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USER GUIDE

UGH053-0420

Thermolator TW-V

Temperature Control Unit

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: UGH053-0420

Serial Number(s):

Model Number(s):

DISCLAIMER: Neither Conair nor its employees shall not 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-V 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.

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.

Zero Energy State (ZES)

⚠ **CAUTION**: Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energizing or start-up.

During maintenance, it is essential that the system be put into a state which eliminates the possibility of components making an unexpected and dangerous movement. This procedure is typically referred to as lockout. After all energy sources have been neutralized, the system is in the zero mechanical state (ZMS). This provides maximum protection against unexpected mechanical movement.

The lockout procedure must include all energy sources:

- Electrical power supply
- Compressed air supply
- Hydraulic fluids under pressure
- Potential energy from suspended parts
- Energy in springs
- Any other source that might cause unexpected mechanical movement

The following is a recommended Zero Energy State procedure which must be followed prior to any inspection, or maintenance of the TCU.

1. **Turn off the all devices attached to the Thermolator.**
2. **Perform the proper shutdown sequence to the connected equipment** and allow all components (internally and externally) to adequately cool.
3. **Disconnect and lock out the primary electrical supply feeding all attached components.**

⚠ **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.

SECTION
2

Description

What is the Thermolator TW-V

The Thermolator TW-V 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-V is available in single zone configuration for process heating and cooling.

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}.
- 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

✎ **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.

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 $2^{[(6.3\text{-}pH)/0.3]}$ 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.

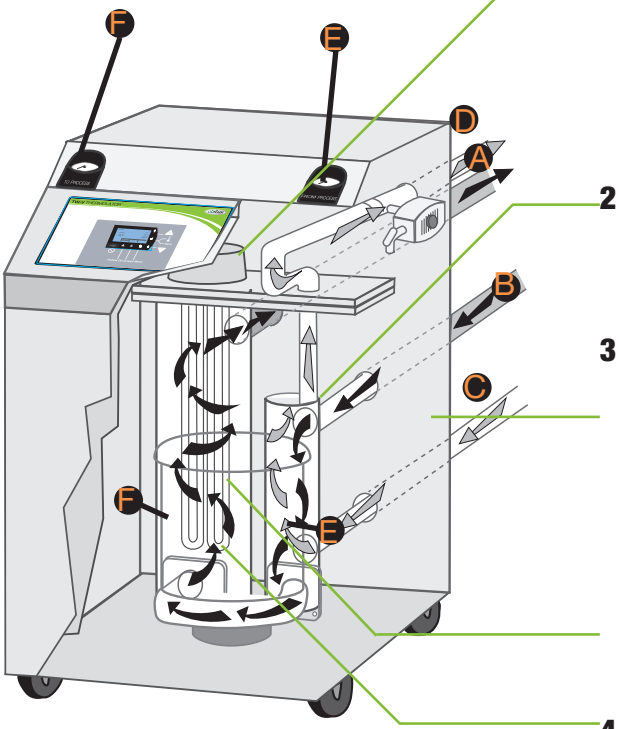
WARNING: Ethylene Glycol is flammable at higher temperatures in a vapor state. Carefully handle this material and keep away from open flames or other possible ignition sources.

Contact Conair for more information about recommendations for your product.

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

How the TW-V 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.

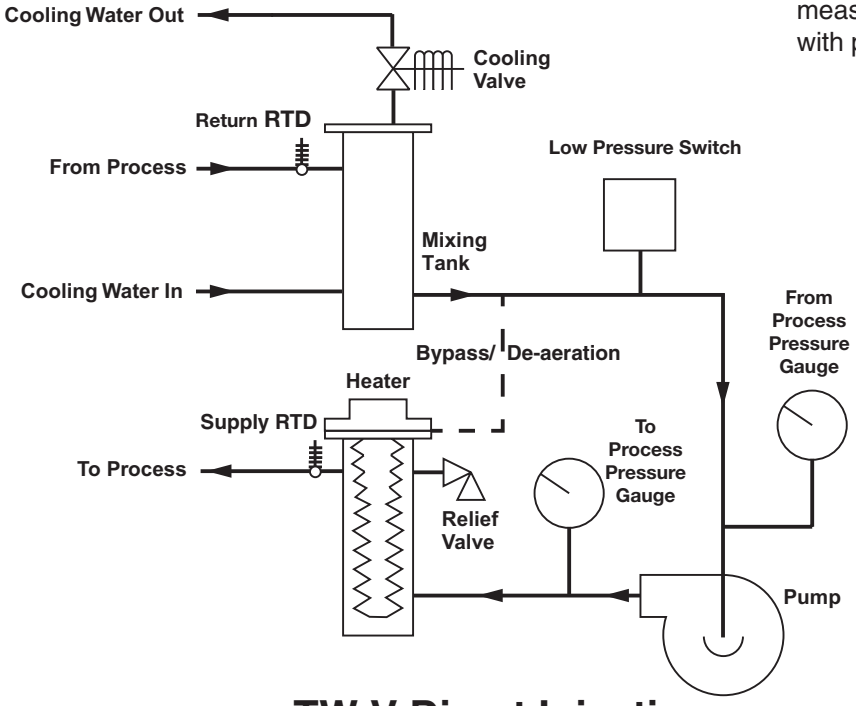
2 The temperature of the process fluid may be measured as it flows into the mixing tank through the "From Process" line B.

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 top of the tank via the "Cooling Out" line D.

NOTE: The "From Process" can also be configured as a controlling source.

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

4 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.



TW-V Direct Injection

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

MODEL	TW-V
Direct Injection	●
Closed Circuit	
CONSTRUCTION	
Standard Pump Range	3/4 or 2 Hp
Standard Heater Range	12 kW
Cast Heater / Pump	●
Incoloy Heaters	●
Silicon Carbide Seal	●
Pressure Gauges	●
CONTROLS	
PID Control	●
Setpoint / Actual Display	●
Password Protection	
Modbus RTU via RS-485	
Modbus TCP via Ethernet	
Ethernet/IP	
Retransmit Proc. Temp (4-20mA)	
Auto Restart Capability	
High Temperature Safety	
Mold Purge (Factory Installed)	❍
Phase Detection Circuit	
Choice of Control Points	●
Remote Start/Stop	
Cool down mode	
STATUS / ALARM LIGHTS	
Panel-mounted status lights	1 LED
Panel-mounted alarm lights	1 LED
Audible alarm / Strobe light	

Purge On/Off button included on control.

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

Control temperature based on temperature at process supply or return points, or an average of the two points.

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

MODEL	TW-S	TW-P
Direct Injection	●	●
Closed Circuit	❍	❍
CONSTRUCTION		
Standard Pump Range	3/4 to 10 Hp	3/4 to 10 Hp
Standard Heater Range	9 to 48 kW	9 to 48 kW
Cast Heater / Pump	●	●
Incoloy Heaters	●	●
Silicon Carbide Seal	●	●
Pressure Gauges	●	●
CONTROLS		
PID Control	●	●
Setpoint / Actual Display	●	●
Password Protection	●	●
Modbus RTU via RS-485	❍	❍
Modbus TCP via Ethernet	❍	❍
Ethernet/IP	❍	
Retransmit Proc. Temp (4-20mA)	❍	❍
Auto Restart Capability		❍
High Temperature Safety	❍	❍
Mold Purge (Factory Installed)	❍	❍
Phase Detection Circuit		❍
Choice of Control Points		●
Remote Start/Stop	❍	❍
Cool down mode		●
STATUS / ALARM LIGHTS		
Panel-mounted status lights	3 LED's	13 LED's
Panel-mounted alarm lights	(6) 7-segment	(3) 7-segment
Audible alarm / Strobe light	❍	❍

● = Standard ❍ = Optional

200 West Kensinger Drive • Cranberry Township, PA 16066 • +1-724-584-5500 • fax 724-584-5299 • www.conairgroup.com

Specifications: TW-V

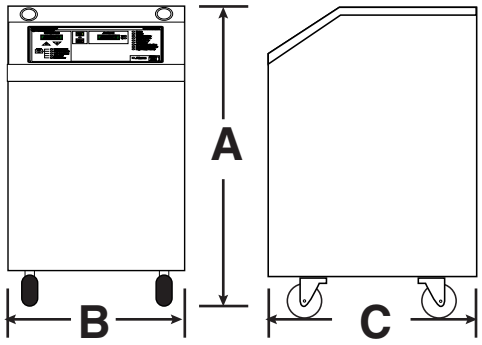
MODELS	TW-V
Performance Characteristics	
Minimum setpoint temperature °F {°C}	40 {4}
Maximum setpoint temperature °F {°C}	250 {121}
Minimum operating temperature °F {°C}	Approximately 20° {11°} above the cooling water inlet temperature*
Standard cooling valve size inches {mm} C_V	3/8 {9.5} C_V 0.5 for 0.75 Hp. 1/2 {12.7} C_V 2.5 for 2 Hp.
Available pump sizes	0.75, 2 {0.56, 1.49 kW}
Available heater sizes	12 kW

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

Pump	3/4 Hp {0.56 kW}	2 Hp {1.49 kW}
Nominal flow gpm {lpm}	50 {189}	75 {284}
Pressure @ nominal flow psi {kg/cm²}	20 {1.4}	30 {2.1}

DIMENSIONS inches {mm}

Cabinet Style	Single Zone (A)
A - Height	28.40 {721}
B - Width	14.00 {356}
C - Depth	25.75 {654}



SHIPPING WEIGHT RANGES lb {kg} Weights vary depending on options

	Single Zone	
Pump	Minimum	Maximum
0.75 Hp {0.56 kW}	240 {109}	325 {147}
2 Hp {1.49 kW}	250 {113}	338 {153}

TOTAL FULL LOAD AMPS PER ZONE

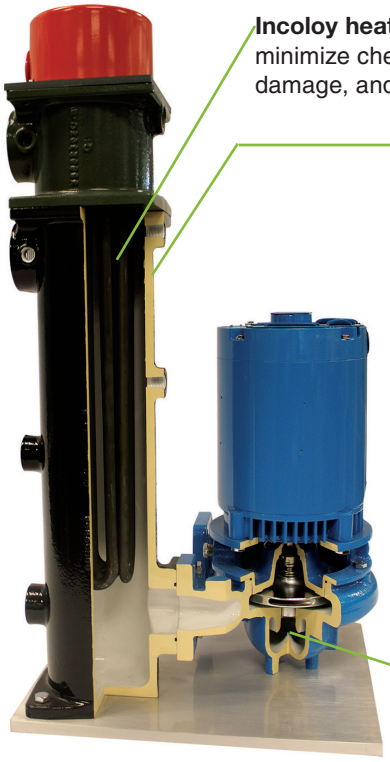
Heater	12 kW					
Voltage	208/3/60	230/3/60	380/3/60	400/3/50	460/3/60	575/3/60
Pump size						
0.75 Hp {0.56 kW}	3.4	33.4	19.3	19.3	16.7	13.5
2.0 Hp {1.49 kW}	36.4	36.4	20.9	21.0	18.1	14.6

SPECIFICATION NOTES:

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

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

TW-V Features and Options



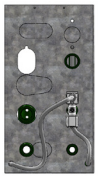
Incoloy heaters
minimize chemical and high temperature damage, and maximizes life.

Two-piece cast
construction

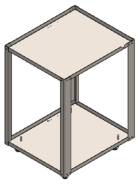
High efficiency pumps.
Silicon carbide seals are standard.

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

Options



Compressed Air Mold Purge
This option quickly evacuates fluid from the process circuit, allowing for faster, cleaner disconnection of the temperature controller from molds and hoses.



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}.

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 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.

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.*

Preparing for Installation

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

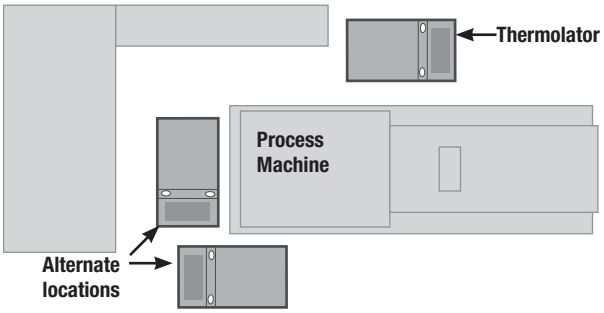
⚠ WARNING: Improper installation, operation, or servicing may result in equipment damage or personal injury.

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.

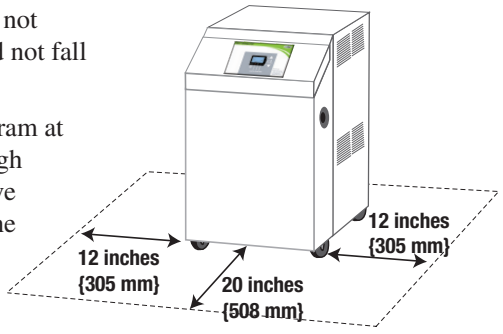
All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

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 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.

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

Preparing for Installation (Continued)

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.

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.

Preparing for Installation (Continued)

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.

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.

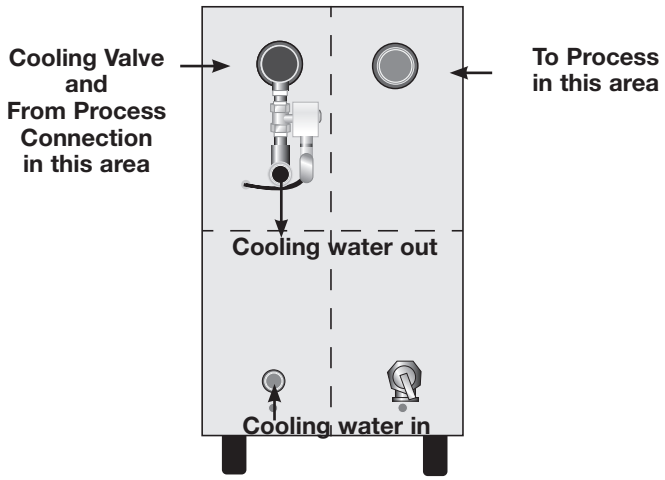
The Thermolator process inlets and outlets must be connected to the plumbing that will circulate the temperature-controlled water or fluid through the process. Cooling water inlets and outlets are connected to the cooling water supply.

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 cooling 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. This valve is controlled like other functions on the Thermolator, from the temperature controller.

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 waterlines as indicated on the previous page. 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 compressed air supply to the purge valve assembly.** The air pressure should not exceed 100 psi.

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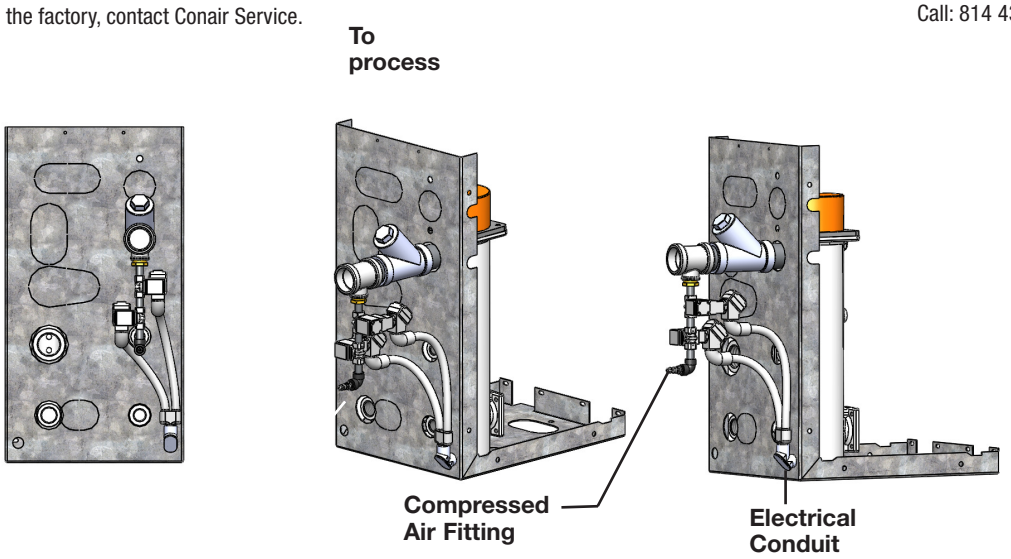
NOTE: For information about how to add a purge valve to your Thermolator if you did not order it equipped that way from the factory, contact Conair Service.



Connecting the Main Power Source

Tools Required

❒ *Flashlight*

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 last sheet of electrical print, and conforms 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.

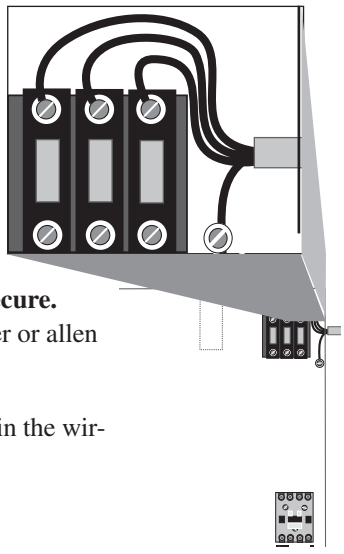
All wiring, disconnects, and fuses should be installed by qualified electrical technicians in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.

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.

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.

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 megaohm (use a multi-meter, not a megger for this measurement).

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.

2 **Apply power to the unit.** The temperature controller display illuminates to indicate that the control has power. "Loading..." will be diplayed for a few seconds while the control boots up. The control then displays the software version, followed by traditional temperature display.

"Low Process Inlet Pres" will be displayed if low water pressure is present.

3 **Check the rotation of the pump.** Remove the top access planel and a side panel. Press the "RUN" button. When the pump starts, press the "RUN" button again to stop the pump. Verify that the pump rotation matches the direction indicated on the rotation sticker on the side of the pump motor.

NOTE: If rotation is incorrect, stop the test and disconnect power to the unit. Open the electrical enclosure and switch any two of the three pump wires on the bottom of the overload protection. Return to step 2 and check again.

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

5 **Press the "RUN" button to start the unit.** If everything is working correctly:

- The "RUN"  button illuminates amber.
- The unit initiates a venting sequence. Only the cooling and venting valves are active for the first half of the sequence. The pump is additionally active for the final half of the sequence. The display indicates that part of the sequence is active and how much time is left. *Refer to the Maintenance section entitled "Control Vent Timer Adjustment" for more information.*
- 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 Thermolator shuts down after venting and displays "Low Process Inlet Pres" and "Low PRES PAUSE", verify that the cooling water supply is connected properly and that the water pressure is at least 25 PSI {1.7 bar}.

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

The temperature controller has been configured at the factory to satisfy most applications, but you can change some settings easily as needed:

TW-V Control Setup

Menus on the controller:
The controller has information available in six areas. Five of them are user accessible. These are: The Home Screen, the User Parameter Screen, the Diagnostic Screen, the Warning Explanation Screen, and the Alarm Explanation Screen. There is also a Factory Parameter Screen, which has additional parameters that are accessible by Conair Service for troubleshooting. Refer to the Troubleshooting section of this user guide for more information.

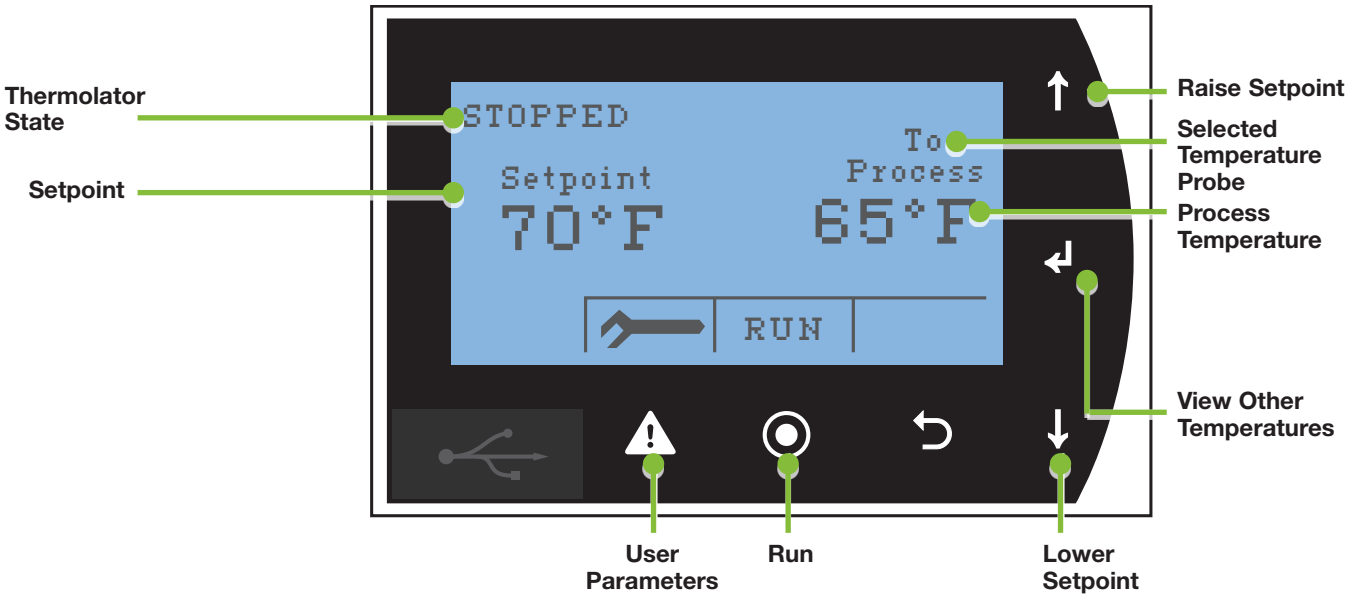
Soft Buttons:

Buttons ⚠, ◎, **and** ⮌ are considered "soft" buttons. Their function is variable and is dictated by what is shown above then on the screen.

Home Screen:
The Home Screen is the normal operating display. The controller always defaults to this page after bootup or when exiting any other menu.

Parameters include:

- Machine State - For the TW-V Thermolator, this will typically be STOPPED / VALVE VENT / VALVE/PUMP VENT / RUNNING / LOW PRES PAUSE.
- Setpoint Temperature - The temperature, shown in units (°F or °C) selected.
- "To Process", "From Process", and "To/From Average" - Can be selected to control the loop. The controlling source is displayed as default.



Changing Temperature Units

The temperature units parameter allows selection of the displayed temperature units. The available choices are degrees Fahrenheit or Celsius.

1. **Stop the Thermolator.**
2. **Press the**  **button to enter the User Parameter Screen.**
3. **Use the "Next"**  **button to navigate to page 3/6.**
4. **Press**  **four times** to move the cursor to the bottom row that shows "Units:".
5. **Use the** **or** **button to change units.**
6. **The controller will reboot** to implement the change.
7. **Verify that units on the home screen have been successfully changed.**

Additional TW-V Control Setup

TW-V allows you to select how the unit will measure and control the process temperature. The temperature control point can be selected as the supply temperature probe, the return temperature probe, or the average of the the two temperature probes.

1. **Stop the Thermolator.**
2. **Press the**  **button to enter the User Parameter Screen.**
3. **Use the "Next"**  **button to navigate to page 3/6.**
4. **The cursor should be positioned on the "PV Source" line.**
5. **Use the** **or** **button to select a different control source.**
6. **Press**  **to save the new selection.**
7. **Press Exit**  **to return to the home screen. The new control source will be shown.**

SECTION
4

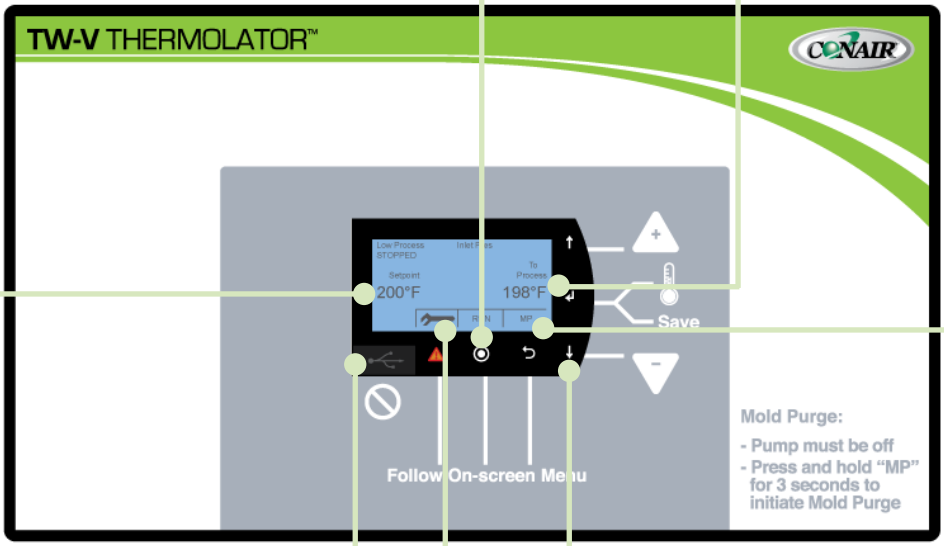
Operation

The TW-V Control

Start Button
When not running, press this button to start the TCU. The button illuminates amber when the TCU is running

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

Stop Pump Button
When running, press this button to stop the TCU. The button stops illuminating when the TCU is turned off.



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

USB Port
The USB port on the front of the controller is used for factory programming only. Please do not connect it to any devices such as a PC, thumbdrive, camera, etc.

Raise and Lower Key
Used to raise/lower 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.

Menu Access Key

Press to enter or exit the menu system. Press ⮌ to index to the next menu.

IMPORTANT: Changing menus and parameters incorrectly can result in improper operation of the Thermolator. Accessing menus and changing parameters is not necessary or possible during normal operation.

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 for three seconds 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.

Home Screen Display

The TW-V temperature controller uses a menu system to access different operating modes or change system parameters. *Please see the Appendix C-1 for default parameter settings and detailed information on each of these modes and parameters*

User Parameters

To review or edit the User Parameters menu, press the green button to cycle through units. Use the up and down buttons to select a choice or change a value. These can be accessed by pushing the  button from the home screen. Use the ↵ button to save and advance to next value. Use the ↑ and ↓ arrow buttons to adjust the parameter.

Use the  and ↩ buttons to navigate to the prior/next parameter screen.

For more information regarding User Parameters, *refer to Appendix B.* These parameters should only be adjusted by experienced individuals with guidance from Conair's Service Department.

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437 6861

(Continued)

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. Check for leaks in the cooling water and process fluid lines before continuing.

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

3. **If Thermolator's process lines were recently reconfigured or you suspect there may be excessive air in the process lines, set the temperature setpoint to 40° F {4.4° C}.** This will provide additional flushing and de-aeration in the process lines via the cooling valve.

4. **Press "RUN"**  **.** The vent cycle should begin.
   If everything is working correctly:
   - The "RUN"  button lights amber and machine status is "VALVE VENT".
   - The unit initiates a venting sequence. The pump starts after "VALVE VENT" is complete and the status becomes "VALVE/PUMP VENT".
   - Normal operation "RUNNING" begins after "VALVE/PUMP VENT" is over. The heater turns on if the actual temperature is below setpoint. The cooling valve is active if the actual temperature is above setpoint.

NOTE: If the Thermolator shuts down after venting and displays "Low Process Inlet Pres" and "Low PRES PAUSE", verify that the cooling water supply is connected properly and that the water pressure is at least 25 PSI {1.7 bar}.

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**. Use the ↑ and ↓ keys to increase or decrease the temperature setting.

6. **If the Fault**  **LED flashes,** *refer to the Troubleshooting section for more information.*

Stopping the Thermolator

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.
- Change any parameters.
- 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 as long as all water has been drained from the unit.

Using the Mold Purge Option

The TW-V Thermolator can be ordered with an optional purge valve, which clears the process lines of fluid using compressed air. The valve is operated by an optional purge button on the temperature controller.

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.

1. **If the Thermolator is running, stop it by pressing STOP.**
2. **Shut off the cooling water supply valve.**
3. **Press the "MP" button for 3 seconds.**
   - "PURGING" is displayed.
   - The cooling valve is opened.
   - The purge solenoids are opened.

Note: The maximum purge time can be adjusted on the User Parameters "Mold Purge T/O". This defines the starting point for the countdown timer shown at the bottom of the purging screen.

4. **Press the "STOP" button to stop Mold Purge.**

Selecting Tuning Parameters

The controller has three pre-configured tuning parameter sets one of which should allow optimum temperature control. Following is a description of each of the choices available to an operator

Slow Responding system:

Select the slow setting “Large” for large systems for parameter “System Size”. More than 80 gallons {303 liters} of water and more than 5,600 lbs {2,540 kg} of steel would be considered a large system. This setting has the smallest proportional band (3ºF {-16 ºC}), which allows larger changes in the control output when the process temperature is far from setpoint.

Normal Responding System:

Normal “Normal” is the factory default tuning setting, as it will cover the majority of applications. This setting is appropriate for systems with 10 to 80 gallons {38 to 303 liters} of water and 700 to 5,600 lbs {318 to 2,540 kg} of steel. The default value for the normal proportional band is 7º F {-14º C}.

Fast Responding system:

Select the fast setting “Small” for small systems for parameter “System Size”. Less than 10 gallons {38 liters} and 700 pounds {318 kg} of steel might be considered a small system. This setting has the largest proportional band (15º F {-14º C}), which allows a fast response to more desirable deviations between the process variable and setpoint. This system is typical for small thermolators with small molds or other process machinery.

1. **If the Thermolator is running, stop it by pressing STOP .**
2. **Press the button to access User Parameters.**
3. **Press the “NEXT” button to get to screen 5/6, which shows the PID parameters.**
4. **Select “Small”, “Normal”, or “Large” for the parameter “System Size” and then press “Enter” .** The additional parameters below will automatically adjust to appropriate values.
5. **Press “Exit” when finished.**

TW-V Control Vent Timer Adjustment

When the unit starts, i.e. RUN  is pressed, the Vent sequence is initiated. This is to de-aerate the process loop.

The venting sequence is divided into two phases governed by user changeable parameters. In the first phase, the cool output energize for the set venting sequence time, “Valve Vent”. This is followed by a second phase in which the cool, and pump outputs are energized for the “Valve/Pump Vent” time.

The vent sequence is bypassed if the process loop is above the “Vent Bypass” temperature.

To access the Vent Timer setups:

1. **If the Thermolator is running, stop it by pressing STOP  .**
2. **Access the configuration screen by pressing  .**
3. **Press the “NEXT” ⮌ button to get to screen 4/6.**
4. **Press “Enter” ↵ to move the cursor to the parameter that you desire to change.**
5. **Use the ↑ and ↓ buttons to change the values if desired.**
6. **Press “Enter” ↵ to save the new value.**

✎ **Note:** It is very important for machine reliability to de-aerate the process lines before turning on the pump, and especially before energizing the heater. Adjusting these parameters to values that will provide insufficient aeration will damage the Thermolator.

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.

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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

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.
- **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.

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- **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. Lift the back of the lid up while pulling the lid towards the front of the unit.**

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.

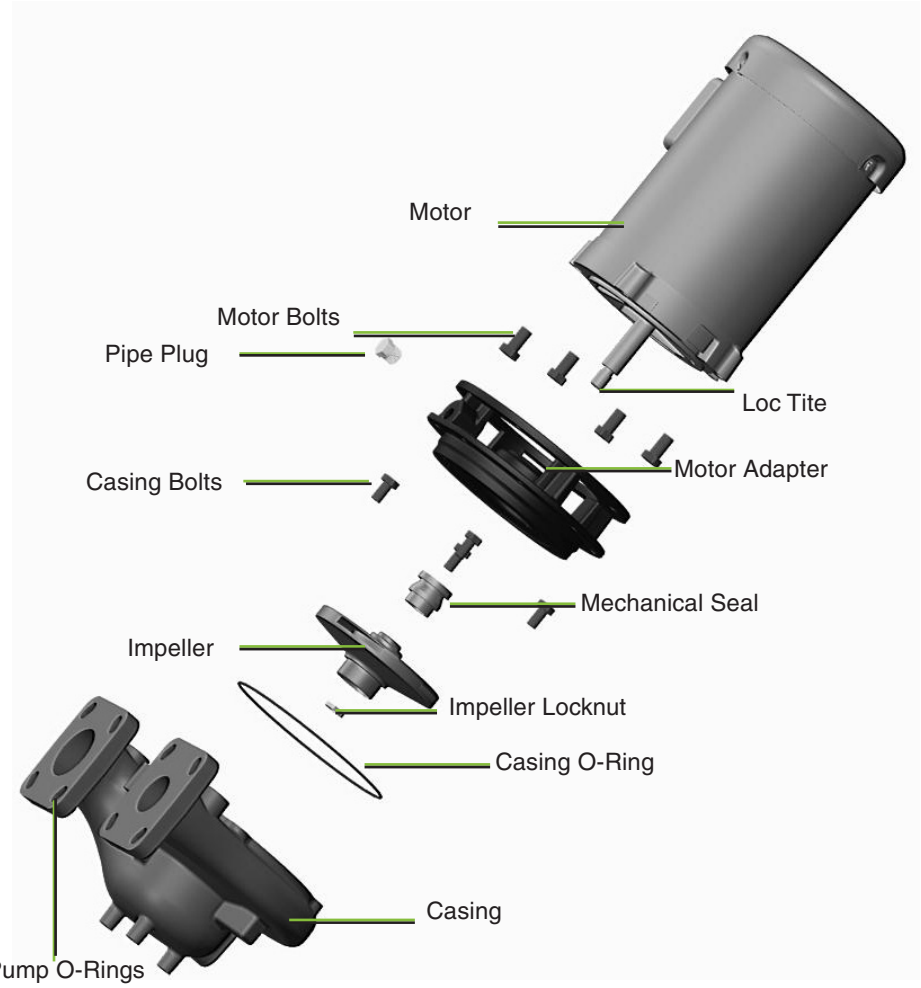
Removing the Pump Motor and Seal

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 O-ring between the motor adapter and the casing.** 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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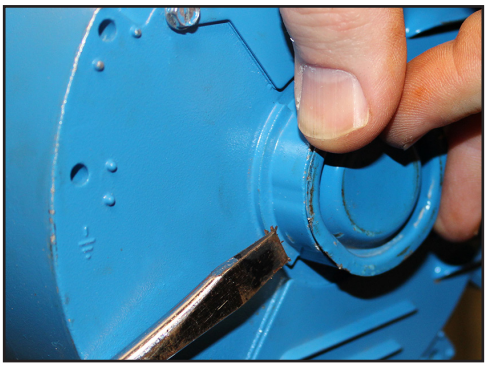
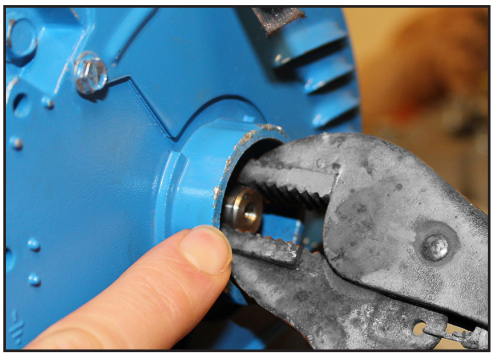
Removing the Pump Motor and Seal
(Continued)

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

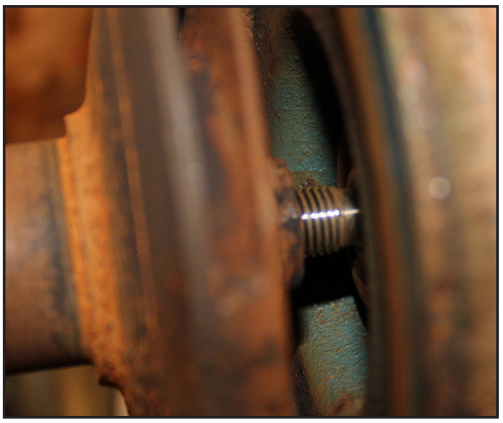


5 **Using a locking pair of pliers, grip the flat sides of the motor shaft.**



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.**



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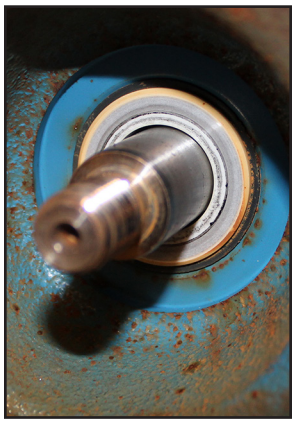
Removing the Pump Motor and Seal
(Continued)

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

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

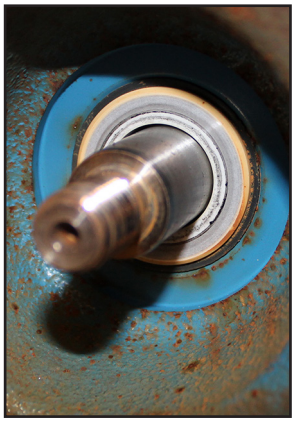
25 Minutes

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.



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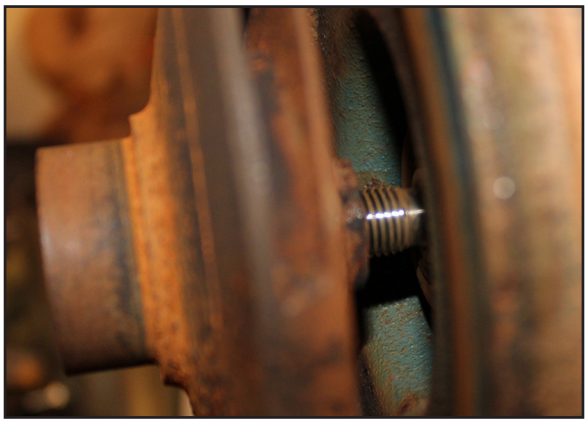
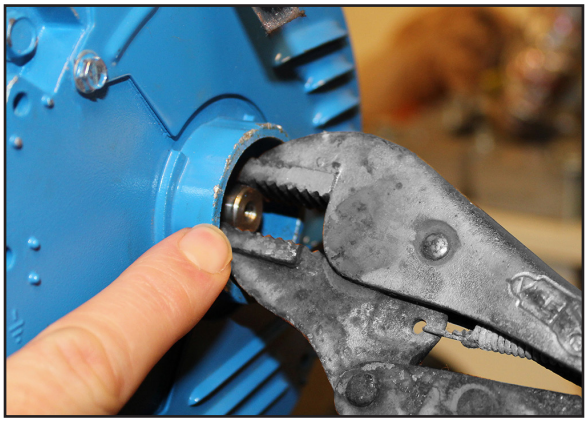
Reassembling the Pump Motor and Seal

(Continued)

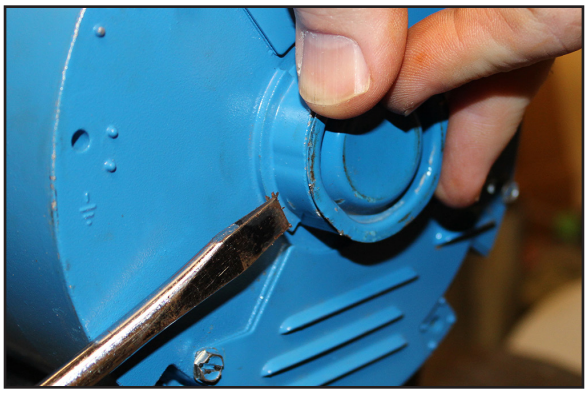
5 **Align the impeller and screw on to shaft.**



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 casing.** Install the 4 bolts, tightening to 20 ft-lbs {27.12 N·m}.

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.

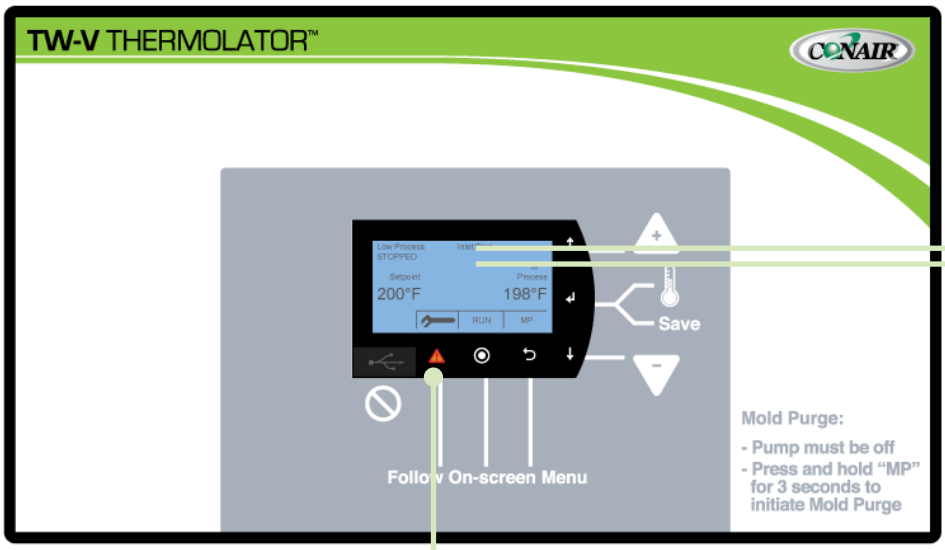
Before attempting maintenance of any kind on the Thermolator, you must stop the unit, disconnect and lockout the main power supply, and allow the unit to cool to less than 100° F {38° C}.

Identifying the Cause of a Problem

The Troubleshooting section covers problems directly related to the operation and maintenance of the TW-V. 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.

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

Unique alarm and warning messages on the temperature controller will alert you to many malfunctions.



Error Message
Refer to Controller Alarms in this Section.

Illuminated Fault LED
Refer to Mechanical/Electrical Problems in this section.

When an Alarm condition occurs:

1. **Note error messages on the screen** to help determine the cause of the problem. This includes both the title and the scrolling description**.**
2. **Note what the machine was doing prior or during the alarm occurrence.** (Was it starting up, running steadily, etc.?)
3. **Find the alarm or warning in the diagnostics tables** in this section of the User Guide. Causes are listed in the order of most likely to least likely.
4. **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 Warnings and Alarms

The TW-V Thermolator classifies machine faults as either warnings or alarms:

- **Alarms:** Problem is severe enough to shut down running Thermolator or prevent operation.
- **Warning:** Thermolator can continue to run even though there is a minor malfunction detected in the machine.

Some malfunctions may have both alarms and warnings associated with it. The current operating mode of the Thermolator determines whether the malfunction is classified as a warning or an alarm. For example, a tripped motor overload is a warning when the Thermolator is sitting idle. This will become an alarm if the user attempts to start the Thermolator and the motor tries to run.

Alarms and warnings are organized from highest to lowest priority. If multiple simultaneous malfunctions occur, the one with the highest priority will be shown.

TW-V Control Alarms

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

◆ The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
`Overtemp Fault` **Hardware Over-Temperature Trip** The overtemperature intelock circuit has been broken. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current ◆ Fault LED illuminated ◆ Pump locks on. ◆ Heater locks off. ◆ Cooling valve locks open **You should immediately disconnect power from the machine and investigate the source of the problem!** This alarm cannot be reset without a power cycle.	The overtemperature interlock jumper, J12, has been removed from the terminal strip.	❒ Verify that the overtemperature interlock jumper, J12, is still intact. See schematic prints for more details. ❒ If the overtemperature interlock circuit has been re-routed to external equipment, investigate the external equipment for a malfunction. ❒ Continuity through overtemperature interlock jumper, J12, must be present for the Thermolator to function correctly.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Htr Cntctr Stuck Closd **Heater Contactor is Welded Closed** The heater contactor is NOT disconnecting the heater when told to open by the temperature controller. The heater is likely running continuously. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current - Fault LED illuminated - Pump locks on. - Heater locks off (but probably still active due to malfunction). - Cooling valve locks open **You should immediately disconnect power from the machine and investigate the source of the problem!** This alarm cannot be reset without a power cycle.	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 Solid-State Relay Thermolator's which are much more appropriate for this application. 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 temperature 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)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
`Temp Over Limit` **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 ◆ Fault LED illuminated ◆ Pump locks on. ◆ Heater locks off. ◆ Cooling valve locks open **You should immediately disconnect power from the machine and investigate the source of the problem!** This alarm cannot be reset without a power cycle.	Has water stopped flowing between supply outlet and return inlet?	❒ Verify that the unit is running and that the pump is working. ❒ Check for a plugged pipe or closed valve. ❒ 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.
	Did the cooling valve fail closed?	Check the cooling valve. *See Repairing Cooling Valves* or the Motorized Cooling Valve instructions.
	Did a heater contactor fail with contacts welded closed?	Replace the contact 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 water return pressure with valve.
	Has the cooling water supply pressure dropped?	Check water supply pressure. If equipped verify strainer not clogged.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Pmp Cntctr Stuck Closd **Pump Contactor is Welded Closed** The pump contactor is NOT disconnecting the pump motor when told to open by the temperature controller. The pump is likely running continuously. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current ◆ Fault LED illuminated ◆ Pump turns off (although is probably still running due to malfunction). ◆ Heater turns off. ◆ Cooling valve closes **Disconnect power to the Thermolator in order to turn off the pump!**	Have the electromechanical pump contactor contacts welded shut and are preventing the contactor from mechanically shuttling to an open position? Is a fault in the control wiring or temperature controller outputs continuously powering the pump contactor coil?	Replace the pump contactor. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861 Test voltage between the A1 and A2 terminals (coil) on the pump contactor. If 120VAC is found, the contactor is probably NOT defective. Troubleshoot the problem by searching for the source of this voltage.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Htr Contctr Stuck Open **Heater Contactor is NOT Closing** The heater contactor is NOT energizing when told to close by the temperature controller. The heater is likely not able to energize. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off (but probably was never on due to the fault). ◆ Cooling valve closes. **This alarm can be cleared by pushing the RESET button.**	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 Solid-State Relay Thermolator's which are much more appropriate for this application. 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 temperature 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)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Pmp Contctr Stuck Open **Pump Contactor is NOT Closing** The pump contactor is NOT energizing when told to close by the temperature controller. The pump is likely not able to run. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current ◆ Fault LED illuminated ◆ Pump turns off (but probably never turned on due to the fault). ◆ Heater turns off. ◆ Cooling valve closes. **This alarm can be cleared by pushing the RESET button.**	Has the electromechanical pump motor contactor become jammed and is being prevented from mechanically shuttling to a closed position?	Replace the pump 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 temperature 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)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
`Temp Under Limit` **Factory Temperature – Low Limit** The process temperature has risen below 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 ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This alarm can be cleared by pushing the 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 (bottom) side of the heater contactor. 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.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Temp Over Setting **User Temperature – High Limit** The process temperature has risen above 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 ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This alarm can be cleared by pushing the 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 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. 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 pressure gauge.
	Has the cooling water supply pressure dropped?	Check the water supply pressure. If equipped, verify that strainer is not clogged.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Temp Under Setting **User Temperature – Low Limit** The process temperature has dropped below 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 ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **This alarm can be cleared by pushing the 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?	Increase the alarm trigger point. The recommended setting is the setpoint minus 2°F {4°C} to 10°F {18°C}.
	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)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Low Pressure Shutdown **Process Coolant Low Pressure Timeout** The Thermolator has remained temporarily shut down with a low pressure warning for an excessive 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 ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **Once you have corrected the problem, push the Caps button to clear this alarm.** Then push the RUN button to restart the Thermolator. ⚠	Water pressure in your building or process loop is only marginally acceptable to run the Thermolator. Any small fluctuations can cause the Thermolator to cycle off. Other equipment fed from the same water line as the Thermolator is consuming significant water flow. Due to the high demand, pressure at the Thermolator drops. Is there a leak in the process loop?	Observe the building/process loop 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 suffcient pressure is retained for the Thermolator. Fix the leak.

(Continued)

TW-V Control Alarms (Continued)

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

- The controller displays a solid alarm LED or an error message indicating the cause of the problem.

Alarm	Possible Cause	Solution
Low Pressure Events **Coolant Low Pressure Low Events** The Thermolator has experienced too many low pressure warnings within a certain time period. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current ◆ Fault LED illuminated ◆ Pump turns off. ◆ Heater turns off. ◆ Cooling valve closes. **Once you have corrected the problem, push the Caps button to clear this alarm.** Then push the RUN button to restart the Thermolator.	Water pressure in your building or process loop is only marginally acceptable to run the Thermolator. Any small fluctuations can cause the Thermolator to cycle on and off repeatedly. Other equipment fed from the same water line as the Thermolator is consuming significant water flow at intermittent intervals. Due to the high demand, pressure at the Thermolator temporarily drops.	Observe the building/process loop 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 suffcient pressure is retained for the Thermolator.

The triggering of this alarm is governed by user parameters, "Low Pres Count" and "Low Pres Time". *See user parameter details for adjustment of these parameters if neccessay.*

NOTE: changing these parameters to allow the pump to frequently start/stop with fluctuating water pressure will decrease the life of the pump and the pump contactor..

TW-V Control Alarm/Warnings

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
Pump Overload Tripped **Pump Overload** The pump is pulling more electrical current than its maximum ratings permit. This is probably due to excessive mechanical loading (high pump fluid flow) 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 **If Warning:** ◆ Fault LED flashes. ◆ Thermolator must not be currently running. If run, it will alarm as soon as pump is started. **If Alarm:** ◆ Fault LED illuminated ◆ Thermolator will not run. **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)

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
`To-Process Probe Open` **To-Process (Supply) RTD Temperature Probe Open Circuit** 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 **If Warning (To-Process probe not controlling):** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (To-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **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.*
	Do you have a loose wire?	Test the RTD with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	If damaged, replace the RTD. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	As temporary solution (with reduced performance), you may choose to make the From-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.	

(Continued)

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
`To-Process Probe Short` **To-Process (Supply) RTD Temperature Probe Short Circuit** The "To-Process" RTD is malfunctioning or has a short 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 **If Warning (To-Process probe not controlling):** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (To-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **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.*
	Do you have a wire whisker that is bridging across two adjacent terminals?	Test the RTD with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	If damaged, replace the RTD. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	As temporary solution (with reduced performance), you may choose to make the From-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.	

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
To-Process Probe Error **To-Process (Supply) RTD Temperature Probe Channel Error** The "To-Process" RTD is picking up external voltages or there is a malfunction in the temperature controller. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current **If Warning (To-Process probe not controlling):** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (To-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **This fault will automatically reset when the problem is corrected.**	Has the RTD wiring become exposed to an external voltage source?	❒ Inspect the RTD loop wiring with a VOM. *See Checking the RTD.* ❒ Test the RTD with a VOM. *See Checking the RTD.* ❒ Disconnect the RTD wiring from the temperature controller and observe if the fault disappears. (It should be replaced by a To-Process, Probe Open Error)
	Has the temperaure controller sustained hardware damage on the RTD input channel?	If damaged, replace the temperature controller. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
		As temporary solution (with reduced performance), you may choose to make the From-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.

(Continued)

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
`From-Proc Probe Open` **From-Process (Return) RTD Temperature Probe Open Circuit** The "From-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 **If Warning (From-Process probe not controlling)::** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (From-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **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.*
	Do you have a loose wire?	Test the RTD with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	If damaged, replace the RTD. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	As temporary solution (with reduced performance), you may choose to make the To-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.	

(Continued)

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
From-Proc Probe Short **From-Process (Return) RTD Temperature Probe Short Circuit** The "From-Process" RTD is malfunctioning or has a short 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 **If Warning (From-Process probe not controlling):** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (From-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **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.*
	Do you have a wire whisker that is bridging across two adjacent terminals?	Test the RTD with a VOM. *See Checking the RTD.*
	Has the RTD itself failed or sustained physical damage?	If damaged, replace the RTD. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	As temporary solution (with reduced performance), you may choose to make the To-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.	

(Continued)

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
From-Proc Probe Error **From-Process (Return) RTD Temperature Probe Channel Error** The "From-Process" RTD is picking up external voltages or there is a malfunction in the temperature controller. **WARNING:** Only qualified electrical service personnel should examine and correct problems that require opening the unit's electrical enclosure or checking electrical current **If Warning (From-Process probe not controlling):** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm (From-Process probe is controlling):** ◆ Fault LED illuminated ◆ Thermolator will not run. **This fault will automatically reset when the problem is corrected.**	Has the RTD wiring become exposed to an external voltage source?	❒ Inspect the RTD loop wiring with a VOM. *See Checking the RTD.* ❒ Test the RTD with a VOM. *See Checking the RTD.* ❒ Disconnect the RTD wiring from the temperature controller and observe if the fault disappears. (It should be replaced by a From-Proc Probe Open Error.)
	Has the temperaure controller sustained hardware damage on the RTD input channel?	If damaged, replace the temperature controller. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861
	As temporary solution (with reduced performance), you may choose to make the To-Process probe controlling. See user parameter "PV Source". This will demote the alarm to a warning and allow you to continue to run.	

(Continued)

TW-V Control Alarm/Warnings

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
High Temp Deviation **Deviation Alarm – Over Setpoint** The process temperature has exceeded the allowable high 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 **If Warning:** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm:** ◆ Fault LED illuminated ◆ Pump will run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **If a warning, it will automatically reset when the problem is corrected.** **If an alarm, push the RESET button to clear this alarm**	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 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 "High Deviation".
	Is the high deviation temperature alarm delay too short?	Modify the high deviation alarm delay by increasing parameter "High Devtn Dly".
	Is the initial deviation alarm delay parameter too short?	Modify the warm-up ignore deviation delay by increasing parameter "Warm Up Delay".
	Are the PID parameters set correctly?	Check the PID parameters, including: "P-Band", "I-Gain", D-Gain", and "Deadband".

TW-V Control Alarm/Warnings (Continued)

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

◆ The controller displays a flashing/solid alarm LED or an error message indicating the cause of the problem.

Alarm or Warning	Possible Cause	Solution
Low Temp Deviation **Deviation Alarm – Under Setpoint** The process temperature has dropped below the allowable low 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 **If Warning:** ◆ Fault LED flashes. ◆ Thermolator will run normally. **If Alarm:** ◆ Fault LED illuminated ◆ Pump will run normally. ◆ Heater continues to run normally. ◆ Cooling valve continues to run normally. **If a warning, it will automatically reset when the problem is corrected.** **If an alarm, push the RESET button to clear this alarm**	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. 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 "Low Deviation".
	Is the low deviation temperature alarm delay too short?	Modify the low deviation alarm delay by increasing parameter "Low Devtn Dly".
	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 PID parameters set correctly?	Check the PID parameters, including: "P-Band", "I-Gain", D-Gain", and "Deadband".

TW-V Control Warnings

The Thermolator has detected a problem

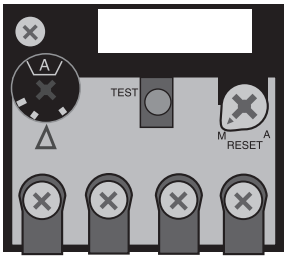
- The controller displays a flashing alarm LED or an error code indicating the cause of the problem.

Warning	Possible Cause	Solution
Low Process Inlet Pres **Low Process Coolant Inlet Pressure** The Thermolator coolant 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 ◆ Alarm LED illuminated ◆ Run LED flashes ◆ Pump temporarily turns off. ◆ Heater temporarily turns off. ◆ Cooling valve continues to regulate. **This warning will automatically reset when system pressure returns.** When it does, the Thermolator will automatically resume normal operation.	Is fresh water turned on to the Thermolator? Does your facility have the required water pressure to run the Thermolator (25psi)? Is the pressure switch faulty? Is there a leak in the process loop?	Be sure to turn on the water supply before starting the Thermolator. The pressure status is indicated on the screen by absence of this warning even when the Thermolator is not running. ❒ Observe the pressure indicated on the pressure gauges. Compare this to the minimum required operating pressure for your specific Thermolator model. ❒ 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. Fix the leak.
Flash Memory Error **Excessive Flash Memory Writes** The flash memory is being written to excessively. ◆ Thermolator operation is not affected. **This warning will automatically reset when the flash memory writes return to a normal rate.**	Something abnormal may be occurring in the temperature controller.	Contact Conair Service to discuss the problem. Contact Conair Parts and Service Phone: 800-458-1960 From outside of the United States, Call: 814 437 6861

Resetting Pump Overload

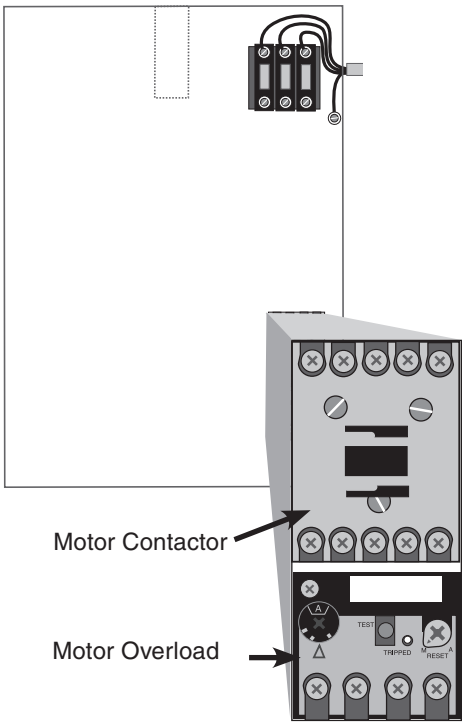
The pump motor overload is located inside the unit's electrical enclosure.

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 Temperature Controller

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.

The temperature controller used in the Thermolator TW-V can be removed from the supporting DIN rail for easy replacement.

To remove the controller:

1. **Disconnect and lockout the main power supply.**
2. **Disconnect all connectors on the rear of the controller.**
3. **Remove screws attaching DIN rail to standoffs.**
4. **Remove controller from DIN rail by pulling on plastic release lever.**
5. **Reverse order to install new controller.** *See Section 3, TW-V Control Initial Setup.*

Replacing the Heater Contactor

⚠ WARNING: Electrical Shock Hazard

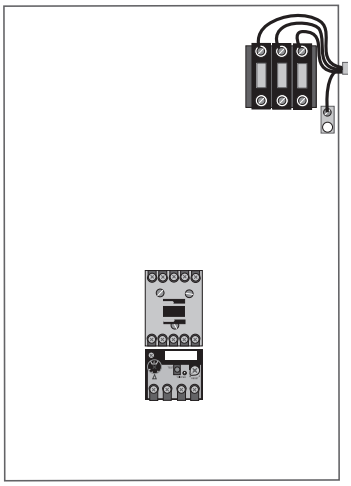
Only qualified service personnel who have been trained on electrical testing and the procedures for avoiding the hazards should diagnose or correct problems that require opening the unit with power on.

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.

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 Pt1000 RTDs, to monitor the to process and from process temperatures. The Pt 1000 “To Process” RTD is installed in the wall of the heater tank at the “to process” outlet. The Pt 1000 “From Process” RTD is installed in the mixing tank.

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. R**emove RTD wiring terminal strip.** Refer to the wiring diagrams that came with your unit.
4. **Verify the resistance of the RTD using a VOM. Conpare against table on next page. Polarity does not matter. If incorrect, replace.**

Checking the RTD

Pt1000

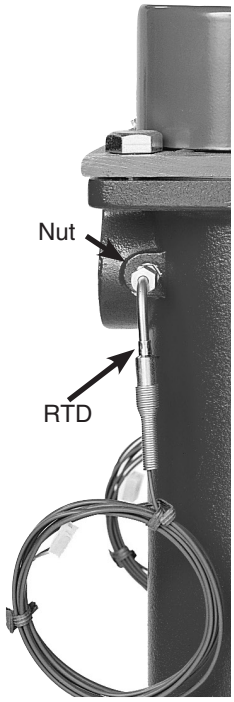
	0	1	2	3	4	5	6	7	8	9	
Temp T	**Resistance at T**	**Resistance at T+1°F**	**Resistance at T+2°F**	**Resistance at T+3°F**	**Resistance at T+4°F**	**Resistance at T+5°F**	**Resistance at T+6°F**	**Resistance at T+7°F**	**Resistance at T+8°F**	**Resistance at T+9°F**	**Temp T**
°F	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	Ohms	°C
50	1039	1041	1043	1046	1048	1050	1052	1054	1056	1058	10.0
60	1061	1063	1065	1067	1069	1071	1074	1076	1078	1080	15.6
70	1082	1084	1087	1089	1091	1093	1095	1097	1099	1102	21.1
80	1104	1106	1108	1110	1112	1115	1117	1119	1121	1123	26.7
90	1125	1127	1130	1132	1134	1136	1138	1140	1143	1145	32.2
100	1147	1149	1151	1153	1155	1158	1160	1162	1164	1166	37.8
110	1168	1170	1173	1175	1177	1179	1181	1183	1185	1188	43.3
120	1190	1192	1194	1196	1198	1200	1203	1205	1207	1209	48.9
130	1211	1213	1215	1217	1220	1222	1224	1226	1228	1230	54.4
140	1232	1235	1237	1239	1241	1243	1245	1247	1249	1252	60.0
150	1254	1256	1258	1260	1262	1264	1266	1269	1271	1273	65.6
160	1275	1277	1279	1281	1283	1286	1288	1290	1292	1294	71.1
170	1296	1298	1300	1303	1305	1307	1309	1311	1313	1315	76.7
180	1317	1320	1322	1324	1326	1328	1330	1332	1334	1336	82.2
190	1339	1341	1343	1345	1347	1349	1351	1353	1355	1358	87.8
200	1360	1362	1364	1366	1368	1370	1372	1374	1377	1379	93.3
210	1381	1383	1385	1387	1389	1391	1393	1396	1398	1400	98.9
220	1402	1404	1406	1408	1410	1412	1414	1417	1419	1421	104.4
230	1423	1425	1427	1429	1431	1433	1435	1438	1440	1442	110.0
240	1444	1446	1448	1450	1452	1454	1456	1459	1461	1463	115.6
250	1465	1467	1469	1471	1473	1475	1477	1479	1482	1484	121.1
260	1486	1488	1490	1492	1494	1496	1498	1500	1502	1504	126.7
270	1507	1509	1511	1513	1515	1517	1519	1521	1523	1525	132.2
280	1527	1530	1532	1534	1536	1538	1540	1542	1544	1546	137.8
290	1548	1550	1552	1554	1557	1559	1561	1563	1565	1567	143.3
300	1569	1571	1573	1575	1577	1579	1581	1584	1586	1588	148.9

Replacing the RTD

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

To replace an RTD:

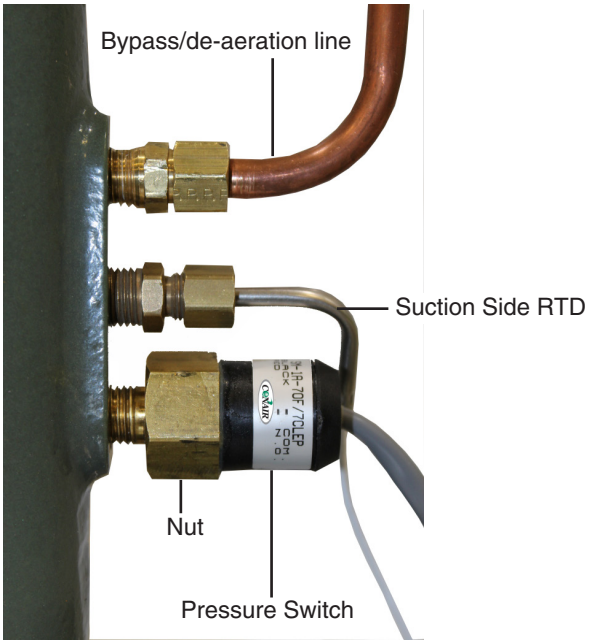
1. **Disconnect and lockout the main power.**
2. **Shut off the cooling water in and drain the unit.** Drain water to below the RTD level using the handle on the Pressure Relief Valve located the bottom of the unit.
3. **Remove the unit's top panel and open the electrical enclosure.**
4. **Remove the 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 the wire from contacting 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.

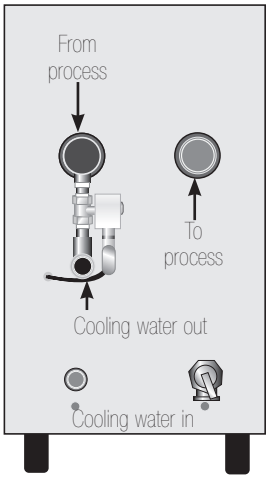


Repairing Cooling Valves

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}.



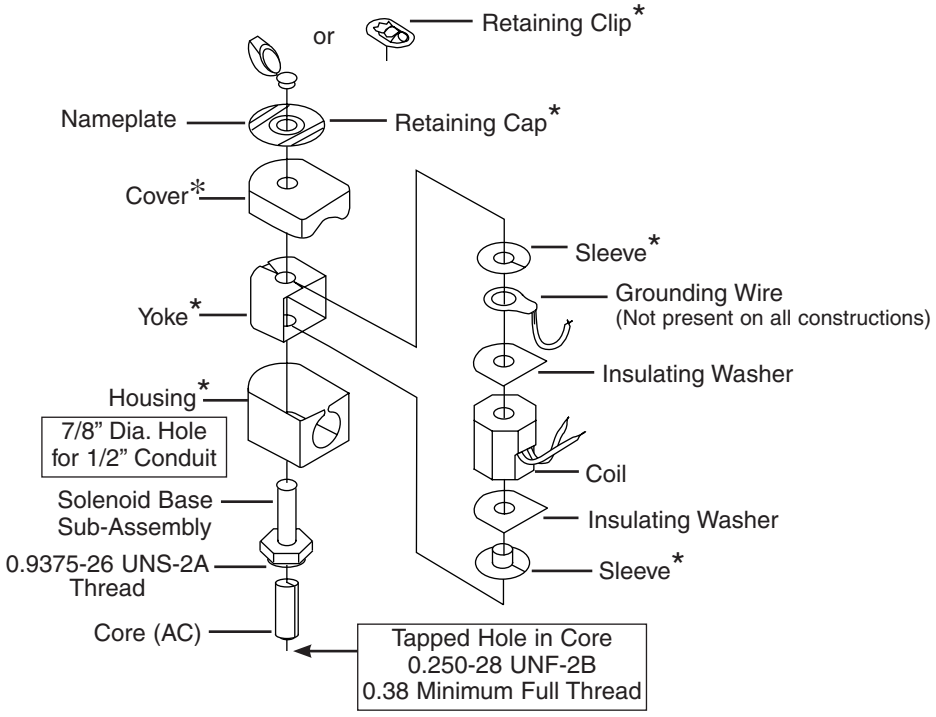
DIRECT INJECTION

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

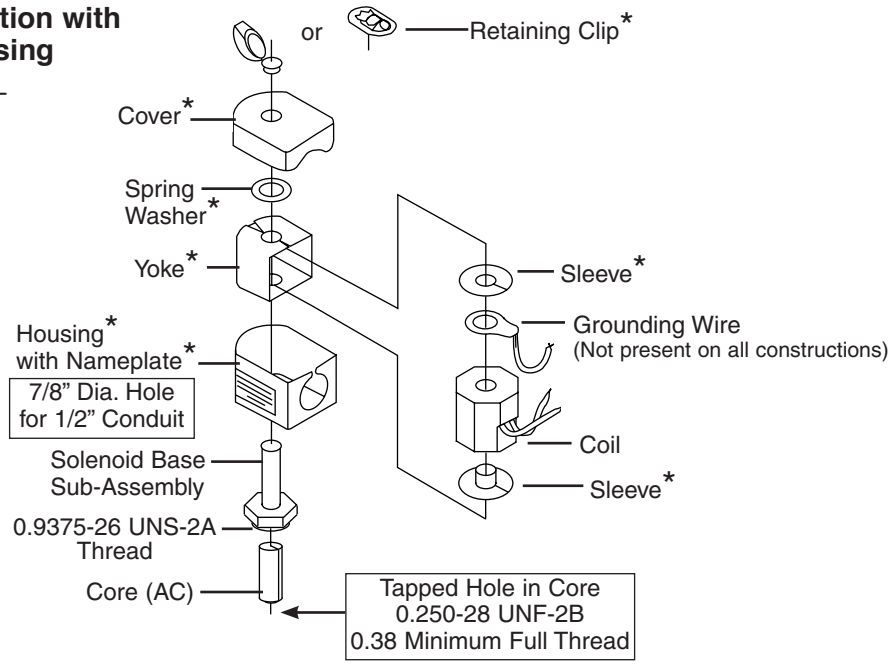
Repairing Cooling Valves

*Indicates Parts Supplied in Solenoid Enclosure Kit



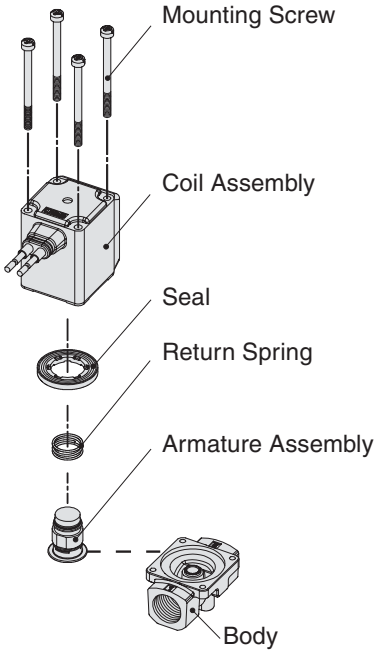
Alternate Construction with Nameplate on Housing

*Indicates Parts Supplied in Solenoid Enclosure Kit



Disassembly of Optional 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.

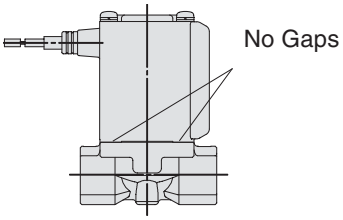
1 **Loosen the mounting screws.** The coil assembly, seal, return spring, armature assembly and body can be removed.

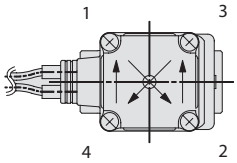
2 **When changing the electrical entry direction, turn the coil assembly in a desired direction to mount it**.

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".

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}



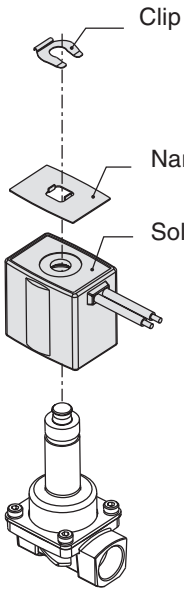


Tighten Screws two or more rounds diagonally.

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.

Optional Pilot Operated Solenoid Valves

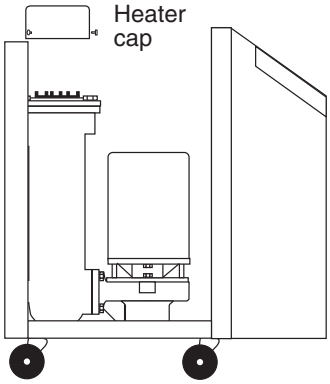


NOTE: Within the valve body and coil assembly there are no user serviceable parts.

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.
4. **Remove the heater wiring harness.** Label the wiring layout of the heater terminals; wires are labeled as 2T1, 2T2, 2T3 and GND.

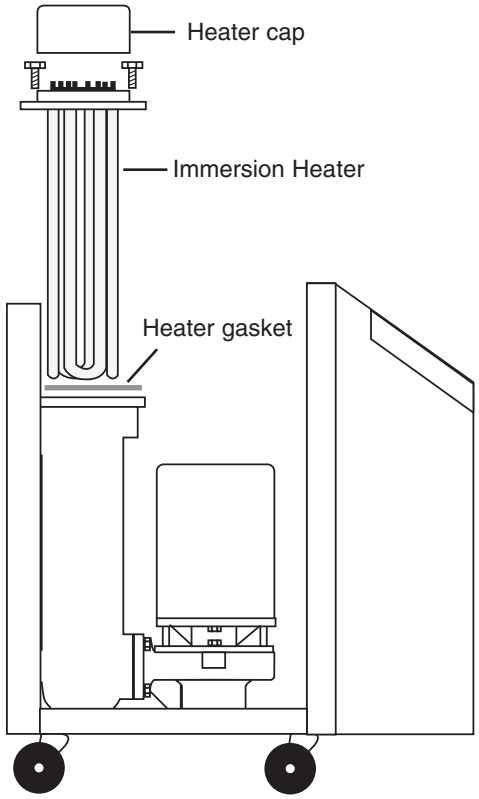
   Record the position of bus links, jumpers, and feed wires so they can be replaced in exactly the same manner on the replacement heater.

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

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.

Replacing Immersion Heaters

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.

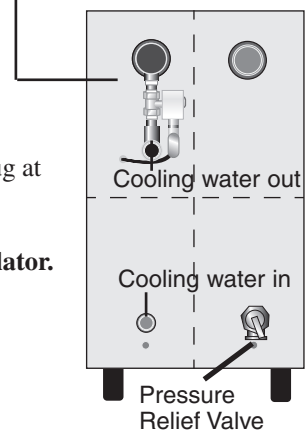
10 **Replace the heater gasket** if it is worn or cracked.

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

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}.



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 rear of the unit.
4. **Remove the top and side panels of the Thermolator.**

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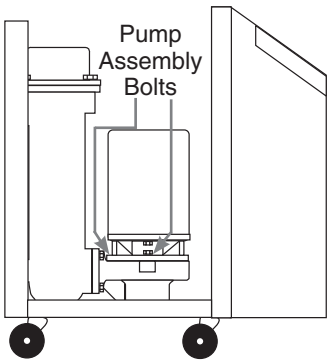
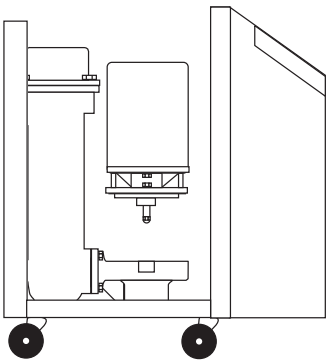


5. **Remove the pump assembly bolts.** Use a 9/16-inch open-end box wrench to remove the bolts holding the pump to the pump casing. The bolt in the rear will require a 9/16-inch socket wrench.
6. **Remove the center brace that runs from the top rear to the front of the Thermolator.**
7. **Lift the pump 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.**

Pump Seal Flush Line

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.

User Parameters

The Thermolator will not operate correctly if certain factory-set parameters are changed. Parameters should be changed only 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 more detailed information about these parameters and returning parameters to the initial factory setup, *See TW-V initial setup, Section 3*.

Category	Screen Number	Parameter (Character Limited)	Default	Range	DESCRIPTION
Deviation Alarm Setup	1/6	Warm Up Delay	30 min	0-999 min	The TCU will not look for a deviation condition until setpoint has been achieved and the machine is running in steady sate. This parameter is the maximum amount of time the TCU will wait for setpoint to be achieved and will therefore ignore a devaition condition. If you have a large tool that takes longer than this delay to reach steady-state conditions, increase this value to eliminate false tripping of the deviation alarm.
		High Deviation	10 ΔºF	1-216 ΔºF	How far the temperature must deviate above setpoint before registering a high deviation condition. This deviation condition is also subject to parameter "High Devtn Dly" below.
		Low Deviation	10 ΔºF	1-216 ΔºF	How far the temperature must deviate below setpoint before registering a low deviation condition. This deviation condition is also subject to parameter "Low Devtn Dly" below.
		High Devtn Dly	30 min	0-720 min	How long to wait before alerting the user via an alarm or warning once a high deviation condition exists. If the deviation condition disappears, the timer is reset. See parameter “Deviation Actn” below for selecting whether a deviation condition produces an alarm or a warning.
		Low Devtn Dly	30 min	0-720 min	How long to wait before alerting the user via an alarm or warning once a low deviation condition exists. If the deviation condition disappears, the timer is reset. See parameter “Deviation Actn” below for selecting whether a deviation condition produces an alarm or a warning.
Limit Alarm Setup	2/6	High Temp Alm	260 ºF	32-260 ºF	User configurable maximum temperature alarm.
		Low Temp Alm	32 ºF	32-260 ºF	User configurable minimum temperature alarm.
		Low Pres Recov	1500 ms	0-60000 ms	If the TCU has paused operation due to low process temperature, this is how long it will wait before automatically restarting after the return of pressure. If your facility suffers from water hammer effects, increase this value to avoid false restarts.

(Continued)

User Parameters (Continued)

Category	Screen Number	Parameter (Character Limited)	Default	Range	DESCRIPTION
TCU Setup	3/6	PV Source	To Proc	To Proc From Proc To/From Average	Allows the user to select which RTD temperature probe to user for temperaure regulation. The selected signal is sent to the control loop control loop, where it will attempt to reach setpoint.
		PV Smoothing	5 sec	0-720 sec	This can be used to smooth the RTD temperature probe signal. Normally, this should remain in the 0-10 sec range, but can be increased if process fluid is not equi-temperature throughout.
		Low Pres Count	3	1-25	Both of these parameters work hand-in-hand to define the TCU's reaction to multiple process fluid low pressure events while the TCU is in operation. By default, the TCU will tolerate up to 3 process fluid low pressure events every 15 minutes; the TCU will temporarilly shutdown during the low pressure event, and automatically restart when the pressure returns. Because excessive, frequent starting/stopping of the TCU can cause motor/pump damage, the purpose of these parameters is to protect the TCU if operating in an environment with unstable fluid pressure.
		Low Pres Time	15 min	1-999 min	
		Units	ºF	ºF or ºC	Used to select your desired temperature unit of measure. After changing, the controller will automatically reboot. Note that this parameter is NOT automatically set to default if the user executes a "Load Defaults" to reset to default parameters.
Venting	4/6	Valve Vent	30 sec	5-180 sec	Upon cold startup, the TCU will flush the process loop with fresh fluid to promote de-aeration. The pump will not run during this time period. Once finished, it will start the pump and continue to flush with the pump's assistance. No loop temperature regulation is performed in this state. Increase this value if you have an excessively long fluid loop.
		Valve/Pmp Vent	30 sec	5-180 sec	Upon cold startup, and after the "Valve Vent" parameter's time peroid has expired, the TCU will start the pump to assist in de-aeration. No loop temperature regulation is performed in this state. Increase this value if you have an excessively long fluid loop.
		Vent Bypass	120 ºF	32-260 ºF	If the process loop is above this temperature, the above two venting stages ("Valve Vent" and "Valve/Pmp Vent") will not be performed. This can be used to make machine re-starts quick, while still de-aerating if the machine is started from a cold state.

(Continued)

User Parameters (Continued)

Category	Screen Number	Parameter (Character Limited)	Default	Range	DESCRIPTION
Control Loop	5/6	System Size	---	Small Normal Large	This setting can be used to quickly select factory-suggested parameters below for P-Band, I-Gain, D-Gain, and Deadband below. Select the setting that best describes your system. Alternatively, you can also directly edit the PID settings below.
		P-Band	10 ΔºF	0.2 - 999.7 ΔºF	Proportional Band for PID temperature control. A smaller number will promote a more aggressive proportional response. At the default 10 ΔºF, this means that the proportional response will be at 100% when the temperature is 10 ΔºF from setpoint.
		I-Gain	50	0-999	Integral Gain for PID temperature control. A smaller number will promote a more aggressive integral response. Zero will disable all integral response.
		D-Gain	10	0-999	Derivative Gain for PID temperature control. A larger number will promote a more aggressive derivative response. Zero will disable all derrivative response.
		Deadband	0.5 ΔºF	0-99.9 ΔºF	Defines a region of process temperatuve deviation that will have no effect in PID control loop. By having a deadband, wear-and-tear on the TCU is minimized because it doesn't have to try as hard to maintian the process temperature perfectly to setpoint.
Additional Settings	6/6	Deviation Actn	Warn	None Warn Alarm	Allows the user to select how the TCU responds to a deviation condition (as defined in screen 1/6 above). **Warnings** are visible on the screen, but have no affect on machine operation. **Alarms** shutdown the machine and require user intervention to reset.
		Mold Purge T/O	60 sec	1-999 sec	"After mold purge is started, this is the max time that it can run before being automatically cancelled. Note that the user can stop mold purge at anytime they desire. *Only visible on menu if mold purge option is installed."
		Diagnostics	No	No Yes	Select "Yes" if you would like to enter the diagnostics menu.
		Load Defaults	No	No Yes	Select “Yes” if you would like to load defaults for all user parameters. If you select “Yes”, all your customized settings will be permanently lost and default parameters will be used instead. The controller will reboot after implementing default settings.
		Factory Menu	---	---	This is used to enter a password for a factory configuration menu. This is not for user access.

Factory Parameters

The Thermolator will not operate correctly if certain factory-set parameters are changed. Parameters should be changed only 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 more detailed information about these parameters and returning parameters to the initial factory setup, *See TW-V initial setup, Section 3.*

Category	Screen Number	Parameter (Character Limited)	Default	Range	DESCRIPTION
Included Options	1/2	MP Installed	No	No Yes	Allows the factory to set whether or not mold purge is installed as an option.
		Setpoint Max	250 ºF	40-250 ºF	Maximum permitted machine setpoint.
		Setpoint Min	40 ºF	40-250 ºF	Minimum permitted machine setpoint.
		Cool-Heat Rto	1.25	0.1-10.0	Describes the effectiveness of cooling vs effectiveness of heating. Having the correct value here enhances the performance fo the PID algorithm. For example, if the TCU's cooling BTU removal happens at twice the rate of the TCU's heating BTU addition, this number should be set to 2.0. Systems with small heaters and plentiful, cold cooling water may want a value of 1.5. Alternatively, warm cooling water or a very powerful heater would work best with a value of 0.75. A value of 1.0 means there is no distinction between heating/ cooling and the PID works works in a very traditional manner. Any experimentation to set this value should be done at lower process temperatures.
		Dynamic Mult:	1.75	0.0-10.0	This parameter helps the TCU achieve setpoint quickly and without overshoot across the entire temperature range of opperation. This factor multiples the "Cool-Heat Rto" set in the parameter above at high temperaures. For example, if "Dynamic Mult" is set to 1.75, a Cool-Heat Rto of 1.25 will actually become 2.19 (1.25x1.75=2.19) when the TCU is running at a process temperature of 250 F. Set to zero to disable all dymanic effects, in which case parameter "Cool-Heat Rto" will be solely responsible and at a fixed value across the entire temperature range.

(Continued)

Factory Parameters (Continued)

Category	Screen Number	Parameter (Character Limited)	Default	Range	DESCRIPTION
Additional Settings	2/2	Cooling Cycle	5.0 sec	0.5-60.0 sec	Time base for solenoid cooling valve. If Cooling Cycle is set to 5.0s, and the unit is cooling at 50% capacity, the solenoid cooling valve will alternate between 2.5s on and 2.5s off.
		Heating Cycle	10.0 sec	0.5-60.0 sec	Time base for heater contactor. If Heating Cycle is set to 10.0s, and the unit is heating at 50% capacity, the heater contactor will alternate between 5.0s on and 5.0s off.
		Track Health	Yes	No Yes	Provides machine run statistics and alarm couting for the diagnostics menu. This can be disabled to decrease processor load or not track these items.
		Diagnostics	No	No Yes	“Select “”Yes”” to enter the Diagnostics menu. Note: Since you have already authenticated as a factory user, you will have WRITE access to directly control outputs for troubleshooting (except for heater output).”
		Load Defaults	No	No Yes	Select “Yes” if you would like to load defaults for all user AND factory parameters. If you select “Yes”, all your customized settings will be permanently lost and default user and factory parameters will be used instead. The controller will reboot after implementing default settings. As a factory user, you will need to then go back and properly configure the factory menu according to the installed TCU options.

(Continued)

Diagnostics

The Thermolator will not operate correctly if certain factory-set parameters are changed. Parameters should be changed only 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 more detailed information about these parameters and returning parameters to the initial factory setup, *See TW-V initial setup, Section 3.*

The Thermolator is equipped with extensive diagnostic screens to assist the user and/or the factory in:

- Troubleshooting
- Installation
- Preventative maintenance

Category	Screen Number	Parameter (Character Limited)	Input/ Output	Device Description	Description
Digital Inputs	1/18	Pres Swtch[1]	U1	Pressure Switch	Pressure switch input. "ON" when sufficient pressure.
		Pump OL[2]	U2	Pump Overload	Pump overload input. "ON" when not tripped.
		Pump Aux[3]	U3	Pump Contactor Auxiliary Contact	Pump contactor auxiliary contact. "ON" when pump contactor energized and armature seated.
	2/18	Hi Temp[4]	U4	High Temperature Input Jumper	High temperature input. "ON" when no high temperature condition exists.
		Heater Aux[5]	U5	Heater Contactor Auxiliary Contact	Heater contactor auxiliary contactor. "ON" when heater contactor energized and armature seated.
		Spare[6]	U6	Spare	Input not used.
Analog Inputs	3/18	Supply RTD[7]	U7	Supply "To Process" RTD	Supply "To Proc" RTD Temperature Probe. Units always in °C.
		Return RTD[8]	U8	Return "From Proc" RTD	Return "From Proc" RTD Temperature Probe. Units always in °C.
		Spare RTD[9]	U9	Spare RTD	Spare RTD Temperature Probe. Units always in °C.
		Spare[10]	U10	Spare	Input not used.
Digital Relay Outputs	4/18	Pump[1]	NO1	Pump Contactor	Pump contactor coil output.
		Heat[2]	NO2	Heater Contactor	Heater contactor coil output.
		Spare[3]	NO3	Spare	Output not used.
	5/18	Cool[4]	NO4	Cooling Solenoid Valve	Cooling solenoid valve coil output.
		Purge[5]	NO5	Purge Solenoid Valve	Purge solenoid valve coil output.
		Alarm[6]	NO6	Alarm Active Output	Alarm active output.

(Continued)

Diagnostics (Continued)

Category	Screen Number	Parameter (Character Limited)	Input/ Output	Device Description	Description
Runtime Statistics	6/18	Pump	---	Pump	Pump motor runtime displayed in units of x100 hours. Pump contactor actuations displayed in units of x100 operations.*
		Heater	---	Heater	Heater runtime displayed in units of x100 hours. Heater contactor actuations displayed in units of x100 operations.*
		CV Open	---	Cooling Solenoid Valve	Cooling solenoid valve runtime displayed in units of x100 hours. Cooling solenoid valve actuations displayed in units of x100 operations.*
	7/18	Pres Switch	---	Pressure Switch	Pressure switch input actuations displayed in units of x100 operations.*
		Mold Purge	---	Mold Purge Solenoid	Mold purge solenoid valve coil actuations displayed in units of x100 operations.*
	8/18	Pump OL	---	Pump Overload	Pump overload input trips. The input transitioning to OFF is considered an operation.
		Alarm	---	Alarm Output	Alarm output actuations. The alarm output transitioning to ON is considered an operation.
		High Temp	---	High Temperature Input	High temperature input trips. The input transitioning to OFF is considered an operation.
	9/18	Cooling Water	---	Cooling Water Temperature	The cooling water temperature as measured at the end of the valve vent during normal TCU startup. Value is saved through power cycles and is overwritten at startup during the venting sequence.
		Cooling LTA-%	---	Cooling Utilization Long-Term Average Percent	Displays the average utilized cooling capacity of the TCU since powerup and since setpoint was achieved and reasonably maintained. Can be used to determine approximate long term cooling loads, TCU potential cooling capacity, and utility costs. This value will be erased if power is cycled or the setpoint is changed.
		Heating LTA-%	---	Heating Utilization Long Term Average Percent	Displays the average utilized heating capacity of the TCU since powerup and since setpoint was achieved and reasonably maintained. Can be used to determine approximate long term heating loads, TCU potential heating capacity, and utility costs. This value will be erased if power is cycled or the setpoint is changed.
Runtime Statistics	9/18	Lst Alm Dur-s	---	Last Alarm Duration in Seconds	How long the machine was in an alarm state. It counts from the initiation of an alarm to the remedying of the condition (for auto-resetting alarms) or the manual reset of the alarm by an operator (for non-auto-resetting alarms).
		Low Pres-hrs	---	Low Pressure Hours	The number of hours the machine was in a running mode, but had turned off the pump because it was waiting for sufficient pressure to be restored to the system.
	10/18	Mem W-x10000	---	Memory Writes	The number of times the memory has been written to. Shown in units of x10,000.
		Loop Time-ms	---	PLC Loop Time	How long it takes the controller to run the entire program and loop back around to begin again. PID loop is updated only once per second regardless of this value.
		Max Lp Tme-ms	---	Max PLC Loop Time	The maximum recorded controller loop time once the controller had loaded all initial parameters.
		PS Volts-V	---	Power Supply Voltage	Incoming power supply voltage.
		PS Freq-Hz	---	Power Supply Frequency	Incoming power supply frequency for AC supply. In the case of a DC supply, this is shown as "0".

(Continued)

Diagnostics (Continued)

Category	Screen Number	Parameter (Character Limited)	Input/ Output	Device Description	Description
Alarm/ Warning Counts	11/18	Sup Probe Srt	---	Supply "To Proc" RTD Temperature Probe Shorted Alarms	Note: Warnings that result from this condition are not counted.
		Ret Probe Srt	---	Return "From Proc" RTD Temperature Probe Shorted Alarms	Note: Warnings that result from this condition are not counted.
	12/18	Sup Probe Opn	---	Supply "To Proc" RTD Temperature Probe Open Alarms	Note: Warnings that result from this condition are not counted.
		Ret Probe Opn	---	Return "From Proc" RTD Temperature Probe Open Alarms	Note: Warnings that result from this condition are not counted.
	13/18	Sup Probe Err	---	Supply "To Proc" RTD Temperature Probe Channel Error Alarms	Note: Warnings that result from this condition are not counted.
		Ret Probe Err	---	Return "From Proc" RTD Temperature Probe Channel Error Alarms	Note: Warnings that result from this condition are not counted.
	14/18	Pmp Stuck Clsd	---	Pump Contactor Stuck Closed Alarms	Number of times pump contactor auxiliary contacts remained actuated when the coil was de-energized.
		Pmp Stuck Open	---	Pump Contactor Stuck Open Alarms	Number of times pump contactor auxiliary contacts remained open when the coil was energized.
		Htr Stuck Clsd	---	Heater Contactor Stuck Closed Alarms	Number of times heater contactor auxiliary contacts remained actuated even the coil was de-energized.
		Htr Stuck Open	---	Heater Contactor Stuck Open Alarms	Number of times heater contactor auxiliary contacts remained open when the coil was energized.
	15/18	Low Pres Time	---	Low Pressure Shutdown Alarms	Number of times the running TCU has remained in a low-pressure paused state for so long that it created an alarm to turn itself off.
		Low Pres Evnts	---	Low Pressure Events Alarms	Number of times the TCU had an alarm due to too many low-pressure events within the selected time period.
		Pump Overload	---	Pump Overload Alarm Alarms	Note: Warnings that result from this condition are not counted.
		Overtemp	---	Overtemperature Alarms	Number of times the TCU has alarmed due to lack of signal on external high-temperature input.
	16/18	Tmp Ovr Limit	---	Temperature Over Factory Limit Alarms	Number of times the TCU has alarmed due to the process temperature exceeding the factory high limit.
		Tmp Und Limit	---	Temperature Under Factory Limit Alarms	Number of times the TCU has alarmed due to the process temperature dropping below the factory low limit.
		Tmp Ovr Setng	---	Temperature Over User Limit Alarms	This is a user-influenced alarm since the user picks the alarm trip points.
		Tmp Und Setng	---	Temperature Under User Limit Alarms	This is a user-influenced alarm since the user picks the alarm trip points.
	17/18	Flash Memory	---	Flash Memory Warnings	Number of times an "excessive number of memory writes" were detected.
		Brownout	---	Brownout Alarms	Number of times the machine lost power while running. This will only register if user turns this alarming on. Note: This functionality is not available on all TCU models.
		Electric Power	---	Electric Power Alarms	Number of times the machine detected incorrect incoming power phase rotation or unequal phase legs. Note: This functionality is not available on all TCU models.

Diagnostics (Continued)

Category	Screen Number	Parameter (Character Limited)	Input/ Output	Device Description	Description
Temperature Loop Monitor	The parameters below are used to monitor the action of the PID temperature control loop. These values are intended for use only by trained individuals for troubleshooting and loop tuning purposes.				
	18/18	P:	---	Proportional Output Contribution	The component of the PID output generated from proportional control.
		I:	---	Integral Output Contribution	The component of the PID output generated from integral control. A ↕ symbol means this value is free to change because the integrator is active; alternatively a ● symbol means the integrator value is frozen due to output saturation (anti-windup), or a large difference between process value and setpoint.
		D:	---	Derivative Output Contribution	The component of the PID output generated from derivative control.
		x	---	Output Multiplier	This multiplier is applied to the sum of the P, I, and D contributions to generate the output percentage. It dynamically changes in proportion to the difference between cooling water temperature and process temperature. The aggressiveness of this multiplier is set by the factory parameter "Cool-Heat Rto".
		→	---	Output Percentage	The final output of the PID loop. This value drives the PWM generator for either the cooling valve or heater. Note that PWM generator outputs under 5% are rounded to 0%, and output above 95% are rounded to 100%.
		To: / From: / Avg:	---	Process Value	The current process value. By default, the controlling process value, as determined by user parameter "PV Source" will be shown. However, you can temporarily view the other RTD temperature probe values by pressing the ↵ key (this will not alter which RTD is actually controlling the PID loop). The display will revert back to the controlling RTD after several seconds.
		SP:	---	Setpoint	Process setpoint. This can be modified by pushing the ↑ or ↓ keys.
		Err:	---	Error Signal	This is the difference between the process value and the setpoint. Ultimately, the goal of the control loop is to reduce this to 0° during operation.
*One on/off cycle is equal to one operation					

PID Parameters

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

The default factory PID parameters loaded into the TW-V 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.

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 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).

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 inter¬nally disabled whenever the Thermolator is far 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.

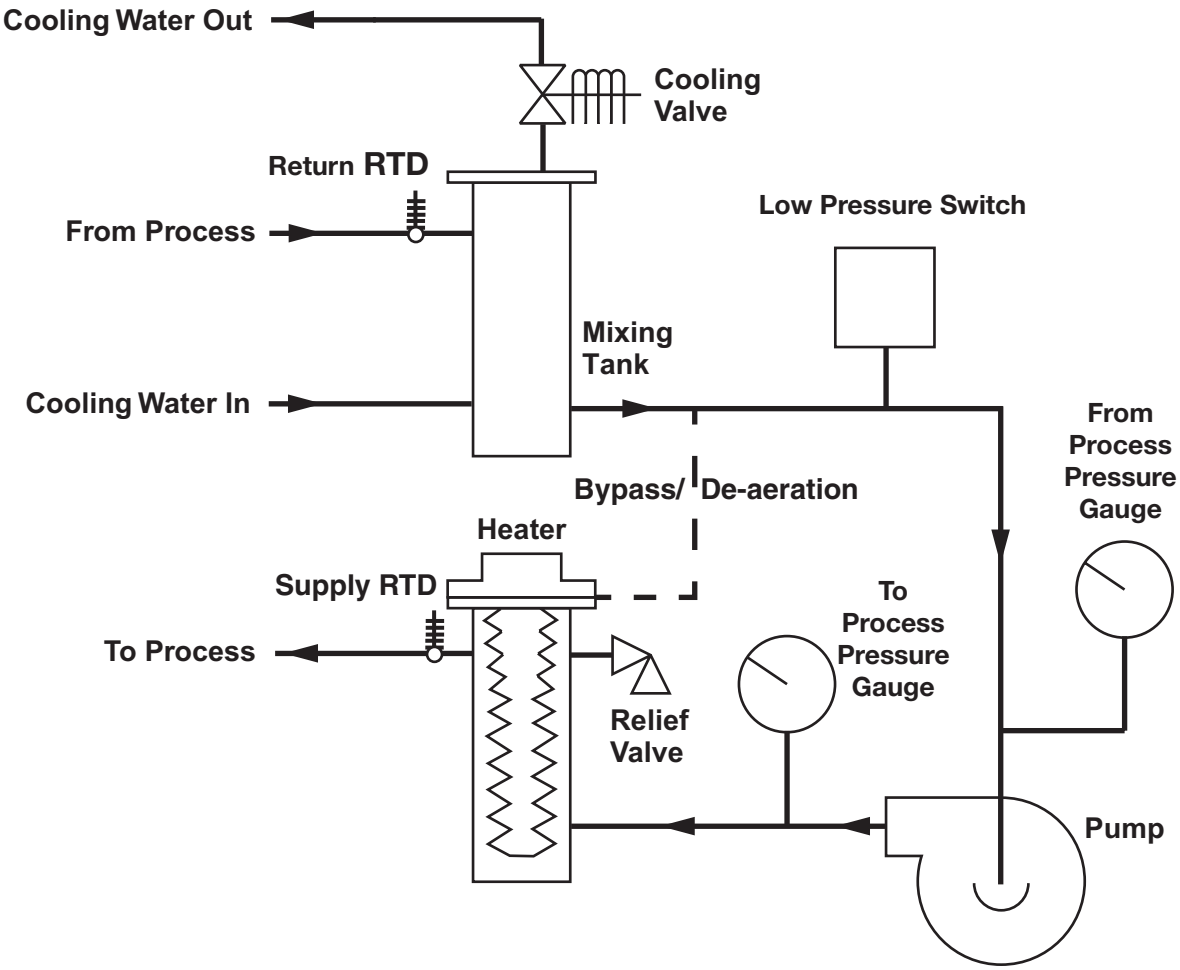
Derivative

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.

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 approach¬ing 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.

Plumbing Diagram



TW-V Direct Injection

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Service Parts List

TW-V Thermolators

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.

Manuals	
PART NUMBER	**DESCRIPTION**
UGH053 - 0320	User Guide, Thermolator TW-V

PUMP ASSEMBLIES	**HP**	**VOLTAGE**	**POWER FREQUENCY**	**NON FERROUS *BRONZE**
PART NUMBER				
2672030104	3/4	208-230/460	60	X*
2672030304	2	208-230/460	60	X*
MOTOR (ONLY)				
2672030000A2	3/4	208-230/460	60	X
2672030000A4	2	208-230/460	60	X
VOLUTE/CASING				
2672030000E4	3/4	208-230/460	60	X
2672030000E5	2	208-230/460	60	X
MOTOR ADAPTERS				
2672030000F3	3/4	208-230/460	60	X
2672030000F3	2	208-230/460	60	X
IMPELLERS				
2672030000G8	3/4	208-230/460	60	X
2672030000G10	2	208-230/460	60	X
SEAL KITS				
267203SK0101	3/4			
267203SK0102	3/4			
267203SK0101	2			
267203SK0102	2			

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