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USER GUIDE

UGH056-0322

Thermolator® TW-S and TW-P

Temperature Control Units

TW-S

TW-P

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: UGH056-0322

Serial Number(s):

Model Number(s):

DISCLAIMER: Neither Conair nor its employees shall be liable for errors contained in this User Guide or for incidental, consequential damages in connection with the furnishing, performance or use of this information. Conair makes no warranty of any kind with regard to this information, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

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Introduction

Purpose of the User Guide

This User Guide describes the Conair Thermolator® TW-S and TW-P and explains step-by-step how to install and operate 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 indicate tasks or steps to be performed by the user.

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

❒ An open box marks items in a checklist.

• A circle marks items in a list.

Indicates a tip. A tip is used to provide you with a suggestion that will help you with the maintenance and the operation of this equipment.

✎ Indicates a note. A note is used to provide additional information about the steps you are following throughout the manual.

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 view 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 sources, intended use, and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.

Foreword

The Thermolator® typically consists of a fluid pump, electric immersion heater, and temperature control valve in a compact packaged cabinet for easy location in industrial applications where fluid temperature control is required.

This manual is to serve as a guide for installing, operating, and maintaining the equipment. Improper installation can lead to poor performance and/or equipment damage. We recommend the use of qualified installers and service technicians for all installation and maintenance of this equipment.

This manual is for our standard product. The information in this manual is general in nature. Unit-specific drawings and supplemental documents are included with the equipment as needed. Additional copies of documents are available upon request. We strive to maintain an accurate record of all equipment during the course of its useful life.

Due to the ever-changing nature of applicable codes, ordinances, and other local laws pertaining to the use and operation of this equipment, we do not reference them in this manual. There is no substitute for common sense and good operating practices when placing any mechanical equipment into operation. We encourage all personnel to familiarize themselves with this manual's contents. Failure to do so may unnecessarily prolong equipment down time.

Follow good piping practices and the information in this manual to ensure successful installation and operation of this equipment.

We trust your equipment will have a long and useful life. If you should have any questions, please contact our Service Department specifying the serial number and model number of the unit as indicated on the nameplate.

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

ATTENTION:
Read This So No One Gets Hurt

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.

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 machine.

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

WARNING: Voltage hazard

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

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 severe personal injury and erratic machine operation.

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

WARNING: Compressed air hazard

If you use compressed air, you must wear eye protection and observe all OSHA and other safety regulations pertaining to the use of compressed air. Bleed off pressure before servicing equipment.

CAUTION: Hot Surfaces

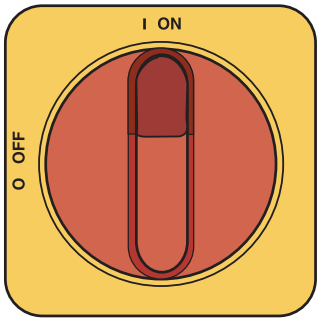
Surface temperatures inside the Thermolator can exceed 300° F {149° C}. Always allow the unit to cool below 100° F {38º C} before opening, servicing, or disassembling the unit.

How to Use the Lockout Device

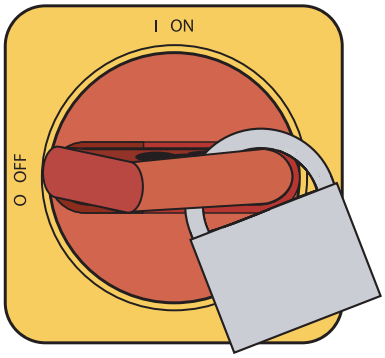
⚠ **CAUTION:** Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energization or start-up. A lockable device may be provided to isolate this product from potentially hazardous electricity.

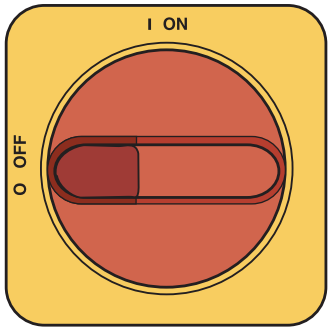
⚠ **WARNING:** Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards reinstalled.

Lockout is the preferred method of isolating machines or equipment from energy sources. Your Conair product may be equipped with the lockout device pictured below. To use the lockout device:



1. **Stop or turn off the equipment.**
2. **Isolate the equipment from the electric power.**
3. **Turn the rotary disconnect switch to the OFF, or "O" position**
4. **Secure the device** with an assigned lock or tag.
5. The equipment is now locked out.





If the machine has no included lockout device, perform the same procedure at the upstream device as part of premises electrical system. Incoming cooling water and compressed air (if purge) are additional energy sources that need to be controlled.

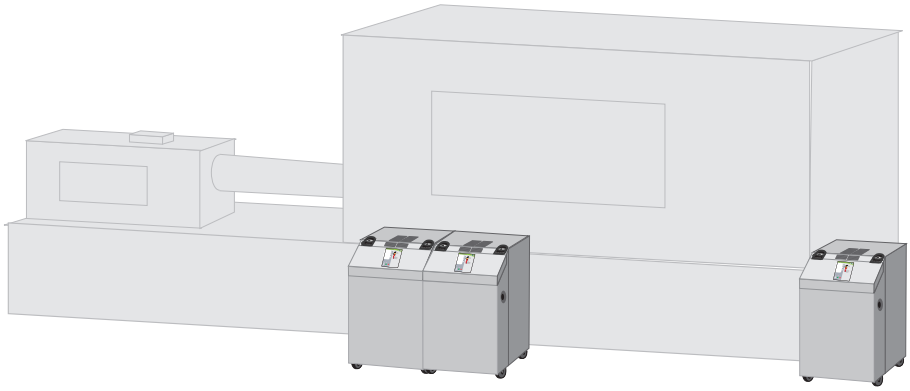
SECTION
2

Description

What is the Thermolator TW-S and TW-P

The Thermolator TW-S and TW-P Series circulates water at a temperature higher than the available water supply, to add or remove heat as needed to maintain a uniform temperature setpoint in the process.

The TW-S and TW-P Series is available in single or multiple-zone configurations for process heating and cooling. Two-zone models can control up to two temperatures at different locations in the process. Two-zone models have common cooling water manifolds and electrical connections.



Typical Applications

The best model for your application depends on the process temperature you need to maintain and the quality of the cooling water supply.

TW direct injection (DI) models control the temperature by discharging heated process water and adding cooling water directly from the water supply. DI models are designed for:

- Process temperatures up to 250°F {121°C} - with options up to 300°F {149°C}.
- Use with chiller water or properly treated and filtered tower or city water.

Check to make sure all piping connections are secure and that all lines are suitable for water or the coolant in the system at the maximum set point temperature and cumulative pressure rating of the maximum pump pressure and the unit fill fluid pressure.

Make sure that the cooling source is the appropriate temperature and pressure for your application. In most cases, the cooling source is between 40°F and 85°F. The cooling source fluid pressure must be above the set point of the pressure switch in order for the unit to start. For most applications, the design cooling source supply pressure is between 25 psi and 50 psi. Units with the 300°F operating range option require an inlet cooling source pressure of 65 psi. If the total pressure in the unit (cooling source inlet pressure plus the pump pressure) exceeds 150 psi, the pressure relief valve in the unit will open. If this becomes an issue, install a pressure-regulating valve (available from our Parts Department) on the supply line to help regulate the pressure to ensure it does not exceed the pressure rating of the pressure relief valve. For further assistance in installing a pressure-regulating valve, please contact our Customer Service Department.

Typical Applications (Continued)

System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a "universal solvent" because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. The table below shows the list of water characteristics and quality limitations.

Typical Applications (Continued)

Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO_3^-)	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH_3)	Less than 2 ppm
Chlorides (Cl^-)	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO2)†	Less than 5 ppm
Free Chlorine(Cl_2)	Less than 1 PPM
HCO_3-/SO_4^{2-}	Greater than 1.0
Hydrogen Sulfide (H_2S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO_3)	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO_4^{2-})	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3-pH)/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$

Recommend Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %

CAUTION: When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the chiller. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.

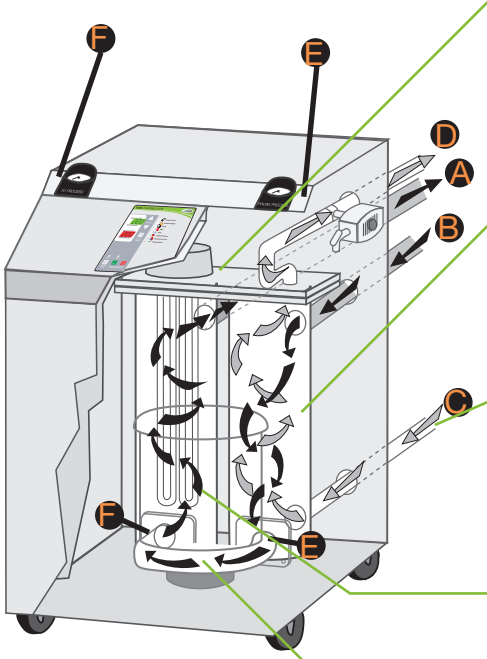
WARNING: Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

Contact Conair Customer Service
1 800 458 1960.
From outside of the United States,
call: 814 437 6861

Contact Conair for more information about recommendations for your product.

How the TW-S and TW-P Series Direct Injection Works

Direct injection models maintain the process temperature by electrically heating and/or injecting cool water supplied to the Thermolator by a chiller, tower, or other water source.



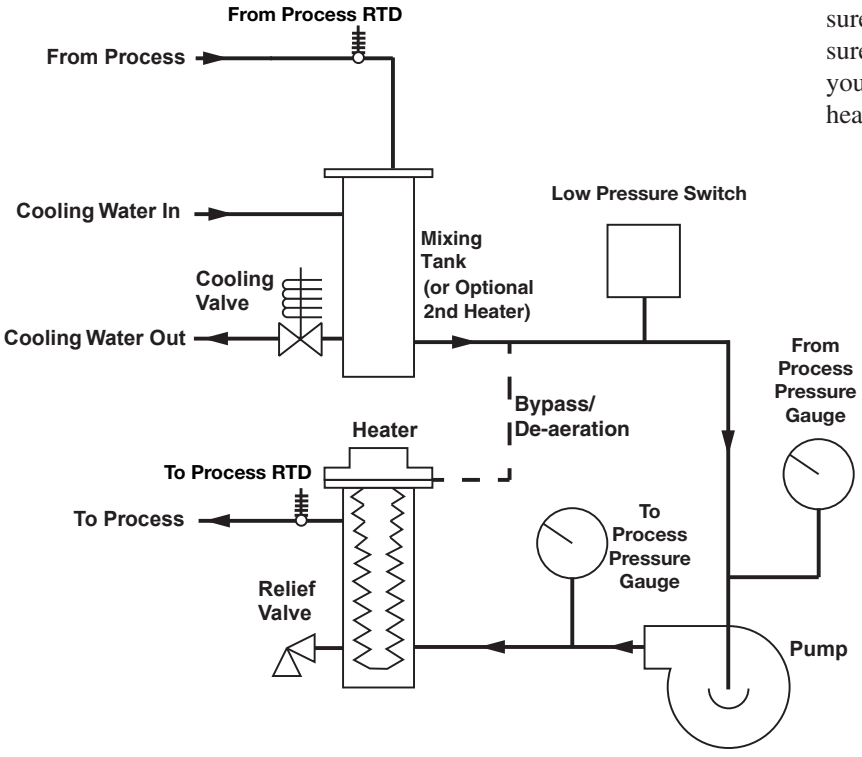
1 The temperature of the process fluid is measured as it leaves the unit's primary heater tank. The fluid then flows through the "To Process" line A to the mold or process. The fluid returns to the unit through the "From Process" line B for reheating or cooling.

2 The temperature of the process fluid is measured as it flows into the mixing tank through the "From Process" line B.

3 If the "To Process" temperature is above the setpoint value, the cooling valve opens. Cool water enters the bottom of the mixing tank via the "Cooling In" line C. Warm water flows out of the mixing tank via the "Cooling Out" line D.

4 If the "To Process" temperature is below the setpoint, the heater elements inside the heater tank are energized.

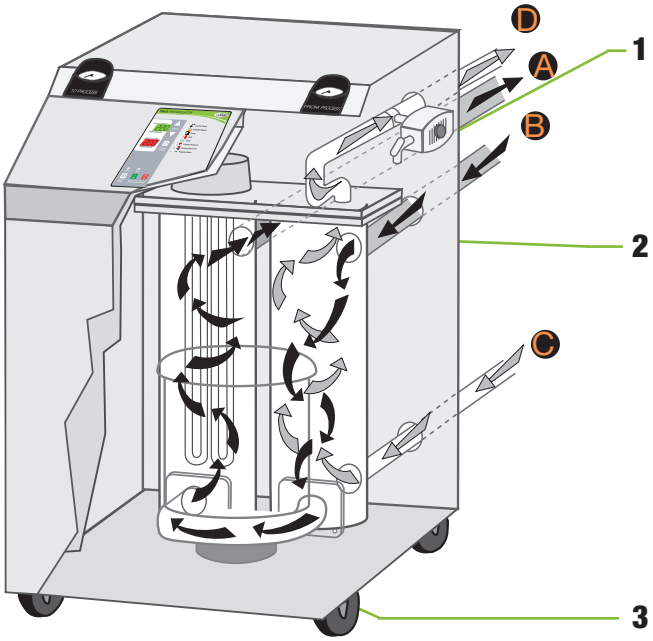
5 The pump moves water from the mixing tank into the heater tank. Pressure is measured before and after the pump with pressure gauges E and F. Note: Depending on your model, you may have an additional heater in the mixing tank.



TW-S Direct Injection

How the Closed Circuit Works

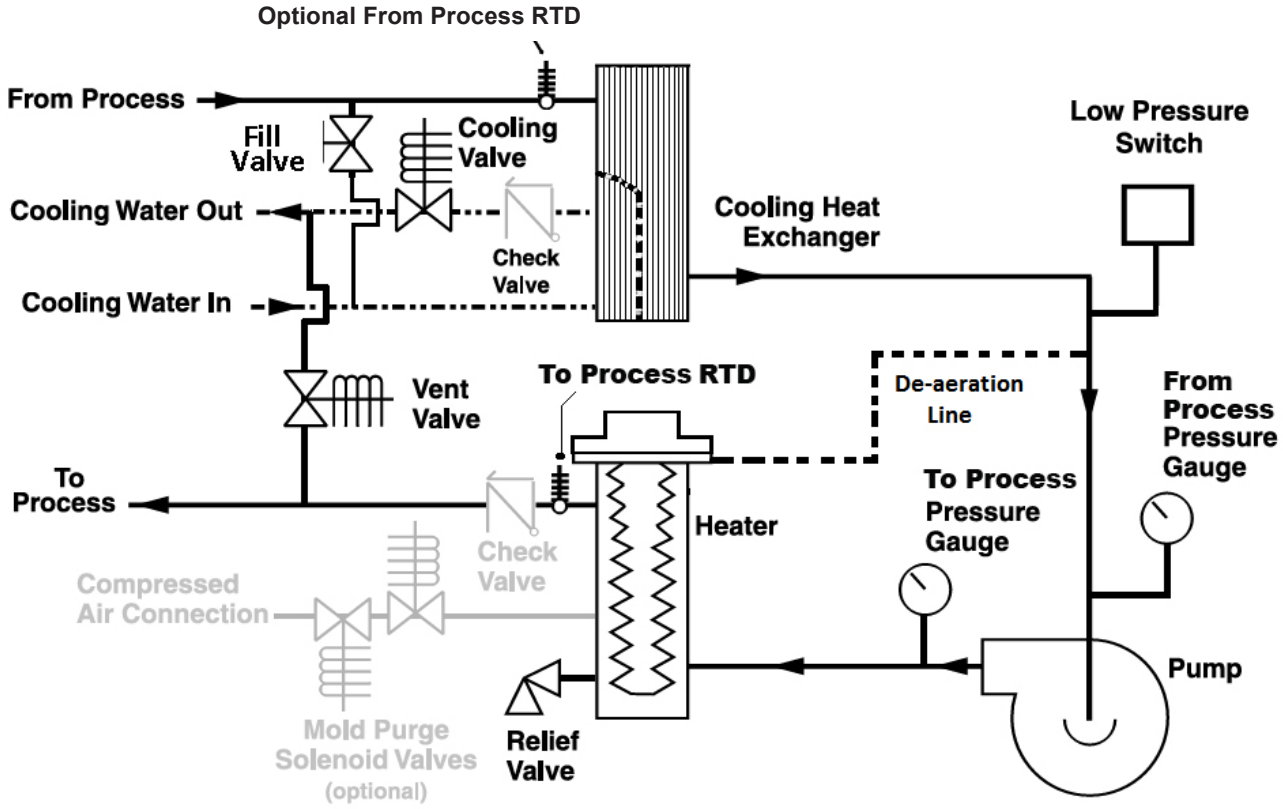
Closed Circuit models maintain the process temperature by electrically heating and indirectly cooling fluid in the process circuit. Cooling water supplied by a chiller, tower or other water source, is mixed with the process fluid only during the initial filling or when water is needed to make up process fluid loss. A brazed-plate heat exchanger replaces the mixing tank used on direct injection units.



1 The temperature of the process fluid is measured as it leaves the unit's heater tank. The fluid then flows through the "To Process" line A to the mold or process. The fluid returns to the unit through the "From Process" line B for reheating or cooling.

2 If the temperature is above the setpoint value, the cooling valve opens. Cool water enters the heat exchanger via the "Cooling In" line. Process fluid is always being circulated through the process side of the heat exchanger. The process fluid is indirectly cooled via conduction from the colder water now running through the cooling side of the heat exchanger. If the measured temperature is below the setpoint, the heater elements inside the heater tank are energized.

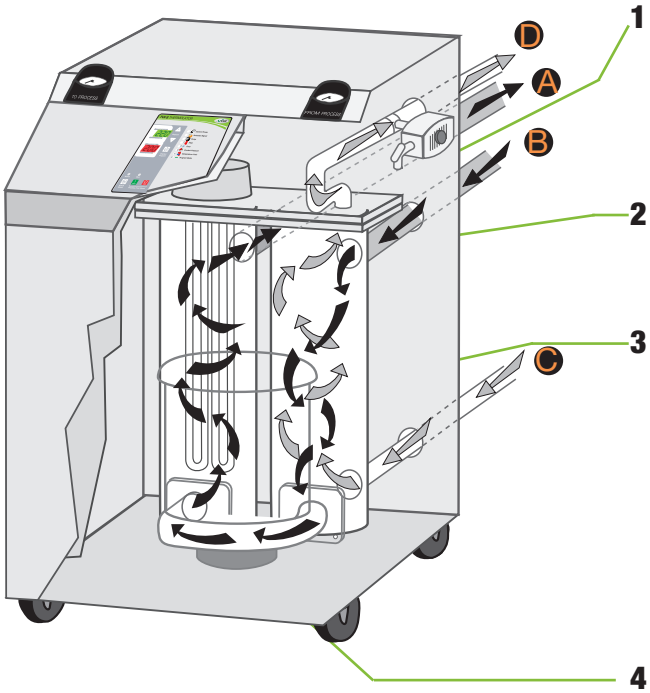
3 The pump moves water from the heat exchanger to the heater tank. Pressure is measured before and after the pump with pressure gauge E and F.



TW-S Closed Circuit

How the Closed Circuit Separate Source Works

Closed Circuit Separate Source models maintain the process temperature by electrically heating and indirectly cooling fluid in the process circuit. Cooling water supplied by a chiller, tower or other water source, is never mixed with process fluid. Fluid to fill the process loop is provided by a "separate source" A brazed plate heat exchanger replaces the mixing tank used on direct injection units.

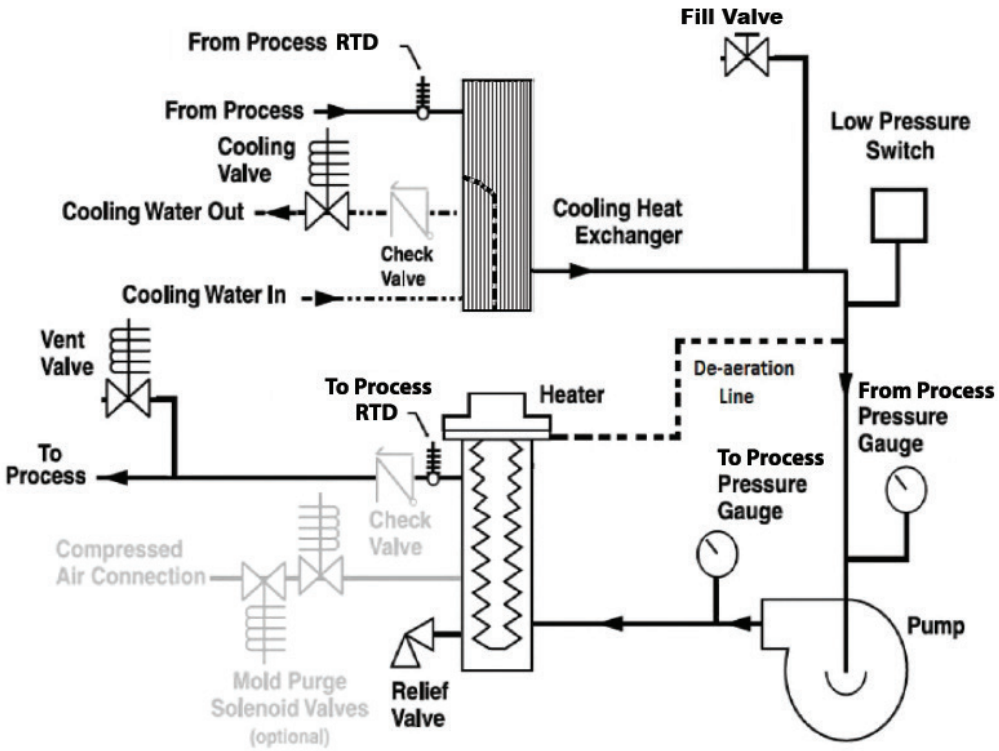


1 The temperature of the process fluid is measured as it leaves the unit's heater tank. The fluid then flows through the "To Process" line A to the mold or process. The fluid returns to the unit through the "From Process" line B for reheating or cooling.

2 Alternatively, the temperature of the process fluid may be measured as it flows into the mixing tank through the "From Process" line B.

3 If the temperature is above the setpoint value, the cooling valve opens. Cool water enters the heat exchanger via the "Cooling In" line. Process fluid is always being circulated through the process side of the heat exchanger. The process fluid is indirectly cooled via transmission from the colder water now running through the cooling side of the heat exchanger. If the measured temperature is below the setpoint, the heater elements inside the heater tank are energized.

4 The pump moves water from the heat exchanger to the heater tank. Pressure is measured before and after the pump with pressure gauge E and F.



TW-P Closed Circuit Separate Source

TW-S Control Features vs TW-V and TW-P

The TW-S Control

Control features on the TW-S Series Thermolators

Model	TW-S
Direct Injection	●
Closed Circuit - Common Source	
Closed Circuit - Separate Source	
Construction	
Standard Pump Range	3/4 to 10 Hp {0.56 to 7.45 kW}
Standard Heater Range	0 to 48 kW
Cast Heater / Pump	●
Incoloy Heaters	●
Silicon Carbide Seals	●
Pressure Gauges	●
250°F Setpoint Range	●
300°F Setpoint Range	○
Controls	
PID Control	●
Setpoint / Actual Display	●
Password Protection	●
Modbus RTU via RS-485	
SPI via RS-485	
Retransmit Process Temp (4-20mA)	
Hand Held Remote	
Auto Restart Capability	●
High Temperature Safety	○
Mold Purge	
Phase Detection Circuit	
Heat Error for Heater Malfunction	
Remote Start/Stop	●
120°F Air Purge Cancel	●
Quick Access Cool Down Mode	●
Status / Alarm Lights	
Panel Mounted Status Lights	7 LEDs
Panel Mounted Alarm Lights	3 LEDs
Audible Alarm	●
Strobe Light	○

● Standard
○ Optional

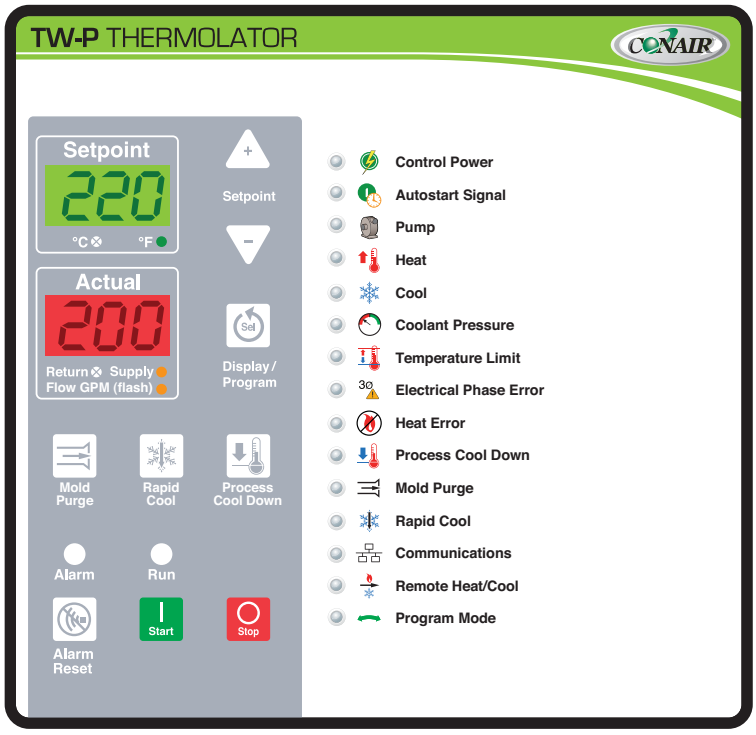
PID Control

Phase detection indicates incorrect pump rotation or an open electrical leg.

Control features on the TW-P and TW-V Series Thermolators

Model	TW-P	TW-V
Direct Injection	●	●
Closed Circuit - Common Source	○	
Closed Circuit - Separate Source	○	
Construction		
Standard Pump Range	3/4 to 10 Hp {0.56 to 7.45 kW}	3/4 or 2 Hp {0.56 or 1.49 kW}
Standard Heater Range	0 to 48 kW	12 kW
Cast Heater / Pump	●	●
Incoloy Heaters	●	●
Silicon Carbide Seals	●	●
Pressure Gauges	●	●
250°F Setpoint Range	●	●
300°F Setpoint Range	○	
Controls		
PID Control	●	●
Setpoint / Actual Display	●	●
Password Protection	●	
Modbus RTU via RS-485	○	
SPI via RS-485	○	
Retransmit Process Temp (4-20mA)	○	
Hand Held Remote	○	
Auto Restart Capability	●	
High Temperature Safety	○	
Mold Purge	○	○
Phase Detection Circuit	●	
Heat Error for Heater Malfunction	●	
Remote Start/Stop	●	
120°F Air Purge Cancel	●	
Quick Access Cool Down Mode	●	
Status / Alarm Lights		
Panel Mounted Status Lights	12 LEDs	1 LED
Panel Mounted Alarm Lights	5 LEDs	1 LED
Audible Alarm	●	
Strobe Light	○	

TW-P Control Features vs TW-V and TW-S



The TW-P Control

Control features on the TW-P Series Thermolators

Model	TW-P
Direct Injection	●
Closed Circuit - Common Source	○
Closed Circuit - Separate Source	○
Construction	
Standard Pump Range	3/4 to 10 Hp {0.56 to 7.45 kW}
Standard Heater Range	0 to 48 kW
Cast Heater / Pump	●
Incoloy Heaters	●
Silicon Carbide Seals	●
Pressure Gauges	●
250°F Setpoint Range	●
300°F Setpoint Range	○
Controls	
PID Control	●
Setpoint / Actual Display	●
Password Protection	●
Modbus RTU via RS-485	○
SPI via RS-485	○
Retransmit Process Temp (4-20mA)	○
Hand Held Remote	○
Auto Restart Capability	●
High Temperature Safety	○
Mold Purge	○
Phase Detection Circuit	●
Heat Error for Heater Malfunction	●
Remote Start/Stop	●
120°F Air Purge Cancel	●
Quick Access Cool Down Mode	●
Status / Alarm Lights	
Panel Mounted Status Lights	12 LEDs
Panel Mounted Alarm Lights	5 LEDs
Audible Alarm	●
Strobe Light	○

● Standard
○ Optional
* 4-20mA

- PID Control
- Purge On/ Off button included on control.
- Phase detection indicates incorrect pump rotation or an open electrical leg.
- Remote Start/ Stop works with external timers or switches for convenient preheating of molds.

Control features on the TW-S and TW-V Series Thermolators

Model	TW-S	TW-V
Direct Injection	●	●
Closed Circuit - Common Source		
Closed Circuit - Separate Source		
Construction		
Standard Pump Range	3/4 to 10 Hp {0.56 to 7.45 kW}	3/4 or 2 Hp {0.56 or 1.49 kW}
Standard Heater Range	0 to 48 kW	12 kW
Cast Heater / Pump	●	●
Incoloy Heaters	●	●
Silicon Carbide Seals	●	●
Pressure Gauges	●	●
250°F Setpoint Range	●	●
300°F Setpoint Range	○	
Controls		
PID Control	●	●
Setpoint / Actual Display	●	●
Password Protection	●	
Modbus RTU via RS-485		
SPI via RS-485		
Retransmit Process Temp (4-20mA)		
Hand Held Remote		
Auto Restart Capability	●	
High Temperature Safety	○	
Mold Purge		○
Phase Detection Circuit		
Heat Error for Heater Malfunction		
Remote Start/Stop	●	
120°F Air Purge Cancel	●	
Quick Access Cool Down Mode	●	
Status / Alarm Lights		
Panel Mounted Status Lights	7 LEDs	1 LED
Panel Mounted Alarm Lights	3 LEDs	1 LED
Audible Alarm	●	
Strobe Light	○	

Specifications: TW-S

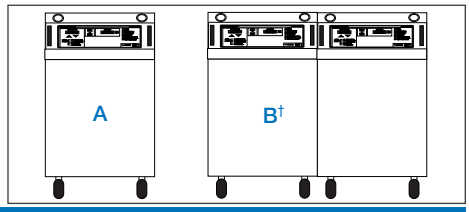
Models	TW-S (direct injection)‡
Performance characteristics	
Minimum setpoint temperature °F {°C}	40 {4}
Maximum setpoint temperature °F {°C}	250 {121}, (300 {149} optional**)
Minimum operating temperature °F {°C}	Approximately 20° {11°} above the cooling water inlet temperature*
Available pump sizes	0.75, 1, 2, 3, 5, 7.5, 10 Hp {0.56, 0.75, 1.49, 2.24, 3.73, 5.59, or 7.46 kW}
Available heater sizes	9, 12, 18, 24, 36 or 48 kW
Connections to/from process NPT (female)	1.50 inches
Connections in/out cooling water NPT (female)	1.00 inches

Pump performance - Consult your Conair representative for pump performance characteristics at other operating points.

Pump	3/4 Hp {0.56 kW}	1 Hp {0.75 kW}	2 Hp {1.49 kW}	3 Hp {2.24 kW}	5 Hp {3.73 kW}	7.5 Hp {5.59 kW}	10 Hp {7.46 kW}
Nominal flow gpm {lpm}	50 {189}	55 {208}	75 {284}	85 {322}	100 {379}	120 {454}	150 {568}
Pressure@ nominal flow psi {kg/cm²}**	20 {1.4}	25 {1.7}	30 {2.1}	32 {2.2}	46 {3.2}	56 {3.9}	65 {4.5}

Dimensions inches {mm}

Cabinet style	Single Zone (A)	Dual Zone (B)†
Height	28.31 {719}	29.00 {734}
Width	14.00 {356}	28.34 {720}
Depth	25.75 {654}	26.06 {662}



Shipping weight ranges lb {kg} Weights vary depending on cabinet size and options.

	Single Zone		Dual Zone	
Pump	Minimum	Maximum	Minimum	Maximum
0.75 Hp {0.56 kW}	240 {109}	280 {127}	491 {223}	576 {261}
1 Hp {0.75 kW}	245 {111}	290 {132}	499 {226}	584 {265}
2 Hp {1.49 kW}	248 {113}	298 {131}	515 {234}	590 {268}
3 Hp {2.24 kW}	259 {118}	299 {136}	538 {244}	623 {283}
5 Hp {3.73 kW}	302 {137}	352 {160}	629 {285}	699 {317}
7.5 Hp {5.59 kW}	317 {144}	362 {164}	649 {294}	729 {331}
10 Hp {7.46 kW}	329 {149}	379 {172}	683 {310}	763 {346}

Total full load amps per zone §

Heater	9 kW						12 kW						18 kW					
Voltage	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60
Pump size																		
0.75 Hp {0.56 kW}	26.0		15.4		13.4	10.5	33.5		19.7		17.2	13.4	48.6		28.4		24.7	19.5
1.0 Hp {0.75 kW}	26.9	15.6	15.7		13.8	10.6	34.4	19.9	20.0		17.6	13.5	49.5	28.6	28.7		25.1	19.6
2.0 Hp {1.49 kW}	29.0	17.0	17.1		14.8	11.6	36.5	21.3	21.4		18.6	14.6	51.6	30.0	30.1		26.1	20.6
3.0 Hp {2.24 kW}	31.8	18.5	18.4		15.9	12.5	39.3	22.8	22.7		19.7	15.4	54.4	31.5	31.4		27.2	21.5
5.0 Hp {3.73 kW}	36.4	21.1	18.6		18.2	14.1	43.9	25.4	22.9		22.0	17.0	59.0	34.1	31.6		29.5	23.1
7.5 Hp {5.59 kW}	42.2	25.3	20.9		20.8	16.3	49.7	29.6	25.2		24.6	19.2	64.8	38.3	33.9		32.1	25.3
10.0 Hp {7.46 kW}	50.4	29.3	25.2		24.6	18.9	57.9	33.6	29.5		28.4	21.8	73.0	42.3	38.2		35.9	27.9

Total full load amps per zone §

Heater	24 kW						36 kW						48 kW					
Voltage	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60
Pump size																		
0.75 Hp {0.56 kW}	63.6		37.0		32.2	25.5	93.8		54.4		47.3	37.5	N/A				62.3	49.6
1.0 Hp {0.75 kW}	64.5	37.2	37.3		32.6	25.6	94.7	54.6	54.7		47.7	37.6	N/A				62.7	49.7
2.0 Hp {1.49 kW}	66.6	38.6	38.7		33.6	26.6	96.8	56.0	56.1		48.7	38.6	N/A				63.7	50.7
3.0 Hp {2.24 kW}	69.4	40.1	40.0		34.7	27.5	99.6	57.5	57.4		49.8	39.5	N/A				64.8	51.6
5.0 Hp {3.73 kW}	74.0	42.7	40.2		37.0	29.1	104.2	60.1	57.6		52.1	41.1	N/A				67.1	53.2
7.5 Hp {5.59 kW}	79.8	46.9	42.5		39.6	31.3	110.0	64.3	59.9		54.7	43.3	N/A				69.7	55.4
10.0 Hp {7.46 kW}	88.0	50.9	46.8		43.4	33.9	118.2	68.3	64.2		58.5	45.9	N/A				73.5	58.0

Specification Notes

* Lower operating temperatures can be obtained with larger cooling valves.

† Available in TW-S and TW-P models only.

‡ Direct Inject (DI) cooling injects cooling water directly into the process loop upon demand.

§ FLA data for reference purposes only. Does not include any options or accessories on equipment. For full FLA detail for power circuit design of specific machines and systems, refer to the electrical diagrams of the equipment order and the nameplate applied to the machine.

** 300°F units require a minimum of 65 psi inlet cooling source pressure.

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

Specifications: TW-P

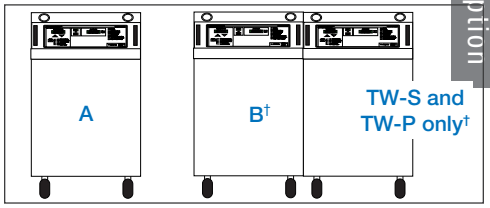
Models	TW-P (direct injection)‡	TW-P (closed circuit)§
Performance characteristics		
Minimum setpoint temperature °F {°C}	40 {4}	
Maximum setpoint temperature °F {°C}	250 {121}, (300 {149} optional† †)	
Minimum operating temperature °F {°C}	Approximately 20° {11°} above the cooling water inlet temperature*	
Standard cooling valve size inches {mm}	1/4 {6.35}	3/4 {19.05} (varies)
Available pump sizes	0.75, 1, 2, 3, 5, 7.5, 10 Hp {0.56, 0.75, 1.49, 2.24, 3.73, 5.59, or 7.46 kW}	
Available heater sizes	6, 9, 12, 18, 24, 36 or 48 kW	9, 12, 18, 24, or 36 kW
Connections to/from process NPT (female)	1.50 inches	
Connections in/out cooling water NPT (female)	1.00 inches	

Pump performance - Consult your Conair representative for pump performance characteristics at other operating points.

Pump	3/4 Hp {0.56 kW}	1 Hp {0.75 kW}	2 Hp {1.49 kW}	3 Hp {2.24 kW}	5 Hp {3.73 kW}	7.5 Hp {5.59 kW}	10 Hp {7.46 kW}
Nominal flow gpm {lpm}	50 {189}	55 {208}	75 {284}	85 {322}	100 {379}	120 {454}	150 {568}
Pressure @ nominal flow psi {kg/cm²} † †	20 {1.4}	25 {1.7}	30 {2.1}	32 {2.2}	46 {3.2}	56 {3.9}	65 {4.5}

Dimensions inches {mm}

Cabinet style	Single Zone (A)	Dual Zone (B)†
Height	28.43 {722}	29.00 {734}
Width	14.00 {356}	28.34 {720}
Depth	25.75 {654}	26.06 {662}



Shipping weight ranges lb {kg} Weights vary depending on cabinet size, options, and cooling type (DI or CC).

	Single Zone		Dual Zone	
Pump	Minimum	Maximum	Minimum	Maximum
0.75 Hp {0.56 kW}	240 {109}	280 {127}	491 {223}	576 {261}
1 Hp {0.75 kW}	245 {111}	290 {132}	499 {226}	584 {265}
2 Hp {1.49 kW}	248 {113}	298 {135}	515 {234}	590 {268}
3 Hp {2.24 kW}	259 {118}	299 {136}	538 {244}	623 {283}
5 Hp {3.73 kW}	302 {137}	352 {160}	629 {285}	699 {317}
7.5 Hp {5.59 kW}	317 {144}	362 {164}	649 {294}	729 {331}
10 Hp {7.46 kW}	329 {149}	379 {172}	683 {310}	763 {346}

Total full load amps per zone **

Heater	9 kW						12 kW						18 kW					
Voltage	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60
Pump size																		
0.75 Hp {0.56 kW}	26.0		15.4		13.4	10.5	33.5		19.7		17.2	13.4	48.6		28.4		24.7	19.5
1.0 Hp {0.75 kW}	26.9	15.6	15.7		13.8	10.6	34.4	19.9	20.0		17.6	13.5	49.5	28.6	28.7		25.1	19.6
2.0 Hp {1.49 kW}	29.0	17.0	17.1		14.8	11.6	36.5	21.3	21.4		18.6	14.5	51.6	30.0	30.1		26.1	20.6
3.0 Hp {2.24 kW}	31.8	18.5	18.4		15.9	12.5	39.3	22.8	22.7		19.7	15.4	54.4	31.5	31.4		27.2	21.5
5.0 Hp {3.73 kW}	36.4	21.1	18.6		18.2	14.1	43.9	25.4	22.9		22.0	17.0	59.0	34.1	31.6		29.5	23.1
7.5 Hp {5.59 kW}	42.2	25.3	20.9		20.8	16.3	49.7	29.6	25.2		24.6	19.2	64.8	38.3	33.9		32.1	25.3
10.0 Hp {7.46 kW}	50.4	29.3	25.2		24.6	18.9	57.9	33.6	29.5		28.4	21.8	73.0	42.3	38.2		35.9	27.9

Total full load amps per zone **

Heater	24 kW						36 kW						48 kW					
Voltage	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60
Pump size																		
0.75 Hp {0.56 kW}	63.6		37.0		32.2	25.5	93.8		54.4		47.3	37.5	N/A				62.3	49.6
1.0 Hp {0.75 kW}	64.5	37.2	37.3		32.6	25.6	94.7	54.6	54.7		47.7	37.6	N/A				62.7	49.7
2.0 Hp {1.49 kW}	66.6	38.6	38.7		33.6	26.6	96.8	56.0	56.1		48.7	38.6	N/A				63.7	50.7
3.0 Hp {2.24 kW}	69.4	40.1	40.0		34.7	27.5	99.6	57.5	57.4		49.8	39.5	N/A				64.8	51.6
5.0 Hp {3.73 kW}	74.0	42.7	40.2		37.0	29.1	104.2	60.1	57.6		52.1	41.1	N/A				67.1	53.2
7.5 Hp {5.59 kW}	79.8	46.9	42.5		39.6	31.3	110.0	64.3	59.9		54.7	43.3	N/A				69.7	55.4
10.0 Hp {7.46 kW}	88.0	50.9	46.8		43.4	33.9	118.2	68.3	64.2		58.5	45.9	N/A				73.5	58.0

Specification Notes

* Lower operating temperatures can be obtained with larger cooling valves.

† Available in TW-S and TW-P models only.

‡ Direct Inject (DI) cooling injects cooling water directly into the process loop upon demand.

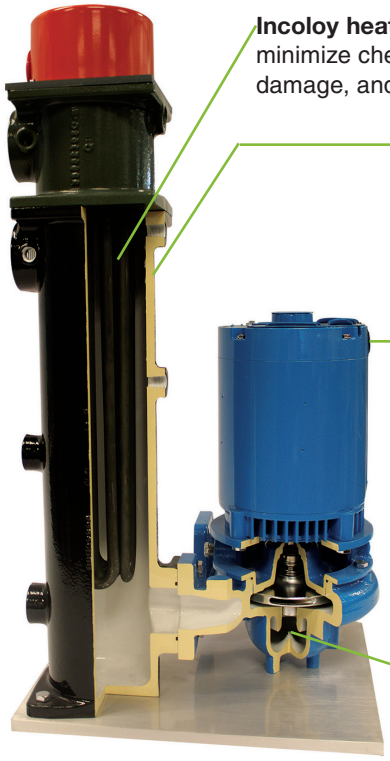
§ Closed Circuit (CC) cooling injects cooling water into the process loop only during the initial filling or when make-up water is needed.

** FLA data for reference purposes only. Does not include any options or accessories on equipment. For full FLA detail for power circuit design of specific machines and systems, refer to the electrical diagrams of the equipment order and the nameplate applied to the machine.

† † 300°F units require 65 psi minimum inlet cooling source pressure.

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

TW-S and TW-P Features and Options



Incoloy heaters
minimize chemical and high temperature damage, and maximizes life.

Two-piece cast
construction

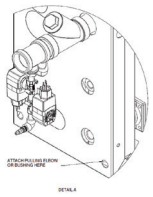
High efficiency pumps
from 3/4 to 10 Hp. Silicon carbide seals are standard.

Built-in sediment trap
settles contaminants away from the pump seals.

Options

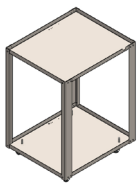
Modulating Valve
This option eliminates thermal shock from your process circuit by modulating the cooling water. If Modulating valve option is not chosen, the Solenoid valve replaces it.

Solenoid Valve



Compressed Air Mold Purge (Available with TW-P only)
This option quickly evacuates fluid from the process circuit, allowing for faster, cleaner disconnection of the temperature controller from molds and hoses.

Alarm packages
The Thermolator control includes an output relay that can be connected to an optional external alarm package to call attention to alarm conditions.



Stacking Rack
Save floor space by stacking Thermolators two-high. The stacking rack can be used only with single-zone models with a height of less than 30 inches{262 mm} high cabinets.

SECTION
3

Installation

Unpacking the Boxes

Thermolator TW models come fully assembled. If they were specified at the time of the order, the optional purge valve or modulating valve is factory-installed.

⚠ CAUTION: Lifting

To avoid personal injury or damage to the Thermolator, lift the unit using a forklift or hoist with straps that have been positioned at the center of gravity.

✎ **NOTE:** If your TW-P was ordered with the remote HMI option, the remote HMI may arrive in a separate box.

1. **Carefully remove the Thermolator** and components from their shipping containers.
2. **Remove all packing material**, protective paper, tape, and plastic. Compare contents to the shipping papers to ensure that you have all the parts.
3. **Carefully inspect all components** to make sure no damage occurred during shipping. Check all wire terminal connections, bolts, and any other electrical connections, which may have come loose during shipping.
4. **Record serial numbers and specifications** in the blanks provided on the back of the User Guide's title page. This information will be helpful if you ever need service or parts.
5. **You are now ready to begin installation.** *See Installation Section entitled, Preparing for Installation.*

✎ **NOTE:** If the temperature control unit is stored prior to installation, it is important to protect it from damage. Blow out any water from the unit to protect it from damage from freezing. Cover the equipment to keep dirt and debris from accumulating on it. Units should not be stored in areas warmer than 145°F {63°C}.

Preparing for Installation

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

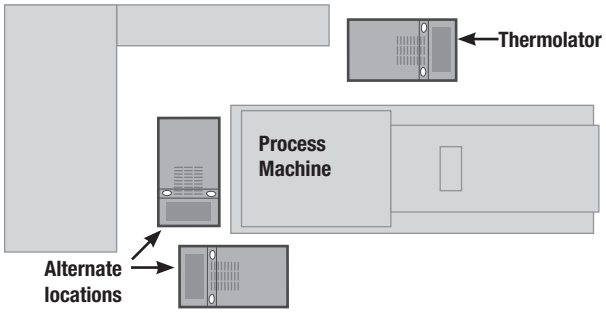
⚠ WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

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

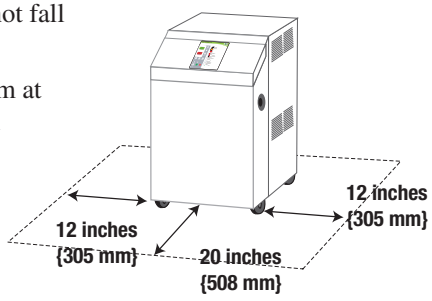
All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

1 **Position the Thermolator 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 Thermolator model.** Check the serial tag on the unit for required voltage, phase, frequency, and full load amps. Check the last page of the electrical power prints for the disconnect fuse size and minimum wire connection size. All wiring should be completed by qualified personnel and should comply with your region's electrical codes.
- ❒ **A clean, well-ventilated environment.** The room temperature should not exceed 104° F {40° C} with 95% non-condensing humidity and should not fall below 32° F {0° C}.
- ❒ **Minimum clearance for safe operation and maintenance.** The diagram at the right shows minimum clearance for operation. You also need enough clearance in rear for water hookups. For maintenance, you should move the Thermolator to provide at least 36 inches {91 cm} on any side of the Thermolator. Additionally, your required electrical codes may require a larger service area in front of the electrical panel.



- ❒ **A source of water for cooling.** City, tower or chiller water may be used, as long as the supply pressure is at least 25 psi and not more than 95 psi for most units; *refer to the appendix for more information on 48 kW and 300° F {149° C} units.*

Check to make sure all piping connections are secure and that all lines are suitable for water or the coolant in the system at the maximum set point temperature and cumulative pressure rating of the maximum pump pressure and the unit fill fluid pressure.

✎ **NOTE:** A cooling source inlet filter ships loose in the crate with the unit. Install this in the inlet of the chilled water line before connecting the cooling source line.

Preparing for Installation (Continued)

Make sure that the cooling source is the appropriate temperature and pressure for your application. In most cases, the cooling source is between 40°F and 85°F. The cooling source fluid pressure must be above the set point of the pressure switch in order for the unit to start. For most applications, the design cooling source supply pressure is between 25 psi and 50 psi. Units with the 300°F operating range option require an inlet cooling source pressure of 65 psi. If the total pressure in the unit (cooling source inlet pressure plus the pump pressure) exceeds 150 psi, the pressure relief valve in the unit will open. If this becomes an issue, install a pressure-regulating valve (available from our Parts Department) on the supply line to help regulate the pressure to ensure it does not exceed the pressure rating of the pressure relief valve. For further assistance in installing a pressure-regulating valve, please contact our Customer Service Department.

System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a “universal solvent” because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. The table below shows the list of water characteristics and quality limitations.

Preparing for Installation (Continued)

Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO_3^-)	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH_3)	Less than 2 ppm
Chlorides (Cl^-)	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO2)†	Less than 5 ppm
Free Chlorine(Cl_2)	Less than 1 PPM
HCO_3-/SO_4^{2-}	Greater than 1.0
Hydrogen Sulfide (H_2S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO_3)	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO_4^{2-})	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3\text{-pH})/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$

Recommend Glycol Solutions

Chilled Water Temperature	Percent Glycol By Volume
50°F (10°C)	Not required
45°F (7.2°C)	5 %
40°F (4.4°C)	10 %
35°F (1.7°C)	15 %
30°F (-1.1°C)	20 %
25°F (-3.9°C)	25 %
20°F (-6.7°C)	30 %

CAUTION: When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the chiller. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.

WARNING: Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

3 Install plumbing for process and cooling lines.

You will need two $1^1/_2$-inch NPT male fittings for the process inlet and outlet and two 1-inch NPT male fittings for the cooling inlet and outlet. Larger line sizes are acceptable as long as they are reduced at the Thermolator connections. Smaller line sizes are not recommended.

Contact Conair Customer Service
1 800 458 1960.
From outside of the United States, call: 814 437 6861

Contact Conair for more information about recommendations for your product.

Rigging

The unit has a structural steel base with casters to facilitate easy movement and positioning. Follow proper rigging methods to prevent damage to components. Avoid impact loading caused by sudden jerking when lifting or lowering the unit. Use pads where abrasive surface contact may occur. Use the frame supporting the unit for positioning it with a crane or a forklift.

Fluid Distribution Piping

Proper insulation of any cooling fluid system where the supply cooling fluid temperature is below the dew point is crucial to prevent condensation. In most cases this will apply to systems where the supply temperature is 55°F {13°C} or colder. The formation of condensation on water piping caused by the state change of the water from gas to liquid adds a substantial heat load and becomes an additional burden for the cooling system.

The importance of properly sized piping between the cooling system and the temperature control unit and between the temperature control unit and the process cannot be overemphasized. See the ASHRAE Handbook or other suitable design guide for proper pipe sizing. In general, run full size piping out to the process and then reduce the pipe size to match the connections on the process equipment. One of the most common causes of unsatisfactory unit performance is poor piping system design. Avoid long lengths of hoses, quick disconnect fittings, and manifolds wherever possible as they offer high resistance to water flow. When manifolds are required, install them as close to the use point as possible. Provide flow-balancing valves at each machine to assure adequate water distribution in the entire system. We recommend shut-off valves at each machine to allow for isolation of the unit.

Installation - Electrical

All wiring must comply with local codes and the National Electric Code (NEC). Full Load Amperes (FLA) and other unit electrical data are on the unit nameplate. A unit specific electrical schematic ships with the unit. Measure each leg of the main power supply voltage at the main power source. Voltage must be within the voltage utilization range given on the drawings included with the unit. If the measured voltage on any leg is not within the specified range, notify the supplier and correct before operating the unit. Voltage imbalance must not exceed two percent. Excessive voltage imbalance between the phases of a three-phase system can cause motors to overheat and eventually fail. Voltage imbalance is determined using the following calculations:

$\%\text{Imbalance} = (V_{avg} - V_x) \times 100 / V_{avg}$

$V_{avg} = (V1 + V2 + V3) / 3$

V_x = phase with greatest difference from V_{avg}

For example, if the three measured voltages were 442, 460, and 454 volts, the average would be:

$(442 + 460 + 454) / 3 = 452$

The percentage of imbalance is then:

$(452 - 442) \times 100 / 452 = 2.2\ \%$

This exceeds the maximum allowable of 2%.
There is a terminal block for main power connection to the main power source. The main power source should be connected to the terminal block through an appropriate disconnect switch. There is a separate lug in the main control panel for grounding the unit. Check the electrical phase sequence at installation and prior to start-up. Operation of the unit with incorrect electrical phase sequencing will result in improper pump performance. Check the phasing with a phase sequence meter prior to applying power. The proper sequence should read “ABC” on the meter. If the meter reads “CBA”, open the main power disconnect and switch two line leads on the line power terminal blocks (or the unit mounted disconnect). Do not interchange any load leads that are from the unit contactors or the motor terminals.
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Connecting Process and Water Supply Lines Without Purge

Tools for Installation:

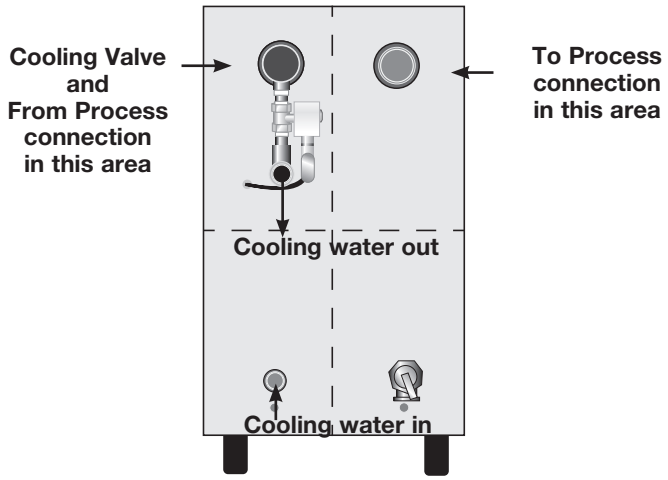
- ❒ *Pipe wrench large enough for a 2-inch pipe*
- ❒ *Premium quality Teflon thread sealant*

✎ **NOTE:** Conair recommends using a second wrench, sometimes referred to as a "back-up wrench", to support the piping when making connections to the Thermolator.

✎ **NOTE:** Conair recommends that you install an external ball valve on the cooling water inlet of the Thermolator. This valve is required when the purge valve option is installed.

The Thermolator 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 Thermolator.
2. **Install pipe to the rear of the Thermolator.** Use male $1^{1}/_{2}$-inch NPT piping for process connections and male 1-inch NPT piping for water connections. 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. 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!**



DIRECT INJECTION

Optional Mold Purge Valve Connections

A mold purge valve is available as an option. This valve quickly evacuates fluid from the process circuit, allowing faster disconnection of the temperature controller from molds and hoses. A manual purge button controls this valve.

If this option is ordered with the Thermolator, purge control wiring and installation of the valve on the process line outlet of the unit is completed at the factory. You still must connect process and cooling water inlets and outlets, as well as supply of non-lubricated compressed air.

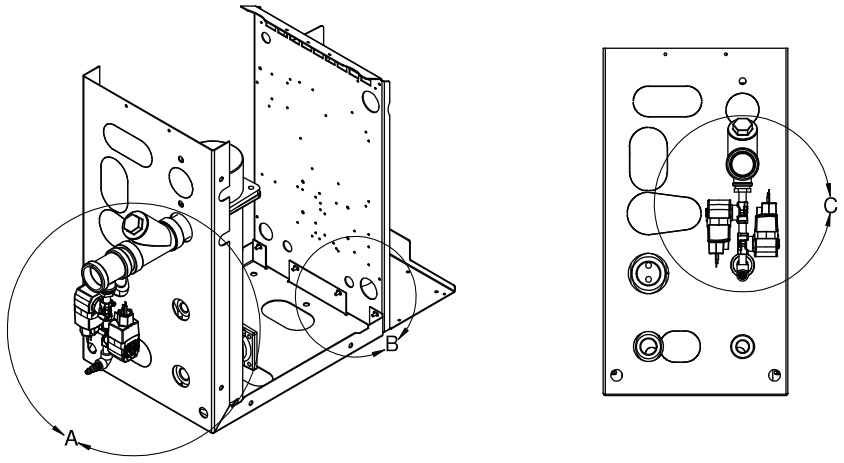
TIP: Conair recommends ordering the purge valve with the Thermolator so that wiring and installation is completed at the factory. However, aftermarket addition of the purge valve is possible.

1. **Remove the shipping pipe plug** from the female connections on the back of the Thermolator.
2. **Install an external ball valve on the cooling water inlet of the Thermolator.** This valve is required when a purge valve is used.
3. **Install pipe to the rear of the Thermolator.** Use male $1^{1}/_{2}$-inch NPT piping for process connections and male 1-inch NPT piping for water connections. 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.
4. **Coat the pipe threads with thread sealant.** Follow the sealant manufacturer's directions.
5. **Connect the male pipe to the appropriate female connection** on the back of the unit. Connect cooling water lines as indicated on the previous page. Connect process lines as indicated below. 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!**
6. **Connect the purge valve to the compressed air supply.** The air pressure should not exceed 100 psi.

NOTE: For information about how to add a purge valve to your Thermolator if you did not order it equipped that way from the factory, contact Conair Service.

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

NOTE: *See Appendix G for Mold Purge Installation Instruction Sheet*



Connecting the Main Power Source

Before beginning, note the electrical specifications on the serial tag mounted to the side of the unit. The electrical connection 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 connection should run through a fused disconnect sized for the amperage noted on the serial tag and conforming to all local and national codes, including Article 250 of the National Electric Code.

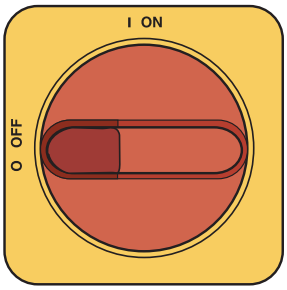
WARNING: Electrical hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device must be used to isolate this product from potentially hazardous electricity.

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

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

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



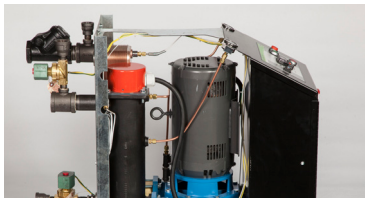
Optional Disconnect Switch

IMPORTANT: Always refer to the wiring diagrams that came with your temperature control unit before making electrical connections. The diagrams show the minimum size main power cable required for your unit, and the most accurate electrical component information.

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.
- ❒ Verify that resistance to ground on each phase is at least 1 mega ohm (use a multi-meter, not a megger for this measurement).

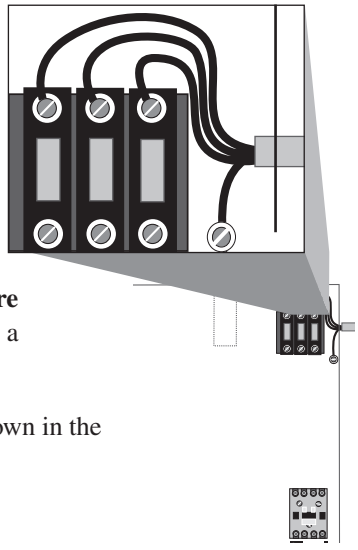
1 **Open the unit's electrical enclosure.** Removing the top panel is recommended. The Thermolator comes from the factory with a knockout for 1/2 inch conduit. A knockout punch should be used if necessary to enlarge the hole for larger diameter conduits.



2 **Insert the main power wires through the conduit in the right side of the enclosure**. See electrical prints for recommended wire size.

NOTE: If using a flexible cord, secure the wire with a rubber compression fitting or strain relief.

3 **Connect the power wires to the terminals indicated on the wiring diagram** that came with your machine. The Thermolator comes pre-wired expecting clockwise (L1-L2-L3) phase rotation.



4 **Check every terminal screw to make sure wires are secure.** Gently tug each wire. If a wire is loose, use a screwdriver or allen wrench to tighten the terminal.

5 **Connect the ground wire to the grounding lug** shown in the wiring diagram shipped with your unit.

Testing the Installation

WARNING: Only qualified personnel should perform this procedure.

Part of this test requires 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.

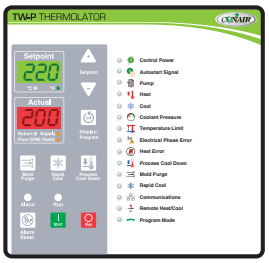
1 **Turn on the cooling water supply and check for leaks.** If any leaks appear, stop the test and fix the problem before continuing. The cooling water must be at least 25 PSI or the unit will not function on standard 250° F {121° C} units less than 48kW. *Refer to the appendix for PSI requirements for units with 48kW heaters and 300° F {149° C} capabilities.*

2 **Apply power to the unit.** The temperature controller display lights up to indicate that the control has power. All LED segments on the display will light for a few seconds while the control performs a self-test. The control then displays the software version, followed by temperature display.

3 **Check the rotation of the pump on the TW-S only.** (The TW-P has a built-in phase rotation monitor.) Remove the top access panel and a side panel.

Press the **RUN** Run button, and wait until the pump starts. It will take approximately 30 seconds to complete vent cycle.

When the pump starts, quickly press the **STOP** Stop button and look at the pump shaft. With a flashlight, verify that the pump rotation matches the direction indicated on the rotation sticker on the side of the pump motor.



Tools Required

❒ *Flashlight*

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 incoming power distribution block. Return to step 2 and check rotation again.

4 **Replace the top/side access panel.**

5 **Press the RUN button** Run

If everything is working correctly:

- The venting and/or pump LED illuminates.
- The unit initiates a 30-second venting sequence. The pump starts automatically when the venting sequence is over.
- Normal operation begins. The heater turns on if the process temperature is below setpoint. The cooling valve is activated if the process temperature is above setpoint.

NOTE: If the coolant pressure low LED illuminates, verify that the cooling water supply is connected properly and that the water pressure is at least 25 PSI or greater except for 48 kw or 300° F {149° C} units. *Refer to the Appendix for more information.*

If everything tested correctly, proceed to the Initial Setup instructions on the next page. If something did not work correctly, *refer to the Troubleshooting section of this user guide.*

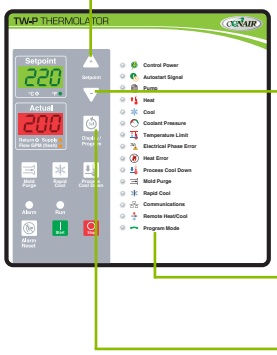
Initial Setup (Continued)

- ❒ Operating Mode
- ❒ Temperature Units
- ❒ Setpoint
- ❒ Alarm Points

⚠ **CAUTION:** The Thermolator will not operate correctly if certain factory-set parameters are changed. Parameters should only be changed by qualified technical personnel who are familiar with the operation of this type of equipment. If the Thermolator does not appear to be working correctly, verify the parameters against the list of factory settings.

For a complete list of the factory-set parameters *see Default Parameters in the appendix of this user guide.*

All parameters can be changed using the keypad and the menu system.



Raise Key
Used to increase values or toggle between setting choices.

Lower Key
Used to decrease values or toggle between setting choices.

Configuration Menu

Select Key
Used to select a parameter for editing, or save the new value of a changed parameter.

Temperature Units

To select the desired temperature units for your system (°F vs. °C), follow this procedure:

1. **Stop the Thermolator or ensure that you are on the home screen by pressing the STOP**  **button.**

2. **Enter the user configuration menu by holding the "Function"**  **button for 5 seconds.**
   If the passcode is at its default "0", simply push "RUN"  .
   If the passcode has been changed to something else, use the "Up"  and "Down"  buttons to scroll to the correct passcode, and then push "RUN"  .

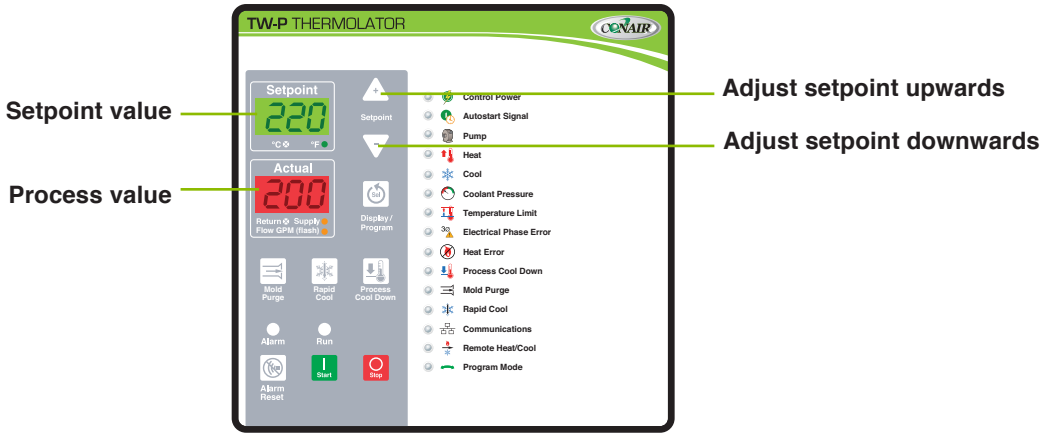
3. **Repeatedly push "Select" to scroll through available user parameters until**  **(Units) is displayed** in the upper display (about 2 presses).
   In the lower display, use the "Up"  or "Down"  buttons to select for a Fahrenheit or  for Celsius.

4. **Push "Select"**  **to save the changed parameter.** Push "STOP"  to exit.

Setpoint

To select the proper setpoint of the system, follow this procedure:

1. **From the home screen you should observe the current setpoint** in green in the upper display and the actual process temperature in the lower window.
2. **Change the setpoint using the "Up"**  **or "Down"**  **buttons.** The new value will automatically be implemented a few seconds after the up or down button is released.



NOTE: From the factory, the TW-P will control the "To Process" or "Supply" fluid to the setpoint.

Alarm Points

To select the desired alarm points for your system (low alarm and high alarm), follow this procedure:

1 **Stop the Thermolator or ensure that you are on the home screen by pressing the STOP**  **button.**

2 **Enter the user configuration menu by holding the "Function"**  **button for 5 seconds.**
If the passcode is at its default "0", simply push "Select"  .
If the passcode has been changed to something else, use the "Up"  and "Down"  buttons to scroll to the correct passcode, and then push "Select"  .

3 **Repeatedly push "Select"**  **to scroll through available user parameters until the desired parameter is shown in the upper display.**
In the lower display, use the "Up"  or "Down"  buttons to select the desired setting. See the following table for a list of relevant parameters.

Display	Description	Default	Permissible Range
The deviation alarms below can be used to create a permissible operating temperature window around the setpoint. Actual process temperature outside of this window for a certain amount of time will create a deviation alarm.			
Lod	Low deviation alarm limit	10	5 to 100 (degrees) below setpoint
hI d	High deviation alarm limit	10	5 to 100 (degrees) above setpoint
Deviation delays below modify the deviation alarms above. You can select how long you want the system to tolerate a temperature excursion outside of the deviation window before alarming.			
idd	Machine startup "ignore deviation" delay	30	0 to 999 (minutes)
AdL	Alarm delay for low deviation	30	0 to 60 minutes (10 to 60 minutes on program versions prior to version 1.33)
Adh	Alarm delay for high deviation	30	0 to 60 minutes (10 to 60 minutes on program versions prior to version 1.33)
AdS	Alarm deviation alarm after start	30	0 to 30 minutes on program versions 1.33 and later only)
AdO	Alarm output	d I S	Disabled (d I S)or Enabled (EnA) on program version 1.33 and later only
These parameters function as absolute temperature alarms. Any excursion beyond these limits will create an immediate alarm. Do not set these within your normal warm-up or operating ranges or you will experience nuisance alarms.			
PbE	Low pressure bypass enabled	d I S	Disabled (d I S)or Enabled (EnA).
PAE	Panel temperature alarm	EnA	Disabled (d I S)or Enabled (EnA)
LSU	User low safety limit alarm	22	Between factory low and high limits.
hSU	User high safety limit alarm	260	Between factory low and high limits.

4 **Push "Select"**  **to save the changed parameters.** Push "STOP"  to exit.

SECTION
4

Operation

The TW-S Control

Raise and Lower Key
Used to enter the setpoint temperature, index through the operating modes or change other parameter values.

Press + to increase a value.

Press − to decrease a value.

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

Setpoint Value Display
The window displays the fluid temperature setpoint during normal operation.

Process Value Display
The window displays the actual temperature of fluid entering the "To Process" line.

Run
Press to begin normal operation.

Audible Alarm (Optional)

Select Key
Used to edit a parameter or save a changed parameter.

Status Lights
The lights indicate the operating status of the listed components.
● = Off or inactive
● = On or active
(1): More Cool
(2): Less Cool
(5): Heat

Start Button
Press and hold to begin normal operation. The button lights when the unit is running after vent cycle has completed.

Note: You must hold the button during entire unit cycle.

Stop Pump Button
Press to stop the Thermolator. Push again to de-assert and allow restart.

The TW-P Control

Raise and Lower Key
Used to enter the setpoint temperature, index through the operating modes or change other parameter values.

Press + to increase a value.

Press − to decrease a value.

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

Setpoint Value Display
The window displays the fluid temperature setpoint during normal operation.

Process Value Display
The window displays the actual temperature of fluid entering the "To Process" line.

Mold Purge Button
(optional)
The purge uses compressed air to clear fluid from the mold and lines before a mold change. Press and hold the purge while evacuating all fluid from mold and line. The purge button is inactive when the TW is running.

⚠ WARNING: Shut off the supply to cooling water inlet before purging.

Run
Press to begin normal operation.

Audible Alarm (Optional)

Select Key
Used to edit a parameter or save a changed parameter.

Stop Button
Press to stop the Thermolator.

Start Button
Press and hold to begin normal operation. The button lights when the unit is running after vent cycle has completed.

Note: You must hold the button during entire unit cycle.

Status Lights
The lights indicate the operating status of the listed components.
- = Off or inactive
- = Problem or Warning
- = Operational
- = Operational

Controller Operating Buttons

Button	Description of Operation
Start 	Pressing the Start button initiates a vent sequence. The vent sequence removes air that may have separated out from the water to prevent improper operation and premature heater failure. When initiated, the vent sequence opens the cooling valve for 30 seconds to allow air to escape then runs the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. Once the vent sequence is complete, the cooling valve closes, the pump remains running, and normal operation begins. When the unit is running the Run indicating light is on and green. If the auto start feature is enabled it will have precedence over the start button. See the Program Menu section for instructions on how to enable or disable the auto start feature. The vent sequence cancel prevents the vent sequence from occurring when the unit has been operating and the fluid temperature is elevated. The factory default value for the vent sequence cancel is 120°F {49°C}. See the Program Menu section for instructions on how to change the vent sequence cancel temperature. The Start button also performs an enter function while in the programming menu.
Stop 	Pressing the Stop button clears all faults and stops the pump. With the auto start function enabled and an auto start signal is present, pressing the stop button will not stop the unit. The Stop button also performs a cancel function while in the programming menu.
Alarm Reset 	When an alarm condition is present, the alarm light is on and red. The first Alarm Reset button press will silence the alarm horn (optional), open the remote alarm contact (optional), and the alarm light changes from red to yellow. The alarm horn (optional) and/or remote alarm contact (optional) remain disabled until a subsequent alarm occurs. A second press of the Alarm Reset button resets the state from Alarm to Normal Operation.
Up 	The Up button raises the set point temperature. Pressing the Up button and releasing it increases the set point temperature by one degree. Pressing the Up button and holding it increases the set point temperature until reaching the maximum allowable set point temperature. In addition to adjusting the set point temperature, the Up button adjusts various alarms and set point values when the unit in the programming mode.
Down 	The Down button decreases the set point temperature. Pressing the Down button and releasing it decreases the set point temperature by one degree. Pressing the Down button and holding it decreases the set point temperature until reaching the minimum allowable set point temperature. In addition to adjusting the set point temperature, the Down button adjusts various alarms and set point values when the unit is in the programming mode.
Display/ Program 	Pressing the Display/Program button changes the temperature displayed in the Process screen from supply to return. When the display is set to supply temperature, an orange indicating light is on in the lower right corner of the Process temperature display. When the display is set to return temperature, there is no orange indicating light in the lower right corner of the Process temperature display. To toggle the Process temperature display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press. In addition to switching between the supply and return process temperature displays, the Display/Program button initiates and navigates through the program menu. See the Program Menu section for more detail.
Mold Purge (Optional) (TW-P Only) 	The Mold Purge button initiates a mold water purge if this option is present and enabled. The mold purge option allows compressed air to purge the circuit of water by forcing it out through the cooling valve. To initiate a mold purge sequence stop the unit then press and release the mold purge button. During a mold purge, the cooling water out valve opens, the mold purge compressed air solenoid valve opens, and the cooling water inlet valve closes. The mold purge sequence is 1 minute long. To stop the mold purge sequence before it is completed, press the Mold Purge button again or press the Stop button. See the Program Menu section for instructions on how to enable or disable this feature.
Rapid Cool (Optional) (TW-P Only) 	The Rapid Cool button opens the solenoid valve if this option is present and enabled. Pressing the Rapid Cool button initiates a Rapid Cool sequence. The sequence opens the Rapid Cool valve, opens the vent/cooling valve, and disables the heater. The sequence is 1 minute long. To stop the Rapid Cool sequence before it is completed, press the button again, or press the Stop button. See the Program Menu section for instructions on how to enable or disable this feature. **NOTE:** Rapid Cool option is not available with 48 kW.
Process Cool Down (Optional) 	The Process Cool Down button initiates a cool-down sequence if the process supply water is above 90°F {32°C}. The Process Cool Down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. To initiate a Process Cool Down sequence, press and release the Process Cool Down button. During this sequence, the cooling valve opens and the pump runs for 120 seconds or until the temperature of the water reaches 90°F {32°C}, whichever occurs first. During the Process Cool Down sequence the Set Point display temporarily toggles between the target value 90°F {32°C} and current set point and the Pump, Cool, and Process Cool Down lights flash green. After the Process Cool Down sequence is complete, the unit stops, the set point temperature displays in the Set Point display, and the Process Cool Down light remains solid green to indicate the completion of the sequence. Pressing the Start and/or Stop buttons during a Process Cool Down sequence stops the sequence. See the Program Menu section for instructions on how to enable or disable this feature.

Note: To initiate a Process Cool Down sequence on a unit with the standard controller press and hold down the Run button, then press the Stop button and then release both buttons.

Temperature Displays

Display	Description of Operation
Setpoint Setpoint	The Setpoint display normally shows the set point temperature. A decimal point in the lower right corner of this display indicates the temperature unit of measure is set to °F, no decimal point indicates the temperature unit of measure is set to °C. See the Program Menu section to change the temperature scale units of measure. This display also shows alarm codes and programming information.
Actual Actual	The Actual Temperature display normally shows supply temperature. A decimal point in the lower right corner of the display indicates the temperature displayed is the supply temperature, no decimal point indicates the temperature displayed is the return temperature. To change the display from supply to return temperature, press and release the Display/Program button. The display will return to the default Supply temperature automatically after 5 seconds without a button press. This display also shows alarm codes and programming information.

Operating Lights

Display	Description of Operation
Control Power 	The Control Power light is on and green when 24VDC control voltage is present.
Autostart Signal 	The Autostart Signal light is green when closed (run), yellow when open (stop), and unlit if this feature is disabled. This feature allows starting and stopping of the unit by a remote contact closure. From the factory, the Autostart feature is disabled. See the Program Menu section for instructions on how to enable or disable the Autostart feature. Do not introduce any external voltage to the Autostart contacts; this will result in damage to the controller.
Pump 	The Pump light is solid green when the pump is running and flashes red if the pump motor overload trips.
Heat 	The Heat light is on and green when the heating is required.
Cool 	The Cool light is on and green while in normal running operation when the cooling valve is open. The light flashes green during an Autovent sequence or Process cool-down sequence.
Coolant Pressure 	The Coolant Pressure In light will flash red if the inlet cooling water pressure drops below the set point of the low-pressure safety switch. If a low-pressure condition occurs, the unit will automatically stop and remain de-energized until the cooling water pressure is above the cut-in set point of the pressure switch. The light is solid green if the Coolant Inlet Pressure is satisfactory. It will flash green while in the Purge mode.
Temperature Limit 	The Temperature Limit light flashes yellow if a high or low temperature limit warning occurs and flashes red if a high or low temperature limit safety occurs. A temperature limit safety stops the unit. Pushing the Alarm Reset button will reset this alarm.
Electrical Phase Error (Optional)[1] 3ø 	The Electrical Phase Error light flashes red when a line voltage problem exists. This error indicates a loss of phase, phase reversal, or phase imbalance.
Heat Error (Optional)[1] 	The Heat Error light is solid red when the controller calls for heat and heating does not occur. The Heat Error light flashes red when the controller does not call for heat but heating occurs. Both conditions cause the unit to stop.
Process Cool Down (Optional)[1] 	The Process Cool Down light flashes green when the unit is executing a Process Cool Down sequence. The Cool and Pump lights will also flash green during a seal saver sequence. After the Process Cool Down sequence is complete, the unit stops and the Process Cool Down light remains green to indicate the completion of the sequence. See the Process Cool Down Button section for a description of the Process Cool Down function and operation.
Mold Purge (Optional)[2] 	The Mold Purge light flashes green when the unit is executing a purge sequence. The Cool light will also flash green during a mold purge sequence. After the Mold Purge sequence is complete, the unit stops and the Mold Purge light remains green to indicate the completion of the sequence. See the Mold Purge Button section for a description of the Mold Purge function and operation. See the Program Menu section for instructions on how to enable or disable this feature.

(Continued)

Operating Lights (Continued)

Display	Description of Operation
Rapid Cool (Optional)[2] 	The Rapid Cool light flashes green when the unit is executing a Rapid Cool sequence. The Cool light will also flash green during a rapid cool sequence. After the Rapid Cool sequence is complete, the unit stops and the Rapid Cool light remains green to indicate the completion of the sequence. See the Rapid Cool Button section for a description of the Rapid Cool function and operation. See the Program Menu section for instructions on how to enable or disable this feature.
Communications (Optional)[2] 	The Communications light flashes green when the unit is properly transmitting and receiving a communication signal. See the Program Menu section for instructions on how to enable or disable this feature.
Remote Heat/Cool (Optional)[2] 	The Remote Heat/Cool light is on and yellow when this option is enabled. This feature allows the heating and cooling to be turned on and off by remote contact closures. Switching a contact from open to close activates the heat or cool function assigned to the contact. Switching the contact from closed to open deactivates the individual heat or cool function assigned to the contact. When enabled the controller does not perform any heat or cool functions and relies exclusively on the external contact closures for these functions; however, the unit maintains all warnings and safety functions. From the factory, the Remote Heat/Cool feature is disabled. See the Program Menu section for instructions on how to enable or disable this feature. Do not introduce any external voltage to the Remote Heat/Cool contacts; this will result in damage to the controller.
Program Mode 	The Program Mode light flashes yellow when the control system is in the programming menu.

[1]Requires the Premium Controller option (TW-P).

[2]Requires the Premium Controller option (TW-P) as well as the individual option for this function.

Default Display

These items are shown by default on the controller. Use the "Up"  and "Down"  buttons to change the setpoint.

DISPLAY EXAMPLE	ITEM	UNITS	DESCRIPTION
	Active Process Value (shown on lower display in red)	°F or °C	The current temperature of the process fluid.
	Active Set Point (shown on upper display in green)	°F or °C	The temperature that the temperature controller is attempting to reach by either heating or cooling the process fluid.

 **NOTE**: The active process value can be changed by pushing the "Display"  button. The default process value can be changed in the user parameter menu.

Starting the Thermolator

Before starting the Thermolator, verify that the system has been installed correctly for your application. *See the Installation section*.

1 **Turn on the water supply to the Thermolator.** The supply pressure must be at least 25 psi for most units. *Refer to the appendix G for more information on 48 kw and 300° F {149° C} units*. Check for leaks in the cooling water and process fluid lines before continuing.

2 **Turn on main power to the Thermolator.**

- The controller display and "Control Power" LED will illuminate to indicate the control has power.
- The controller will show the firmware version on the lower display while showing "tcP" on the upper display. After a few seconds, process temperature will be displayed (red, bottom display) and setpoint will be shown (green, top display).

NOTE: All LEDs will flash to test their operation.

3 **Set the temperature setpoint to 40° F (4.4° C)** if the Thermolator's process lines were recently reconfigured, or if you suspect excessive air is in the process lines.

Press + to increase or − to decrease the temperature setting. This will provide additional flushing and de-aeration in the process lines via the cooling valve.

4 **Press RUN** Run **.**
The unit initiates a 30-second (or as otherwise defined by user parameter) venting sequence. The Venting LED illuminates.

- The pump starts after the venting cycle is over. The Pump LED illuminates when the pump is running.
- Normal operation begins. The heater turns on if the actual temperature is below setpoint. The cooling valve opens if the actual temperature is above setpoint.

NOTE: If the coolant pressure low LED illuminates, verify that the cooling water supply is connected properly and that the water pressure is at least 25 PSI or greater except for 48 kw or 300° F {149° C} units. *Refer to the Appendix for more information.*

NOTE: Both venting stages will be skipped if the process temperature is above the vent bypass temperature, and the Thermolator will consequently start the pump immediately in the "RUNNING" state.

5 **Set the setpoint to the desired temperature**, Shown in green on the top display.

Press + to increase or − to decrease the temperature setpoint. If you followed step 3, wait until process lines are de-aerated before raising setpoints.

6 **If the Alarm LED turns on, press "Silence/Reset"** to silence the optional audible alarm.
Refer to the Troubleshooting section for more information.

Start-up

Every unit is factory set to deliver water in accordance with the standard operating specifications for that particular unit. Due to variables involved with different applications and different installations, minor adjustments may be required during the initial start-up to ensure proper operation. We recommend a qualified technician perform the start-up and that they follow the start-up procedure in sequence. The following serves as a checklist for the initial start-up and for subsequent start-ups if the unit is out of service for a prolonged time.

WARNING: Electrical hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device must be used to isolate this product from potentially hazardous electricity.

WARNING:

This equipment contains hot water or coolant under pressure. Accidental release of this hot fluid may result in steam formation and can cause personal injury and or property damage.

WARNING:

This equipment may contain fan blades or other sharp edges. Make sure all fan guards and other protective shields are securely in place.

WARNING:

The exposed surfaces of motors, heater tubes, and other fluid circuit components can be very hot and can cause burns if touched with unprotected hands

CAUTION: Disconnect and lock out incoming power before installing, servicing, or maintaining the equipment. Connecting power to the main terminal block energizes the entire electric circuitry of the unit. A power supply provides 24 VDC control power. Electric power at the main disconnect should be shut off before opening access panels for repair or maintenance.

CAUTION: Wear eye protection when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: Wear protective gloves when installing, maintaining, or repairing the equipment to protect against any sparks, debris, or fluid leaks.

CAUTION: To prevent improper pump performance due to reverse rotation, connect L1-L2-L3 in the A-B-C phase sequence.

(Continued)

Start-up (Continued)

⚠ **CAUTION:** Do not shut off To Process, From Process, Cooling Water In, or Cooling Water out valves while this equipment is operating. Equipment failure and/or serious injury could result.

⚠ **CAUTION:** Always keep the cover in place while operating this equipment. Internal surfaces may be extremely hot. Only qualified personnel should remove this cover.

⚠ **CAUTION:** Ground the unit properly in compliance with local and national codes.

Step 1 – Connecting Main Power

Connect main power properly ensuring it matches the voltage shown on the nameplate of the unit. Check the electrical phase sequence prior to start-up. The proper sequence is "ABC". If the phasing is incorrect, open the main power disconnect and switch two line leads on the main power terminal blocks (or the unit mounted disconnect). All electrical components are in-phase at the factory. Do not interchange any load leads that are from the unit contactors or the motor terminals. After confirming proper power connection and grounding exist, turn the main power on.

Step 2 – Fill Coolant Circuit

Check to make sure all piping connections are secure. All fluid lines and connectors should be rated for 150 psi {10.3 bar}at the maximum operating temperature except for 7½ hp and 10 hp units with the 300°F {149°C} option that require lines and connectors rated for at least 175 psi {12.1 bar}. We recommend the cooling source supply and return lines are of metal composition (black steel, galvanized or copper).

Make sure that the cooling source is the appropriate temperature and pressure for your application. In most cases, the cooling source is between 40°F and 85°F {4°C and 29°C}. The cooling source fluid pressure must be above the set point of the pressure switch in order for the unit to start. For most applications, the design cooling source supply pressure is between 25 psi and 50 psi {1.7 and 3.4 bar} Units with the 300°F {148.89°C} operating range option require an inlet cooling source pressure of 75 psi {5.2 bar}. If the total pressure in the unit (cooling source inlet pressure plus the pump pressure) exceeds 150 psi {10.3} the pressure relief valve in the unit will open. If this becomes an issue, install a pressure-regulating valve (Part #9616548 available from our Parts Department) on the supply line to help regulate the pressure to ensure it does not exceed the pressure rating of the pressure relief valve. For further assistance in installing a pressure-regulating valve, please contact our Service Department (800-458-1960 or 1-814-437-6861 from outside of the United States).

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

(Continued)

Start-up (Continued)

System Fill Water Chemistry Requirements

The properties of water make it ideal for heat transfer applications. It is safe, non-flammable, non-poisonous, easy to handle, widely available, and inexpensive in most industrialized areas.

When using water as a heat transfer fluid it is important to keep it within certain chemistry limits to avoid unwanted side effects. Water is a "universal solvent" because it can dissolve many solid substances and absorb gases. As a result, water can cause the corrosion of metals used in a cooling system. Often water is in an open system (exposed to air) and when the water evaporates, the dissolved minerals remain in the process fluid. When the concentration exceeds the solubility of some minerals, scale forms. The life giving properties of water can also encourage biological growth that can foul heat transfer surfaces.

To avoid the unwanted side effects associated with water cooling, proper chemical treatment and preventive maintenance is required for continuous plant productivity.

Unwanted Side Effects of Improper Water Quality

- Corrosion
- Scale
- Fouling
- Biological Contamination

Cooling Water Chemistry Properties

- Electrical Conductivity
- pH
- Alkalinity
- Total Hardness
- Dissolved gases

The complex nature of water chemistry requires a specialist to evaluate and implement appropriate sensing, measurement and treatment needed for satisfactory performance and life. The recommendations of the specialist may include filtration, monitoring, treatment and control devices. With the ever-changing regulations on water usage and treatment chemicals, the information is usually up-to-date when a specialist in the industry is involved. The table below shows the list of water characteristics and quality limitations.

(Continued)

Start-up (Continued)

Fill Water Chemistry Requirements

Water Characteristic	Quality Limitation
Alkalinity (HCO3-)	70-300 ppm
Aluminum (Al)	Less than 0.2 ppm
Ammonium (NH3)	Less than 2 ppm
Chlorides (Cl-)	Less than 300 ppm
Electrical Conductivity	10-500µS/cm
Free (aggressive) Carbon Dioxide (CO2)†	Less than 5 ppm
Free Chlorine(Cl2)	Less than 1 PPM
HCO3-/SO42-	Greater than 1.0
Hydrogen Sulfide (H2S)	Less than 0.05 ppm
Iron (Fe)	Less than 0.2 ppm
Manganese (Mn)	Less than 0.1 ppm
Nitrate (NO3)	Less than 100 ppm
pH	7.5-9.0
Sulfate (SO42-)	Less than 70 ppm
Total Hardness (dH)k	4.0-8.5

† Dissolved carbon dioxide calculation is from the pH and total alkalinity values shown below or measured on the site using a test kit. Dissolved Carbon Dioxide, PPM = TA x $2^{[(6.3\text{-}pH)/0.3]}$ where TA = Total Alkalinity, PPM as $CaCO_3$

CAUTION: When your application requires the use of glycol, use industrial grade glycol specifically designed for heat transfer systems and equipment. Never use glycol designed for automotive applications. Automotive glycols typically have additives engineered to benefit the materials and conditions found in an automotive engine; however, these additives can gel and foul heat exchange surfaces and result in loss of performance or even failure of the unit. In addition, these additives can react with the materials of the pump shaft seals resulting in leaks or premature pump failures.

WARNING:

Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

(Continued)

Start-up (Continued)

Step 3 – Initial Unit Operation

Enter the set point temperature. Refer to the Control Panel Operation section for further information.

Start the unit by pressing the Start button on the control panel. Pressing the Start button enables the microprocessor control functions, initiates an Auto-vent sequence, and turns on the Run indicating light which is green when on.

The Auto Vent sequence removes air that may have separated out from the water or been entrapped in the water circuit for some reason. Air in the system can lead to improper operation and premature heater failure. When initiated, the Auto Vent sequence opens the cooling valve for 30 seconds to allow air to escape. This allows the majority of the air to escape from the system. For further air purging, the Auto Vent sequence energizes the pump for 30 seconds while the cooling valve is open to remove any remaining air from the system. While in the vent sequence, the Pump and Cool lights will flash. Once the Auto Vent sequence is complete, the cooling valve is closed, the pump remains energized, and normal operation initiates.

Check the rotation of the pump by visually confirming the motor shaft rotation matches the directional arrow sticker on the motor case. If the pump is running backwards, switch two of the main power leads, after shutting off the disconnect switch.

The unit is now ready for service.

Stopping the Thermolator

WARNING: Electrical Shock and Hot Surface Hazards

Before attempting maintenance of any kind on the Thermolator, you must stop the unit, disconnect and lockout the main power supply, and allow the unit to cool to less than 100° F {38° C}.

You must shut down the Thermolator whenever you:

- Change the water hookups.
- Shut down the process machine.
- Purge the process circuit of the water or fluid.
- Perform routine or preventative maintenance.
- See an alarm condition that requires troubleshooting.
- Relocate, ship or store the unit.

To shut down the unit during a normal interruption in production process, where no maintenance will be performed:

1 **Press STOP** 

.

To shut down the unit to change water hookups:

1 **Change setpoint to 80° F {27° C} and allow the Thermolator to cool itself to less than 100° F {38° C}.**

2 **Press STOP** 

.

3 **Shut off the cooling water supply, and relieve any pressure in the unit** (see pressure gauge) by lifting the relief valve lever; then drain the unit of all fluid. The cooling water inlet hose can be removed to provide additional draining.

4 **Once the unit is cool, remove the water hookups.**

To shut down the unit for relocation or storage:

1 **Change setpoint to 80° F {27° C} and allow Thermolator to cool itself to less than 100° F {38° C}.**

2 **Press STOP** 

.

3 **Shut off the cooling water supply, and relieve any pressure in the unit** (see pressure gauge) by lifting the relief valve lever; then drain the unit of all fluid. The cooling water inlet hose must be removed to provide maximum draining.

4 **Disconnect the power supply and all water feeds.**

In shipment or storage, the Thermolator can withstand an environment between -40° F {-40° C} and 150° F {65° C} with 95% relative humidity non-condensing.

Program Menu

Access to the program menu is password protected to prevent unintended alteration to the program settings and parameters. To access the programming menu the unit must be in a stopped state.

To enter the program menu stop the unit then press and hold the Display/Program button for 10 continuous seconds to put the controller in program mode. The Program Mode light flashes yellow and the display will show PAS on the Process display and 000 on the Set Point display. The unit is now ready to have the password entered. From the factory, the password is set to 000.

5. **Use the Up or Down arrow buttons to increase the numeric value on the Set Point display until the correct password value is shown.**

6. **To enter the password, press and release the Start button.** If an incorrect password is entered the Set Point display shows no and the Process display shows PAS. After 5 seconds, the unit will go back to the password entry mode and display PAS on the Process display and "blanks" on the Set Point display. If no activity occurs for another 5 seconds, the controller exits the programming mode and returns to the Stopped state.

7. **Once in the program menu, use the Display/Program button to scroll through the different adjustable parameters** *(see Program Menu Items table).*

8. **To change an item, press the Display/Program button until the item code displays in the Process display.** Pressing the Alarm Reset button and Display/Program button at the same time will reverse the direction the Display/Program button indexes through the menu items.

9. Once the desired menu item code displays in the Process display, use the Up and Down arrow buttons to adjust the value shown in the Set Point display until the desired value is shown. Press the Start button to enter the display value. Press the Stop button to cancel and revert to the previously value.

10. There is a Master Reset function to restore all User menu parameters to their factory default values. To initiate a Master Reset the unit must be in a stopped state. Once the unit is stopped, press and hold the Alarm Silence/Reset button and Stop button simultaneously for 10 consecutive seconds until PRG is displayed on the Set Point display and RSt is displayed on the Process display. To confirm a Master Reset is desired, press and release the Start button and the system will perform a Master Reset and reboot. The Master Reset is aborted after the PRG is displayed on the Set Point display and RSt is displayed on the Process display by turning the control power off or taking no action for 10 consecutive seconds.

Program Menu Items

Item Name	Item Code	Default Valve	Range
Alarm delay for high deviation alarm	AdH	30	0 to 60 minutes (10 to 60 minutes on program versions prior to version 1.33)
Alarm delay for low deviation alarm	AdL	30	0 to 60 minutes (10 to 60 minutes on program versions prior to version 1.33)
Alarm deviation alarm delay after start	ADS	30	0 to 30 minutes on program version 1.33 and later only
Alarm output	AdO	DIS	Disabled (DIS) or Enabled (EnA) on program versions 1.33 and later only
Autostart enable	ASE	ENA	Disabled (DIS) or Enabled (EnA)
Brownout monitor	brn	EnA	Disabled (DIS) or Enabled (EnA)
Communications Baud rate[1]	bAU	96	12 to 96
Communications Modbus ID[1]	bId	1	1 to 247
Communications SPI address[1]	SPA	32	32 to 63
Communications type[1]	COt	OFF	OFF, Retransmit (rEt), SPI (SPI), ModBus (bUS), Handheld Remote (Han)
Crash Cool enabled[1]	CCE	DIS	Disabled (DIS) or Enabled (EnA)
Derivative time	dEr	5	0 to 200
Display units	Unt	F	F or C
High deviation alarm limit	HId	10	5 to 100 degrees above set point
Integral time	Int	25	1 to 800
Low deviation alarm limit	Lod	10	5 to 100 degrees below set point
Low pressure bypass enabled	pbE	dIS	Disabled (DIS) or Enabled (EnA)
Panel Temperature Alarm	PAe	EnA	Disabled (DIS) or Enabled (EnA)
Panel Temperature Readout	Pte		Display only
Proportional band	bnd	20	1 to 300
Proportional band ratio	Pbr	5	1 to 10
Pump run hours	PrH	0	0 to 999 (x100)
Purge enabled (optional)[1]	PuE	DIS	Disabled (DIS) or Enabled (EnA)
Remote heat/cool enabled [1]	rHC	DIS	Disabled (DIS) or Enabled (EnA)
Remote Setpoint enabled[1]	rSE	DIS	Disabled (DIS) or Enabled (EnA)
Remote Setpoint high limit[1]	rSH	260	rSL to 999
Remote Setpoint low limit [1]	rSL	10	-99 to rSH
Retransmit high limit[1]	rEH	260	rEL to 999
Retransmit low limit[1]	rEL	10	-99 to rEH
Return Temperature Probe Enable	SSE	EnA	Disabled (DIS) or Enabled (EnA)
Seal-Saver enabled	SSE	EnA	Disabled (DIS) or Enabled (EnA)
User high safety limit alarm	HSU	260	Between factory low and high limits
User low safety limit alarm	LSU	22	Between factory low and high limits
User password	UPA	000	0 to 999
Vent sequence cancel temperature	SCt	120	Between factory low and high limits

[1] Requires the Premium Controller option (TW-P) as well as the individual option for this function.

Process Cool Down Sequence Initiation

The Process Cool Down sequence reduces the water temperature before the unit shuts off to extend the life of the pump seal. See the Program Menu section for instructions on how to enable or disable this feature. During this sequence, the cooling valve opens and the pump runs for 120 seconds or until the temperature reaches 90°F {32°C}, whichever occurs first. During the Process Cool Down sequence the Set Point display temporarily toggles between the target value 90°F and current set point and the Pump, Cool, and Process Cool Down lights flash green. After the Process Cool Down sequence is complete, the unit stops, the set point temperature displays in the Set Point display, and the Process Cool Down light remains solid green to indicate the completion of the sequence. Pressing the Start and/or Stop buttons during a Process Cool Down cool-down sequence stops the sequence.

To initiate a Process Cool Down sequence on units with the Premium Controller simply press and release the Process Cool Down button. To initiate a sequence on units with the standard controller, press and hold the Start button, then press the Stop button and release both buttons. The Process Cool Down sequence begins if the process supply temperature is above 90°F {32°C}.

Pump Running Hour Display

The total accumulated pump running hours are stored for maintenance purposes. See the Program Menu section to display the pump running hours. Running hours are in units of hundreds so a display value of 10 means 1,000 hours. To reset the pump running hours, press the Start and Alarm Reset buttons at the same time and hold for 3 seconds.

SPI Communications (Optional)

Several members of SPI : The Plastics Industry Trade Association developed a communications standard for plastic processing equipment to communicate using the Serial Peripheral Interface bus (SPI bus), which coincidently has the same abbreviation as the trade association. This option includes an expansion module and a RS-485 communication port on the unit. The communication hardware firmware is SPI 3.01 standard compliant.

To activate or deactivate this feature use the program menu Communication Type function. In addition to activating the communication type, a baud rate and SPI address must be set using the Communication Baud Rate and SPI Address function. If multiple pieces of equipment are on the same network, the base address of each machine has to be unique.

SPI Option Parameters

Command	Poll	Select	Description
Echo	20 20	20 21	Controller integrity command used to accept and retain data and provide it in response to a poll inquiry in an open 4-byte ASCII format with ASCII units.
Version	20 22		Controller version command used to provide a version number following format: AABB, where AA=SPI assigned version level, BB=vendor assigned version level in an open 4-byte ASCII format with ASCII units.
Set Point Process Temperature	20 30	20 31	Target supply coolant temperature leaving the unit in a numeric format in °F.
Alarm, High Temperature Deviation	20 32	20 33	Value in conjunction with the process set point that determines the high alarm temperature in a numeric format in °F must always be positive.
Alarm, Low Temperature Deviation	20 34	20 35	Value in conjunction with the process set point that determines the low alarm temperature in a numeric format in °F must always be positive.
Status, Process	20 40		Process status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=an alarm affecting the machine has occurred (probe fault or pump fault) 4=the controller has exceeded its over set point deviation 5=the controller has exceeded its below set point deviation.
Status, Machine 1	20 42		Machine status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=an alarm affecting the machine operation has occurred (probe fault or pump fault) 4=the controller has exceeded its over set point deviation 5=the controller has exceeded its below set point deviation.
Status, Machine 2	20 44		Machine status in a 16-bit format as follows: 0=controlling 1=an alarm is present 2=an alarm affecting the process has occurred (high or low temperature deviation) 3=a sensor error has been detected 4=an alarm affecting the machine operation has occurred.:
Mode, Machine	20 48	20 40	Machine mode in two 8-bit bytes. When polling 20 48 bit 0 indicated the machine is off. 20 40 bit 0 commands the unit to be turned on or off (on when high or off when low). 20 40 bit 1 is used to recognized the alarm condition.
Temperature, To Process (Supply)	20 70		Returns the process supply temperature in a numeric format in °F.
Temperature, To Process (Return)	20 72		Returns the process return temperature in a numeric format in °F.

Modbus RTU (Optional)

The Modbus RTU option provides a set of terminals for Modbus RTU communications. Note the ModBus Parity = None, Stop Bits = 1, and default Baud Rate = 9,600.

Modbus Option Parameters

Register	Command	Poll	Select	Description
4002	Machine State	R	Integer	0=Off, 1=Stop, 2=Run, 3=Run Fault 2, 4=Run Fault 3, 5=Fault 1, 6=Factory Menu, 7=User Menu, 8=Get User Password, 9=Master Reset
4007	Derivative	R/W	Integer	
4008	Integral	R/W	Integer	
4009	Heat Cycle Rate	R		
4010	Cool Cycle Rate	R		
4011	Low Alarm Delay	R	Integer	
4012	High Alarm Delay	R	Integer	
4013	Temperature Display Units	R	Integer	0 = °F, 1 = °C
4015	Brownout Enabled	R	Integer	0 = Disabled, 1 = Enabled
4017	Process Cool Down Enabled	R		0 = Disabled, 1 = Enabled
4018	Remote Heat Cool Enabled	R		0 = Disabled, 1 = Enabled
4019	Mold Purge Enabled	R		0 = Disabled, 1 = Enabled
4020	Rapid Cool Enabled	R		0 = Disabled, 1 = Enabled
4024	Remote Setpoint Enabled	R	Integer	0 = Disabled, 1 = Enabled
4025	Autostart Enabled	R	Integer	0 = Disabled, 1 = Enabled
4027	Communication BAUD Rate	R/W	Integer	0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600
4028	MODBUS Identification	R/W	Integer	
4030	SPI Communications Address	R/W	Integer	
4038	PID OUT	R		-100 to 100 PID algorithm output
4039	MODBUS Command	R/W	Integer	0 = Do Nothing, 1 = Start, 2 = Stop
8002	Supply Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8004	Return Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8010	Low Temperature Deviation (°C)	R/W	Floating Point	
8012	High Temperature Deviation (°C)	R/W	Floating Point	
8014	Low Setpoint Limit Temperature (°C)	R	Floating Point	
8016	High Setpoint Limit Temperature (°C)	R	Floating Point	
8018	Supply Temperature Retransmit Range Low (°C)	R	Floating Point	
8020	Supply Temperature Retransmit Range High (°C)	R	Floating Point	
8022	Low Temperature Safety – User Set (°C)	R/W	Floating Point	
8024	High Temperature Safety – User Set (°C)	R/W	Floating Point	
8026	Proportional Band (°C)	R/W	Floating Point	
8002	Supply Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8004	Return Fluid Temperature (°C)	R	Floating Point	Error Hi = 9.9E05, Error Low = -9.9E05
8010	Low Temperature Deviation (°C)	R/W	Floating Point	
8012	High Temperature Deviation (°C)	R/W	Floating Point	
8014	Low Setpoint Limit Temperature (°C)	R	Floating Point	
8016	High Setpoint Limit Temperature (°C)	R	Floating Point	

(Continued)

Modbus Option Parameters (Continued)

Register	Command	Poll	Select	Description
8018	Supply Temperature Retransmit Range Low (°C)	R	Floating Point	
8020	Supply Temperature Retransmit Range High (°C)	R	Floating Point	
8022	Low Temperature Safety – User Set (°C)	R/W	Floating Point	
8024	High Temperature Safety – User Set (°C)	R/W	Floating Point	
8026	Proportional Band (°C)	R/W	Floating Point	
8052	Pump Running Hours	R	Floating Point	
8054	Setpoint Temperature (°C)	R/W	Floating Point	
8056	Low Temperature Safety – Factory Set (°C)	R	Floating Point	
8058	High Temperature Safety – Factory Set (°C)	R	Floating Point	
8070	Supply Temperature Input Offset	R	Floating Point	
8072	Return Temperature Input Offset	R	Floating Point	
8074	Remote Setpoint Temperature Input Offset	R	Floating Point	
8080	Remote Setpoint Limit Temperature (°C)	R	Floating Point	
8082	Remote Setpoint High Temperature Limit (°C)	R	Floating Point	

Modbus Registers

The following is a list of Modbus Registers that are remotely available.

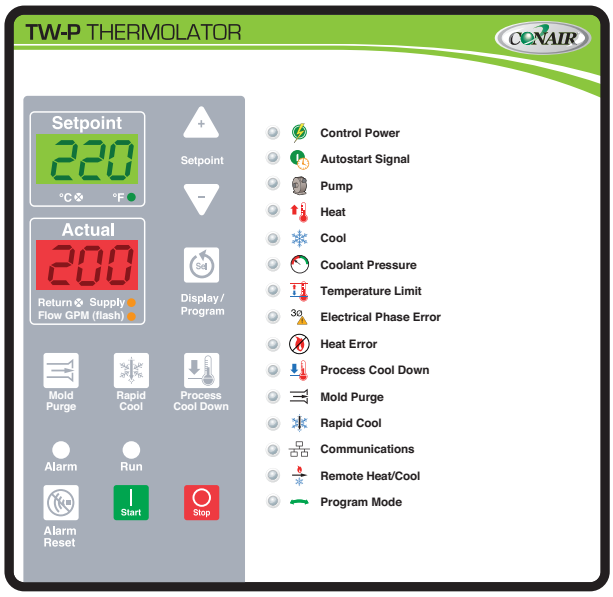
Notes:

- There is a limitation on the maximum Modbus block size of 40 for integers and 20 for floats.
- Additional settings include:
  - Baud: Set by parameter bAU, 9600 baud by default.
  - Parity: None
  - Data bits: 8
  - Stop bits: 1
  - Flow control: None
- It is common for external software to apply an address offset of “1”, so you may need to add “1” to the Modbus addresses based on the software in the remote system.
- In newer versions of Modbus, you may have to append a “4” or a “40” prefix on the registers listed.

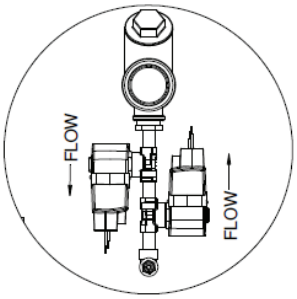
For example, to get to “MACHINE STATE” in register 4002, you may have to access register 4002, 4003, 44002, 44003, 404002, or 404003. Once you test your system and get a valid response, you will know the rules to consistently apply to your system for all addresses.

Using the Optional Mold Purge Option

Only the TW-P Thermolator can be ordered with an optional purge valve (Mold Purge), which clears the process lines of fluid using compressed air. The valve is operated by an optional manual purge button on the control panel.



IMPORTANT: Before purging the process lines, be sure that the cooling water source feed is closed. If the feed is open and the air line has a higher pressure than the cooling water, air may be injected into the cooling water system. If the cooling water pressure is higher than the air line, cooling water may be injected into the air line.



DETAIL C

1 **Press STOP**  **to stop the Thermolator.**

2 **Shut off the cooling water supply valve.**

3 **Press MOLD PURGE**  **to start purging.**

- The "Purge" LED lights.
- The cooling valve is opened.

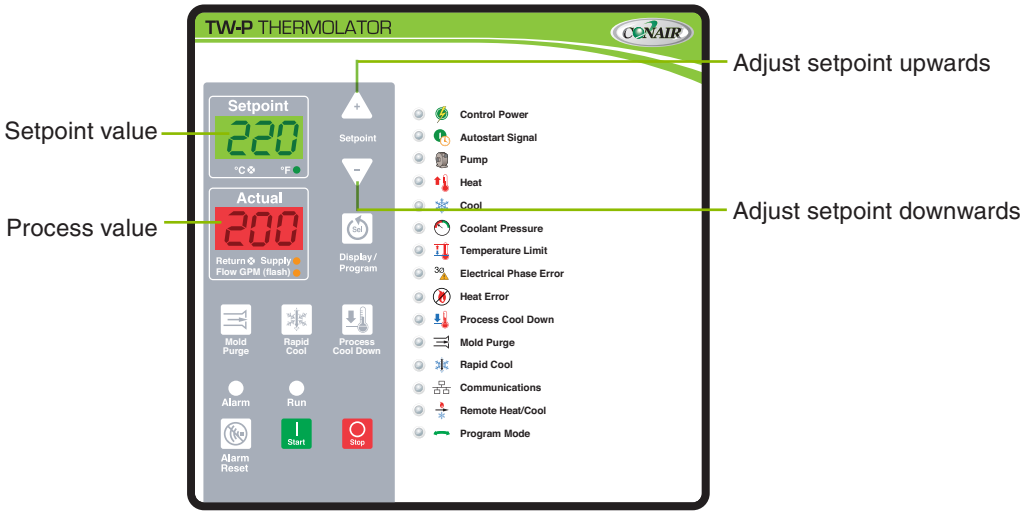
The time required to clear the process lines of fluid will vary according to the length of the process piping and the size of the tooling.

4 **Release MOLD PURGE**  **to stop purging.**

Conair TW-P Thermolator

Normal Operation

For normal operation of the TW-P Thermolator, set the setpoint on the temperature controller using the + and − buttons. On the display, the lower red display shows the current temperature, and the upper green display shows the setpoint. In the right-hand column, the various LEDs describe the status of the machine.



(Continued)

SECTION
5

Maintenance

Maintenance of your Thermolator

Depending on which features, options, and additions you ordered with your Thermolator, your maintenance procedures and necessities may differ from what is shown in this user guide. Please note that all illustrations, photos, and instructions are based on a typical configuration of a Thermolator. Always refer to the wiring diagrams and other documentation - including manuals from the manufacturer of any valves, heat exchangers, and parts used on your Thermolator - when completing any maintenance or troubleshooting tasks.

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

If you have any questions or concerns about your Thermolator, feel free to call Conair's Parts and Service departments for assistance.

Preventative Maintenance Schedule

Once the unit is in service, we suggest following the maintenance procedures as closely as possible. The importance of a properly established preventive maintenance program cannot be overemphasized. Taking the time to follow these simple procedures will result in substantially reduced downtime, reduced repair costs, and an extended useful lifetime for the unit. Thermolator TW water temperature controllers are essentially maintenance-free. However, to maintain the best performance, we recommend the following maintenance schedule.

- **Daily or as often as necessary**
  - ❒ **Check for leaks in cooling and process lines.**
    Before and during operation, you should inspect the unit and all plumbing lines for leaks. If a leak develops, stop the Thermolator 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 vent areas. Keep floor around the unit dry. The Thermolator exchanges air from in front of, underneath, on top and beside the unit, so make sure that nothing is against the front, bottom, top or sides of the unit that would stop proper ventilation around the unit.

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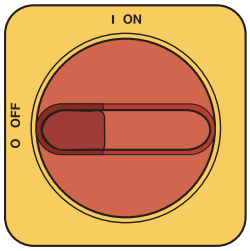
From outside of the
United States,
Call: 814 437 6861

- **Quarterly (every 3 months) or as often as necessary**
  - ❒ **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 RTD connections. Replace any wire that appears damaged or has worn or cracked insulation.
- **Every five years**
  - ❒ **Replace cooling fan in electrical cabinet.**

Accessing the Thermolator Enclosure

Depending on which features, options, and additions you ordered with your Thermolator, your Thermolator may appear different and operate differently from the illustrations and photos shown in this user guide.

WARNING: Electrical shock and hot surface hazards.
Before attempting maintenance of any kind on the Thermolator, you must stop the unit, disconnect and lockout the main power supply, and allow the unit to cool to less than 100° F {38° C}.



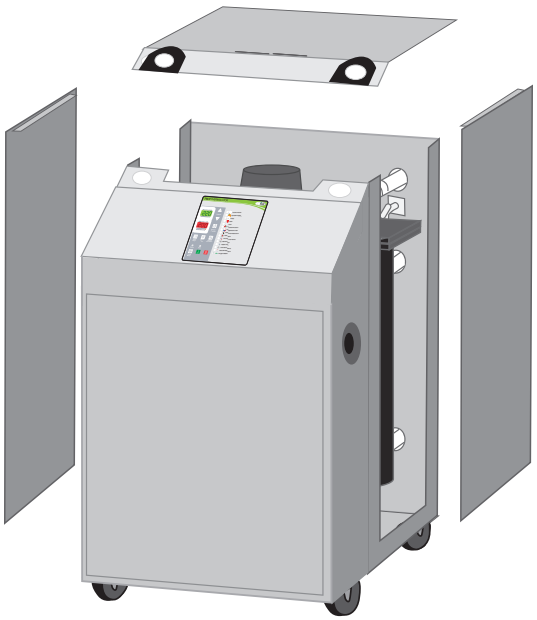
To access the Thermolator enclosure:

1 **Remove the top panel.**

2 **Remove each side panel by lifting straight up**.

NOTE: The side panels fit into slots at the bottom. Note how they fit so that reassembly will be easy.

3 **Set the top panel and side panels out of the way for maintenance procedures.**
Note that the right side and left side panels are unique and will only fit on the unit in their appropriate position.



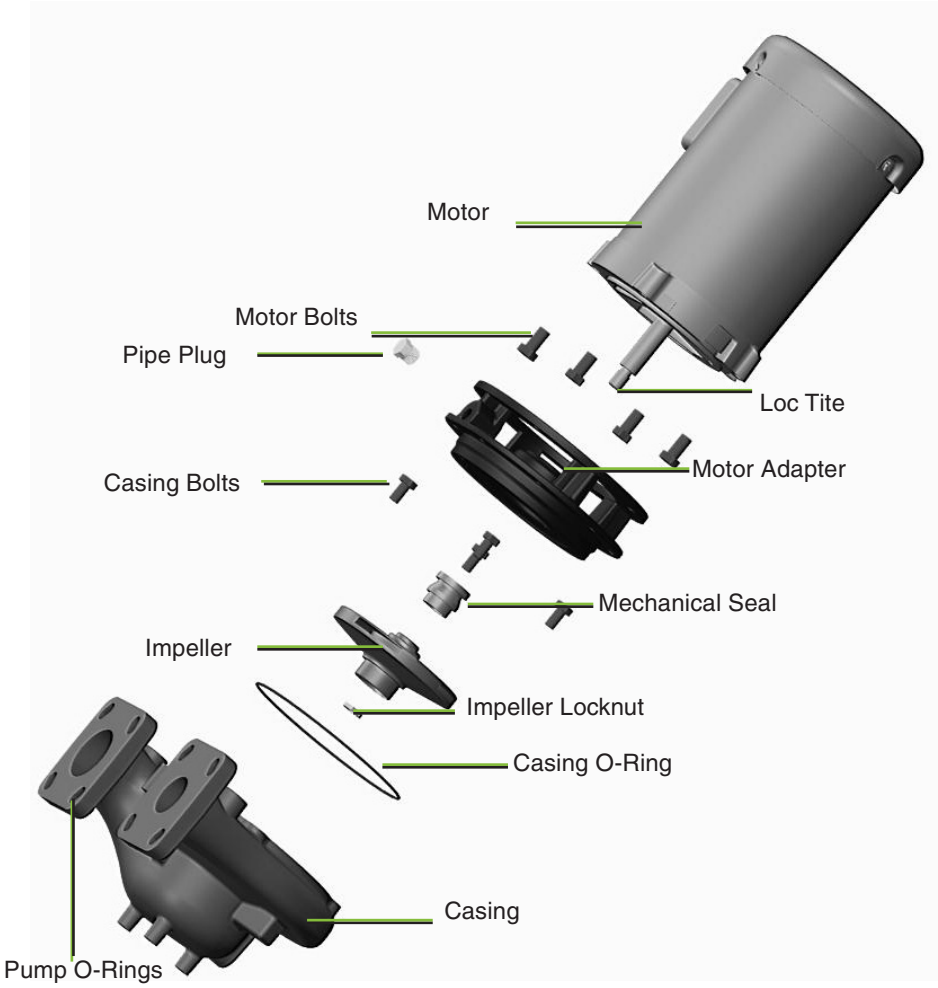
Removing the Pump Motor and Seal
(1/2 to 2 Hp, any frequency and 3 HP, 60 Hz units)

Tools Required

- ❒ *9/16-inch wrench*
- ❒ *Flat-blade screwdriver*
- ❒ *5/8 inch deep socket*
- ❒ *Press for removal of pump seal*

Time Required

45 Minutes



If the pump motor or seal ever needs to be replaced, the following procedure can be used on all models with 1/2 to 3 Hp motors for disassembly:

1 **Using a 9/16-inch wrench, remove the four (4) casing bolts** that hold the motor and impeller adapter assembly to the Thermolator.

2 **Remove the motor and adapter from the pump adapter to volute.**

3 **Remove the casing O-ring.** Inspect for damage or wear. If in good condition, set aside for re-use. If a new part is needed, contact Conair Parts and request part number 267204-0160-02

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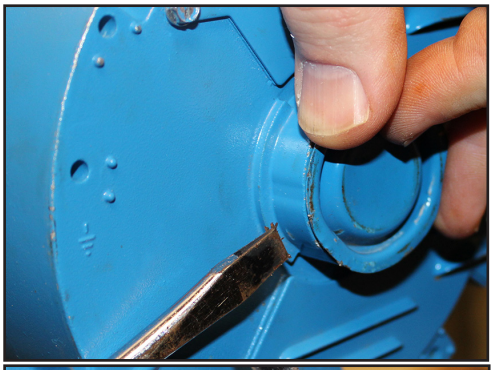
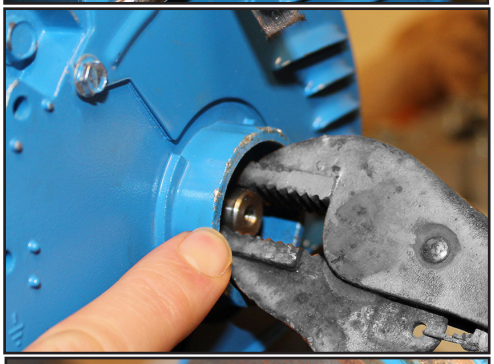
(Continued)

Removing the Pump Motor and Seal
(1/2 to 2 Hp, any frequency and 3 HP, 60 Hz units) (Continued)

4 **Remove the dust cap** from the bell end motor housing to expose the motor shaft.

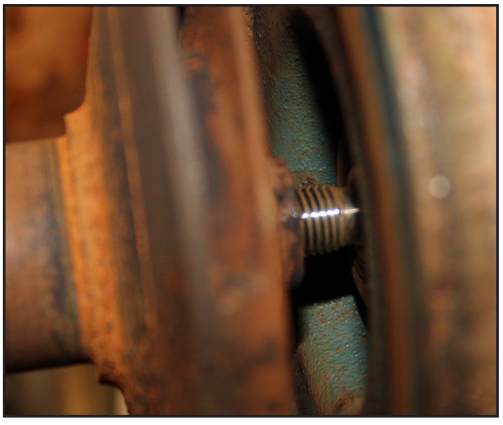


5 **Using a locking pair of pliers, grip the flat sides of the motor shaft.**



6 **Remove impeller lock nut using a 5/8 inch deep socket.** The lock nut is secured in place with a high performance thread locker. A significant amount of torque will be required to break it free. Use the locking pliers at the other end of the shaft to prevent shaft rotation when removing the lock nut and impeller. Standard clockwise thread is used.

7 **Unscrew the impeller from the shaft.**



(Continued)

Removing the Pump Motor and Seal

(1/2 to 2 Hp, any frequency and 3 HP, 60 Hz units)

(Continued)

8 **Slide the rotating half of the shaft seal off of the shaft**. Be careful not to contaminate, chip, or scratch seal surfaces if it is to be re-used. Set seal half aside for re-use if appropriate.

9 **Using a 9/16-inch wrench, remove the four (4) casing bolts.**

10 **Slide motor adapter off of motor shaft.**

11 **Press stationary half of pump seal out of motor adapter, being careful not to damage rubber diametral seal or rotating/non-rotating seal interface surface. Set seal half aside for re-use if appropriate.**

Reassembling the Pump Motor and Seal

(1/2 to 2 Hp, any frequency and 3 HP, 60 Hz units)

The following procedure can be used on all models with 1/2 to 3 Hp motors for reassembly:

Tools Required

- ❒ *9/16-inch wrench*
- ❒ *Flat-blade screwdriver*
- ❒ *5/8 inch deep socket*
- ❒ *Blue Loc-Tite ® (271)*

Time Required

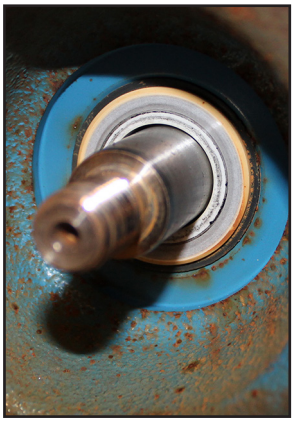
25 Minutes

1 **Gently press stationary half of pump seal into motor adapter** being careful to not damage rotating / non-rotating seal interface surface.

2 **Slide motor adapter assembly on to motor shaft.**

3 **Install and tighten the 4 bolts to 20 ft-lbs {27.12 N·m}.** While tightening the bolts, be careful to maintain the motor adapter perpendicular to the shaft.

4 **Slide the rotating portion of the shaft seal onto the shaft** with the spring on the impeller side.

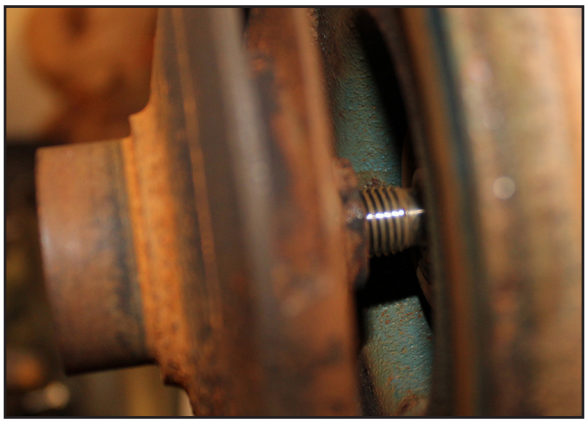


(Continued)

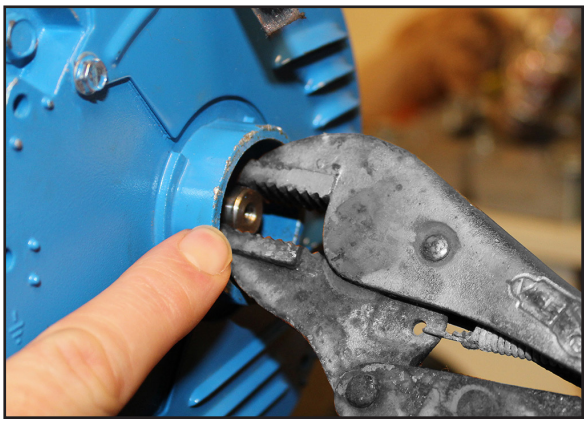
Reassembling the Pump Motor and Seal

(1/2 to 2 Hp, any freq. and 3 HP, 60 Hz units)(Cont.)

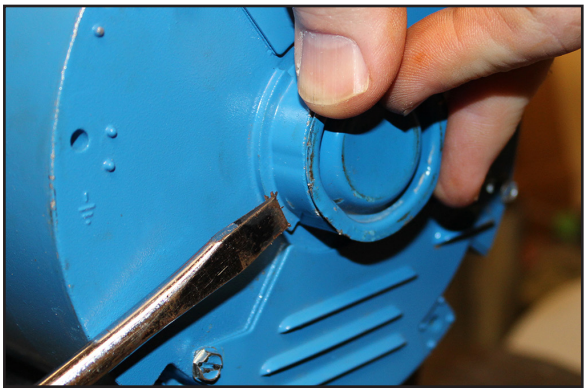
5 **Align the impeller and screw on to shaft.**



6 **Place a small amount of Blue Loc-Tite #271 on the shaft end thread.**



7 **Install the impeller jam nut on the shaft, and tighten to 12 ft-lbs {16.27 N·m}. Use a locking pair of pliers to grip the flat side of the shaft at the motor bell end. Re-install dust cap if removed during disassembly.**

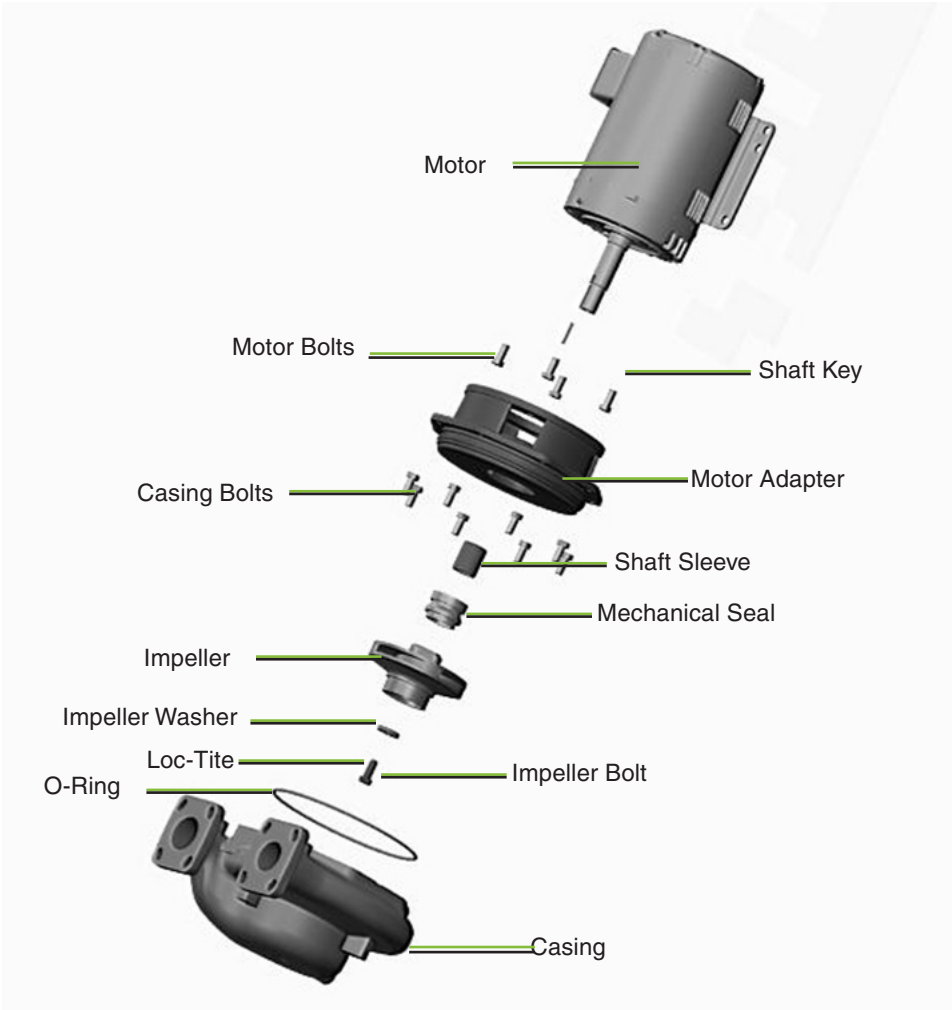


8 **Place pump to adapter o-ring on motor adapter.** Locate the o-ring as far up the adapter as possible such that it sits tight to the angle formed by the mounting flange.

9 **Locate the motor and motor adapter assembly on the pump volute. Install the 4 bolts, tightening to 20 ft-lbs {27.12 N·m}.**

Removing the Pump Motor and Seal

(3 Hp, 50Hz and 5 to 10 Hp, any frequency units)



Tools Required

- ❒ *9/16-inch wrench*
- ❒ *Flat-blade screwdriver*
- ❒ *9/16-inch deep socket*

Time Required

20 Minutes

The following procedure can be used on all models with 5 to 10 hp pump motors for disassembly:

1. **Remove eight (8) pump casing bolts using a 9/16-inch wrench.**
2. **Remove motor and adapter from casing.**
3. **Inspect pump casing to adapter o-ring for damage.** If appropriate obtain replacement part number 267204-0265-02.
4. **Remove impeller bolt and washer using a 9/16-inch deep socket.** The bolt is secured in place with a high performance thread locker. A significant amount of torque will be required to break it free. The impeller may be clamped on the smallest diameter round section behind the witness line of the casing interface only. Do not damage the outside surface where the close clearance between the casing and impeller exists.

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Call: 814 437 6861

(Continued)

Removing the Pump Motor and Seal
(3 Hp, 50Hz and 5 to 10 Hp, any frequency units)
(Continued)

5 **Unscrew impeller from shaft.**

6 **Slide rotating half of shaft seal off of shaft.** Be careful not to contaminate, chip or scratch seal surfaces if it is to be re-used. Set seal half aside for re-use if appropriate.

7 **Slide shaft sleeve off of shaft.**

8 **Remove 4 motor bolts using 9/16-inch wrench.**

9 **Slide motor adapter off of motor shaft.**

10 **Press stationary half of pump seal out of motor adapter** being careful not to damage rubber diametral seal or rotating / non-rotating seal interface surface. Set seal half aside for re-use if appropriate.

Reassembling Pump Motor and Seal

(3 Hp, 50Hz and 5 to 10 Hp, any frequency units)

The following procedure can be used on all models with 5 to 10 Hp motors for disassembly:

Tools Required

- ❒ *9/16-inch wrench*
- ❒ *Flat-blade screwdriver*
- ❒ *9/16-inch deep socket*
- ❒ *Blue Loc-Tite ® (271)*

Time Required

60 Minutes

1. **Gently press stationary half of pump seal into motor adapter being careful not damage rotating / non-rotating seal interface surface.**
2. **Slide motor adapter assembly on to motor shaft.**
3. **Install and tighten the four (4) bolts to 37 ft lbs {50.12 N·m}. Holding the motor adapter on to the motor being careful to maintain the adapter perpendicular to the shaft.**
4. **Slide the shaft sleeve over top of shaft.**
5. **Slide the rotating portion of the shaft seal on to the shaft with the spring on the impeller side.**
6. **Align the impeller and screw on to shaft.**
7. **Place a small amount of Blue Loc-Tite #271 on the impeller bolt thread.**
8. **Install the impeller bolt and washer on the shaft, tighten to 20 ft-lbs {27.12 N·m}.**
9. **Place pump to adapter o-ring on motor adapter if removed. Locate the o-ring in the groove on the adapter without residual twist.**
10. **Locate the motor and motor adapter assembly on the pump casing. Install the eight (8)bolts, tightening to 37 ft-lbs {50.12 N·m}.**

Tools Required

❒ *Phillips Screwdriver*

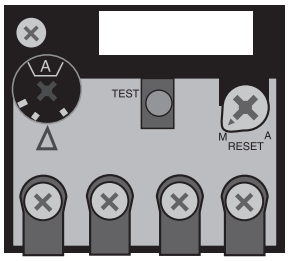
Resetting Pump Overload

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.** Press the blue button to attempt to reset the overload. If it clicks, the overload was tripped. Verify that the overload trip point is set as specified by the electrical power prints.



Replacing 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 color/placement of each lead and label as needed.

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

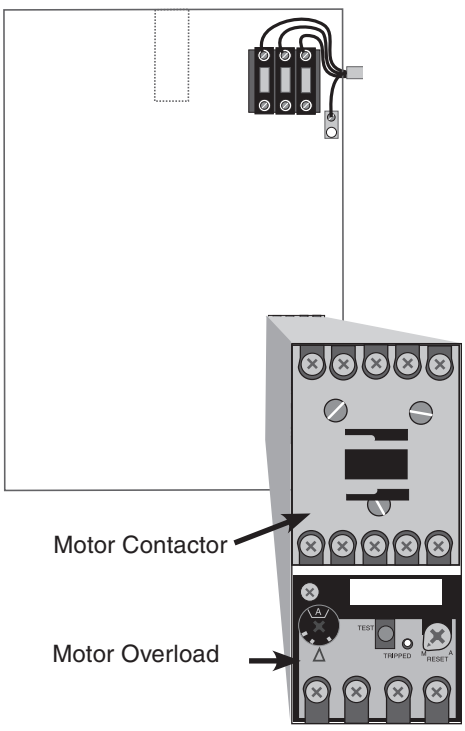
6 **Remove the overload module.** Loosen the three screws that connect the overload module to the motor contactor. Pull the overload module down to release it from the starter.

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.** Trip point will be shown on electrical prints

10 Push reset button on overload to ensure it is not in the tripped state.



11 Verify that pump rotation is correct (*see Installation section of this manual*).

Replacing the Controller Boards

The controller boards used in the Thermolator TW-P can be replaced if necessary. Two main circuit boards make up the controller. One is the display board that contains all the numeric displays, LEDs and pushbuttons. The other is the main board that contains the microprocessor, inputs, outputs, and option daughter cards. They are connected with a 20-conductor ribbon cable. Any or all can be independently replaced.

To remove controller:

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

2 **If replacing the main board, remove all terminal strips.** If the daughter cards are to not be replaced, use a pair of needle-nose pliers to release the daughter cards from the plastic standoffs. Unplug ribbon cable.

If replacing the HMI board, unplug ribbon cable from the back.

3 **Remove the four mounting screws holding the board in place.**

4 **Remove the board to be replaced**.

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

To reinstall the controller:

5 **If replacing the main board and/or any of the daughter cards, please check carefully that all the jumpers and DIP switches on the new part are set exactly the same as the old part.** If the old part is not available for reference, all factory jumper settings are shown on the electrical control prints.

6 **If replacing the main board, insert all terminal strips.** Replace all daughter cards on plastic standoffs. Take care to ensure that daughter card connections to the main board are properly aligned. Reattach ribbon cable.

If replacing HMI board, reattach ribbon cable from the back.

7 **Replace the four mounting screws as shown in the pictures above in step 3.**

8 **The user parameters are stored on the main board, and will be set to their factory defaults. If the main board was replaced, please be sure to re-configure parameters to control operation of the TCU as desired.**

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Call: 814 437 6861

SECTION
6

Troubleshooting

Before Beginning

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

Before you begin troubleshooting:

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee. Most manuals can be downloaded free of charge from the product section of the Conair website.www.conairgroup.com

- ❒ Find any wiring, parts, and assembly diagrams that were shipped with your equipment. These are the best reference for correcting a problem. The diagrams will note any custom features or options not covered in this User Guide.
- ❒ Verify that you have all instructional materials related to the Thermolator. Additional details about troubleshooting and repairing specific components are found in these materials.
- ❒ Check that you have manual for other equipment connected in the system. Troubleshooting may require investigating other equipment attached to, or connected with the Thermolator.

A Few Words of Caution

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

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

All wiring, disconnects, and fuses should be installed and adjusted by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

WARNING: Electrical hazard

Before performing maintenance or repairs on this product, disconnect and lock out electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.

WARNING: Compressed air hazard

If you use compressed air, you must wear eye protection and observe all OSHA and other safety regulations pertaining to the use of compressed air. Bleed off pressure before servicing equipment.

WARNING: Hot surface and liquid hazards.

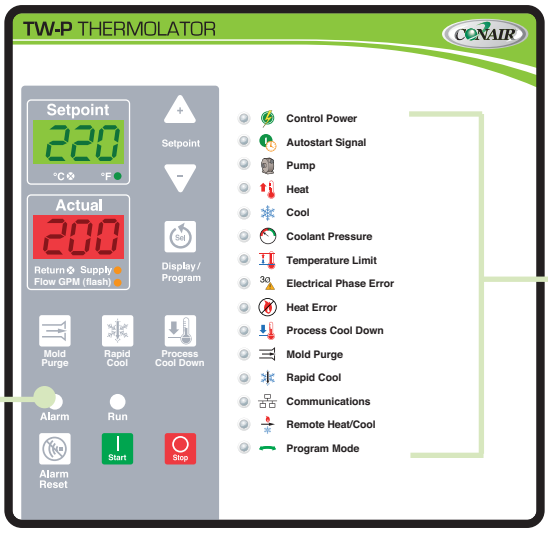
Before attempting maintenance of any kind on the Thermolator, you must stop the unit, disconnect and lockout the main power supply, and allow the unit to cool to less than 100° F {38° C}.

Identifying the Cause of a Problem

NOTE: Additional troubleshooting help can be found in the documentation manuals included with this User Guide.

The Troubleshooting section covers problems directly related to the operation and maintenance of the TW-P. This section does not provide solutions to problems that originate with other equipment. Additional troubleshooting help can be found in manuals supplied with the other equipment.

Illuminated alarm LEDs and error codes on the temperature controller will alert you to many malfunctions. If the optional alarm package is installed, an audible alarm also will activate.



Standard Indicator Lights and Alarm Codes
Refer to Controller Alarms in this Section.

Visual + Audible Alarm (Optional) and Illuminated Fault Light
Refer to Mechanical/Electrical Problems in this section.

When an Alarm condition occurs:

1. **Press Fault to silence optional audible alarm.**
2. **Note any indicator lights or error messages** to help determine the cause of the problem.
3. **Note what the machine was doing prior or during the alarm occurrence.** (Was it starting up, running steadily, etc.?)
4. **Find the alarm or error code in the diagnostics tables** in this section of the User Guide. Causes are listed in the order of most likely to least likely problem.
5. **Determine and fix the cause of the alarm**.

WARNING: Always disconnect and lock out the main power source before opening the Thermolator or its electrical enclosure.

Also disconnect air and water supply lines as needed.

Controller Alarms

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

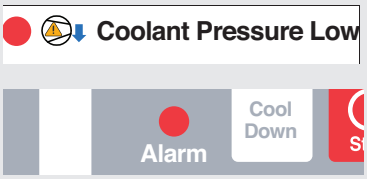
Alarm	Possible Cause	Solution
	Is fresh water turned on to the TCU?	Be sure to turn on the water supply before starting the TCU. The pressure status can be observed on the COOLANT PRESSURE LOW LED even when the TCU is not running.
Low Coolant Inlet Pressure The TCU fluid circuit does not have enough pressure to operate the pump or heater. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ COOLANT PRESSURE LOW LED illuminates. Optional strobe, sounds, dry contacts actuated. ◆ Pump temporarily turns off. ◆ Heater temporarily turns off. ◆ Cooling valve continues to regulate. **This alarm will automatically reset when system pressure returns. When it does, the TCU will automatically resume normal operation.**	Does your facility have the required water pressure to run the TCU? Normally this is 25psi, but may be significantly higher on certain models.	Observe the pressure indicated on the pressure gauges. Compare this to the minimum required operating pressure for your specific TCU model.
	Is the pressure switch faulty?	Upgrade your facility plumbing if necessary, or add an external booster pump If you are sure that sufficient water pressure is present, test the pressure switch with a VOM. Low pressure should allow the switch to open, whereas high pressure should cause it to close.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **Coolant Pressure Low Timeout** The TCU has experienced either; 1. Too many low pressure alarms within a certain time period. OR 2. The TCU has remained temporarily shut down with a low pressure alarm for too long. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with COOLANT PRESSURE LOW LED. ◆ Optional strobe, sounds, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **Once you have corrected the problem, push the alarm silence/reset button to clear this alarm. Then push the RUN button to restart the TCU.**	Water pressure in your building is only marginally acceptable to run the TCU. Any small fluctuations can cause the TCU to cycle on and off repeatedly. Other equipment fed from the same water line as the TCU is consuming significant water flow at intermittent intervals. Due to the high demand, pressure at the TCU temporarily drops.	Observe the building water pressure over time. If it drops below the minimum require pressure, you will need to upgrade your facility plumbing, or add an external booster pump. Observe the building water pressure over time. If it drops below the minimum require pressure, you will need to upgrade your facility plumbing, or add an external booster pump. If permitted by the manufacturer of the other equipment, install flow reducers to the other equipment so that flow is restricted to a reasonable level and sufficient pressure is retained for the TCU.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **Deviation Alarm – Over Setpoint** The process temperature has exceeded the allowable deviation window for a certain amount of time. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjuction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm will automatically reset when the problem is corrected.**	Has water stopped flowing throughout the unit or between supply outlet and return inlet?	Verify that the unit is running and that the pump is working. Check for closed or defective cooling or vent valves and plugged lines. *See Repairing Cooling Valves.* Check for external closed valve on the process fluid going to external equipment. Check for a plugged pipe.
	Did the cooling valve fail closed?	Check the cooling valves. *See Repairing Cooling Valves or the Motorized Cooling Valve instructions.*
	Is the temperature difference between the cooling water supply and the setpoint too small?	The temperature difference should be at least 25° F {14° C} to achieve proper cooling. Increase the process setpoint, decrease the cooling water supply temperature or increase the cooling water supply pressure.
	Is the cooling valve under-sized for the application?	Check the cooling load (Btu/hr) for which the valve was specified.
	Is the high process temperature alarm too sensitive?	Modify the High Deviation Alarm trigger point by increasing parameter H ıd.
	Is the high deviation temperature alarm delay too short?	Modify the High Deviation Alarm Delay by increasing parameter AdH.
	Is the initial deviation alarm delay parameter too short?	Modify the "Startup Ignore Deviation Delay" by increasing parameter ıdd.
	Are the algorithm and PID parameters set correctly?	Check the algorithm/PID parameters, including: At, PbC, dEC, ınC, PbH, dEH, ınH, and Pbr.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **Deviation Alarm – Under Setpoint** The process temperature has dropped below the allowable deviation window for a certain amount of time. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjuction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm will automatically reset when the problem is corrected.**	Is the cooling valve stuck open or leaking water?	Disassemble the cooling valve and check for particles blocking the valve seat. Check the valve seat for excessive wear. Replace as required using a valve repair kit. *See Repairing Cooling Valves.*
	Did a heater element fail or open?	With the unit powered down: Check for loose connections on heater wiring. Check resistance between the phase legs on the output side of the heater contactor (or SSR if present). Readings should be within 0.25 ohms of each other. Replace the heater, if necessary. *See Replacing Heater Elements.*
	Did a heater contactor fail open?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the low process temperature alarm too sensitive?	Modify the Low Deviation Alarm trigger point by increasing parameter Lod.
	Is the low deviation temperature alarm delay too short?	Modify the Low Deviation Alarm trigger point by increasing parameter AdL.
	Is the initial deviation alarm delay parameter too short?	Modify the "Startup Ignore Deviation Delay" by increasing parameter idd.
	Is the Thermolator under-sized for the application?	Review specifications and selection guidelines that apply to heater and pump sizes in temperature control units.
	Is the Thermolator or equipment to which it is attached leaking?	Verify that there are no water leaks. Fix as necessary.
	Are the algorithm and PID parameters set correctly?	Check the algorithm/PID parameters: At, PbC, dEC, inC, PbH, dEH, inH, and Pbr.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **User Temperature – High Limit** The process temperature has risen beyond the user-configured maximum high limit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm can be reset by pushing the Alarm Silence/Reset button once the temperature returns to an acceptable level.**	Has water stopped flowing thought the unit or between the supply outlet and return inlet?	Verify that the unit is running and that the pump is working. Check for closed or defective cooling or vent valves and plugged lines. *See Repairing Cooling Valves.* Check for external closed valve on the process fluid going to external equipment. Check for a plugged pipe.
	Did the cooling valve fail closed?	Check the cooling valve. *See Repairing Cooling Valves or the Motorized Cooling Valve instructions.*
	Is the temperature difference between the cooling water supply and the setpoint too small?	The temperature difference should be at least 25°F {14°C} to achieve proper cooling. Increase the process setpoint, decrease the cooling water supply temperature or increase the cooling water supply pressure.
	Has the heater contactor failed with the contacts welded closed?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the cooling valve under-sized for the application?	Check the cooling load (Btu/hr) for which the valve was specified.
	Is the high process temperature alarm too sensitive?	Increase the alarm trigger point HSU. The recommended setting is the setpoint plus 2° F {4° C} to 10°F {18° C}.
	Is the cooling water return line plugged?	Verify the free flow of water out of the unit.
	Has the cooling water return pressure risen?	Check the water return pressure with valve.
	Has the cooling water supply pressure dropped?	Check the water supply pressure. If equipped, verify that strainer is not clogged.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

Alarm	Possible Cause	Solution
 **Factory Temperature – High Limit** The process temperature has risen beyond the factory-configured maximum high limit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm can be reset by pushing the Alarm Silence/Reset button once the temperature returns to an acceptable level.**	Has water stopped flowing thought the unit or between the supply outlet and return inlet?	Verify that the unit is running and that the pump is working. Check for closed or defective cooling or vent valves and plugged lines. *See Repairing Cooling Valves.* Check for external closed valve on the process fluid going to external equipment. Check for a plugged pipe.
	Did the cooling valve fail closed?	Check the cooling valve. *See Repairing Cooling Valves or the Motorized Cooling Valve instructions.*
	Has the heater contactor failed with the contacts welded closed?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the cooling valve under-sized for the application?	Check the cooling load (Btu/hr) for which the valve was specified.
	Is the cooling water return line plugged?	Verify the free flow of water out of the unit.
	Has the cooling water return pressure risen?	Check the water return pressure with valve.
	Has the cooling water supply pressure dropped?	Check the water supply pressure. If equipped, verify that strainer is not clogged.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **User Temperature – Low Limit** The process temperature has risen beyond the user-configured minimum low limit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjuction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm can be reset by pushing the Alarm Silence/Reset button once the temperature returns to an acceptable level.**	Is the cooling valve stuck open or leaking water?	Disassemble the cooling valve and check for particles blocking the valve seat. Check the valve seat for excessive wear. Replace as required using a valve repair kit. *See Repairing Cooling Valves.*
	Did a heater element fail or open?	With the unit powered down: Check for loose connections on heater wiring. Check resistance between the phase legs on the output side of the heater contactor (or SSR if present). Readings should be within 0.25 ohms of each other. Replace the heater, if necessary. *See Replacing Heater Elements.*
	Did the heater contactor fail open?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the low process temperature alarm too sensitive?	Decrease the alarm trigger point LSU. The recommended setting is the setpoint minus 2°F {4°C} to 10°F {18°C}. Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the Thermolator under-sized for the application?	Review specifications and selection guidelines that apply to heater and pump sizes in temperature control units.
	Is the Thermolator or equipment to which it is attached leaking?	Verify that there are no water leaks. Fix as necessary.

(Continued)

Controller Alarms (Continued)

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **Factory Temperature – Low Limit** The process temperature has risen beyond the factory-configured minimum low limit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjuction with an alternating actual temperature display. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **This alarm can be reset by pushing the Alarm Silence/Reset button once the temperature returns to an acceptable level.**	Is the cooling valve stuck open or leaking water?	Disassemble the cooling valve and check for particles blocking the valve seat. Check the valve seat for excessive wear. Replace as required using a valve repair kit. *See Repairing Cooling Valves.*
	Did a heater element fail or open?	With the unit powered down: Check for loose connections on heater wiring. Check resistance between the phase legs on the output side of the heater contactor (or SSR if present). Readings should be within 0.25 ohms of each other. Replace the heater, if necessary. *See Replacing Heater Elements.*
	Did the heater contactor fail open?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	Is the Thermolator under-sized for the application?	Review specifications and selection guidelines that apply to heater and pump sizes in temperature control units.
	Is the Thermolator or equipment to which it is attached leaking?	Verify that there are no water leaks. Fix as necessary.

Controller Alarms

When an alarm occurs, the Thermolator has detected a problem with the process. Without correction, the TCU will not be able to produce process fluid of the correct temperature. Under certain conditions, an alarm could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- If the optional alarm package is installed, the Fault strobe will illuminate and the audible alarm will activate.

Alarm	Possible Cause	Solution
 **Low Flow** The optional flowmeter has detected flow below the user-configured low flow limit.	Is a valve closed in the process loop?	Examine the process loop and look for blockages, closed valves, etc.
	Is there some kind of blockage in the process loop?	
◆ "FLL" is displayed in the setpoint display. ◆ Pump continues to run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. ◆ Alarm LED, optional strobe, sounder, dry contacs are all not actuated.	Did the process loop change in length or configuration that now provides more flow resistance to the pump?	Modify the Flowmeter Alarm Threshold by decreasing parameter FA.
	Is the user-configured low-flow limit set too high?	Modify the Flowmeter Alarm Threshold by decreasing parameter FA.
This alarm will automatically reset once flow is above the low flow limit.		

Controller Control Fault Logic

Fault	Alarm Indication	Pump Shut Off	Heater Shut Off	Unit Shut Off	Alarm Reset Required[1]	Manual Reset Required[2]	Remote Alarm Activated[3]
Low Coolant Inlet Pressure 	The Coolant Pressure In Light flashes red	Yes	Yes	Yes	No	No	Yes
Temperature Limit Safety 	The Set Point and Process Temperatures Flash and the Temperature Limit Light flashes red	Yes	Yes	Yes	Yes	No	Yes
Temperature Limit Warning 	The Temperature Limit Light flashes yellow	No	No	No	Yes	No	Yes
Pump Motor Overload 	The Pump Light flashes red	Yes	Yes	Yes	Yes	Yes	Yes
Supply Probe Fault Hi **Setpoint**	The Set Point Temperature Display shows PrS and the Process Temperature Display shows EHi	Yes	Yes	Yes	Yes	No	Yes
Supply Probe Fault Lo **Setpoint**	The Set Point Temperature Display shows PrS and the Process Temperature Display shows ELo	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Hi **Setpoint**	The Set Point Temperature Display shows Prr and the Process Temperature Display shows EHi	Yes	Yes	Yes	Yes	No	Yes
Return Probe Fault Lo **Setpoint**	The Set Point Temperature Display shows Prr and the Process Temperature Display shows ELo	Yes	Yes	Yes	Yes	No	Yes
Brownout **Setpoint**	The Set Point Temperature Display shows brn and the Process Temperature Display shows OUt	Yes	Yes	Yes	Yes	No	Yes
3-Phase Power Error (Optional)[4] 	The Electrical Phase Error light flashes red	Yes	Yes	Yes	Yes	No	Yes
Heater Contactor Error (Optional)[4] 	The Heat Error light flashes red	Yes	Yes	Yes	Yes	No	Yes

[1] Pressing the Alarm Silence/Reset resets alarm.

[2] A manual reset of the pump motor thermal overload is required to reset this alarm.

[3] Activates the alarm horn and closes the alarm contact (optional).

[4] Requires the Premium Controller option (TW-P).

Unit Faults

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
tcU hot **Hardware Over-Temperature Trip** The temperature of the process fluid bypass tube has exceeded the maximum permissible operating temperature. For models with SSR's, this fault can also refer to an overheated SSR heatsink. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump locks on. ◆ Heater locks off. ◆ Cooling valve locks open. **Power must be cycled to reset this fault.**	Has water stopped flowing through the unit or between the supply outlet and return inlet?	Verify that the unit is running and that the pump is working. Check for closed or defective cooling or vent valves and plugged lines. *See Repairing Cooling Valves.* Check for external closed valve on the process fluid going to external equipment.
	Has the heater contactor (or SSR) failed with the contacts welded closed?	Replace the contactor if defective. *See Replacing the Heater Contactor.*
	If SSR Model: Has the heatsink fan failed or is the air pathway blocked?	Replace the fan or clear the blocked air pathway. Reset the heatsink thermostat by depressing the button on the top of it.
	Has the optional high temperature switch failed?	Verify that the switch is closed near room temperature with a VOM. If not, replace the optional temperature limit switch.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
brd hot **Controller Board Overheated** The temperature of the controller board has exceeded the maximum permissible operating temperature. This is probably due to excessive temperature inside the electrical control enclosure. **WARNING:** : Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump operates normally. ◆ Heater operates normally. ◆ Cooling valve operates normally. **This fault can be reset by pushing the Alarm Silence/Reset button once the controller board temperature returns to an acceptable level.**	Have the cooling vents on the TCU been blocked?	Check for blocked or plugged cooling vents.
	Is the TCU operating in an ambient environment outside its maximum permissible limits (max of 104°F {40°C}?	Relocate the TCU or provide additional external ventilation or cooling.
	Has the enclosure cooling fan failed or is the air pathway blocked?	Replace the fan or clear the blocked air pathway.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
PUP oL **Pump Overload** The pump is pulling more electrical current than its maximum ratings permit. This is probably due to excessive mechanical loading of the motor. **WARNING:** : Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump shuts off. ◆ Heater shuts off. ◆ Cooling valve closes. **The reset button on the overload must be depressed to clear this fault.** *See Resetting Pump Overload section.*	Is enough restriction provided in the fluid circuit loop?	Install a flow-reducing orifice or introduce some additional fittings/smaller diameter piping.
	Is there mechanical binding due to a physical jam/obstruction in the pump casing volute?	Remove the endcap from the motor and check that the shaft is free to rotate. If not, *see Removing the Pump and Motor.*
	Have the bearings in the motor failed, causing excessive mechanical loading or misalignment?	Remove the endcap from the motor and check that the shaft is free to rotate. If not, *see Removing the Pump and Motor.*
	Is the correct voltage supplied to the pump motor?	Supply voltage should match the rating on the pump nameplate ±10%. If voltage is correct, check wiring connections.
	Is a phase open?	Check voltage, L1 to L2, L2 to L3, L3 to L1. All should be within 3% voltage imbalance*.
	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 is specified on the electrical power prints. Manually trip and reset the overload. If the problem continues, replace the overload. *See Resetting and Replacing Overloads.*

* % Voltage imbalance = 100 x (Maximum deviation from average voltage) / (average voltage)

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

✎ **NOTE:** Although somewhat counter-intuitive, restrictions in the fluid make it easier for the motor to pump the fluid, and therefore require less electrical current.

Fault	Possible Cause	Solution
htr Er 1 **Heater Contactor is Welded Closed** The heater contactor is NOT disconnecting the heater when told to open by the controller. The heater is likely running continuously. ✎ **Note:** This fault is only valid for units with electromechanical contactors. Mercury or SSR heater controls do not produce this error. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump locks on. ◆ Heater locks off (although it is probably still active due to malfunction). ◆ Cooling valve locks open. **Power must be cycled to reset this fault.**	Have the electromechanical heater contactor contacts welded shut and are preventing the contactor from mechanically shuttling to an open position?	Replace the heater contactor. Ensure that the application is a cooling-based application and will only require heater operation for initial machine warm up. For applications requiring continuous heating regulation, contact Conair customer service and inquire about Mercury or SSR upgrade kits for the heater contactor. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	Is a fault in the control wiring or controller outputs continuously powering the heater contactor coil?	Test voltage between the A1 and A2 terminals (coil) on the heater contactor. If 120VAC is found, the contactor is probably not defective. Troubleshoot the problem by searching for the source of this voltage.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
htr Er2 **Heater Contactor is NOT Closing** The heater contactor is NOT closing when told to open by the controller. The heater is likely not able to run. ✎ **Note:** This fault is only valid for units with electromechanical contactors. Mercury or SSR heater controls do not produce this error. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump locks on. ◆ Heater locks off. ◆ Cooling valve locks open. **Power must be cycled to reset this fault.**	Has the electromechanical heater contactor become jammed and is being prevented from mechanically shuttling to a closed position?	Replace the heater contactor. Ensure that the application is a cooling-based application and will only require heater operation for initial machine warm up. For applications requiring continuous heating regulation, contact Conair customer service and inquire about Mercury or SSR upgrade kits for the heater contactor. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	Is a fault in the control wiring or controller outputs failing to provide power to the heater contactor coil?	Test voltage between the A1 and A2 terminals (coil) on the heater contactor. If 120VAC is never found, the contactor is probably not defective. Troubleshoot the problem by searching for why the control signal is not reaching the heater contactor coil.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
brn oUt **Brownout** The TCU experienced a loss of power while it was running. ✎ **Note:** This fault can be selectively enabled/disabled in the user menu under parameter brn. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **Push the Fault Silence/Reset button to reset this fault.**	Did your facility experience a power outage?	Ensure that no other connected equipment has been adversely affected by the power outage. Push the Fault Silence/Reset button, and then push the Run button to restart the TCU.
	Is there a disturbance or voltage imbalance in your electrical system?	Have a qualified electrician review your facility wiring and electrical power. Correct any issues so that the voltage provided to the TCU is as required.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
PhS Err **Phase Loss/Rotation Error** The three-phase electrical power being provided to the TCU is either missing a leg, or has incorrect phase rotation direction (TCU is factory-wired for clockwise, L1-L2-L3, phase rotation). This fault is only present on TCU's that have the optional three-phase monitor included. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED illuminated. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump locks off. ◆ Heater locks off. ◆ Cooling valve locks closed. **Power must be cycled to reset this fault.**	Do you have a dead/low leg in the incoming three phase power? If a portable installation, are different parts of your factory phased differently?	Have a qualified electrician check your three-phase power, and correct any problems. Ensure consistent phasing throughout your facility. --Or-- Reverse any two incoming power legs on the TW-P. *See Connecting the Main Power Source.* Check for proper rotation of pump. *See Testing the Installation.*

NOTE: This feature is an option and not present on all models.

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Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
PrS EH1 **Supply Probe Fault Hi** The "To Process" RTD is malfunctioning or has a break in the wiring. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with SUPPLY LED. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This fault will automatically reset when the problem is corrected.**	Do you have a break in your RTD wiring? Do you have a loose wire?	Check the RTD loop wiring with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	Test the RTD with a VOM. *See Checking the RTD.* If damaged, replace the RTD.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
PrS ELo **Supply Probe Fault Low** The "To Process" RTD is malfunctioning or has a short circuit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with SUPPLY LED. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This fault will automatically reset when the problem is corrected.**	Do you have a short circuit in your RTD wiring?	Check the RTD loop wiring with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	Test the RTD with a VOM. *See Checking the RTD.* If damaged, replace the RTD.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
Prr EH 1 **Return Probe Fault Hi** The "To Process" RTD is malfunctioning or has a break in the wiring. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with SUPPLY LED. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This fault will automatically reset when the problem is corrected.**	Do you have a break in your RTD wiring? Do you have a loose wire?	Check the RTD loop wiring with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	Test the RTD with a VOM. *See Checking the RTD.* If damaged, replace the RTD.

(Continued)

Unit Faults (Continued)

The Thermolator has detected a problem with the internal components, wiring, electrical power, or operating environment. Without correction, the fault could lead to equipment damage or personal injury if it is not corrected.

- The controller displays an error code indicating the cause of the problem.
- The TCU may take automatic control actions, based on the nature of the fault, to best protect the operator and the TCU until the fault is corrected.
- If the optional alarm package is installed, the fault strobe will illuminate and the audible alarm will activate.
- Some faults require a power cycle to reset.

Fault	Possible Cause	Solution
Prr ELo **Return Probe Fault Low** The "To Process" RTD is malfunctioning or has a short circuit. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current. ◆ ALARM LED flashes in conjunction with RETURN LED. ◆ Optional strobe, sounder, dry contacts actuated. ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This fault will automatically reset when the problem is corrected.**	Do you have a break in your RTD wiring?	Check the RTD loop wiring with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	Test the RTD with a VOM. *See Checking the RTD.* If damaged, replace the RTD.

Unit Will Not Power Up

If you press the control power button and the control panel does not light, you have a problem with the main power circuit or the unit's temperature controller.

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

Symptom	Possible Cause	Solution
Applying power does not illuminate the temperature controller display.	Is power reaching the Thermolator?	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 power supply. Replace any damaged wires or cables.
	Is the correct voltage reaching the Thermolator?	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

Symptom	Possible Cause	Solution
Alternating overheating and overcooling or rapid cycling from heat to cool.	Poor water flow.	Check connectors and increase size if necessary. If there are a large number of hoses and/or they are long, try to shorten hose runs and use as large of a hose as possible to minimize water-circuit pressure drop. If quick disconnects with check valves are used, remove the check valves to reduce pressure drop through water circuit.
	Poor connection or failure of RTD.	Check connection, replace if necessary.
	Failure of the microprocessor.	Replace controller.
Unable to heat properly.	Cooling valve is stuck in the open position.	Flush out the cooling valve by adjusting the Set Point up and down several times to open and close the cooling valve. If this does not work, stop the unit and turn off the electric power, shut off the cooling source, and take the valve apart for cleaning or replacement.
	Leaking connection and/or the manual pressure relief valve is in an open condition.	Check for leaks and replace any faulty valves.
	Immersion heater is inoperative	Have a qualified electrician check to see if the heater and/or heater contactor are functioning correctly and replace any defective components.
	Microprocessor controller failure.	Replace controller.
	Failure of RTD.	Replace RTD.

(Continued)

Troubleshooting (Continued)

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

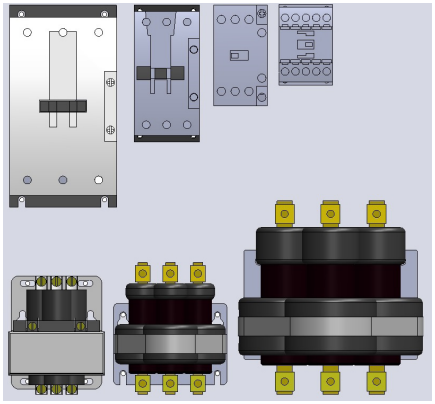
Symptom	Possible Cause	Solution
Unable to cool properly.	Cooling water supply is not sufficient.	Check to make sure the cooling water supply is of sufficient temperature, volume and pressure for the unit.
	Drain (cooling water return line) is not sufficient.	Check the drain (cooling water return line) to ensure there is no restriction preventing water flow to the drain (cooling water return line).
	Cooling valve is inoperative.	Check the drain (cooling water return line) and see if you can feel or hear a change in the flow as the cooling valve open and closes. If you cannot hear or feel the flow it is likely the valve has failed. Replace valve if necessary.
	Plugged heat exchanger (only on models with heat exchanger option).	Clean or replace heat exchanger.
	High backpressure in the cooling water system	Reduce backpressure.
Heater failure.	Unit not filled with water.	Fill unit with water.
	Faulty heater.	Replace heater.
	Plugged heater tube / flow restriction.	Clear obstruction.
Pressure relief valve leaks.	The combined pressure of the incoming cooling water pressure and the unit pump pressure exceeds the pressure rating of the pressure relief valve.	Install a pressure-reducing valve on the incoming cooling water line. Review the start-up procedure for cooling water pressure requirements at various operating temperatures.
	Pressure relief valve stuck in open position.	Replace valve.

Replacing the Heater Contactor

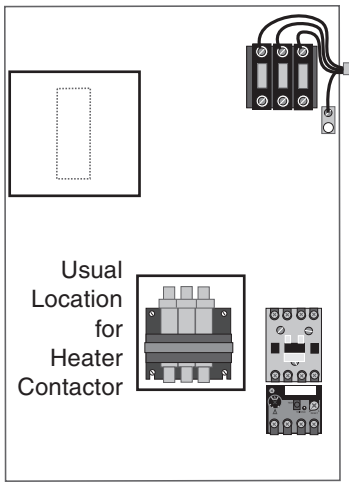
⚠ WARNING: Electrical Shock Hazard
Only qualified service personnel who have been trained on electrical testing and the procedures for avoiding the hazards should diagnose or correct problems that require opening the unit with power on.

The heater contactors should be replaced if:

- You have checked the continuity and found that resistance across the coil equals zero ohms or is an open circuit.
- You have checked continuity of the power legs (with the heater wires disconnected) and find them continuously connected. Or, you have checked continuity across the power legs and find an open circuit even when the coil is energized.



To replace the heater contactor:



1. **Disconnect and lockout the main power.**
2. **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.
3. **Disconnect wires from the heater contactor.** Make sure you label the wires to ensure you can connect them correctly to the new contactor.
4. **Remove the contactor** by removing the mounting screws that hold it in place.
5. **Reverse this procedure starting with step 4 to install the new contactor.** Make sure the wires are connected correctly.

Checking the RTD

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 Thermolator uses a Pt100 RTD to monitor the "to process" and "from process" temperature. One Pt 100 RTD is installed in the wall of the heater tank at the "to process" outlet. The other is installed in the mixing tank (or heat exchange) near the "from process" outlet.

Sensor error codes (Er_1) displayed by the temperature controller may indicate RTD failure.

To check a RTD after a sensor error:

1. **Disconnect and lockout the main power.**
2. **Open the electrical enclosure door.** Turn the screw on the front panel counterclockwise to open.
3. **Remove RTD wiring terminal strip.** Refer to the wiring diagrams that came with your unit.
4. **Verify the resistance of the RTD using a VOM. Polarity does not matter. If incorrect, replace.** *Refer to the table on the nest page.*

(Continued)

Checking the RTD (Continued)

Pt100

	0	1	2	3	4	5	6	7	8	9	
Temp T	**Resistance at T**	**Resistance at T+1°F**	**Resistance at T+2°F**	**Resistance at T+3°F**	**Resistance at T+4°F**	**Resistance at T+5°F**	**Resistance at T+6°F**	**Resistance at T+7°F**	**Resistance at T+8°F**	**Resistance at T+9°F**	**Temp T**
°F	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	°C
50	103.9	104.1	104.3	104.6	104.8	105.0	105.2	105.4	105.6	105.8	10.0
60	106.1	106.3	106.5	106.7	106.9	107.1	107.4	107.6	107.8	108.0	15.6
70	108.2	108.4	108.7	108.9	109.1	109.3	109.5	109.7	109.9	110.2	21.1
80	110.4	110.6	110.8	111.0	111.2	111.5	111.7	111.9	112.1	112.3	26.7
90	112.5	112.7	113.0	113.2	113.4	113.6	113.8	114.0	114.3	114.5	32.2
100	114.7	114.9	115.1	115.3	115.5	115.8	116.0	116.2	116.4	116.6	37.8
110	116.8	117.0	117.3	117.5	117.7	117.9	118.1	118.3	118.5	118.8	43.3
120	119.0	119.2	119.4	119.6	119.8	120.0	120.3	120.5	120.7	120.9	48.9
130	121.1	121.3	121.5	121.7	122.0	122.2	122.4	122.6	122.8	123.0	54.4
140	123.2	123.5	123.7	123.9	124.1	124.3	124.5	124.7	124.9	125.2	60.0
150	125.4	125.6	125.8	126.0	126.2	126.4	126.6	126.9	127.1	127.3	65.6
160	127.5	127.7	127.9	128.1	128.3	128.6	128.8	129.0	129.2	129.4	71.1
170	129.6	129.8	130.0	130.3	130.5	130.7	130.9	131.1	131.3	131.5	76.7
180	131.7	132.0	132.2	132.4	132.6	132.8	133.0	133.2	133.4	133.6	82.2
190	133.9	134.1	134.3	134.5	134.7	134.9	135.1	135.3	135.5	135.8	87.8
200	136.0	136.2	136.4	136.6	136.8	137.0	137.2	137.4	137.7	137.9	93.3
210	138.1	138.3	138.5	138.7	138.9	139.1	139.3	139.6	139.8	140.0	98.9
220	140.2	140.4	140.6	140.8	141.0	141.2	141.4	141.7	141.9	142.1	104.4
230	142.3	142.5	142.7	142.9	143.1	143.3	143.5	143.8	144.0	144.2	110.0
240	144.4	144.6	144.8	145.0	145.2	145.4	145.6	145.9	146.1	146.3	115.6
250	146.5	146.7	146.9	147.1	147.3	147.5	147.7	147.9	148.2	148.4	121.1
260	148.6	148.8	149.0	149.2	149.4	149.6	149.8	150.0	150.2	150.4	126.7
270	150.7	150.9	151.1	151.3	151.5	151.7	151.9	152.1	152.3	152.5	132.2
280	152.7	153.0	153.2	153.4	153.6	153.8	154.0	154.2	154.4	154.6	137.8
290	154.8	155.0	155.2	155.4	155.7	155.9	156.1	156.3	156.5	156.7	143.3
300	156.9	157.1	157.3	157.5	157.7	157.9	158.1	158.4	158.6	158.8	148.9

(Continued)

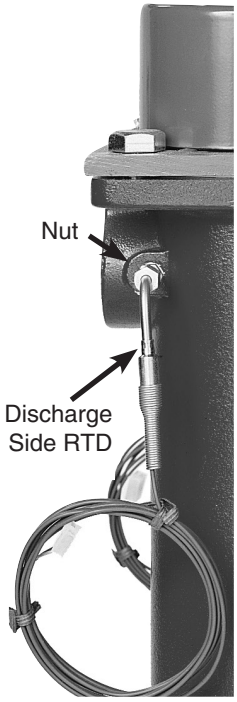
Replacing RTDs

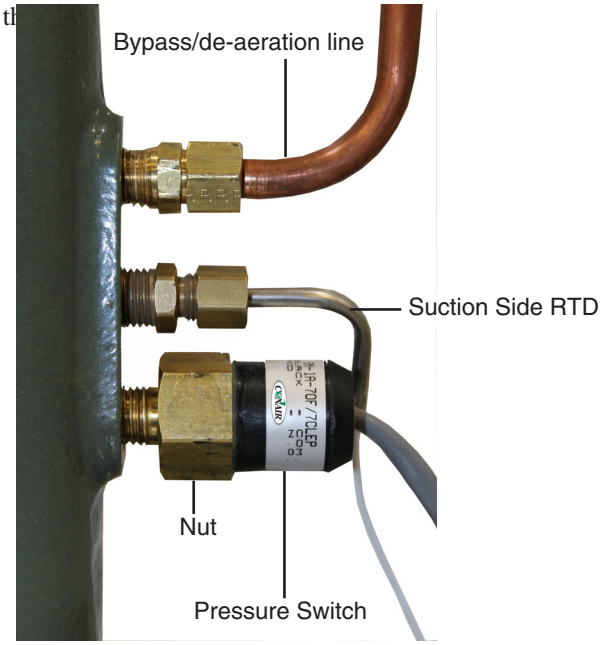
WARNING: Hot Surfaces

Allow the Thermolator to cool to below 100° F {38° C} before servicing the unit.

To replace an RTD:

1. **Disconnect and lockout the main power.**
2. **Shut off the cooling water in and drain the unit.** Drain water to below the RTD level using the handle on the Pressure Relief Valve located the bottom of the unit.
3. **Remove the unit's top panel and open the electrical enclosure.**
4. **Remove the RTD.** Loosen the compression nut to slide the RTD out of the casing. Disconnect the RTD wires at the terminal strip. Note locations of wires before disconnecting. Remove wire ties.
5. **Install the new RTD.** Insert the tip of the new RTD at least 1 inch into the tank. Tighten the compression nut. Thread the leads through the raceway leading to the electrical enclosure.
6. **Re-secure RTD wires to the various wire mounts** to keep th the heater housing, pump casing, or motor housing. Wire the RTD wires to secure them within the electrical cabinet.
7. **Trim extra wire off, if possible. Strip and attach RTD leads to the terminal strip at locations noted in step 4.** Polarity does not matter.





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

NOTE: You may want to test the resistance of the new RTD to ensure it aligns with the table in the previous section.

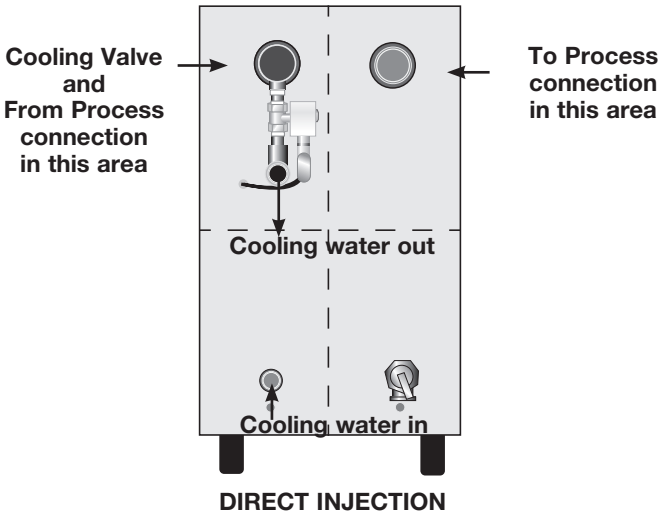
Repairing Cooling Valves

Every Thermolator has a valve assembly that controls the cooling water out flow. Cooling valves also are found on the optional purge valve.

WARNING: Electrical Shock and Hot Surface Hazard

Before attempting maintenance of any kind on the Thermolator, you must stop the unit; disconnect and lockout the main power supply; and allow the unit to cool to 100° F {38° C}.

This configuration is used for 48 kW and ¾ valves and up.



DIRECT INJECTION

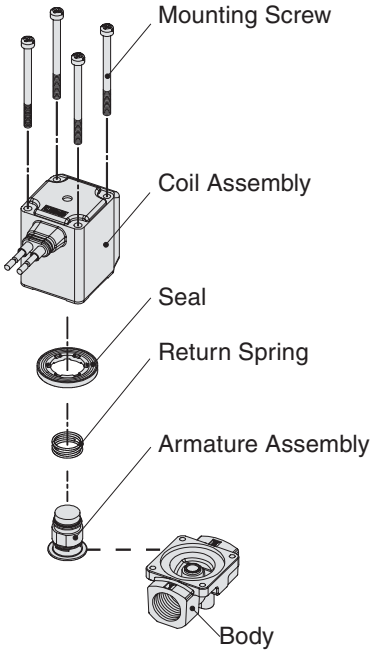
1. **Shut off the cooling water in.**
2. **Drain the unit of all water** through the drain plug in the rear of the unit.
3. **Remove the connections to the cooling water out.**
4. **Disconnect and lockout main power.**
5. **Remove the valve from the cooling water out line.**
6. **Disassemble the valve.** *(See exploded views on next page.)*
7. **Inspect and clean or repair the valve body assembly.** Remove foreign particles and replace damaged parts as necessary.
8. **Reassemble the valve and other components.** Reassemble in reverse order. Seal all pipe fittings with pipe sealant. Check that all flows are in the correct direction. Check for leaks before resuming operation.

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the United States,
Call: 814 437 6861

Disassembly of Alternate Direct Acting Solenoid Valves

Disassembly

1 **Loosen the mounting screws.** The coil assembly, seal, return spring, armature assembly and body can be removed.



Assembly

Common to N.C. and N.O.

1 **Loosen the mounting screws.** The coil assembly, seal, return spring, armature assembly and body can be removed.

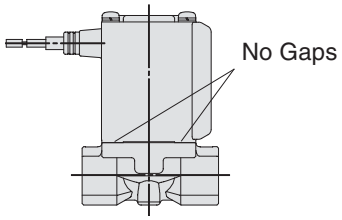
2 **When changing the electrical entry direction, turn the coil assembly in a desired direction to mount it**.

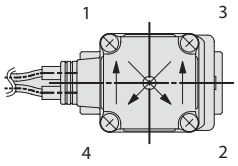
3 **Push the coil assembly against the body and tighten the screws two or more rounds diagonally in the status that there are not gaps between the coil assembly and body.** Tighten the screws in the order of "1-> 2 -> 3 -> 4 -> 1 -> 2 -> 3 -> 4".

NOTE: Your valve may appear different from this model. *Refer to the next page.*

Proper Tightening Torque

267201-01 & 267201-02	0.37 lbf ft {0.5 N·m}
All others	0.52 lbf ft {0.7 N·m}



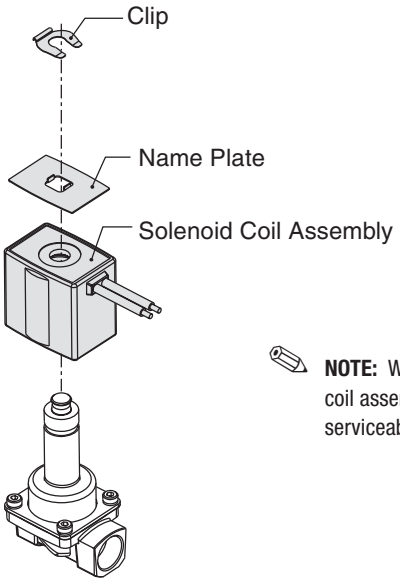


Tighten Screws two or more rounds diagonally.

4 **After tightening the screws, make sure that there are no gaps between the coil and body.**

5 **After the disassembly and assembly have been completed, make sure that no leak occurs from the seal.** Additionally, when restarting the valve, make sure that the valve operates correctly after checking the safety.

Alternate Pilot Operated Solenoid Valves

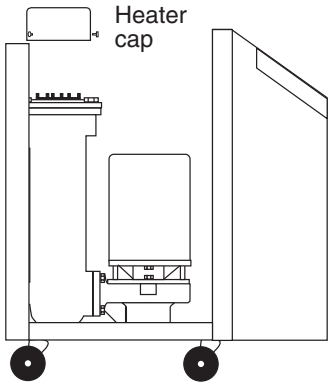


NOTE: Within the valve body and coil assembly there are no user serviceable parts.

Replacing Immersion Heaters

WARNING: Electrical Shock and Hot Surface Hazard

Before attempting maintenance of any kind on the Thermolator, you must stop the unit; disconnect and lockout the main power supply; and allow the unit to cool to 100° F {38° C}.



1. **Disconnect and lockout the main power.**
2. **Remove the top panel of the Thermolator.**
3. **Remove the heater cap.** Use a 1/4-inch open-ended wrench to remove the three bolts that hold the cap to the heater tank.
4. **Remove the heater wiring harness.** Label the wiring layout of the heater terminals; wires are labeled as 2T1, 2T2, 2T3 and GND. (They may also be labelled as 3T1, 3T2, 3T3 if dual-fed or 48kw units)

   Record the position of bus links, jumpers, and feed wires so they can be replaced in exactly the same manner on the replacement heater.

   Then unscrew the nuts on the cable connectors and remove the wires.

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

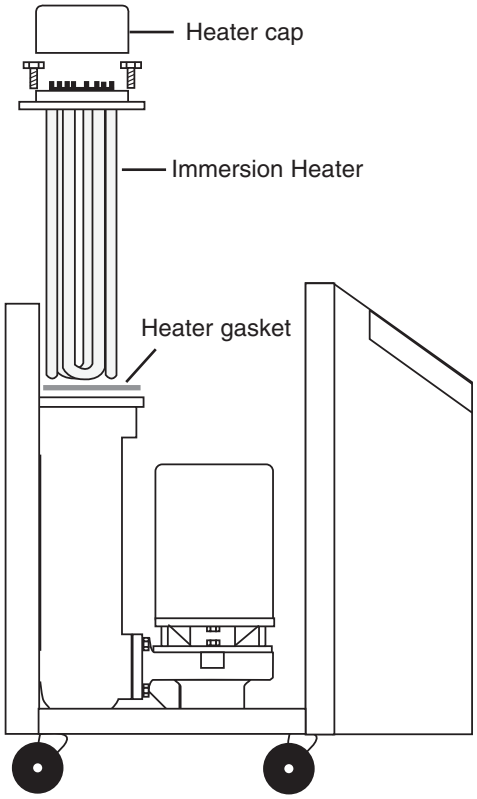
5. **Shut off the cooling water in.**
6. **Drain the Thermolator using the Pressure Relief Valve located at the rear of the unit.**
7. **Remove the four bolts that hold the heater element in place.** Use a 9/16-inch socket.

If heater feed wires terminate in hexagonal termination studs, remove those studs from the heater with a nutdriver and re-install on the replacement heater."

(Continued)

Replacing Immersion Heaters (Continued)

8 **Lift the heating element out of the heater tank.** Lift the element straight up.



9 **Clean the heater tank.** Remove any rust or solids that may have built up before inserting the heater elements.

10 **Replace the heater gasket** if it is worn or cracked.

11 **Reverse these steps to install the new heater element and reassemble the unit.**

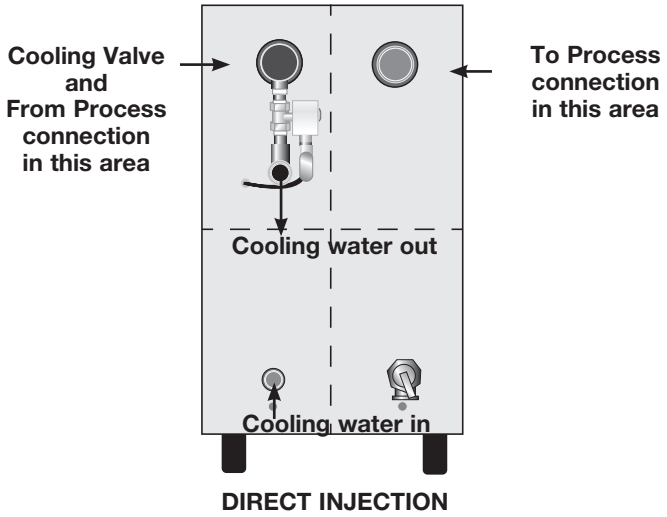
Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

Removing the Pump

WARNING: Electrical Shock and Hot Surface Hazard

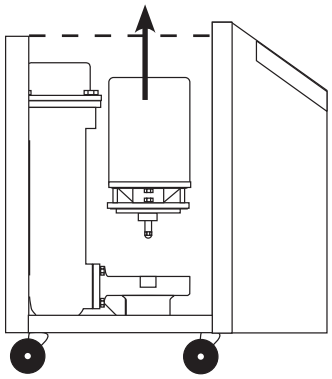
Before attempting maintenance of any kind on the Thermolator, you must stop the unit; disconnect and lockout the main power supply; and allow the unit to cool to 100° F {38° C}.

This configuration is used for 48 kW and ¾ valves and up.



1. **Disconnect and lockout the main power.**
2. **Shut off the cooling water in feed.**
3. **Drain the unit of all fluid.** Remove the drain plug at the rear of the unit.
4. **Remove the top and side panels of the Thermolator.**
5. **Remove the pump assembly bolts.** Use a 9/16-inch open-end box wrench to remove the bolts holding the pump to the pump casing. The bolt in the rear will require a 9/16-inch socket wrench.
6. **Remove the center brace that runs from the top rear to the front of the Thermolator.**
7. **Lift the pump assembly straight up to remove.** The pump can now be replaced or disassembled for repair. The center brace detail needs to be removed on selection pumps removal.
8. **Reverse the steps to reassemble the unit.**

NOTE: Before restarting, close all drain openings using sealant on the threads and reprime the pump. Do not start until the pump is completely filled with water.



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.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee.
Most manuals can be downloaded free of charge from the product section of the Conair website.
www.conairgroup.com

How to Contact Customer Service

To contact Customer Service personnel, call:

NOTE: Normal operating hours are 8:00 am - 5:00 pm EST. After hours emergency service is available at the same phone number.

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, control type from the serial tag, 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.

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.

PID Parameters

The Conair TW-S and TW-P Thermolator features a PID ("proportional-integral-derivative") control-loop algorithm implemented in the programming of the controller board. This algorithm is used to achieve the proper temperature of the process fluid quickly and accurately. The following tables and paragraphs describe its operation.

The default factory PID parameters loaded into the TW-S and TW-P should work well under most applications. However, due to a wide variety of situations and system requirements, these parameters can be adjusted to best serve a particular application.

PID Default Parameters			
	Default	**Controller Parameter**	**Comments**
Proportional band	20	bnd	*Smaller* number = more aggressive proportional cooling response.
Derivative time	5	dEr	*Larger* number = more aggressive derivative cooling response.
Integral time	25	I nt	*Smaller* number = more aggressive integral cooling response.
Proportional band ratio	5	Pbr	Used to adjust closing vs. opening strength of modulating valve.

Proportional

The main driver for the Thermolator control loop is the proportional response. Proportional logic is very simple—it selects a heating or cooling level (strength) based on how close the process temperature is to the setpoint.

The proportional parameter defines a band over what range of degrees the temperature controller will taper-off its heating or cooling. Heating/Cooling will be applied at 100% if the process temperature is more than the band parameter away from the setpoint. A smaller number will produce a more aggressive proportional response because it will shrink the band.

If the Thermolator is not providing a strong enough heating or cooling response for a given situation, this parameter number should be made more aggressive (a smaller number should be used).

Typical values would be 1% to 30% of setpoint. The cool proportional band and the heat proportional band are factory set to the same number. If you have a very warm external cooling water source, you may want to make the cool proportional band number smaller than the heat proportional band. Likewise, if your cooling water source is very cold, you may want to make the cool proportional band larger than the heat proportional band.

(Continued)

PID Parameters (Continued)

Integral

Using only proportional control will cause the Thermolator to have steady-state error (it will never exactly reach setpoint). Integral response is used to eliminate this undesirable condition.

Integral logic introduces the awareness of the passage of time into the logic by looking into the past—and observing how far the process has been from the setpoint over time. The farther away the process is from setpoint for a longer and longer time, the more it causes the Thermolator to produce a stronger counter-response. Integral action is internally disabled whenever the Thermolator is far (further than the proportional band) from the setpoint because it has no merit under this condition.

A smaller number will produce a more aggressive integral response. "0" will completely turn off integral response.

If the process temperature is approaching the setpoint too slowly, a stronger integral response (a smaller parameter number) can be used to remedy the situation. Too much integral response can cause the Thermolator temperature to severely oscillate. Typical values would range from 30 to 400.

Derivative

Derivative response is used to eliminate overshoot. It is also used to compensate for the slow-responding modulating valve option. Like integral logic, it is aware of the passage of time—it looks forward into the future and anticipates if the machine will be overshooting the setpoint at some point in the future, based on current trends.

Derivative action is disabled whenever the Thermolator is far (further than twice the proportional band) from the setpoint.

A larger number will produce a more aggressive derivative response.
If the system temperature is overshooting the setpoint, try a more aggressive derivative response. If the system stutters or temporarily reverses temperature direction as approaching setpoint, your derivative response is too aggressive. If overshoot is not a concern, or you have a very large system, derivative control can be completely turned off by setting the parameter to "0" without negative consequences.

Manual Tuning Procedure

If you find yourself in a situation where the Thermolator is responding in an unpredictable manner, follow the procedure below to simplify the control loop and pick appropriate PID parameters.

PREREQUISITES:

- ❒ *Your cooling water must be at a reasonably stable temperature and pressure.*
- ❒ *Your external heat load on the Thermolator must be reasonably constant.*
- ❒ *Select a setpoint for tuning that is similar to a typical setpoint for the process.*
- ❒ *You must have sufficient time to run your system through several thermal cycles in order to perform a full tuning.*

(Continued)

PID Parameters (Continued)

STEPS:

Set Default Parameters

1 **Turn off all derivative control by setting dEr and dEH to "0".**

2 **Minimize integral control by setting Int and inH to "800".**

3 **Set proportional control of bnd and PbH to an initial value of approximately 10% of setpoint.** For example, if your setpoint is 150°F {66°C}, set these parameters to "15".

Run a Test - Proportional

4 **Start the Thermolator and observe it attempting to reach setpoint.**

5 **Decrease the values of bnd and PbH until the system beings to oscillate around the setpoint.** You may have to cool-down your system and repeat the experiment several times so you can accurately observe the process temperature approaching setpoint.

6 **Multiply the value determined by step 5 by "2" and enter it as parameters bnd and PbH.**

Continue the Test – Proportional + Integral

7 **Decrease the integral setting Int and inH by a factor of two and run the system through a thermal cycle.** For example, change it from "800" to "400", then "200", then "100, etc. Repeat as necessary. You should observe the steady-state error disappear and the system reach setpoint. If the system begins to oscillate around the setpoint, you have gone too far.

8 **Cool-down your system and repeat the experiment so you can truly observe the process temperature approaching setpoint.** You will probably observe the temperature overshooting the setpoint. If overshoot is acceptable for your process, there is no reason to continue tuning. If you would like to eliminate overshoot in exchange for slightly longer times until setpoint it reached, read on, as overshoot can be eliminated using the next step.

Continue the Test – Proportional + Integral + Derivative

9 **Set the derivative parameters dEr and dEH to "1".** Run the system through a thermal cycle and observe the overshoot the first time it reaches setpoint.

10 **Double the derivative parameters dEr and dEH and run the machine through another thermal cycle.** If you have a modulating valve, you may wish to observe its position, since derivative control will help the system properly anticipate the slow operating time for such a valve.

11 **Repeat the doubling process of parameters dEr and dEH until overshoot is satisfactorily eliminated.** If the system stutters or temporarily reverses temperature direction as approaching setpoint, your derivative response is too aggressive and you need to decrease this parameter.

(Continued)

PID Parameters (Continued)

Finished

12 **You should review your work and make sure your system is not on the verge of oscillating.** If your system oscillates intermittently, you probably have your gains too aggressive. It is better to be mild in your tuning than over-aggressive.

13 **You are now finished tuning your system.** Be sure to record your parameters bnd, dEr, Int, PbH, dEH, inH. The parameters may need to be tweaked if your system or setpoint changes significantly.

Setting the Security Passcode

The TW-S and TW-P Thermolator provides the ability to protect system parameters from accidental or unauthorized changes. Access to all user-configurable parameters can be limited by selecting a three digit passcode between 0 and 500.

While the TW-S and TW-P ships with the factory-default "0" as the passcode, we recommend selecting your own unique passcode to protect your machine setup and application.

To change the security passcode:

1 **Stop the TCU or ensure that you are on the home screen by pressing the STOP button** 

.

2 **Enter the user configuration menu by holding the "Function"** 

button for ten seconds. Assuming that the existing passcode is at its default "0", simply push "Select" 

.

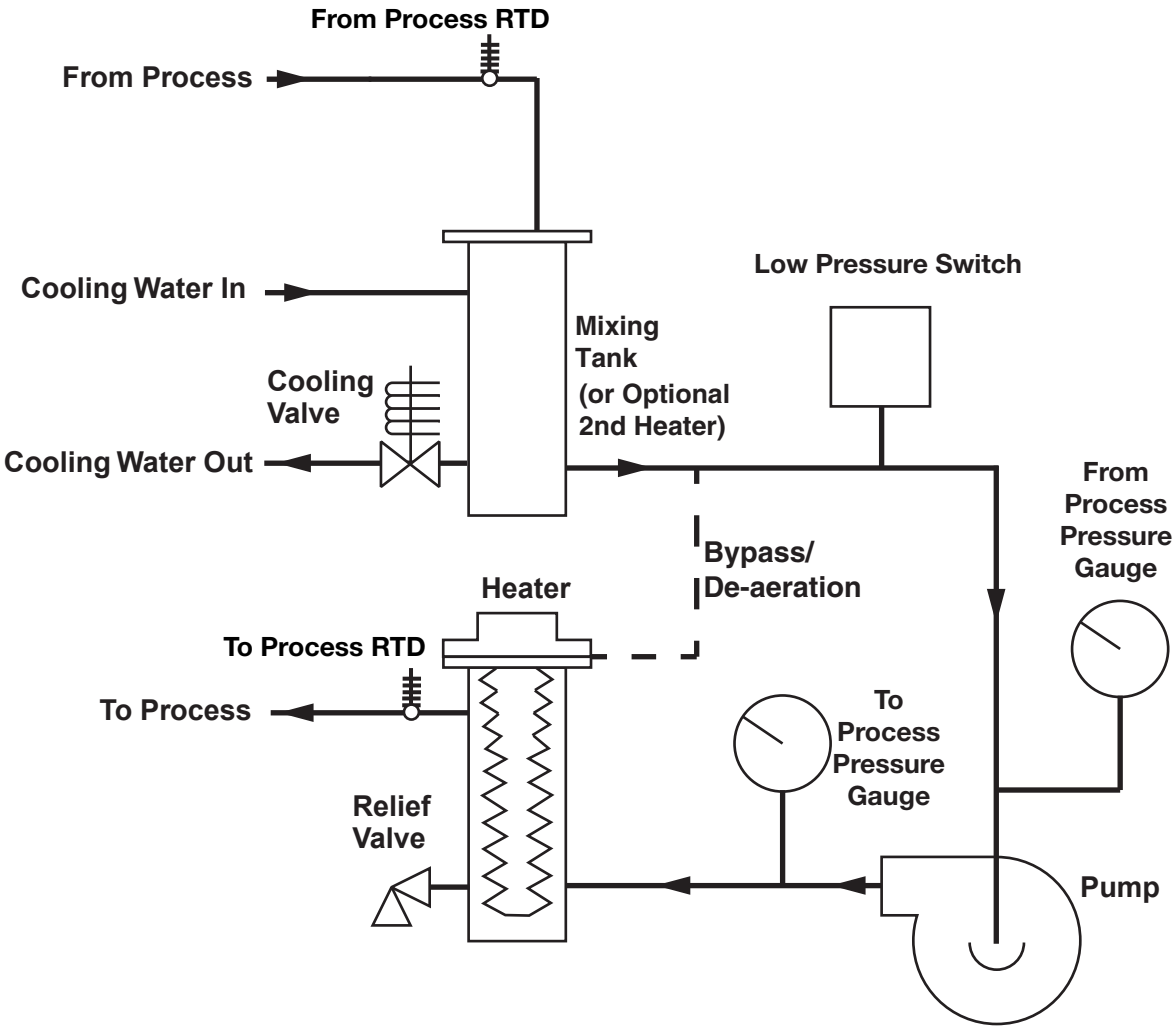
3 **The upper display should now show UPA. In the lower display, use the "Up" or "Down"**   **buttons to select the three-digit passcode from 0 to 500 as desired.**

4 **Push "Select"** 

to save the changed parameter. Push "STOP" 

to exit.

Plumbing Diagram

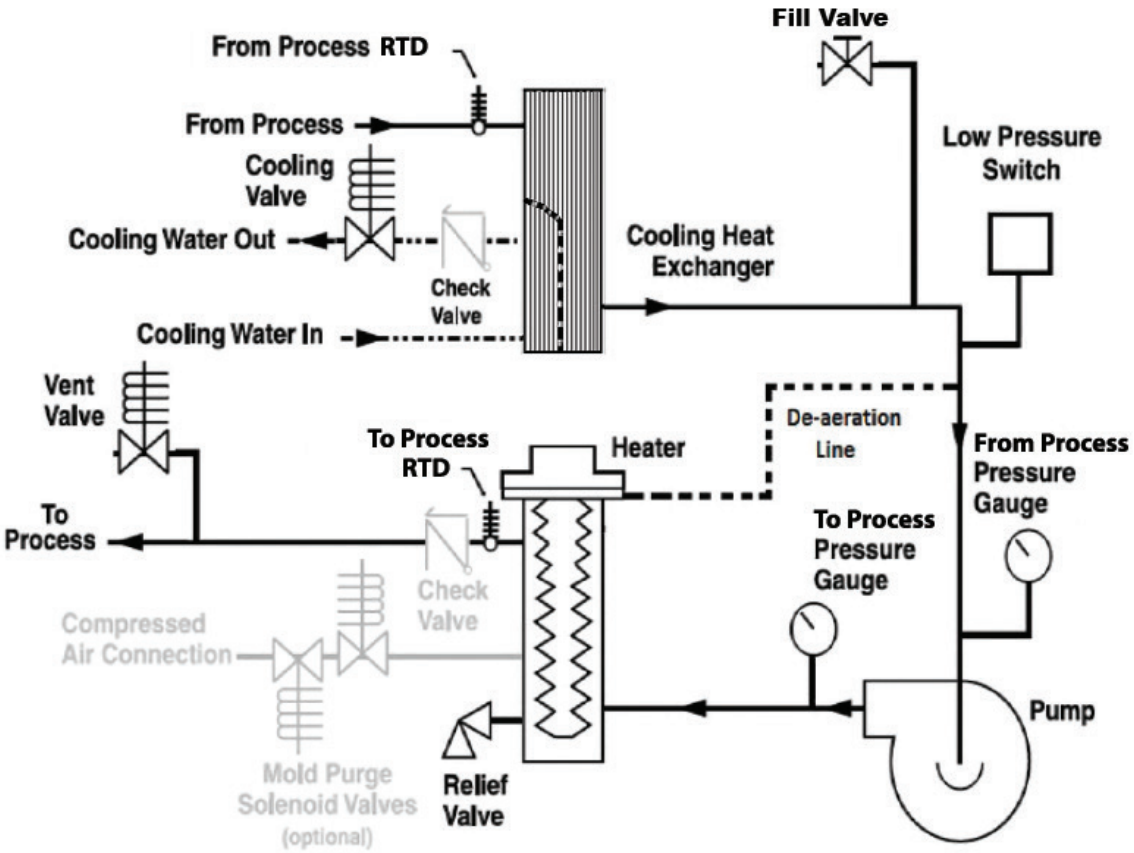


TW-S Direct Injection

(Continued)

Plumbing Diagram (Continued)

Closed Circuit Separate Source



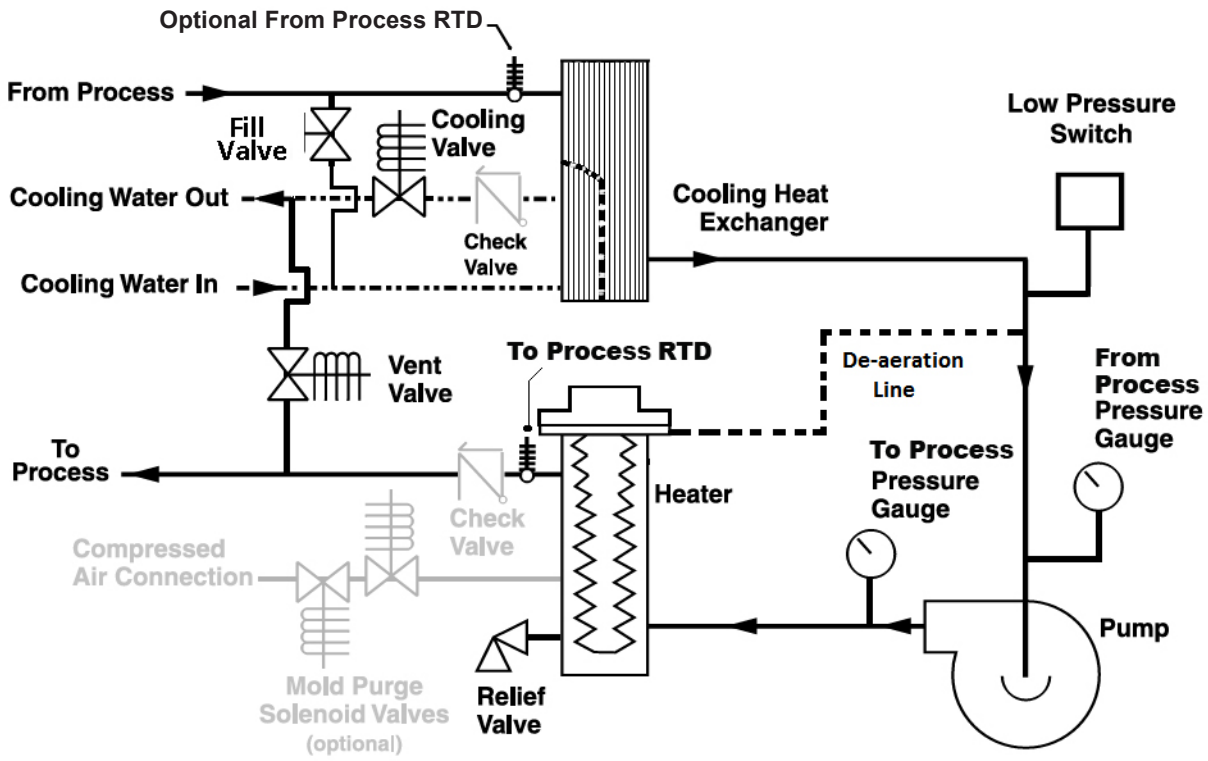
TW-P Closed Circuit Separate Source

In this configuration process and cooling fluids do not mix.

(Continued)

Plumbing Diagram (Continued)

Closed Circuit Common Source



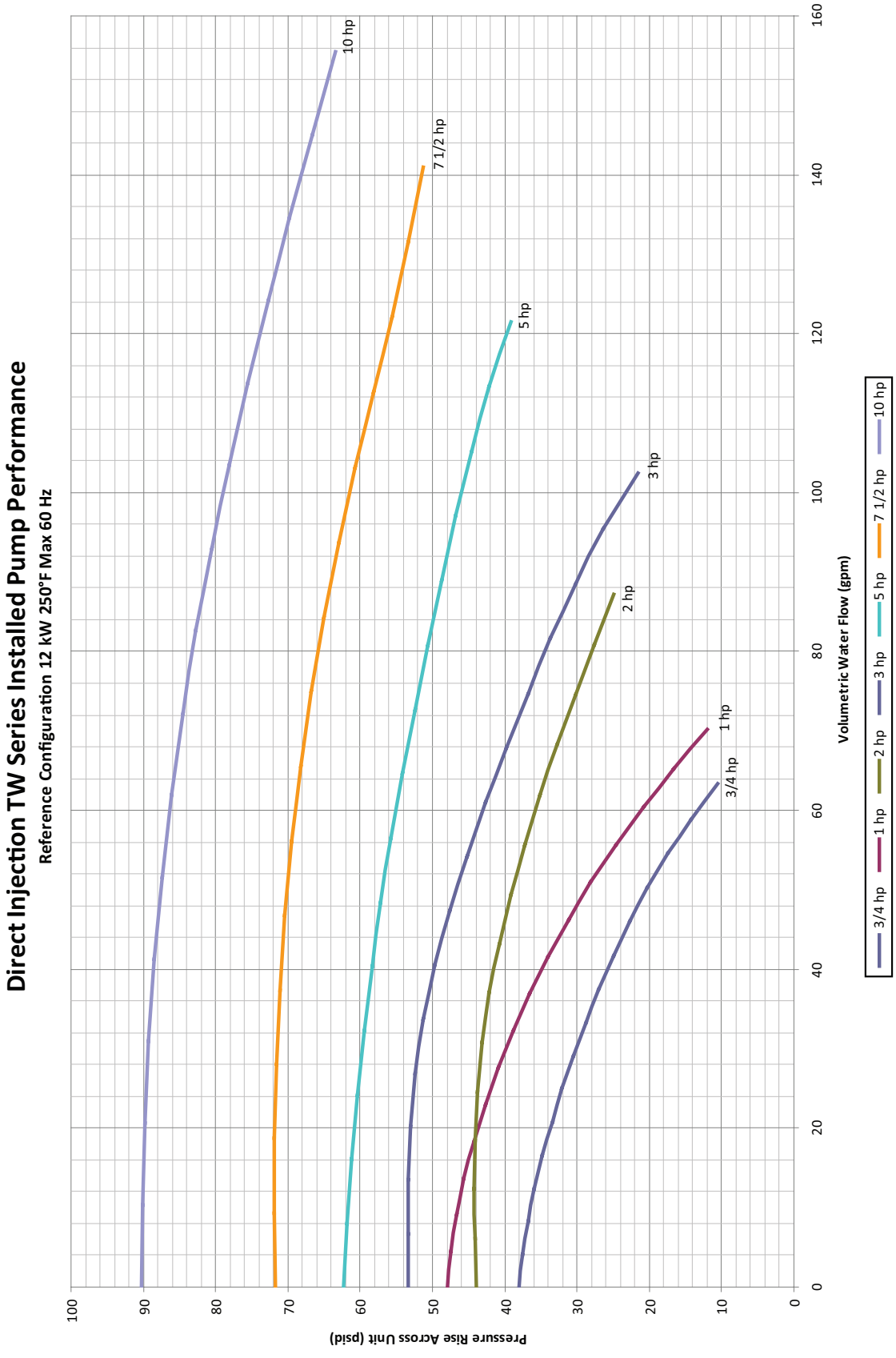
TW-S Closed Circuit

In this configuration process and cooling fluids mix only at filling.

Fill line is used for both pressurization and expansion of process fluid (causes limited interaction of process and cooling water).

Plumbing Curves

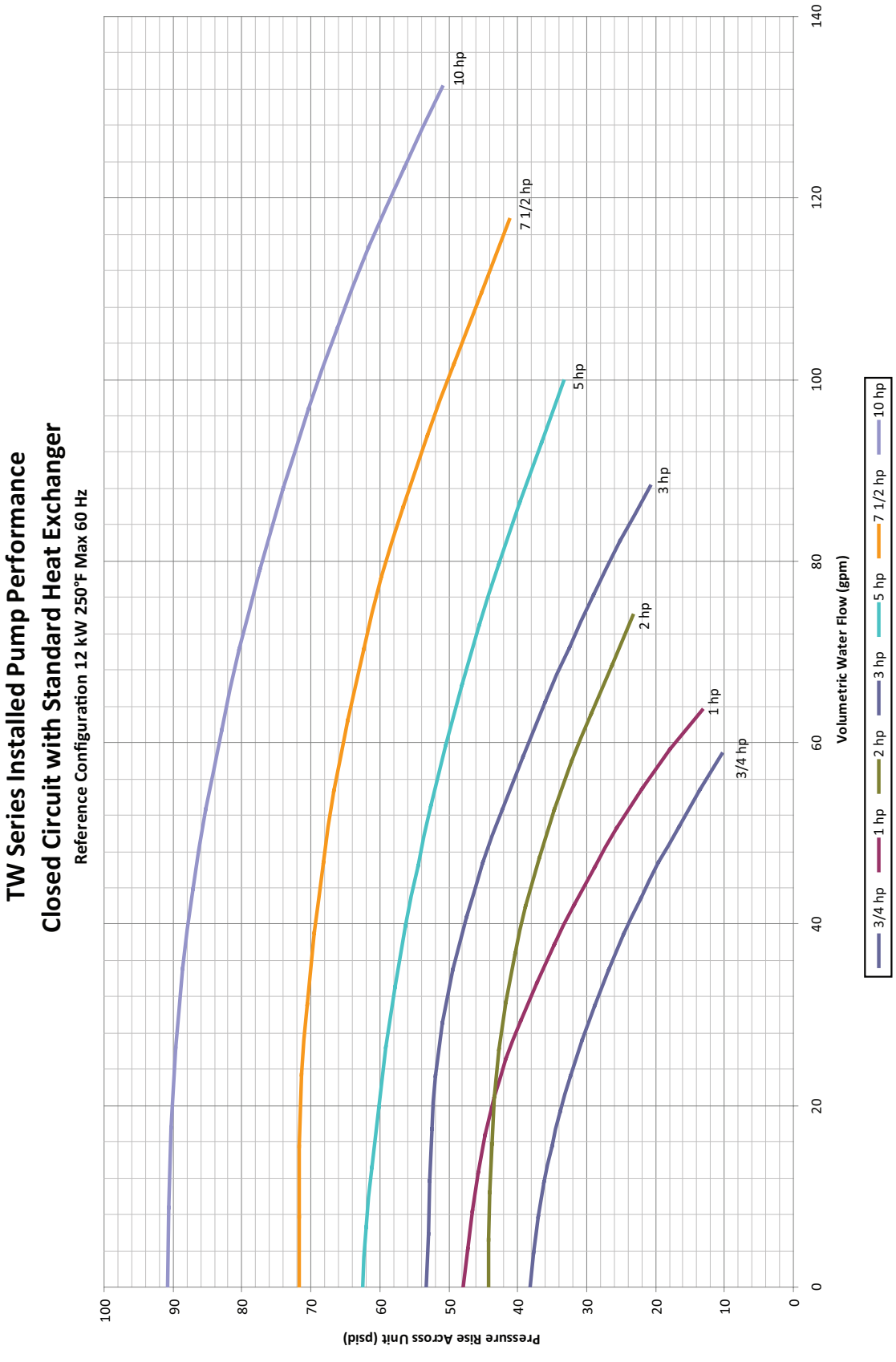
Direct Injection



(Continued)

Plumbing Curves (Continued)

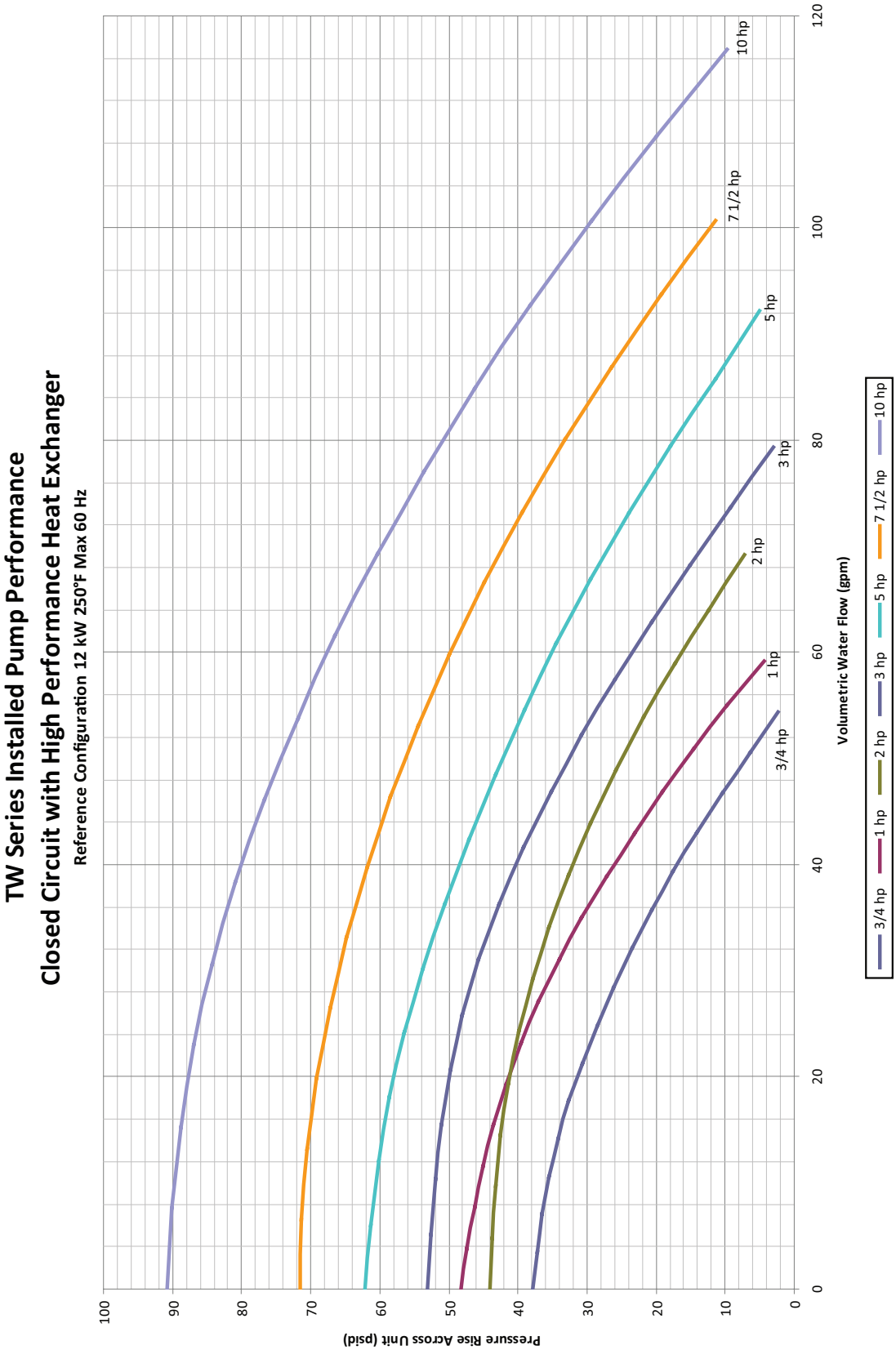
Closed Circuit Standard Performance



(Continued)

Plumbing Curves (Continued)

Closed Circuit High Performance



Service Parts List

IMPORTANT: The spare parts list shown in this manual is for guidance and reference only. This list is based on commonly used parts on standard equipment at the time of publication of the manual. Always consult with Conair for the most accurate information when it comes to what parts should be used on your piece of Conair equipment. Having your serial number available when you contact Conair ensures that you get the correct parts for your equipment.

TW-S and TW-P Thermolators

Manuals	
PART NUMBER	**DESCRIPTION**
UGH056/0320	User Guide, Thermolator TW-S and TW-P

PUMP ASSEMBLIES	HP	VOLTAGE	POWER FREQUENCY	NON FERROUS *BRONZE
PART NUMBER				
2672030104	3/4	208-230/460	60	X*
2672030204	1	208-230/460	60	X*
2672030304	2	208-230/460	60	X*
2672030401	3	208-230/460	60	X*
2672030504	5	208-230/460	60	X*
2672030604	7.5	208-230/460	60	X*
2672030701	10	208-230/460	60	X*
MOTOR (ONLY)				
2672030000A2	3/4	208-230/460	60	X
2672030000A3	1	208-230/460	60	X
2672030000A4	2	208-230/460	60	X
2672030000A5	3	208-230/460	60	X
2672030000A6	5	208-230/460	60	X
2672030000A7	7.5	208-230/460	60	X
2672030000A8	10	208-230/460	60	X
VOLUTE/CASING				
2672030000E4	3/4	208-230/460	60	X
2672030000E4	1	208-230/460	60	X
2672030000E5	2	208-230/460	60	X
2672030000E5	3	208-230/460	60	X
2672030000E6	5	208-230/460	60	X
2672030000E6	7.5	208-230/460	60	X
2672030000E6	10	208-230/460	60	X
MOTOR ADAPTERS				
2672030000F3	3/4	208-230/460	60	X
2672030000F3	1	208-230/460	60	X
2672030000F3	2	208-230/460	60	X
2672030000F3	3	208-230/460	60	X
2672030000F4	5	208-230/460	60	X
2672030000F4	7.5	208-230/460	60	X
2672030000F4	10	208-230/460	60	X

Contact Conair
Parts and Service
Phone: 800-458-1960
From outside of the
United States,
Call: 814 437 6861

(Continued)

Service Parts List (Continued)

TW-P Thermolators

PUMP ASSEMBLIES	HP	VOLTAGE	POWER FREQUENCY	NON FERROUS *BRONZE
IMPELLERS				
2672030000G8	3/4	208-230/460	60	X
2672030000G9	1	208-230/460	60	X
2672030000G10	2	208-230/460	60	X
2672030000G11	3	208-230/460	60	X
2672030000G12	5	208-230/460	60	X
2672030000G13	7.5	208-230/460	60	X
2672030000G14	10	208-230/460	60	X
SEAL KITS				
267203SK0101	3/4			
267203SK0102	3/4			
267203SK0101	1			
267203SK0102	1			
267203SK0101	2			
267203SK0102	2			
267203SK0101	3			
267203SK0102	3			
267203SK0201	5			
267203SK0202	5			
267203SK0201	7.5			
267203SK0202	7.5			
267203SK0201	10			
267203SK0202	10			

External Interfaces

Analog Remote Setpoint / Process Temp Retransmit

Connecting to the Thermolator

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

External analog signals must be fully isolated from ground. Be sure to use fully isolated analog channels and/or power supplies. Analog wires must not be common or referenced to earth ground! Failure to heed this requirement will permanently damage the analog circuits in the TCU.

Setting the Jumpers

See the table below for the proper jumper position. These jumpers are also shown on sheet 4 of the electrical print.

Wiring the circuit

Sheet 4 on the electrical print illustrates the proper way to wire the remote interface. You can choose either 4-20mA or 0-10VDC, not both simultaneously.

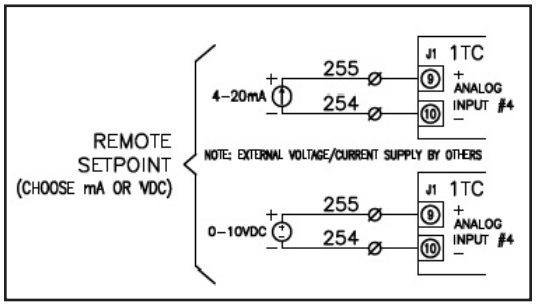
Circuit Impedance Requirements		
	0-10VDC	**4-20mA**
Remote Temperature Setpoint (Input)	11kΩ internal controller impedance.	50Ω internal controller impedance.
	NOTE: Voltage or loop current source must be supplied by the external interface.	
Process Temperature Retransmit (Output)	1kΩ minimum external impedance.	500Ω maximum external impedance.
	NOTE: Voltage or loop current is self-generated by the TCU's temperature controller.	

Terminal Wiring / Jumpers								
	0-10VDC		**4-20mA**					
Remote Temperature Setpoint (Input)	+ Terminal 255	- Terminal 254	+ Terminal 255	- Terminal 254	Analog Input	Jumper Number	Placement (4-20mA)	Placement (0-10V)
					Input #4 J1-9 & J1-10	JMP10	OUT	OUT
						JMP11	OUT	IN
						JMP13	IN	IN
						JMP22	IN	OUT
Process Temperature Retransmit (Output)	+ Terminal #5 on 10-pin analog output daughter card	- Terminal #6 on 10-pin analog output daughter card	+ Terminal #3 on 10-pin analog output daughter card	- Terminal #4 on 10-pin analog output daughter card	Jumper Number	Placement (4-20mA)	Placement (0-10V)	
					JMP1	Pins 2 & 3	Pins 1 & 2	
					For 0-10VDC operation, pins 3&4 must be connected together with an external jumper.			

See electrical print sheet 5 for terminal block locations.

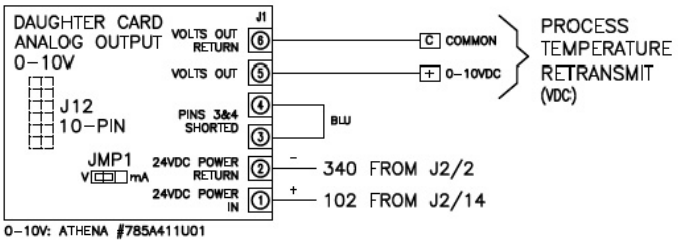
(continued)

External Interfaces (Continued)



1TC Input #4 Jumper Positions			
Analog Input	**Jumper Number**	**Placement (4-20mA)**	**Placement (0-10V)**
Input #4 J1-9 & J1-10	JMP10	OUT	OUT
	JMP11	OUT	IN
	JMP13	IN	IN
	JMP22	IN	OUT

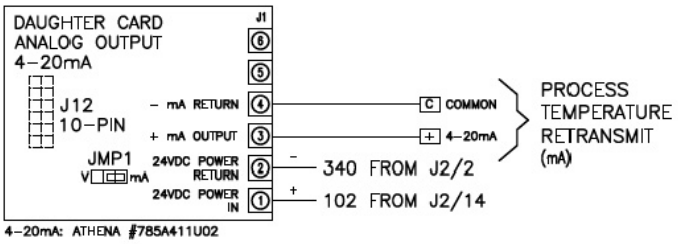
NOTE: Signal is not ground-isolated. Customer's interface must be isolated from ground (or ground loop damage will result).



1kΩ Minimum input impedance

Terminate analog output signal wire directly on J12 daughter board connector J1.

Analog Output (J12) Daughter Card Jumper Positions		
Jumper Number	**Placement (4-20mA)**	**Placement (0-10V)**
JMP1	Pins 2 & 4	Pins 1 & 2



500Ω Maximum input impedance

Terminate analog output signal wire directly on J12 daughter board connector J1.

NOTE: Voltage signal is self-generated by temp controller, but is not ground-isolated. Customer's interface must be isolated from ground (or ground loop damage will result).

NOTE: Current signal is self-generated by temp controller but is not ground-isolated. Customer's interface must be isolated from ground (or ground loop damage will result).

NOTE: Both analog input and output signals are not isolated from each other in controller. Customer's interface must have isolated channels (or reference loop damage will result).

(continued)

External Interfaces (Continued)

Setting the Software

If you ordered the "remote setpoint" option with the TCU, your TCU will come pre-configured to accept a remote setpoint. This means that you will NOT be able to select a setpoint directly from the temperature controller (without changing the default parameters). Additionally, the TCU comes from the factory set to 0-20mA covering the entire range of 10°F to 260°F.

Remote Setpoint Related Parameters				
U34	Remote setpoint enabled	rSE	EnA	Disabled (dLS) or Enabled (EnA)
U35	Remote setpoint type	rSt	nnA	4-20mA (nnA) or 0-10 Volts (U) (be sure to also change jumpers)
U36	Remote setpoint high range	rSH	260	rSL to 999
U37	Remote setpoint low range	rSL	10	-99 to rSH

Process Value Retransmit Analog Output:

If you ordered the "process value retransmit" communication option with the TCU, your TCU will come pre-configured to accept a remote setpoint. This means that you will NOT be able to select a setpoint directly from the temperature controller (without changing the default parameters). Additionally, the TCU comes from the factory set to 0-20mA covering the entire range of 10°F to 260°F.

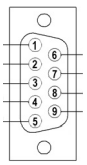
Process Value Related Parameters				
U38	Communications type	Cot	rEt	OFF, Retransmit (rEt), ModBus-RTU (bUS), ModBus-TCP (tcP), or Handheld Remote (HAn) NOTE: No SPI communications
U39	Retransmit type	rtt	nnA	4-20mA (nnA) or 0-10 Volts (U)
U40	Retransmit high limit	rtH	260	rSL to 999
U41	Retransmit low limit	rtL	10	-99 to rEH

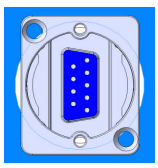
Modbus RTU Communication

Connecting to the Thermolator

The Thermolator has a 2-wire (plus common) RS-485 network for Modbus communication.

Pin 4	T+/R+
Pin 5	T-/R-
DB-9 hood	Common





Setting the Modbus Address and Speed

Modbus Related Parameters				
U38	Communications type	Cot	bUS	OFF, Retransmit (rEt), ModBus-RTU/TCP (bUS), or Handheld Remote (HAn)
U42	Communications Baud Rate	bAU	96	12 to 96
U43	Modbus ID	b id	1	1 to 247

Pressure Switch Settings

All 250° F {121° C} maximum set point temperature units require 25 psig to operate.
For 250° F {121° C} maximum set point temperature and 48 kW heater units the unit with 36 kW of heat will operate at 25 psig, the last 12 kW of heat will not operate without at least 35 psig in the suction side tank.
For 300° F {149° C} units please refer to the tables below.

Direct Injection Units at 300 °F {149° C}									
Minimum System Pressure Required for System Operation (in psig) for 60 Hz Input Power (Digit 7 of Part # is B,C, F, A or D)									
Heater Capacity (Digit 7 of Part #)		Pump Power (Digit 6 of Part #)							
		¾ hp	1 hp	2 hp	3 hp	5 hp	7½ hp	10 hp	Description
Description	Digit 7 Value	D	E	H	J	K	L	M	Digit 6 Value
0 kW	0	60	60	60	60	60	60	60	
3 kW	A	65	65	65	60	60	60	60	
6 kW	B	65	65	65	60	60	60	60	
9 kW	C	65	65	65	60	60	60	60	
12 kW	D	65	65	65	60	60	60	60	
18 kW	E	65	65	65	60	60	60	60	
24 kW	F	60	60	60	60	60	60	60	
36 kW	G	N/A	75	75	75	60	60	60	
48 kW*	H	N/A	75	75	75	60	60	60	
* For 300°F {149° C}, 48 kW, Direct Injection units the minimum pressure in the suction tank for the 12 kW heater to operate is 80 psig									
Minimum System Pressure Required for System Operation (in psig) for 50 Hz Input Power (Digit 7 of Part # is E)									
Heater Capacity (Digit 7 of Part #)		Pump Power (Digit 6 of Part #)							
		½ hp	¾ hp	1 hp	2 hp	3 hp	5 hp	7½ hp	Description
Description	Digit 7 Value	C	D	E	H	J	K	L	Digit 6 Value
0 kW	0	60	60	60	60	60	60	60	
3 kW	A	N/A	70	70	70	60	60	60	
6 kW	B	N/A	70	70	70	60	60	60	
9 kW	C	N/A	70	70	70	60	60	60	
12 kW	D	N/A	70	70	70	60	60	60	
18 kW	E	N/A	70	70	70	60	60	60	
24 kW	F	N/A	70	70	70	70	60	60	
36 kW	G	N/A	N/A	N/A	N/A	75	60	60	
48 kW*	H	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

(continued)

Pressure Switch Settings(continued)

Closed Circuit Units at 300 °F {149° C}									
Minimum System Pressure Required for System Operation (in psig) for 60 Hz Input Power (Digit 7 of Part # is B,C, F, A or D)									
Heater Capacity (Digit 7 of Part #)		Pump Power (Digit 6 of Part #)							
		¾ hp	1 hp	2 hp	3 hp	5 hp	7½ hp	10 hp	Description
Description	Digit 7 Value	D	E	H	J	K	L	M	Digit 6 Value
0 kW	0	60	60	60	60	60	60	60	
3 kW	A	65	65	65	65	60	60	60	
6 kW	B	65	65	65	65	60	60	60	
9 kW	C	65	65	65	65	60	60	60	
12 kW	D	65	65	65	65	60	60	60	
18 kW	E	65	65	65	65	60	60	60	
24 kW	F	65	60	60	60	60	60	60	
36 kW	G	N/A	N/A	N/A	N/A	60	60	60	
48 kW*	H	N/A	75	75	75	60	60	60	
Minimum System Pressure Required for System Operation (in psig) for 50 Hz Input Power (Digit 7 of Part # is E)									
Heater Capacity (Digit 7 of Part #)		Pump Power (Digit 6 of Part #)							
		½ hp	¾ hp	1 hp	2 hp	3 hp	5 hp	7½ hp	Description
Description	Digit 7 Value	C	D	E	H	J	K	L	Digit 6 Value
0 kW	0	60	60	60	60	60	60	60	
3 kW	A	70	70	70	70	60	60	60	
6 kW	B	70	70	70	70	60	60	60	
9 kW	C	70	70	70	70	60	60	60	
12 kW	D	70	70	70	70	60	60	60	
18 kW	E	70	70	70	70	60	60	60	
24 kW	F	75	70	70	70	75	70	70	
36 kW	G	N/A	N/A	N/A	N/A	N/A	70	70	
48 kW*	H	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Mold Purge Installation Instruction Sheet

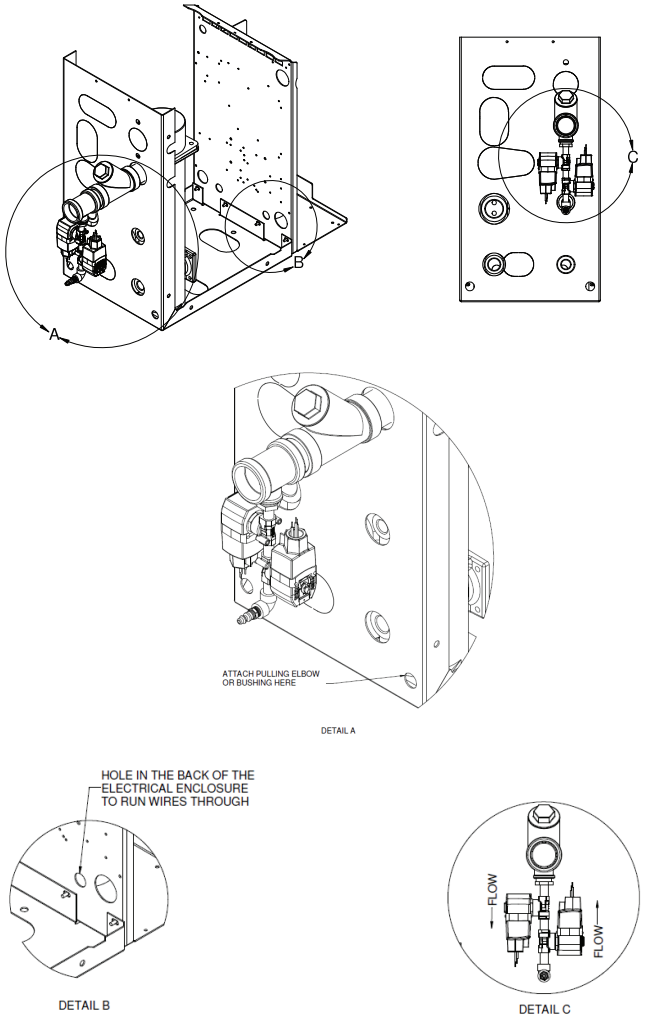
PRH020-0915

1 Install external ball valve at cooling water inlet, if not already installed, in order to shut off water supply during installation and when using mold purge.

2 Remove any plumbing used to connect the unit to the process.

✎ **NOTE:** The unit's 'To Process' plumbing could be at a different location on the back and could use different plumbing from what is shown in the drawing views below. Regardless of pump piping and configuration, the mold purge should always be added to the existing piping attached to the unit.

✎ **NOTE:** Solenoid valves shown are for reference only. Actual valves supplied could look different.



3 Starting with the part in Detail A closest to the heater tank, add sealant to the threads and attach components to the tank, or the end of the 'To Process' line plumbing attached to the unit. If a 'To Process' check valve is already installed, a second one is not needed.

– The flow direction arrows on the solenoid valves should point towards each other as shown in Detail C.

4 **If installing mold purge on a TW-V, proceed to Step 5. If installing on a TW-P, skip to Step 12.**

(continued)

Mold Purge Installation Instruction Sheet (continued)

TW-V

5 Attach the flexible metallic conduit to 1/2” NPT elbows (quantity 2) to the solenoid valves.

6 Attach the 1/2” pulling elbow to the back of the mechanical enclosure with the male end going through the hole labeled in Detail A, and the female end pointing straight up. Attach the duplex connector, to the female end of this elbow.

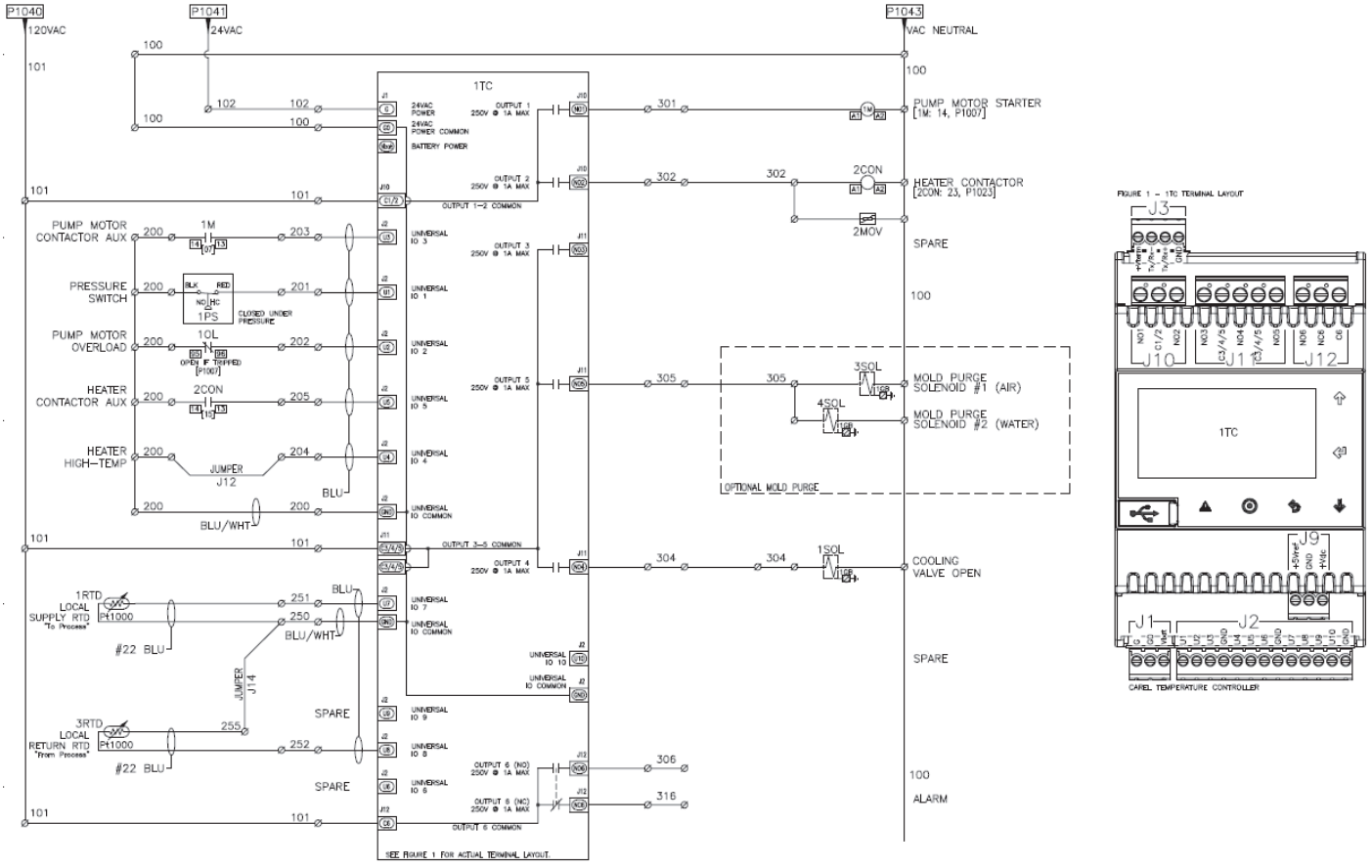
7 Cut the flex metallic conduit into two pieces long enough to carry the wires of each solenoid valve to the duplex connector on the back of the mechanical enclosure.

8 Using anti-short bushings on each end of the conduit pieces, run the wires of the solenoid valves through the separate pieces of flex conduit, the duplex connector and elbow, the mechanical enclosure, the hole towards the bottom of the electrical enclosure back panel labeled in Detail B and into the electrical enclosure.

9 Secure the ends of the flexible conduit pieces in the elbows on the solenoid valves and the duplex connector.

10 Wire the electrical components according to the mold purge option in the control schematic shown below.

11 Skip to step 20.



Value Control Electrical Schematic

(continued)

Mold Purge Installation Instruction Sheet (continued)

TW-P

12 Attach the two 1/2” pipe nipples to the solenoid valves.

13 Attach the two electrolet elbows to the 1/2” pipe nipples.

14 Attach the two clamp connectors to the electrolet elbows.

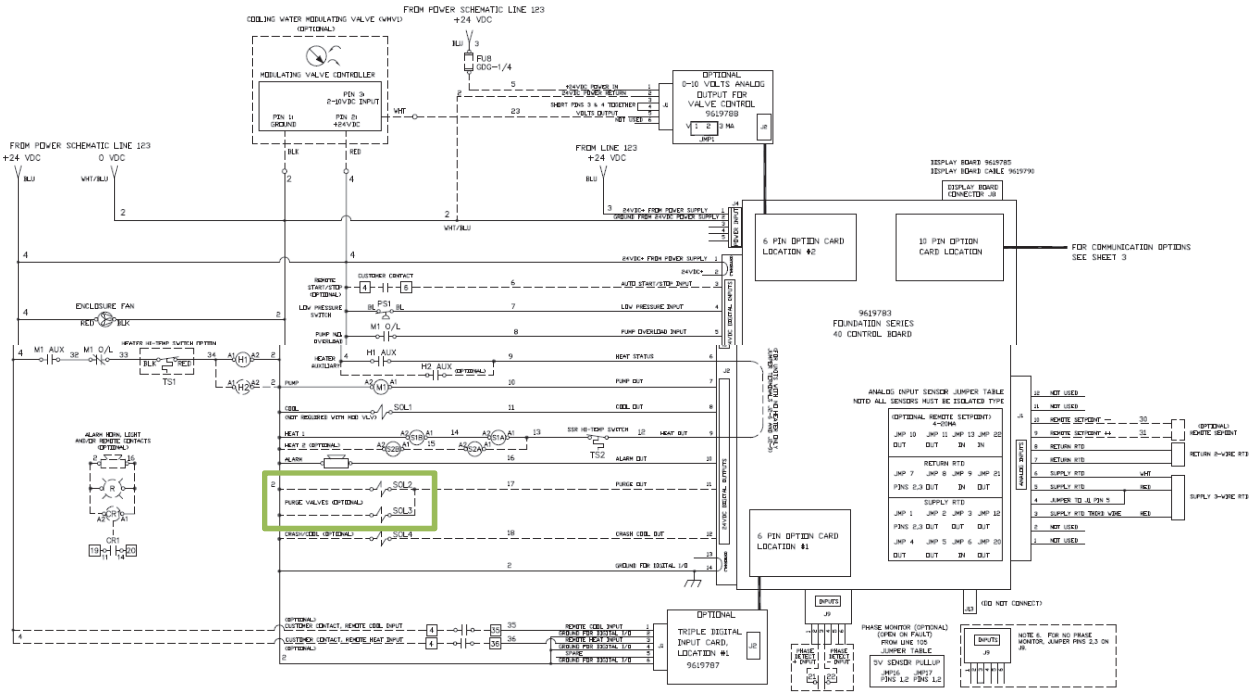
15 Cut power cord into two equal lengths.

16 Wire one end of each of the pieces of cable to each of the valves, connecting the wires inside the electrolet elbows.

17 Secure the bushing in the hole in the bottom right corner on the back of the mechanical enclosure and labeled in Detail A.

18 Run the cables through the hole with the bushing just attached, through the hole in the back of the electrical enclosure labeled in Detail B and into the electrical enclosure.

19 Wire the electrical components according to the mold purge option in the control schematic shown below.



Premium Control Electrical Schematic

20 Reinstall all plumbing that was removed during installation.

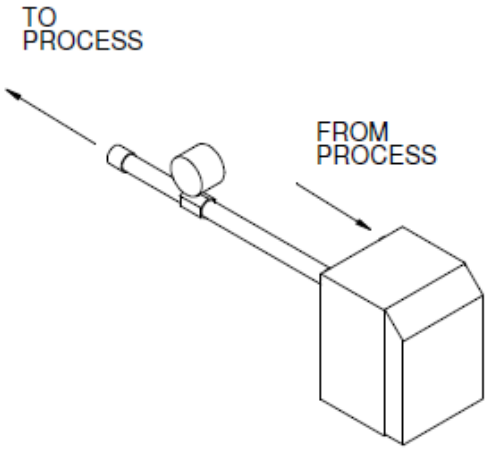
21 Turn water on and check for leaks. Repair as required.

22 Refer to user manual for mold purge operation. Test unit to confirm operation.

Flowmeter Installation Instruction Sheet

PRH021-0915

1. **Remove the plumbing connection from the unit to the process.**
2. **Add sealant to threads and attach flow meter and fittings to the unit according to the figure below.** The flow direction is indicated on the valve body. Make sure the meter is installed with the correct orientation.



3. **Reinstall all plumbing that was removed during installation.**
4. **Turn water on and check for leaks. Repair as required.**
5. **If the flowmeter has auxiliary contacts, reduce the process flow below the designated alarm threshold to test if they were set up properly.**