

 ThermOmegaTech®

THERM-O-MIX® WWM STATION

Troubleshooting Manual



Table of Contents

| Topic | Section |
|--|----------------|
| Introduction | 1.0 |
| Definitions and Terminology | 1.1 |
| Recommended Tools | 1.2 |
| Checklist | 1.3 |
| Operating Sequence and Failure Modes | 2.0 |
| Normal Operating Sequence For Therm-O-Mix Station | 2.1 |
| Failure Modes | 2.2 |
| V1 Failure Mode | 2.2.1 |
| WWM Diaphragm Actuator Failure Mode | 2.2.2 |
| V4 Failure Mode | 2.2.3 |
| Troubleshooting | 3.0 |
| Troubleshooting Warning Statement | 3.1 |
| Decommissioning the Therm-O-Mix Station for Troubleshooting and Repairs..... | 3.2 |
| Analyzing Component Failure by Conditions | 3.3 |
| Adjustments and Repairs | 4.0 |
| V1 Mixing Valve Adjustment Instructions with the Unit Running | 4.1 |
| V1 Mixing Valve Adjustment Instructions with the WWM Diaphragm Removed..... | 4.2 |
| WWM Diaphragm Actuator/VI Mixing Valve Replacement Instructions..... | 4.3 |
| V4 Control Valve Replacement Instructions | 4.4 |

Appendices

| | |
|---|----|
| Therm-O-Mix Safety Shower Station Schematic..... | A1 |
| Therm-O-Mix Safety Shower Station Flow Chart..... | A2 |
| Station Line Drawing..... | A3 |
| Therm-O-Mix WWM Safety Shower Station Checklist..... | A4 |
| WWM Diaphragm Actuator/V1 Mixing Valve Line Drawing..... | A5 |
| WWM Diaphragm Actuator/V1 Mixing Valve Adjustment Photos..... | A6 |
| V4 Control Valve Photo..... | A7 |

Section 1.0: Introduction

This manual is designed to aid selected companies/qualified personnel to troubleshoot and repair Therm-OmegaTech's Therm-O-Mix WWM Safety Shower Stations. Any qualified personnel assigned to troubleshoot or repair a Therm-O-Mix Safety Shower Station should read the entire manual before proceeding. If you have any questions or concerns about the information found in this manual please contact ThermOmegaTech Inc. at 1-877-379-8258.

Section 1.1: Definitions and Terminology

- System = safety shower/eyewash station
- Station = Therm-O-Mix Station tempered water unit
- Normal Range = tepid/moderately warm/lukewarm potable water not to exceed 100°F
- Flow Pressure = gauge pressure measured during flow (dynamic pressure)
- V1 = primary mixing valve; mixes cold inlet water with hot inlet water
- V4 = normally closed; final safety control; senses water temperature out of mixing valve V1; V4 opens if the outlet water temperature is too high, short circuiting the WWM Diaphragm Actuator, closing the hot port of V1 and reducing hot water flow
- WWM Diaphragm Actuator = normally retracted for standard mixing mode; pressure sensitive diaphragm overrides and closes hot port during over-temperature or loss of hot water supply at V1

Section 1.2: Recommended Tools

The following is a list of recommended tools needed to properly troubleshoot and repair a Therm-O-Mix WWM Safety

- 1/8, 3/16 Hex Keys
- Open-end wrenches including 7/16", 1/2, 1", 1-1/8", 1 1/2"
- Channel lock/ Alligator Pliers
- (2) 12" or 14" Pipe wrenches
- (2) 12" or 14" Spud wrench w/ 2-5/8" Capacity
- Thermometer or Thermocouple w/ reader
- Phillips screwdriver

Section 1.3: Check List

Review the checklist below before troubleshooting the Therm-O-Mix WWM Safety Shower Station. See Appendix #4 for the printable checklist.

- Does the plant have adequate Hot Water Flow Pressure? (Recommended min. 45 PSIG/ max. 100 PSIG)
- Is the station's hot water supply line properly sized? (Recommended min. 1" IPS)
- Does the plant have adequate Cold Water Flow Pressure? (Recommended min. 45 PSIG/ max. 100 PSIG)
- Is the station's cold water supply line properly sized? (Recommended min. 1" IPS)
- Is the station supplying tempered water to anything other than the Safety Shower Station?
- Are freeze and scald protection valves installed correctly? (As required for outdoor applications)
- Is the cold water supply line in contact with or being overheated by another source? (Steam supply lines, solar radiation or steam tracing)

Section 2.0: Operating Sequence and Failure Modes

Section 2.1: Normal Operating Sequence For Therm-O-Mix Station

The V1 mixing valve blends the cold inlet water with the hot inlet water to produce the set-point outlet water temperature. If the water temperature out of V1 is high, V4 opens which short circuits the WWM Diaphragm Actuator reducing the hot water flow to the mixing valve outlet. If the outlet water temperature is above 95°F prior to activating the system the V4 will short circuit the WWM Diaphragm Actuator holding the hot water port closed until the outlet water temperature falls below 85°F. The water supply lines should have pressure regulators installed as per the factory's installation instructions. The hot water flow pressure should be slightly higher than the cold water flow pressure but not more than 10 PSIG higher. Refer to Appendix #1 for the Station Schematic and Appendix #2 for the Station Flow Chart.

Section 2.2: Failure Modes

Section 2.2.1: V1 Failure Mode

If V1 failed with cold port closed (hot port open): only hot water flows to mixing valve outlet. V4 will open and short circuit the WWM Diaphragm Actuator when the Station outlet exceeds approximately 95°F, thus closing the hot inlet port on the mixing valve. With the hot port closed, no hot water can flow to the mixing valve, so the Station outlet is cold water only. Station will start to cycle hot - cold as the V4 sees cold water.

If V1 failed with hot port closed (cold port open): no hot water can flow to V1 mixing valve; system supplied with cold water only. V1 is probably jammed open with debris.

Section 2.2.2: WWM Diaphragm Actuator Failure Mode

If Diaphragm Actuator failed retracted (normal mixing mode): will not be noticed unless there is an over-temperature situation or loss of hot water supply to the Station.

If Diaphragm Actuator failed extended (override mode): no hot water can flow to V1 mixing valve; system supplied with cold water only.

Section 2.2.3: V4 Failure Mode

If V4 failed closed: no significance unless V1 also fails or outlet temperature is over 95°F for more than 15 seconds.

If V 4 failed open: mixing valve hot port will be closed, so only cold water flows from the Station. Debris may be stuck to the seat area inside the V 4 not allowing a good seal.

Section 3.0: Trouble Shooting and Repairs

Section 3.1: Trouble Shooting/Repair Warning Statement

Troubleshooting a Therm-O-Mix Station in the field may require turning off the hot and cold water supply to the emergency safety shower/eyewash system. As such, please contact the plant safety manager/supervisor and follow proper procedures for tagging, locking out, and other possible issues relating to servicing and temporarily rendering the safety equipment unusable. Notify all personnel working in the area that the emergency safety shower/eyewash equipment will be temporarily disabled.

Section 3.2: Decommissioning the Therm-O-Mix Station For Troubleshooting and Repairs

Follow the steps listed below to properly decommission the Therm-O-Mix Station for troubleshooting and repairs:

1. Close the hot water supply line valve to the station.
2. Activate the shower and eyewash system for a minimum of two minutes to deplete the hot water pressure trapped between the supply shutoff valve and the station. A longer period of time may be needed, depending on the size and length of supply piping.
3. With the system activated close the cold water supply valve to the station.

CAUTION: THERM-O-MIX PIPING MAY BE HOT AND CARE SHOULD BE TAKEN DURING REPAIRS. BE CAREFUL WHEN REMOVING PARTS FOR REPAIR OR REPLACEMENT; HOT WATER MAY BE TRAPPED IN THE STATION.

4. See Section 4.0, for individual valve adjustment and/or replacement.
5. Once Therm-O-Mix has been repaired, open the hot and cold water supply valves to the station. Allow station to run for at least one minute to purge the system.
6. Insert the temperature-reading device into the eyewash nozzle. Activate the eyewash and record the temperature several times over a 5-10 minute cycle. Repeat this step for the shower, attaching the temperature-reading device to the shower head. Record temperatures on the Unit Checklist (see Appendix# 4).

Section 3.4: Analyzing Component Failure by Conditions

| CONDITION | COMPONENT FAILURE |
|--|--|
| If the outlet temperature remains above the normal range for long periods of time without fluctuation in the outlet temperature. | Follow Section 3.1 & 3.2 to decommission the station for repair. Follow Section 4.2 to adjust the V1 Mixing Valve outside the unit. If the valve cannot be adjusted correctly a replacement WWM Diaphragm Actuator is required. If the outlet temperature is above 95°F, replacement of the V4 Control Valve is required. (See section 4.3 & 4.4 for replacement instructions) |
| If the outlet temperature fluctuates, rising above the normal range and then drops below the normal range. | Follow Section 3.1 & 3.2 to decommission the station for repair. Follow Section 4.2 to adjust the V1 Mixing Valve outside the unit. If the valve cannot be adjusted correctly a replacement WWM Diaphragm Actuator is required. (See section 4.3 for replacement instructions) |
| Cold Water Only | Verify that the hot water flow pressure is adjusted slightly high than the cold water flow pressure as per the factory's installation instructions. Follow Section 3.1 & 3.2 to decommission the station for repair. Remove the V4 Control Valve for testing (See section 4.4). If the V4 tests correctly Follow Section 4.2 to adjust the V1 Mixing Valve outside the unit. If the valve cannot be adjusted correctly a replacement WWM Diaphragm Actuator is required. If the V1 Mixing Valve is properly adjusted verify that the hot water supply is not blocked before replacing the WWM Diaphragm Actuator by slowly opening the hot water supply valve. |
| Unit Runs Slightly Off Set-Point | Minor adjustments can be made to the V1. (See section 4.1) |

Section 4.0: Adjustments and Repairs

Section 4.1: V1 Mixing Valve Adjustment Instructions with the Unit Running

Before beginning repairs read and understand Section 3.1. The Station should be tested after all adjustments are completed.

1. Remove the cap nut located on the top of the diaphragm head with a 1" wrench.
2. Loosen calibration lock nut with a 7/16" wrench.
3. Use a marking pen to make a reference mark so that the calibration screw can be reset to the original location if needed.
4. Use a 1/8" hex key to adjust the calibration screw while the unit is running. Turning the screw counter clock-wise will raise the temperature and turning the screw clock-wise will lower the temperature. The calibration screw should only be adjusted a ½ turn at a time. Allow the unit to stabilize for at least one minute after adjustment before trying to make other adjustments.
5. Once the necessary adjustments are made tighten the lock nut onto the calibration screw.
6. Re-install the cap nut making sure the face seal does not get pinched. Snug the acorn nut with a 1" wrench.

Section 4.2: V1 Mixing Valve Adjustment Instructions with the WWM Diaphragm Removed

Before beginning repairs read and understand Section 3.1 and follow the steps in Section 3.2 to decommission the Therm-O-Mix Station. The Station should be tested after all repairs are completed.

1. Label each hose connection going to the diaphragm housing for easy re-installation. (See Appendix #3)
2. Disconnect hoses from the diaphragm housing only.
3. Use a 1-1/2" wrench or spud wrench to loosen diaphragm valve assembly. Once unthreaded, pull diaphragm valve out. Some resistance may be felt due to O-ring seal.
4. Remove cap nut and loosen calibration lock nut with a 7/16" wrench.
5. Place the stainless steel sensor into a water bath with a temperature 5F over the set point for five minutes. *Note: The sensor should be at or below 75F prior to being placed into the water bath for proper calibration. Use calibration screw to adjust the valve spool so that the opening between the spool and the cap is .160-.175 in. (See Appendix #5 & #6).
6. Place stainless steel sensor into a water bath with a temperature 5°F below the set point for five minutes. Verify that the top of the spool is sitting on the bottom of the cap.
7. Once properly adjusted, tighten the calibration lock nut and replace cap nut.
8. Thread WWM Diaphragm Actuator back into the V1 Mixing Valve Tee assembly and tighten with 1-1/2" wrench.
9. Position the diaphragm housing so that the adaptor fittings are pointing to the side of the body with the braided hoses. *Note: To position the diaphragm housing, rotate clockwise when looking down on the Therm-O-Mix® Station/WWM to prevent the valve internals from loosening.
10. Reconnect the braided hose lines by hand tightening the hose swivel fittings onto the adaptor fittings. Use a 9/16" open end wrench to tighten the swivel nut 1 to 1-1/2 hex flats or 60 to 90 past hand tight. *Use second 1/2" wrench as a back-up wrench to prevent hose from twisting.
*If braided hose connections containing orifice plates are opened, the orifice plate must be replaced. Orifice plates have been included in the replacement kit in case they are needed. (See Appendix #3)

Section 4.3: V1 Mixing Valve Replacement Instructions

Before beginning repairs read and understand Section 3.1 and follow the steps in Section 3.2 to decommission the Therm-O-Mix Station. The Station should be tested after all repairs are completed.

1. Label each hose connection going to the diaphragm housing for easy re-installation.
(See Appendix #3)
2. Disconnect hoses from the diaphragm housing only.
3. Use a 1-1/2" wrench or spud wrench to loosen diaphragm valve assembly. Once unthreaded pull diaphragm valve out. Some resistance may be felt due to O-ring seal.
4. Remove old body O-ring.
5. Install new #221 Quad O-ring supplied with replacement kit.
6. Install new diaphragm valve assembly and tighten with 1-1/2" wrench.
7. Position the diaphragm housing so that the adaptor fittings are pointing to the side of the body with the braided hoses. *Note: To position the diaphragm housing, rotate clockwise when looking down on the Therm-O-Mix® Station/WWM to prevent the valve internals from loosening.
8. Reconnect the braided hose lines by hand tightening the hose swivel fittings onto the adaptor fittings. Use a 9/16" open end wrench to tighten the swivel nut 1 to 1-1/2 hex flats or 60 to 90 past hand tight. *Use second 1/2" wrench as a back-up wrench to prevent hose from twisting.
*If braided hose connections containing orifice plates are opened, the orifice plate must be replaced. Orifice plates have been included in the replacement kit in case they are needed.
(See Appendix #3)

Section 4.4: V4 Control Valve Replacement Instructions

Before beginning repairs read and understand Section 3.1 and follow the steps in Section 3.2 to decommission the Therm-O-Mix Station. The Station should be tested after all repairs are completed.

V4 Control Valve Test

1. Label each hose going to the V4 Control Valve to ensure proper orientation during re-assembly.
2. Using a 9/16" wrench disconnect the 3 hose connections on the V4 Control Valve.
*Note: two orifice plates will drop out of the upper and lower hose connections.
3. Unthread the V4 Control Valve from the V1 Valve Mixing Tee assembly using a 1-1/8" wrench.
4. Place V4 Control Valve stainless steel sensor into a water bath at 98F or above for five minutes.
5. Using a compressed air nozzle, blow air into the upper angled hose fitting. (See Appendix #8) If air can be felt coming from the center hose fitting, the V4 Control Valve has failed and must be replaced. If not, continue to the next step.
6. Place V4 Control Valve stainless steel sensor into a water bath at 85F or below for five minutes.
7. Using a compressed air nozzle, blow air into the lower straight hose fitting. (See Appendix #8) If air can be felt coming from the center hose fitting, the V4 Control Valve has failed and must be replaced. If not, continue to the next step.
8. If the V4 Control Valve is working correctly, thread the valve back into the 3/8 NPT port. Use teflon tape or equal pipe thread sealant on all NPT threads.
9. The 2 outside connections on the V4 Control Valve require orifice plates to be installed. Place an orifice plate in the female end of the hose and carefully thread the hose on to the proper male fitting. *Note: the middle connection of the V4 Valve does not receive an orifice plate.
10. Thread fitting until hand tight. Use a 9/16" wrench to tighten the swivel nut 1 full revolution to crush the orifice plate. Now turn swivel nut 1 to 1-1/2 hex flats or 60 to 90 to complete tightening the hose.
*Use a second 1/2" wrench as a backup wrench to prevent hose from twisting.

V4 Control Valve Replacement

1. Label each hose going to the V4 Valve to ensure proper orientation during re-assembly.
2. Using a 9/16" wrench disconnect the 3 hose connections on the V4 Valve.
3. Unthread the V4 Valve from the V1 Valve Mixing Tee assembly using a 1-1/8" wrench.
4. Thread the replacement V4 Valve into the 3/8 NPT port. Use teflon tape or equal pipe thread sealant on all NPT threads.
5. The 2 outside connections on the V4 Valve require orifice plates to be installed. Place an orifice plate in the female end of the hose and carefully thread the hose on to the proper male fitting. *Note: the middle connection of the V4 Valve does not receive an orifice plate.
6. Thread fitting until hand tight. Use a 9/16" wrench to tighten the swivel nut 1 full revolution to crush the orifice plate. Now turn swivel nut 1 to 1-1/2 hex flats or 60 to 90 to complete tightening the hose.
*Use a second 1/2" wrench as a backup wrench to prevent hose from twisting.

Appendices

Appendix #1

The Station schematic shows related valves and flow directions.

Appendix #2

The station flow chart shows the standard operating conditions and their relation to the Station as a unit.

Appendix #3

The Station line drawing shows the unit with callouts for each valve or referenced part.

Appendix #4

The Station checklist should be used whenever troubleshooting or repair work is done on a unit. The Station Serial Number is located on the V1 Mixing Body. The checklist can be sent to valves@thermomegatech.com or faxed to # 215-674-8594, Attn: Engineering, if any additional troubleshooting is required.

Appendix #5

Line drawing for WWM Diaphragm Actuator/V1 Mixing Valve adjustment.

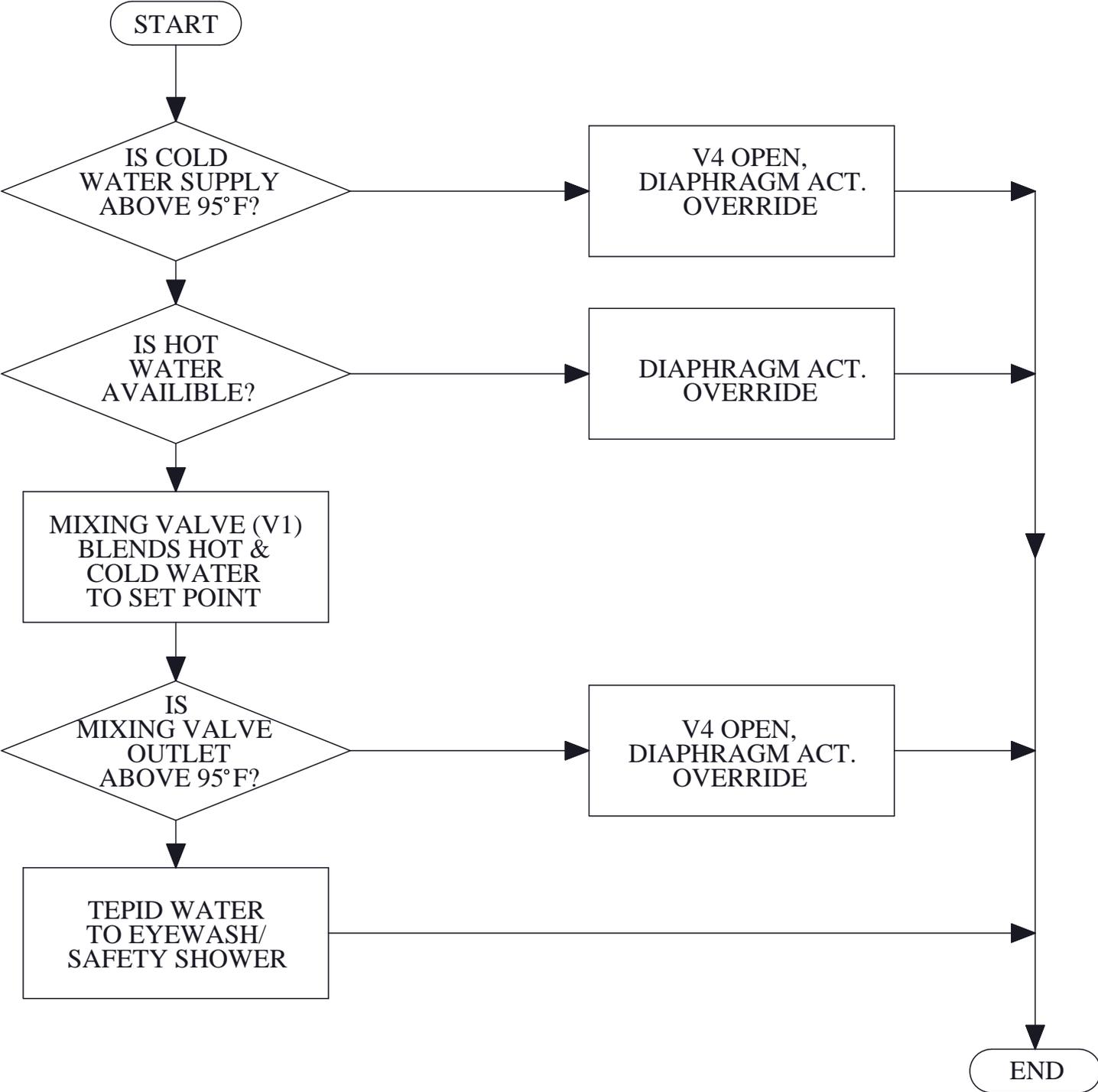
Appendix #6

V1 Mixing Valve adjustment photos.

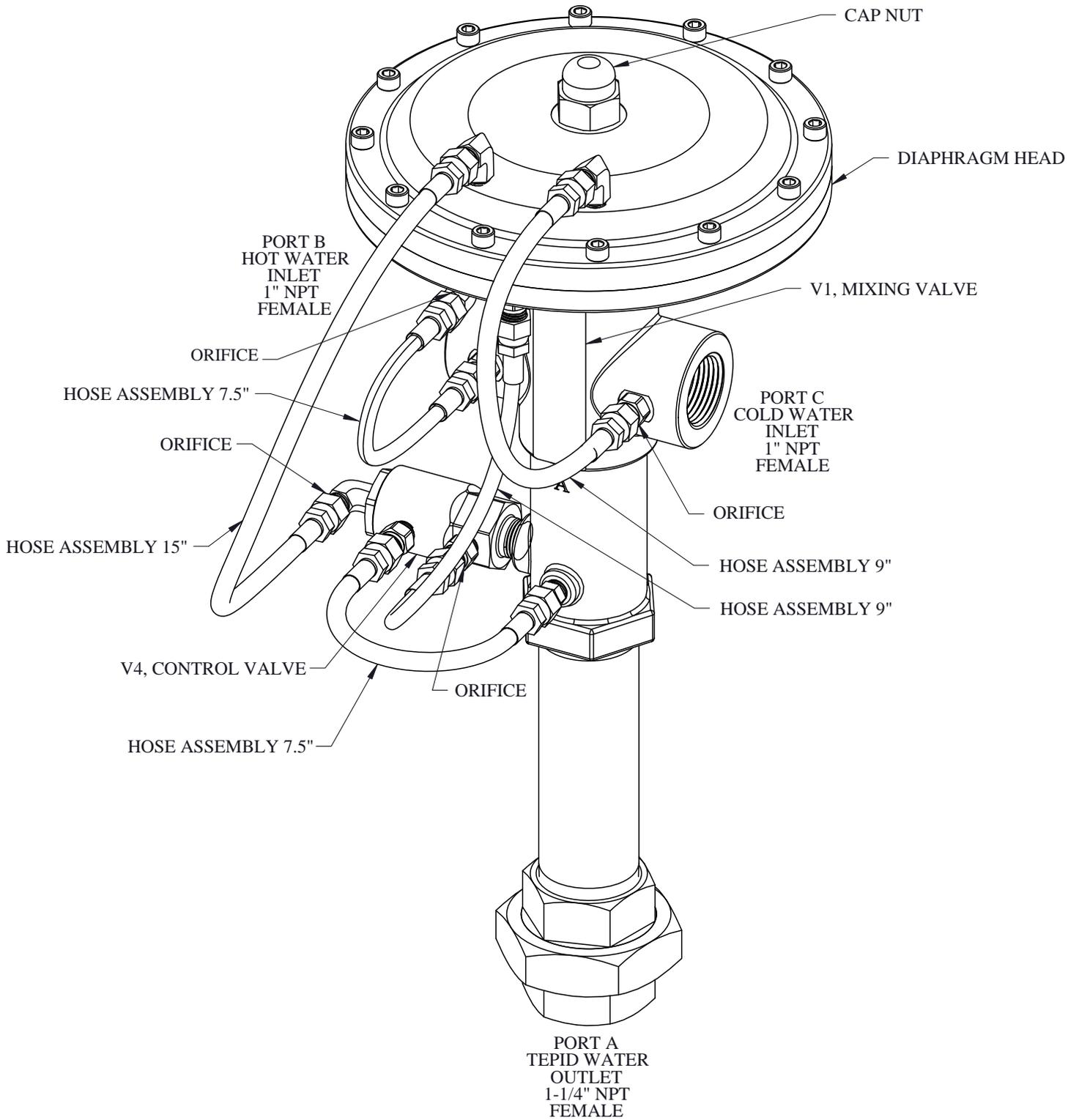
Appendix #7

V4 Control Valve test photo.

APPENDIX #2: Therm-O-Mix Safety Shower Station Flow Chart



APPENDIX #3: Station Line Drawing



APPENDIX #4: Therm-O-Mix WWM Safety Shower Station Checklist

Company _____
Plant Location _____
Serviceman/Company _____
Station/Serial Number _____

Contact _____
Phone _____
Date _____
Unit Location _____

Does the plant have adequate hot water flow pressure? (Recommended min. 45 PSIG/ max. 100 PSIG) _____

Is the stations hot water supply line properly sized? (Recommended min. 1" IPS) _____

Does the plant have adequate cold water flow pressure? (Recommended min. 45 PSIG/ max. 100 PSIG) _____

Is the stations cold water supply line properly sized? (Recommended min. 1" IPS) _____

Is the station supplying tempered water to anything other than the Safety Shower Station?
YES/NO

If "YES," explain: _____

Are freeze and scald protection valves installed correctly? YES/NO

If "NO," please explain: _____

Is the cold water supply line or the tempered water outlet in contact with or being overheated by another source? (Steam supply lines, steam tracing or solar radiation) YES/NO

If "YES," please explain: _____

Run #1

Eyewash Temperature: _____ F / C

Shower Temperature: _____ F / C

Eyewash Start-up Spike: _____ F / C

Shower Start-up Spike: _____ F / C

Run #2

Eyewash Temperature: _____ F / C

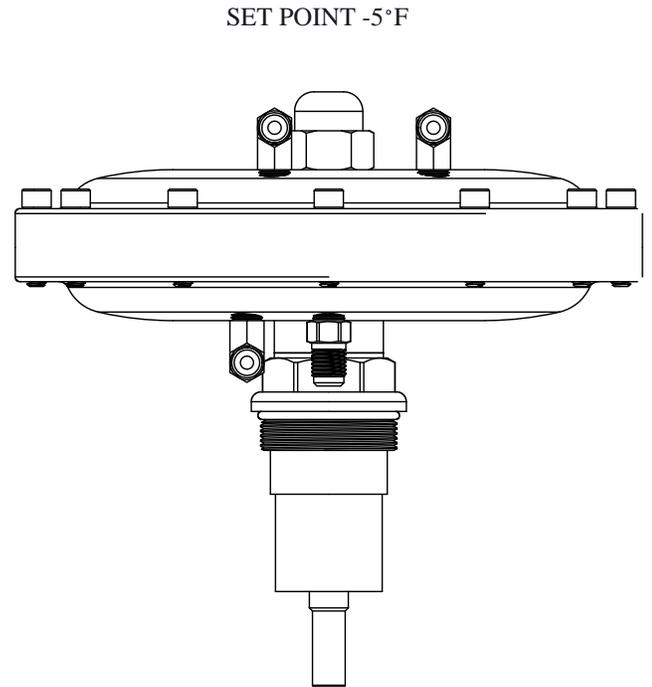
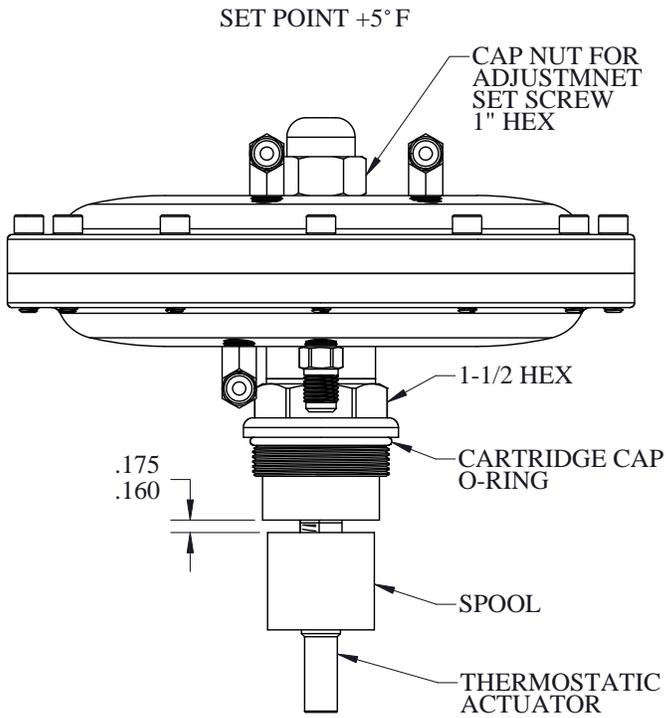
Shower Temperature: _____ F / C

Eyewash Start-up Spike: _____ F / C

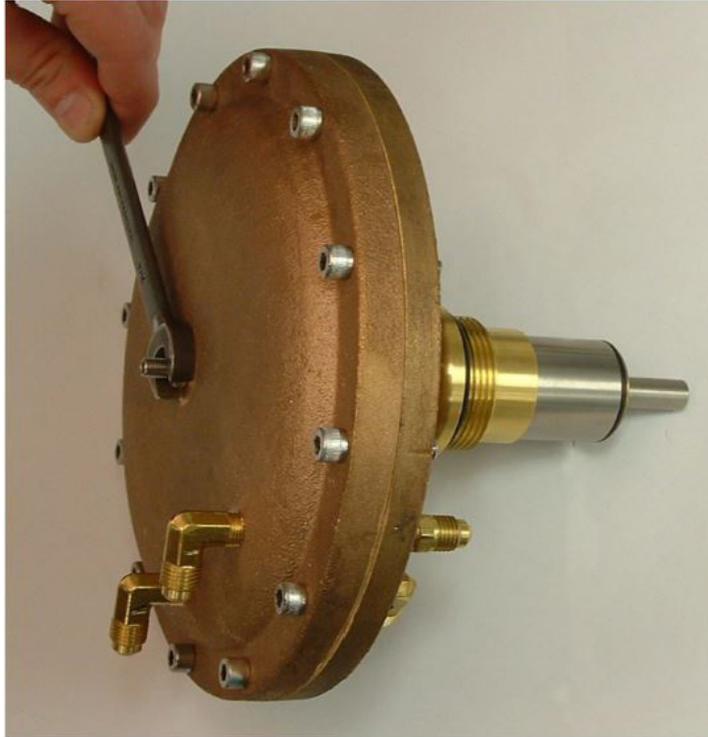
Shower Start-up Spike: _____ F / C

Comments: _____

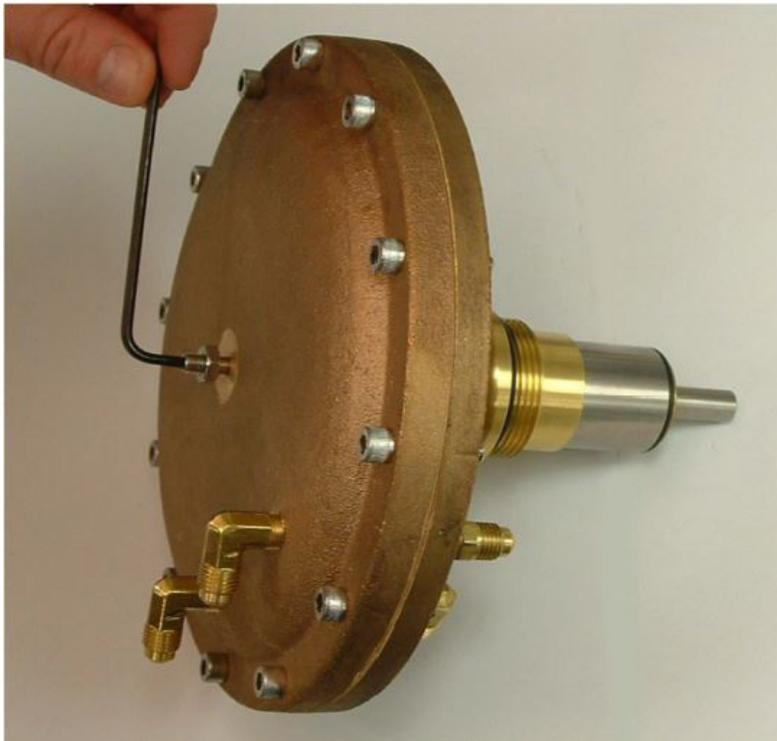
APPENDIX #5: WWM Diaphragm Actuator/V1 Mixing Valve Line Drawing



APPENDIX #6: WWM Diaphragm Actuator/V1 Mixing Valve Adjustment
Photo

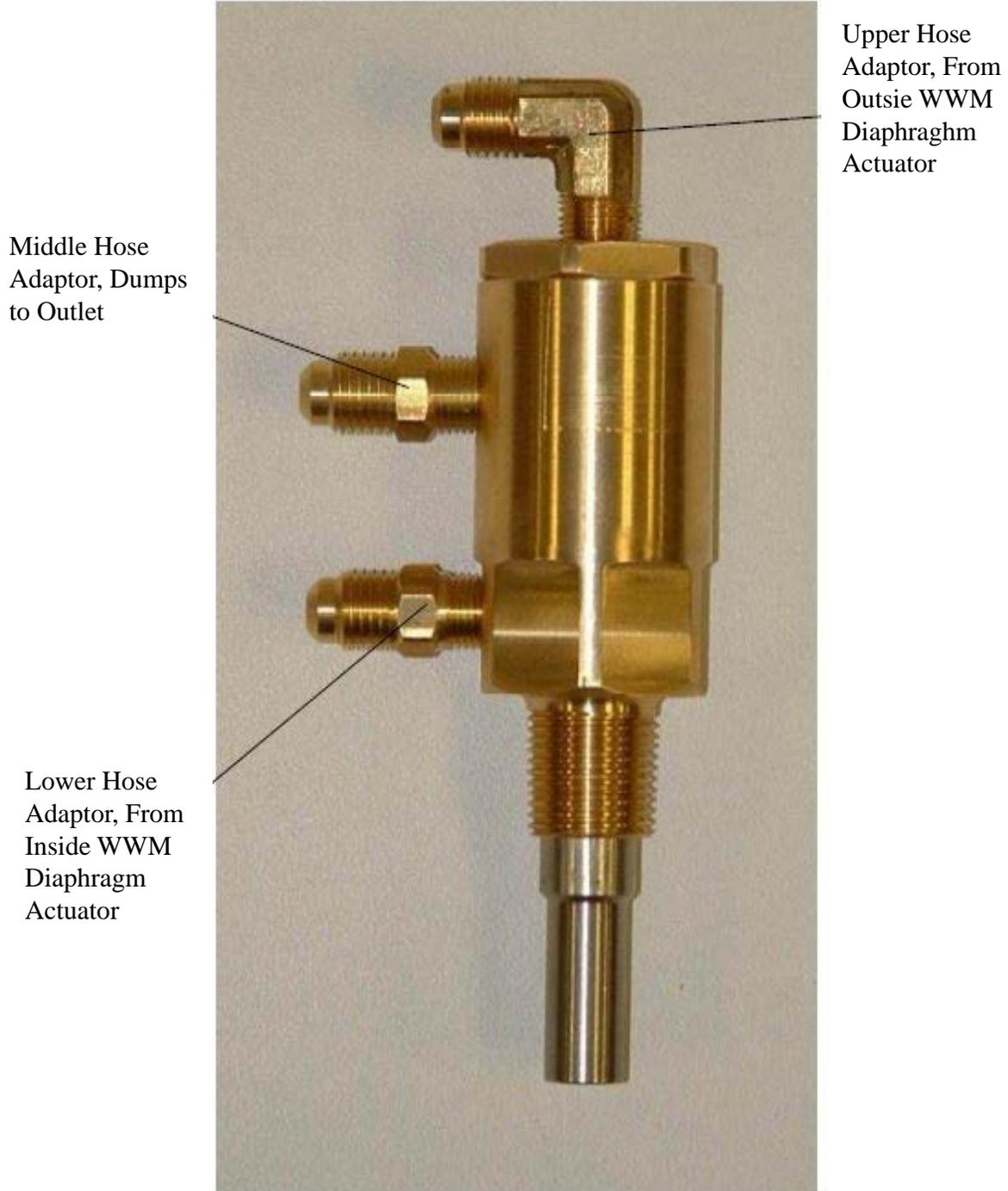


Loosen lock nut.



Adjust calibration screw.

APPENDIX #7: V4 Control Valve Test Photo



 **WARNING:** This product can expose you to chemicals, for example lead, nickel, acrylonitrile, which are known to the State of CA to cause cancer, birth defects, or reproductive harm. For more information, go to www.P65Warnings.ca.gov



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