$30.^{00}$

Application Engineering®

Operation and Installation Manual

Pinnacle Series Central Chilling Stations

Important! **Read Carefully Before Attempting to Install or Operate Equipment**

Part No. A0556333 **Bulletin No. AE3-610**

Performance figures stated in this manual are based on a standard atmosphere of 95°F (35°C) at 29.92” Hg (1,014 millibars) at sea level, using 60 hz power. Altitude is an important consideration when specifying chillers with pump tanks. AEC/Application Engineering can advise you on proper selection and sizing of systems for your operating environment.

AEC/Application Engineering is committed
to a continuing program of product improvement.
Specifications, appearance, and dimensions described in this manual
are subject to change without notice.

Effective 10/3/02
Part No. A0556333
Bulletin No. AE3-610.1

Safety Considerations

AEC/Application Engineering Pinnacle Series central chillers with pump tanks are designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes.

To avoid possible personnel injury or equipment damage when installing, operating, or maintaining this equipment, use good judgment and follow these safe practices:

- ☑ Follow all **SAFETY CODES**.
- ☑ Wear **SAFETY GLASSES** and **WORK GLOVES**.
- ☑ Disconnect and/or lock out power before servicing or maintaining the chiller.
- ☑ Use care when **LOADING**, **UNLOADING**, **RIGGING**, or **MOVING** this equipment.
- ☑ Operate this equipment within design specifications.
- ☑ **OPEN**, **TAG**, and **LOCK ALL DISCONNECTS** before working on equipment. You should remove the fuses and carry them with you.
- ☑ Make sure the chiller and components are properly **GROUNDED** before you switch on power.
- ☑ Do not jump or bypass any electrical safety control.
- ☑ Do not restore power until you remove all tools, test equipment, etc., and the chiller and related equipment are fully reassembled.
- ☑ Only **PROPERLY TRAINED** personnel familiar with the information in this manual should work on this equipment.

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1 General Information

1-1 Introduction

AEC/Application Engineering Pinnacle Series central water chilling stations are available in water-cooled and remote air-cooled designs. They differ only in the condensing media used. Pinnacle units can be configured with two or three independent circuits using *multiples* of 15 ton (45,360 Kcal/hr.) compressors for each circuit. This manual lists information for two-circuit and three-circuit Pinnacle units.

Pinnacle chilling stations include stainless steel pump tanks for use as reservoirs for chilled water processes. These dual-well models hold hot and cold water before and after it is pumped through the chiller. Tanks have recirculation pump(s) to send return water to the chiller and process pump(s) to pump cooled water directly to process. Standby pumps may be utilized to distribute pump service or to allow uninterrupted chiller operation during pump maintenance.

Properly installed, operated, and maintained Pinnacle chilling stations provide many years of reliable operation. **To get the most satisfaction from your new chiller, read and follow the instructions in this manual.**

1-2 Necessary Documents

These documents are necessary for the operation, installation, and maintenance of AEC/Application Engineering Pinnacle chilling stations. Additional copies are available from AEC, Inc. **Make sure that the appropriate personnel get familiar with these documents:**

- This manual.
- The schematic and connection diagram in the control enclosure.
- Operation and installation manuals for accessories and options selected by the customer.
- The Customer Parts List included in the information packet.

1-3 Models Covered

Model numbers are listed on the serial tag of the chiller. A **-Q** following the model number indicates a specially constructed unit; not all information in this manual may apply. Make sure that you know the model number, serial number, and operating voltage of your chilling station if you need to contact AEC, Inc.

Pinnacle chiller models are designated by the number of refrigeration circuits, total compressor horsepower of all circuits (30 through 90), and the cooling method used. Remote air-cooled models are designated **PINN2-xxR** and water-cooled models are designated **PINN2-xxW**. For example, a two-circuit remote air-cooled Pinnacle with two 15 hp scroll compressors is designated as **PINN2-30R**.

1-4 Standard Features

Your Pinnacle central chilling station comes standard with the following features:

- High-efficiency scroll compressors
- Off-the-shelf PLC control with NEMA 4 color touch screen interface (MMI)
- Integral SS 304L stainless steel reservoir
- Stainless steel brazed plate evaporator
- Process and recirculation pumps
- NEMA 12 electrical enclosure
- High and low refrigerant pressure safeties
- Touch-safe branch circuit fusing
- Pre-piped water circuit
- Two-way water regulating valve (water-cooled models)
- Cleanable shell and tube condenser(s) (water-cooled models)
- Remote condenser(s) with variable speed lead fan and fan cycling (remote air-cooled models)
- Digital low temperature freezestat
- Liquid line solenoid and shut-off valves
- Chilled water flow switches
- Insulated tank cover
- Automatic water makeup valve
- AEC Warm Gray and black paint
- 1 year warranty on parts and labor
- 3 year warranty on controller
- Y-strainer on recirculating water system

Standard Features on Remote Condensers

- Direct-drive 3-phase fan motors are 1½ hp (1.12 kW) at 1,140 rpm with ball bearings and internal overload protection; variable speed fan motor is 1 hp (0.75 kW), 1-phase
- Electronic variable-speed control of lead fan and fan cycling for constant condenser head pressure control
- Fans are 30" (76 cm) in diameter and have PVC-coated steel fan guards; 1½ hp (1.12 kW) variable-speed fans are 26" (66 cm) in diameter
- Internal baffles between fan cells
- UL listed in the United States and Canada
- Patented floating tube coil to eliminate tube sheet leaks
- Copper tube condenser coils have corrugated aluminum fins
- Weather-proof control panel with factory-mounted door interrupt switch
- High-efficiency condenser coil, designed for optimum performance
- Aluminum housing provides corrosion protection for outdoor applications

1-5 Available Options

Pinnacle units are available with options to tailor the unit to your requirements. Some are factory installed, some can be retro-fitted in the field. Contact your AEC sales representative for more information.

Operating Voltages

Pinnacle chillers are available configured for the following operating voltages:

- 208 V to 230 V / 3 phase / 60 Hz
- 380 V / 3 phase / 50 Hz (derate capacity by multiplying by **0.83**)
- 460 V / 3 phase / 60 Hz
- 575 V / 3 phase / 60 Hz

Advanced Control Package

The Advanced Control package includes a flow meter on process pumps with volumetric flow rate displayed through touch screen control interface. The package also provides compressor lead-lag, which lets you use the touch screen control interface to enter the rotation schedule you want (from 100 hours to 500 hours) for the lead refrigeration circuit. Pumps include this same feature when standbys are ordered. Pressure transducers provide a digital display of discharge and recirculation pump manifold pressures.

Note: The temperature profile displays a graph of leaving water temperature (LWT) over time.

Pressure Gauges

Liquid filled compound dual scale pressure gauges are available for all pumps.

Tank Sight Glass

The 30” (76 cm) tank sight glass includes isolation valves.

Non-Fused Disconnect

The non-fused disconnect provides convenient means for local power disconnection.

Special Voltages

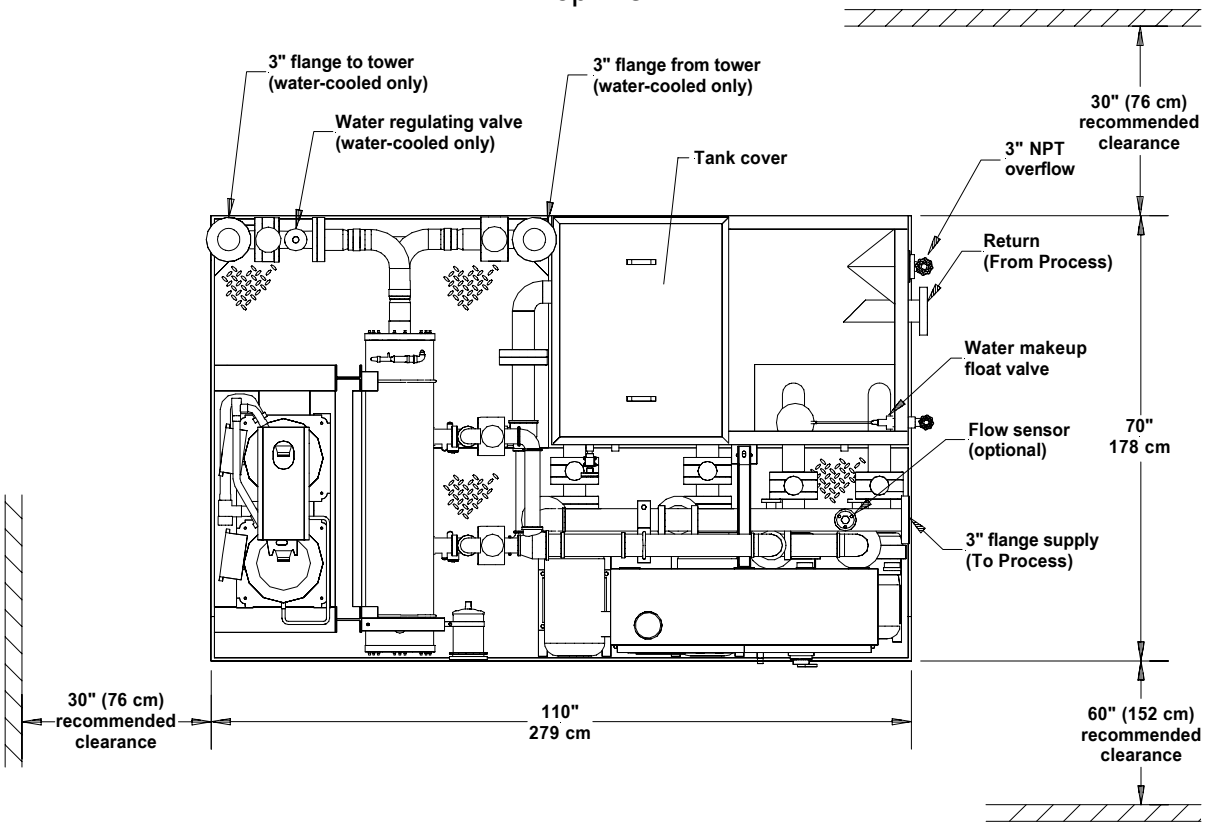
Pinnacle units voltages include a re-rated 380/3/50.

General Fault Alarm with Elevated Light Stack

This general fault alarm offers an elevated light stack mounted on top of the NEMA 12 enclosure. It displays a red light for any system fault and green light for **STATUS O. K.** The lights provide convenient system observation from a distance.

Push the **Push to Silence** button on the control panel to silence the alarm horn. The red lights on the door and the light stack remain illuminated until the operator corrects the alarm condition.

Figure 1
Typical Pinnacle Two-Circuit Central Chilling Station
Top View



Front View

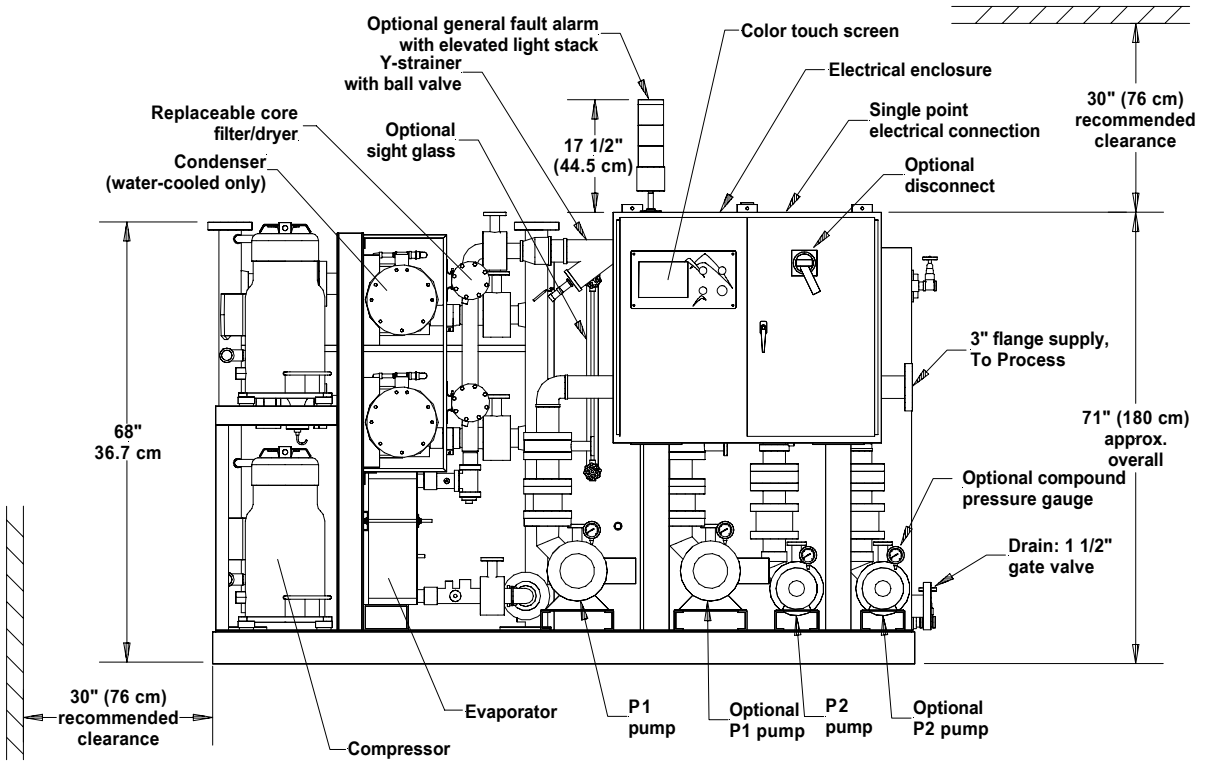


Figure 2
Pinnacle Water-Cooled Two-Circuit Central Chilling Station Specifications

American Standards

Model no.	Capacity tons ①	Stages	EER ② Btuh/w	Refrig-erant	Chilled water flow gpm	Cond. water flow gpm	Cond. conn. Class 150 flange	Tank matrl.	Tank gal. oper.	P2 pump std. hp	P1 pump std. hp	To proc. connection Class 150 flange
PINN2-30W	28	2	15.9	HCFC-22	67	84	3”	SS 304L	500	1½	5	3”
PINN2-45W	42	3	15.9	HCFC-22	101	126	3”	SS 304L	500	2	7½	3”
PINN2-60W	57	4	15.9	HCFC-22	137	171	3”	SS 304L	500	3	10	3”

Metric Standards

Model no.	Capacity Kcal/hr ①	Stages	EER ② Btuh/w	Refrig-erant	Chilled water flow lpm	Cond. water flow lpm	Cond. conn. Class 150 flange ③	Tank matrl.	Tank liters oper.	P2 pump std. kW	P1 pump std. kW	To proc. connection Class 150 flange ③
PINN2-30W	84,672	2	15.9	HCFC-22	253	317	3”	SS 304L	1,892	1.12	3.73	3”
PINN2-45W	127,008	3	15.9	HCFC-22	382	476	3”	SS 304L	1,892	1.49	5.59	3”
PINN2-60W	172,368	4	15.9	HCFC-22	518	647	3”	SS 304L	1,892	2.24	7.46	3”

① Capacities rated at 50ºF (10ºC) leaving water temperature, 2.4 gpm per ton with 85ºF (29ºC) condenser supply water. *Capacities are not adjusted for pump heat*.

② As published by compressor manufacturer. Conditions may vary, depending on operating temperature and ambient conditions.

③ Metric dimension is approx. **76 mm**. *Customer is responsible to convert to metric*.

Water-Cooled Dimensions, Weights, Amp Draw Values

Model	Dimensions						Weights ①						Amp draw values @ 460/3/60	
	L		W		H		Dry		Operating		Shipping			
no.	in.	cm	in.	cm	in.	cm	lbs.	Kg	lbs.	Kg	lbs.	Kg	FLA ②	RLA running
PINN2-30W	70”	178	110”	280	71”	181	6,645	3,017	10,800	4,904	7,145	3,244	59	41
PINN2-45W	70”	178	110”	280	71”	181	7,410	3,365	11,565	5,251	7,910	3,592	87	60
PINN2-60W	70”	178	110”	280	71”	181	8,475	3,848	12,630	5,734	8,975	4,075	115	79

① Weights do not include pumps.

② Amp draw values do not include P1 pump.

Figure 3
Pinnacle Remote Air-Cooled Two-Circuit Central Chilling Station Specifications

American Standards

Model no.	Capacity tons ①	Stages	EER ② Btuh/w	Refrig-erant	Cond.conn. Class 150 flange	Tank matrl.	Tank gal. oper.	P2 pump std. hp	P1 pump std. hp	To proc. conn. Class 150 flange
PINN2-30R	26	2	12.4	HCFC-22	3”	SS 304L	500	1½	5	3”
PINN2-45R	39	3	12.4	HCFC-22	3”	SS 304L	500	2	7½	3”
PINN2-60R	53	4	12.4	HCFC-22	3”	SS 304L	500	3	10	3”

Metric Standards

Model no.	Capacity Kcal/hr ①	Stages	EER ② Btuh/w	Refrig-erant	Cond. conn. Class 150 flange ③	Tank matrl.	Tank liters oper.	P2 pump std. kW	P1 pump std. kW	To proc. conn. Class 150 flange ③
PINN2-30R	78,624	2	12.4	HCFC-22	3”	SS 304L	1,892	1.12	3.73	3”
PINN2-45R	117,936	3	12.4	HCFC-22	3”	SS 304L	1,892	1.49	5.59	3”
PINN2-60R	160,272	4	12.4	HCFC-22	3”	SS 304L	1,892	2.24	7.46	3”

① Capacities rated at 50ºF (10ºC) leaving water temperature, 2.4 gpm per ton with 95ºF (35ºC) ambient supply air. *Capacities are not adjusted for pump heat*.

② As published by compressor manufacturer. Conditions may vary, depending on operating temperature and ambient conditions.

③ Metric dimension is approx. **76 mm**. *Customer is responsible to convert to metric*.

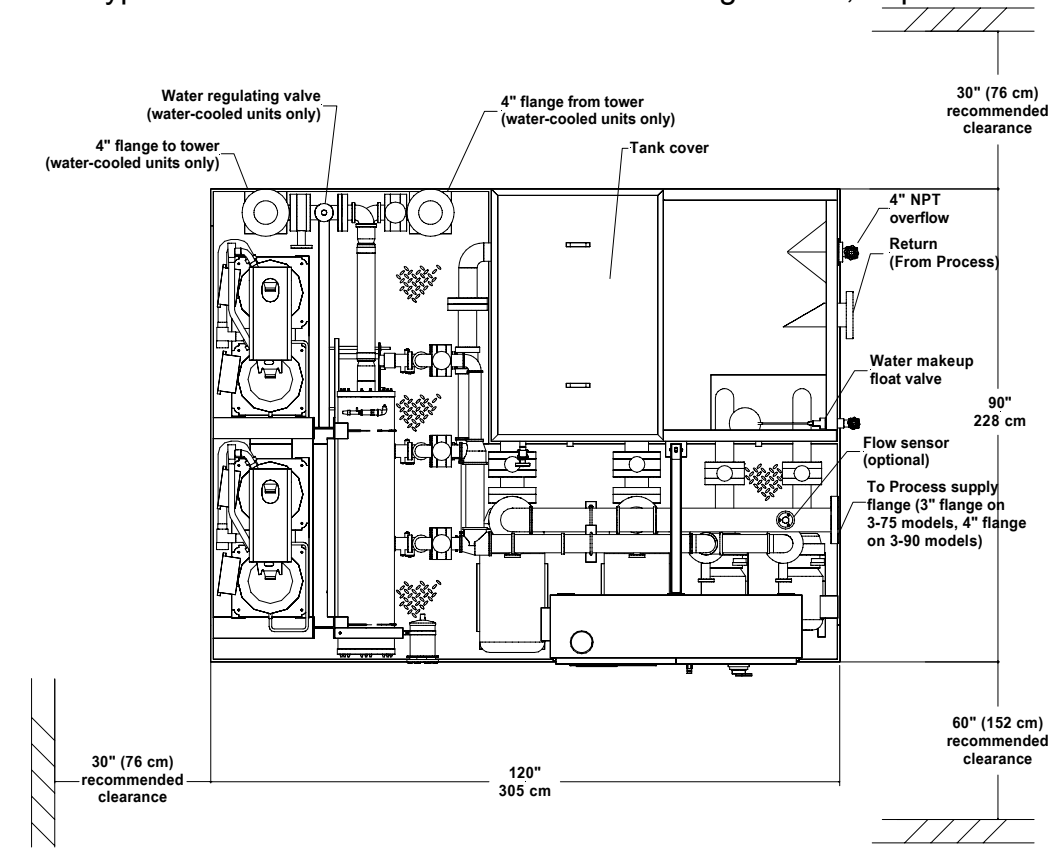
Remote Air-Cooled Dimensions, Weights, Amp Draw Values

Model no.	Dimensions						Weights ①						Amp draw values @ 460/3/60	
	L		W		H		Dry		Operating		Shipping			
	in.	cm	in.	cm	in.	cm	lbs.	Kg	lbs.	Kg	lbs.	Kg	FLA ②	RLA running
PINN2-30R	70”	178	110”	280	71”	181	6,037	2,741	10,192	4,627	6,537	2,968	59	47
PINN2-45R	70”	178	110”	280	71”	181	6,641	3,015	10,796	4,902	7,141	3,242	87	69
PINN2-60R	70”	178	110”	280	71”	181	7,545	3,426	11,700	5,312	8,045	3,653	115	91

① Weights do not include pumps.

② Amp draw values do not include P1 pump.

Figure 4
Typical Pinnacle Three-Circuit Central Chilling Station, Top View



Front View

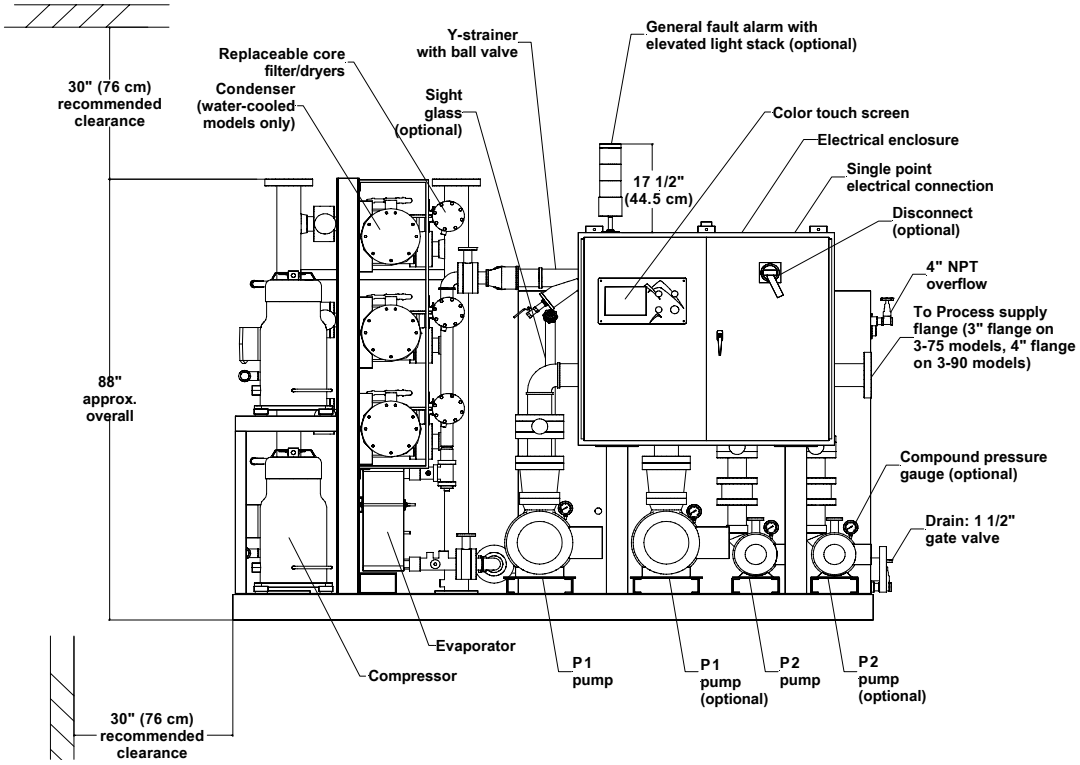


Figure 5
Pinnacle Water-Cooled Three-Circuit Central Chilling Station Specifications

American standards					Chilled water	Cond. water	Cond. conn.		Tank	P2 pump	P1 pump	To proc. connection
Model no.	Capacity tons ①	Stages	EER ② Btuh/w	Refrig-erant	flow gpm	flow gpm	Class 150 flange	Tank matrl.	gal. oper.	std. hp	std. hp	Class 150 flange
PINN3-75W	72	5	15.9	HCFC-22	173	216	4"	SS 304L	750	3	15	3"
PINN3-90W	87	6	15.9	HCFC-22	209	261	4"	SS 304L	750	5	15	4"
Metric standards					Chilled water	Cond. water	Cond. conn.		Tank	P2 pump	P1 pump	To proc. connection
Model no.	Capacity Kcal/hr ①	Stages	EER ② Btuh/w	Refrig-erant	flow lpm	flow lpm	Class 150 flange ③	Tank matrl.	gal. oper.	std. kW	std. kW	Class 150 flange ③
PINN3-75W	217,728	5	15.9	HCFC-22	654	817	4"	SS 304L	750	2.24	11.19	3"
PINN3-90W	263,088	6	15.9	HCFC-22	791	988	4"	SS 304L	750	3.73	11.19	4"

① Capacities rated at 50ºF (10ºC) leaving water temperature, 2.4 gpm per ton with 85ºF (29ºC) condenser supply water. *Capacities are not adjusted for pump heat*.

② As published by compressor manufacturer. Conditions may vary, depending on operating temperature and ambient conditions.

③ Approx. metric for 3" is **76 mm**; 4" is **101 mm**. *Customer is responsible for conversion to metric.*

Water-Cooled Dimensions, Weights, Amp Draw Values

Model	Dimensions						Weights ①						Amp draw values @ 460/3/60	
	L		W		H		Dry		Operating		Shipping			
no.	in.	cm	in.	cm	in.	cm	lbs.	Kg	lbs.	Kg	lbs.	Kg	FLA ②	RLA running
PINN3-75W	90"	229	120"	305	88"	224	10,105	4,588	16,338	7,418	10,605	4,815	142	97
PINN3-90W	90"	229	120"	305	88"	224	10,810	4,908	17,043	7,738	11,310	5,135	172	118

① Weights do not include pumps.

② Amp draw values do not include P1 pump.

Figure 6
Pinnacle Remote Air-Cooled Three-Circuit Central Chilling Station Specifications

Model	Capacity ①		Stages	EER ②	Refrig-	Cond. conn. Class 150	Tank	Tank gal./liters	P2 pump std.		P1 pump std.		To proc. connection Class 150
no.	tons	Kcal/hr		Btuh/w	erant	flange ③	matrl.	oper.	hp	kW	hp	kW	flange ③
PINN3-75R	68	205,632	5	12.4	HCFC-22	4"	SS 304L	750/2,838	3	2.24	15	11.19	3"
PINN3-90R	80	241,920	6	12.4	HCFC-22	4"	SS 304L	750/2,838	5	3.73	15	11.19	4"

① Capacities rated at 50ºF (10ºC) leaving water temperature, 2.4 gpm per ton with 95ºF (35ºC) ambient supply air. *Capacities are not adjusted for pump heat*.

② As published by compressor manufacturer. Conditions may vary, depending on operating temperature and ambient conditions.

③ Approx. metric for 3" is **76 mm**; 4" is **101 mm**. *Customer is responsible for conversion to metric.*

Remote Air-Cooled Dimensions, Weights, Amp Draw Values

Model	Dimensions						Weights ①						Amp draw values @ 460/3/60	
	L		W		H		Dry		Operating		Shipping			
no.	in.	cm	in.	cm	in.	cm	lbs.	Kg	lbs.	Kg	lbs.	Kg	FLA ②	RLA running
PINN3-75R	90"	229	120"	305	88"	224	8,932	4,056	15,165	6,885	9,432	4,283	142	112
PINN3-90R	90"	229	120"	305	88"	224	9,495	4,311	15,728	7,151	9,995	4,438	172	136

① Weights do not include pumps.

② Amp draw values do not include P1 pump.

Figure 7
Pinnacle Remote Condenser Assembly Models

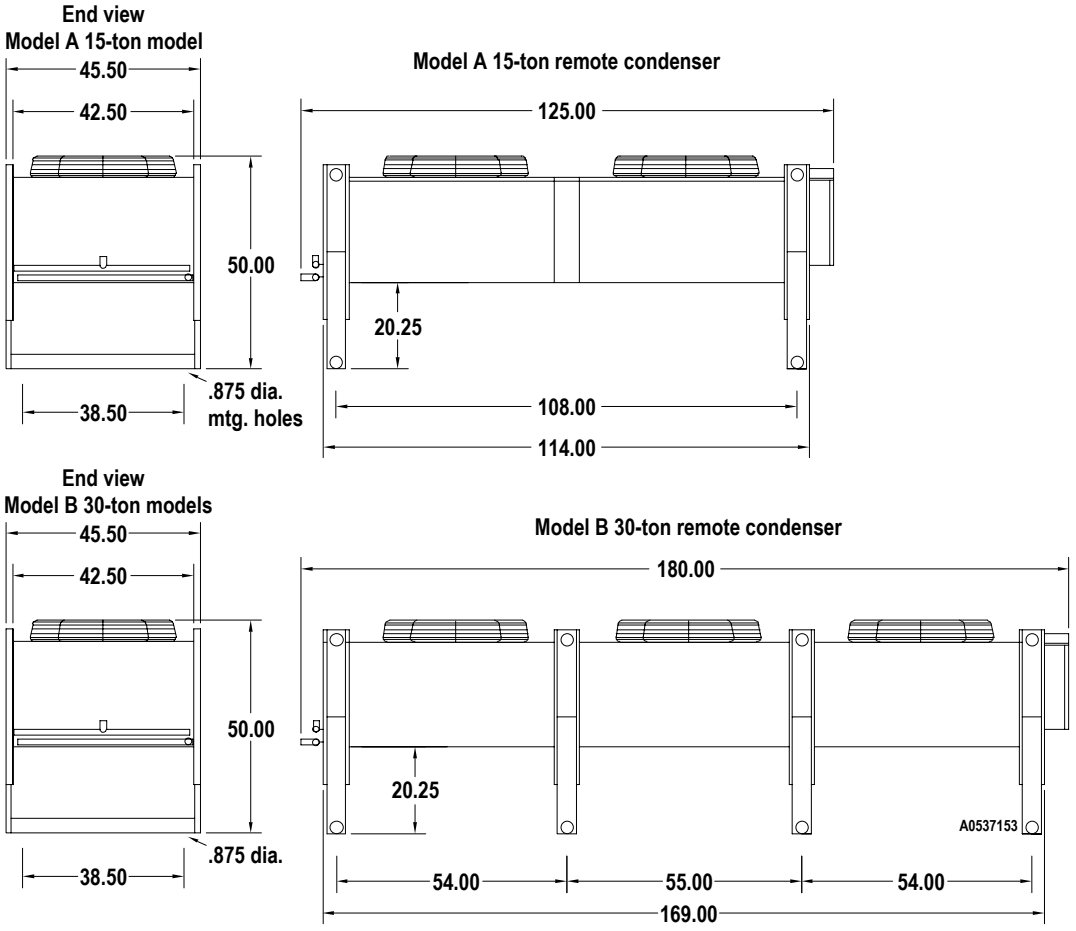


Figure 8
Pinnacle Remote Condenser Specifications and Configurations

Model	Size in tons	No. fans	Air flow in cfm	Amps FLA 460/3/60	Connections in. dia. Cu Inlet	Connections in. dia. Cu Outlet	Dimensions in inches L	Dimensions in inches W	Dimensions in inches H	Weights in pounds Dry	Weights in pounds Shipping	Weights in pounds Operating
A	15	2	23,200	7	1⅝	1⅝	125”	45½”	50”	770	945	800
B	30	3	32,900	10½	2⅛	2⅛	180”	45½”	50”	1,210	1,465	1,270

Note: The following table lists the quantity and model (A or B from the above table) of remote condensers supplied with Pinnacle remote air-cooled condenser models.

Model	Quantity supplied A	Quantity supplied B	Model	Quantity supplied A	Quantity supplied B	Model	Quantity supplied A	Quantity supplied B	Model	Quantity supplied A	Quantity supplied B	Model	Quantity supplied A	Quantity supplied B
PINN2-30R	2	0	PINN2-45R	1	1	PINN2-60R	0	2	PINN3-75R	1	2	PINN3-90R	0	3

2 Shipping Information

2-1 Unpacking and Inspection

You should inspect your central chilling station for possible shipping damage. If the container and packing materials are in re-usable condition, save them for reshipment if necessary.

Thoroughly check the equipment for any damage that might have occurred in transit, such as broken or loose wiring and components, loose hardware and mounting screws, etc. In case of breakage, damage, shortage, or incorrect shipment, refer to the following sections.

2-2 In the Event of Shipping Damages

Important!

According to the contract terms and conditions of the Carrier, the responsibility of the Shipper ends at the time and place of shipment. The Carrier then assumes full responsibility of the shipment.

- ☑ Notify the transportation company's local agent if you discover damage.
- ☑ Hold the damaged goods and packing material for the examining agent's inspection. **Do not return any goods to AEC, Inc. before the transportation company inspection and authorization**.
- ☑ File a claim against the transportation company. Substantiate the claim by referring to the agent's report. A certified copy of our invoice is available upon request. The original Bill of Lading is attached to our original invoice. If the shipment was prepaid, write us for a receipted transportation bill.
- ☑ Advise AEC, Inc. regarding your wish for replacement and to obtain an RMA (return material authorization) number.

2-3 If the Shipment is Not Complete

Check the packing list. The apparent shortage may be intentional. Back-ordered items are noted on the packing list. You should have:

- ☑ AEC/Application Engineering Pinnacle Series central chilling station
- ☑ Bill of lading
- ☑ Packing list
- ☑ Operating and Installation packet
- ☑ Electrical schematic and panel layout drawings

☑ Component instruction manuals

☑ Parts list

Re-inspect the container and packing material to see if you missed any smaller items during unpacking. Determine that the item was not inadvertently taken from the area before you checked in the shipment. Notify AEC, Inc. immediately of the shortage.

2-4 If the Shipment is Not Correct

If the shipment is not what you ordered, **contact AEC, Inc. immediately**. Include the order number and item. *Hold the items until you receive shipping instructions*.

2-5 Returns

Important!

Do not return any damaged or incorrect items until you receive shipping instructions from AEC, Inc.

2-6 Uncrating Your Chiller

! WARNING !

DUE TO THE SIZE AND WEIGHT OF PINNACLE SERIES CHILLERS, AEC, INC. RECOMMENDS USING BONDED PROFESSIONAL MILLWRIGHTS TO UNLOAD AND MOVE PINNACLE CHILLERS.

Rig the chiller from the frame only, using spreader bars to prevent load transfer to any chiller components. Rig the frame from at least four points and balance the load before lifting to clear the skid. Use a forklift of adequate size when lifting the chiller by the fork pockets.

Insert the forks all the way into the pockets and be sure to balance the load before lifting the chiller to clear the skid. Lift only as high as necessary. Use a pry bar to free the skid if necessary. Lower slowly. Retain the crating in case reshipment is necessary due to hidden shipping damage.

Caution!

Due to the weight of these units, use extreme caution when moving and placing Pinnacle Series chillers.

3 Installation

3-1 Installation Location Considerations

The following points should be considered when selecting a location for an Pinnacle unit:

- Locate close to the process to reduce piping expense.
- Locate adjacent to drain and city water sources.
- Consult a structural engineer to assure that the floor, mounting pad or structural steel support is of adequate strength.
- Allow for required service clearances necessary for condenser maintenance and easy access to all components.

3-2 Making Electrical Connections

Check the serial tag voltage and amperage requirements and make sure your electrical service conforms.

Bring properly sized power leads and ground from a fused disconnect (installed by your electrician) to the unit. Use fuses in the disconnect switch, sized according to the National Electrical Code recommendations listed on the electrical schematic in the control enclosure.

Caution!

- **Electrical connections must comply with all applicable electrical codes.**
- **The chiller must be grounded in accordance with NEC Article 250.**
- **Voltage must be within plus or minus ten percent (±10%) of the nameplate rating.**
- **Phase imbalance must be less than two percent (<2%) in accordance with NEMA MG1-14.32.**
- **Air-cooled remote condensers must have properly sized disconnects conforming with all local codes.**

Note: The scroll compressors were phased with the pumps at the factory.

- Never switch contactor leads or motor leads for reversing rotation.
- Do **not** use contactor or motor leads for phase matching.
- Compressor noise from reverse rotation is noticeable. Do **not** run in this mode for more than ten (10) seconds. The compressor shuts off if run longer in this mode.
- Reverse rotation can cause suction and discharge pressures to be approximately equal; *amp draws will be lower than normal*.
- If you discover that compressor rotation is reversed, correct it by switching any two **main** power leads **into the disconnect switch or distribution block** on the unit.

Check your work and proceed to the following **Piping Considerations** section.

3-3 Piping Considerations

Piping systems vary with process application and pump tank configuration. Typical system configuration drawings are provided in this manual; the details may or may not apply to your application. Piping systems must be designed by a person knowledgeable in piping system design and configuration. AEC's Contracting Department can design and install a piping system tailored to your process.

- All piping returning to the pump tank **must** be equipped with an inverted trap with a vacuum breaker at the high point of the system to prevent mains from siphoning into the pump tank.
- Run mains full size in order to reduce pressure drop in the system and provide maximum pressures at the ends of the mains.

3-4 Making Process Water Connections

All Models

All Pinnacle chilling stations have two chilled water connections per unit, and on water-cooled models, one more set of water connections for condenser water:

To Process

The chilled water supply outlet leading to the process being controlled.

From Process

The chilled water return for water returning back to the chiller from the process to be cooled and recirculated.

3-5 Making Tank Piping Connections

Return

Bring the chilled water returning from the process to the pump tank warm **From Process** side. This line is sized according to the flow rate from the process to the pump tank. See Section 3-3 on Page 20 for more information on piping considerations.

Important!

Do *not* use the Pinnacle unit to support piping.

Makeup

Connect a city water source to maintain water level in the pump tank.

Overflow

Connect the **OVERFLOW** outlet to an approved, trapped drain to permit excess water in the pump tank to overflow to the drain. The overflow line is sized according to the size of the pump tank.

To Drain

Connect to a 1½" line (approx. 63 mm) leading to an approved, trapped drain. You can drain the pump tank if necessary.

3-6 Water Connection Sizing Considerations

Important!

- **Run all external chilled water connections with adequate size to the process.**
- **Provide the largest possible openings and passages for the flow of chilled water through platens, dies, molds, or other pieces of equipment.**
- **Minimum external pressure drop is *critical* for proper operation.**

3-7 Galvanic Corrosion Considerations

Water circuit piping components are primarily ferrous (iron) and react electro-chemically with non-ferrous metallic materials such as copper. Some water has dissolved minerals that will greatly accelerate the reaction between dissimilar metals.

Use PVC or ferrous piping to minimize galvanic action. If piping must be copper, use dielectric unions at the chiller.

3-8 Water Treatment Considerations

Water treatment is important in any piping system. In some locations, raw water may be used in the system without problem; in other locations, it will result in large deposits of scale and corrosion.

AEC, Inc. offers a complete line of water treatment equipment. Contact your AEC, Inc. sales representative for water testing and treatment options.

3-9 Making Water-Cooled Condenser Connections

Pinnacle water-cooled chilling stations use city or tower water as a cooling medium. All external condenser supply and discharge piping and connections should be of adequate size.

Two connections are made to each Pinnacle unit:

Condenser Water In

The city or tower water supply inlet is located at the side or rear of the chiller.

- Water pressure ≥25 psi (≥172.4 kPa/≥1.72 bars)
- Water temperature ≤85°F (≤29ºC)

Condenser Water Out

The return outlet, located at the chiller side or rear is connected to a cooling tower inlet, a sewer or other approved discharge receiver.

- A water regulating valve is a **standard** feature in the condenser water out line.

Caution!

The water regulating valve is set at the factory.

It must *not* be adjusted except by a qualified refrigeration technician.

3-10 Installing the Remote Air-Cooled Condenser

Pinnacle models use the surrounding air to cool the remote condenser. All models have variable speed fans and low ambient controls to allow proper operation down to -20°F (-29ºC) outdoor air temperature.

Install the remote air cooled condenser where there is:

- Greater than or equal to -20°F (-29ºC) air temperature.
- Free passage of air for condensing.
- Adequate structural support.
- Protection from strong winds and drifting snow.
- Provisions for removal of heated air from the area.
- No steam, hot air or fume exhausts drawn into the condenser coils.
- Service accessibility.

Pinnacle condensing pressure with 95ºF (35ºC) condenser air
R-22 = 260 psi (1,793 kPa/17.93 bars)

Note: Due to the variables involved in remote air-cooled condenser installations, no set or standard piping procedure exists. Each installation must be designed and installed by qualified persons. Follow the instructions supplied with the condenser.

3-11 Checking Motor Direction

Compressor

Note: The scroll compressor was phased with the pump and fan motor at the factory.

- Never switch contactor leads or motor leads for reversing rotation.
- Do **not** use contactor or motor leads for phase matching.
- Compressor noise from reverse rotation is noticeable. Do **not** run in this mode for more than ten (10) seconds. The compressor shuts off if run longer in this mode.
- Reverse rotation can cause suction and discharge pressures to be approximately equal; *amp draws will be lower than normal*.
- If you discover that compressor rotation is reversed, correct it by switching any two **main** power leads **into the disconnect switch or distribution block** on the unit.

Water Pump

A positive pressure of 20 to 30 psi (137.9 to 206.8 kPa/1.38 to 2.07 bars) on the **TO PROCESS** line indicates correct pump rotation.

Condenser Fan

On Pinnacle remote air-cooled units, air should draw through the condenser and discharge up from the condenser.

Changing fan rotation direction

- Disconnect and lock out power at the fused disconnect.
- If all fans are going backwards, reverse any two main power leads.
- If only some of the fans are going backwards, switch any two of their respective motor leads.

Figure 9
Pinnacle 60 Hz 5 to 15 hp P1 Pump Curves

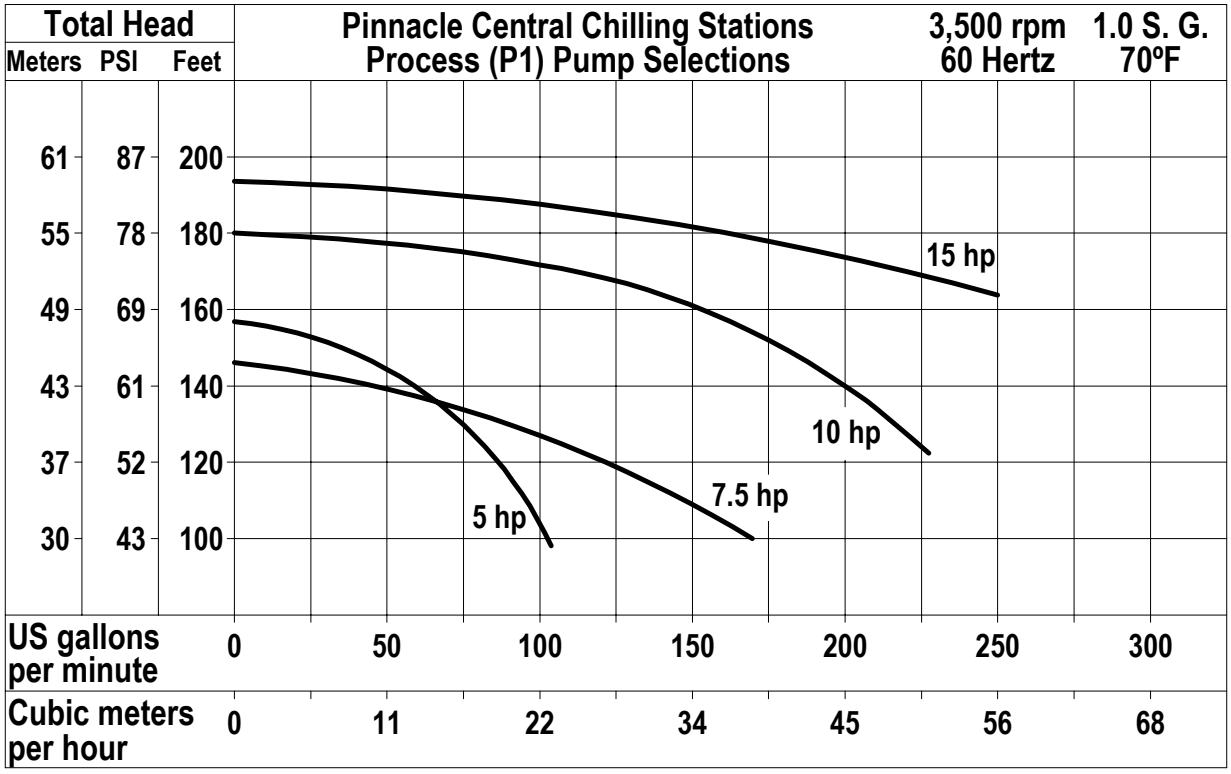


Figure 10
Pinnacle 60 Hz 20 to 40 hp P1 Pump Curves

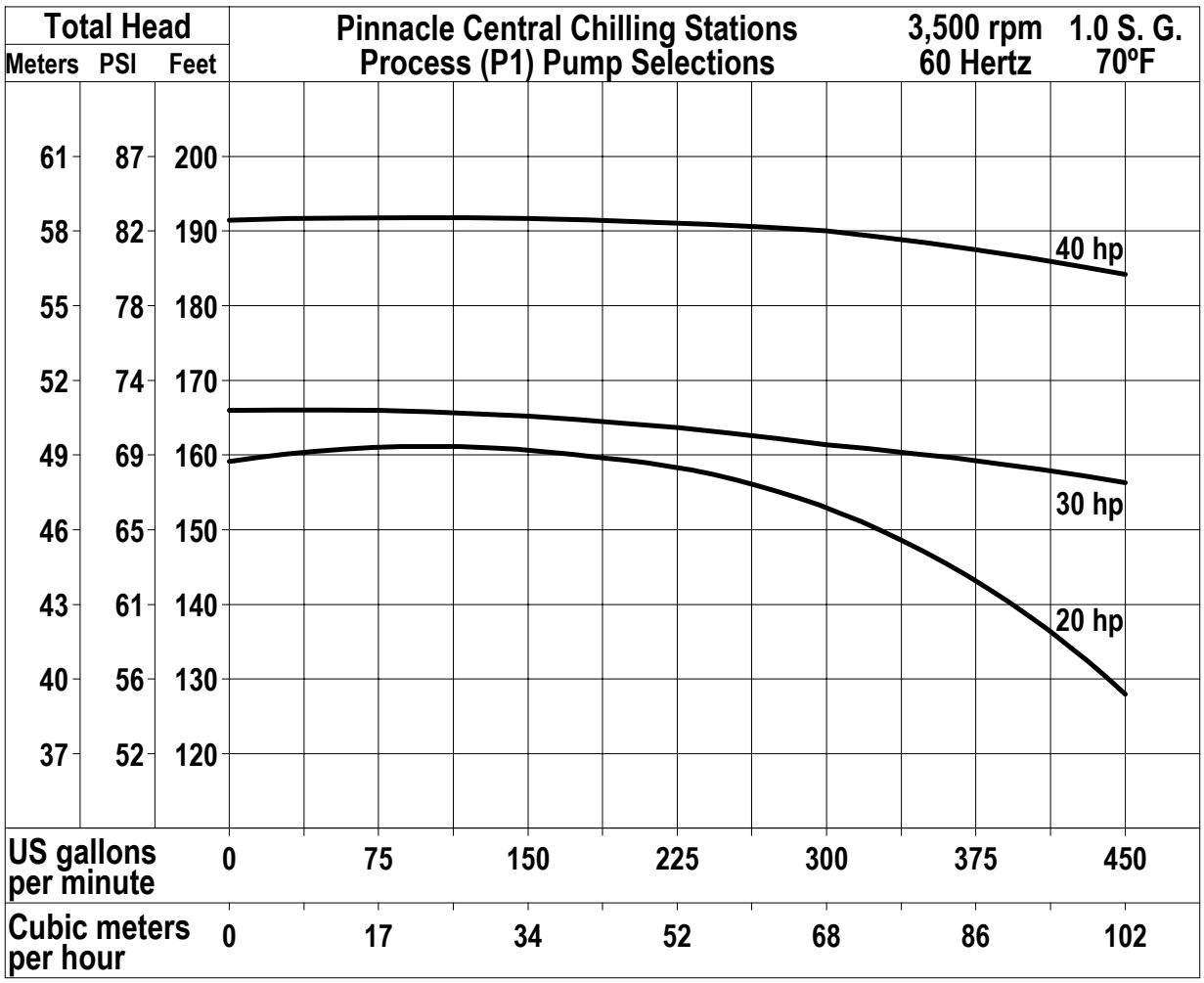


Figure 11
P2 60 Hz Recirculation Pump Curves

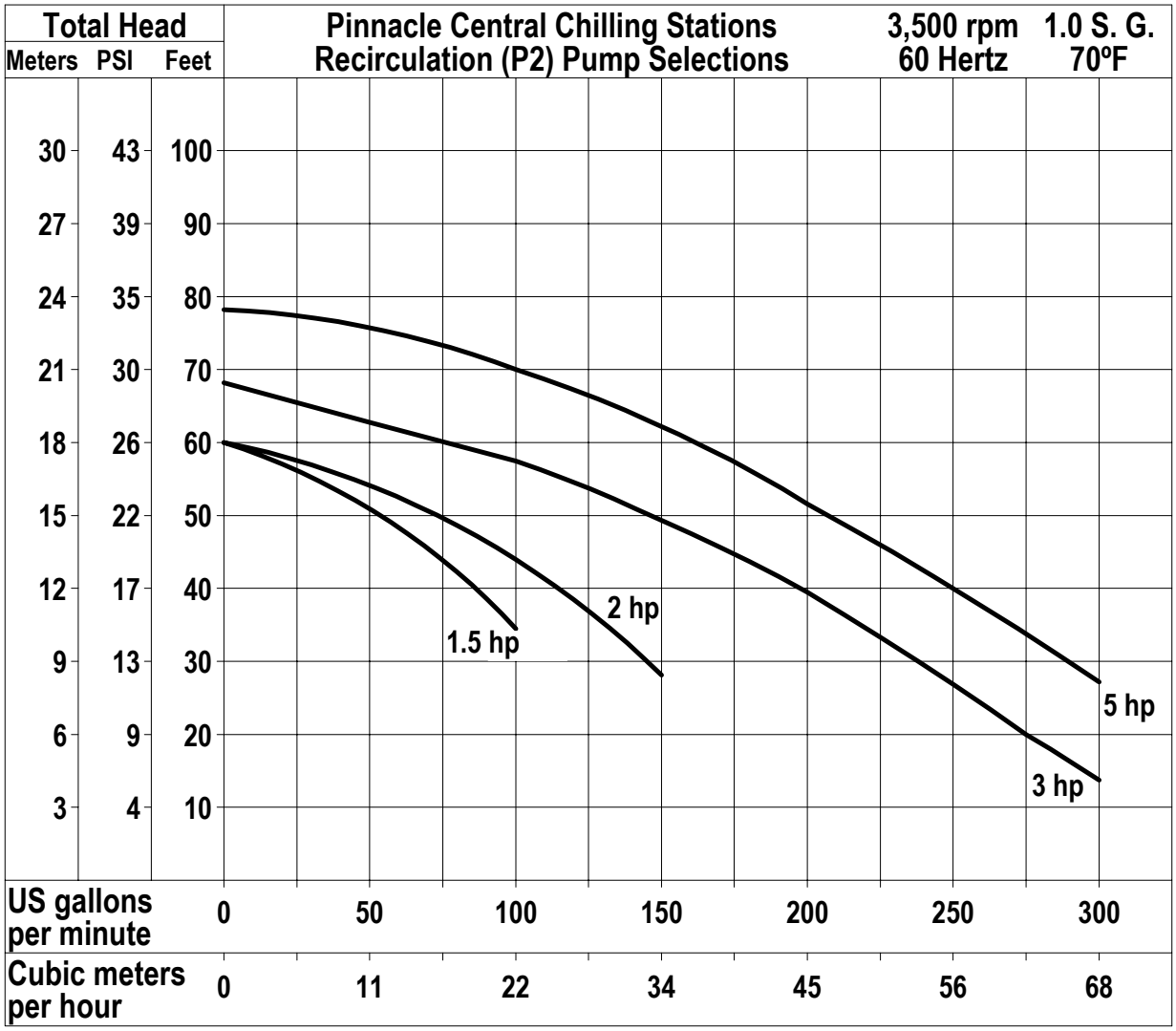
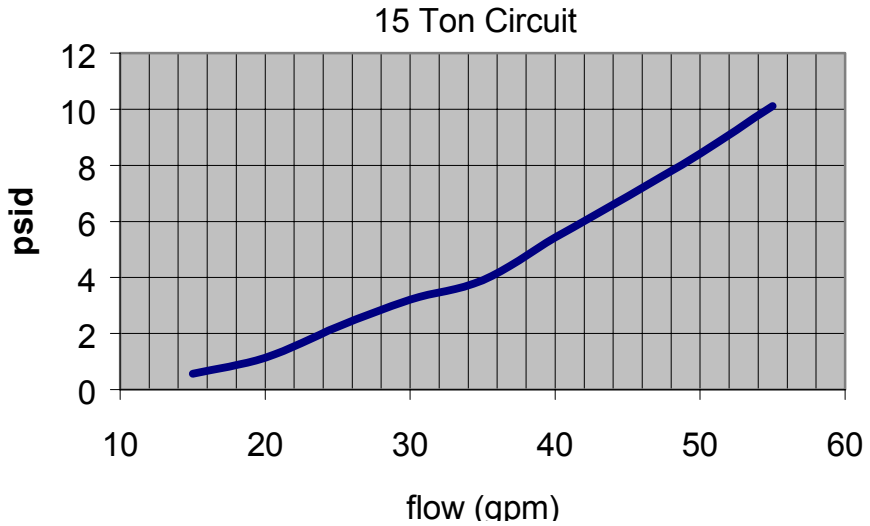


Figure 12
Evaporator Pressure Drops



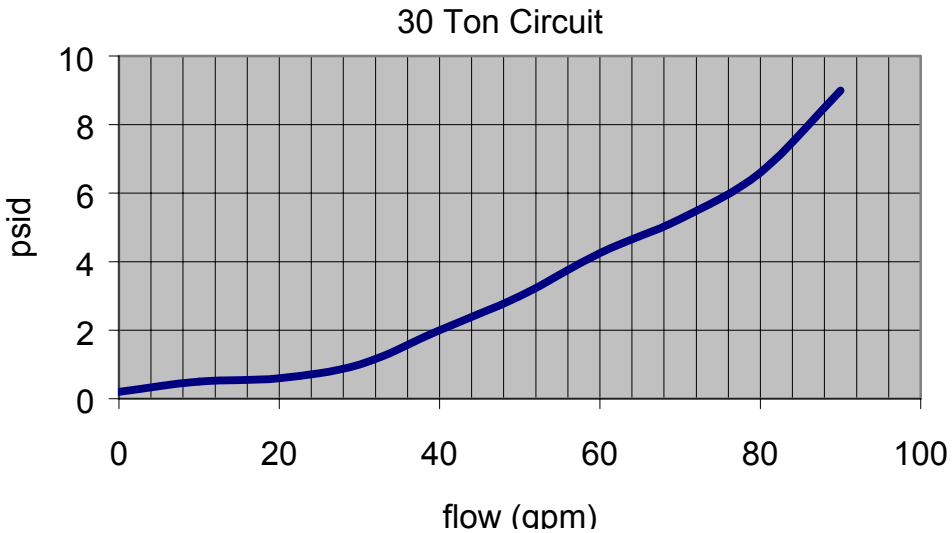
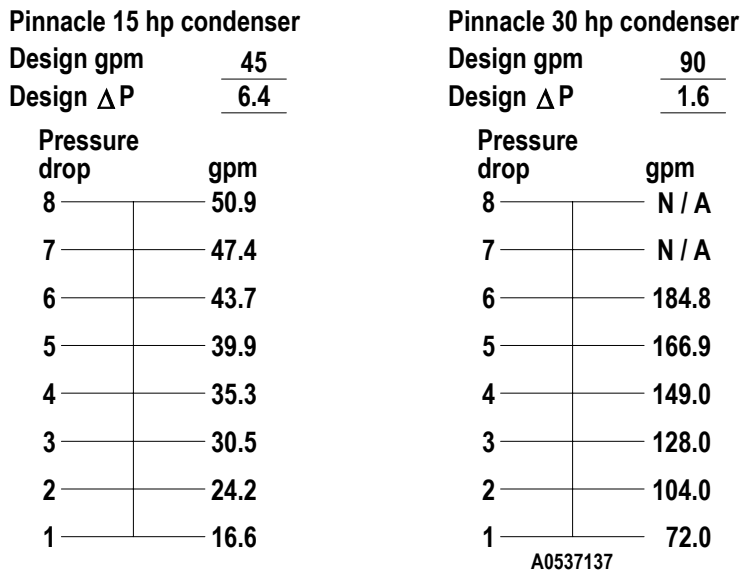


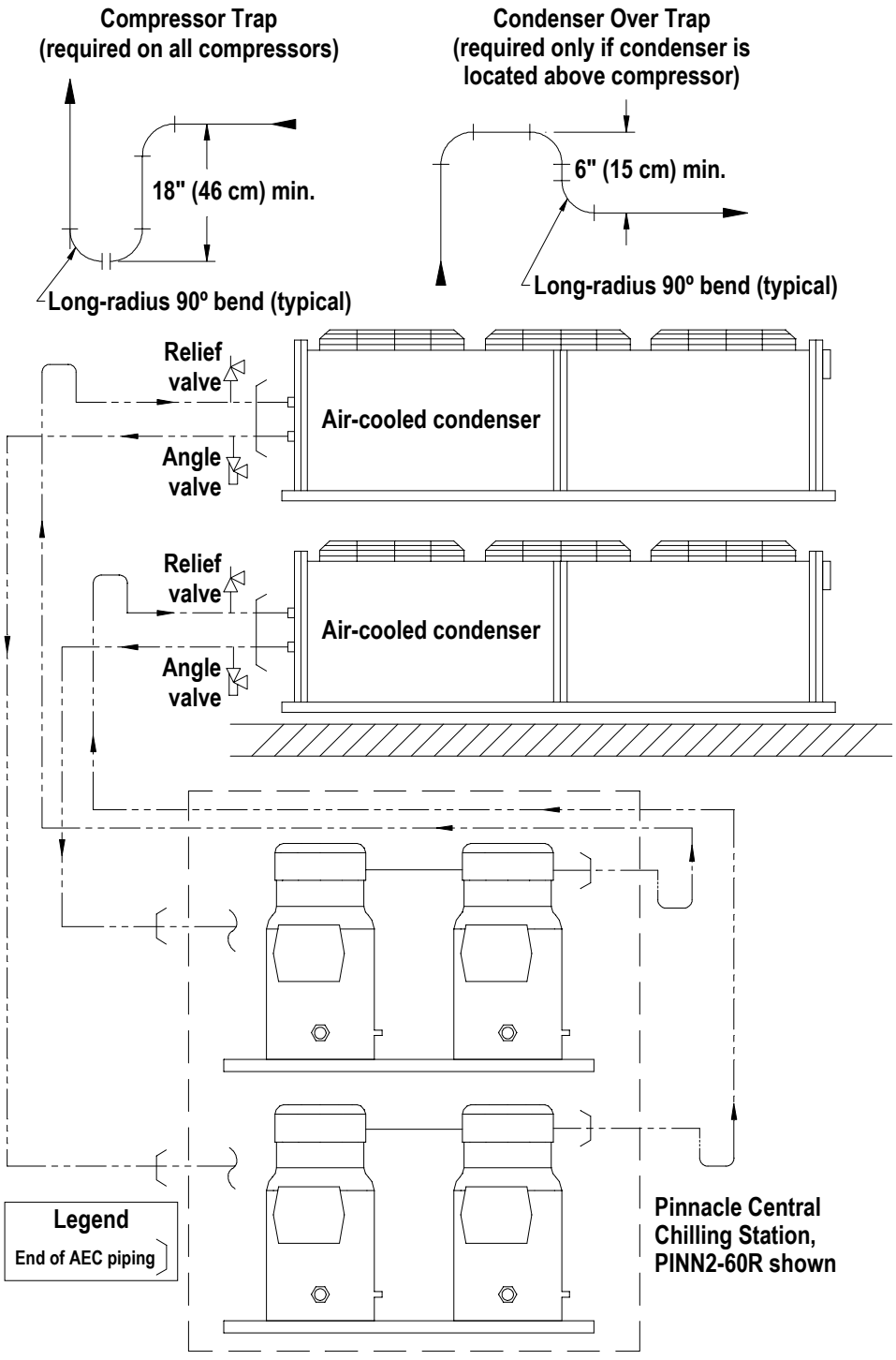
Figure 13
Condenser Pressure Drops



Notes:

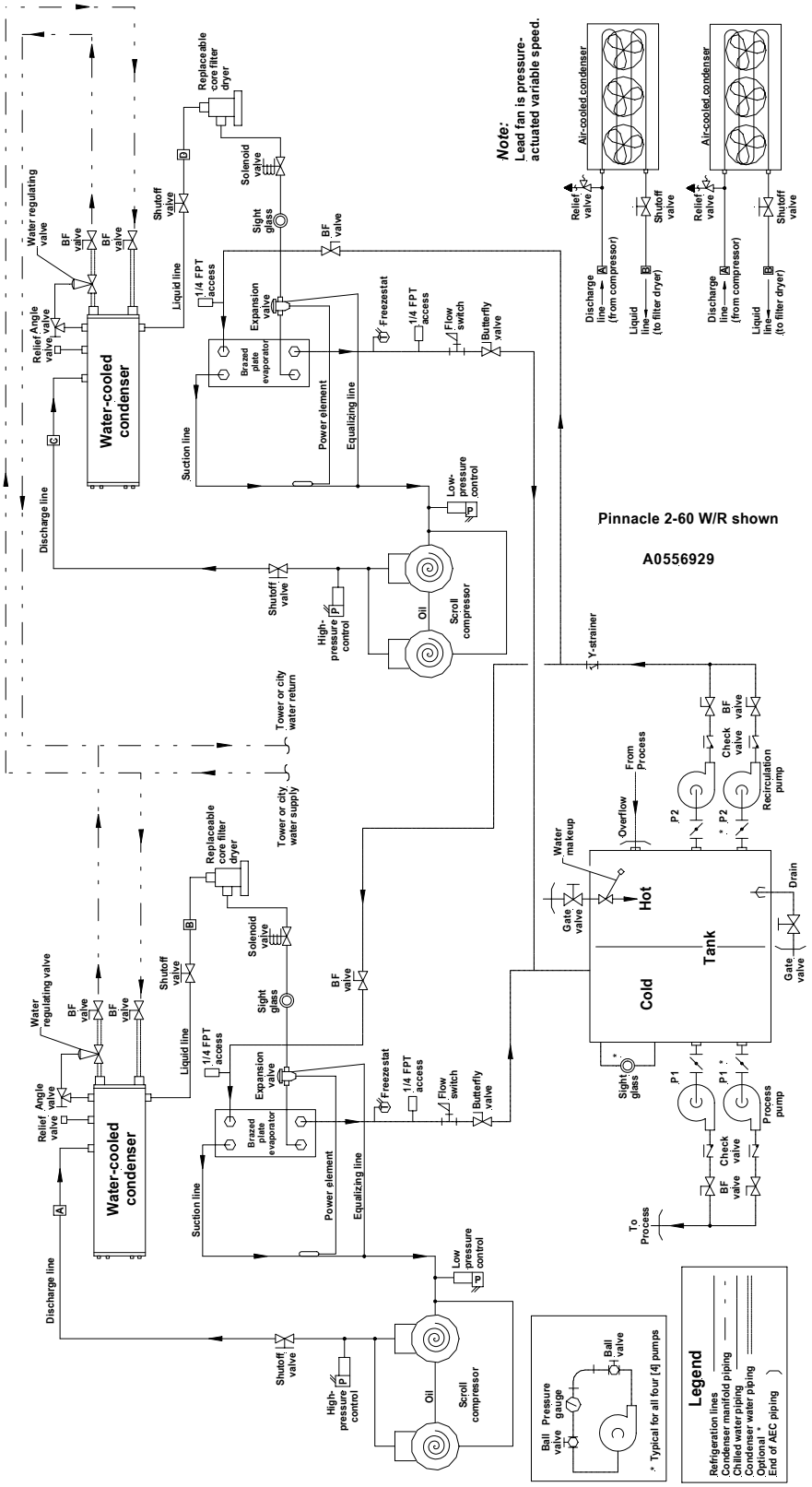
1. Design gpm and Δ P are based on 3 gpm per nominal compressor horsepower.
2. Actual gpm is calculated by determining chilled water capacity ton = $\frac{\Delta T \times gpm}{24} \times 3$ (formula for water systems, no additives).
3. ΔP readings are taken directly across the condenser.

Figure 14
Typical Remote-Air Cooled Condenser Piping Installation



Note: Consult a qualified refrigeration technician to design a proper remote condenser piping system tailored to your installation.

Figure 15
Two-Circuit Process/Standby Four-Pump Piping Schematic



4 Sequence Of Operation

4-1 Staging

1. Compressors stage, in sequence, beginning with Circuit 1, Compressor 1A, through Circuit 3, Compressor 3B.
2. If not all circuits are started, the unit stages around the Off circuit.
3. The Throttling Range (TR) = 4ºF. That is, 0% to 100% compressor operation occurs over this range. TR is typically centered around process set point.
4. Compressor interstage time is thirty (30) seconds.
5. Compressor anti-recycle time is three (3) minutes.

4-2 Alarms

1. Any circuit 1, 2, or 3 Alarm condition will shut down the corresponding circuit. Manually restart from the Compressors operation screen after correcting the alarm condition.
2. If only one circuit trips an alarm, the other circuit(s) will continue to operate.
3. If you attempt to start any compressor circuit without having a recirculation pump run, the flow alarm activates.
4. Any pump alarm condition will turn off Pump Lead Lag mode if the unit is a four pump configuration.
5. Any alarm condition on chiller circuits will turn off the Compressor Lead Lag mode if the chiller is configured with the Advanced Control Package. **Restart Lead Lag mode**.
6. If the lead circuit was in an alarm condition, compressors will momentarily shut down, re-sequence, and start again beginning with circuit 1, compressor 1a upon correction and circuit re-start.

Note: Thirty (30) -second interstage and three (3) -minute anti-recycle timers still govern the unit at this point.

4-3 Lead-Lag Compressors

1. You, the user, must be responsible to start Lead Lag mode. The Lead Lag mode does not work if all compressor circuits are not started. Furthermore, the ***All CKTS Available*** option would not respond. The control button is **green** if all circuits are on.

2. Start Lead Lag by pushing the Start Auto button.

   The button color changes to green.

3. Set the lead-lag set point (the auto-switchover point) between 100 and 400 hours. The Comp. Lead Lag screen displays elapsed time and the counter resets to zero at the switchover point.

4. At set point, compressors resequence using the following sequence:

Model	Staging: Lead	Staging: Lag
PINN2-30	1a – 2a	2a – 1a
PINN2-45	1a – 2a – 2b	2b – 2a – 1a
PINN2-60	1a – 1b – 2a – 2b	2a – 2b – 1a – 1b
PINN3-75	1a – 2a – 2b – 3a – 3b	3a – 3b - 2b – 1a – 2a
PINN3-90	1a – 1b – 2a – 2b – 3a – 3b	3a – 3b– 2a – 2b – 1a – 1b

5. Compressors revert back at the next cycle.

6. Any alarm or circuit power down turns off Lead Lag Auto mode. The CNT time, however, is **not** lost. Upon restarting the Lead Lag mode, CNT picks up where it left off.

4-4 Lead-Lag Pumps

- Functions similar to Compressor Lead Lag operation.

4-5 Chilled Water Circuit

Make the process cooling water supply connection at the P1 manifold at the right side of the chiller at the exposed flanged connection. Bring the process cooling water return connection to the **Hot** well of the tank on the right side at the flanged connection.

Warm coolant (water and ethylene glycol mixture) returns from the process to the tank, then gets pumped through the evaporator where it is cooled. The coolant flows to the process and returns to repeat the cycle.

4-6 Refrigeration Circuit

- Pinnacle chilling station air- and water-cooled unit refrigeration cycles differ only in the way the compressed gas is condensed to a liquid.
- Liquid refrigerant from the condenser passes through a shut-off valve into a filter/dryer.
- The refrigerant then passes through the sight glass and solenoid valves into the thermal expansion valve which regulates flow; the valve lowers pressure and boiling point. Heat from the fluid causes the refrigerant to boil off into a vapor.
- The refrigerant vapor flows through the suction line back into the compressor.
- The refrigerant gives up heat as it re-condenses to a liquid in the condenser.

4-7 Freezestat Control

The freezestat shuts down the compressor if the chilled water temperature approaches the freezing point. The chilled water pump on the system will continue to run. It is factory-set at 40°F (4ºC) or 10°F (6ºC) below the rated capacity operating temperature of 50°F (10ºC).

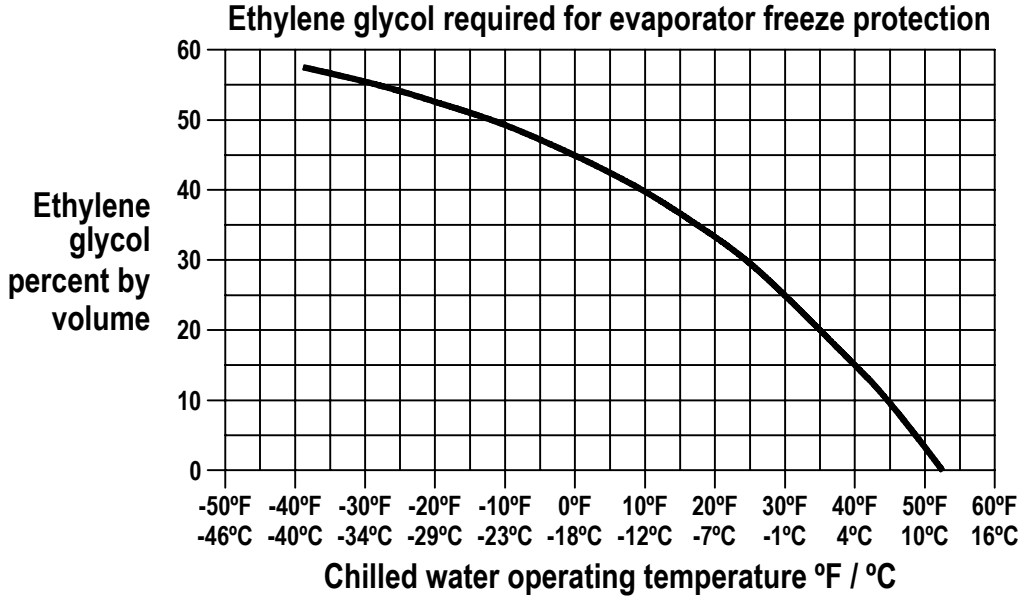
If you want lower chilled water temperatures, you'll need to mix process water with industrial- (not automotive) grade ethylene or propylene glycol with rust inhibitor to provide protection down to 20°F (12ºC) below the operating temperature you want. Figure 16 below shows the proper mixtures needed to provide protection to 20°F (12ºC) below the operating temperature you want. You can then reset the freezestat cutout temperature to a temperature 10°F (6ºC) below the operating temperature you selected.

Caution!

Make sure all freezestat adjustments are performed by a qualified refrigeration service technician.

The AEC, Inc. product warranty does not cover system freeze-up!

Figure 16
Freezing Protection Curve



4-8 High Pressure Cutout

This electro-mechanical safety feature opens the control circuit if the system condensing pressure exceeds a safe level.

High pressure cutout setting			
Model	**psi**	**kPa**	**bars**
Pinnacle water-cooled chilling stations	290 psi	2,000 kPa	20 bars
Pinnacle remote air-cooled chilling stations	375 psi	2,586 kPa	26 bars

Important!

The high pressure cutout is a manual reset control, so you should reset it *once*.

***If the problem persists*, call a refrigeration service technician to analyze the problem and to reset the control.**

4-9 Low Pressure Cutout

This encapsulated switch safety feature prevents the compressor suction pressure from dropping below a pre-set point. It is factory set to open the control circuit when pressure drops below a safe level. The chiller will need to be restarted when the suction pressure reached above 65 psi (448.2 kPa/4.5 bars).

Model	Opens control circuit @			Resets control circuit @		
	psi	**kPa**	**bars**	**psi**	**kPa**	**bars**
Pinnacle water-cooled chilling stations	15 psi	103.4 kPa	1.0 bars	30 psi	206.9 kPa	2.1 bars
Pinnacle remote air-cooled chilling stations	15 psi	103.4 kPa	1.0 bars	30 psi	206.9 kPa	2.1 bars

4-10 Flow Switch

The flow switch shuts down the chiller if the evaporator water flow falls below a safe operating gallons-per-minute (liters-per-minute) flow rate.

4-11 Control Nipple

All Pinnacle chilling station evaporators have two control nipples. The flow switch, freezestat, and flush port are located in the control nipple. Optional pressure gages can be mounted in the control nipples to aid in achieving proper flow through the evaporator and balancing flows.

Coupling mounts for customer-installed pressure gauges are included on both control nipples. Pressure drop between evaporator entering water pressure and evaporator leaving water pressure can be converted to gallons per minute using the pressure drop charts provided.

4-12 Control Probe

Two control probes sense temperatures. One probe measures the temperature of the hot well and the other does the same for the cold well of the reservoir. These temperatures are used by the PLC controller to sequence the compressors, based on load.

4-13 Chilled Water Manifold

The chilled water manifold allows one-point connections of **TO PROCESS** piping. The Sch. 40 steel piping includes butterfly valves at each evaporator for flow balancing and circuit isolation; optional pressure gauges can be installed.

4-14 Condenser Water Manifold

The condenser water manifold allows one-point connection of **TO TOWER** (drain) and **FROM TOWER** (city water) piping. Sch. 40 steel include butterfly valves for each condenser. Drain points are at the bottom of the header.

- Notes -

5 Startup Checklists

5-1 Introduction

Important!

These lists assume the installation information in this manual has been read and followed.

Have new chillers started up and checked by a qualified refrigeration service technician.

AEC Inc. offers factory startup for Pinnacle Series chilling stations. Call the AEC/Application Engineering Service Department at 1 (800) 233-4819 for more details.

5-2 Water-Cooled Pinnacle Startup Checklist

- ☑ Check the shipping papers against the serial tag to be sure chiller size, type and voltage is correct for the process.
- ☑ Check the transformer primary voltage connections to be sure they are configured for the electrical power you are using.
- ☑ The voltage at the main power connection must be within plus or minus ten percent (±10%) of the voltage listed on the serial tag.
- ☑ Phase imbalance must be less than two percent (<2%).
- ☑ Electrical connections must conform to all applicable codes.
- ☑ Complete the chilled water **TO** and **FROM PROCESS** connections.
- ☑ The optional or field installed chilled water supply and return valves on the chiller must be open.
- ☑ Be sure the pump tank and chilled water circuit are filled with a water/glycol mixture that provides freeze protection to 20°F (12ºC) below the leaving water temperature you want.
- ☑ Complete the tower or city condenser **WATER IN** and **WATER OUT** connections. Provide an adequate condenser water supply; 2 gpm per ton for city water or 3 gpm per ton for tower water operation.
- ☑ Remove all tools, foreign matter and debris from the pump tank reservoir and piping.
- ☑ Complete all piping leading to and from the pump tank. Observe all applicable codes.
- ☑ Complete all electrical wiring. Observe all applicable codes.
- ☑ Prepare all related equipment in the system for operation.

Note: The scroll compressors were phased with the pump(s) at the factory.

- Never switch contactor leads or motor leads for reversing rotation.
- Do **not** use contactor or motor leads for phase matching.
- Compressor noise from reverse rotation is noticeable. Do **not** run in this mode for more than ten (10) seconds. The compressor shuts off if run longer in this mode.
- Reverse rotation can cause suction and discharge pressures to be approximately equal; *amp draws are lower than normal*.
- If you discover that compressor rotation is reversed, correct it by switching any two **main** power leads **into the disconnect switch or distribution block** on the unit.

☑ Open the 1" (approx. 25 mm) makeup water valve and allow the tank to fill until the automatic float valve shuts off. The float level should be adjusted so the standing water level is 8" (20 cm) from the top of the tank.

☑ Check for proper pump rotation direction. To confirm proper rotation:

1. Observe a pump pressure gauge connected to the suction and discharge sides of the pump casing through two ¼" (approx. 6.4 mm) gauge cocks.
2. Close the gauge cock leading to the pump suction and open the gauge cock leading to the pump discharge.
3. Close the discharge butterfly valve, crack it open, then start the pump and observe the gauge.
   - If the gauge indicates within 15 psi (103.4 kPa/1.03 bars) below the pump curve, pump rotation is correct. **Pump rotation is clockwise opposite the shaft end**.
   - If the gauge indicates 20 psi (137.9 kPa/1.38 bars) or more below the pump curve, the pump is running backwards. Reverse rotation by interchanging any two power mains to the pump motor or starter.
   - Recheck the pressure to be sure it increased.

☑ Check the water level in the pump tank to be sure the pump does not run dry while the system piping is being filled.

☑ Check your work and proceed to the Startup procedure.

5-3 Water-Cooled Pinnacle Startup

1. Start the chiller by pushing the **Start** button on the control panel of the unit.

   Both panel lights flash about four (4) times; this is a light bulb test.
2. Touch the screen anywhere to display the Main Menu screen.
3. Turn on the pumps by selecting Pumps on the Main Menu screen; select the pumps you want to turn on at the Pumps screen.
4. Adjust the Freezestat cut-out, located in the main electrical enclosure, to 10°F (6ºC) below the process temperature set point you want.

Note: Make sure that a recirculation pump is running before you start any compressor circuit.

5. To turn the compressor circuit(s) **ON**, return to the Main Menu screen, then select `Compressors`; select the compressors you want to turn on at the Compressors screen.
6. Put the chiller under a process load.
7. To set process temperature, return to the Main Menu screen, then select `Temperature`; select the process temperature you want by pressing ▲ or ▼.
8. Check the pump(s) amp draws and pressures. The amp draws must be within the pump(s) running load and service factor amps.
9. Operate the chiller, looking for leaks and listening for unusual noises or vibrations that could indicate improper operation.

5-4 Remote Air-Cooled Pinnacle Startup Checklist

☑ Check the shipping papers against the serial tag to be sure chiller size, type and voltage is correct for the process.

☑ Check the transformer primary voltage connections to be sure they are configured for the electrical power you are using.

☑ The voltage at the main power connection must read within plus or minus ten percent (±10%) of the voltage listed on the serial tag.

☑ Phase imbalance must be less than two percent (<2%).

☑ Electrical connections must conform to all applicable codes.

☑ Complete the chilled water **TO** and **FROM PROCESS** connections.

☑ The optional or field installed chilled water supply and return valves must be open.

☑ Be sure the tank and chilled water circuit piping are filled with a water/glycol mixture. The water/glycol mix should provide freeze protection to 20°F below the leaving water temperature you've selected.

☑ The air cooled condenser should have an adequate supply of air for proper operation.

☑ Connect the main power to the unit and bump-start it to check for proper rotation direction. If the fans are operating backwards, reverse any two main power leads at the incoming terminal block.

☑ Remove all tools, foreign matter and debris from the pump tank reservoir and piping.

☑ Complete all piping leading to and from the pump tank. Observe all applicable codes.

☑ Complete all electrical wiring. Observe all applicable codes.

☑ Prepare all related equipment in the system for operation.

Note: The scroll compressors were phased with the pump(s) at the factory.

- Never switch contactor leads or motor leads for reversing rotation.

- Do **not** use contactor or motor leads for phase matching.
- Compressor noise from reverse rotation is noticeable. Do **not** run in this mode for more than ten (10) seconds. The compressor shuts off if run longer in this mode.
- Reverse rotation can cause suction and discharge pressures to be approximately equal; *amp draws are lower than normal*.
- If you discover that compressor rotation is reversed, correct it by switching any two **main** power leads **into the disconnect switch or distribution block** on the unit.

☑ Open the 1" (approx. 25 mm) makeup water valve and allow the tank to fill until the automatic float valve shuts off. The float level should be adjusted so the standing water level is 8" (20 cm) from the top of the tank.

☑ Check for proper pump rotation direction. To confirm proper rotation:

1. Observe a pump pressure gauge connected to the suction and discharge sides of the pump casing through two ¼" (approx. 6.4 mm) gauge cocks.
2. Close the gauge cock leading to the pump suction and open the gauge cock leading to the pump discharge.
3. Close the discharge butterfly valve, crack it open, then start the pump and observe the gauge.
   - If the gauge indicates within 15 psi (103.4 kPa/1.03 bars) below the pump curve, pump rotation is correct. **Pump rotation is clockwise opposite the shaft end**.
   - If the gauge indicates 20 psi (137.9 kPa/1.38 bars) or more below the pump curve, the pump is running backwards. Reverse rotation by interchanging any two power mains to the pump motor or starter.
   - Recheck the pressure to be sure it increased.

☑ Check the water level in the pump tank to be sure the pump does not run dry while the system piping is being filled.

☑ Check your work and proceed to the Startup procedure in the following section.

5-5 Remote Air-Cooled Pinnacle Startup

1. Start the chiller by pushing the **Start** button on the control panel of the unit.

   Both panel lights flash about four (4) times; this is a light bulb test.
2. Touch the screen anywhere to display the Main Menu screen.
3. Turn on the pumps by selecting Pumps on the Main Menu screen; select the pumps you want to turn on at the Pumps screen.
4. Adjust the Freezestat cut-out, located in the main electrical enclosure, to 10°F (6ºC) below the process temperature set point you want.

Note: Make sure that a recirculation pump is running before you start any compressor circuit.

5. To turn the compressor circuit(s) **ON**, return to the Main Menu screen, then select Compressors; select the compressors you want to turn on at the Compressors screen.
6. Put the chiller under a process load.
7. To set process temperature, return to the Main Menu screen, then select Temperature; select the process temperature you want by pressing ▲ or ▼.
8. Check the pump(s) amp draws and pressures. The amp draws must be within the pump(s) running load and service factor amps.
9. Operate the chiller, looking for leaks and listening for unusual noises or vibrations that could indicate improper operation.
10. Check condenser fans for pressure switch settings as shown in the table below:

Fan number	Set on			Set off		
	psi	kPa	bars	psi	kPa	bars
1	not applicable; Fan 1 is a variable-speed fan					
2	240	1,654.8	16.5	190	1,310.1	13.1
3	265	1,827.2	18.3	215	1,482.4	14.8
4	285	1,965.1	19.7	235	1,620.3	16.2
5	305	2,102.9	21.1	255	1,758.2	17.6

5-6 Determining Flow Rate

Note: If your chilling station is equipped with the Advanced Control package, see Section 7-9 on Page 67 for more information on flow rates.

To determine flow:

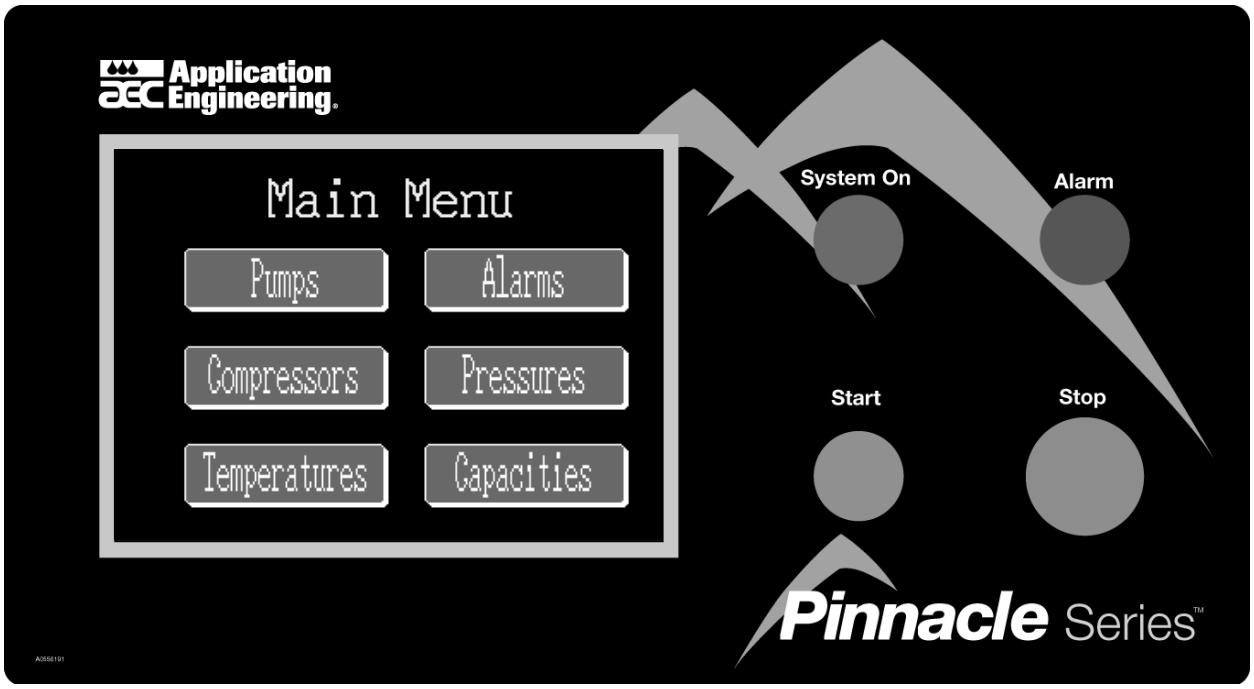
1. Close the gauge cock leading to the pump suction side and open the gauge cock leading to the pump discharge.
2. Start the pump and make note of the discharge pressure in psi (kPa/bars).
3. Check the pump curves on Pages 24 and 25 for the appropriate horsepower (kW) pump at the discharge pressure in psi (kPa/bars).
4. Project this point down to find the flow in gpm (lpm).
5. Flow-through evaporator(s) set at factory; recheck based on curves in Figure 12 on Page 27. Process pumps can be left wide open if running amps are below full load amps.

5-7 Shutdown

1. Ready process and related equipment for shut down.
2. Shut down the individual chiller circuits.
3. Shut down all pumps.

4. Turn off main power.
5. Close the water make up valve.
6. If the system is to be drained, open the 1½" (approx. 38 mm) drain valve.

Figure 17
Pinnacle Control Panel



6 Graphic Panel Devices

6-1 Indicator Lights and Control Switches (MMI)

System On

The green **System On** indicator lights when the main power switch is on and the control circuit is energized.

Alarm

The red **Alarm** indicator lights when any alarm condition exists. If so equipped, the optional alarm light stack activates during a general fault alarm as well.

Start

The **Start** push-button lets you energize the unit.

Stop

The **Stop** push-button lets you de-energize the unit.

Touchscreen Interface

The color touchscreen interface gives you control over the chilling station. It has an easy-to-use control menu that lets you quickly change or adjust chiller settings and also gives you all the operation information you need to control the unit effectively.

See Chapter 7 on Page 49 for more information on touchscreen interface operation.

Note: During startup, the **System On** and **Alarm** indicators flash about four (4) times; this is a light bulb test and is a normal routine of the startup cycle.

Figure 18
Typical Water-Cooled Pinnacle Electrical Schematic, Drawing 1

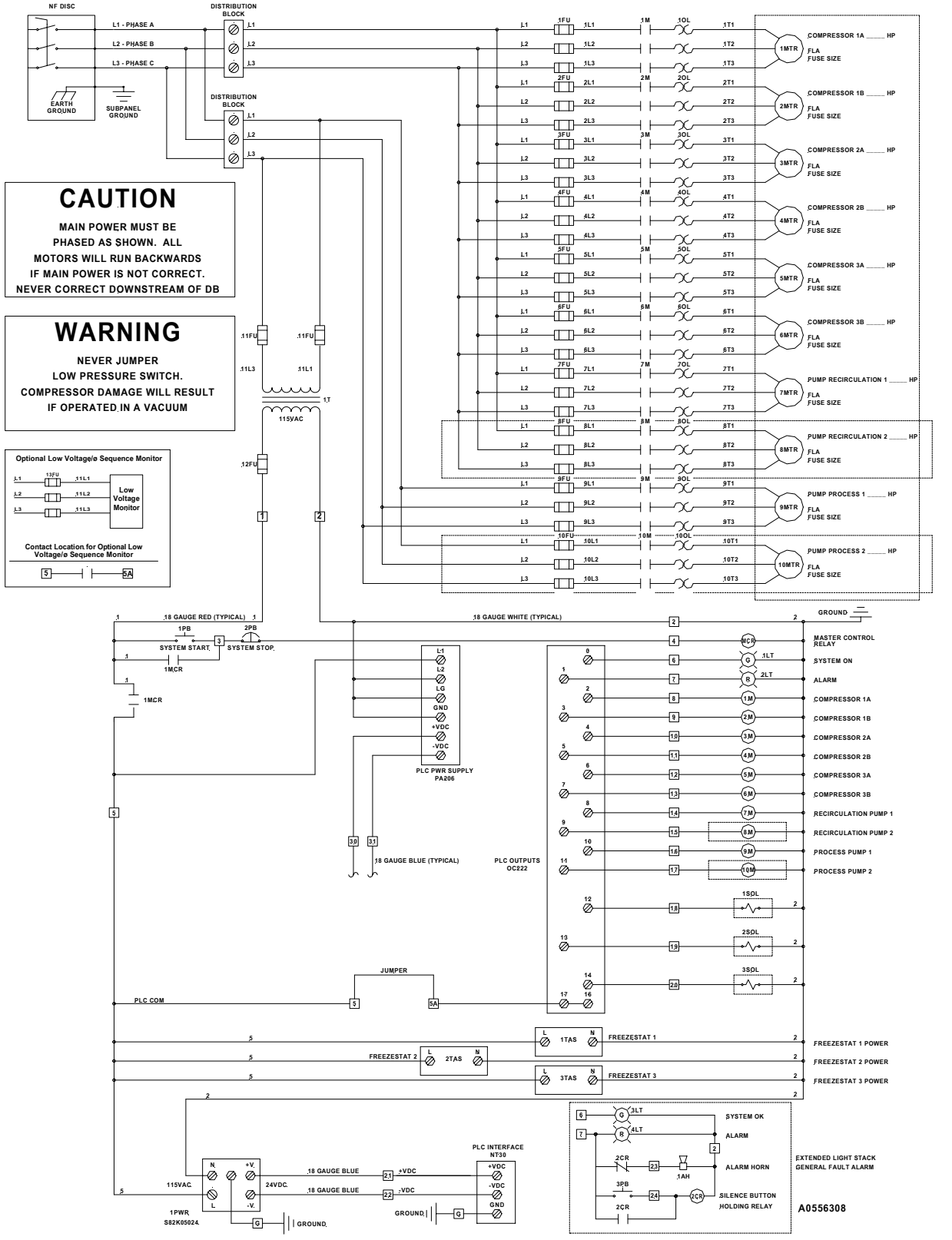


Figure 18
Typical Water-Cooled Pinnacle Electrical Schematic, Drawing 2

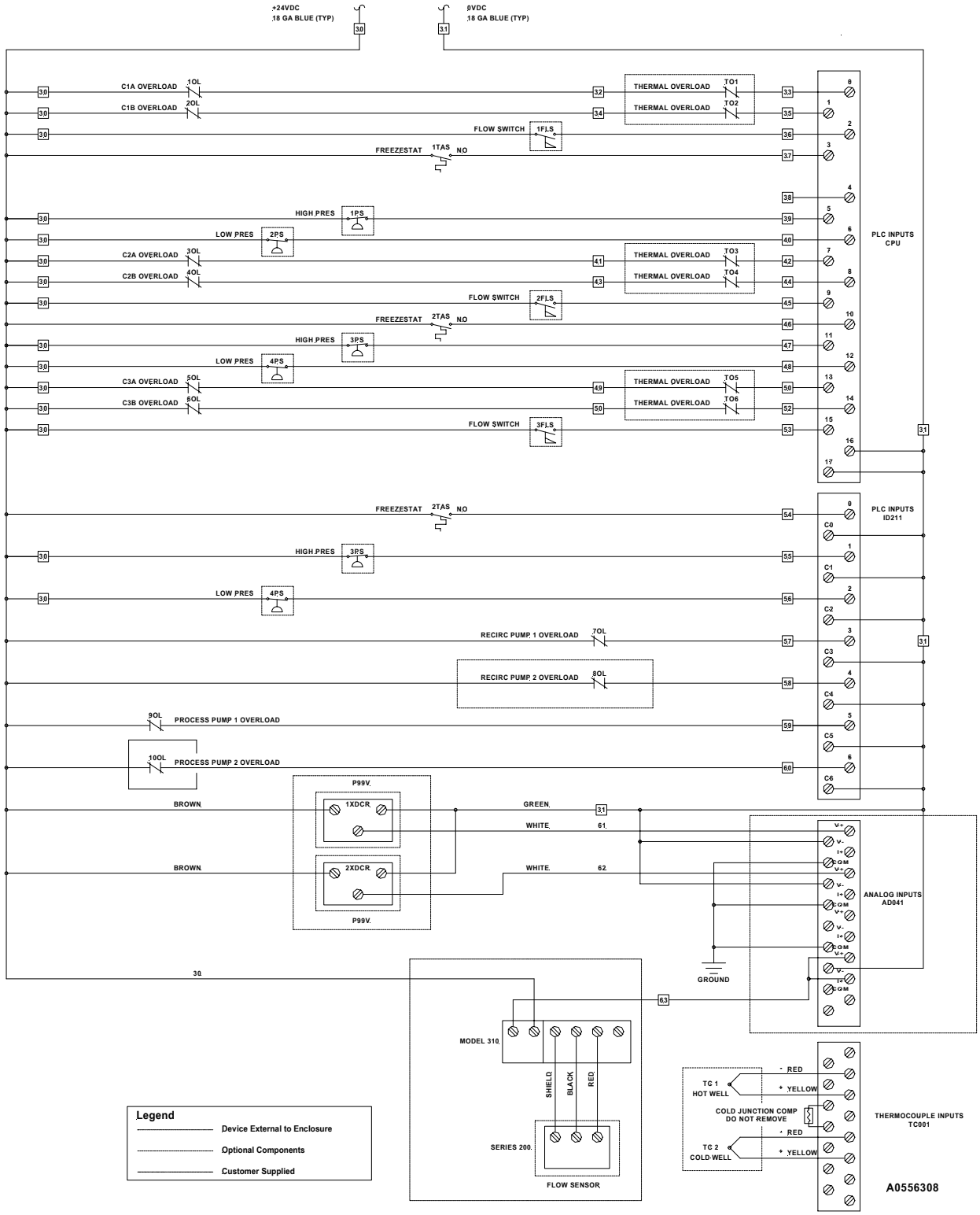


Figure 19
Typical Remote Air-Cooled Pinnacle Electrical Schematic, Drawing 1

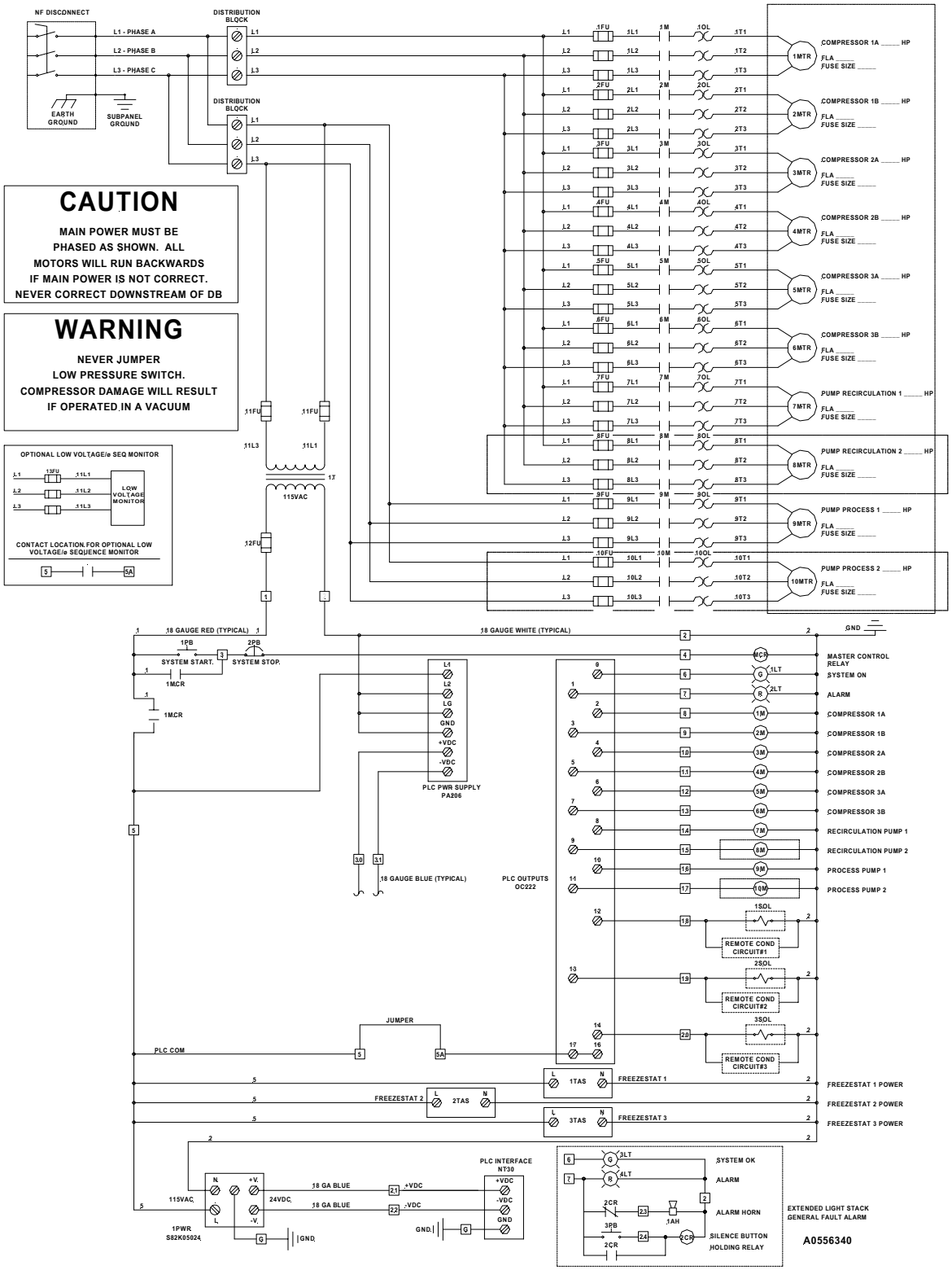


Figure 19
Typical Remote Air-Cooled Pinnacle Electrical Schematic, Drawing 2

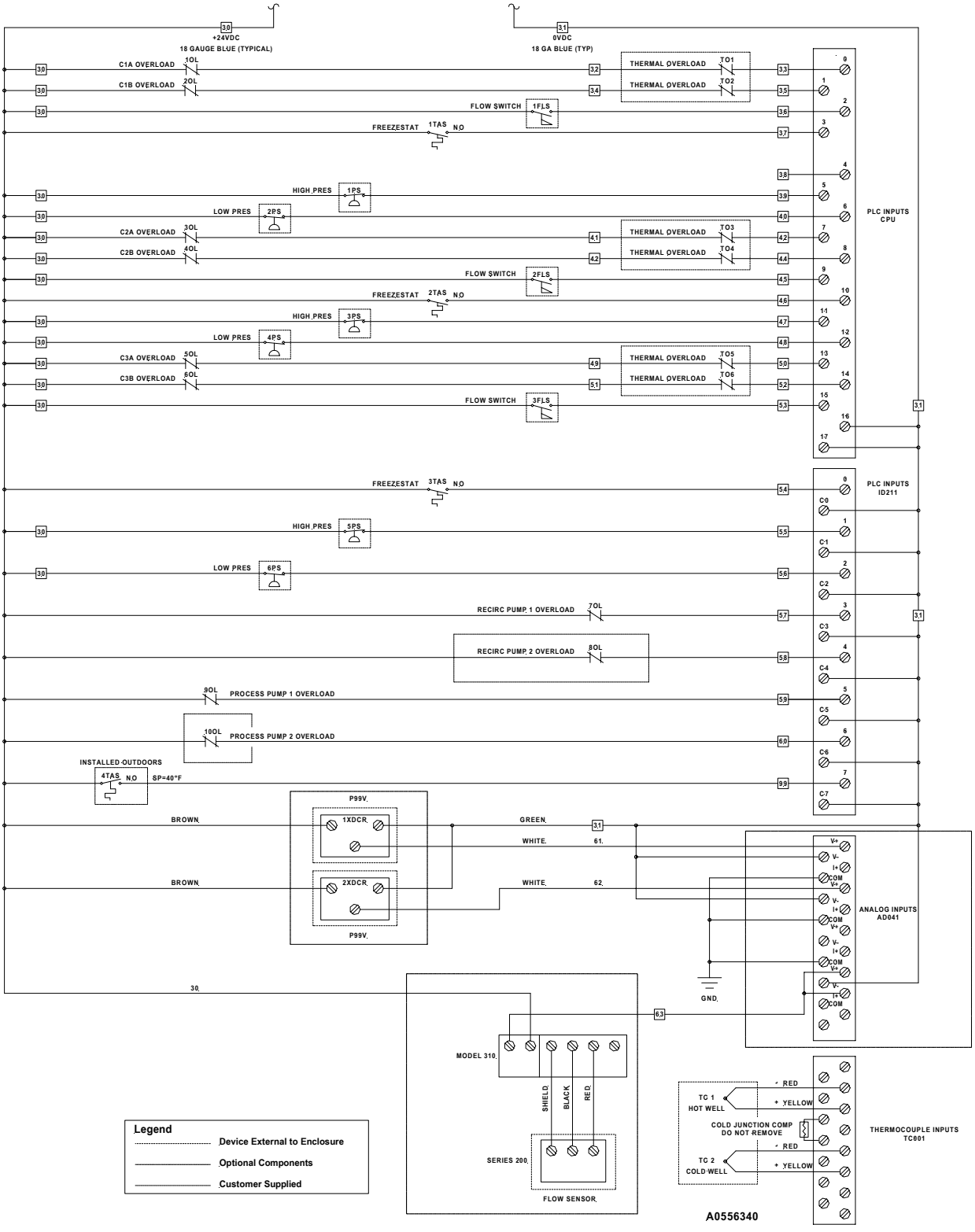
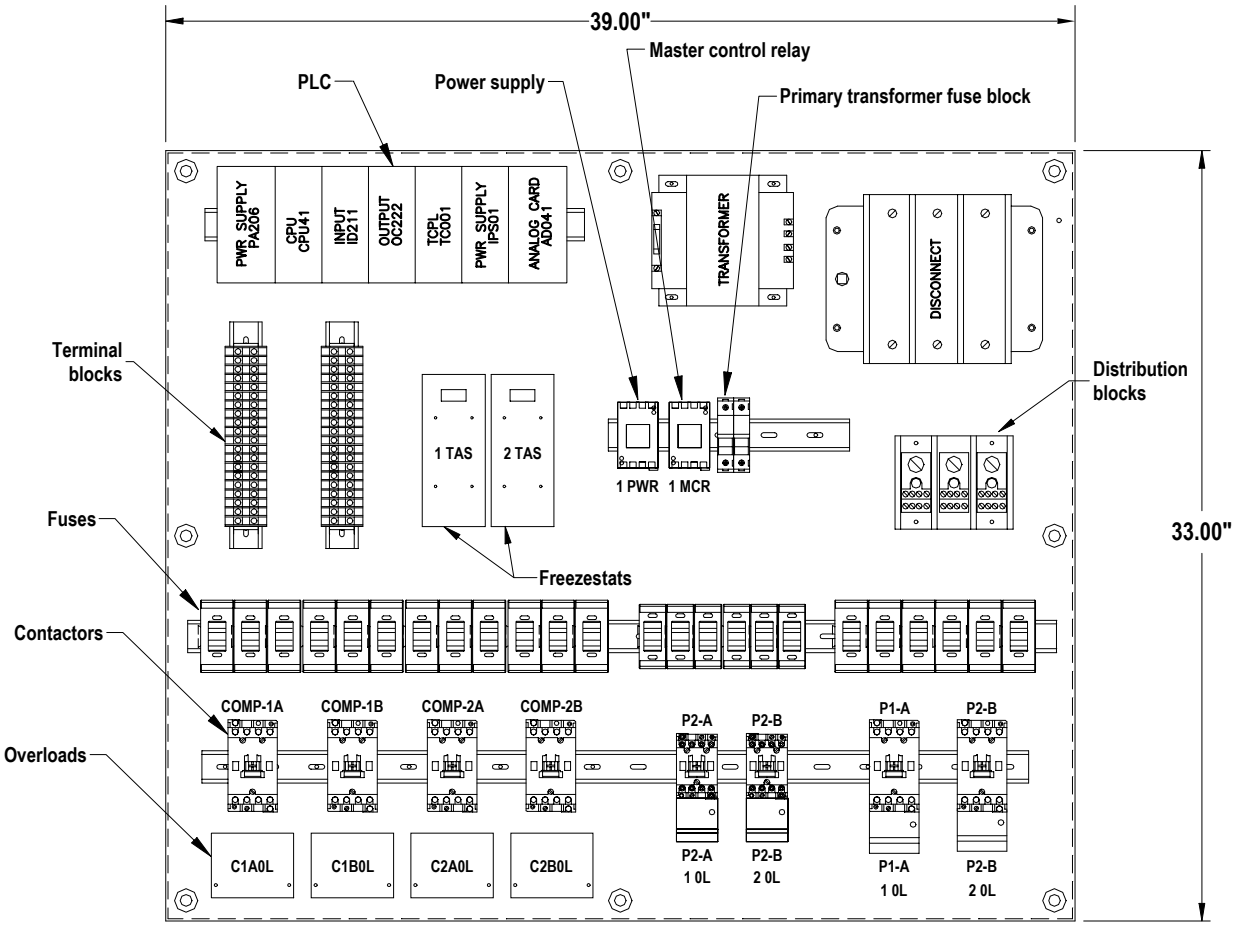


Figure 20
Typical Pinnacle Subpanel Layout



7 Using the Touchscreen Interface

7-1 Touchscreen Interface Introduction (MMI)

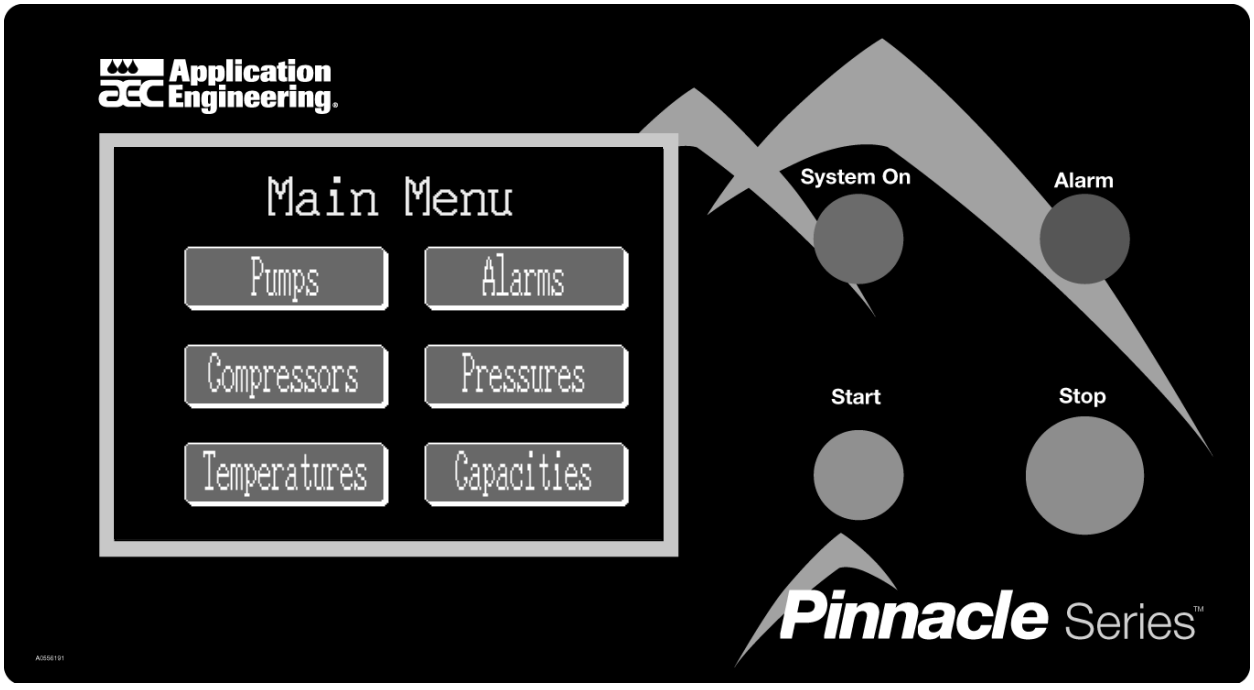
The touchscreen interface lets you control your Pinnacle central chilling station. You can do such things as:

- Control pumps and compressors
- View current statuses of operation, such as pressures, temperatures, and capacities
- Handle alarm conditions

The sections in this chapter list special instructions for operating your Pinnacle touchscreen interface.

Note: The screens shown in this chapter are ***sample*** screens. Actual screen representations may be slightly different in appearance, but are no different in operation.

Figure 21
Pinnacle Control Panel



7-2 Using the Pinnacle Touchscreen Interface

The Pinnacle touchscreen interface is the "manager" of your Pinnacle central chilling station. The screen contains screen buttons you can press to control system operation.

For example, if you need to resolve an alarm condition, press the 

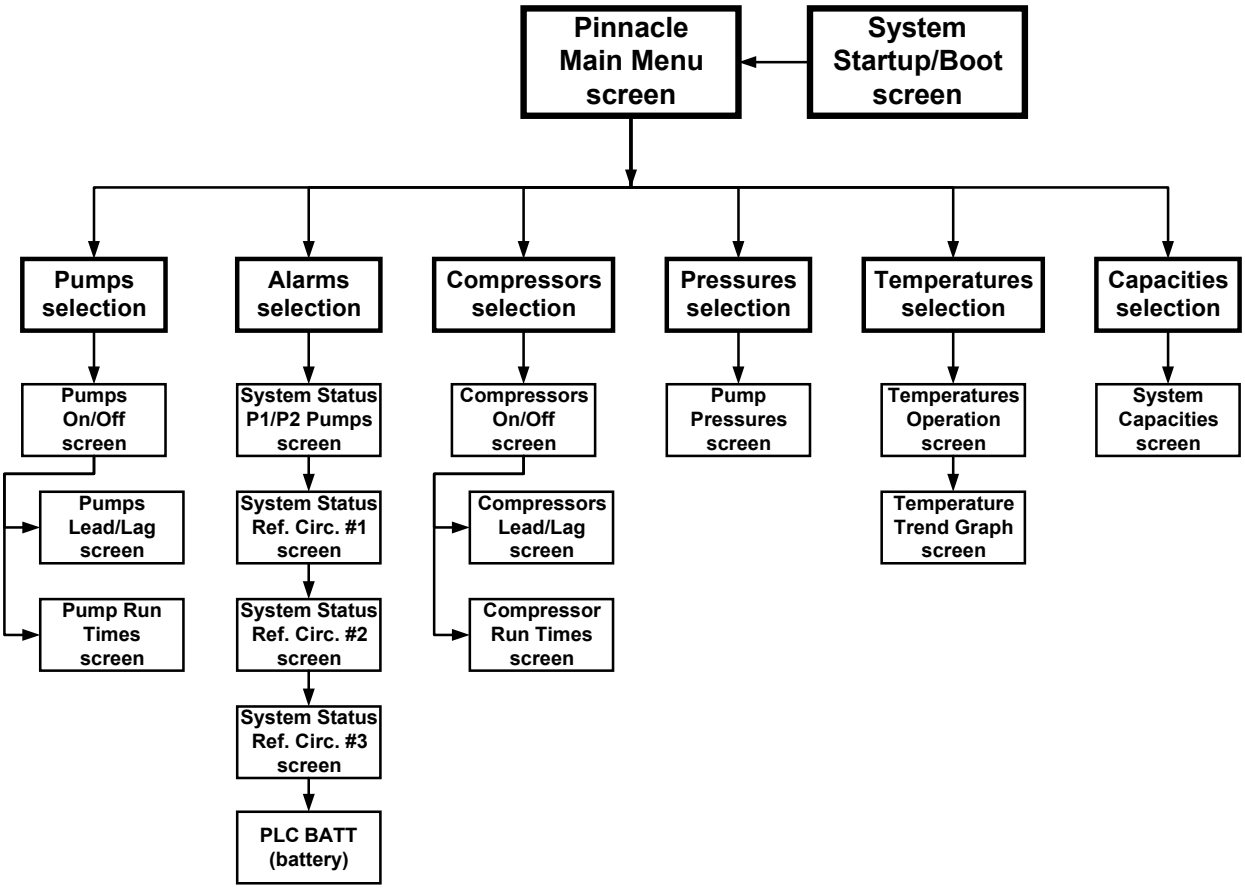
screen button of the Main Menu screen. The first System Status screen then displays.

To return to the Main Menu screen at this point, press the 

screen button of the screen, usually located in the lower right corner. The Main Menu screen then displays.

Some screens let you directly control the operation of the chilling station, while others are for information purposes and are "display-only" screens. This chapter distinguishes between operation and display screens.

Figure 22
Pinnacle Touchscreen Flow Chart, Typical 3-Circuit Unit



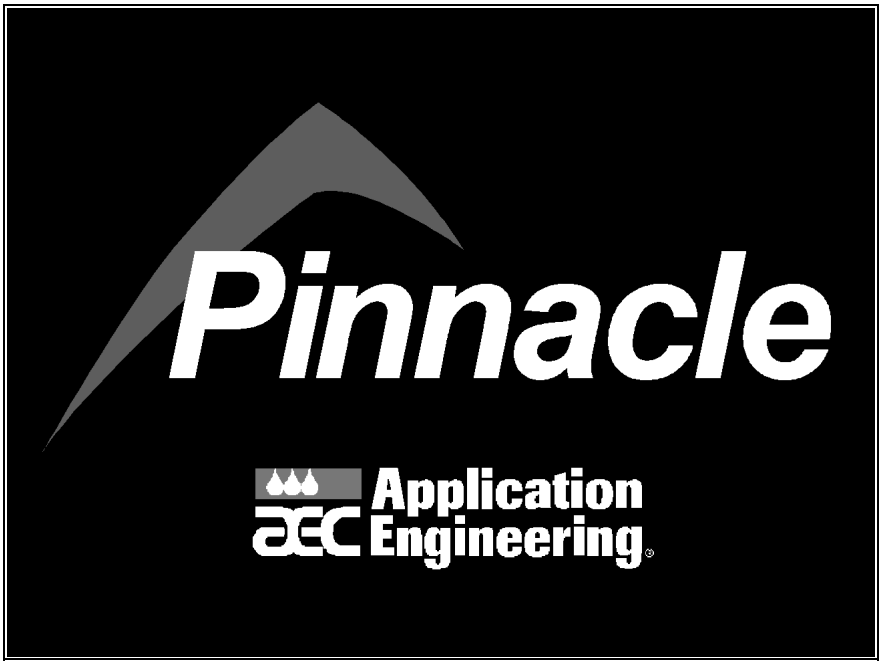
7-3 Getting Started on the Pinnacle Touchscreen Interface

To start the Pinnacle touchscreen interface:

- Push the **ON/OFF** button on the cabinet.

  The Pinnacle control panel energizes and the **System On** and **Alarm** indicators flash five times.

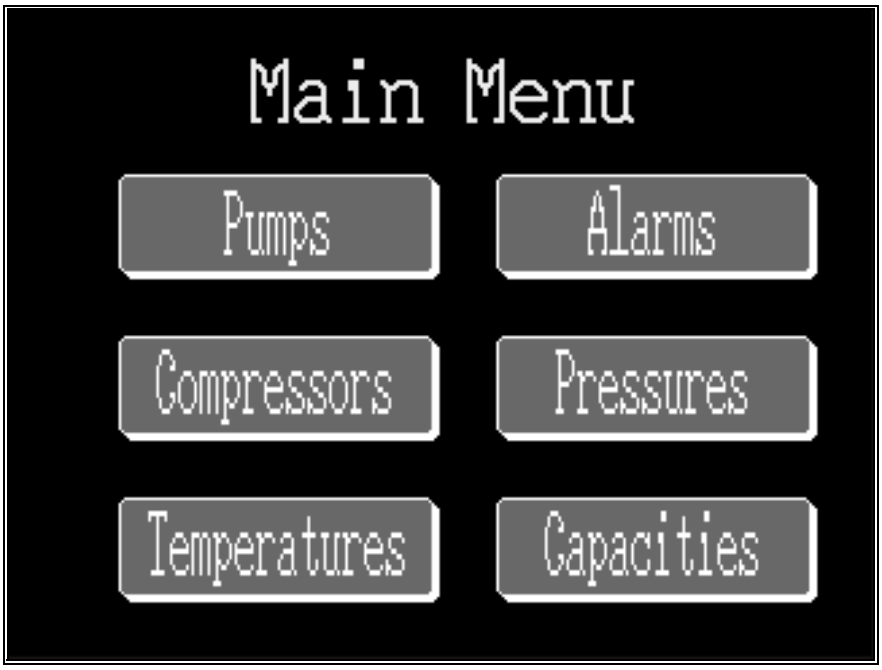
  The screen displays the initial System Startup/Boot screen:



System Startup/Boot Screen

- Press anywhere on the System Startup/Boot screen to continue.

The Main Menu screen displays:



Main Menu Screen

The Main Menu screen lets you gain access to:

- the 

screen button, containing the Pump On/Off operation screen, the Pump Run Times display screen, and the Lead/Lag display screen
- the 

screen button, containing System Status operation and display screens and PLC Status Alarm operation screen
- the 

screen button, containing the Compressors On/Off operation screen, the Compressor Run Times display screen, and the Lead/Lag display screen
- the 

screen button, containing the Pump Pressures display screen
- the 

screen button, containing the Temperatures operation screen and the Temperature Profile display screen
- the 

screen button, containing the System Capacities display screen

The following sections in this chapter list the information you need to navigate through these screens for operating and monitoring your Pinnacle central chilling station.

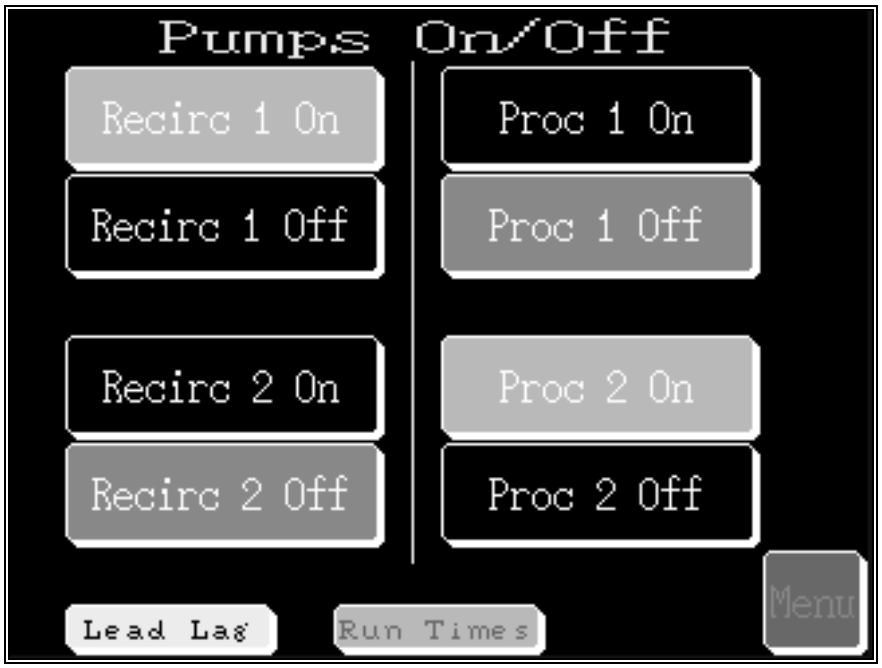
7-4 Operating Chiller Station Pumps

To operate chiller station pumps, start at the Main Menu screen, then:

- Press 

.

  The Pumps On/Off operation screen displays:



Pumps On/Off Operation Screen

The Pumps On/Off operation screen lets you turn on and off process and recirculation pumps. It also lets you navigate to the Pump Run Times display screen and the Lead/Lag display screen.

To control pumps:

- Select the pump(s) you want to turn on or off, then press the screen button at the pump you want to control.

  The pump you selected responds by turning on or off, as indicated by the colored portion you selected on the screen. **On** is green, **Off** is red, and the opposite selection is black.

To return to the Main Menu screen:

- Press 

.

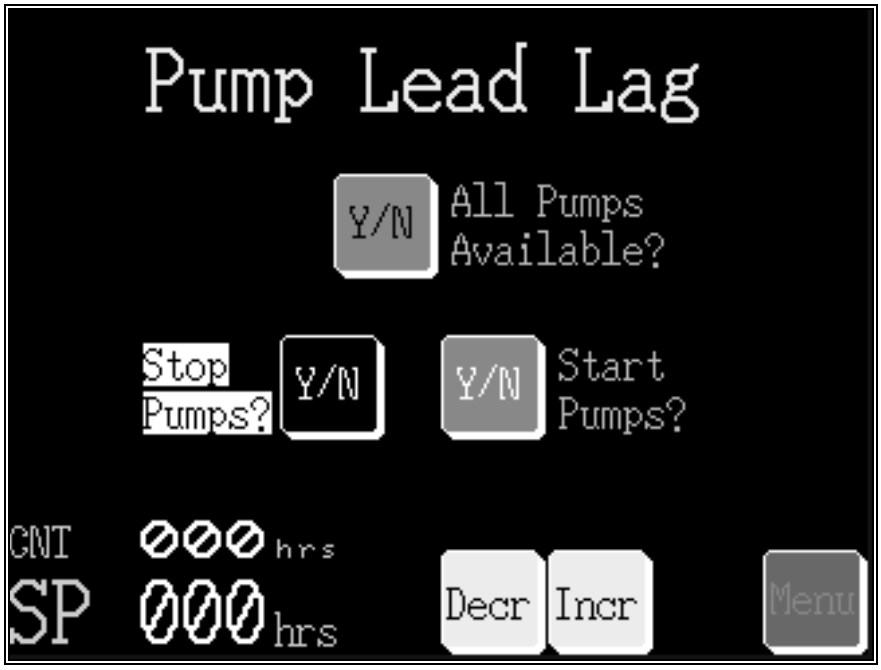
  The Main Menu screen displays.

Setting Pump Lead/Lag Times and Activating Pump Lead/Lag Operation

To navigate to the Pump Lead Lag screen, start at the Pumps On/Off screen, then:

- Press Lead/Lag at the bottom of the screen.

  The Pump Lead/Lag screen displays:



Pump Lead/Lag Operation Screen

The Pump Lead/Lag operation screen lets you activate and deactivate the Pump Lead/Lag mode, as well as set the rotation schedule interval you want. *This function is available only with the optional Advanced Control Package, and only if your unit has four (4) pumps*. **CNT** is the elapsed count on the lead pump motor. **SP** is the of the lead/lag rotation schedule set point you can set.

Note: You can set or adjust the pump lead/lag rotation schedule at any time.

To **decrease** the pump lead/lag rotation schedule interval:

- Press ▼ (decrease).

  The pump lead/lag interval decreases by 25-hour increments.

- or -

To *increase* the pump lead/lag rotation schedule interval (by 25-hour increments):

- Press ▲ (increase).

  The pump lead/lag value increases by 25-hour increments.

To activate or deactivate the Pump Lead/Lag mode:

- Press the **Y/N** screen button next to the **All Pumps Available?** screen prompt.

  If the **Y/N** screen button turns green, all pumps are available for activating or deactivating the Pump Lead/Lag mode.

- or -

  If the **Y/N** screen button **stays red**, an alarm condition exists that prohibits you from activating or deactivating the Pump Lead/Lag mode.

  Make sure you correct any alarm condition before continuing.

To start pumps, first check pump status as listed in the previous procedure, then:

- Press the **Y/N** screen button next to the **Start Pumps?** screen prompt.

  The pumps start.

- or -

To stop pumps:

- Press the **Y/N** screen button next to the **Stop Pumps?** screen prompt.

  The Pumps On/Off screen displays. Select the pumps you want to stop from this screen.

To return to the Main Menu screen:

- Press 

.

  The Main Menu screen displays.

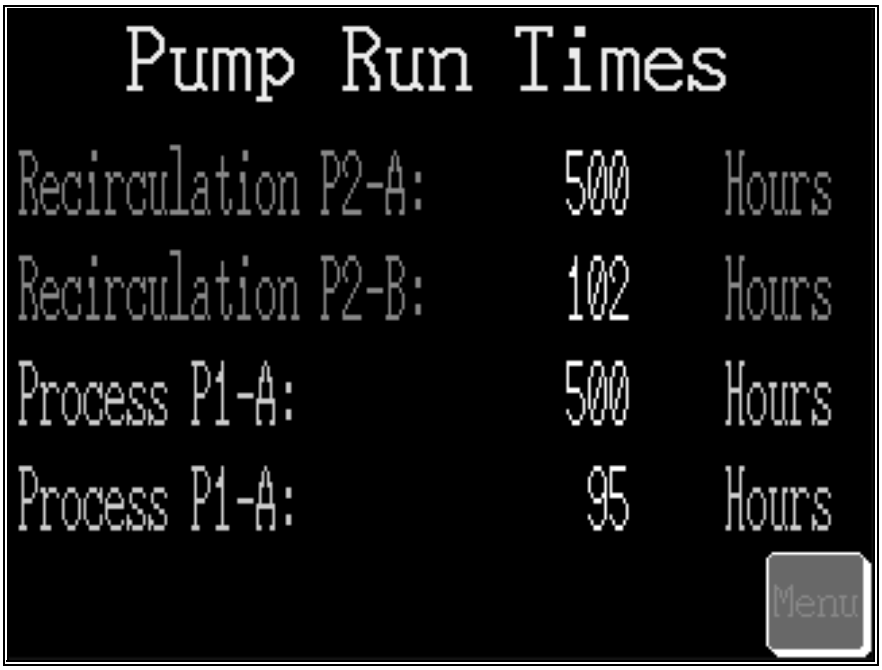
Viewing Pump Run Times

To navigate to the Pump Run Times display screen, start at the Pumps On/Off screen, then:

- Press 

at the bottom of the screen.

The Pump Run Times screen displays:



Pump Run Times Display Screen

The Pump Run Times display screen lets you view the number of hours that each listed pump has run. This information is useful for determining regular maintenance events. This screen also lets you navigate to the Lead/Lag screen. *This function is available only with the optional Advanced Control Package.*

To return to the Main Menu screen:

- Press Menu.

  The Main Menu screen displays.

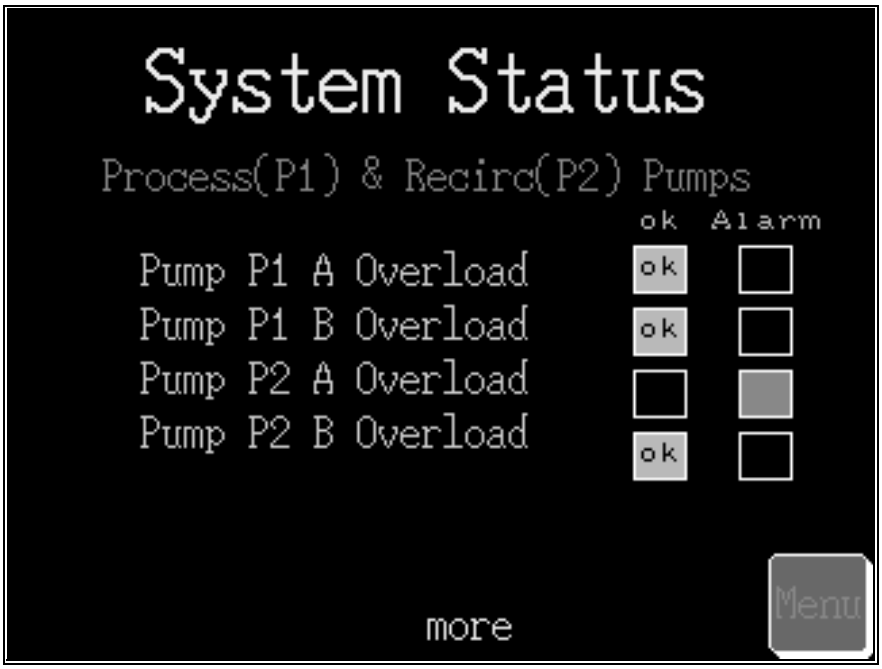
7-5 Viewing System Statuses and Handling Alarm Conditions

This series of screens let you view system statuses and any alarm conditions for process and recirculation pumps and refrigeration circuits.

To begin, start at the Main Menu screen, then:

- Press Alarms.

The System Status Process (P1) & Recirculation (P2) Pumps screen displays:



System Status Process (P1) and Recirculation (P2) Pumps Alarm Display Screen

The System Status Process (P1) and Recirculation (P2) Pumps alarm display screen lets you view any pump overload alarm condition so you can make corrections and reset the alarm. *In this example*, the **P2 A** pump is in an overload alarm condition. ***Make sure you correct any alarm condition before continuing***.

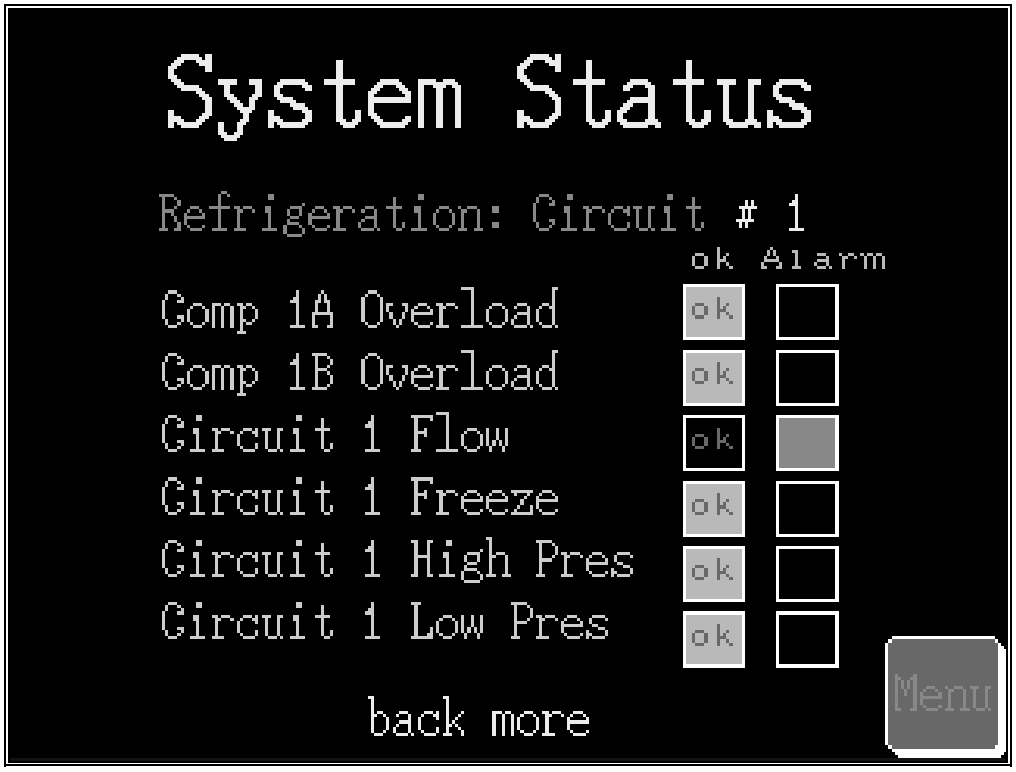
This screen also lets you navigate to other System Status screens.

Checking System Refrigeration Circuit Status

The next three screens contain alarm information on refrigeration circuits 1, 2, and, if applicable, 3. To navigate to the screen(s):

- Press more.

The first of the System Status Refrigeration Circuit screens displays:



System Status Refrigeration: Circuit #1 Alarm Display Screen

The System Status Refrigeration: Circuit #1 alarm screen is the first of two (or three, if your Pinnacle chiller station is so equipped) screens that lets you view refrigeration circuit information and any alarm condition. As on the previous screen, check and correct any alarm condition before continuing. *In this example*, **`Circuit 1 Flow`** indicates an alarm condition.

To navigate to other System Status alarm display screens:

- Press **more** to go forward to the next screen.

- or -

- Press **back** to display the previous screen.

To return to the Main Menu screen:

- Press Menu.

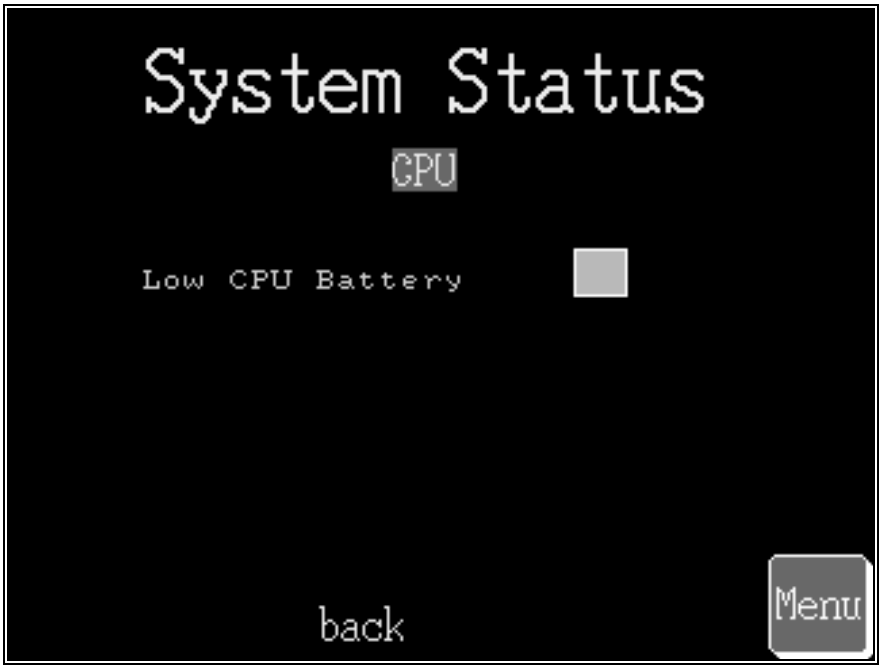
  The Main Menu screen displays.

Checking the CPU Battery

To navigate to the System Status CPU screen:

- Press more.

  The System Status CPU screen displays:



System Status CPU Screen

The screen indicator glows green to indicate a good battery. If the indicator glows red, replace the CPU battery as soon as possible. Typical CPU battery life is approximately five (5) years.

To return to the Main Menu screen:

- Press Menu.

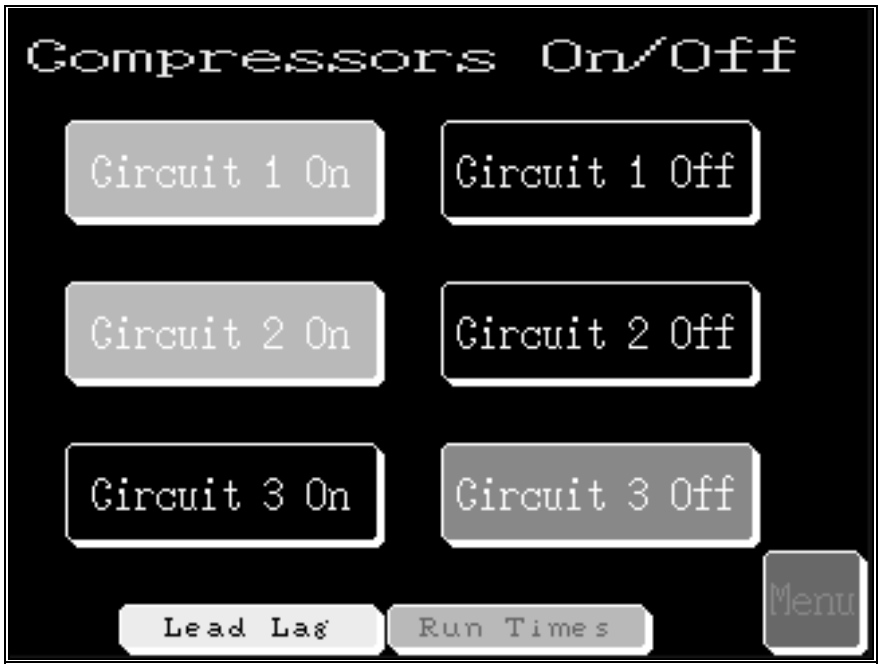
  The Main Menu screen displays.

7-6 Operating Chiller Station Compressors

To operate chiller station compressors, start at the Main Menu screen, then:

- Press Compressors.

The Compressors On/Off operation screen displays:



Compressors On/Off Operation Screen

The Compressors On/Off operation screen lets you turn on and off circuit compressors. It also lets you navigate to the Compressor Run Times display screen and the Lead/Lag display screen.

To control compressors:

- Select the circuit(s) you want to turn on or off, then press the screen button at the circuit you want to control.

  The circuit you selected responds by turning the appropriate compressor(s) on or off, as indicated by the colored portion you selected on the screen. **On** is green, **Off** is red, and the opposite selection is black.

To return to the Main Menu screen:

- Press 

.

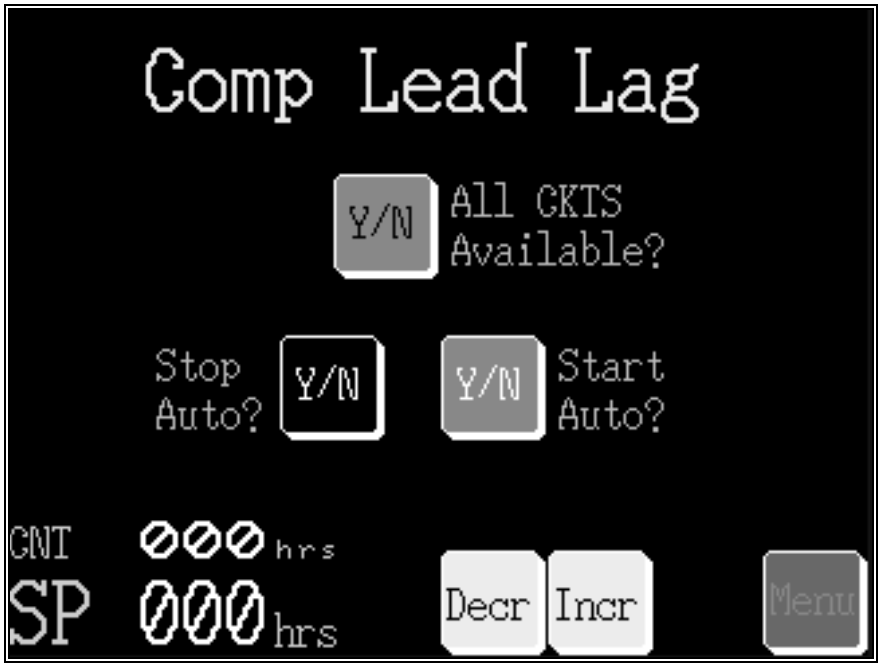
  The Main Menu screen displays.

Viewing and Setting Compressor Circuit Lead/Lag Times

To navigate to the Compressor Lead/Lag display screen:

- Press Lead/Lag at the bottom of the screen.

  The Compressor Lead/Lag screen displays:



Compressor Lead/Lag Operation Screen

The Compressor Lead Lag operation screen lets you activate and deactivate the Compressor Lead/Lag mode, as well as set the rotation schedule interval you want. *This function is available only with the optional Advanced Control Package.* **CNT** is the elapsed count on the lead pump motor. **SP** is the of the lead/lag rotation schedule set point you can set.

Note: You can set or adjust the compressor lead/lag rotation schedule at any time.

To **decrease** the compressor lead/lag rotation schedule interval:

- Press ▼ (decrease).

  The compressor lead/lag interval decreases by 25-hour increments.

- or -

To *increase* the compressor lead/lag rotation schedule interval (by 25-hour increments):

- Press ▲ (increase).

  The compressor lead/lag value increases by 25-hour increments.

To activate or deactivate the Compressor Lead/Lag mode:

- Make sure that you have energized all compressor circuits before continuing this procedure.

- Press the **Y/N** screen button next to the **All CKTS Available?** screen prompt.

  If the **Y/N** screen button turns green, all compressor circuits are available for activating or deactivating the Compressor Lead/Lag mode.

- or -

If the **Y/N** screen button **stays red**:

- An alarm condition exists that prohibits you from activating or deactivating the Compressor Lead/Lag mode. ***Make sure you correct any alarm condition before continuing***.

  - or -

- You may not have energized all compressor circuits.

To activate the Automatic Lead/Lag mode:

- Press the **Y/N** screen button next to the **Start Auto?** screen prompt.

  The Automatic Lead/Lag mode is activated.

- or -

To deactivate the Automatic Lead/Lag mode:

- Press the **Y/N** screen button next to the **Stop Auto?** screen prompt.

  The Automatic Lead/Lag mode is deactivated.

To return to the Main Menu screen:

- Press 

.

  The Main Menu screen displays.

Viewing Compressor Run Times

To navigate to the Compressor Run Times display screen from the Compressors On/Off screen:

- Press Run Times at the bottom center of the screen.

  The Compressor Run Times screen displays:

Compressor Run Times Display Screen

The Compressor Run Times display screen lets you view the number of hours that each listed circuit compressor has run. This information is useful for determining regular maintenance events. *This function is available only with the optional Advanced Control Package.*

To return to the Main Menu screen:

- Press Menu.

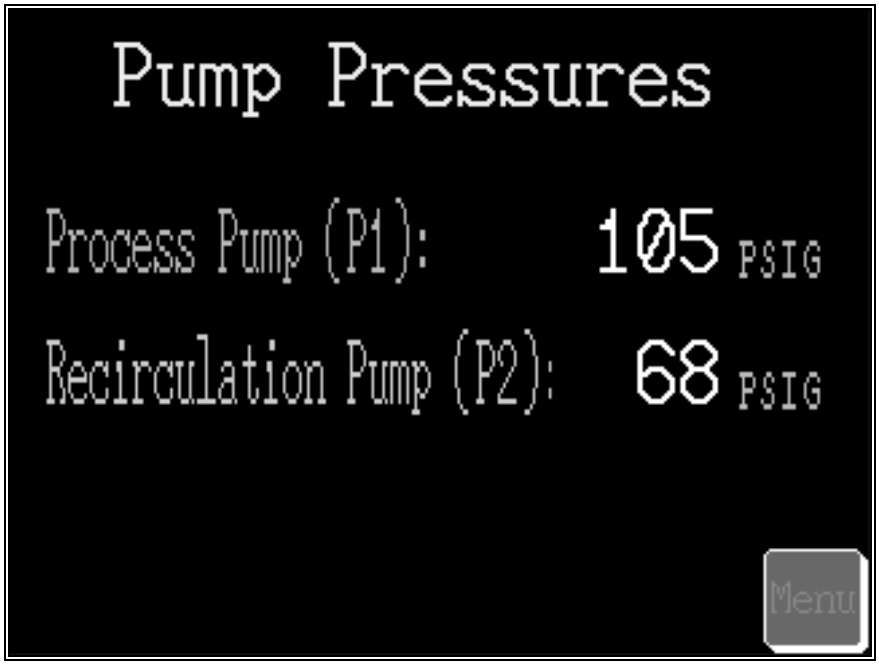
  The Main Menu screen displays.

7-7 Viewing Current Pump Pressures

To view current pump pressures, start at the Main Menu screen, then:

- Press Pressures.

The Pump Pressures display screen displays:



Pump Pressures Display Screen

The Pump Pressures screen lets you view current pressures **in psig** for the process (P1) and recirculation (P2) pumps **that are currently operating**. *This function is available only with the optional Advanced Control Package.*

Note: If you have a metric version of the Pinnacle controller, the screens display in converted metric values.

To return to the Main Menu screen:

- Press Menu.

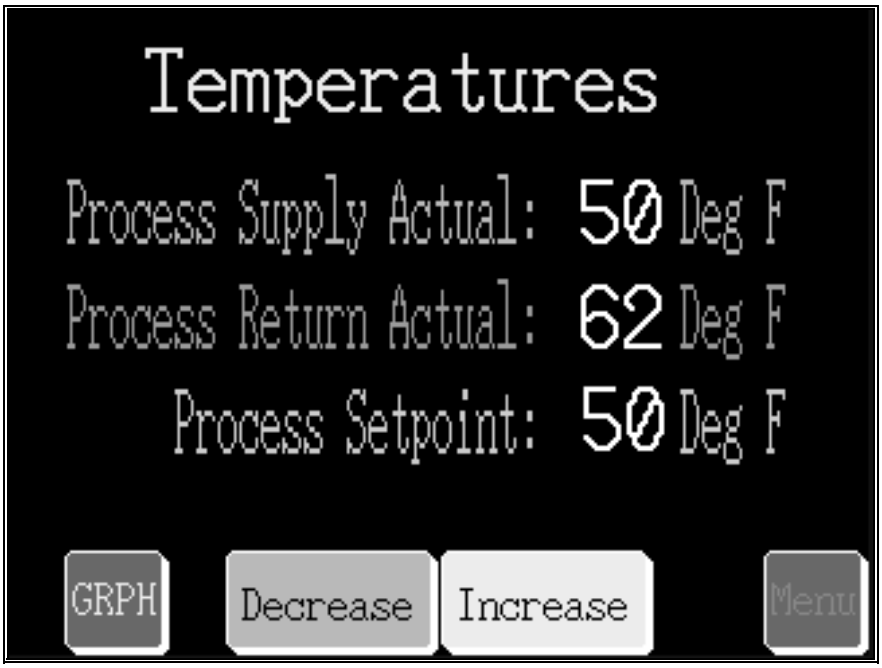
  The Main Menu screen displays.

7-8 Setting and Viewing System Temperatures

To set and view system temperatures, start at the Main Menu screen, then:

- Press Temperatures.

The System Temperatures operation screen displays:



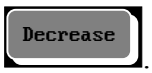
System Temperatures Operation Screen

The System Temperatures operation screen lets you:

- View process supply actual temperature in ºF
- View process return actual temperature in ºF
- Change the process set point temperature
- Navigate to the Temperature Trend Graph display screen

Note: If you have a metric version of the Pinnacle controller, the screens display in converted metric values.

To **decrease** the process temperature set point:

- Press and hold 

.

  The temperature set point increments **downward** by single degrees F.

- or -

To **increase** the process temperature set point:

- Press and hold 

.

  The temperature set point increments **upward** by single degrees F.

To return to the Main Menu screen:

- Press Menu.

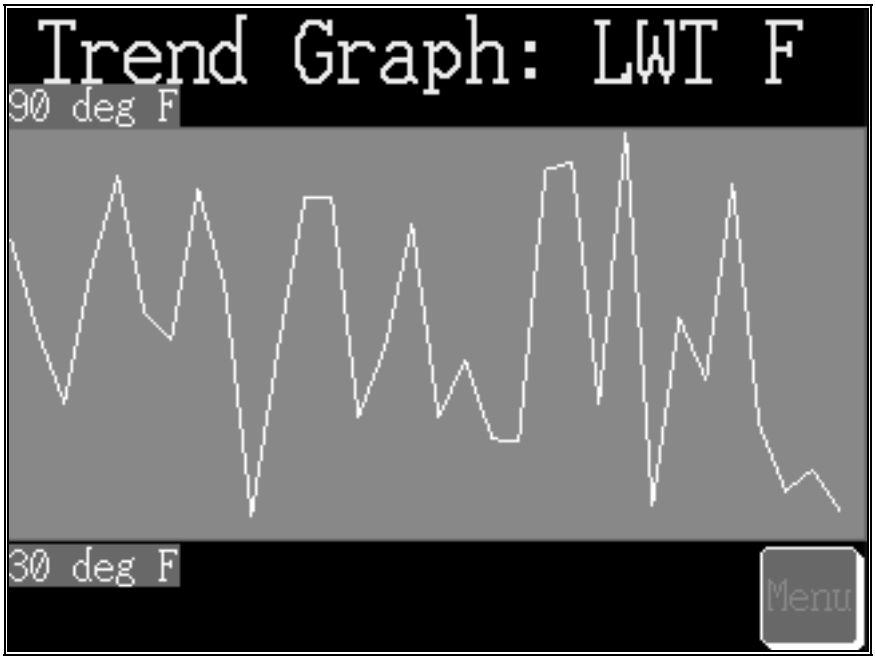
  The Main Menu screen displays.

Viewing Temperature Trends

To navigate to the Temperature Trend Graph display screen from the Temperatures screen:

- Press GRPH at the ***bottom left*** of the screen.

  The Temperature Trend Graph screen displays:



Temperature Trend Graph Display Screen

Notes: • The Temperature Trend Graph display screen shown is **only a representation**. The actual screen on your Pinnacle unit will graph the trending more evenly.

- If you have a metric version of the Pinnacle controller, the screens display in converted metric values.

The Temperature Trend Graph display screen lets you view the real time temperature track in increments of ten (10) seconds, represented by the graph line modulating between 30ºF and 90ºF (-1ºC and 32ºC). *This function is available only with the optional Advanced Control Package.*

To return to the Main Menu screen:

- Press Menu.

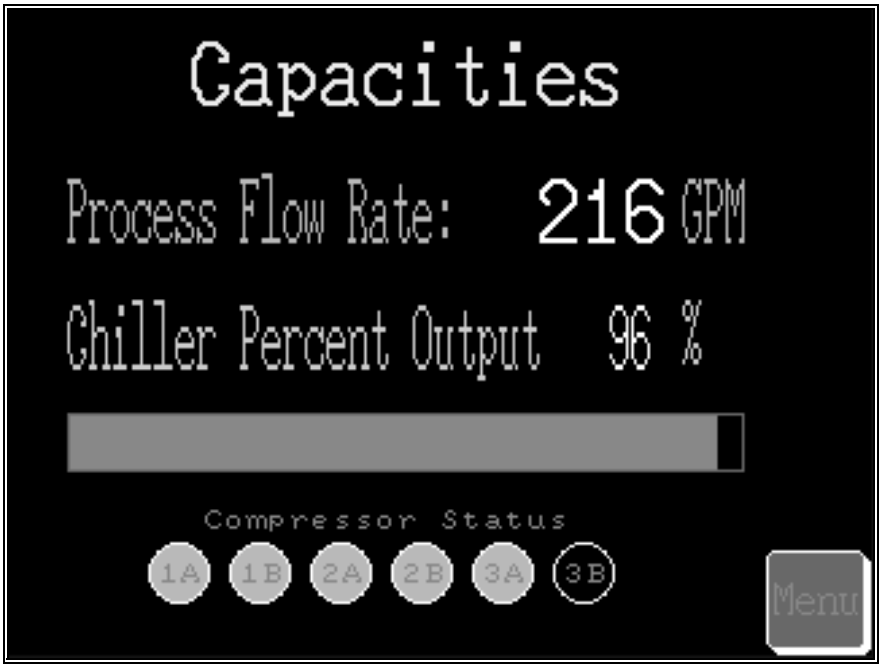
  The Main Menu screen displays.

7-9 Viewing Current System Capacities

To view current system capacities, start at the Main Menu screen, then:

- Press Capacities.

  The System Capacities screen displays:



System Capacities Display Screen

The System Capacities screen lets you:

- View the current process flow rate in gpm (lpm)
- View current chiller output in percent at maximum capacity
- View current compressor status

Notes: • Not all models have all compressors.

- If you have a metric version of the Pinnacle controller, the screens display in converted metric values.

This information is useful for determining how well the chilling station is running. *This function is available only with the optional Advanced Control Package.*

To return to the Main Menu screen:

- Press 

.

  The Main Menu screen displays.

8 Routine Maintenance

8-1 Lubrication

Grease all fan bearings, fan motors, and pump motors that do not have permanently sealed bearings. Remove the grease relief plug (motors only) before adding grease. **Failure to do so may dislodge the bearing grease retainer which will eventually cause bearing failure**.

Lubricate components regularly, based only on the component manufacturer's specifications for frequency and lubricant.

Compressors require a special scroll oil (Suniso 3GSA or equivalent); **failure to use this oil when lubricating will *void the warranty.***

8-2 Condenser Maintenance

Dirty condenser heat exchange surfaces reduce system capacity. Inspect and clean as needed.

Remote Air-Cooled

Brush or vacuum light dirt accumulations. Avoid bending or damaging the fins. Heavy soil accumulations on the coil require professional steam cleaning by a qualified refrigeration service technician. Washing from the outside will only make matters worse.

Water-Cooled

Proper water treatment will greatly reduce cleaning intervals.

Remove dirt in the condenser tubes with a nylon tube brush. Mineral deposits can be removed by circulating AEC Liquid De-Scaling Solution (AEC Model Number A0502600) through the water side of the condenser. Follow the directions on the container.

The refrigerant side is sealed and requires no routine maintenance.

8-3 Evaporator Maintenance

The evaporator(s) may be accessed for back-flushing by removal of the 2" plug (approx. 51 mm) in the return control nipple and the flow switch in the supply control nipple. If the suggested piping recommendations have been followed, one circuit of a multiple circuit chiller may be back-flushed without shutting down the entire system. Check Y-strainer for any clogging.

8-4 Pump Motor Seal

Pump seals require water for lubrication, so the pump(s) must never be run dry. Always fill the tank before attempting to operate the pump(s). Seal failures usually follow a period of dry operation of the pump.

8-5 Makeup Valve

Periodically inspect the water makeup valve assembly for proper operation. If the valve no longer shuts off completely or reliably, replace it. The plastic ball float should be buoyant for proper operation.

8-6 Recommended Pump Tank Spare Parts

Part no.	Part description	Quantity
A0550190	Pressure gauge	1 per pump
A0102396	Float valve, 1” (approx. 25 mm)	1 per tank
A0069538	Plastic ball float, 6” (approx. 152 mm)	1 per tank
A0102394	Float rod, 10” (25 cm)	1 per tank
- Call AEC Parts -	Pump seal and casing gasket	1 per pump

Check your Customer Information Packet for a complete list of spare parts and part numbers for your Pinnacle chilling station.

8-7 Preventive Maintenance Service

A systematic preventive maintenance program helps avoid costly down time. Call the AEC/ Application Engineering Service Department at AEC, Inc. to arrange a schedule of inspections. This service, described in AEC, Inc. Bulletin No. 10-106.3, is tailored to fit your maintenance requirements.

Inspections include:

- ☑ Check refrigerant suction and discharge pressures.
- ☑ Check safety and operating controls.
- ☑ Check voltage and amperage of all motors.
- ☑ Check all electrical connections.
- ☑ Check quantity of refrigerant.
- ☑ Check compressor oil level.
- ☑ Check lubrication of motor and pump bearings.
- ☑ Check circulating pump operation.
- ☑ Check flow through heat exchangers.
- ☑ Check compressor efficiency.
- ☑ Check noise levels.
- ☑ Check cleanliness of equipment area.

- Notes -

9 Troubleshooting

Problem	Possible Cause	Solution
Unit does not run.	No power.	Check main disconnect, fuses, wiring, and power lead to unit.
	Wrong voltage supplied to unit.	Voltage must be within plus or minus ten percent (±10%) of nameplate rating.
	Defective On/Off switch.	Replace switch.
	Control circuit fuse blown.	Replace fuse, check transformer, check wiring for loose wires, check for shorted coils on contactors and solenoids, check crankcase heater.
	Defective control transformer.	Replace.
	Flow switch circuit is open.	Check pump for proper rotation.
	Pump motor off on overload.	Reset and test motor.
	Unit is off on flow switch or pressure switch.	Check that the chiller pump is running.
		Check that all valves are open.
		Check for defective flow switch or pressure switch.
Pump runs, compressor does not.	Freeze control set higher than temperature of liquid in system.	Lower freeze control setting to 10°F (6ºC) below the leaving temperature you want.
	High pressure refrigerant cutout switch contacts open.	*Air cooled units:* Check and clean air filters. Check condenser fans for proper rotation. Check for dirty condenser. Check for condenser air obstruction. Check for tripped motor overload, blown fuses, or bad condenser fan motor.
		Water cooled units: Check for water valves turned on. Check for dirty condenser. Check water flow through condenser.

Problem	Possible Cause	Solution
Pump runs, compressor does not (cont'd).	Compressor internal overload open.	Allow time to cool and reset. Check for high/low voltage. Voltage must be within plus or minus ten percent (±10%) of nameplate rating.
		Check for poor compressor electrical connections.
		Check compressor rotation on scroll compressors.
	Compressor contactor holding coil open.	Repair or replace.
	Defective fan motor.	Repair or replace.
	Fan motor out on overload.	Reset and test.
	Defective freezestat.	Replace.
	Refrigerant low.	Check the refrigerant charge.
	Defective fan cycling control.	Replace.
	Low refrigerant pressure switch contact open.	Sight glass should be clear while comperssor runs. Call for service if bubbling or foaming.
	Defective pump motor interlock to compressor control circuit.	Repair or replace.
	Broken wire in the compressor control circuit.	Locate and repair.
Pump runs, compressor cycles at short intervals.	Freezestat control setting is too high.	Lower set point to 10°F (6ºC) below the leaving water temperature you want with at least 15 degrees differential.
	Refrigerant is too low.	Check refrigeration charge; check refrigerant sight glass for bubbles or a level in the glass.
Leaving water temperature is not at set point.	Improper water/glycol mixture.	Be sure the antifreeze mixture protection is right for the process.
	Defective freezestat control.	Replace.
	Refrigerant charge is low.	Call service to find and repair the leak. Add refrigerant.
Pump pressure is too high.	Restricted water flow.	Check for partially closed valves etc. Be sure all lines are properly sized.

Problem	Possible Cause	Solution
Pump pressure is too low.	Pump is running in reverse.	Verify proper rotation; if incorrect, see Changing Rotation Direction on Page 20 for more information.
	Check for foreign matter.	Clean the system. You may also have to pull the pump and inspect the impeller. Check for foam in the water circuit; add anti-foam if needed.
Process water pressure low, pressure at pump high.	Evaporator frozen.	Isolate evaporator, thaw out, check for leaks. Check coolant solution. Coolant solution should be good for at least 10ºF (6ºC) below leaving water temperature.
Unit runs continuously, but not enough cooling power.	Restricted condenser air flow.	Clean air filters, clean condenser, check water flow.
	Refrigerant not feeding.	Check superheat on expansion valve.
	Improper water/glycol solution.	Make sure that coolant mixture protection is right for the process.
	Poor heat transfer in evaporator.	Backflush and clean evaporator.
	Unit low on refrigerant.	Call service.
	Low waer flow through evaporator.	Increase flow to design flow of 2.4 gpm/ton. See Figure 12 on Page
	Inefficient compressor.	Call service.
	Unit under-sized for application.	Call sales representative.

Figure 23
Recommended Spare Parts List

Part number	Description
A0006023	Sight glass, SA-17S, ⅞”
A0006027	Filter, dry, core, RC-4864
A0006099	Valve, angle, Henry, #7761-B
A0015430	Valve, gate, BR, 1”
A0015434	Valve, gate, BR, 1½”

Figure 23
Recommended Spare Parts List Cont'd.

Part number	Description
A0015555	Gasket, Clarbestos, 2.5"
A0015556	Gasket, Clarbestos, 3"
A0015557	Gasket, Clarbestos, 4"
A0015652	Valve, check, 3", Val-Mati7c, #1403
A0015657	Valve, butterfly, 2"
A0015658	Valve, butterfly, 2½"
A0066090	Switch, flow, MM #FS4-3
A0069538	Ball, plastic, float, 6", PF-6
A0102394	Rod, float, ¼"–20 x 10"
A0102396	Valve, float, 1", R-400
A0102485	Valve, WR, Penn #V46AT-2, 2.50", 2W
A0103830	Valve, ball, BR, ¾"
A0500222	Filter, dry, MTG, bracket, A-685
A0556048	Filter, dry, C-487-G, ⅞"
A0556468	Strainer, Y, CI, 3.00", FPT, 20M
A0530723	Control, AB #100-A09ND3
A0530725	Control, AB #100-A30ND3
A0533819	Valve, refrigeration, ball, ⅞"
A0500548	Valve, RFG, solenoid, ⅞", E25S2
A0501642	Valve, RFG, relief, 350#, ⅜" MPT x 3/8" flare
A0104093	Valve, RFG, relief, 400#, ⅜" MPT x 3/8" flare
A0530372	Thermocouple, K, UNG, 4" P, 304SS, 15' L
A0534258	Fuse holder, 600 V, CL #CC, 2P, 30 amp
A0550162	Fuse holder, 600 V, CL #J, 1P, 30 amp, DIN
A0550163	Fuse holder, 600 V, CL #J, 1P, **60 amp**, DIN
A0534843	Fuse, 600 V, CL #J, DETD, 12 amp
A0536825	Fuse, 600 V, CL #J, DETD, 40 amp
A0537164	Transformer, 500 VA, 208/230/460-120
A0537197	Cond., water, STD-REF, HSE-30
A0544058	Switch, PB, 22 mm, flush head, black
A0544063	Switch, PB, 22 mm, mush head, red
A0544068	Switch, 22 mm, contact, INO
A0544069	Switch, 22 mm, contact, INC
A0544073	Light, 22 mm, lens, optic, green
A0544074	Light, 22 mm, lens, optic, red
A0544076	Light, 22 mm, unit, 120 V, LED, green
A0544077	Light, 22 mm, unit, 120 V, LED, red
A0546247	Relay, Type-F, AB #700-F400A1
A0546248	Relay, deck, adder, AB #195-FA04
A0546280	Power supply, 24 VDC, 0.6 amp, 15 W, S82KO

Figure 23
Recommended Spare Parts List Cont'd.

Part number	Description
A0550077	Controller, pressure, TI #20PS008MA030E015D
A0550078	Controller, pressure, TI #20PS008**MA060G035D**
A0550080	Controller, pressure, TI #29PSL012-162
A0556046	Controller, temperature, RANCO #111000-000, DIG
A0550140	Clamp, hose, T-bolt, 2.8750" – 3.1250"
A0550145	Clamp, hose, T-bolt, 2.500" – 2.6875"
A0556019	Furnace Overload1 460V CSHA150
A0556037	PLC, Omron, ANLPWR, CQM1-IPS01
A0556038	PLC, Omron, 4PTAI, CQM1-AD041
A0556039	PLC, Omron, 8DI-24DC, CQM1-ID211
A0556041	Display, Omron, NT30C-ST141B-E
A0556483	Transducer, pressure, 0-100 psig, P99V1C
A0556485	Transmitter, flow, sensor, Data Ind, 220B
A0556486	Transmitter, flow, Data Ind Model 310

Service Notes

Parts Department

Call toll-free 7am–6pm CST [800] 423-3183 or call [847] 273-7700

The AEC/Application Engineering Parts Department at AEC, Inc. is ready to provide the parts to keep your systems up and running. Application Engineering replacement parts ensure operation at design specifications. Please have the model and serial number of your equipment when you call. Consult the Customer Parts List included in your information packet for replacement part numbers.

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Call toll-free 8am–5pm CST [800] 233-4819 or call [847] 273-7700

Emergencies after 5pm CST, call [847] 439-5655

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Warranty

AEC, Inc. warrants all equipment manufactured by it to be free from defects in workmanship and material when used under recommended conditions. The Company's obligation is limited to repair or replace FOB the factory any parts that are returned prepaid within one year of equipment shipment to the original purchaser, and which, in the Company's opinion, are defective. Any replacement part assumes the unused portion of this warranty.

This parts warranty does not cover any labor charges for replacement of parts, adjustment repairs, or any other work. This warranty does not apply to any equipment which, in the Company's opinion, has been subjected to misuse, negligence, or operation in excess of recommended limits, including freezing or which has been repaired or altered without the Company's express authorization. If the serial number has been defaced or removed from the component, the warranty on that component is void. Defective parts become the property of the warrantor and are to be returned.

The Company is not liable for any incidental, consequential, or special damages or expenses. The Company's obligation for parts not furnished as components of its manufactured equipment is limited to the warranty of the manufacturers of said parts.

Any sales, use, excise, or other tax incident to the replacement of parts under this warranty is the responsibility of the purchaser.

The company neither assumes nor authorizes any other persons to assume for it any liability in connection with the sale of its equipment not expressed in this warranty.

Many types of AEC, Inc. equipment carry an additional one-year service policy. Consult your AEC sales representative for specific details.

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