



Model "SRN and HRN" Atmospheric Steam Boiler

Operating and Maintenance Manual

***Designed and Manufactured in Accordance with
ASME Code Section I (SRN) & ASME Code Section IV (HRN) Heating Boilers***

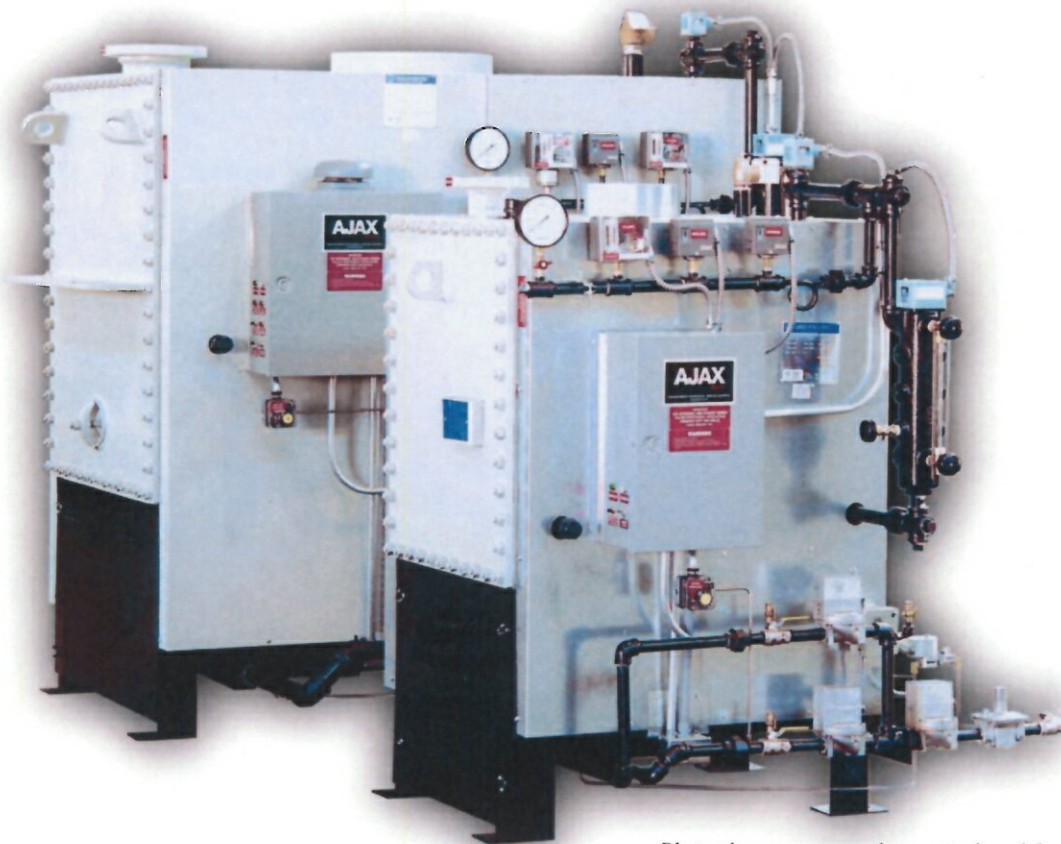


Photo shown may vary from actual model.



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Operating and Installation Instructions (Model SRN & HRN)

Congratulations on your purchase of a new Ajax Boiler. In this book, we have included installation and maintenance instructions that, if followed, will provide you with many years of service from your boiler. Also included are instruction manuals for each of the controls furnished with the boiler. Please read them carefully. They should be helpful in both the installation and services of the boiler. Keep these instructions with the boiler for future reference.

The Ajax steam boiler is of rugged construction, yet of simple design. The boiler is of the incline water tube type, consisting of two water headers with interconnecting, 2" O.D., straight inclined tubes. Normally, steel tubes are supplied on "closed" systems where the amount of make-up water is negligible. Copper tubes should be used on "raw" water applications, where a total or a high percentage of water make up takes place, or where water with high corrosive properties is encountered.

The tubes are rolled and flared into tube sheets with a minimum 1/2" thick, P.V. quality steel plate. The boiler is equipped with removable head plates, front and rear, giving easy access to the straight tubes for inspection, cleaning or replacing.

The combustion chamber and flue passages are designed to give maximum efficiency and serviceability. The best grade of castable refractory is used. Expansion joints are provided to allow for normal contraction and expansion of the refractory. The refractory is backed up with 3" of rockwool insulation. The boiler is enclosed in a casing of 18 gauge-galvanized steel.

The boiler serial number is stamped on the front header plate and on the boiler nameplate, generally mounted on the right hand side of the boiler. All boilers furnished with copper tubes will have a decal applied on the front and rear head plates and will have sacrificial anodes fixed in the water box section of the head plates.

Experience in the field has proven that the Ajax Boilers, if properly applied and maintained, will give many years of efficient, dependable and economical service.

The Boiler Nameplate And Model Number

The Boiler Name Plate

The following illustration is an accurate depiction of the nameplate found on the right hand side of the boiler. You will also find an ASME nameplate on the front head plate with some of the same information.

- A. Boiler description
- B. Model number
- C. Serial number
- D. Minimum relief valve capacity
- E. Maximum Btu/Hr fuel input
- F. Maximum Btu/Hr output**
- G. Boiler horsepower
- H. Square feet of heating surface
- I. Minimum Btu/Hr fuel input*
- J. Minimum Btu/Hr output***
- K. Gross E.D.R.
- L. Max. allowable working press.***
- M. Supply voltage
- N. Electrical supply Hertz
- O. Electrical supply Phase
- P. Required Amperage
- Q. Motor amp draw****
- R. Control voltage****
- S. Control amp draw****
- T. Min. Gas pressure*****
- U. Max. Gas pressure*****
- V. Manifold gas pressure*****
- W. Fuel type (See model #)
- X. Gallons per hour oil*****
- Y. Int. Group Prim Safety****
- Z. Minimum distances btw. boiler and adjacent construction.

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A MODEL NUMBER		C SERIAL NUMBER		D MIN. RELIEF VALVE CAP.	
B MAX. BTU/HOUR INPUT		F BTU/HOUR OUTPUT		H HEATING SURFACE	
E MIN. BTU/HOUR INPUT		J BTU/HOUR OUTPUT		L M.A.W.P.	
I MIN. BTU/HOUR INPUT		K GROSS E.D.R.		M SUPPLY VOLT.	
N ELECTRICAL SUPPLY HERTZ		O ELECTRICAL SUPPLY PHASE		P REQUIRED AMPERAGE	
Q MOTOR AMP DRAW		R CONTROL VOLTAGE		S CONTROL AMP DRAW	
T MIN. GAS PRESS.		U MAX. GAS PRESS.		V MANIFOLD GAS PRESS.	
W FUEL TYPE		X GALLONS PER HOUR OIL		Y INT. GROUP PRIM SAFETY	
Z MINIMUM CLEARANCES TO ADJACENT CONSTRUCTION					

NOT FOR INSTALLATION ON COMBUSTIBLE FLOORING

- * Minimum Btu/Hr ratings apply to high-low and modulating type boilers only.
- ** Boiler output ratings are based on factory tests under appropriate conditions. Field results may vary.
- *** Maximum allowable working pressure for boiler only. Relief valve set pressure should not exceed the lowest MAWP of any component in your system.
- **** Applies to forced draft type burners only
- ***** Minimum and maximum gas pressure values are measured at the point of connection to the boiler gas train. Manifold gas pressures are measured after the gas train.

The Boiler Model Number

S R N G 50 W

Type of boiler:

- W = 125 PSIG MAWP Hot Water
- HR = 15 PSIG MAWP Low Pressure Steam
- SR = 150 PSIG MAWP High Pressure Steam

Type of burner:

- N = Atmospheric (H-Burner)
- F = Forced Draft
- E = High Efficiency Forced Draft
- P = Premix Low NOx
- R = Atmospheric (Round Burner)

Fuel Type:

- G = Natural Gas
- P = Propane
- C = Combination #2 Oil/Natural Gas

DR = 150 PSIG MAWP Hot Water

Firing Rate:

150 = 150,000 Btu/Hr.
(On high pressure steam, # represents HP)

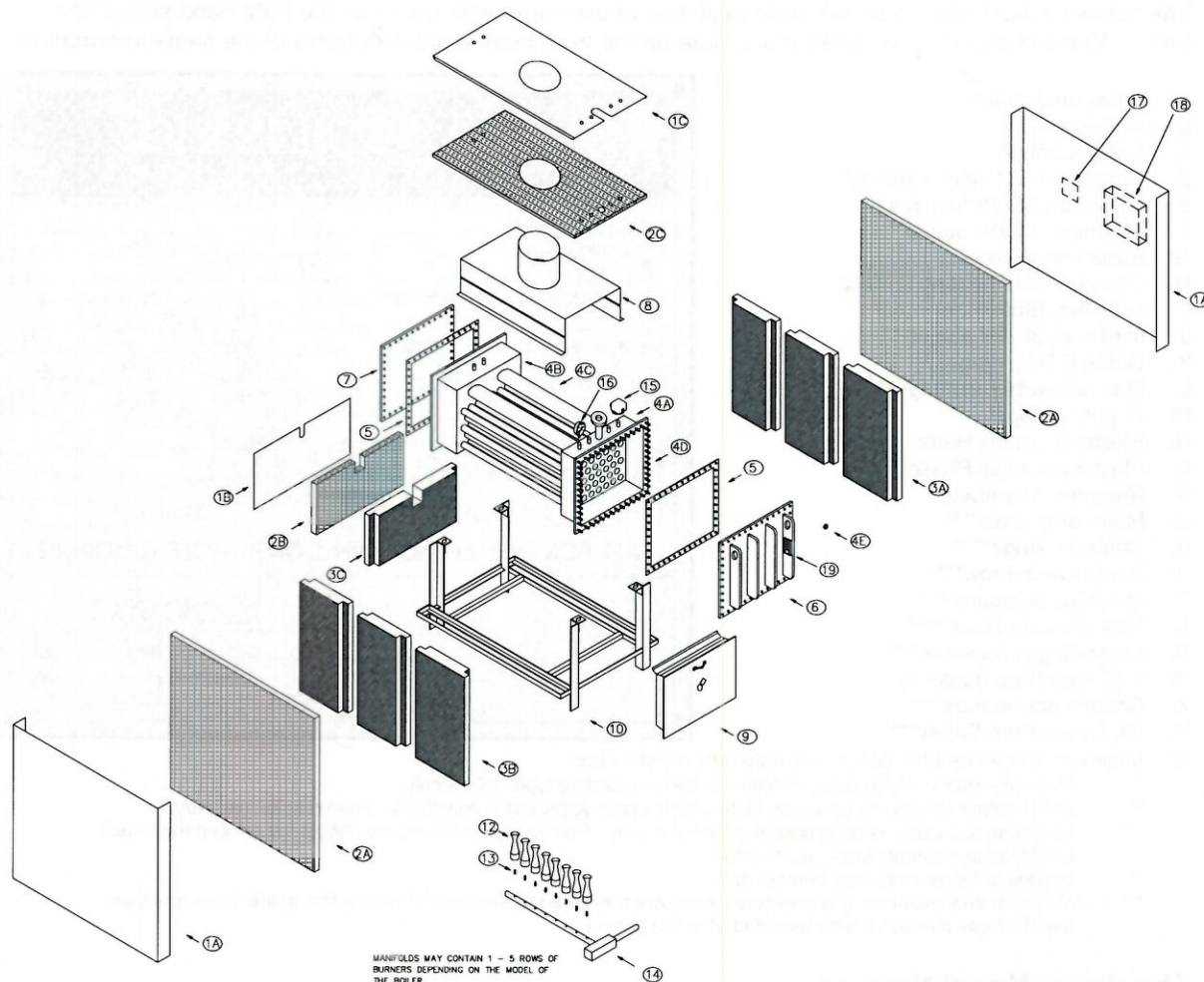
W = Outdoor

O = #2 Oil

D = Dual Gas (Natural Gas/Propane)

The Parts of the Boiler

Exploded Boiler View



Parts

1a	Outer sheet metal jacket-RT	6,7	Head plates
1b	Outer sheet metal jacket-LFT	8	Inner top flue collector
1c	Rear jacket panel	9	Front door
1d	Top sheet metal jacketing	10	Stand frame
2a,b,c,d	Rockwool insulation	12	Burner head
3a,b,c	High temp refractory	13	Orifice
4a	Front box header	14	Manifold
4b	Rear box header	15	Low water probes
4c	Boiler tubes and steam drum	16	Pressure-temperature gauge
4d	Welded stud bolts	17	Boiler name plate
4e	Head plate nuts	18	Electrical panel
5	Gasket	19	ASME data plate

See manufacturer's cut-sheets enclosed with the boiler for complete information on the various parts.

Receiving your boiler And Installation

Receiving your boiler

Check Equipment Received: Inspect the boiler for any shipping damage. Make sure you have received all loose parts, such as draft hoods or controls packaged separately, which are listed on the packing slip. Note any damages or shortages on the bill of lading prior to signing it. *If a boiler is received damaged or missing parts, it is your responsibility to notify the shipping company and file a freight claim.* Ajax Boiler cannot send replacement parts for freight damaged or missing equipment as warranty items. Consignee must file claims for shortages and damages with the carrier. Permission to return goods must be received from the factory prior to shipping. Goods returned without a Returned Goods Authorization number will not be accepted. Purchased parts are subject to replacement only under the manufacturer's warranty. The warranty does not include the cost of labor, removal, or installation of the warranted part.

Installation

Code Requirements: It is very important that your installation comply with all federal, state and local codes (NFGC, NEC, NFPA, CSD-1) as well as meet good industry practices as shown in publications issued by ASME, AGA, UL, ASHRAE, ABMA, ANSI etc.

Boiler Placement: The boiler should be placed on a solid foundation, preferably a concrete pad, adequately sized for your boiler. Ajax Boilers are not suitable for installation on combustible surfaces. Electrical conduit **should not** be imbedded in the concrete directly under the boiler without first consulting with the engineer of the approved boiler pad. Provide adequate clearance for normal inspection and maintenance purposes and allow proper clearances for combustion air. Also, allow tube pull length clearance in the front or rear of the boiler for servicing (see boiler dimensions page for tube lengths). The minimum clearances to combustible surfaces are listed under the UL-795 clearance guidelines and on the boiler nameplate. Make sure the boiler is level, from side to side and front to back. Use metal shims if necessary.

Combustion Air: Adequate combustion air is one of the most important requirements for an atmospheric fired boiler. A lack of proper airflow can result in poor combustion, sooting and premature failure to the boiler. Sizing combustion air intakes according to the National Fuel Gas Code or NFPA 54 is acceptable. Ventilation openings should be provided per the National Fuel Gas Code. The boiler room should have two permanent openings. One opening shall be within two feet of the ceiling and one more within two feet of the floor. Each opening should have a free area of not less than 1 square inch per 1,000 BTU/HR of the total input of every combustion product in the boiler room. The openings should not be obstructed from the outside and air conditioning or exhaust fans should not interfere with proper airflow and ventilation of the boiler room. Consideration should always be given to the blocking effect of louvers in determining total free area. Always leave adequate clearance around the base of the boiler to allow the combustion air to freely enter the combustion chamber. The combustion air entering the boiler must be free of hazardous and flammable vapor fumes. This includes such fumes as perchlorethylene, chlorine, etc.

Venting: This boiler operates with a negative vent static pressure and is approved for use with "B" vent. The boiler must be vented as directly as possible and protected from excessive wind and/or down draft conditions. The stack must be equipped with an appropriate weather cap of the correct size, and protected from excessive wind and or down draft conditions. Draft hoods or barometric dampers should be installed directly above the boiler. The stack must be the same diameter as the boiler vent or the combined area of multiple boiler vents. The recommended upward slope of the horizontal breaching is 1" per linear foot. In other words, the stack should rise 1" vertically for each foot horizontally. The stack should reach at least 3 feet above the highest obstruction of the roof to insure proper venting. At no time should the boiler support the stack weight. (Refer to the latest version of the National Fuel Gas Code for additional installation requirements).

When a draft inducer is required, a draft proving switch must be wired to the boiler to prevent the boiler from firing unless the draft is proven.

Relief Valve: The relief valve discharge must be piped to a floor drain to eliminate the potential of scalding burns. The drain line must be the same size as the relief valve outlet and have a downward slope to insure proper drainage. The drain line termination should be visible to see discharge. Check the relief valve nameplate. The boiler operating pressure cannot exceed that listed on the relief valve. Also, confirm the boiler does not exceed the maximum Btu rating on the relief valve.

Stud Nuts on Boiler Headers: During shipment, the head plate nuts may loosen. Tighten these if required to the torques specified later in this manual. After the boiler has been in operation for a few days, check and retighten the head plate nuts. Ajax recommends using an anti-seize compound when reinstalling head plate nuts. Refer to [Quick Reference Guide](#).

Water Connections: See typical piping diagram as shown in the installation instructions (page 9).

Gas Connections: Check supply gas pressure and select gas line pipe size for adequate capacity at boiler firing rate. Install a condensate trap in the gas line ahead of the boiler gas valve regulator. Do not use Teflon tape on the gas line pipe threads. Use a pipe compound rated for use with gas. All gas piping must be leak tested after installation as components may work loose during shipment. Do not check for gas leaks with an open flame. Use a bubble test. Do not test the boiler gas piping at a pressure higher than the boiler maximum gas pressure rating as this can damage the gas train components. Support the gas piping with hangers, not by the boiler or its accessories.

Manual Main Gas Shutoff Valve: This valve is located on the upstream of the main gas pressure regulator and is normally located on the lower right side of the boiler. The gas supply is to be connected to this valve. Boilers with a minimum input rating are set for the specified rating at the factory. The minimum input rating is not adjustable in the field.

Electrical: The boiler is wired for 120volts 60hz 1phase and 12 amps, unless otherwise noted on the boiler nameplate. Verify the electrical supply using a voltmeter. The voltage tie-in leads are indicated on the wiring diagram. *For your safety, turn off electrical power supply at the service entrance before making any electrical connections.* This boiler contains sensitive control components and should be protected by a suitable commercial grade surge protection device and properly grounded. The boiler must be installed in accordance with the National Electric Code and in accordance with all state and local codes.

Pump Selection: An appropriate sized pump will need to be installed, to pump water through the boiler at its appropriate flow rate. Ajax recommends using a delta T of 20° to 40°F through the boiler. The boiler circulation pump must interlock with the boiler, so the pump will operate under normal boiler operation.

Expansion Tank: A properly sized expansion tank is required on the boiler-piping loop.

Indoor Boilers: Protect all electrical components from moisture. The venting must be completely sealed to prevent spent flue gas into the boiler room. The draft diverter must be installed on top of metal screws in the boiler vent(s) per U.L. requirement. **Note:** Boilers are not designed to support stack weight.

Outdoor Boilers: The Ajax atmospheric outdoor boiler design is UL and ETL certified for outdoor installation. Outdoor boilers have been tested to light off in 40 MPH and operate in 10 MPH wind conditions. Boiler must be protected from excessive wind and or down draft conditions (see venting). The boiler must not be installed under any overhang that is less than 6 feet from the top of the boiler. Three sides must be open in the area under the overhang. All roof water drainage must be diverted away from the boiler. Outdoor boilers are self-venting when supplied with the factory supplied rain cap and require no additional vent piping, however, the vent must not be exposed to down draft conditions.

Size of Piping to Gas Boilers

In determining the size of gas pipe, the following factors should be considered:

- Length of pipe and number of fittings.
- Maximum gas consumption to be provided for (including possible future expansion).
- Allowable loss in pressure from meter outlet to boiler.

The volume to be used (in cubic feet per hour) shall be determined, whenever possible, directly from BTU ratings of the boiler which will be installed and the heating value of the gas to be used. To obtain the cubic feet per hour, divide the total BTU input of the boiler by the BTU heating value per cubic foot of gas.

PIPE DELIVERY SCHEDULE

Length of Pipe in Feet	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"
10	520	1,050	1,600	3,050	4,800	8,500	17,500	44,000
20	350	730	1,100	2,100	3,300	5,900	12,000	31,000
30	285	590	890	1,650	2,700	4,700	9,700	25,000
40	245	500	760	1,450	2,300	4,100	8,300	22,000
50	215	440	670	1,270	2,000	3,600	7,400	19,000
75	175	360	545	1,020	1,650	2,900	6,000	16,000
100	150	305	460	870	1,400	2,500	5,100	14,000
150	120	250	380	710	1,130	2,000	4,100	11,600

* Capacity of Pipes in Cubic Feet of Gas per Hour

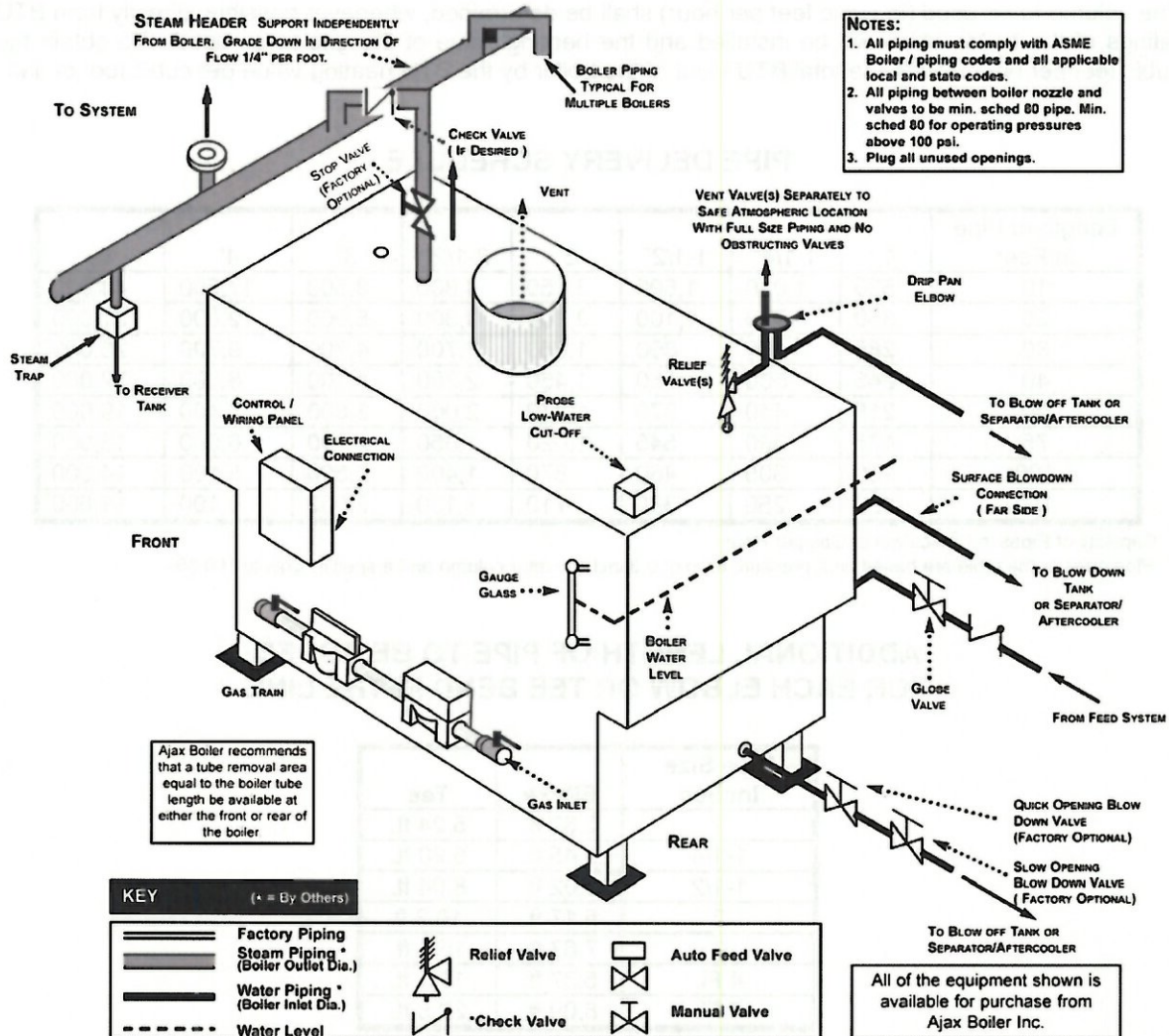
** Pipe sizes in the table are based on a pressure drop of 0.3 inches water column and a specific gravity of 0.60.

ADDITIONAL LENGTH OF PIPE TO BE ADDED FOR EACH ELBOW OR TEE BEND IN THE LINE

Pipe Size Inches	Elbow	Tee
1	2.62 ft.	5.24 ft.
1-1/4	3.45 ft.	6.90 ft.
1-1/2	4.02 ft.	8.04 ft.
2	5.17 ft.	10.3 ft.
3	7.67 ft.	15.3 ft.
4 Fl.	5.37 ft.	15.1 ft.
6 Fl.	8.09 ft.	22.8 ft.

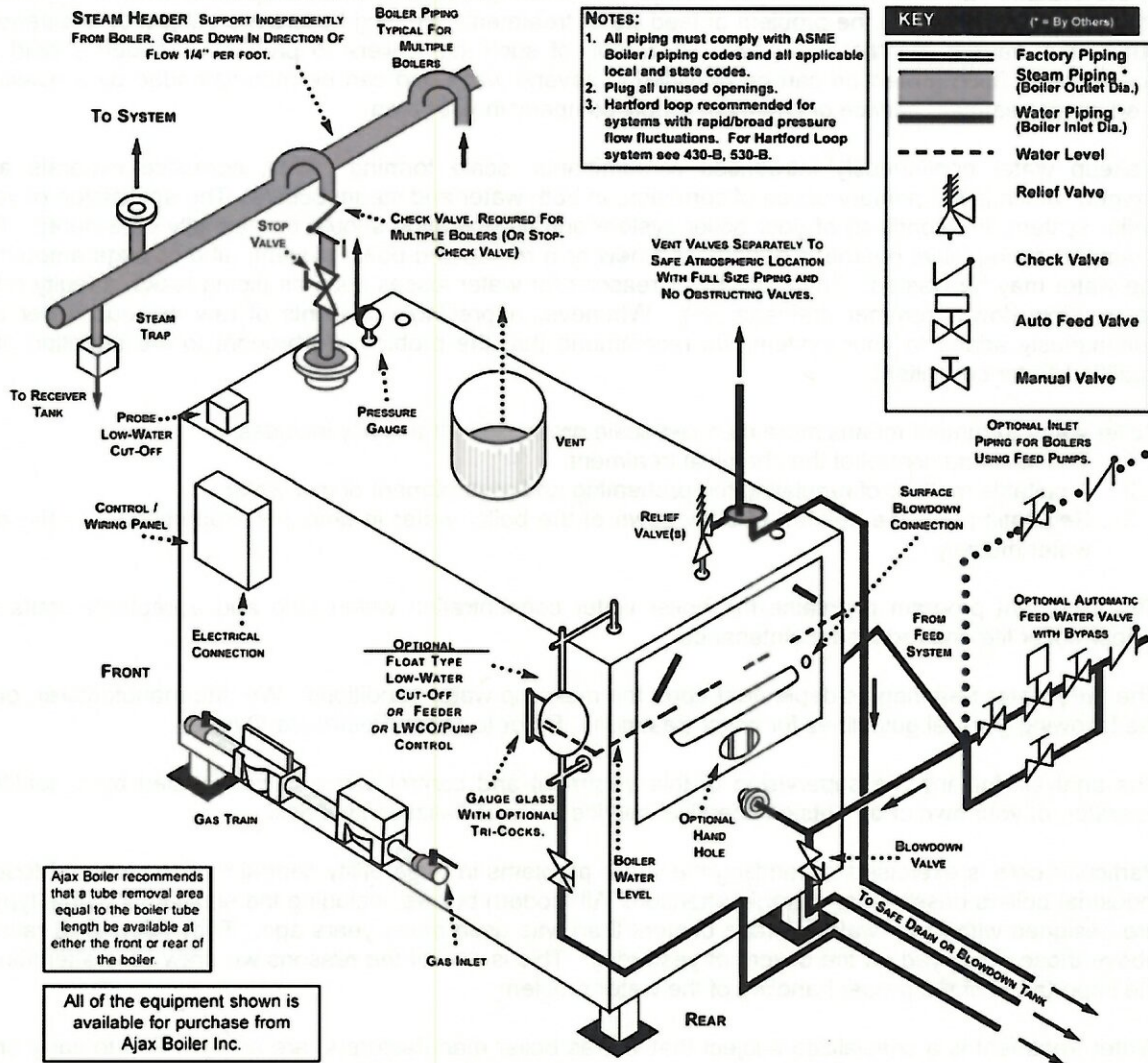
Installation Diagram (High Pressure)

HIGH PRESSURE STEAM BOILER INSTALLATION DIAGRAM for use with all SR Models.



Installation Diagram (Low Pressure)

LOW PRESSURE STEAM BOILER INSTALLATION DIAGRAM for use with Models HRN and HRF.



Water Treatment

We, the manufacturer of your boiler, wish to call to your attention to the necessity for a sound approach to the broad problem of boiler feed water treatment.

Boilers used for space heating purposes only, operate with a closed system of piping in which all of the boiler water is brought back to the boiler. Under these conditions, very little raw makeup water is added to the system. Unless there are system leaks, only a small amount of makeup is required and there is little need for attention to the problem of feed water treatment. Heating boilers are subject to idle periods during the warmer months of a year. Protection of such idle boilers to prevent corrosion should be considered. Such protection can be provided in several ways and can be recommended by a qualified feed water treatment service or chemical supply company in your area.

Makeup water continuously introduces contaminants; scale forming solids, corrosive minerals and oxygen, which is the primary cause of corrosion, in both water and steam boilers. The application of your boiler system, the condition of your boiler system and its operation should be carefully considered. For example, during initial operating periods of a new or a remodeled boiler system, all or a large amount of the water may be wasted. There are other reasons for water losses such as piping leaks, a faulty relief valve, blow down, summer drainage, etc. Whenever appreciable amounts of raw makeup water are continuously added to your system, we recommend that the problem be brought to the attention of a qualified water consultant.

Boiler water treatment means more than just scale prevention. It actually includes:

1. The kind and control of the chemical treatment.
2. A suitable method of regulating the preheating and pretreatment of raw water.
3. Regulating and the method of blow down of the boiler water in amounts proportionate to the raw water makeup.

The treatment program maintains the boiler water concentration within safe and acceptable limits for longer boiler life and reduced maintenance.

The feed water treatment is dependent upon the make-up water conditions. We, the manufacturer, offer the following general guidelines for water treatment. Refer to [Quick Reference Guide](#).

The analysis for and the supervision of this treatment and control can only be handled by a qualified operator, of your own or an outside chemical service that specializes in the field.

Particular care is exercised in handling the water problems in large utility central station plants. Modern industrial boilers deserve comparable attention. All modern boilers, including the smaller industrial types, are designed with lower water storage content than was used many years ago. They operate at ratings above those employed on the boilers of yesterday. This is one of the reasons we draw your attention to the importance of the proper handling of the water problem.

Water treatment is a specialized subject that we, as boiler manufacturers, are not qualified to carry on a water treatment service. We, therefore, recommend that a qualified feed water treatment service company be used to supervise all phases of the water problem that may be encountered in your installation. This service should be picked most carefully as the prevention of trouble costs far less than the cost of repairs to equipment that has been neglected.

Final proof of any feed water treatment program is in the continued observation of its effectiveness on the waterside surfaces of the boiler. Regular internal inspection of the boiler, therefore, should become part of the maintenance program.

Before Start-up

1. **Check the burners:** Remove the front door to get access to the boiler firebox. Remove shipping tie down wire from the burner heads. The wire is used to hold the burners intact during shipping.



If not removed, the wire may cause failure of the controls and/or cause improper combustion.

Examine each burner to make sure that the burner heads and venturi tubes are straight and securely in place. Make sure that the burner heads are lined up properly and have not been misaligned in shipping. Also, examine the pilot, sensor and spark electrode to make sure that they have not become misaligned.

2. **Clean system:** The boiler and the entire system should be cleaned and flushed prior to filling the boiler in accordance with ASME recommendations.
3. **Fill the boiler:**
 - a.) After cleaning, fill the system with a treated water mixture according to a water treatment specialist's recommendation and to the correct system pressure. Further information can be found at www.H2Ochem.com.
 - b.) After filling the system, inspect all piping throughout the system for leaks. If found, make necessary repairs.
4. **Additional controls:** Boilers are pre-wired at the factory. If additional controls are to be installed, care should be taken not to disturb the continuity of the existing circuit. Refer to the boiler wiring diagram and control manufacturer's instructions supplied with the boiler.
5. **Check factory assembled joints and head bolts:** Although the boiler pressure vessel and the gas train are pressure tested prior to shipping, often times during shipment, items may work loose. These items may include head plate nuts, relief valves and gas train assemblies. These items should be checked prior to operating the boiler and tightened. Refer to [Quick Reference Guide](#).

Important! The boiler gas piping and all connections should be tested for leaks before starting up the boiler. Do not use a flame test. It is important that you check the boiler gas train as some components may shift during transport. The boiler has been furnished completely assembled at the factory and all burner heads, venturi tubes and orifices have been furnished to deliver rated capacity, for the type of gas specified, as designated on the boiler nameplate. The manifold pressure must be set between 3.5" to 4" Water Column for natural gas and 11" Water Column for propane (LPG). The supply pressure to the boiler regulator must be set between the minimum and maximum pressures stated on the boiler nameplate.

Start-up Instructions

Boilout Instruction: Cleaning of the water side surfaces of the boiler to remove loose scale, grease and other foreign material prior initial operation is necessary to maintain high quality steam.

Important! When starting up your boiler for the first time, run it at low fire for 30 minutes prior to running it at high fire. The refractory panels may contain moisture from the curing process. Running the boiler at low fire will dry out the panels. If the boiler is immediately operated at high fire, there may be a chance that the refractory will crack. A "cold" boiler should be treated the same way.

1. **Read manual:** Before attempting to start-up the boiler, read this manual in its entirety and be familiar with the details contained within.
2. **Verification:** Locate the boiler nameplate and verify the voltage, type of gas, gas pressure and regulator setting. Ensure free combustion air openings to the boiler room meet the requirements on the boiler nameplate, local codes, gas industry standards and the O&M manual. The venting will include a draft hood or barometric damper (Indoor units only). A wind deflecting vent cap that prevents down drafts, must be securely fastened to the vent outlet. Outdoor units will be provided with a rain cap as standard.
3. **Inspect:** Turn off all electric power and open the main gas valve. Smell for gas, especially around the floor. **If you smell gas, shut the main gas valve to the boiler immediately and check for piping leaks!** If you do not smell gas, go on to the next step.
4. **Operating controller:** Set the operating pressure controller to its lowest setting and the hi-limit 10psi above the operating pressure control. (Figure 1.4)



Figure 1.4

5. **Verify pilot and ignition:** Before attempting to fire the boilers main burners, verify the operation of the ignition and pilot. Disable the main burners by closing the manual gas valves (closest to the burner manifold) on each burner stage. (If this is an on-off staged boiler, it will have only one valve).



6. **Turn on main power:** Open the pilot and main manual gas valve and turn the ON-OFF switch on the boiler control panel to the ON position. The pilot should light after attempting its trial for ignition. If the pilot does not light, check all the manual resets on the boiler (gas pressure switches, high limit). It may take several tries to purge the air from the pilot lines.

7. **Open main valve(s):** Once the pilot has been established, open the manual valves on the gas train to half open. The main burners should light. Let the boiler run at this low input rate for 30 minutes. This will evaporate the moisture in the refractory panels.
8. **Low fire run time:** After running the boiler at low fire for 30 minutes, open the manual gas valves fully. Make sure the boiler operating pressure control is set at the desired output pressure.
9. **Full fire:** The boiler will continue to operate at full fire until it satisfies its set operating pressure. Once satisfied, the boiler will shut down or go to low fire if equipped.
10. **Testing:** While the boiler is running, test all interlocks and safeties. Once the boiler has reached at least 150°F, test the high limit by turning the pressure dial to its lowest setting. The boiler should shut down and lock out. To put the boiler back in operation, turn the high limit pressure setting to 10psi higher than the operating pressure setting and press the reset button on the high limit. The boiler will now resume.
11. **Testing low water cut-off:** To check the low water cut-off, push the test button located on the boiler control panel, labeled LWCO. Hold it for 5 seconds. This will produce a simulated low water shutdown. Upon release of the button, the boiler will remain locked out. The boiler will remain locked out until the low water cut-off reset button, located on the control panel, is depressed.
12. **Draft:** Stack Draft Requirements (ATM), -0.02" to -0.04" Water Column.
13. **System Piping Temperature:** In steam applications, if the boiler has been shut off for a prolonged periods of time, the system piping temperature is usually at ambient temperature. Low system piping temperature at start-up may cause condensation and a vacuum condition can occur in the system piping. This vacuum condition can draw steam away from the boiler, which will result in a low water boiler shut down. To prevent this condition, at start-up the system must be gradually brought to the desired temperature.

After Start-up Check List

- ☐ Has air been purged from the system?
- ☐ Has the gas line piping been checked for gas leaks?
- ☐ Have the operating and high limit pressure controls been set?
- ☐ Is the boiler inlet water temperature above 140°F?
- ☐ **Flue gas spillage and soot:** Check for spillage at the draft hood. Check for soot around the sheet metal joints. Use the smoke from a match to detect flue gas spillage. If spillage is present, determine the cause of the problem and correct it.
- ☐ **Leaks:** Look for water on the floor. Check for water leaks from any part of the boiler, valves or piping.
- ☐ **Supports:** Check for proper supports on the water piping and gas lines.
- ☐ **Caution:** Keep flammable materials away from the boiler. In the event of the boiler overheating – shut the boiler down by (1) turning off the manual gas valve located in the gas controls manifold adjacent to the boiler and (2) turn off the electricity to the boiler.

Shutting Down the Boiler

1. **Operating controller:** Set the operating pressure controller to its lowest setting.
2. **Power:** Turn off the boiler by switching the toggle switch on the control panel into the OFF position.
3. **Gas valves:** Close the boilers main gas valve.

Maintenance Instructions

1. **Keep tubes clean:** In order to maintain high boiler efficiency and boiler life, the boiler tubes should be cleaned periodically, both inside and outside. The frequency of cleaning the inside of the boiler tubes depends on the characteristics of the water and the type of installation. When a large amount of makeup water is used, it is good practice to inspect and clean, if necessary, the inside of the tubes after 30 days. The accumulation of lime and other solids within this time will establish the criterion for how often the boiler tubes should be cleaned. On closed systems, where only a small amount of makeup water is used, the insides the boiler tubes should be examined and if necessary, cleaned at the end of the heating season. When makeup water is negligible, such as boilers connected to unit heaters or radiators, the boiler should be flushed at the end of each heating season. All water and steam boiler should have a tee installed at the boiler inlet for draining the boiler. Steam boilers should have a properly sized blowdown valve piped to a blowdown tank and/or suitable drain per local codes. Steam boiler installations that consume steam and therefore use makeup water should be blown down daily. Clean tubes will not only ensure higher boiler efficiency but will also prevent possible damage to the boiler. The boiler should never be fired unless it is full of water.
2. **Gaskets:** Tighten gaskets during start up and periodically thereafter. Leaky gaskets will cause the use of excessive makeup water and could cause corrosion of the stud bolts. It is good practice to use a new gasket; however, if the gasket is not damaged, it may be reused. Use a soft gasket compound on both sides of the gasket. Specify boiler model number and the height and width of the boiler head plate when ordering new gaskets.
3. **Studs:** Keep studs protected from corrosion with paint or oil. Keep stud bolts tight to prevent leaky gaskets. Stud bolts will not corrode if they are kept dry and protected. Use caution in removing and reinstalling head plates. The boiler must be shut down and drained. Before removing the nuts, apply penetrating oil and allow it to set for a few minutes. Tap the head plate lightly around each stud bolt before trying to break the nut loose. Forcing the nut off could cause breakage. Use a torch to heat the nut and it will come off easier. If a torch is not available, take a cold chisel, place it across the flat of the nut, and strike several sharp blows with a heavy hammer. This should loosen the nut. If necessary, it is better to split the nut open and replace it than to break the stud off.

Should, for any reason, a stud bolt on a boiler head be broken, it can be replaced as follows: without removing the heat plate, use a slow speed drill to drill out the remaining portion of the stud. Re-drill the header and tap using a standard thread tap. Spare studs may be obtained from the factory.
4. **Controls:** Under normal conditions, controls furnished with the Ajax Boiler require very little service. It is important, however, that the controls be protected from moisture and dirt. All controls should be checked frequently to make sure that they are working properly. Turn both the operating controls and the safety controls up and down to verify that they will operate satisfactorily. The high limit control furnished with the boiler should only be used as a safety control.
5. **Safety pilots:** Keep pilot, igniter and sensor clean and properly adjusted. Dirty pilot orifices may cause unwarranted shutdowns. The pilot flame should be in contact with the sensor rod and the spark electrode must be located directly in front of the pilot orifice. Test per the manufacture's cut-sheet instructions.
6. **Gas burner:** The burner heads and orifices must be kept free from foreign matter. The burner heads should be brushed periodically with a steel brush to remove carbon build-up.

7. **Relief valve:** Boilers are equipped with a lever type relief valve of "ASME" rated capacity. To maintain the valve in good working condition, it should be manually opened once a month on "closed" systems and once a week on "open" systems. The relief valve outlet should be piped directly to an open drain and the drain checked frequently for discharge. If the relief valve is leaking or does not operate freely, it should be replaced.
8. **Low water cut-off:** A low water cutoff is furnished to protect the boiler against damage by preventing it from operating without water. This is particularly important when the boiler is installed above the water level, i.e., on a roof. Low water level cutoffs should be checked periodically by lowering the water level in the boiler and verifying that the safety circuit opens. Float type low water cutoffs should be flushed at least once a week on "open" systems and once a month on "closed" systems (if applicable). If neglected, accumulation of sediment within the low water cutoff casing may render the control inoperative and thereby become a safety hazard. Probe low water cutoffs may accumulate deposits on the grounding element. These should be carefully cleaned.
9. **Operating control:** The operating pressure control sets the desired boiler water pressure output. To adjust the water pressure, insert a small straight screwdriver into the slotted screw hole at the front of the controller. This controller has an adjustable differential wheel under its casing.
10. **High limit manual reset:** The boiler is equipped with a manual reset high limit pressure safety designed to shut down the boiler in the event the boiler water pressure exceeds the high limit set point. The high limit should be set 10psi above the operating pressure controller.
11. **Gas pressure switches (Optional, where applicable):** The low gas pressure switch is designed to shut down the boiler if the gas supply drops below its set point. The high gas pressure switch is designed to shut the boiler down if the gas pressure exceeds its set point. Both switches will lock out and must be manually reset if tripped.
12. **Anodes:** Magnesium anodes are standard on all copper tube boilers. They will extend the life of the boiler, and must be replaced periodically. The replacement frequency can vary from six months to several years. Higher temperatures and/or higher total dissolved solid contents in the boiler water will speed electrolysis and decrease the life of the anodes. Normally, two anodes in each header are adequate for header protection. Under adverse conditions, it may be necessary to install as many as three or four anodes in each header. New anodes may be purchased from your Ajax Boiler representative.
13. **Venting system (indoor boilers):** Examine the venting system externally at least once a year for:
 - a.) Tightness of all joints and connections including the draft hood to the boiler and the vent connection from the draft hood to the stack.
 - b.) Corrosion of metal in the vent ducting.
14. **Flue gas passageways:** Inspect and clean, if necessary, at least once every five years.
 - a.) Shut off gas and turn off electric power to boiler.
 - b.) Disconnect vent pipe and remove draft hood(s) or vent cap on outdoor boilers.
 - c.) Examine flue gas passageways and the inside of the venting system for soot and corrosion.
 - d.) If cleaning is needed, open front door, remove main burners, and cover burner orifices and pilot burner with a waterproof covering.
 - e.) Protect controls, electrical, etc. with waterproof covering.
 - f.) Clean tube bundle through vent opening(s) at top of boiler using a water or steam hose. Clean out and reassemble boiler after cleaning.

Note: If any parts need tightening or replacement, consult a qualified serviceman.

It is highly recommended that an operator's log be kept as a record of boiler readings as a way of tracking operational changes that may affect warranty and/or boiler reliability.

Maintenance Intervals

Daily Maintenance

1. **Check water level:** An unstable water level can indicate several problems such as excessive solids or water treatment, contamination from oil, overload or control malfunction. Ensure there is water in the gauge glass (if applicable) every time you enter the boiler room.
2. **Blow down the boiler:** Blow down the boiler in accordance with the recommendation of your feed water consultant. A water quality and chemical treatment program will dictate frequency of the boiler blow down.
3. **Blow down water level controls:** Blow down the water level controls to purge the float bowl of possible sediment accumulation (if applicable). Operating conditions will dictate frequency of this check.
4. **Check combustion visually:** Look at the flame to see if anything has changed. Changes may be an indication that a problem is developing.
5. **Treat water according to the established program:** Add chemicals and take tests as outlined by your chemical feed water consultant.
6. **Record boiler operating pressure and temperature:** An excessive steam or water temperature drop will alert you to excessive loading on the boiler.
7. **Record feed water pressure and temperature:** A change in pressure or temperature may indicate a problem is developing with your feed pump(s), deaerator or packaged feed system.
8. **Record stack temperatures:** Changes in stack temperatures could indicate the boiler is sooting, scaling or there is a problem with baffles or refractory.
9. **Record gas pressure:** Changes in pressure could have an effect on combustion in the boiler and indicate a problem in the gas delivery system.
10. **Check with general boiler/burner operation personnel:** Has anything changed from the day before? If so, why?
11. **Record boiler water supply and return temperatures:** On hot water boilers, record these temperatures to assist in detecting system changes. Return temperatures below 140°F will cause the boiler to condense.
12. **Record makeup water usage:** Excessive makeup water could be an indication of system problems (leaks) in both steam and hot water systems.
13. **Check auxiliary equipment:** There is a vast difference between "is it running" and "is it running properly." Take nothing for granted, as auxiliary equipment can shut down your operation.

Weekly Maintenance

1. **Check for tight closing fuel valves:** Check to ensure fuel does not flow through the fuel valve(s) when the burner is shut off.
2. **Check indicating lights and alarms:** Check for burned out or loose light bulbs. In addition, check to ensure the alarm bell sounds on the appropriate shut down condition.
3. **Check operation of water level controls:** Stop the boiler feed pump and allow the control to stop the boiler under normal low fire conditions.
4. **Check for leaks, noise, vibration, unusual conditions, etc.:** Checking for these items, is a cost-effective way to detect system operational changes. Small problems can be corrected before they become large problems.
5. **Check operation of all motors:** By developing a routine, any change in operation or bearing temperature will usually be caught in time to avoid a failure.
6. **Check the flame scanner assembly (if applicable):** Using the appropriate meter, check the flame signal strength at the program relay flame amplifier. Ensure the scanner assembly is clean and dry.
7. **Check gauge glass:** Ensure there are no scratches or etching in the glass or leakage around the package.

Monthly Maintenance

1. **Inspect burner operation:** Do a visual inspection of the pilot flame and main burner flame throughout the firing range.
2. **Analyze combustion:** Take the flue gas analysis over the entire firing range, comparing the combustion analysis and stack temperature reading with the previous month.
3. **Check for flue gas leaks:** Ensure something hasn't changed in the breaching, stack or overall system that allows flue gas to be drawn into the boiler room.
4. **Check boiler blow down:** Review boiler blow down to determine that a waste of treated water is not occurring. Check water treatment and testing procedures with your feed water consultant.
5. **Check all combustion air supply inlets:** Ensure sufficient combustion air is being supplied to the boiler room and burner.
6. **Check the fuel system:** Make sure certain strainers, vacuum gauges, pressure gauges and pumps are properly cared for.
7. **Check lubrication:** Verify lubrication requirements of all bearing supported equipment. Do not over-lubricate electric motors.

Semi-Annual Maintenance

1. **Clean low water cut-off(s):** Remove the head assembly or probes, inspect and clean out any sediment or contamination in the column or piping. Determine why sediment or contamination condition exists.
2. **Repair refractory:** Repair all cracks and fill in gaps.
3. **Reset combustion:** The entire combustion process should be carefully checked, O₂ readings taken and necessary burner adjustments made. Make certain readings are recorded and used as a basis of comparison for future tests. Combustion adjustments should only be made by those thoroughly familiar with all aspects of burner adjustments and combustion.

Annual Maintenance

1. **Clean fireside surfaces:** Clean fireside surfaces by brush or use a powerful vacuum cleaner to remove soot. After the cleaning process, and if the boiler is to be left open, it is advisable to spray all fireside surfaces with some type of corrosion preventative.
2. **Clean breaching:** Inspect breaching, stack, and remove any soot build-up.
3. **Clean waterside surfaces:** Remove all head plates and inspect tubes. Inspect water columns, tee's and float assemblies from water columns. Thoroughly wash all waterside surfaces.
4. **Check gauge glass for possible replacement:** If internal erosion at water level is noted, replace with new glass and gaskets.
5. **Remove and recondition safety valves:** Have them reconditioned by an authorized safety valve facility. The safety valve is an important device yet possibly receives less attention than any other device.
6. **Boiler feed pumps:** Strainers should be reconditioned. Feed pump elements wear and must be replaced. Sometimes a review of the condensate return system and chemical feed arrangement will reveal causes of short pump life.
7. **Chemical feed systems:** Chemical feed systems should be completely emptied, flushed and reconditioned. Metering valves or pumps should be reconditioned at this time.
8. **Tighten all electrical terminals:** All terminals should be checked for tightness, particularly on starters and moveable relays.

Trouble Shooting Guide

The following is a list of items that can cause boiler performance problems if not installed correctly.

Available combustion air: Normal Conditions: 1 sq. in. open area per 1000 Btu/hr. Note: This must be open area between louvers.

Stack draft: Normal Conditions: Atmospheric: -0.02 to -0.04 in. WC.

Fuel pressure: Normal Conditions: Atm.: 4"WC natural gas manifold pressure and 11"WC propane manifold pressure.

Inlet water treatment, flow, and/or temperature: Minimum inlet water temperature without boiler recirculator line = 140°F

The following are common problems with possible causes and solutions.

1. **Nuisance flame failures:**

- a.) The flame safeguard is not sensing an adequate flame signal. If your boiler contains a Fireye Micro M controller, measure the flame signal across its two ports (See [Fireye manual](#)). Voltage signal should measure between 14 and 18 volts DC. If your boiler uses a Honeywell S8610, consult the Honeywell S8610 trouble-shooting guide included in this manual.
- b.) The flame rod is dirty or sooted.
- c.) The copper lead is grounding on the boiler between the junction box and the pilot.
- d.) The flame rod on the pilot is not directly in the flame. If the flame is pulling away from the flame rod, the gas pressure may be too low or the stack draft too high.
- e.) Check all connections on the flame rod, pilot, and the flame safeguard controller and make sure the pilot is grounded.

2. **Burners have yellow flame:** Some yellow tipping is normal with atmospheric boilers. However, the best way to insure appropriate burner flame is the use of a combustion analyzer. Check the percentage of combustibles against the standard list included in this manual. Also, check the stack draft, inlet and outlet water temperatures at high fire and the combustion air openings in the boiler room.

3. **Boiler not putting out enough heat:** The main reason a boiler will not put out enough heat is usually due to there not being enough gas reaching the burners. Check the following:

- a.) Have you been able to accurately measure the gas flow rate at the meter
- b.) What is the gas pressure at the burner manifold, after the gas train, before the burners
- c.) What is the inlet gas pressure, while the burner is firing? This number will be lower than when the burner is not firing.
- d.) Review combustion report, if the boiler is under fired, there should be too much Oxygen in the stack gases.
- e.) Is the boiler at altitude? If yes, has it been derated?

4. **Boiler is sooting up:**

- a.) If the gas pressure is too low, the burners will overheat and soot up the boilers. For instance, if they have propane gas and the boiler has natural gas orifices, the manifold pressure will be too low and the boiler will soot. Running a boiler at less than 2" water column (WC) may cause sooting.
- b.) Running the boiler in a condensing mode with inlet water temperatures below 140°F. When this happens, it will "rain" down on the burners and appear to be leaking. The boiler will subsequently soot up.
- c.) If the boiler uses propane gas "candling" may be a problem. Propane is heavier than air. When a propane burner shuts off, the gas remaining in the manifold pipe continues to burn at the top of the orifice, below the burner and venturi tube. It takes about 15-45 seconds to burn

the remaining propane. If the burner comes on before the propane is completely burned, the "candle" on the top of the orifice lights the burner and the flame burns inside the venturi and burner casting. This will soot up the boiler quickly. The solution is to eliminate the short cycling. This can be done with a "delay on break" time delay relay powered off the main valve.

- d.) Insufficient combustion air/draft may cause sooting. The only way to tell if this is the cause is by obtaining answers to the following:
- 1.) Start-up or Combustion report.
 - 2.) Open a door to the boiler room. Any improvement? If so, there is not enough combustion air in the boiler room.
 - 3.) Check for flame rollout. In extreme cases, flame rollout will light the gas at the orifice and produce a situation similar to the candling propane burners.
 - 4.) Is the room pressurized? Is there other equipment in the room? Is there an extractor fan in the room?
5. **My boiler is leaking:** Sometimes boilers appear to be leaking when they are actually operating in a condensing mode. To prevent condensing, inlet water temperature should be 140°F or higher.

Condensation

During startup conditions, when the boiler water temperature is below 140°F, condensation will occur. Condensation will stop when the return boiler water temperature exceeds 140°F. *Water tube boilers, including the Ajax Boiler, should not be operated at water inlet temperatures below 140°F. **Prolonged operation of the boiler under condensation conditions will cause damage to the boiler.*** If the boiler application requires inlet water temperatures below 140°F, a boiler recirculation system must be installed so that the cold inlet water is mixed with hot boiler water in a ratio to ensure that condensation does not occur.

Cold Start-ups

Too many cold startups will be evidenced by rust stains on the refractory inside the boiler and around the boiler doors. If condensation occurs regularly, eventually the boiler tubes and firebox area may rust apart and collapse. Frequent shutdowns of the heating system can endanger the boiler life expectancy. With a water boiler, maintain at least the minimum inlet water temperature recommended (140°F). If an outdoor reset control is used, the controls must be arranged so that the boiler never falls below the recommended water temperature.

Soot

No matter what kind of fuel is used (gas, LPG), soot and scale deposits will accumulate on the outside of the boiler tubes. If the tubes aren't cleaned regularly, boiler efficiency will be sacrificed and fuel will be wasted. Soot has excellent insulating properties, which can result in a tremendous heat loss and increased fuel consumption.

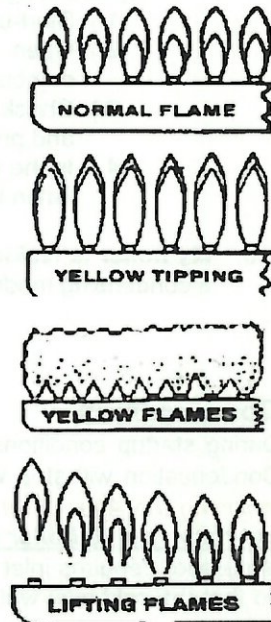
CAUTION:

1. Check daily to be sure that boiler area is free and clear of combustible materials, gasoline, solvents, and other flammable vapors, liquids or materials.
2. Check daily to be sure that the flow of combustion and ventilating air to the boiler is not obstructed.
3. If the boiler overheats, shut it down immediately by (1) turning off the manual gas valve located on the boiler and (2) turning off the electric power to the boiler.

Burner Flames

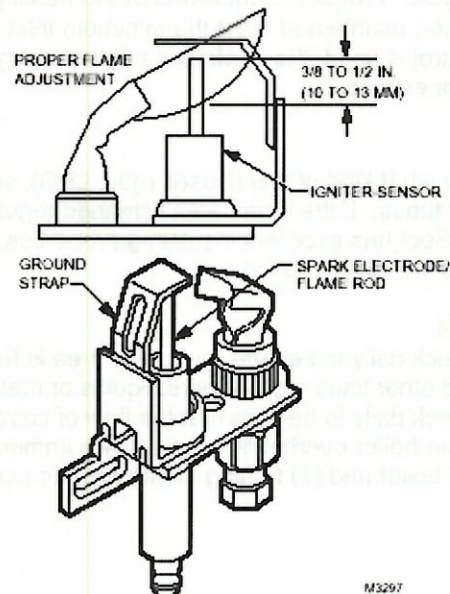
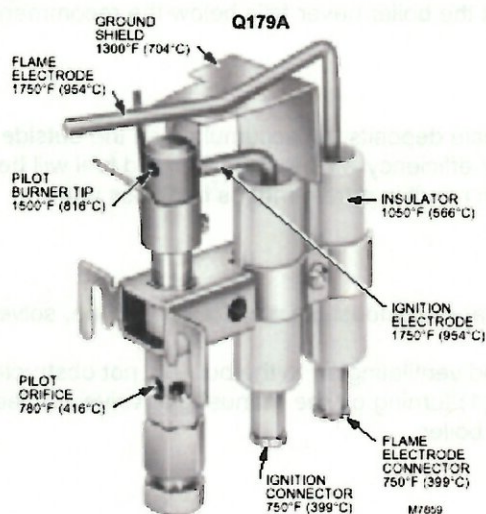
The gas manifold and control assembly provided on Ajax boilers have been tested and met safe lighting and other performance criteria specified by Underwriters Laboratories UL-795 and American National Standard ANSI Z221.13.-1982. The main burner and pilot burner flames should be visually checked at each start up and at least once a month during regular operation. The following is a description of various flames:

1. **Normal Flame:** A normal flame is blue-white with a well-defined blue inner cone. The flame should not have yellow tips and should not be lifting.
2. **Yellow Tipping:** Caused by a lack of primary air to the burners. Check air opening to boiler room and air access to boiler, soot and carbon monoxide may form. Dust may cause orange-yellow streaks in the flames but will have little effect on combustion.
3. **Yellow Flames:** Caused by severe lack of primary air to boiler, burner heads/venturi tubes not properly in place or excessive gas input to boiler. This condition must be corrected immediately.
4. **Lifting Flame:** Caused by high gas pressure at the burner or an up draft condition. Slight lifting from a cold burner is acceptable if the flame settles back down to the port as the burner heats up.



Pilot Burners

The Q345A and Q179A are combination pilot burners and rectifying flame rod detectors (sensors) with an ignition electrode intermittent or interrupted ignition pilot system. The Q345A is used with the S8610H controller, and the Q179A is used with the Fireye controller. The pilot flame should envelop the tip of the flame rod detector/sensor. See illustrations below.



For other trouble shooting issues, please reference the specific control sheets included in this manual.

Quick Reference Guide

Head Plate Torque Requirement

(Model "SRN")		(Model "HRN")	
1/2" bolts	78 ft.lbs	5/8" studs	90 ft.lbs.
5/8" bolts	156 ft.lbs.	3/4" studs	150ft.lbs
3/4" bolts	260 ft.lbs	7/8" studs	240ft.lbs
Stack Draft Requirements (ATM)		-0.02" to -0.04" Water Column	
Manifold gas pressure (Nat. Gas)		3.5" to 4" Water Column	
Manifold gas pressure (LPG)		11" Water Column	
Minimum Inlet Water Temperature		140° F	
Water Treatment			
Hardness		Less than 0.3 ppm	
PH Value		7.2 to 9.5	
Suspended solids		Less than 10 ppm	
Dissolved solids		Less than 3000 ppm	
Oxygen before scavenger addition		Less than 0.2 ppm	
Oxygen after scavenger addition		Less than 0.007 ppm	
Total alkalinity		Less than 350 ppm	

Replacement Parts

Ajax Boilers have been manufactured since 1924. In the course of these years, many improvements have been incorporated in the design of our boilers. Information on the Ajax Boiler is subject to change without notice as design improvements continue. Ajax Boiler maintains a complete equipment list for each boiler filed by boiler serial number. In order for us to give prompt service and to ensure that correct parts are supplied, please be sure and supply the boiler model and serial number.

1. **Head Plate Gaskets:** Specify the height and width of the boiler head plate with the model and serial number when ordering.
2. **Anodes:** Give boiler model and serial number when ordering.
3. **Burners:** When ordering burners and burner orifices advise boiler model, serial number, altitude and the type of gas (natural or LPG).
4. **Boiler Tubes:** All Ajax Boilers are equipped with 2" O.D. steel or copper tubes. These tubes are rolled and flared into a tube sheet with a minimum thickness of 1/2". Furnish overall boiler length, taken at the top of the jacket, with the model and serial numbers when ordering boiler tubes.
5. **Studs:** If a stud on a boiler header should break, see stud replacement in the service instructions.
6. **Control and Pilot Burners:** To order replacement controls or pilot burners, refer to the attached "Equipment List" and the control manufacturer's bulletins included with these instructions.

Material Safety Data Sheets

Some of Ajax Boiler products contain materials that have been recognized as posing health risks. Material Safety Data Sheets for these materials are available from your local Manufacturer's rep. When requesting this information, be sure to have the model number and serial number available.

If you do not know who your local Manufacturer's Rep is, you can find out by logging into the www.ajaxboiler.com website, and clicking on the Representative tab found in the table of contents.

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AJAX BOILER INC. - ACE BOILER INC. FACTORY LIMITED WARRANTY POLICY

The Ajax Boiler Factory limited warranty provides assurance that all products are free from manufacturer defects at the time of shipment and meet specifications and performance described in the product literature.

It is important to understand the difference between a factory warranty and an installed warranty. There are many factors that can occur to the products after they are shipped that the company has no control over and can not fully verify. These include:

1. Hidden damage during the shipping.
2. Handling damage.
3. Damage during storage.
4. Installation conditions.
5. Other unknown variables in the system design: maintenance, pulsation and vibrations.

The installed warranty is the responsibility of the architect, specifying engineer, contractor and/or owner who jointly have control over the application, installation, location, operating and maintenance conditions.

The Ajax Boiler Inc. warranty excludes extended liabilities. Extended liability typically occurs when products are installed without proper drainage, flooding containment or when safety devices are not tested and repaired or replaced when needed.

Product problems are often caused by the condition of the water, the lack of water treatment and/or the improper treatment of the water, insufficient combustion air, improper draft conditions, bolts not re-tightened, pipes not flushed and cleaned of oil, metal chips, rags, vibration and pulsation etc. These are installation, operating and/or maintenance conditions that are beyond the seller's responsibility and are not covered by the factory warranty, but may be covered by the installer's warranty.

The factory warranty covering company products is based upon extensive product development and testing. Combustion products under go certification testing and approvals to Underwriters Laboratory (UL) standards. Auditing of the production of combustion products is conducted by a nationally recognized testing laboratory.

Pressure vessel products are designed and manufactured to American Society of Mechanical Engineering (ASME) and National Board (NB) Design standards. Design reviews, factory product manufacturing quality inspections and testing are carried out by a third party National Board authorized inspection agency.

Ajax Boiler Inc. products have proven themselves in service for over 85 years which indicates that the company products perform exceedingly well when normal installation, operating and maintenance conditions exist.

The following is a review from the terms and conditions of sale. Also included in paragraph two, below, is the Ajax Boiler Inc. non-conformance policy.

1. Ajax Boiler Inc. warrants its products against defective material and/or workmanship only. The warranty does not apply to operational failures, electrical failures, gasket leaks, and/or other malfunctions caused by improper application, installation and/or maintenance.
2. It is the buyer's responsibility to inspect and accept the product, when received, as conforming to their purchase order, specifications and approved drawings. All claims for non-conformance, errors, shortages, etc. must be made within 10 days after receipt of the shipment.
3. Ajax Boiler Inc. do not provide a warranty or guarantee, express or implied, in any manner, form, usage of trade, merchantability or fitness which extend beyond the product description and quotation.
4. Ajax Boiler Inc. liability is limited to the factory repair or replacement of warranty failures, or non-conformance, upon the return of the product to the factory.
5. Ajax Boiler Inc. is not liable for any direct or consequential damages.
6. The Ajax Boiler Inc. warranty is based upon section 23161(2) of the uniform commercial code and is printed in the terms and conditions of sale which is referenced in every quotation, on the back of sales order acknowledgements and invoices. It is legally correct and is an industry standard policy.

AJAX BOILER INC. - ACE BOILER INC.

WARRANTY

LIMITED THERMAL SHOCK

In addition to our standard one (1) year warranty against defective parts and workmanship, Ajax Boiler Inc. provides the following guarantee with all commercial hot water, forced circulation, space heating boilers:

Ajax Boiler Inc. guarantees this new boiler pressure vessel for twenty (20) years after date of installation from damage due to thermal shock. Thermal shock occurs when cold makeup water, up to 150°F less than the boiler water outlet temperature, is added directly into the boiler while the boiler is operating within the normal temperature range from 140°F to 250°F with a temperature rise from 20°F to 40°F. This guarantee shall cover damage to the boiler tubes, tube headers, and tube sheets when such damage is attributed to unequal expansion, poor circulation and/or other causes quite often described as "thermal shock". This guarantee does not cover damage or failures that can be attributed to corrosion, condensation, scale, boiler treatment chemicals, dirt accumulation, low water conditions, or any other abnormal operating conditions.

The liability of Ajax Boiler Inc. is limited solely to the replacement of the complete pressure vessel, with tubes, if found by our inspection to be damaged by thermal shock. In no event shall Ajax Boiler Inc. be held liable for replacement labor charges or for freight or handling charges.



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**AJAX BOILER INC. - ACE BOILER INC.
LIMITED**

WARRANTY

Ajax Boiler Inc. provides a limited warranty on its products against **defective material and/or workmanship only**. This limited warranty is not applicable to operational failures, electrical failures, gasket leaks, wear or malfunctions caused by improper application, installation, and/or maintenance.

Product Period - The following Limited Warranty period are from date of shipment:

Boiler Pressure Vessels: One year.

Carbon Steel Tank and Heat Exchanger Pressure Vessels: One year.

Stainless Steel Tanks: Three years.

Boiler Copper Fin Coils: Three years.

Single-wall or Double-wall Tank/Exchanger Coils: One year.

Single-wall or Double-wall Mini-Packs™: One year.

Atlas Series Condensing Boiler: One year.

Linings: (Pro-rated Warranty)

In Section VIII Tanks: Glass 30" dia. and above (Five years).

Glass 24" dia. and under (One year).

Cement (Five years).

Pre-Krete (Ten years).

In Section IV Tanks: Glass (One year).

Controls: Components manufactured by other than Ajax Boiler Inc. such as controls, instruments, forced draft burner, etc., provided with the boilers and packaged products are not covered by the Ajax Boiler Inc. Warranty. However, Ajax Boiler Inc. extends to the customer the same warranty provided by the manufacturer to Ajax Boiler Inc. The customer shall receive the full benefits of adjustments made to Ajax Boiler Inc. by the manufacturer.

Any claim for adjustment under this limited warranty must be made within the warranty period. Ajax Boiler Inc.'s liability shall be limited to factory repair or, at Ajax Boiler Inc.'s option, replacement of all parts which, upon test and examination by Ajax Boiler Inc., prove to be defective material and/or workmanship and within the above limited warranty. If required by Ajax Boiler Inc., parts which are claimed to be defective must be promptly delivered to the Ajax Boiler Inc. facility, transportation charges prepaid. This warranty does not cover the cost of labor, removal, or installation of the warranted item during the limited period.

This warranty is limited to the above and applies only for the period set forth. Ajax Boiler Inc. will not be liable for any loss damage, direct, incidental or consequential damages of any kind, whether based upon warranty, contract, negligence or strict liability and arising in connection with the sale, use or repair of the products. Ajax Boiler Inc.'s maximum liability shall exceed the contract price for the product's merchantability or fitness for any particular purpose and in no event shall be held responsible for any consequential damages.

For complete Limited Warranty conditions see Section G and H under terms and condition of sale.

Ajax Boiler Inc., also doing business as Ace Boiler Inc., is referred to herein as Ajax Boiler Inc.



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