

Page	
2	WARNINGS
2	WATER QUALITY REQUIREMENTS
3	DESCALING
4-5	ROUTINE MAINTENANCE
6	TANK PRESSURE CONTROL ASSEMBLY
7	WATER GAUGE SIGHT GLASS
8	INSTALLING THE WATER GAUGE SIGHT GLASS
9	HEATING ELEMENT INSTALLATION
10	WIRING THE HEATING ELEMENT

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WARNING: All Maintenance Procedures must be performed by qualified personnel familiar with boilers and boiler accessories.

WARNING: The boiler shall not be left unattended while tests are being performed and the Steam Room(s) should not be occupied.

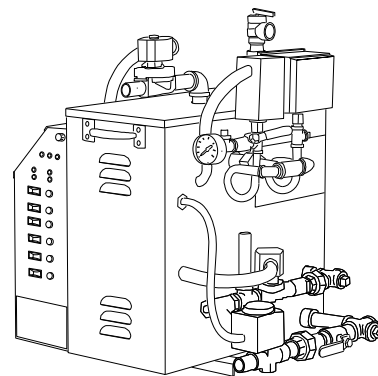
WARNING: Failure to properly maintain the Boiler can cause equipment failure and may void the warranty.

CAUTION: Turn Main Power and Control Circuit power off before servicing equipment!

CAUTION: Exposed plumbing may be over 200°F [93°C] during normal operation and can present a severe burn hazard. Be sure to protect yourself and others from accidental contact!

CAUTION: Draining a hot boiler may release dangerously hot water or steam, risking personal injury and damage to plumbing! Your local code may require that boiler pressure be limited to under 5 psi [34,5 kPa] and require a special drain system to drain a hot boiler while under pressure!

CAUTION: Loose wire connections can cause heat damage to wires, terminal blocks and other components and may void the warranty.



Note: If the water drains slowly or sporadically, it may be necessary to remove the heating element assembly and clean the tank by hand. It is strongly recommended that a spare heating element gasket be available whenever the heating element is removed. If this condition is seen, stop using the generator and contact Amerec Technical Support for assistance between 7:00am and 3:30pm Pacific Time at 1-800-363-0251 or Support@amerec.com.

Water Quality Requirements:

The nature of a steambath generator requires testing of the feedwater to avoid potential high concentrations of impurities which can cause a deposit or scale to form on the internal surfaces. This deposit or scale can interfere with proper operation of the equipment and eventually cause premature generator failure. Concentration of impurities is generally controlled by treating the feedwater and/or “blowing down” the generator when it is not heating. The “blow down” process involves removing a portion of the tank water with high solid concentration and replacing it with makeup water.

To reduce corrosion and heating element damage risks, always flush feedwater lines thoroughly prior to start-up to eliminate flux residue and avoid sodium-based water softeners. The ASX-200 filter system available from Amerec provides very good protection in most installations and should be connected to a cold-water supply. **Feedwater temperature must be no hotter than 100°F if the ASX-200 is installed!**

To ensure proper operation, the water supply should be tested prior to operating the equipment. There are several treatment processes which can be used if you have hard water. A local reliable water treatment company can recommend the appropriate treatment if required. The recommended feedwater quality is listed below.

Feedwater Quality

Hardness	10 – 30ppm	(0.5 – 1.75 gpg)
T-Alkalinity	150 – 700ppm	(8.75 – 40.8 gpg)
Silica	15 – 25ppm	(.875 – 1.45 gpg)
PH (strength of alkalinity)	10.5 – 11.5	

Filtration equipment for reducing water harness problems is available through Amerec. Contact us for further information.

DESCALING PROCEDURE using **OptiClean**. The same procedure can be used with other descalant. *Alter dilution and soak times as appropriate.* Whatever is used for cleaning, ensure the tank is thoroughly rinsed afterward! *Descalant residue in the boiler's water can cause erratic operation and foaming and this can cause an element failure.*

1. Allow the boiler tank water to cool down or drain and refill with cool water.
2. Turn the RUN, HEAT and FEEDWATER switches on the control panel to their OFF positions and set the RUN clock (if installed) to leave the boiler off.
3. Manually open the pressure relief valve to relieve any residual pressure in the tank, then release. Remove the brass plug located on the Y pipe fitting under to the pressure relief valve.
4. Drain the tank:

If an electronic drain is installed, set the ELECTRONIC DRAIN switch on the control panel to MANUAL OPEN to drain the water in the tank. Set the DRAIN switch set to its CLOCK position after the water has drained

If the boiler is not equipped with electronic drain, then open the manual drain ball valve to drain the water from the tank. Close the drain valve after all the water is drained out of the tank.
5. Remove the fuse from the panel mounted fuse holder in order to remove power from the boiler control circuit.
Note: line voltage will still be present in the element/contact area and in the boiler's electrical box.
6. Pour the recommended amount of OptiClean a suitable plastic container. Add 2.5 gallons of hot water for a single element tank or 4 gallons of hot water for a double element tank.
7. Mix the solution together.
8. Using a funnel, pour in the mixed solution thru the Y fitting on the boiler where you removed the brass plug.
9. Allow the OptiClean water mix to sit in the boiler for 1-2 hours.
10. Reinstall the fuse.
11. Open the manual drain ball valve or set DRAIN to MANUAL OPEN to allow OptiClean water mix to completely drain from tank. If an electronic drain is installed it will automatically open when power is restored.
12. Turn the FEEDWATER switch to its NORMAL position to allow water to flush the remaining OptiClean water mix out of the tank for a minimum of 5 minutes (10minutes for a two element tank).
13. If an electronic drain is installed, set the DRAIN switch to CLOCK to close electronic drain valve. If the boiler is not equipped with an electronic drain valve, close the manual drain ball valve. Allow the tank to fill to normal levels.
14. Reinstall brass plug in the Y pipe fitting.
15. Turn the HEAT switch on the control panel to NORMAL.
16. All switches should now be in their NORMAL positions.
17. Your steam generator is now ready for use.

ROUTINE MAINTENANCE

1. Daily

BLOWDOWN Daily blowdown/draining of the boiler is recommended, particularly in commercial installations and areas with hard water. Failure to properly maintain the boiler in this manner may cause equipment failure and void the warranty! When possible, allow the boiler to cool before opening the drain. Refer to local codes for drain plumbing requirements. **CAUTION: Draining a hot boiler may release dangerously hot water or steam, risking personal injury and damage to plumbing! Your local code may require that boiler pressure be limited to under 5 psi [34,5 kPa] and require a special drain system to drain a hot boiler under pressure!**

Manual Drain: After allowing the boiler to cool, open the manual ball valve (or open the Autodrain using the **ELECTRONIC DRAIN** switch) to drain the tank. Open the steam or safety valve to relieve the vacuum and let the drain flow fully. When the tank is fully drained, close the drain again and the boiler is ready for normal operation.

Autodrain: Set the **DRAIN** clock to start the auto drain cycle daily at a convenient time. The best time for this is shortly before the boiler will be turned on for the day so the restart will use fresh, clean water. The **Cool Flush** option adds fresh water and partially drains the tank multiple times to reduce the drain water temperature and thoroughly rinse the tank.

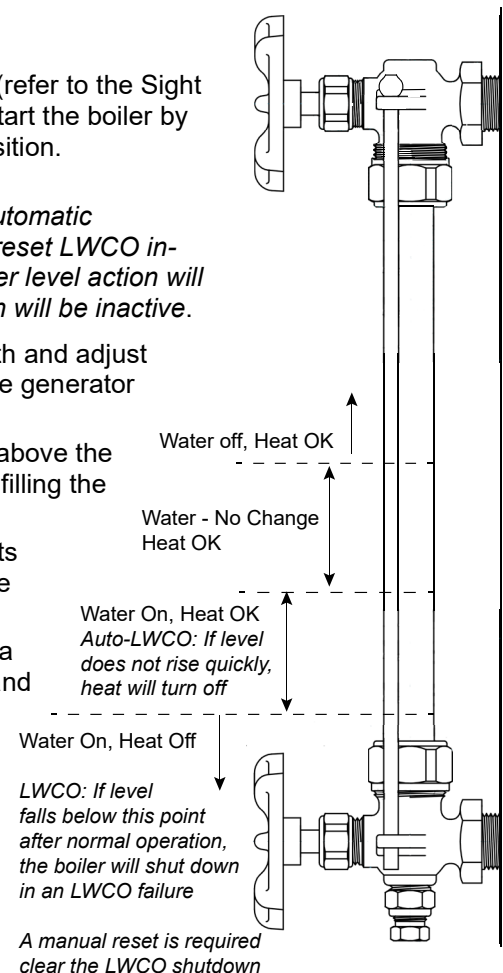
1. Weekly

- a. Check the water level circuit and LWCO for proper operation. (refer to the Sight Glass picture at right). To test the LWCO level control circuit, start the boiler by moving the BOILER OPERATION switch to the MANUAL RUN position.

NOTE: late model boilers (with black paint) normally have an automatic resetting LWCO (Low Water CutOff) and an integral manually reset LWCO installed. If your boiler does not have an integral LWCO, the water level action will be the same as follows except the LWCO alarm and shut-down will be inactive.

- Set the HEAT switch to the OFF position. Turn on the steam bath and adjust the thermostat to open the room's steam valve (this will help the generator drain more quickly in the following steps).
- Check the water level in the gauge glass: when the level rises above the middle of the glass, the feedwater valve should close and stop filling the generator.
- Open the generator drain valve and return the HEAT switch to its NORMAL position: the BOILER HEATING light will turn on and the heating contactors will close.
- Watch the water level in the gauge glass: as the level reaches a depth of about 1/3 of the glass, the WATER VALVE OPEN light and the water valve will turn on and add water to the tank.
- Set the FEEDWATER switch to the STOP FILL position. The WATER VALVE OPEN light will turn off and the water valve will close.
- Allow the water to continue to drain and watch the level in the glass. When the water level drops to about 1/2" depth in the glass, the BOILER HEATING light will turn off and the heat contactor will open. This is the low water cut-off level.

NOTE: If the BOILER HEATING light does not turn off, immediately move the HEAT switch to its OFF position, move the FEEDWATER switch to its NORMAL position and close the Drain Valve. Determine why the Low Water Cutoff did not function. Contact Amerec steam technical support for assistance.



- After the BOILER HEATING light turns off, allow the water to continue to drain. After six seconds the LWCO STATUS light will change from green to orange and the ROOM STATUS lights will blink in an alternating pattern. Press the red RESET button next to the LWCO STATUS light. The ROOM STATUS lights will stop blinking and the LWCO STATUS light will remain orange.
 - Close the drain valve and set the FEEDWATER switch to the NORMAL position. The WATER VALVE OPEN light will turn on and water valve will open. Observe the water level in the gauge glass: when the level rises above the middle of the glass, the feedwater valve should close and stop filling the generator. Verify that the LWCO STATUS light has turned Green.
 - Set the BOILER OPERATION switch to the (OPTIONAL) CLOCK RUN position, close the drain valve and return all remaining switches to their NORMAL positions. Reset the thermostat to its original position. The generator is now ready for normal operation again.
- b. Check for steady flow of water when tank is filling.
 - c. Check for smooth rapid flow of water out of drain line during manual or auto drain cycles. Clean drain valve and drain piping if necessary. A cross fitting is provided at the drain coupling to help with inspection and clean-out.
 - d. Check sight glass for adequate water level & discoloration
 - e. Check sight glass, all valves, pressure switches pressure gauge, and plumbing fittings for water or steam leaks; repair if necessary.
 - f. Check sight glass for proper water level during steam cycle. *Refer to drawing on page 9.*
 - g. Check pressure gauge for proper operating pressure. When the boiler is running and the steam valve(s) are closed, the indicated pressure should be approximately 3 to 5 psi [20 to 35 kPa]. When the Steam Valve(s) are open, the indicated pressure should be 0.5 psi [3,4 kPa] or less.
 - h. Check for noisy or worn contactors, replace if necessary.
 - i. Check IT-1 Thermostat and optional I60 On/Off or Refresh switches for proper operation

2. Monthly

- a. Check for loose or overheated wires, and for indications of corrosion.
- b. Check pressure switches for proper operation. (*See Pressure Control Assembly on page 6*)
- c. Remove and check water level probes, check for signs of scale and clean if necessary (probe access cover is located on top of the Boiler near the Pressure Relief Valve).
- d. Check steam valve(s) for leak-by. With the boiler on, place both ROOM LOCKOUT rocker switches in the CLOSE position. Verify that boiler pressure gauge is reading at least 3psi. Inspect all steam heads for any visible steam leaks. Return ROOM LOCKOUT rocker switches in the NORMAL position when done.

3. Quarterly

- a. Check the pressure relief safety valve. Open and close the safety valve to make sure it moves freely and that it is sealing properly. The safety valve must remain installed in the upright position as shown. Test and replace relief valve based on local boiler codes. (*Refer to De-Scaling Procedure, page 3.*)
- b. Check heating elements: they should be removed and checked for scale build-up. Clean elements with descalant as needed (*Refer to Element Installation Instructions on page 9*).
- c. Check tank (remove element to view) and baffle area (remove level probes to view) for scale build up. Clean as needed. (*Refer to Descaling procedure on page 3*).
- d. Check heating element and contactor wire connections. All connections must be tight. Tighten as necessary.
- e. Check that all element flange bolts are tight. Tighten to recommended torque specifications as needed. (*Refer to Element Installation Instructions on page 10.*)
- f. Check water inlet strainer (y fitting); clean as necessary.
- g. Check all plumbing connections for tightness.



4. Annually

- a. Conduct a complete inspection of the Boiler and replace all faulty or worn components.
- b. Check all equipment contactors, valve coils, and pressure switches and replace if necessary.
- c. Replace element gasket.
- d. Inspect Tank for signs of erosion, cracks or leakage.
- e. Test emergency disconnect switch (if installed). by activating and making sure all power shuts off.

TANK PRESSURE CONTROL ASSEMBLY

The AI boiler comes equipped with two pressure switches, wired in series, to control boiler heating. The (green) Operating Pressure switch automatically closes when the generator's internal pressure is low (less than 3psi [20,7 kPa]) and opens when the pressure is high (greater than 5psi [34,5 kPa]), turning the heating elements on and off as needed to create steam and maintain tank pressure when the steam valve is closed. The (gray) High Limit safety switch is a safety control. It remains closed during normal operation but if the tank pressure rises near 10psi the Limit switch opens, shutting off power to the elements. **When the pressure rises too high, the Limit switch opens and remains opened until manually reset after the pressure drops again. This is an indication that the Operating Pressure switch is stuck closed and has stopped regulating the element operation.** If the Limit switch also fails, the pressure relief safety valve opens to release the pressure.

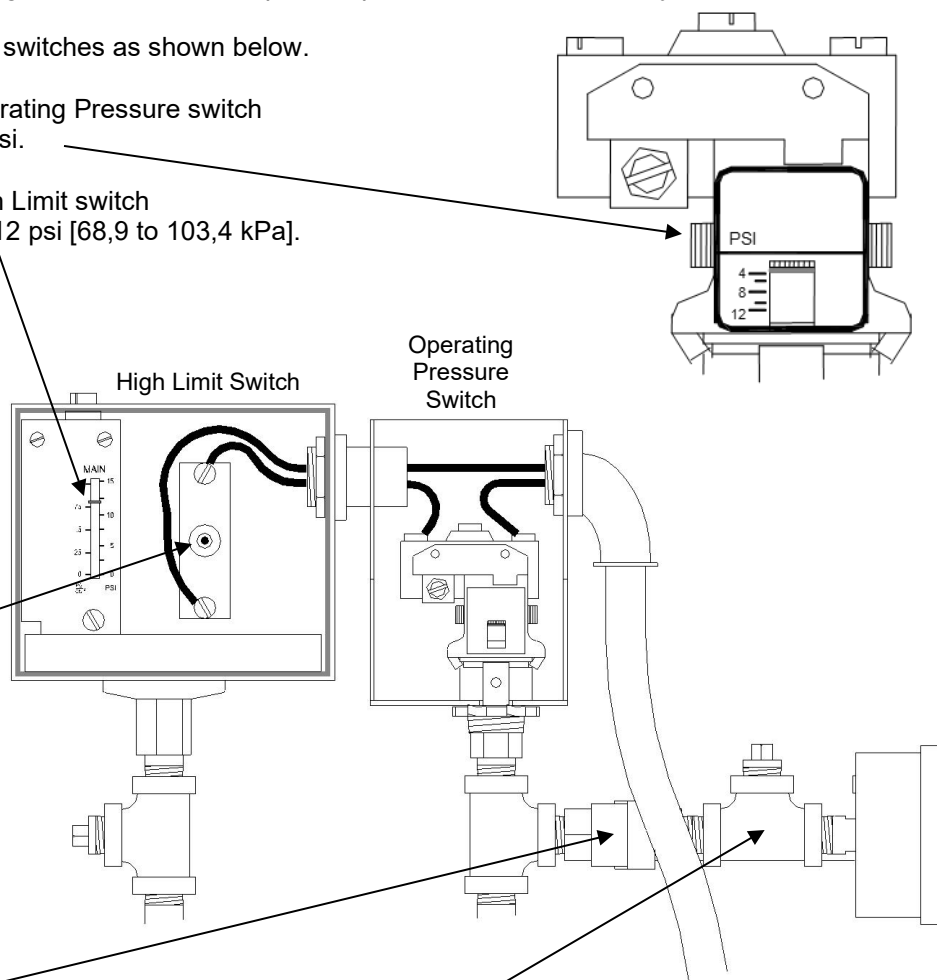
If the High Limit safety switch opens: check the Operating Pressure switch operation by creating pressure in the generator. Verify that the pressure gauge shows a smooth and steady pressure increase. If the Operating Pressure switch does not open at the correct pressure or the gauge shows rapid pressure increases, release all pressure and remove line voltage from the generator. Clean or repair the pressure control assembly as needed.

If necessary, adjust the pressure switches as shown below.

Turn the thumbwheel on the Operating Pressure switch and set the indicator to about 4 psi.

Turn the screw on top of the High Limit switch and set the Limit switch to 10 to 12 psi [68,9 to 103,4 kPa].

If tank pressure exceeds the High Limit switch setting, allow tank pressure to drop below 10psi and press the red button to reset it.



A shut off valve is supplied to easily replace the tank pressure gauge and a T-fitting is supplied to allow connecting a second pressure gauge for inspection. *The shut off valve must be left open during normal operation.*

WATER GAUGE SIGHT GLASS

DO NOT reuse any tubular glass or glass packings.

DO NOT use the glass if it contains any scratches, chips, or any other visible signs of damage.

DO NOT subject gauge glass to bending or torsional stresses.

DO NOT over tighten glass packing nuts.

DO NOT allow glass to touch any metal parts

DO NOT exceed the recommended pressure of the gauge or gauge glass.

DO NOT clean the gauge or gauge glass while pressurized or in operation

DO verify proper gauge has been supplied.

DO examine gauge glass and packings carefully for damage before installation.

DO install protective guards and utilize automatic ball checks where necessary to help prevent injury in case of glass breakage.

DO inspect the gauge glass daily, keep maintenance records, and conduct routine replacements

DO protect glass from sudden changes in temperatures such as drafts, water spray, etc.

MAINTENANCE

Examine the gauge glass regularly for any signs of leaks, clouding, scratching, erosion, or corrosion. The glass should be inspected daily until the need for replacement becomes apparent. This will help establish the routine inspection and routine replacement schedules.

CLEANING

Use commercial non-abrasive glass cleaners to keep the glass clean. Use diluted acids such as hydrochloric (muriatic) acid when regular cleaners do not seem to work. Do not use wire brushes or any other abrasive materials which could scratch the glass.

INSPECTION

Examine the surface of the glass for scratches, corrosion, chips, cracks, surface flaws, or nicks. To do this, shine a very bright concentrated light at an angle of about 45 degrees. A defective glass will glisten as the light strikes imperfections. Glass which appears cloudy or roughened, and will not respond to cleaning, should be replaced.

Note: Steam leaking at the glass ends can etch away the glass. If this happens, replace the packing, packing not and glass and ensure the new parts are tightened properly.

Storing

Keep gauge glass in original packaging until ready to install.

INSTALLING THE WATER GAUGE SIGHT GLASS ASSEMBLY

Only properly trained personnel should install and maintain water gauge glass and connections.

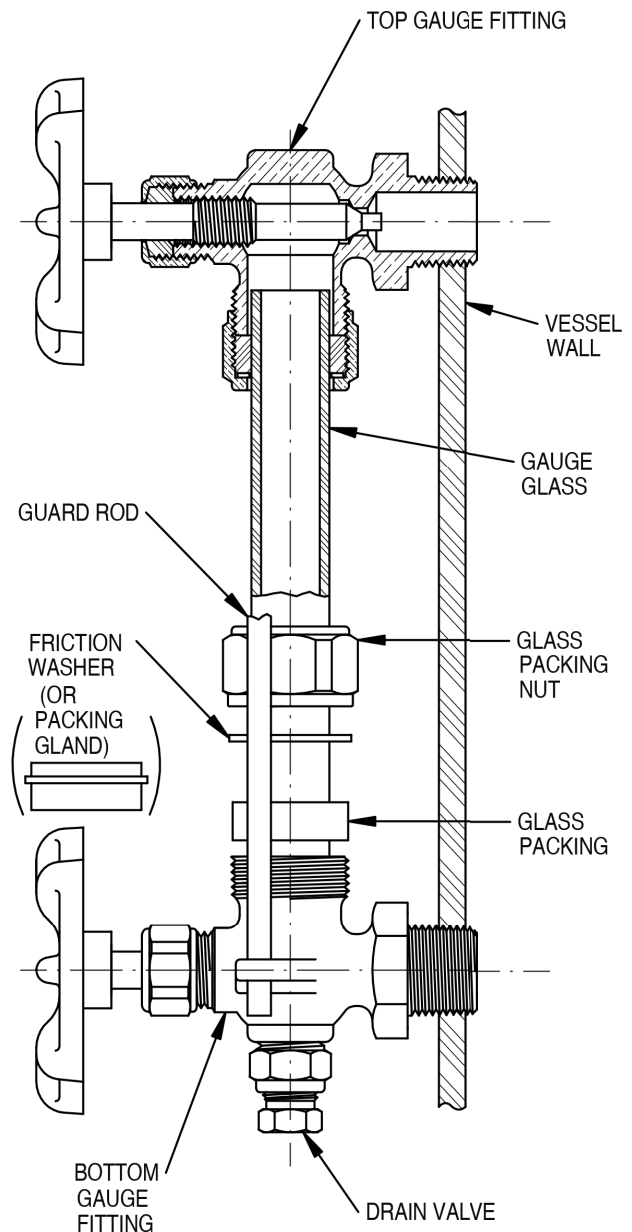
NOTICE: READ ALL WARNINGS AND INSTRUCTIONS BEFORE PERFORMING INSTALLATION OR MAINTENANCE.

WARNING! SAFETY GLASSES AND GLOVES SHOULD BE WORN AT ALL TIMES WHEN WORKING WITH OR EXAMINING WATER GAUGE GLASS AND CONNECTIONS.

WARNING! IMPROPER INSTALLATION OR MAINTENANCE OF GAUGE GLASS AND CONNECTIONS CAN CAUSE IMMEDIATE OR DELAYED BREAKAGE RESULTING IN BODILY INJURY AND/OR PROPERTY DAMAGE,

BEFORE INSTALLING, MAKE SURE ALL PARTS ARE CLEAN AND FREE OF CHIPS AND DEBRIS.

1. Apply Teflon tape to pipe threads. Install top gauge fitting (fitting without a drain valve) into the uppermost tank tapping. Wrench tighten the fitting until it is snug, and the glass outlet is pointing at five o'clock. (about 1/8 turn from its final downward vertical position.)
2. Install the bottom gauge fitting (the fitting with a drain valve) until it is snug, and the glass outlet is pointing directly upward. Verify top and bottom fittings are threaded into the tank threads the same number of turns (distance A = distance B).
3. Remove glass packing nut, friction washer (or packing gland, depending upon the model), and glass packing from the fittings and place them, in same order, onto both ends of the gauge glass. Push both packings about an inch up the gauge glass.
4. Gently insert one end of the glass into the top gauge fitting. Keeping the glass inside the top fitting, gently rotate the top gauge fitting clockwise until vertically aligned with the bottom gauge fitting, then insert glass into bottom fitting until glass bottoms out on the shoulder inside the bottom fitting.
5. Carefully raise glass about 1/16" and slide lower glass packing down until the glass packing contacts the lower gauge fitting. DO NOT allow the glass to remain in contact with any metal!
6. Carefully slide upper glass packing up as far as possible.
7. Hand tighten both glass packing nuts, and then tighten 1/2 turn more by wrench. Tighten only enough to prevent leakage. DO NOT OVER TIGHTEN! If any leakage should occur, tighten slightly, a quarter turn at a time, checking for leakage after each turn.



HEATING ELEMENT INSTALLATION

1. **Remove the heating element** Disconnect the wires and remove the heating element. Set aside the bolts and washers for reuse. Clean the element's tubes and flange removing any scale build-up, gasket debris and old sealant, and ensure the flange surface is smooth and undamaged.

Note: If it is necessary to replace a bolt, use only Grade 8 5/16" steel bolts with a rust proof finish, 18 threads per inch. Bolts should be 1" long for 3/8" thick flanges or 3/4" long for 1/4" thick flanges.

After removing the heating element from the boiler tank, inspect the inside surfaces of the tank for scale build up and debris. Clean as necessary. Ensure all ports are free of build-up. If tank cleaning is necessary, also check the water level probes and clean as needed. *Refer to the De-Scaling Procedure as needed.*

Note: Scale and sediment build up will affect boiler operation and reliability. Excessive build-up can cause heating element failure, slow draining, safety valve leakage and erratic operation.

2. **Install the heating element** Run a bead of sealant between and around the bolt holes on both sides of a new element gasket.

Mount the gasket to the element flange after placing two bolts through mounting holes. The bolts will help hold the gasket in place while mounting the element flange.

Insert the element in place in the boiler tank and loosely install all mounting bolts. Each bolt requires one lock washer and at least one flat washer as shown at right.

Tighten all bolts until snug: the element should be flat against the tank.

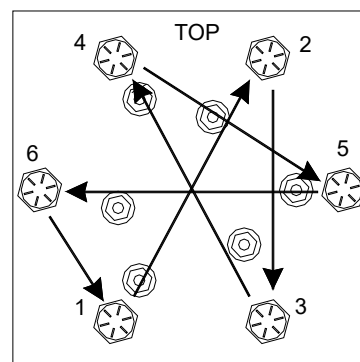
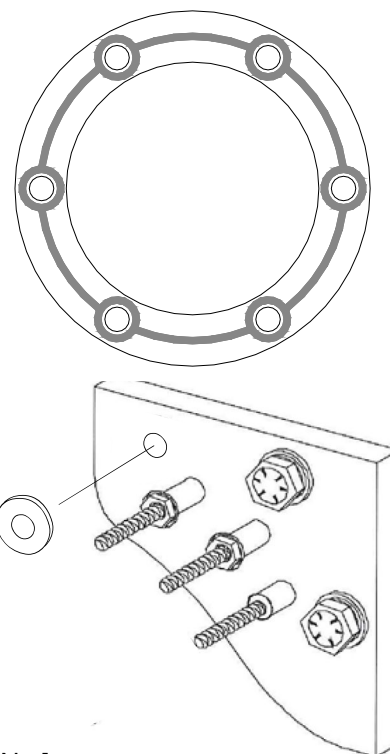
3. **Tighten all the bolts** in a crisscross sequence (shown below right) until they are snug. *This pattern helps ensure the flange is held flat against the tank.*

Use a torque wrench to tighten the bolts in the sequence shown until the bolts are at 18 to 19 foot pounds [24 to 26 Nm].

Then tighten all the bolts in sequence to a final torque of 20.5 foot pounds [28 Nm].

4. Allow the gasket seal time to set up. Set up time varies depending on the sealant used, generally at least 20 minutes for low pressure applications such as the boiler. *Use set up times as recommended by the manufacturer, when known.*

Once the sealant sets-up, test for leaks by using the boiler again and check frequently for leaks for at least the first 24 hours.



WIRING THE HEATING ELEMENT

Connect each element's terminals to the boiler's contactors' screw terminals as shown below. Make sure the terminals are screwed tight against the wire ends. *Note that the drawing shows wire connections only, not actual wire routing.*

Route the wires to ensure they do not rest against any sharp edges and so there is no stress on the connections. Secure element end of each wire to its element terminal as shown. Tighten the first nut and its washers down to the tube – *this will be just snug*. Add the wire, lock washers and nut as shown. *Tighten the outer nut while holding the inner nut in place.*

When finished, the wire should be held securely in place. *If a wire end is not well secured, it can overheat and burn the wire and connection.*

