.
3. Chilled and condensing water circuits are full and valves are open.
4. Correct steam or hot water supply is available.
5. Air supply for pneumatic controls is adequate.
6. Alarm indicator lights are off.

Start the Chiller — If the chiller has manual auxiliary start, first energize the auxiliaries.

To release the control circuit after a safety shutdown, from the LID, press the [RESET] and then the [LOCAL] or [CCN] softkeys. This starts the chiller.

Now follow one of the 2 procedures described below as it applies to your chiller:

- Start-Up After Limited Shutdown — If chiller has been shut down for less than 3 weeks
- Start-Up After Extended Shutdown — If chiller has been shut down for 3 weeks or more

Stop the Chiller

1. The occupancy schedule starts and stops the chiller automatically once the time schedule has been set up.
2. Pressing the Stop button on the control panel for one second causes the alarm light to blink once to confirm that the Stop button has been pressed. Then, the chiller follows the normal shutdown sequence described in the Controls section, page 13. The chiller will not restart until the [CCN] or [LOCAL] softkey is pressed. The chiller is now in the OFF mode.

   If the chiller fails to stop, in addition to action the PIC initiates, the operator should close the manual steam valve and then open the main disconnect.

Start-Up After Limited Shutdown

1. Place the Cycle-Guard™ switch on the control panel door (Item 19 in Fig. 10) in the AUTO position.
2. Press the [LOCAL] or [CCN] softkey to start the chiller.

   The chiller should start in the normal manner. The primary and secondary locations on the LID default screen should display a series of messages reflecting the run status of the chiller. See Table 3, Example 1 (MAINSTAT screen) for the list of possible *RUN STATUS* displays. The solution typically heats up to normal operating conditions within 20 to 30 minutes.

   If, however, the chiller does not lower the leaving chilled water temperature to the design level, noncondensables may be present. In this case, take an absorber loss reading (see Maintenance Procedures, Absorber Loss Determination section, page 80).

   If absorber loss is 12° F (6.7° C) or less, the chilled water temperature should drop to the design level within a short period as the automatic purge evacuates the chiller. A completely evacuated chiller normally has an absorber loss of 8° F (4.4° C) or less. Purge the chiller.

   If absorber loss is greater than 12° F (6.7° C), follow the procedure for Start-Up After Extended Shutdown.
3. Empty the purge chamber periodically to allow the purge system to operate optimally. See Purge Manual Exhaust Procedure, page 79.

Start-Up After Extended Shutdown

1. Place the Cycle-Guard™ switch on the control panel door (Item 19 in Fig. 10) in the AUTO position.
2. Press the LOCAL or CCN softkey to start the chiller. When the refrigerant pump starts and the solution is warm (strong solution approximately 100 to 130 F [38 to 55 C]), override the normal capacity valve position. Access the MAINSTAT screen., scroll to *TARGET CAPACITY VALVE*, and press the INCREASE or DECREASE softkeys until the capacity reaches 50%. Press the SELECT and ENTER softkeys.
3. Let the chiller run until there is a temperature drop across the evaporator. To determine this, access the LID default screen and read the temperatures for CHW_IN and CHW_OUT. The CHW_OUT temperature should be lower than the CHW_IN temperature.
4. Empty the purge storage chamber. See Purge Manual Exhaust Procedure, page 79.
5. Check the noncondensables accumulation rate. See Noncondensable Accumulation Rate section, page 80.
6. If the noncondensable accumulation rates are within acceptable limits, slowly increase the *CAPACITY VALVE TARGET* (from the MAINSTAT screen) to 100%. Take at least 1 hour to do this step.
7. Determine the chiller absorber loss (see Maintenance Procedures, Absorber Loss Determination section, page 80). If absorber loss is 12° F (6.7° C) or less, open the capacity control valve by selecting *TARGET CAPACITY VALVE* from the MAINSTAT screen and pressing the RELEASE softkey to allow the chiller to operate. The purge will evacuate the chiller to the normal absorber loss of 8° F (4.4° C) or less. Purge the chiller.

   If absorber loss is more than 12° F (6.7° C), evacuate the chiller to remove noncondensables that can prevent normal operation (see Maintenance Procedures, Chiller Evacuation section, page 81). An alternative procedure is to limit steam pressure so that the low-stage generator strong solution temperature remains below 140 F (60 C) while the chiller purge removes the noncondensables.
8. When absorber loss is reduced to 12° F (6.7° C) or less, return steam pressure to normal and allow the purge to establish the normal 8° F (4.4° C) or less absorber loss rate.
9. After evacuation, check the noncondensable accumulation rate to determine chiller tightness (see Noncondensable Accumulation Rate section, page 80).
10. Empty the purge chamber periodically to allow the purge system to operate optimally. See Purge Manual Exhaust Procedure, page 79.

Start-Up After Below-Freezing Conditions — Refill all water circuits if previously drained. Then follow the procedure for Start-Up After Extended Shutdown.

Remove the solution from the refrigerant circuit by following the procedure, Removing Lithium Bromide from Refrigerant, page 82.

Chiller Shutdown — Normal Conditions

1. From the LID, press the STOP softkey. The chiller goes through automatic dilution for about 15 minutes and shuts down.
2. Close the main steam valve and stop the system pumps. Leave the chiller in this condition until the next start-up.

Chiller Shutdown — Below Freezing Conditions

1. From the LID, press the STOP softkey. Wait until automatic dilution is complete (about 15 minutes) and all chiller pumps stop.
2. Close the main steam valve and stop the system pumps.
3. The refrigerant circuit requires special treatment.
   a. Fill a hose with water (to avoid letting air into the chiller) and connect the hose between the solution pump and refrigerant pump service valves.
   b. Start the solution pumps by accessing the PUMPSTAT screen from the LID, selecting *SOLUTION AND SPRAY PUMPS*, and pressing the ON softkey. Open both service valves. Keep the steam valve closed. If the chiller has a refrigerant pump with above-atmospheric discharge pressure, it must be stopped for this procedure.
   c. Allow the solution pump(s) to run for 10 minutes. This transfers lithium bromide solution into the refrigerant and lowers the refrigerant's freezing point. Close the service valves and remove the hose.
   d. Start both solution and spray pumps and the refrigerant pump, and operate them for about one minute to be sure lithium bromide has been mixed throughout the refrigerant circuit.
   e. Release the solution pumps and the refrigerant pump by accessing the PUMPSTAT screen from the LID, selecting *SOLUTION AND SPRAY PUMPS* and *REFRIGERANT PUMP*, and pressing the RELEASE softkey.
4. Completely drain all tube bundles and flush all tubes with an antifreeze chemical such as glycol.

Actions After Abnormal Shutdown — Abnormal stop occurs automatically when any of the safety devices sense a condition which might be potentially damaging to the chiller. When this happens the steam valve closes completely, the alarm relay closes, and the type of problem is indicated in the primary and secondary messages on the LID default screen. The messages on the LID inform the operator of the most recent alarm condition. Record the default screen values, since they indicate the chiller's state before the alarm occurred. This information is lost after the alarm is cleared.

There may be multiple alarms and/or alerts stored in the alarm history. To view the alarm history, Press the MENU softkey, the SERVICE softkey, enter your 4-digit password, and then use the SELECT softkey to view the ALARM HISTORY screen.

To clear any alarms, the condition that caused the alarm must be corrected. Then press the RESET softkey. The alarm light will stop flashing and the alarm relay will open. The chiller is now ready for a dilution cycle or a restart.

If the condition that caused the alarm or alert is a one that does not allow shutdown dilution, the condition should be corrected and the chiller should be either restarted or be put into a normal dilution cycle. Put the chiller into a normal dilution cycle by following the instructions under Desolidification Mode (DESOLID), page 73.

Actions After Power Interruption — If the control power is interrupted during operation, the chiller stops immediately without the normal shutdown sequence and dilution cycle. If the capacity control valve is open, close the steam supply valve immediately.

Solution crystallization can occur if the concentration is high (e.g., chiller was operating with a relatively large load). If so, press the LOCAL or CCN softkey to restart the chiller as soon as possible after the power is restored. The chiller will not restart automatically when power is recovered. If the chiller cannot be operated because of crystallization, follow the decrystallization instructions in the Maintenance Procedures section, page 78.

To change the *DESOLIDIFICATION TIME*, press the MENU and then the SERVICE softkeys. Scroll to the EQUIPMENT SERVICE screen. Use the SELECT softkey to view the SERVICE1 screen. Scroll to *DESOLIDIFICATION TIME*, press the SELECT softkey, and then press the INCREASE or DECREASE softkey to change the desolidification time. Press the ENTER softkey to record your change.

PERIODIC SCHEDULED MAINTENANCE

Normal preventive maintenance for 16JT absorption chillers requires periodic, scheduled inspection and service. Each item in the list below is detailed in the Maintenance Procedures section.

Every Day

1. Log the chiller and system readings. To obtain the readings, access the Maintenance screens by pressing the MENU and SERVICE softkeys. Enter your 4-digit password, and then scroll to CONTROL ALGORITHM STATUS. Use the SELECT softkey to view the Control Algorithm Status screen. From this screen, you can use the SELECT softkey to view the COOLING, APPROACH, OVERRIDE, and CONCENTR tables from which you can access chiller and system readings.
2. Exhaust purge.

Every Month

1. Determine absorber loss.
2. Determine noncondensable accumulation rate.
3. Check the cooling fan on the control panel to be sure it is running properly.
4. Clean the chiller as needed.
5. Check safety and operating controls.

Every 2 Months

1. Check low-temperature cutout.
2. Check Cycle-Guard™ valve operation.

Every 6 Months

1. Check refrigerant charge.
2. Check octyl alcohol.

Every Year — Check tubes for scale and fouling.

Every 3 Years — Replace service valve diaphragms.

Every 5 Years or 50,000 Hours (Whichever Comes First)

1. Inspect hermetic pumps.
2. Filter or regenerate the solution if necessary.

MAINTENANCE PROCEDURES

Establish a regular maintenance schedule based on the actual chiller requirements, such as chiller load, run hours, and water quality. The time intervals listed in this section are offered only as guides to service.

Service Ontime — The LID displays a *SERVICE ONTIME* value on the PUMPSTAT screen. This value should be reset to zero by the service person or the operator each time major service work is completed so that the time between service can be seen.

Inspect the Control Center — Maintenance is generally limited to general cleaning and tightening of connections. Vacuum the cabinet to eliminate dust build-up. If the chiller controls malfunction, refer to the Troubleshooting Guide, page 92 for control checks and adjustments.

⚠ CAUTION

Be sure that power to the control center is off when cleaning and tightening connections inside the control center.

Check Safety and Operating Controls Monthly — To ensure chiller protection, the Automated Control Test should be done at least once a month. On the LID, press the MENU and SERVICE softkeys. Scroll to CONTROL TEST and press the SELECT softkey. See the PIC Control Tests section, page 31, for more details on these tests.

Log Sheets — Readings of chiller and system pressure-temperature conditions should be recorded daily to aid the operator in recognizing both normal and abnormal chiller conditions. The record also aids in planning a preventive maintenance schedule and in diagnosing chiller problems. A typical log sheet is shown in Fig. 39. Table 10 briefly explains how to obtain the data for log sheets.

Inspect Rupture Disc and Piping — The rupture disc on this chiller protects the system against the potentially dangerous effects of overpressure. To ensure against damage to the equipment and possible injury to personnel, this device must be kept in peak operating condition. At a minimum, the following maintenance is required.

1. At least once a year, disconnect the vent piping at the disc outlet and carefully inspect the holder and disc for any evidence of internal corrosion or rust, dirt, scale, leakage, etc.
2. If corrosion or foreign material is found, do not attempt to repair or recondition the disc. *Replace the rupture disc.*
3. If the chiller is installed in a corrosive atmosphere, conduct rupture disc inspections more frequently.

Inspect the Heat Exchanger Tubes

EVAPORATOR — Inspect and clean the evaporator tubes at the end of the first operating season. The tube condition determines the scheduled frequency for cleaning and indicates whether water treatment is adequate in the chilled water/brine circuit. Inspect the entering and leaving chilled water temperature sensors for signs of corrosion or scale. Replace the sensor if it is corroded or remove any scale if found.

ABSORBER/CONDENSER — Since this water circuit is usually an open system, the tubes may be subject to contamination and scale. Clean the tubes with a tube cleaning system at least once per year and more often if the water is contaminated. Inspect the entering and leaving absorber and condenser water sensors for signs of corrosion or scale. Replace the sensors if corroded or remove any scale if found.

Higher than normal condenser and absorber approaches, together with the inability to reach full refrigeration load, usually indicate dirty tubes or air in the chiller. If the refrigeration log indicates a rise above normal approaches, check the absorber/condenser loss against the leaving absorber/condenser water temperatures. If these readings are more than what the design difference is supposed to be, then the absorber or condenser tubes may be dirty or water flow may be incorrect. Check the absorber loss to verify that no noncondensables are in the chiller.

During the tube cleaning process, use brushes especially designed to avoid scraping and scratching the tube walls. Contact your Carrier representative to obtain these brushes. *Do not use wire brushes.*

⚠ CAUTION

Hard scale may require chemical treatment for its prevention or removal. Consult a water treatment specialist for proper treatment procedures.

Water Leaks — Water can infiltrate from the evaporator, absorber, or condenser circuits. Water accumulation is indicated during chiller operation when the refrigerant level increases and the Cycle-Guard™ valve operates too soon.

Water Treatment — Untreated or improperly treated water may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

⚠ CAUTION

Water must be within design flow limits, clean, and treated to ensure proper chiller performance and to reduce the potential of tube damage due to corrosion, scaling, erosion, and algae. Carrier assumes no responsibility for chiller damage that results from untreated or improperly treated water.

Purge Manual Exhaust Procedure (Fig. 47) — See also Chiller Description section, pages 4-12, for an explanation of the purge operation, component identification, and illustrations.

NOTE: The following does not apply to optional vacuum pump operation.

⚠ CAUTION

NEVER LEAVE the chiller during the purge operation. A failure to close the exhaust valve will disable the chiller and could cause the solution to crystallize.

OPERATE THE VALVES in the correct sequence.

NEVER LET AIR leak into the chiller.

MAKE SURE that the tip of the vinyl tube is at the bottom of the plastic bottle at all times.

NEVER SPILL any solution from the plastic bottle. If spilled on personnel or the floor, follow the warning pertaining to Handling Lithium Bromide (LiBr) Solution, page 58.

1. Exhaust purge only when the chiller and solution pump are operating, because the exhaust pressure is supplied by the solution pump.
2. Keep the end of the plastic tube below the liquid level in the plastic bottle.
3. Close the solution return valve (Fig. 8, Item 8; Fig. 9, Item 2).
4. Wait approximately 5 minutes for the storage chamber pressure to rise above atmospheric pressure.
5. Slowly open the exhaust valve. (Fig. 8, Item 10; Fig. 9, Item 11). If the liquid level in the exhaust bottle drops, close the valve and wait approximately 2 minutes.
6. Slowly reopen the exhaust valve. If bubbles appear in the exhaust bottle, leave the exhaust valve open until bubbles stop and the solution level in the bottle begins to rise. Close the valve; the purge is now exhausted. If bubbles are still present and the exhaust bottle is full, the procedure must be repeated (Steps 3 through 8).
7. Open the solution return valve to resume the purge operation.
8. Slowly open the exhaust valve and allow the solution in the bottle to be drawn into the purge tube. Lower the solution level until the bottle is one-third to one-half full. Close the exhaust valve before the solution level in the bottle nears the tube end. *Do not allow air to be drawn into the purge tube.*
9. Log the date and time of the purge evacuation to provide an indication of changes in the rate of noncondensable accumulation.

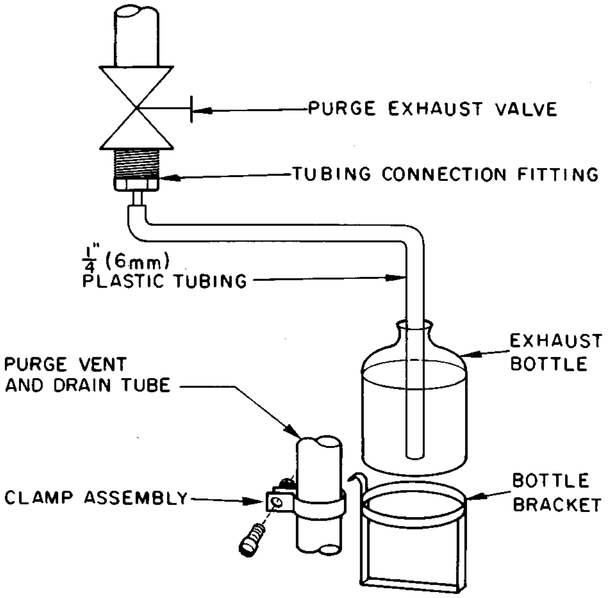


Fig. 47 — Purge Exhaust Assembly

Absorber Loss Determination — Take absorber loss readings when the chiller is operating with a stable temperature.

1. Make sure that the Cycle-Guard™ valve is closed and has not operated for at least 10 minutes before taking readings.
2. Fill thermometer wells on the discharge lines of the solution and refrigerant pumps with oil or heat-conductive compound and insert the thermometers.
3. Take refrigerant and solution samples (see Solution or Refrigerant Sampling, page 81), and determine the specific gravity and temperature of each sample. The samples can be returned to the chiller through the purge exhaust bottle.
4. Using the equilibrium diagram (Fig. 40 or 41), plot the intersection point of the specific gravity and temperature of the *solution* sample. Extend this point horizontally to the right and read the saturation temperature. Repeat with the *refrigerant* sample, using Fig. 40 and 41 and reading to the right for the saturation temperature.
5. Subtract the solution saturation temperature from the refrigerant saturation temperature. The difference is the absorber loss. Repeat the readings with a second sample to verify steady state conditions. (On larger chillers with multiple solution pumps, determine the saturation temperature for each pump.) If the absorber loss is greater than 12° F (6.7° C), chiller evacuation is necessary because excessive noncondensables may interfere with normal operation before they can be removed by the purge (see Chiller Evacuation section, page 81).

The absorber loss is calculated by the PIC and can be read on the LID. Press the MENU and then the SERVICE softkeys. Enter your 4-digit password. Scroll to the Control Algorithm Status screen. Select the APPROACH table. Read the value for *ABSORBER LOSS*. This value is much larger than those used on earlier chillers, because we are measuring the values corresponding to the conditions existing inside the absorber.

For probable causes and suggested remedies for high absorber loss, refer to the Troubleshooting Guide, beginning on page 92.

Noncondensable Accumulation Rate — The most important maintenance item on the 16JT absorption chiller is to maintain chiller vacuum within acceptable limits. Chiller vacuum tightness can be checked by determining the rate at which noncondensables accumulate. Some noncondensables are normally generated within the chiller; however, an air leak or the need for additional inhibitor is indicated if the accumulation rate increases.

After chiller evacuation or other service, operate the chiller for at least 200 hours before determining the noncondensable accumulation rate. Then proceed as follows (Fig. 48):

1. Fill a length of flexible hose with water and connect it to the purge exhaust connection. Insert the free end of the hose into a container of water. Exhaust the purge completely (see Purge Manual Exhaust Procedure section, on page 79).
2. Operate the chiller for 24 hours with the purge operating normally.
3. Fill a 2-pint (1000 cm^3) bottle with water and invert it in a clean container filled with water.
4. Insert the free end of a water-filled hose into the bottle.
5. Follow the purge exhaust procedure. Noncondensables displace water in the inverted bottle. Continue until bubbling in the bottle ceases and only solution flows from the exhaust tubing.

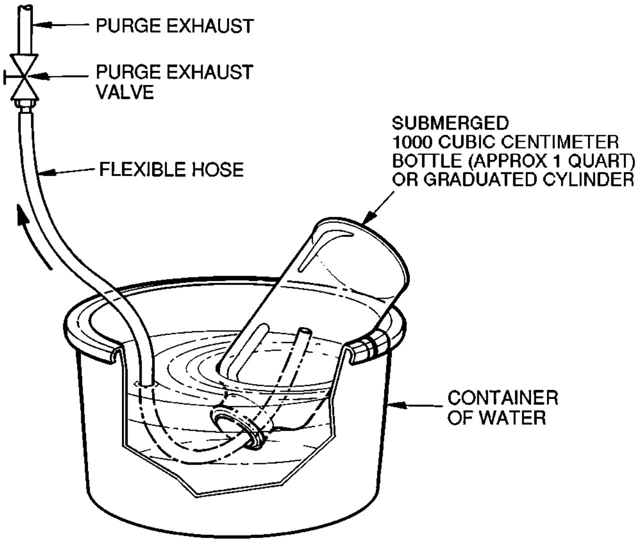


Fig. 48 — Collecting Noncondensables

6. Close the exhaust valve and mark the liquid level on the inverted bottle. Remove the bottle from the container.
7. Return the purge to normal operation. Replace the exhaust bottle (Fig. 8, Item 7; Fig. 9, Item 10). Open the solution return valve (Fig. 8, Item 8; Fig. 9, Item 2).
8. Measure the amount of noncondensables removed. If a graduated bottle was used to collect the noncondensables, the amount (volume) of noncondensables removed is indicated on the bottle. If a nongraduated bottle was used, mark the exhaust level, take the bottle out of the water container emptying any liquid that may be left in the bottle, and then fill the bottle with liquid to the exhaust mark. Pour the liquid into a graduated container to measure the volume displaced.
9. If the operating accumulation rate has increased substantially from previous rates, the chiller has an air leak or requires additional inhibitor. Have a solution sample analyzed (see Solution Analysis section, page 82, to determine the proper corrective action). *If a leak is indicated, it must be found and repaired as soon as possible to minimize internal corrosion damage.*

Chiller Leak Test — All joints welded at the time of chiller installation must be leak tested before initial start-up of the chiller. If the chiller has been opened for service, the chiller or the affected vessels must be pressurized and leak tested. Joints must also be leak tested after repair. If there is any indication of air leakage, leak test the entire chiller. There are 2 ways to leak test the chiller: pressurizing with dry nitrogen or introducing a refrigerant tracer.

DRY NITROGEN

1. Be sure the auxiliary evacuation valve, purge exhaust valve, and all pump service valves are closed.
2. Connect a copper tube from the pressure regulator on the cylinder to the auxiliary evacuation valve. Never apply full cylinder pressure to the pressurizing line.
3. Open the charging valve fully.
4. Slowly open the cylinder regulating valve.
5. Observe the pressure gage on the chiller and close the cylinder regulating valve when pressure reaches test level. *Do not exceed 8 psig (55 kPa).*
6. Test all joints with an ultrasonic leak detector or soap bubble solution. Mark the leaks.

7. Release chiller pressure, correct all leaks, and retest to ensure a proper repair.
8. Perform a chiller evacuation.

REFRIGERANT TRACER — Use an environmentally acceptable refrigerant as a tracer for leak test procedures such as HFC-134a or HCFC-22. Because HCF-134a and HCFC-22 are above atmospheric pressure at room temperature, leak testing can be performed with these refrigerants in the chiller.

⚠ DANGER

HCFC-22 and HFC-134a will dissolve oil and some nonmetallic materials, dry the skin, and, in heavy concentrations, may displace enough oxygen to cause asphyxiation. When handling these refrigerants, protect the hands and eyes and avoid breathing fumes.

⚠ WARNING

HFC-134a should not be mixed with air or oxygen and pressurized for leak testing. In general, HFC-134a should not be present with high concentrations of air or oxygen above atmospheric pressure, because the mixture can undergo combustion.

Use an electronic leak detector, halide leak detector, soap bubble solution, or ultra-sonic leak detector. Be sure that the room is well ventilated and free from concentration of refrigerant tracer to keep false readings to a minimum. Before making any necessary repairs to a leak, release the pressure in the chiller vessels.

Repair the Chiller Leak, Retest, and Apply a Standing Vacuum Test — After pressurizing the chiller, test it for leaks with a soap bubble solution, an electronic leak detector, a halide torch, or an ultrasonic leak detector. Bring the chiller back to atmospheric pressure, repair any leaks found, and retest.

After retesting and finding no leaks, apply a standing vacuum test. Refer to the Standing Vacuum Test section on page 56.

Chiller Evacuation — The chiller must be evacuated in order to remove excessive noncondensables. In addition, the chiller must be evacuated after air has entered it during service work or when absorber loss is greater than 12° F (6.7° C) during operation.

1. Connect an auxiliary evacuation device to the auxiliary evacuation valve (Fig. 49). Use a line size at least equal to the connection size on the auxiliary device and keep the line as short as possible. *A check valve must be used on the suction lines. Be sure all connections are vacuum tight.*

   A vacuum pump oil trap can also serve as a cold trap if it has a center well to hold dry ice or a mixture of salt and ice. Any water vapor that can contaminate the oil in the vacuum pump is condensed and removed by the cold trap. The cold trap reduces the time required for evacuation and eliminates the need for frequent replacement of the pump oil charge.
2. Start the evacuation device. After one minute, open the auxiliary evacuation valve. If the chiller is not operating, reduce chiller absolute pressure to the pressure equivalent to the saturation temperature of the refrigerant. (To determine the saturation temperature, determine the current chiller temperature. Then, read the corresponding saturation temperature from Fig. 40 or 41.) If the chiller is operating, evacuate it until absorber loss is 12° F (6.7° C) or less.
3. Close the auxiliary evacuation valve and turn off the auxiliary evacuation device.
4. Chiller evacuation can remove octyl alcohol. Check a solution sample for the presence of octyl alcohol and add more if necessary (see Adding Octyl Alcohol, page 82).

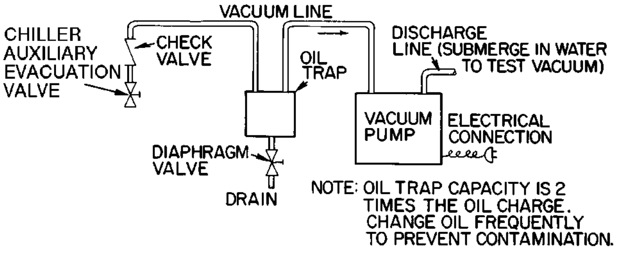


Fig. 49 — Chiller Evacuation Device

Solution or Refrigerant Sampling — (See precautions pertaining to handling lithium bromide solution as described in Charge Chiller with Solution and Refrigerant section, page 58.)

Take solution or refrigerant samples from the pump service valve while the pump is operating.

Before taking a sample for analysis or absorber loss determination, be sure the chiller is operating with a steady load and that the Cycle-Guard™ valve has not been energized within 10 minutes prior to sampling.

Attach a hose adapter to the pump service valve. *Do not use copper or brass fittings when taking samples for analysis; copper oxide can form and contaminate the samples.*

The solution pump normally discharges at above atmospheric pressure, but the refrigerant pump discharges at a vacuum, so the respective sampling procedures are different.

SOLUTION SAMPLE

1. Fill a length of flexible tubing with water and connect one end to the hose adapter. Place the free end in a container of water. Be sure the end is submerged (Fig. 50).
2. Open the valve slightly. When the container water level rises, wait several seconds to purge the water from the tube. Then remove the tube end from the water and fill the sample container.
3. Turn off the service valve and remove the hose and adapter.

REFRIGERANT SAMPLE (Fig. 51)

1. Connect a clean, empty vacuum sample container to the refrigerant pump service valve with a length of flexible hose.
2. Connect a vacuum pump to the vacuum sample container with a flexible hose and an isolation valve.
3. Pull a deep vacuum on the vacuum sample container and close the isolation valve.
4. Open the service valve slightly to drain the refrigerant sample into the container.
5. Turn off the service valve, remove the hose and adapter, and disconnect the vacuum pump.

Inhibitor — The initial charge of lithium bromide includes a lithium chromate or lithium molybdate inhibitor. The inhibitor is used in conjunction with alkalinity control to minimize the amount of hydrogen normally generated within the chiller. Excessive hydrogen generation interferes with chiller performance.

The inhibitor is gradually depleted during chiller operation and occasional replenishment is necessary. Solution alkalinity also changes over a period of time and must be adjusted (see Solution Analysis, below).

> IMPORTANT: Altering the inhibitor or using solution and internal surface treatments not specified by the equipment manufacturer may result in performance deterioration and damage to the absorption chiller.

Solution Analysis — Laboratory analysis of a solution sample gives an indication of change in solution alkalinity and depletion of inhibitor and may indicate the degree of chiller leak tightness.

Have the solution analyzed regularly. The frequency depends on the type of inhibitor in your chiller (chromate or molybdate). Check with your Carrier service representative for a suggested schedule. In addition, have the solution analyzed if there is an indication of a noncondensable problem. Take the sample from the solution pump service valve while the chiller is running (see Solution or Refrigerant Sampling section, page 81). The sample concentration should be between 58% and 62% by weight for best results.

Solution analysis should be done by an approved laboratory. The analysis interpretation and the adjustment recommendations should be made by a trained absorption specialist.

Solution adjustment procedures are not the same for chromate and molybdate solution inhibitors. Call your Carrier service representative for instructions on how to make this adjustment.

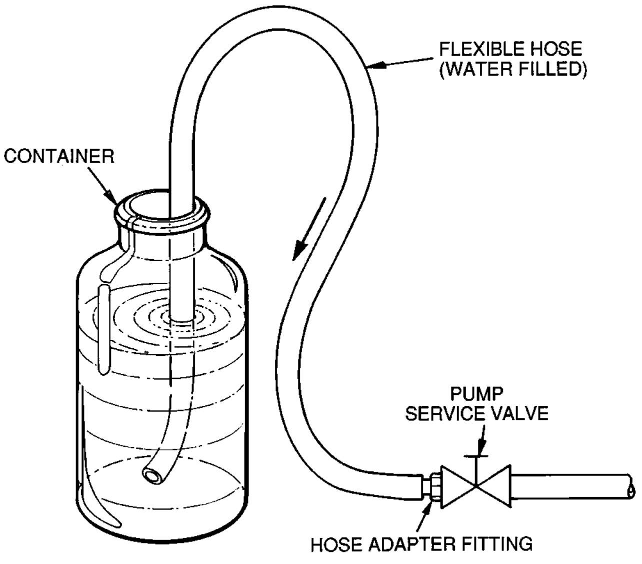


Fig. 50 — Adding or Removing Fluid

Adding Octyl Alcohol — Octyl alcohol may be required when the leaving chilled water temperature starts to rise above the design temperature without alteration of the control set point. Since the rise in temperature can also be caused by fouled tubes or other problems, use the following procedure to determine whether a lack of octyl alcohol is the cause.

1. Remove a sample of solution from the solution pump service valve (see Solution or Refrigerant Sampling section, page 81). If the solution has no odor of alcohol (very pungent), add about ½ gal. (2 L) of octyl alcohol.

   The addition of octyl alcohol also may be required after the chiller has been evacuated or after an extended period of operation.

> **⚠ CAUTION**
>
> Use only specified octyl alcohol. Other types of alcohol have a detrimental effect on chiller performance. Use Carrier Part No. 16B4−1551.

2. Fill a length of flexible tubing with water and connect one end to the solution pump service valve (see Fig. 50). Insert the other end in a container of octyl alcohol. Stop the chiller. Then open the service valve to allow alcohol to be drawn into the chiller. *Close the valve before drawing air into the hose.* Restart the chiller.

Removing Lithium Bromide from Refrigerant — During normal operation, some lithium bromide may be carried over into the refrigerant. Lithium bromide in the refrigerant is automatically transferred back to the absorber by the Cycle-Guard™ valve when it is needed. The refrigerant flows through the Cycle-Guard valve into the solution circuit, and separation is made in the generator in the normal manner.

Lithium bromide recovery can also be initiated by placing the Cycle-Guard switch in the manual position while the chiller is running and the capacity control valve is open. When the refrigerant specific gravity drops below 1.02, return the Cycle-Guard switch to AUTO. to close the Cycle-Guard valve.

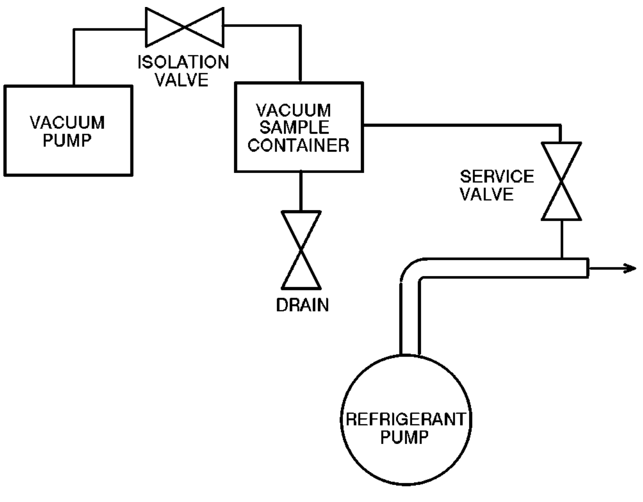


Fig. 51 — Refrigerant Sampling Technique

Refrigerant Charge Adjustment — Check the evaporator refrigerant (water) charge after every 6 months of operation. An increase in the amount of water in the chiller indicates tube leakage. Furthermore, the correct refrigerant charge must be maintained for accurate operation of the Cycle-Guard™ system.

For charge adjustment, refer to the Initial Start-Up, Final Refrigerant Charge Adjustment section, page 62.

Low Temperature Cutout Adjustment — This chiller safety serves to prevent freeze-up damage to the evaporator tubes. Check the cutout periodically to confirm that it trips at the selected setting. See Item TA1 on Fig. 4 and the figure of the leaving chilled water cut-out switch that accompanies Table 5. Also refer to the sensor locations in Fig. 52.

NOTE: If the cutout sensor has been exposed to temperatures above 120 F (49 C), the control must be recalibrated. See the figure below Table 4, page 34.

1. Remove the control sensing element from its well in the chilled water pipe. Immerse the element in a container of cool water. Slowly stir crushed ice into the water so that the temperature goes down at a rate not exceeding 1° F (0.5° C) per minute.
2. Observe the cutout temperature. It should be 9° F (5° C) below the design leaving chilled water temperature or a minimum of 36 F (2 C). *If the control fails to cut out by 36 F(2 C), stop the chiller immediately and replace the switch with a new calibration switch.*
3. When the control cuts out, the chiller shuts down immediately without going through the dilution cycle. The control cuts in when the sensing element warms up 7.2° F (4° C).

   If necessary, reset the cutout adjustment screw (Table 5) and recalibrate. Restart the chiller by pressing the RESET softkey and then the LOCAL or CCN softkey. Replace the sensing elements in their wells.

Cycle-Guard System Operation — To check the Cycle-Guard operation, place the Cycle-Guard switch in the manual position. The Cycle-Guard transfer valve energizes. The flow of refrigerant will cause the transfer line between the valve and the solution pump inlet to feel cold to the touch. This line should not feel cold when the transfer valve is closed (not energized). If the line is cold when the valve is deenergized, the valve is leaking and must be repaired. Return the Cycle-Guard switch to the AUTO. position.

During normal operation, the PC6400 controller controls the Cycle-Guard valve. The controller senses the strong solution concentration.

A Cycle-Guard system malfunction makes the chiller susceptible to solution crystallization. See the Troubleshooting Guide, pages 92-110 (Additional Problems/Symptoms and Their Probable Causes and Remedies, ‘‘Solution Crystallization During Operation’’). Also, refer to the section, Normal Run Mode, page 71.

Internal Service — To prevent corrosion from air inside the chiller, break the vacuum by introducing nitrogen whenever the chiller is opened for maintenance or repair.

While the chiller is open, it is good practice to minimize the amount of air entering it by continuously feeding nitrogen into the chiller at approximately 1 psig (7 kPa) pressure.

Perform service work promptly and efficiently and close the chiller as soon as possible. Do not rely on the inhibitor for corrosion protection unless all lithium bromide and refrigerant have been removed and the chiller has been completely flooded with a lithium inhibitor-water solution prior to chiller opening.

Leak test the chiller thoroughly after the chiller has been closed up.

⚠ WARNING

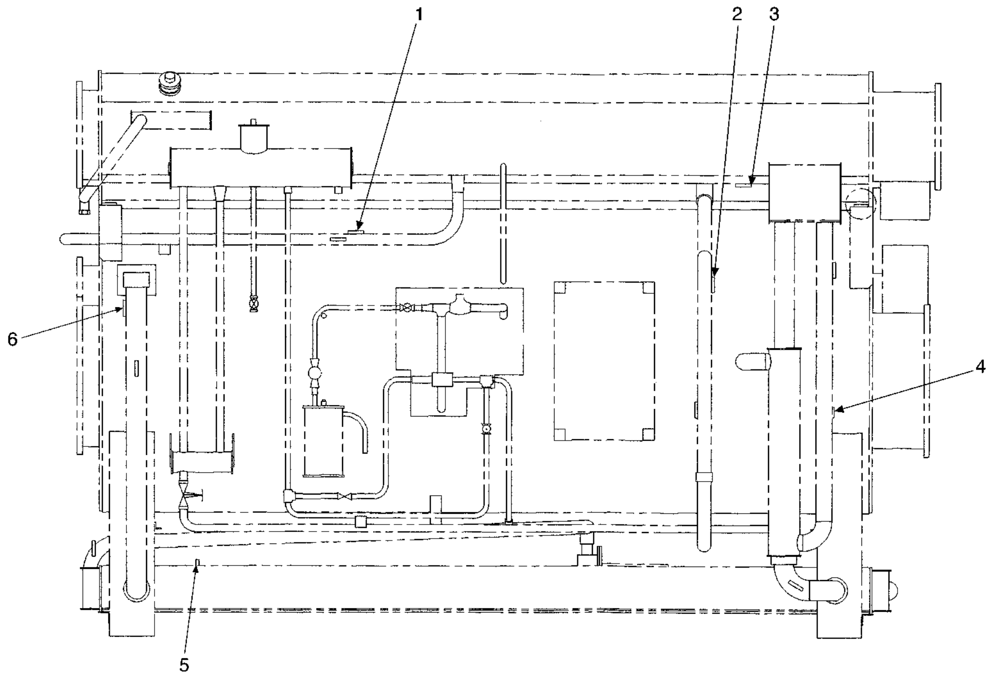
When flamecutting or welding on an absorption chiller, some noxious fumes may be produced. Ventilate the area thoroughly to avoid breathing concentrated fumes.

⚠ WARNING

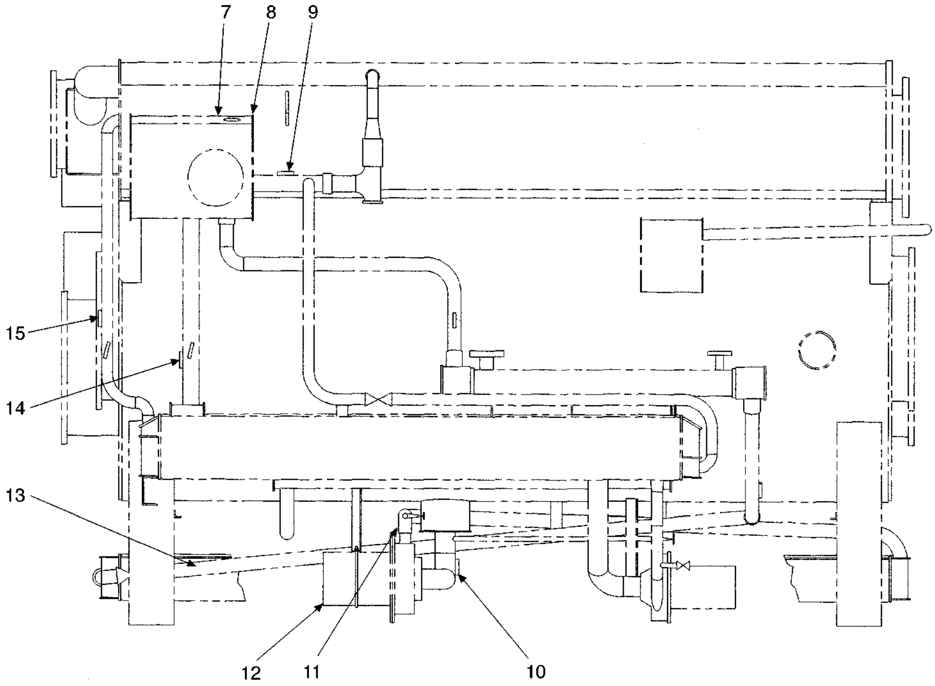
Never cut into the purge chamber to remove any hydrogen gas that might be present in the chamber unless the purge has been exhausted. Hydrogen can form an explosive mixture in the air.

Service Valve Diaphragm Replacement — To replace valve diaphragms:

1. Break the chiller vacuum by introducing nitrogen. Solution and refrigerant can be transferred to opposite sumps within the chiller or removed from the chiller. If they are removed from the chiller, store them in clean containers for recharging.
2. Remove and replace old valve diaphragms. Clean the mating surfaces before replacing the valves and diaphragms. Torque the valve bolts to approximately 3 lb-ft (0.4 kg-m).
3. Test all affected connections for leakage (see Chiller Leak Test section, page 80).
4. Re-evacuate the chiller after servicing (see Chiller Evacuation section, page 81).
5. Replace solution and refrigerant in the chiller (the same quantity that was removed).



FRONT VIEW

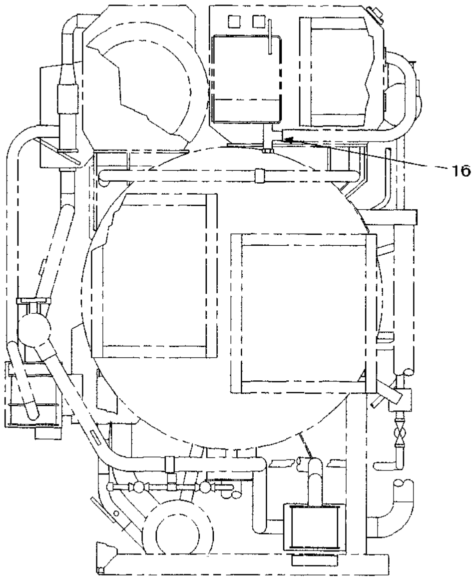


REAR VIEW

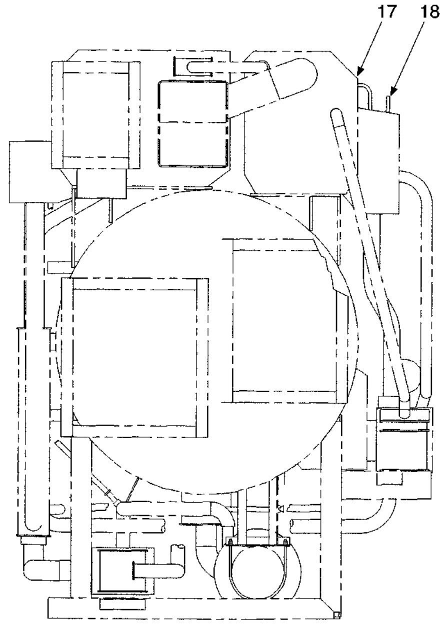
LEGEND

1 — Vapor Condensate Temperature Thermistor
2 — Strong LiBr Leaving High-Temperature Heat Exchanger (HX1) Thermistor
3 — Strong LiBr Leaving Low-Stage Generator (G2) Thermistor
4 — G2 LiBr Overflow Pipe Thermistor
5 — Strong LiBr Leaving Low-Temperature Heat Exchanger (HX2) Thermistor
6 — Recirculated LiBr at Absorber Spray Thermistor
7 — High-Stage Generator (G1) High Level Probe
8 — G1 High Temperature Switch
9 — Weak LiBr Leaving Level Control Device (LCD) Box Thermistor
10 — Weak LiBr Leaving Absorber Thermistor
11 — Solution Pump No. 1 Discharge Thermistor
12 — Solution Pump High Temperature Internal Thermistor
13 — Weak LiBr Leaving HX2 Thermistor
14 — Strong LiBr Leaving G1 Thermistor
15 — Weak LiBr Leaving HX1 Thermistor

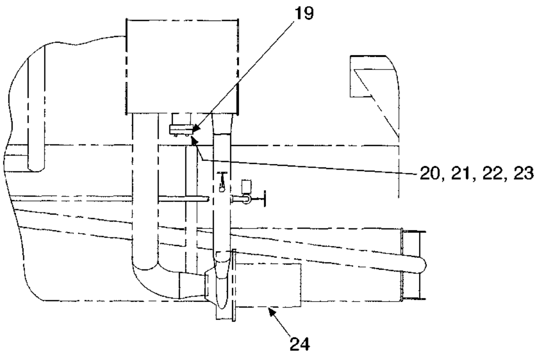
Fig. 52 — Typical 16JT PIC Sensor Locations



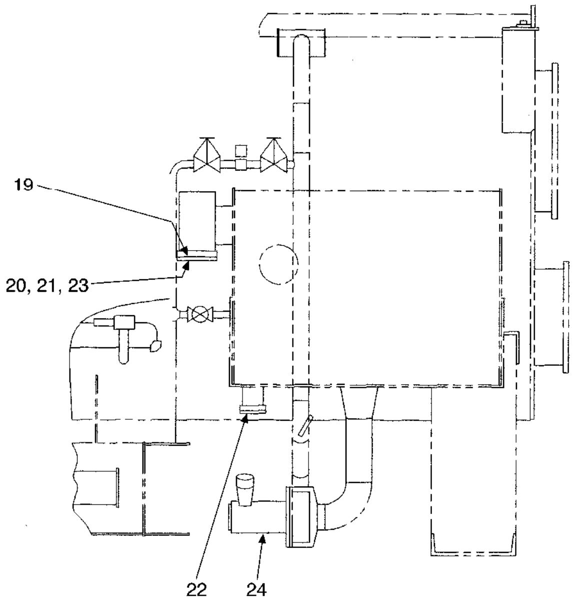
LEFT END VIEW



RIGHT END VIEW



SMALL FRAME 16JT
(16JT810 to 16JT880)

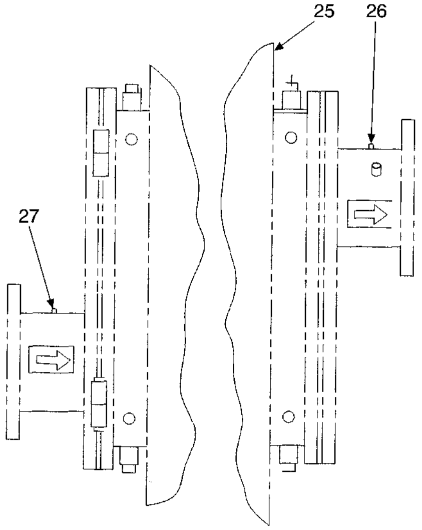


LARGE FRAME 16JT
(16JT080 to 16JT150,
16JT080L to 16JT150L)

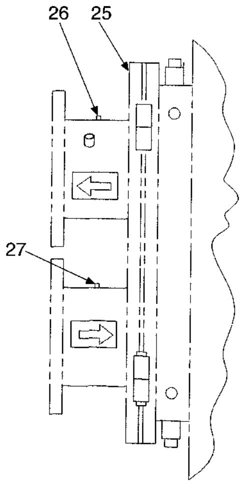
LEGEND

16 — Condensate Temperature from G2 Thermistor
17 — G1 Internal Pressure Transducer
18 — G1 High Pressure Switch
19 — Refrigerant Temperature Thermistor
20 — Refrigerant Level Sensor (Analog Switch)
21 — Refrigerant Dilution Switch
22 — Low Refrigerant Level Switch
23 — High Refrigerant Level Switch
24 — Refrigerant Pump High Temperature Internal Thermistor

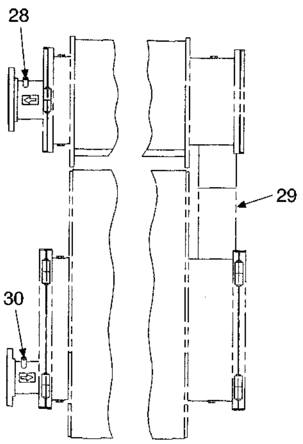
Fig. 52 — Typical 16JT PIC Sensor Locations (cont)



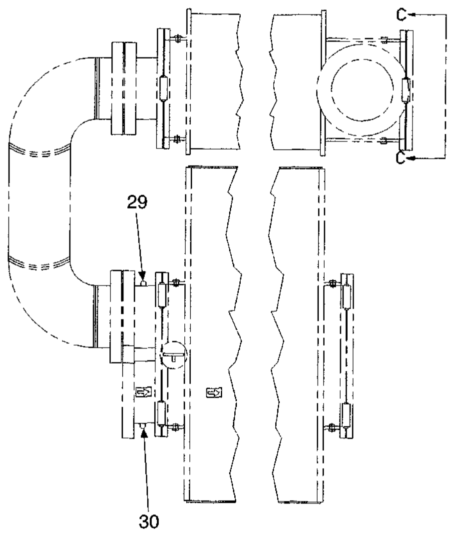
3-PASS EVAPORATOR ARRANGEMENT
(STANDARD ON MODELS 16JT816 TO 16JT828)



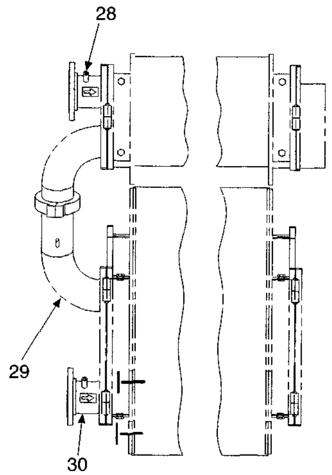
2- AND 4-PASS EVAPORATOR ARRANGEMENT
(STANDARD ON MODELS 16JT810 TO 16JT814, 4-PASS;
16JT832 TO 16JT150L, 2-PASS)



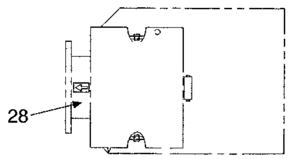
3-PASS ABSORBER/1-PASS
CONDENSER ARRANGEMENT



2-PASS ABSORBER/1-PASS CONDENSER
ARRANGEMENT (STANDARD ON MODELS
16JT832 TO 16JT150L)



4-PASS ABSORBER/2-PASS
CONDENSER ARRANGEMENT
(STANDARD ON MODELS 16JT810
TO 16JT814)



VIEW C-C

25 — Low Chilled Water Temperature Switch
26 — Leaving Chilled Water Temperature Thermistor
27 — Entering Chilled Water Temperature Thermistor
28 — Cooling Water Leaving Condenser Thermistor
29 — Cooling Water Leaving Absorber Thermistor
30 — Cooling Water Entering Absorber Thermistor

Fig. 52 — Typical 16JT PIC Sensor Locations (cont)

Hermetic Pump Inspection — The pumps used on Carrier absorption chillers are hermetic and do not require seals. Pump motors are cooled by the fluids being pumped.

⚠ CAUTION

Never run a hermetic pump motor dry. Even momentary operation without the chiller filled with liquid will damage bearings and overheat the motor. Use only the current value specified in the control circuit diagram when setting the pump starter overloads.

The pumps are a stamped design and fall into one of 3 frame sizes and 5 horsepower ranges:

- ½ HP, Frame 8. See Fig. 53.
- 3 and 5 HP, Frame P66K/R. See Fig. 54.
- 6 and 7½ HP, Frame P215M. See Fig. 55.

Disassemble, inspect, and reassemble the pumps as follows.

DISASSEMBLY — Items in ( ) refer to Fig. 53-55.

⚠ WARNING

Disconnect all primary power to the pumps; lock and tag all disconnect switches.

1. Break the chiller vacuum with dry nitrogen if not already done.
2. Remove the solution and refrigerant from the chiller. Store the solution in clean containers until ready to recharge the chiller.
3. Disconnect the motor power leads at the stator junction box (Item 23). Mark the leads to ensure proper reassembly.
4. Remove cap screws (Fig. 53-55, Item 5).

NOTE: Use blocking to support the weight of the motor stator (Item 19) when removing bolts.

5. Pull the motor stator and adapter flange (Item 17) straight back from the pump casing. If the flange is frozen to the casing by paint, gently pry between the adapter flange and the pump discharge pipe (Item 6) to break the paint seal.
6. Remove and discard the gasket (Fig. 54, Item 16) or O-ring (Fig. 53 and 55, Item 16).
7. Remove the impeller (Item 8) by straightening the locking tabs on the impeller locking washer (Item 10). Keep the impeller from rotating while removing the impeller locking bolt (Item 11). Remove the impeller key (Item 12). Remove the motor side wearing ring (Item 13).
8. Remove the stud nuts (Item 14). Tap and slightly twist the motor wearing ring housing (Item 15). Loosen and remove the housing.
9. Slide out the rotor (Item 3) to avoid damage to the stator can (Item 1), rotor liner (Item 2), and motor end bearing (Item 21).
10. Remove the motor end bearing and the motor end bearing spring (Item 20).

INSPECTION

1. Check for front end and motor end bearing (Items 18 and 21) wear by measuring the depth from the large end of the cone to the start of the cone as indicated in Fig. 56. If wear exceeds 3/16 in. (5 mm), replace the bearing.
2. Check the recirculation passages (Item 4). Clean if necessary.
3. Examine the impeller, stator can, rotor liner, casing wearing ring (Item 9), and motor wearing ring (Item 13) for wear. Clean or replace during reassembly if necessary.

NOTE: The original wearing rings (Items 9 and 13) are held in place with Loctite™ adhesive. If it becomes necessary to replace them, break the old ring with a chisel.

4. Check the bearing spring (Item 20) for free movement within the bearing housing.

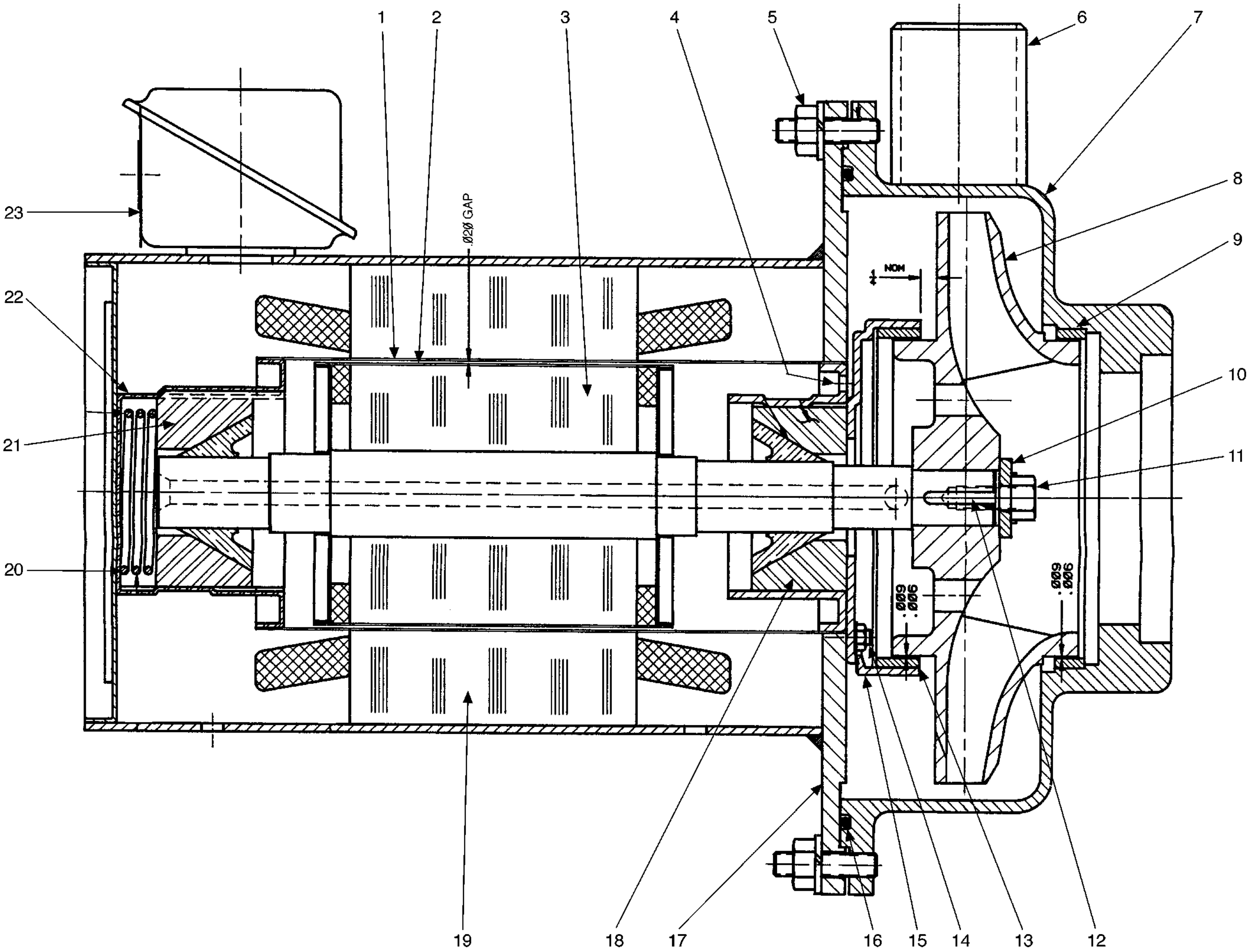
REASSEMBLY — Refer to Fig. 53-55.

1. Clean all parts.
2. Install the bearing spring in the motor end bearing housing (Item 22).
3. Insert the motor end bearing in the motor end housing. The fit should be free, sliding without excessive radial play.
4. Guide the rotor into position carefully to avoid damage to the rotor liner, stator can, and motor end bearing.
5. Install the front end bearing (Item 18) in the wearing ring housing (Item 15).
6. Install the bearing and wearing ring housing onto the adapter flange (Item 17). Tighten the stud nuts.
7. Replace both wearing rings (Items 9 and 13), if necessary. Before replacing them, thoroughly clean the surface of the wearing ring housings. Use hand pressure to position the new rings. Do not use Loctite adhesive.
8. Install the impeller with the impeller key, lock washer, and locking bolt. Bend the washer tabs over the flats of the locking bolt heads.
9. Install a new 1/32-in. (0.8 mm) thick EPR (Ethylene Propylene Rubber) gasket (Fig. 54, Item 16) on the 3 or 5 HP, Frame P66K/R motor. For the ½ HP, Frame 8 motor (Fig. 53) and the 6 or 7½ HP, Frame P215M motor (Fig. 55), install a new O-ring (Item 16).
10. Be sure the casing wearing ring (Item 9) is in place.
11. Slide the motor stator housing and adapter flange assembly into the pump casing. Use blocking to support the motor stator. Oil, install, and tighten bolts and washers to approximately 18 lb-ft (2.4 kg-m) torque. Remove the blocking.

COMPLETION

1. Leak test the affected joints to be sure that all pump connections are tight. See Chiller Leak Test, page 80.
2. Evacuate the chiller. See Chiller Evacuation, page 81.
3. Recharge the chiller with the same amount of solution and refrigerant as removed. See Charge the Chiller with Solution and Refrigerant, page 58.
4. Reconnect the motor power leads to the proper motor wires and replace the stator junction box.
5. Resupply power to the pump.
6. Record the inspection date and results in your chiller log.

Solution Decrystallization — Crystallization (solidifcation) occurs when the strong solution concentration and temperature cross over to the right of the crystallation line on the equilibrium diagram (Fig. 6, 7, and 41). It should not occur if the chiller controls are correctly adjusted and the chiller is properly operated. Refer to the Troubleshooting Guide, beginning on page 92, for probable causes and remedies.

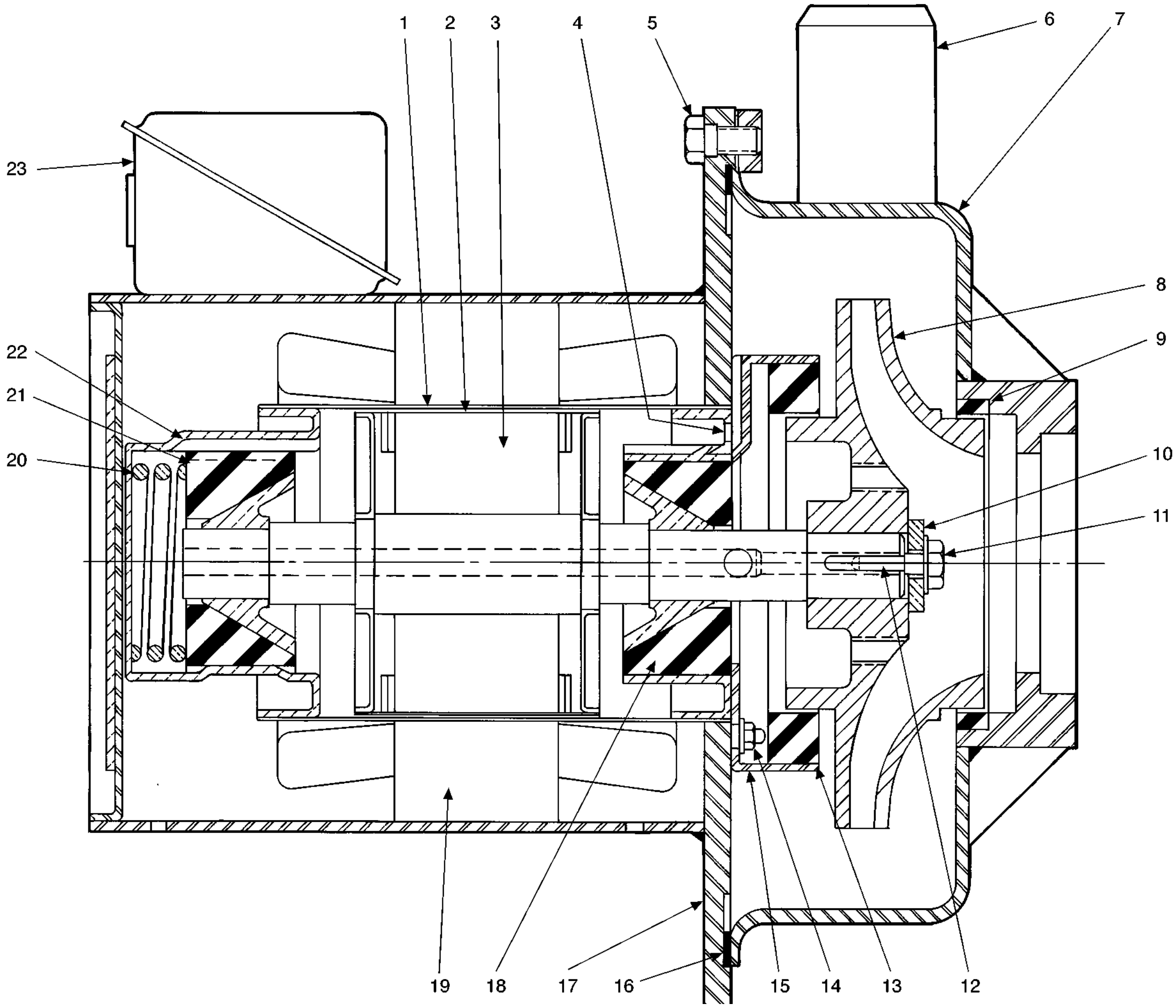


LEGEND

1 — Stator Can
2 — Rotor Liner
3 — Rotor Core
4 — Recirculation Passage
5 — Cap Screw
6 — Pump Discharge Pipe
7 — Pump Casing
8 — Impeller
9 — Casing Wearing Ring
10 — Impeller Locking Washer
11 — Impeller Locking Bolt
12 — Impeller Key
13 — Motor Side Wearing Ring
14 — Stud Nuts
15 — Motor Wearing Ring Housing
16 — O-Ring
17 — Adapter Flange
18 — Front End Bearing
19 — Stator
20 — Motor End Bearing Spring
21 — Motor End Bearing
22 — Motor End Bearing Housing
23 — Stator Junction Box

NOTE: See assembly and reassembly procedures for item references.

Fig. 53 — Hermetic Pump (½ HP, Frame 8)

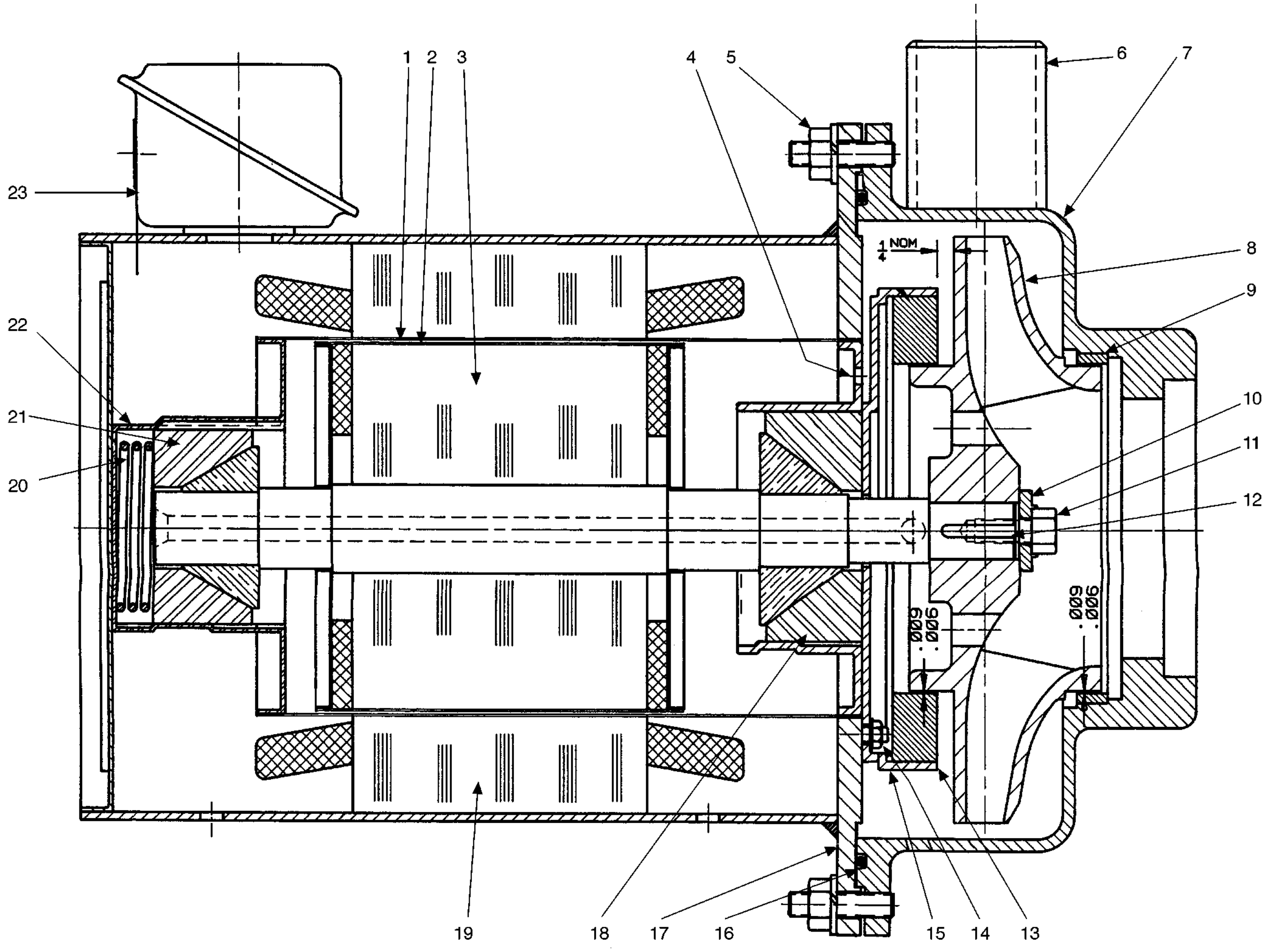


LEGEND

1	—	Stator Can
2	—	Rotor Liner
3	—	Rotor Core
4	—	Recirculation Passage
5	—	Cap Screw
6	—	Pump Discharge Pipe
7	—	Pump Casing
8	—	Impeller
9	—	Casing Wearing Ring
10	—	Impeller Locking Washer
11	—	Impeller Locking Bolt
12	—	Impeller Key
13	—	Motor Side Wearing Ring
14	—	Stud Nuts
15	—	Motor Wearing Ring Housing
16	—	Casing Gasket
17	—	Adapter Flange
18	—	Front End Bearing
19	—	Stator
20	—	Motor End Bearing Spring
21	—	Motor End Bearing
22	—	Motor End Bearing Housing
23	—	Stator Junction Box

NOTE: See disassembly and reassembly procedures for item references.

Fig. 54 — Hermetic Pump (3 and 5 HP, Frame P66K/R)



LEGEND

1 — Stator Can		**13** — Motor Side Wearing Ring	
2 — Rotor Liner		**14** — Stud Nuts	
3 — Rotor Core		**15** — Motor Wearing Ring Housing	
4 — Recirculation Passage		**16** — O-Ring	
5 — Cap Screw		**17** — Adapter Flange	
6 — Pump Discharge Pipe		**18** — Front End Bearing	
7 — Pump Casing		**19** — Stator	
8 — Impeller		**20** — Motor End Bearing Spring	
9 — Casing Wearing Ring		**21** — Motor End Bearing	
10 — Impeller Locking Washer		**22** — Motor End Bearing Housing	
11 — Impeller Locking Bolt		**23** — Stator Junction Box	
12 — Impeller Key			

NOTE: See assembly and reassembly procedures for item references.

Fig. 55 — Hermetic Pump (6 and 7½ HP, Frame P215M)

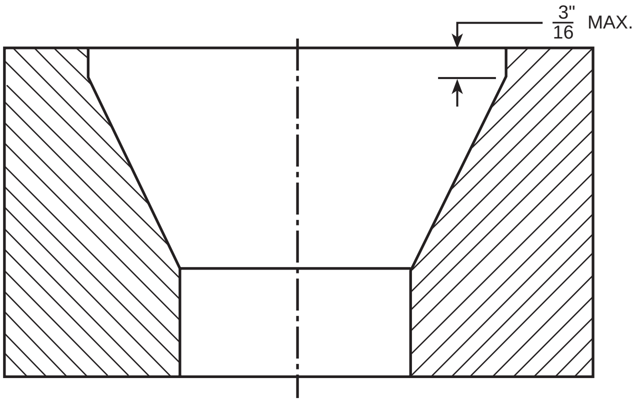


Fig. 56 — Check Front End and Motor End Bearing Wear

DECRYSTALLIZATION USING THE PIC CONTROLS — If crystallization occurs, it generally takes place in the shell side of the low-temperature heat exchanger and blocks the flow of strong solution from the generators. The strong solution then overflows into a pipe that returns it directly to the absorber sump. The solution pump(s) then returns the hot solution through the heat exchanger tubes, automatically heating and decrystallizing the shell side. The PIC controls indicate an alarm condition if the temperature of the G2 (low-stage generator) overflow pipe exceeds the value of *G2 OVERFLOW ALARM*. *G2 OVERFLOW ALARM* can be adjusted by accessing the SERVICE1 screen on the LID. Adjust the alarm temperature by pressing the [INCREASE] or [DECREASE] softkey until the desired temperature is reached. Then press the [ENTER] softkey to record your change.

Before the chiller can be put in DESOLID mode, it must be OFF. After the chiller is OFF, set the *DESOLIDIFICATION TIMER* as follows.

1. Access the SERVICE1 screen.
2. Scroll to *DESOLIDIFICATION TIME* and press the [SELECT] softkey.
3. Press the [INCREASE] or [DECREASE] softkey until the required time is reached.
4. Press the [ENTER] softkey to record your selected time.

NOTE: The usual time to completely desolidify is 4 hours or 240 minutes, which is also the maximum time configurable from the SERVICE1 screen.

Now, the chiller can be put in DESOLID mode, as follows.

1. Access the PUMPSTAT screen on the LID. Scroll to *DESOLIDIFICATION MODE*; then, press the following softkeys: [SELECT], [ENABLE], and [ENTER].
2. Scroll to *SOLUTION AND SPRAY* then, press [SELECT] , [ON], and [ENTER] softkeys.
3. Scroll to *REFRIGERANT PUMP*. Then, press the [SELECT], [ON], and [ENTER] softkeys.
4. Scroll to *CYCLE GUARD AUTO/MANUAL* and press the [MANUAL] and [ENTER] softkeys.
5. Press the [EXIT] softkey. Access the MAINSTAT screen. Scroll to *TARGET CAPACITY VALVE* and press the [SELECT] softkey. Press the [INCREASE] or [DECREASE] softkey to adjust to a value that will open the capacity valve and add heat. Press the [ENTER] softkey when the desired value is shown on the LID.

   At this point the chiller is in manual control. Monitor the solution temperature to maintain 140 F (60 C). The refrigeration pump and Cycle-Guard™ valve will pump the refrigerant into the solution to dilute it to aid in desolidification.

⚠ WARNING

When the chiller is in desolidification mode, the operator has sole control over heat input to the chiller. The operator must attend the chiller and monitor it continuously during this time.

When heating the chiller in this manner, remove the low-temperature cutout (LTCO) sensing bulbs from their wells and insulate them to prevent overheating. When the chiller temperatures return to normal, recalibrate the LTCO (see Low Temperature Cutout Adjustment, page 83).

When the DESOLID mode has ended, release the target capacity valve as follows.

1. Access the STATUS screen on the LID.
2. Scroll to *TARGET CAPACITY VALVE*; then, press the [SELECT] and [RELEASE] softkeys.
3. Press the [EXIT] softkey to return to the STATUS screen.
4. Scroll the *SOLUTION AND SPRAY PUMPS,* then press the [SELECT] and [RELEASE] softkeys.
5. Scroll to *REFRIFERANT PUMP*; then, press the [SELECT] and [RELEASE] softkeys.
6. Scroll to *CYCLE GUARD AUTO/MANUAL*; then, press the [SELECT] and [RELEASE] softkeys.

SEVERE CRYSTALLIZATION — If crystallization (solidifcation) results from a long, unscheduled shutdown (such as from a power failure) without proper dilution, the solution pump(s) may become bound and fail to rotate. This causes the overloads to trip out. In such a case, the chiller is severely crystallized and the solution pump will not start.

If the chiller is severely crystallized and the solution pump will not start, add heat to the outside of the solution pump as follows.

1. Heat the solution pump casing and adjacent lines with steam.

⚠ CAUTION

Under no circumstances apply heat directly to pump motor or controls when warming the casing. Do not apply direct heat to any flange connections; high temperature can deteriorate the gasket material.

2. Since rotation of a hermetic pump cannot be viewed directly, check the solution pump rotation by installing a compound gage on the pump service valve and reading the discharge pressure. Reset the pump overloads in the control panel if they are tripped.

   If the pump is rotating normally, the gage will show a reading above atmospheric pressure. If the pump casing and discharge line are completely blocked, the gage will show zero atmospheric pressure. If the pump interior is only partially blocked, a deep vacuum will indicate that the pump is not rotating.
3. Continue heating the casing until the gage pressure shows above atmospheric pressure with pump overloads reset. *Do not reset pump overloads more than once in any 7-minute period.*

   If the heat exchanger is also blocked, the decrystallization process will begin as soon as the solution pump starts rotating and the adjacent weak solution lines have decrystallized. If the heat exchanger or adjacent piping does not decrystallize automatically, heat the blocked area externally with steam or a soft torch flame. Crystallization in purge piping can be broken up by applying heat in the same manner.
4. If the strong solution line from heat exchanger to absorber spray nozzles is blocked, operate the chiller in DESOLID mode.

⚠ WARNING

When the chiller is in DESOLID mode, all alarms and safeties may not protect the chiller. The operator must attend to the chiller and monitor the solution leaving absorber temperature (which must not exceed 140 F [60 C]) to avoid overheating the chiller.

When desolidification is complete, release manual control of the target capacity valve by pressing the MENU, STATUS, and MAINSTAT softkeys. Highlight *TARGET CAPACITY VALVE,* and press the RELEASE softkey.

At this point, the operator must set the *DESOLIDIFICATION TIMER* from the LID and initiate a normal DESOLID mode. To set the *DESOLIDIFICATION TIME*, access the SERVICE1 screen. Use the INCREASE and DECREASE softkeys to adjust the value.

To put the chiller in DESOLID mode, press the MENU and STATUS softkeys; select the PUMPSTAT screen, highlight *DESOLIDIFICATION MODE* and press the ENABLE softkey. Set the Cycle-Guard™ control to MANUAL to dilute the solution: press the MENU, STATUS, and MAINSTAT softkeys. Highlight *ACTUAL CAPACITY VALVE*, and press the INCREASE softkey.

The entire unit will pick up heat and the crystallization will dissolve. To avoid overheating the solution pump motor, do not heat the solution leaving the absorber above 140 F (60 C). If severe crystallization is present, it may take 4 to 6 hours to fully decrystallize.

When heating the chiller in this manner, remove the low-temperature cutout (LTCO) sensing bulbs from their wells and insulate them to prevent overheating. When the chiller temperatures return to normal, recalibrate the LTCO (see Low-Temperature Cutout Adjustment, page 83).

Condensing Water Tube Scale — Condensing water tube scale is indicated if the temperature difference between the condensing water leaving the condenser and the refrigerant condensate from the condenser is greater than the normal 4 to 7° F (2 to 4° C) difference at full load (capacity control valve fully open). Scale reduces heat transfer, increases steam consumption, and limits chiller capacity. Scale can also cause serious corrosion damage to the tubes.

Soft scale can be removed from tubes with cleaning brushes, specially designed to avoid scraping or scratching the tube walls. The brushes are available through your Carrier representative. *Do not use wire brushes.*

⚠ CAUTION

Hard scale may require chemical treatment for its prevention or removal. Consult a water treatment specialist for proper treatment.

Water Treatment — Untreated or improperly treated water may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

⚠ CAUTION

Water must be within design flow limits, clean, and treated to ensure proper chiller performance and reduce the potential of tubing damage due to corrosion, scaling, or erosion. Carrier assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

Ordering Replacement Chiller Parts — When ordering Carrier-specified parts, the following information must accompany an order.

- chiller model and serial numbers
- name, quantity, and part number of part required
- delivery address and method of shipment.

TROUBLESHOOTING GUIDE

Overview — The PIC has many features to help the operator and technician troubleshoot a 16JT chiller.

- The LID display shows the chiller's actual operating conditions and can be viewed while the chiller is running.
- The default LID screen freezes when an alarm occurs. The freeze enables the operator to view the chiller conditions at the time of the alarm. The STATUS screens show current information. Once all alarms have been cleared (by correcting the problems and pressing the RESET softkey), the default LID screen returns to normal operation.
- The CONTROL ALGORITHM STATUS screens (COOLING, APPROCH, OVERRIDE, and CONCENTR) display information that helps to diagnose problems with chilled water control, chilled water temperature control overrides, and component performance.
- The control test feature facilitates the proper operation and test of temperature sensors, pressure transducers, the capacity valve, water pumps, tower control, and other on/off outputs.
- Other SERVICE screens can access configured items such as chilled water resets, override set points, approaches, absorber loss, cycle concentrations, etc. If an operating fault is detected, an alarm message is generated and displayed on the LID default screen. A more detailed message, along with a diagnostic message, is stored in the ALARM HISTORY table.

Checking the LID Display Messages — The first area to check if a problem occurs with the 16JT chiller is the LID display screen. If the alarm light is flashing, check the primary and secondary message line on the LID default screen (Fig. 14). These messages indicate where the fault is occurring. The ALARM HISTORY table, accessible from the LID SERVICE menu, also carries an alarm message to further expand on the alarm. For a complete list of possible alarm messages, see Table 11. For a list of additional problems and symptoms and their probable causes and remedies, see Table 12.

If the alarm light starts to flash while accessing a menu screen, press the EXIT softkey to return to the default LID screen to read the alarm message. The chiller will not run while an alarm condition exists unless the alarm is caused by an unauthorized start or a failure to shut down.

Checking Temperature Sensors — All temperature sensors are thermistor-type sensors; that is, the resistance of the sensor varies with its temperature. All sensors have the same resistance characteristics. Determine sensor temperature by measuring voltage drop if the controls are powered on. There are 2 ranges of thermistors, 5K ohm and 100K ohm. They are distinguished from each other by part number and a color band on the 100K ohm thermistor. Compare the readings to the values listed in Tables 13A-14B.

RESISTANCE CHECK — Turn off the control power and disconnect the terminal plug of the sensor in question from the module. Measure the sensor resistance between receptacles designated by the wiring diagram with a digital ohmmeter. The resistance and corresponding temperature are listed in Tables 13A-14B. Check the resistance of both wires to ground. This resistance should be infinite.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides

LEGEND FOR TABLE 11 (A-N)

ABS — Absorber
ABSORB — Absorber
CCN — Carrier Comfort Network
CHW — Chilled Water
COND — Condenser
ECW — Entering Chilled Water
ENT — Entering
G1 — High-Stage Generator
G2 — Low-Stage Generator
HITEMP — High Temperature
HX1 — High-Temperature Heat Exchanger
HX2 — Low-Temperature Heat Exchanger
LCD — Level Control Device
LIBR — Lithium Bromide
LID — Local Interface Device
LVG — Leaving
OVERLD — Overload
PIC — Product Integrated Control
PRESS — Pressure
RECIRC — Recirculated
REF — Refrigerant
SOL — Solution

A. SHUTDOWN WITH ON/OFF/RESET-OFF

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
MANUALLY STOPPED	PRESS CCN OR LOCAL TO START	PIC in OFF mode; press the CCN or LOCAL softkey to start unit.
SHUTDOWN IN PROGRESS	DILUTION CYCLE. COMPLETE IN XX.X MIN.	This is a 15-minute cycle run to dilute the solution to prevent crystallization after shutdown.
DILUTION CYCLE SHUTDOWN	COMPLETE IN XX.X MIN.	Possible power outage. Chiller solution is too strong at last shutdown. If this is a safety shutdown, a dilution cycle will be initiated.

B. TIMING OUT OR TIMED OUT

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
READY TO START	UNOCCUPIED MODE	Time schedule for PIC is unoccupied. Chillers will start only when occupied.
READY TO START	REMOTE CONTACTS OPEN	Remote contacts have stopped the chiller. Close contacts to start.
READY TO START	STOP COMMAND IN EFFECT	*CHILLER START/STOP* on MAINSTAT screen manually forced to stop. Release value to start.

C. IN RECYCLE SHUTDOWN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE/REMEDY
RECYCLE RESTART PENDING	OCCUPIED MODE	Unit in RECYCLE mode, chilled water temperature is not high enough to start.
RECYCLE RESTART PENDING	REMOTE CONTACTS CLOSED	Unit in RECYCLE mode, chilled water temperature is not high enough to start.
RECYCLE RESTART PENDING	START COMMAND IN EFFECT	*CHILLER START/STOP* on MAINSTAT screen manually forced to start: chilled water temperature is not high enough to start.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

D. PRESTART FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM MESSAGE/PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
PRESTART ALERT	G1 LEAVING SOL HIGH TEMP	Strong LiBr Leaving G1 exceeded the value of (LIMIT)* G1 HITEMP (VALUE)*.	Check capacity valve and linkage. Fill out chiller log and look for abnormal temperatures; check absorber loss.
PRESTART ALERT	LOW REFRIGERANT TEMP	Refrigerant Temp. exceeded the value of (LIMIT)* EVAP_REF (VALUE)*.	Check chilled water pump. Check solution concentrations and weak solution saturation temperature. Log current chiller readings and investigate abnormal readings. Check absorber loss.
PRESTART ALERT	HIGH G1 INTERNAL PRESS	G1 Internal Pressure exceeded the value of (LIMIT)* G1 PRESS (VALUE)*	Check for a leak. Check G1 temperature. Check capacity valve and linkage. Check for solidification in strong solution piping. Log current chiller readings and investigate abnormal readings. Check absorber loss.
PRESTART ALERT	WEAK LIBR LEAVING ABSORB	Weak LiBr Leaving Absorber temperature exceeded the value of (LIMIT)* of ABS_SOL (VALUE)*.	Log current chiller readings and investigate abnormal readings, especially water flow in the absorber. Brush absorber tubes.
PRESTART ALERT	LOW LEVEL SWITCH	Refrigerant Low Level switch open.	Check Cycle-Guard™ operation. Check low level switch. Run chiller manually to generate refrigerant. Log current chiller readings and investigate abnormal readings. Check absorber loss.

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

E. NORMAL OR AUTO. RESTART

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE / REMEDY
STARTUP IN PROGRESS	OCCUPIED MODE	Chiller starting. Time schedule for PIC is occupied.
STARTUP IN PROGRESS	REMOTE CONTACTS CLOSED	Chiller starting. Remote contacts are closed.
STARTUP IN PROGRESS	START COMMAND IN EFFECT	Chiller starting. *CHILLER START/STOP* on MAINSTAT manually forced to start. Release value to stop.
STARTUP IN PROGRESS	SOLUTION WARM-UP	Chiller starting. Chiller is warming up.

F. START-UP FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
FAILURE TO START	LOW CHILLED WATER FLOW	Startup: CHWFLOW Water Flow Fault: Check Chilled Water Flow	Verify chilled water flow. Make sure cooling water pump is operating properly. Check wiring to the flow switch. Use control test to check for proper switch operation. Set up *WATER FLOW VERIFY TIME.*
FAILURE TO START	LOW COOLING WATER FLOW	Startup: COOLFLOW Water Flow Fault: Check Cooling Water Flow	Same as above except for the cooling water pump.
PROTECTIVE LIMIT	SOLUTION PUMP 1 PRESSURE	SOLPRS1 (VALUE)* exceeded limit of (LIMIT)*. Solution Pump 1 Pressure.	The solution pump 1 pressure is greater than 20 psia (138 kPa) with the pumps deenergized. The chiller may have a leak or is warm from a previous run period.
PROTECTIVE LIMIT	SOLUTION PUMP 2 PRESSURE	SOLPRS2 (VALUE)* exceeded limit of (LIMIT)*. Solution Pump 2 Pressure.	The solution pump 2 pressure is greater than 20 psia (138 kPa) with the pumps deenergized. The chiller may have a leak or is warm from a previous run period.
PROTECTIVE LIMIT	SOLUTION PUMP 1 PRESSURE	SOLPRS1 (VALUE)* exceeded limit of (LIMIT)*. Solution Pump 1 Pressure.	The solution pump 1 pressure is less than 25 psia (172 kPa) with the pumps energized for the *WATER FLOW VERIFY TIME.* The chiller may have a leak or is warm from a previous run period.
PROTECTIVE LIMIT	SOLUTION PUMP 2 PRESSURE	SOLPRS2 (VALUE)* exceeded limit of (LIMIT)*. Solution Pump 2 Pressure.	The solution pump 2 pressure is less than 25 psia (172 kPa) with the pumps energized for the *WATER FLOW VERIFY TIME.* The chiller may have a leak or is warm from a previous run period

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

G. WARM-UP FAILURES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE / REMEDY
PROTECTIVE LIMIT	SLOW PULLDOWN: CHW_OUT	Slow Pulldown At Startup: Check for Absorber Loss or for Non-Condensables	15 minutes has elapsed since the refrigerant pump has been energized, and the chilled water pulldown is less than or equal to 0. The *STARTUP PULLDOWN FAILURE* has to be enabled. Check absorber loss and purge chiller.
PROTECTIVE LIMIT	STRONG LIBR LEAVING G1	G1_SOL (VALUE)* exceeded limit of (LIMIT)*. Strong LiBr Leaving G1.	15 minutes has elapsed since the refrigerant pump has been energized and the strong LiBr leaving G1 is less than 158 F (70 C). Check capacity valve.

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

H. EMERGENCY/LOSS OF COMMUNICATIONS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE / REMEDY
MACHINE CRYSTALLIZATION	RUN DESOLIDIFICATION	Low Solution Temp After Power Loss; Run Desolidification	Stored values for points 9 and 14 compared to current values indicate that the solution in the chiller is very near or to the right of the crystallization line.

I. NORMAL RUN

PRIMARY MESSAGE	SECONDARY MESSAGE	PROBABLE CAUSE / REMEDY
RUNNING - RESET ACTIVE	4-20 mA SIGNAL	Reset program active based upon CONFIG table set-up .
RUNNING - RESET ACTIVE	REMOTE SENSOR CONTROL	Reset program active based upon CONFIG table set-up.
RUNNING - RESET ACTIVE	CHW TEMP DIFFERENCE	Reset program active based upon CONFIG table set-up.
RUNNING - TEMP CONTROL	LEAVING CHILLED WATER	Default method of temperature control.
RUNNING - TEMP CONTROL	ENTERING CHILLED WATER	ECW control activated on CONFIG table.
RUNNING - TEMP CONTROL	TEMPERATURE RAMP LOADING	Ramp loading is in effect. Use SERVICE1 screen to modify.
DESOLIDIFICATION MODE	XX MIN. TIL COMPLETION	DESOLID Mode is in effect. Use PUMPSTAT screen to modify.

J. NORMAL RUN WITH OVERRIDES

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	LIMIT
RUN CAPACITY LIMITED	G1 HIGH SATURATION TEMP	G1_SAT (VALUE)* exceeded limit of (LIMIT*). G1 High Saturation Temp Override.	See Capacity Overrides, Table 4 for correct operating condition.
RUN CAPACITY LIMITED	G1 HIGH SOLUTION TEMP	G1_SOL (VALUE)*, exceeded limit of (LIMIT)*. G1 High Solution Temp Override.	See Capacity Overrides, Table 4 for correct operating condition.
RUN CAPACITY LIMITED	LOW REFRIGERANT TEMP	EVAP_REF (VALUE)*, exceeded limit of (LIMIT)*. Refrigerant Temp Override.	See Capacity Overrides, Table 4 for correct operating condition.
RUN CAPACITY LIMITED	MANUAL CAPACITY VALVE	CV_TRG Run Capacity limited: Manual Capacity Valve Target.	See Capacity Overrides, Table 4 for correct operating condition.
RUN CAPACITY LIMITED	HIGH CONCENTRATION	CV_ACT Run Capacity Limited: High LiBr Concentration.	See Capacity Overrides, Table 4 for correct operating condition.
RUN CAPACITY LIMITED	CYCLE GUARD OPERATION	Cycle-Guard™ Valve ON; Check chiller for excess water/trim charge.	See Capacity Overrides, Table 4 for correct operating condition.

(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

K. OUT OF RANGE SENSORS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE / REMEDY
SENSOR FAULT	G1 INTERNAL PRESSURE	Sensor Fault: Check G1 Internal Pressure	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	REFRIGERANT LEVEL SENSOR	Sensor Fault: Check Refrigerant Level Sensor	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	ENTERING CHILLED WATER	Sensor Fault: Check Entering Chilled Water	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	LEAVING CHILLED WATER	Sensor Fault: Check Leaving Chilled Water	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	COOLING WATER ENT ABSORB	Sensor Fault: Check Cooling Water Ent Absorb	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	COOLING WATER LVG ABSORB	Sensor Fault: Check Cooling Water Lvg Absorb	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	COOLING WATER LVG COND	Sensor Fault: Check Cooling Water Lvg Cond	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	WEAK LIBR LEAVING ABSORB	Sensor Fault: Check Weak Libr Leaving Absorb	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	WEAK LIBR LVG LOW HX2	Sensor Fault: Check Weak Libr Lvg Low HX2	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	STRONG LIBR LVG LOW HX2	Sensor Fault: Check Strong Libr Lvg Low HX2	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	CONDENSATE TEMP FROM G2	Sensor Fault: Check Condensate Temp From G2	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	RECIRC LIBR ENT SPRAYS	Sensor Fault: Check Recirc LiBr Ent Sprays	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	REFRIGERANT TEMP	Sensor Fault: Check Refrigerant Temp	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	VAPOR CONDENSATE TEMP	Sensor Fault: Check Vapor Condensate Temp	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	G2 LIBR OVERFLOW PIPE	Sensor Fault: Check G2 Libr Overflow Pipe	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	WEAK LIBR LVG HIGH HX1	Sensor Fault: Check Weak Libr Lvg High HX1	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	STRONG LIBR LEAVING G1	Sensor Fault: Check Strong Libr Leaving G1	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	STRONG LIBR LEAVING G2	Sensor Fault: Check Strong Libr Leaving G2	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	STRONG LIBR LVG HIGH HX1	Sensor Fault: Check Strong Libr Lvg High HX1	See sensor test procedure and check sensors for proper operation and wiring.
SENSOR FAULT	WEAK LIBR LVG LCD BOX	Sensor Fault: Check Weak Libr Lvg LCD Box	See sensor test procedure and check sensors for proper operation and wiring.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

L. PROTECTIVE LIMIT FAULTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE/REMEDY
PROTECTIVE LIMIT	STRONG LIBR LEAVING G1	G1_SOL (VALUE)* exceeds limit of (LIMIT)*, Strong LiBr Leaving G1.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	G1 HIGH SOLUTION LEVEL	G1HILEV G1 High Solution Level. Check G1 Immersion Electrode.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	GENERATOR HITEMP/PRESS	GENHITP Generator Hi Temp/Press.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	LOW CHILLED WATER TEMP	LOWCHWT Low Chilled Water Temp.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	LOW CHILLED WATER FLOW	CHWFLOW Flow Fault: Check Water Pump/Flow switch.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	LOW COOLING WATER FLOW	COOLFLOW Flow Fault: Check Water Pump/Flow switch.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	REF PUMP OVERLD/HITEMP	RFPMPFLT Ref Pump Overld/Hi Temp.	Internal wait until pump cools off.
PROTECTIVE LIMIT	SOL PUMP OVERLD/HITEMP	SPMPFLT1 Sol Pump1 Overld/Hi Temp.	Internal wait until pump cools off.
PROTECTIVE LIMIT	SOL PUMP2 OVERLD/HITEMP	Protective Limit: SPMPFLT2 Sol Pump2 Overld/Hi Temp.	Internal wait until pump cools off.
PROTECTIVE LIMIT	SPARE SAFETY DEVICE	SPR_PL Spare Prot Limit Input.	Check local wiring.
PROTECTIVE LIMIT	SPRAY PUMP OVERLD/HITEMP	Protective Limit: SPRAYFLT Spray Pump Overld/Hi Temp.	Internal wait until pump cools off.
PROTECTIVE LIMIT	LOW REFRIGERANT TEMP	Protective Limit: EVAP_REF (VALUE)* exceeds limit of (LIMIT)*. Low Refrigerant Temp.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	LOW CHILLED WATER TEMP	Protective Limit: CWH_OUT (VALUE)* exceeds limit of (LIMIT)*. Leaving Chilled Water.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	WEAK LIBR LEAVING ABSORB	Protective Limit: ABS_SOL (VALUE)* exceeds limit of (LIMIT)*. Weak LiBr Leaving Absorb	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	G2 LIBR OVERFLOW PIPE	Protective Limit: G2OVFLOW (VALUE)* exceeds limit of (LIMIT)*. G2 LiBr Overflow Pipe.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	TRANSDUCER VOLTAGE FAULT	Protective Limit: V_REF (VALUE)* exceeds limit of (LIMIT)*. Transducer Voltage Ref.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	TRANSDUCER VOLTAGE FAULT	Protective Limit: V_REF (VALUE)* exceeds limit of (LIMIT)*. Transducer Voltage Ref.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	G1 INTERNAL PRESSURE	Protective Limit: G1PRESS (VALUE)* exceeds limit of (LIMIT)*. G1 Internal Pressure.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	CCN OVERRIDE STOP	CHIL_S_S CCN Override Stop While in LOCAL Run Mode.	Check BS (Building Supervisor) software.
PROTECTIVE LIMIT	SLOW PULLDOWN: CHW_OUT	Slow Pulldown At Startup: Check Absorber Loss/Non-Condensables.	Check log.
PROTECTIVE LIMIT	STRONG LIBR LEAVING G1	Protective Limit: G1_SOL (VALUE)* exceeds limit of (LIMIT)*. Strong LiBr Leaving G1.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	HIGH CONCENTRATION FAULT	High LiBr Concentration Shutdown: Check Capacity Valve Linkage/Closure.	Check log.
PROTECTIVE LIMIT	HIGH CONCENTRATION FAULT	High LiBr Concentration Shutdown: Check Capacity Valve Linkage/Closure.	Check log.
PROTECTIVE LIMIT	SOLUTION PUMP 1 PRESSURE	SOLPRS1 (VALUE)* exceeds limit of (LIMIT)*. Solution Pump 1 Pressure.	See sensor test procedure and check sensors for proper operation and wiring.
PROTECTIVE LIMIT	SOLUTION PUMP 2 PRESSURE	SOLPRS2 (VALUE)* exceed limit of (LIMIT)*. Solution Pump 2 Pressure.	See sensor test procedure and check sensors for proper operation and wiring.

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

Table 11 — LID Primary and Secondary Messages and Custom Alarm/Alert Messages with Troubleshooting Guides (cont)

M. MACHINE ALERTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE/ REMEDY
LOW TEMPERATURE ALERT	COOLING WATER ENT ABSORB	ABS_IN (VALUE)* exceeded limit of (LIMIT)*. Cooling Water Ent Absorb.	Check LID plugs.
HIGH TEMPERATURE ALERT	COOLING WATER LVG ABSORB	ABS_OUT (VALUE)* exceeded limit of (LIMIT)*. Cooling Water Lvg Absorb.	Check LID plugs.
HIGH TEMPERATURE ALERT	COOLING WATER LVG COND	COND_OUT exceeded limit of (LIMIT)*. Cooling Water Lvg Cond.	Check LID plugs.
NO MESSAGE	NO MESSAGE	Chiller Power Loss During Run Mode: Check Voltage Supply.	Check LID plugs.

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

N. SPARE SENSOR ALERTS

PRIMARY MESSAGE	SECONDARY MESSAGE	ALARM HISTORY MESSAGE/ PRIMARY CAUSE	ADDITIONAL CAUSE / REMEDY
SENSOR ALERTS	COMMON SUPPLY SENSOR	CHWS (VALUE)* exceeded limit of (LIMIT)*. Common Supply Sensor	Check alert temperature set points on Equipment Service SERVICE2 LID screen. Check sensor for accuracy if reading is not accurate.
SENSOR ALERTS	COMMON RETURN SENSOR	CHWR (VALUE)* exceeded limit of (LIMIT)*. Common Return Sensor	Same as above.
SENSOR ALERTS	REMOTE RESET SENSOR	R_RESET (VALUE)* exceeded limit of (LIMIT)*. Remote Reset Sensor	Same as above.
SENSOR ALERTS	COMMON SUPPLY SENSOR	CHWS (VALUE) exceeded limit of (LIMIT)*. Common Supply Sensor	Same as above.
SENSOR ALERTS	COMMON RETURN SENSOR	CHWR (VALUE)* exceeded limit of (LIMIT)*. Common Return Sensor	Same as above.
SENSOR ALERTS	REMOTE RESET SENSOR	R_RESET (VALUE)* exceeded limit of (LIMIT)*. Remote Reset Sensor	Same as above.

*(LIMIT) is shown on the LID as the temperature, pressure, voltage, etc., set point predefined or selected by the operator as an override, alert, or alarm condition. (VALUE) is the actual temperature, pressure, voltage, etc., at which the control is tripped.

Table 12 — Additional Problems/Symptoms and Their Probable Causes and Remedies

PROBLEM/SYMPTOM	PROBABLE CAUSE	REMEDY
Chiller Will Not Start or Shuts Down **(Panel RUN light out, pumps off.) LID not lit.**	No power to control panel	Check for building power failure. Check main circuit breaker.
	Control panel fuse blown	Examine circuits for ground or short. Replace fuse.
	Control panel main circuit breaker open	Close main circuit breaker.
	Chilled water or condensing water pump overloads or flow switches open	Check chilled water and condensing water pumps,starters, and valves.
	Solution pump overloads open	Push overload reset button. Measure pump discharge pressure to check for solution crystallization. See Solution Decrystallization section on page 87.
	Refrigerant pump overloads open	Push overload reset button.
	Low temperature cutout	Depress Reset button after chilled water has warmed at least 7° F (4° C). Measure chilled water temperature. Recalibrate or replace switch if temperature is above set point. Check set point setting and operation of capacity valve if temperature is below switch setting. See PIC Control Test section on page 31 to test.
	High generator solution temperature or pressure, high absorber pressure.	Check cooling water temperature and flow. Check absorber pressure. Check for solution crystallization.
Leaving Chilled Water Temperature Too High **(Chiller running, chilled water temperature above design.)**	Capacity valve not open	Verify that the capacity valve is operational. Check capacity valve operation per Control Test.
	Set point too high	Reset set point temperature on LID SETPOINT screen.
	Excessive cooling load (chiller at capacity)	Check for cause of excessive load.
	Excessive chilled water flow (above design)	Check pressure drop per selection data and reset flow.
	Low condensing water flow (below design)	Check pressure drop per selection data and reset flow.
	High supply cooling water temperature (above design)	Check cooling tower operation and temperature controls.
	Low steam pressure (below design)	Raise to design per selection data.
	Inadequate steam condensate drainage (condensate backs up into tube bundle)	Check operation of steam traps, strainers, valves, and condensate receivers.
	Fouled tubes (poor heat transfer)	Clean tubes. Determine if water treatment is necessary.
	Chiller needs octyl alcohol	Check solution sample and add octyl alcohol if necessary. See Adding Octyl Alcohol section on page 82.
	Noncondensables in chiller	Check absorber loss. See Absorber Loss Determination section on page 80. If above 12° F (8° C), see causes and remedies under Inadequate Purging (high absorber loss) in this table.
	Capacity valve malfunction	Check calibration and operation of capacity valve. See PIC Control Tests section, page 31.
	Solution crystallization (solution flow blockage)	See causes and remedies under Solution Crystallization in this table.
	Low refrigerant level	Check the low-level switch operation and check for low cooling water temperature.
	Cycle-Guard™ control malfunction (low solution concentration)	Check refrigerant charge and *CYCLE GUARD LEVEL ADJUST.* See sections on Final Refrigerant Charge Adjustment (page 62), Cycle-Guard System Operation (page 82), Capacity Overrides (page 34), and Manual Capacity Valve Control (page 35). Verify that Cycle-Guard switch is set to AUTO.
Leaving Chilled Water Temperature Too Low **(Chiller running, chilled water temperature below design.)**	Set point too low	Reset temperature control on SETPOINT screen.
	Capacity control malfunction	Check calibration and operation of capacity valve. See Capacity Control section on page 22.

Table 12 — Additional Problems/Symptoms and Their Probable Causes and Remedies (cont)

PROBLEM/SYMPTOM	PROBABLE CAUSE	REMEDY
Leaving Chilled Water Temperature Fluctuates **(Chiller running, capacity control hunting.)**	Chilled water flow or load cycling	Check chilled water system, controls, and load.
	Condensing water flow or temperature cycling	Check condensing water temperature control and cooling tower operation.
	Steam pressure cycling	Check steam pressure control.
	Inadequate steam condensate drainage (condensate backs up into tube bundle)	Check operation of steam traps, strainer, valves, and condensate receivers.
	Capacity control malfunctions	Check calibration and operation of capacity valve. See Capacity Control section, page 22. Check configuration of *CONTROL POINT DEADBAND, PROPORTIONAL INCR BAND, PROPORTIONAL DECR BAND, PROPORATIONAL CHW_IN GAIN,* and G1 solution temperature bias.
Inadequate Purging **(Low chiller capacity and high absorber loss. See Absorber Loss Determination, page 80, and APPROACH screen (from CONTROL ALGORITHM STATUS tables) on the LID.**	Air leakage in vacuum side of chiller (high noncondensable accumulation rate)	Have solution analyzed for indication of air leaks. Leak test and repair if necessary. See Noncondensable Accumulation Rate, Solution Analysis, and Chiller Leak Test sections on pages 80, 82, and 80, respectively.
	Inhibitor depleted (high noncondensable accumulation rate)	Have solution analyzed. Add inhibitor and adjust solution alkalinity if necessary. See Noncondensable Accumulation Rate, Solution Analysis, and Inhibitor sections on pages 80, 82, and 82, respectively.
	Purge valves not positioned correctly	Check valve positions. See Purge Manual Exhaust Procedure section on page 79.
	Purge solution supply lines crystallized (not able to exhaust purge)	Heat solution supply lines, See Purge Manual Exhaust procedure and Solution Decrystallization sections on pages 78 and 91.
Solution Crystallization During Operation **(Strong solution overflow pipe hot.) G2 Overflow Alarm**	Cycle-Guard™ control malfunction (solution overconcentration)	Check refrigerant charge, Cycle-Guard system, and valve operation. See Final Refrigerant Charge Adjustment and Cycle-Guard System Operation sections on pages 62 and 83, respectively.
	Noncondensables in chiller (high absorber loss)	Check absorber loss. See APPROACH screen on the CONTROL ALGORITHM STATUS menu or Absorber Loss Determination section on page 80. If above 12° F (8° C), see Causes and Remedies under Inadequate Purging above.
	High steam pressure temperature (above design)	See Chiller Selection Data provided with the chiller. Set at design.
	Absorber tubes fouled (poor heat transfer)	Clean tubes. Determine if water treatment is necessary.
	Octyl alcohol depletion	Check solution sample and add octyl alcohol if necessary. See Adding Octyl Alcohol section on page 82.
Solution Crystallization at Shutdown **(Crystallization symptoms when chiller is started.)**	Insufficient solution dilution at shutdown	After shutdown, restart chiller and measure concentration of weak solution. See Solution or Refrigerant Sampling section on page 81. If above 56%, check dilution level switch and Cycle-Guard transfer valve.
Abnormal Noise from Solution Pump	Cavitation of solution pump (low solution level in absorber)	Open the Cycle-Guard valve manually (toggle switch SS1) for about 3 minutes while chiller is running. Adjust the charge.
Abnormal Noise from Refrigerant Pump	Temperature of cooling water supply below 59 F (15 C).	Raise cooling water temperature above 59 F (15 C). Stop the chiller and then restart it about 20 minutes later. Check Final Refrigerant Charge Adjustment section (see page 62).
Frequent Cycle-Guard System Operation	Fouled absorber or evaporator tubes	Clean tubes.
	Excessive noncondensable gas (high absorber loss)	See Inadequate Purging, above.
	Refrigerant overcharge or tube leak.	Remove refrigerant to trim charge, per start-up instructions. Repair tube leak.
	Cycle-Guard level adjust	The Cycle-Guard level adjust parameter works with the strong LiBr leaving high HX2 (heat exchanger) temperature <118 F (47.8 C) to energize the Cycle-Guard valve. The high level float switch works with the Strong LiBr leaving high HX2 temperature >118 F (47.8 C) to energize the Cycle-Guard valve.

VOLTAGE DROP —Using a digital voltmeter, the voltage drop across any energized sensor can be measured while the control is energized. Tables 13A-14B list the relationship between temperature and sensor voltage drop (volts dc measured across the energized sensor). Exercise care when measuring voltage to prevent damage to the sensor leads, connector plugs, and modules. Voltage should also be checked at the sensor plugs. Check the sensor wire at the sensor for 5 vdc if the control is powered.

⚠ CAUTION

Relieve all water pressure or drain the water before replacing the temperature sensors.

CHECK TEMPERATURE SENSOR ACCURACY — Place the sensor in a medium of a known temperature and compare that temperature to the measured reading. The thermometer used to determine the temperature of the medium should be of laboratory quality with 0.5 F (0.25 C) graduations. The sensor in question should be accurate to within 2 F (1.2 C) for both the 5K and 100K ohm sensors.

See Fig. 51 for the sensor locations. The sensors are immersed in wells on the chiller or directly in water circuits. The wiring at each sensor is easily disconnected by unlatching the connector. These connectors allow only a one-way connection to the sensor. When installing a new sensor, apply a pipe sealant or thread sealant to the sensor threads.

Pressure Transducers — If the PIC pressure readings for solution pump 1, solution pump 2 (if applicable), and G1 pressure are within acceptable ranges but those readings do not agree with manually obtained readings, the pressure transducer(s) should be replaced.

CHECK PRESSURE TRANSDUCERS —To take a manual reading of discharge solution pump 1 or discharge solution pump 2, attach a pressure gage to the service valve on the pump(s). See Fig. 3, Item 18, for the service valve location(s). When the pump(s) is off, the correct pressure should be <20 psia (138 kPa). When the pump(s) is on, the correct pressure should be >25 psia (172 kPa). See Pre-Start section, page 69.

The G1 pressure is normally out of range on the low side when the chiller is at rest. To take a manual reading of the G1 pressure, place a pressure gage on the G1 gage port, located in the same area of the chiller as the G1pressure transducer and the G1 high-pressure switch. See Fig. 51. The G1 internal pressure should be less than or equal to 2 psia (13.9 kPa) for non-recycle starts; less than or equal to 5 psia (34.5 kPa) for recycle starts. See the Pre-Start section, page 69.

REPLACING TRANSDUCERS — Since the PIC does not allow transducers to be calibrated, they must be replaced if they are malfunctioning. Because the transducers are mounted on Schrader fittings, there is no need to break the chiller vacuum to change the transducers. Disconnect the transducer wiring by pulling up on the locking tab while pulling up on the weather-tight connecting plug from the end of the transducer. *Do not pull on the transducer wires.* Unscrew the transducer from the Schrader fitting. When installing a new transducer, do not use pipe sealer, which can plug the sensor. Put the plug connector back on the sensor and snap it into place. Check for chiller leaks.

Control Algorithm Checkout Procedure — One of the tables in the LID SERVICE menu is CONTROL ALGORITHM STATUS. This table contains 4 maintenance screens which may be viewed on the LID to see how a particular control algorithm is operating; that is, to see what parameters and values the PIC is using to control the chiller. The 4 screens are:

COOLING	Capacity Control	Shows all values used to calculate chilled water/brine control point.
APPROACH	Performance	Provides details on all Delta Ts, approaches, and absorber loss.
OVERRIDE	Override Alert	Displays the strong LiBr leaving G1 and condensate temperatures from G2.
CONCENTR	Concentration Status	Displays the conditions at concentration Points 2, 3, 6, 8, 9, 9X, 10, 14, and 14X.

These maintenance tables are very useful in determining how the control temperature is calculated, how the heat exchanger is performing, and the status of absorber loss, cycle temperatures, and concentrations.

Control Test — The control test feature can check the thermistor temperature sensors, pressure transducers, pumps and their associated flow switches, control assembly, and other control outputs. For example, the test can help to determine whether a switch is defective or a pump relay is not operating. For more details on control tests, see the sections, PIC Control Tests, page 31, and Perform an Automated Control Test, page 59.

Control Modules

⚠ CAUTION

Turn controller power off before servicing controls. This ensures safety and prevents damage to the controller.

The processor module (PC6400), slave PSIO module, 8-input modules, and the local interface device (LID) module perform continuous diagnostic evaluations of the hardware to determine its condition. Proper operation of all modules is indicated by LEDs (light-emitting diodes) located on the side of the LID and on the front surfaces of the PC6400, slave PSIO, and 8-input modules.

RED LED — If the LED blinks continuously at a 2-second rate, it indicates proper operation. If it is lit continuously, it indicates a problem requiring replacement of the module. Off continuously indicates that the power should be checked. If the red LED blinks 3 times per second, a software error has been discovered and the module must be replaced. If there is no input power, check fuses and the circuit breaker. If the fuses are good, check for a shorted secondary of the transformer or, if power is present to the module, replace the module.

Table 13A — 5K Ohm Thermistor Temperature (F) vs Resistance/Voltage Drop

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
−25.0	4.821	98010
−24.0	4.818	94707
−23.0	4.814	91522
−22.0	4.806	88449
−21.0	4.800	85486
−20.0	4.793	82627
−19.0	4.786	79871
−18.0	4.779	77212
−17.0	4.772	74648
−16.0	4.764	72175
−15.0	4.757	69790
−14.0	4.749	67490
−13.0	4.740	65272
−12.0	4.734	63133
−11.0	4.724	61070
−10.0	4.715	59081
−9.0	4.705	57162
−8.0	4.696	55311
−7.0	4.688	53526
−6.0	4.676	51804
−5.0	4.666	50143
−4.0	4.657	48541
−3.0	4.648	46996
−2.0	4.636	45505
−1.0	4.624	44066
0.0	4.613	42679
1.0	4.602	41339
2.0	4.592	40047
3.0	4.579	38800
4.0	4.567	37596
5.0	4.554	36435
6.0	4.540	35313
7.0	4.527	34231
8.0	4.514	33185
9.0	4.501	32176
10.0	4.487	31202
11.0	4.472	30260
12.0	4.457	29351
13.0	4.442	28473
14.0	4.427	27624
15.0	4.413	26804
16.0	4.397	26011
17.0	4.381	25245
18.0	4.366	24505
19.0	4.348	23789
20.0	4.330	23096
21.0	4.313	22427
22.0	4.295	21779
23.0	4.278	21153
24.0	4.258	20547
25.0	4.241	19960
26.0	4.223	19393
27.0	4.202	18843
28.0	4.184	18311
29.0	4.165	17796
30.0	4.145	17297
31.0	4.125	16814
32.0	4.103	16346
33.0	4.082	15892
34.0	4.059	15453
35.0	4.037	15027
36.0	4.017	14614
37.0	3.994	14214
38.0	3.968	13826
39.0	3.948	13449
40.0	3.927	13084
41.0	3.902	12730
42.0	3.878	12387
43.0	3.854	12053
44.0	3.828	11730
45.0	3.805	11416
46.0	3.781	11112
47.0	3.757	10816
48.0	3.729	10529
49.0	3.705	10250
50.0	3.679	9979
51.0	3.653	9717
52.0	3.627	9461
53.0	3.600	9213
54.0	3.575	8973
55.0	3.547	8739
56.0	3.520	8511
57.0	3.493	8291
58.0	3.464	8076
59.0	3.437	7868
60.0	3.409	7665
61.0	3.382	7468
62.0	3.353	7277
63.0	3.323	7091
64.0	3.295	6911
65.0	3.267	6735
66.0	3.238	6564
67.0	3.210	6399
68.0	3.181	6238
69.0	3.152	6081
70.0	3.123	5929
71	3.093	5781
72	3.064	5637
73	3.034	5497
74	3.005	5361
75	2.977	5229
76	2.947	5101
77	2.917	4976
78	2.884	4855
79	2.857	4737
80	2.827	4622
81	2.797	4511
82	2.766	4403
83	2.738	4298
84	2.708	4196
85	2.679	4096
86	2.650	4000
87	2.622	3906
88	2.593	3814
89	2.563	3726
90	2.533	3640
91	2.505	3556
92	2.476	3474
93	2.447	3395
94	2.417	3318
95	2.388	3243
96	2.360	3170
97	2.332	3099
98	2.305	3031
99	2.277	2964
100	2.251	2898
101	2.217	2835
102	2.189	2773
103	2.162	2713
104	2.136	2655
105	2.107	2597
106	2.080	2542
107	2.053	2488
108	2.028	2436
109	2.001	2385
110	1.973	2335
111	1.946	2286
112	1.919	2239
113	1.897	2192
114	1.870	2147
115	1.846	2103
116	1.822	2060
117	1.792	2018
118	1.771	1977
119	1.748	1937
120	1.724	1898
121	1.702	1860
122	1.676	1822
123	1.653	1786
124	1.630	1750
125	1.607	1715
126	1.585	1680
127	1.562	1647
128	1.538	1614
129	1.517	1582
130	1.496	1550
131	1.474	1519
132	1.453	1489
133	1.431	1459
134	1.408	1430
135	1.389	1401
136	1.369	1373
137	1.348	1345
138	1.327	1318
139	1.308	1291
140	1.291	1265
141	1.289	1240
142	1.269	1214
143	1.250	1190
144	1.230	1165
145	1.211	1141
146	1.192	1118
147	1.173	1095
148	1.155	1072
149	1.136	1050
150	1.118	1029
151	1.100	1007
152	1.082	986
153	1.064	965
154	1.047	945
155	1.029	925
156	1.012	906
157	0.995	887
158	0.978	868
159	0.962	850
160	0.945	832
161	0.929	815
162	0.914	798
163	0.898	782
164	0.883	765
165	0.868	750
166	0.853	734
167	0.838	719
168	0.824	705
169	0.810	690
170	0.797	677
171	0.783	663
172	0.770	650
173	0.758	638
174	0.745	626
175	0.734	614
176	0.722	602
177	0.710	591
178	0.700	581
179	0.689	570
180	0.678	561
181	0.668	551
182	0.659	542
183	0.649	533
184	0.640	524
185	0.632	516
186	0.623	508
187	0.615	501
188	0.607	494
189	0.600	487
190	0.592	480
191	0.585	473
192	0.579	467
193	0.572	461
194	0.566	456
195	0.560	450
196	0.554	445
197	0.548	439
198	0.542	434
199	0.537	429
200	0.531	424
201	0.526	419
202	0.520	415
203	0.515	410
204	0.510	405
205	0.505	401
206	0.499	396
207	0.494	391
208	0.488	386
209	0.483	382
210	0.477	377
211	0.471	372
212	0.465	367
213	0.459	361
214	0.453	356
215	0.446	350
216	0.439	344
217	0.432	338
218	0.425	332
219	0.417	325
220	0.409	318
221	0.401	311
222	0.393	304
223	0.384	297
224	0.375	289
225	0.366	282

Table 13B — 5K Ohm Thermistor Temperature (C) vs Resistance/Voltage Drop

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (Ohms)
−40	4.896	168 230
−39	4.889	157 440
−38	4.882	147 410
−37	4.874	138 090
−36	4.866	129 410
−35	4.857	121 330
−34	4.848	113 810
−33	4.838	106 880
−32	4.828	100 260
−31	4.817	94 165
−30	4.806	88 480
−29	4.794	83 170
−28	4.782	78 125
−27	4.769	73 580
−26	4.755	69 250
−25	4.740	65 205
−24	4.725	61 420
−23	4.710	57 875
−22	4.693	54 555
−21	4.676	51 450
−20	4.657	48 536
−19	4.639	45 807
−18	4.619	43 247
−17	4.598	40 845
−16	4.577	38 592
−15	4.554	38 476
−14	4.531	34 489
−13	4.507	32 621
−12	4.482	30 866
−11	4.456	29 216
−10	4.428	27 633
−9	4.400	26 202
−8	4.371	24 827
−7	4.341	23 532
−6	4.310	22 313
−5	4.278	21 163
−4	4.245	20 079
−3	4.211	19 058
−2	4.176	18 094
−1	4.140	17 184
0	4.103	16 325
1	4.065	15 515
2	4.026	14 749
3	3.986	14 026
4	3.945	13 342
5	3.903	12 696
6	3.860	12 085
7	3.816	11 506
8	3.771	10 959
9	3.726	10 441
10	3.680	9 949
11	3.633	9 485
12	3.585	9 044
13	3.537	8 627
14	3.487	8 231
15	3.438	7 855
16	3.387	7 499
17	3.337	7 161
18	3.285	6 840
19	3.234	6 536
20	3.181	6 246
21	3.129	5 971
22	3.076	5 710
23	3.023	5 461
24	2.970	5 225
25	2.917	5 000
26	2.864	4 786
27	2.810	4 583
28	2.757	4 389
29	2.704	4 204
30	2.651	4 028
31	2.598	3 861
32	2.545	3 701
33	2.493	3 549
34	2.441	3 404
35	2.389	3 266
36	2.337	3 134
37	2.286	3 008
38	2.236	2 888
39	2.186	2 773
40	2.137	2 663
41	2.087	2 559
42	2.039	2 459
43	1.991	2 363
44	1.944	2 272
45	1.898	2 184
46	1.852	2 101
47	1.807	2 021
48	1.763	1 944
49	1.719	1 871
50	1.677	1 801
51	1.635	1 734
52	1.594	1 670
53	1.553	1 609
54	1.513	1 550
55	1.474	1 493
56	1.436	1 439
57	1.399	1 387
58	1.363	1 337
59	1.327	1 290
60	1.291	1 244
61	1.258	1 200
62	1.225	1 158
63	1.192	1 118
64	1.160	1 079
65	1.129	1 041
66	1.099	1 006
67	1.069	971
68	1.040	938
69	1.012	906
70	0.984	876
71	0.949	836
72	0.920	805
73	0.892	775
74	0.865	747
75	0.838	719
76	0.813	693
77	0.789	669
78	0.765	645
79	0.743	623
80	0.722	602
81	0.702	583
82	0.683	564
83	0.665	547
84	0.648	531
85	0.632	516
86	0.617	502
87	0.603	489
88	0.590	477
89	0.577	466
90	0.566	456
91	0.555	446
92	0.545	436
93	0.535	427
94	0.525	419
95	0.515	410
96	0.506	402
97	0.496	393
98	0.486	385
99	0.476	376
100	0.466	367
101	0.454	357
102	0.442	346
103	0.429	335
104	0.416	324
105	0.401	312
106	0.386	299
107	0.370	285

Table 14A — 100K Ohm Thermistor Temperature (F) vs Resistance/Voltage Drop

TEMPERATURE (F)	VOLTAGE DROP(V)	RESISTANCE (OHMS)	TEMPERATURE (F)	VOLTAGE DROP(V)	RESISTANCE (OHMS)	TEMPERATURE (F)	VOLTAGE DROP(V)	RESISTANCE (OHMS)
442	0.300	395	**342**	0.770	1,127	**244**	1.999	4,122
441	0.303	399	**341**	0.778	1,140	**243**	2.017	4,184
440	0.305	403	**340**	0.786	1,154	**242**	2.035	4,247
439	0.308	407	**339**	0.793	1,168	**241**	2.053	4,312
438	0.311	410	**338**	0.801	1,181	**240**	2.071	4,377
437	0.314	414	**337**	0.809	1,196	**239**	2.089	4,444
436	0.317	418	**336**	0.817	1,210	**238**	2.108	4,512
435	0.319	422	**335**	0.826	1,124	**237**	2.127	4,581
434	0.322	426	**334**	0.834	1,239	**236**	2.145	4,651
433	0.325	430	**333**	0.842	1,254	**235**	2.164	4,723
432	0.328	435	**332**	0.851	1,269	**234**	2.183	4,796
431	0.331	439	**331**	0.859	1,284	**233**	2.202	4,870
429	0.337	447	**330**	0.868	1,300	**232**	2.221	4,946
428	0.340	452	**329**	0.876	1,316	**231**	2.240	5,023
426	0.346	460	**328**	0.885	1,332	**230**	2.259	5,101
425	0.349	465	**327**	0.894	1,348	**229**	2.278	5,181
424	0.352	469	**326**	0.903	1,364	**228**	2.297	5,262
423	0.356	474	**325**	0.912	1,381	**227**	2.317	5,345
422	0.359	479	**324**	0.921	1,398	**226**	2.336	5,429
421	0.362	483	**323**	0.930	1,415	**225**	2.356	5,515
420	0.366	488	**322**	0.940	1,433	**224**	2.375	5,602
419	0.369	493	**321**	0.949	1,450	**223**	2.395	5,692
418	0.372	498	**320**	0.959	1,468	**222**	2.415	5,782
417	0.376	503	**319**	0.968	1,487	**221**	2.435	5,875
416	0.379	508	**318**	0.978	1,505	**220**	2.455	5,969
415	0.383	513	**317**	0.988	1,524	**219**	2.474	6,065
414	0.386	518	**316**	0.998	1,543	**218**	2.494	6,163
413	0.390	523	**315**	1.008	1,562	**217**	2.515	6,262
412	0.393	528	**314**	1.018	1,582	**216**	2.535	6,364
411	0.397	534	**313**	1.028	1,602	**215**	2.555	6,467
410	0.401	539	**312**	1.038	1,622	**214**	2.575	6,573
409	0.404	545	**311**	1.049	1,643	**213**	2.595	6,680
408	0.408	550	**310**	1.059	1,664	**212**	2.615	6,790
407	0.412	556	**309**	1.070	1,865	**211**	2.636	6,901
406	0.416	561	**308**	1.081	1,706	**210**	2.656	7,015
405	0.420	567	**307**	1.091	1,728	**209**	2.677	7,131
404	0.424	573	**306**	1.102	1,751	**208**	2.697	7,249
403	0.428	579	**305**	1.113	1,773	**207**	2.717	7,369
402	0.432	585	**304**	1.124	1,796	**206**	2.738	7,492
401	0.436	591	**303**	1.136	1,819	**205**	2.758	7,617
400	0.440	597	**302**	1.147	1,843	**204**	2.779	7,745
399	0.444	603	**301**	1.158	1,867	**203**	2.800	7,875
398	0.448	609	**300**	1.170	1,891	**202**	2.820	8,008
397	0.452	615	**299**	1.182	1,916	**201**	2.841	8,143
396	0.456	622	**298**	1.193	1,941	**200**	2.861	8,281
395	0.461	628	**297**	1.205	1,966	**199**	2.882	8,422
394	0.465	635	**296**	1.217	1,992	**198**	2.902	8,565
393	0.470	642	**295**	1.229	2,018	**197**	2.923	8,712
392	0.474	648	**294**	1.242	2,045	**196**	2.944	8,861
391	0.479	655	**293**	1.254	2,072	**195**	2.964	9,013
390	0.483	662	**292**	1.266	2,100	**194**	2.985	9,169
389	0.488	669	**291**	1.279	2,128	**193**	3.005	9,327
388	0.492	676	**290**	1.292	2,156	**192**	3.026	9,489
387	0.497	683	**289**	1.304	2,185	**191**	3.047	9,654
386	0.502	691	**288**	1.317	2,214	**190**	3.067	9,822
385	0.507	698	**287**	1.330	2,244	**189**	3.088	9,993
384	0.511	705	**286**	1.343	2,274	**188**	3.108	10,169
383	0.516	713	**285**	1.357	2,305	**187**	3.128	10,347
382	0.521	721	**284**	1.370	2,336	**186**	3.149	10,530
381	0.526	728	**283**	1.384	2,368	**185**	3.169	10,716
380	0.531	736	**282**	1.397	2,400	**184**	3.190	10,906
379	0.537	744	**281**	1.411	2,433	**183**	3.210	11,100
378	0.542	752	**280**	1.425	2,466	**182**	3.230	11,297
377	0.547	760	**279**	1.439	2,500	**181**	3.250	11,499
376	0.552	769	**278**	1.453	2,535	**180**	3.271	11,706
375	0.558	777	**277**	1.467	2,570	**179**	3.291	11,916
374	0.563	785	**276**	1.481	2,605	**178**	3.311	12,131
373	0.568	794	**275**	1.495	2,641	**177**	3.331	12,350
372	0.574	803	**274**	1.510	2,678	**176**	3.351	12,574
371	0.580	812	**273**	1.525	2,715	**175**	3.370	12,803
370	0.585	821	**272**	1.539	2,753	**174**	3.390	13,037
369	0.591	830	**271**	1.554	2,792	**173**	3.410	13,275
368	0.597	839	**270**	1.569	2,831	**172**	3.430	13,519
367	0.602	848	**269**	1.584	2,871	**171**	3.449	13,768
366	0.608	858	**268**	1.600	2,912	**170**	3.469	14,022
365	0.614	867	**267**	1.615	2,953	**169**	3.488	14,281
364	0.620	877	**266**	1.630	2,995	**168**	3.507	14,546
363	0.626	887	**265**	1.646	3,037	**167**	3.527	14,817
362	0.633	897	**264**	1.662	3,081	**166**	3.546	15,094
361	0.639	907	**263**	1.677	3,125	**165**	3.565	15,377
360	0.645	917	**262**	1.693	3,170	**164**	3.584	15,665
359	0.651	927	**261**	1.709	3,215	**163**	3.603	15,960
358	0.658	938	**260**	1.725	3,262	**162**	3.621	16,262
357	0.664	948	**259**	1.742	3,309	**161**	3.640	16,570
356	0.671	959	**258**	1.758	3,357	**160**	3.659	16,885
355	0.677	970	**257**	1.774	3,405	**159**	3.677	17,207
354	0.684	981	**256**	1.791	3,455	**158**	3.696	17,536
353	0.691	993	**255**	1.808	3,505	**157**	3.714	17,872
352	0.698	1,004	**254**	1.825	3,557	**156**	3.732	18,215
351	0.705	1,015	**253**	1.842	3,609	**155**	3.750	18,567
350	0.712	1,027	**252**	1.859	3,662	**154**	3.768	18,926
349	0.719	1,039	**251**	1.876	3,716	**153**	3.785	19,293
348	0.726	1,051	**250**	1.893	3,771	**152**	3.803	19,669
347	0.733	1,063	**249**	1.910	3,827	**151**	3.821	20,053
346	0.740	1,076	**248**	1.928	3,884	**150**	3.838	20,445
345	0.748	1,088	**247**	1.945	3,942	**149**	3.855	20,846
344	0.755	1,101	**246**	1.963	4,001	**148**	3.872	21,257
343	0.763	1,114	**245**	1.981	4,061	**147**	3.889	21,677

Table 14A — 100K Ohm Thermistor Temperature (F) vs Resistance/Voltage Drop (cont)

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
146	3.906	22,106
145	3.923	22,545
144	3.940	22,995
143	3.956	23,454
142	3.972	23,925
141	3.988	24,406
140	4.004	24,898
139	4.020	25,402
138	4.036	25,917
137	4.052	26,445
136	4.067	26,985
135	4.082	27,538
134	4.097	28,103
133	4.112	28,682
132	4.127	29,275
131	4.142	29,882
130	4.157	30,504
129	4.171	31,140
128	4.185	31,791
127	4.199	32,458
126	4.213	33,142
125	4.227	33,842
124	4.240	34,558

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
123	4.254	35,293
122	4.267	36,045
121	4.280	36,816
120	4.293	37,606
119	4.306	38,415
118	4.319	39,243
117	4.331	40,093
116	4.344	40,964
115	4.356	41,856
114	4.368	42,771
113	4.380	43,708
112	4.391	44,669
111	4.403	45,655
110	4.414	46,665
109	4.426	47,701
108	4.437	48,763
107	4.448	49,853
106	4.459	50,970
105	4.469	52,116
104	4.480	53,291
103	4.490	54,497
102	4.500	55,734
101	4.510	57,003

TEMPERATURE (F)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
100	4.520	58,305
99	4.530	59,641
98	4.539	61,012
97	4.549	62,420
96	4.558	63,864
95	4.567	65,346
94	4.576	66,868
93	4.585	68,430
92	4.594	70,034
91	4.603	71,681
90	4.611	73,372
89	4.619	75,108
88	4.627	76,892
87	4.636	78,724
86	4.643	80,605
85	4.651	82,538
84	4.659	84,523
83	4.666	86,563
82	4.674	88,659
81	4.681	90,813
80	4.688	93,027
79	4.695	95,302
78	4.702	97,640
77	4.709	100,044

Table 14B — 100K Ohm Thermistor Temperature (C) vs Resistance/Voltage Drop

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
228	0.299	394
227	0.304	401
226	0.309	407
225	0.314	414
224	0.319	422
223	0.324	429
222	0.329	436
221	0.335	444
220	0.340	452
219	0.346	460
218	0.351	468
217	0.357	476
216	0.363	484
215	0.369	493
214	0.375	502
213	0.381	511
212	0.388	520
211	0.394	530
210	0.401	539
209	0.407	549
208	0.414	559
207	0.421	569
206	0.428	580
205	0.436	591
204	0.443	602
203	0.451	613
202	0.458	624
201	0.466	636
200	0.474	648
199	0.482	661
198	0.490	673
197	0.499	686
196	0.508	699
195	0.516	713
194	0.525	727
193	0.534	741
192	0.544	755
191	0.553	770
190	0.563	785
189	0.573	801
188	0.583	817
187	0.593	833
186	0.604	850
185	0.614	867
184	0.625	885
183	0.636	903
182	0.648	921
181	0.659	940
180	0.671	959
179	0.683	979
178	0.695	999
177	0.707	1020
176	0.720	1041
175	0.733	1063
174	0.746	1086
173	0.760	1109
172	0.773	1132
171	0.787	1157
170	0.801	1181
169	0.816	1207
168	0.831	1233
167	0.846	1260
166	0.861	1287
165	0.876	1316
164	0.892	1345
163	0.908	1374
162	0.925	1405
161	0.942	1436

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
160	0.959	1468
159	0.976	1501
158	0.994	1535
157	1.012	1570
156	1.030	1606
155	1.049	1643
154	1.068	1681
153	1.087	1720
152	1.107	1759
151	1.127	1801
150	1.147	1843
149	1.168	1886
148	1.189	1931
147	1.210	1977
146	1.232	2024
145	1.254	2072
144	1.276	2122
143	1.299	2173
142	1.323	2226
141	1.346	2280
140	1.370	2336
139	1.394	2394
138	1.419	2453
137	1.444	2514
136	1.470	2577
135	1.495	2641
134	1.522	2708
133	1.548	2776
132	1.575	2847
131	1.603	2920
130	1.630	2995
129	1.658	3072
128	1.687	3152
127	1.716	3234
126	1.745	3318
125	1.774	3405
124	1.804	3495
123	1.835	3588
122	1.865	3684
121	1.896	3782
120	1.928	3884
119	1.959	3989
118	1.991	4097
117	2.024	4209
116	2.056	4325
115	2.089	4444
114	2.123	4567
113	2.156	4694
112	2.190	4825
111	2.224	4961
110	2.259	5101
109	2.294	5246
108	2.328	5395
107	2.364	5550
106	2.399	5710
105	2.435	5875
104	2.470	6046
103	2.506	6222
102	2.543	6405
101	2.579	6594
100	2.615	6790
99	2.652	6992
98	2.689	7201
97	2.726	7418
96	2.763	7643
95	2.800	7875
94	2.837	8116
93	2.874	8365

TEMPERATURE (C)	VOLTAGE DROP (V)	RESISTANCE (OHMS)
92	2.911	8 624
91	2.948	8 891
90	2.985	9 169
89	3.022	9 456
88	3.059	9 754
87	3.096	10 063
86	3.133	10 383
85	3.169	10 716
84	3.206	11 061
83	3.242	11 418
82	3.279	11 789
81	3.315	12 175
80	3.351	12 574
79	3.386	12 990
78	3.422	13 421
77	3.457	13 869
76	3.492	14 334
75	3.527	14 817
74	3.561	15 320
73	3.595	15 842
72	3.629	16 384
71	3.662	16 949
70	3.696	17 536
69	3.728	18 146
68	3.761	18 781
67	3.793	19 442
66	3.824	20 130
65	3.855	20 846
64	3.886	21 592
63	3.916	22 369
62	3.946	23 177
61	3.976	24 020
60	4.004	24 898
59	4.033	25 813
58	4.061	26 767
57	4.088	27 762
56	4.115	28 800
55	4.142	29 882
54	4.168	31 011
53	4.194	32 190
52	4.219	33 420
51	4.243	34 704
50	4.267	36 045
49	4.291	37 446
48	4.314	38 909
47	4.336	40 439
46	4.358	42 037
45	4.380	43 708
44	4.401	45 456
43	4.421	47 284
42	4.441	49 196
41	4.461	51 197
40	4.480	53 291
39	4.498	55 484
38	4.516	57 780
37	4.534	60 186
36	4.551	62 705
35	4.567	65 346
34	4.583	68 115
33	4.599	71 017
32	4.614	74 061
31	4.629	77 254
30	4.643	80 605
29	4.657	84 122
28	4.671	87 814
27	4.684	91 691
26	4.696	95 764
25	4.709	100 044

GREEN LEDS — There are one or 2 green LEDs on each type of module. These LEDs indicate the communication status between different parts of the controller and the network modules as follows:

LID Module

Upper LED — Communication with CCN network if present; blinks when communication occurs.

Lower LED — Communication with PC6400 module; it must blink every 5 to 8 seconds when the LID default screen is displayed.

PC6400 Module

Green LID — Communication with the slave PSIO and the 8-input module; it must blink continuously.

Yellow LID — Communication with the LID and other CCN devices; it must blink every 3 to 5 seconds.

Slave PSIO Module

Green LED Closest to Communications Connection — Communication with PC6400 module; it must blink continuously.

8-Input Modules

Green LED — Communication with PC6400 module; blinks continuously.

Notes on Module Operation

1. The chiller operator monitors and modifies configurations in the microprocessor through the 4 softkeys and the LID. Communication with the LID and the PC6400 module is accomplished through the CCN bus. The communication between the PC6400, slave PSIO, and the three 8-input modules is accomplished through the sensor bus, which is a 3-wire cable.

   On the sensor bus terminal strips (COMM3), Terminal 1 of the PC6400 module is connected to Terminal 1 of each of the other modules. Terminals 2 and 3 are connected in the same manner. If a Terminal 2 wire is connected to Terminal 1, the system does not work.
2. If a green LED is on continuously, check the communication wiring. If a green LED is off, check the red LED operation. If the red LED is normal, check the module address switches. Proper addresses are:

MODULE ADDRESSING (COMM3)	ADDRESS	
	S1	**S2**
Slave PSIO (Processor/Sensor Input/Output Module)	1	7
1st 8-input Module	3	5
2nd 8-input Module	4	3
3rd 8-Input Module	5	1
CCN MODULE ADDRESSING (COMM1)	**BUS**	**ADDRESS**
PC6400 Comfort Controller	0	1
LID (Local Interface Device)	0	230

   If all modules indicate a communications failure, check the communications plug on the PC6400 module for proper seating. Also check the wiring terminations (Level II — 1:red, 2:wht, 3:blk; Sensor bus — 1:red, 2:wht, 3:blk). If the connections are good and the condition persists, perform an ATTACH TO NETWORK DEVICE upload of the PC6400 module. Enter the correct PC6400 module address (the factory-set address is Bus 0 Address1). If the ATTACH TO NETWORK DEVICE upload does not eliminate the failure, replace the module.

   If only one 8-input module indicates a communication failure, check the communications plug on that module. If the connection is good and the condition persists, replace the module.

   All system operating intelligence resides in the PC6400 module. The PC6400 module monitors conditions using input ports on the PC6400, slave PSIO, and the 8-input modules. Outputs are controlled by the PC6400 module and the slave PSIO module via the PC6400 module as well.
4. Power is supplied to modules within the control panel via 21-vac power sources.

   The transformers are located within the power panel, with the exception of the PC6400 module, which operates from a 24-vac power source and has its own 24-vac transformer located within the control box.

   Within the power panel, TR1 supplies power to the LID, the slave PSIO module, and the 5-vac power supply for the transducers. Another 21-vac transformer, TR2, supplies power to the first and second 8-input modules. TR3 supplies power to the third 8-input module and is capable of supplying power to one additional module. If additional modules are added, another power supply will be required. TR5 is a 24 vac power supply that powers the PC6400 module.

   Power is connected to Terminals 1 and 2 of the power input connection on each module.

PC6400 Module (Fig. 57)

INPUTS — Each input channel has 3 terminals; only 2 terminals are used. Always refer to the job-specific certified wiring diagrams for the correct terminal numbers.

OUTPUTS — Output is 20 vdc or 4 to 20 mA. There are 2 terminals per output. Refer to the job-speciific wiring diagrams for the correct terminal numbers.

The PC6400 hardware address and I/O selectors for the DIP switches are shown in Fig. 57.

Processor Module (Slave PSIO) (Fig. 58)

INPUTS — Each input channel has 3 terminals; only 2 of the terminals are used. The chiller application determines which terminals are normally used. Always refer to the job-specific wiring diagrams for the correct terminal numbers.

OUTPUTS — Output is 20 vdc. There are 3 terminals per output, only 2 of which are used, depending on the application. Refer to the job-specific wiring diagrams for the correct terminal numbers.

First, Second, and Third 8-Input Modules (Fig. 59) — The 8-input modules are used to add system temperatures, system discrete switch inputs, temperature reset inputs, and spare sensor inputs. Each input module contains 8 inputs, and each input has a specific task. See the wiring diagram for exact module wire terminations.

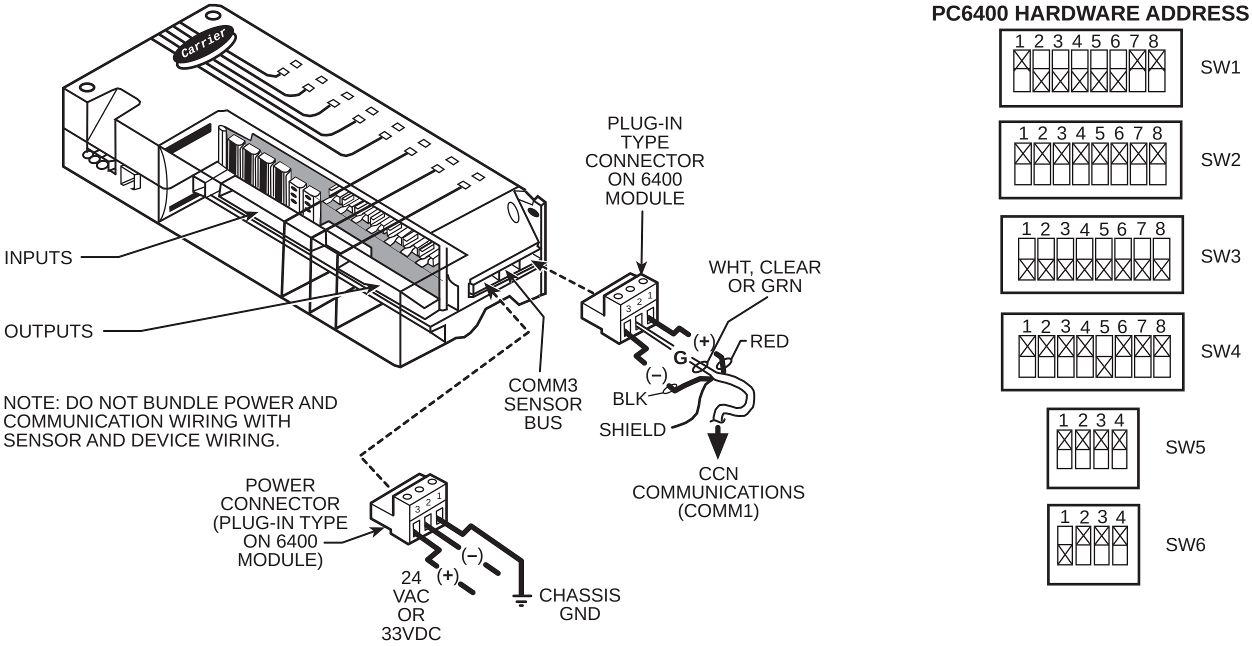
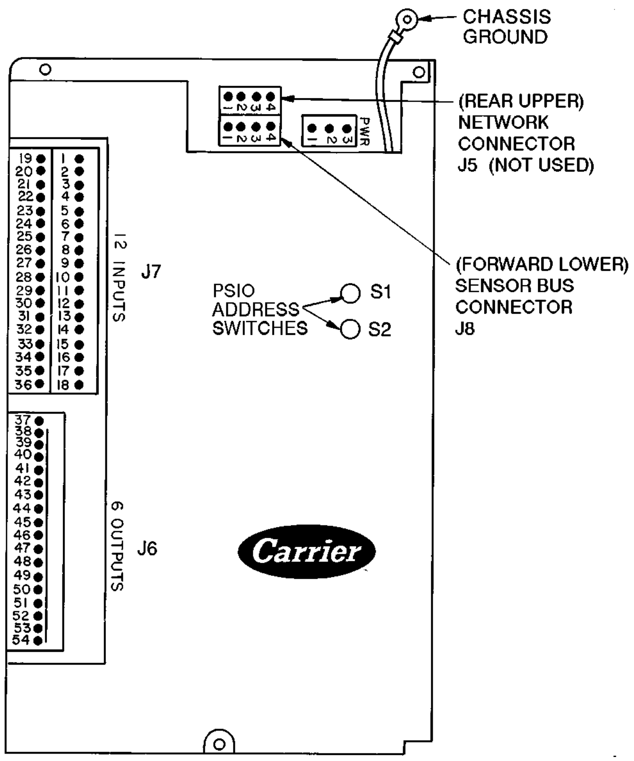


Fig. 57 — PC6400 Module



CCN — Carrier Comfort Network
COMM — Communications
GND — Ground
J — Module Connector
PSIO — Processor Sensor Input/Output
PWR — Power
S1 — Switch Setting 1
S2 — Switch Setting 2
SW — Module Address Switches

NOTE: PSIO address switches are factory set as follows: S1 is set at 1; S2 is set at 7.

Fig. 58 — Processor Module (Slave PSIO)

Terminal block connections are provided on the 8-input modules. Any spare sensor inputs are field wired and installed. For installation, refer to the unit or field wiring diagrams. The addresses of the modules are shown in Fig. 60. They are factory set and should not need adjustment.

Replacing Defective Processor Modules — The replacement part number is printed in a small label on the front of the PC6400 module. The chiller model and serial numbers are printed on the unit nameplate located on an exterior corner post. The proper software is factory installed by Carrier in the replacement module. When ordering a replacement processor module (PC6400), specify complete replacement part number, full chiller model number, and serial number. This new unit requires reconfiguration to the original chiller data by the installer. Follow the procedures described in the Set Up Chiller Control Configuration section on page 57.

⚠ CAUTION

Electrical shock can cause personal injury. Disconnect all electrical power before servicing.

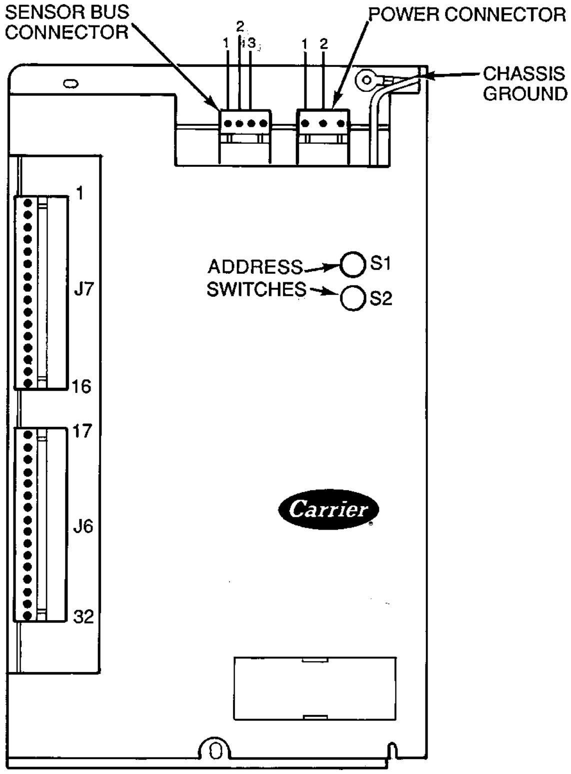
INSTALLATION

1. Verify if the existing PC6400 module is defective by using the procedure described in the Notes on Module Operation section, page 106, and Control Modules section, page 101. Do not select the ATTACH TO NETWORK DEVICE table if the LID displays communication failure.
2. Data regarding the PC6400 configuration should have been recorded and saved. This data will have to be reconfigured into the LID. If this data is not available, follow the procedures described in the Set Up Chiller Control Configuration section.

If a CCN Building Supervisor or Service Tool is present, the module configuration should have already been uploaded into memory; then, when the new module is installed, the configuration can be downloaded from the computer.

Any communication wires from other chillers or CCN modules should be disconnected to prevent the new PC6400 module from uploading incorrect run hours into memory.

3. To install this module, first record the *SOLUTION PUMP STARTS* and the *SOLUTION PUMP ONTIME* from the PUMPSTAT screen on the LID.
4. Turn off the power to the controls.
5. Remove the old PC6400. DO NOT install the new PC6400 at this time.
6. Turn on the power to the controls. When the LID screen reappears, press the MENU softkey, then press the SERVICE softkey. Enter the password, if applicable. Move the highlight bar down to the ATTACH TO NETWORK DEVICE line. Press the SELECT softkey. Press the ATTACH softkey. The LID will then display UPLOADING TABLES, PLEASE WAIT and then display, COMMUNICATIONS FAILURE. Press the EXIT softkey.
7. Turn off the power to the controls.



NOTE: Options module address switch as should be set as follows:

SWITCH SETTING	1ST 8-INPUT MODULE	2ND 8-INPUT MODULE	3RD 8-INPUT MODULE
S1	3	4	5
S2	5	3	1

Fig. 59 — 8-Input Modules

8. Install the new PC6400 module. Turn on the power to the controls.
9. The LID will now automatically upload the new PC6400 module.
10. Access the PUMPSTAT table and move the highlight bar down to the *SOLUTION PUMP STARTS* line. Press the SELECT softkey. Increase the value to indicate the correct starts value as recorded in Step 3. Press ENTER when you reach the correct value. Move the highlight bar to the *SOLUTION PUMP ONTIME* line. Press SELECT. Increase the run hours value to indicate the value recorded in Step 3. Press ENTER when you reach the correct value.
11. Complete the PC6400 installation. Following instructions in this manual, input all the proper configurations, time, date, etc.

Physical Data — For operator convenience during troubleshooting , additional details regarding physical data may be found in Tables 15-17. For information on wiring, refer to the wiring schematics provided for your specific jobsite.

Table 15 — 16JT Heat Exchanger Weights

16JT UNIT SIZE	ENGLISH					SI				
	Absorber/ Evaporator	Generator/ Condenser	LiBr	Refrigerant (Water)	Operating Weight (lb)	Absorber/ Evaporator	Generator/ Condenser	LiBr	Refrigerant (Water)	Operating Weight (lb)
810	8,595	3,085	137	87	15,210	3 900	1 400	840	330	6 900
812	8,815	3,085	137	87	15,430	4 000	1 400	840	330	7 000
814	9,035	3,085	137	87	15,650	4 100	1 400	840	330	7 100
816	11,460	4,630	200	106	21,610	5 200	2 100	1225	400	9 800
818	11,680	4,630	200	106	21,830	5 300	2 100	1225	400	9 905
821	11,680	4,850	200	106	22,050	5 300	2 200	1225	400	10 005
824	11,900	5,070	246	92	22,710	5 400	2 300	1505	350	10 305
828	12,120	5,290	257	92	23,370	5 500	2 400	1575	350	10 600
832	13,885	6,390	309	114	27,120	6 300	2 900	1890	430	12 305
836	14,325	6,610	314	114	28,000	6 500	3 000	1925	430	12 700
841	16,090	7,275	366	137	31,970	7 300	3 300	2240	520	14 505
847	16,530	7,495	400	137	32,850	7 500	3 400	2450	520	14 900
854	18,295	8,155	440	165	36,360	8 300	3 700	2695	625	16 500
857	22,040	9,700	463	165	44,100	10 000	4 400	2835	625	20 005
865	22,480	9,920	514	203	45,200	10 200	4 500	3150	770	20 505
873	23,005	11,460	560	232	48,510	10 800	5 200	3430	880	22 005
880	26,010	12,125	623	285	50,710	11 800	5 500	3815	1080	23 005
080	29,755	14,325	754	177	61,740	13 500	6 500	4620	670	28 005
090	34,160	15,430	846	201	70,560	15 500	7 000	5180	760	32 005
100	37,470	16,970	903	215	79,380	17 000	7 700	5530	815	36 010
110	41,875	17,630	1017	202	85,950	19 000	8 000	6230	765	38 990
120	47,385	18,735	1097	206	94,810	21 500	8 500	6720	780	43 005
135	51,795	19,835	1264	238	105,840	23 500	9 000	7740	900	48 010
150	55,100	22,040	1377	271	114,660	25 000	10 000	8435	1025	52 010
080L	35,265	15,430	823	197	70,560	16 000	7 000	5040	745	32 005
090L	40,335	16,530	922	211	79,380	18 300	7 500	5650	800	36 010
100L	42,980	17,630	1006	225	85,950	19 500	8 000	6160	850	38 990
110L	45,845	19,175	1114	219	94,810	20 800	8 700	6825	830	43 005
120L	50,690	20,715	1200	238	105,840	23 000	9 400	7350	900	48 010
135L	59,510	24,245	1380	277	116,860	27 000	11 000	8450	1050	53 010
150L	62,845	24,245	1504	304	130,090	28 500	11 000	9210	1150	59 010

Table 16 — 16JT Waterbox Cover Weights for Unit Sizes 810 to 880

(lb)

16JT UNIT SIZE	CONDENSER COVER		ABSORBER COVER		EVAPORATOR COVER		STEAM COVER	CROSSOVER PIPE
	With Nozzle	Without Nozzle	With Nozzle	Without Nozzle	With Nozzle	Without Nozzle		
810 - 814	51	29	187	179	182	168	123	28
816 - 821	55	33	201	187	175	170	123	—
824 - 828	68	33	227	216	207	198	139	—
832 - 836	68	51	238	216	214	201	139	114
841 - 847	84	60	280	249	236	228	139	306
854	86	62	313	287	275	268	139	306
857 - 865	62	60	280	249	236	228	258	306
873	86	62	313	287	275	268	258	318
880	107	83	342	313	298	291	298	351

(kg)

16JT UNIT SIZE	CONDENSER COVER		ABSORBER COVER		EVAPORATOR COVER		STEAM COVER	CROSSOVER PIPE
	With Nozzle	Without Nozzle	With Nozzle	Without Nozzle	With Nozzle	Without Nozzle		
810 - 814	23.0	13.0	85	79	82.5	76.0	56.0	12.8
816 - 821	25.0	15.0	91	85	79.5	77.2	56.0	—
824 - 828	31.0	15.0	103	98	94.0	90.0	62.9	—
832 - 836	31.0	23.2	108	98	97.0	91.0	62.9	51.8
841 - 847	38.0	27.3	127	113	107.0	103.5	62.9	138.6
854	38.9	28.1	142	130	124.7	121.6	62.9	138.6
857- 865	28.1	27.3	127	113	107.0	103.5	117.0	138.6
873	38.9	28.1	142	130	124.7	121.6	117.0	144.3
880	48.4	37.7	155	142	135.0	132.0	135.0	159.0

Table 17 — 16JT Waterbox Cover Weights for Unit Sizes 080 to 150, 080L to 150L

(lb)

16JT UNIT SIZES	CONDENSER COVER		ABSORBER COVER		EVAPORATOR COVER		EVAPORATOR W/NOZZLE		STEAM COVER	CROSSOVER PIPE
	(150 psi)	(300 psi)	(150 psi)	(300 psi)	(150 psi)	(300 psi)	(150 psi)	(300 psi)		
080, 080L	106	234	430	701	386	536	474	597	207	431
090, 090L	132	249	540	741	474	591	562	664	245	444
100, 100L	148	282	551	794	518	640	606	698	273	—
110, 110L	154	304	639	882	628	697	717	778	289	—
120, 120L	165	320	705	950	683	752	672	736	311	—
135, 135L	209	359	838	1016	838	838	822	822	353	—
150, 150L	212	379	882	1131	922	922	952	952	320	—

(kg)

16JT UNIT SIZES	CONDENSER COVER		ABSORBER COVER		EVAPORATOR COVER		EVAPORATOR W/NOZZLE		STEAM COVER	CROSSOVER PIPE
	(1034 kPa)	(2068 kPa)	(1034 kPa)	(2068 kPa)	(1034 kPa)	(2068 kPa)	(1034 kPa)	(2068 kPa)		
080, 080L	48	106	195	318	175	243	215	271	94	195.6
090, 090L	60	113	245	336	215	268	255	301	111	201.2
100, 100L	67	128	250	360	235	290	275	316	124	—
110, 110L	70	138	290	400	285	316	325	535	131	—
120, 120L	75	145	320	431	310	341	305	334	141	—
135, 135L	95	163	380	461	380	380	373	373	160	—
150, 150L	96	172	400	513	418	418	432	432	145	—

INDEX

INITIAL START-UP CHECKLIST FOR

16JT DOUBLE-EFFECT HERMETIC ABSORPTION LIQUID CHILLER
(Remove and use for job file.)

CUT ALONG DOTTED LINE

MACHINE INFORMATION:

NAME ______________________________ JOB NO. ____________________

ADDRESS ______________________________ MODEL ____________________

CITY ____________________ STATE __________ ZIP ____________

SUPPLY STEAM PRESSURE ______________________________

STEAM PRESSURE AT GENERATOR ______________________________

DESIGN DATA:

	TONS	FLOW RATE	TEMPERATURE IN	TEMPERATURE OUT	PRESSURE DROP	PASS
EVAPORATOR						
ABSORBER						
COOLER						

ELECTRICAL DATA: Volts __________

INHIBITOR: __________

CARRIER OBLIGATIONS:

Assemble . . . . Yes ☐ No ☐
Leak Test . . . . Yes ☐ No ☐
Dehydrate . . . . Yes ☐ No ☐
Charging . . . . Yes ☐ No ☐

Operating Instructions ____________ Hrs.

START-UP TO BE PERFORMED IN ACCORDANCE WITH APPROPRIATE MACHINE START-UP INSTRUCTIONS

JOB DATA REQUIRED:

1. Machine Installation Instructions . . . . Yes ☐ No ☐
2. Machine Assembly, Wiring, and Piping Diagrams . . . . Yes ☐ No ☐
3. Starting Equipment Details and Wiring Diagrams . . . . Yes ☐ No ☐
4. Applicable Design Data (see above) . . . . Yes ☐ No ☐
5. Diagrams and Instructions for Special Controls . . . . Yes ☐ No ☐

CUT ALONG DOTTED LINE

INITIAL MACHINE PRESSURE: ____________

	YES	NO
Was Machine Tight?		
If Not, Were Leaks Corrected?		

WHAT WAS FINAL VACUUM AFTER REPAIRS? __________

RECORD PRESSURE DROPS: Cooler __________ Condenser __________ Absorber __________

CHARGE LiBr: Initial Charge ______________ Final Charge After Trim ______________

CHARGE REFRIGERANT: Initial Charge ______________ Final Charge After Trim ______________

INSPECT WIRING AND RECORD ELECTRICAL DATA:

RATINGS:

Line Voltages: Controls______________

CONTROLS: SAFETY, OPERATING, ETC.

Perform Control Test (Yes/No) _______

PIC CAUTION

PUMP MOTORS AND CONTROL CENTER **MUST** BE PROPERLY AND INDIVIDUALLY CONNECTED BACK TO THE EARTH GROUND IN CONTROL BOX (IN ACCORDANCE WITH CERTIFIED DRAWINGS).

Yes _______

RUN MACHINE: Do these safeties shut down machine?

Chilled Water Flow Switch	Yes ☐	No ☐
Cooling Water Flow Switch	Yes ☐	No ☐
Pump Interlocks	Yes ☐	No ☐
High G1 Temperature	Yes ☐	No ☐
High G1 Pressure	Yes ☐	No ☐
LCWCO (Leaving Chilled Water Cut-Out)	Yes ☐	No ☐

INITIAL START:

Line Up All Valves in Accordance With Instruction Manual: _______

LiBr is Charged ______________ gal. Refrigerant is Charged ______________ gal.

Check Solution Pump(s) Rotation and Record:
Correct _______ Incorrect _______

Check Refrigerant Pump Rotation and Record:
Correct _______ Incorrect _______

Start Water Pumps and Establish Water Flow ______________

START MACHINE AND OPERATE. COMPLETE THE FOLLOWING:

1. Complete Any Remaining Control Calibration and Record Under Controls Section (pages 13-55).
2. Take At Least 2 Sets of Operational Log Readings and Record.
3. Trim Charge. Check Operation of Cycle-Guard™ Valve. Add Alcohol.
4. Give Operating Instructions to Owner’s Operating Personnel. Hours Given: ___________ Hours
5. Call your local Carrier factory representative to report start up (1-800-333-CHIL).

SIGNATURES:

CARRIER TECHNICIAN ____ DATE ______________

CUSTOMER REPRESENTATIVE _____________________________________ DATE ______________

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Carrier COMFORT NETWORK

16JT DOUBLE-EFFECT ABSORPTION LIQUID CHILLER CONFIGURATION SETTINGS LOG

(Remove and use for job file.)

16JT SET POINT TABLE CONFIGURATION SHEET				
DESCRIPTION	**UNITS**	**RANGE**	**DEFAULT**	**VALUE**
Cooling Setpoint	DEG F (DEG C)	41 to 65 (5 to 18.3)	50.0 (10)	

PC6400 Software: Version ____________
LID Software: Version ____________

PC6400 Controller Identification: Bus ____________ Address ____________
Default Bus: 0 Default Address: 1

LID Identification: Bus ____________ Address ____________
Default Bus: 0 Default Address: 230

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LOCAL 16JT PIC TIME SCHEDULE CONFIGURATION SHEET OCCPC01S

	Day Flag									Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H										
Period 1:																		
Period 2:																		
Period 3:																		
Period 4:																		
Period 5:																		
Period 6:																		
Period 7:																		
Period 8:																		

NOTE: Default setting is OCCUPIED 24 hours each day.

CCN 16JT PIC TIME SCHEDULE CONFIGURATION SHEET OCCPC02S

	Day Flag									Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H										
Period 1:																		
Period 2:																		
Period 3:																		
Period 4:																		
Period 5:																		
Period 6:																		
Period 7:																		
Period 8:																		

NOTE: Default setting is OCCUPIED 24 hours each day.

16JT PIC TIME SCHEDULE CONFIGURATION SHEET OCCPC__ S

	Day Flag									Occupied Time					Unoccupied Time			
	M	T	W	T	F	S	S	H										
Period 1:																		
Period 2:																		
Period 3:																		
Period 4:																		
Period 5:																		
Period 6:																		
Period 7:																		
Period 8:																		

NOTE: Default setting is OCCUPIED 24 hours each day.

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16JT PIC CONFIG TABLE CONFIGURATION SHEET				
DESCRIPTION	**RANGE**	**UNITS**	**DEFAULT**	**VALUE**
RESET TYPE 1				
Degrees Reset at 20 mA	−15 to 15 (−8.3 to 8.3)	DEG F (DEG C)	10 (5.6)	
RESET TYPE 2				
Remote Temp (No Reset)	−40 to 245 (−40 to 118)	DEG F (DEC C)	65 (18.3)	
Remote Temp (Full Reset)	−40 to 245 (−40 to 118)	DEG F (DEG C)	85 (29.4)	
Degrees Reset	−15 to 15 (−8.3 to 8.3)	DEG F (DEG C)	10 (5.6)	
RESET TYPE 3				
CHW Temp (No Reset)	0 to 15 (0 to 8)	DEG F (DEG C)	10 (5.6)	
CHW Temp (Full Reset)	0 to 15 (0 to 8)	DEG F (DEG C)	0 (0)	
Degrees Reset	−15 to 15 (−8.3 to 8.3)	DEG F (DEG C)	5 (2.8)	
Select/Enable Reset Type	0 to 3		0	
CHW_IN Control Option	DSABLE/ENABLE		DSABLE	
Remote Contacts Option	DSABLE/ENABLE		DSABLE	
Temp Pulldown Deg/Min	2 to 10 (1.1 to 5.6)	DEG F/MIN. (DEG C/MIN.)	3 (1.7)	
CCN Occupancy Config: Schedule Number	2 to 99		2	
CCN Occupancy Config: Broadcast Option	DSABLE/ENABLE		DSABLE	

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16JT PIC SERVICE1 TABLE CONFIGURATION SHEET				
DESCRIPTION	**RANGE**	**UNITS**	**DEFAULT**	**VALUE**
Refrigerant Trip Point	37 to 42 (2.8 to 55)	DEG F (DEG C)	38 (3.3)	
Refrigerant Override Delta T	2 to 5 (1.1 to 2.8)	DEG F (DEG C)	2 (1.1)	
Water Flow Verify Time	0.5 to 5	MIN	0.5	
Recycle Restart Delta T	2 to 10 (1.1 to 5.6)	DEG F (DEG C)	5 (2.8)	
Weak LiBr Lvg Abs Alert	100 to 150 (37.8 to 65.6)	DEG F (DEG C)	110 (43.3)	
G2 Condensate Override	199 to 204 (92.8 to 95.5)	DEG F (DEG C)	199 (92.8)	
G1 Strong LiBr Override	311 to 320 (155 to1 60)	DEG F (DEG C)	311 (155)	
G2 Overflow Alarm	150 to 240 (65.6 to 115.6)	DEG F (DEG C)	175 (79.4)	
Desolidification Time	15 to 240	MIN	60	
Concentration Sensor Cal:				
Conc at Low Level	50 to 60	%	55	
Volts at Low Level	0 to 5.0	VOLTS	4.5	
Conc at High Level	50 to 60	%	60	
Volts at High Level	0 to 5.0	VOLTS	3.0	
Cycle-Guard™ Level Adjust	0 to 15	—	8	
Line Frequency Select: 0 = 60 Hz, 1 = 50 Hz	0/1	Hz	0	

16JT PIC SERVICE2 TABLE CONFIGURATION SHEET				
DESCRIPTION	**RANGE**	**UNITS**	**DEFAULT**	**VALUE**
CHWS Temp Enable	0 to 2 (0 = DSABLE 1 = LOW 2 = HIGH)		0	
CHWS Temp Alert	−40 to 245 (−40 to 118)	DEG F (DEG C)	245 (118.3)	
CHWR Temp Enable	0 to 2 (0 = DSABLE 1 = LOW 2 = HIGH)		0	
CHWR Temp Alert	−40 to 245 (−40 to 118)	DEG F (DEG C)	245 (118.3)	
Reset Temp Enable	0 to 2 (0 = DSABLE 1 = LOW 2 = HIGH)		0	
Reset Temp Alert	−40 to 245 (−40 to 118)	DEG F (DEG C)	245 (118.3)	

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16JT PIC SERVICE3 TABLE CONFIGURATION SHEET				
DESCRIPTION	**RANGE**	**UNITS**	**DEFAULT**	**VALUE**
Control Point Deadband	0.5 to 2.0 (0.3 to 1.1)	DEG F (DEG C)	1.0 (0.56)	
Proportional Inc Band	2 to 10		6.5	
Proportional Dec Band	2 to 10		6.0	
Proportional CHW_IN Gain	1 to 3		2.0	
G1 Solution Temp Bias	1 to 10		5.0	
Capacity Valve Setup:				
Warmup Travel Limit	15 to 80	%	65	
Running Travel Limit	15 to 100	%	100	
Linear Valve Type	0/1	NO/YES	NO	
Pneumatic Valve Type	0/1	NO/YES	NO	
Spray Pump Fault	0/1	DSABLE/ENABLE	ENABLE	
Solution Pump 2 Fault	0/1	DSABLE/ENABLE	ENABLE	
Solution Pump:				
Ontime	0 to 500,000	Hours	0	
Starts	0 to 65,534		0	

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HOLIDAY CONFIGURATION SHEET (HOLDY__S)			
DESCRIPTION	**RANGE**	**UNITS**	**VALUE**
Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

HOLIDAY CONFIGURATION SHEET (HOLDY__S)			
DESCRIPTION	**RANGE**	**UNITS**	**VALUE**
Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

HOLIDAY CONFIGURATION SHEET (HOLDY__S)			
DESCRIPTION	**RANGE**	**UNITS**	**VALUE**
Start Month	1 to 12		
Start Day	1 to 31		
Duration	0 to 99	DAYS	

NOTE: There are no holidays defined on the default menu. Holiday dates must be updated yearly if they are used.

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BROADCAST (BRODEF) CONFIGURATION SHEET				
DESCRIPTION	**RANGE**	**UNITS**	**DEFAULT**	**VALUE**
Time Broadcast Enable	ENABLE/DSABLE		DSABLE	
Daylight Savings Start				
Start Month	1 to 12		4	
Start Day of Week	1 to 31		15	
Start Time	00:00 to 23:59	HH:MM	02:00	
Start Advance	1 to 1440	MIN	60	
Stop Month	1 to 12		10	
Stop Day of Week	1 to 31		15	
Stop Time	00:00 to 23:59	HH:MM	02:00	
Stop Back	1 to 1440	MIN	60	

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