INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

X-2™ Series

Cast Iron Gas - Fired Boiler

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ETL LISTED US
Intertek
9700609

For service or repairs to boiler, call your heating contractor. When seeking information on boiler, provide Boiler Model Number and Serial Number as shown on Rating Label.

Boiler Model Number	Boiler Serial Number	Installation Date
X-20		
Heating Contractor		Phone Number
Address		

U.S. Boiler Company

106636-01 - 10/15

Price - $5.00

The City of New York requires a Licensed Master Plumber supervise the installation of this product.

The Massachusetts Board of Plumbers and Gas Fitters has approved the X-2™ Series Boiler. See the Massachusetts Board of Plumbers and Gas Fitters website, **http://license.reg.state.ma.us/pubLic/pl_products/pb_pre_form.asp** for the latest Approval Code or ask your local Sales Representative.

The Commonwealth of Massachusetts requires this product to be installed by a licensed Plumber or Gas fitter.

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

Table of Contents

Table 1A: Dimensions and Connections

Boiler Model	Depth	Width	Height	Supply NPT (inch)	Return NPT (inch)	Vent (inch)	Gas NPT (inch)	Relief Valve NPT (inch)	Drain NPT (inch)
X-203	32	14	40	1¼	1¼	4	½	¾	¾
X-204	32	16	40	1¼	1¼	5	½	¾	¾
X-205	32	19	40	1¼	1¼	6	½	¾	¾
X-206	32	22	40	1¼	1¼	6	½	¾	¾
X-207	32	25	40	1¼	1¼	7	¾	¾	¾
X-208	32	28	40	1¼	1¼	7	¾	¾	¾
X-209	32	31	40	1¼	1¼	8	¾	¾	¾

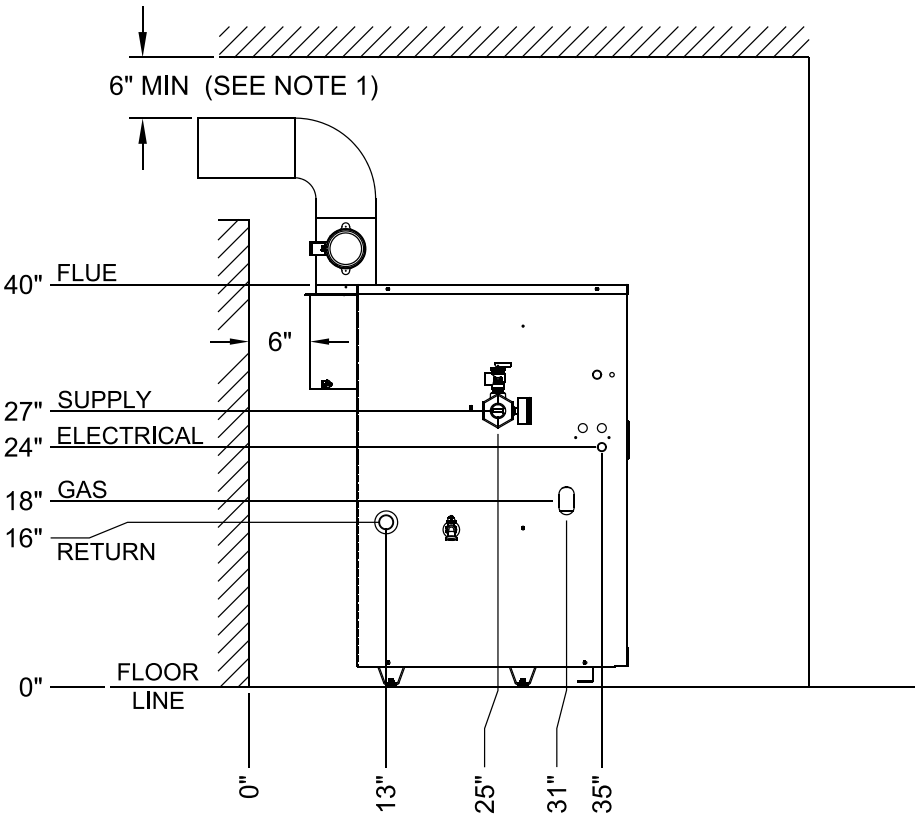
Table 1B: Weights and Volume

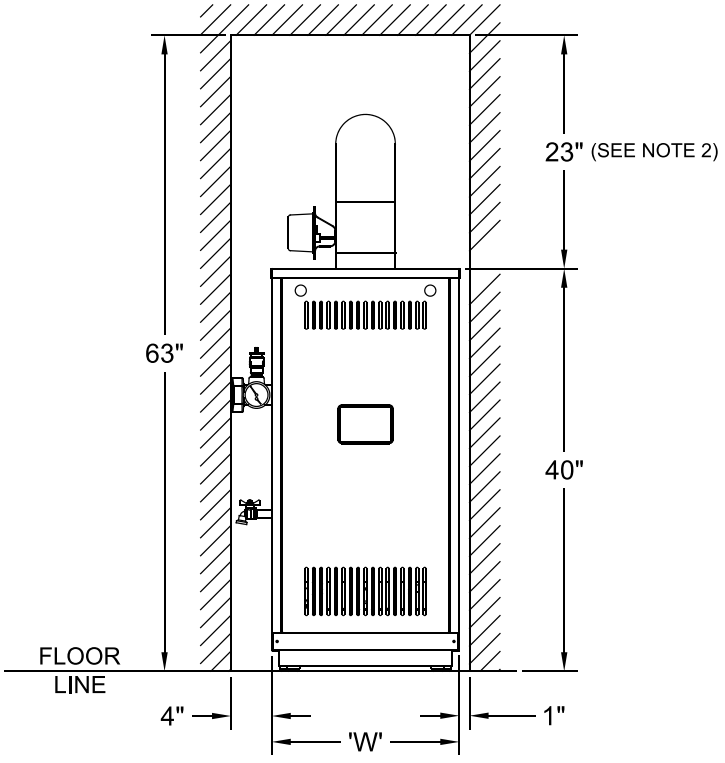
Boiler Model	Input (MBH) [1]	Shipping Weight (lbs)	Empty Weight (lbs)	Water Content (gal)
X-203	70	254	180	2
X-204	105	304	231	3
X-205	140	357	284	4
X-206	175	405	332	5
X-207	210	462	382	6
X-208	245	518	438	7
X-209	280	564	484	8

[1] Input ratings can be used for elevations up to 2000 ft. Refer to System Start-up and Checkout Sections for elevations 2000 ft. or higher.

Electrical Requirements: 120VAC, 60 Hz, 1-ph, Less than 12A

Maximum Allowable Working Pressure - 50 psi. Boiler shipped from factory with a 30 psi relief valve.





MODEL	'W'
X-203	14"
X-204	16"
X-205	19"
X-206	22"
X-207	25"
X-208	28"
X-209	31"

NOTES:
1. MINIMAL RADIAL DISTANCE AROUND VENT PIPE AND BREECHING FOR SINGLE-WALL METAL PIPE VENT CONNECTOR. OTHERWISE, FOLLOW VENT CONNECTOR MANUFACTURER'S RECOMMENDED CLEARANCES.
2. ADD HEIGHT REQUIRED TO MAINTAIN 6" CLEARANCE FROM ALL BREECHING COMPONENTS.

Figure 1: Minimum Clearance to Combustible Materials and Alcove Dimensions

I. Pre-Installation

WARNING

Carefully read all instructions before installing boiler. Failure to follow all instructions in proper order can cause personal injury or death.

A. **Inspect shipment** carefully for any signs of damage. All equipment is carefully manufactured, inspected and packed. Our responsibility ceases upon delivery of boiler to carrier in good condition. Any claim for damage or shortage in shipment must be filed immediately against carrier by consignee. No claims for variances or shortages will be allowed by Boiler Manufacturer, unless presented within sixty (60) days after receipt of equipment.

B. **Installation must conform** to the requirements of the authority having jurisdiction. In the absence of such requirements, installation must conform to *National Fuel Gas Code*, ANSI Z223.1/NFPA 54.

C. **Appliance is design certified for installation on combustible flooring**. The boiler must not be installed on carpeting.

D. **Provide clearance between boiler jacket and combustible material** in accordance with local fire ordinance. Refer to Figure 1 for minimum clearance from combustible material for alcove installation. Provide 1/2" clearance from water piping to combustible materials.

E. **Provide practical service clearances.** A minimum of 24" from the left side and front jacket panels is recommended for servicing but may be reduced to minimums shown in Figure 1.

F. **Install on level floor.** For basement installation provide concrete base if floor is not level or if water may be encountered on floor around boiler.

CAUTION

ASSURE THAT THE FRONT AIR DAM is in place and undamaged. A damaged front air dam will negatively affect the performance of this boiler, which can cause serious property damage, personal injury or death.

G. **Protect gas ignition system components** from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, condensate trap, control replacement, etc.).

H. **Provide combustion and ventilation air** in accordance with the section "Air for Combustion and Ventilation," of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54, or applicable provisions of local building codes.

WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion.

I. **Do not install boiler where gasoline** or other flammable vapors or liquids, or sources of hydrocarbons (i.e. bleaches, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) are used or stored.

II. Unpack Boiler

CAUTION

Do not drop boiler. Do not bump boiler jacket against floor.

A. Move boiler to approximate installed position.

B. Remove all crate fasteners.

C. Lift outside container and remove with all other inside protective spacers and bracing. Save two of the wooden slats from the container sleeve for use in Steps E and F.

D. Remove all boiler hold-down fasteners.

E. Tilt the boiler to one side and slide a wooden slat under the two raised feet.

F. Tilt the boiler to the other side and slide another wooden slat under the two raised feet.

G. Slide the boiler forward or backward off the skid using the two wooden slats as runners.

H. Move boiler to its permanent location.

III. Water Piping and Trim

WARNING

Failure to properly pipe boiler may result in improper operation and damage to boiler or building.

A. Design and install boiler and system piping to prevent oxygen contamination of boiler water.

Oxygen contamination sources are system leaks requiring addition of makeup water, fittings, and oxygen permeable materials in distribution system. Eliminate oxygen contamination by repairing system leaks, repairing fittings, and using non-permeable materials in distribution system.

B. Install circulator with flanges, gaskets and bolts provided.

C. Install Safety Relief Valve. See Figure 2. Safety Relief Valve must be installed with spindle in vertical position.

WARNING

Safety relief valve discharge piping must be piped near floor to eliminate potential of severe burns. Do not pipe in any area where freezing could occur. Do not install any shut-off valves.

D. Connect system supply and return piping to boiler. Refer to Figures 2, 4 and 5. Also consult Residential Hydronic Heating Installation and Design I=B=R Guide. Maintain minimum ½ inch clearance from hot water piping to combustible materials.

E. If boiler is used in connection with refrigeration systems, boiler must be installed with chilled medium piped in parallel with the heating boiler using appropriate valves to prevent chilled medium from entering boiler. See Figure 3. Also consult Residential Hydronic Heating Installation and Design I=B=R Guide.

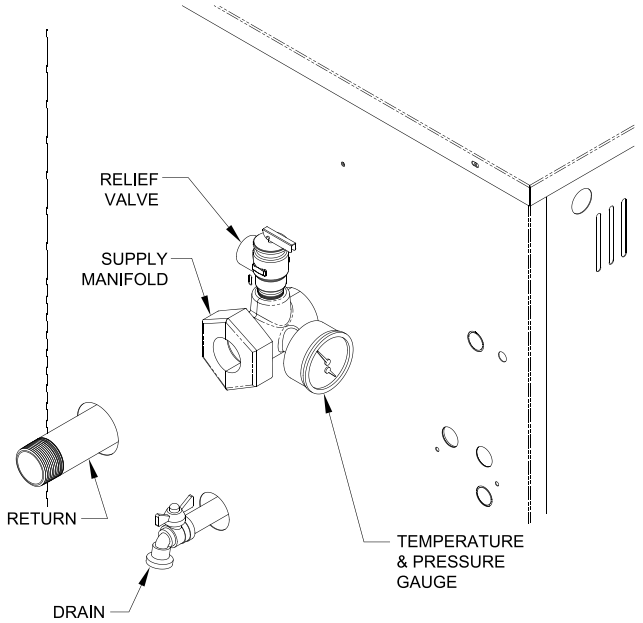


Figure 2: Near Boiler Piping

F. If boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air, boiler piping must be equipped with flow control valves or other automatic means to prevent gravity circulation of boiler water during operation of cooling system.

G. Use a boiler bypass if the boiler is to be operated in a system which has a large volume or excessive radiation where low boiler water temperatures may be encountered (i.e. converted gravity circulation system, etc.).

Remove circulator and install pipe tee between circulator and boiler return along with second tee in supply piping as shown in Figures 4 and 5. Bypass should be same size as the supply and return lines with valves located in bypass and supply outlet as illustrated in Figures 4 and 5 in order to regulate water flow to maintain higher boiler water temperatures.

Set by-pass and boiler supply valves to half throttle position to start. Operate boiler until system water temperature reaches normal operating range.

Adjust valves to provide 180° to 200°F supply water temperature. Opening the boiler supply valve will raise system temperature, while opening by-pass valve will lower system supply temperature.

H. If it is required to perform a long term pressure test of the hydronic system, the boiler should first be isolated to avoid a pressure loss due to the escape of air trapped in the boiler.

To perform a long term pressure test including the boiler, ALL trapped air must first be removed from the boiler.

A loss of pressure during such a test, with no visible water leakage, is an indication that the boiler contained trapped air.

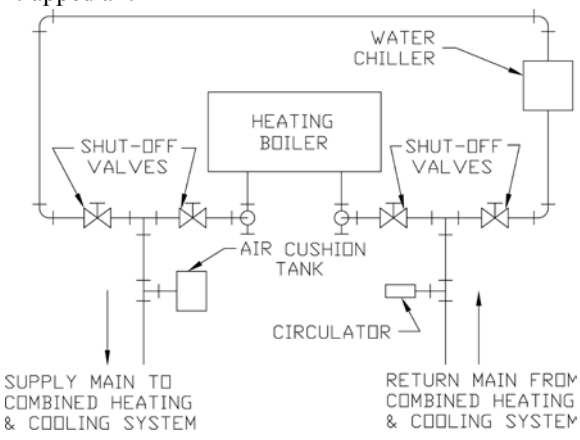


Figure 3: Recommended Piping for Combination Heating & Cooling (Refrigeration) Systems

III. Water Piping and Trim (continued)

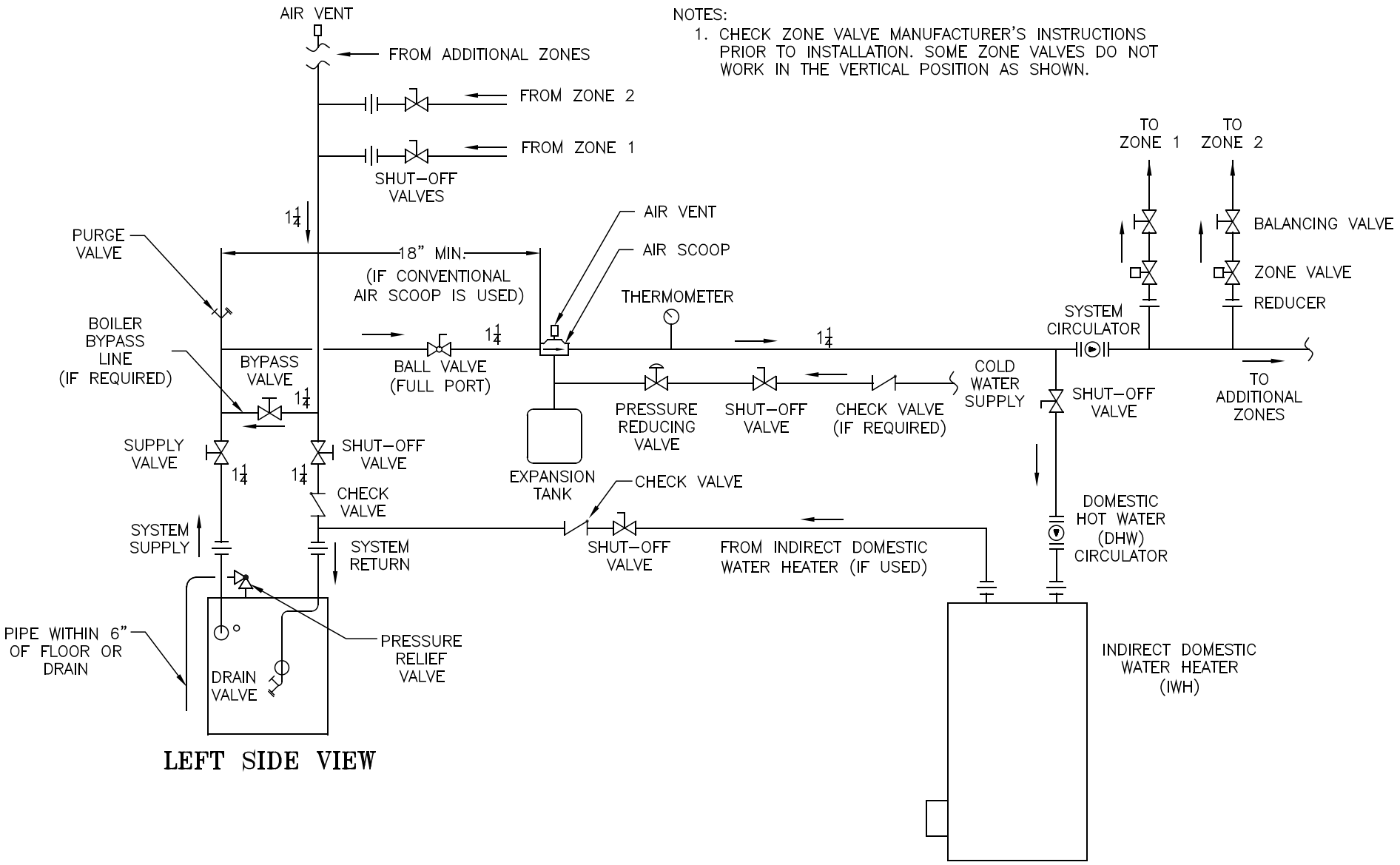


Figure 4: Recommended Water Piping for Zone Valve Zoned Heating Systems

III. Water Piping and Trim (continued)

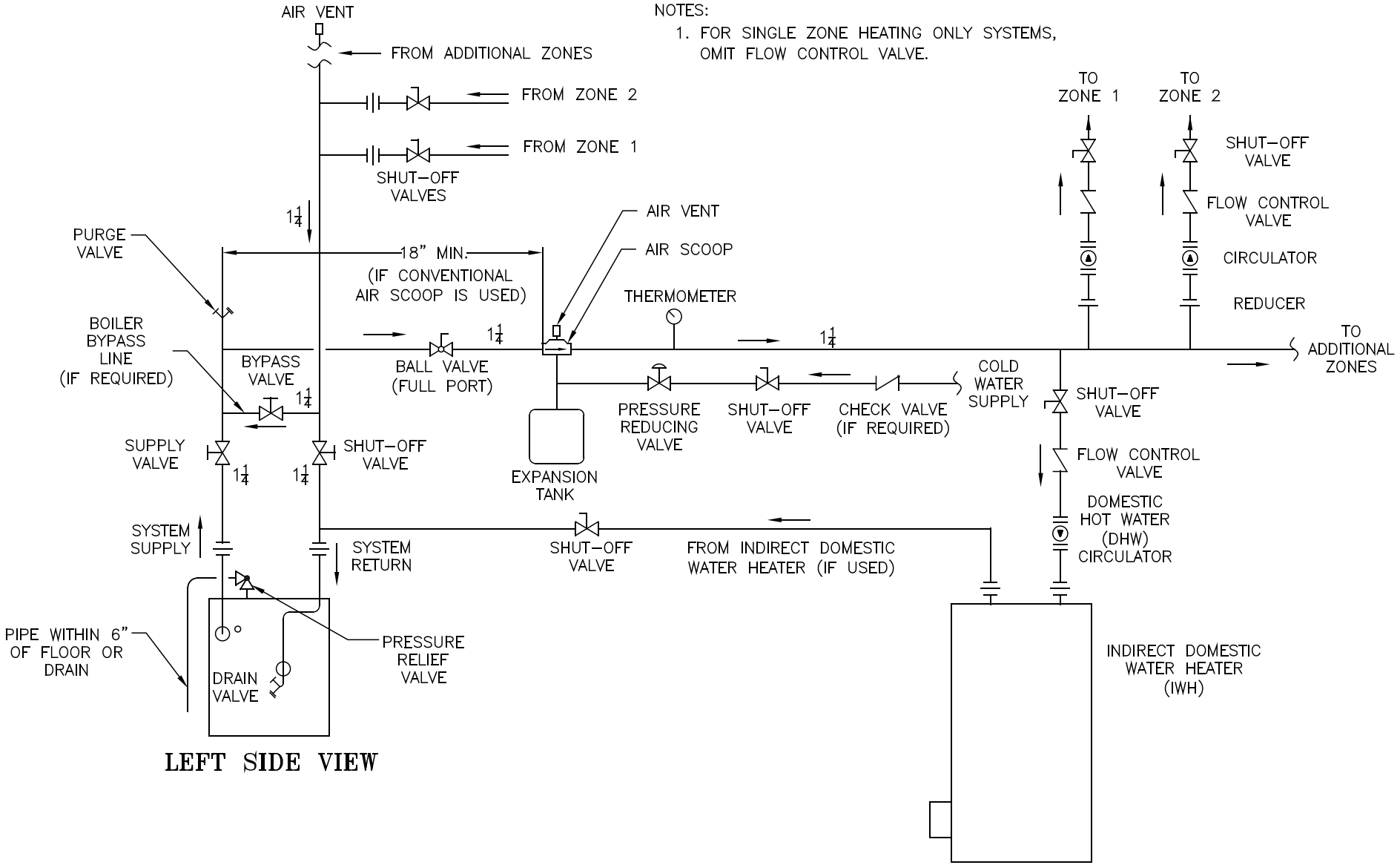


Figure 5: Recommended Water Piping for Circulator Zoned Heating Systems

IV. Venting

A. Install Vent Damper

OPEN THE VENT DAMPER CARTON and remove the Installation Instructions. READ THE INSTALLATION INSTRUCTIONS THOROUGHLY before proceeding.

The automatic gas control valve supplied on each X-2 Series boiler provides the redundancy referenced in the vent damper Installation Instructions.

CAUTION

Do not use one vent damper to control two heating appliances.

1. The vent damper must be the same size as the outlet of the Draft Hood supplied with the boiler (see Table 1A). Unpack the damper carefully - DO NOT FORCE IT CLOSED! Forcing the damper may damage the gear train and void the warranty.
2. Mount the vent damper assembly onto the canopy/ diverter. (Refer to Figure 6 and to instructions packed with the vent damper for specific instructions). Do not modify either the draft hood or vent damper.

NOTICE

Provide adequate clearance for servicing.

3. Locate vent damper position indicating means to be visible following installation.

WARNING

Provide 6" minimum clearance between damper and combustible construction.

4. Plug the factory harness vent damper connector into damper motor polarized receptacle.

DANGER

Inspect existing chimney before installing boiler. Failure to clean or replace perforated pipe or tile lining will cause severe injury or death.

B. Inspect chimney and remove any obstructions or restrictions. Clean chimney if previously used for solid or liquid fuel-burning appliances or fireplaces.

C. Install vent system in accordance with "Venting of Equipment" of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54, or applicable provisions of local building codes. The X-2 Series boiler is a Category I, draft hood equipped appliance.

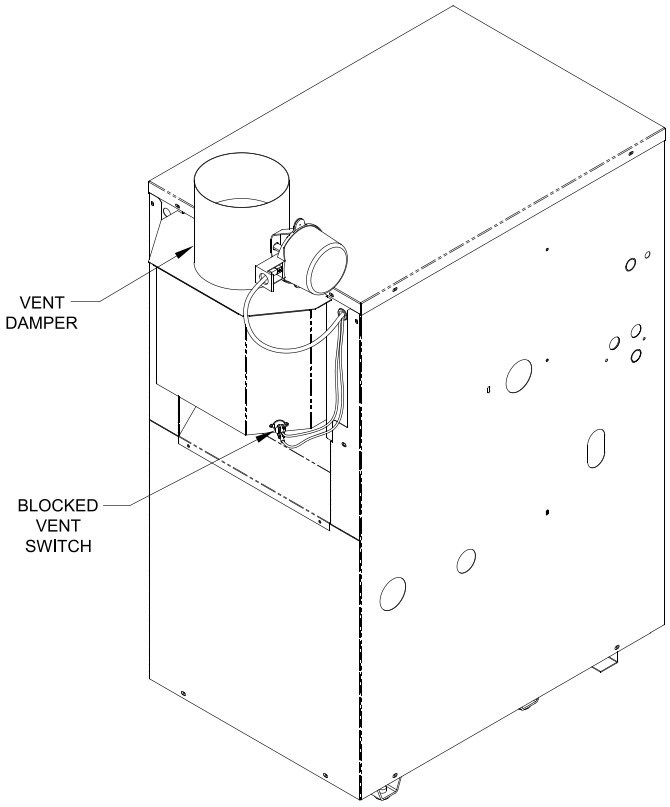


Figure 6: Vent Damper Installation

WARNING

D. If an Existing Boiler is Removed:

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

a. Seal any unused openings in the common venting system.
b. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
c. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the

building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

d. Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.

e. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.

f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.

g. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Chapter 13 of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54.

V. Gas Piping

A. Size gas piping. Design system to provide adequate gas supply to boiler. Consider these factors:

1. Allowable pressure drop from point of delivery to boiler. Maximum allowable system pressure is ½ psig. Actual point of delivery pressure may be less; contact gas supplier for additional information. Minimum gas valve inlet pressure is listed on rating label.
2. Maximum gas demand. Consider existing and expected future gas utilization equipment (i.e. water heater, cooking equipment).

B. Connect boiler gas valve to gas supply system.

1. Use methods and materials in accordance with local plumbing codes and requirements of gas supplier. In absence of such requirements, follow *National Fuel Gas Code*, ANSI Z223.1/NFPA 54.
2. Use thread (joint) compounds (pipe dope) resistant to action of liquefied petroleum gas.
3. Install sediment trap, ground-joint union and manual shut-off valve upstream of boiler gas control valve. See Figure 7.
4. All above ground gas piping upstream from manual shut-off valve must be electrically continuous and bonded to a grounding electrode. Do not use gas piping as grounding electrode. Refer to *National Electrical Code*, ANSI/NFPA 70.

C. Pressure test. The boiler and its gas connection must be leak tested before placing boiler in operation.

1. Protect boiler gas control valve. For all testing over ½ psig, boiler and its individual shutoff valve must be disconnected from gas supply piping. For testing at ½ psig or less, isolate boiler from gas supply piping by closing boiler's individual manual shutoff valve.
2. Locate leaks using approved combustible gas detector, soap and water, or similar nonflammable solution. Do not use matches, candles, open flames, or other ignition source.

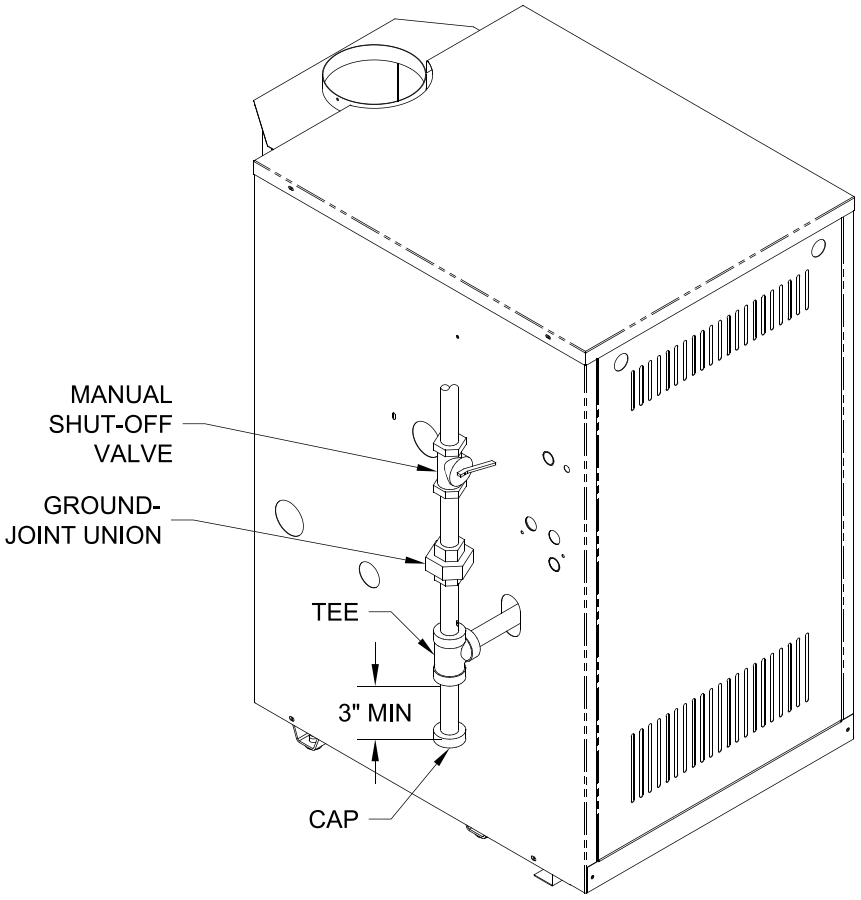


Figure 7: Pilot and Gas Piping

VI. Electrical

A. **General.** Install wiring and electrically bond boiler to ground in accordance with requirements of authority having jurisdiction, or in absence of such requirements, with the *National Electrical Code*, ANSI/NFPA 70.

B. **Install thermostat.** Locate on inside wall approximately 4 feet above floor. Do not install on outside wall, near fireplace, or where influenced by drafts or restricted air flow, hot or cold water pipes, lighting fixtures, television, or sunlight. Allow free air movement by avoiding placement of furniture near thermostat.

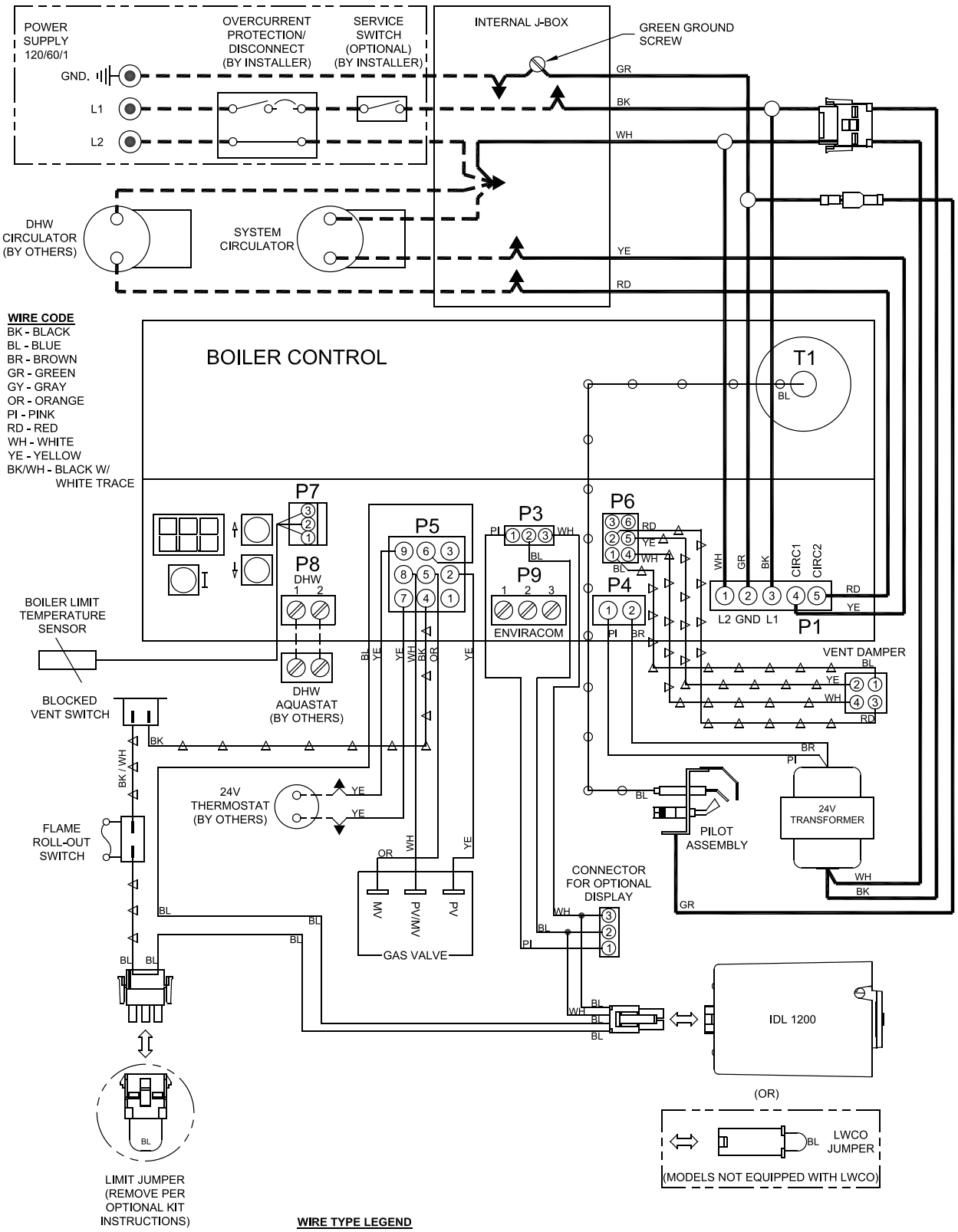
C. **Wire boiler.** Boiler is rated for 120 VAC, 60 hertz, less than 12 amperes. A separate electrical circuit must be run from the main electrical service with an over-current device/disconnect in the circuit. A service switch is recommended and may be required by some local jurisdictions. Connect to black and white wires and green ground screw. See Figures 8 and 9.

D. **For installations using zone valves** provide separate transformer for zone valve wiring. Consult zone valve manufacturer for assistance. See Figure 10.

CAUTION

This boiler contains controls which may cause the boiler to shut down and not restart without service. If damage due to frozen pipes is a possibility, the heating system should not be left unattended in cold weather; or appropriate safeguards and alarms should be installed on the heating system to prevent damage if the boiler is inoperative.

VI. Electrical (continued)



WIRE TYPE LEGEND

- LOW VOLTAGE FACTORY WIRING SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE, 105°C
- LOW VOLTAGE FIELD WIRING
- LINE VOLTAGE FACTORY WIRING SIZE 14 AWG TYPE TW OR TEW/AWM WIRE
- LINE VOLTAGE FIELD WIRING
- IGNITOR - 250°C
- LOW VOLTAGE FACTORY WIRING SIZE 18 AWG TYPE CL2(X) OR CL3R STRANDED WIRE, 75 TO 105°C

NOTES:
1. IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH THE SAME TYPE SHOWN OR ITS EQUIVALENT.

Figure 8: Wiring Connection Diagram

VI. Electrical (continued)

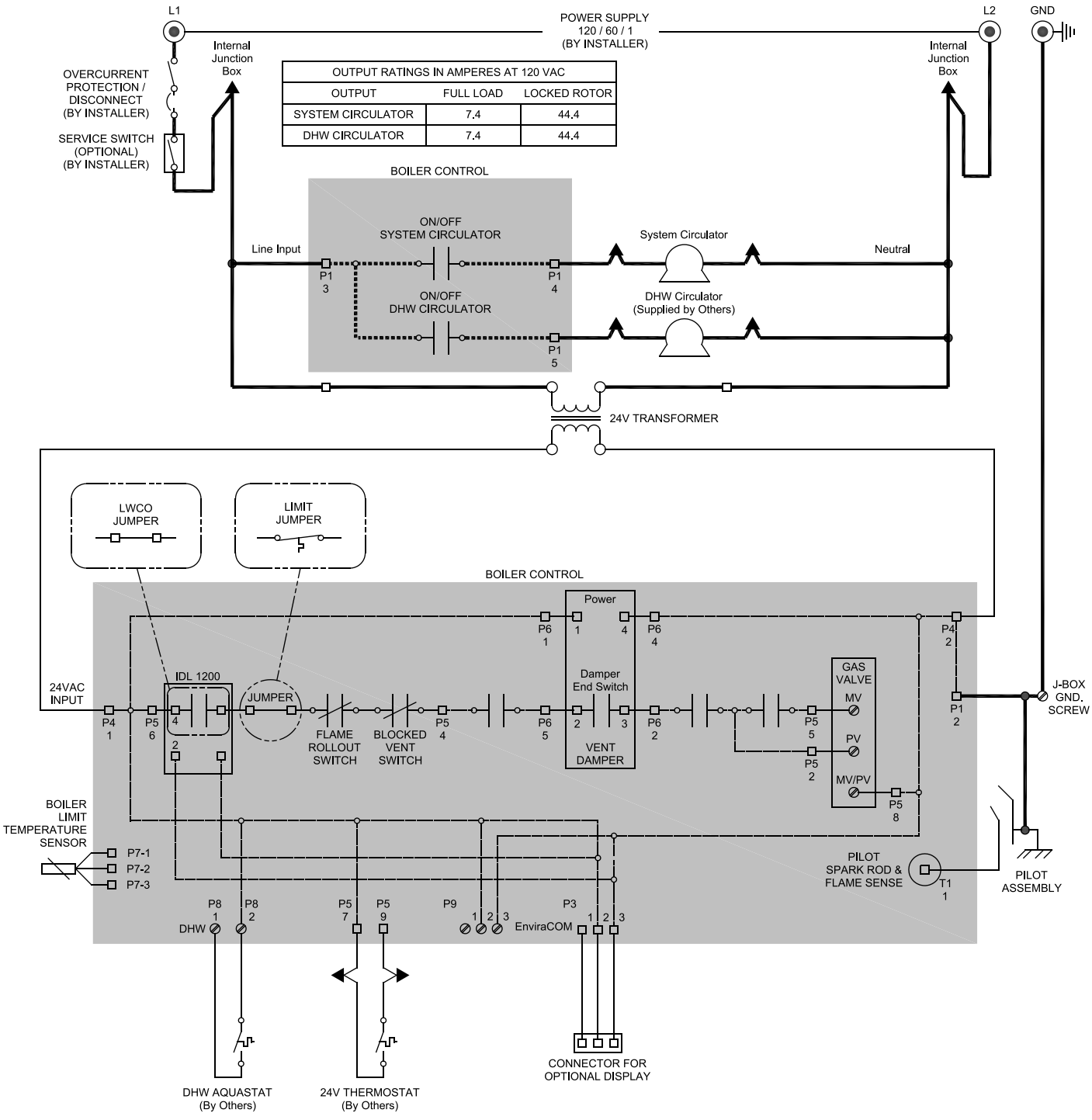


Figure 9: Schematic Ladder Diagram

VI. Electrical (continued)

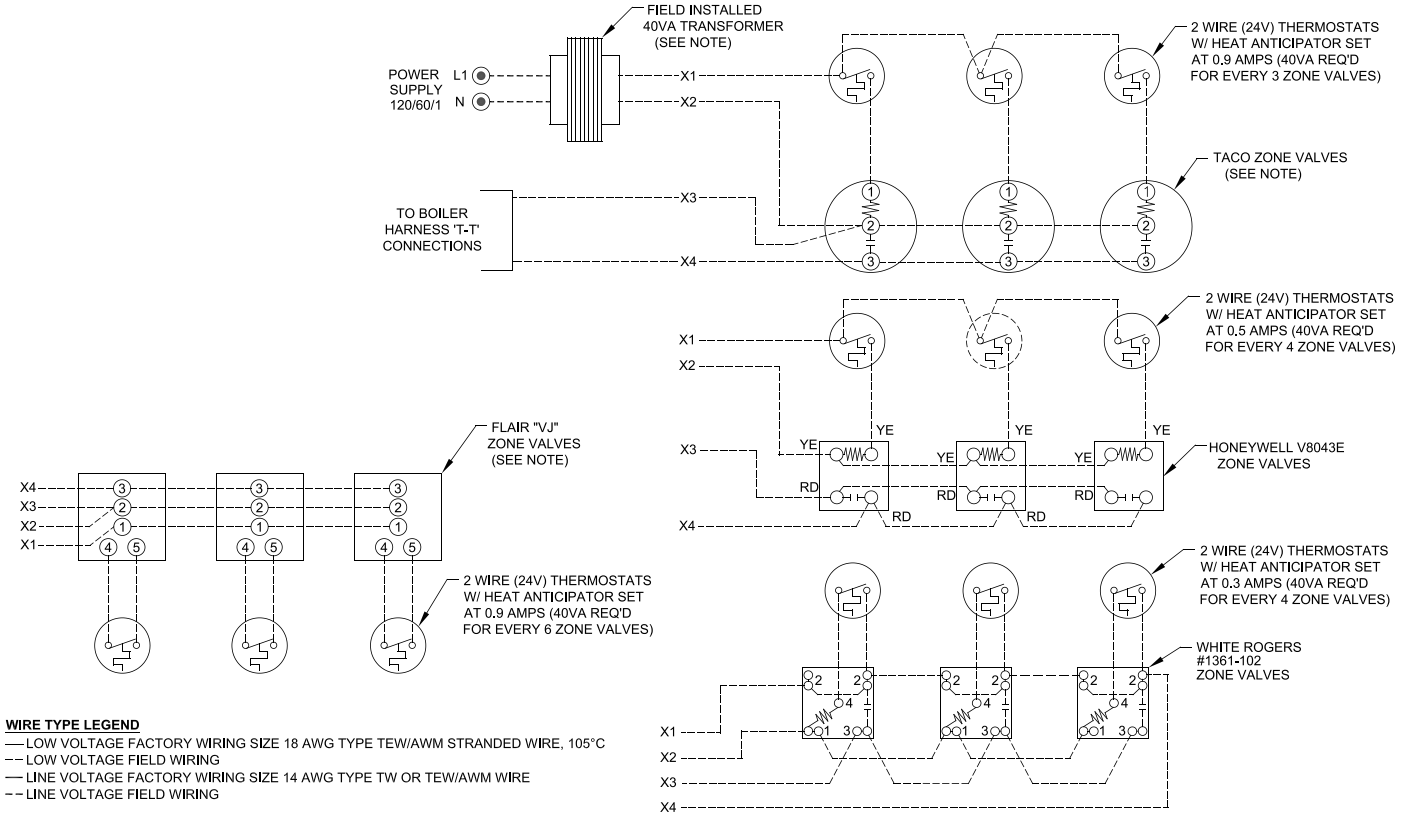


Figure 10: Wiring Schematic, Zone Valves

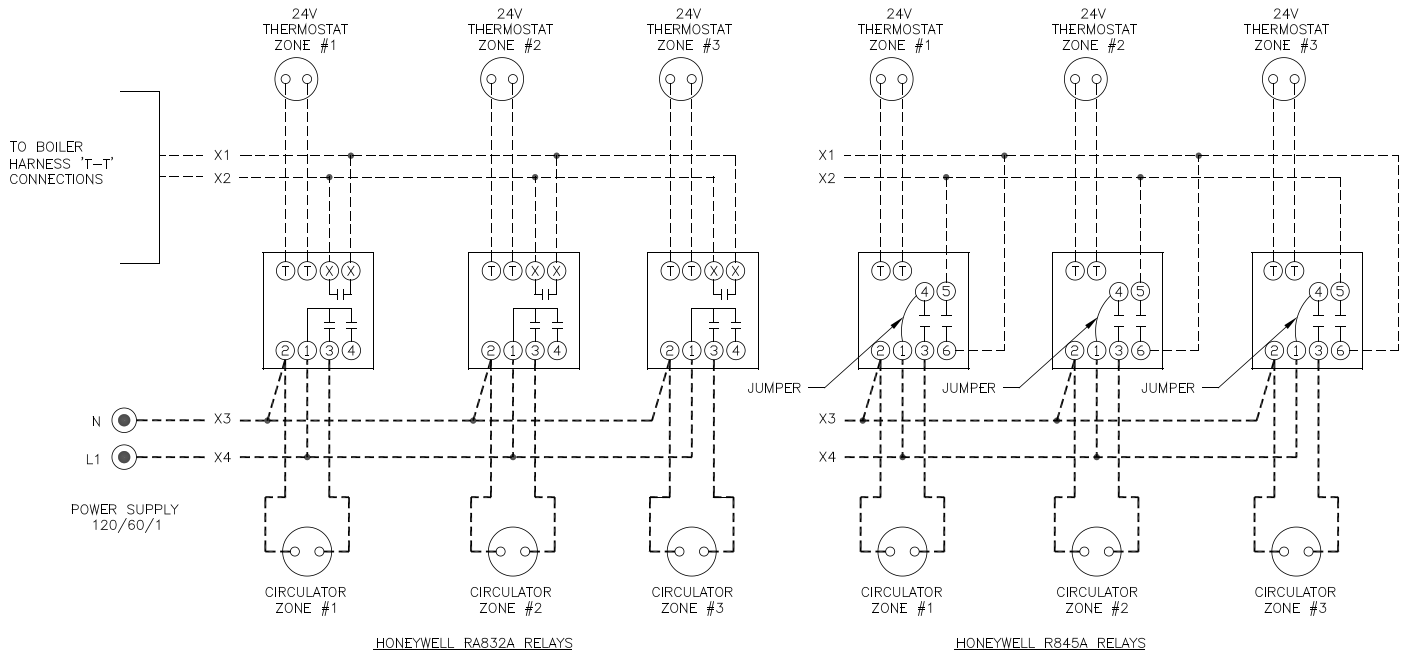


Figure 11: Wiring Schematic, Zone Circulators

VII. System Start-up and Checkout

A. Main Burner Check - Check main burners to see that they were not dislodged during shipment. Rear of burners should be in the vertical slots in the rear of burner tray and the front of the burners should be seated completely on the orifices.

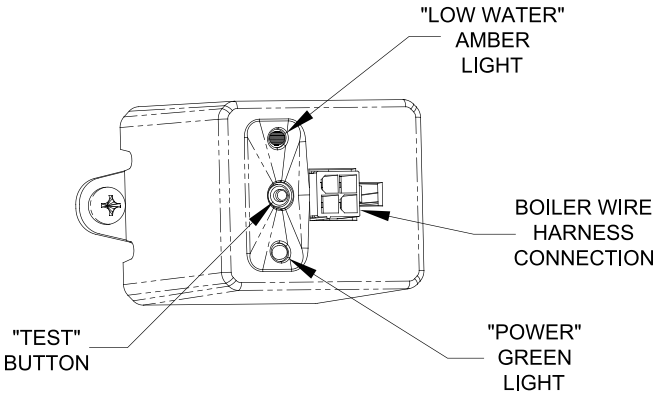


Figure 12: IDL 1200 Low Water Cut-Off

B. Initial start -

For models equipped with IDL 1200 LWCO follow these steps:

1. Before filling the boiler with water, turn on power to the boiler and set the thermostat to call for heat. Both the green "POWER" LED and amber "LOW WATER" LED should illuminate (see Figure 12). The burner should not fire. **WARNING**: If the burner fires with no water at the probe, immediately shut down power to the boiler and contact the factory for assistance.
2. Proceed to fill the boiler with water. When water reaches the IDL 1200 Sensor, the "LOW WATER" LED will turn off and the burner will fire.
3. Turn off the power to the boiler and finish filling the system.
4. Before leaving the job, set the thermostat to call for heat and push the "TEST" button on the Model IDL 1200 to simulate a low water condition. The amber "LOW WATER" LED will illuminate and the burner will shut down.
5. Release the "TEST" button and the burner will light off.

For models equipped with zone valves follow the these steps.

1. **Fill entire heating system with water** and vent air from system.
   a. Close isolation valve in boiler supply piping.
   b. Isolate all circuits by closing zone valves or balancing valves.
   c. Attach a hose to hose bib located just below isolation valve in boiler supply piping. (Note - Terminate hose in five gallon bucket, at a suitable floor drain, or outdoor area).

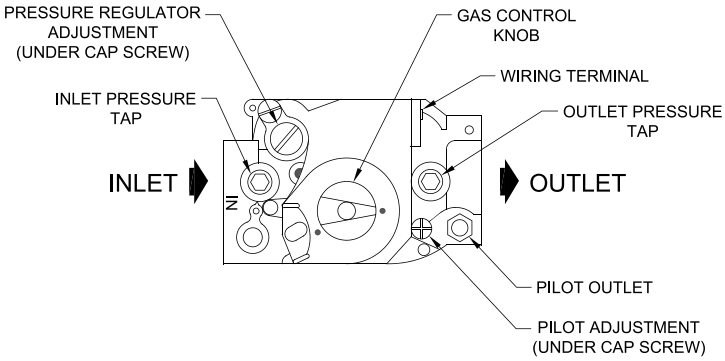


Figure 13: Top View of Honeywell Gas Valves

   d. Starting with one circuit, open zone valve.
   e. Open hose bib.
   f. Open fill valve (Make-up water line should be located directly above isolation valve in boiler supply piping).
   g. Allow water to overflow from bucket until discharge from hose is bubble free for 30 seconds.
   h. Open zone valve to the second zone to be purged, then close the first. Repeat this step until all zones have been purged, but always have one zone open. At completion, open all zone valves.
   i. Close hose bib, continue filling the system until the pressure gauge reads 12 psi. Close fill valve. (Note - If make-up water line is equipped with pressure reducing valve, system will automatically fill to 12 psi. Leave globe valve open).
   j. Open isolation valve in boiler supply piping.
   k. Remove hose from hose bib.
2. Turn ROOM THERMOSTAT to lowest setting.
3. Be sure that gas to pilot and main burners has been off for at least five minutes and vent damper has been in the open position.
4. Turn "OFF" the electric switch serving boiler.
5. Open valve on main gas line at meter.
6. PURGE AIR FROM GAS PIPING. **Adequate ventilation must be provided and no smoking or open flame permitted.**
7. Turn "ON" electric switch serving boiler.
8. Open Manual Shut-off Valve upstream of Combination Gas Valve.
9. Loosen or remove Inlet Pressure Tap Plug in Combination Gas Valve and when purging is complete, tighten or replace plug. (See Figure 13).
10. Check pipe and fittings from meter to Combination Gas Valve using soap solution or other approved methods.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

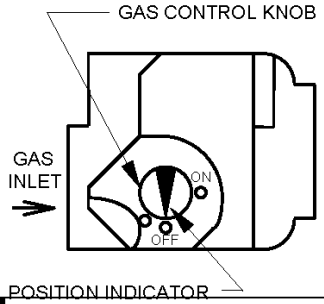
WHAT TO DO IF YOU SMELL GAS
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
5. Remove front door.
6. Locate the gas control valve at the end of the gas supply pipe going into the boiler. The gas control knob is the brown or blue plastic knob located on top of the gas control valve.



7. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
8. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you do not smell gas, go to the next step.
9. Rotate gas control knob counterclockwise from "OFF" to "ON". Make sure knob rest against stop. Do not force.
10. Replace front door.
11. Turn on all electric power to the appliance.
12. Set thermostat to desired setting.
13. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front door.
4. Rotate gas control knob clockwise from "ON" position to "OFF". Make sure knob rests against stop.
5. Replace front door.

Figure 14: Operating Instructions

CAUTION

11. Test gas piping and connections between Combination Gas Valve and manifold, orifices, and pilot piping for leaks after boiler is operating. Use soap solution or other approved method.

C. Check Gas Input to Boiler

1. Input Rate and Maximum Inlet Pressure shown on Rating Label must not be exceeded. Inlet pressure must not be lower than minimum inlet pressure shown on Rating Label.
2. Input ratings shown on boiler rating label can be used for elevations up to 2000 ft. For elevations 2000 ft or higher, reduce input rate 4 percent per 1000 ft above sea level. Do not install at elevations above 12,000 ft. See Table below.

Boiler Model	Input [Mbh]			
	Rating Label	5000 ft. (1525 m)	7,000 ft. (2130 m)	10,000 ft. (3050 m)
X-203	70.0	56.0	49.0	42.0
X-204	105.0	84.0	73.5	63.0
X-205	140.0	112.0	98.0	84.0
X-206	175.0	140.0	122.5	105.0
X-207	210.0	168.0	147.0	126.0
X-208	245.0	196.0	171.5	147.0
X-209	280.0	224.0	196.0	168.0

3. All Rate checks and all adjustments are to be made while boiler is firing - all other appliances connected to the same meter as the boiler must be off.
4. With boiler off, water Manometer or water column gauge should be connected to a shut-off valve installed in the 1/8" outlet pressure tap in the gas valve (see Figure 13). By installing gas valve upstream of manometer, gas pressure can be introduced gradually - without shut-off valve; surge of pressure when boiler is turned on, could blow liquid out of manometer. Replace plug in gas valve when rate check is finished.
5. Lp Gas Input:
   Adjust Regulator on Gas Valve so that manifold pressure is 10 inches water column. Turning Regulator Adjusting Screw Clockwise increases pressure. Counterclockwise rotation decreases pressure.
6. Natural Gas Input:
   Adjust regulator on Gas Valve so that manifold pressure is 3½ inches water column. Turning Regulator Adjusting Screw Clockwise increases pressure. Counter-clockwise rotation decreases pressure.

D. Check Main Burner Flame.

See Figure 15. Flame should have a clearly defined inner cone with no yellow tipping. Orange-yellow streaks caused by dust should not be confused with true yellow tipping.

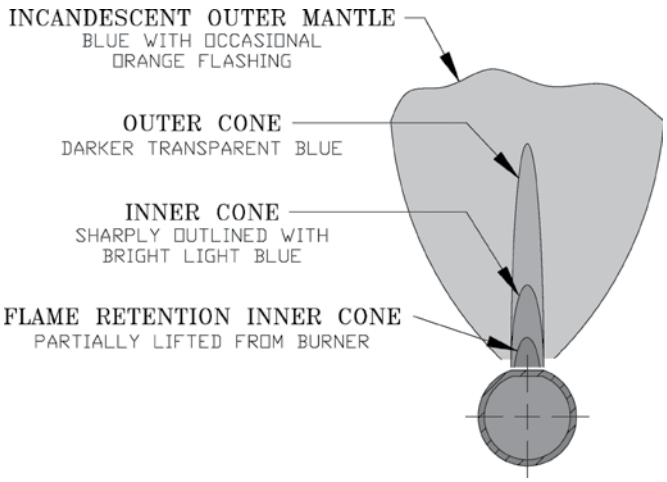


Figure 15: Main Burner Flame

CAUTION

Avoid operating this boiler in an environment where saw dust, loose insulation fibers, dry wall dust, etc. are present. If boiler is operated under these conditions, the burner interior and ports must be cleaned and inspected daily to insure proper operation.

E. Check Pilot Burner Flame.

1. See Figure 16. The pilot burner should be lit only if thermostat is calling for heat. The pilot burner produces three (3) flames. The center flame should be steady, medium hard blue enveloping 3/8 to 1/2 inch of sensing probe.

F. Check Ignition System Safety Shut-off Device.

Remove 3-wire plug from gas valve.
If burners do not shut down determine cause of malfunction. Replace necessary items and check operation.

G. Check Vent Damper Operation.

Vent Damper must be in open position when main burners are operating.

H. Check High Limit Control.

Jumper Thermostat connections in boiler wiring harness. Allow burners to operate until shutdown by limit. REMOVE JUMPER.

I. Check Thermostat Operation.

Raise and lower temperature setting to start and stop boiler operation. Adjust thermostat to normal setting.

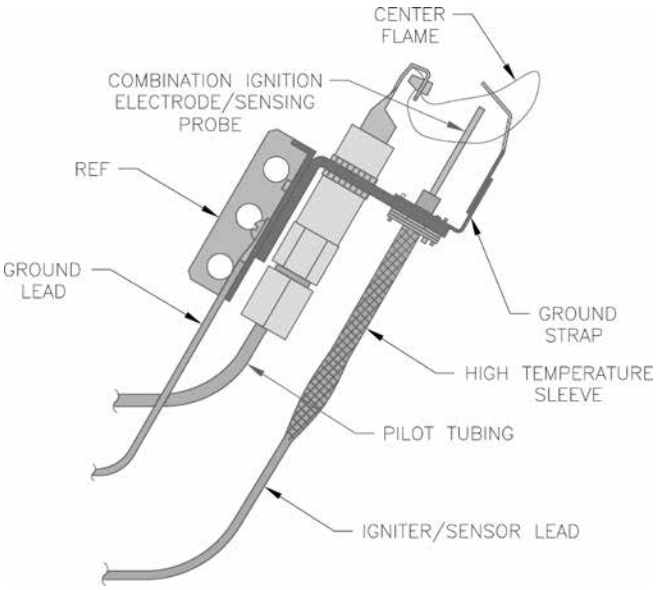


Figure 16: Pilot Burner Flame

J. Combustion Chamber Burn-off

1. The mineral wool combustion chamber panels may contain a cornstarch based binder that must be burned out at installation to prevent odors during subsequent boiler operation.
2. Ventilate the boiler room, set the high limit to its maximum setting, set the thermostat to call for heat. Allow the boiler to fire for at least an hour or until the odor from the cornstarch has dissipated.
3. Return the high limit and thermostat to their desired settings.

K. Review User's Information Manual and system operation with owner or operator.

L. Post instructions near boiler for reference by owner and service personnel.

VIII. Operation

A. BOILER SEQUENCE OF OPERATION

NORMAL OPERATION

1. The X-2 Series Boilers are equipped with an Intelligent Hydronic Control (control). This control replaces the traditional separate ignition control, high limit switch and circulator relay and adds energy saving thermal purge features. Energy is saved by starting the circulator and delaying the burner start when there is residual heat available in the boiler.
2. The boiler's sequence of operation is shown in Table 2.
3. When the thermostat calls for heat the control starts the system circulator and the thermal purge (circulator Pre-purge time) begins. If the time is completed or boiler temperature is less than the Start Temperature (140°F default) the start sequence continues by energizing the vent damper. Once the vent damper is fully open the ignition sequence is started allowing gas flow and ignition of the burners. Damper must be in open position when appliance main burners are operating.
4. If the thermostat is not satisfied and the operating setpoint is reached the system circulator will continue to operate and the burners will stop. When the boiler water temperature drops below the setpoint less the differential setting the burners will restart.
5. After the thermostat is satisfied the burners and circulator are stopped and vent damper is closed.
6. When an indirect water heater aquastat call for heat is wired to the DHW input, the control starts the Domestic Hot Water circulator and, if the boiler temperature is less than the operating setpoint less differential, the vent damper is energized without delay. Once the vent damper is fully open, the ignition sequence is started allowing gas flow and ignition of the burners.
7. **Models equipped with IDL 1200 LWCO:** The IDL 1200 Low Water Cut-Off is designed to protect from potentially damaging low water conditions in the boiler. In the event of a low water condition, the "LOW WATER" LED will turn on and the control will shutdown the burner.

WARNING

A low water condition is a serious and potentially dangerous condition. In the event the IDL 1200 detects a low water condition, the system must be inspected by a qualified service technician before the boiler is returned to service. *Do not attempt to add water to a hot boiler. Allow the boiler to fully cool before adding water.*

B. BOILER FAULT

In the event the boiler fails to start, the control provides status information to help determine the cause of the problem. Table 3 provides a list of boiler status codes that are reported. Refer to the Troubleshooting Section for more information.

Table 2: Sequence of Operation

Status Codes displayed in StA Mode		
Status	StA	Description
Standby (Burner off Circulator off)	1	No call for heat detected
Circulator Pre-purge (burner off circulator on)	1	Either condition is true: a. Call for heat detected and boiler temperature higher than operating setpoint. b. Call for heat detected and boiler temperature higher than Start Temperature (140°F default) and Circulator Pre-purge Time has not expired.
Self Test	17	Control internal checking
Drive Damper Open	18	The damper is energized. The control is waiting for the damper switch to close. If the damper end switch doesn't close within 60 seconds, the control goes to StA 20
Pre-purge	4	Damper is open for a 2 second delay
Spark	6	The pilot fuel valve is open and sparking is started.
Flame Proving	7	The main fuel valve is open and flame is being proven.
Running	8	The burner runs until the call for heat is satisfied or the operating setpoint is reached.

Table 3: Sequence Fault

Status Codes displayed in StA Mode		
Status	StA	Description
Retry / Recycle Delay	10	If the burner fails to light off (no flame signal), it waits 5 minutes and retries or if the control loses flame signal during running, it will wait 10 seconds and then recycle.
Soft Lockout	13	System is shutdown and will restart following a one hour enforced delay.
Hard Lockout	14	System is locked out. A manual or power reset is required to be able to light off again.
Limit Open	15	There is a call for heat from the thermostat, but a Safety Limit is open.
Flame Present Out of Sequence	16	Flame signal is still present when expected to be 0 (no flame).
Damper Failed to Open	20	The damper is still energized and the damper end switch has not closed.

VIII. Operation (continued)

C. USING DISPLAY

The control is located inside the boiler front door. (Figure 17).

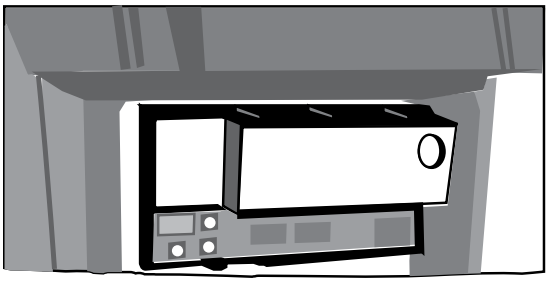


Figure 17: Intelligent Hydronic Control

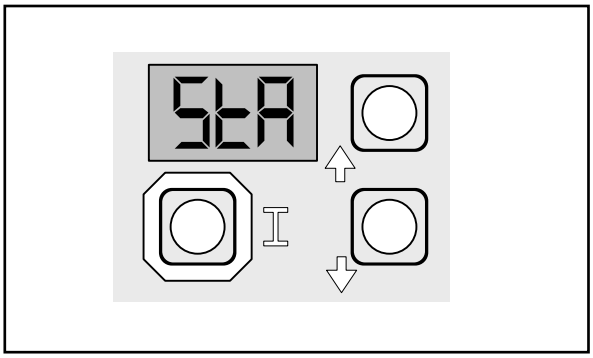


Figure 18: Boiler Display

The control display, along with Up ⇧, Down ⇩, and "𝙸" keys may be used to view boiler operating status (Figure 18).

D. VIEWING THE OPERATING MODE OPTIONS

In operating mode the user may view (but not change) boiler operating status, settings and troubleshooting information. To view control display information:

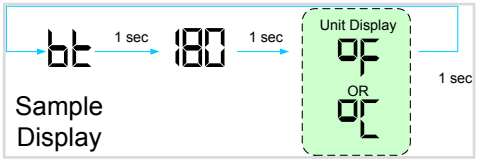
1. Press and release the "𝙸" key on the control to change from one parameter to the next. Each setting will alternately flash between the relevant display code and its corresponding value.

Operating Mode Options	
StA	Status
bt	Boiler Temperature
SP	Operating Setpoint (Outdoor Reset)
HL	High Limit Setting
HdF	High Limit Differential
tt	Heat Request Status
dh	DHW Heat Request Status
FLA	Flame Current
run	Run Time Hours
CYC	Boiler Cycles
Err	Error (see Error Numbers)

The StA (status) display code has the below listed values. This list is also available on the control cover.

Status Code Displayed in StA Mode	
1	Standby
4	Prepurge
6	Spark
7	Flame Proving
8	Running
10	Retry/Recycle Delay
13	Soft Lockout
14	Hard Lockout
15	Waiting for Limit to Close
16	Flame Present Out of Sequence
17	Self Test
18	Waiting for Damper to Open
20	Damper Failure to Open

For example, when the "𝙸" key is pressed on the control until "bt" is displayed, it will then flash a three digit number (such as " 180") followed by either "F" (or "C"). This indicates that the boiler water temperature is 180°F. Other operating parameters display the information in a similar fashion.



Please note that in operating mode to hold the display on the value the user can press and hold either the Up ⇧ or Down ⇩ keys and the value will be continuously shown. This may be helpful in watching a value "live".

E. CHANGING THE ADJUSTABLE PARAMETERS

To adjust parameters such as High Limit Setpoint and High Limit Differential:

1. Access the adjustment mode by pressing and holding the Up ⇧, Down ⇩, and "𝙸" keys simultaneously for three (3) seconds. This procedure is intended to discourage unauthorized changes or accidental changes to limit settings.
2. Press the "𝙸" key to display available Adjustment Mode options. Select an option.

Adjustment Mode Options		
HL_	140-220°F	Adjust High Limit Setting
dF_	10-30°F	Adjust High Limit Differential
Or_	0-10 minutes	Circulator Overrun Time
PP_	2-20 minutes	Circulator Pre-purge Time
St_	140-180°F	Start Temperature
Pt_	On or oFF	Priority time
dh_	dh or tt2	DH Terminal Function
rSt		Reset Lockout
F-C	F or C	Select degrees F or C Mode
bAc		Back to Operating Mode

3. Press the Up ⇧ and Down ⇩ keys to adjust the displayed item to the desired value.
4. To return to the normal operating mode from the Adjustment Mode, when the "bAc" option is displayed, press either the Up ⇧ or Down ⇩ key. If no keys are pressed, after five (5) minutes the control will automatically return to the Operating Mode.

F. MORE INFORMATION ABOUT ADJUSTABLE PARAMETERS

1. High Limit (HL_)
   The control is factory programmed with a High Limit Setpoint of 180°F. The burner turns "off" when the boiler water temperature (bt) is above this value. The High Limit setpoint is adjustable between 140° and 220°F. The Operating Setpoint (SP) will equal the High Limit Setpoint.
2. Differential (dF_)
   The control is factory programmed with a Differential of 15°F. The Differential is the number of degrees the boiler temperature must decrease below the Operating Setpoint before the boiler can restart. The differential is adjustable between 10° through 30°F.
3. Circulator Overrun Time (Or_)
   The control is factory programmed with a Circulator Overrun Time of 0 minutes. Circulator Overrun Time (also called "circulator off delay" or "circulator post purge") continues circulator operation after a call for heat has ended, sending excess heat from the boiler into the system. Ensure system piping and zone panel settings allow water flow to the priority zone after the call for heat ends. The Circulator Overrun Time is adjustable between 0 through 10 minutes.
4. Circulator Pre-purge Time (PP_)
   When the boiler is warm (boiler water temperature higher than 140°F (adjustable using Start Temperature parameter)) and there is a thermostat call for heat, the system circulator is started and boiler firing is delayed Circulator Pre-purge minutes. If the temperature drops below 140°F or there is a DHW call for heat the boiler is started without delay. Additionally, the boiler is started without delay if the thermostat call for heat is initiated when the boiler water temperature is less than 140°F. This feature helps save energy by satisfying home heating needs with residual boiler heat rather than cycling the boiler. The Circulator Pre-purge time has a factory setting of 2 minutes and is field adjustable between 2 and 20 minutes. Refer to Table 4.

Table 4: Circulator Pre-purge Time example, (PP_ = 2 minutes)

Call for Heat Source	DHW Terminal Selection	Boiler Temperature	Burner Status
TT = on	-	<140	Start with no delay
TT = on	-	>140	Start after 2 minute delay
DHW = on	tt2	<140	Start with no delay
DHW = on	tt2	>140	Start after 2 minute delay
DHW = on	dh	<140	Start with no delay
DHW = on	dh	>140	Start with no delay

5. Start Temperature (St_)
   Amount of "Heat available" is calculated by taking the difference between measured boiler water temperature and the Start Temperature setting. Useful "Heat Available" is dependent on the type of heating emitter installed in the home. Heat emitters require a certain minimum temperature to operate effectively. Our default settings reflect cast iron radiators. Fan Coils may require a start temperature setting of 180°F or 160°F before providing heat to the home. The Start Temperature has a factory setting of 140°F and is field adjustable between 140°F and 180°F.
6. Priority Time (Pt_)
   When the Priority Time parameter is set to "on" and Domestic Hot Water (DHW) call for heat is "on" the DHW demand will take "Priority" over home heating demand. During Priority Time the system circulator will be forced "off". Priority Time ends and the system circulator is released to service home heating demand when Domestic Hot Water call for heat is over. When Priority Time parameter is set to "Off" the DHW call for heat does not force "off" the system circulator. The Priority Time has a factory setting of "On" and is field adjustable between "On" and "Off" Refer to Table 5.
7. Domestic Hot Water (DHW) Terminal Function (dh_)
   The control allows configuration of the DHW Circulator output functionality to help the X-2 Series integrate into each installation more effectively. The DHW Circulator output can be connected to a domestic hot water circulator or a second heating zone circulator. These applications are selected as follows:
   a. When dh_ is set equal to Domestic Hot Water Demand (dh)
      When there is an Indirect Water Heater (IWH) the control provides "DHW" input terminals for the IWH Aquastat and "DHW Circulator" output terminals for the DHW Circulator.

When there is a DHW call for heat, the System Circulator is “forced off”, the DHW Circulator terminal is energized and the circulator pre-purge time delay control logic is bypassed to allow the boiler to fire without delay. When DHW demand ends the System Circulator “force off” is removed, the circulator can respond normally, and the DHW Circulator is de-energized. The DHW call for heat is detected by a voltage on to the "DHW" terminal. When the Priority Time parameter is set to “oFF” the System Circulator is not forced off for a DHW call for heat. Refer to Table 5.

b. When dh_ is set equal to Second Heating Zone (tt2)

When there is no IWH the “DHW Circulator” output may be configured to control a second heating zone. This is particularly helpful when the home uses only two heating zones. The control replaces the need for a two circulator zone panel. When DHW Terminal Function (dh_) is set to “tt2" the control’s two circulator outputs are used to control two independent heating zones. Refer to Table 6. A “TT” input causes a call for heat and energizes the “System Circulator” output to service heating zone 1 and a second zone's thermostat wired to the “DHW” input causes a call for heat and energizes heating zone 2 circulator wired to the "DHW Circulator" output.

When there is a Second Heating Zone (call for heat) the boiler is started and the DHW Circulator terminal is energized. When Second Heating Zone terminal is de-energized the call for heat is ended and the DHW Circulator is de-energized. A Second Heating Zone is detected by sensing a voltage on the DHW terminal.

Table 5: DHW Terminal Function (dh_) Selection = Domestic Hot Water Demand, (Parameter dh_ = dh)

Call for Heat			Circulator Status	
T-T Input	DHW Input	Priority Time (Pt_)	System Circulator Output	DHW Circulator Output
on	off	0n	on	off
on	on	0n	off	on
off	on	0n	off	on
on	off	0FF	on	off
on	on	0FF	on	on
off	on	0FF	off	on

Table 6: DHW Terminal Function (dh_) Selection = Second Heating Zone, (Parameter dh_ = tt2)

Call for Heat		Circulator Status	
T-T Input	DHW Input	System Circulator Output (Zone 1)	DHW Circulator Output (Zone 2)
off	off	off	off
on	off	on	off
on	on	on	on
off	on	off	on

Important Product Safety Information
Refractory Ceramic Fiber Product

Warning:

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures above 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
2. Long sleeved, loose fitting clothing
3. Gloves
4. Eye Protection

- Take steps to assure adequate ventilation.
- Wash all exposed body areas gently with soap and water after contact.
- Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
- Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

IX. Service and Maintenance (continued)

WARNING

Service on this boiler should be undertaken only by trained and skilled personnel from a qualified service agency. Inspections should be performed at intervals specified in this manual. Maintain manual in a legible condition.

Keep boiler area clear and free of combustible materials, gasoline and other flammable vapors and liquids.

Do not place any obstructions in boiler room that will hinder flow of combustion and ventilation air.

A. General. Inspection and service should be conducted annually. Turn off electrical power and gas supply while conducting service or maintenance. Follow instructions TO TURN OFF GAS TO APPLIANCE. See Figure 14.

CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

B. Inspect Vent System.

1. Remove obstructions in vent pipe and chimney.
2. Remove soot accumulations with wire brush and vacuum.
3. Repair or replace deteriorated vent pipe and vent accessories.
4. Provide proper support. Repair sags, particularly in horizontal sections.
5. Repair leaking joints.

C. Inspect Boiler Flue Passages for blockage or soot accumulation.

1. Remove vent pipe, vent damper and blocked vent switch.
2. Remove sheet metal screws securing Jacket Top Panel. Remove Top Panel.
3. Remove screws securing Canopy to Section Assembly. Remove Canopy.
4. Using flashlight, examine all flue passageways.
   a. If passageways are free of soot and obstruction, replace canopy, secure and seal.
   b. If passageways need cleaning, remove burners as described in Paragraph D. Using long handle wire or bristle flue brush and vacuum, brush flueways thoroughly from top of boiler.
   5. Install new gasket material (See Section XI: Repair Parts). Install canopy.
6. Install Jacket Top Panel, Blocked Vent Switch, Vent Damper, and vent pipe.

D. Clean Main Burners and Firebox.

1. To remove burners for cleaning, changing orifices, or repairs:
   a. Remove Jacket Front Panel.
   b. Disconnect pilot tubing at gas valve.
   c. Disconnect 3-wire plug at the gas valve.
   d. Remove wires to flame roll-out switch.
   e. Remove the burner access panel.
   f. Mark the location of the pilot main burner on the manifold if the marking on manifold is missing or obliterated.
   g. Hold burner at throat. Lift front of burner to clear orifice. Burner which holds pilot can only be removed by lifting the burner adjacent to its right first.
2. Brush top of burners with a soft bristle brush. Vacuum burners.
3. Check orifices. Drilled passageways must be free of lint or dirt.
4. Vacuum tip of Pilot Burner.
5. Clean firebox by vacuuming. Exercise care not to damage base insulation.
6. Install burners by reversing procedure used to remove burners. Make sure burner with pilot assembly is in same location as original installation.
   Check burners to see that they are located properly in slot at rear of burner tray. Reinstall burner access panel. Reconnect flame roll-out switch wires, pilot gas supply, thermocouple lead or pilot lead.
7. Connect pilot gas supply, igniter/sensor wire, and ground wire at Boiler Control.
8. Install Burner Access Panel. Connect Flame Rollout Switch wires.

E. Check Operation. Follow steps C through J from Section VII: System Start-up and Checkout.

F. For Models equipped with IDL 1200 LWCO:
Check control operation annually by pressing the "TEST" button. The amber "LOW WATER" LED will illuminate and the burner will shut down.

IX. Service and Maintenance (continued)

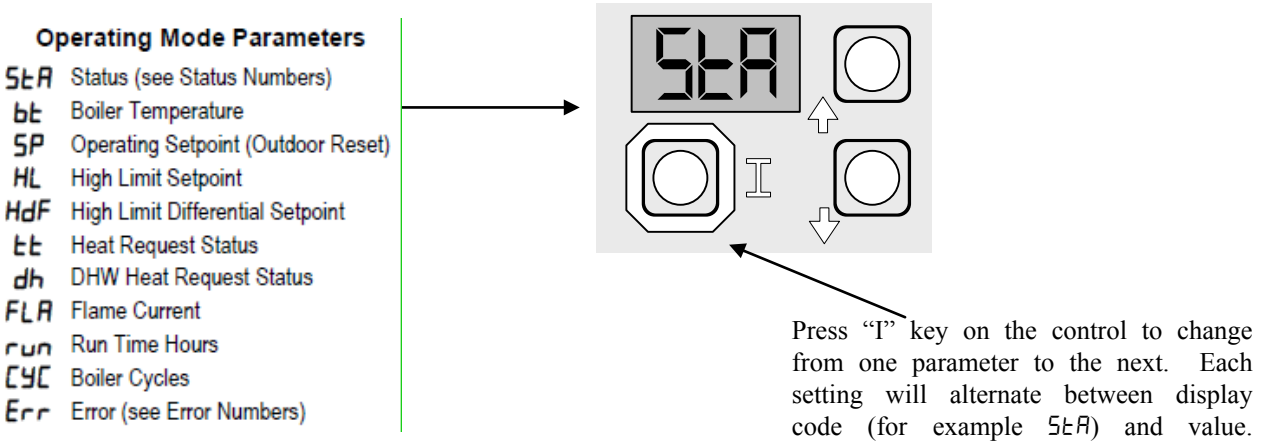
G. Lubrication. There are no parts requiring lubrication by service technician or owner. Circulator bearings are water lubricated.

X. Troubleshooting

A. BEFORE TROUBLESHOOTING

The following pages contain trouble shooting tables for use in diagnosing control problems. When using these tables the following should be kept in mind:

1. This information is only meant to be used by a professional heating technician as an aid in diagnosing boiler problems.
2. In general, these tables assume that there are no loose or miswired electrical connections. Before using these tables inspect all electrical connections on the boiler to make sure that they are tight. Also, check the wiring on the boiler against the wiring diagram in Figures 8 and 9. Ensure that incoming 120 Vac power polarity is correct and that the boiler is properly grounded. Further, ensure that the control power supply is 24 VAC (minimum 18 VAC to maximum 30 VAC) and polarity is correct.
4. All controls on the X-2 Series are tested at least once in the manufacturing process and a defective control or component is generally the least likely cause. Before replacing a component, try to rule out all other possible causes.
5. When checking voltage across wiring harness pins be careful not to insert the meter probes into the pins. Doing so may damage the pin, resulting in a loose connection when the harness is reconnected.



When Err (error) is shown:

Value	Description
4	Flame current lower than threshold
6	Flame Out of Normal Sequence
18	Electronics Failure
23	Flame Sensed During Pre-purge
32	Temperature Sensor Failure
55	Damper Failed to Open
56	Damper Failed to Close
57	Flame Rod Shorted to Ground
58	AC Line Frequency
59	Line Voltage Error
60	Thermostat input higher than threshold
61	Line Voltage Unstable
63	Soft Lockout – Recycles Exceeded
64	Soft Lockout – Internal Failure

Possible StA (status) values:

Value	Description
1	Standby
4	Pre-purge
6	Spark
7	Flame Proving
8	Running
10	Retry/Recycle Delay
13	Soft Lockout
14	Hard Lockout
15	Waiting for Limit to Close
16	Flame Present Out of Sequence
17	Self Test
18	Waiting for Damper to Open
19	Waiting for Damper to Close
20	Damper Failure to Open
21	Damper Failure to Close

Figure 27: Using Control Display to Troubleshoot

X. Troubleshooting (continued)

B. USE CONTROL DISPLAY Err (ERROR) NUMBER TO DIRECT TROUBLESHOOTING EFFORTS

If the control detects an error it will flash "Err" (error) followed by a number. Use this number to identify the boiler problem and corrective action in the table below. If there is no Err display proceed to Paragraph C:

Display	Status	Recommended Corrective Action
Blank	Boiler or Control is not powered	No 120 Vac Power at boiler, check breaker and wiring between breaker panel and boiler
Err 4	Flame Current Lower than Threshold	Check pilot assembly. Refer to Troubleshooting Section, C6.
Err 6	Flame Sensed Out of Normal Sequence	Flame sensed out of normal sequence (before opening gas valve or after closing gas valve). Check the gas valve for proper operation.
Err 18	Electronics Failure	Cycle power to control. Replace control if problem persists.
Err 23	Flame Sensed During Pre-purge	Flame sensed during pre-purge (before gas valve signaled open). Check the gas valve for proper operation. Replace gas valve if problem persists.
Err 32	Temperature Sensor Failure	Temperature sensor or interface failure (open or short connection, increased connection resistance, dual sensor mismatch) or control hardware failure. - Check sensor is securely attached to control P7 connector. - Check sensor wire is not damaged. - If secure and in good condition, replace sensor. - If problem persists, replace control.
Err 55	Damper Failed to Open	Atmospheric Damper End Switch failed to close (end switch contacts stuck open). Refer to Troubleshooting Section, C5.
Err 56	Damper Failed to Close	Damper open. Voltage should not be present on P6-5. Control, vent damper or wire harness is defective. While the Err 56 is displayed by the control, perform the following tasks: • Remove the call for heat (adjust thermostat or remove wire from TT terminals. • Check for 24Vac between P6-5 and ground. • If voltage not present, attempt to start boiler again. • If 24Vac is present, unplug the vent damper harness from control. • With wire harness unplugged, check for 24Vac between P6-5 (on Control) and ground. • If voltage present, replace the control. • If voltage not present, failed vent damper or wiring harness. • Check wiring harness for shorts or mis-wiring. Replace if defective. • If harness not defective, replace vent damper.
Err 57	Flame Rod Shorted to Burner Ground	Flame Rod shorted to burner ground, this can result from excessive flue gas condensation. - Check for excessive condensate. Dry pilot. Adjust setpoint higher. - Check for loose or damaged ignition wire.
Err 58	AC Line Frequency	Error AC Signal is too noisy or frequency is incorrect. Check supply voltage. Check Sensor for Common shorted to ground.
Err 59	Line Voltage Error	AC voltage out of specification high or low. Check supply voltage.
Err 60	Thermostat Input Higher than Threshold	Check thermostat wiring.
Err 61	Line Voltage Unstable	Possibly too many heavy loads switching on and off cause erratic supply voltage. Check supply voltage.
Err 63	Soft Lockout – Maximum Recycles Exceeded	Maximum number of recycles exceeded. Refer to Troubleshooting Section, C6.
Err 64	Soft Lockout – Internal Failure	The electronics has detected an error. This can be caused by an actual controller internal fault or wiring fault: - Check vent damper, cycle power with vent damper disconnected. If error is cleared, reconnect the vent damper and refer to Recommended Corrective Action listed under SEA 20, damper failed to open. - Check pilot assembly, - If problem persists, replace the control.

X. Troubleshooting (continued)

C. USE STA (STATUS) NUMBER TO GUIDE TROUBLESHOOTING

The control will flash "STA" followed by a number. Use this number to identify the boiler problem in the table below:

1. Boiler and Circulator Off

Display / Status	Recommended Corrective Action
STA 1 Standby Burner off Circulator off	The boiler has not detected a call for heat (tt = oFF and dh = oFF). Check that the thermostat: - When a thermostat call for heat is detected control display "tt" will show "on" - Make sure thermostat is calling for heat and contacts (including appropriate zone controls) are closed. Check for loose connection. Check the DHW demand: - When a domestic call for heat is detected "dh" will show "on" - Make sure the DHW aquastat contact is closed. Check for loose connection.

2. Circulator is On, But Boiler is Off

Display / Status	Recommended Corrective Action
STA 1 Circulator Pre-purge Burner off Circulator on	The boiler is warm and circulator is providing residual boiler heat to building: Check boiler temperature - The boiler will not start until boiler water temperature is less than the Setpoint (SP) minus differential (dF) - If boiler water temperature is higher than Start Temperature (St_, default = 140 F) and the Circulator Pre-purge (PP_, default = 2 minutes) time has not expired, boiler start will be delayed until water temperature drops or time expires. To permit the boiler to start sooner increase Start Temperature parameter. Refer to Operation Section for additional information.

3. Boiler is On, But Circulator is Off

Display / Status	Recommended Corrective Action
STA 8 Burner on Circulator off	Domestic Hot Water (DHW) Priority Forcing Circulator Off - When there is a DHW heat request wired to the Control's DHW terminal the System Circulator will be "forced off" for the duration of the DHW heat request. When the DHW heat request ends the System Circulator "force off" is removed, the circulator can respond normally. When the Priority Time, (Pt_) Parameter is set to "oFF" the System Circulator is not "forced off" for a DHW call for heat. Wiring / Circulator Issue: - Check wiring for loose connection, miswiring - Check circulator

4. Circulator is On But Damper is Not Open

Display / Status	Recommended Corrective Action
STA 15 Limit Open	Waiting for Limit to Open. - Check Blocked Vent Switch, in the event of a blocked vent or poor draft condition, the blocked vent switch will open interrupting power to control P5-4. The main burners will be extinguished immediately and the circulator will remain on until the thermostat is turned off. The source of blockage must be corrected by trained and skilled personnel from a qualified service agency before resetting switch. Blocked Vents are caused by a collapsed chimney resulting in full or partial blockage, chimney cross sectional area too small, height insufficient or cold chimney causing sustained poor draft. Always follow the recommendations in Section I, Figure 1 and Section IV, Venting. - Check Flame Rollout Switch, in the event of excessive blockage of the boiler section flue passageways is developed the flame rollout switch will open interrupting power to control P5-4. The main burners will be extinguished immediately and the circulator will remain on until the thermostat is turned off. If the flame rollout switch is activated, do not attempt to place the boiler in operation. The source of the blockage must be corrected and the identical flame rollout switch replaced by trained and skilled personnel from a qualified service agency. - Check External Limit.

X. Troubleshooting (continued)

5. Circulator is On But Damper is Not Open

Display / Status	Recommended Corrective Action
StA 20 Damper Failed to Open	The control is waiting for the damper to open. Damper end switch has failed to close (end switch contact is stuck open). Combustion can never take place unless the damper blade is in the fully open position. Check the following: - During status "StA 18" or "StA 20" the control terminal "P6 - 5" (yellow wire) is energized. - Check for loose connection between control and vent damper, check damper harness. - Check for obstruction in path of damper - When damper is open (end switch closed) control terminal "P6 – 2" should receive power from the vent damper. - Place jumper between control terminal P6-5 and P6-2. If error 55 does not clear, replace control. - Defective harness or vent damper.

6. Circulator is On, Damper is Open But Boiler Fails to Start

Display / Status	Description
StA 10 Retry / Recycle Delay	The Boiler is in "Retry Delay": - The burner failed to light (no flame signal). After a 5 minute delay, Control will attempt to light the burner again. There is no limit to the number of retries. Recycle Delay - The burner loses flame during running mode, ("StA 8"). After a 10 second delay, Control will attempt to light the burner again. If the burner loses flame during running mode, "StA 8" during the next six recycles, Control will progress to a soft lockout.
StA 13 Soft Lockout	When a soft lockout occurs, boiler will shut down. Boiler automatically restarts once condition that caused the lockout is corrected and the one-hour time delay is completed. Boiler can be restarted sooner than the time delay by using Adjustment Mode and selecting the reset button (see Adjustment Mode instructions) or by cycling power. Soft Lockout is caused by one of the following: - Err 63, Maximum Recycles Exceeded – The burner lost flame during running mode, "StA 8" six times in a row. Refer to recommended corrective actions on next page to help determine the cause of the problem. - Err 64, Internal Failure, refer to Error code listing for recommended corrective action. - Err 23, Flame sensed during post-purge (before gas valve signaled open). Check the gas valve for proper operation. Replace gas valve is problem persists.
StA 14 Hard Lockout	When a hard lockout occurs boiler shuts down.
StA 16 Flame Out of Sequence	If flame is detected in pre-purge Control goes to Flame Out of Sequence Before trial, "StA 16" and "Err 23" is reported. The control gives a flame 10 seconds to disappear. If flame goes away, control resumes heating cycle from the beginning. If it doesn't "Err 23" is cleared and "Err 6" is reported. When flame is off control goes to Soft Lockout and "Err 6" is cleared. Check the gas valve for proper operation.

X. Troubleshooting (continued)

6. Circulator is On, Damper is Open But Boiler Fails to Start (continued)

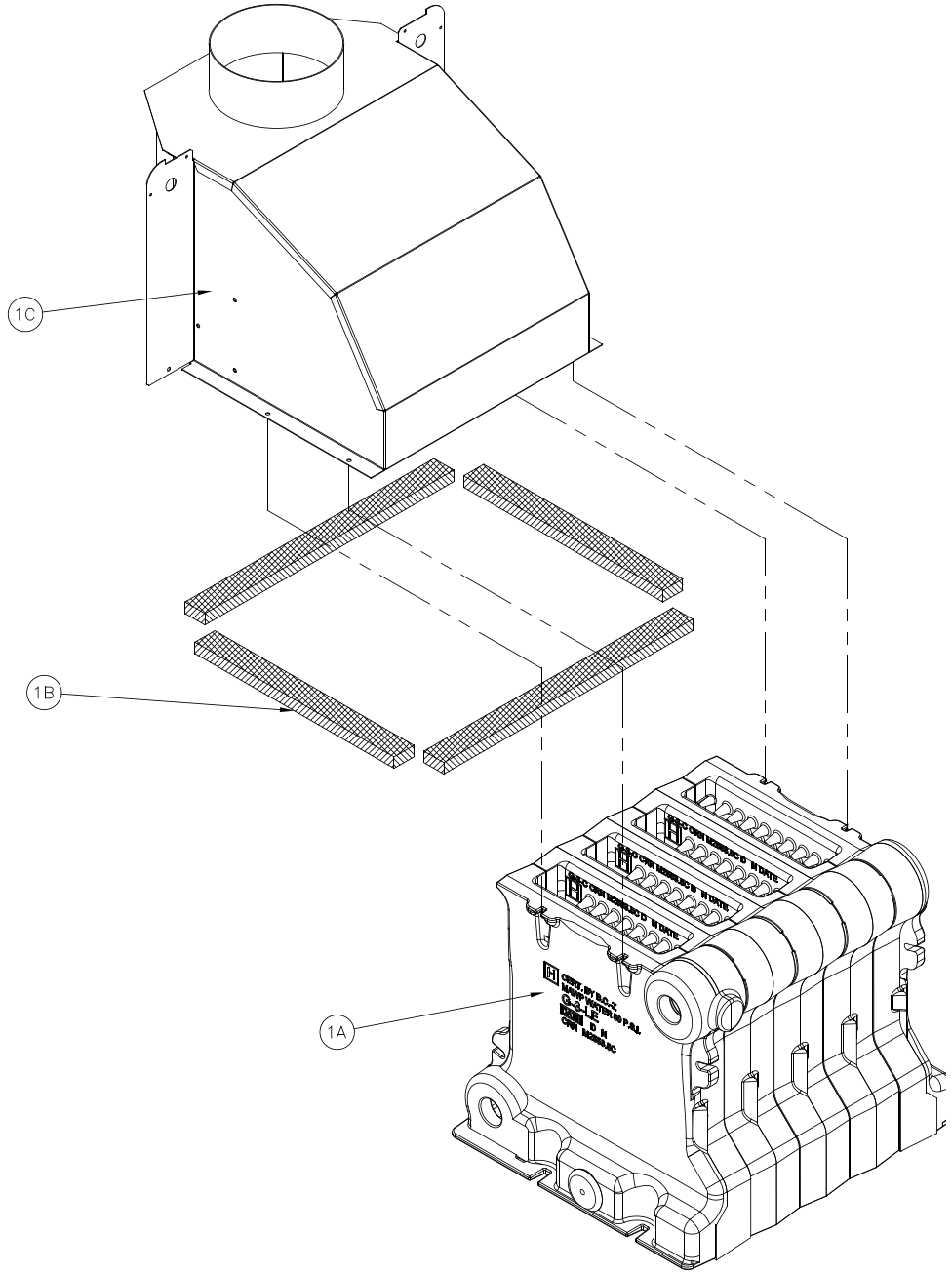
Display / Status	Recommended Corrective Action
StA 10 Retry / Recycle Delay StA 13 Soft Lockout	**1. No Spark** a. Can you hear sparking while StA 6 is displayed? - If there is no spark noise replace the control. b. If you can hear spark noise check the following: - Loose connection in ignition cable or ground wire - Continuity of ignition cable - Break in ignition cable insulation - Loose ground connection - Break in pilot ceramic insulator - Incorrect pilot spark gap
	2. No Pilot Flame a. If pilot does not light check the following: - All manual gas valves are open - Supply tubing is not plugged, kinked or leaking - Gas line pressures are good - Gas line is purged of air - Pilot orifice is not plugged (pilot gas is flowing) - Condensate quenching pilot **Note**: It may be necessary to recycle the "call for heat" more than once to clear the pilot supply tubes of air. b. If no gas flow check the following: - 24 volts across PV and MV/PV at gas valve, if voltage ok replace defective gas valve - Check for break in wiring harness to gas valve - 24 volts across control connector P5–2 and P5–5, if no voltage at control replace defective control
	3. Spark does Not Stop When Pilot Lights If the spark does not stop when the pilot lights check the following: - Loose connection in ignition cable or ground wire - Continuity of ignition cable - Clean flame rod - Pilot electrode porcelain cracked - Pilot flame covers flame rod and is steady and blue, if not adjust pilot flame - Low gas pressure at gas valve inlet - Defective control
	4. Main Flame Does Not Light If the main burners do not light check the following: - Check orifice size and/or blockage - 24 volts across control terminals P5-8 and P5-5? If no voltage while in StA 7 defective control. - 24 volts across MV and MV/PV at gas valve? Check for break in wiring harness to gas valve - Defective gas valve

D. FOR MODELS EQUIPPED WITH IDL 1200 LWCO:

1. **If the AMBER Light is On and the boiler is filled with water:** The amber "LOW WATER" light indicates the control is not sensing water in the boiler. If you are certain that the boiler is filled with water, remove the sensor from the well. Make sure that the metal clip is protruding enough to come in contact with the inside of the well tube. Check that the well does not have any heat transfer grease or other contaminants that may interfere with the metal sensor head contacting the well. If this does not resolve the problem, remove the well and examine for excessive residue build-up. Clean as needed and re-install.
2. **If the AMBER Light is blinking:** If the LOW WATER light is blinking, the IDL1200 is nearing the limit of its water detection range. This can occur as a result of a poor connection between the metal sensor head and the inside of the copper well or as a result of excessive residue build-up on the exterior of the well. To address this situation, follow the steps above under 'If the Amber Light is On.'

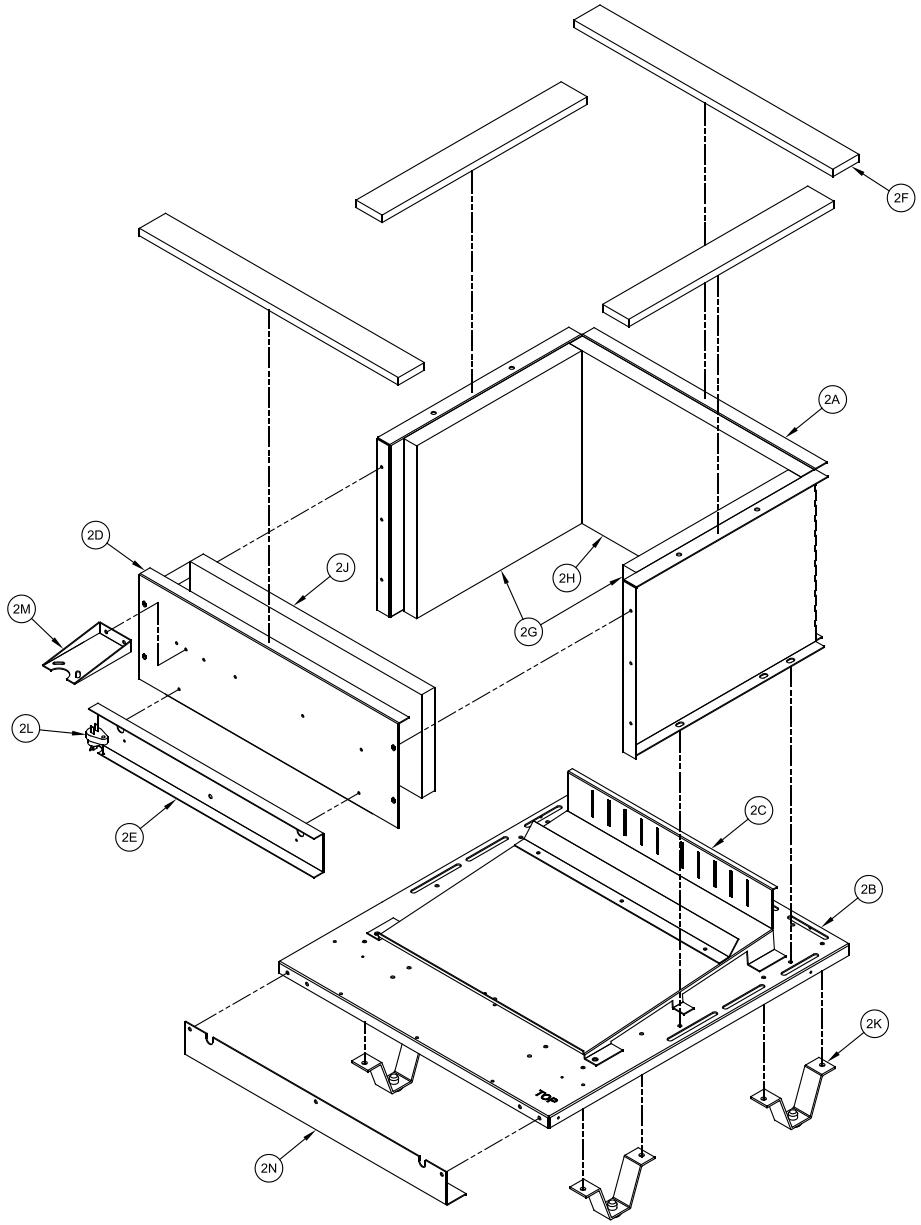
XI. Repair Parts

All X-2 Series Repair Parts may be obtained through your local U.S. Boiler Company Wholesale distributor. Should you require assistance in locating a U.S. Boiler Company Distributor in your area, or have questions regarding the availability of U.S. Boiler Company products or repair parts, please contact U.S. Boiler Company Customer Service at (717) 481-8400 or Fax (717) 481-8408.



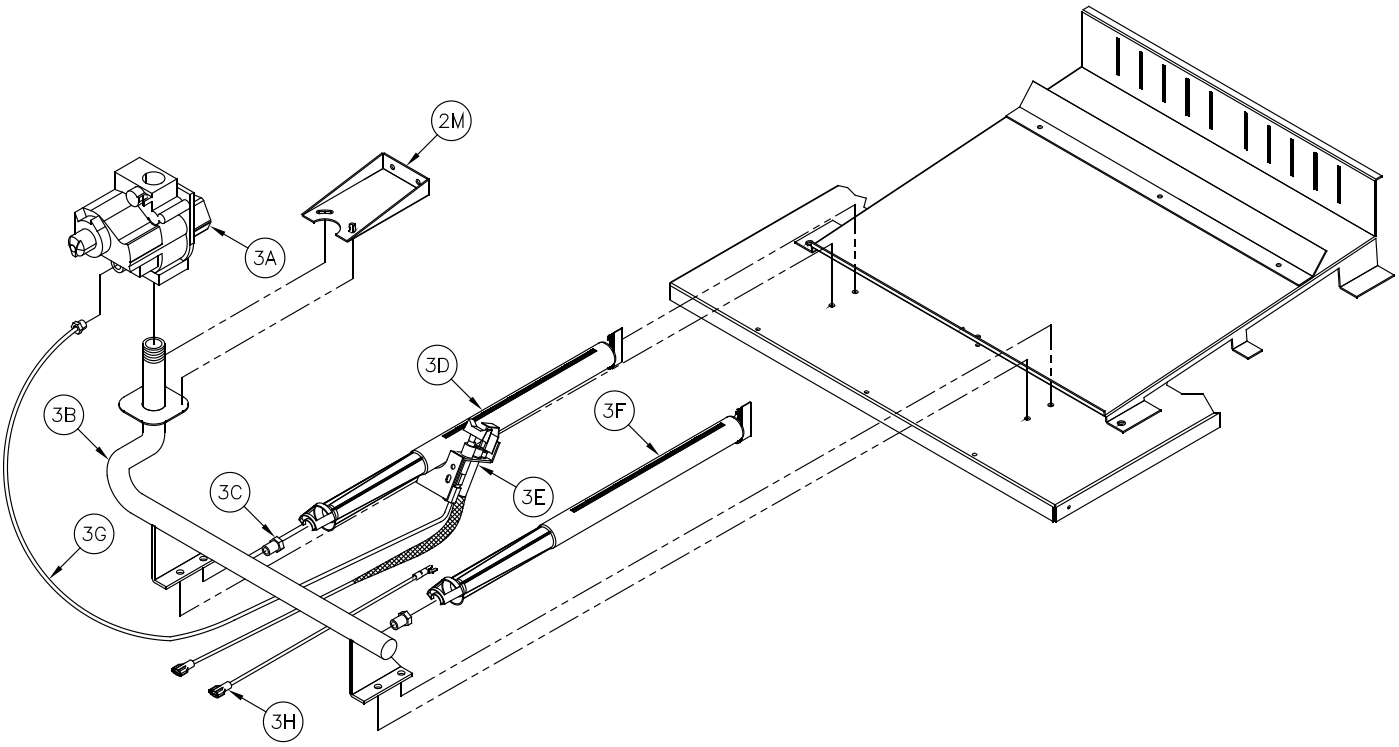
Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
1A	Block Assembly	102287-03	102287-04	102287-05	102287-06	102287-07	102287-08	102287-09
1B	Canopy Gasket Kit	6206001						
1C	Canopy Assembly	102554-03	102554-04	102554-05	102554-06	102554-07	103860-08	102554-09
	Blocked Vent Switch (not shown)	80160157						

XI. Repair Parts (continued)



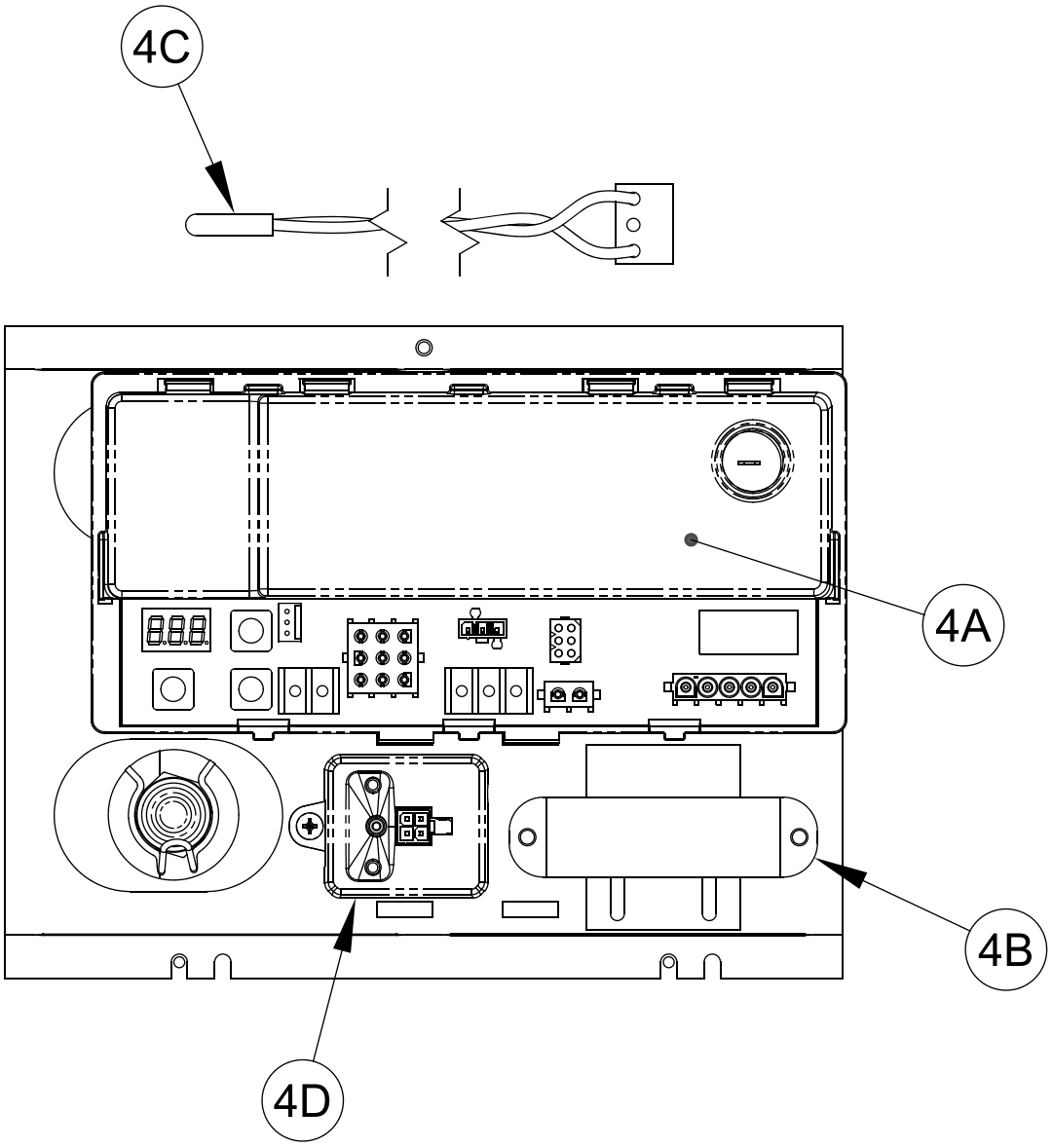
Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
2A	Base Wrapper	71807031	71807041	71807051	71807061	71807071	71807081	71807091
2B	Base Tray	102543-03	102543-04	102543-05	102543-06	102543-07	102543-08	102543-09
2C	Burner Tray Assembly	61807031	61807041	61807051	61807061	61807071	61807081	61807091
2D	Base Front Panel	102705-03	102705-04	102705-05	102705-06	102705-07	102705-08	102705-09
2E	Burner Access Panel	102707-03	102707-04	102707-05	102707-06	102707-07	102707-08	102707-09
2F	Base Gasket Kit	6206002						
2G	Base Side Insulation	[2] 72007001						
2H	Base Rear Insulation	72007031	72007041	72007051	72007061	72007071	72007081	72007091
2J	Base Front Insulation	72007032	72007042	72007052	72007062	72007072	72007082	72007092
2K	Base Leg Assembly	[4] 6186001						
2L	Flame Roll-out Switch	80160044						
2M	Manifold Support Bracket	718070001						
2N	Front Air Dam	103718-03	103718-04	103718-05	103718-06	103718-07	103718-08	103718-09

XI. Repair Parts (continued)



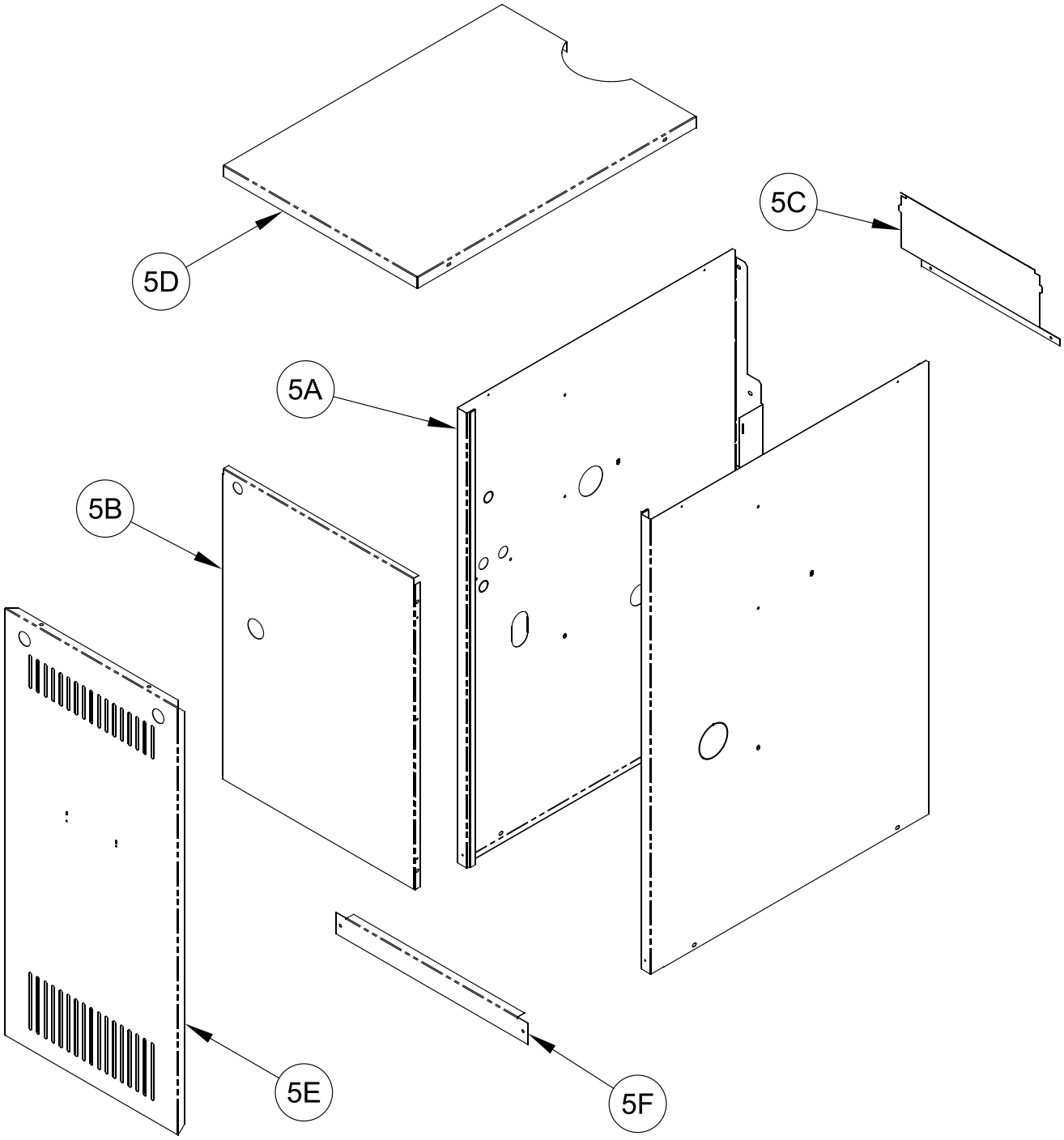
Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
3A	Gas Valve (Natural Gas), Honeywell VR8204P1171	81660282				N/A		
	Gas Valve (Natural Gas), Honeywell VR8304P4496	N/A				81660283		
	Gas Valve (LP Gas), Honeywell VR8204C3015	81660146				N/A		
	Gas Valve (LP Gas), Honeywell VR8304P4314	N/A				81660160		
3B	½" Gas Manifold	82207031	82207041	82207051	82207061	N/A		
	¾" Gas Manifold	N/A				82207071	82207081	82207091
3C	Burner Orifices - Natural Gas #47	[4] 822710	[6] 822710	[8] 822710	[10] 822710	[12] 822710	[14] 822710	[16] 822710
	Burner Orifices - LP Gas 1.20mm	[4] 822792	[6] 822792	[8] 822792	[10] 822792	[12] 822792	[14] 822792	[16] 822792
3D	Pilot Burner	100147-01						
3E	Pilot Assembly - Natural Gas	8236163						
	Pilot Assembly - LP Gas	8236164						
3F	Main Burner	[3] 100146-01	[5] 100146-01	[7] 100146-01	[9] 100146-01	[11] 100146-01	[13] 100146-01	[15] 100146-01
3G	Pilot Tubing	8236122						
3H	Ground Wire Assembly	103776-01						

XI. Repair Parts (continued)



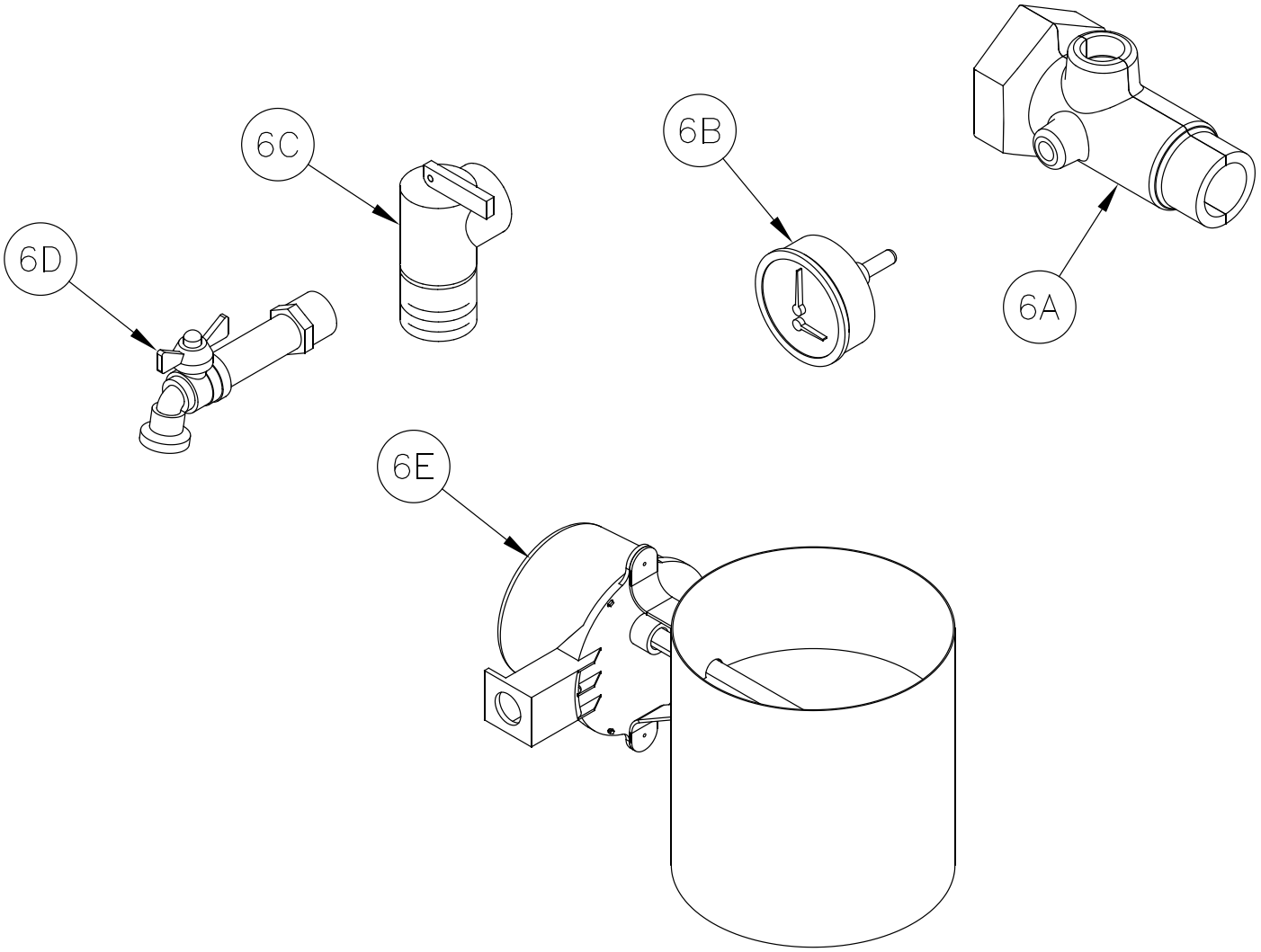
Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
4A	Control	103660-01						
4B	Transformer	102516-01						
4C	Temperature Sensor	103195-01						
4D	Temperature Sensor/LWCO (if equipped)	106495-02						
	Temperature Sensor Spring Clip (not shown)	102422-01						

XI. Repair Parts (continued)



Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
5A	Jacket Wrap-around Jacket Panel	106357-03	106357-04	106357-05	106357-06	106357-07	106357-08	106357-09
5B	Jacket Vestibule Panel	106358-03	106358-04	106358-05	106358-06	106358-07	106358-08	106358-09
5C	Jacket Rear Discharge	102549-03	102549-04	102549-05	102549-06	102549-07	102549-08	102549-09
5D	Jacket Top Panel	106359-03	106359-04	106359-05	106359-06	106359-07	106359-08	106359-09
5E	Jacket Front Door	106360-03	106360-04	106360-05	106360-06	106360-07	106360-08	106360-09
5F	Jacket Tie Bar	106361-03	106361-04	106361-05	106361-06	106361-07	106361-08	106361-09

XI. Repair Parts (continued)



Key No.	Description	[Quantity] Part Number						
		X-203	X-204	X-205	X-206	X-207	X-208	X-209
6A	Supply Water Manifold	80607001						
6B	Temperature/Pressure Gauge	100282-01						
6C	30 PSI Relief Valve	81660363						
6D	Drain Valve	102802-01						
6E	Vent Damper	102284-01	102284-02	102284-03		102284-04		102284-05
	Taco 007 (not shown)	8056170						
	Grundfos UPS15-58 (not shown)	105654-01						
	Grundfos Alpha 15-55 (not shown)	Available through Grundfos spare parts service.						

SERVICE RECORD

DATE	SERVICE PERFORMED

SERVICE RECORD

DATE	SERVICE PERFORMED

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