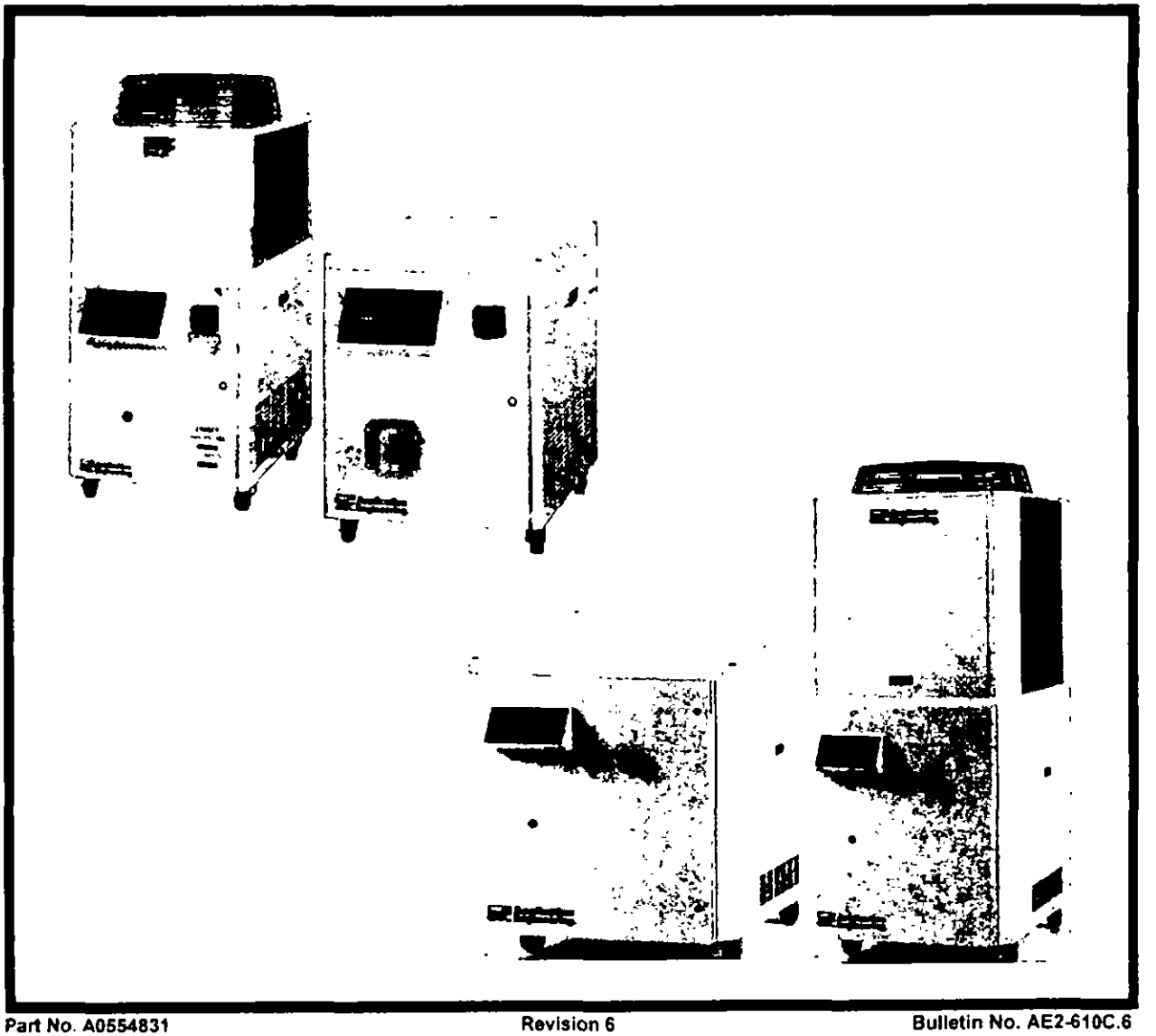
$30.00

Application Engineering®

Operation and Installation Manual

PS Series 2 to 40 hp Portable Chillers

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



Part No. A0554831 Revision 6 Bulletin No. AE2-610C.6

Write down your portable chiller serial numbers here for future reference

_____	_____
_____	_____
_____	_____
_____	_____

Performance figures stated in this manual are based on a standard atmosphere of 59°F (15°C) at 29.92" Hg (1,014 millibars) at sea level, using 60 Hz power. Altitude is an important consideration when specifying chillers. 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.

Part No. A0554831 Bulletin No. AE2-610C.6 Effective 10/18/01
DCN No. _____

Please note that our address and phone information has changed. Please reference this page for updated contact information.

⚠CAUTION These manuals are obsolete and are provided only for their technical information, data and capacities. Portions of these manuals detailing procedures or precautions in the operation, inspection, maintenance and repair of the products may be inadequate, inaccurate, and/or incomplete and shouldn't be relied upon. Please contact the ACS Group for more current information about these manuals and their warnings and precautions.

Parts and Service Department

The ACS Customer Service Group will provide your company with genuine OEM quality parts manufactured to engineering design specifications, which will maximize your equipment's performance and efficiency. To assist in expediting your phone or fax order, please have the model and serial number of your unit when you contact us. A customer replacement parts list is included in this manual for your convenience. ACS welcomes inquiries on all your parts needs and is dedicated to providing excellent customer service.

For immediate assistance, please contact:

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  North America, emergencies after 5pm CST (847) 439-5855
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Safety Considerations

AEC/Application Engineering PS Series portable chillers are designed to provide safe and reliable operation when installed and operated within design specifications, following national and local safety codes.

To avoid possible personal 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.
- ☑ When welding or brazing in or around this equipment, make sure **VENTILATION** is **ADEQUATE. PROTECT** adjacent materials from flame or sparks by shielding with sheet metal. An approved **FIRE EXTINGUISHER** should be close at hand and ready for use if needed.
- ☑ The refrigeration system can develop refrigerant pressures in excess of 500 psi (3,447.5 kPa/ 34.47 bars). **DO NOT CUT INTO THE REFRIGERATION SYSTEM. This must be performed by a qualified service technician only.**
- ☑ 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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Charts and Figures

Charts and Figures Cont'd.

1 General Information

1-1 Introduction

AEC, Inc./Application Engineering PS Series portable water chillers are reliable, accurate, and easy to use process cooling units. They are available in air-, water-, and remote air-cooled designs in a range of sizes from 2 to 40 tons. All are self-contained, fully portable, and shipped ready-to-use (remote air-cooled chillers require field installation by qualified technicians).

Standard range of operation is 30°F to 65°F (-1°C to 18°C) for applications using a water/glycol mix and 45°F to 65°F (7°C to 18°C) for water only applications.

A factory installed crankcase pressure regulating valve option is available for processes requiring a leaving water temperature of up to 75°F (24°C).

A properly installed, operated, and maintained PS Series portable chiller provides 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

The following documents are necessary for the operation, installation, and maintenance of an AEC, Inc./Application Engineering PS Series portable chiller. Additional copies are available from AEC, Inc. **Make sure that the appropriate personnel are familiar with these documents**:

- This manual.
- The electrical schematic and connection diagram mounted inside the control enclosure. Typical schematics for general reference are provided in Figures 7 through 15 on Pages 35 through 43.
- The 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

This manual provides operation, installation, and maintenance instructions for AEC, Inc./Application Engineering, PS Series Portable Chillers.

You'll find model numbers on the serial tag. You should know the model number, serial number, and operating voltage of your chiller if you need to contact AEC, Inc./Application Engineering.

PS Series chiller models are designated by approximate compressor horsepower (2, 3½, 5, 7½, 10, etc.) and the cooling method used—air-cooled are PSA, water-cooled are PSW, and remote air-cooled units are PSR. All sizes are available with any cooling method.

1-4 Standard Features

Mechanical Features

Compressor

Hermetic scroll compressors are used on 2 hp through 30 hp (1.49 through 23.37 kW) models. Semi-hermetic discus compressors are used on the 35 hp and 40 hp (26.10 & 29.83 kW) models.

Evaporator

Stainless steel copper brazed plate evaporators are used on 2 hp through 30 hp (1.49 through 23.37 kW) models. Shell and tube evaporators are used on the 35 hp and 40 hp (26.10 & 29.83 kW) models.

Air-Cooled Condenser (PSA)

Aluminum fin/copper tube with washable filters, *package unit only.*

Water-Cooled Condenser (PSW)

Two (2) hp to 7.5 hp (1.49 kW to 5.95 kW), tube-in-tube; 10 to 40 hp (7.49 & 29.83 kW), cleanable shell and tube; all come with cooling water regulating valves for cooling tower water or city water.

Remote Air-Cooled Condenser (PSR)

Five (5) hp to 40 hp (3.73 to 29.83 kW) only; aluminum fin/copper tube with low ambient control down to -20°F (-29°C) via pressure-actuated fan staging and a variable-speed primary fan.

Reservoir

A six- (6) gallon polyethylene tank is used on the 2 hp and 3½ hp (1.49 kW and 2.61 kW) models, 20-gallon (76-liter) polyethylene tank is used on the 5 hp and 7.5 hp (3.73 and 5.59 kW) models, 40-gallon (151-liter) polyethylene tank is used on the 10 hp and 15 hp (7.46 and 11.19 kW) models, 80-gallon (303-liter) polyethylene tank on the 20 hp to 30 hp (14.91 and 22.37 kW) models, and 80-gallon (303-liter) stainless steel tank on the 35 hp and 40 hp (26.10 and 29.83 kW) models.

Piping

Non-ferrous piping for models 2 hp through 30 hp (1.49 through 23.37 kW). Ferrous piping for models 35 hp and 40 hp (26.10 & 29.83 kW).

Pump

Non-overloading ODP motors, horizontally mounted stamped stainless steel or cast bronze construction.

Other Mechanical Features

- External fill/drain sight glass
- Low process water pressure switch on 2 hp and 3½ hp (1.49 kW to 2.61 kW) models
- Low process water flow switch on 5 hp to 40 hp (3.73 kW to 29.83 kW) models
- Galvanized steel mounting rails for PSR models
- NEMA-rated ODP fan motor(s) (PSA air-cooled chillers)
- Galvanized structural steel frame, painted cabinetry, with 2½" (6.4 cm) swivel casters on 2 hp and 3½ hp (1.49 kW to 2.61 kW) models, 4" (10 cm) swivel casters on 5 hp to 15 hp (3.73 kW to 11.19 kW) models, and 5" (12.7 cm) swivel casters with brake on 20 hp to 40 hp (14.91 kW to 29.83 kW) models
- Valved Process water connections

- Pressure-actuated Process water bypass valve for system protection only; on single pump models **only**
- To Process 2½" (63 mm) dual scale liquid-filled water pressure gauge
- Fully insulated refrigeration and Process water piping
- Isolated fan section on PSA models allows chiller to run during maintenance
- 20 mesh Y strainer on Process water piping into the evaporator
- Easy access to the mechanical cabinet and fan section with fastener-less panels

Electrical Features

- Fully accessible NEMA 12-style electrical control enclosure on 2 hp to 40 hp (1.49 kW to 29.83 kW) models
- Single-point power and ground connection
- Non-fused disconnect switch, lockable
- Branch circuit fusing
- 208-230/3/60 and 460/3/60 volt
- 208-230/1/60 volt on 2 and 3½ hp models
- Consult factory for other voltages

Refrigeration Features

- R-22 refrigerant
- Hot gas bypass capacity control
- High discharge temperature cut-out 2 hp to 30 hp (1.49 kW to 22.37 kW) models
- High and low refrigerant pressure cut-out switches
- Fan cycling switch (PSA5 to 30 models only)
- High pressure spring actuated relief valve
- Multiple refrigeration access ports
- Compressor service valves

- Hot gas bypass and liquid line shut-off ball valves on 5 hp to 40 hp (3.73 kW to 29.83 kW) models
- Filter-dryer
- Sight glass
- Balanced port thermal expansion valve

Controller Features

- Off-the-shelf microprocessor-based PID auto-tuning controller with To Process and Set Point LED readout
- Microprocessor temperature switch with LCD display for process water freeze protection compressor cut-out, and high Process water temperature pump cut-out
- Electronic time delay for proof of water flow or pressure (models with pump only).
- Off-delay water flow timer to prevent short cycling (models with pump only).
- Low refrigerant pressure switch, override timer for low ambient start-up on PSA chillers with the variable-speed fan option, and on PSR chillers (adjustable)
- Graphic control panel with indicating and warning status lights

Other Features

- One (1) year labor warranty
- One (1) year warranty on compressor
- Two (2) year warranty on parts
- Three (3) year limited warranty on controller

1-5 Available Options

PS Series portable chillers are available with options that tailor the unit to your requirements. Some must be factory installed and some can be retrofitted in the field. Consult your sales representative for more information.

Automatic Water Make-up

Also Available as Field Retrofit Kit

The Automatic Water Make-up option ***(not available on chillers less reservoir tank)*** includes a pressure regulating valve set at 3 to 5 psi (20.7 to 34.5 kPa), an electric water solenoid valve, a float switch mounted in the reservoir tank, and the necessary internal piping to connect a PS chiller to a make-up water source. See figures 30 to 32 on pages 64 to 66 for piping diagrams.

Caution: Customer piping must provide backflow protection and venting of tank to atmosphere to prevent over-pressurization of the reservoir tank (See Figure 29 on page 60).

Process Water Sidestream Filter

Also Available as Field Retrofit Kit

The Process Water Side Stream Filter option ***(not available on chillers less pump and reservoir tank)*** includes a 50 micron filter, flow meter, ball valve for throttling water flow, and the necessary piping to provide constant filtering of the Process water at about one gallon per minute (1 gpm/3.8 lpm.).

General Fault Indicator Audible Alarm

Also Available as Field Retrofit Kit

The General Fault Indicator Audible Alarm option includes an 85 dB @ 2 ft. (61 cm) audible alarm buzzer and silence button with provisions for customer wiring indication interlock. The alarm signals anytime that a fault is recognized during the operation of the chiller.

General Fault Indicator Audible/Visual Alarm

Also Available as Field Retrofit Kit

The General Fault Indicator Audible/Visual Alarm option includes a 100 dB @ 10 ft. (3 m) audible alarm horn/108,000 peak candlepower 80-flash/min. visual alarm strobe and silence button with provisions for customer wiring indication interlock. The alarm signals anytime that a fault is recognized during the operation of the chiller.

Compressor Hour Meter

Also Available as Field Retrofit Kit

The Compressor Hour Meter option includes a DIN-mount hour meter that keeps track of the total time that the compressor runs when your PS chiller is operating. AEC, Inc./Application Engineering offers these same parts as a kit for field installation.

Communications Options

External communications options for your PS Series chiller include RS-232C and RS-485 communications standards.

Recirculation Pump

The Recirculation Pump option is necessary whenever Process water flow is less than 2.2 gpm per ton (8.3 lpm per 3.517 kW) or greater than 4.8 gpm per ton (18.2 lpm per 3.517 kW).

High Pressure Fan(s)

The High-Pressure Fan(s) option provides for an additional 0.30" WC (75 pa) of static pressure on fan discharge. High-pressure fans are necessary and must be included in chiller installations where exiting air exhausts through ductwork.

The fans are available on 5 to 15 hp (3.73 through 11.19 kW) PSA Series air-cooled chillers. They can be retrofitted without sheet metal modification, but will require changing out fan blades, and in some cases fan motors and electrical components.

Models 20 hp to 30 hp (14.91 through 22.37 kW) come standard with squirrel cage blowers which can be ducted.

Variable Speed Fan

The Variable speed fan option reduces the speed of the fan based upon entering air temperature and system load allowing the chiller to operate in ambient temperatures below 60°F (15.5°C).

This option will also reduce fan noise in ambients below 95°F (35°C).

The variable speed fan option is only available on 5 to 15 hp (3.73 to 11.19 kW) PSA Series air-cooled chillers.

Crankcase Pressure Regulating (CPR) Valve

A crankcase pressure regulating (CPR) valve is necessary and must be included on chillers operating at leaving water temperatures from 66°F to 75°F (19°C to 24°C). This valve prevents compressor motor overloading.

Stainless Steel Reservoir

The stainless steel reservoir tank option is manufactured from 304 stainless steel and is available on the 5 hp to 30 hp models **only**. Models 35 hp and 40 hp come standard with a stainless steel reservoir.

Mounting Features

- Non-locking swivel casters, standard on PSA and PSW models; 2½" (6.4 cm) on 2 hp and 3½ hp (1.49 kW to 2.61 kW) models, 4" (10 cm) on 5 hp to 15 hp (3.73 kW to 11.19 kW) models, and 5" (12.7 cm) swivel casters with brake on 20 hp to 40 hp (14.91 kW to 29.83 kW) models
- Locking 5" (127 mm) swivel casters with brake; optional on PSA and PSW 5 hp to 15 hp models **only**
- Mounting rails; standard on PSR, optional on PSA and PSW models
- Mounting rails with feet; optional on PSA, PSW, and PSR models

Optional Operating Voltages

- 380/3/50 volt; available on 5 hp to 40 hp models **only**.
- Consult factory for other voltages.

Note: **50 Hz operations;** be sure to derate 60 Hz cooling capacity in the specification tables by 17% for 50 Hz cooling capacity. Refer to 50 Hz pump curves for pressure (psi/kPa) and flow (gpm/lpm). **Nominal 60 Hz chiller water flow rate must be maintained.**

UL Labeled Electrical Subpanel

The UL Labeled Electrical Subpanel option provides for the subpanel to be listed with Underwriters Laboratory, with UL-related benefits and features.

Optional Pumps

Pump options are available for greater pressure and flow rates. A recirculation pump is required whenever Process water flow is less than 2.2 gpm per ton (8.3 lpm per 3.517 kW) or greater than 4.8 gpm per ton (18.2 lpm per 3.517 kW).

NEMA 12 Electrical Enclosure

5 hp to 40 hp Models Only

The NEMA 12 electrical enclosure option provides for NEMA 12-level electrical enclosure protection. It includes an accessible protective window kit over the graphic control panel.

NEMA 12 Control Access Door

The NEMA 12 control access door option includes an accessible protective window kit over the graphic control panel.

Figure 1
Optional Pump Amperages

Optional pump full load amps (FLA) at 208-230/1/60									
hp	amps	hp	amps	hp	amps	hp	amps	hp	amps
0.75 hp bronze turbine	5.4 amps	1 hp ss	6.4 amps	1.5 hp ss	7.5 amps	2 hp ss	9.6 amps	3 hp ss	12.7 amps

Optional pump full load amps (FLA) at 460/3/60									
hp	amps	hp	amps	hp	amps	hp	amps	hp	amps
0 75 hp bronze turbine	1.5 amps	1 hp ss	1 8 amps	1.5 hp ss	2.3 amps	2 hp ss	3.1 amps	3 hp ss	4.2 amps
5 hp ss	6.2 amps	7.5 hp ss	9 8 amps	10 hp ss	13.2 amps	15 hp ss	19 0 amps	2 hp dual ss	2 7 amps
3 hp dual ss	4 5 amps	5 hp dual ss	6.6 amps	7½ hp bronze	9.0 amps				

Figure 2
PSA Series 2 hp and 3½ hp Air-Cooled Portable Chillers

Nominal operating parameters for PSA Series air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① in tons		Water flow	Com-pressor	Nominal pump	Discharge air		Power in amps ③, 460/3/60 ④	
	no pump	1 pump	gpm ②	hp	hp	openings	cfm ⑤	rated	running
PSA2	1 9	1.7	4.6	2.0	1.0	1 @ 18.5"	1,475	8.0	6 9
PSA3.5	3 3	3 1	7.9	3.5	1.0	1 @ 18.5"	2,350	10.9	8.8

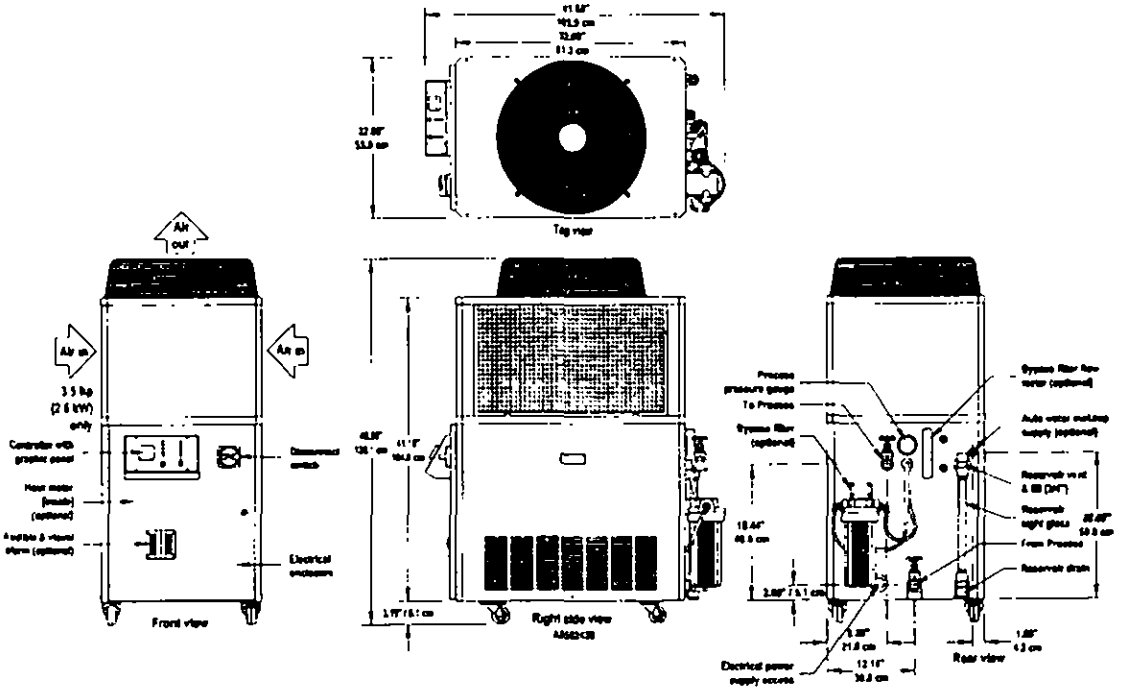
① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp (kW) reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

② Based on 2 4 gpm per ton (9 1 lpm per 3 517 kW), nominal 1 pump

③ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see tables on Page 16), and add it to the chiller rated or running amperage.

④ Multiply 460/3/60 amperage by 2 0 for 208-230/3/60 amperages.

⑤ *To convert cfm to cmh, multiply by 1.699.*



PSA portable chillers come standard with 2½" (*63 mm*) swivel casters.

Model number	Compressor hp	Process connections in. NPT	Dimensions inches ① height	width	depth	Weights Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSA2	2.0	¾" or 1.0"	49 7"	22.0"	41.7"	387	417	437
PSA3.5	3.5	1.0"	49.7"	22.0"	41.7"	410	440	460

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options

② Weight is for standard chiller. Some optional features will increase weight. Multiply lbs. by **0.454** to calculate *Kg*

③ Operating weight is with a full 6-gallon (*22 7 liter*) reservoir tank of water.

Figure 2
PSW Series 2 hp and 3½ hp Water-Cooled Portable Chillers

Nominal operating parameters for PSW Series air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 85°F (29°C) tower water. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① in tons		Nominal water flow	Com-pressor	Nominal pump	Condenser water			Amp draws ⑤	
						Water conn.	flow in gpm		460/3/60 ⑥	
	no pump	1 pump	gpm ②	hp	hp	in. NPT	Tower water ③	City water ④	rated	running
PSW2	2.1	1.9	5.1	2.0	1.0	1.0"	6.2	4.2	12.2	8.3
PSW3.5	3.6	3.4	8.6	3.5	1.0	1.0"	10.5	7.2	16.4	11.8

① Based on 50°F (10°C) chilled water supply temperature and 85°F (29°C) tower water. Optional additional process pump hp (kW) reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

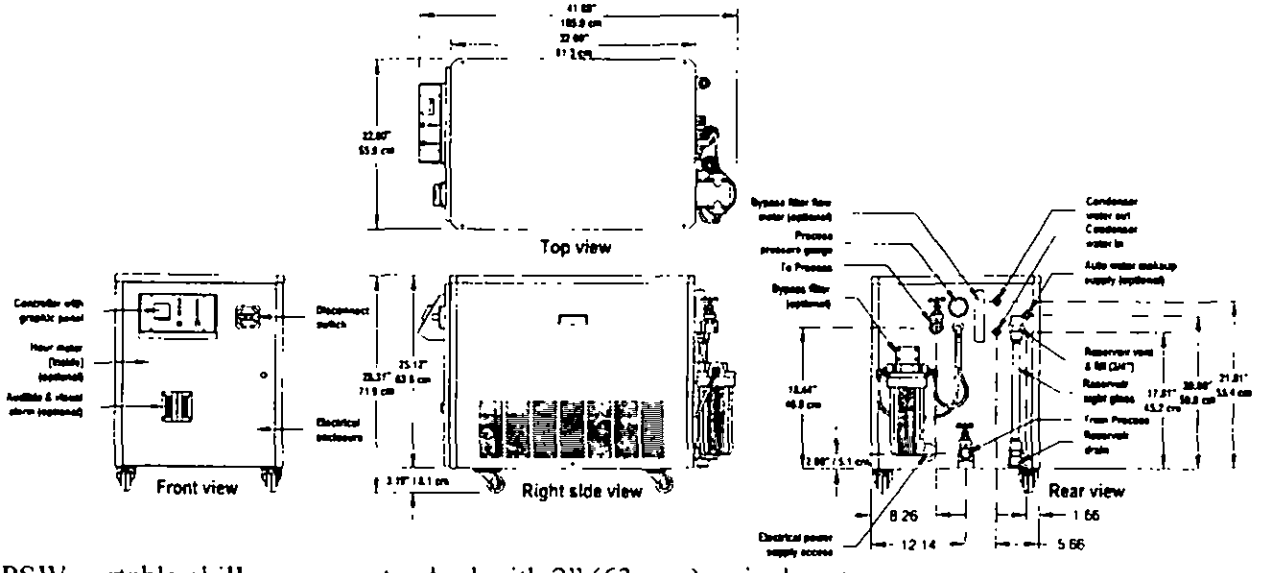
② Based on 2.4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ Based on availability of 85°F (29°C) tower water at 25 psi (172.4 kPa/1.7 bars) minimum.

④ Based on availability of 70°F (21°C) city water at 25 psi (172.4 kPa/1.7 bars) minimum.

⑤ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see tables on Page 16), and add it to the chiller rated or running amperage

⑥ Multiply 460/3/60 amperage by 2.0 for 208-230/3/60 amperages.



PSW portable chillers come standard with 2" (63 mm) swivel casters.

Model number	Compressor hp	Process connections in. NPT	Dimensions in inches ①			Weights		
			height	width	depth	Dry ② lbs.	Shipping ② lbs.	Operating ② ③ lbs.
PSW2	2.0	1.0"	28.3"	22.0"	41.7"	333	363	383
PSW3.5	3.5	1.0"	28.3"	22.0"	41.7"	362	392	412

① To convert to *cm*, multiply by **2.54** Add to height dimension based on mounting options

② Weight is for standard chiller Some optional features will increase weight. Multiply by **0.454** to calculate *Kg*.

③ Operating weight is with a full 6-gallon (*22.7 liter*) reservoir tank of water.

Figure 3
PSA Series 5 to 7.5 hp Air-Cooled Portable Chillers

Nominal operating parameters for PSA Series air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① in tons			Water flow	Com-pressor	Nom. pump	Discharge air ③		Power in amps ④, 460/3/60 ⑤			
									1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	openings	cfm ⑥	rated	running	rated	running
PSA5	4 8	4 6	4 5	11 6	5 0	1 0	1 @ 27"	3,400	14 0	11.0	14 9	11 9
PSA7 5	6 6	6 4	6 3	15 7	7 5	1 0	1 @ 27"	5,100	18.2	14 6	19.1	15 5

① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

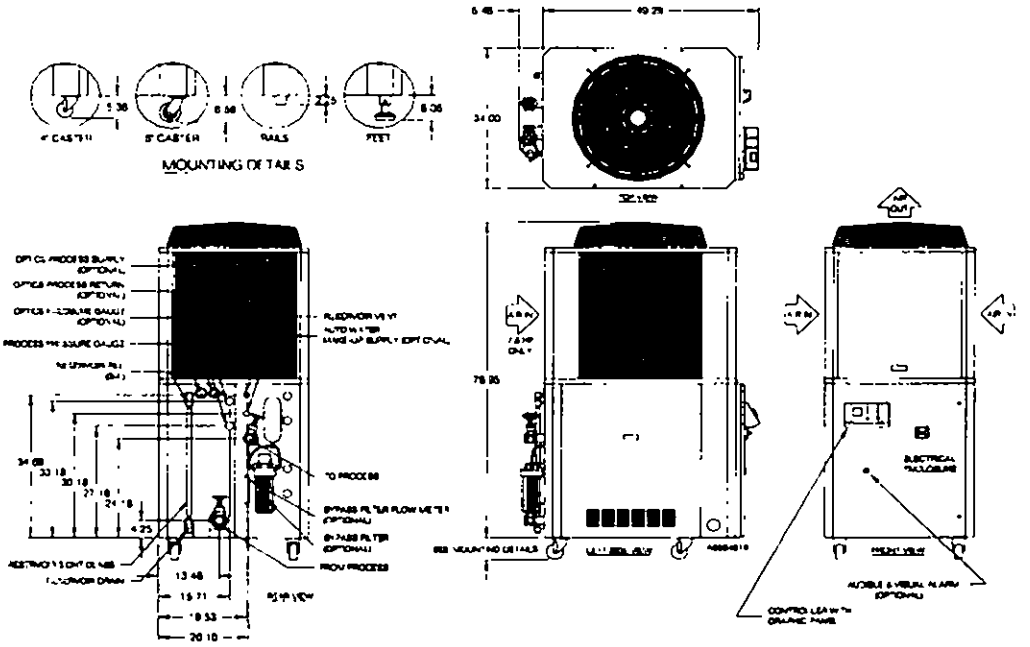
② Based on 2.4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ Customer use of ductwork requires optional high-pressure fan for 5 hp to 15 hp (3.73 kW to 11.20 kW) models.

④ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑤ Multiply 460/3/60 amperage by 2.0 for 208-230/3/60 amperages; multiply by 0.8 for 575/3/60 amperages.

⑥ To convert cfm to cmh, multiply by 1.699.



PSA portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSA5	5 0	1 5	2 0	1 5"	1 5" / 2 0"	82 3"	34 0"	48 5"	872	1,047	1,205
PSA7 5	7 5	1 5	2 0	1 5"	1.5" / 2.0"	82 3"	34 0"	48 5"	922	1,097	1,255

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller. Some optional features will increase weight. Multiply lbs. by **0.454** to calculate *Kg*

③ Operating weight is with a full 20-gallon (76 *liter*) reservoir tank of water.

Figure 3
PSA Series 10 to 15 hp Air-Cooled Portable Chillers

Nominal operating parameters for PSA Series air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Water flow	Com-pressor	Nom. pump	Discharge air ③		Power in amps ④, 460/3/60 ⑤			
									1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	openings	cfm ⑥	rated	running	rated	running
PSA10	9 9	9.5	9 4	23 8	10 0	2 0	2 @ 27"	5,800	26 1	21 8	27.8	23 5
PSA15	14 5	14 1	14 0	34 9	15 0	2 0	2 @ 27"	10,000	33.3	27.5	35 0	29 2

① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

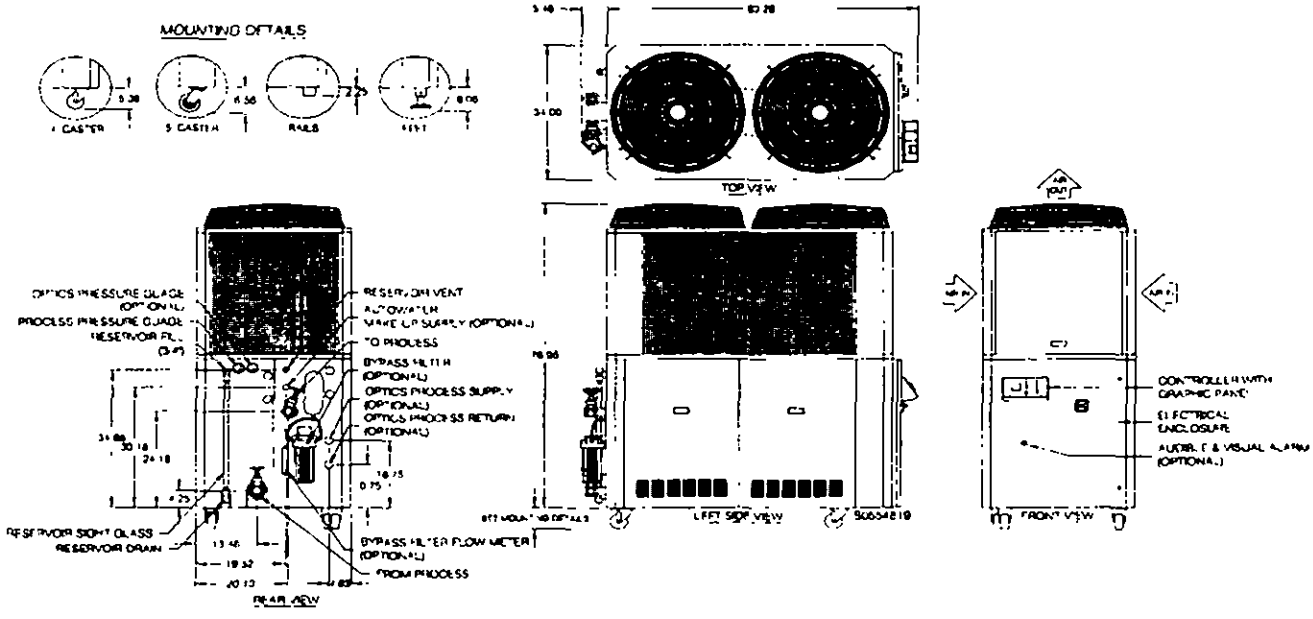
② Based on 2.4 gpm per ton (9.1 lpm per 3 517 kW), nominal 1 pump.

③ Customer use of ductwork requires optional high-pressure fan for 5 hp to 15 hp (3.73 kW to 11.20 kW) models

④ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑤ Multiply 460/3/60 amperage by 2.0 for 208-230/3/60 amperages; multiply by 0.8 for 575/3/60 amperages

⑥ To convert cfm to cmh, multiply by 1.699.



PSA portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSA10	10 0	1 5"	2 0"	1 5"	1.5" / 2 0"	82 3"	34 0"	68 6"	1,305	1,570	1,637
PSA15	15 0	2 0"	2 5"	2 0"	2 0" / 3 0"	82.3"	34 0"	68.6"	1,388	1,653	1,720

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller. Some optional features will increase weight. Multiply lbs by **0.454** to calculate *Kg*.

③ Operating weight is with a full 40-gallon (*151 liter*) reservoir tank of water.

Figure 3
PSA Series 20 to 30 hp Air-Cooled Portable Chillers

Nominal operating parameters for PSA Series air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Water flow	Com-pressor	Nom. pump	Discharge air		Power in amps ③, 460/3/60 ④			
									1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	openings	cfm ⑤	rated	running	rated	running
PSA20	19.4	18.4	18 0	46 5	2 @ 10	5	25" x 18 5"	10,200	48 3	42 0	51.4	45 1
PSA25	23.9	22.8	22.4	57.2	2 @ 13	5	25" x 18 5"	13,300	62.1	48 3	65.2	51 4
PSA30	29.2	28.2	27 8	70 2	2 @ 15	5	25" x 18 5"	18,150	74 1	64 4	77 2	67.5

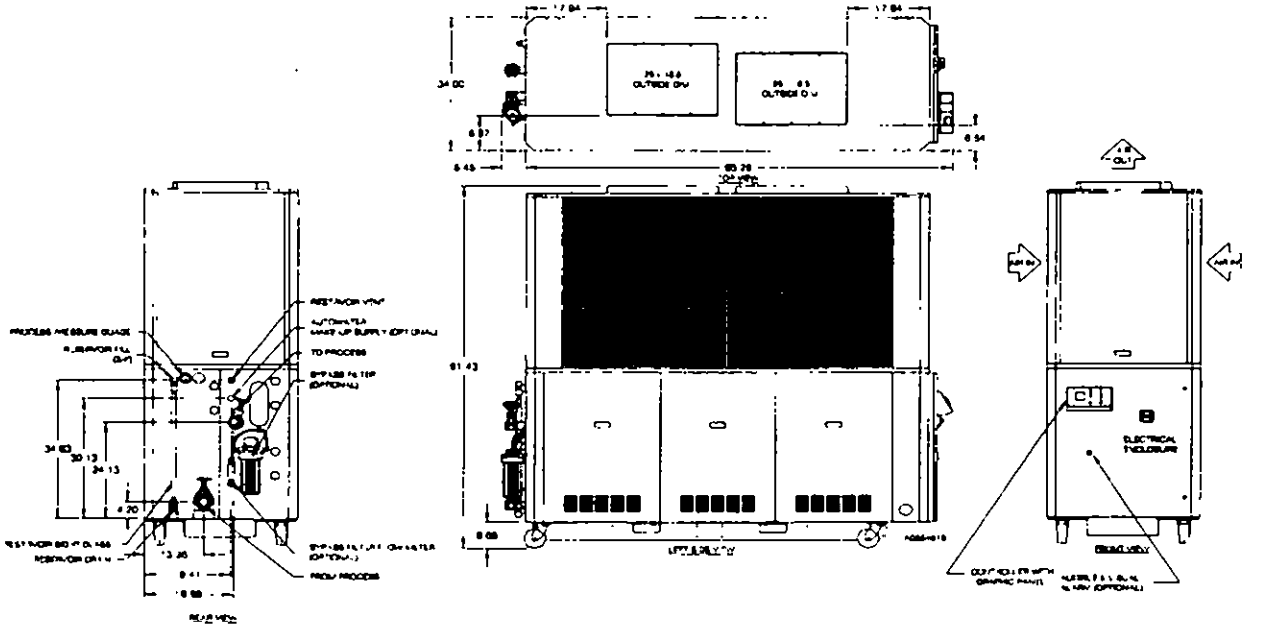
① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap per 0.746 kW pump power).

② Based on 2 4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

④ Multiply 460/3/60 amperage by 2.0 for 208-230/3/60 amperages; multiply by 0.8 for 575/3/60 amperages.

⑤ To convert cfm to cmh, multiply by 1.699.



PSA portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 Pump to/from	2 Pump to/from	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSA20	2 @ 10	2" / 3"	2.5" / 3"	2.0"	2" / 3"	91 4	34 0	100 7	2,305	2,605	2,971
PSA25	2 @ 13	2" / 3"	2.5" / 3"	2 0"	2" / 3"	91 4	34.0	100 7	2,348	2,648	3,014
PSA30	2 @ 15	2" / 3"	2.5" / 3"	2.0"	2" / 3"	91.4	34 0	100.7	2,610	2,910	3,276

① To convert to *cm*, multiply by **2.54** Add to height dimension based on mounting options.

② Weight is for standard chiller. Some optional features will increase weight. Multiply lbs. by **0.454** to calculate *Kg*

③ Operating weight is with a full 80-gallon (*303 liter*) reservoir tank of water.

Figure 4
PSW Series 5 to 7.5 hp Water-Cooled Portable Chillers

Nominal operating parameters for PSW Series water-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 85°F (29°C) tower water. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Nominal water flow	Com-pres-sor	Nom. pump	Condenser water			Power in amps ⑤ 460/3/60 ⑥			
							Water conn.	flow in gpm		1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. NPT	Tower water ③	City water ④	rated	running	rated	running
PSW5	5 2	5 0	4 9	12 6	5.0	1 0	1 0"	15 7	7 9	12 2	8 3	13.1	9 2
PSW7 5	7 1	6.9	6.8	17.0	7 5	1.0	1 0"	21 3	10.7	16 4	11.8	17 3	12 7

① Based on 50°F (10°C) chilled water supply temperature and 85°F (29°C) tower water. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap per 0.746 kW pump power).

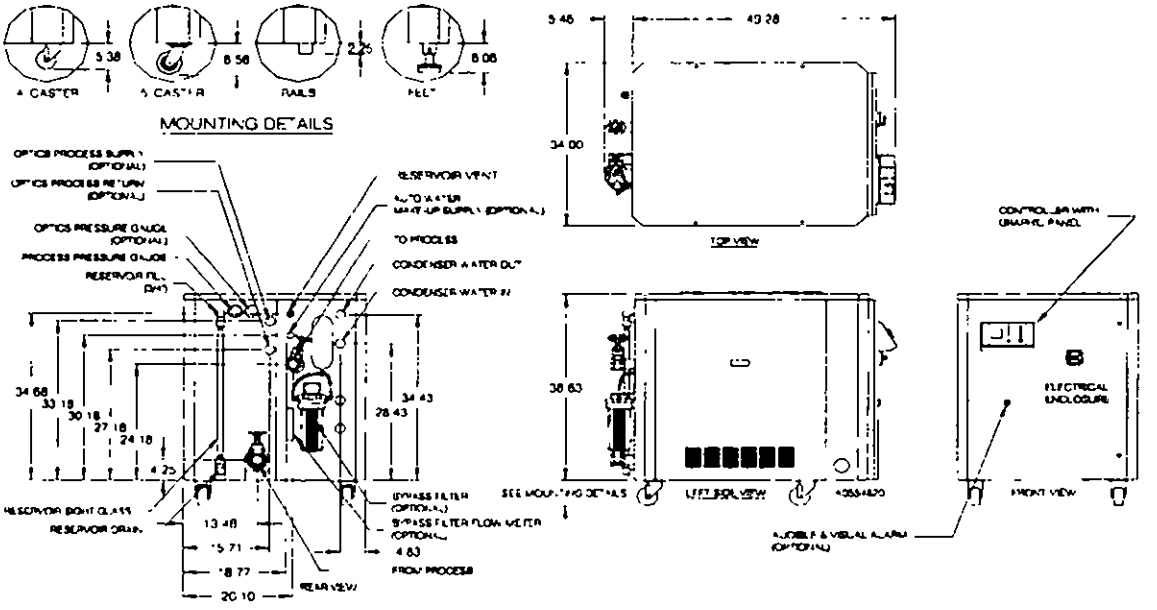
② Based on 2.4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ Based on availability of 85°F (29°C) tower water at 25 psi (172.4 kPa/1.7 bars) minimum.

④ Based on availability of 70°F (21°C) city water at 25 psi (172.4 kPa/1 7 bars) minimum.

⑤ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑥ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages.



PSW portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSW5	5 0	1 5"	2 0"	1.5"	1 5" / 2 0"	44.0"	34 0"	48.5"	637	787	970
PSW7 5	7 5	1 5"	2 0"	1 5"	1 5" / 2.0"	44.0"	34 0"	48.5"	727	877	1,060

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight Multiply by **0.454** to calculate *Kg*.

③ Operating weight is with a full 20-gallon (*76 liter*) reservoir tank of water.

Figure 4
PSW Series 10 to 15 hp Water-Cooled Portable Chillers

Nominal operating parameters for PSW Series water-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 85°F (29°C) tower water. **For 50 Hz applications,** multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Nominal water flow	Compressor	Nom. pump	Condenser water			Power in amps ⑤ 460/3/60 ⑥			
							Water conn.	flow in gpm		1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. NPT	Tower water ③	City water ④	rated	running	rated	running
PSW10	10.7	10.3	10.2	25 7	10 0	2 0	1 5"	32 2	16 1	22 5	16 7	24.2	18 4
PSW15	15.9	15.5	15 3	38 1	15 0	2 0	2 0"	47 6	23 8	29 7	21.6	31.4	23 3

① Based on 50°F (10°C) chilled water supply temperature and 85°F (29°C) tower water Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0 746 kW pump power)

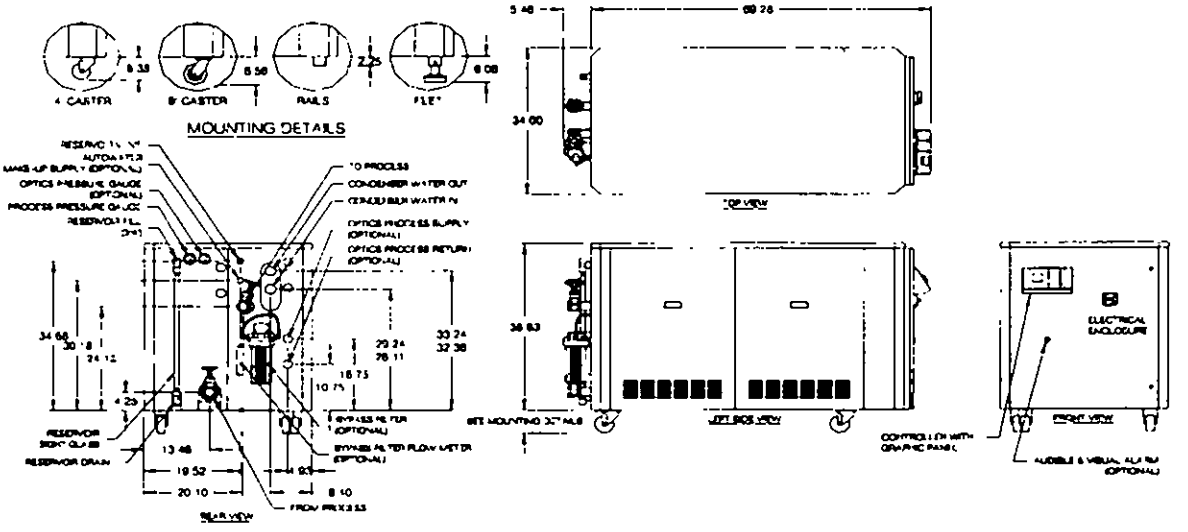
② Based on 2 4 gpm per ton (9 1 lpm per 3 517 kW), nominal 1 pump

③ Based on availability of 85°F (29°C) tower water at 25 psi (172.4 kPa/1.7 bars) minimum.

④ Based on availability of 70°F (21°C) city water at 25 psi (172.4 kPa/1 7 bars) minimum.

⑤ An optional oversized process pump adds to the total rated or running chiller amperage To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑥ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages.



PSW portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Compressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSW10	10.0	1 5"	2.0"	1 5"	1 5" / 2 0"	44 0"	34.0"	68.6"	950	1,175	1,282
PSW15	15 0	2.0"	2 5"	2 0"	2 0" / 3 0"	44 0"	34.0"	68.6"	1,024	1,249	1,365

① To convert to *cm*, multiply by **2.54** Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight Multiply by **0.454** to calculate *Kg*

③ Operating weight is with a full 40-gallon (*151 liter*) reservoir tank of water

Figure 4
PSW Series 20 to 30 hp Water-Cooled Portable Chillers

Nominal operating parameters for PSW Series water-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 85°F (29°C) tower water. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Nominal water flow	Com-pres-sor	Nom. pump	Condenser water			Power in amps ⑤ 460/3/60 ⑥			
							Water conn.	flow in gpm		1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. NPT	Tower water ③	City water ④	rated	running	rated	running
PSW20	21 0	20.0	19 6	50.4	2 @ 10	5.0	2 0"	61.7	31 5	43.9	34.7	47 0	37 8
PSW25	25 7	24 7	24.3	61 7	2 @ 13	5 0	2.0"	75.9	38 6	55 9	38 2	59 0	41 3
PSW30	31.8	30 8	30 4	76.2	2 @ 15	5.0	2.5"	93 9	47.6	60 1	45.3	63 2	48 4

① Based on 50°F (10°C) chilled water supply temperature and 85°F (29°C) tower water. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

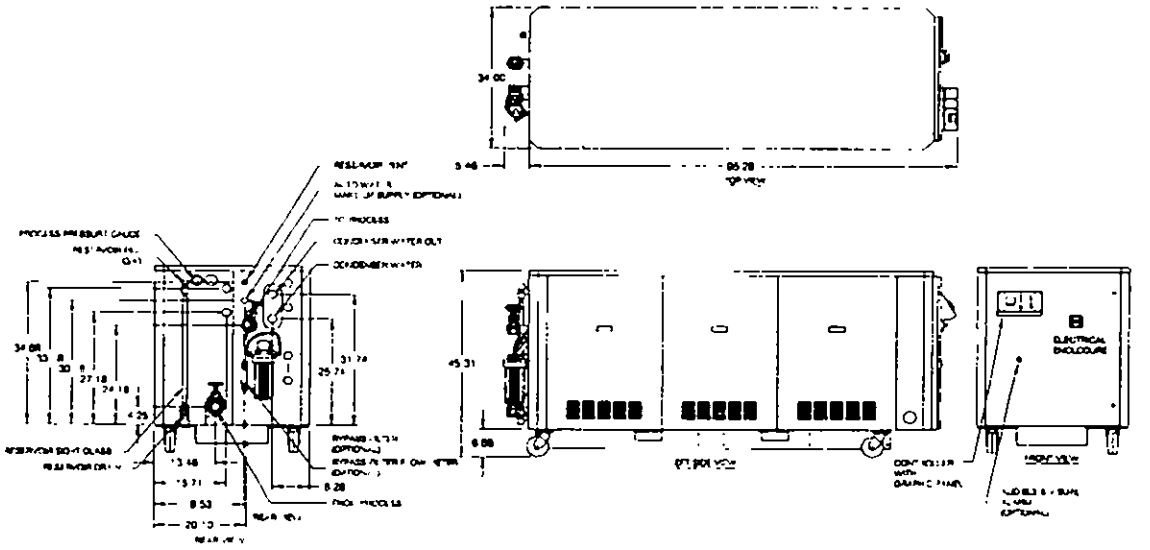
② Based on 2.4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump

③ Based on availability of 85°F (29°C) tower water at 25 psi (172.4 kPa/1.7 bars) minimum

④ Based on availability of 70°F (21°C) city water at 25 psi (172.4 kPa/1.7 bars) minimum.

⑤ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑥ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages.



PSW portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump to/from	2 Pump to/from	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSW20	2 @ 10	2" / 3"	2.5" / 3"	2 0"	2" / 3"	45.3"	34 0"	100 7"	1,495	1,745	2,161
PSW25	2 @ 13	2" / 3"	2 5" / 3"	2 0"	2" / 3"	45 3"	34.0"	100.7"	1,680	1,930	2,346
PSW30	2 @ 15	2" / 3"	2 5" / 3"	2 0"	2" / 3"	45 3"	34 0"	100 7"	1,885	2,135	2,551

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight Multiply by **0.454** to calculate *Kg*

③ Operating weight is with a full 80-gallon (*303 liter*) reservoir tank of water

Figure 4
PSW Series 35 and 40 hp Water-Cooled Portable Chillers

Nominal operating parameters for PSW Series water-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 85°F (29°C) tower water. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

Model number	Nominal cooling capacity ① tons			Nominal water flow	Com-pres-sor	Nom. pump	Condenser water			Power in amps ⑤ 460/3/60 ⑥			
							Water conn.	flow in gpm		1 pump		2 pumps	
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. NPT	Tower water ③	City water ④	rated	running	rated	running
PSW35	34.2	32.7	32 3	82 0	35	7 5	2 5"	102 5	51.3	64 4	55.7	67 5	58.8
PSW40	41 0	39 5	39 1	98 4	40	7.5	2 5"	123 0	61.5	81 9	63.1	85 0	66 2

① Based on 50°F (10°C) chilled water supply temperature and 85°F (29°C) tower water. Optional additional process pump hp reduces chiller capacity by 0 2 tons per hp (0.703 kW ref. cap per 0.746 kW pump power).

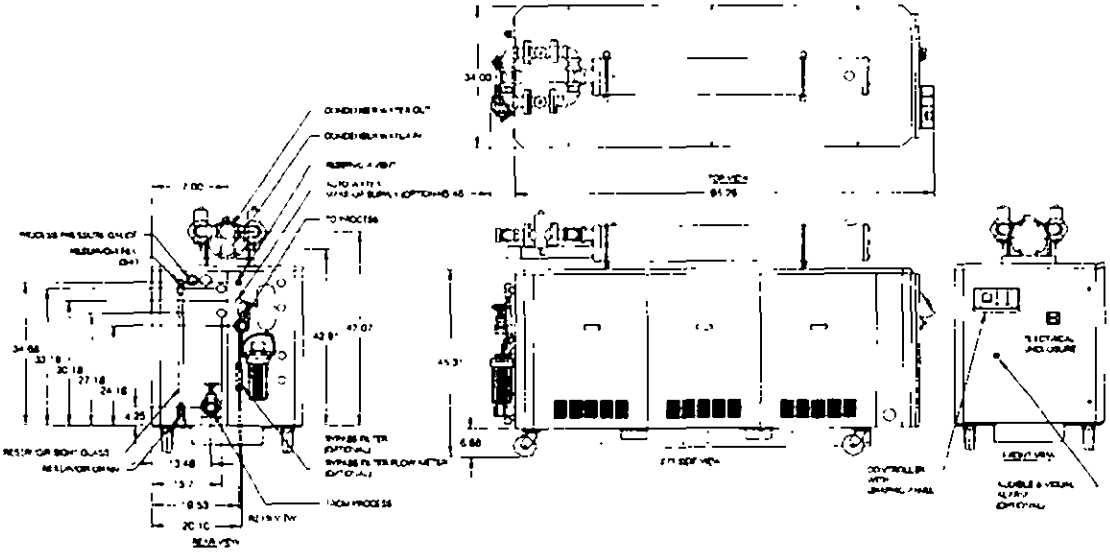
② Based on 2 4 gpm per ton (9 1 lpm per 3 517 kW), nominal 1 pump.

③ Based on availability of 85°F (29°C) tower water at 25 psi (172.4 kPa/1.7 bars) minimum.

④ Based on availability of 70°F (21°C) city water at 25 psi (172 4 kPa/1.7 bars) minimum.

⑤ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

⑥ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages.



PSW portable chillers come standard with 4" (101 mm) swivel casters.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump to/from	2 Pump to/from	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSW35	35	2 5" / 3"	2 5" / 3"	2 5"	2 5" / 3"	59 9"	34 0"	100 7"	2,669	2,919	3,358
PSW40	40	2 5" / 3"	2 5" / 3"	2.5"	2 5" / 3"	59 9"	34 0"	100 7"	2,680	2,930	3,369

① To convert to *cm*, multiply by **2.54** Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight Multiply by **0.454** to calculate *Kg*.

③ Operating weight is with a full 80-gallon (*303 liter*) reservoir tank of water.

Figure 5
PSR Series 5 to 7.5 hp Remote Air-Cooled Portable Chillers

Nominal operating parameters for PSR Series remote air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained*

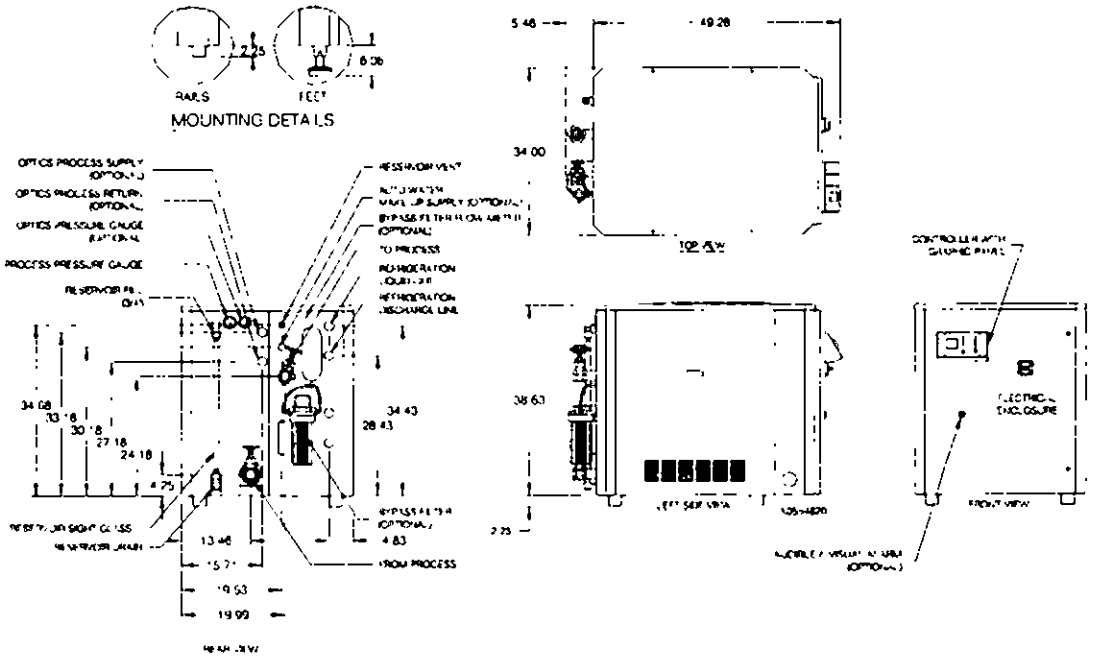
Model number	Nominal cooling capacity ① tons			Nom. water flow	Com-pres-sor	Nom. pump	Refrigeration connections		Power in amps ③ 460/3/60 ④			
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. dia. ODS		1 pump		2 pumps	
							Discharge	Liquid	rated	running	rated	running
PSR5	4 8	4 6	4 5	11 6	5 0	1 0	⅞"	⅝"	12.2	9 2	13 1	10 1
PSR7 5	6 6	6.4	6 3	15 7	7.5	1.0	⅞"	⅝"	16.2	12 8	17 3	13 7

① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref cap per 0.746 kW pump power).

② Based on 2 4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ An optional oversized process pump adds to the total rated or running chiller amperage To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

④ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages; multiply by **0.8** for 575/3/60 amperages.



PSR portable chillers come standard with mounting rails. PSR portable chillers are charged with 25 psi (172.4 kPa/1.72 bars) nitrogen for shipping purposes.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSR5	5 0	1 5"	2 0"	1 5"	1 5" / 2 0"	40 9"	34 0"	48 5"	597	748	930
PSR7 5	7 5	1 5"	2 0"	1 5"	1 5" / 2 0"	40 9"	34 0"	48 5"	644	794	977

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight.

③ Operating weight is with a full 20-gallon (*76 liter*) reservoir tank of water.

Figure 5
PSR Series 10 to 15 hp Remote Air-Cooled Portable Chillers

Nominal operating parameters for PSR Series remote air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

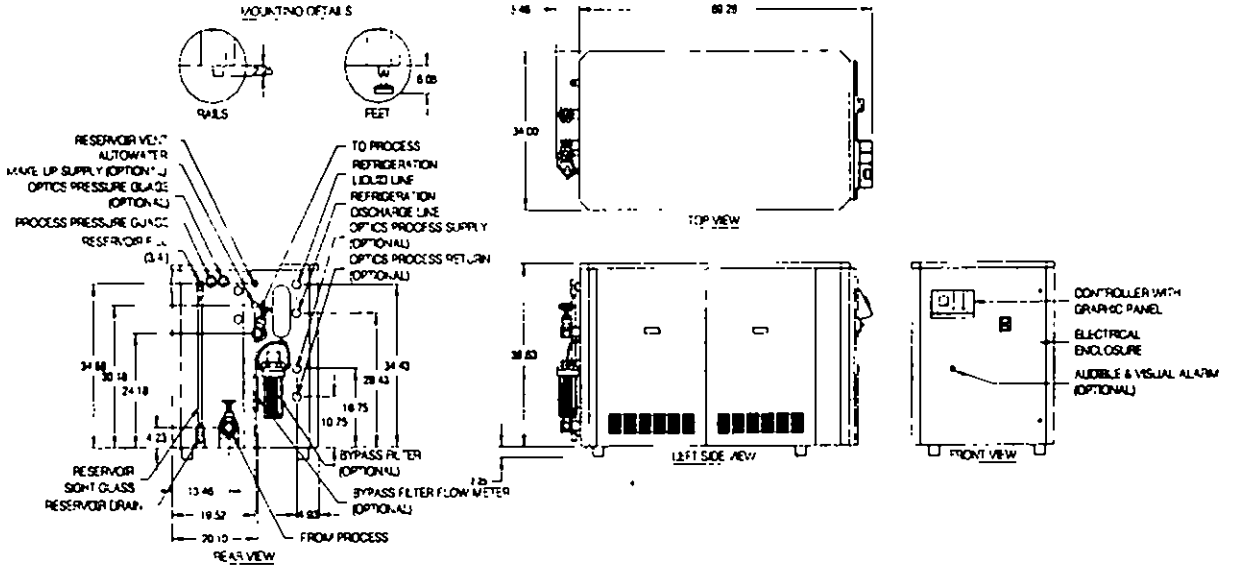
Model number	Nominal cooling capacity ① tons			Nom. water flow	Com-pres-sor	Nom. pump	Refrigeration connections		Power in amps ③ 460/3/60 ④			
	no pump	1 pump	2 pump				in. dia. ODS		1 pump		2 pumps	
				gpm ②	hp	hp	Discharge	Liquid	rated	running	rated	running
PSR10	9 9	9 5	9.4	23 8	10.0	2.0	1⅛"	⅞"	22 5	18 2	24 2	19 9
PSR15	14 5	14.1	14.0	34 9	15 0	2 0	1⅛"	⅞"	29 7	23.9	31 4	25 6

① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0 2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

② Based on 2.4 gpm per ton (9.1 lpm per 3.517 kW), nominal 1 pump.

③ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

④ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages, multiply by **0.8** for 575/3/60 amperages.



PSR portable chillers come standard with mounting rails. PSR portable chillers are charged with 25 psi (172.4 kPa/1.72 bars) nitrogen for shipping purposes.

Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump	2 pumps	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSR10	10 0	1.5"	2 0"	1 5"	1.5" / 2 0"	40 9"	34.0"	68.6"	827	1,052	1,159
PSR15	15 0	2.0"	2 5"	2 0"	2.0" / 3 0"	40 9"	34.0"	68 6"	870	1,095	1,202

① To convert to *cm*, multiply by **2.54**. Add to height dimension based on mounting options.

② Weight is for standard chiller Some optional features will increase weight.

③ Operating weight is with a full 40-gallon (*151 liter*) reservoir tank of water.

Figure 5
PSR Series 20 to 40 hp Remote Air-Cooled Portable Chillers

Nominal operating parameters for PSR Series remote air-cooled models are 50°F (10°C) leaving water temperature at 2.4 gpm per ton (9.1 lpm per 3.517 kW) with 95°F (35°C) ambient air. **For 50 Hz applications**, multiply capacity by **0.83**. *Nominal 60 Hz capacity flow rate must be maintained.*

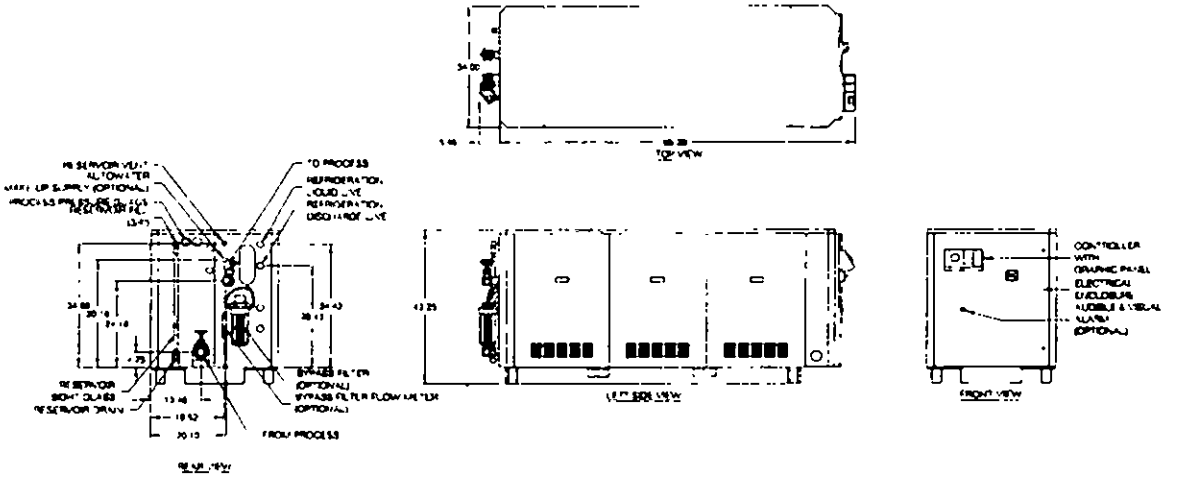
Model number	Nominal cooling capacity ① tons			Nom. water flow	Com-pres-sor	Nom. pump	Refrigeration connections		Power in amps ③ 460/3/60 ④			
	no pump	1 pump	2 pump	gpm ②	hp	hp	in. dia. ODS		1 pump		2 pumps	
							Discharge	Liquid	rated	running	rated	running
PSR20	19 4	18 4	18 0	46 5	2 @ 10	5	1⅜"	⅞"	43 9	37 6	47.0	40.7
PSR25	23 8	22 8	22 4	57 2	2 @ 13	5	1⅜"	⅞"	55 9	42.1	59.0	45 2
PSR30	29 2	28 2	27 8	70 2	2 @ 15	5	1⅜"	⅞"	60.0	50 4	63.2	53 5
PSR35	30.6	29 1	28 7	73.5	35	7 5	1⅜"	1⅛"	64.4	60.3	67.5	63.4
PSR40	36.9	35 4	35 0	88.6	40	7 5	1⅜"	1⅛"	81 9	68.8	85.0	58.0

① Based on 50°F (10°C) chilled water supply temperature and 95°F (35°C) ambient air. Optional additional process pump hp reduces chiller capacity by 0.2 tons per hp (0.703 kW ref. cap. per 0.746 kW pump power).

② Based on 2.4 gpm per ton (9.1 lpm per 3 517 kW), nominal 1 pump.

③ An optional oversized process pump adds to the total rated or running chiller amperage. To find the new total chiller amperage, subtract the standard process pump amperage from the optional pump amperage (see Figure 1 on Page 16), and add it to the chiller rated or running amperage.

④ Multiply 460/3/60 amperage by **2.0** for 208-230/3/60 amperages; multiply by **0.8** for 575/3/60 amperages.



PSR portable chillers come standard with mounting rails. PSR portable chillers are charged with 25 psi (172.4 kPa/1.72 bars) nitrogen for shipping purposes.

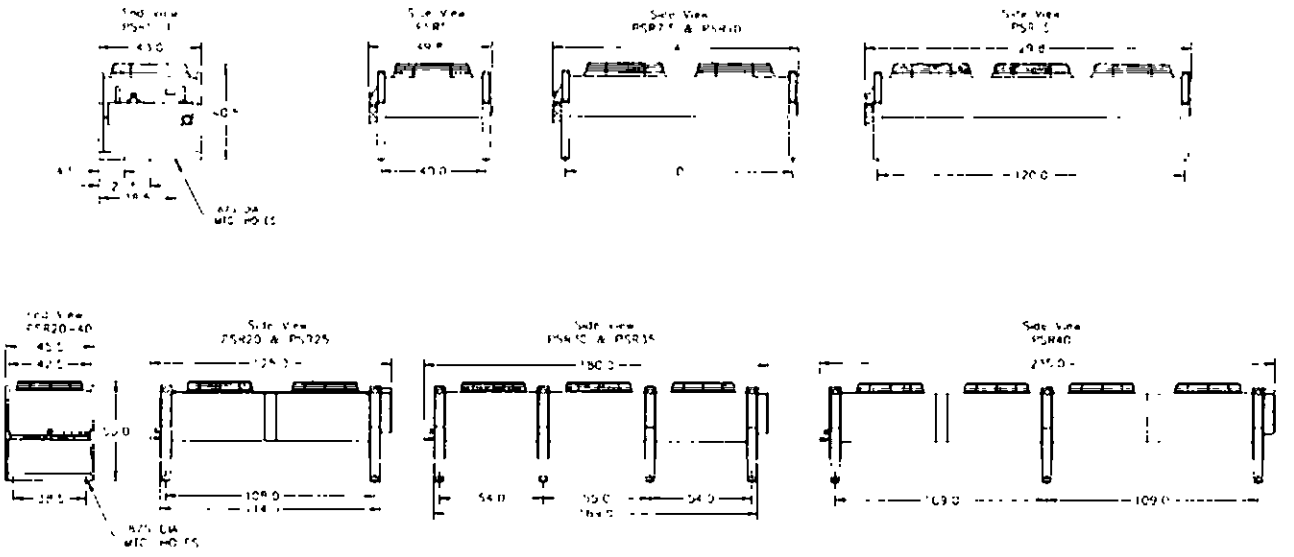
Model number	Com-pressor hp	Process connections, in. NPT				Dimensions in inches ①			Weights		
		1 pump to/from	2 Pump to/from	no pump, no tank	1 pump, no tank, to/from	height	width	depth	Dry ② lbs.	Ship. ② lbs.	Oper. ② ③ lbs.
PSR20	2 @ 10	2" / 3"	2 5" / 3"	2 0"	2" / 3"	43 3"	34 0"	100 7"	1,299	1,549	1,965
PSR25	2 @ 13	2" / 3"	2.5" / 3"	2.0"	2" / 3"	43 3"	34 0"	100 7"	1,305	1,555	1,971
PSR30	2 @ 15	2" / 3"	2 5" / 3"	2 0"	2" / 3"	43 3"	34.0"	100 7"	1,607	1,857	2,273
PSR35	35	2 5" / 3"	2 5" / 3"	2 5"	2 5" / 3"	43 3"	34 0"	100 7"	2,235	2,462	2,901
PSR40	40	2 5" / 3"	2 5" / 3"	2 5"	2 5" / 3"	43 3"	34 0"	100 7"	2,243	2,470	2,909

① To convert to *cm*, multiply by **2.54** Add to height dimension based on mounting options.

② Weight is for standard chiller. Some optional features will increase weight.

③ Operating weight is with a full 80-gallon (*303 liter*) reservoir tank of water.

Figure 6
PSR Remote Condenser Assembly Models



To convert inches to *cm*, multiply dimension by **2.54.**

Model Number	Fan(s) ② ③ ④						Remote Condenser				Refrigeration ⑤		
	Each			Totals ③ ④			Overall Dimensions				Connections		Charge
	Dia. in.	Motor hp ①	Amps 460V	Fans	Air flow cfm ⑥	Net wt. lbs. ⑥	Length 'A'(in.)	Width 'B'(in.)	Height 'C'(in.)	Mtg. 'D'(in.)	Discharge ODS(in.)	Liquid ODS(in.)	R-22 lbs. ⑤
PSR5	26	¾ hp 1 ø	2 4	1	6,450	260	49 8	43.0	40.5	40.0	1⅛	⅞	3 6
PSR7.5	26	⅓ hp 3 ø	3 7	2	12,400	470	69.8	43 0	40 5	60 0	1⅛	⅞	3 6
PSR10	26	⅓ hp 3 ø	3 7	2	13,700	510	89.8	43.0	40 5	80 0	1⅜	1⅛	4 6
PSR15	26	⅓ hp 3 ø	5 0	3	20,500	550	129 8	43 0	40 5	120 0	1⅜	1⅛	6 4
PSR20	30	1 ½ hp 3 ø	5.9	2	23,000	840	125 0	45 5	50 0	108 0	1⅜	1⅜	10 0
PSR25	30	1 ½ hp 3 ø	5.9	2	21,900	860	125.0	45.5	50 0	108 0	1⅜	1⅜	16.0
PSR30	30	1 ½ hp 3 ø	9.4	3	34,800	1,280	180 0	45.5	50.0	⑦	2⅛	2⅛	24.0
PSR35	30	1 ½ hp 3 ø	9 4	3	32,900	1,300	180 0	45 5	50 0	⑦	2⅛	2⅛	24 0
PSR40	30	1 ½ hp 3 ø	12 9	4	46,400	1,690	235 0	45 5	50 0	⑦	2⅛	2⅛	29.0

① ø represents electrical phase; all motors are 1,140 rpm Multiply hp by **0.746** to convert to *kW*.

② All first fan motors (Header Side) are ¾ hp (*0.56 kW*) single phase variable speed.

③ Multiply 460V amperages by **2.0** for 208-230V amperages

④ Multiply 460 V amperages by **0.8** for 575 V amperages.

⑤ Refrigeration charge is for **remote condenser only!**

⑥ To convert cfm to *cmh*, multiply by **1.699** To convert lbs. to *Kg*, multiply by **0.454.**

⑦ See drawing above.

2 Shipping Information

2-1 Unpacking and Inspection

You should inspect your AEC, Inc./Application Engineering PS Series portable chiller 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. 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.

- ☑ 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. If the shipment was prepaid, call us for a receipted transportation bill.
- ☑ Advise AEC, Inc. regarding your wish for assistance and to obtain an RMA (return material authorization) number.

2-3 If the Shipment is Not Complete

Check the packing list. You should have:

- ☑ AEC, Inc./Application Engineering PS Series portable chiller
- ☑ Bill of lading for equipment shipped
- ☑ Operating and Installation packet
- ☑ Electrical schematic and panel layout drawings

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 the AEC, Inc. shipping department immediately**. For shipments in the United States and Canada, call 1 (800) 233-4819; for all other countries, call our international desk at 001 (630) 475-7491. Have the order number and item number available.
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

PS Series Portable Chiller Models 2 hp to 5 hp

PS Series portable chillers are shipped mounted on a skid, enclosed in a plastic wrapper, and contained in a cardboard box.

Remove the nails holding the box to the skid and lift the box off carefully, avoiding staples in the 1' x 4' wood supports. Cut steel banding.

Use a pry bar to remove the blocks securing the unit to the skid.

Insert forks between skid and portable chiller from the side until they protrude beyond the opposite side of the unit. The forks must be equidistant from the centerline of the unit and the unit must be balanced on the forks.

Lift the unit off the skid with a fork truck. Lift slowly and only high enough to clear the skid. Use a pry bar if necessary to **carefully** remove the skid from the unit.

Lower slowly. The unit should land on its casters or rails and can then be moved into position.

Temporary hardware has been installed to prevent side panels from shifting in transit. Remove hardware.

Important!

Retain the crating material for reshipping the chiller in case hidden shipping damage is found.

PS Series Portable Chiller Models 7.5 hp to 15 hp

PS Series portable chillers are shipped mounted on a skid, enclosed in a plastic wrapper, and open-crated on all four sides and top.

1. Pry the crating away from the skid.
2. Follow steps 2 through 6 above.

PS Series Portable Chiller Models 20 hp to 40 hp

PS Series portable chillers are shipped mounted on a skid, enclosed in a plastic wrapper, and open-crated on all four sides and top.

1. Pry the crating away from the skid.
2. Use a pry bar to remove the blocks securing the unit to the skid.
3. Lift unit from the sides inserting forklift under the base into the lifting openings provided. Use a pry bar if necessary to **carefully** remove the skid from the unit.
4. Follow steps 5 and 6 above.

Important!

Never remove the unit from the front (electrical control end) or the rear (pipe connection end) – DAMAGE MAY RESULT.

- Notes

3-1 Making Electrical Connections

Check serial tag voltage and amperage requirements and make sure your electrical service conforms. Total running amps for PS Series portable chillers are also found in the specification tables in Figures 2 through 5 on Pages 17 through 28.

Bring properly sized power leads and ground from a fused disconnect (installed by your electrician) to the unit. Use dual-element fuses in the disconnect switch, sized according to National Electrical Code recommendations. Note the outline drawings for egress into the cabinet. **Make sure all electrical connections are *tight*.**

⚠ WARNING

1. **Make sure that electrical connections comply with all applicable electrical codes.**
2. **Ground the chiller in accordance with NEC Article 250.**
3. **Operation voltage must be within plus or minus ten percent (±10%) of the nameplate rating.**
4. **Phase imbalance must be below 10%.**

Figure 7
Typical PS Series Electrical Subpanel

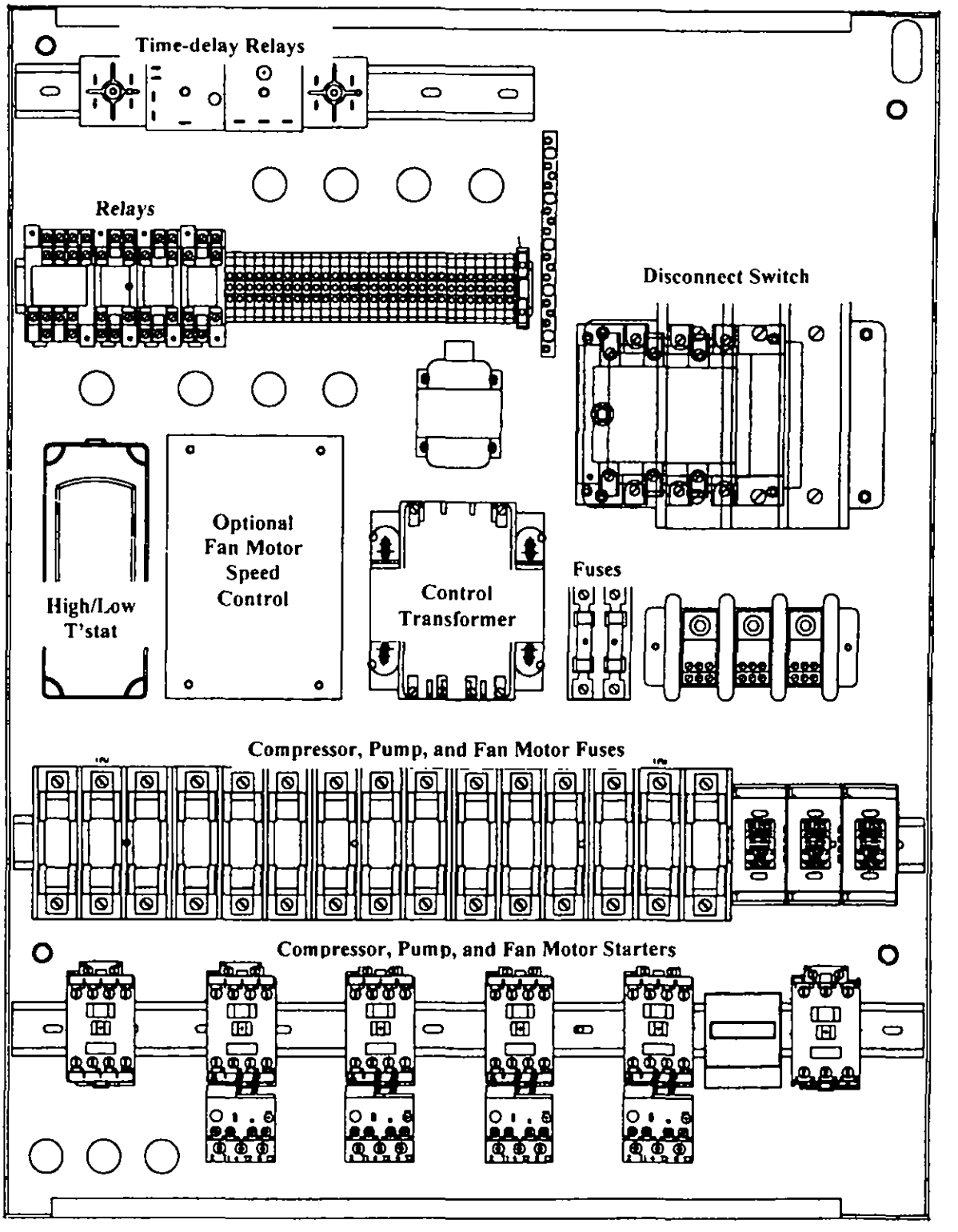


Figure 8
Typical PS Series Electrical Schematic, 2 hp and 3½ hp Models

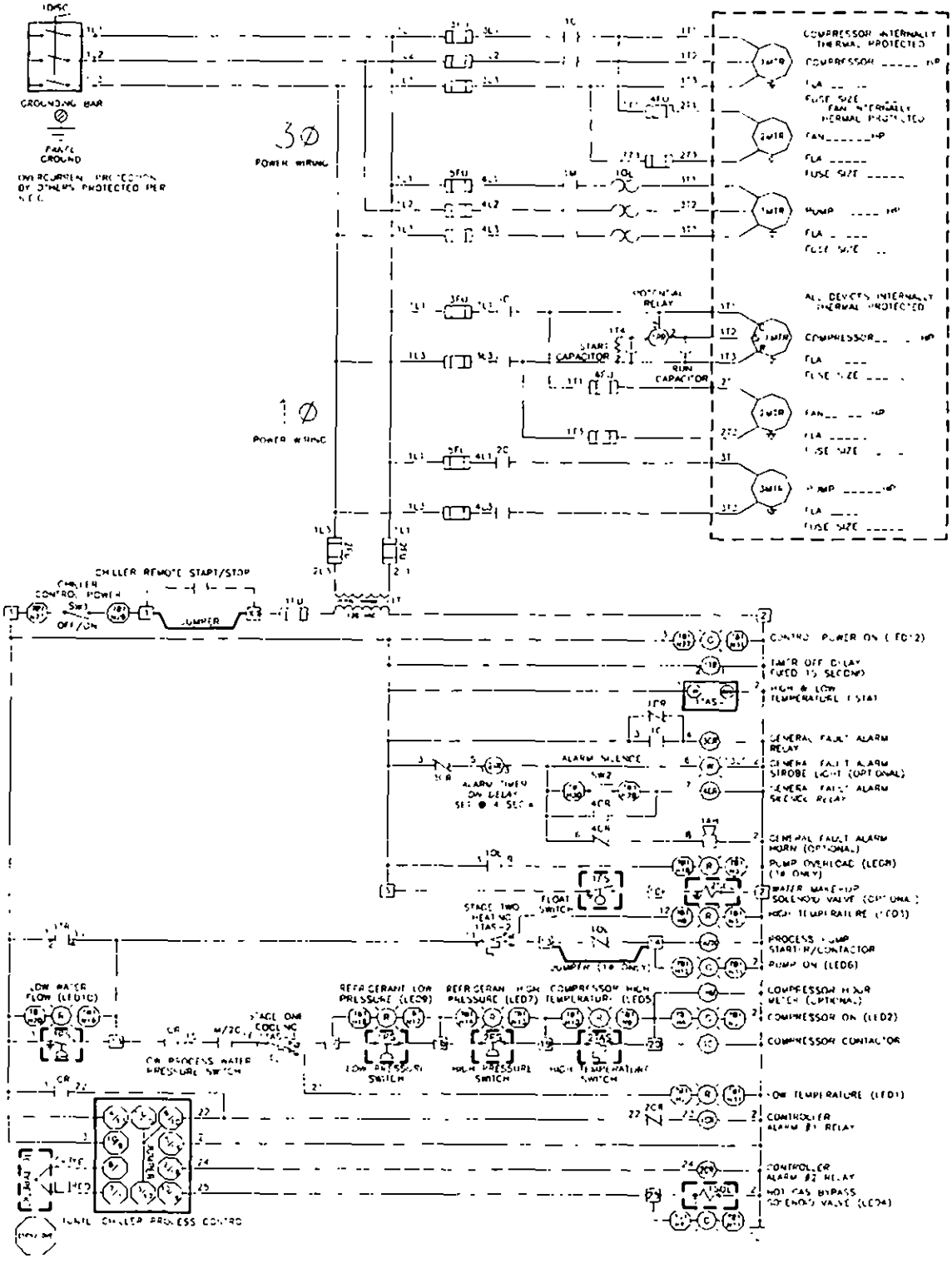


Figure 9
Typical Power Wiring Schematic, PS Series 5-40 hp Models

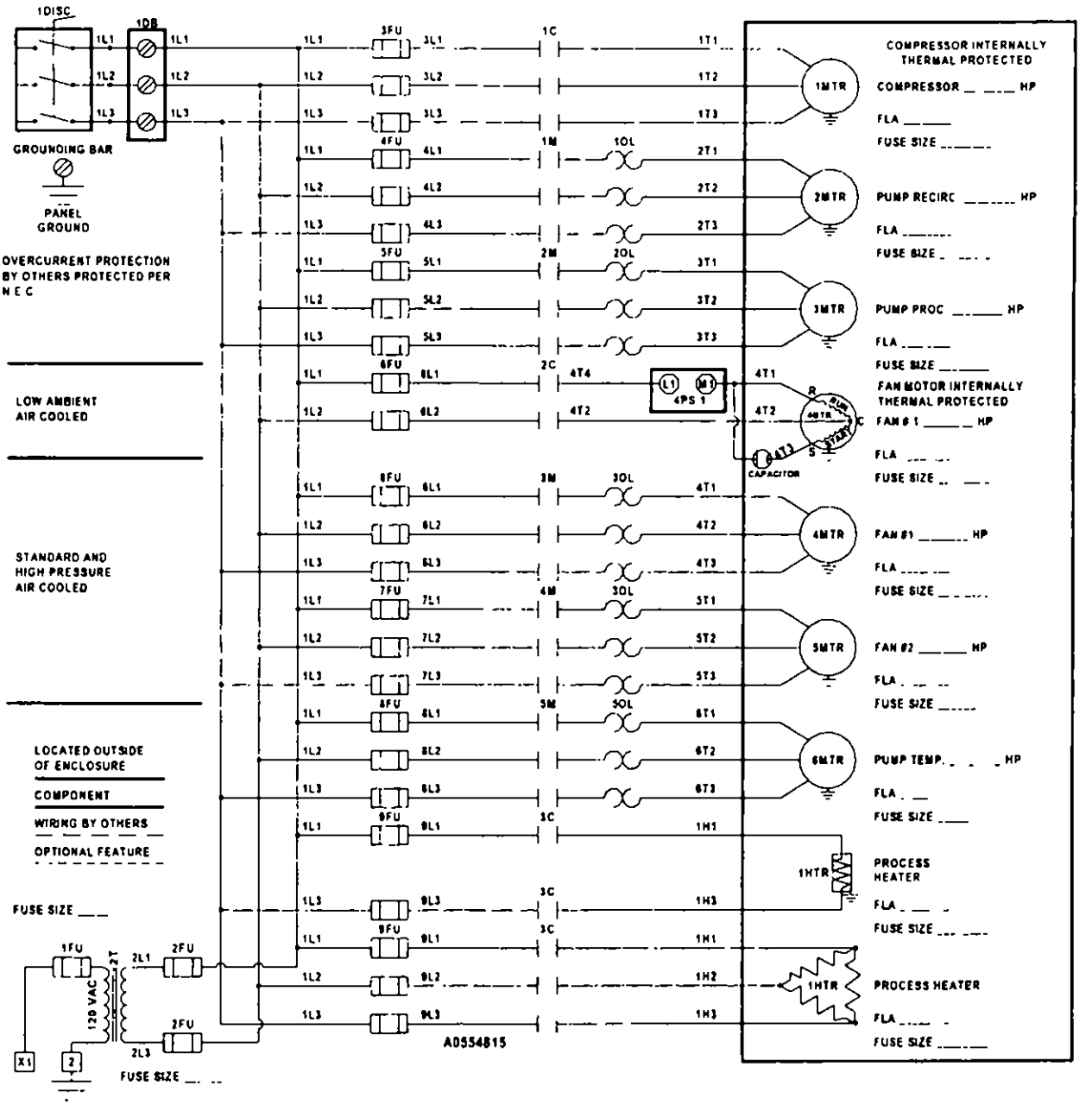


Figure 10
Typical Wiring Schematic, PS Series 5-15 hp Models with Pump

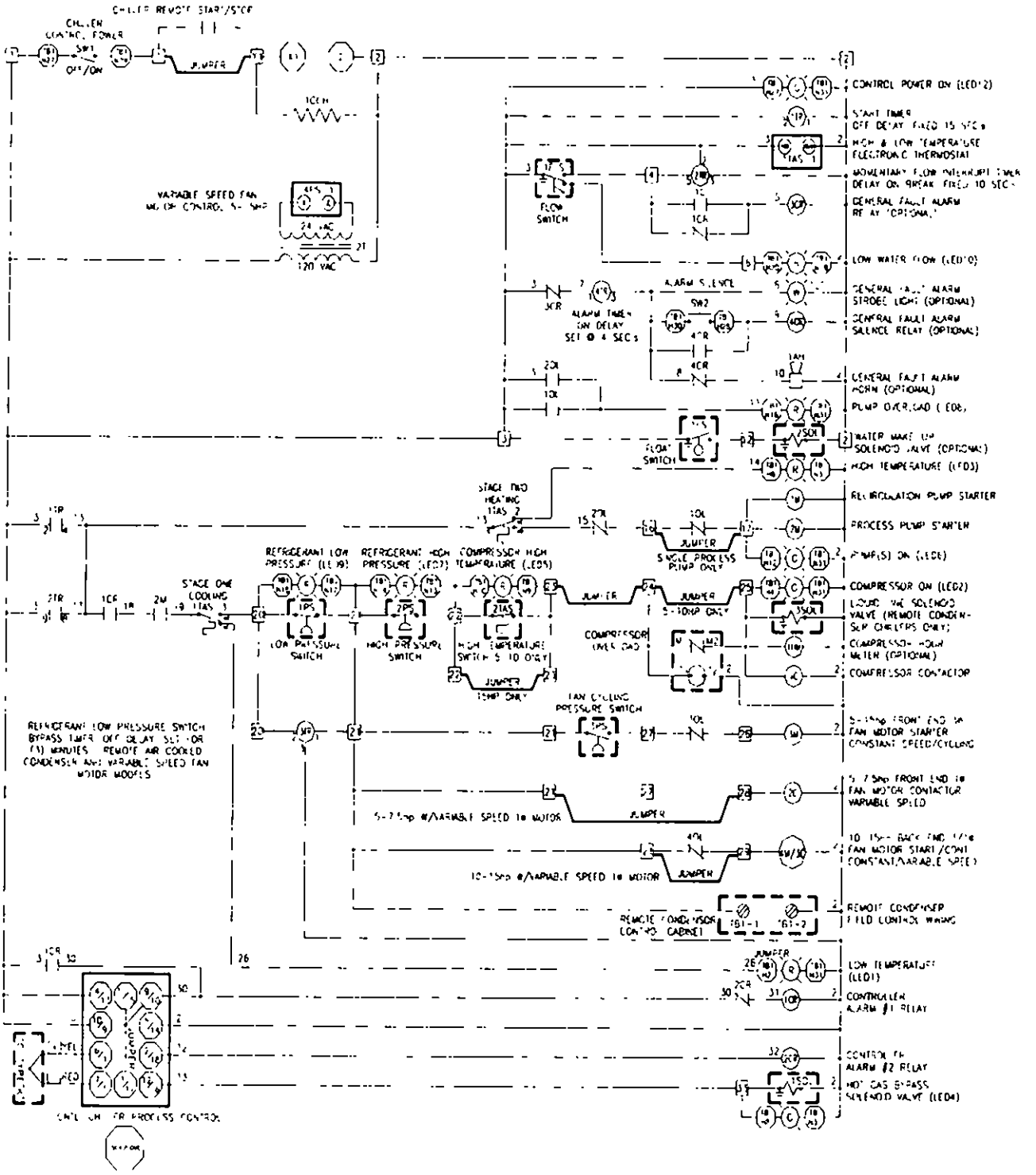


Figure 11
Typical Wiring Schematic, PS Series 5-15 hp Models without Pump

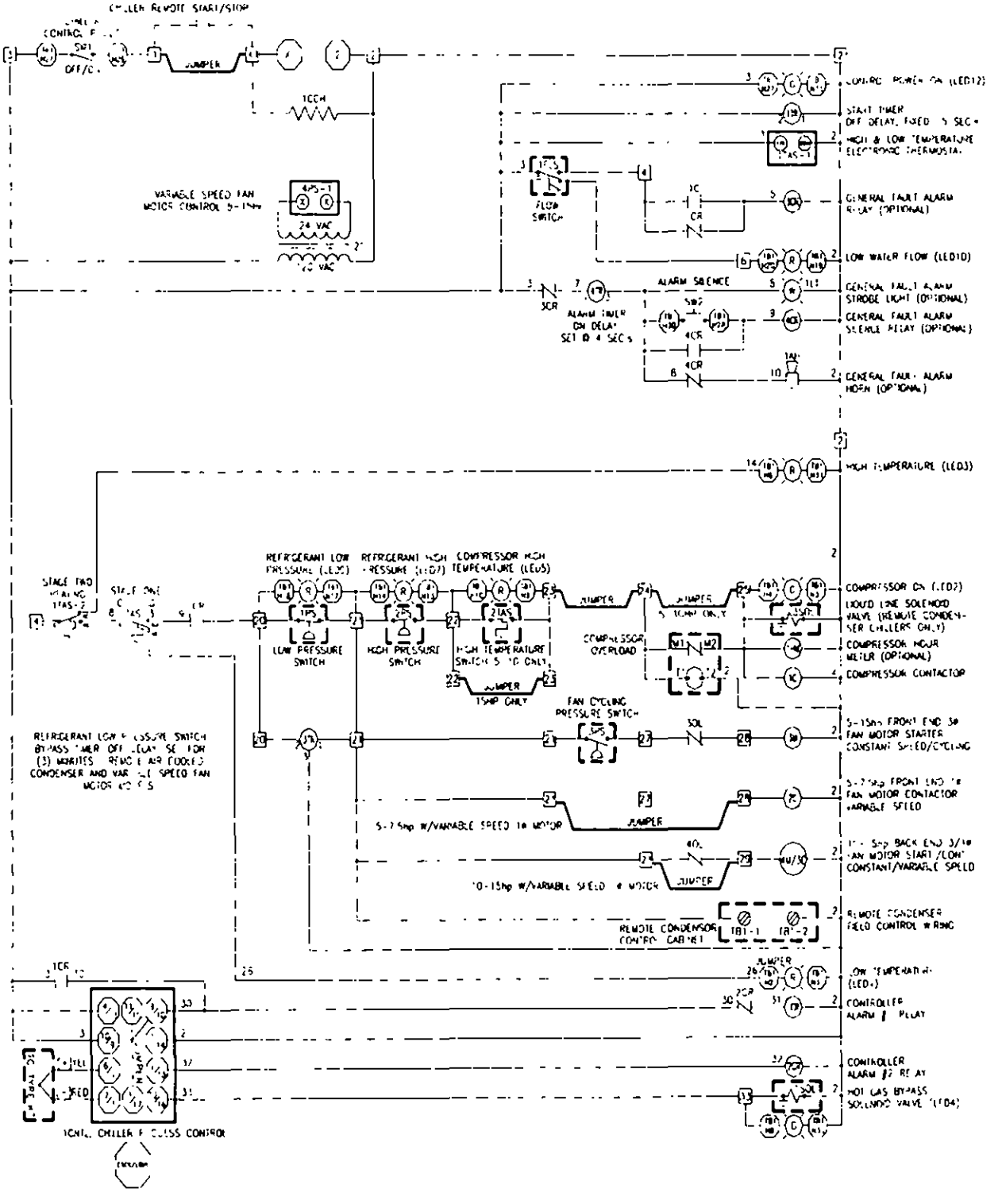


Figure 12
Typical Wiring Schematic, PS Series 20-30 hp Models with Pump

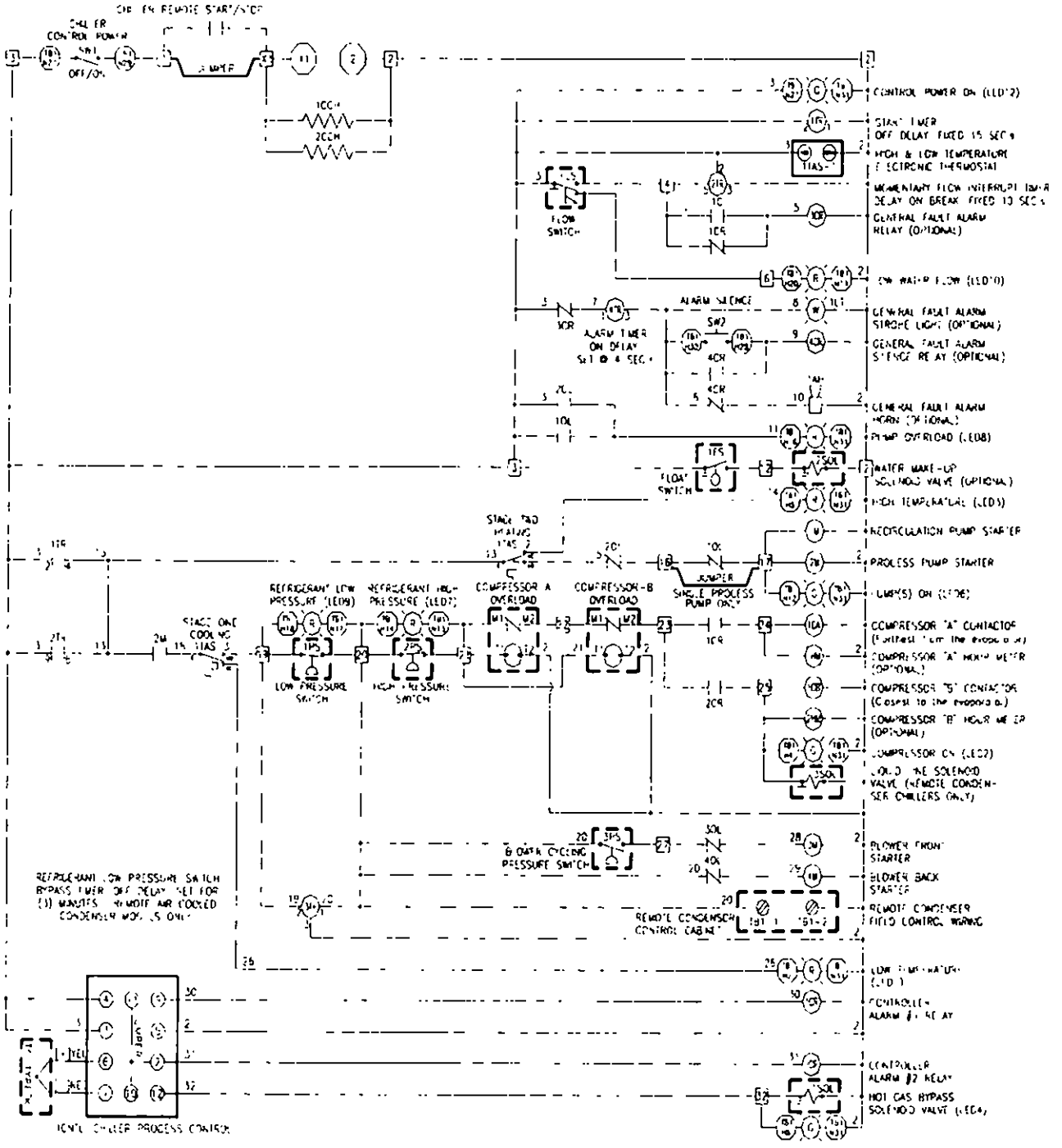


Figure 13
Typical Wiring Schematic, PS Series 20-30 hp Models without Pump

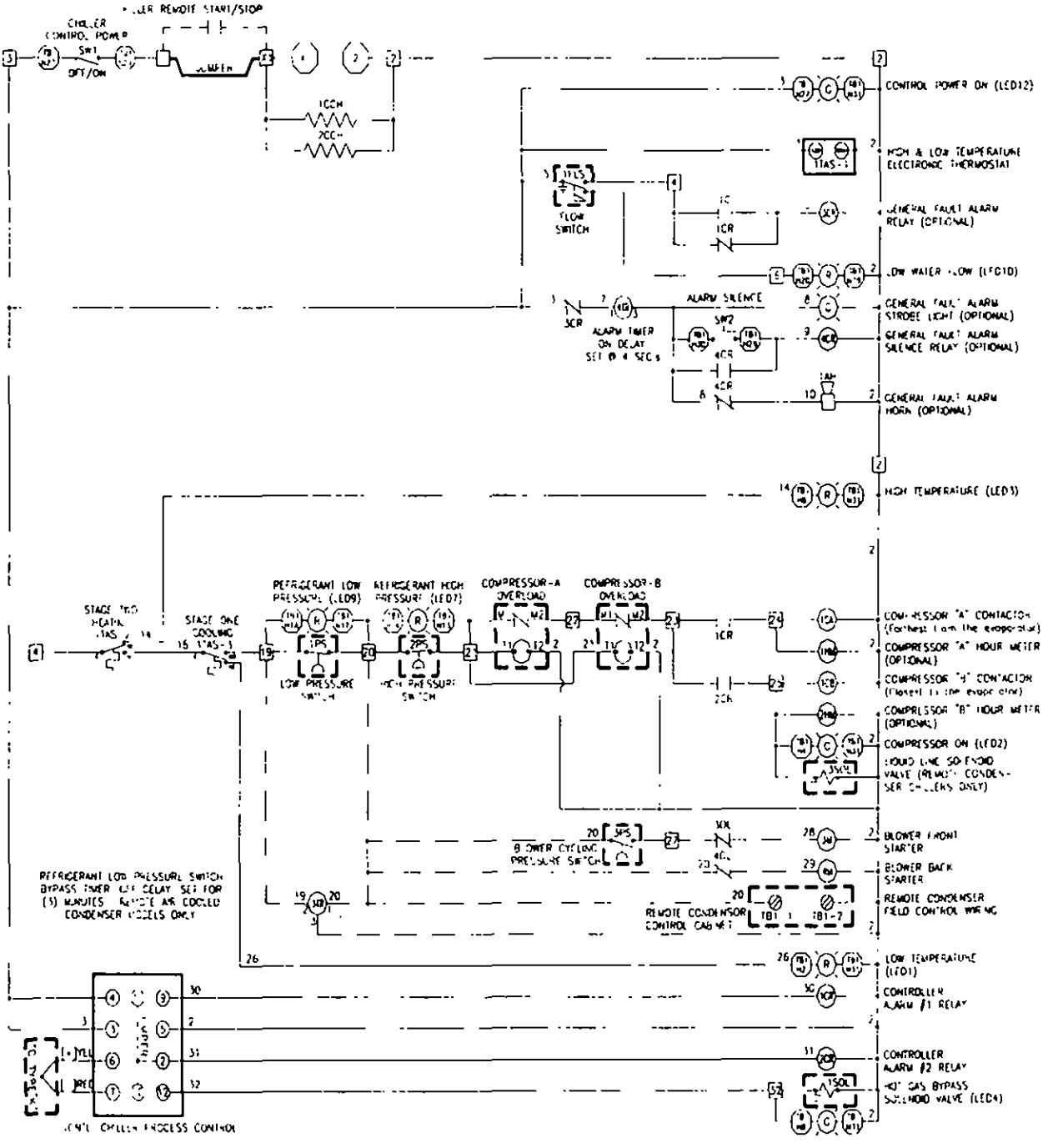


Figure 14
Typical Wiring Schematic, PS Series 35 & 40 hp Models with Pump

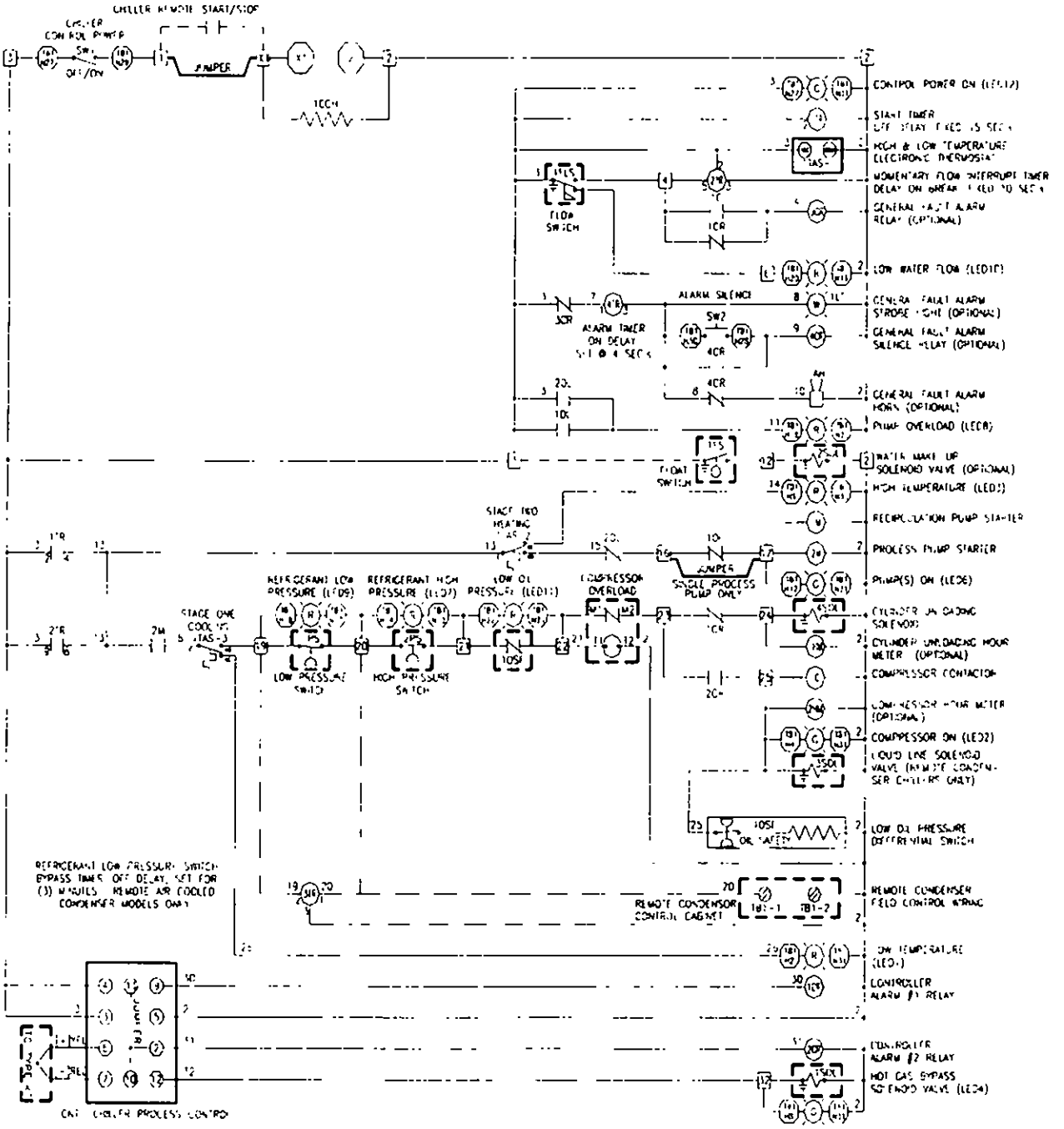
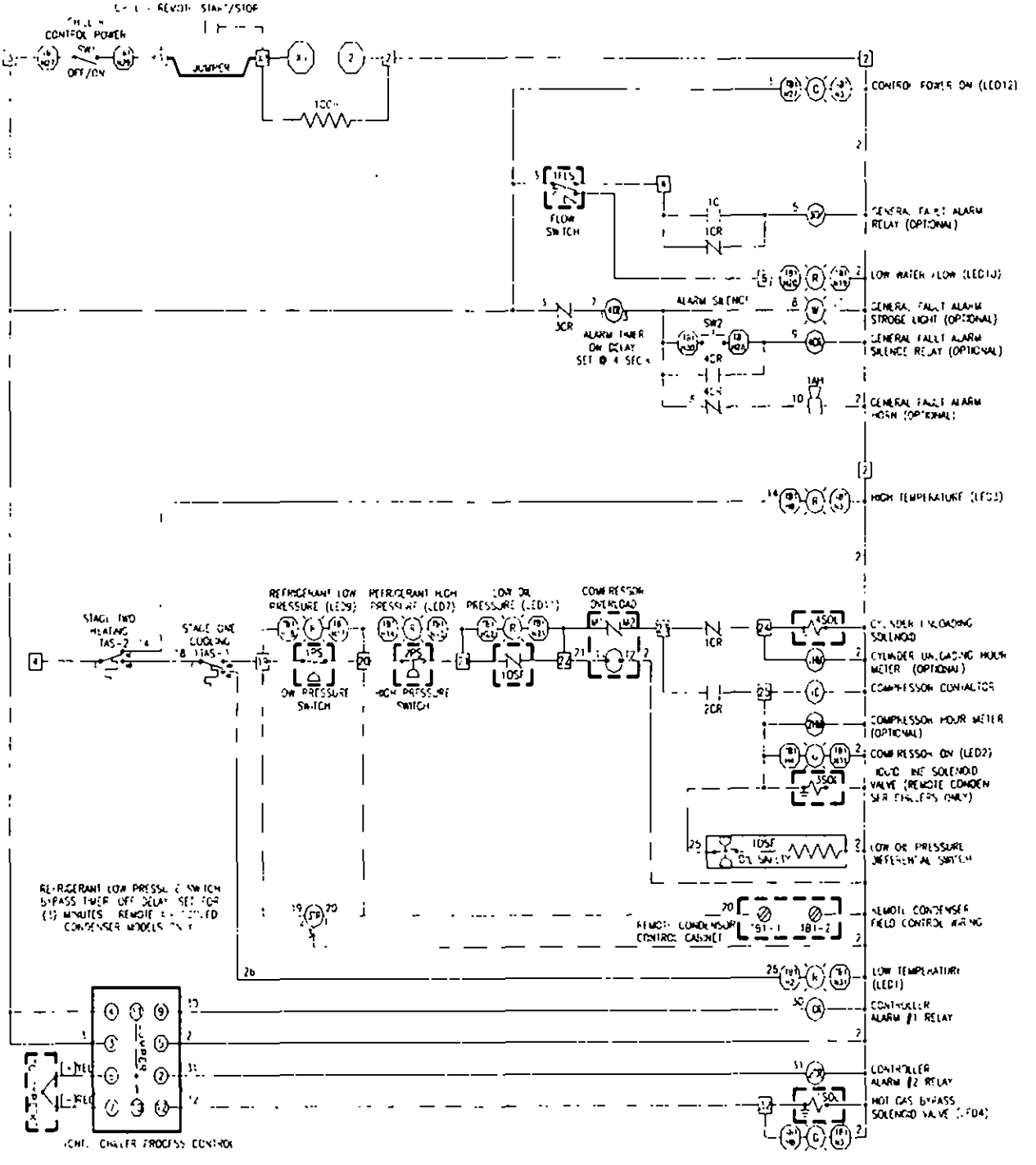


Figure 15
Typical Wiring Schematic, PS Series 35 & 40 hp Models without Pump



3-2 Making Process Water Connections

All Models

All PS Series portable chillers have two chilled water connections:

- The chilled water supply, labeled **TO PROCESS**, is the outlet for the chilled water leading to the process being cooled.
- The chilled water return, labeled **FROM PROCESS**, is the inlet leading from the process back into the chiller to be cooled and recirculated.

3-3 Sizing Water Connections

All external chilled water connections should be run full size to the process; see Figures 17 and 18 on Pages 47 and 48. The largest possible openings and passages should be provided for the flow of chilled water through platens, dies, molds or other pieces of equipment.

Important!

Be sure to reduce external pressure drop as much as possible by generously sizing piping and tooling water passage ways!

3-4 Bypass Valve Considerations

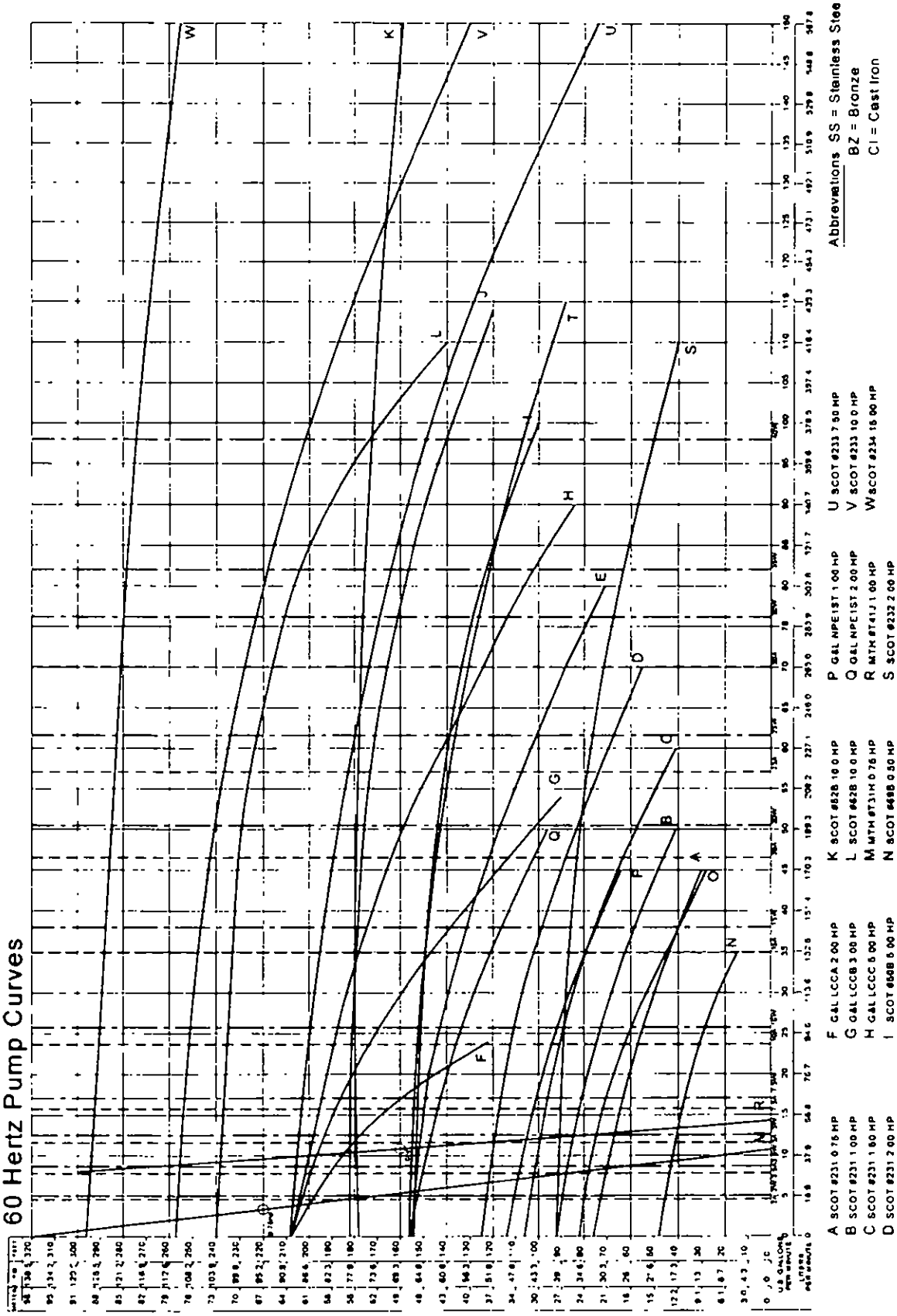
PS Series portable chillers have a spring-loaded bypass valve. If the chilled water shut-off valves are inadvertently closed while the chiller is running, the factory-set bypass valve opens and allows a small amount of water to flow through the chiller. This action protects the chiller from freeze-up and allows the other cut-out devices to shut down the chiller. **The bypass valve is not intended to provide continuous full bypass flow.**

⚠ CAUTION

Do not attempt to adjust or otherwise tamper with the bypass valve.

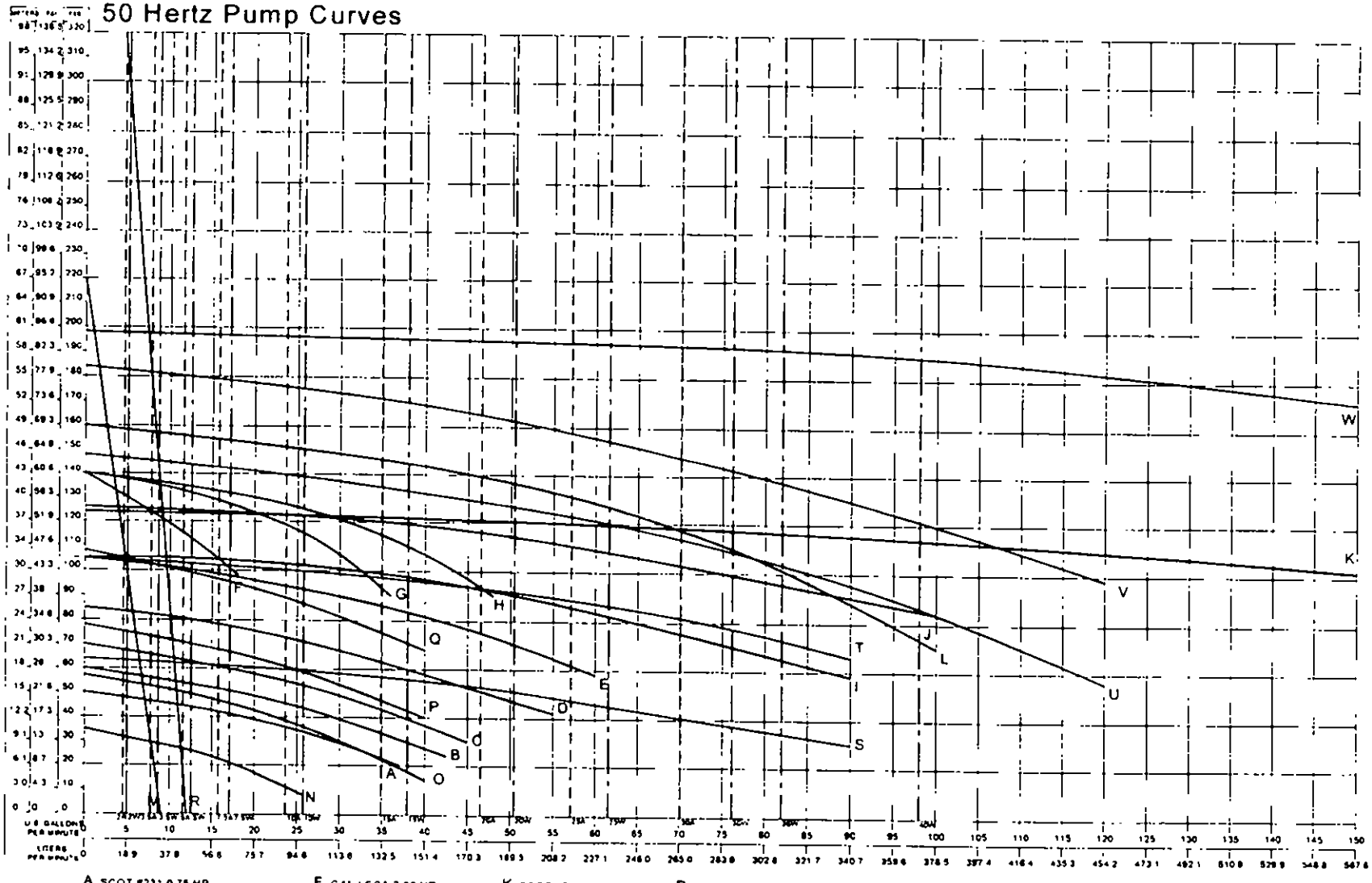
Your AEC, Inc. warranty will be voided!

Figure 16
PS Series Pump Curve: 60 Hz



Important! Pump pressure must be corrected for pressure at chiller 'To Process' connection

Figure 16
PS Series Pump Curve: 50 Hz



Important! Pump pressure must be corrected for pressure at chiller To Process connection

Figure 17
PS Series Chiller Internal Water Pressure Drop Tables

Notes:
- **A recirculation pump is required** for flows greater than the maximum or less than the minimum indicated.
- Process flow less than or greater than the flow rates shown below **requires a recirculation pump**.

Pressure drops in ΔP, psig and *kPa*																
PS-2				PS-3.5				PS-5				PS-7.5			
Flow		Δ P		Flow		Δ P		Flow		Δ P		Flow		Δ P	
gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*
4.06	*15 4*	3 5	*24 1*	8 03	*30 4*	4 0	*27 6*	10 0	*37 9*	1 5	*10.5*	12 0	*45 4*	2 3	*16 1*
6.01	*22 8*	7 0	*48 3*	10 00	*37 9*	6 5	*44 8*	12.0	*45 4*	2.2	*14 8*	16.0	*60.6*	2 9	*20.1*
8.02	*30 4*	11 5	*79 3*	12 00	*45 4*	10.0	*69*	18.0	*68 1*	4 7	*32 1*	20.0	*75 7*	5 0	*34.5*
10.00	*37 9*	18 0	*124 1*	14.00	*53 0*	13 0	*89 6*	24.0	*90 8*	7.3	*50 2*	24 0	*90.8*	6 9	*47.4*
				16.00	*60 6*	18 0	*124.1*					28.0	*106.0*	9.6	*65 9*
												33.0	*124 9*	12 7	*87 8*
PS-10				PS-15				PS-20				PS-25			
Flow		Δ P		Flow		Δ P		Flow		Δ P		Flow		Δ P	
gpm	*lpm*	psig	kPa	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*
22.0	*83 3*	4 7	*32 6*	30 0	*113.6*	4 5	*31 3*	40 0	*151 4*	4 0	*27 6*	55.0	*208 2*	5.5	*37.9*
30 0	*113 6*	8 28	*57 1*	40 0	*151.4*	7 5	*51 7*	45 0	*170 3*	4 0	*27.6*	58.0	*219 5*	5 8	*40 0*
38 0	*143 8*	12 91	*89 0*	50 0	*189 3*	12 4	*85.2*	50.0	*189 3*	5.0	*34 5*	61 0	*230 9*	6 0	*41.4*
46 0	*174 1*	16 77	*115 6*	60.0	*227 1*	17 8	*122.8*	52.0	*196 8*	6 0	*41 4*	70 0	*264.9*	8.5	*58 6*
50.0	*189 3*	20 00	*137 9*	70.0	*264 9*	24 2	*166.6*	55 0	*208 2*	6.5	*44.8*				
PS-30				PS-35								PS-40			
Flow		Δ P		Flow		Δ P		Flow		Δ P		Flow		Δ P	
gpm	*lpm*	psig	kPa	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*	gpm	*lpm*	psig	*kPa*
72.0	*272.5*	6 0	*41 1*	38 7	*146 5*	1 5	*10 4*	92 6	*350.5*	7 9	*54 5*	44.7	*169 2*	2 0	*13 8*
75 0	*283 9*	6 5	*44 8*	51 2	*193.8*	2 6	*17.9*	107.1	*405 4*	10 4	*71.7*	58 5	*221 4*	3 4	*23 4*
80 0	*302 8*	8 0	*55 2*	62.3	*235 8*	3 8	*26 2*					70 9	*268 3*	4 9	*33 8*
85 0	*321 7*	9 5	*65 5*	71.8	*271 7*	4 9	*33.8*					81 6	*308 8*	6 3	*43.5*
				82 9	*313.7*	6 5	*44 8*					105 7	*400 0*	10.3	*71 0*

Note: These pressure drop values are valid for single- and no-pump PS Series portable chillers.

Calculating Chiller Nominal Flow and Pressure to Process

- **Flow rate:** Obtain the flow reading from the pump curve that you selected on Pages 45 or 46.
- **Pressure:** Obtain a corresponding pressure reading from the pump curve you selected, then **subtract** the one-pump pressure drop listed in the above table using the appropriate chiller hp and flow rate.
- For two-pump (Process/Recirc) chillers, do not subtract pressure drop from table above for process pump.

Figure 18
Flow and Pressure Considerations for PS Series Portable Chillers

Model	Design flow		Design Δ P		Standard pump power		To Process pressure		
number	gpm	*lpm*	psig	*kPa*	hp	*kW*	psi	*kPa*	*bars*
PSA2	4 6	*17 5*	4.4	*30 4*	1	*0 746*	34.1	*235 3*	*2 4*
PSA3 5	7 9	*29.9*	4.9	*33.7*	1	*0 746*	33.0	*227 5*	*2 3*
PSA/R5	11 6	*43 8*	2 0	*13 7*	1	*0.746*	34 9	*240 8*	*2 4*
PSA/R7 5	15 7	*59 6*	2 8	*19.0*	1	*0 746*	32 7	*225 7*	*2.3*
PSA/R10	23 8	*90 1*	5 1	*35 2*	2	*1 492*	43 4	*299 0*	*3 0*
PSA/R15	34 9	*132 1*	6 1	*41 8*	2	*1 492*	38 0	*262 1*	*2 6*
PSA/R20	46 5	*175.9*	7.1	*49 0*	5	*3 73*	54 0	*372 3*	*3.7*
PSA/R25	57 2	*216 4*	8.1	*55.9*	5	*3.73*	52.0	*358 5*	*3 6*
PSA/R30	70.2	*265 6*	10 5	*72 4*	5	*3 73*	47 5	*327 5*	*3 3*
PSR35	73 5	*278 2*	5 4	*37 2*	7 5	*5 59*	64.0	*441 3*	*4.4*
PSR40	88 6	*335 4*	8 2	*56 5*	7.5	*5 59*	55.0	*379 2*	*3.8*
PSW2	5 1	*19 1*	5.7	*39 1*	1	*0.746*	32.9	*226.6*	*2.3*
PSW3 5	8 6	*32.7*	6.0	*41.2*	1	*0 746*	31 7	*218.5*	*2.2*
PSW5	12 6	*47.7*	2 3	*16 00*	1	*0.746*	34 3	*236.2*	*2 4*
PSW7.5	17 0	*64 5*	3.1	*21.4*	1	*0.746*	32.0	*220 3*	*2 2*
PSW10	25 7	*97.4*	6.3	*43 3*	2	*1 492*	41.4	*285 3*	*2 9*
PSW15	38.1	*144 1*	7 0	*48 1*	2	*1.492*	35 5	*244 4*	*2.4*
PSW20	50.4	*190 8*	8.8	*60 3*	5	*3 73*	52 0	*358 5*	*3 6*
PSW25	61.7	*233.7*	9.0	*62.1*	5	*3.73*	49 0	*337 9*	*3 4*
PSW30	76 2	*288.5*	10 8	*74 1*	5	*3.73*	43.0	*296 5*	*3 0*
PSW35	82 0	*310 4*	5.4	*37.2*	7.5	*5 59*	64 0	*441 3*	*4 4*
PSW40	98.4	*372.4*	8 2	*56.5*	7 5	*5 59*	55 0	*379 2*	*3 8*

Note: Pressure is proportional to flow. **Recirculation pump is required** for values exceeding those listed.

Recirculation Pump Specifications

Model	Recirc. power		Flow Rate		ρ pressure		Model	Recirc. power		Flow Rate		ρ pressure	
number	hp	*kW*	gpm	*lpm*	psi	*kPa*	number	hp	*kW*	gpm	*lpm*	psi	*kPa*
PS5	0 75	*0 373*	13 0	*49.2*	2 3	*16 0*	PS25	*2 0*	*1 492*	63 0	238 4	*9.0*	*62 0*
PS7 5	0 75	*0 373*	17 0	*64.3*	3 1	*21 4*	PS30	*2.0*	*1 492*	76.0	287 6	*10.8*	*74.1*
PS10	0.75	*0 595*	26.0	*98.4*	6.3	*43.3*	PS35	*3 0*	*2 238*	82 0	310.4	*5 4*	*37 2*
PS15	0 75	*0 595*	38 0	*143 8*	7 0	*48.0*	PS40	*3.0*	*2.238*	98 0	370 9	*8 2*	*56 5*
PS20	*2 0*	*1 492*	50 0	*189 2*	8.8	*60.3*							

3-5 Galvanic Corrosion Considerations

The materials used in the water circuit piping of these chillers are non-ferrous and react electro-chemically with ferrous metallic materials. Some water has dissolved minerals that greatly accelerate the reaction between dissimilar metals.

PVC or non-ferrous piping is recommended to reduce galvanic action. **If iron piping must be used, use dielectric unions at the chiller.**

3-6 Water Treatment Considerations

Water treatment is an integral part of the system. In some locations, water may cause large deposits of scale, erosion, algae, and/or corrosion.

The use of a poor quality water may result in inefficient operation, heat exchanger damage, and pump seal damage. Consult a qualified water treatment specialist to determine whether treatment is needed.

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

3-7 Water-Cooled Chiller Condenser Connections

PSW Series Water-Cooled Chillers

PSW Series water-cooled portable chillers can use city water or tower water as a cooling medium. Make sure that all external piping and connections supplying and discharging water to and from the condenser are full size.

You'll make two (2) connections to the water cooled condenser:

- The condenser water supply, labeled **CONDENSER WATER IN**, is located at the rear of the chiller, and is the **inlet** for city or tower water.

  Make sure that water is supplied at a maximum temperature of 85°F (29°C) and a minimum pressure of 25 psi (172.4 kPa/1.7 bars).

⚠ CAUTION

The water-regulating valve is set at the factory.
A qualified refrigeration technician should only adjust it!

Normal R-22 refrigerant condensing pressure is 210 psi (1,447.9 kPa/14.5 bars), with 85°F (27°C) water at 25-psi (172.4 kPa/1.7 bars) entering condenser water pressure.

- Condenser water return, labeled **CONDENSER WATER OUT**, is located at the rear of the chiller, and is the **outlet** for water after it has passed through the condenser.

  It is connected to the tower inlet or to a sewer or other approved discharge receiver. A water regulating valve is a standard feature in the condenser water return line.

3-8 Air-Cooled Condenser Chiller Air Supply

PSA Series Air-Cooled Chillers

PSA Series air-cooled chillers use the surrounding air to cool the condenser. Install the chiller in an area where there is free passage of air for condensing and provisions for removal of heated air from the area.

Do not locate PSA Series chillers in locations where steam, hot air, or fume exhausts can be drawn into the chiller.

⚠ CAUTION

Clean air-cooled condensers and filters *frequently*. Failure to do so results in reduced capacity increased operating costs, and possible failure of the equipment. See Section 7-2 on Page 88 for cleaning instructions.

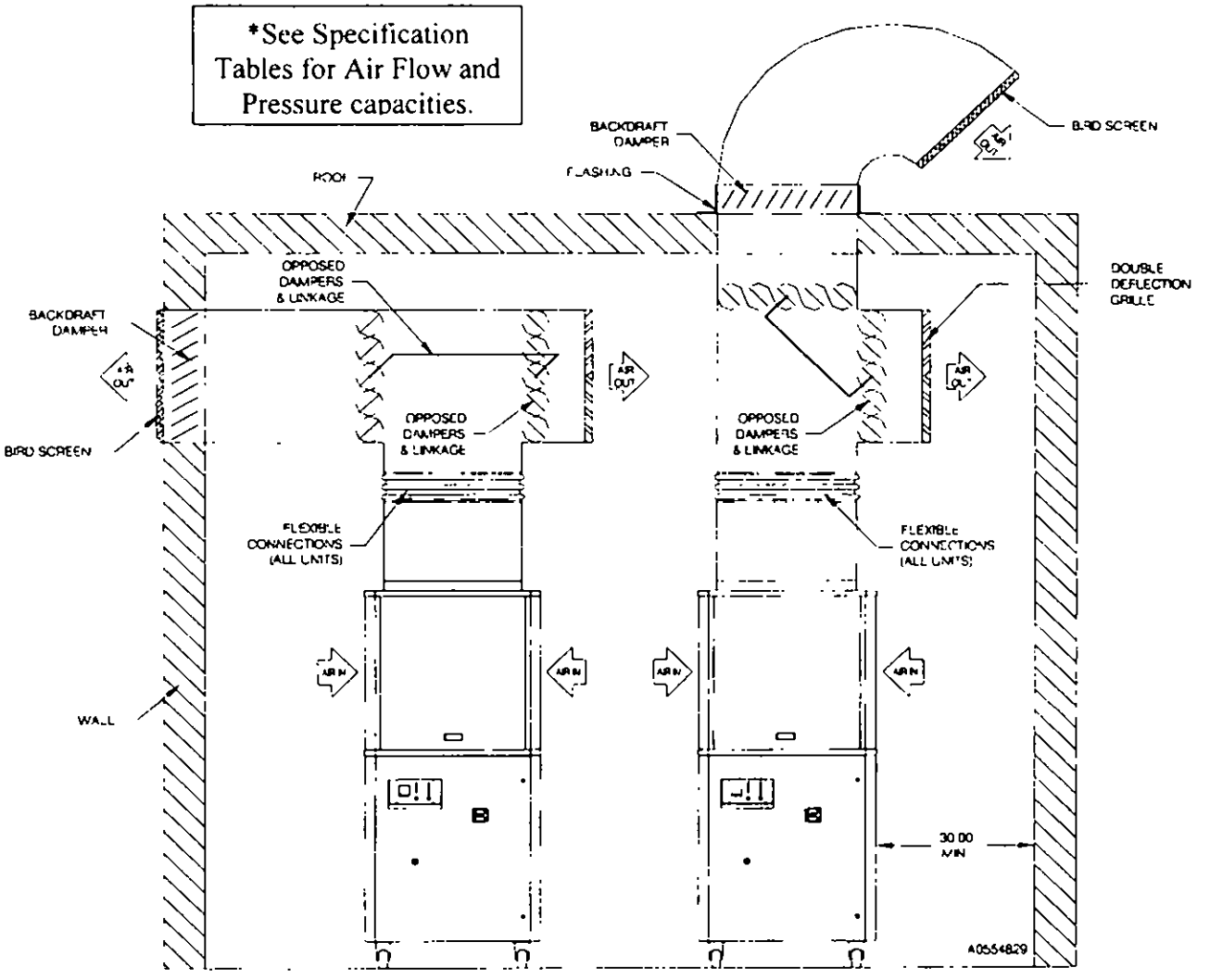
Normal maximum R-22 refrigerant condensing pressure with 95°F (35°C) air entering the condenser is 260 psi (1,792.7 kPa/ 17.9 bars).

3-9 Condensing Air Temperature

PS Series portable chillers are designed to operate at a minimum condenser entering air temperature of approximately 60°F (15.5°C). Operation of the equipment at a lower condenser entering air temperature can cause the chiller to lose capacity. For entering air temperatures below 60°F, an optional fan motor speed control is available.

AEC, Inc. recommends that you maintain ambient temperature at 60°F (15.5°C) or above.

Figure 19
Typical Ductwork for PSA Series 5-40 hp Air Cooled Chiller



When locating your PS Series chiller and designing its ductwork, note any potential high temperature conditions when discharging into your building and any negative pressures with the building when discharging air outside.

Notes: • Customer use of ductwork requires the high pressure fan option for models 5 through 15 hp. • Allow 30" (77 cm) minimum clearance around the chiller footprint to facilitate free passage of cooling air and service accessibility • Size the ductwork for maximum capacity • Support ductwork from the building structure, not off of the chiller • Back draft damper to outside must be closed at all times when fan/blower is not operating • Chillers with dual fans/blower must have a back draft damper on the cycling fan/blower to prevent recirculation of hot discharge air • Chillers are designed to operate at a condensing entering air temperature of 60°F (16°C) minimum • Maximum total static pressure drop external to the chiller must not exceed 0.30" WG (75 pa)

3-10 PSR Series with Remote Condenser

PSR Series portable chillers are shipped with nitrogen holding charge and a full charge of oil (excluding the amount needed for field piping). The PSR condenser is shipped with a dry air charge. Verify that the holding charge has not been lost prior to installation. If there is no pressure, leak test the unit and repair before installing the interconnecting refrigerant piping. Read this complete section before installation.

Important!

Piping should be type 'L' or type 'K' refrigerant grade copper tubing only. Proper sizing and installation has a significant effect on system performance, reliability, and safety!

Interconnecting Refrigerant Piping

The chiller and condenser refrigerant lines are terminated with a cap and brazed closed. ***Do not use a saw to remove the end caps since this will allow copper chips to contaminate the system. Use a tube cutter to remove caps.*** A certified refrigeration contractor need only to install the interconnecting refrigerant piping between the PSR chiller and the outdoor air-cooled condenser. This piping must be properly sized, Type 'L' or type 'K' refrigerant grade tubing, high temperature brazed, for safe reliable operation. Install a customer supplied 400 psi approved refrigerant relief valve in the discharge line at the condenser, following all codes.

When brazing copper joints, flow dry nitrogen through the system, which will prevent carbon/scale formation that causes contamination. Isolate the refrigerant lines from the building, preventing transfer of line vibration to the structure. Do not secure the lines rigidly.

Leak Check and evacuate the system down to 400 microns. A decay of 50 microns after one hour is acceptable.

⚠ CAUTION

To prevent injury or death due to explosion and/or inhalation of phosgene gas, purge system thoroughly while brazing refrigerant piping connections. Use a pressure regulator in the line between the unit and the high-pressure nitrogen cylinder to avoid over-pressurization and possible explosion.

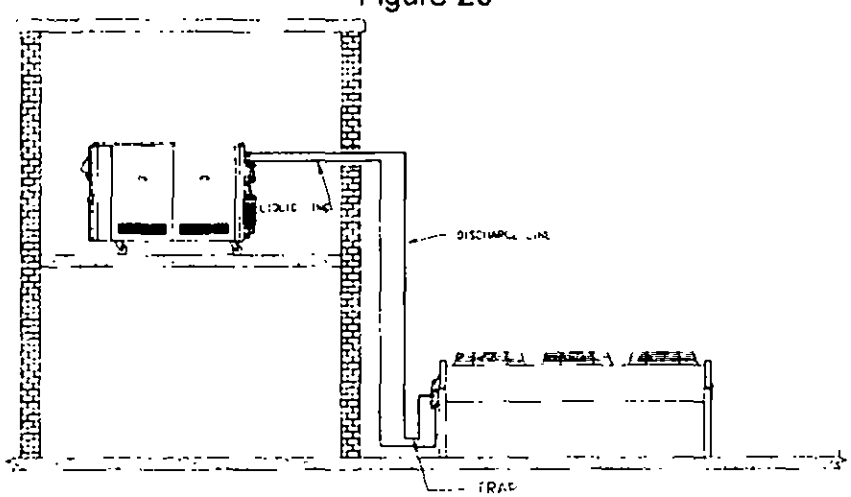
System Configuration

The system can be configured in any of the arrangements shown in Figures 20, 21 and 22. The configuration and distance between them effects pipe size, refrigerant charge, oil return, and oil charge. Therefore there are limitations that must be adhered to for reliable and optimal operation.

The limitations are as follows:

1. Leaving water temperature effects discharge line size, be sure to inform the installing contractor of the leaving water temperature range that the chiller will be operating.
2. The total distance between the PSR Series chiller and condenser must not exceed 200 feet or 300 equivalent pipe feet.
3. Liquid line risers must not exceed 15 feet from the base of the air-cooled condenser (See figure 20).
4. Discharge line risers cannot exceed an elevation difference greater than 100 feet without a 2% efficiency decrease.
5. Refer to Figures 20, 21, and 22 for the location of traps.
6. Refrigeration lines must not be crossed i.e. chiller liquid lines are to be piped to condenser liquid lines etc.
7. Discharge lines should pitch downward, in the direction of flow, at a rate of ½" per 10 feet of horizontal run. It should be sized based upon velocity needed for sufficient oil return.

Figure 20



(Figure 20 – Remote Condenser Piping Trap Locations)
Liquid line riser should not exceed 15 feet from base of air-cooled condenser.

Figure 21

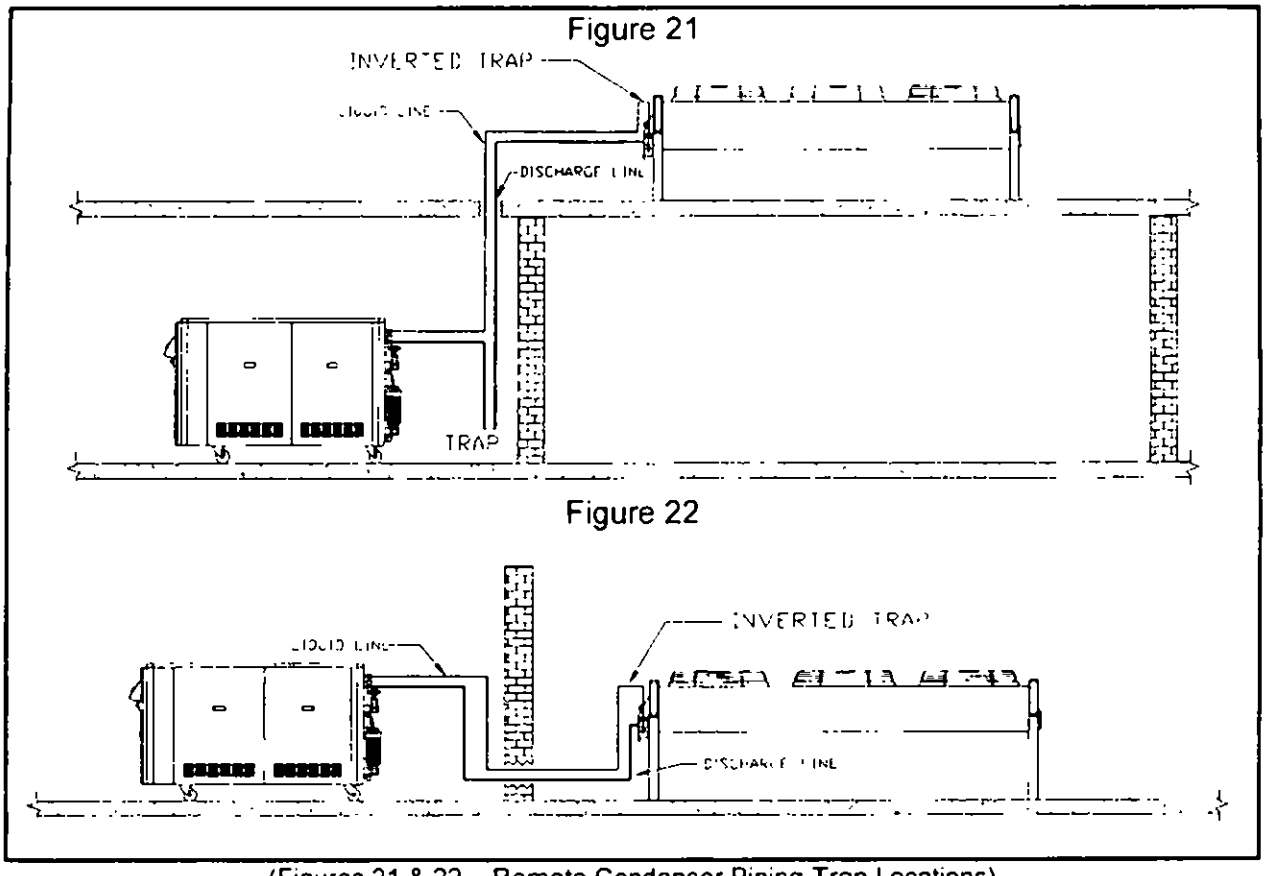


Figure 22

(Figures 21 & 22 – Remote Condenser Piping Trap Locations)

Sizing Refrigerant Lines

To determine field installed liquid and discharge line sizes, it is first necessary to establish the equivalent length of pipe for each line, valves, and elbows. Chiller capacity and leaving water temperature range is also required. Figure 23 states the equivalent length in feet, for refrigerant valves and fittings.

Example: If the actual length of horizontal piping for a PSR-5 is 60 feet , the vertical piping is 35 feet, and (4) elbows (Figure 23) are 6.4 feet. 60 + 35 + 6.4 = 101.4 equivalent feet, therefore the liquid line piping size (Figure 24) would be 5/8".

Figure 23
Refrigerant Line Sizing

Line Size Inches OD	Globe Valve Equivalent Ft	Angle Valve Equivalent Ft	Short Radius Elbow Equivalent Ft	Long Radius Elbow Equivalent Ft
1/2"	43	15	1 4	0 9
5/8"	55	18	1 6	1 0
7/8"	69	24	2 0	1 4
1 1/8"	87	29	2 7	1 9
1 3/8"	102	33	3 2	2 2
1 5/8"	115	34	3 8	2 6
2 1/8"	141	39	5 2	3 4
2 5/8"	159	44	6 5	4 2

Liquid Line Sizing

The liquid line should be sized as small as possible, while maintaining acceptable pressure drop, to minimize the refrigerant charge. The total length between components must not exceed 200 actual feet or 300 equivalent feet. See Figure 24 for sizing.

Liquid risers should not exceed 15 feet.

Horizontal runs do not require a pitch. Insulation is not required unless the line is installed in a high ambient area i.e. boiler room.

Install a liquid line charging valve to facilitate refrigerant charging. Refer to Figures 26 and 27 for charge determination.

Discharge Line Sizing

For horizontal runs, the discharge line should be pitched downward, in the direction of flow, at a rate of ½ inch for every 10 feet. This will allow oil to flow towards the condenser.

Discharge line sizing is based on the velocity required for sufficient oil return back to the compressor. Discharge line sizing is shown in Figure 25.

Figure 24
Liquid Line Sizing

30 – 65°F Leaving Water Temperature									
	Liquid Line Size (O.D.")								
Eqiv. FT	PSR-5	PSR-7.5	PSR-10	PSR-15	PSR-20	PSR-25	PSR-30	PSR-35	PSR-40
25	5/8	5/8	5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
50	5/8	5/8	5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
75	5/8	5/8	5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
100	5/8	5/8	5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
125	5/8	5/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8
150	5/8	5/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
175	5/8	5/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
200	5/8	5/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8
225	5/8	5/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8
250	5/8	5/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8
275	5/8	5/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8
300	5/8	5/8	7/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8

Figure 25
Discharge Line Sizing

30 – 65°F Leaving Water Temperature									
Discharge Line Size (O.D.")									
Eqiv. FT	PSR-5	PSR-7.5	PSR-10	PSR-15	PSR-20	PSR-25	PSR-30	PSR-35	PSR-40
25	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8
50	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8
75	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8
100	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8
125	7/8	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8
150	7/8	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8
175	1 1/8	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8
200	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8
225	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8
250	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8
275	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8
300	1 1/8	1 1/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8

Refrigerant Charge Determination

The approximate amount of refrigerant charge required by the system varies based upon the total length of the refrigerant lines and the size of the chiller. First refer to Figure 26 for the amount of charge based upon the model number of the chiller. Then add that to Figure 27, discharge and liquid line refrigerant charges, based upon line size and installed length of each. The final operating charge must be verified by running the system and checking the liquid line sight glass.

Figure 26
PSR Chiller + Condenser Charge

Chiller Model	Lbs. of R-22
PSR5	5 9
PSR7.5	6 1
PSR10	10 8
PSR15	12 6
PSR20	21 2
PSR25	24 2
PSR30	40.2
PSR35	41 2
PSR40	50 2

Figure 27
Field Installed Piping Charge

Pipe O.D. Inches	Discharge Line ① R-22(Lbs.)	Liquid Line ① R-22(Lbs.)
1/2"	-	7 2
5/8"	-	11 5
7/8"	1 6	24.0
1 1/8"	2.7	40 9
1 3/8"	4 0	62 2
1 5/8"	5 7	88.1
2 1/8"	10.0	153 0
2 5/8"	15.0	236 0

① Based on 100 feet of pipe, 100 °F Liquid, 100 °F Discharge

Oil Charge Determination

The PSR Series portable chillers are factory charged with the amount oil required without field-installed piping. Additional oil required is dependent upon the amount of additional refrigerant added.

Calculate the amount of additional oil required by using the following formula:

$$\text{Pints of oil (Sunisco 3GS)} = \frac{\text{Lbs. of R-22 added for field installed piping}}{100}$$

3-11 Checking Motor Direction

All PS chillers have their motor rotation(s) properly phased at the factory. If compressors, pumps, or fans are running in reverse rotation:

- Disconnect and lock out power at the source.
- Reverse any two power leads into the chiller disconnect switch to change motor direction (all motors have been phased in one direction at the factory).

Important!

Do not switch leads at the motors, motor starters, or contactors.

Three-Phase Compressors

Scroll compressors are directionally-dependent and compress in one rotational direction.

Reversing rotation direction results in an elevated sound level over the correct rotation; you'll also observe substantially-reduced current draw as compared with tabulated values.

Water Pumps

Correct pump rotation is indicated by a positive pressure of 20 to 40 psi (137.9 to 275.8 kPa/1.38 to 2.76 bars) on the pump pressure gauge. Pump rotation should be clockwise when viewed from the motor end.

Important!

Do not run pump dry, doing so will result in seal damage.

For PS Series portable chillers with an optional pump, check the appropriate pump curve in Figures 16 on Pages 45 to 46.

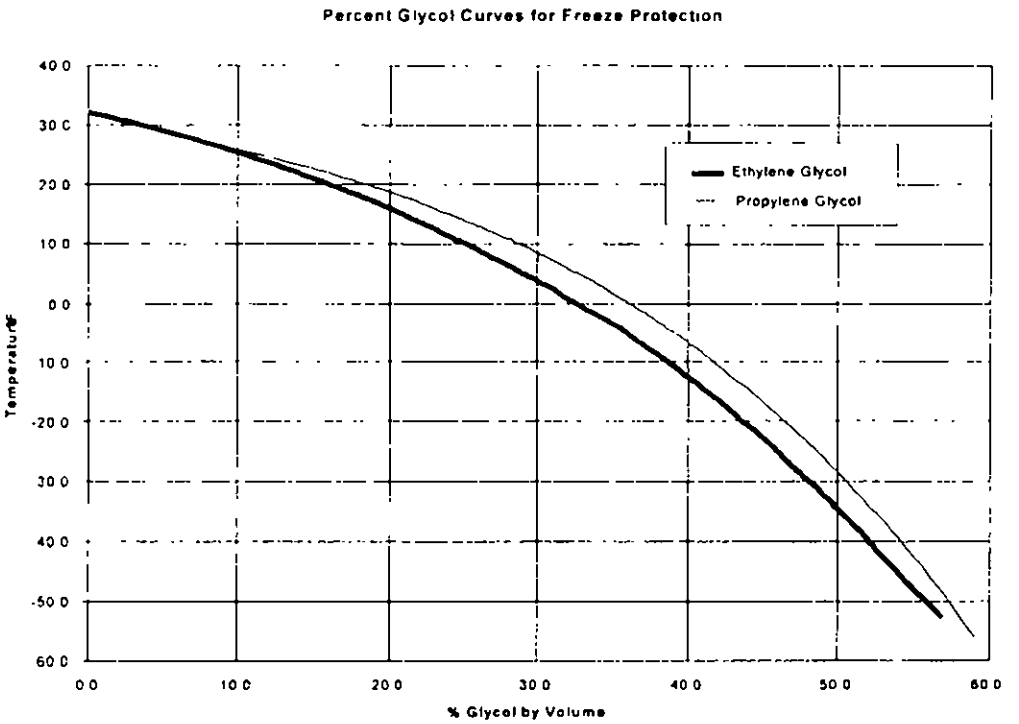
Condenser Fan

Air should be drawn through the condenser and discharged vertically from the chiller. See the following section.

3-12 Water Reservoir

All PS Series portable chillers shipped during the fall, winter, or spring, or those units that are shipped from stock, are flushed at the factory with a water/ethylene glycol solution to prevent piping components prone to retaining water from freezing. During startup and when additional solution is required, refer to the ethylene glycol and propylene glycol curves in Figure 28 below. Add a pre-mixed solution of industrial quality (not automotive) ethylene glycol or propylene glycol and water to provide freeze protection to a temperature 20°F (11°C) below the normal chiller operating temperature set point. *Note the AEC part number table on the following page*

Figure 28
Ethylene Glycol and Propylene Glycol Curves



Glycol and/or water, with an inhibitor, should be used to protect the materials (cooper, steel, stainless steel, and bronze) in the system from corrosion. If you intend to use straight water, **AEC strongly advises a minimum leaving water temperature of 50°F (10°C)** *or* contact the AEC, Inc. Service Department.

The following table lists available glycol products available from AEC, Inc.

Part no.	Description	Part no.	Description
A0541358	Ethylene glycol, 5 gallons (18 9 liters)	A0542990	Propylene glycol, 5 gallons (18 9 liters)
A0539637	Ethylene glycol, 55 gallons (208.2 liters)	A0542991	Propylene glycol, 55 gallons (208.2 liters)

⚠ CAUTION

Do not connect make-up water directly to the chilled water reservoir unless you have an approved automatic water make-up system installed.

See Section 3-13 on Page 61 for more information.

The reservoir is not designed to withstand water pressure. The fill opening and vent line must be vented to the atmosphere for proper operation. The optional automatic make-up system is described in Section 3-13 on Page 61.

⚠ CAUTION

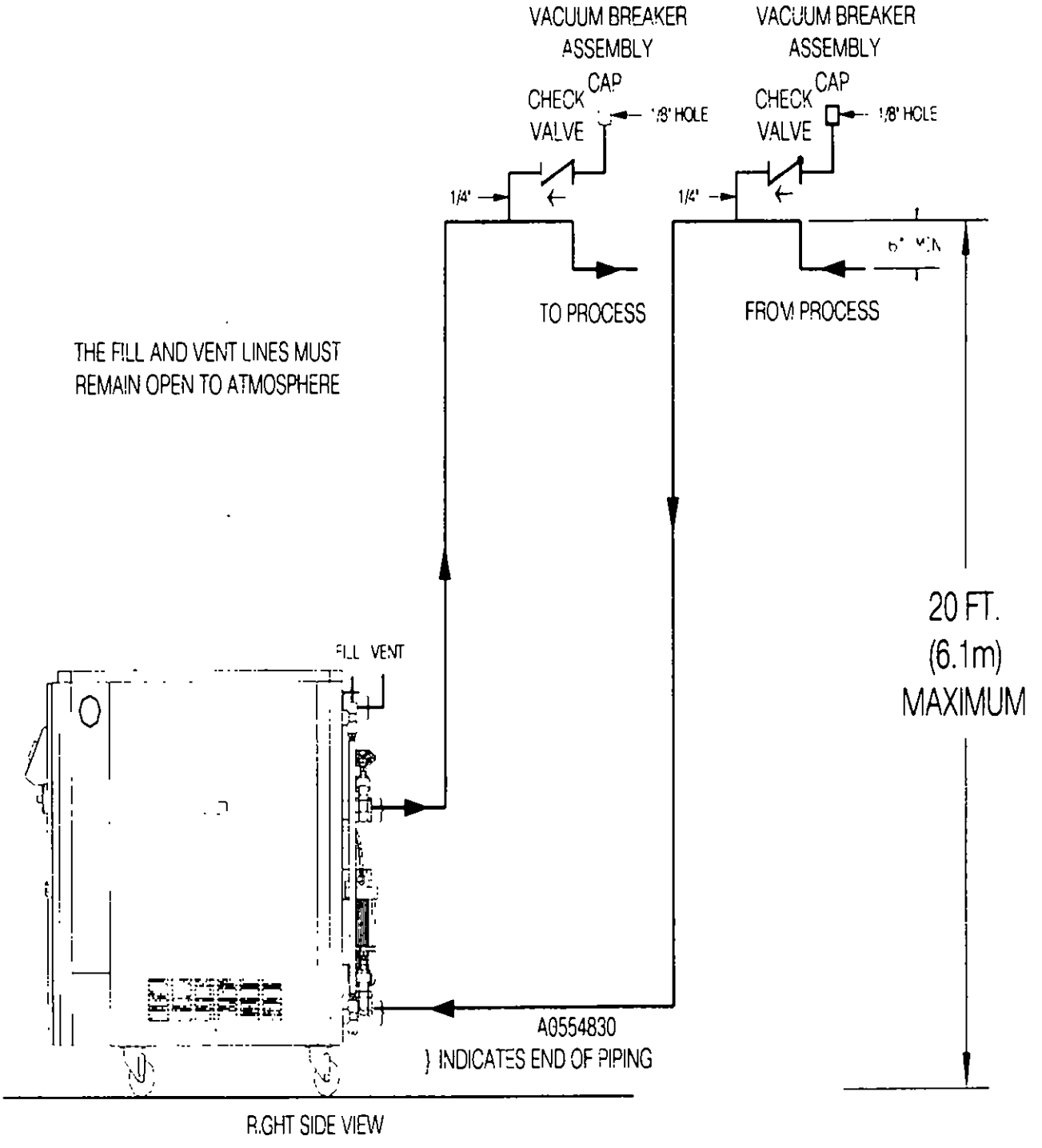
DO NOT PRESSURIZE TANK! FILL AND VENT LINES MUST BE OPEN TO ATMOSPHERE. SUPPLY AND RETURN CONNECTIONS MUST BE TRAPPED AND VENTED TO ALLOW VERTICAL RISERS TO DRAIN INTO TANK. DO NOT OVERFILL SYSTEM. ALLOW ENOUGH FREE SPACE IN TANK FOR VERTICAL PIPING TO DRAIN.

If your application has chilled water or process piping above the reservoir fill and vent level, Trap and vent the supply and return lines to allow vertical piping to drain into tank. See Figure 29.

Installation Note: In applications where the process or process piping is above the reservoir, take steps to prevent over pressurization of the reservoir.

This condition can occur on system shutdown when the water in the system drains into the reservoir. To prevent this, a vacuum breaker at the high point of the **TO PROCESS** and **FROM PROCESS** lines. See Figure 29 on the following page for more information.

Figure 29
Central and Gravity Return Piping with Standpipe



3-13 Automatic Water Make-up Option

The PS Series Chiller may be connected to an automatic make-up system if the optional package (float switch, pressure regulating, pipe fittings, solenoid valve and ½" NPT city water make-up connection) is factory installed.

Refer to Figures 30 to 32 on Pages 64 to 66 for the additional components necessary for this installation. ***Your piping must provide backflow protection and prevent over-pressurization of the reservoir.***

> **⚠ CAUTION**
>
> - **Prevent reservoir over-pressurization by setting the required pressure-regulating valve to limit make-up water pressure to less than 5 psi (34.5 kPa). The reservoir must remain vented to the atmosphere.**
> - **If the automatic make-up system is connected to a city water system, make provisions to prevent backflow contamination. Install an approved backflow preventer in accordance with local codes. See Figures 30 to 32 on Pages 64 to 66 for a suggested piping arrangement.**
> - **Adding straight city water into a glycol/water mixture dilutes the solution and eventually leads to system freeze-up. *Damage from freeze-up is not covered by the AEC, Inc. warranty!***

To prevent system freeze-up in automatic make-up applications, use a system to replenish glycol. AEC, Inc. suggests the following methods:

Chemical Feeder

Use a chemical feeder to meter glycol into the make-up water and to maintain the water/glycol mixture you want. Contact the AEC/ Application Engineering Sales Department for more information on this equipment.

Make-up Reservoir

You may mix a glycol/water solution in a tank and use it as a source of make-up fluid. Contact the Application Engineering Sales Department for more information on this piping configuration.

4 Sequence of Operation

4-1 Chilled Water Circuit

Cooling water **To Process** and **From Process** connections are made at the gate valves provided outside the unit. Warm coolant (water and glycol mixture) returns from the process and goes into the reservoir tank. The coolant is then pumped through the evaporator where it is cooled. The coolant flows to the process and returns to repeat the cycle.

A pressure-actuated process water bypass valve located between the supply line and reservoir tank (single pump models only) allows minimal flow through the unit during intermittent fluctuating flow conditions. *It is not intended to provide continuous full bypass flow.*

This minimal flow allows the temperature sensor to signal the controller to shut down the compressor because of the drop in process water temperature. Typically the flow switch shuts down the chiller in this low flow condition.

The 2 hp and 3½ models have a ¼" (6.4 mm) poly-tubing constant bypass to provide additional Process water bypass to prevent system freeze-up.

4-2 Refrigeration Circuit

PS Series portable chillers are available with air-, water-, or remote air-cooled refrigerant condensing. The refrigeration cycles differ only in the way the compressed gas is condensed to a liquid.

Liquid refrigerant from the condenser heat exchanger flowing in the liquid line passes through a shutoff valve (5 hp to 40 hp [3.73 kW to 29.83 kW] chillers **only**) into a filter/dryer that removes moisture and other contaminants. A refrigerant sight glass is provided. The refrigerant then passes through the thermal expansion valve which allows the refrigerant to expand (boil off), and cool the fluid inside of the evaporator. The refrigerant gas flows through the suction line back into the compressor.

The refrigerant is compressed in the compressor and flows through the discharge line as a gas to the condenser. There it gives up its heat as it condenses to a liquid in the condenser.

A hot gas bypass valve is used to control cooling capacity during intermittent or partial load conditions. This feature contributes substantially to chiller longevity by eliminating excessive cycling of the compressor and providing close temperature control.

Note the piping schematics on the following pages.

- Notes -

Figure 30
Typical Piping Schematic; 2 to 3½ hp Chillers

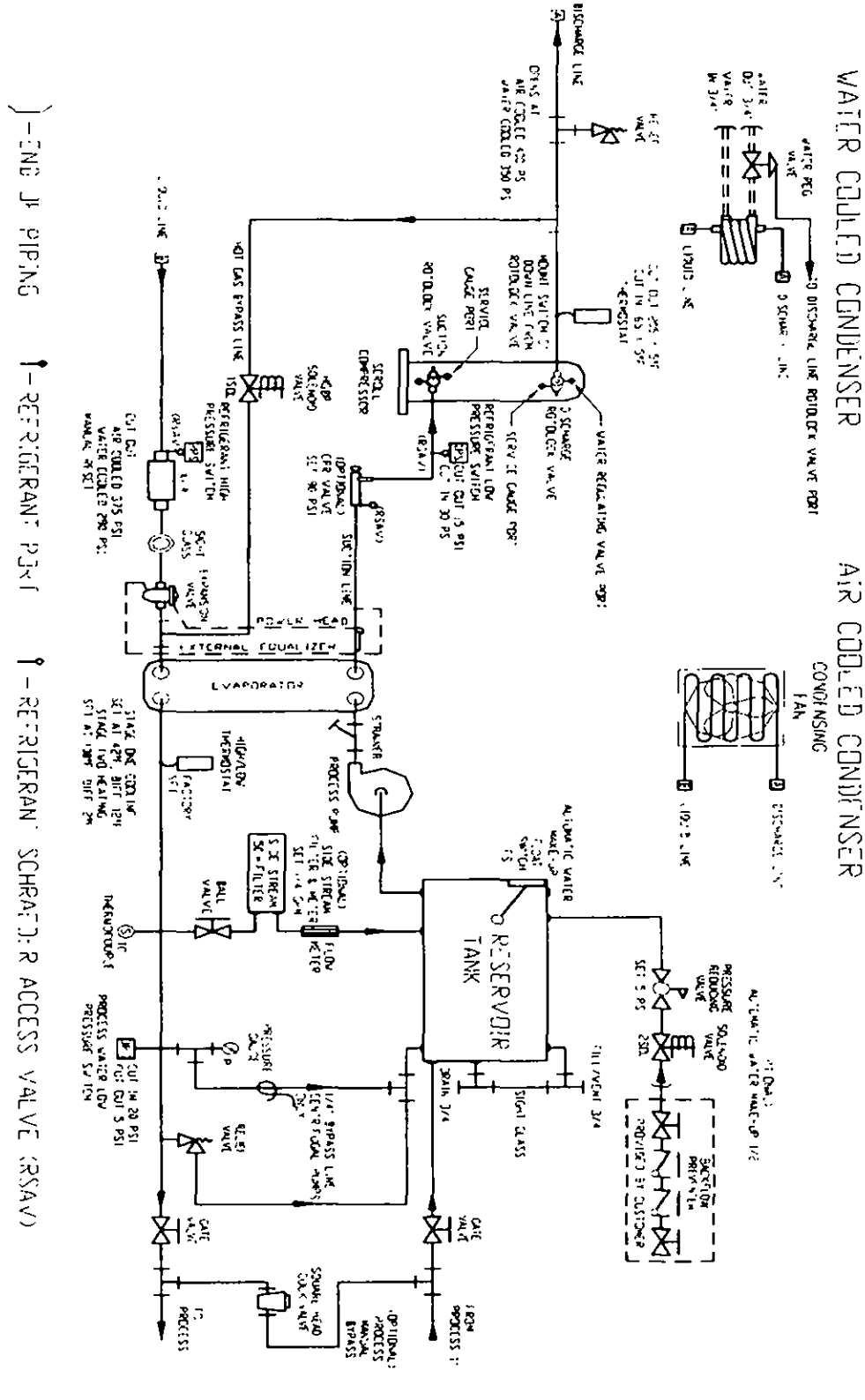


Figure 31
Typical Piping Schematic, One-Pump Chillers; 5 to 40 hp Models

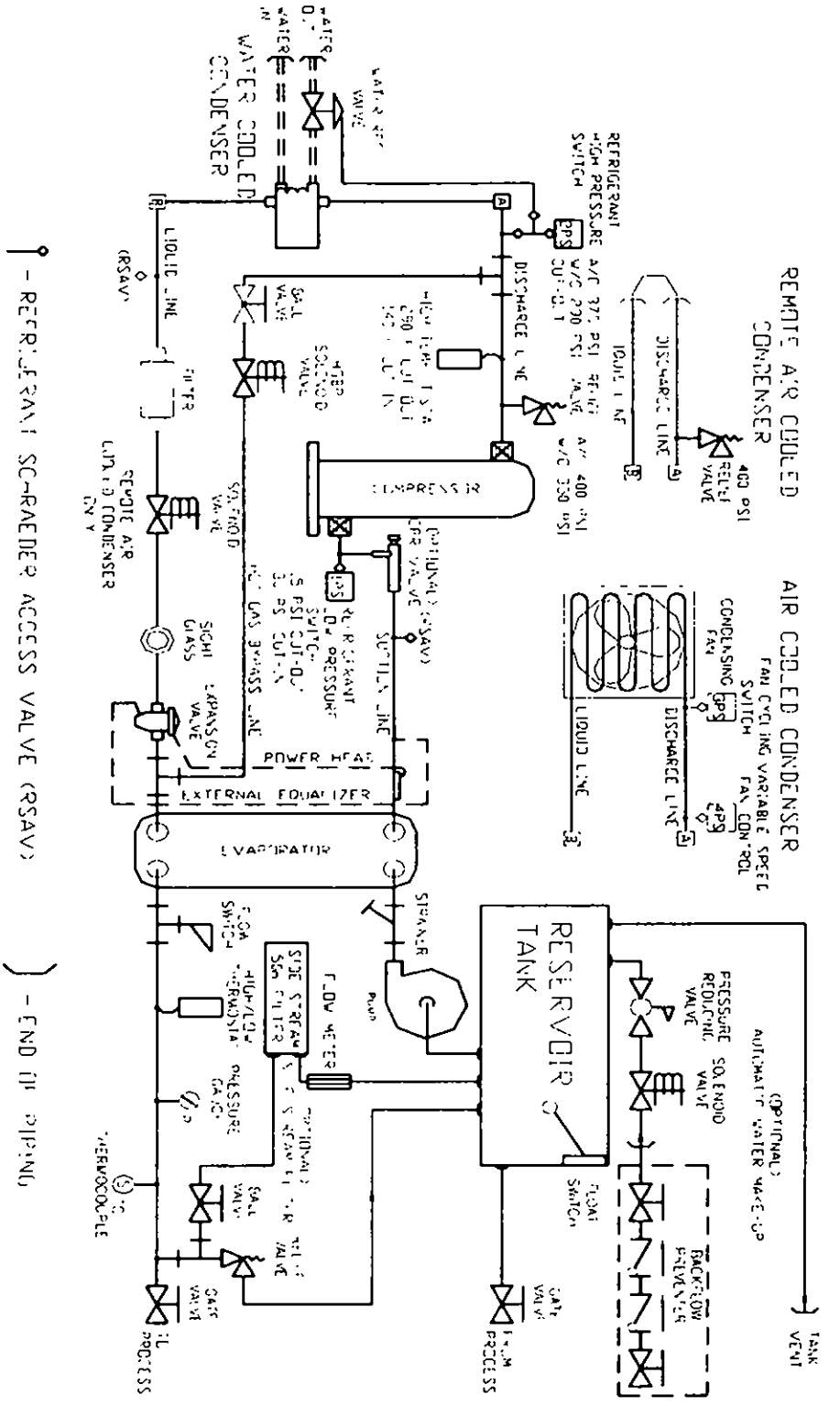


Figure 32
Typical Piping Schematic, Two-Pump Chillers; 5 to 40 hp Models

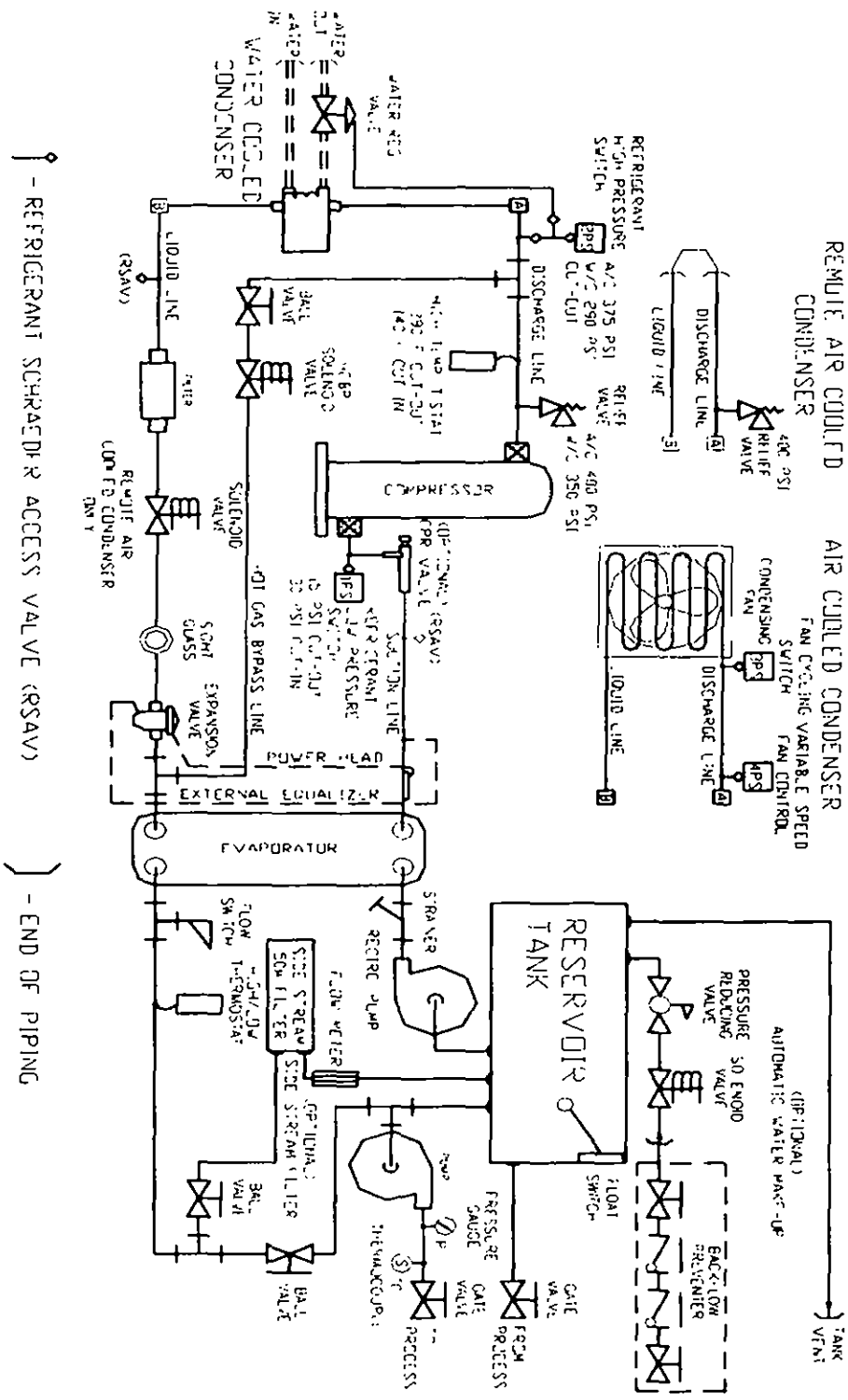


Figure 33
Typical Piping Schematic, No Pump Models; 5 to 40 hp Models

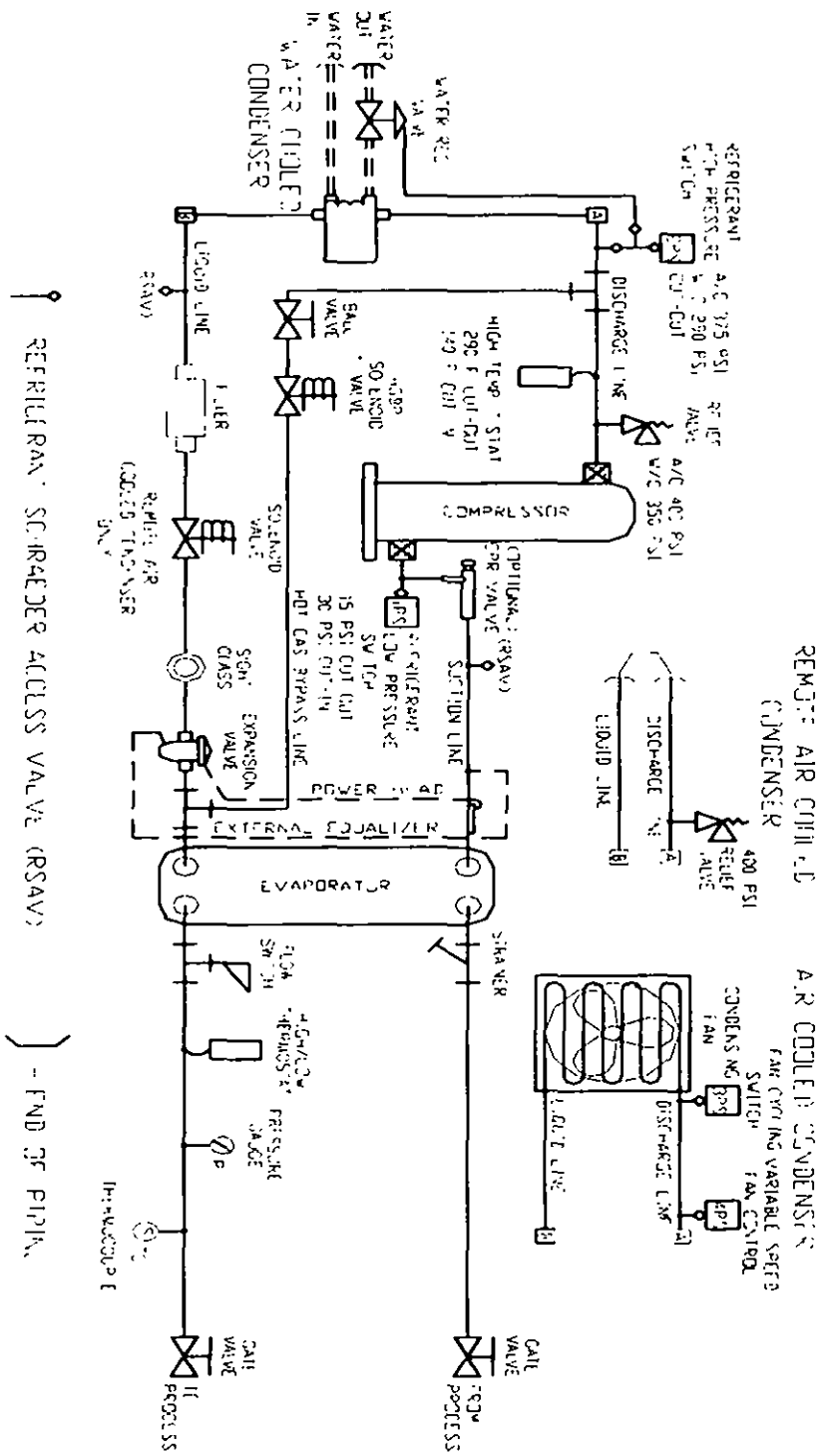
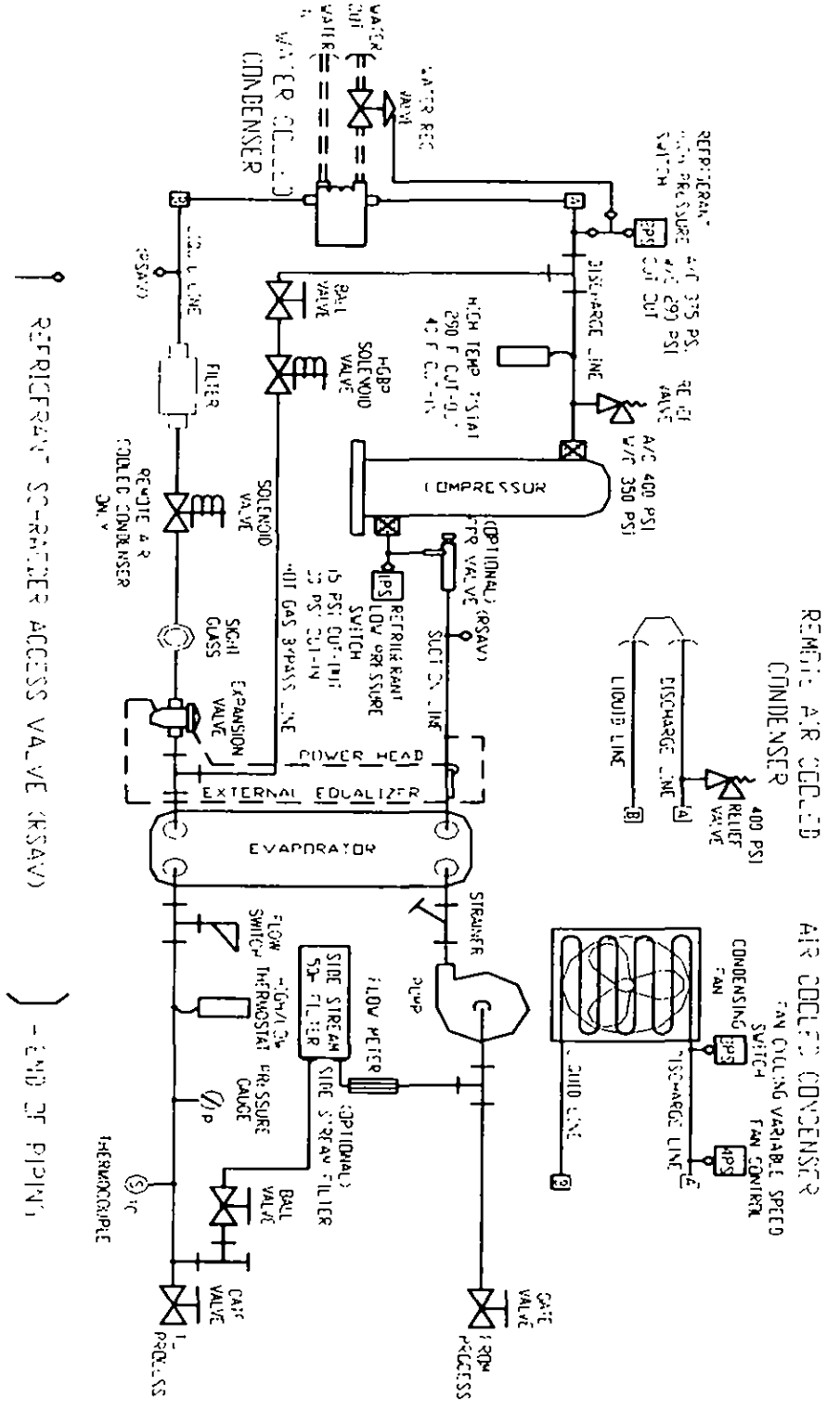


Figure 34
Typical Piping Schematic, No Tank Models; 5 to 40 hp Models



4-3 High/Low Thermostat Control

The *High/Low thermostat* is a cutout device that protects the chiller system in two ways. Stage one (1) of the thermostat shuts down the compressor if the chilled process water/glycol temperature approaches the particular mixture's freezing point. The chilled process water/glycol pump will continue to run.

Stage Two (2) of the High/Low thermostat shuts down the pump(s), therefore, the chiller shuts off, if the chilled process water/glycol temperature rises above the selected cutout point. This prevents possible damage to the complete process piping system due to overheating of components by the process water/glycol.

The High/Low thermostat stage one (1) cutout temperature is factory set at 42°F (5.5°C). This is correct for a supply water temperature of 50°F (10°C), the rated capacity operating temperature. If you want lower chilled water temperatures, mix process water with glycol to provide protection down to 20°F (11°C) below the operating To Process temperature you want. See Figure 16 on Page 53 for more information.

You can then reset the High/Low thermostat cutout temperature to a temperature 8°F (4.4°C) below the operating temperature you want. The thermostat stage two (2) cut-out temperature is factory set at 100°F (38°C). See Section 6-8 on Page 83 for more information.

⚠ CAUTION

Protect the system from freezing with glycol 20°F (11°C) below the leaving water temperature set point. Condensation may form inside the pump tank and dilute the mixture, therefore the freezing point should be verified periodically. See Figure 28 on page 58 for the correct mixture.

Set High/Low thermostat cut-out temperature 8°F (4.4°C) below the set point leaving water temperature.

Your AEC, Inc. product warranty *does not cover system freeze-ups!*

4-4 Crankcase Heater

PS Series models 5 through 40 portable chillers have a crankcase heater. It is wired through the control transformer that operates continuously whenever power is applied to the chiller.

> **⚠ CAUTION**
>
> **Energize the crankcase heater for at least 24 hours before initial startup to drive dissolved refrigerant from compressor oil.**
>
> ***Failure to do so will damage the compressor!***

4-5 High Pressure Cutout

This electro-mechanical cut-out device opens the compressor control circuit if the refrigeration system compressor discharge pressure exceeds **375 psi** (2,413.25 kPa/24.1 bars) **for an air-cooled chiller** and **290 psi** (2,413.25 kPa/24.1 bars) **for a water-cooled chiller**.

> **Important!**
>
> **The high-pressure cutout is a *manual reset device* typically mounted on the compressor discharge line inside the mechanical cabinet.**
>
> ***Call a refrigeration service technician to analyze the problem!***

4-6 Low Pressure Cutout

This electro-mechanical cut-out device opens the compressor control circuit if refrigeration system compressor suction pressure drops below 15 psi (220.6 kPa/2.2 bars). It automatically resets when refrigerant suction pressure reaches 30 psi (344.8 kPa/3.4 bars).

> **Important!**
>
> **The low pressure cutout is an *automatic reset device* typically mounted on the compressor suction line inside the mechanical cabinet.**
>
> ***Call a refrigeration service technician to analyze the problem!***

4-7 Oil Pressure Safety Switch

This mechanical cut-out device is installed on chillers built with semi-hermetic compressors that have oil pumps. A differential pressure switch monitors the difference between crankcase pressure and oil pump pressure.

If the pressure drops to an unsafe level for more than two (2) minutes, the switch opens the control wiring circuit, shutting off the compressor, turning the light on, but allows the pump(s) to continue running. This is a manual reset switch.

Important!

The oil pressure safety switch is a *manual reset device.*

Call a refrigeration service technician to analyze the problem and to reset the control.

4-8 Fan Cycling Switch

PSA Series Air-Cooled Models Only

PSA-5 and PSA-7.5 Models

These models have one fan. The fan cycling switch turns on the fan when the discharge pressure in the condenser reaches 300 psi (1,896.1 kPa/18.9 bars) and turns it off when the pressure drops below 190 psi (1,379.0 kPa/13.8 bars).

PSA10 to PSA30 Models

These models have two fans. One fan runs continuously every time the compressor operates. The second fan cycles based on the parameters listed in the above section.

The fan cycling switch turns on the second fan when the condenser pressure reaches 275 psi (1,896.1 kPa/18.9 bars) and turns it off when the pressure drops below 200 psi (1,379.0 kPa/13.8 bars).

4-9 Pressure Switch

PSA/PSW2 and 3.5 Models

The pressure switch cut-out device, mounted in the process piping, shuts down the chiller if it senses that the water/glycol pressure through the evaporator has dropped below an acceptable level. **The pressure switch opens the control circuit, shuts down the pump(s), and shuts off the chiller.**

4-10 Flow Switch

PSA/PSW/PSR5 to 40 Models

The flow switch cut-out device, mounted in the process piping, shuts down the chiller if senses that the water/glycol flow rate through the evaporator has dropped below an acceptable level. **The flow switch opens the control circuit shutting down the pump(s), and the chiller shuts off.**

4-11 Remote Start/Stop Interlock

An additional contact is provided to allow the remote starting or stopping of the PS Chiller from a remote location. To use this feature, remove the jumper between terminals **X1** and **1** and supply a switch or dry contact interlock connected in series between these two terminals. Refer to the schematic inside the control enclosure door, or typical schematic drawings in Figures 8 to 15 on Pages 36 to 43.

- Notes -

5 Startup Checklists

5-1 Introduction

Follow the check lists below for the start-up of your new chiller. These lists assume the installation information elsewhere in this manual has been read and followed. New chillers should be started up and checked by a qualified refrigeration service technician.

5-2 PS Series Chiller Startup Checklist

- ☑ Check the shipping papers against the serial tag to be sure chiller size, type and voltage is correct for the process that will be controlled. PSA chillers are built with a voltage specific compressor and cannot be re-wired for an alternate voltage.
- ☑ 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. Electrical connections must conform to all applicable codes.
- ☑ Complete chilled water To Process and From Process connections.
- ☑ The chilled water To and From process valves on the chiller must be open.
- ☑ Be sure the reservoir tank and chilled water circuit piping are filled to the full mark with a water/glycol mixture. The water/glycol mixture should provide for freeze protection to at least 20°F (11°C) below the leaving water temperature you want.

Important!

Do not run the system dry, doing so will result in pump seal damage.

- ☑ The air-cooled condenser should have an adequate supply of 60° to 95°F (16° to 35°C) air for proper operation.
- ☑ The tower or city water condenser cooling in and out connections should be completed and an adequate supply of 85°F (30°C) tower or 70°F (21°C) city water, at 25 psi pressure, for proper operation.

☑ Connect the main 3 phase incoming power to the unit making certain that line one (1) L1 is connected to the A phase, line two (2) L2 is connected to the B phase, and line three (3) L3 is connected to the C phase. Check for proper rotation direction of fan(s) and pump(s). Models PS-2 and 3 are single phase.

Scroll compressors are directional dependent, i.e., they will only compress in one rotational direction. See Section 3-10 on Page 52 for more information.

The crankcase heater is automatically energized when the main power is applied. It should be **ON** for at least 24 hours before startup to force dissolved refrigerant from the compressor oil.

☑ Check your work and proceed to Section 5-3 below.

5-3 Starting Up PS Series Chillers

1. Turn **ON** the chiller and put it under a process load.
2. Set the controller for the To Process temperature you want, using the **Up Arrow** button or the **Down Arrow** button located on the face of the controller.
3. Adjust the High/Low thermostat, located in the electrical enclosure, to 8°F (4.4°C) below the To Process temperature you want. The High/Low thermostat is factory-set at 42°F (6°C). See Section 6-8 on Page 80 for information on resetting the High/Low thermostat.
4. Check the pump amp draw and pump pressure. Make sure that the amp draw reading is within the running load and service factor amps.
5. Operate the chiller, looking for any leaks and listening for unusual noises or vibrations that could indicate improper operation.

Important!

Reverse rotation also results in an elevated sound level over correct rotation, as well as substantially reduced current draw compared to tabulated values.

After several minutes of operation, the compressor internal protector trips.

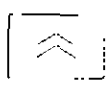
6-1 Introduction

Standard PS Series chillers use a microprocessor-based PID controller. The controller is a modular, self-contained unit that can slide from its mounting housing. It is factory set and adjusted; no field adjustment to the internal controls is necessary.

PSA • PSW • PSR Control Operation Range	
Standard models	30°F to 65°F (-1°C to 18°C)

6-2 Setting Process Water Temperature

To change the process water temperature set point:

- Press the  Up Arrow button to raise the set point.
- Press the  Down Arrow button to lower the set point.

6-3 LED Indicators

PV or Process Value Numeric LED

During normal operation, the large red **PV** LED on the controller displays the actual process temperature at the To Process thermocouple. It also lists parameter symbols during setup and error messages if an error occurs.

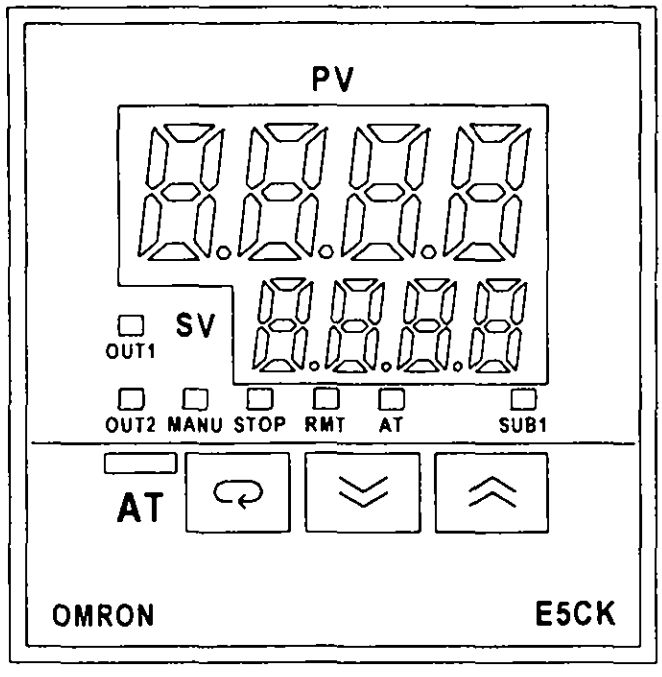
SV or Set Value Numeric LED

During normal operation, the green **SV** LED on the controller displays the process set point you want the chiller to maintain. It also displays parameter and pre-set function values during setup.

OUT1 LED

The orange **OUT1** LED lights when the **control output** energizes the hot-gas bypass solenoid valve.

Figure 35
Typical PS Series E5CK Microprocessor Controller



OUT2 LED

The orange **OUT2** energizes whenever the process temperature is two degrees (2°F/°C) or more above the To Process set point. The compressor then comes on and runs until the temperature at the To Process thermocouple is two degrees (2°F/°C) below the set point.

This +2°F/°C control set point is factory-set for proper compressor operation. Changing it is **not recommended** without consulting the AEC/Application Engineering Service Department.

MANU LED

The orange **MANU** LED does not light because it is not used.

STOP LED

The orange **STOP** LED does not light because it is not used.

RMT LED

The orange **RMT** LED is lit during remote operation.

AT LED

The orange **AT** LED flashes during auto-tuning.

SUB1 LED

The orange **SUB1** LED energizes whenever the process temperature is two degrees (2°F/°C) or more below the To Process set point. The compressor then shuts down by means of a latching circuit, and does not run again until the temperature at the To Process thermocouple is two degrees (2°F/°C) above the set point.

This +2°F/°C control set point is factory-set for proper compressor operation. Changing it is **not recommended** without consulting the AEC/Application Engineering Service Department.

6-4 Temperature Controller Keys

AT AT Key

Press and hold the **AT** key for two seconds to initiate *or* stop the auto-tune function.

Display Key

The functions of the **Display** key change, based on how long you press it. Press the **Display** key for less than one (1) second to scroll through parameters within the mode.

Press the **Display** key for at least one (1) second or more to display the menu; this function also lets you select the mode you need to adjust.

Important!

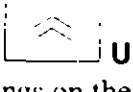
Do not change any of the control settings without consulting the AEC/Application Engineering Service Department.

The AEC, Inc. warranty does not cover chiller failures from tampering with controller settings!

Down Key

Each press of the  **Down Arrow** key decrements or reduces the values or settings on the **SV** display.

Up Key

Each press of the  **Up Arrow** key increments or advances the values or settings on the **SV** display.

6-5 Auto-Tuning PS Series Chillers

The Auto-Tune function lets you fine-tune the control PID to process requirements. Activate the Auto-Tune function whenever the process under control changes. Don't be alarmed by control response. It may take the process temperature above and below the set points as many as three (3) times. It will then level off and control to the process set point. **Auto tuning can take up to 45 minutes**, and is best done before any product is being run.

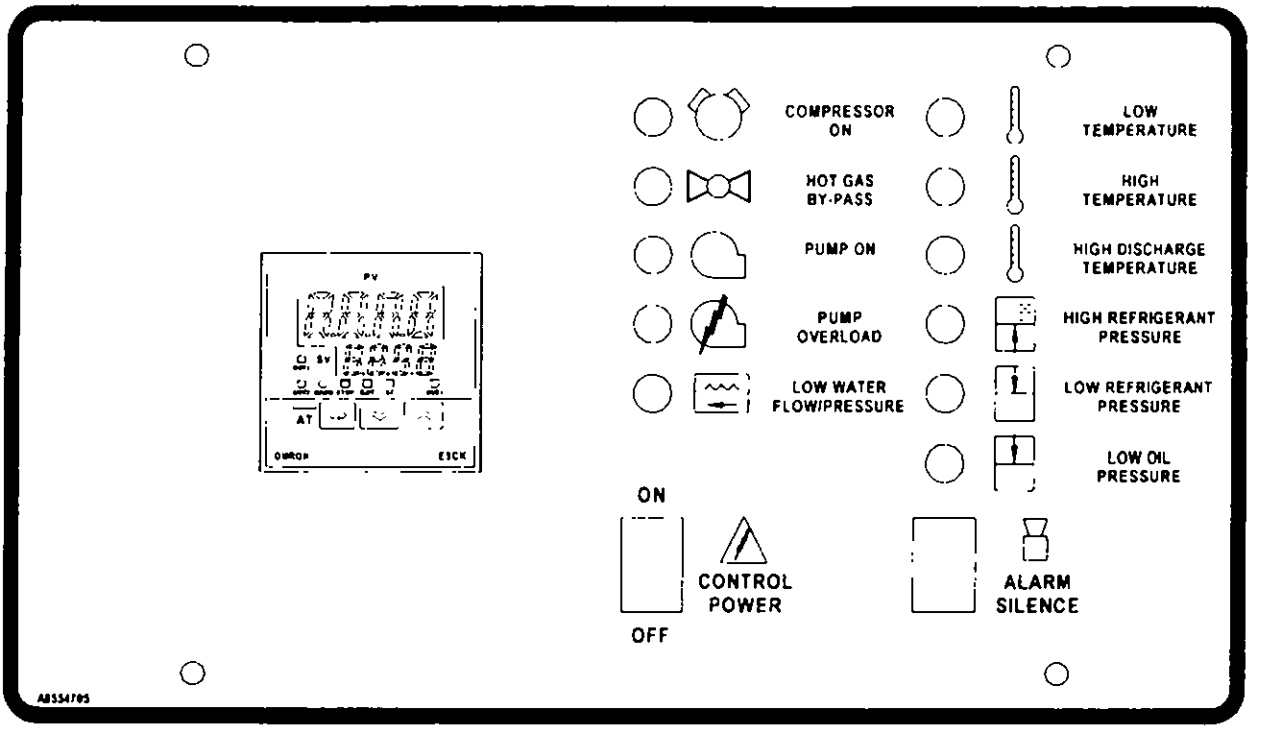
Important!

Factory default settings are: P = .3, I = 7, and D = 1

To auto-tune the controller:

- Press and hold down the **AT** **AT** key for several seconds until the **AT** indicator flashes.
- The **AT** LED flashes to indicate that the control is tuning itself. When the **AT** LED light stops flashing, the controller is tuned and ready for operation.

Figure 36
Typical PS Series Graphic Panel



6-6 Graphic Panel Indicators and Switches

Compressor On Light

The **Compressor On** light turns on whenever the compressor is operating.

Low Temperature Light

The **Low Temperature** light comes on if the process water/glycol temperature drops below the High/Low thermostat set point. The High/Low thermostat stage one (1) switch opens the control circuit shutting down the compressor, but the process water/glycol pump(s) continue to operate. This action prevents possible chiller evaporator freeze-up.

Important!

Your AEC, Inc. warranty does not cover damage from evaporator freeze-up.

Be sure there is enough glycol in the system and that the High/Low thermostat is set to the correct cutout temperature to prevent freeze-up!

Hot Gas By-Pass Light

The **Hot Gas By-Pass** light turns on when the hot gas bypass valve is in operation. The **OUT1 LED** on the controller also lights when the hot gas bypass valve is in operation.

High Temperature Light

The **High Temperature** light comes on if the process water/glycol temperature rises above the High/Low thermostat stage two (2) set point. The High/Low thermostat stage two (2) switch opens the control circuit shutting down the process water/glycol pump(s), and the chiller shuts off. This action prevents possible system failure from overheating of the process water/glycol.

Pump On Light

The **Pump On** light, installed on chillers with a pump, lights whenever the pump(s) operates.

High Discharge Temperature Light

The **High Discharge Temperature** light comes on if the compressor discharge line temperature switch opens. This switch prevents possible compressor failure due to over loading, the compressor stops, but the pump(s) continue to run. This occurs when the discharge line temperature rises above 260°F (127°C). ***Call a qualified refrigeration service technician or contact the AEC/Application Engineering Service Department.***

Pump Overload Light

The **Pump Overload** light, installed on chillers with a pump(s), lights whenever a pump motor(s) has shut down from a motor overload condition.

High Refrigerant Pressure Light

The **High Refrigerant Pressure** light comes on if the compressor discharge pressure exceeds the limit of the high pressure cut-out switch. The compressor stops but the pump(s) continue to run until you manually reset the high pressure cut-out switch. ***Call a qualified refrigeration service technician or contact the AEC/ Application Engineering Service Department.***

Low Water Flow/Pressure Light

The **Low Water Flow/Pressure** light comes on when the flow switch (pressure switch on PS2 & 3) senses that the water/glycol flow rate through the evaporator has dropped below an acceptable level. **The flow switch opens shutting down the pump(s) and the chiller.**

Low Refrigerant Pressure Light

The **Low Refrigerant Pressure** light come on if the compressor suction pressure drops below the limit of the low pressure cut-out switch. **The compressor shuts off, but the pump(s) continues to run.**

The indicator turns off and compressor restarts automatically when the refrigerant pressure raises to the limit of the low pressure cut-out switch. ***Call a qualified refrigeration service technician or contact the AEC/Application Engineering Service Department.***

Low Oil Pressure Light

The **Low Oil Pressure** light is installed on chillers with a semi-hermetic compressor that have an oil pump. A differential pressure switch monitors the difference between crankcase pressure and oil pump pressure.

If the pressure drops to an unsafe level for more than two (2) minutes the switch will open the control wiring circuit, shutting off the compressor, turning the light on, but allow the pump(s) to continue running. This is a manual reset switch. ***Call a qualified refrigeration service technician or the AEC/Application Engineering Service Department.***

Control Power Lighted Switch

The green, lighted sustained-on **Control Power Switch** lights whenever the switch is in the **ON** position and the control circuit is energized.

Alarm Silence Switch

The red momentary-on **Alarm Silence Switch** is used to turn off the audible alarm on chillers that are built with the audible or audible/visual alarm option. This switch is always provided and requires no additional wiring if either alarm option is installed at a later time.

6-7 Optional Communications

Standard Omron Protocol

The communications function allows you to monitor and set E5CK parameters by a program prepared and running on a host computer connected to the E5CK controller.

When using the communications function, you must add on the unit for RS-232C or RS-485 communications. The E5CK communications function allows you to read/write parameters, do operating instructions, and select the setting level.

6-8 Programming the Electronic High/Low Thermostat

Perform the following procedures to program the electronic High/Low thermostat control. It is located in the chiller enclosure, and has three (3) control keys and a one-line four-character LCD display.

Selecting Fahrenheit or Celsius

Step One (1)

To select Fahrenheit or Celsius temperatures:

- Press the SET **Set** key once to access Fahrenheit/Celsius mode.

  The screen displays the current status; F for degrees Fahrenheit or C for degrees Celsius.

Then:

- Press the ↑ **Up Arrow** key or the ↓ **Down Arrow** key to toggle between °F or °C modes.

Stage 1: Freeze Protection

Step Two (2)

- Press the SET **Set** key again to access the Stage 1 set point.

  The screen displays the current set point and the **S1** annunciator blinks on and off to indicate that the control is in Set Point mode.

Then:

- Press the ↑ **Up Arrow** key to increase the set point or the ↓ **Down Arrow** key to decrease the set point for the evaporator freeze protection temperature you selected.

  At 50°F (10°C) leaving water temperature, the setting should be 42°F (6°C).

Step Three (3)

- Press the SET **Set** key again to access Stage 1 differential.

  The screen displays the current differential and the **DIF 1** enunciator blinks on and off to indicate that the control is in Differential mode.

Then:

- Press the ↑ **Up Arrow** key increase the differential or the ↓ **Down Arrow** key to decrease the differential for the setting you want.

  The setting should be 12°F (6°C).

Step Four (4)

- Press the SET **Set** key again to access Stage 1 cooling or heating mode.

  The screen displays display the current mode; C1 for cooling or H1 for heating.

Then:

- Press the  **Up Arrow** key or the  **Down Arrow** key to toggle between C1 or H1 designations.

  The setting should be C1 for cooling.

Stage 2: High Temperature Protection

Step Five (5)

- Press the  **Set** key again to access the Stage 2 set point.

  The screen displays the current set point and the **S2** annunciator blinks on and off to indicate that the control is in Set Point mode.

Then:

- Press the  **Up Arrow** key to increase the set point or the  **Down Arrow** key to decrease the set point for the high temperature protection you selected.

  The setting should be 100°F (38°C).

Step Six (6)

- Press the  **Set** key again to access the Stage 2 differential.

  The screen displays the current differential and the **DIF 2** enunciator blinks on and off to indicate that the control is in Differential mode.

Then:

- Press the  **Up Arrow** key to increase the differential or the  **Down Arrow** key to decrease the differential for the setting you want.

  The setting should be 2°F (1°C).

Step Seven (7)

- Press the SET **Set** key again to access Stage 2 cooling or heating mode.

  The screen displays display the current mode; C2 for cooling or H2 for heating.

Then:

- Press the **Up Arrow** key or the **Down Arrow** key to toggle between C2 or H2 designations.

  The setting should be H2 for heating.

The thermostat automatically ends programming if no keys are pressed for a period of thirty (30) seconds. Any settings that have been entered into the control will be accepted at that point. All settings are retained in non-volatile memory.

The thermostat is provided with a lockout slide switch to prevent tampering by unauthorized personnel. **The switch is located on the inside cover of the thermostat.**

The keypad is disabled when the switch is moved to the left in the **LOCK** position, and no changes can be made to the settings. The keypad functions normally in the right-hand **UNLOCK** position. All chillers are shipped with the switch in the **LOCK** position.

- Notes -

7 Routine Maintenance

7-1 Lubrication

Quarterly

Grease all blower bearings, fan and blower motors, and pump motors that ***do not*** have ***permanently sealed bearings***. Remove the grease relief plug (motors only) before adding grease, add grease until a small amount pours out, and replace the plug when finished.

Important!

Failure in removing the grease relief plug will result in dislodging the bearing grease seal, eventually causing bearing failure!

Refrigeration compressors are hermetically sealed and no lubrication is required.

7-2 Filter Cleaning

PSA Series Air-Cooled Models

Air filter cleaning is important to keep your PS Series air cooled portable chiller operating at peak efficiency and capacity. Clean the filters whenever they appear dirty, or at regularly scheduled intervals.

To clean, **turn the chiller off**, slide the filter up off of the retaining pins holding it in place along its bottom, tip the bottom of the filter away from the chiller, and slide it down and out.

Wash down the filter with clean water (preferably with a garden hose), directing the flow of water opposite the direction of airflow. If dirt is heavy, use a *mild* detergent and **rinse well**. Allow the filter to **dry completely** *before* replacing it on the chiller.

Note: AEC recommends keeping a spare air filter set on hand. Install and use it while cleaning filter(s).

⚠ CAUTION

Do *not* use compressed air to blow off a dirty filter.

It will not clean very well, and *could be damaged!*

NEVER RUN THE CHILLER WITHOUT PROPERLY-INSTALLED FILTERS!

7-3 Maintaining the Condenser

Dirty condenser heat exchange surfaces reduce system capacity and efficiency.

PSA Series Air-Cooled and PSR Series Remote Air-Cooled Chillers

Brush or vacuum light dirt accumulations off the aluminum condenser fins. *Avoid bending or damaging them.* Heavy dirt accumulations on the fins may require professional cleaning.

PSW Series Water-Cooled Chillers

Proper water treatment will greatly reduce cleaning intervals.

Coaxial Condensers: 2 to 7.5 hp (1.49 to 5.59 kW)

Remove dirt and slime in the condenser tube water side by reverse-circulating with a mild detergent and water solution. Remove mineral deposits by reverse-circulating AEC Liquid Inhibited Acid De-Scaling Solution (AEC Part No. A0502600) through the water side of the condenser. **Follow the directions on the container.**

Shell & Tube Condensers: 10 to 40 hp (7.49 to 29.83 kW)

Remove dirt and slime in the condenser tube water side by cleaning with a nylon tube brush. Remove mineral deposits by reverse-circulating AEC Liquid Inhibited Acid De-Scaling Solution (AEC Part No. A0502600) through the tube water side of the condenser. **Follow the directions on the container.**

The refrigerant side is sealed and requires no routine maintenance.

Important!

Do *not* use steam or water over 140°F (60°C) to clean a condenser *unless you* are monitoring the refrigeration circuit for excessive pressure with gauges.

AEC, Inc. recommends that only a trained technician use this method!

7-4 Maintaining the Evaporator

Dirty evaporator heat exchange surfaces reduce system capacity and efficiency. Remove dirt and slime in the evaporator by reverse-circulating with a mild detergent and water solution.

Remove mineral deposits by reverse-circulating AEC Liquid Citric Acid De-Scaling Solution (AEC Part No. A0536607). **Follow the directions on the container.**

7-5 Evaporator Process Piping Y-Strainer

The process piping Y-strainer requires periodic cleaning of its screen to insure the proper flow through the evaporator. To clean the strainer screen remove the access plug and retaining cap, and pull out the screen.

Wipe, brush, or vacuum out any and all dirt left in the strainer body. Clean the screen and replace it in the strainer taking care to fit it squarely into the machined seat provided.

⚠ CAUTION

Do not forget to re-install the screen after cleaning it.

Operating the chiller with no strainer screen can potentially plug the evaporator with dirt.

The AEC, Inc. warranty does not cover chiller failures from a dirty evaporator!

7-6 Preventive Maintenance Service

Follow a systematic preventive maintenance program to help avoid costly down time. Call the AEC/Application Engineering Service Department to arrange a schedule of inspections. This service can be tailored to fit your maintenance requirements.

These inspections include, but are not limited to:

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

- Notes -

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 10% of nameplate rating.
	Defective on/off switch.	Replace.
	Control circuit fuse blown.	Replace control circuit fuse.
		Check transformer.
		Check for a short circuit.
	Defective control transformer.	Replace.
	Piping flow switch circuit open.	Add water or water/glycol solution as required.
	Pump motor off on overload.	Reset and test.
Pump runs; compressor does not.	High/Low thermostat set higher than temperature of liquid in system.	Lower thermostat stage 1 set to 10°F (6°C) below the leaving temperature you want.
	Defective High/Low thermostat.	Replace.
	Low refrigerant indicator on.	Check refrigerant charge.
	Refrigerant low pressure switch contacts open.	Sight glass should be clear and the moisture indicator should be green while compressor is running. Bubbles or foaming is normal when the hot-gas by-pass solenoid is energized. Call for service if bubbling is occurring and/or moisture indicator is yellow.
	Refrigerant high-pressure indicator on.	Clean the air filters.
		Check condenser fans for proper rotation.
		Check for dirty condenser.
		Reset and test.
	Fan motor out on overload.	Reset and test.
	Defective fan cycling control.	Replace.
	Defective fan motor.	Repair or replace.
	Compressor internal overload or fuses are open.	Allow time to cool and reset, then check for high/low volt-age. It must be within plus or minus 10% of the nameplate rating.
		Check for open fuses and loose compressor electrical connections.

Problem	Possible cause	Solution
Pump runs; compressor does not (cont'd.).	Compressor contactor holding coil open.	Repair or replace.
	Defective pump motor to compressor auxiliary contact.	Repair or replace.
	Broken wire in the compressor control circuit.	Locate and repair.
Pump runs, compressor cycles at short intervals.	Incorrect High/Low Thermostat setting.	Lower set point to 10°F (6°C) below desired leaving water temperature.
Water temperature is too high.	Water/glycol mixture inadequate for process.	Make sure that the water/glycol mixture protection is right for the process.
	Defective or improperly set High/Low thermostat.	Adjust or replace.
	Refrigerant low pressure switch is set too high.	Call service to adjust pressure control.
	Refrigerant charge is low.	Call service to find and repair the leak, then have refrigerant added.
Pump pressure low (refer to curves for normal pressure for various pumps).	Pump running in reverse.	Verify rotation; if running in reverse rotation, reverse any two main power leads. Re-verify for correct pump rotation.
	Check for foreign matter.	Clean the system.
Pump pressure is too high.	Restricted water flow.	Check for partially closed valves etc. Make sure that all lines are properly sized.
Unit runs continuously, but not enough cooling power.	Restricted condenser air.	Clean filters.
		Clean condenser.
	Unit low on refrigerant.	Check the refrigerant charge.
	Compressor not operating efficiently.	Call service.
	Unit under-sized for application.	Call sales rep.

Service Notes

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Application Engineering®

Parts Department

Call toll-free 7am–6pm CST [800] 423-3183 or call [630] 595-1060

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.

Service Department

Call toll-free 8am–5pm CST [800] 233-4819 or call [630] 595-1060

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

AEC/Application Engineering has a qualified service department ready to help. Service contracts are available for most AEC/Application Engineering products.

Sales Department

Call [630] 595-1060 Monday–Friday, 8am–5pm CST

AEC/Application Engineering products are sold by a world-wide network of independent sales representatives. Contact our Sales Department for the name of the sales representative nearest you.

Contract Department

Call [630] 595-1060 Monday–Friday, 8am–5pm CST

Let AEC/Application Engineering install your system. The Contract Department offers any or all of these services: project planning; system packages including drawings; equipment, labor, and construction materials; and union or non-union installations.

AEC, Inc.
801 AEC Drive
Wood Dale IL 60191-1198
[630] 595-1060 • Fax [630] 595-6641

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.

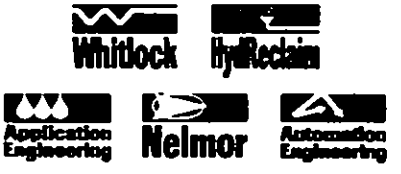
The Company is not liable for any incidental, consequential, or special damages or expenses. The Company's obligation for parts not furnished as components of its manufactured equipment is limited to the warranty of the manufacturers of said parts.

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.

801 AEC Drive • Wood Dale, Illinois 60191-1198 USA
Phone (630) 595-1060 • Fax (630) 595-6641
http://www.aecinternet.com



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