User Guide

VL Series, 0.25 to 1.5 ton models

Portable Chillers

Installation

Maintenance

Operation

Troubleshooting

CONAIR™

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UGH020/0301

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

Please record your equipment's model and serial number(s) and the date you received it in the spaces provided.

It's a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints and parts lists together for documentation of your equipment.

Date:
Manual Number: UGH020/0301
Serial number(s):
Model number(s):

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TABLE OF CONTENTS

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1.0 GENERAL

1.1 UNIT LOCATION
1.2 EFFICIENCY
1.3 SAFETY
1.4 CLEAN AIR ACT
1.5 MISCELLANEOUS

1.1 UNIT LOCATION

A. The unit is designed for indoor use only. For most efficient operation, locate the chiller in a clean, dry and well ventilated environment.

B. The unit has an air-cooled refrigerant condenser. For air-cooled condensers, a motor driven fan generates air flow through the condenser to remove heat from the refrigerant system. The air-cooled condenser on the unit will discharge a maximum of 15,000 BTUs per hour per ton of cooling.

C. The unit must have a minimum entering air temperature of 60°F and a maximum entering air temperature of 95°F for efficient operation.

D. The unit must have a minimum of two feet clearance at the air intake and six feet at the exhaust air discharge.

E. If the operator has any questions concerning the location and operation of the unit, contact the **Conair** service department at 800-458-1960.

1.2 EFFICIENCY

A. Long term efficiency of operation is largely determined by proper maintenance of the mechanical parts of the unit and the water quality. **Conair** recommends filtering where required to prevent solids from plugging critical parts (pumps, heaters, seals for example). **Conair** highly recommends the services of a competent water treatment specialist be obtained and his recommendations followed. **Conair** accepts no responsibility for inefficient operation, or damage caused by foreign materials or failure to use adequate water treatment.

1.3 SAFETY

A. It is important to become thoroughly familiar with this manual and the operating characteristics of the unit.

B. It is the owner's responsibility to assure proper operator training, installation, operation, and maintenance of the unit.

C. Observe all warning and safety placards applied to the unit. Failure to observe all warnings can result in serious injury or death to the operator and sever mechanical damage to the unit.

1.4 CLEAN AIR ACT

A. The unit contains HCFC-22 (chlorodifloromethane). This is a class 2 substance.

B. Please be aware that effective July 1, 1992, it is unlawful for any person in the course of maintaining, servicing, repairing, or disposing of refrigeration equipment to knowingly vent or otherwise dispose of any class 2 substance used as a refrigerant in the manner which permits such substance to enter the environment.

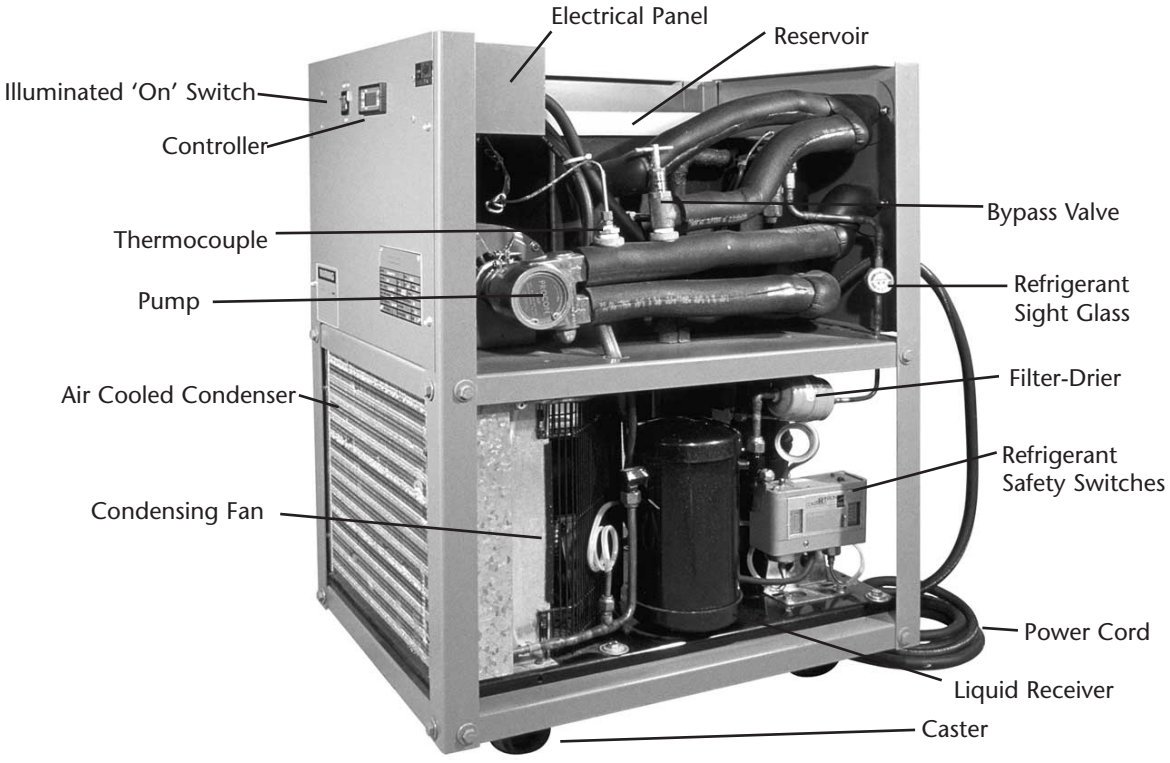
C. De minimis releases associated with good faith attempts to recapture, reclaim, or recycle such substance shall not be subject to the prohibition set forth in the preceding paragraph.

1.5 MISCELLANEOUS

A. The purpose of the unit is to circulate temperature stabilized fluid through your process, resulting in process temperature control.

B. The ability of the **unit** to maintain process temperature control is significantly affected by the method of installation.

C. If the operator has any questions concerning the location and operation of the **unit**, please contact the **Conair** service at 800-458-1960 or 814-437-6861



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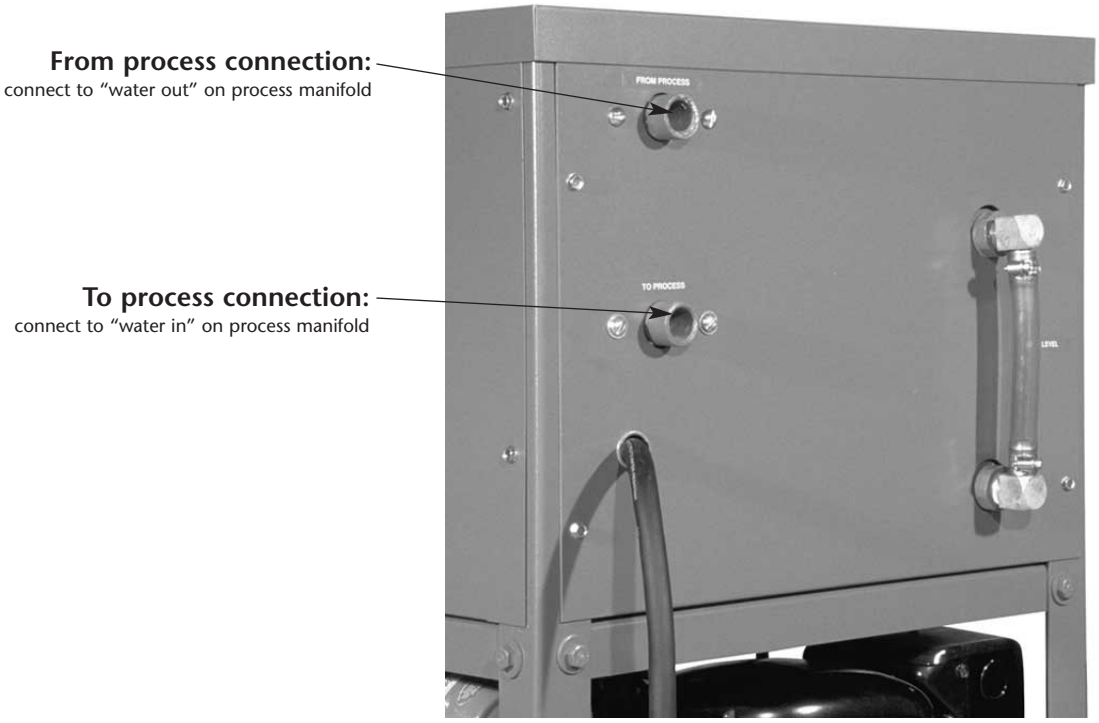
2.0 INSTALLATION

2.1 GENERAL

A. All process piping materials (such as hose, rigid piping, valves or filters) used in process water piping circuitry must be rated for 100°F minimum temperature and 100 PSI minimum pressure.

B. All such materials must have the equivalent or larger diameter of the particular process connection that length of process water piping is connected to.



2.2 TO AND FROM PROCESS CONNECTIONS

A. Connect the chiller's "to process" connection to the "water in" manifold on the mold or process.

B. Connect the chiller's "from process" connection the "water out" manifold at the mold or process.

C. Process water piping circuitry should be designed to avoid an excessive use of elbows and/or lengths of pipe or hose. If hose is the material of choice, avoid tight twists or curls and excessive lengths.

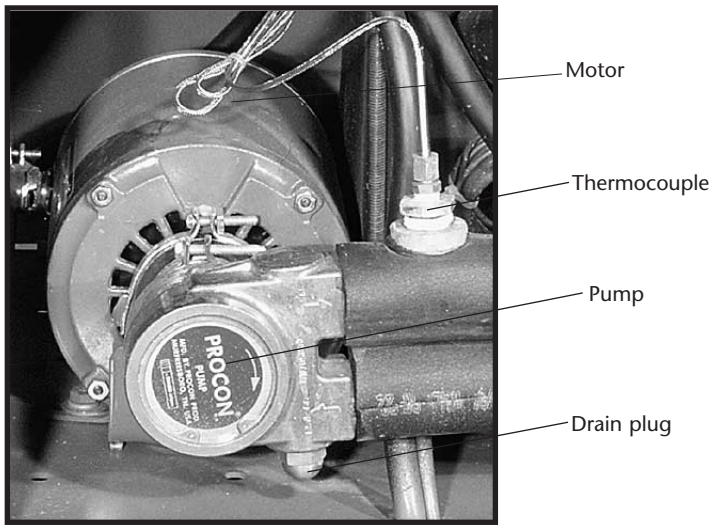
D. Valves and filters may be installed in the process water piping circuitry to facilitate service and maintenance provided that such devices maintain the full inside diameter of the process connection. If installed, all such devices must be open and clean during unit operation.

2.3 DRAIN CONNECTION:

A. The unit is supplied as standard with a ProCon type pump. In some cases, it may be necessary to drain the unit. This is done by removing the pump volute plug in the pump assembly.

B. Note that if chemical treatment of process fluid or additives are use, drainage shall be done according to local codes.

C. It is important to note that drainage procedures must be done prior to shipment or outdoor storage or the unit. If not, freezing damage can occur.



2.4 AIR COOLED CONDENSER

A. Air-cooled condenser require ambient air temperatures between 60°F and 95°F for efficient operation. Operating above 95°F may result in elevated condensing pressures and eventual shut-down on the high pressure safety switch. Check with the **Conair** service department for more information on operating with ambient air temperatures above 95°F or below 60°F.

B. Air flow is generated by the motor driven fan. Air flow is from the outside of the chiller, through the condenser and exhausted through the unit. Exhaust air can not be ducted on motor driven fan models.

C. A free air space of at least four (4) feet is required at the condenser intake and four (4) feet at the condenser discharge to allow for proper air flow.

D. At full load, this chiller will discharge approximately 15,000 BTU/hr per hour per ton of cooling.

2.5 ELECTRICAL CONNECTION

A. NEMA 1 MODELS

1. Electrical power supply requirements for Nema 1 units (figure 2.5A) are identified on the equipment data plate. Verify that available voltage supply is the same as the unit's voltage requirements. **WARNING: Do not connect the unit to a voltage supply source not equal to the unit's voltage requirements as specified on the unit's data plate. Use of incorrect voltage will void the unit's warranty and cause a significant hazard that may result in serious personal injury and unit damage.**

2. A factory supplied, four conductor cable is installed for connection to a customer supplied fused power disconnect device. The fused disconnect device shall be sized and installed according to the unit's power supply requirements and local electrical codes.

C. CONTROL CIRCUIT WIRING

1. The unit's supplied control circuit is indicated in the electrical diagrams. The control circuit is supplied by the factory installed transformer.

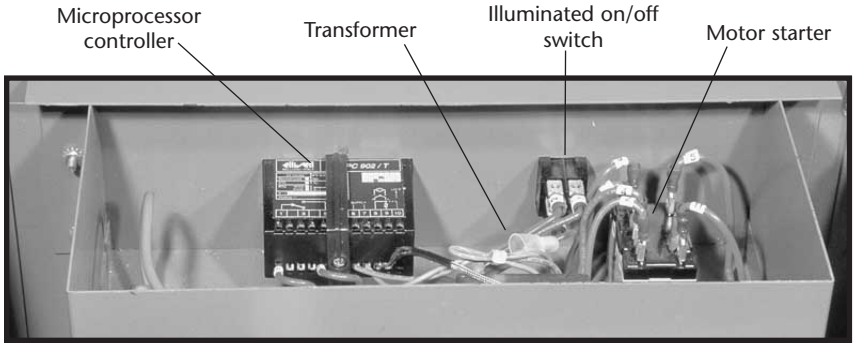
D. GENERAL

1. Make certain all ground connections to the unit are properly affixed.

2. Make certain power conductor, disconnect device, and fusing are properly sized according to the unit's power supply requirements.

3. Make certain all electrical connections are tightly affixed. Any loose wiring connections must be tighten before engaging the power supply.

4. Make certain no moisture or standing water is present inside the electrical cabinet.



3.0 OPERATIONS

3.1 GENERAL

A. Failure to follow the factory required operation procedures may adversely affect the unit's ability to control process temperature and may create a hazardous operating condition which may result in unit damage and serious operator injury or death.

B. The Operations segment of this manual is outlined below:

3.2 **Machine start-up/operations procedure** - follow this segment to start the unit after the initial installation or to restart the unit after reinstallation to the same or different process. This section includes information on system fill, electric motor phasing (pump rotation) and process flow adjustments.

3.3 **Instrument** - follow this segment to start up and operate the instrument controller. This section includes information on automatic and manual venting, setpoint selection and adjustment, and feature explanations.

3.4 **Shut down procedure** - follow this segment to shut down the unit. This segment includes information on system cool down, shut down, electrical power supply precautions, and disconnection from system.

3.2 START UP/OPERATIONS PROCEDURE

A. SYSTEM FILL

1. The unit has an internal reservoir which must be filled and maintained for proper operation.

2. **Conair** recommends the addition of 20% inhibited propylene glycol to the process fluid. This should help prevent the process fluid from freezing and internal components from rusting. A biocide must be added to the water to prevent organism growth in the chilled water system. See water treatment section in **section 8** of this manual for more information.

3. Remove the top panel to access the reservoir. Add fluid directly to the reservoir tank. Please note, when the pump is first started, and after the process lines are filled and entrained air is purged, additional fluid may be required to restore the reservoir to the correct level.

B. OPERATIONS

1. Turn the thermostat to the highest setting.

2. Shift the illuminated toggle switch to the 'ON' position. The pump will begin operations. Note the reservoir level, if it drops below 3/4 full, add fluid.

3. Check the unit and process system for leaks. Repair any that are discovered.

4. Adjust the setpoint thermostat as required for the process.

5. Note, the compressor will start if the fluid temperature is above the selected setpoint temperature. When the compressor starts, listen for any knocking or other unusual noise. Report any unusual noise to the Service department and discontinue operations.

6. Do not operate the unit without all sheet metal enclosure panels secured.

7. Process flow is adjusted according to the pump motor amperage. This rating can be found on the pump motor data plate.

a. With all process valves fully open and with the pump motor operating, check amp draw with an amp meter and note findings.

b. Compare amp draw with pump motor rating. If excessive, partially close the from process valve to adjust motor amps.

3.3 INSTRUMENT OPERATION

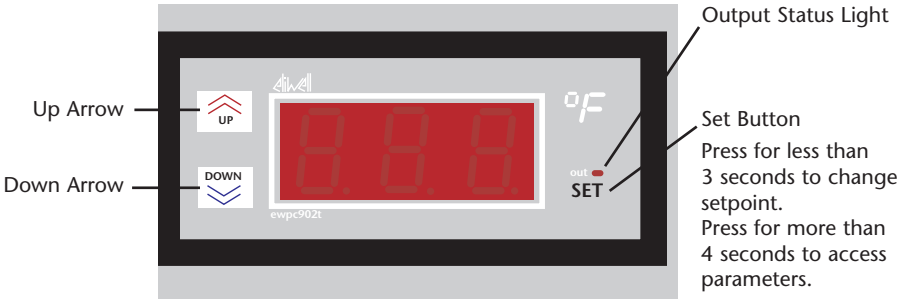
A. GENERAL DESCRIPTION

A. The EWPC 902/T/R/P controller is a new series of microprocessor-based and fully programmable process controllers for single point applications.

B. The front keypad of this controller offers several alpha-numeric menu prompts to configure the controller for each specific application).

B. FRONT KEYPAD

1. **SET:** push to display the setpoint value. The setpoint can be changed by using the "up" or "down" button. The control will automatically switch back to normal operating mode within 3 seconds. The last entered setpoint will stay in memory.



2. **UP:** used to increase the setpoint value, as well as the parameter when in programming. When held down for a few seconds, the change rate accelerates.

3. **DOWN:** used to decrease the setpoint value, as well as the parameter when in programming. When held down for a few seconds, the change rate accelerates.

4. **OUT:** status light of the output, blinks when in setpoint display/change mode or during programming.

C. DESCRIPTION OF PARAMETERS

1. **D1:** setpoint differential. The switching differential (hysteresis) can be set with positive value (make on rise) or with negative value (make on fall). See parameter "HC1".

2. **LS1:** lower set. This is the lower limit below which the user cannot change the setpoint; normally set at the lowest value recommended for the sensor.

3 **HS1:** higher set. Similar to "LS1", however setting an upper limit for the setpoint.

4. **od:** output delay. This provides a delay selection for the outputs in applications where noise may cause brief erroneous signals from the sensor to the controller. Factory set at "0".

5. **Lci:** lower current input (for EWPC 902/R, EWPC 902/P and EWPC 902/T with current input only). Read-out corresponding to 4 mA input signal (factory set at 20 %R.H for EWPC 902/R).

6. **Hci:** high current input (for EWPC 902/R, EWPC 902/P and EWPC 902/T with current input only). Read-out corresponding to 20 mA input signal (factory set at 100 %R.H for EWPC 902/R).

7. **CAL:** CALibration. This offers an adjustment up or down of the read-out, if needed. Factory set at "0".

8. **PSE:** Probe SElection. Input type (for RTD or Thermocouples only). RTD models: Ni = Ni100; Pt = Pt100. T/C models: FE = TcJ; Cr = TcK; rh = TcS.

9. **HC1:** Heating/Cooling. Relay switch function. H = heating (humidification; reverse action); C = cooling (dehumidification; direct action).

10. **rP1:** relay Protection 1. Determines the status of the relay in case of sensor defect. Factory set at "ro". ro = relay open; rc = relay closed.

11. **LF1:** Led Function 1. Determines whether the status light in ON or OFF in relation to output 1. di = direct = light ON when output 1 is energized; in = reverse = light OFF when output 1 is energized.

12. **dP:** decimal Point. Choose whether the resolution is required with or without decimal point. oF = without decimal point; on = with decimal point.

13. **Notes:** (a) the decimal point of models with current or voltage input is shifted: the actual value of parameters "Lci" and "Hci" must be multiplied by 10. (b) On all versions, if a unit is changed from without decimal point to with decimal point, all parameter values expressed in degrees will automatically be divided by 10, including the setpoint! (c) The decimal point selection is not available on models for thermocouple input.

14. **hdd:** half digit display. The right-most digit can be set to read-out in 0 or 5 only, or in all 10 digits. hdd = n : e.g. 070, 071, 072 etc (if without decimal point) or 70.0, 70.1, 70.2 etc (if with decimal point.); hdd = y : e.g. 070, 075, 080, etc. (if without decimal point) or 70.0, 70.5, 80.0 etc, (if with decimal point). Useful when measuring values varying rapidly (e.g. %R.H.)

15. **tAb:** tAble of parameters. This shows the configuration of the parameters as set in the factory; can not be modified (for factory identification and diagnostic purposes only).

D. PARAMETERS DEFAULTS

1. Programming is easily accessed by holding the "SET" button down for more than 4 seconds.

2. The first parameter is displayed while the status light Led "out" remains blinking during the programming period.

DEFAULT SETTING - STANDARD MODLES

PARAMETER	DECRIPTION	RANGE	UNIT	FACTORY
d1	differential	min / max	C / F	4
LS1	Lower Set	min / max	C / F	40
HS1	Higher Set	min / max	C / F	70
od	output delay	min / max	seconds	60
Lci	Low current input	min / max	various	0
Hci	High current input	min / max	various	0
CAL	CALibration	min / max	C / F	0
PSE	Probe SElection	Ni / Pt / Fe / Cr / rh	/	Fe
HC1	Heating / Cooling	H / C	flag	C
rP1	relay Protection	ro / rc	flag	RO
LF1	Led Function	di / in	flag	OF
dp	decimal Point	on / oF	flag	N
hdd	half digit display	n / y	flag	
tAb	tAble of parameter	/	flag	

3. Other parameters are accessed with the “UP” and “DOWN” button. With the “SET” button, the actual setting of each parameter is displayed. To change a parameter setting, push the “SET” plus the “UP” (or “DOWN”).

4. The system will automatically return to its normal operating mode a few seconds after the programming procedure is completed or interrupted.

E. ERROR ANNUNCIATION

1. Any sensor input defect will be displayed as follows: “ - - - ” in case of shorted sensor - “ EEE ”; in case of sensor break or sensor absence. The “ EEE ” error message also appears in the event of overrange of underrange of the system temperature.

2. It is recommended to double check the sensor wiring before diagnosing a probe as defective.

3.4 SHUT DOWN/DISCONNECT SEQUENCE

A. PRECAUTIONS/WARNINGS

1. The operator must precisely follow all shut down procedures outlined in this manual. If the operator fails to do so, an unsafe condition can develop resulting in damage to the unit or injury and/or death to operating personnel.

B. UNIT SHUT DOWN (without system disconnect)

1. To shut down the unit: toggle ‘off’ the rocker switch and disconnect the electrical supply.

4.0 TROUBLESHOOTING

4.1 UNIT WILL NOT START

A. Blow fuse at power supply - isolate open fuse and replace. Double check fuse sizes against nameplate amperage.

B. Low voltage - measure incoming voltage with meter, voltage must be within 10% of nameplate voltage or warranty will be voided.

4.2 PUMP WILL NOT START

A. Impeller bound or frozen shaft bearing in motor.

B. Open motor winding.

C. Internal overload tripped.

D. Loose wire connection or defective start capacitor.

E. On/off circuit breaker tripped.

4.3 COMPRESSOR WILL NOT START

A. Safety switch open - unsafe condition exists (consult safety switch section in this manual).

B. Windings overheated - over temperature switch on compressor tripped.

C. Circuit breaker tripped - reset and check amperage. Verify voltage is correct, check for loose wire connection at motor. Defective circuit breaker.

D. Bad or defective start capacitor.

4.4 UNIT SHUTS DOWN ON HIGH PRESSURE SWITCH

A. Low air flow across condenser. Check for dirty condenser fins.

B. Fan not operating. Check for loose fan blade or open/grounded motor winding.

C. High ambient air temperature (above 95°F).

D. Insufficient clear space around unit.

4.5 UNIT SHUTS DOWN ON LOW PRESSURE SWITCH

A. Attempting to operate below 40°F.

B. Low refrigerant charge.

C. Restriction to refrigerant flow in refrigeration circuit.

D. Poor heat transfer in evaporator tank because (1) percentage of glycol to water is too high and (2) scaled tubes in evaporator tank (chemically descale).

E. Low flow through evaporator tank due to (1) process flow restricted or (2) glycol foaming.

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5.0 MAINTENANCE

5.1 WARRANTY SERVICE PROCEDURE

A. In the event of a problem with a chiller that can not be resolved by normal troubleshooting procedures, the customer is invited to consult the **Conair** service department for assistance. The correct model number and serial number of the chiller must be available. The service department will attempt to isolate the problem and advise repair procedures. Often times, with the customer's input and with the machine diagnostics, problems can be determined with "over-the-phone" consultation.

B. If the problem is beyond the scope of "over-the-phone" consultation, and if the warranty status of the machine is valid, **Conair** will contact the nearest authorized service contractor and provide authorization to conduct an "on-site" inspection of the unit in order to determine the course of repair. If the chiller is not covered by the warranty, **Conair** will advise on the repair and recommend available service contractors.

C. **Conair** manufactures a complete line of heat transfer equipment. It is of the utmost importance that **Conair** have the correct model number and serial number of the machine in question. This will allow **Conair** to obtain the correct manufacturing records which will help the service department to properly troubleshoot the problem and obtain the proper replacement parts when they are required. This information is stamped on the metal data tag that is attached to the machine.

D. The **Conair** service department must be notified prior to any repair or service of a warranty nature. Warranty claims will not be honored without prior authorization.

5.2 PERIODIC PREVENTATIVE MAINTENANCE

A. Lubricate all motors. Note that some motors are supplied with sealed bearings.

B. Tighten all wire terminals.

C. Clean and check motor starter and contactor contacts.

D. Check safety switch settings.

E. Clean condenser fins of dust and dirt.

F. Back flush evaporator.

G. Check glycol/water solution ratio for operating temperature.

H. Check system for leaks.

I. Refrigerant sight glass: check for bubbles when compressor is operating at 100%. Check the moisture indicator for a color other than green.

J. Clean unit.

5.3 SPECIAL MAINTENANCE

A. Any service of the refrigeration system must be accomplished by a certified refrigeration technician.

1. Vacuum check compressor.

2. Addition of compressor oil.

3. Addition of refrigerant.

4. Repair of a refrigerant leak.

5. Adjustment of super heat.

6. Changing of filter-drier or drier core.

7. Repair of a refrigeration solenoid.

8. Valve plate replacement on compressor.

5.4 PUMP REPAIR

A. The positive displacement pump in the unit is not field serviceable. To arrange for repair contact:

PROCON PUMPS
910 RIDGELY ROAD
MURFEESBORO, TN 37310
615-890-5710

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6.0 COMPONENTS

6.1 WATER SYSTEM

6.2 REFRIGERATION SYSTEM

6.1 WATER SYSTEM

A. **MOTOR/PUMP ASSEMBLY:** the motor/pump assembly circulates chilled fluid to the process loop. The pump assembly is built of brass to maintain water quality.

6.2 REFRIGERATION SYSTEM

A. **COMPRESSOR:** hermetic compressors take low pressure/low temperature refrigerant gas and compress the gas into high pressure/high temperature gas).

B. **AIR COOLED CONDENSER:** the air cooled condenser removes BTUs from the compressor refrigerant gas. The action causes the gas to "condense" into a liquid state still under high pressure. Air flow across the condenser is achieved via a motor driven fan.

C. **FILTER-DRIER:** the filter-drier removes contaminants and moisture from the liquid refrigerant.

D. **LIQUID RECEIVER:** serves as a collection tank for high pressure liquid refrigerant to ensure total charge at all times.

E. **REFRIGERANT SIGHT GLASS:** the refrigerant sight glass indicates refrigerant charge and moisture content. Refrigerant charge is determined by a clear liquid flow. Bubbles indicate low refrigerant. Moisture content is indicated by the color of the element. Element color is normally green. If the color of the element is chartreuse or yellow, the system has been contaminated with moisture. In such case, the filter-drier must be replaced. The replacement of the filter-drier must be completed by a qualified refrigerant service technician.

F. **EXPANSION VALVE:** the expansion valve throttles flow of refrigerant liquid into the evaporator and creates a pressure drop in the refrigerant system that allows the liquid refrigerant to "boil off" inside the evaporator.

G. **EVAPORATOR:** the evaporator is a tube in tube heat exchanger where the refrigerant liquid is allowed to evaporate (boil off) to absorb heat (BTU) from the process fluid. As the heat is absorbed, the process fluid is chilled.

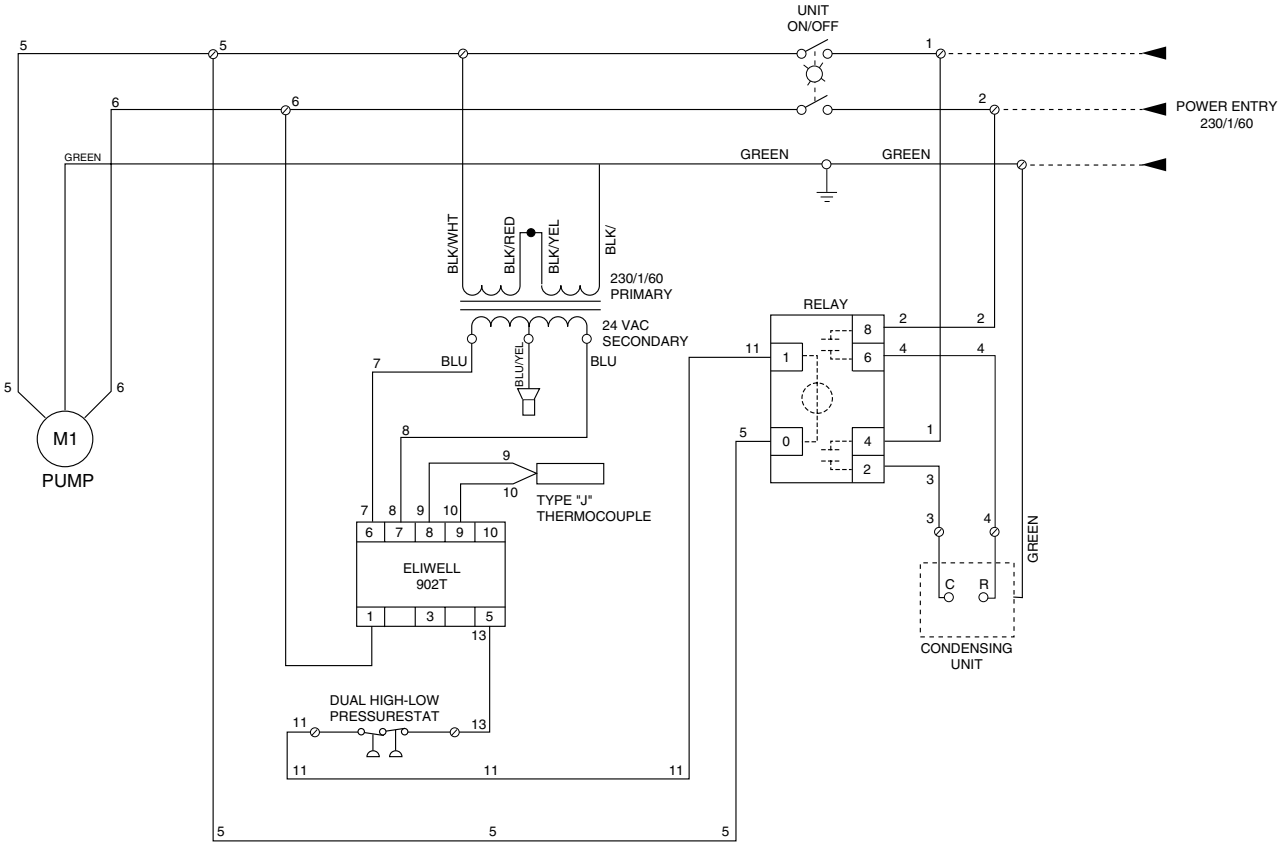
H. **HIGH/LOW PRESSURESTATS:** the high/low pressurestats protect the refrigeration system from unsafe operating levels. The **high pressure switch** is factory set to open at 325 psi and protects the refrigeration components and personnel from potential damage of injury from excessive high pressure. The high pressure safety must not be altered in the field for any reason. The **low pressure switch** is factory set to open at 58 psi and to close at 63 psi. The low pressure switch protects the chillers from possible damage due to low operating pressure. The low pressure switch is field adjustable for setpoints below 48°F.

7.0 RELATED DRAWINGS

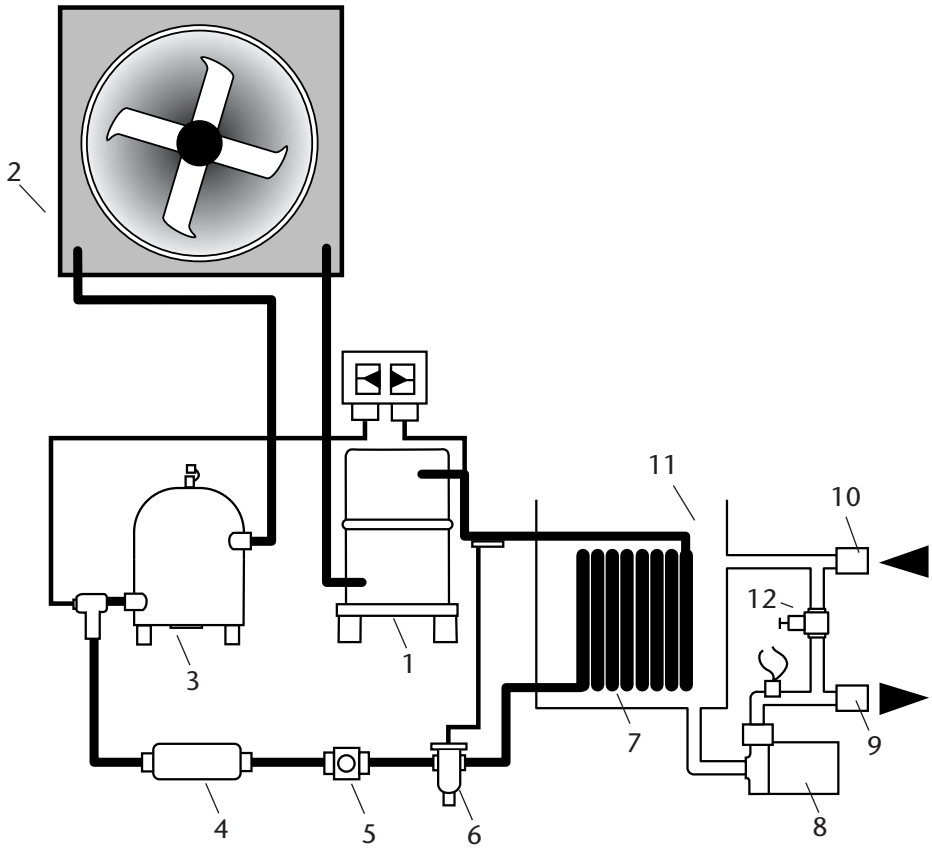
7.1 ELECTRICAL DRAWING (TYPICAL)

7.2 CIRCUIT SCHEMATIC

7.1 ELECTRICAL DRAWING (TYPICAL)



7.2 CIRCUIT SCHEMATIC



ITEM	DESCRIPTION
1	Compressor
2	Air cooled condenser
3	Liquid receiver
4	Filter-drier
5	Refrigerant sight glass
6	Expansion valve
7	Evaporator
8	Pump
9	To process connection
10	From process connection
11	Reservoir tank
12	Refrigerant safety switch

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8.0 APPENDIX

8.1 SPECIFICATIONS

VL Air-cooled Portable Chillers: 0.25 to 1.5 tons

MODEL	VLA-.25	VLA-.33	VLA-.5	VLA-.75	VLA-1	VLA-1.5
Performance characteristics						
Capacity* tons	0.25	0.32	0.41	0.70	0.98	1.35
Compressor Hp {kW}†	0.25 {0.19}	0.33 {0.25}	0.5 {0.37}	0.75 {0.56}	1 {0.75}	1.5 {1.1}
Pump Hp {kW}	0.25 {0.19}	0.25 {0.19}	0.25 {0.19}	0.25 {0.19}	0.5 {0.37}	0.5 {0.37}
Chilled water flow‡ gpm {lpm}	0.6 {2.3}	0.8 {3.0}	0.9 {3.4}	1.7 {6.4}	2.4 {9.1}	3.6 {13.6}
Chilled water pressure‡ psi {bar}	60 {4.1}	60 {4.1}	60 {4.1}	60 {4.1}	60 {4.1}	60 {4.1}
Reservoir capacity gal {liters}	4 {15}	4 {15}	4 {15}	4 {15}	4 {15}	4 {15}
Dimensions in {mm}						
Height	33 {838}	33 {838}	33 {838}	33 {838}	33 {838}	37 {940}
Width	18 {457}	18 {457}	18 {457}	18 {457}	18 {457}	19 {483}
Depth	24 {610}	24 {610}	24 {610}	24 {610}	24 {610}	25 {635}
Pipe size NPT in.						
Process (to and from)	0.5	0.5	0.5	0.5	0.5	0.75
Condenser	—	—	—	—	—	—
Weight lb {kg}						
Shipping§	150 {68}	150 {68}	170 {77}	205 {93}	210 {95}	220 {100}
Voltages full load amps**						
115V/1 phase/60Hz	11	12	14	22	24	—
220V/1 phase/60Hz	—	—	8	11	12	15
Refrigerant	HCFC-22					

SPECIFICATION NOTES

* Ton capacity at 12,000 BTU/ton @ 50°F leaving water temperature @ 115°F condensing temperature. Capacities may be ± 5% as reserved by the compressor manufacturer. Capacity multipliers are: 50°F - 1.00; 40°F - 0.80; 30°F - 0.60; 20°F - 0.40.

† Hermetic reciprocating compressor.

‡ Consult pump curve for exact characteristics relating to pump performances.

§ Unit weight crated for shipment

** No allowance for inrush. Service disconnect by owner. Full load amps must be used to size disconnects and supply conductors. Consult factory for 50hz operation.

Specifications can change at any time. Contact your Conair representative for the most current information.

8.2 OPERATION BELOW 48°F

A. A chiller typically operates with a setpoint of 50°F or higher. However, if setpoints between 20° - 48°F are required, special precautions must be taken to prevent freezing and possible damage. Attention must be given to freeze protection, water supply and safety adjustments.

B. FREEZE PROTECTION

1. It is understood that untreated water freezes at 32°F. Therefore, an inhibited propylene glycol and water solution must be used in lieu of ordinary water. Prescribed amounts are listed in figure 8.2A.

OPERATING TEMPERATURE	ANTI-FREEZE MIXTURE GLYCOL	WATER
40°F	20%	80%
25°F	25%	75%
30°F	30%	70%

Figure 8.2A

2. On initial installation of the unit, the water/glycol solution should be premixed, then added to the reservoir. After the pump has been started, water lines filled and air purged, it may be necessary to add more water/glycol solution to maintain the recommended reservoir level. **Note:** a hygrometer should be used on a regular basis to determine the mixture strength according to freeze point. The freeze point temperature should be 25° below the lowest required setpoint. Water will evaporate from the mixture, and if you continue to add a premixed solution eventually you will have too much glycol. It is necessary to add water or glycol to maintain proper freeze point temperature.

3. **PLEASE NOTE THAT A CHILLER IS NOT DESIGNED TO ACCOMMODATE AUTOMOTIVE TYPE ANTI-FREEZE.** This is due to the fact that automotive type anti-freeze contains silicates that adhere to heat transfer surfaces of the system preventing maximum heat transfer. Also, improper portions of inhibited propylene glycol to water inhibits effective heat transfer. Consult the chiller's operating manual for specific details.

C. WATER SUPPLY

1. The automatic water supply (if equipped) restores the reservoir water level as needed. However, if untreated water is added to an water/glycol solution, dilution will occur decreasing the freeze protecting ability of the solution.

Therefore, the water supply source must be disconnected and the connection capped. The operator must monitor the water/glycol level and manually make-up to maintain proper reservoir level.

D. SAFETY ADJUSTMENTS

1. To ensure safe and efficient operations at lower setpoints, adjustments of the freezestat and low pressurestat factory settings are required. Figure 8.2B lists the appropriate settings.

OPERATING TEMPERATURE	LOW CUT IN	LOW CUT OUT	FREEZESTAT SETTING
48°F	55#	40#	38°F
40°F	50#	35#	30°F
35°F	45#	30#	25°F
30°F	40#	25#	20°F

Figure 8.2B

2. The freezestat serves as the mainline defense against freezing in that it shuts down the chiller if the coolant temperature ever decreases to its setting. For mechanical freezestats, adjustments are made by removing the cover and rotating the selector dial with a screwdriver. Electronic freezestats are adjusted through the setup parameters via the instrument control panel.

3. The low pressurestat serves to protect the compressor from unsafe suction pressures. Suction pressures decrease with lower operating setpoints. To prevent short cycling of the compressor, the low pressurestat must be adjusted to accommodate the lower setpoint. Adjustments to the low pressurestat are made by rotating the adjusting screws on top of the control and observing the movement of the pointers in the control window until the prescribed setting is determined.

E. PRECAUTIONS

1. At any setpoint, the possibility of freezing exists and it is the operator's responsibility to take necessary action to prevent freezing at all times.

8.3 WATER QUALITY CONTROL

A. Lack of, as well as, improper water treatment can damage the chilling unit. The services of a competent water treatment specialist should be obtained and their recommendations followed. It is the equipment owner's responsibility to prevent damage from foreign material or inadequate water treatment.

B. The two main things to consider for water treatment in chillers are corrosion and organism growth. Proper chemical treatment can control PH levels and algae growth. An alternative to chemical treatment is the addition of 20% inhibited propylene glycol to the water. This will help prevent organism growth and coat the heat transfer surfaces with corrosion inhibitor.

8.4 INHIBITED PROPYLENE GLYCOL

A. The use of a water-glycol mixture is needed when the operator desires a process temperature below 48°F. Freeze protection is required so ice crystals do not form and cause severe damage to both the water and refrigeration system.

FREEZING POINTS FOR WATER/PROPYLENE GLYCOL SOLUTIONS

PERCENTAGE OF GLYCOL*	PERCENTAGE OF WATER	FREEZE POINT ˚F	FREEZE POINT ˚C
0	100	32	0
10	90	25	-3.9
20	80	10	-12.2
30	70	0	-17.8
40	60	-10	-23.3
50	50	-30	-34.4
60	40	-60	-51.4

*PROPLYLENE GLYCOL

NOTE: GLYCOL FREEZE POINT MUST BE 25˚F BELOW LOWEST SETPOINT

B. CHOOSING THE PROPER GLYCOL:

1. For getting the most efficiency from your system, a propylene glycol such as "DowFrost" is a must. DowFrost contains special corrosion inhibitors for low system maintenance and better transfer capabilities than normal glycols. It also has a much longer fluid life up, to 20 years in some cases.

2. **SOURCES OF INHIBITED PROPYLENE GLYCOLS:** for a complete literature package, material, safety data sheets and purchasing information, contact the following:

DOW CHEMICAL 1-800-447-4369
(Canada 1-800-363-6250)
Dowfrost inhibited propylene glycol

MONSANTO CHEMICAL 1-800-459-2665
Monsanto FS inhibited propylene glycol

C. USE OF PLAIN GLYCOL:

1. Even through they do lower the freeze point, plain glycols are even more corrosive than water. The corrosion rate of plain ethylene glycol on iron, for example, is more than 2.5 times faster than plain water. On steel, it is 4.5 times faster.

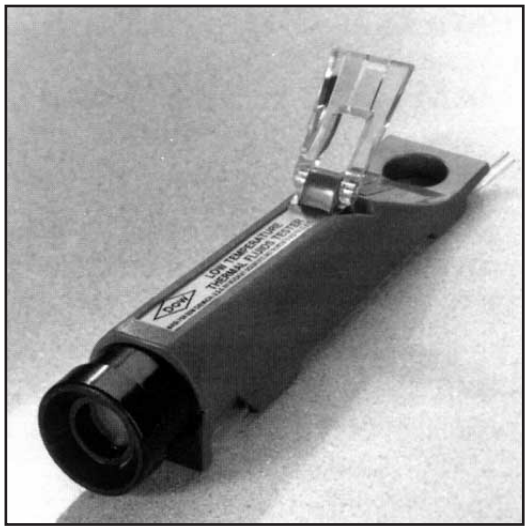
D. AUTOMOTIVE BASED ANTIFREEZE:

1. **SHOULD NEVER BE USED!** Automotive antifreeze contains silicate based inhibitors, which are compatible with automotive components. In an industrial application, the silicates will leach out and form a gel-like substance on the heat transfer surfaces and reduce cooling efficiency of the system. These silicates have shown to significantly reduce the lifetime of pump seals.

E. MAINTENANCE RESPONSIBILITY:

1. A hygrometer should be used on a regular basis to determine the mixture strength according to freeze point. The freeze point temperature should be 25°F below the lowest required setpoint (see charts on page 35 and 37). Water will evaporate from the mixture, and if you continue to add a premixed solution, eventually you will have too much glycol. It is necessary to add water or glycol to maintain proper freeze point temperature. The device pictured is by far the most accurate and easy to use for maintaining and checking for proper glycol levels.

Contact:
Misco Products:
1-800-358-1100
Model #7084VP



8.5 CHILLER CAPACITY AND DERATE CHART

Standard chiller rating is at 50°F. For all other temperature settings, output tonnage is altered as follows:

OUTPUT TEMPERATURE °F	FULL AVAILABLE % CAPACITY	
60	105%	
50	100%	
45	90%	
40	80%	
35	70%	
30	60%	
25	50%	
20	40%	
15	30%	*
10	22%	*
5	15%	*
0	9%	*
-5	5%	*

NOTES:

If operation of the chiller at less than 48°F is required, an inhibited propylene glycol solution is required.

Consult factory for chiller operation below 20°F.

Ambient conditions affect air cooled chiller operation and capacity. Standard rating is at 95°F entering air temperature. For ambient air conditions greater than 95°F, chiller derating will occur. For ambient temperatures of 95-105°F, select the next larger capacity chiller. For ambient temperatures over 105°F, consult factory.

* These ranges require special options.

8.6 PRESSURE-TEMPERATURE CHART FOR R-22 REFRIGERANT

SATURATED TEMPERATURE	FREON PRESSURE
40°F	68
45°F	76
50°F	84
55°F	93
60°F	100
65°F	112
70°F	122
75°F	132
80°F	144
85°F	156
90°F	168
95°F	182
100°F	196

THESE PRESSURE/TEMPERATURE RELATIONSHIPS ARE IN AN AT-REST, SATURATED CONDITION. FOR EXAMPLE, IF THE UNIT HAS BEEN IN A WAREHOUSE AT 40° AND IS BROUGHT INTO A ROOM WHERE IT IS 80°, IT MAY TAKE A COUPLE OF HOURS FOR THE UNIT TO WARM UP AND THE PRESSURE TO RISE TO THE SURROUNDING AMBIENT CONDITIONS.

8.7 USEFUL ENGINEERING FORMULAS

1 ton = 12,000 btu
BTU = Material (lbs) X material 's specific heat X temperature difference
1 BTU = .293 watts
1 watt = 3.42 BTU
1 KW = 1000 watts
1 KW = 3420 BTUs
BTU/hr = GPM X ΔT (for water cooled condensers)

$$\text{TONS} = \frac{\text{GPM (water) X 8.34 X 60 X temperature difference X specific heat}}{12{,}000}$$

$$\text{TONS} = \frac{\text{GPM (water) X } \Delta T}{12{,}000}$$

1 Gallon of Water = 8.34 lbs
= 231 cubic inch
= .1337 cubic feet
= 3.785 liters
= 4 quarts
1 Pound of Water = .1198 gallon
1 Cubic foot of Water = 7.481 gallons
= 62.37 pounds

1 HP = 2546.5 BTU/hr
= 745.7 watts
= 42.442 BTU/min

$$1\ \text{HP} = \frac{\text{PSI X GPM}}{1199}$$

$$1\ \text{HP} = \frac{\text{Feet of Head X GPM x Specific Gravity}}{2772}$$

PSI = .4331 X Feet of Head

$$\text{PSI} = \frac{\text{Feet of Head}}{2.3}$$

1 Foot of Head = .4332 PSI
Feet of Head = PSI X 2.3

Watts = Amps X Volts (single phase)
= Amps X Volts X 1.73 (three phase)
Volts = Ohms X Amps

$$\text{Volts} = \frac{\text{Watts}}{\text{Amps}}$$

$$\text{Volts} = \sqrt{\text{Watts X Ohms}}$$

$$1\ \text{KVA} = \frac{\text{Amps X Volts X 1.73}}{1000} \quad \text{(three phase)}$$

$$1\ \text{KVA} = \frac{\text{Amps X Volts}}{1000} \quad \text{(single phase)}$$

$$\text{CFM} = \frac{\text{KW X 300}}{\text{Temperature Difference}}$$

$$\text{CFM} = \frac{\text{Tons X 10530}}{\text{Temperature Difference}}$$

$$\text{KW} = \frac{\text{CFM X Temperature Difference}}{3000}$$

°F = (9/5 X °C) +32
°C = 5/9 X (°F - 32)
Volume of Cylinder = Π X R^2X L
Circumference of Circle = Diameter of Circle X Π
Diameter of Circle = Circumference X .3183
Area of Circle = Π X R^2X L
= D^2 X .7854
1 Gram = .0353 oz
1 Foot = 30.48 centimeter
454 Gram = 1 lb
1 Oz = 28.35 grams
1 Kilogram-calorie = BTUH X .252
1 Millimeter = inches X 25.4
1 Kilogram = Lbs X .454
1 Square Centimeter = .155 square inch
1 Square Inch = 6.452 sqaure centimeter

METRIC CONVERSION TABLE

TO CONVERT FROM	TO	Multiply by:
UNIT VOLUME		
US GPM	liters/min	3.785
US GPM	cum/hr	.2271
CFM	liters/min	28.317
CFM	cum/hr	1.6992
UNIT WEIGHT		
Lbs/sq in	gr/sq cm	70.31
Lbs/sq in	kPA	6.894
Lbs/sq in	kg/sq cm	.07031
Lbs/cu in	gr/cu cm	27.68
LENGTH		
Inches	cm	2.540
Feet	meters	.3048
Yards	meters	.9144
Miles	km	1.609
VOLUME		
Cu inches	cu cm	16.387
Cu inches	liters	.01639
Cu feet	cu meters	.02832
Cu feet	liters	28.317
Cu years	cu meters	.7646
Fl ounces	cu cm	29.57
US gal	liters	3.785

TO CONVERT FROM	TO	Multiply by:
POWER		
FT/LB/SEC	watts	1.356
KW	BTUH	3420
Boiler HP	BTUH	33475
HP	BTUH	2545
HP	kw	.7457
HEAT		
BTU	kg-cal	.252
BTU/LB	kg-cal	.5556
BTU/SQ FT	gr-cal/sq cm	.2713
BTU/CU FT	kg-cal/cum	8.899
WEIGHT		
Grains	grams	.0648
Ounces*	grams	28.350
Pounds*	kg	.4536
US tons	lg	907.2
US tons	tonnes	.9072
Long tons	kg	1016
AREA		
Sq inches	sq cm	6.452
Sq years	sq meters	.8361
Sq miles	sq km	2.590

*Auoirdupois pounds and ounces

TEMPERATURE

°F	°C	°F	°C
0	-17.8	35	1.7
5	-15	40	4.4
10	-12.2	45	7.2
15	-9.4	50	10.0
20	-6.7	55	12.8
30	1.1	60	15.6

°F to °C = (°F - 32) x .55 = °C

°C to °F = (°C x 1.8) + 32 = °F

ABBREVIATIONS, EQUIVALENTS & FORMULAS

PSI = Pounds Per Square Inch
GPM = Gallons Per Minute
EWT = Entering Water Temperature
LWT = Leaving Water Temperature
BTU = British Thermal Unit
BTU/HR = GPM x 500 x ΔT (water)
FT. H.D. = PSI x 2.31
1 COOLING TOWER TON = 15,000BTU/HR
1 REFRIGERANT TON = 12,000 BTU/HR

1 GALLON = 8.33 lbs (water)
1 CUBIC FOOT = 7.48 gallons
TOWER CELL EVAPORATION RATE = 2 gal. per ton per hour

8.8 PARTS LIST

PART	DESCRIPTION
800000	Caster - 3″ swivel
810000	Caster - 3″ rigid
895010	Coil - Chas 3100
1527475	Condensing unit #F3AHA101CFV-201 203-1-60 R-22
2169475	Filter drier - C-0525
2971475	Expansion valve - #EVGE-1-CP100
4345900	CONTROLLER - #EWPC 902T Type J
4714350	Pump motor - 1/2 HP 1725 RPM 230-1-60 #3K090
6206498	Thermocouple - Type J ungrounded #SP-498J A4 B48
6214050	Procon pump - #CB2507XH AMP #1113
6648300	Relay - #GL7-2A-TUBJ-CB 230 volt
7550000	Pressure switch - P70MA-1
7591075	Rocker switch - #2600A21E
7732200	Reservoir tank - #06299
8213775	Transformer - #44F3095
8828995	Bypass valve - #5300A 1/2″

Note: this is a typical parts list. Please obtain exact model # and serial # before contacting our parts department to assure an exact replacement part.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.