User Guide

Portable Chiller

microKool MPA and MPW Models with PC-1 or PC-2 controls

Installation

Operation

Maintenance

Troubleshooting

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UGH004/0999

⚠ **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This manual is out-of-date and is provided only for its technical information, data and capacities.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containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.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: UGH004/0999
Serial number(s):
Model number(s):

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INTRODUCTION

PURPOSE OF THE USER GUIDE

This User Guide describes the Conair microKool water-cooled and air-cooled portable chillers and explains step-by-step how to install, operate, maintain and repair this equipment.

Before installing this product, please take a few moments to read the User Guide and review the diagrams and safety information in the instruction packet. You also should review manuals covering associated equipment in your system. This review won't take long, and it could save you valuable installation and operating time later.

HOW THE GUIDE IS ORGANIZED

Symbols have been used to help organize the User Guide and call your attention to important information regarding safe installation and operation.

⚠ Symbols within triangles warn of conditions that could be hazardous to users or could damage equipment. Read and take precautions before proceeding.

1 Numbers within shaded squares indicate tasks or steps to be performed by the user.

◆ A diamond indicates the equipment's response to an action performed by the user.

❒ An open box marks items in a checklist.

● A shaded circle marks items in a list.

YOUR RESPONSIBILITY AS A USER

You must be familiar with all safety procedures concerning installation, operation and maintenance of this equipment. Responsible safety procedures include:

- Thorough review of this User Guide, paying particular attention to hazard warnings, appendices and related diagrams.
- Thorough review of the equipment itself, with careful attention to voltage requirements, intended uses and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

⚠ ATTENTION: READ THIS SO NO ONE GETS HURT

⚠ WARNING: Improper installation, operation or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation and potential hazards of this type of equipment.

All wiring, disconnects and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region.

Always maintain a safe ground. A properly sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure. Improper grounding can result in personal injury and erratic machine operation.

Do not operate the equipment at power levels other than what is specified on the the equipment serial tag and data plate.

Only certified refrigerant technicians should recharge the refrigerant used in this system.

WARNING: Electrical shock hazard

This equipment is powered by three-phase main voltage, as specified on the machine serial tag and data plate.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as troubleshooting or maintenance. Only qualified personnel should perform procedures that require access to the electrical enclosure while power is on.

DESCRIPTION

WHAT IS THE MICROKOOL CHILLER?

The microKool portable chillers are designed to provide chilled water for industrial applications requiring 24-hour-a-day performance.

Operation of air-cooled and water-cooled units differ only in the medium used to remove heat from the refrigerant in the condensers.

Water-cooled models use 85° F (29° C) cooling tower water, and are equipped with high efficiency tube-in-tube condensers with water regulating valves.

Air-cooled models use 95° F (35° C) ambient air and aluminum-fin, copper-tube condensers. Units above 1.5 Hp include automatic fan cycling controls.

Units are totally self-contained for easy, economical installation. To operate, simply connect the power source, process piping and fill with water or an industrial antifreeze mixture.

The standard PC-1 microprocessor control displays setpoint and actual temperature of the process fluid, and provides SPI communication. Nine operating and fault indicator lights display the status of the chiller components.

The enhanced PC-2 control offers the same features as the standard control plus autostart capabilities, which enables the chiller to start automatically with a timing device or the starting of the primary process machine.

TYPICAL APPLICATIONS

These chillers are ideal for cooling to maintain process temperatures in an injection molding machine or extruder and wherever you need a small, moveable cooling unit.

Capacities range from 1.2 to 10.2 tons. Standard operating setpoints are between 20° F (-7° C) and 65° F (19° C) LWT. Adequate freeze protection is required.

Choose water-cooled portable chillers:

- for maximum capacity and minimal maintenance.
- when maintaining ambient air temperature is important, such as an air-conditioned environment.
- when tower water or another inexpensive water source is available.

Choose air-cooled portable chillers.

- when plant water supply is inadequate or limited.
- when process heat must be extracted and used for space heating.

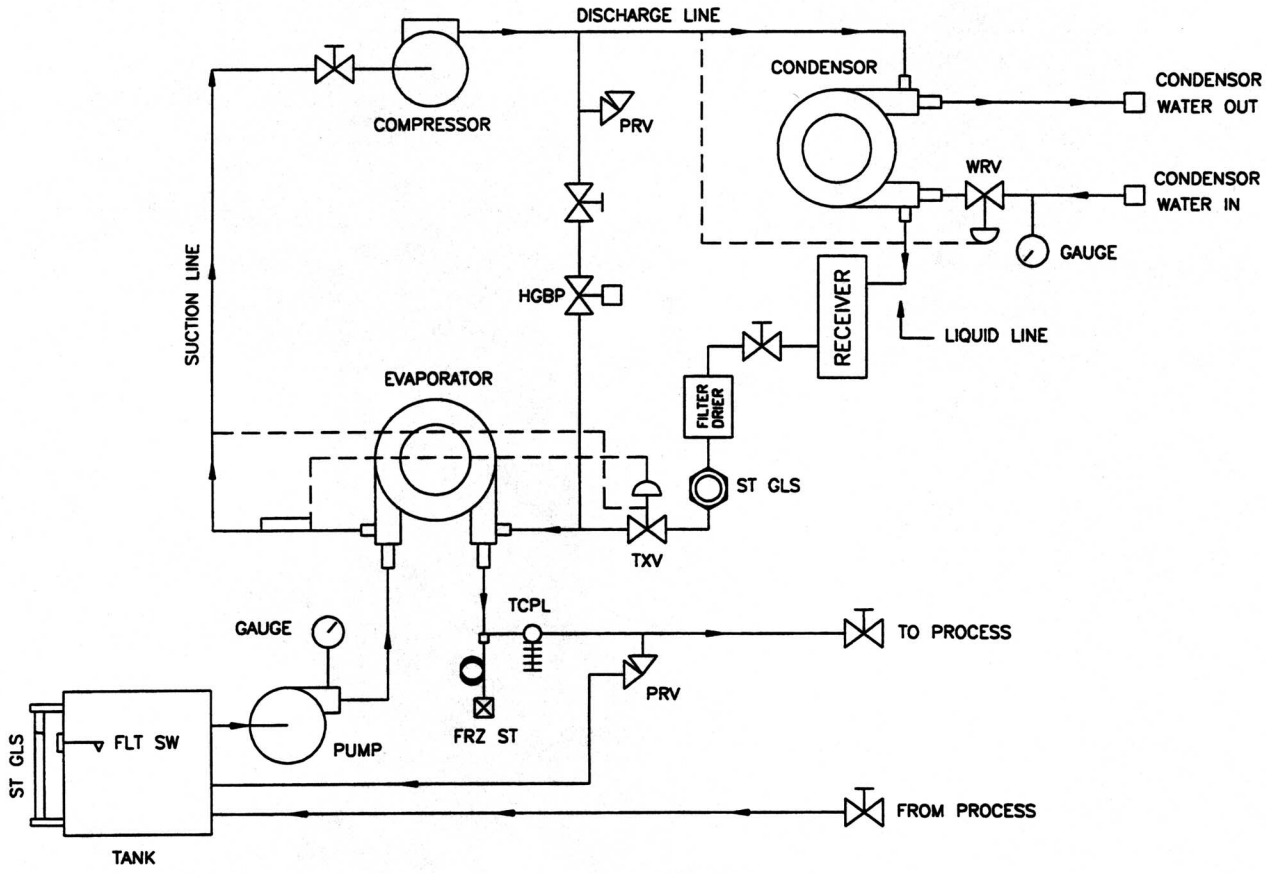
HOW IT WORKS: WATER COOLED

Water-cooled models use tube-in-tube heat exchangers to condense the hot, compressed, refrigerant gas from the compressor to a cool liquid.

The cool liquid refrigerant passes through a filter/dryer, which protects the system from moisture or other contaminants. An in-line sight glass gives a visual indication of proper refrigerant charge and any dangerous moisture present in the system.

The refrigerant passes through a thermal expansion valve, where it expands, cools and is precisely metered into the refrigerant heat exchanger (evaporator).

The evaporator removes the heat from the process fluid.



Typical water-cooled plumbing diagram

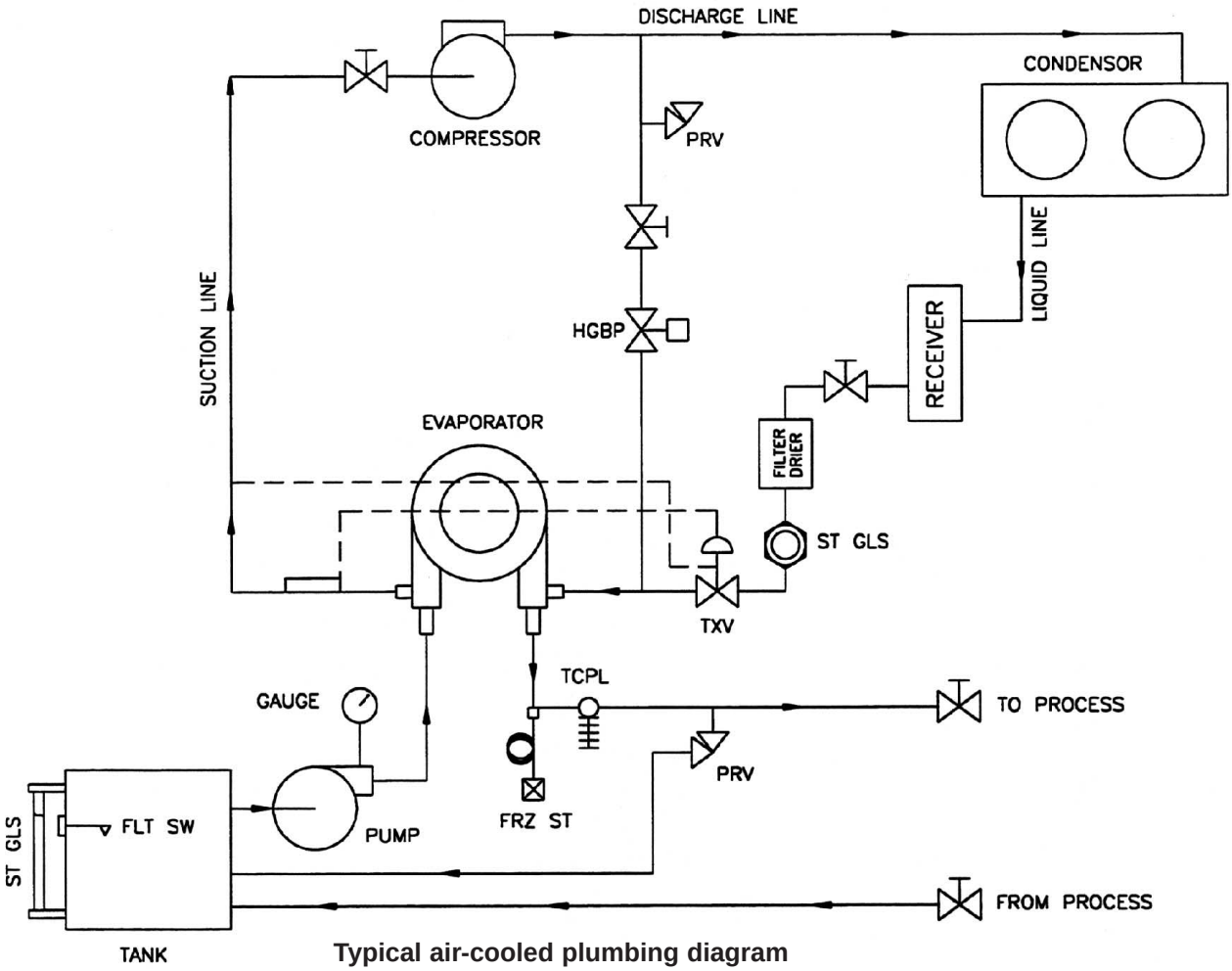
How It Works: Air Cooled

Air-cooled models use aluminum-finned, copper tube condensers to condense the hot, compressed, refrigerant gas from the compressor to a cool liquid.

The cool liquid refrigerant passes through a filter/dryer, which protects the system from moisture or other contaminants. An in-line sight glass gives a visual indication of proper refrigerant charge and any dangerous moisture present in the system.

The refrigerant passes through a thermal expansion valve, where it expands, cools and is precisely metered into the refrigerant heat exchanger (evaporator).

The evaporator removes the heat from the process fluid.



Typical air-cooled plumbing diagram

FEATURES

High Efficiency Compressors
All microKool chillers are equipped with quiet Copeland hermetically sealed compressors. Hot-gas bypass capacity control is standard, permitting efficient operation with cooling loads as low as 25% of rated chiller capacities.

Control Extension
Controls can be extended approximately 11 inches from the control base.

Molded Plastic Reservoirs
Large,thick-walled, insulated polyethylene reservoirs provide corrosion-free operation. Low-water level sensors, external fill ports and level indicators are standard.

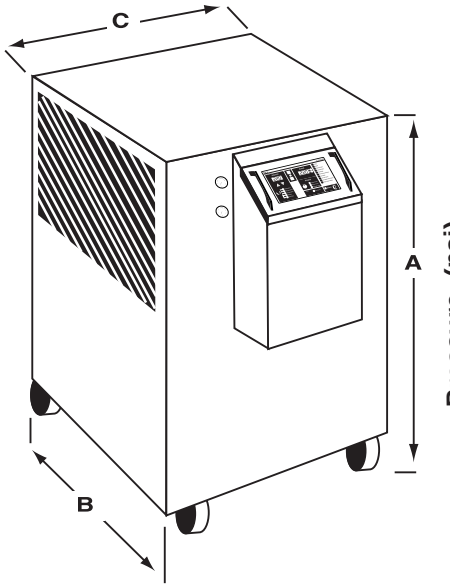
Water-cooled unit shown

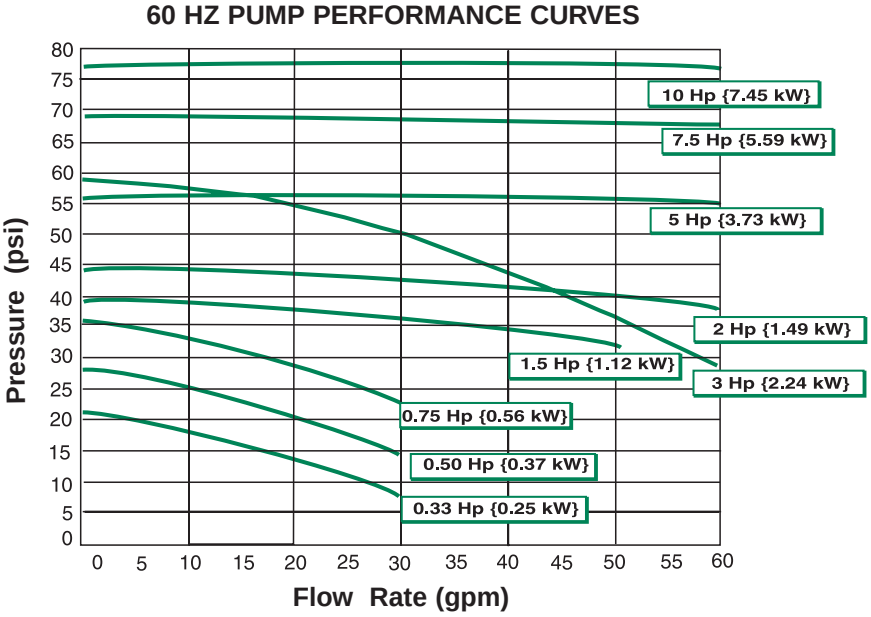
Water Connections
All chilled water and condenser water connections are welded to the structure. Every unit includes bronze chilled water supply and return valves.

Corrosion-Free Evaporators
On models through 7.5 Hp, chilled water flows through heavy gauge tube-in-tube evaporators. The water comes in contact with only copper surfaces, eliminating corrosion and scale build-up that can severely reduce chiller efficiency. Low pressure drops, averaging less than 2 psi, result in more flow to the process.

Performance-engineered condensers
Water-cooled models are equipped with high efficiency, non-ferrous tube-in-tube condensers and water regulating valves. Air-cooled models have aluminum fin, copper tube condensers. MPA models with compressors above 1.5 Hp have automatic fan cycling controls.

SPECIFICATIONS: MPW (WATER COOLED)





MODEL	MPW-1.5		MPW-2		MPW-3		MPW-4		MPW-5		MPW-7.5		MPW-10	
Performance characteristics														
Capacity {tons} *	1.4		1.8		3.1		4.1		4.8		7.6		10.2	
Compressor Hp {kW}	1.5 {1.12}		2 {1.49}		3 {2.24}		4 {2.98}		5 {3.73}		7.5 {5.59}		10 {7.45}	
Pump Hp {kW} †	0.33 {0.246}		0.50 {0.373}		0.75 {0.559}		1.5 {1.12}		1.5 {1.12}		1.5 {1.12}		1.5 {1.12}	
Chilled water flow gpm {l/min} ‡	3.4 {12.9}		4.5 {17.0}		7.5 {28.3}		9.9 {37.5}		11.4 {43.2}		18.2 {68.9}		24.5 {81.0}	
Chilled water pressure psi {bar} §	20 {1.4}		26 {1.8}		34 {2.3}		38 {2.6}		38 {2.6}		37.5 {2.6}		37 {2.5}	
Reservoir capacity gal (l)	10 {37.9}		10 {37.9}		10 {37.9}		30 {114}		30 {114}		30 {114}		30 {114}	
Condenser water flow gpm {l/min}	4.3 {16.3}		5.6 {21.2}		9.4 {35.6}		12.4 {47.0}		14.3 {54.2}		22.8 {86.4}		30.6 {116.0}	
Dimensions inches {mm}														
A - Height **	45 {1143}		45 {1143}		45 {1143}		56 {1422}		56 {1422}		70 {1778}		70 {1778}	
B - Depth	32 (812}		32 {812}		32 {812}		48 {812}		48 {812}		48 {812}		48 {812}	
C - Width	29 {737}		29 {737}		29 {737}		34 {737}		34 {737}		34 {737}		34 {737}	
Weight lb {kg}														
Shipping weight	550 {249}		755 {342}		755 {342}		1010 {458}		1010 {458}		1250 {567}		1250 {567}	
Installed weight	420 {190}		585 {265}		585 {265}		840 {381}		840 {381}		1080 {490}		1080 {490}	
Utility requirements														
Water connections NPT (female) inches	1		1		1		1.5		1.5		1.5		1.5	
Process and condenser water inches	1		1		1		1.5		1.5		1.5		1.5	
Voltages running and full load amps	run	full	run	full	run	full	run	full	run	full	run	full	run	full
208V/3 phase/60hz	8.8	15.5	13.7	15.9	17.7	22.3	23.9	28.3	27.0	30.5	34.9	41.5	44.2	50.8
230V/3 phase/60hz	8.0	14.0	12.4	14.4	16.0	20.2	21.6	25.6	24.4	27.6	31.6	37.6	40.0	46.0
460V/3 phase/60hz	4.0	7.0	6.2	7.2	8.0	10.1	10.8	12.8	12.2	13.8	15.8	18.8	20.0	23.0
575V/3 phase/60hz	3.2	5.6	5.0	5.8	6.4	8.1	8.6	10.2	9.8	11.0	12.6	15.0	16.0	18.4

SPECIFICATION NOTES

* Based on 50° F (10° C) water temperature (100% water) leaving the chiller, standard pump selections, 85° F (27° C) condenser water supply @ 25 psi minimum. Consult factory for other conditions.

† Standard pump selection. Larger pumps available as options.

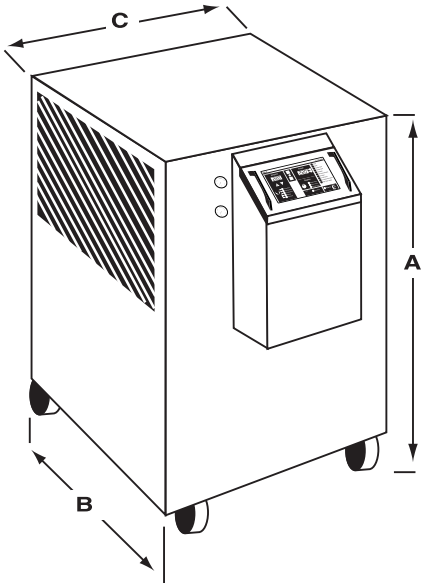
‡ Based on 50° F water temperature leaving the chiller and 60° F (15° C) water temperature returning to the chiller.

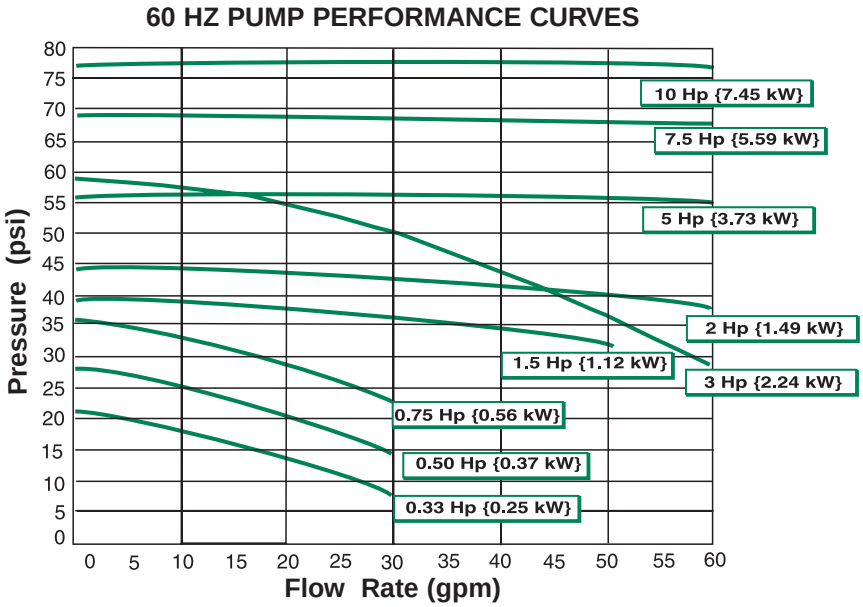
§ Pressure at pump discharge.

** Control can be extended upward approximately 11 inches, which may or may not increase the overall height of the unit.

Specifications may change without notice. Check with a Conair representative for the most current information.

SPECIFICATIONS: MPA (AIR COOLED)





MODEL	MPA-1.5		MPA-2		MPA-3		MPA-4		MPA-5		MPA-7.5		MPA-11	
Performance characteristics														
Capacity {tons} *	1.2		1.7		2.7		3.5		4.1		6.9		10.2	
Compressor Hp {kW}	1.5 {1.12}		2.25 {2.05}		3.25 { 279.7}		4 {2.98}		5 {3.73}		9 {6.71}		12 {8.95}	
Pump Hp (kW)†	0.33 {0.246}		0.50 {0.373}		0.75 {0.559}		1.5 {1.12}		1.5 {1.12}		1.5 {1.12}		1.5 {1.12}	
Chilled water flow gpm {l/min}‡	2.8 {10.6}		4.2 {15.9}		6.4 {24.2}		8.5{32.1}		9.9 {37.5}		16.6 {62.8}		24.5 {92.7}	
Chilled water pressure psi {bar}§	20 {1.4}		26 {1.8}		34 {2.3}		38 {2.6}		38 {2.6}		37.5 {2.6}		37 {2.5}	
Reservoir capacity gal {l}	10 {37.9}		30 {114}		30 {114}		30{ 114}		30 {114}		30 {114}		40.5 {153}	
Number of condenser fans	1		2		2		2		2		2		4	
Condenser fan power Hp {kW}	0.063 {0.047}		0.063 {0.047}		0.063 {0.047}		0.063 {0.047}		0.063 {0.047}		0.50 {0.047}		0.50 {0.047}	
Condenser air flow ft³/min {l/min}	1050 {496}		1704 {804}		2420 {1142}		4237 {2000}		4237 {2000}		5300 {2501}		8400 {3964}	
Dimensions inches {mm}														
A - Height **	45 {1143}		48 {1129}		48 {1129}		56 {1422}		56 {1422}		70 {1778}		76 {1930}	
B - Depth	32 {812}		44 {1118}		44 {1118}		48 {1219}		48 {1219}		48 {1219}		48 {1219}	
C - Width	29 {737}		29 {737}		29 {737}		34 {737}		34 {737}		34 {737}		40{1016}	
Weight lb {kg}														
Shipping weight	750 {340}		1000 {454}		1000 {454}		1200 {544}		1200 {544}		1400 {635}		1600 {726}	
Installed weight	610 {277}		830 {376}		830 {376}		1030 {467}		1030 {467}		1230 {558}		1430 {649}	
Utility Requirements														
Water connections NPT (female) inches	1		1		1		1.5		1.5		1.5		1.5	
Process water inches	1		1		1		1.5		1.5		1.5		1.5	
Voltages running and full load amps	run	full	run	full	run	full	run	full	run	full	run	full	run	full
208V/3 phase/60hz	11.7	18.3	16.1	18.6	21.0	27.0	27.8	32.3	31.0	34.5	63.0	69.6	90.8	97.8
230V/3 phase/60hz	10.6	16.6	14.6	16.8	19.0	24.4	25.2	29.2	28.0	31.2	57.0	63.0	82.2	88.5
460V/3 phase/60hz	5.3	8.3	7.3	8.4	9.5	12.2	12.6	14.6	14.0	15.6	28.5	31.5	41.1	44.3
575V/3 phase/60hz	4.2	6.6	5.8	6.7	7.6	9.8	10.1	11.7	11.2	12.5	22.8	25.2	32.9	35.4

SPECIFICATION NOTES

* Based on 50° F (10° C) water temperature (100% water) leaving the chiller, standard pump selections, 95° F (35° C) ambient air conditions. Consult factory for other conditions.

† Standard pump selection. Larger pumps available as options.

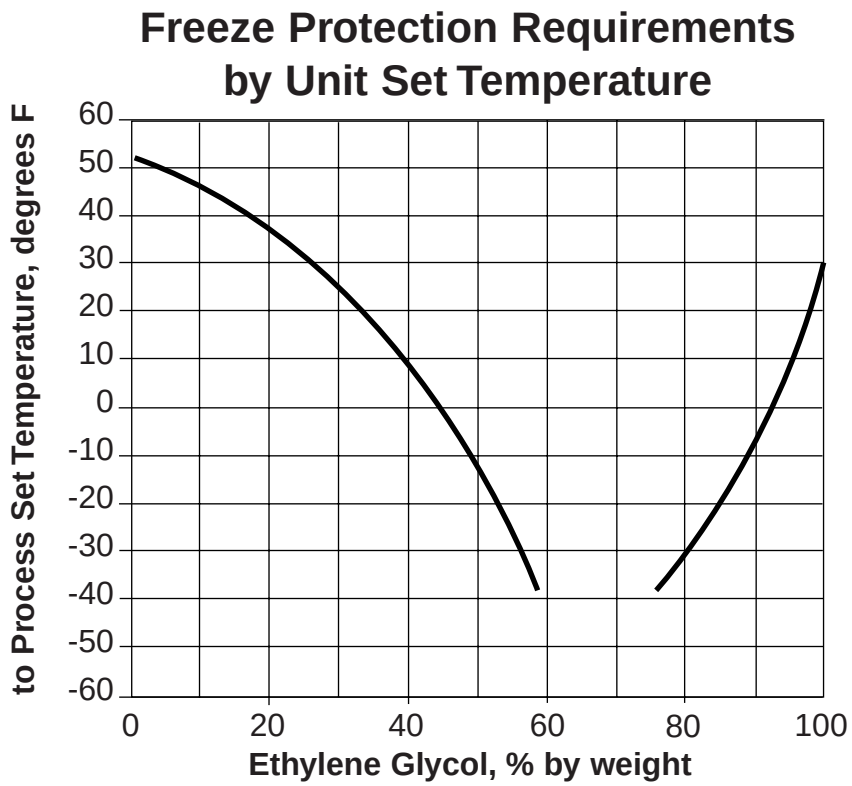
‡ Based on 50° F water temperature leaving the chiller 60° F (15° C) water temperature returning to the chiller.

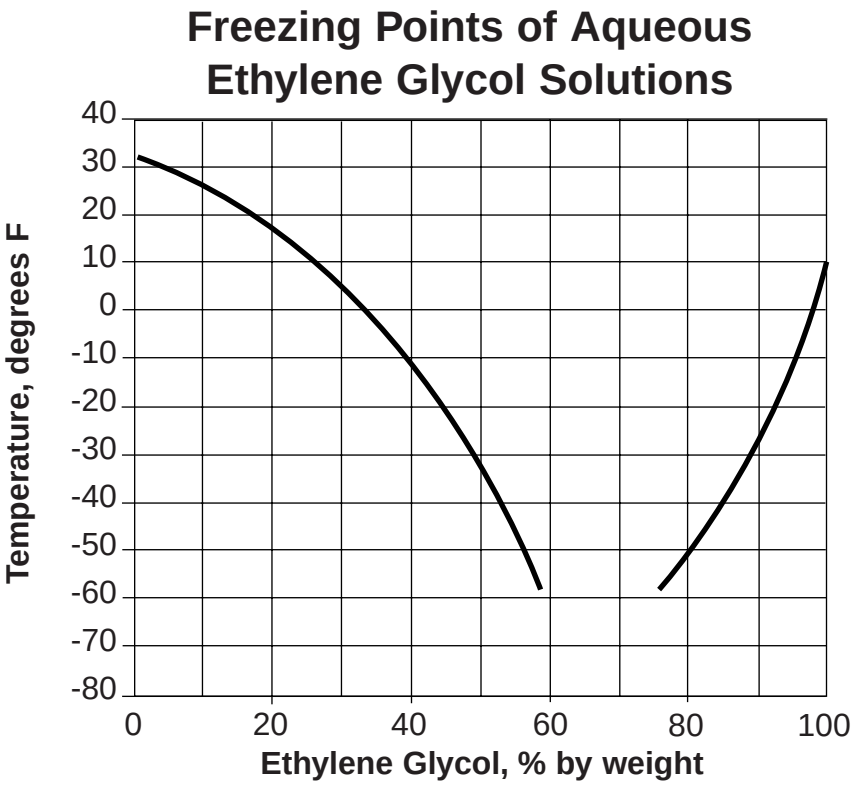
§ Pressure at pump discharge.

** Control can be extended upward approximately 11 inches, which may or may not increase the overall height of the unit.

Specifications may change without notice. Check with a Conair representative for the most current information.

FREEZE PROTECTION REQUIREMENTS





INSTALLATION

UNPACKING THE BOXES

MicroKool Portable Chillers come fully assembled.

1. **Carefully remove the chiller** and components from their shipping containers, and set upright.

2. **Remove all packing material**, protective paper, tape, and plastic. Check inside the electrical enclosure and behind the side panels for accessories or hardware that may have been placed there for shipping.

3. **Carefully inspect all components** to make sure no damage occurred during shipping, and that you have all the necessary hardware. If damage is found, notify the freight company immediately.

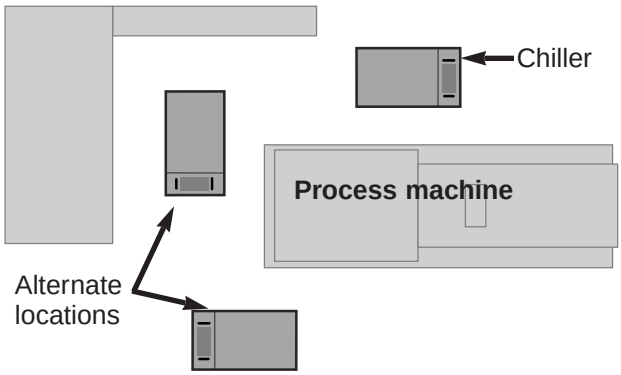
4. **Take a moment to record serial numbers** and specifications in the blanks provided on the back of the User Guide's title page. The information will be helpful if you ever need service or parts.

5. **You are now ready to begin installation.** Complete the preparation steps on the next page.

PREPARING FOR INSTALLATION

The microKool chiller is easy to install, if you plan the location and prepare the area properly.

1 Position the chiller as close to the process machine as possible.



2 Make sure the installation area provides:

❒ **A three-phase power source supplying the correct current** for your chiller model. Check the serial tag on the side of the electrical enclosure for the required voltage, phase, frequency, full load amps, disconnect fuse size and minimum wire connection size. Field wiring should be completed by qualified personnel to the planned location for the chiller. All electrical wiring should comply with your region's electrical codes.

❒ **A clean, well-ventilated environment.** The room temperature should not exceed 110° F (43° C) with 95% non-condensing humidity and should not fall below 55° F (12° C).

❒ **Minimum clearance for safe operation and maintenance.** Nothing should be placed on top of the unit while the unit is operating. All models require a minimum clearance of 5 ft. around the perimeter for servicing. Models equipped with fans also require unrestricted outlet air flow.

❒ **A source of water for cooling on water-cooled units.** City, tower or chiller water may be used, as long as the supply pressure is at least 25 psi and not more than 85 psi.

3 Install plumbing for process and cooling lines.

See the specification tables for the correct line and fitting sizes. Larger line sizes are acceptable as long as they are reduced at the chiller connections. Smaller line sizes are not recommended.

CONNECTING PROCESS AND WATER SUPPLY LINES

Tools for installation:
❒ Pipe wrench large enough for a 2-inch pipe
❒ Premium quality Teflon thread sealant

The chiller process inlets and outlets must be connected to the plumbing that will circulate the temperature-controlled water or fluid through the process. Cooling water inlets and outlets are connected to the cooling water supply.

1 **Remove the shipping pipe plug** from the female connections on the back of the chiller.

2 **Install pipe to the rear of the chiller.**
Use appropriately sized male NPT piping for the process connections and the MPW condenser water connections.

Process connections (NPT):

MPW-1.5 MPA-1.5	MPW-2 MPA-2	MPW-3 MPA-3	MPW-4 MPA-4	MPW-5 MPA-5	MPW-7.5 MPA-7.5	MPW-10 MPA-11
1 in.	1 in.	1 in.	1.5 in.	1.5 in.	1.5 in.	1.5 in.

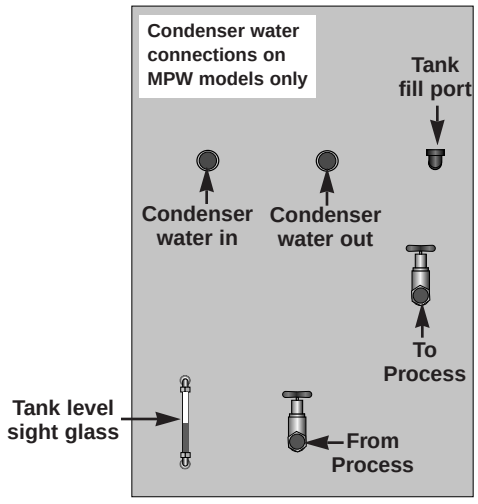
Condenser water connections (NPT):

MPW-1.5	MPW-2	MPW-3	MPW-4	MPW-5	MPW-7.5	MPW-10
1 in.	1 in.	1 in.	1.5 in.	1.5 in.	1.5 in.	1.5 in.

Pipe and pipe threads must be clean and new. Clean threads with solvent, removing all oil, grease and dirt. Allow the threads to dry before proceeding.

3 **Coat the pipe threads with thread sealant.**
Follow the sealant manufacturer's directions.

4 **Connect the male pipe to the appropriate female connection on the back of the unit**.
Connections are labeled on the chiller. Start by hand until the threads engage, then use a pipe wrench to tighten the connection only enough to prevent leaks.
Do not over-tighten!



NOTE: *Make sure the chiller tank is full of process fluid before you begin operating. Use a glycol mixture if operating temperatures are below 45° F. See* ***FREEZE PROTECTION REQUIREMENTS****.*

CONNECTING THE MAIN POWER SUPPLY

WARNING: Electrical shock hazard

This equipment is powered by three-phase main voltage. Always disconnect and lock out the main power source before performing any work involving electrical connections. All wiring, disconnects and fusing should conform to your region's electrical codes and should be installed only by qualified personnel.

Before beginning, note the electrical specifications on the nameplate mounted to the side of the unit. The electrical hookup must match these specifications with +/- 10% maximum voltage variance. An improper power supply could damage the unit as well as seriously injure an operator.

The electrical hookup also should run through a fused disconnect sized for the nameplate amperage and conforming to Article 250 of the National Electrical Code.

IMPORTANT: *Always refer to the wiring diagrams that came with your unit before making electrical connections. The diagrams show the most accurate electrical component information.*

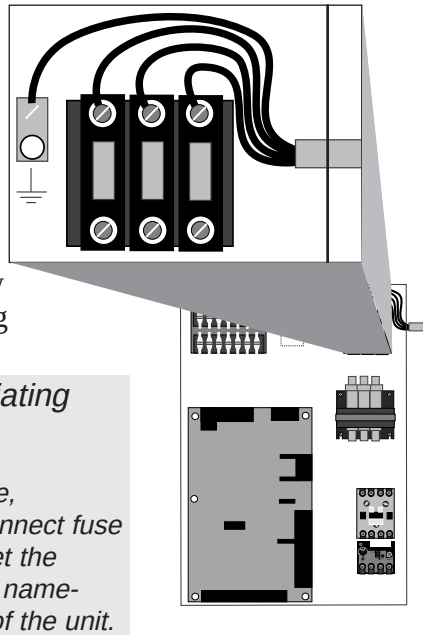
1 Open the unit's electrical enclosure.

2 Insert the main power wire through the knockout hole in the right side of the enclosure.

3 Secure the power wire with a rubber compression fitting or strain relief.

4 Connect the power wires to the terminals.
Connect the three hot wires to L1, L2, and L3 on the terminal block.

5 Connect the ground wire to the copper grounding mount.
If you have installed a disconnect device, follow the manufacturer's wiring instructions.



IMPORTANT! *Before initiating power to the unit:*

- ❒ *Check the system for leaks.*
- ❒ *Verify that the voltage, phase, frequency, amperage, disconnect fuse and minimum wire size meet the specifications stated on the nameplate mounted on the side of the unit.*
- ❒ *Verify that resistance to ground on each phase is at least 1 meg ohm.*

TESTING THE INSTALLATION

WARNING: Only qualified personnel should perform this procedure.

Parts of this test require opening the unit while it is energized. Only qualified personnel who have been trained in the use of electrical testing devices and in avoiding the safety hazards involved in safely troubleshooting this type of equipment should perform this test procedure.

NOTE: Make sure the chiller tank is full of process fluid before you begin operating.

1 Turn on the condenser water supply (MPW units) and check for leaks. If any leaks appear, stop the test and fix the problem before continuing. The water pressure must be at least must be at least 25 PSI at the condenser inlet.

2 Apply power to the unit.

- Indicator lights on the control panel blink green, then red, to test operation of the LEDs.
- Setpoint and actual windows will display 888 for three seconds, followed by the software version. The windows then display the factory default setpoint of 50° F (10° C) and the actual temperature.

3 Check the rotation of the pump. Remove the access panel and verify that the pump rotation matches the direction indicated on the rotation stamp on the pump.

***NOTE:** If the rotation is incorrect, stop the test and disconnect power to the unit. Open the electrical enclosure and switch any two of the three power source wires on the terminal block. Return to Step 2 and check rotation again.*

4 Replace the access panel.

5 Press the RUN key to start the unit.

If everything is working correctly:

- The RUN/STOP light turns green.
- The pump begins operating. The compressor turns on after 3 seconds, if the actual temperature is above the setpoint.
- Normal operation begins. The unloader valves turn on, if the actual temperature is below setpoint. The compressor remains active until the actual temperature is 6° F below the setpoint.

The test is over. Proceed to initial setup if the unit operated normally; refer to the *TROUBLESHOOTING* section if it did not.

ENTERING SETPOINT DEVIATION PARAMETERS

You can establish a normal operating range around the process temperature setpoint using the high and low deviation parameters. If the process temperature exceeds the high deviation limit, or falls below the low deviation limit for longer than 15 minutes, the chiller will alert you to the unacceptable temperature variation with an alarm light.

These temperature deviation limits will adjust automatically relative to the process temperature setpoint.

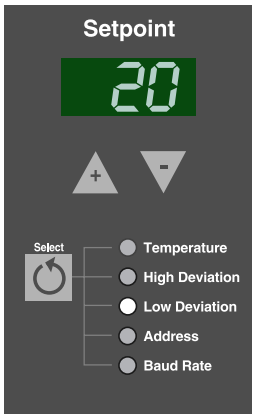
The factory default setting is the process temperature setpoint ± 10° F (6° C). This parameter is adjustable to establish a narrower or wider acceptable temperature range for normal operation. You cannot set the Low Deviation below the factory-set Low Safety temperature. The High Deviation cannot be set to exceed the factory-set High Safety temperature.

FACTORY DEFAULT SETTINGS		
Model	**MPW**	**MPA**
Process Setpoint	50° F (10° C)	50° F (10° C)
High Safety	75° F (24° C)	75° F (24° C)
Low Safety	10° F (-12° C)	10° F (-12° C)

To change the temperature deviation settings:

1 **Press the Setpoint Select button to select the deviation parameter you want to change.**

2 **Use the ▲ and ▼ setpoint buttons to enter the deviation temperature.** The setting is stored in memory even when the power is turned off. The recommended setting is ± 2-10° F.



NOTE: *If you enabled passcode protection, you must enter the passcode to change this parameter.* ***See*** ***ENABLING AND DISABLING PASSCODE PROTECTION.***

Too enter the passcode:

Hold down the Setpoint Select button for 5 seconds. When the control displays " 1 PaS", use the setpoint adjustment buttons to enter the passcode. Press the Setpoint Select button again. If the correct passcode was entered the controller will display ACC PAS for 3 seconds. If the passcode was incorrect, the controller will display rEJ PAS (rejected passcode).

Access to system parameters remain until power is cycled or the RUN or STOP button is pressed.

INITIAL SETUP

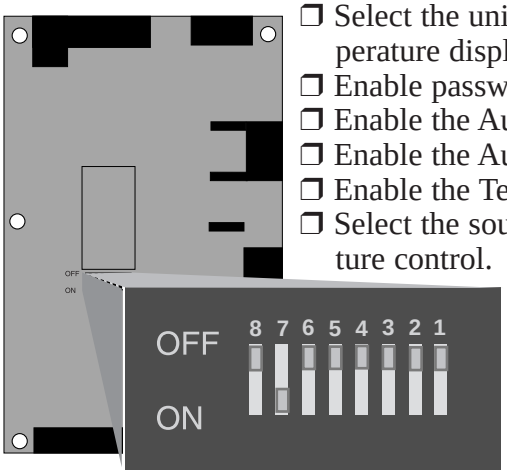
WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

The factory-set parameters and operating modes will satisfy most applications. But you can change some settings and enable or disable features as needed.

You can modify the parameters for high and low process temperature deviation warnings from the control panel. **See *SETTING SETPOINT DEVIATION PARAMETERS*.**

Dip switches on the motherboard inside the PC-1 and PC-2 electrical enclosure allow you to:



- ❒ Select the units of measure for temperature displays.
- ❒ Enable password protection.
- ❒ Enable the Auto Tune.
- ❒ Enable the Auto Start feature.
- ❒ Enable the Test Mode.
- ❒ Select the source point of temperature control.

NOTE: *Dip switch 7 must be ON and dip switch 8 must be OFF for the chiller to work. Do not change the factory setting of these two dip switches.*

Dip switch Configuration

No.	OFF	ON
1	Display units in °F	Display units °C
2	Auto Tune disabled	Auto Tune enabled
3	Passcode protect	Password reset/modify
4 *	Auto Start disabled	Auto Start enabled
5 *	Control point protect	Control point source select
6	Test Mode disabled	Test mode enabled
7 †	Controller type selection	Controller type selection
8 †	Controller type selection	Controller type selection

* Available only on PC-2 control models.
† Switch 7 must be ON, and switch 8 must be OFF. Do not change the settings of these two switches.

To change the dip switch settings, see the appropriate topic on the following pages.

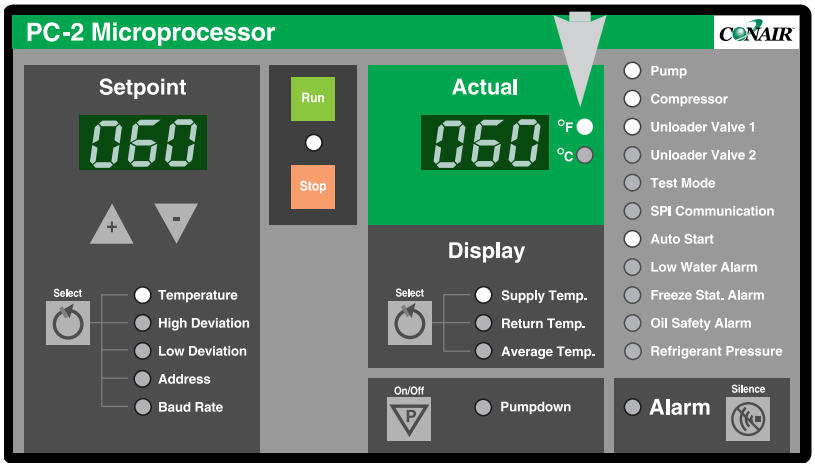
CHANGING TEMPERATURE UNITS

WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

The temperature units are factory-set as degrees Celsius or degrees Fahrenheit, as specified when the unit was ordered.

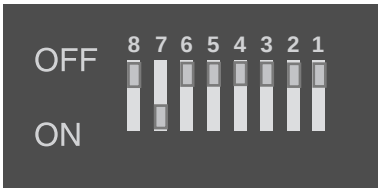
When the chiller is on, the indicator lights to the right of the Actual temperature display on the control panel will show which temperature unit has been set.



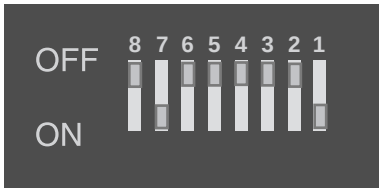
To change this setting, move Dip Switch 1 on the control circuit board.

1. **Disconnect and lock out main power** to the chiller.
2. **Open the electrical enclosure.**
3. **Change Dip Switch 1 to:**

OFF for °F



ON for °C



4. **Close the electrical enclosure** and restore main power to begin operating.

ENABLING AND DISABLING PASSCODE PROTECTION

WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

The PC-1 and PC-2 controls provide the ability to protect system parameters from unauthorized changes during normal operating mode. When system passcode protection is enabled, the following parameters cannot be changed unless you enter the correct passcode:

- The Process Setpoint
- High Deviation Alarm Setpoint
- Low Deviation Alarm Setpoint
- Baud Rate selection for serial communications
- Address selection for serial communications

When the unit is turned on for the first time, passcode protection is disabled. To enable passcode protection:

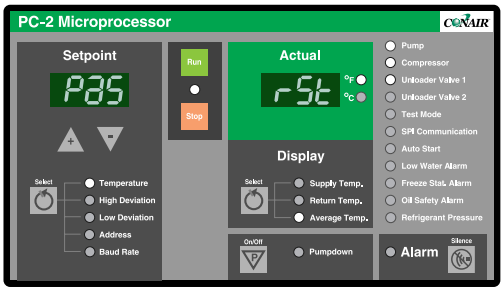
1 **Disconnect and lock out main power** to the unit.

2 **Open the electrical enclosure.**

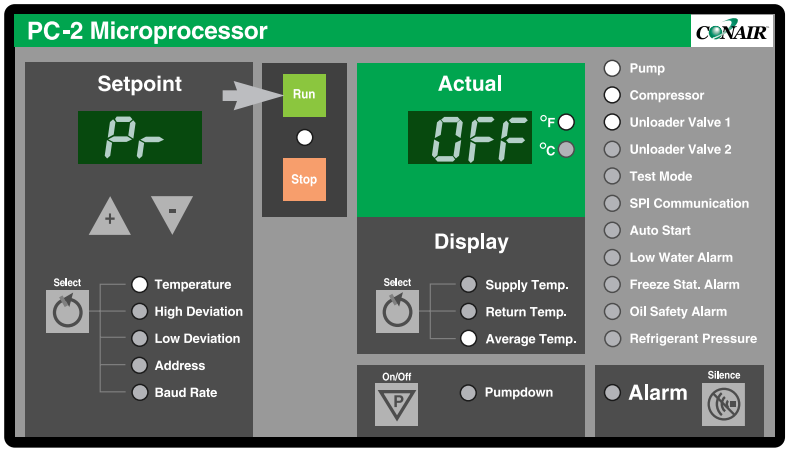
3 **Set dip switch 3 to ON and switches 5 and 6 to OFF.**

4 **Close the electrical enclosure and restore power to the unit.**

5 **Press any button when the control displays "Pas rSt"** (Passcode Reset)**.** The control will display the last passcode used.



6 **Select a new passcode using the ▲ and ▼ setpoint adjustment buttons.**
Stop pressing the setpoint buttons when the passcode you want appears in the setpoint display window. Selecting "OFF" as the passcode will disable the passcode feature.



7 **Press the RUN button to save the passcode.**
◆ The control will display "Pr OFF" to prompt you to remove power to the unit.

> ***IMPORTANT:*** *If RUN is not pressed, the new passcode will not be saved.*

8 **Turn off power to the unit.** Disconnect and lock out the main power supply.

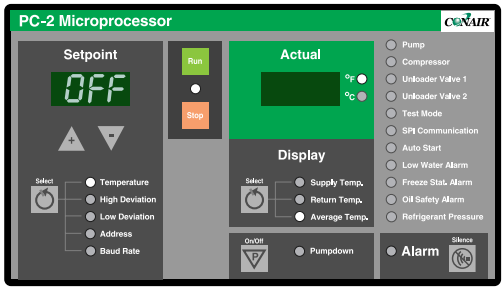
9 **Open the electrical enclosure.**

10 **Set dip switch 3 to OFF.**

11 **Close the electrical enclosure and restore power to the unit.**
A passcode now is required to change system parameters.

Disabling Passcode Protection

To disable passcode protection and allow universal access to system parameters:



1 **Follow Steps 1 through 5** in the previous section on enabling pass-code protection.

2 **Hold down the ▼ setpoint adjustment button to select "OFF" as the new passcode.**

3 **Follow steps 7 through 11 in the previous section.**

SELECTING THE TEMPERATURE CONTROL POINT

(PC-2 CONTROL ONLY)

WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

PC-1 microprocessors control the process temperature based upon the average of the temperatures recorded at the supply (to process) and return (from process) thermocouples.

The PC-2 microprocessor allows you to select how the unit will measure and control the process temperature. The control point can be selected as the supply, the return or the average of the the two temperatures.

To select the control point source on units with PC-2 control:

1 Disconnect and lockout power to the unit.

2 Open the electrical enclosure.

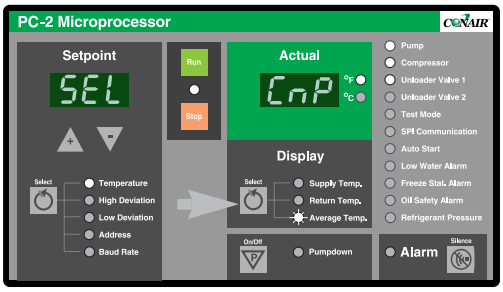
3 Set dip switches 3 and 6 to the OFF position.

4 Set dip switch 5 to the ON position.

5 Close the electrical enclosure and restore power to the unit.

6 Press any button when the control displays "Cnt Pt".

The controller will display "Sel CnP" and flashes the LED for the current control point.

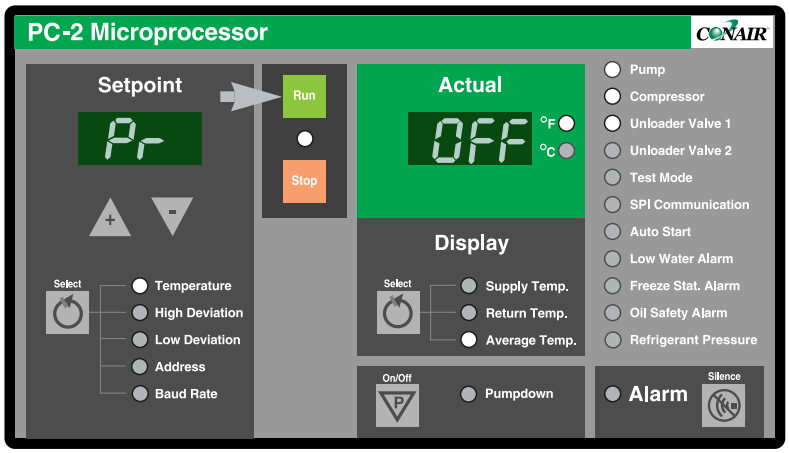


7 Select a new control point using the Display button.

Stop pressing the select button until the indicator light next to the control point you want illuminates.

SELECTING THE TEMPERATURE CONTROL POINT

(PC-2 CONTROL ONLY)



8 **Press the RUN button to save the control point.**

◆ The control will display "Pr OFF" to prompt you to remove power to the unit.

IMPORTANT: *If RUN is not pressed, the new control point source will not be saved.*

9 **Turn off power to the unit.** Disconnect and lock out the main power supply.

10 **Open the electrical enclosure.**

11 **Set dip switch 5 to OFF.**

12 **Close the electrical enclosure and restore power to the unit.**

The chiller will now control the process temperature based on actual temperatures recorded at the new control point source.

INSTALLING THE AUTO START FEATURE

(PC-2 CONTROL ONLY)

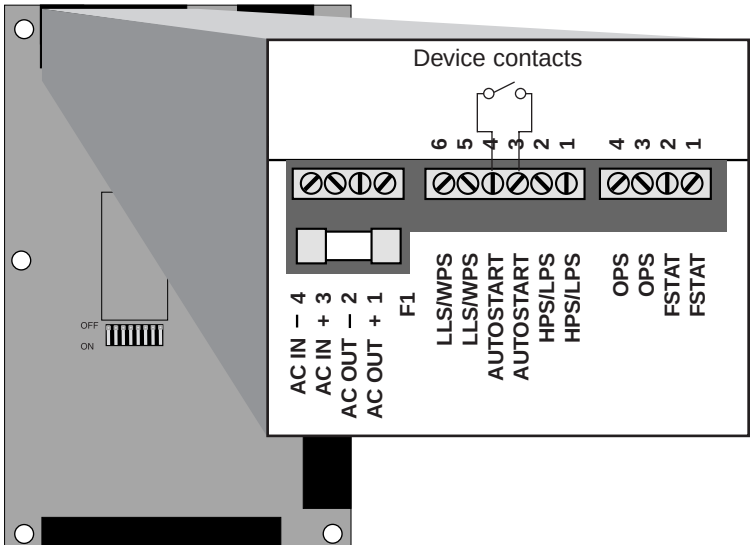
WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

If you have a PC-2 microprocessor control, you can automatically start and stop the chiller from a remote switching or timing device that has power contacts rated 110VAC, such as the process machine control.

Wiring the device to the chiller is accomplished through a dry contact to the appropriate terminals on the motherboard. After wiring the device to the unit, Auto Start must be enabled by configuring a dip switch on the motherboard.

1. **Disconnect and lockout power to the unit.**
2. **Open the electrical enclosure.**
3. **Punch a small hole in the left side of the electrical enclosure.** The hole must be large enough to accommodate conduit for the power contact wires from your switching or timing device.
4. **Insert the two power leads from the device** through the conduit into the electrical enclosure.



5. **Connect the 110VAC device contact wires to the Auto Start terminals.** Make sure terminals are screwed tight.

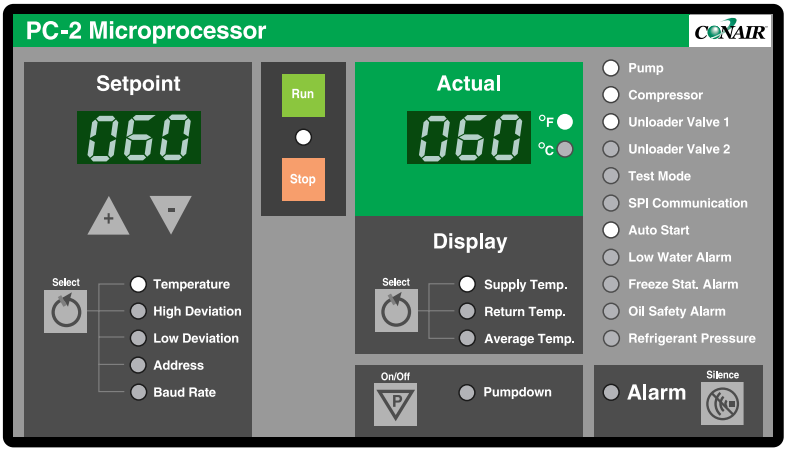
IMPORTANT: *Always refer to the wiring diagrams that came with your unit before making electrical connections. The diagrams show the most accurate electrical component information.*

INSTALLING THE AUTO START FEATURE

(PC-2 CONTROL ONLY)

6 **Set dip switch 4 to the ON position.**

7 **Close the electrical enclosure and restore power to the unit.**



When Auto Start is enabled:

- The Auto Start indicator light flashes to indicate that the Chiller can start at any time. The chiller will start whenever the remote switching or timing device sends a signal to start processing.
- The Auto Start indicator light is on whenever the chiller is under the control of the remote device.

To disable Auto Start:

Repeat steps 1, 2 and 7, setting dip switch 4 to the OFF instead of the ON position.

ACTIVATING SPI COMMUNICATION

NOTE: *To disable SPI, use the setpoint ▲ or ▼ arrow to select Address. Press the ▼ arrow until OFF is displayed in the setpoint window.*

See the APPENDIX for additional SPI programming information.

MicroKool portable chillers provide SPI compatible support for RS-485 serial communications with a host machine. You can use SPI communication to change or monitor the:

- Process temperature setpoint
- High and low temperature deviation alarms
- Process status (run and alarm conditions)
- Machine 1 status
- Machine 2 status
- Actual temperature to process
- Actual temperature from process

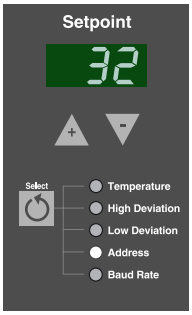
To use the SPI communication option, you must connect the chiller to the host machine and set the communication baud rate and node address using the setpoint select and adjustment buttons on the control panel.

1 Connect the host machine to the chiller.
Plug the male DB9 connector into the serial communications port on the chiller.

2 Apply power to the chiller.

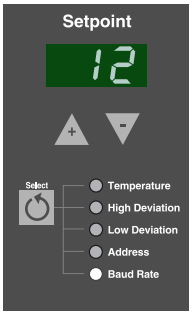
3 Enter the passcode, if necessary.
Hold the Setpoint Select button for 5 seconds. When the control displays 1 PaS, use the setpoint adjustment buttons to enter the passcode.

4 Enter the node address.
Press the Setpoint Select button to choose Address. Then press the setpoint ▲ or ▼ arrow until the address you want appears in the setpoint display. The address may be set to any number from 32 to 254 (a hexadecimal integer between 20 and FE), as long as that number has not been assigned to another machine connected to the same network.



5 Set the baud rate to 12, 24, 48 or 96.
The chiller must be set to send and receive data at the same baud rate as the host machine. Press the setpoint ▲ or ▼ arrow until the baud rate you want appears in the setpoint display window.

12 = 1200 bps 48 = 4800 bps
24 = 2400 bps 96 = 9600 bps



The green SPI status light on the control panel should flash when the unit is communicating. The LED will turn red, indicating an alarm, if SPI communication is not properly set up.

OPERATION

PC-1 Control Features

All normal operating functions can be controlled from the microKool PC-1 control panel.

Setpoint display

The Setpoint display shows the setpoints entered for fluid temperature, high and low temperature deviation alarms, the SPI baud rate, and the SPI address.

Setpoint and Actual value display windows also display some alarm codes and setup instructions.

Run/Stop

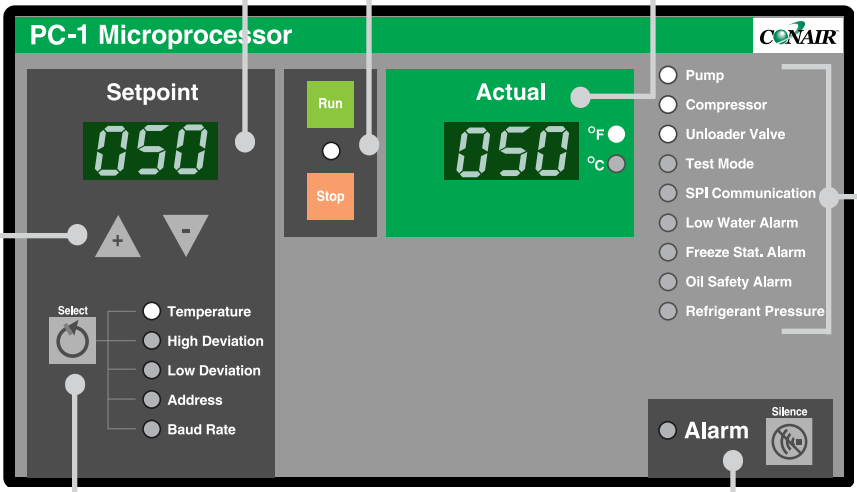
Press the RUN button to start normal operation. Press STOP to stop the unit.

- = Running (green)
- = Stopped (red)
- = Alarm (red, flashing)

Actual values display

The green window displays the temperature at the middle of the process. This is calculated as an average of the process fluid temperatures at the chiller inlet and outlet.

The lights indicate whether the temperature is in degrees Fahrenheit or Celsius. See the *Installation* section for instructions on how to change the temperature units.



Status lights

The lights indicate the operating status of the listed components. Except in Test Mode, the lights indicate:

- = Off or inactive
- = On or active (green)
- = Alarm condition (red)

Test Mode is used for testing displays, keys and input/output functions. When test mode is enabled, normal operation is disabled.

- = Test Mode off
- = Test Mode on (red); unit disabled

Setpoint Select button

Press repeatedly until a green light appears next to the parameter you want to program or view.

NOTE: Default settings for the deviation setpoints are:
High = setpoint + 10° F
Low = setpoint - 10° F
A warning alarm occurs (indicator light red) whenever the actual temperature is outside this setpoint range for more than 15 minutes. Recommended setting: ± 2-10° F.

Alarm

Press to acknowledge the alarm light and silence the optional audible alarm. The alarm light will flash until the cause of the alarm condition is fixed. See Troubleshooting for alarm descriptions and remedies.

Setpoint adjustment buttons

Press ▲ or ▼ to enter the process temperature setpoint, SPI parameters and passcodes.

Press ▲ to increase a value.
Press ▼ to decrease a value.

TIP: Press and hold the button for faster scrolling speed.

***NOTE:** Passcode protection prevents accidental or unauthorized changes to all operating parameters. If passcode protection has been enabled, you must enter the correct passcode to change the process temperature setpoint.*

PC-2 Control Features

All normal operating functions can be controlled from the microKool PC-2 control panel, including the optional pump-down feature.

Setpoint display

The Setpoint display shows the setpoints entered for fluid temperature, high and low temperature deviation alarms, the SPI baud rate, and the SPI address.

Setpoint and Actual value display windows also display some alarm codes and setup instructions.

Run/Stop

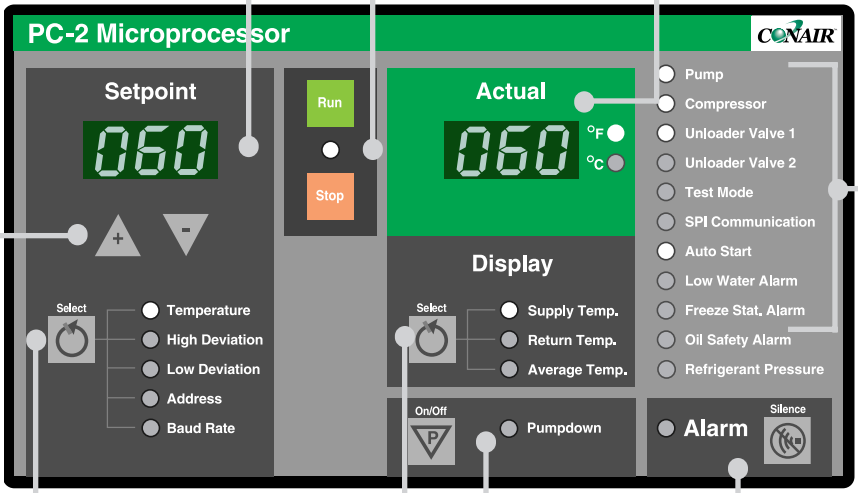
Press the RUN button to start normal operation. Press STOP to stop the unit.

= Running (green)
= Stopped (red)
= Alarm (red, flashing)

Actual values display

The green window displays the temperature at the middle of the process. The control point for this temperature is selectable as the temperature at the supply outlet, return inlet or the average of the two temperatures.

The lights indicate whether the temperature is in degrees Fahrenheit or Celsius. See the *INSTALLATION* section for instructions on how to change the temperature units.



Status lights

The lights indicate the operating status of the listed components. Except in Test Mode and Auto Start, the lights indicate:

= Off or inactive
= On or active (green)
= Alarm condition (red)

Test Mode is used for testing displays, keys and input/output functions. When test mode is enabled, normal operation is disabled.

= Test Mode off
= Test Mode on (red); unit disabled

Auto Start allows you to start and stop the chiller from a remote switching or timing device, such as the processing machine control. This feature can only ben enabled by configuring a dip switch on the control motherboard.

= Disabled; Auto Start not available
= Enabled (flashing green); unit can start any time
= On and under control of the remote device

Setpoint Select button

Press repeatedly until a green light appears next to the parameter you want to program or view.

NOTE: Default settings for the deviation setpoints are:
High = setpoint + 10° F
Low = setpoint - 10° F
A warning alarm occurs (indicator light red) whenever the actual temperature is outside this setpoint range for more than 15 minutes.
Recommended setting: ± 2-10° F.

Alarm

Press to acknowledge the alarm light and silence the optional audible alarm. The alarm light will flash until the cause of the alarm condition is fixed. See Troubleshooting for alarm descriptions and remedies.

Pumpdown On/Off

The Pumpdown feature prevents refrigerant migration. The compressor turns on and off as needed to store refrigerant in the condenser.

Setpoint adjustment buttons

Press ▲ or ▼ to enter the process temperature setpoint, SPI parameters and passcodes.

Press ▲ to increase a value.
Press ▼ to decrease a value.

TIP: Press and hold the button for faster scrolling speed.

Display Select button

Press repeatedly until a green light appears next to the parameter you want to program or view.

POSITIONING THE CONTROL PANEL

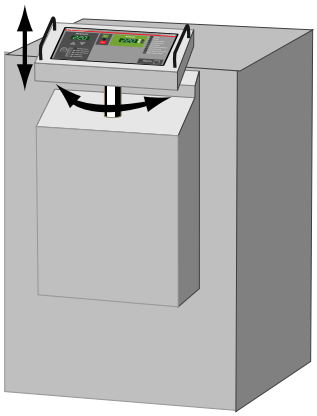
CAUTION: Improper use of the swiveling control panel can damage the unit.

- **Do not** rotate the control panel 360 degrees. This will twist and possibly damage the control wiring and connections to the motherboard in the electrical enclosure.
- **Do not** use the control panel handles or control cables to move the chiller. The handles are designed only for orientation of the control panel.
- **Do not** mount the detachable PC-2 control panel to a hot surface.

The control panel on microKool chillers can be swiveled, raised and lowered to provide easy viewing and access. The PC-2 control panel also can be mounted up to 50 feet from the unit, using a remote control cable and the magnetic back on the back of the panel.

To raise and swivel the control panel:

Grasp the black control panel handles, and pull upward. Use the handles to rotate the control panel. Do not rotate the panel 360 degrees.



To lower the control panel:

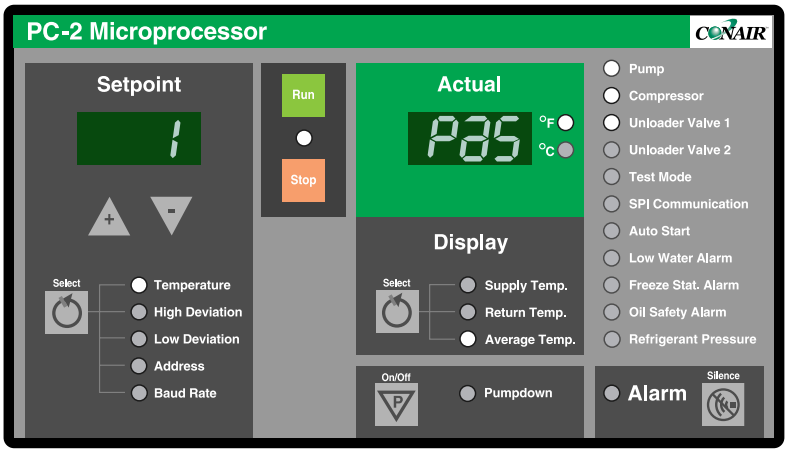
Grasp the black control panel handles, and rotate the control until it is aligned with the unit. Do not rotate the panel 360 degrees. Gently push down on the handles until the control panel is flush with the unit.

To detach the PC-2 control panel:

The PC-2 control panel may be removed and mounted up to 50 feet from the unit. **Do not stretch the cable.** The cable is available in various lengths so that you can order the appropriate cable for your installation.

Grasp the black control panel handles and pull upward. Use the magnetic back to mount the control panel in the remote location. Connect the remote-mounted control to the unit with the cable provided.

ENTERING A PASSCODE



PC-1 and PC-2 controls have a security feature that prevents accidental or unauthorized changes to the setpoint temperature, high and low deviation limits, SPI address, and baud rate.

If passcode protection is enabled, you must enter the correct passcode to change these parameters. To enter the passcode:

1 Press and hold the Setpoint Select button for 5 seconds. The control will display 1 PaS to indicate a passcode is needed.

2 Press the Select ▲ button until the correct passcode appears in the display.

3 Press again to enter the passcode. If the passcode is correct, the control displays ACC PAS for 3 seconds. If the passcode is incorrect, the control displays rEJ PAS (rejected passcode).

4 Press Setpoint to select the parameter you want to change.

You will have access to the system parameters until:

- The power is cycled off and on.
- The RUN or STOP button is pressed.
- No key has been pressed for 30 seconds.

NOTE: *Pressing the STOP or RUN key while you are entering a passcode will abort the passcode entry sequence*

STARTING THE CHILLER

Before starting the chiller, verify that the system has been installed correctly for your application. See the *INSTALLATION* section. If Passcode Protection has been enabled, you must enter the correct passcode before you can change or enter any of the operating parameters, including the setpoint.

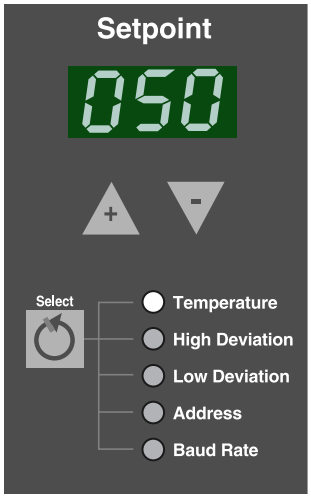
IMPORTANT: *If you are operating the chiller for the first time since installation, you should perform an Auto Tune after two hours of normal operation. You should perform the Auto Tune periodically to ensure that the control correctly calculates how much heat and cooling should be applied to maintain the process setpoint.* ***See PERFORMING AN AUTO TUNE.***

1 Turn on main power to the chiller at least 12 hours before you want to begin processing.
This allows time for crankcase heater to evaporate liquid refrigerant migrating in the compressor. When power is turned on:
- ◆ The compressor crankcase heater turns on.
- ◆ Indicator lights blink green, then red.
- ◆ Setpoint and actual windows will display 888 for three seconds, followed by the software version. The windows then display the previously entered setpoint and the actual temperature.

2 Make sure the chiller tank is full of fluid.

3 Turn on the water supply to the chiller (MPW).
The supply must be at least 25 psi. Check for leaks in the condenser water and process fluid lines before continuing.

4 Enter the passcode, if necessary. Hold the Setpoint Select button for 5 seconds. When the control displays 1 PaS, use the setpoint adjustment buttons to enter the passcode. Press the Setpoint Select button again.



5 Enter the temperature setpoint. Press the Setpoint Select button until the green light appears next to Temperature. Press ▲ to increase or ▼ to decrease the temperature setting.

6 Press Run to start normal operation.
- ◆ The RUN/STOP light turns green.
- ◆ The pump begins operating. The compressor turns on after 3 seconds, if the actual temperature is above the setpoint.
- ◆ Normal operation begins. The unloader valves turn on if the actual temperature is below setpoint. The compressor remains active until the actual temperature is 6° F below the setpoint.

If the Alarm light turns on, press  to silence the optional audible alarm. Then see the *TROUBLESHOOTING* section.

STOPPING THE CHILLER

WARNING: Electrical shock hazard
Before attempting maintenance of any kind on the chiller, you must stop the unit; disconnect and lockout the main power supply.

You must shut down the chiller whenever you:

- Change water or process hookups.
- Shut down the process machine.
- Run the unit's diagnostic tests.
- Perform routine or preventative maintenance.
- See an alarm condition that requires troubleshooting.
- Relocate, ship or store the unit.

To shut down the unit:

1 Press Stop .

2 Disconnect the power supply if you have shut down to service or repair the chiller.

If you have shut down the chiller for relocation or storage, drain all fluid from the unit; disconnect the power supply; and disconnect all process and water connections. In shipment or storage, the chiller can withstand an environment between -40° F (-40° C) and 150° F (65° C) with 95% relative humidity non-condensing.

USING THE PUMPDOWN FEATURE

(PC-2 CONTROL ONLY)

The microKool must be running to use this feature.

1 Press the P button to turn on Pumpdown.

- The green Pumpdown light will flash, indicating the feature is ready to start when needed.
- When Pumpdown is needed, the compressor runs occasionally to pump refrigerant to the condenser. When Pumpdown is running, the green light remains on but does not flash.

2 Press the P button again to turn off Pumpdown.

PERFORMING AN AUTO TUNE

WARNING: Electric shock hazard

This equipment is powered by high voltage. Always disconnect and lock out the main power source before opening the unit or the electrical enclosure to modify factory settings. Failure to disconnect and lock out the main power source can result in severe personal injury.

You should perform an Auto Tune after the first two hours of operation and whenever process variables change (changes in condenser water pressure, piping or molds; large ambient swings; new setpoint temperature) to ensure that the control continues to obtain good approximations of the PID constants used to compensate for the thermal lag of the system.

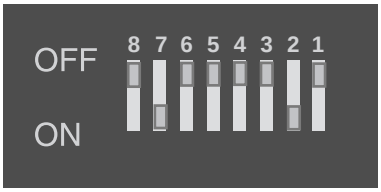
To ensure a successful Auto Tune, verify that:

- ❒ **The Auto Tune feature has been enabled.** Auto Tune is enabled or disabled via dip switch 2 on the motherboard.
- ❒ **The process value is stable.** A fluctuating process value will fool the software into making inaccurate tuning decisions. The software waits 5 minutes for the process value to stabilize before it starts the Auto Tune process. If the process value still fluctuates after 5 minutes, the Auto Tune terminates and the control displays the "At ti" error.
- ❒ **The control is in STOP mode and the process value is in ambient temperature.** This allows the software to obtain good approximations of process parameters, which are critical for performing an accurate tune. If this requirement is not met, then a good tune cannot be guaranteed.
- ❒ **The setpoint/process deviation is at least 25° F.** If the absolute value of setpoint - process temperature is not greater than or equal to 25° F, the Auto Tune will terminate. The control will display an "At dEV" error.

1 Press Stop **to shut down the chiller.**

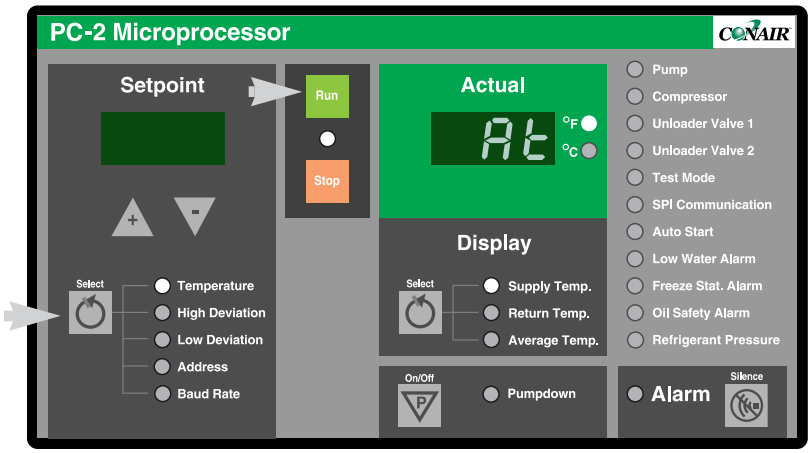
2 Disconnect and lock out main power to the unit.

3 Enable Auto Tune.
Open the electrical enclosure.
Set dip switch 2 to ON.
Close the electrical enclosure and restore power to the unit.



4 Restore power to the unit.

PERFORMING AN AUTO TUNE



5 **Press Run and (the Setpoint Select button) simultaneously to begin the Auto Tune.**
The Actual display will flash "At" and the current process temperature to indicate that an Auto Tune is underway.

If Auto Tune is successful, the controller automatically starts controlling using the new PID parameters.

If you press the STOP button or a fault occurs during the Auto Tune, the control enters stop mode and Auto Tuning immediately terminates. The actual display stops flashing "At." If a fault occurred, the control will display the appropriate error message.

ERROR MESSAGE	ERROR DESCRIPTION
At dEv	**Insufficient setpoint/process deviation.** If the absolute value of (setpoint - process value) is less than 25° F. The Auto Tune cannot be started until the temperature difference is at least 25° F.
At tI	**Auto Tune timed out.** Auto Tune will time out if a stable process value cannot be obtained 5 minutes into the tune, or if the tuning process takes longer than 30 minutes. If this error occurs, verify that you followed every requirement under "To ensure a successful Auto Tune" and perform a second tune.
At bad	**Invalid PID constants were generated.** The most likely causes of this error is a tune started inappropriately or an external element (i.e., loose thermocouple) that upset the process while tuning was in progress. Verify that you followed every requirement under "To ensure a successful Auto Tune" and perform a second tune.

MAINTENANCE

PREVENTATIVE MAINTENANCE SCHEDULE

To maintain the best performance, we recommend the following maintenance schedule.

● Whenever process variables change

❒ **Perform an Auto Tune.**
The Auto Tune ensures that the control continues to obtain good approximations of the PID constants used to compensate for the thermal lag of the system.. You should perform an Auto Tune after the first two hours of operation and whenever the process changes, such as after a mold change; installation of different pipe sizes; or change in process setpoint. **See** ***PERFORMING AN AUTO TUNE*** *in the* ***OPERATION*** *section.*

● Weekly, or as often as needed

❒ **Check for leaks in condenser and process lines.**
Before and during operation, you should inspect the unit and all plumbing lines for leaks. If a leak develops, stop the chiller and repair it.

❒ **Keep the unit and the area around it clean.**
Check for and remove lint, dust or other obstructions on the unit, especially around air intake areas. Keep the floor around the unit dry. If you notice a decrease in efficiency over time, check all heat transfer surfaces of the evaporator and condenser for fouling. See ***CLEANING EVAPORATORS AND CONDENSERS***.

❒ **Check the process fluid level.**
Check the level indicator on the back of the unit to make sure the tank contains an adequate amount of process fluid. Refill as needed. See ***REFILLING THE TANK.***

● Monthly, or as often as needed.

❒ **Check the refrigerant charge.**
A sight glass located between the condenser and evaporator indicates refrigerant pressure. See ***CHECKING REFRIGERANT CHARGE.***

❒ **Clean all external surfaces.**
Surfaces fouled by dust, dirt, slime, minerals and other contaminants will decrease performance. Wipe all external surfaces, paying particular attention to heat transfer surfaces. Clean the air-cooled condenser surfaces if you find dirt or clogging.

❒ **Check the water treatment system.**
If you use a water treatment system for the water-cooled condenser or the process fluid circuit, maintain the proper chemical levels and follow the recommendations of your water treatment specialist.

PREVENTATIVE MAINTENANCE SCHEDULE

● Quarterly (every 3 months)

❒ **Inspect power cords, wires and electrical connections.**
Check for loose or frayed wires, burned contacts, and signs of overheated wires. Check exterior power cords to the main power source and from the electrical box to the pump and heating elements. Check the ground wire and thermocouple connections. Replace any wire that appears damaged or has worn or cracked insulation.

● Annually (every 12 months)

❒ **Test and calibrate the unit's control systems.**
The chiller's Test Mode checks the operation of displays, control buttons, inputs and outputs. You can also calibrate the supply and return thermocouples. **See *PERFORMING SYSTEM TESTS*** in this section.

❒ **Clean all surfaces that come in contact with water.**
Minerals and other water contaminants cause heat-transfer surface fouling and decrease performance, especially in the water-cooled chiller's condenser. Clean all water-cooled condenser surfaces. The refrigerant side does not foul because the refrigerant acts as a solvent and operates in a closed filter cycle. **See *CLEANING EVAPORATORS AND CONDENSERS*** in this section.

⚠ **WARNING: Improper servicing may result in equipment damage or personal injury.**

This equipment should be installed, adjusted, and serviced by qualified technical personnel who are familiar with the construction, operation and potential hazards of this type of equipment.

All wiring, disconnects and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region.

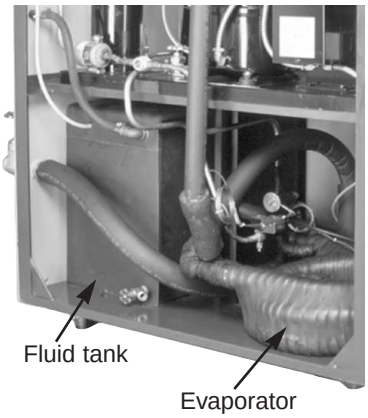
Only certified refrigerant technicians should recharge the refrigerant used in this system.

Always disconnect and lock out the incoming main power source before opening the electrical enclosure or performing non-standard operating procedures, such as troubleshooting or maintenance. Only qualified personnel should perform procedures that require access to the electrical enclosure while power is on.

CLEANING EVAPORATORS

Minerals and other water system contaminants produce deposits, scales, slime, or algae on the heat-transfer surfaces exposed to water. Fouled surfaces decrease cooling capacity. We recommend that you consult a water treatment specialist to develop a treatment program that will minimize fouling.

To clean the evaporator:



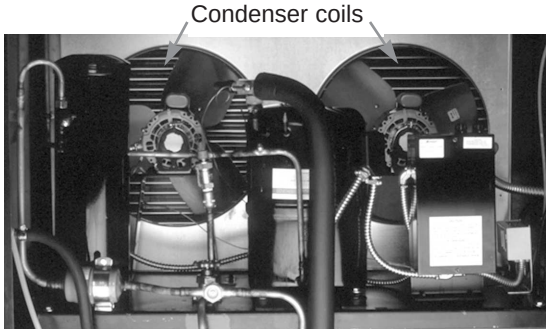
1. **Consult a water treatment specialist** for recommendations on the best chemicals to use to remove contaminants from the evaporator and process fluid circuit surfaces that come in contact with water.
2. **Thoroughly flush cleaning chemicals** from the evaporator and all water-contact surfaces in the process fluid circuit.

CLEANING CONDENSERS

For water-cooled condensers:
You should consult a water treatment specialist for recommendations on the best chemicals to use to remove contaminants from the condenser. Thoroughly flush chemicals from the condenser before resuming operation.

For air-cooled condensers:
The air-cooled condensers can accumulate dirt and clog quickly if it is run in a dusty or dirty environment. A clogged condenser increases refrigerant pressure, lowers performance and may cause the fan motors and compressor to overheat.

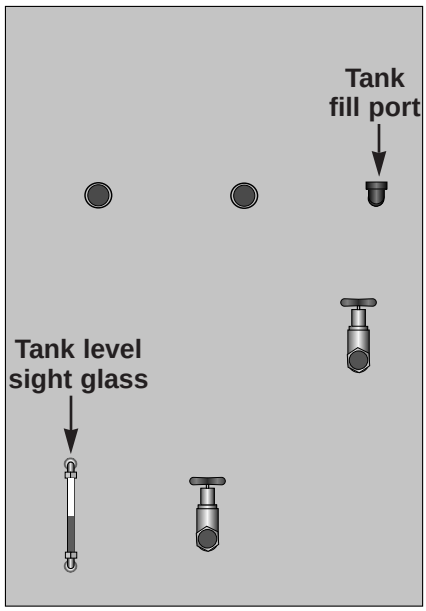
1. **Clean dirty coil surfaces with a soft brush.** Brush and rinse in the direction of the fins to prevent bending the fins.
2. **Rinse** with cool water or a commercial coil cleaner.



REFILLING THE TANK

The process fluid, which can be water or a glycol mixture, is held in a tank inside the unit. This tank should be kept at least three-quarters full of the process fluid.

You can check the fluid level in the tank using the sight glass on the back of the chiller.



To fill the reservoir:

1. **Locate the fill port at the back of the chiller.**
2. **Refill the tank.** Monitor the level using the sight glass on the back of the unit. Because chillers can use pure water or glycol mixtures, make sure you are adding the correct fluid for your application.

IMPORTANT: *Do not use deionized water or glycol mixtures containing additives in a this chiller. Softened water or glycol mixtures with additives, such as automotive fluids, can damage the chiller.*

Glycol/water process loop mixtures should use industrial-grade ethylene glycol only. Use a glycol mixture if operating temperatures are below 45° F

See ***FREEZE PROTECTION REQUIREMENTS*** *in the* DESCRIPTION *section for information on glycol mixtures.*

CHECKING REFRIGERANT CHARGE

All chillers are fully charged with refrigerant at the factory. Your chiller mode's nameplate identifies the type and amount of total refrigerant charge required.

1 **While the unit is running, check the refrigerant charge through the sight glass** located between the evaporator and the condenser. Use a flashlight to look at the liquid-line sight glass.

- ◆ Under full-load conditions, the sight glass should be clear.
- ◆ Under low-load conditions, when the hot-gas bypass valves are operating, bubbles may be visible in the sight glass. This is normal.

2 **If the charge is low, recharge the system.** Contact a certified refrigerant technician to recharge or replace refrigerant. This procedure should be performed only be a qualified technician.

PERFORMING SYSTEM TESTS

The microKool portable chillers provide a Test Mode that tests displays and keys on the control panel, as well as inputs and outputs. The Test Mode also allows calibration of the supply and return line thermocouples.

System tests and calibration should be performed annually.

To enable Test Mode:

1 **Press Stop to shut down the chiller.**

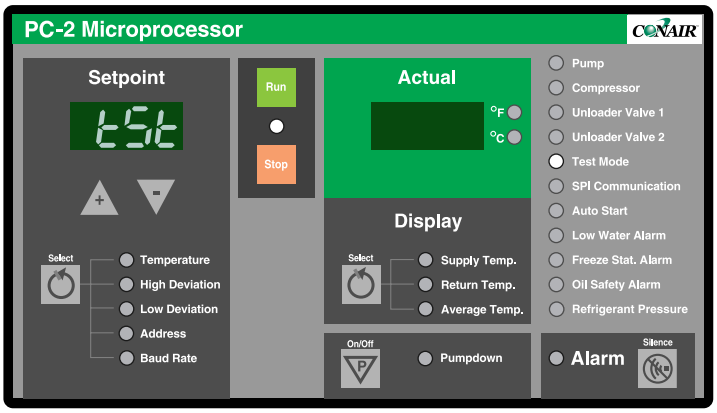
2 **Disconnect and lock out main power to the unit, then open the electrical enclosure.**

3 **Set dip switches 3 and 5 to OFF.**

4 **Set dip switch 6 to ON.**

5 **Close the electrical enclosure and restore power to the unit.**

- ◆ The control displays “tSt.”
- ◆ The Test Mode LED lights.



6 **Press any button to display the first test menu.**

Test mode provides the following menus:

- ● Key/Display Test
- ● Input Test
- ● Output Test
- ● Calibration
- ● Total Operating Hours
- ● Output Monitor Enable/Disable

7 **After performing each test, hold the Setpoint for 3 seconds to index to the next test menu.**

The procedure for each test is described on the following pages.

IMPORTANT: *All normal operating functions are disabled while Test Mode is enabled. To return to normal operation, you must disable Test Mode.*

To disable Test Mode*, repeat steps 2 through 5, setting dip switch 6 to OFF instead of ON.*

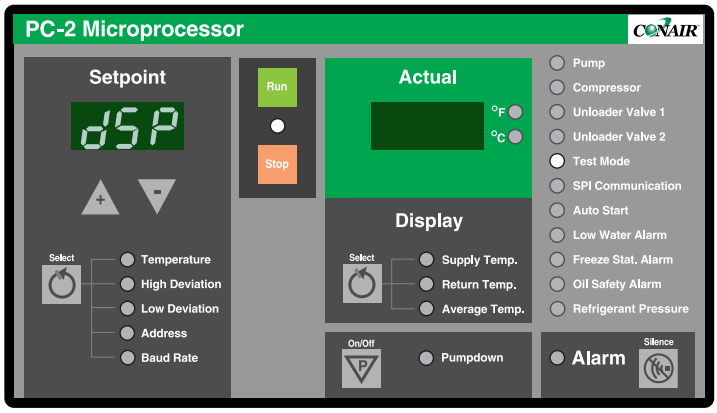
KEY/DISPLAY TEST

The Key/Display Test verifies the function of displays, LEDs and buttons on the control panel.

1 Enable Test Mode.

2 Press any key.

3 If necessary, index to the Key/Display menu.



Press and hold the Setpoint key for 3 seconds to index to each test menu until the controller displays “dSP”.

4 Press any key to clear all displays.

5 Repeatedly press any key to test displays.
With each key press, a new segment of all six 8-segment LEDs and a select group of LED indicator lights will illuminate.

6 Exit the test and enter the next test.
Press and hold the Setpoint key for 5 seconds to exit and index to the next test.

INPUT TEST

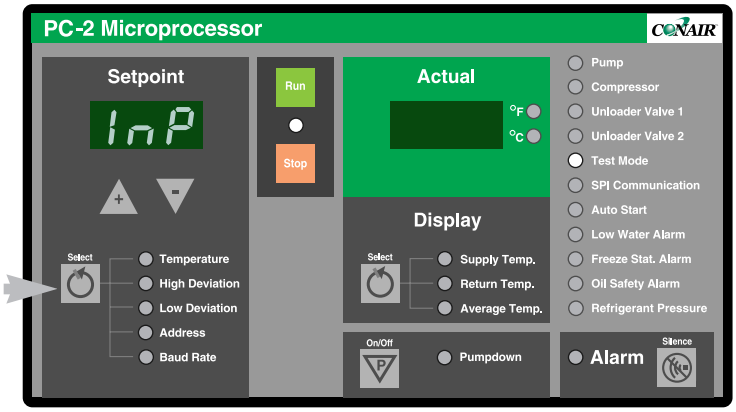
The Input Test verifies the function of inputs available on the various models of the microKool chiller. Not all inputs are used on all models. The performance evaluation of the inputs is based on the voltage sensing device (VSD).

1 Connect all inputs to the system.

2 Press any key to display the first test menus.

3 Select the Input Test menu.

Press and hold the Setpoint key for 3 seconds to index to each test menu until the controller displays “InP”.



4 Repeatedly press and release any key to test.

With each key press and release, the left display will indicate the number of the input being tested (v1, v2, v3, etc.). The right display indicates either “1” for voltage present or “O” for an absence of voltage.

Only inputs that are actually used by the particular model will be tested.

5 Exit the test and enter the next test.

Press and hold the Setpoint key for 3 seconds to exit and index to the next test.

OUTPUT TEST

The Output Test verifies the function of outputs available on the various models of microKool chillers. Not all outputs are used on all models. The performance evaluation of the inputs is based on the output monitors (OM).

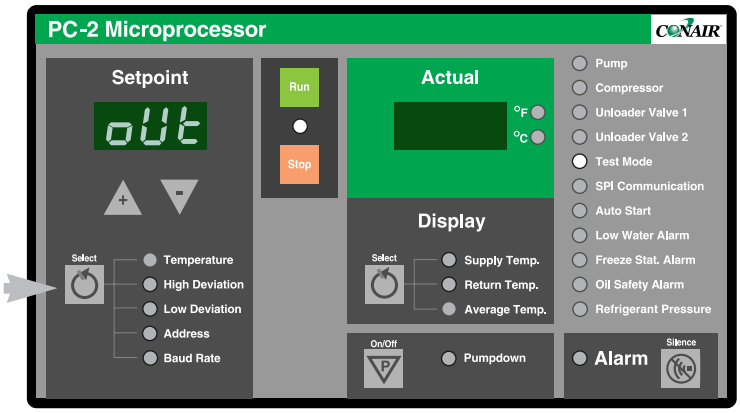
1 Connect all outputs to the system.

IMPORTANT: *Testing each output requires the firing of the associated solid state relay. Make sure an output device is connected to the controller, otherwise the test result will be erroneous.*

2 Enable Test Mode.

3 Press any key to display the first test menus.

4 Select the Output Test menu.



Press and hold the Setpoint key for 3 seconds to index to each test menu until the controller displays “oUt”.

5 Repeatedly press and release any key to test.

With each key press and release, the left display will indicate the number of the output being tested (oS1= OM1; oS2 = OM2; etc.). The right display indicates either “1” for a good output or “O” for a failed output.

Only outputs that are actually used by the particular model will be tested.

6 Exit the test and enter the next test.

Press and hold the Setpoint key for 3 seconds to exit and index to the next test.

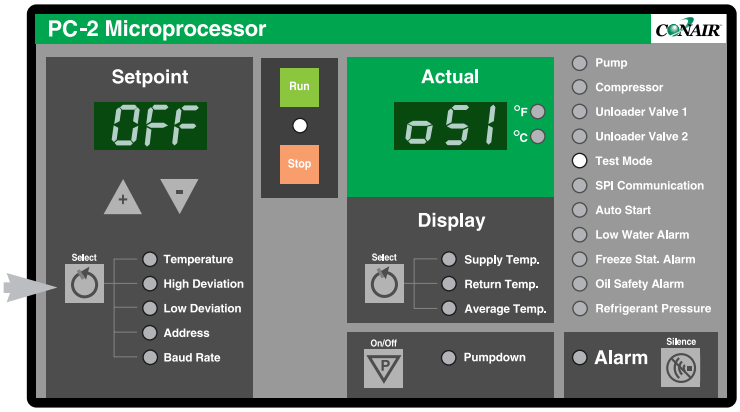
DISABLING OR ENABLING OUTPUT MONITORS

All output monitors on the microKool chiller can be enabled or disabled permanently through the OM Enable/Disable Menu in Test Mode.

You need to use this feature if you have replaced the mother-board, or if dip switches 7 and 8 have been changed erro-neously. This will enable any required output monitors that were disabled and give fuse failures.

1 Enable Test Mode.

2 Press any key to display the first test menus.



3 Select the OM Enable/Disable menu.

Press and hold the Setpoint key for 3 seconds to index to each test menu until the controller indicates “oS1” in the actual display and the status of the selected output in the Select display.

4 Press the Setpoint ▲ or ▼ key to change the status. Each press of the key changes the output status from ON to OFF or OFF to ON.

5 Press the Setpoint to select the next output. Repeat Step 4 to change the status of the output, or press any key to continue indexing through the outputs.

6 Save changes and exit the output menu.

Press and hold the Select key for 3 seconds to save the changes and exit.

CALIBRATING TEMPERATURE SENSORS

Special Tools Needed:
❒ *thermocouple calibrator*

The microKool chillers use thermocouples to sense the temperature in the return and supply process lines. These thermocouples should be calibrated annually, or when a new thermocouple is installed, to ensure correct operation.

The chiller's Calibration Mode provides zero and span calibration of both the supply and return line thermocouples. You access the Calibration Mode while in Test Mode.

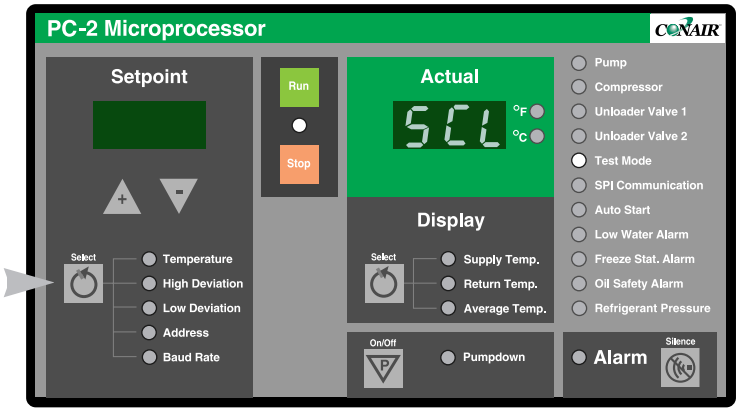
1 Enable Test Mode.

See *PERFORMING SYSTEM TESTS.*

2 Press any button to display the first test menu.

3 Select the Calibration Mode menu.

Press and hold the Setpoint key for 3 seconds to index to each test menu until the controller indicates "SC.L" in the Actual display.



4 Release the Setpoint key.

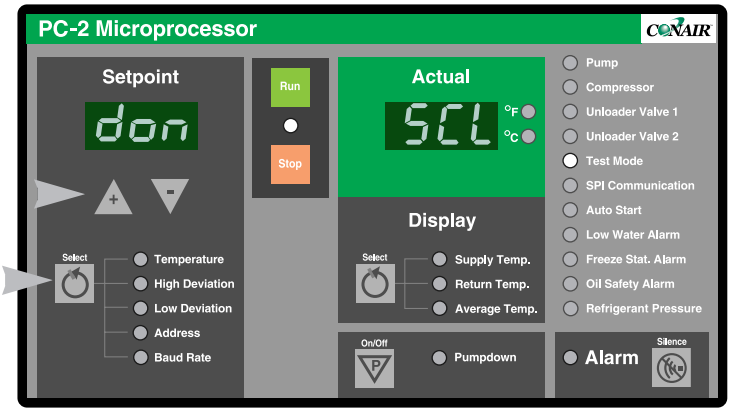
You are now in calibration mode. Each press and release of this key will exit the current calibration and start the next calibration. The table below lists the calibrations that will be performed.

CALIBRATION	SETPOINT DISPLAY	ACTUAL DISPLAY
Zero Calibrate Supply Sensor	32° F (0° C)	SC.L
Zero Calibrate Return Sensor	32° F (0° C)	rC.L
Span Calibrate Supply Sensor	510° F (266° C)	SC.H
Span Calibrate Return Sensor	510° F (266° C)	rC.H

5 Using the thermocouple calibrator, apply the appropriate temperature to the control input.

6 Press the up ▲ key to begin calibrating.

The controller displays the name of the current calibration (examples: 32 SC.L; 32 rC.L; 510 SC.H; or 510 rC.H).



7 Wait until the control displays “don” or “bad.”

A “don” message in the Setpoint display indicates the calibration was successful. A “bad” message in the Setpoint display indicates a bad calibration.

NOTE: *The original calibration value stored in EEProm can be restored for the current calibration by pressing the STOP key at any time.*

8 Press Select ↻ to start the next calibration.

Pressing and releasing the Select ↻ key at the end of a calibration tells the controller to perform the next calibration.

9 Exit Calibration Mode.

Press and hold the Select ↻ key for 3 seconds to exit the Calibration Mode.

You can now proceed to the next test in Test Mode, or disable Test Mode and resume normal operation.

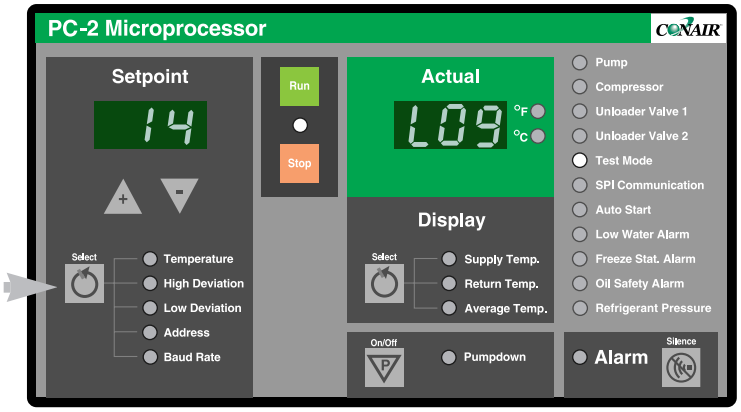
TO DISABLE TEST MODE*, complete steps 2 through 5 in* ***PERFORMING SYSTEM TESTS****, setting dip switch 6 to OFF instead of ON.*

LOGGING OPERATING HOURS

You can see the total numbers of operation by accessing the Total Operating Hours Log in Test Mode.

1 **Enable Test Mode.**

2 **Press any key to display the first test menus.**



3 **Index through test menus to the operating log.**

Press and hold the Setpoint key for 3 seconds to index to each test menu until the Actual display indicates “Log”. The Setpoint display indicates the total number of operating hours in 100-hour units.

4 **Exit the Operating Hours Log.**

Press and hold the Select key for 3 seconds to exit and index to the next test.

You can now proceed to another menu in Test Mode, or disable Test Mode and resume normal operation.

***TO DISABLE TEST MODE**, complete steps 2 through 5 in “Performing System Tests”, setting dip switch 6 to OFF instead of ON.*

TROUBLESHOOTING

BEFORE BEGINNING

You can avoid most problems by following the recommended installation, operation and maintenance procedures outlined in this User Guide. If you do have a problem, this section will help you determine what caused it and tell you how to fix it.

Before you begin troubleshooting:

- ❑ **Find the wiring, plumbing and other diagrams that were shipped with your equipment.** These diagrams are the best reference for correcting a problem. The diagrams also will note any custom features, such as special wiring, control or plumbing options, not covered in this User Guide.
- ❑ **Verify that you have manuals for other equipment in the process line.** Solving problems may require troubleshooting malfunctions or incorrect operating procedures on other pieces of equipment.
- ❑ **If an alarm is present, note any indicator lights and messages shown on the control panel.** These indicators will help you discover the cause of the problem more quickly.

A FEW WORDS OF CAUTION

The chiller is equipped with many safety devices. Do not remove or defeat them. Improper corrective action can lead to hazardous conditions, and should never be attempted to sustain production.

WARNING: This machines should be adjusted and serviced only by qualified technical personnel who are familiar with construction and operation of this type of equipment.

DANGER: Voltage hazard.
Troubleshooting the electrical system of this equipment requires use of precision electronic measuring equipment, and may require access to the electrical enclosure while power is on. Exposure to potentially fatal voltage levels may be unavoidable. These troubleshooting procedures should be performed only by qualified electrical technicians who know how to use this precision electronic equipment and who understand the hazards involved.

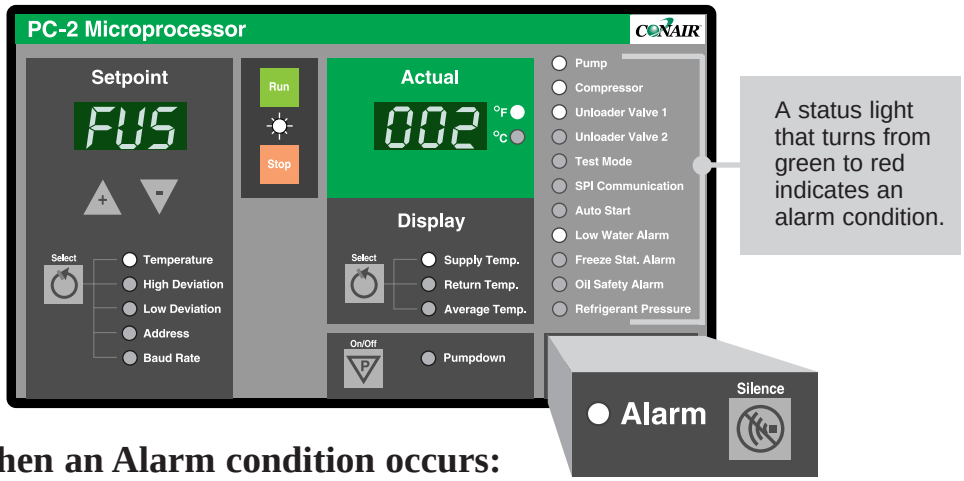
How to Identify the Cause of a Problem

Most chiller malfunctions are indicated by an illuminated alarm light and error codes displayed on the control panel.

A problem can trigger three types of alarms:

- **Shut Down Alarms:** The chiller detected a problem that caused it to shut down automatically to prevent equipment damage or personal injury.
- **Warning Alarms:** The chiller continues to operate, but warns of a problem that could lead to a condition that will shut down the unit.
- **System Errors:** The system error codes indicate a non-recoverable problem with the microprocessor control.

When the chiller control detects a problem, the red Alarm light is activated and the RUN/STOP light changes from green to flashing red.



A status light that turns from green to red indicates an alarm condition.

When an Alarm condition occurs:

1 Press  **to silence any optional audible alarm.**

◆ The RUN/STOP light changes from flashing red to steady red.

2 Note any indicator lights or error messages to help determine the cause of the problem.

3 Find the alarm or error code in the diagnostics tables in the TROUBLESHOOTING section of this manual.

4 Press Stop **to clear the alarm and shut down the chiller to correct the problem.**

Press Run **to resume normal operation after the problem is corrected.**

⚠ WARNING:
Disconnect and lock out the main power source before opening the chiller or its electrical enclosure for servicing. Disconnect water supply lines as needed.

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller automatically shuts down.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
● Pump **The pump motor overload has tripped. The contact is open.** **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current to diagnose the cause of a problem.	**Is the correct voltage supplied to the pump motor?**	Supply voltage should match the rating on the pump name plate. If voltage is correct, check wiring connections.
	Is the required water flow greater than the pump's capacity?	❒ Review pump sizing for the application. ❒ Decrease the water flow from the process.
	Is the motor overload faulty or set incorrectly?	Disconnect the power and open the electrical enclosure. Verify that the overload is set to trip at the proper amperage, which should not exceed the FLA. Manually trip and reset the overload. If the problem continues, replace the overload. **See *RESETTING AND REPLACING OVERLOADS*.**
	Is the pump working properly?	Replace the pump if supply voltage, wiring and overload settings are correct, but the pump continues to draw excessive current.
Hi SAF **The actual temperature of water supplied to the process is 100° F, or has exceeded 75° F for more than 30 minutes.**	**Is the refrigerant charge low?**	**See *CHECKING REFRIGERANT CHARGE*.** If the charge is low, contact a certified refrigeration technician to recharge.
	Is the unloader valve stuck open?	See ***CHECKING THE UNLOADER VALVE.*** If the valve is stuck open, contact a certified refrigeration technician to repair.
	Did the compressor fail?	Check compressor electrical connections. Replace the compressor, if it has failed.

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller automatically shuts down.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
Lo SAF **Actual temperature of water supplied to the process is below the programmed 10° F safety limit.**	**Has the compressor contactor failed closed?**	Check phase continuity through the compressor contactor. If the contactor has failed, replace it. See ***REPLACING THE COMPRESSOR CONTACTOR.***
	Has the unloader valve failed?	See ***CHECKING THE UNLOADER VALVE.***
	Has the freezestat failed?	❒ Check the freezestat setting. It should be set to cut out at 5° F above the freeze point of the process fluid solution. ❒ Check for improper freezestat installation. Verify the freezestat sensor bulb is well insulated and inserted into the piping well. If the freezestat is properly installed and set, it may have failed See ***REPLACING THE FREEZESTAT.***
Pbr Err **The thermocouple in the process return line failed.**	**Is the thermocouple loose?**	Check for a loose thermocouple or loose wire connections to the thermocouple.
	Has the thermocouple failed?	Check the thermocouple and replace if necessary.
PbS Err **The thermocouple in the process supply line failed.**	**Is the thermocouple loose?**	Check for a loose thermocouple or loose wire connections to the thermocouple.
	Has the thermocouple failed?	Check the thermocouple and replace if necessary.

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller automatically shuts down.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
PHS Err **The incoming power is out of phase. A leg may have failed or is disconnected.** **NOTE:** This alarm is available only on PC-2 models.	**Is the pump rotating in the wrong direction?**	Check pump rotation against the arrow stamped on the pump. If the pump is rotating in the wrong direction, disconnect and lockout the main power source. Open the electrical enclosure, and reverse any two leads on the power connection.
	Has one of the main supply wire leads become disconnected?	Disconnect power and open the electrical enclosure. Check for loose connections in main supply and on motherboard.
FUS 002 **Pump fuse.** FUS 003 **Compressor fuse.** FUS 004 **Unloader valve fuse.** FUS 005 **Unloader valve fuse.** FUS 006 **Level Switch fuse.**	**Has the indicated device blown a fuse?**	Disconnect and lockout the main power. Open the electrical enclosure. Check for loose wires and incorrectly installed jumpers or terminal blocks associated with the fuse error. Replace the fuse, if necessary. See ***CHECKING AND REPLACING FUSES***.
	Is the correct device being used for this fuse location?	Replace the fuse, then enter Test Mode. Turn off the Output Monitor associated with the fuse location and test outputs. See ***PERFORMING SYSTEM TESTS*** and ***DISABLING OR ENABLING OUTPUT MONITORS*** in the *MAINTENANCE* section.
	Has the motherboard output channel at the designated fuse failed?	Replace the motherboard. See ***REPLACING THE MOTHERBOARD.***

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller turns off the compressor, but normal operation resumes after you clear the alarm or the problem corrects itself.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
● Compressor **The compressor overload has tripped.** **NOTE:** This alarm is available only on models with semi-hermetic compressor sizes 15 Hp and above.	**Is the correct voltage supplied to the motor on the compressor?**	Supply voltage should match the rating on the motor name plate. If voltage is correct, check wiring connections.
	Is the overload faulty or set incorrectly?	Disconnect the power and open the electrical enclosure for the compressor. Verify that the overload is set to trip at the proper amperage, which should not exceed the FLA. Manually trip and reset the overload. If the problem continues, replace the overload.
	Is the compressor faulty?	Replace the compressor if supply voltage, wiring and overload settings are correct, but the pump continues to draw excessive current.
● Oil Safety Alarm **The Oil Safety input is open.** **NOTE:** This alarm can be present only on models with compressor sizes 15 Hp and above.	**Oil level in the compressor is low, or the input has failed.**	See *PERFORMING SYSTEM TESTS* and perform an *INPUT TEST*. If the input is OK, call Conair service.

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller turns off the compressor, but normal operation resumes after you clear the alarm or the problem corrects itself.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
● Refrigerant Pressure **Refrigerant pressure is either too low or too high.**	**Low refrigerant pressure:**	
	Is the refrigerant charge low?	See ***CHECKING REFRIGERANT CHARGE.*** Check for leaks in the refrigerant circuit. Contact a certified refrigerant technician to repair and recharge the system.
	Is the liquid refrigerant line restricted?	Check for closed valves or a plugged refrigerant line. ❒ Verify that the liquid line shut-off valve is open. ❒ Verify that the suction valve at the compressor is open. ❒ Verify that the expansion valve is working properly.
	High refrigerant pressure	
	Has the water or air flow through the condenser become restricted?	Check for closed valves and obstructions, contaminants or dirt that may have blocked or restricted condenser efficiency. **All models:** ❒ Clean the condenser coils. See ***CLEANING CONDENSERS.*** **Air-cooled units:** ❒ Remove any obstructions to air flow at the condenser air inlet and outlet. ❒ Verify that the condenser fans are working. Confirm proper rotation and check for an electrical overload. **Water-cooled units:** ❒ Check for closed valves or plugged water supply lines. ❒ Verify that the condenser water supply is working and that incoming water pressure is at least 25 psi.

WARNING:
The microKool should be tested and repaired only by qualified technicians equipped with the correct tools and trained in the maintenance and repair of electrical and refrigerant systems used in industrial applications.

(Continued on next page)

SHUT DOWN ALARMS

The chiller has detected a problem that could lead to equipment damage or personal injury if it is not corrected.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller turns off the compressor, but normal operation resumes after you clear the alarm or the problem corrects itself.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
● Refrigerant Pressure **Refrigerant pressure is either too low or too high.**	**<u>High refrigerant pressure</u>**	
	Is the temperature of the condenser supply air or water too high?	Load conditions may be too high for proper operation. Air-cooled chillers will not work properly if the ambient air temperature is above 100° F (38° C). Water-cooled chillers will not work properly if the condenser water supply temperature is above 85° F (29° C). Check cooling tower operation, if a tower supplies the water.
	Is the refrigerant over-charged?	Contact a certified refrigerant technician for servicing.
● Low Water Alarm **Process fluid in the chiller tank is at the minimum level.**	**Is there enough fluid in the tank?**	Check the fluid level by looking at the tank level sight glass at the rear of the chiller. Add fluid, if necessary. See ***FILLING THE TANK.***
● Freeze Stat Alarm **The Freeze Stat Input is open.**	**Is there sufficient fluid flow through he evaporator?**	Check for incorrect pump rotation and closed valves in the process circuit. Verify required GPM rating for the chiller: (GPM=2.4 x chiller ton capacity)
	Is the freezestat setting too high?	Setting should be 10° F (5° C) below the operating temperature, and at least 5° F (2° C) above the freezing point of the process fluid.
	Is the freezestat sensor installed correctly?	Check that the sensor bulb is well insulated and inserted completely into piping well.

WARNING ALARMS

The chiller has detected a problem that could lead to a shut down condition if it is not corrected.

- The Alarm LED lights.
- The chiller continues operating.
- The control displays a red LED or alarm code indicating the source of the problem.

Alarm	Possible cause	Solution
● Low Deviation **The actual temperature of fluid supplied to the process is lower than the setpoint deviation limit allows.**	**Is the low deviation temperature set too low?**	Increase the low deviation limit setting. The recommended setting is 2° F to 10° F below the process setpoint.
● High Deviation **The actual temperature of fluid supplied to the process is higher than the setpoint deviation allows.**	**Is the low deviation temperature set too high?**	Increase the high deviation limit setting. The recommended setting is 2° F to 10° F above the process setpoint.
	Has the process fluid stopped flowing between outlet and inlet?	Check for plugged pipes and closed valves. Clear any obstructions and open valves.
	Is the unloader valve stuck open?	See *CHECKING THE UNLOADER VALVE.*
● SPI Communication **The SPI communication link has failed.**	**Is the unit connected to a host machine?**	If the chiller is not connected to a host device, set the SPI address to OFF.
	Are the network address and baud rate correct?	❒ Check the network address. The address may be set to any number from 32 to 254 (a hexadecimal integer between 20 and FE), as long as that number has not been assigned to another machine on the same network. ❒ Make sure the baud rate (9600, 4800, 2400, or 1200) matches the host machine.
	Is something wrong with the cable?	Check the communication cable condition and connections. The cable must conform to SPI standards.

SYSTEM ALARMS

The chiller has detected a non-recoverable error involving he microprocessor control.

- The Alarm LED lights and the STOP/RUN LED flashes red.
- The chiller shuts down or will not start.
- The control displays an error code indicating the source of the problem.

Alarm	Cause	Solution
ERR 001 **RAM hardware failure.**	Electrical noise or failed CPU on the motherboard caused system write tests do fail during power up.	Make sure all connections on the motherboard are solid. Operate unit in a noise free environment. If error persists, contact Conair service.
ERR 002 **ROM, checksum failure.**	The CPU and/or PROM chip (U1 or U2) is not making good contact with its socket, or the PROM chip has failed.	Make sure the CPU and PROM chips are seated correctly in the sockets. If error persists, contact Conair service.
ERR 003 ERR 004 **COP failures.**	A failed CPU, failed motherboard, software bug or electrical noise caused an internal software error.	Cycle power to the unit. If the problem persists, contact Conair service technicians. You may need to replace the motherboard.
ERR 005 **Illegal Opcode.**	The CPU tried to execute an illegal software instruction due to electrical noise or a failed motherboard.	Make sure all connections to the motherboard are solid and that the unit is operating in a noise free environment. If error persists, contact Conair service.
ERR 006 **through** ERR 014	A failed CPU, failed motherboard, software bug or electrical noise caused an internal software error.	Cycle power to the unit. If the problem persists, contact Conair service technicians. You may need to replace the motherboard.
ERR 015 ERR 016 **Software cannot write to CPU non-volatile memory.**	The memory has exceeded its usable life or there is a software bug. This error occurs only after changes have been made to non-volatile memory either through the operator panel or SPI.	Cycle power to the unit. Contact Conair service if an operating parameter such as the setpoint is not being saved or if this error persists.

CHILLER WILL NOT POWER UP

If you apply power to the chiller and the control panel does not light, you have a problem with the main power circuit or the unit's microprocessor board.

WARNING: Electrical Shock Hazard
Disconnect and lockout the main power supply before proceeding.

Symptom	Possible cause	Solution
Applying power does not turn on the chiller or light the control panel.	**Is power reaching the chiller?**	❒ Verify that the main power supply and any customer-installed electrical disconnect or emergency stop devices are in the ON position. ❒ Verify correct electrical connections between the unit and the control, and between the unit and the power supply. Replace any damaged wires or cables.
	Has the unit blown a fuse?	Check Fuse 1 on the motherboard and any fuses or breakers associated with customer-installed disconnect devices. Replace or reset as required. Identify the cause of the ground fault and correct it. See ***CHECKING AND REPLACING FUSES***.
	Is the correct voltage reaching the chiller?	Check the electrical requirements on the unit nameplate. Verify correct main supply voltage to the unit and the secondary voltage supply from the transformer to unit components. Replace the transformer, if necessary.
The control panel is lit, but the chiller will not operate when RUN is pressed.	**Is the unit in Test Mode?**	If the Test Mode LED is lit, you must disable Test Mode on the motherboard before resuming operation. See ***PERFORMING SYSTEM TESTS*** in the *MAINTENANCE* section.

CHECKING AND REPLACING FUSES

This procedure covers the factory-installed fuses on the unit's motherboard. If you have installed an electrical disconnect or emergency stop switch, additional fuses and/or breakers may have been used elsewhere in the in the main power circuit.

To replace a blown fuse:

1 **Disconnect and lockout the main power.**

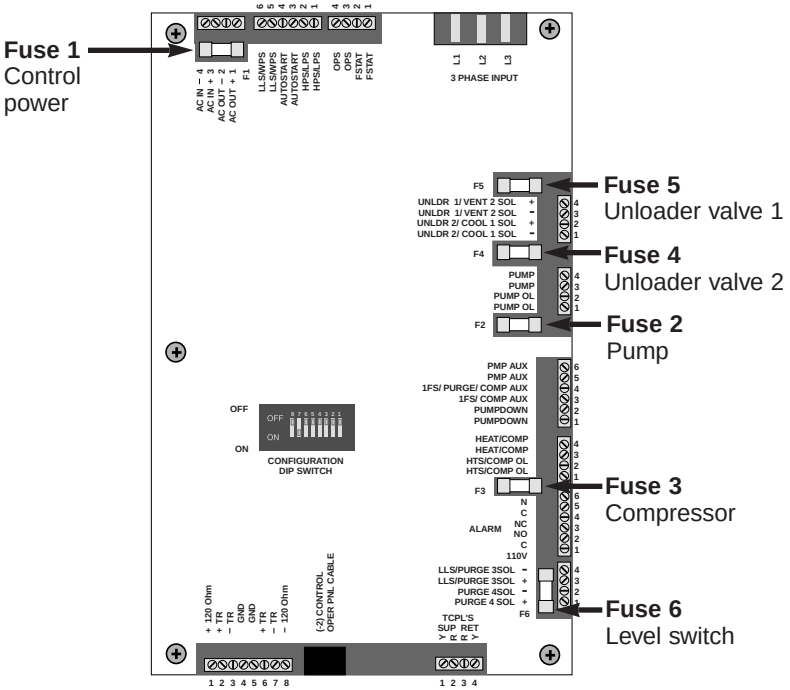
2 **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.

3 **Replace the fuse.** The fuses are located on the motherboard and are labeled and identified on the orange shield.

4 **Close the electrical enclosure and restart the unit.**

If fuses continue to fail:

- ❒ Verify that the unit is receiving the correct voltage. Check the voltage, phasing and amperage ratings on the unit's nameplate.
- ❒ Verify that the unit's transformer is operating correctly. Check for proper voltage (120V 10%) to the voltage sensing device for the fuse location.
- ❒ Check all wiring referencing the fusing location for loose connections, damage or improper grounding. Verify that the correct device is being used for this fuse location. See ***DISABLING OR ENABLING OUTPUT MONITORS*** in the *MAINTENANCE* section.



WARNING: Shock Hazard

Only qualified service personnel familiar with electrical testing and industrial equipment should examine and correct problems that require opening the unit with power on to diagnose the cause of a problem.

IMPORTANT: *Always refer to the wiring diagrams that came with your chiller to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.*

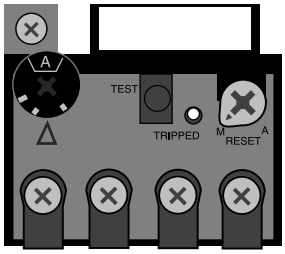
RESETTING OVERLOADS

The pump motor overload is located inside the unit's electrical enclosure.

1 **Disconnect and lockout the main power.**

2 **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.

3 **Check the overload.**
If the yellow button is out, the overload has tripped. Press the blue button to reset the overload. Verify that the overload trip point does not exceed the FLA for the pump.



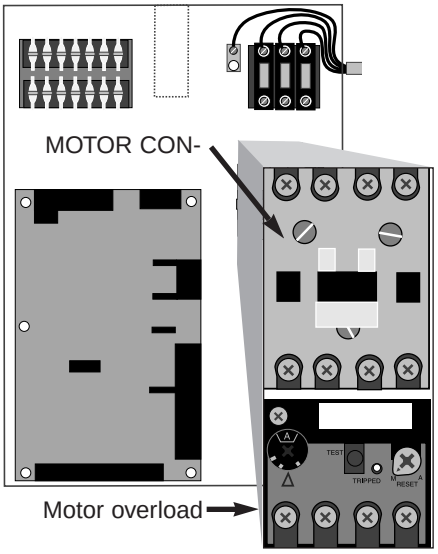
REPLACING THE PUMP OVERLOAD

1 **Disconnect and lockout the main power.**

2 **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.

3 **Locate the pump overload module** attached to the pump motor starter.

4 **Disconnect the three power leads** from the overload module to the pump motor. Note the placement of each lead and label as needed.



5 **Disconnect auxiliary wiring on the overload module.**

6 **Remove the overload module.**
Loosen the three screws that connect the overload module to the motor contactor. Pull the overload module down to release it from the starter.

7 **Reverse these steps to install the new overload module.**

8 **Set the module reset mode to M for manual.**

9 **Set the proper FLA trip point.**
Do not exceed the FLA for the pump motor.

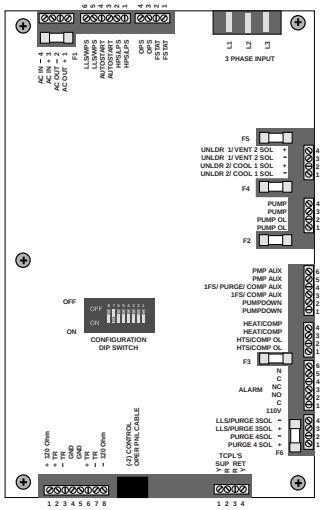
REPLACING THE MOTHERBOARD

IMPORTANT: *Always refer to the wiring diagrams that came with your chiller to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.*

1 **Disconnect and lockout the main power supply.**

2 **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.

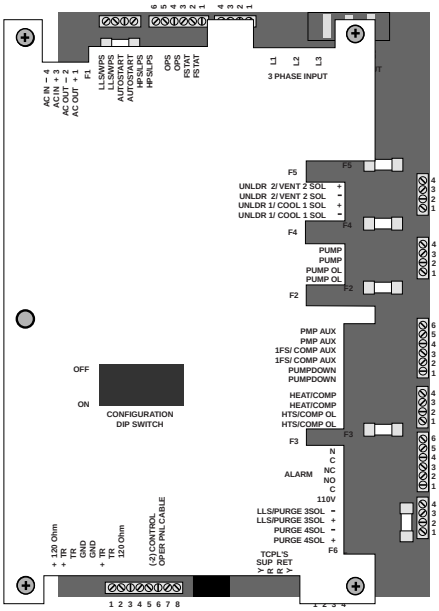
3 **Mark or label each wire connected to the motherboard.** The orange shield is labeled with the connection information. You must label the wires to ensure they are connected to the correct terminals on the new motherboard.



4 **Disconnect the wires from the motherboard by pulling the terminal blocks up.**

5 **Loosen the screws holding the orange shield.**

6 **Remove the motherboard and shield** from the electrical enclosure as a unit.



7 **Remove the motherboard from the shield** and replace with the new motherboard.

8 **Reattach the shield and new motherboard** in the electrical enclosure. Tighten the screws.

9 **Reconnect the terminal blocks and wires to the new board.**
Make sure you align the terminal blocks with the correct pins on the board. Push the terminal blocks onto the pins, taking care not to bend any pins.

10 **Set dip switches 7 and 8 to the correct unit type.**
Set switch 7 to ON and switch 8 to OFF for chillers.

11 **Program output monitors on the new board.**
See ***DISABLING OR ENABLING OUTPUT MONITORS*** in the *MAINTENANCE* section.

REPLACING THE COMPRESSOR CONTACTOR

IMPORTANT: *Always refer to the wiring diagrams that came with your chiller to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.*

WARNING: Electrical Shock Hazard

Only qualified service personnel who have been trained on electrical testing and the procedures for avoiding the hazards should diagnose or correct problems that require opening the unit with power on.

The compressor may be located in the compressor electrical enclosure or in the main chiller electrical enclosure, depending on the model of your chiller.

The compressor contactor should be replaced if:

- You have checked the amp draw on each of the three-phase legs and discovered a voltage imbalance greater than 10%.
- You have checked the continuity and found that ohms at the coil equal zero.

To replace the compressor contactor:

1. **Disconnect and lockout the main power.**
2. **Open the electrical enclosure.** Turn the screw on the front panel counterclockwise to open.
3. **Disconnect the wires from the compressor contactor contactor.** Label the wires to ensure you can connect them correctly to the new contactor.
4. **Remove and discard the old contactor.**
5. **Reverse this procedure to install the new contactor.** Make sure the wires are connected correctly.

CHECKING THE UNLOADER VALVE

The unloader valve is located between the compressor and the condenser on both air-cooled and water-cooled chillers. It works only during low demand conditions, when loads are up to 24% below normal.

During low-load conditions, the compressor cycles off. To decrease the frequency of cycling, which is harmful to the compressor, the microKool uses an unloader valve to channel some of the hot refrigerant gas from the compressor directly back into the condenser. This increases the temperature within the condenser, simulating an increased load and keeping the compressor running at full capacity.

You can check whether the unloader valve is working properly by observing its behavior while the microKool is running.

1 Clear any alarms and restart the chiller.

2 Watch for the following:

- ❒ The unloader valve light should turn on for 2 seconds when the compressor starts. You should hear the solenoid activate when the unloader valve light turns on.
- ❒ If the process fluid temperature is below the setpoint, the unloader valve should stay lit until the temperature of the process fluid exceeds the setpoint.
- ❒ If the process fluid temperature is above the setpoint, the unloader valve light should turn off after 2 seconds. You can verify that the unloader valve is inactive by checking the refrigerant line from the solenoid valve to the expansion valve. The line should be cool.
  If the line is hot all the way to the expansion valve, then the unloader valve is active. The solenoid valve may be leaking, or the unloader valve may be stuck open with power still supplied to the solenoid.

NOTE: *Units with the enhanced PC-2 control have two unloader valves that work together.*

REPLACING THE FREEZESTAT

WARNING: Electrical shock hazard
Before attempting maintenance of any kind, stop the unit and disconnect and lock out the main power supply.

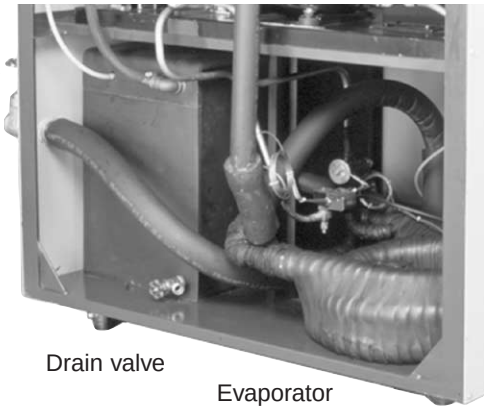
The freezestat unit is a bulb and capillary thermostat. To replace the unit:

1. **Shut down the chiller and disconnect the process fluid lines.**

2. **Disconnect and lockout the power supply.**

3. **Drain the tank of all fluid** through the drain valve in the base of the tank.

4. **Locate the freezestat bulb.** The bulb sensor is located on the process piping just after the evaporator.



5. **Remove the insulation around the bulb.**

6. **Detach the bulb from the process line.**

7. **Open the chiller electrical enclosure and locate the freezestat unit.**

8. **Disconnect freezestat unit wires from their terminals.** Mark the wires so that you can easily reconnect the new unit to the appropriate terminals..

9. **Loosen the screws holding the freezestat unit to the electrical panel.**

10. **Remove the entire freezestat unit.** Threat the bulb and capillary through the raceway.

11. **Reverse the process to install the new unit.** Be sure to insert the bulb sensor completely into the process piping well and replace the insulation around the bulb.

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.

SPI COMMANDS SUPPORTED BY THE CONAIR MICROKOOL

The SPI commands supported by Conair microKool portable chillers are listed in the following tables.

The standard required commands and three optional commands are listed in the SPI Command Pairs table, along with the Select and Poll command pairs in hexadecimal format. Select commands set or change chiller functions. Poll commands retrieve information from the chiller.

SPI Command Pairs

Portable chillers **Device ID: hex 21**

Commands	Select	Poll
Echo - Select stores 4 bytes of information at the chiller; Poll retrieves it.	0x21 0x21	0x21 0x20
Setpoint Process Temperature - Sets and retrieves the process temperature setpoint.	0x21 0x31	0x21 0x30
Alarm, High Temperature Deviation* - Sets the alarm band temperature; retrieves setpoint + alarm band value.	0x21 0x33	0x21 0x32
Alarm, Low Temperature Deviation* - Sets the alarm band temperature; retrieves setpoint + alarm band value.	0x21 0x35	0x21 0x34
Mode, Machine - Start/stops the chiller; acknowledges alarms; retrieves run status	0x21 0x49	0x21 0x48
Version - Retrieves 4 bytes of SPI version information.		0x21 0x22
Process Status - Retrieves run status and alarm conditions.		0x21 0x40
Status, Machine 1 - Retrieves run status and alarm conditions.		0x21 0x42
Status, Machine 2 - Retrieves run status and alarm conditions.		0x21 0x44
Temperature, from Process - Retrieves the actual temperature of fluid returning to the chiller.		0x21 0x72

*** NOTE: Both High and Low Temperature Deviation commands set the same variable. Use only one of these commands to avoid problems.**

See the tables on the following pages for the SPI status words and BIT positions for Process Status, Machine 1 Status and Machine 2 status.

For more information on the SPI protocol, you can obtain the SPI Communication Protocol Manual by contacting:

The Society of the Plastics Industry, Inc.
1801 K Street, NW, Suite 600K
Washington, D.C. 20006
(202) 974-5200 Fax: (202) 296-7005
www.plasticsindustry.org

SPI STATUS WORDS

Status, Process
Poll: 0x21 0x40

SPI STATUS WORD	Open	Open	Reserved	Reserved	Reserved	Reserved	Alarm, Low flow	Reserved	Alarm, Low pressure condition	Alarm, High pressure condition	Alarm, Low temperature deviation	Alarm, High temperature deviation	Alarm, Machine	Alarm, Process	Alarm, System	Processing
Word BIT position	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
EEprom error														SET	SET	*
A/D converter error														SET	SET	*
CJC Error														SET	SET	*
RAM hardware														SET	SET	*
ROM checksum														SET	SET	*
Probe Failure													SET		SET	*
E/M Hi temp safety																*
Prog. Hi temp safety																*
Output monitor failure													SET		SET	*
Low water pressure									SET				SET		SET	*
High deviation alarm												SET		SET	SET	*
Low deviation alarm											SET			SET	SET	*
Prog. Lo temp safety																*
Pump overload													SET		SET	*
Refrig. Pressure													SET		SET	*
Oil Safety													SET		SET	*
Compressor overload													SET		SET	*
Freeze Stat													SET		SET	*
Low water level													SET		SET	*
Test Mode																*
Phase error																*

NOTES:

* The SPI I/O list defines the Processing bit as being cleared if the unit is not processing; otherwise it is SET.

Elsewhere on the chart:

- If a bit is not shown to be SET, it is cleared.
- The System Alarm bit is SET if an alarm is present. It is the logical OR of Process alarm and Machine alarm.
- Processing, System Alarm, Process Alarm and Machine Alarm bits are repeated for Process Status, Machine 1 Status and Machine 2 Status.

SPI STATUS WORDS

Status, Machine 1
Poll: 0x21 0x42

SPI STATUS WORD	Open	Alarm, Phase	Alarm, Low current	Alarm, High current	Alarm, Low volts	Alarm, High volts	Reserved	Reserved	Alarm, Low pressure safety limit	Alarm, High pressure safety limit	Alarm, Low temperature safety limit	Alarm, High temperature safety limit	Alarm, Machine	Alarm, Process	Alarm, System	Processing
Word BIT position	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
EEprom error														SET	SET	*
A/D converter error														SET	SET	*
CJC Error														SET	SET	*
RAM hardware														SET	SET	*
ROM checksum														SET	SET	*
Probe Failure																*
E/M Hi temp safety												SET	SET		SET	*
Prog. Hi temp safety												SET		SET	SET	*
Output monitor failure													SET		SET	*
Low water pressure									SET				SET		SET	*
High deviation alarm																*
Low deviation alarm																*
Prog. Lo temp safety											SET			SET	SET	*
Pump overload													SET		SET	*
Refrig. Pressure													SET		SET	*
Oil Safety													SET		SET	*
Compressor overload													SET		SET	*
Freeze Stat													SET		SET	*
Low water level													SET		SET	*
Test Mode																*
Phase error		SET											SET		SET	*

NOTES:

* The SPI I/O list defines the Processing bit as being cleared if the unit is not processing; otherwise it is SET.

Elsewhere on the chart:

- If a bit is not shown to be SET, it is cleared.
- The System Alarm bit is SET if an alarm is present. It is the logical OR of Process alarm and Machine alarm.
- Processing, System Alarm, Process Alarm and Machine Alarm bits are repeated for Process Status, Machine 1 Status and Machine 2 Status.

SPI STATUS WORDS

Status, Machine 2
Poll: 0x21 0x44

SPI STATUS WORD	Open	Open	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Fault, CAL	Fault, Sensor	Alarm, Machine	Alarm, Process	Alarm, System	Processing
Word BIT position	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
EEprom error														SET	SET	*
A/D converter error														SET	SET	*
CJC Error														SET	SET	*
RAM hardware														SET	SET	*
ROM checksum														SET	SET	*
Probe Failure												SET		SET	SET	*
E/M Hi temp safety																*
Prog. Hi temp safety																*
Output monitor failure													SET		SET	*
Low water pressure																*
High deviation alarm																*
Low deviation alarm																*
Prog. Lo temp safety																*
Pump overload													SET		SET	*
Refrig. Pressure													SET		SET	*
Oil Safety													SET		SET	*
Compressor overload													SET		SET	*
Freeze Stat																
Low water level													SET		SET	*
Test Mode																*
Phase error																*

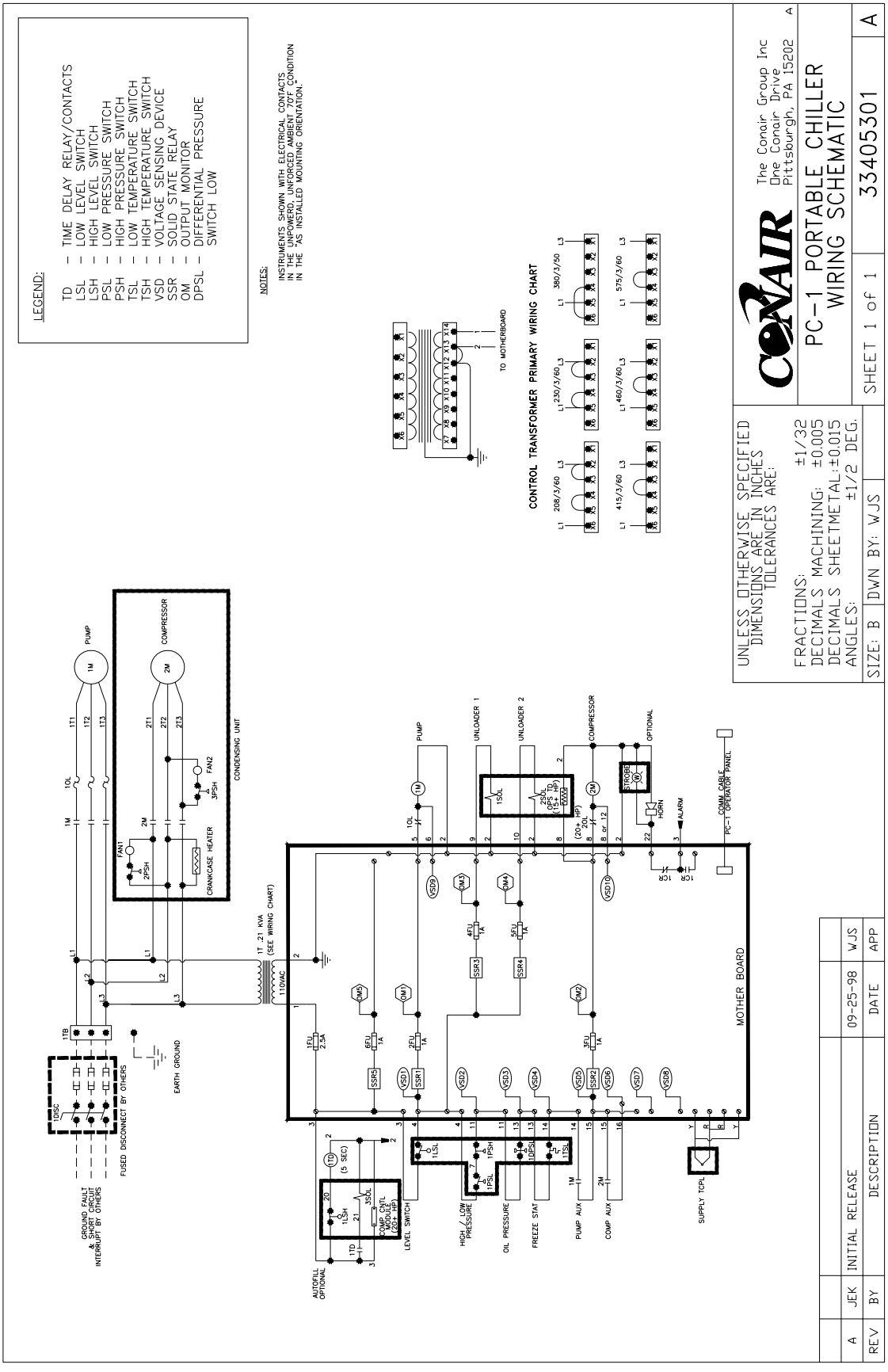
NOTES:

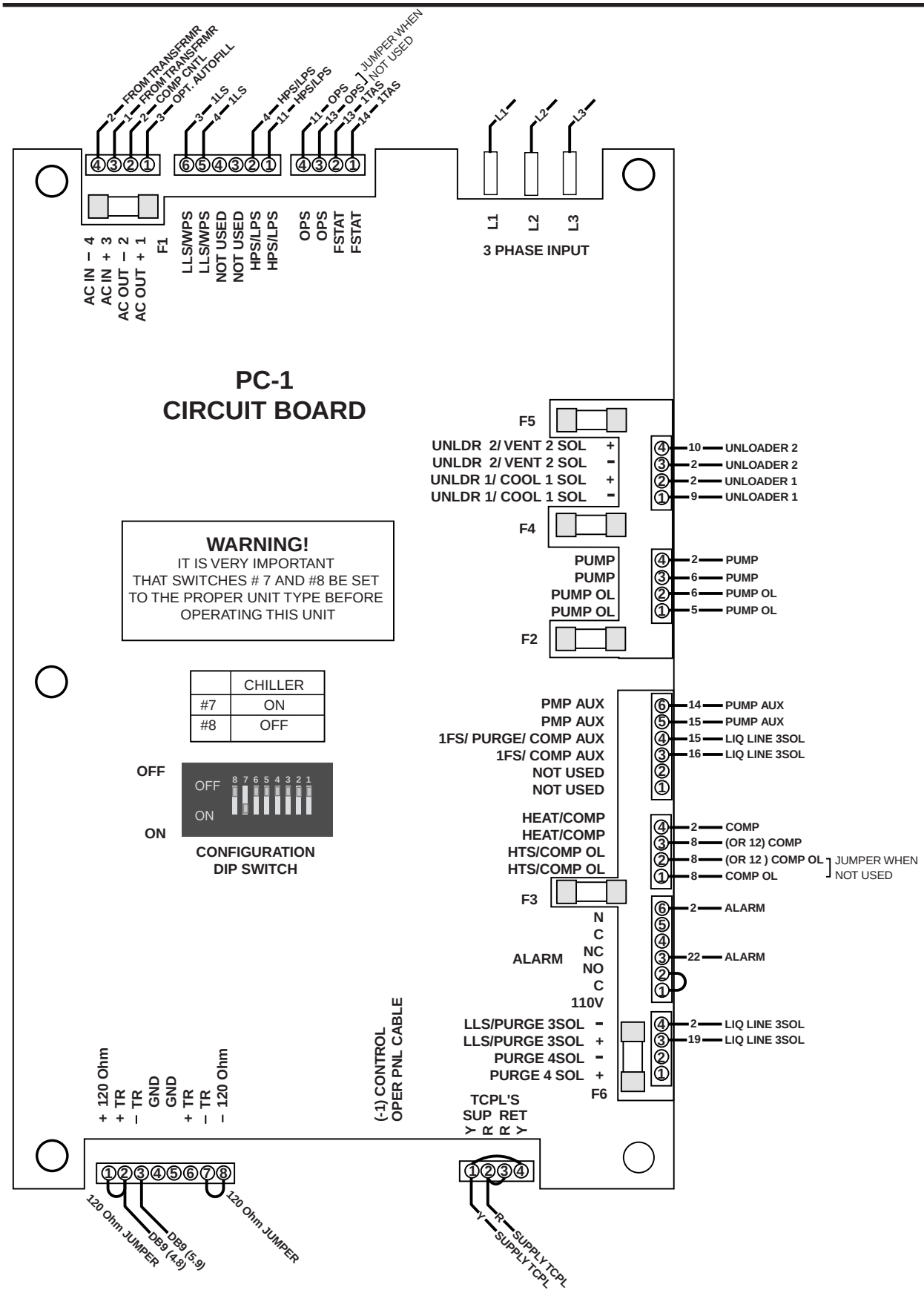
* The SPI I/O list defines the Processing bit as being cleared if the unit is not processing; otherwise it is SET.

Elsewhere on the chart:

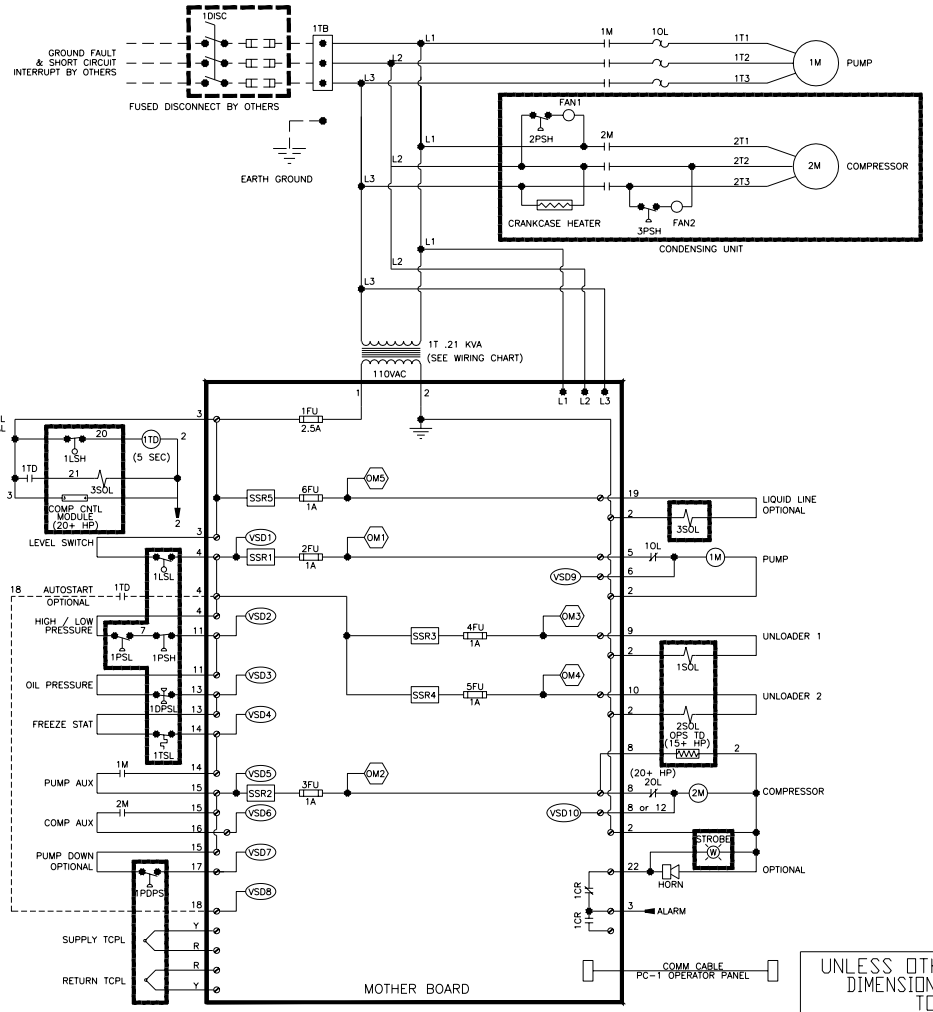
- If a bit is not shown to be SET, it is cleared.
- The System Alarm bit is SET if an alarm is present. It is the logical OR of Process alarm and Machine alarm.
- Processing, System Alarm, Process Alarm and Machine Alarm bits are repeated for Process Status, Machine 1 Status and Machine 2 Status.

PARTS/DIAGRAMS


LEGEND:
TD – TIME DELAY RELAY/CONTACTS
LSL – LOW LEVEL SWITCH
LSH – HIGH LEVEL SWITCH
PSL – LOW PRESSURE SWITCH
PSH – HIGH PRESSURE SWITCH
TSL – LOW TEMPERATURE SWITCH
TSH – HIGH TEMPERATURE SWITCH
VSD – VOLTAGE SENSING DEVICE
SSR – SOLID STATE RELAY
OM – OUTPUT MONITOR
DPSL – DIFFERENTIAL PRESSURE SWITCH LOW
NOTES:
INSTRUMENTS SHOWN WITH ELECTRICAL CONTACTS IN THE UNPOWERED, UNFORCED AMBIENT 70°F CONDITION IN THE "AS INSTALLED MOUNTING ORIENTATION."
CONTROL TRANSFORMER PRIMARY WIRING CHART
208/3/60
230/3/60
380/3/50
415/3/50
460/3/60
575/3/60
TO MOTHERBOARD
FUSED DISCONNECT BY OTHERS
GROUND FAULT & SHORT CIRCUIT INTERRUPT BY OTHERS
EARTH GROUND
PUMP
COMPRESSOR
CRANKCASE HEATER
CONDENSING UNIT
1T .21 KVA (SEE WIRING CHART)
110VAC
MOTHER BOARD
UNLOADER 1
UNLOADER 2
COMPRESSOR
OPTIONAL
STROBE
HORN
ALARM
COMM CABLE
PC-1 OPERATOR PANEL
AUTOFILL OPTIONAL
LEVEL SWITCH
HIGH / LOW PRESSURE
OIL PRESSURE
FREEZE STAT
PUMP AUX
COMP AUX
SUPPLY TCPL
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS: ±1/32
DECIMALS MACHINING: ±0.005
DECIMALS SHEETMETAL: ±0.015
ANGLES: ±1/2 DEG.
SIZE: B
DWN BY: WJS
CONAIR
The Conair Group Inc
One Conair Drive
Pittsburgh, PA 15202
PC-1 PORTABLE CHILLER
WIRING SCHEMATIC
SHEET 1 of 1
33405301
A
REV
BY
DESCRIPTION
DATE
APP
A
JEK
INITIAL RELEASE
09-25-98
WJS


PC-1
CIRCUIT BOARD
FROM TRANSFRMR
FROM TRANSFRMR
COMP CNTL
OPT. AUTOFILL
1LS
1LS
HPS/LPS
HPS/LPS
OPS
OPS
1TAS
1TAS
JUMPER WHEN NOT USED
L1
L2
L3
3 PHASE INPUT
AC IN – 4
AC IN + 3
AC OUT – 2
AC OUT + 1
F1
LLS/WPS
LLS/WPS
NOT USED
NOT USED
HPS/LPS
HPS/LPS
OPS
OPS
FSTAT
FSTAT
F5
UNLDR 2/ VENT 2 SOL +
UNLDR 2/ VENT 2 SOL -
UNLDR 1/ COOL 1 SOL +
UNLDR 1/ COOL 1 SOL -
10 UNLOADER 2
2 UNLOADER 2
2 UNLOADER 1
9 UNLOADER 1
F4
PUMP
PUMP
PUMP OL
PUMP OL
2 PUMP
6 PUMP
6 PUMP OL
5 PUMP OL
F2
WARNING!
IT IS VERY IMPORTANT
THAT SWITCHES # 7 AND #8 BE SET
TO THE PROPER UNIT TYPE BEFORE
OPERATING THIS UNIT
CHILLER
#7 ON
#8 OFF
OFF
ON
CONFIGURATION
DIP SWITCH
PMP AUX
PMP AUX
1FS/ PURGE/ COMP AUX
1FS/ COMP AUX
NOT USED
NOT USED
14 PUMP AUX
15 PUMP AUX
15 LIQ LINE 3SOL
16 LIQ LINE 3SOL
HEAT/COMP
HEAT/COMP
HTS/COMP OL
HTS/COMP OL
2 COMP
8 (OR 12) COMP
8 (OR 12) COMP OL
8 COMP OL
JUMPER WHEN NOT USED
F3
ALARM
N
C
NC
NO
C
110V
2 ALARM
22 ALARM
LLS/PURGE 3SOL -
LLS/PURGE 3SOL +
PURGE 4SOL -
PURGE 4 SOL +
F6
2 LIQ LINE 3SOL
19 LIQ LINE 3SOL
+ 120 Ohm
+ TR
+ TR
– TR
GND
GND
+ TR
– TR
– 120 Ohm
(-1) CONTROL
OPER PNL CABLE
TCPL'S
SUP RET
Y R R Y
120 Ohm JUMPER
DB9 (4,8)
DB9 (5,9)
120 Ohm JUMPER
Y
R
SUPPLY TCPL
SUPPLY TCPL

PC-2 WIRING DIAGRAM

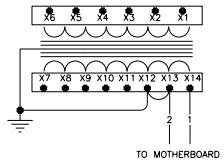


LEGEND:

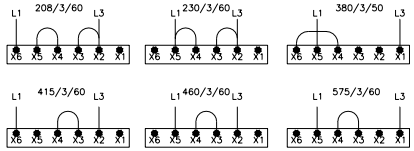
TD	–	TIME DELAY RELAY/CONTACTS
LSL	–	LOW LEVEL SWITCH
LSH	–	HIGH LEVEL SWITCH
PSL	–	LOW PRESSURE SWITCH
PSH	–	HIGH PRESSURE SWITCH
TSL	–	LOW TEMPERATURE SWITCH
TSH	–	HIGH TEMPERATURE SWITCH
VSD	–	VOLTAGE SENSING DEVICE
SSR	–	SOLID STATE RELAY
OM	–	OUTPUT MONITOR
DPSL	–	DIFFERENTIAL PRESSURE SWITCH LOW

NOTES:

INSTRUMENTS SHOWN WITH ELECTRICAL CONTACTS IN THE UNPOWERD, UNFORCED AMBIENT 70°F CONDITION IN THE "AS INSTALLED MOUNTING ORIENTATION."



CONTROL TRANSFORMER PRIMARY WIRING CHART



REV	BY	DESCRIPTION	DATE	APP
A	JEK	INITIAL RELEASE	09-25-98	WJS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:

FRACTIONS: ±1/32
DECIMALS MACHINING: ±0.005
DECIMALS SHEETMETAL: ±0.015
ANGLES: ±1/2 DEG.

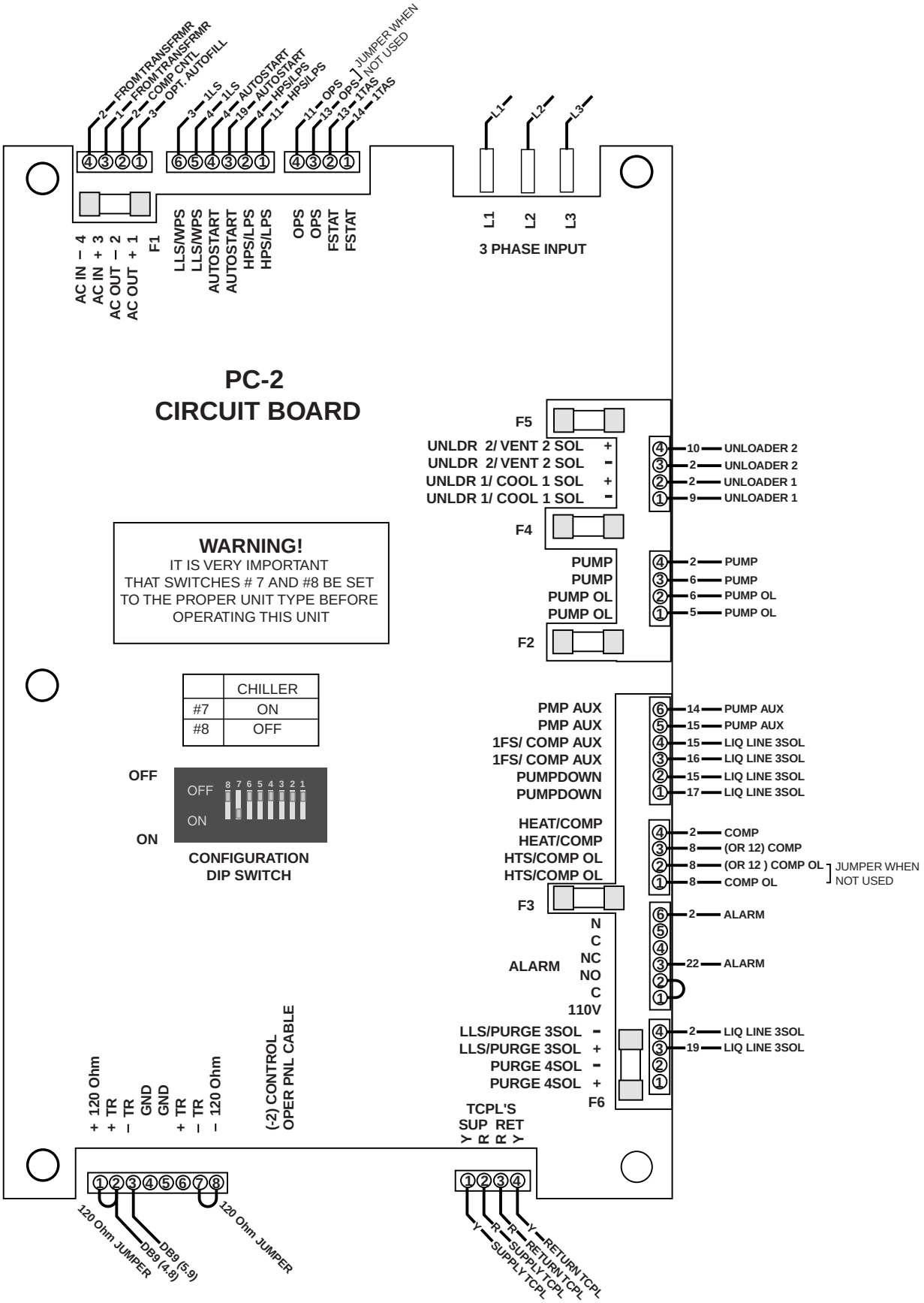
SIZE: B | DWN BY: WJS

CONAIR

The Conair Group Inc
One Conair Drive
Pittsburgh, PA 15202 A

PC-2 PORTABLE CHILLER WIRING SCHEMATIC

SHEET 1 of 1 | 33405302 | A


PC-2
CIRCUIT BOARD
WARNING!
IT IS VERY IMPORTANT
THAT SWITCHES # 7 AND #8 BE SET
TO THE PROPER UNIT TYPE BEFORE
OPERATING THIS UNIT
CHILLER
#7 ON
#8 OFF
OFF
ON
CONFIGURATION
DIP SWITCH
3 PHASE INPUT
L1
L2
L3
AC IN – 4
AC IN + 3
AC OUT – 2
AC OUT + 1
F1
LLS/WPS
LLS/WPS
AUTOSTART
AUTOSTART
HPS/LPS
HPS/LPS
OPS
OPS
FSTAT
FSTAT
JUMPER WHEN NOT USED
F5
UNLDR 2/ VENT 2 SOL +
UNLDR 2/ VENT 2 SOL –
UNLDR 1/ COOL 1 SOL +
UNLDR 1/ COOL 1 SOL –
UNLOADER 2
UNLOADER 2
UNLOADER 1
UNLOADER 1
F4
PUMP
PUMP
PUMP OL
PUMP OL
F2
PUMP
PUMP
PUMP OL
PUMP OL
PMP AUX
PMP AUX
1FS/ COMP AUX
1FS/ COMP AUX
PUMPDOWN
PUMPDOWN
LIQ LINE 3SOL
LIQ LINE 3SOL
LIQ LINE 3SOL
LIQ LINE 3SOL
HEAT/COMP
HEAT/COMP
HTS/COMP OL
HTS/COMP OL
F3
COMP
(OR 12) COMP
(OR 12) COMP OL
COMP OL
JUMPER WHEN NOT USED
ALARM
N
C
NC
NO
C
110V
ALARM
LLS/PURGE 3SOL –
LLS/PURGE 3SOL +
PURGE 4SOL –
PURGE 4SOL +
F6
LIQ LINE 3SOL
LIQ LINE 3SOL
TCPL'S
SUP RET
RET SUP
+ 120 Ohm
+ TR
– TR
GND
GND
+ TR
– TR
– 120 Ohm
(-2) CONTROL
OPER PNL CABLE
120 Ohm JUMPER
DB9 (4,8)
DB9 (5,9)
120 Ohm JUMPER
Y RETURN TCPL
R RETURN TCPL
R SUPPLY TCPL
Y SUPPLY TCPL