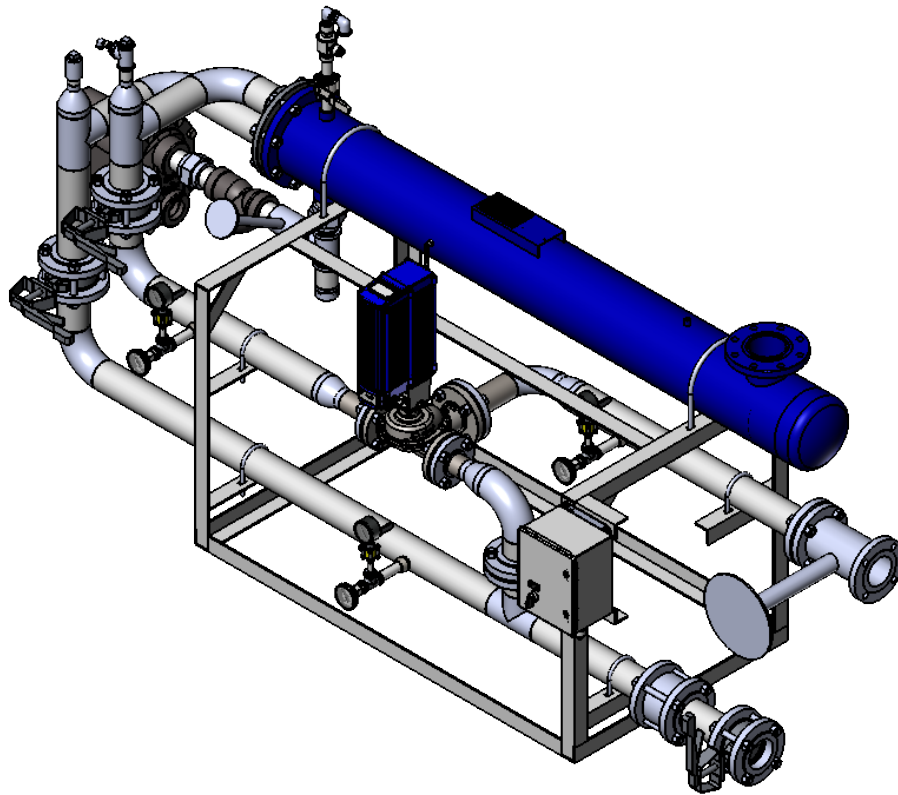


ReadiTemp® Steam-to-Water Shell and Tube Water Heater Installation, Operation, & Maintenance Manual



Safety

Icon Legend



DANGER! Injury or death and property damage are imminent.



WARNING! Injury or death and property damage are possible.



CAUTION! Property damage, costly repairs, and/or voiding the equipment warranty may result.



BURN HAZARD! Contact with steam, hot water, or hot metal surfaces can cause severe skin burns. Skin exposure to 140° F (60° C) water or metal for five (5) seconds can cause a second-degree burn.

Failure to comply with instructions following a safety icon may result in adverse consequences, including property damage, personal injury, or, in extreme cases, death.

General Safety Guidelines

1. This product is designed and constructed to withstand conditions expected during normal use.
2. Inappropriate use of this product could cause damage to the product and other property. Inappropriate use can also result in personal injury or, in extreme cases, death.
3. Installation or maintenance must be carried out in accordance with the instructions provided in this Installation, Operation, & Maintenance manual. Installation or maintenance must be completed by designated, qualified, and competent personnel.
4. Installation shall comply with all applicable federal, state, and local sanitary, construction, plumbing, and regulatory codes.
5. Improper installation, start-up, orientation, maintenance, or service may void the warranty.
6. When installing, commissioning, or serving this product:
 - a. ALWAYS ensure that all steam and water supply, recirculation, and return lines are isolated.
 - b. ALWAYS carefully relieve any residual internal pressure in the system or connecting pipe work before breaking or loosening any plumbing joints.
 - c. ALWAYS allow hot parts to cool before commencing work, to avoid the risk of burns.
 - d. ALWAYS wear appropriate personal protective equipment (PPE) before carrying out any installation or maintenance work.

General Description

ReadiTemp® is an instantaneous water heater that heats on demand and store very little hot water. ReadiTemp® transfers heat from steam to cold water and then precisely blends hot water, cold water, and recirculation return water (if supplied) to deliver water at a programmable setpoint temperature.

ReadiTemp® water heaters feature an Emech® Digital Control Valve (Models E20W, E25W, E40W, E50WR, or E80WR) that utilizes ceramic shear action disc technology to provide high-pressure differential capability and long life integrity. ReadiTemp® is supplied pre-piped and pressure-tested.

Fitted with the electronic actuator and integrated temperature sensor, the Emech® system delivers high performance, stand-alone, closed-loop temperature control. Even when sudden changes occur in inlet temperature and pressure to the valve, the actuator works to aggressively minimize outlet temperature variations, making the system ideal for use in process applications. The Emech® valve's ability to precisely control water temperature eliminates the requirement for the following separate components that are typically associated with steam-to-water heat exchangers:

- PID temperature controllers
- High temperature limit thermostats
- High temperature limit controllers
- Cold water injection valves
- Internal circulating pumps
- Compressed air requirements

All ReadiTemp® water heaters may be connected via 4-20mA signals for input and output temperature control and position signals for interfacing with a building automation system (BAS).

ReadiTemp® is engineered to precision and crafted with pride to deliver years of superior performance and customer satisfaction provided the following criteria are met:

1. Installation, commissioning, operation, and maintenance are in accordance with the recommendations provided in this product installation and operation manual (IOM), in addition to generally-accepted plumbing, pipe-fitting, and maintenance guidelines.
2. Periodic attention is given as necessary to maintaining the product, the accessory fittings and components, and the overall plumbing/distribution system in sound functional order.

Standard components for a ReadiTemp® system include (see the Typical Layout Diagram):

- Emech® E20W, E25W, E40W, E50WR, or E80WR Digital Control Valve
- Heat exchanger
- Thermometers and pressure gauges
- Check valves
- Isolation valves

An application-related, low surface-temperature option is available that requires a secondary steam control valve for instances where high mineral content in the supply water can cause excessive scaling in the heat exchanger.

Because the ReadiTemp® can be manufactured in customized configurations, there may be optional components that are not addressed in this IOM. Armstrong reserves the right to make design or specification changes without notification.

Specifications

Operating Specifications	
Steam Supply Pressure	2-15 PSIG (0.14-1 BARG)
Water Supply Pressure	20-145 PSIG (1.4-10 BARG)
Operating Temperature Range	-13-257° F (-10.5-125° C)
Set Point Range (Emech®)	32-212° F (0-100° C)
Minimum Temperature Differential for Control	1°
Minimum Flow Rate	E20W: 0.9 GPM (3.4 LPM); E25W: 4 GPM (15.1 LPM); E40W: 7 GPM (26.5 LPM) E50WR: 20 GPM (72 LPM); E80WR: 53 GPM (200.6 LPM)
Control Circuit Fuse	3 A
Enclosure Protection Rating (Emech® Actuator)	NEMA 4
Duty Cycle	100%
Power Supply Requirements	120 VAC / 60 Hz / 1 Ph.
Position Mode Capable Range	0-100%

Operational Limitations (all models):

Steam pressure, maximum allowable = 150 PSIG (10.3 barg)

Steam pressure, maximum operating = 15 PSIG (1 barg)

Water pressure, maximum allowable = 145 PSIG (10 barg)

ReadiTemp® Specification Matrix

Model	Heat Exchanger	Standard	Optional	Optional
		Emech®	Double Wall Tube Bundle	Recirculation
RT	415	E20W	DW	R
RT	535	E25W	DW	R
RT	665	E40W	DW	R
RT	8120	E50WR	DW	R
RT	10200	E50WR	DW	R
RT	12300	E80WR	DW	R
Examples	RT665 exchanger (E40W) with double wall tube bundle and recirculation			RT66540DWR
	RT8120 heat exchanger (E50WR) without recirculation			RT812050G

Materials of Construction

Component	Material (RT415, RT535, RT665, RT8120)	Material (RT10200)	Material (RT12300)
Heat Exchanger Shell	Carbon steel, ASTM SA-106 Gr. B, ASME "U-Stamped" shell with 316 SS two-pass head	Carbon Steel	Carbon Steel
Heat Exchanger Tube Bundle	5/8" OD x 16 BWG wall, admiralty brass	1/2" OD x 20 Copper	3/4" OD x 20 Copper
Integral Supply Pipe Work	Stainless steel		
Integral Valves and Fittings	Stainless steel		
Condensate Piping	Cast iron & carbon steel		
Mixing valve (Emech®)	Stainless steel		

Connections Detail

ReadiTemp® Specification Matrix

Model	Water Side						Steam Side					
	Connections				Flow Capacity at 15 psi (1 bar)		Connections				Flow Capacity at 15 psi (1 bar)	
	Hot/Cold Inlets		Recirc. Return**		100°F (38°C) Delta T		Steam Inlet		Condensate Outlet		100°F (38°C) Delta T	
	in.	mm	in	mm	GPM	LPM	in.	mm	in.	mm	lb/hr	kg/hr
RT41520	1"	25mm	1"	25mm	16 GPM	60 LPM	2"	50mm	3/4"	20mm	845 lb/hr	343 kg/hr
RT53525	1-1/2"	40mm	1"	25mm	34 GPM	113 LPM	2-1/2"	65mm	1"	25mm	1,801 lb/hr	817 kg/hr
RT66540	2"	50mm	1"	25mm	63 GPM	239 LPM	3"	80mm	1-1/4"	32mm	3,338 lb/hr	1,514 kg/hr
RT812050	3"	80mm	1-1/2"	40mm	120 GPM	454 LPM	4"	100mm	2"	50mm	6,358 lb/hr	2,884 kg/hr
RT1020050	3"	80mm	1-1/2"	40mm	200 GPM	757 LPM	6"	150mm	2"	50mm	10,597 lb/hr	4,806 kg/hr
RT1230080	4"	100mm	2"	50mm	300 GPM	1,125 LPM	8"	200mm	2-1/2"	65mm	15,896 lb/hr	7,210 kg/hr

* Factory connections are US nominal pipe sizes (NPS) w/ ANSI taper pipe threads (NPT) or ASME/ANSI B16.5, Class 150, bolted flange connections, as noted. The nearest equivalent pipe sizes in SI (metric system), known as “nominal diameter”, are listed in parentheses. Consult factory for pressure drop information.

** If Model Number does not include ‘R’ (ex: RT66540**R**), then no recirculation return connection is provided.

Precautions



WARNING! The design of the Read iTemp® electrical system is NOT suitable for installation in interior spaces classified as “hazardous locations”, i.e., spaces containing explosive and combustible vapors or dusts, as defined in the National Electrical Code, NEC.



WARNING! Always use appropriate lockout/tagout procedures when turning off and disconnecting power sources during installation, service, and repair. Failure to follow safety precautions may result in property damage, shock causing personal injury, or even electrocution and death.



WARNING! Always use appropriate personal protective equipment (PPE) when working with high-voltage electricity.



WARNING! Water conducts electricity. DO NOT stand in water or touch wet surfaces while working with “live” electrical equipment.



WARNING! The factory-supplied, pressure relief valve is a required safety device.

- DO NOT remove the relief valve from the heater
- DO NOT plug the open end of the relief valve
- DO NOT install any valve(s) or restrictions in the pressure relief valve, drain line



CAUTION! The requirements of all applicable local and regional equipment installation codes supersede the installation instructions in this manual. Governing codes must be followed. In the absence of these codes, installation shall conform to these instructions and the guidelines contained in the latest edition of the National Electrical Code (NEC), NFPA 70.



CAUTION! For long and satisfactory service, Armstrong recommends the facility use, or install, effective electrical surge and lightning protection to protect this equipment.

Only designated, qualified, and competent personnel shall conduct product installation according to these instructions.

Water Treatment Requirements

The end user shall be responsible for providing effective water treatment systems suitable to the application. The heater design does not incorporate a water quality control system.

Since the Read iTemp® design incorporates a steam-to-water, shell and tube type, heat exchanger., Minimizing scaling and deposit formation on heat exchange surfaces is critical to maintaining satisfactory operation. Therefore, consistent control of system water quality could be a very important factor in maintaining the water heating performance of the Read iTemp®. Under certain conditions (e.g., water with a high dissolved mineral content or high discharge water temperatures), scale build-up in the heater and associated plumbing may be rapid and excessive causing heater performance to noticeable deteriorate. Periodic cleaning and descaling may be required under these conditions.

Installation Requirements

The RediTemp® water heater requires connections to adequate sources of low-pressure, saturated steam; electrical power (85-264 VAC / 60 Hz / 1 Ph., typ.); and clean (usually potable) cold water. Connections to a steam condensate return system, a recirculated return (if supplied as 'R') water circuit, and to a system that will utilize, distribute, or store the mixed (heated), water are also required.

Although the physical construction of the heater incorporates highly corrosion-resistant materials and watertight (NEMA 4-rated) control enclosures, the device is intended to be located within a structure or protective enclosure furnished by the end user. The enclosure should provide adequate free space around the heater for service and maintenance. In locations w/ severe climates, means to protect the heater from low (freezing) and high ambient temperatures may also be required.

Proper installation usually requires mounting and securing the heater to a rigid base or foundation that can provide adequate bearing support, prevent movement and tipping, and resist differential settling. The base or foundation material should be able to withstand, without significant degradation, occasional exposure to moisture and wetting.

Support all steam and water piping connecting to the heater from a fixed structure capable of independently holding the operational weight of the piping. Consider employing design features in the piping and supports to accommodate thermal expansion and contraction of the piping during normal operation.

Plumbing

A licensed plumber or pipe fitter familiar with local code requirements should install the RediTemp® water heater and oversee the commissioning of the heater. Refer to the Typical Installation Diagram for a depiction of the location of connection points.

1. Before beginning any installation or maintenance procedure, always ensure that all supply, return, and recirculation water and steam lines are isolated (i.e. shutoff valves are closed).
2. Ensure any residual internal pressure in the system or connecting pipework is carefully relieved.
3. Allow hot parts to cool before commencing work, to avoid the risk of burns.
4. Always wear appropriate personal protective equipment (PPE) before carrying out any installation or maintenance work.
5. Place the RediTemp® water heater in the desired mounting location, ensuring that there is adequate free space from adjacent walls and other obstructions for service and maintenance access. If movement or tipping of the water heater could occur, secure the heater stand or base to the floor.
6. Connect an appropriately-sized boiler steam supply line to the heat exchanger steam connection. (See Steam Piping Installation Detail).

Note: In the event the tube bundle must be extracted from the heat exchanger, allow sufficient clearance between the removable head end of the heat exchanger and any obstructions to enable complete tube bundle removal from the heater (refer to the "Dimensions" table for tube bundle lengths). Assure sufficient clearance distances on all other sides of the heater assembly for service access.

Installation, cont.

1. Connect an appropriately-sized condensate return line to the steam trap outlet.
2. Connect the inlet cold water supply to the isolation valve on the inlet piping (tagged accordingly).

NOTE: The water supply pressure must be controlled so that the maximum operating conditions (See Page 4) are not exceeded. Use a pressure-reducing valve (PRV) to control pressure fluctuations or reduce line pressure where necessary. Water pressure must exceed steam pressure at all times.

3. Connect the outlet mixed water supply to the isolation valve on the discharge piping (tagged accordingly).
4. Connect the recirculation return (if supplied) line to the isolation valve on the recirculation piping (tagged accordingly).
5. If the RediTemp® unit is feeding an atmospheric tank, a globe valve (or similar) must be installed on the Emech® mixed water outlet prior to the tank.
6. Pipe the outlet from the factory-supplied water pressure relief valve to a sanitary drain to avoid contact with hot water should a pressure release occur. The drain line should terminate over the drain with the open end exposed to atmospheric pressure. The relief valve drain line should slope downward toward the sanitary drain so that all water can completely flow from the line. Standard cracking pressure for the factory-supplied pressure relief valve is 165 psi.

Notes:

The Emech® is designed to operate with a minimum flow rate of either draw/off demand or continuous recirculation flow. If supplied for a recirculated system, a recirculation pump (not supplied by Armstrong) must be installed on the recirculation line to the unit. The recirculation pump should operate continuously. Avoid switched power sources, timer-controlled power sources, and power sources tied to energy conservation circuits.

- **Emech® E20W** requires a minimum continuous flow rate of 0.9 GPM.
- **Emech® E25W** requires a minimum continuous flow rate of 4 GPM.
- **Emech® E40W** requires a minimum continuous flow rate of 6 GPM.
- **Emech® E50WR** requires a minimum continuous flow rate of 20 GPM.
- **Emech® E80WR** requires a minimum continuous flow rate of 53 GPM.

See Steam Piping Installation Detail on the following pages.

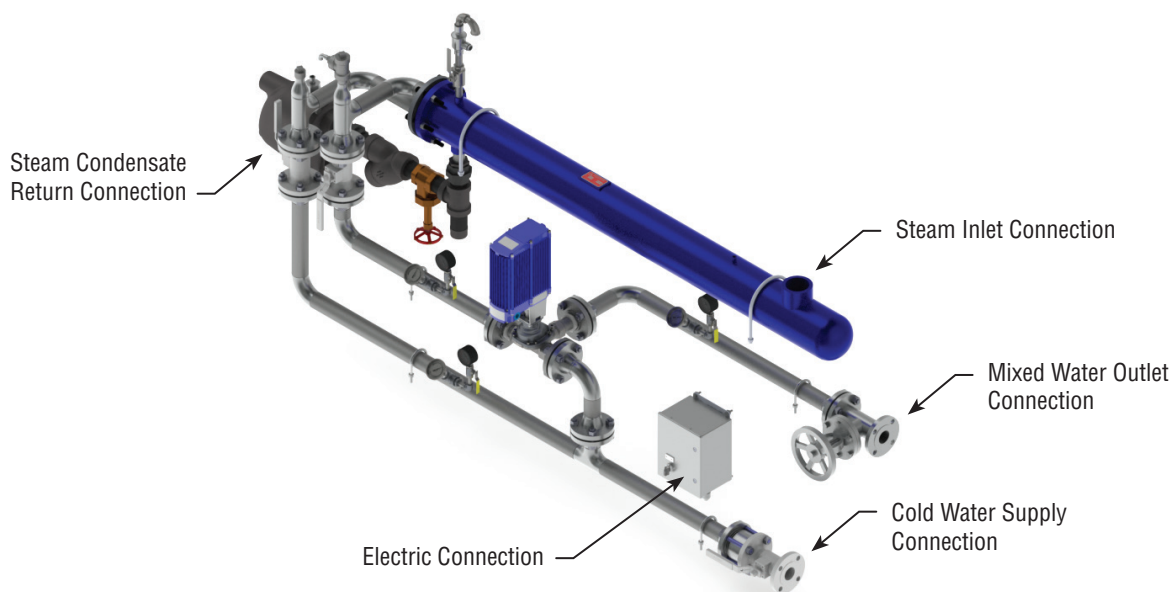


Figure 2
RediTemp® connections diagram

Installation, cont.

Steam Piping Installation

1. Install the RediTemp® with adequate room to allow for tube bundle removal when cleaning is required. See Table on Page 5 for specific dimensions.
2. If 2-15 psig steam is available, a pressure reducing valve is NOT required. If a pressure reducing valve is required, an Armstrong Inverted Bucket Steam Trap is recommended to drain condensate at the inlet of the pressure reducing valve.
3. An Armstrong Y-strainer should be installed before the pressure reducing valve to reduce the chance of dirt fouling.
4. If an externally piloted pressure reducing valve is used, the control pipe should be pitched away from the PRV and installed at the pressure gauge on the shell of the heat exchanger.
5. A steam safety relief valve should be used prior to the heat exchanger if either or both of the following conditions exist:
 - a. The maximum steam pressure could exceed the minimum water pressure in the tubes, or
 - b. The maximum steam pressure could exceed 150 psig (10.3 bar) (the maximum steam pressure rating of the shell).

IMPORTANT: Steam supply pipe size coming to the heat exchanger should NOT be smaller than the steam connection supplied on the heater. Otherwise, steam flow could be restricted. If a pressure-reducing valve is used, installation should be as close as possible to the RediTemp®. Downstream piping from the pressure-reducing valve should be expanded immediately after the pressure-reducing valve to accommodate the expanded volume of steam.

6. To vent start-up air, an Armstrong Thermostatic Air Vent is included and installed on the top connection opposite the trap drain connection of the heat exchanger. This discharge can be piped to the drain or the floor if preferred.
7. Install a suitable steam pressure gauge in the 1/4" (6.3 mm) coupler located in the top mid-section of the heat exchanger shell. This gauge will help diagnose pressure problems should they occur. This port may also be used for a pressure-reducing valve external control pipe if a pressure-reducing valve is required.

Always consult local codes and standards for detailed installation requirements.

NOTE: RediTemp® assembly is provided with (1) Armstrong steam trap, (1) vacuum breaker, (1) safety relief valve, and (1) thermostatic air vent. All other items shown in gray are not included.

Installation, cont.

Electrical

The ReadiT[®] water heater requires external electrical power to operate the Emech[®] valve.

A licensed electrician or electrical contractor should run electrical current from a 120-240 VAC / 50-60 Hz / 1 Ph. power source to the ReadiT[®] control cabinet. An electrical schematic for a ReadiT[®] control system with an Emech[®] mixing valve appears in Figure X below.

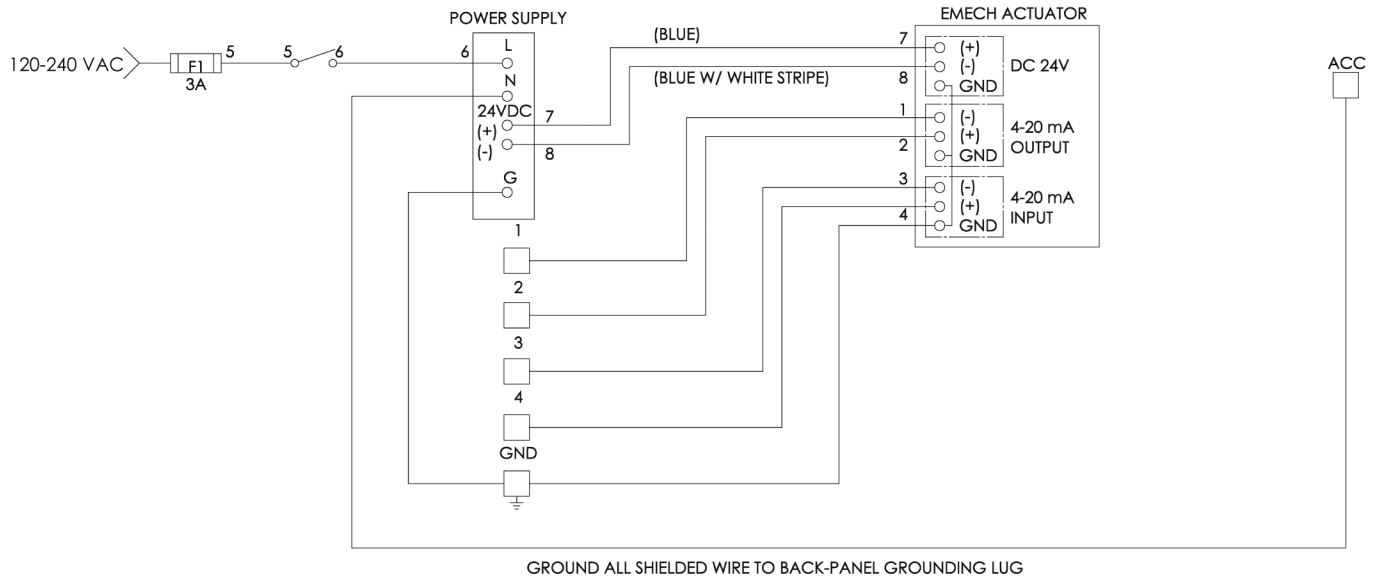


Figure 3

Electrical schematic for a standard ReadiT[®] with an Emech[®] digital mixing valve

Installation, cont.

Electrical Connection Procedure

1. Connect the line voltage wire to the side of the fused terminal block marked “LINE”.
2. Connect the neutral wire to a terminal block marked “ACC”.
3. Connect the ground wire to the ground terminal block marked
4. Energize the power source to the control panel and turn the manual selector switch to the “ON” position.
5. The Emech® display should illuminate once the switch has been turned to the “ON “ position.
6. Turn the manual selector switch to the “OFF” position.
7. The Emech® display should deactivate once the switch has been turned to the “OFF” position.

 **WARNING! The Emech® does not move to the cold position in the event of a power supply loss. It will stop in the position it was last in prior to the loss of power.**

Notes:

The Emech® is designed to operate with a minimum flow rate of either draw/off demand or continuous recirculation flow. If supplied for a recirculated system, a recirculation pump (not supplied by Armstrong) must be installed on the recirculation line to the unit. The recirculation pump should operate continuously. Avoid switched power sources, timer-controlled power sources, and power sources tied to energy conservation circuits.

- **Emech® E20W** requires a minimum continuous flow rate of 0.9 GPM.
- **Emech® E25W** requires a minimum continuous flow rate of 4 GPM.
- **Emech® E40W** requires a minimum continuous flow rate of 6 GPM.
- **Emech® E50WR** requires a minimum continuous flow rate of 20 GPM.
- **Emech® E80WR** requires a minimum continuous flow rate of 53 GPM.

Commissioning



WARNING! The following procedure should **ONLY** be performed by qualified persons. **DO NOT** attempt any of the following actions if you are:

1. **NOT** experienced with handling high-voltage electrical power **AND/OR**
2. **NOT** using appropriate personal protective equipment.

DO contact a qualified HVAC or electrical contractor instead.



WARNING! Water conducts electricity. **DO NOT** stand in water or touch wet surfaces while working with “live” electrical equipment.



WARNING! Failure to follow these instructions may result in a fire, explosion, or electrocution that could cause property damage, personal injury, or, in extreme cases, death.



CAUTION! If cold water pressure is lost while steam is present, overheating and hydraulic pressure shock “water hammer” damage could occur in the heater and plumbing system. Verify that adequate water volume and pressure is supplied to the Read iTemp® **BEFORE** introducing steam into the heat exchanger.

Only designated, qualified, and competent personnel shall conduct commissioning according to these instructions.

Commissioning Procedure

1. Perform a visual overview and confirm that the Read iTemp® is installed per our installation schematics described in this Installation, Operation, and Maintenance manual.
 - a. Confirm all water supply lines are connected correctly and that all isolation valves are closed.
 - i. Hot water supply
 - ii. Cold water supply
 - iii. Mixed water outlet
 - iv. Recirculation return (if supplied as ‘R’) from the system loop to the Read iTemp®
 - b. Confirm all steam/condensate lines are connected correctly and that all isolation valves are closed.
2. Energize the Read iTemp® control panel, turn switch(es) on, and verify Emech® display(s) is/are illuminated.
3. Flood the system slowly and in the following sequence:
 - a. Cold water supply
 - b. Mixed water outlet
 - c. Hot water supply
4. Create a demand in the system loop.
 - a. Open 4-5 fixtures (slop sinks, showers, baths, hose stations, etc...).
5. If application is an atmospheric tank fill, throttle the globe valve (or similar) downstream of the Emech® outlet until the temperature stabilizes.
6. Turn on recirculation pump(s) (if supplied as ‘R’)
 - a. Confirm continuous minimum flow: **E20W:** ≥ 0.9 GPM (3.4 LPM); **E25W:** ≥ 4 GPM (15.1 LPM); **E40W:** ≥ 7 GPM (26.4 LPM); **E50WR:** ≥ 20 GPM (72 LPM); or **E80WR:** ≥ 53 GPM (200.6 LPM)

Commissioning, cont.

7. Open the condensate discharge isolation valves on the RediTemp®
8. Supply steam to the RediTemp®, slowly
 - a. Purge any condensate/water in the system
 - b. DO NOT exceed 15 psi of steam pressure
9. Confirm all supply temperatures and pressures are sufficient
 - a. Hot water
 - b. Cold water
 - c. Recirculation return (if supplied as 'R')

Observe the Emech® to adjust and maintain the outlet temperature that was preprogrammed by the factory (based on information provided on the Installation Details Form). Allow time for open fixtures to evacuate air from the system.

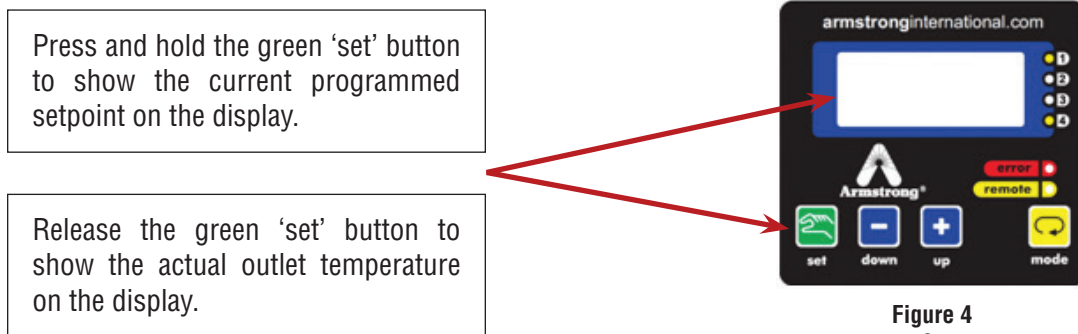


Figure 4
Emech® display

11. Shut off all open fixtures and confirm presence of continuous recirculation (if supplied as 'R').
12. Monitor Emech® outlet and confirm the valve is maintaining set point. New systems may take some time for the recirculation return temperature to rise to an appropriate level.

Note: The Emech® setpoint temperature is programmed in the factory before the valve is shipped to the customer, based on information provided to Armstrong on the Installation Details Form. If a desired setpoint was not provided, the Emech® will ship with a setpoint factory default of 32°. Refer to the Emech® Actuator Installation and Operation Manual (IOM 440-EN).

Note: When starting up a RediTemp®, the water supply MUST be turned on to the unit BEFORE any steam is supplied to the heater. Once the unit is operating, the inlet water valve should NEVER be closed unless the steam is first turned off. When shutting down a RediTemp®, ALWAYS shut off the steam supply FIRST, and then allow water to run through the unit until it has cooled and completely condensed all steam remaining in the heat exchanger.

Note: During system startup, the Emech® display may indicate an Error condition. This Error condition should clear during the commissioning procedure. If the Error condition does not clear, refer to the Troubleshooting Guide in the Emech® Actuator Installation and Operation Manual (IOM 440-EN).

Preventative Maintenance



BURN HAZARD! Contact with steam, hot water, or hot metal surfaces can cause severe skin burns. Skin exposure to 140° F (60° C) water or metal for five (5) seconds can cause a second-degree burn.

TEMP (°F)	Approx TIME for 1st Deg Burn	Approx TIME for 3rd Deg Burn
100	Safe for bathing	Safe for bathing
120	8 min	10 min
125	2 min	4 min
130	17 sec	30 sec
140	3 sec	5 sec
155	Instant	1 sec
160	Instant	0.5 sec
180	Instant	Instant

Prior to performing any invasive procedure, perform any lockout/tagout procedures. Then, close the steam inlet and allow the heat exchanger to cool. Always close the steam inlet BEFORE closing the water inlet.

De-energize the RediTemp® electrical control panel following lockout/tagout procedures.

Stop recirculation pump(s), close cold water inlet, and relieve water pressure before breaking any couplings and joints.

Critical Preventative Maintenance

O-Rings and Seals: Check Emech® O-Rings and seals every 24 months**, or more frequently if these components are exposed to harsh water conditions. See Emech® IOMs 442-EN and 443-EN for comprehensive maintenance details.

** Intervals are recommended. Site conditions and maintenance trends may support extending or reducing preventive maintenance intervals.

Interval**	Task
Quarterly	Check heat exchanger temperatures and flow rates against standard specifications.
Quarterly	Check bolted joints for loose fasteners and for signs of steam or water leakage. Tighten or replace excessively corroded parts and fasteners as needed.
Quarterly	Check condition of heat exchanger and two-pass head for signs of leakage and excessive corrosion. Tighten joints or replace parts as required.
Quarterly	Wipe down assembly. Check for damaged components. Touch-up paint as required.
As required	Descale system (frequency depends on water quality).
As required	If excessive leakage is found, replace worn or damaged plumbing, parts, and heat exchanger gaskets as required.

Preventative Maintenance, cont.

Heat Exchanger Maintenance

Performance: Check temperatures and flow rates against the commissioning data. If there is a noticeable reduction in heat exchanger capacity, temperature, or an elevated pressure drop across the exchanger, excessive mineral scale or fouling may be present.

Two scale remediation options are:

1. Manual disassembly, descaling, and cleaning.
2. Clean-in-Place method that floods the heat exchanger with a descaling solution, such as Rite-Qwik™

Before attempting manual cleaning, confirm that an appropriately sized Read iTemp® heat exchanger gasket kit is on-site.

1. Manual Cleaning by Removing Heat Exchanger Tube Bundle

1. De-energize the Read iTemp® control panel following lockout/tagout procedures. Close the steam inlet following lockout/tagout procedures, stop recirculation pump(s), close cold water inlet, and close recirc return line - in that order. Allow the heat exchanger to cool. Drain all liquids from the heat exchanger shell.
2. Remove the two-pass head from the shell of the heat exchanger.
3. Extract the tube bundle from the heat exchanger for inspection and manual cleaning. Gentle mechanical cleaning or pressure washing may be effective in removing deposits from the tube bundle. Soaking the tube bundle in a chemical cleaning agent, such as Rite-Qwik™, may expedite the manual cleaning process.
4. If cleaning a single wall tube bundle, remove the floating end cover. Descal and remove any mineral deposits on the inside surface of end cover.
5. The two-pass head, inlet and outlet tubes, and the internal surface of the heat exchanger shell may also require cleaning and flushing to remove mineral deposits and sediment.
6. Thoroughly, but gently, clean all mating surfaces of the heat exchanger and two-pass head.
7. Reassemble the tube bundle and heat exchanger using new gaskets and O-rings. Replace any compromised fasteners with identical new parts.
8. Recommission the water heater following IMPORTANT instructions on Page 17.

2. Clean-in-Place (CIP) Method

Armstrong offers a cleaning agent, Rite-Quik™, a non-hazardous chemical cleaner that is proven effective at removing deposits without damaging or causing deterioration to internal surfaces the Read iTemp® heater.

Rite-Qwik™ can be pumped directly into the heat exchanger by using an Armstrong Clean-In-Place unit conveniently assembled on a portable handcart. See CIP connections detail on **Page 18**.

If ordering Rite-Qwik™, a minimum of 10 gallons (37.8 liters) is recommended. Review the Rite-Qwik™ safety data sheet BEFORE using the solution, and follow appropriate safety and disposal guidelines.

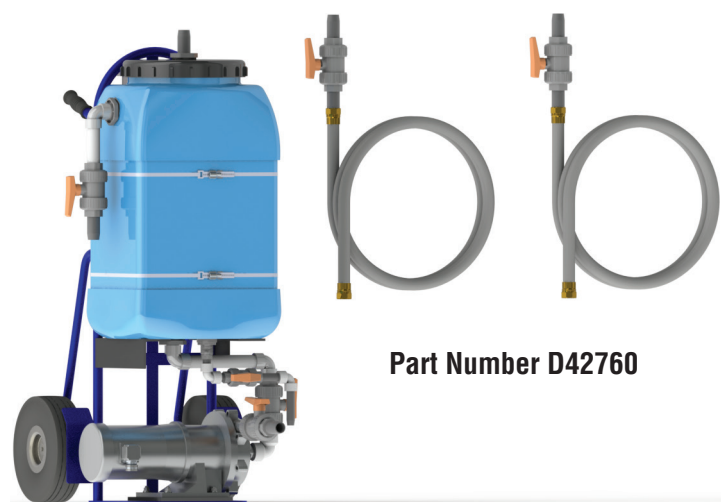


Figure 5
Clean-in-Place unit

Preventative Maintenance, cont.

Clean-in-Place (CIP) Procedures for ReadiTemp® (RT)

1. Close the steam inlet following lockout/tagout procedures.
2. Close the condensate line.
3. Stop recirculation pump(s), close the cold water inlet and recirculation return line, depressurize the exchanger (via blowdowns or HWO pressure gauge ball valve with hose to drain), then close the hot water outlet.
4. De-energize the RT control panel following lockout/tagout procedures.
5. Remove the 1" (25.4 mm) NPT pipe plug from the RT cold water inlet CIP connection and replace it with the close pipe nipple supplied on union-end of the CIP hose. See CIP unit detail on following pages.
6. Connect a hose to the close pipe nipple and position to drain.
7. Open the cold water inlet to flow water through the heat exchanger, and through the garden hose to drain. Flush for 10 minutes, or until the outside of the heat exchanger is cool to the touch.
8. While the heat exchanger is being flushed, prepare the Armstrong CIP unit for service: Connect CIP hoses – with ball valves closed – to the pump discharge and tank inlet connections. Verify that the tank drain valve is closed. Open the pump discharge and tank inlet valves. Fill the holding tank with Rite-Qwik™ (minimum of 10 gallons (37.8 liters). See CIP unit detail on following pages.
9. Close the RT cold water inlet, and allow flush-water to drain completely.
10. Disconnect garden hose.
11. Remove the 1" (25.4 mm) NPT pipe plug from the RT hot water outlet CIP connection and replace it with the close pipe nipple supplied on union-end of the CIP hose.
12. Connect the CIP hose from the pump discharge outlet to the close pipe nipple installed on the hot water outlet. Verify ball valve is closed.
13. Connect the CIP hose from the tank inlet to the close pipe nipple installed on the cold water inlet. Verify ball valve is closed, and leave tank fill opening uncapped to allow venting.
14. Connect the Armstrong CIP unit power cord to a GFI protected circuit, verify the tank-to-pump valve is open, and start the pump.
15. Slowly open the ball valve on CIP hose connected to hot water outlet.
16. Slowly open the ball valve on CIP hose connected to cold water inlet. The CIP unit will begin circulating Rite-Qwik™ through the heat exchanger.
17. Fizzing and foaming in the CIP unit tank will indicate scale is being actively dissolved. Monitor level of foaming, and be prepared to stop pump to prevent overflow.
18. When the Rite-Qwik™ is no longer fizzing or foaming, the cleaning process is complete. Note that the maximum Rite-Qwik™ circulation time is three hours.
19. Stop the pump, close the CIP hose ball valve connected at the hot water outlet, and allow the heat exchanger to drain to the CIP tank.
20. Close the CIP hose ball valve connected at the cold water inlet.
21. Disconnect the hose from the CIP tank inlet, and position to drain.
22. Open the cold water inlet to allow fresh water to flush through the heat exchanger, and through the CIP hose to drain. Flush for 15 minutes.
23. Close the cold water inlet, and disconnect the CIP hoses from the ReadiTemp®.
24. Remove the close pipe nipples and replace the 1" (25.4 mm) NPT pipe plugs. Return the close pipe nipples to the CIP hoses for safekeeping.
25. Recommission the ReadiTemp® following IMPORTANT instructions on page 12.
26. See Clean-in-Place unit maintenance details on following page.

Preventative Maintenance, cont.

Clean-in-Place Unit Maintenance Details

- Rite-Qwik™ that remains active may be stored for later use. Test the solution by dropping a calcium antacid tablet into the tank. Fizzing indicates the solution is still active, and can be returned to the original shipping container via the CIP tank drain outlet. If the solution does not fizz, it is inactive and not worthy of storing.
- Unused product can be flushed with water into a sanitary sewer. Used solution may be hazardous as a result of the pre-existing contaminants present in the equipment being cleaned. Dispose of material in accordance with the local, state, provincial, and federal regulations for your location.
- After draining and properly storing or disposing of contents in the CIP unit tank, close the tank drain and fill the CIP tank with fresh water.
- Connect a CIP hose to the pump discharge outlet, position to drain, and open ball valve.
- Perform a brief flush of the CIP tank drain by opening and closing tank drain ball valve.
- Start CIP unit pump. Immediately stop the CIP unit pump once the tank is empty.
- Perform manual flush of the second CIP hose. Allow components to air dry.
- Store the Armstrong CIP unit in a warm and dry place. Do not expose to freezing temperatures.

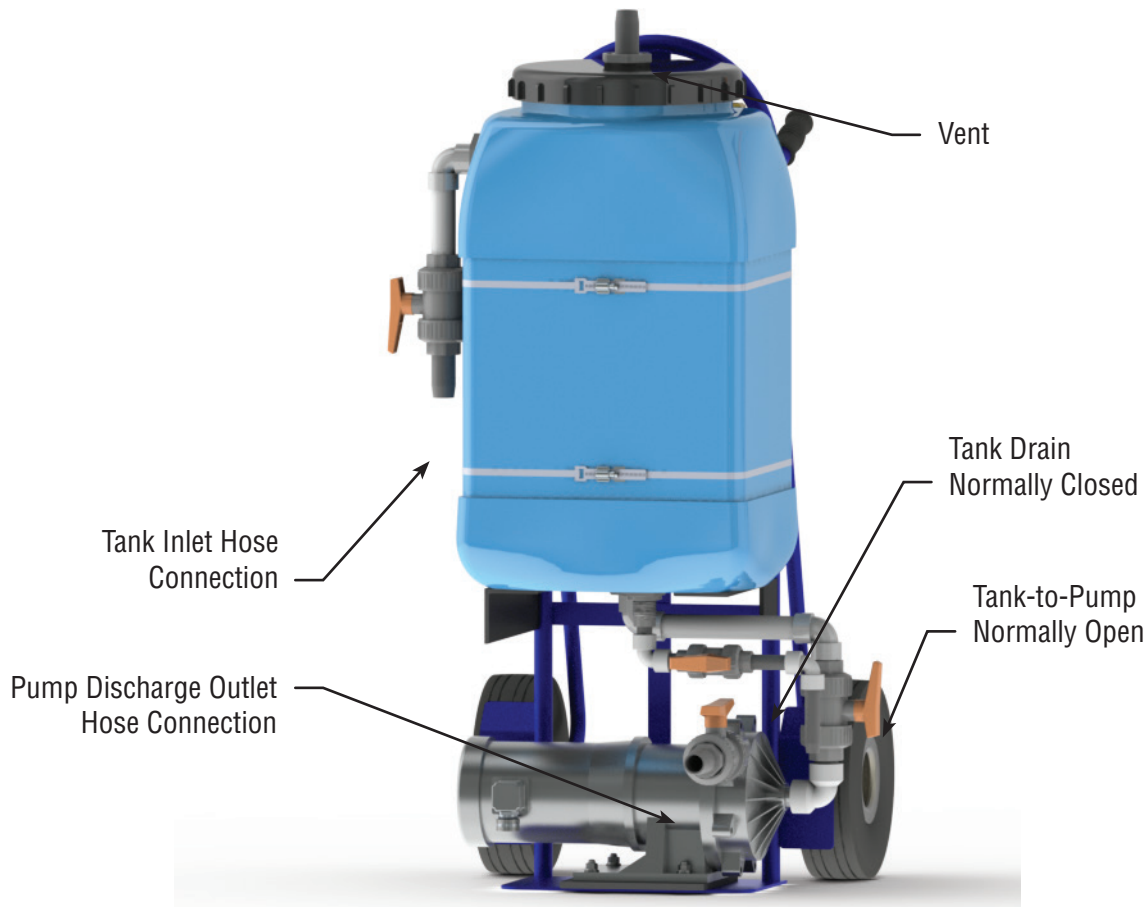


Figure 6
Clean-in-Place unit detail

Preventative Maintenance, cont.

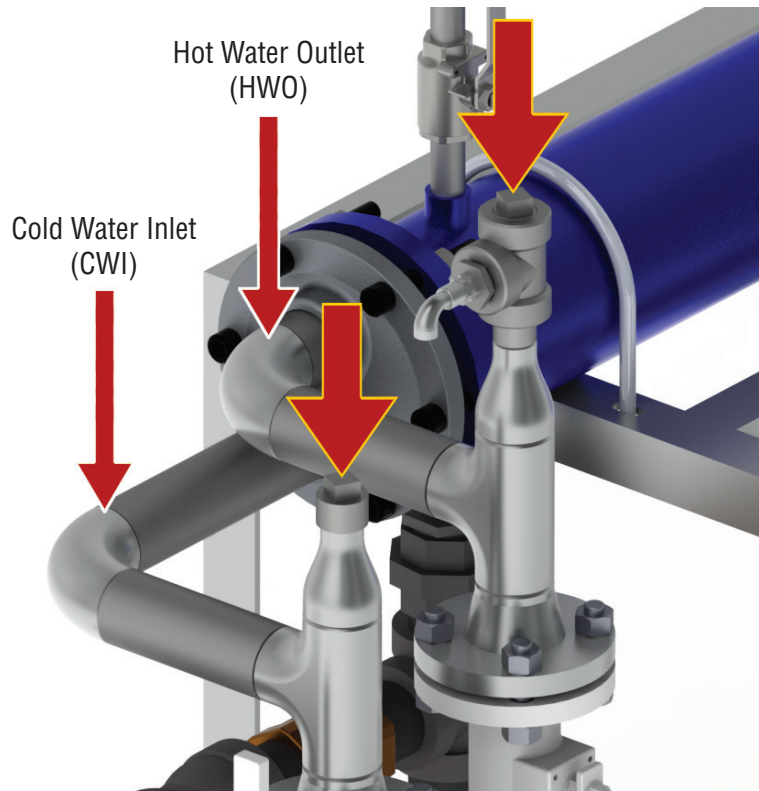


Figure 7
Clean-in-Place connections

Troubleshooting



WARNING! Always use appropriate lockout/tagout procedures when closing the steam inlet and de-energizing the RediTemp® control panel during installation, service, and repair. Failure to follow safety precautions may result in property damage, burns, and/or shock causing personal injury, including electrocution, or, in extreme cases, death.



WARNING! Always use appropriate personal protective equipment (PPE) when working with high-voltage electricity.



WARNING! Water conducts electricity. **DO NOT** stand in water or touch wet surfaces when working with “live” electrical equipment.



BURN HAZARD! Contact with steam, hot water, or hot metal surfaces can cause severe skin burns. Skin exposure to 140° F (60° C) water or metal for five (5) seconds can cause a second-degree burn.

TEMP (°F)	Approx TIME for 1st Deg Burn	Approx TIME for 3rd Deg Burn
100	Safe for bathing	Safe for bathing
120	8 min	10 min
125	2 min	4 min
130	17 sec	30 sec
140	3 sec	5 sec
155	Instant	1 sec
160	Instant	0.5 sec
180	Instant	Instant

Prior to performing any invasive procedure, perform any lockout/tagout procedures. Then, close the steam inlet and allow the heat exchanger to cool. Always close the steam inlet **BEFORE** closing the water inlet.

De-energize the RediTemp® electrical control panel following lockout/tagout procedures.

Stop recirculation pump(s), close cold water inlet, and relieve water pressure before breaking any couplings and joints.

NOTE: For troubleshooting problems that are exclusive to the Emech® digital control valve, refer to the Emech® IOMs 440-EN, 442-EN, and 443-EN.

Generally, performance problems with the RediTemp® can be categorized under three areas:

1. System faults: Performance issues associated with either the steam or water supply to the heater or the return lines for mixed water and condensate from the heater.
2. Emech® faults / process errors: Performance issues associated with inappropriate settings, out-of-bounds operating conditions, or component failures in the Emech® digital control valve.
3. Heat exchanger faults: Performance issues associated with the heat exchanger, such as fouling, scaling, or leakage.

Consult the following RediTemp® Troubleshooting Table for assistance in determining the cause of a performance problem and suggestions for actions to remedy or alleviate the problem.

ReadiTemp® Troubleshooting Table

Problem	Probable Cause	Corrective Action
Unable to bring ReadiTemp® up to temperature	System fault	<ol style="list-style-type: none"> 1. Open steam isolation valve. 2. Increase steam pressure. Do not exceed 15 psi. 3. Reduce domestic water flow rate. 4. Open steam trap isolation valve, if equipped. 5. Steam trap is blocked. Disassemble trap and clear blockage(s). 6. Back pressure in the condensate line may be too high. Temporarily disconnect the pipework downstream of the steam trap. While running the condensate to drain, determine if the hot water comes up to temperature. If so, investigate potential problems on the condensate return system or install a pump trap to overcome the higher back pressure. 7. A check valve may be defective and requires replacement. If the re-circulation line is not hot, a failed check valve may cause cold water to bypass the heat exchanger.
	Emech® fault	See Emech® Troubleshooting Guide in the following section.
	Heat exchanger fault	<ol style="list-style-type: none"> 1. Vent trapped air (gases) from heat exchanger shell. 2. Clean scaled or fouled heat exchanger tubes.
Water from ReadiTemp® is too hot	System fault	<ol style="list-style-type: none"> 1. Reduce steam pressure. 2. Steam is superheated – reduce superheating.
	Emech® fault	See Emech® Troubleshooting Guide in the following section.
System temperature rises during periods of no system demand	System fault	<ol style="list-style-type: none"> 1. Confirm continuous minimum flow: <ul style="list-style-type: none"> • E20W: ≥ 0.9 GPM (3.4 LPM) • E25W: ≥ 4 GPM (15.1 LPM) • E40W: ≥ 7 GPM (26.4 LPM); • E50WR: ≥ 20 GPM (72 LPM); • E80WR: ≥ 53 GPM (200.6 LPM) 2. Confirm continuous recirculation of: <ul style="list-style-type: none"> • E20W: At least 0.9 GPM (3.4 LPM) • E25W: At least 4 GPM (15.1 LPM) • E40W: At least 7 GPM (26.4 LPM); • E50WR: At least 20 GPM (72 LPM); • E80WR: At least 53 GPM (200.6 LPM) 3. Check for air locks and closed valves. 4. Confirm return temperature is at least 1°F below Emech® setpoint. 5. Confirm installation and location of check valves is correct. Refer to schematics. Ensure that check valves are fully functional. 6. Verify hot water and cold water supply pressures are balanced and constant. Ensure that there is adequate mixed return flow to the cold water inlet of the water heater. 7. Rule out that a higher temperature cross-connection (from kitchen or laundry loop) is feeding water into the return line. Eliminate cross-connections.

ReadiTemp® Troubleshooting Table, cont.

Problem	Probable Cause	Corrective Action
System temperature fluctuates more than +/- 5°F (2.8°C)	System fault	<ol style="list-style-type: none"> 1. Confirm continuous minimum flow: <ul style="list-style-type: none"> • E20W: ≥ 0.9 GPM (3.4 LPM) • E25W: ≥ 4 GPM (15.1 LPM) • E40W: ≥ 7 GPM (26.4 LPM); • E50WR: ≥ 20 GPM (72 LPM); • E80WR: ≥ 53 GPM (200.6 LPM) 2. Check for air locks and closed valves. 3. Confirm return temperature is at least 1°F below Emech® setpoint. 4. Confirm installation and location of check valves is correct. Refer to schematics. Ensure that check valves are fully functional. 5. Verify hot water and cold water supply pressures are balanced and constant. Ensure that there is adequate mixed return flow to the cold water inlet of the water heater. 6. Rule out that a higher temperature cross-connection (from kitchen or laundry loop) is feeding water into the return line. Eliminate cross-connections.
	Emech® fault	See Emech® Troubleshooting in the next section.
Emech® display shows any of the following: 1. Error Code 1 2. Error Code 2	System fault	See Emech® Troubleshooting in the next section.
	Emech® fault	See Emech® Troubleshooting in the next section.
Reduced heater capacity	Heat exchanger fault	Heat exchanger may be partially blocked due to scaling. Clean the heat exchanger using a suitable de-scaling fluid via the CIP connections. If the heat exchanger has become completely blocked, major disassembly and manual cleaning may be required.

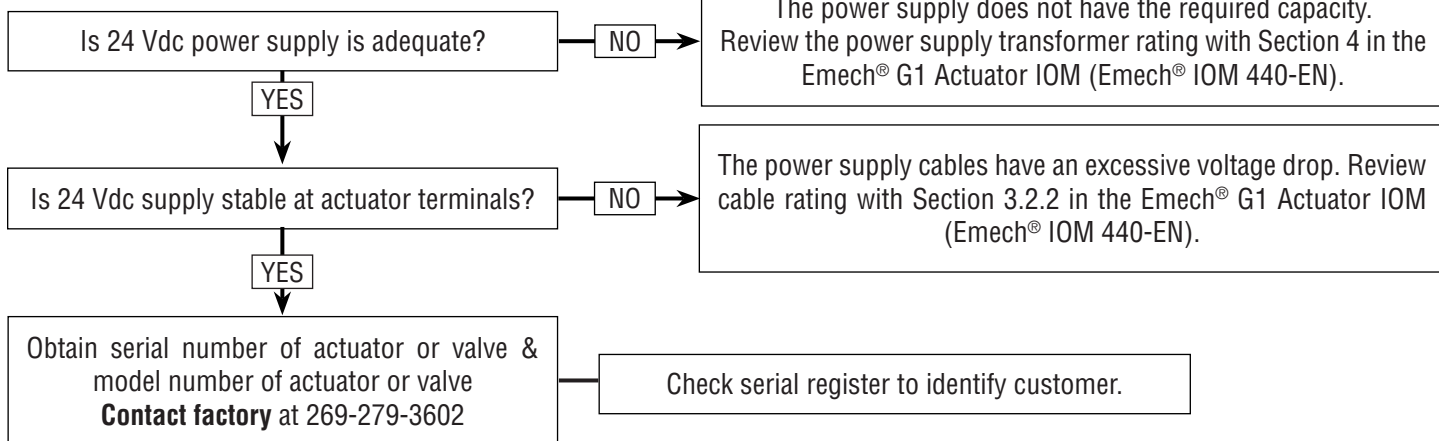
ReadiTemp® Troubleshooting Table, cont.

Problem	Probable Cause	Corrective Action
Unable to adjust system temperature	System fault	<ol style="list-style-type: none"> 1. Confirm continuous minimum flow of ≥ 7 gpm (26.4 lpm) to E40W, ≥ 20 GPM (72 LPM) to E50WR, or ≥ 53 GPM (200.6 LPM) to E80WR. 2. Check for air locks and closed valves. 3. Confirm return temperature is at least 1°F below Emech® setpoint. 4. Confirm installation and location of check valves is correct. Refer to schematics. Ensure that check valves are fully functional. 5. Verify hot water and cold water supply pressures are balanced and constant. Ensure that there is adequate mixed return flow to the cold water inlet of the water heater. 6. Rule out that a higher temperature cross-connection (from kitchen or laundry loop) is feeding water into the return line. Eliminate cross-connections.
	Emech® fault	See Emech® Troubleshooting Guide in the following section.
No display on Emech® and/or no control	System fault	<ol style="list-style-type: none"> 1. Confirm uninterrupted power to ReadiTemp® control panel. 2. Check status of Emech® power switches on the ReadiTemp® control panel.
	Emech® fault	See Emech® Troubleshooting Guide in the following section.
ReadiTemp® “bangs” and “hammers” during operation	System fault	<ol style="list-style-type: none"> 1. Steam pressure has dropped and a vacuum has formed inside the heat exchanger. Increase steam pressure or reduce water flow through the heater. 2. Water pressure has dropped below the steam pressure and steam is forming inside the tubes. Increase water pressure or water flow through the heater.
	Heat exchanger fault	<ol style="list-style-type: none"> 1. The shell of the heat exchanger is not properly drained. Confirm condensate is draining freely (steam trap is not blocked & return line is not pressurized). 2. Remove and inspect tube bundle for tube or seal failures.
Water leaking from Emech®	Emech® fault	Check all Emech® seals for wear and/or damage. Clean, lubricate or replace. Body casting failure – replace Emech®.

Emech® Troubleshooting Guide

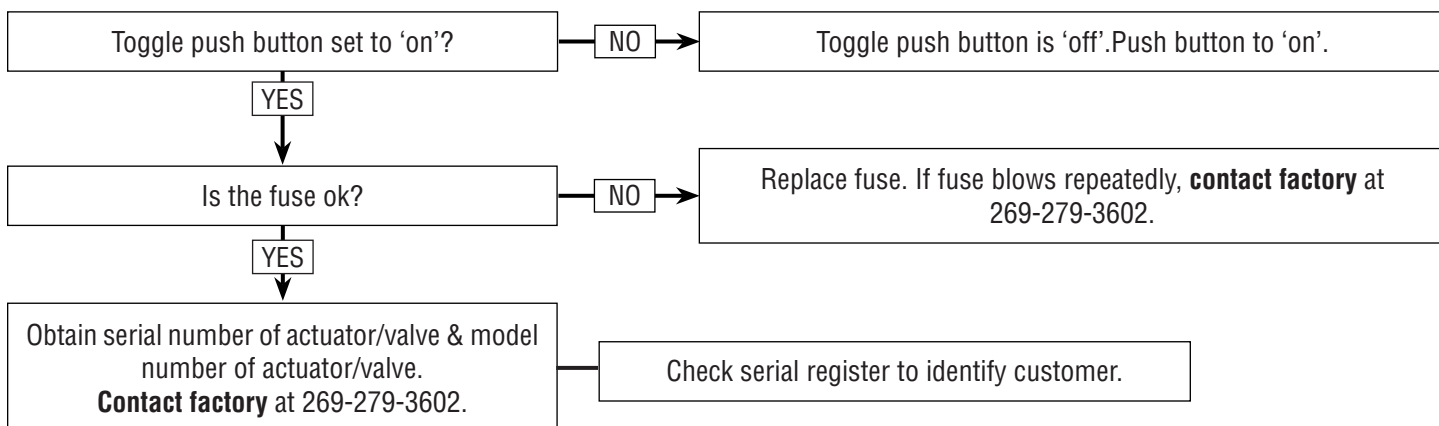
Actuator display lights up intermittently, but does not move

Check



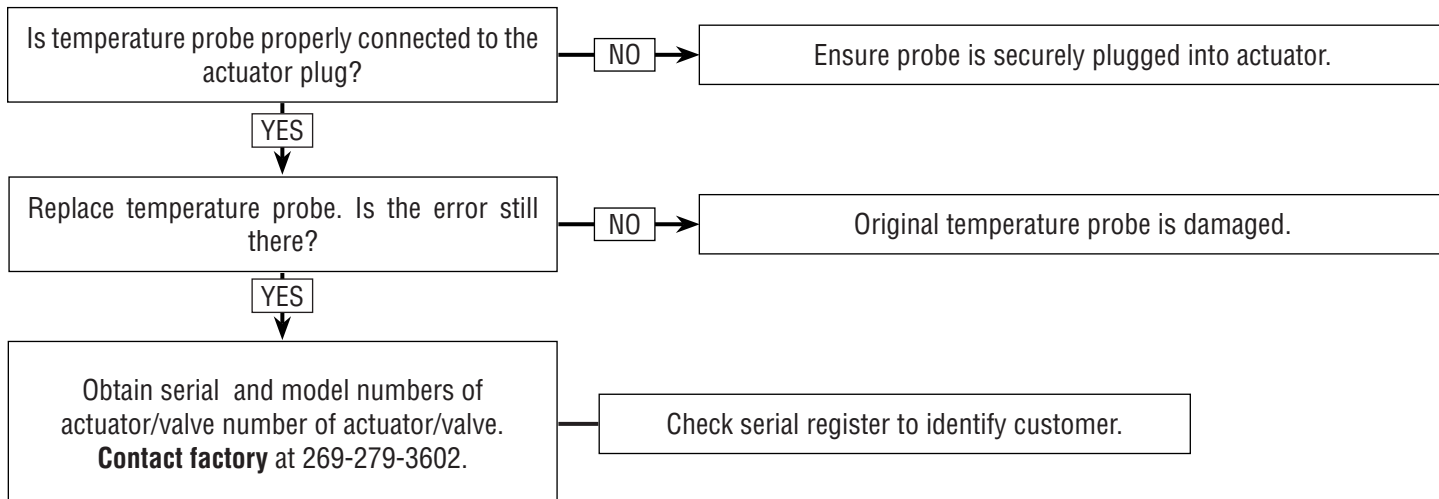
Actuator dead (display not lit, no movement)

Check

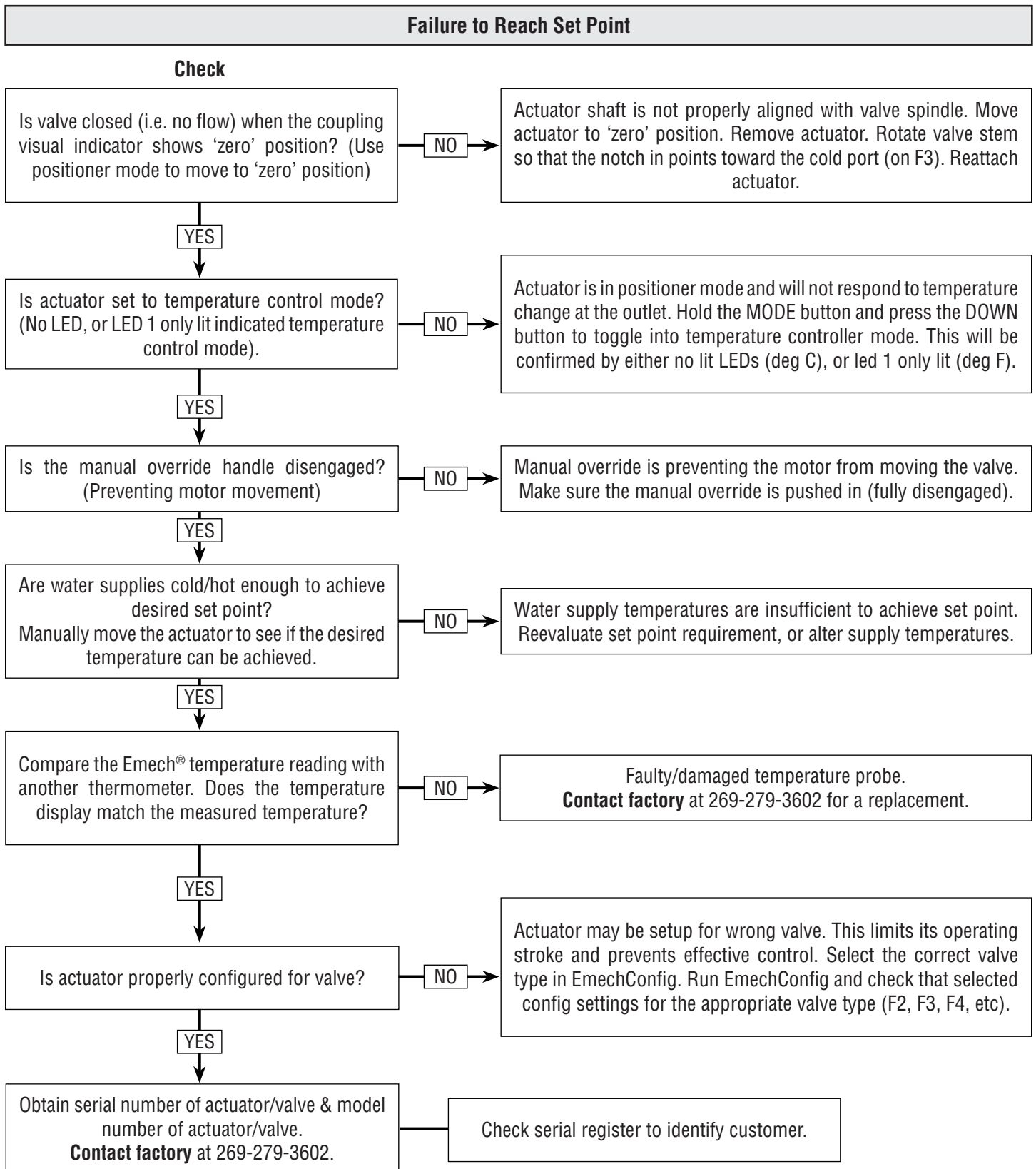


Actuator displays 'E2' when set Temperature Controller Mode

Check



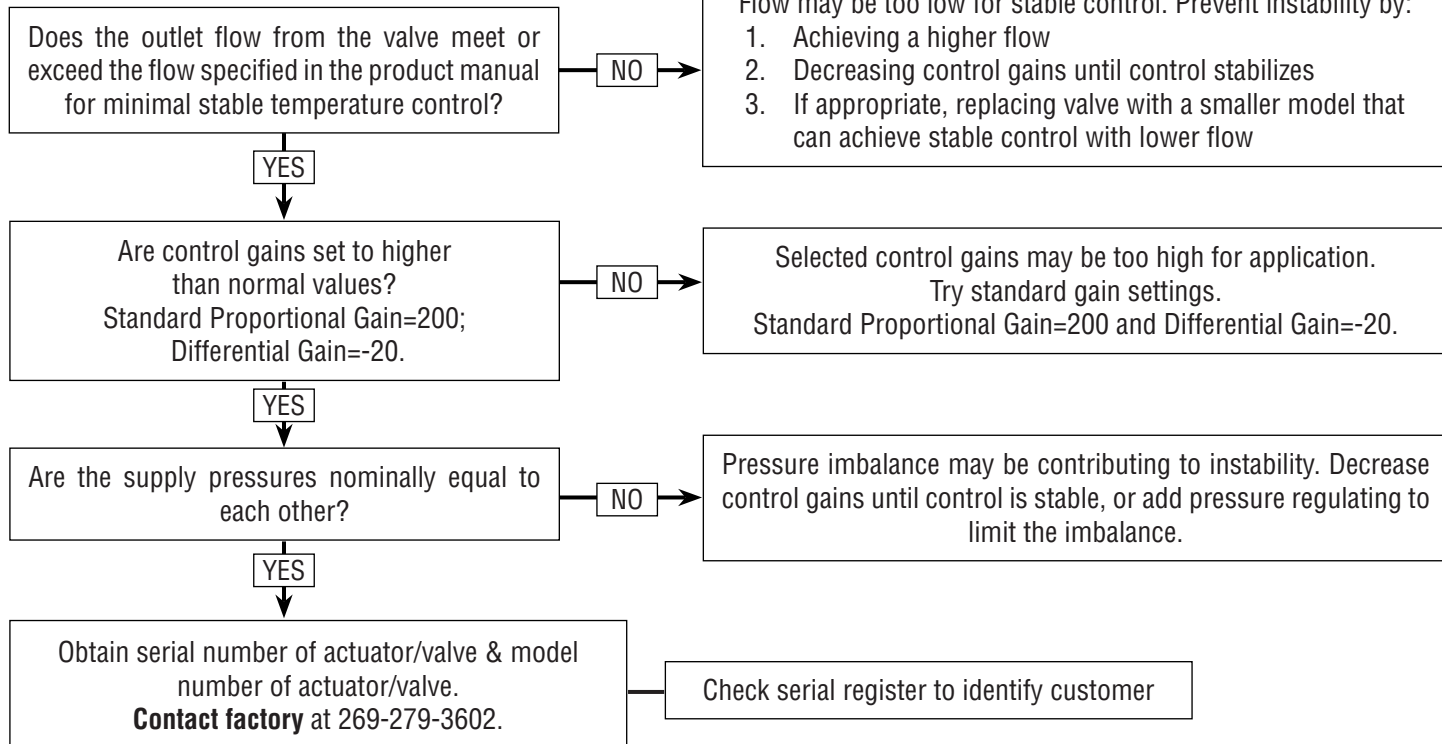
Emech® Troubleshooting Guide, cont.



Emech® Troubleshooting Guide, cont.

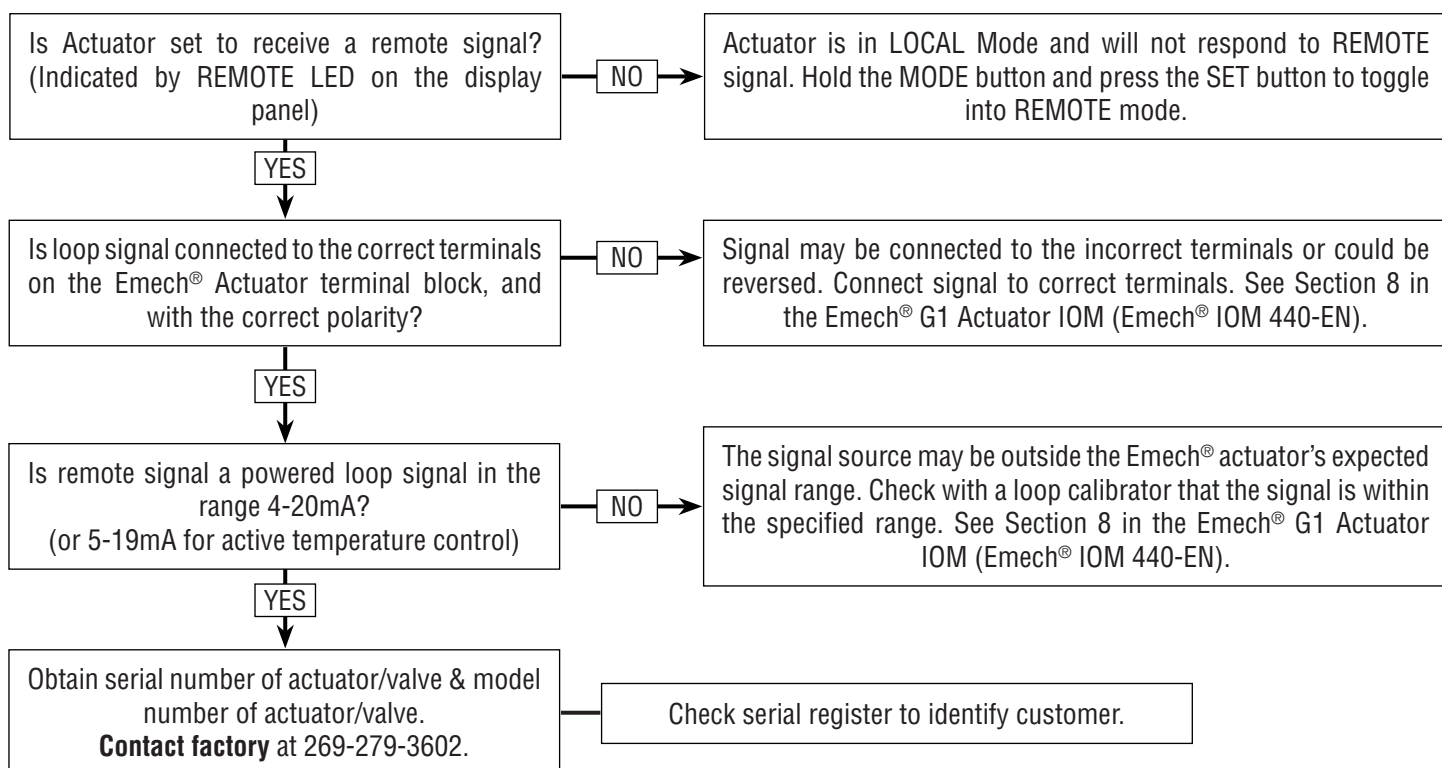
Control is Unstable/Oscillates

Check



Control is Unstable/Oscillates

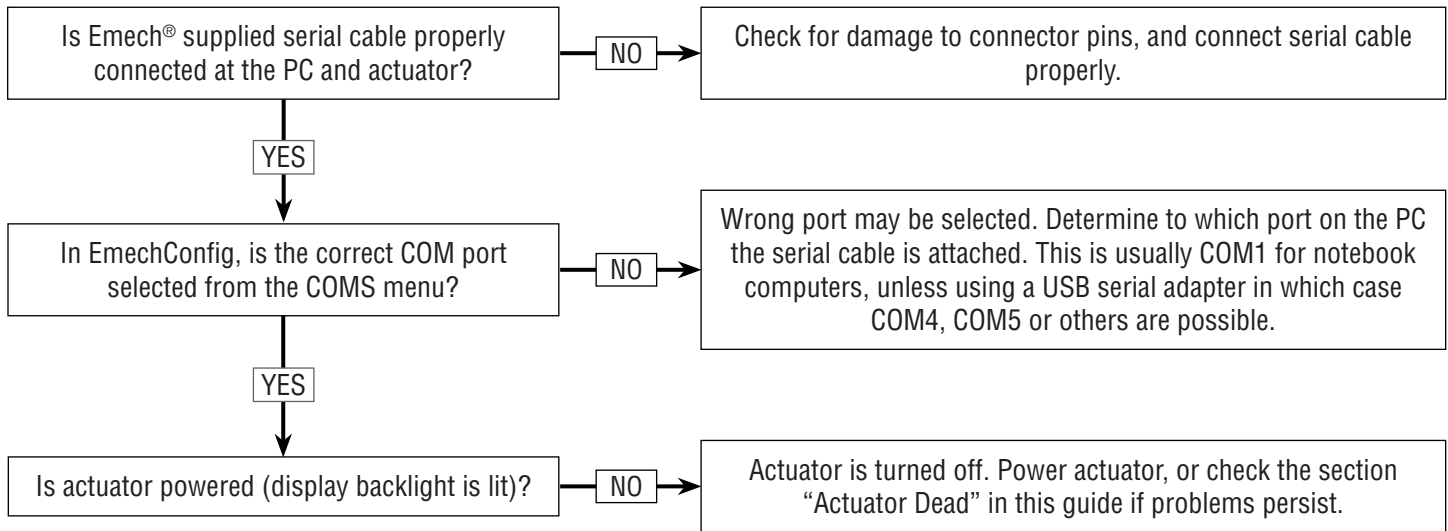
Check



Emech® Troubleshooting Guide, cont.

No communication when using EmechConfig

Check



ReadiTemp® Spare Parts

Single Wall Tube Bundle and Heat Exchanger Gasket Kit

SW Model	Part Number
RT41520	D60696
RT53525	D60697
RT66540	D60698
RT812050	D60699
RT1020050	Consult Factory
RT1230080	

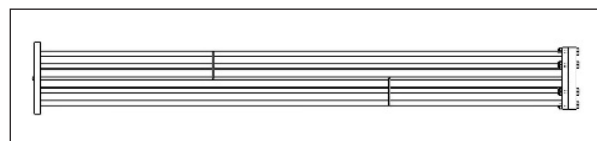


Figure 8
Single wall tube bundle

Double Wall Tube Bundle and Heat Exchanger Gasket Kit

SW Model	Part Number
RT41520DW	D60700
RT53525DW	D60701
RT66540DW	D60702
RT812050DW	D60703
RT1020050DW	Consult Factory
RT1230080DW	

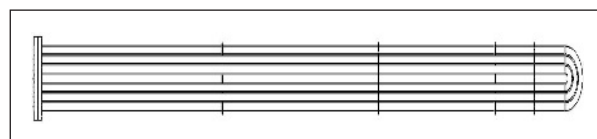


Figure 9
Double wall tube bundle

Heat Exchanger Gasket Kit for ReadiTemp®

Single or Double Wall Model	Part Number
RT41520	D32594
RT53525	D32595
RT66540	D33790
RT812050	D33791
RT1020050	Consult Factory
RT1230080	

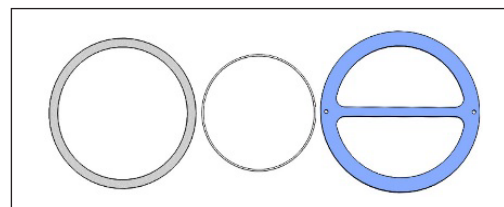


Figure 10
Heat exchanger gasket kit for ReadiTemp®

Two-Pass Head for ReadiTemp® Heat Exchanger

SW Model	Part Number
RT41520	D33012
RT53525	D33005
RT66540	D33002
RT812050	D33008
RT1020050	Consult Factory
RT1230080	

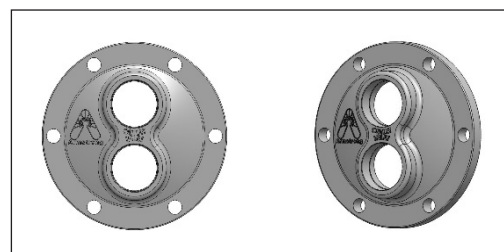


Figure 11
Two-pass head for ReadiTemp® heat exchanger

Limited Warranty and Remedy

Armstrong International, Inc. or the Armstrong division that sold the product ("Armstrong") warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended, that such products shall be free from defects in material and workmanship for a period of one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the factory, [unless a Special Warranty Period applies, as listed below]. This warranty does not extend to any product that has been subject to misuse, neglect or alteration after shipment from the Armstrong factory. Except as may be expressly provided in a written agreement between Armstrong and the user, which is signed by both parties, Armstrong **DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to defects or any condition or use of the products supplied by Armstrong, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Armstrong's repair or replacement of the part or product, excluding any labor or any other cost to remove or install said part or product, or at Armstrong's option, to repayment of the purchase price. As a condition of enforcing any rights or remedies relating to Armstrong products, notice of any warranty or other claim relating to the products must be given in writing to Armstrong: (i) within 30 days of last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. **IN NO EVENT SHALL ARMSTRONG BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS.** The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Armstrong.

Special Warranty Periods are as follows:

ReadiTemp® Instantaneous Water Heater (RT41520, RT53525, RT66540, and RT8120 Models ONLY): The tube bundle shall have a 10-year guarantee against failure caused by materials or workmanship provided by Armstrong, but not against gasket failure or damage caused by corrosion, water hammer or lack of proper maintenance.

ReadiTemp® Instantaneous Water Heater (RT1020050, RT12300 Models ONLY): Products shall be free from defects in material and workmanship for a period of one (1) year from date of installation, but no longer than 15 months from the date of shipment from the factory.

ReadiTemp® Instantaneous Water Heaters: The stainless steel structure and stainless steel internals shall have a 5-year guarantee against failure caused by materials or workmanship provided by Armstrong, provided only clean, potable water is supplied to the heater.

ReadiTemp® Instantaneous Water Heater Pre-Piped Assemblies: Two (2) years from the date of installation, but not longer than 27 months from the date of shipment.

Important Notice

Armstrong's products are capable of being used in many different types of industrial applications and operating environments. Consequently, Armstrong is only able to provide general guidelines concerning the suitability and use of its products. It is not possible for Armstrong to provide specific guidelines for specific applications and operating environments simply because there are too many of them. Therefore, proper selection of a specific product for a specific application and operating environment, and its compatibility with other equipment to which it is attached, is the customer's responsibility. The customer must assume the ultimate responsibility for the proper sizing, selection, compatibility, installation, and operation of Armstrong products. All operating parameters should be validated for the customer's application by a professional engineer, qualified installer, or by another technical expert. Armstrong does not warrant the performance of its products or their suitability for a particular purpose.

Although the information is believed to be accurate, Armstrong accepts no liability for any errors or omissions. Armstrong has endeavored to provide timely information, but it cannot represent that the information is complete. The information shall not be deemed a warranty, representation, or guarantee concerning a product's suitability or fitness for a customer's specific purpose. Armstrong does not warrant the information or any particular benefits that the customer will derive. It is the customer's responsibility to determine the suitability for its own use of the products described herein. The customer must make its own independent judgment and assessment and should not rely upon any opinions, interpretations, statements, assurances, or representations given.

Because Armstrong is continually improving and upgrading its products, the specifications, dimensions, and information contained herein are subject to change without notice. This information is intended to provide general guidance to the customer. For specific guidance or support, contact Armstrong or an authorized representative.

Installation is entirely at the customer's risk. Armstrong accepts no liability for direct, indirect, incidental, special, or consequential damages resulting from the customer's failure to follow Armstrong's warnings, instructions, and procedures or such other procedures generally applicable to equipment of the same type. The foregoing limitation extends to damages to person or property, as well as loss of profits, loss of products, loss of operations, the cost of alternative arrangements and loss of time, whether incurred by the customers, its employees, or a third party.

Armstrong products should be installed by qualified technicians only. Do not attempt installation unless you are a qualified technician. Armstrong accepts no liability for damage resulting from faulty installation.

Nothing in this document is intended to cancel, modify, or supersede the terms of the Armstrong Limited Warranty and Remedy on Page 29.

Notes

Notes

ReadiTemp® Steam-to-Water Shell and Tube Water Heater Installation, Operation, & Maintenance Manual



Design, materials, weights, and performance ratings subject to change without notice.
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