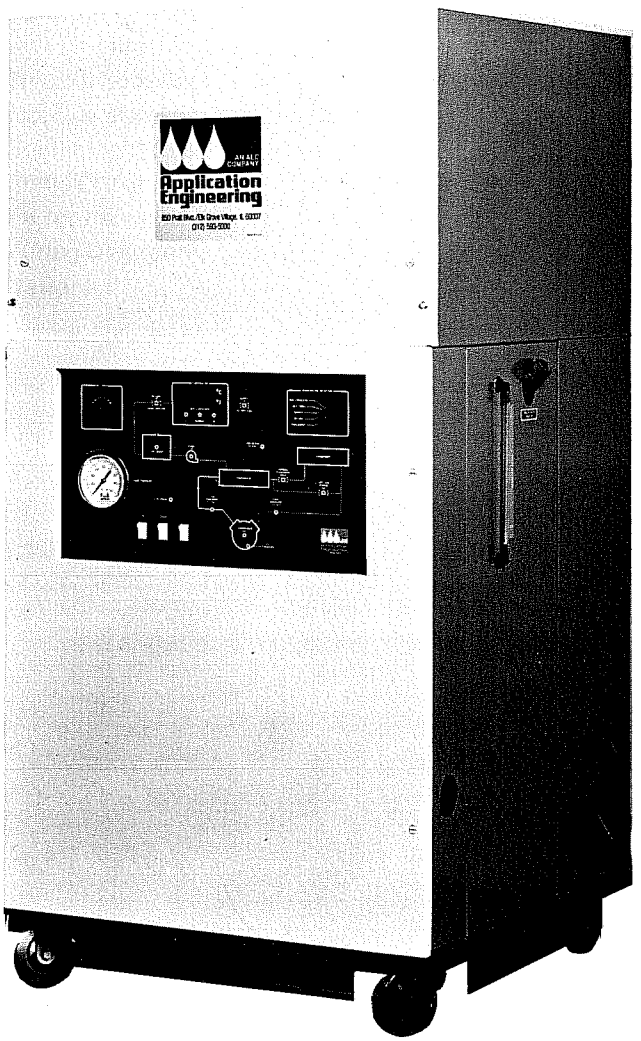
PORTABLE CHILLERS DIRECTOR SERIES

OPERATING AND INSTALLATION INSTRUCTIONS



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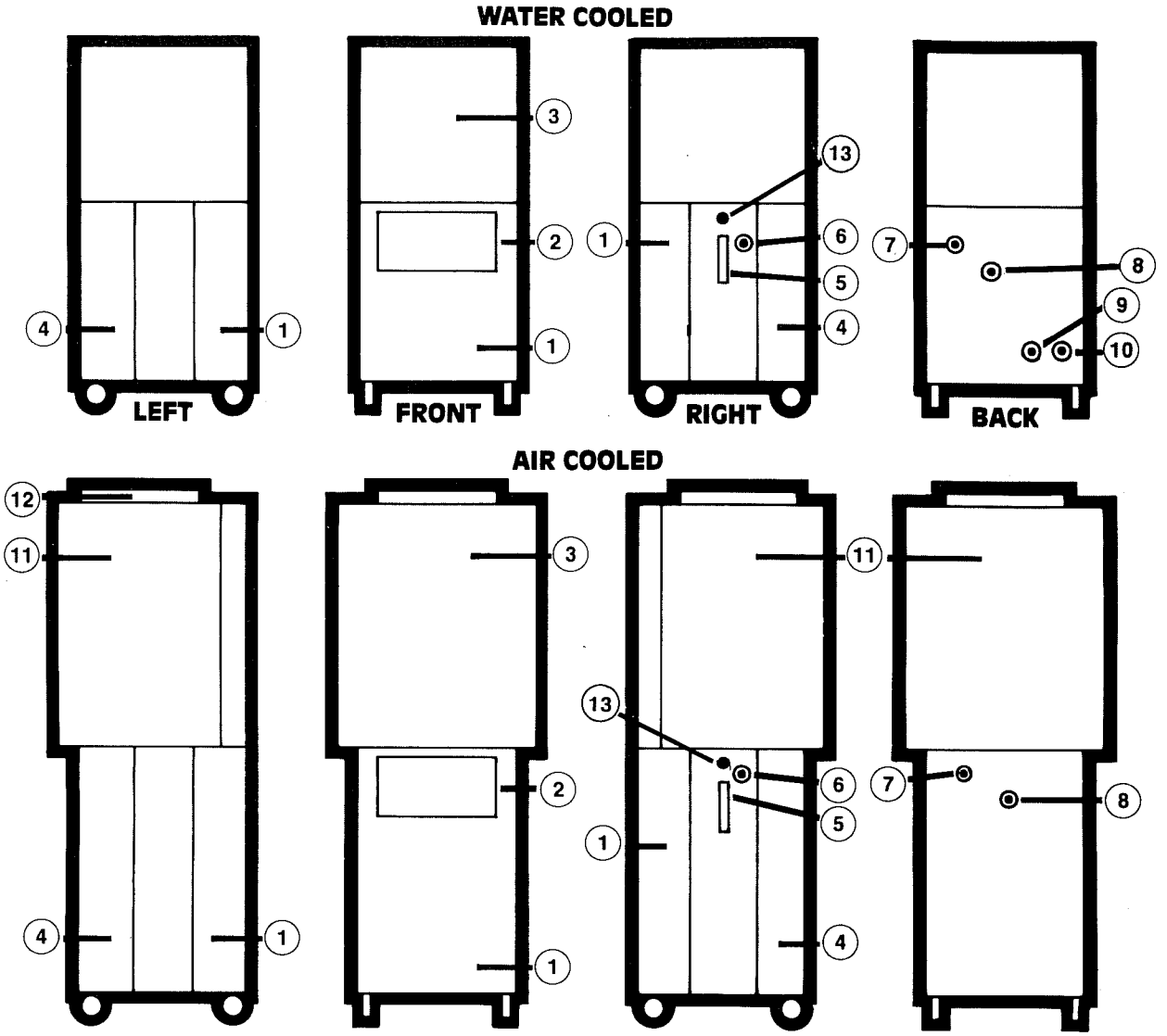

1. Control Box
2. Solid State Display
3. Compressor Access
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5. Hydrometer/Sight Glass
6. Fill
7. Chilled Water to Process
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9. Condenser Water Out
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13. Vent

Selections and Specifications

Model No.	Cooling Capacity (tons) ①	Chilled Water (gpm) ②	Standard Pump hp	Pipe Conn. Size (in)	Total Running Amps 230/3/60	Condenser City Water (gpm) ③	Condenser Tower Water (gpm) ③	Approx. Dimensions L x W x H (in)	Approx. Shipping Weight (lbs)
DSW-3	3.1	7	¾	2	16	4	9	35 x 30 x 62	1000
DSW-5	5.1	13	1½	2	25	6	16	35 x 30 x 62	1400
DSW-7½	8	19	1½	2	32	10	24	35 x 30 x 62	1600
DSA-3	2.6	6	¾	2	20	—	—	38 x 36 x 76	950
DSA-5	4.3	11	1½	2	30	—	—	38 x 36 x 76	1300
DSA-7½	6.5	16	1½	2	45	—	—	38 x 36 x 76	1950

① Based on 50°F chilled water supply temperature. Consult factory for other requirements.
② Flow rate based upon 2.4 gpm/ton at 25 PSI or higher. Alternate pump selections available, consult factory.
③ Requirement based on availability of 70°F city water or 85°F tower water at 25 PSI minimum. Consult factory for other conditions.

Model No.	Cooling Capacity (kcal/hr) ①	Chilled Water (m^3/min) ②	Standard Pump (kW)	Pipe Conn. Size (mm)	Total Running Amps 230/3/60	Condenser City Water (m^3/min) ③	Condenser Tower Water (m^3/min) ③	Approx. Dimensions L x W x H (mm)	Approx. Shipping Weight (kg)
DSW-3	9,300	0.026	.56	50.8	16	0.015	0.034	889x762x1575	454
DSW-5	15,400	0.049	1.12	50.8	25	0.023	0.061	889x762x1575	635
DSW-7½	24,200	0.072	1.12	50.8	32	0.038	0.091	889x762x1575	726
DSA-3	7,800	0.023	.56	50.8	20	—	—	965x914x1930	431
DSA-5	13,00	0.042	1.12	50.8	30	—	—	965x914x1930	589
DSA-7½	19,600	0.060	1.12	50.8	45	—	—	965x914x1930	884

① Based on 10°C chilled water supply temperature. Consult factory for other requirements.
② Flow rate based upon 3.004 x 10^{-6} m^3/min./kcal/hr per kW at 1.723 Bar or higher. Alternate pump selections available, consult factory.
③ Requirement based on availability of 21°C city water or 29°C tower water at 1.723 Bar minimum. Consult factory for other conditions.

AEC WATER CHILLER
Sequence of Operation

Chilled Water Circuit

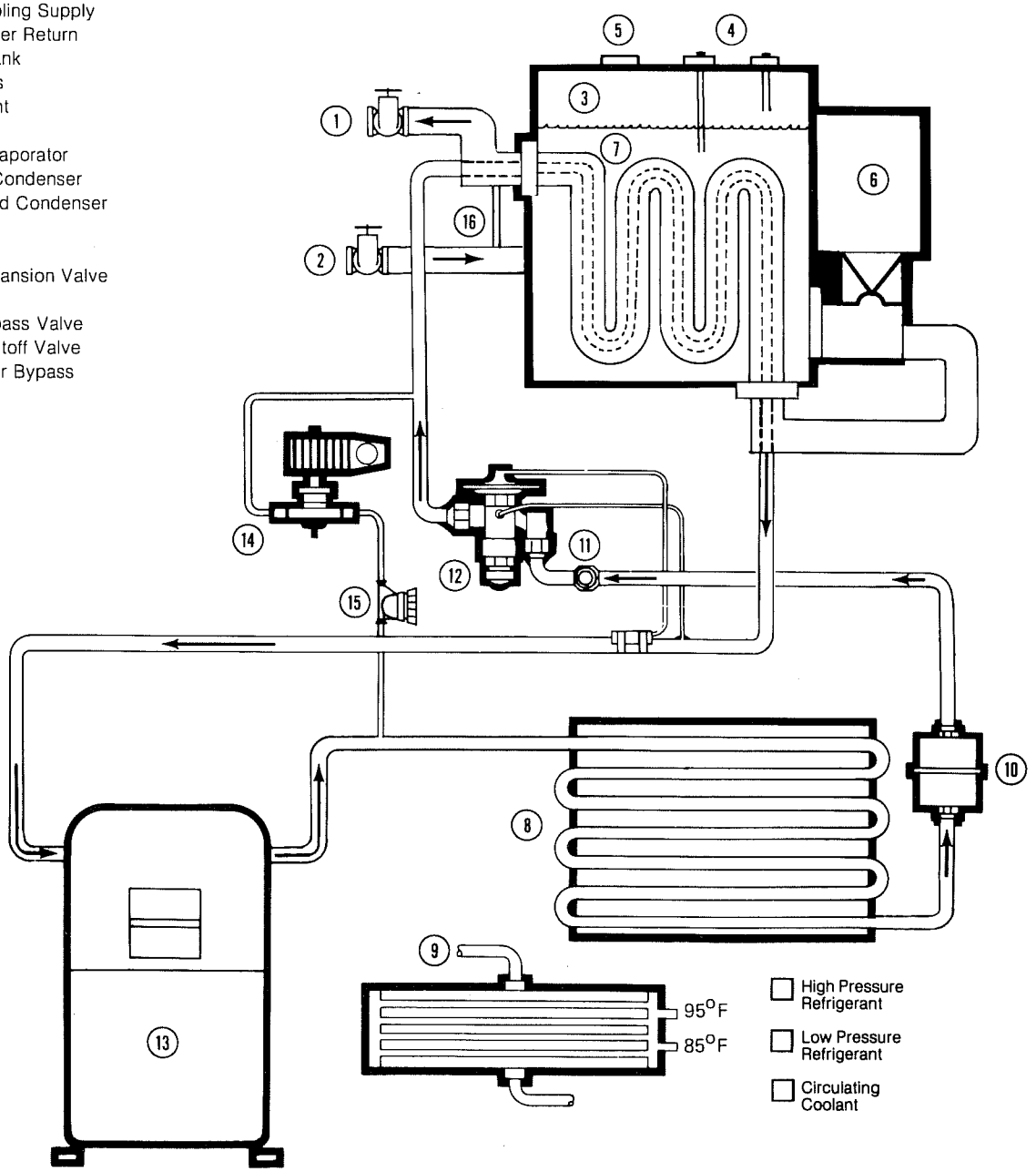
Process cooling supply (1) and return (2) connections are made at the gate valves provided in the unit. Warm coolant (water and ethylene glycol) returns from process, entering the reservoir tank (3) Coolant is then pumped by a centrifugal pump (6) through the Flexi-Vap evaporator (7) where it is cooled before returning to process. A chilled water bypass (16) between the supply line and return line guarantees a constant flow in the unit during intermittent fluctuating load conditions.

Refrigeration Circuit

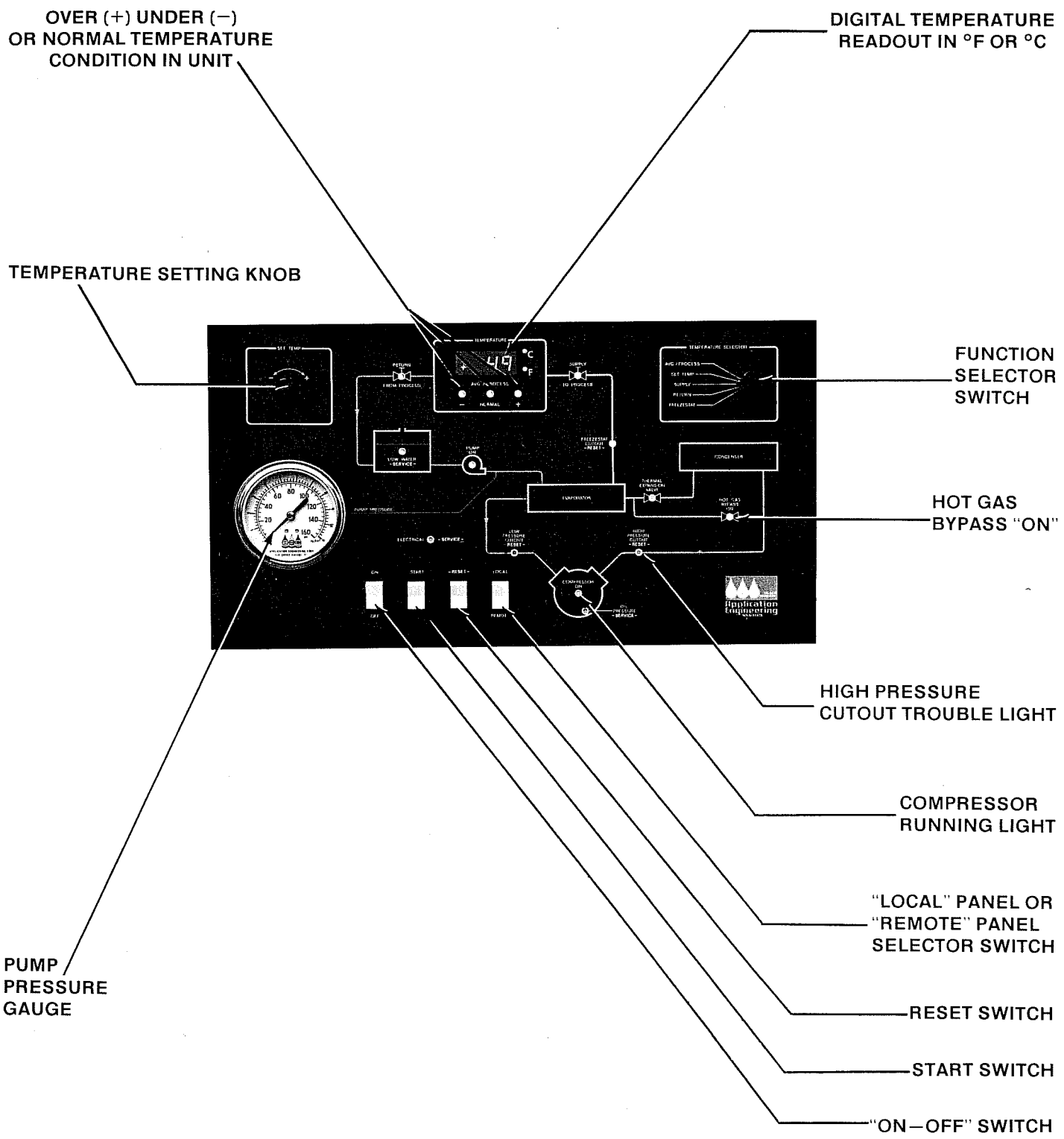
AEC Portable Water Chillers are available with either air (8) or water cooled (9) refrigerant condensing. The sequence of operation of the two types differ only in the method in which hot compressed freon gas from the compressor (13) is condensed to a cool liquid.

Liquid refrigerant from the air or water cooled condenser passes through a filter/dryer (10) which protects the system from water or other contaminants. The refrigerant then passes through the thermal expansion valve (12) where the refrigerant commences to expand and cool inside the Flexi-Vap evaporator (7). Here the refrigerant expands to its gaseous state and extracts process heat from the coolant. The expanded and heat laden refrigerant gas is then compressed by the compressor (13) before giving up its heat and recondensing to a liquid in either an air or water cooled condenser. To prevent excessive cooling and compressor off-on cycling, a hot gas bypass valve (14) is used to control the cooling capacity during intermittent or partial load conditions. This feature promotes longevity which eliminates cycling of the compressor and provides close temperature control.

1. Process Cooling Supply
2. Process Water Return
3. Reservoir Tank
4. Level Probes
5. Tank Fill/Vent
6. Pump
7. Flexi-Vap Evaporator
8. Air Cooled Condenser
9. Water Cooled Condenser
10. Filter/Dryer
11. Sight Glass
12. Thermal Expansion Valve
13. Compressor
14. Hot Gas Bypass Valve
15. Hot Gas Shutoff Valve
16. Chilled Water Bypass



DS CHILLER CONTROL PANEL



A. Checking the Shipment

1. Remove crate from base skid.
2. Examine the unit for shipping damage. Report damages to transportation agency at once. This is the responsibility of the consignee.
3. Check the nameplate to be sure power supply agrees with nameplate.
4. Your chiller was charged, tested, and operated before leaving the factory. It is ready to run after connections to proper services.

B. Preparing Unit for Operation

1. Check nameplate voltage and amperage. Bring properly sized power leads to fused disconnect. Use Fusetrons in the disconnect switch and size them according to recommendations listed on AEC drawing attached to the unit. Some units are furnished with a twistlock plug and receptacle together with 10 feet of power cord. Be certain that the unit is grounded through the (green) ground wire provided in the power cord before attempting to start. Voltage supplied to the unit must be within 10% of nameplate voltage.

2. There is a chilled water supply connection and a chilled water return connection on each unit. Chilled water supply or discharge means water from chiller to process. All external connections must be run full size to the process. The largest possible openings and passages should be provided for the flow of chilled water through platens, dies, or other pieces of equipment. It is extremely important to have a minimum pressure drop external to the unit. Each unit has a spring loaded by-pass valve which is factory set. This will allow a small quantity of water to flow through the chiller if the chilled water shutoff valves are inadvertently closed while the unit is running. The small flow of water will allow safety controls to remain effective.

3. There is a condenser water supply and condenser water discharge connection on the water cooled units. All external lines must be run full size. Water should be supplied at maximum 85°F (29°C) and a minimum of 25 psi (1.72 Bar). A water regulating valve is optional in the condenser water supply line. The water regulating valve is factory set and should not be changed except by a qualified refrigeration serviceman. Normal refrigerant condensing pressures with 85°F (27°C) water at 25 psi (1.72 Bar) being supplied to the condenser are 210 psi (15.86 Bar) with Refrigerant R-22. The type of refrigerant used is indicated on the nameplate.

4. The air cooled units do not require water for condensing and so do not have condenser water supply and discharge connections. Air cooled units should be located in a well ventilated area where there is free passage of air for condensing. The air cooled condenser and filter must be cleaned frequently. Failure to do this will result in reduced capacity and possible failure of the equipment. Normal maximum refrigerant condensing pressures with 95°F (35°C) air entering the condenser are 260 psi (17.92 Bar) with Refrigerant R-22. The type of refrigerant used is indicated on the nameplate.

5. Units are designed to operate at a minimum entering air temperature of approximately 60°F (15.5°C), operation of the equipment at a lower temperature than 60°F (15.5°C) can cause low pressure cutout of the compressor due to the low refrigerant pressure. Therefore, it is recommended that the ambient temperature be maintained at 60°F (15.5°C) or above.

6. After all water and power connections have been made to the unit, fill the chilled water reservoir through the fill opening on the top of the unit. (The unit is shipped with the reservoir approximately half full of a solution containing 70% water and 30% antifreeze.) Whenever additional solution is required, refer to ethylene glycol curve on page 19 of the O & I Manual. Add a premixed solution of ethylene glycol and water strong enough to provide freeze protection to a temperature 20°F (11.1°C) lower than your desired leaving water temperature. We recommend a chemically inhibited permanent type antifreeze. After the chilled water reservoir has been filled, the unit is ready to run. All compressors will run properly in either direction. It is necessary to check pump rotation. For standard pumps correct pump rotation will be indicated by a positive pressure of 20 to 30 psi (1.38 to 2.07 Bar) on the control panel pump pressure gauge. (For oversized pumps check appropriate pump curve page 18.) All condenser air fans draw through the condensers. Units with three-phase fan motors will have to be checked for correct rotation. Access to the selection and adjustment switches is achieved by removing 6 hex buttonhead screws which secure the solid state control panel, and tilting the top forward to allow operation of the slide switch selectors.

   a. Temperature Indication Selection — the °F/°C slide switch S5 is located along the top center of the printed circuit board. Moving the slide switch to the left selects °F, and to the right °C, in addition, the selected mode is displayed on the front panel when the unit is energized.

   b. Temperature Control Mode Selection — the AVG-PRO/SUPPLY switch S6 is located along the top edge of the printed circuit board directly above the Temperature Selector switch. This switch is normally in the (right) SUPPLY position which causes the control to maintain the leaving water to the process at the SET TEMP. This is the optimum position when multiple loads are supplied from the chiller. In some applications however a one load per chiller exists. Under these conditions the AVG-PRO/SUPPLY switch may be place in the AVG-PRO position which will cause the chiller to control the average temperature of the leaving and returning water. This control action in effect acts as though a probe is inserted into

the middle of the process and will tend to compensate for low flow or other conditions which would produce higher than normal differential process temperatures.

c. Freezestat Temperature Adjustment — After the initial switch set-ups are made, turn on the ON/OFF switch and rotate the TEMPERATURE SELECTOR switch to the FREEZESTAT position. Read the freezestat cutout temperature on the TEMPERATURE display. This is factory set to +40°F (+4.4°C) which is correct for a supply water temperature of +50°F (+10.0°C) - the design capacity operating temperature. If lower operating temperatures are desired, an antifreeze solution (see chart page 19 of O & I Manual) must be mixed with the process circulating water which will protect to a minimum of 20°F (11.1°C) below the desired operating temperature. Set the freezestat cutout point 10°F (5.6°C) below the desired operating temperature by turning the adjustment screw of the FZST potentiometer located at the top right rear edge of the printed circuit board until the TEMPERATURE display indicates the proper temperature. Do not set freezestat less than 10°F (5.6°C) above water freezing temperature or damage will result to the unit which is not covered by warranty protection.

7. Do not connect makeup water directly to chilled water reservoir. Reservoir is not able to withstand any water pressure. Fill opening must be vented to atmosphere for proper operation. On systems with piping above the reservoir level, install standpipe to a point 1'0" (304.8 mm) above the highest point in the system.

8. Control Panel Description

SWITCHES

a. ON/OFF — This switch controls the 110v AC source to all electrical control circuits except for the crankcase heater which is directly wired to the 110v AC secondary of the control power transformer. NOTE: In systems with the remote control option the local ON/OFF switch is the master switch and has priority over the remote control. The local ON/OFF switch must be ON in order for the remote ON/OFF to function.

b. START — This momentary action switch causes the unit to start provided the unit is first turned ON, the LOCAL/REMOTE switch is in the proper position, all operating safety controls are normal, and sufficient water is in the reservoir tank.

c. RESET — This momentary action switch resets the cutout safety controls i.e. LOW PRESSURE CUTOUT—RESET—, HIGH PRESSURE CUTOUT—RESET—, FREEZESTAT CUTOUT—RESET—. This reset action is "Trip-Free" which means as long as the unsafe condition exists the —RESET— switch cannot defeat the safety control and will not reset the unit. In systems with the remote control option or the shutdown alarm option, the —RESET— switch must be operated twice to effect a reset action. The first actuation silences the audible alarm and acknowledges the visual alarm from flashing to steady-on. The second actuation provides the reset action.

d. LOCAL/REMOTE — This switch selects the operating station which has control over the system. In the LOCAL position the controls on the chiller are operational. In the REMOTE position the controls on the remote control panel are operational. The control functions transferred from LOCAL to REMOTE are: ON/OFF, START, SET TEMP.

e. TEMPERATURE SELECTOR — This switch determines the temperature being displayed on the digital indicator. On the local panel five positions are provided i.e.

AVG/PROCESS This is the average temperature of the supply and return water and is the equivalent of having a single remote temperature probe in the middle of the process. It may be selected as the controlled temperature by behind the panel switch option. (See Section 6b.)

SET TEMP — This is the control point temperature.

SUPPLY — This is the water temperature at the discharge of the evaporator. It may be selected as the controlled temperature by behind the panel switch option. (See Section 6b.)

RETURN — This is the water temperature at the inlet to the evaporator.

FREEZESTAT — This is the supply water temperature cutout setting which will shut down the compressor.

CONTROLS

a. SET TEMP — This control adjusts the control point temperature and is a blind set control i.e. the TEMPERATURE SELECTOR switch must be in the SET TEMP position in order to have the digital display indicate the setting of this control.

GRAPHICS

The control panel utilizes a multi-colored graphic display to depict the functioning elements of the system. The graphics are also backlighted with light emitting diode indicator lamps which show the operating condition of the chiller system. These indicators and their functions are:

a. LOW WATER —SERVICE— Indicates that the water level in the reservoir is insufficient for safe operation of the circulating pump and service is required.

b. ELECTRICAL —SERVICE— Indicates the unit is disabled because of an electrical problem. A motor controller failed to energize within 2 seconds after the command was given. This is probably due to an over load tripped, loose wire, etc. or other electrical problem requiring the attention of a qualified electrician for service.

c. OIL PRESSURE —SERVICE— Indicates the unit is disabled because of an oil pressure problem and a qualified refrigeration repairman should be called for service.

d. LOW PRESSURE CUTOUT —RESET— Indicates the unit has shut down because of a low refrigeration pressure on the suction side of the compressor. This is a front panel reset control indicator which will require a refrigeration serviceman to effect repairs if repeated reset actions are required by the operator.

e. HIGH PRESSURE CUTOUT —RESET— Indicates the unit has shut down because of high refrigeration pressure in the system. This could be caused by too much hot water being introduced into the process loop, incorrect valving on the condensing water supply, too warm condensing water or air, or clogged air filters, etc. This is a front panel reset control indicator which will permit operator reset action once the corrective action has been taken. NOTE: Resetting more than two times indicates a refrigeration serviceman should be called for repairs. If reset more than two times the high pressure relief valve may rupture causing a loss of refrigerant in the system.

f. FREEZESTAT CUTOUT —RESET— Indicates the supply water has been cooled below a preset limit and the compressor has been turned off. The water circulating pump will continue to operate. This is caused by improper SET TEMP adjustment. This is a front panel reset control indicator which will permit operator reset action once the water temperature has risen 2°F (1.1°C) above the cutout temperature. Make proper SET TEMP adjustments, add ethylene glycol to the unit before adjusting freezestat setting (See Section 6c.) RESET and START unit. (The freezestat control is set by a behind the panel adjustment).

g. PUMP ON Indicates the pump starter is energized supplying power to the pump motor.

h. COMPRESSOR ON Indicates the compressor starter is energized supplying power to the compressor motor.

i. HOT GAS BY-PASS ON Indicates an electrically operated solenoid valve is energized causing an additional heat load to be added to the evaporator to maintain proper water temperature control. This indicator should normally be flashing on and off for some period of time within a 10 second time period. The flashing indication shows the load on the chiller to be within the machine control capacity.

j. AVG/PROCESS — Indicates the controlled circulating water temperature is more than 3°F (1.6°C) below the SET TEMP valve.

k. AVG/PROCESS NORMAL Indicates the controlled circulating water temperature is within plus or minus 3°F (1.6°C) of the SET TEMP valve.

l. AVG/PROCESS + Indicates the controlled circulating water temperature is more than 3°F (1.6°C) above the SET TEMP valve.

m. °C The lighting of the degree circle symbol adjacent to the letter C indicates the TEMPERATURE indicator is in Celsius Degrees. This is selected by a behind the panel switch option (See Section 6a.)

n. °F ,The lighting of the degree circle symbol adjacent to the letter F indicates the TEMPERATURE indicator is in Fahrenheit Degrees. This is selected by a behind the panel switch option (See Section 6a.)

o. The graphic display of the circulating fluid media are color coded as follows:

Light Blue — Warm Returning Water

Dark Blue — Cool Supply Water

Dark Red — High Pressure Refrigeration Gas

Light Red — High Pressure Refrigeration Liquid

Orange — Low Pressure Refrigeration Gas

p. PRESSURE INDICATOR The pump water pressure is displayed on the front panel by means of a pressure gauge.

This section covers the trouble shooting of the AEC Solid State Chiller. In general, Application Engineering Corporation does not recommend that trouble shooting be done on the printed circuit board itself. The problem should be isolated to one of the mechanical components or to the printed circuit board. If the board is faulty, a new board should be installed and the old board returned to AEC for repair. The solid state control system has a series of trouble lights on the panel to indicate the area of equipment malfunction. Correct these mechanical malfunctions prior to investigating the solid state printed circuit board for malfunction.

TROUBLE SHOOTING

CONDITION	ITEM	CAUSE	CORRECTION
I. High negative supply temperature reading on digital display (greater than −100°F), unit does not run, freezestat light on, "−" light on.	1	Loose wire on thermocouple probe on terminal block #5 (TB-5) on printed circuit board.	Reconnect wire and operate restart and reset switches.
	2	Defective probe. (Check by replacing probe wires by jumper wires across terminals #2 to terminal #3 on terminal block #5 (TB-5) on printed circuit board. You should read approximately ambient temperature on the digital readout when this is done.)	Replace probe and operate reset and restart switches.
	3	Loose ground wire from evaporator to terminal block 5 (TB-5) terminals 1 or 6.	Reconnect loose ground wire and operate reset and restart switches.
	4	Defective printed circuit board. (Make above checks first).	Replace printed circuit board and operate reset and restart switches.
II. High negative return temperature reading on digital display (greater than −100°F). Unit not running.	1	Loose wire on thermocouple probe on terminal block #5 (TB-5) on printed circuit board.	Reconnect wire and operate reset and restart switches.
	2	Defective Probe. (Check by replacing probe by a jumper wire across terminals 4 & 5 on terminal block #5 (TB-5). You should read approximately ambient temperature on the digital readout).	Replace probe and operate reset and restart switches.
	3	Loose ground wire from evaporator to terminal block 5 (TB-5) terminals 1 or 6.	Reconnect loose ground wire and operate reset and restart switches.
	4	Defective printed circuit board. (Make above checks first).	Replace printed circuit board and operate reset and restart switches.
III. High negative process temperature reading on digital display (greater than ±100°F). Unit is not operating and "−" or "+" light "on".	1	Check the supply and return temperature return settings. If either the supply or the return temperatures give a high negative temperature reading, repair as in Condition I or Condition II.	Repair as in Condition I or Condition II. Operate reset and restart switches.
	2	If the supply and return temperatures are correct and the process temperature reading still gives a high negative reading, the printed circuit board is defective.	Replace printed circuit board. Operate reset and restart switches.
IV. Unit will not run — low water level light is "on".	1	Check liquid level in reservoir.	Fill reservoir. Operate reset and restart switches.
	2	Disconnected probe in either the probes themselves or at the printed circuit board.	Reconnect probes. Operate reset and restart switches.
	3	Printed circuit board is defective.	Replace printed circuit board. Operate reset and restart switches.

CONDITION	ITEM	CAUSE	CORRECTION
V. Unit will not run — freezestat light "on".	1	Temperature setting is set too close to the freezestat setting.	Check the anti-freeze level and reset freezestat to 10°F below the desired temperature setting (see Section 6C of this O & 1 Manual). Operate reset and restart switches.
	2	"Supply" thermocouple probe (See Condition I).	Correct as is indicated under Condition I.
	3	Printed circuit board is defective.	Change printed circuit board. Operate reset and restart switches.
	4	**Restricted water flow causing freeze control to shut down compressor.**	Install bypass connections across supply and return line to provide adequate flow through chiller.
VI. Unit will not run. High pressure cutout light is "on".	1	A nuisance trip.	When pressure returns to normal, operate reset and restart switch. Do not operate reset and restart switch more than twice. Call a qualified serviceman if operated more than twice.
	2	A loose wire (unit will not reset).	Reconnect wire. Operate reset and restart switch.
	3	Defective high pressure cutout switch. (Unit will not reset).	Replace high pressure cutout switch. Operate reset and restart switches.
	4	Defective circuit board (Unit will not reset and all of above checks are correct).	Replace defective printed circuit board and operate reset and restart switches.
	5	Refrigerant high pressure cut out switch continuously opens. Unit resets after cooling.	Air Cooled Condensers A. Clean air filters (if so equipped). B. Check condenser fan for rotation. C. Check for dirty condenser. D. Check for condenser air obstruction. Water Colled Condensers A. **Check water supply to condenser. Water lines must run full size to condenser. Water is to be supplied at 25 PSI** (1.72 Bar) and 75°F (23.8°C). Units. piped into cooling tower systems should have condenser connections made for high water temperature operation. B. Check water regulating valve setting. Setting should maintain 105°F (40.5°C) condensing temperature. C. Check for fouled or scaled condenser. D. Check for contaminants in refrigerant.
VII. Unit will not run. Low pressure cutout light is "ON".	1	A nuisance trip.	When pressure returns to normal, operate reset and restart switch. Do not operate reset and restart switch more than twice. Call a qualified serviceman if necessary to operate switch more than twice.
	2	A loose wire (unit will not reset). (Unit will not reset).	Reconnect wire. Operate reset and reset and restart switch.
	4	Refrigerant low pressure switch set too high.	Call serviceman - Adjust pressure control to 5°F (-15°C) cut out and 40°F (4.4°C) cut in.
	5	Refrigerant charge low.	Find and repair leak - Add gas.

CONDITION	ITEM	CAUSE	CORRECTION
VIII. Unit will not operate — oil pressure light is "ON"	1	Loose wire (Unit will not restart after resetting oil pressure control on the oil pressure control and operating reset and restart switches on panel.	Reconnect wire to terminal block 3 (TB-3) terminal #1 and terminal block 3 (TB-3) terminal #8 check connections at oil pressure switch and operate reset and restart buttons.
	2	Defective pressure switch (unit wll not restart after resetting oil pressure con- trol on the control and operating reset and resart switches on the panel).	Replace the control and operate rset and restart switches on the unit.
	3	Low oil pressure.	Call qualified serviceman.
	4	Defective printed circuit board. (Items 1, 2, and 3 check O.K.)	Replace printed circuit board. Operate reset and restart switches.
IX. Unit not running. Electrical service light is "ON".	1	An overload tripped on any one of the contactors.	Reset overload, operate reset and restart switches on unit.
	2	Loose wire preventing contactor operation.	Check all power wiring in control panel and all wiring to printed circuit board. Operate reset and restart switches on the unit.
	3	Bad coil on the contactor.	Replace coil and operate reset and restart switches.
	4	Loss of phase on power supply to the unit.	Correct power supply to the unit. Reset overloads and operate reset and restart switches on the unit.
X. Pump Pressure low (refer to curves for normal pressure for various pumps).	1	Pump running in reverse.	Check rotation. Reverse (2) motor leads.
	2	Check for foreign matter.	Clean.
XI. Pump pressure too high.	1	Restricted water flow.	Check for partially closed valves, etc. Be sure all lines are proper size.
XII. Unit runs continously not enough cooling.	1	Restricted condenser air.	Clean condenser/filter.
	2	Unit low on refrigerant.	Check refrigerant charge. Call serviceman.
	3	Inefficient compressor.	Call service company for compressor check.
	4	Possible rerigerant circuit trouble.	Call local service company.
	5	Unit undersized for load.	Call Sales Representative.
	6	Dirty condenser.	See section II - item 10.
XIII. Chilled water anti-freeze solution leaves system through fill opening. NOTE: Do not plug vent opening on top of reservoir. Do not connect city water or other lines to reservoir.	1	May happen when chilled water lines are higher than unit.	Install open standpipe to a point higher than the highest system point.
	2	Normal reaction when anti-foam additive is not used.	Consult anti-freeze manufacturer for proper additive. If non available, drain system and use 50-50 Water-Anti-freeze solution, which contains anti-foam solution.
	3	Air trapped in lines creating a back pressure.	Vent all lines and fixtures.
	4	Air entering system from unknown source.	Rare. Pump seal may leak, drawing air into system. Check seal - replace.

ROUTINE MAINTENANCE CHECKLIST

Lubrication: (Every Three Months)

Grease all fan bearings, fan motors, and pump motors that do not have permanently sealed bearings: Remove grease relief plug (motors only) before adding grease. Failure to do so may result in dislodging the bearing grease retainer which will eventually cause bearing failure.
Compressors are hermetically sealed and no oiling is required. Compressors with cast iron bodies have an oil level sight glass on the side of the crankcase. Normal oil level is half way up in the glass while the compressor is running. If oil level stays abnormally low, call in a trained refrigeration serviceman to check it.

Filters:

Air filters should be cleaned as often as they become dirty. Ordinary dirt and dust are best removed by hosing the filter with clear water. If the filter cannot be cleaned with water alone then a mild detergent may be used. Be certain to flush all soap from the filter before replacing it on the unit.

Condensers:

Fouled condenser heat exchange surfaces will cause a serious reduction in system capacity. They should be cleaned as follows:

1. Air Cooled: If dirt accumulation is light and on the surface of the coil, it may be removed by brushing and/or vacuuming. Care should be taken not to bend or damage the fins.
2. Water Cooled: Dirt in the condenser tubes should be removed with a nylon tube brush.

Mineral deposits (calcium, etc.) can be removed by circulating AEC liquid descaling solution through the water side of the condenser.

Antifreeze:

Periodically check hydrometer/sight glass on the side of the chiller to insure that the chilled water/glycol solution is providing freeze protection to at least 20°F (11.1°C) below the lowest expected operating temperature of the chiller. Refer to Freezing Point Curve (page 19) for required glycol concentrations.

Preventative Maintenance Service:

A planned program of scheduled inspections at regular intervals is the best deterrent to machine breakdown. Such an arrangement can be worked out through your local AEC service representative.