Copper-Fin Coil High Efficiency Condensing Boiler / Water Heater Models A050-A300

Operating and Maintenance Manual

Designed and Manufactured in Accordance with ASME Code Section IV Heating Boilers

Photo shown may vary from actual model.

E.T.L. Listed

E.T.L. Canadian Listed

HLW

H

U.L. 795
CSA 3.1

Ace Heating Solutions, LLC

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1 Introduction

This manual covers installation, maintenance, and operation instructions as well as instruction manuals for each of the control options. Please review this manual carefully before installation or operation. A copy of this manual should be kept with the boiler at all times for reference. If this manual is misplaced or lost, check the Ace Heating Solutions, LLC. website, www.aceheatingllc.com , to print from an electronic copy or contact your local Ace Heating Solutions, LLC representative.

Atlas Series High Efficiency Condensing Boilers have a rugged all-steel frame and low jacket temperatures allowing zero-clearance installation. It features 6½" forklift holes for easy handing, a front removable exchanger assembly for serviceability, an efficient blower allowing at least 30 ft each of intake and exhaust vertical venting, and a microprocessor based flame safeguard with non-volatile ignition lockout.

The heat exchanger tubes are formed into a cylindrical shape to provide maximum waterside and fireside performance. The entire heat exchanger assembly is easily removable and replaceable using hand tools only, without performing welding or cutting operations and without the use of gaskets. Your condensing boiler is E.T.L. listed and carries the E.T.L. listing mark. It is constructed and stamped in accordance with Section IV of the ASME Code, and is stamped on the nameplate with applicable markings.

Warning: Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, loss of warranty, exposure to hazardous materials or loss of life. Review the information in this manual carefully.

For your safety: Do not store or use gasoline or other flammable vapors and liquids or other combustible materials in the vicinity of this or any other appliances. To do so may result in an explosion or fire.

What to do if you smell gas:

- Do not try to light any appliance
- Open any windows and secure area
- Do not touch any electrical 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.

Installation and Service must be performed by a qualified installer, service agency or the gas supplier

Warning: Make sure the gas on which the boiler will operate is the same as that specified on the boiler rating plate (natural gas/propane).

Warning: Caution when servicing gas train components. Propane (LPG) is heavier than air and may trap in pipes, vents, combustion chamber, or other areas. Always handle with care.

Warning: Should overheating occur or if the gas supply valve fails to shut, do not turn off or disconnect the electrical supply to the boiler. Instead, shut off the gas supply at a location external to the boiler.

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

Warning: To minimize the possibility of improper operation, serious injury, fire, or damage to the boiler:

1. Always keep area around the unit(s) free of chlorine, combustible materials, gasoline, and other flammable liquids and vapors.
2. Water to be heated in the boiler should be free or have low levels of chlorine or other chemicals or water conditions that would be harmful to the copper heat exchanger. Boiler room ambient temperature shall not exceed 100 degrees F.
3. Boiler should never be covered or have any blockage to the flow of fresh air to the boiler.

Warning: Risk of electrical shock. More than one disconnect switch may be required to de–energize the equipment before servicing.

Warning: When servicing ceramic fiber based refractory or insulation blanket, gloves and respirators should be worn to reduce exposure to airborne Refractory Ceramic Fibers.

Caution: This boiler requires forced water circulation when burner is operating. See minimum and maximum flow rates. Severe damage will occur if the boiler is operated without proper water flow circulation. A flow switch is used to ensure that water flows through the boiler, but does not check for the minimum flow rate into the boiler. Numbers are approximate and may vary depending on installation. See Chart below.

Model	Inlet Temp	Outlet Temp	Recommended Flow rate	Pressure Drop (ft) for Rec Flow	Min Flow rate (gpm)	Max Flow rate (gpm)
500,000	60	79	50	12.5	30	60
750,000	60	88	50	13	30	60
1,000,000	60	97	50	14	30	60
1,500,000	60	116	50	15	30	60
2,000,000	60	97	100	15.5	60	120
2,500,000	60	107	100	17	60	120
3,000,000	60	116	100	18	60	120

- Note for complete information see attached graph for all flow rates for your specific unit.

Table 1.1. Recommended Flow Rates for All Atlas Models

1-1 Pre-Installation

Ace strongly recommends that this manual be reviewed thoroughly before installing your Atlas High Efficiency Condensing Boiler. Please review the General safety information before installing the boiler. Factory warranty does not apply to boilers that have been improperly installed or operated (Refer to the warranty in chapter 8). Installation and service must be performed by a qualified installer, service agency or gas supplier. If, after reviewing this manual, you still have questions not covered in this manual, please contact the manufacturer or your local Ace representative.

Product Receipt

On receipt of the unit, visually inspect for external damage to the shipping crate or unit. If the crate or unit is damaged, make a note to that effect on the Bill of Lading when signing for the shipment. Remove the boiler from the shipping packaging and inspect the unit internally. Report all damages and missing or incorrect parts to the carrier and supplier immediately. Claims for damages must be filed with the carrier by the consignee. Permission to return goods must be received from the factory prior to shipping. Goods returned to the factory without an authorized Return Goods Authorization number will not be accepted. Ace Heating Solutions, LLC. is not responsible for any damage that the unit receives while in shipping. As each shipping company has its own procedure for filing a claim, please contact the shipper for claim instructions.

Model Identification

Your Atlas Series Condensing Boiler carries two identification plates: The coil identification plate, which carries the ASME Code Stamping and Registration Number (when applicable) is attached to the water inlet, with a duplicate on the heat exchanger top plate. The unit's nameplate is located on the right side of the rear panel of the unit, and lists information concerning the input and output of the unit, electrical and gas ratings, working pressure and clearance to adjacent construction figures. In addition the model and serial numbers are on the plate. You will need these to order replacement parts from the manufacturing representative in your area or from the factory.

The information on the National Board plate is the same as on the nameplate with the exception of the National Board registration number, which is required in most states for installation of the unit.

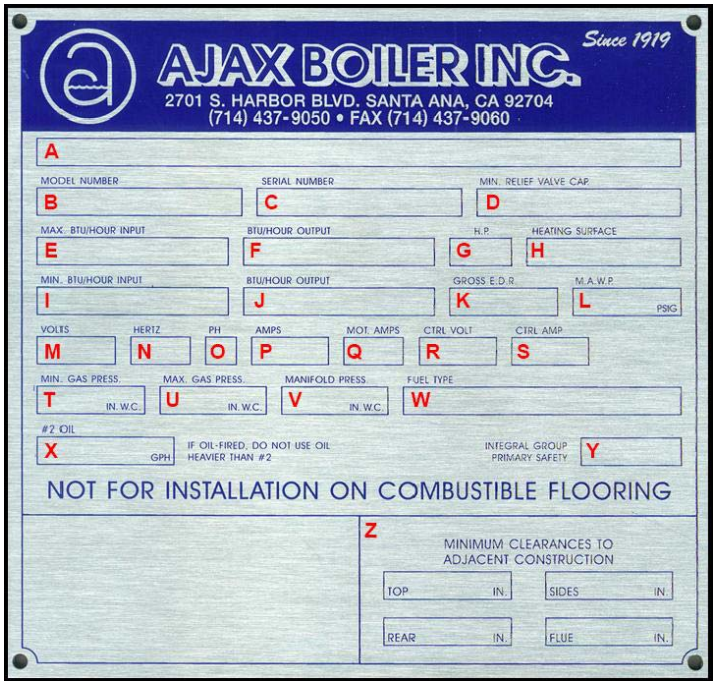
Do not remove any of these plates from the unit for any reason. Removal of these plates will void the warranty.

1-2 Boiler Nameplate and Model Number

The Boiler Name Plate

The following illustration is an accurate depiction of the nameplate found on the rear side of the boiler. You will also find an ASME nameplate on the inlet pipe 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.



* 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 the boiler. 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

ATLAS A 150 C - W

Type of boiler:
A = Atlas

Firing Rate:
050 = 500,000 Btu/Hr
075 = 750,000 Btu/Hr
100 = 1,000,000 Btu/Hr
150 = 1,500,000 Btu/Hr
200 = 2,000,000 Btu/Hr
250 = 2,500,000 Btu/Hr
300 = 3,000,000 Btu/Hr

Fuel Type:
G = Natural Gas
P = Propane
C = Combination Natural Gas/Propane (used one at a time)

Jacketing Type:
W = Outdoor

(No Suffix refers to Indoor Jacketing)

1-3 Rating and Certifications

All units must be installed in accordance with all state and local codes, and national codes, including but not limited to:

- ANSI Z21.10.2, Gas Water Boilers
- ANSI Z223.1/ NFPA 54, National Fuel Code
- ANSI/ NFPA 70, National Electric Code

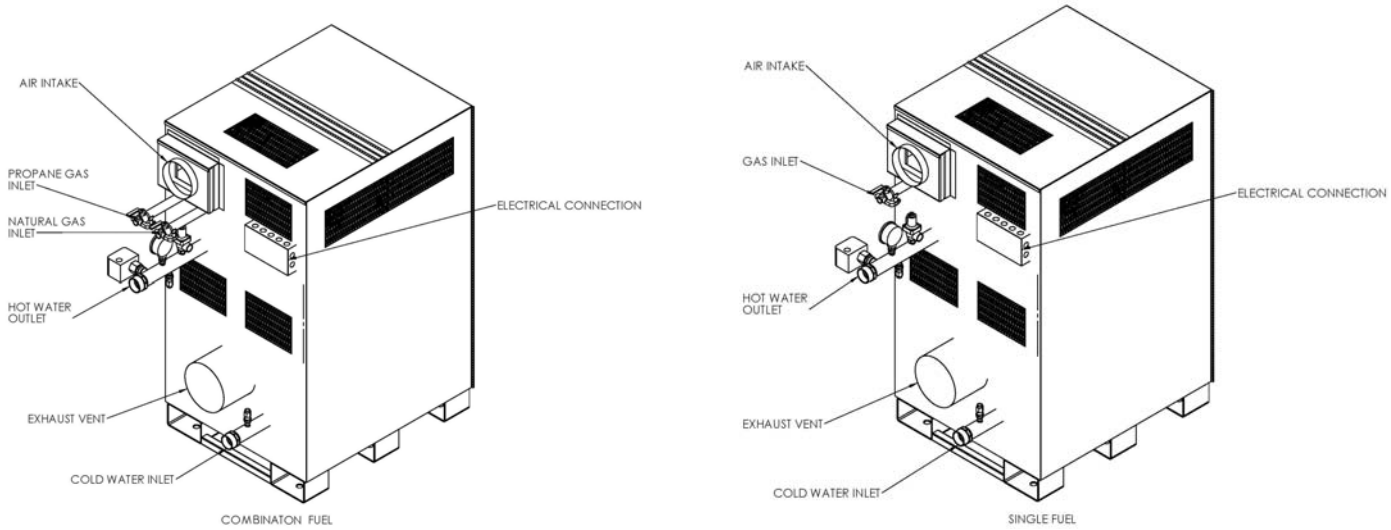
Atlas and Ace Boilers are National Board approved and designed–certified and tested by Intertek (E.T.L.), standards for the US and Canada (Can Std 1-3.1), and UL 795. Each unit is constructed in accordance with Section IV of the American Society of Mechanical Engineers (ASME) Boiler Pressure Vessel Code and bears the ASME "HLW" stamp or "H" stamp.

WARNING: Altering any Atlas or Ace boilers pressure vessel by installing replacement heat exchangers, tube bundles, coils or any ASME parts not manufactured and/or approved by Ace will instantly void the ASME and E.T.L. rating of the vessel and any Ace warranty on the vessel. Altering the ASME or E.T.L. ratings of the vessel also violates national, state, and local approval codes.

Installations at Elevation

Rated inputs are suitable for up to 2,000 ft. elevation without de-rating. Consult the factory for installations over 2,000 ft. above sea level. No hardware changes are required to the unit. (Adjustments may be required).

1-4 Connection Information



CONNECTION SIZES

MODEL	AIR INTAKE	EXHAUST VENT	WATER IN/OUT	PROPANE/NATURAL GAS INLET
A050	4"	6"	2"	1"
A075	4"	6"	2"	1"
A100	6"	8"	2"	1"
A150	6"	8"	2"	1 ¼"
A200	8"	10"	2 ½"	1 ¼"
A250	10"	12"	2 ½"	1 ¼"
A300	10"	12"	2 ½"	1 ¼"

Figure 1.1. Atlas Connection Diagram

1-5 General Safety

In order to meet commercial hot water needs, the high limit safety control on this hot water boiler is adjustable up to 240 degrees F by the OEM or installer only. **However, water temperatures exceeding over 125 degrees can cause instant**

and severe burns or death from scalds. When supplying general purpose domestic hot water, the recommended setting for the Operating control is 125 degrees F.

Safety and energy conservation are factors to consider when setting the temperature aquastat on the unit. The most energy–efficient operation will result when the temperature setting is the lowest that satisfies the needs of the application.

Maximum outlet water temperatures are seen when the boiler reaches the high temperature limit and shuts off. To test the maximum water temperature delivered, turn on the hot water on a faucet and use a thermometer to read the outlet temperature.

2 Installation

2-1 Installation Codes

Installations must follow these codes:

- Local, state, provincial, and national codes, laws, regulations and ordinances
- National Fuel Gas Code, ANSI Z223.1/ NFPA 54 – latest edition (NFGC)
- National Electrical Code, ANSI/ NFPA 70 – latest edition (NEC)
- Standards for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD–1, (CSD–1) when required.

Note: If any code listed above conflict, the stricter of the conflicting codes shall be followed for installation.

Note: Installation and Service must be performed by a qualified installer, service agency or the gas supplier

2-2 Equipment Base

The boiler should be mounted on a level, structurally sound surface. The boiler is approved for mounting on a combustible surface but cannot be installed on carpeting. Gas fueled equipment installed in enclosed parking garages must be located at least 18" above the floor.

Note: Ace strongly recommends that you secure the boiler to the base pad by the mounting holes provided at the base of the unit.

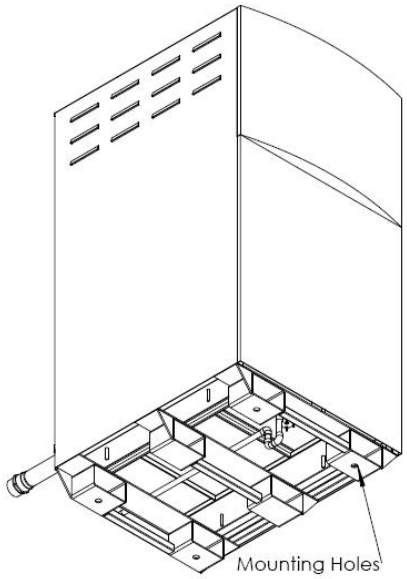


Figure 2.1. Isometric View of Atlas Base with Mounting Holes

Caution: Locate the unit so that the condensate can be treated and piped to meet city and local code requirements.

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during boiler operation or service (circulator replacement, control replacement, etc.)

2-3 Determining Unit Location

The optimal location for the boiler is as close to an exterior wall as possible to reduce vent loss and to minimize the costly exhaust Stainless Steel vent materials. Maintain minimum specified clearances for adequate operation. All installations

must allow sufficient space behind the boiler to service vent connections, water pipe connections, piping and other auxiliary equipment, as well as the appliance.

MODEL	TOP CLEARANCE	FRONT CLEARANCE	SIDE CLEARANCE	BOTTOM CLEARANCE
A050	18"	36"	6"	0"
A075	18"	36"	6"	0"
A100	18"	36"	6"	0"
A150	18"	36"	6"	0"
A200	22"	40"	6"	0"
A250	22"	40"	6"	0"
A300	22"	40"	6"	0"

Table 2.1. Atlas Minimum Clearances

Multiple appliances may be installed side by side with 6" clearance between adjacent appliances to allow sufficient air for the pilot blower. It is recommended to maintain 16" clearance between adjacent boilers to allow access for service to the rear of the unit.

The minimum clearance between an Atlas boiler and a storage tank is 6". For alcove installations, the minimum clearance to combustible construction is 6" to side, 24" to rear walls and 22" from top of the unit to the ceiling. The front alcove shall remain open. This will allow boiler to be serviced in its location without movement or removal of the unit.

Note: Local and state codes requiring greater clearances supersedes these minimum clearances.

Outdoor Installations (Optional)
Atlas Condensing Boilers can be design–certified for outdoor installation. Boilers must not be installed under an overhang that is less than 3' from the top of the vent terminal. Three sides must be open in the area under the overhang. Roof water drainage must be diverted away from the boiler(s) installed under overhangs.

It is highly recommended that you allow sufficient space in front and the rear of the unit for replacement and adjustment of all parts requiring such attention.

Caution: Keep the area around the unit(s) free from combustibles and flammable liquids.

2-4 Combustion and Ventilation Air

WARNING: THE LACK OF ADEQUATE COMBUSTION AIR IS THE SINGLE BIGGEST OPERATING PROBLEM ENCOUNTERED WITH GAS FIRED WATER BOILERS

Note: Use of the boiler in construction areas where fine particulate matter, such as concrete dust or dry wall dust, is present may result in damage to the boiler that is not covered by the warranty. If operated in a construction environment, a clean source of combustion air must be provided directly to the boiler.

Your Atlas boiler is equipped with a filter to help prevent such an occurrence above and **must be checked at least every month.** A single replacement filter is located inside the control box.

Indoor Units (Standard)
The boiler must be supplied with sufficient quantities of non–contaminated air to support proper combustion and equipment ventilation. Combustion air can be supplied via conventional means where combustion air is drawn from the area immediately surrounding the boiler, or via direct vent, where combustion air is drawn directly from outside. All installations must comply with the requirements of the National Fuel Gas Code, NFPA 54, Canada B149, and all local codes.

Note: In calculating free area, the required size of the opening for combustion, ventilation, and dilution air shall be based on net free area of each opening. If free area through a design of louver or grill is known, it shall be used in calculating the size opening required to provide the free area specified. For additional information, refer to the latest NFGC code requirements.

Provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes. In order to protect electrical components, the boiler room ambient air temperature shall not exceed 100 F.

The equipment room **MUST** be provided with properly sized openings to assure adequate combustion and ventilation air when unit is installed with a basic Category IV venting system.

Note: All additional gas fired equipment should be considered when calculating the necessary air supply.

Direct vent

If outside air is drawn through the intake vent directly to this unit for combustion:

1. Install combustion air direct vent in accordance with drawing below. (Refer to Section 2-6 for details)

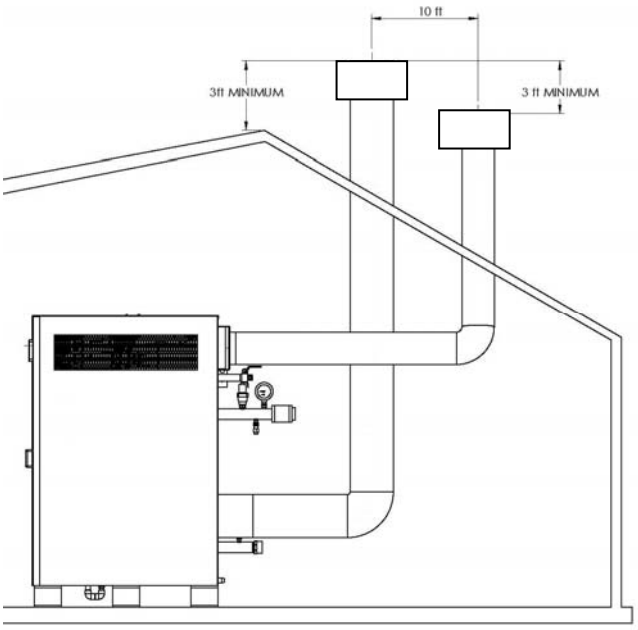


Figure 2.2. Atlas with Vertical Intake and Exhaust Venting

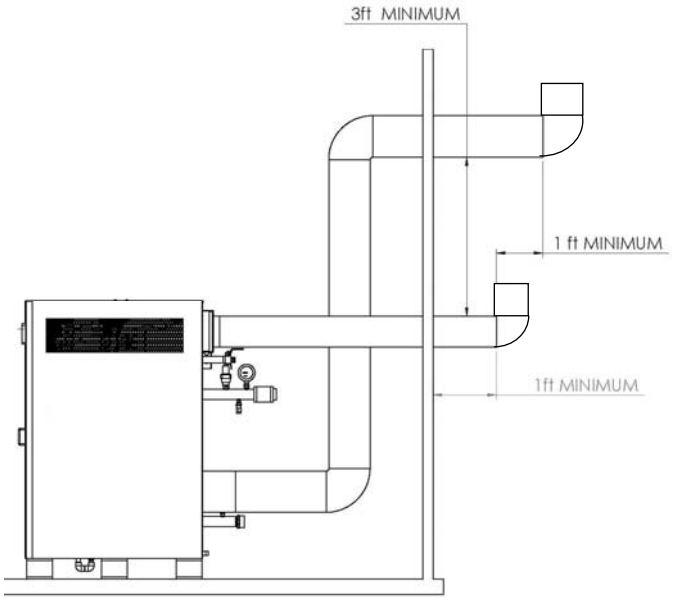


Figure 2.3. Atlas with Horizontal Intake and Exhaust Venting

2. The exhaust vent must be installed with a slight upward slope of not more than ¼ inch per foot of horizontal run to vent terminal.

3. The exhaust vent must be insulated through the length of the horizontal run.

4. Intake and Exhaust vents with vertical termination should have a rain cap installed.

5. It is recommended to install a drain on the exhaust vent.

6. In cold climates, and to mitigate potential freeze up, Ace highly recommends the installation of a motorized sealed damper to prevent circulation of cold air through the boiler during the non – operating hours. When installing motorized damper actuator with switch contacts, prove the damper is fully open to prevent unit from firing when damper is not fully open.

2-5 Conventional Combustion Air Supply

U.S installations

All Air from inside the building: If all combustion air is drawn from inside the building, the mechanical equipment room does not receive air from outside, the following applies:

1. The mechanical room must be provided with two permanent openings communicating directly with additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. (An unconfined space is defined as a space whose volume is more than 50 cubic feet per 1,000 BTUH of the aggregate input rating of all appliances installed in that space. (NFGC).

2. Each opening must have a minimum free area of 1 sq. in. per 1,000 BTUH of the total input rating of all gas utilization equipment in the mechanical room.

3. One opening must commence within 12" of the top, and one opening must commence within 12" of the bottom of the room.

Ace recommends that one opening shall commence with 6" from the top and one opening shall commence 6" from the bottom. The combined area of the two opening should not be less than 200 sq. in. for the first 100,000 BTUH boiler input, and 100 sq. in. for each additional 100,000 BTUH boiler input.

All Air from Outdoors: If all the combustion air is drawn from the air outside the building, the mechanical equipment room directly communicates with outdoor air, either of the following methods can be used:

Method 1:

1. The mechanical equipment room must be provided with two permanent opening, one commencing within 12" of the top and one commencing within 12" from the bottom of the room.

2. The opening must communicate directly, or by ducts, with the outdoors

3. Each opening must have a minimum free area of 1 sq. in. per 4,000 BTUH of all equipment in the room when the opening is communicating directly with the outdoors or through vertical ducts. The minimum free area required for horizontal ducts is 1 sq. in. per 2,000 BTUH of the total input rating to all the equipment in the room.

(For addition information, refer to the latest NFGC)

Method 2 (normally applied in cold climate regions):

1. The mechanical equipment room must be provided with at least one permanent opening, commencing within 12" of the top of the enclosure.

2. The opening must communicate directly or by ducts with the outdoors.

3. The opening must have a minimum free area of 1 sq. in. per 3,000 BTUH of the total input rating of all equipment in the room, or no less than the sum of the areas of all vent connectors in the confined space.

(For additional information, referred to the latest NFGC)

Warning: Do not use the "one permanent opening" method if the equipment room is under negative pressure conditions or the equipment is common vented with other gas fired appliances.

Note: Louvers and grilles. The required size of opening for combustion, ventilation and dilution air shall be based on the net free area of each opening. Where free area through a design of louver or grille is known, it shall be used in calculating the size opening required to provide the free area specified. Where the louver and grille design and free area are not known, it shall be assumed that wood louvers will have 25% free area, and metal louvers and grilles will have 75% free area (NFGC).

Canadian Installation

Caution: All combustion air must be drawn from the outside air of the building; the mechanical equipment room must communicate directly with outdoor air.

1. Ventilation of the space occupied by the boiler shall be provided by an opening(s) for ventilation air at the highest practical point communicating with the outdoors. The total cross-sectional area of such an opening(s) shall be at least 10% of the area required in (2) below, but no less than 10 sq. in.

2. For boilers using a barometric damper vent system there shall be a permanent air supply opening(s) having a cross section area of not less than 1 sq. in. per 7,000 BTUH up to and including 1 million BTUH, plus 1 sq. in. per 14,000 BTUH in excess of 1 million BTUH. This opening(s) shall be located at or ducted to a point no more than 18" nor less than 6" above floor level. The duct can also "goose neck" through the roof. The duct is preferred to be straight down and terminated 18" from the floor, but not near the piping. This air supply opening requirement shall be in addition to the air opening for ventilation air required in (1). (above)

3. For additional information, referred to CGA, B149

Warning: Care must be taken to ensure that the equipment room is not under negative pressure conditions.

2-6 Conventional Exhaust Venting

Caution: Proper installation of flue venting is critical for the safe and efficient operation of the boiler.

Definition of ANSI Categories for High Efficiency Appliances
Boilers are divided into four categories based on the pressure produced in the exhaust and the likelihood of condensate production in the vent.

Category I A boiler which operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent.

Category II: A boiler which operates with a non-positive vent static pressure and with a vent gas temperature that may cause excessive condensate production in vent.

Category III: A boiler which operates with a positive vent pressure and a vent gas temperature that avoids excessive condensate production in the vent.

Category IV: A boiler which operates with a positive vent pressure and with a gas temperature that may cause excessive condensate production in the vent.

Note: *These definitions apply to the appliances and do not necessarily reflect the performance of the connected vent system.*

Note: For additional information on appliance categorization, see appropriate ANSI Z21 Standard and the NFGC (US), or CGA (Canada) B149, or applicable provisions of local building codes.

Note: Your Atlas Series Condensing Boiler requires Category IV venting. (See NFGC, NFPA 54, Section 7 "Venting Equipment" for more detailed information).

The Atlas is designed to operate with a chamber pressure of 0 to +0.5" w.c. The Atlas Condensing boiler is capable of 100 feet of vertical equivalent exhaust when equipped with the standard exhaust vent. When more than 100 feet of exhaust venting is used, the chamber pressure could increase beyond the maximum designed +0.5"w.c. An optional enlarged vent maybe be used to increase vent runs in case more than the 100ft maximum is needed, however venting must be designed by a professional to ensure the boiler chamber pressure stays within the designed range. Boiler vents must be constructed of AL29-4C or similar suitable material acceptable for use with exposure to condensate.

Atlas combustion air intake can be taken using the boiler room air or may be vented directly outside. When using direct combustion air venting, the Atlas is capable of up to 30ft of equivalent venting. If more than 30ft of equivalent venting must be used, an enlarged vent diameter may be used to extend maximum vent lengths, but must be properly sized to allow for sufficient combustion air to be supplied to the boiler. Although direct intake is possible, it is recommended to take combustion air from a well ventilated boiler room.

Warning: Using improper venting materials can result in personal injury, death or property damage.

Support of the vent stack

The weight of the vent stack or chimney must not rest on the boiler vent connection. Support must be provided in compliance with applicable codes. The vent should also be installed to maintain proper clearances from combustible materials. Use insulated vent pipe spacers where the vent passes through combustible roofs and walls.

Vent Termination Location

Note: During winter months check the vent cap and make sure no blockage occurs from buildup of snow and ice. Condensate can freeze on the cap. Frozen condensate on the vent cap can result in a blocked flue.

1. Give special attention to the location of the vent termination to avoid possibility of property damage or personal injury.

2. Gases may form a white vapor plume in the winter. The plume could allow hazardous flue gas in through an open window or obstruct a window view if the termination is installed near windows.

3. Prevailing winds, in combination with below freezing temperatures, can cause freezing of condensate and water/ice build up on building, plants or roofs.

4. The bottom of the vent terminal and air intake shall be located at least 12" above grade, including normal snow line.

5. Un-insulated single wall Category IV metal vent pipe shall not be used outdoors in cold climates for venting gas – fired equipment without insulation.

6. Through the wall vents for Category IV appliances shall not terminate over public walkways or over an area where condensate or vapor could be detrimental to the operation of regulators, relief valves, or other equipment.

7. Locate and guard vent termination to prevent accidental contact by people or pets.

8. **Do not** terminate vent in window well, stairwell, alcove, courtyard or other recessed area.

9. **Do not** terminate above any door, window, or gravity air intake. Condensate can freeze, causing ice formations.

10. Locate or guard vent to prevent condensate from damaging exterior finishes. Use a rust resistant sheet metal backing plate against brick masonry surfaces.

11. **Do not** extend exposed vent pipe outside of building beyond minimum distance required for vent termination. Condensate could freeze and block vent pipe.

US Installations
Refer to the latest edition of the National Fuel Gas Code.

1. Vent must terminate at least 4ft below, 4 ft horizontally from or 1 ft above any door, window or gravity air inlet to the building.

2. The vent must not be less than 7ft above grade when located adjacent to public walkways.

3. Terminate vent at least 3ft above forced air inlet located within 10ft.

4. Vent must terminate at least 4ft horizontally, and in no case above or below unless 4ft horizontal distance is maintained, from electric meters, gas meters, regulators, and relief equipment.

5. Terminate vent at least 6ft away from adjacent walls.

6. **Do not** terminate vent closer to 5ft below roof overhang.

7. Terminate vent at least 1ft above grade, including snow line.

8. Multiple direct vents installations require a 4ft clearance between the ends of vent caps located on the same horizontal plane.

Canadian Installations
Refer to the latest edition of CGA, B149 Installation Code.

1. A vent shall not terminate directly above a paved sidewalk or driveway which is located between two single – family dwelling and serves both dwellings.

2. A vent shall not terminate less than 7ft above a paved sidewalk or paved driveway located on public property.

3. A vent shall not terminate within 6ft of a mechanical air supply inlet to any building.

4. A vent shall not terminate above a meter/regulator assembly within 3ft horizontally of the vertical centre – line of the regulator.

5. A vent shall not terminate within 6ft of any gas service regulator.

6. A vent shall not terminate less than 1ft above grade level.

7. A vent shall not terminate within 3ft of a window or door which can be opened in any building, any non – mechanical air supply inlet of any other appliance.

8. A vent shall not terminate underneath a verandah, porch or deck, unless the verandah, porch or deck is fully open on a minimum of two sides beneath the floor, and the distance between the top of the vent termination and the underside of the verandah, porch or deck is greater than 1ft.

Venting Tips:
Support piping: For horizontal runs, add supports at least every 5ft.; For vertical runs, use braces under or near elbows.

<u>Warning:</u> Examine the venting system at least once a year. Check all joints and vent pipe connections for tightness, corrosion or deterioration.

Venting Configurations

For boilers connected to gas vents or chimneys, vent installations shall be in accordance with the NFGC (US) or CGA, B149 (Canada), or applicable provisions of local building codes.

Vertical Venting (Category IV)
The maximum and minimum venting length for this Category IV appliance shall be determined per the NFGC (US) or CGA, B149 (Canada).

The diameter of the vent flue pipe should be sized according to NFGC (US) and Appendix B of the CGA, B149 (Canada). The minimum flue diameter for conventional venting using Category IV, stainless steel AL29-4C vent is:

6 inches for Models A050 – A075
8 inches for models A100 – A150
10 inches for model A200
12 inches for models A250 – A300

The connections from the appliance vent to stack must be as direct as possible and shall be same diameter as the vent outlet. The horizontal breaching of a vent must have an upward slope of not less than ¼" per linear foot from the boiler to vent terminal. The horizontal portions of the vent shall also be supported for the design and weight of the material clearances and to prevent physical damage or separation of joints.

Note: A vent adapter (field supplied) may be required to connect the Category IV vent to the boiler.

Termination
The vent terminal should be vertical and should terminate outside the building at least 2ft above the highest point of the roof that is within 10ft. The vent cap should have minimum clearance of 4ft horizontally from, and in no case above or below (unless a 4ft horizontal distance is maintained), electric meters, gas meters, regulators and relief equipment. The distance of the vent terminal from adjacent public walkways, adjacent building, open windows and building opening must be consistent with the NFGC (US) or CGA, B149 (Canada). Gas vents supported only by flashing and extended above the roof more than 5ft should be secured by guy-wires or braced to withstand snow and wind loads.

Caution: A listed vent cap terminal suitable for connection to the Category IV vent materials, adequately sized, must be used to evacuate the flue products from boilers.

Common Venting
The NFGC does not address sizing guidelines for the common venting of multiple Category IV boilers. When common venting multiple units together, the venting must be designed by a professional engineer to ensure the chamber pressure of each boiler is always below 0.5" w.c. at high fire.

Warning: Vent connectors serving any other appliances shall not be connected into any portion of the mechanical draft systems operating under positive pressure. If an Ace unit is installed to replace an existing boiler, the vent system must be verified to be of the correct size and of Category IV AL29-4C vent material. **If it is not, it must be replaced**.

2-7 Gas Supply

Danger: Make sure the gas on which the boiler will operate is the same as that specified on the boiler rating plate (natural gas/propane).

The gas line should be a separate line running directly from the gas meter to the unit, unless the existing gas line is of ample capacity. Verify the capacity of the existing gas piping if it is to be used.

The gas pipe must have a sediment trap ahead of the boiler connection controls and a manual shut – off valve (one set for each fuel source if using an Atlas Combination Fuel Unit) located outside the boiler cabinet. It is highly recommended that a union be installed in the gas supply line adjacent to the boiler for serving (see diagram below). The maximum working gas pressure for both natural gas and propane is 14" w.c. Keep in mind that an increase the gas pressure, without making additional adjustments, leads to an increased BTU input and a decreased efficiency.

Caution: If the gas pressures exceed 14" w.c., a gas pressure regulator must be installed prior to the gas connection to reduce the supply pressure.

WARNING: A sediment trap MUST be installed on the gas piping for each gas line.

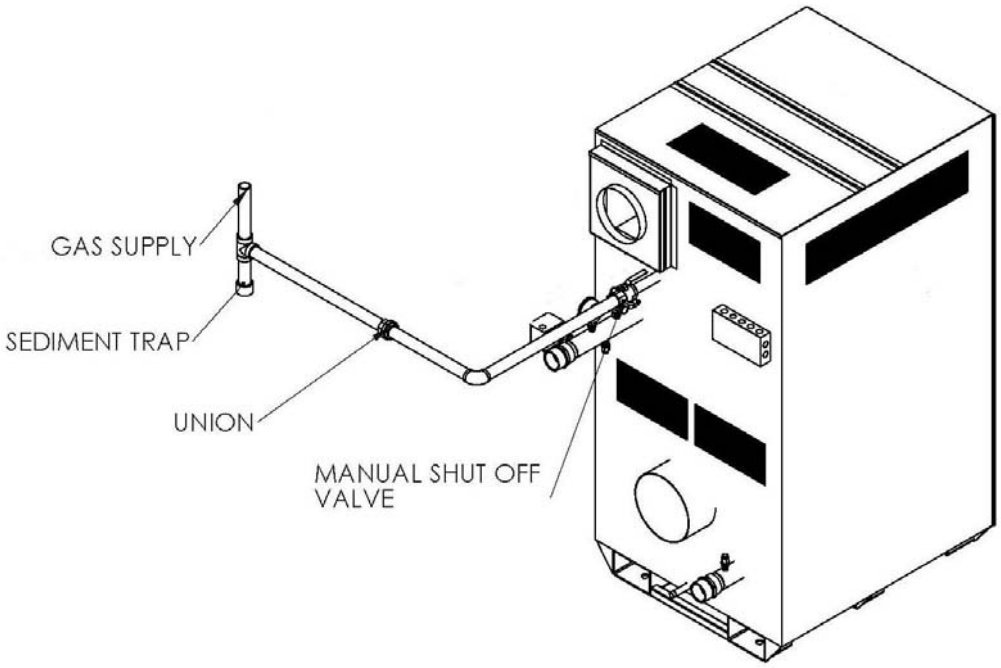


Figure 2.4. Suggested Single Fuel Atlas Gas Piping

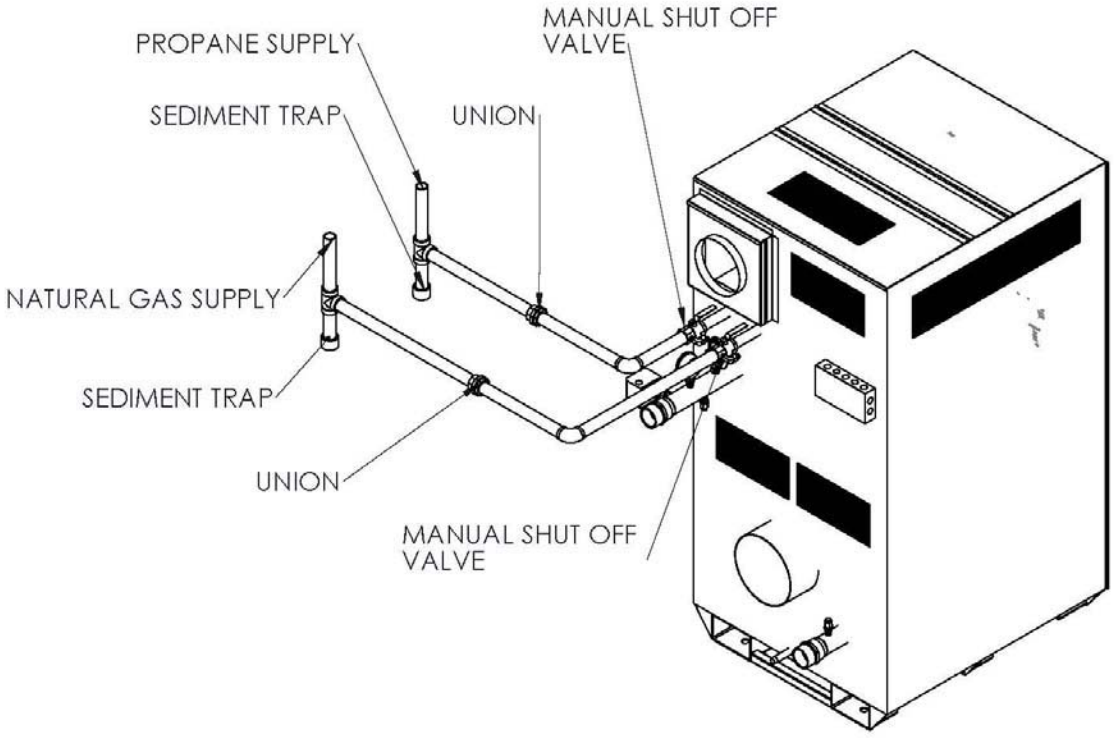


Figure 2.5. Suggested Dual Fuel Atlas Gas Piping

Testing Gas Line

Caution: The boiler must be disconnected from the gas supply during any pressure testing of the gas supply at test pressures in excess of ½ psi (14" w.c.).

WARNING: The boiler must be isolated from the gas supply piping system by closing the upstream manual shut – off valve during any pressure testing of the gas supply system at test pressures equal to or more than ½ psi (14" w.c.). Relieve the pressure in the gas supply line prior to reconnecting the boiler and its manual shut off valve to the gas supply line. Failure to follow this procedure may damage the gas valve. Gas valves damaged by high gas pressures are not covered by the warranty. The boiler and its gas connections must be tested for leaks before operation of the units.

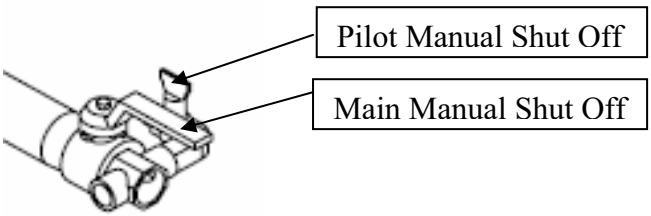


Figure 2.6. Manual Shut-Off Valve

Caution: Do not use Teflon tape on gas line thread. A pipe compound rated for natural and propane gases are recommended. Apply sparingly only on the male pipe ends, leaving the two end threads bare.

Gas Pressure Supply

Input may decrease if gas pressure falls below these values. The maximum gas supply pressure is 14" w.c. for all Atlas units. If gas pressure exceeds 14" w.c an intermediate gas pressure regulator of the lockup type must be installed. If gas pressures less than those provided below are used, input may be decreased.

	A050	A075	A100	A150	A200	A250	A300
Natural Gas	5"	5"	5"	5"	7"	7"	9"
Propane	5"	5"	7"	7"	9"	9"	9"

Table 2.2 Required Gas Pressure Supply

When connecting additional gas utilization equipment to the gas piping, the existing piping must be checked to determine if it is adequate for the combined load.

2-8 Pump Installation

Caution: The supplied pump installation and maintenance manual must be read and followed before installation or wiring pumps. If pump installation instructions in this O&M differ from Wilo Top Z O&M, the Wilo O&M shall supersede these instructions.

Warning: Electrical Shock Hazard!
1) Electrical work must be done by qualified electricians only.
2) National Electrical codes, local codes and regulations must be followed.
3) All electrical connections must be performed after the electrical supply has been switched off and secured against unauthorized switching.

Warning: Depending on installation, the pump/motor can become extremely hot. To avoid risk of burning, handle pump with heat resistant gloves or ensure the pump is cool before handling the pump.

Caution: Never operate the pump dry, the system must be filled before starting the pump. Ensure all isolation valves are open before start up.

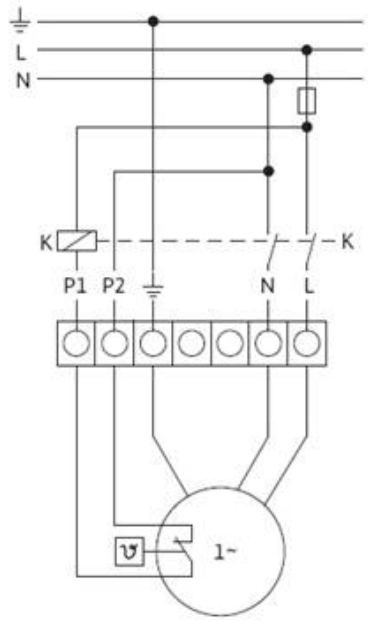
An optional pump can be ordered through Ace sized for the boiler. If a pump is ordered, a Wilo Top Z 2x30 single phase, Bronze, Lead free pump will be supplied. Flange kits are also provided with the pump to fit the boiler connection sizes. Pumps flange kits for A050-A150 include two 2" flange kits. Pumps flange kits for A200-A300 include 2 ½" flange kits. The same pump will be used on for all Atlas units, but power setting will changed for different size boilers. The setting will be preset from factory, but can be checked by opening the terminal box on the pump. The A050-A150 should be set on the "MIN" setting and the A200-A300 should be set for "MAX" setting. Please refer to the supplied WILO Installation Manual for more detail.

Pump Overload Protection

A fused plug or circuit breaker in the power line is required.

The pump must be connected to the electrical supply via an external contactor/relay to provide thermal overload protection. The contactor/relay must be connected to the built-in **thermal overload switch terminals P1 and P2** (potential-free normally closed contact, contact load 250 VAC/1A) to protect the pump against thermal overloading at all speeds.

If the pump is protected by means of a motor starter, the starter must be set to the current consumption of the pump at the selected speed. The motor starter setting must be changed every time the pump speed is changed. The current consumption at the individual speeds is stated on the pump rating plate.



Note: The pump must be connected to the electrical supply via an external contactor to provide thermal overload protection.

2-9 Electrical Connections

Installations must follow these codes

- National Electric Code and any other national, state, provincial or local codes or regulations having jurisdiction
- Safety wiring must be NEC class 1.
- Boiler must be grounded as required by the NEC ANSI/NFPA 70.
- In Canada, CSA C22.1 C.E.C. Part 1.

The Atlas A050 – A100 boilers are wired for 120 VAC, 10 amps, while models A150 – A300 are wired for 120 VAC, 15 amps, although the units current will usually be much lower. Before starting the boiler, check to ensure proper voltage is supplied to the boiler and pump (if supplied).

For multiple unit installations, each unit is to be wired in parallel with other units so that each unit will operate independently.

The circulating pump (and the return pump if used) should be wired in parallel with the unit(s) to run independently of the unit.

If any of the original wiring as supplied with the unit is replaced, it must be replaced with 16 AWG, 105° C. wire or its equivalent.

Check the Power Source

Warning: Using a multi–meter, check the following voltages at the circuit breaker panel prior to connecting any equipment. Make sure proper polarity is followed and house ground is proved. (See below)

AC = 108 VAC Minimum, 132 VAC Max; AB = 108 VAC Minimum, 132 VAC Max; BC = <1 VAC Max

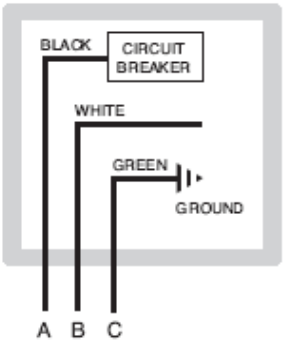


Figure 2.7. Circuit Breaker Diagram

Making the Electrical Connections

Verify that the circuit breaker is properly sized by referring to the boiler rating plate. A dedicated circuit breaker should be provided.

Note: Current draw on rating plate does not include pump current.

Turn off all power to the boiler. Verify that power has been turned off by testing with a multi meter prior to working with any electrical connections or components.

Observe proper wire colors while making electrical connections. Many electronic controls are polarity sensitive. Components damaged by improper electrical installation are not covered by warranty.

Provide overload protection and a disconnect means for equipment serviceability as required by local and state code.

Install boiler controls, thermostats, or building management systems in accordance with the applicable manufacturers' instructions.

Conduit should not be used as the earth ground.

Note: A grounding electrode conductor shall be used to connect the equipment grounding conductors, the equipment enclosures, and the grounded service conductor to the grounding electrode.

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

Danger: Shock Hazard: Make sure electrical power to boiler is disconnected to avoid potential serious injury or damage to components.

Figure 2.8. Atlas Field Wiring Box

2-10 DHW/CH Installation and Programming

Your Atlas Boiler is preprogrammed from the factory for Domestic Hot Water or Central Heating Application. Three different panel options are available: Basic Panel, Enhanced Panel, System Operator Interface Panel (reference pictures below). Installation and settings vary depending on the two programming modes and the display panel chosen.

Basic Panel

Enhanced Panel

2-10.1 Domestic Hot Water Mode

The Domestic Hot Water Programming option comes standard with three temperature sensors: one installed on the inlet, one installed on the outlet of the boiler, and one (two wire single safety sensor) shipped loose to be installed on the storage tank. The tank sensor should be installed on the tank in an immersion well. For faster heat transfer, or if the well is not a snug fit on the sensor, use of heat conductive compound is suggested. Sensor wires can be extended with 22AWG shield cable up to 50 feet.

Modulation sensor

The Domestic Hot Water mode is designed to modulate the boiler to maintain the setpoint of the storage tank. If the tank sensor cannot be installed, it is optional to operate the boiler using the factory installed inlet temperature sensor. The Controller's parameters can be changed using the Enhanced panel or the System Operator Interface panel. To adjust to the proper settings, see section 4-20 for more information.

2-10.2 Central Heating Mode

Central Heating Mode also comes standard with three temperature sensors: one installed on the inlet, one installed on the outlet, and one (two wire single safety sensor) outdoor temperature sensor shipped loose.

Modulation sensor

In Central Heating Mode, by default, outlet sensor is chosen as the modulation sensor. Boiler will modulate to maintain outlet temperature at setpoint. The modulation sensor for Central Heating can be changed to inlet or header sensor, using the Enhanced panel or the System Operator Interface panel, see section 4-18 for more information.

Outdoor reset

Outdoor reset algorithm will be disabled from the factory. To enable reset function using the Basic Panel, see section 3-5. For Enhanced panel instructions, see section 4-19 for more details. The outdoor temperature sensor should be installed in a shady location and away from vents. Sensor wires can be extended with 22AWG shield cable up to 50 feet.

2-10.3 4–20 mA Remote Setpoint

Remote setpoint control will be enabled from the factory with default setting of 40^0F for 4 mA and 200^0F for 20 mA. When the remote signal is connected to the boiler, setpoint is provided using the linear interpolation of the 4 mA and 20 mA input signal from the building automation controller. If the signal is disconnected, the boiler will automatically use the local setpoint as operating setpoint. 4-20 mA setpoint range can be changed using the Enhanced panel or the System Operator Interface panel, see section 4-21 for parameters.

For other related parameter and functions see chapter 4 for details.

2-11 Lead Lag Installation and Programming

Atlas A Boiler comes standard with embedded lead lag control. Lead lag function is disabled from the factory but can be enabled with programming covered in this section. Also, necessary wiring connection must be completed before Lead Lag System can operate.

Each unit contains the ability to be a standalone boiler or to operate as a part of lead lag system. Lead lag master will send messages through the communication port to add or drop stage as well as send its firing rate and check slave status.

Lead lag master will command its slaves to maintain the system header temperature (common outlet connection of all boilers in the system). The sensor must be installed on pipe with immersion well and should be installed on the pipe with system flow. Flow on each boiler should be adjusted to assure all boilers in the system have same flow rates.

2-11.1 Sensor Wiring

Lead lag master's multipurpose S5 sensor (Terminals H1 & H2) is used to read system header temperature. If the lead lag master's system header sensor fails for any reason, the lead lag master will use the average outlet temperature of the lead lag slaves currently firing.

If lead lag system uses outdoor reset, outdoor sensor can be connected to one of any slave's multipurpose S5 sensor (Terminals H1 & H2). Lead lag master will automatically use this input as outdoor temperature.

Use the single element NTC sensor (Ace PN: CAA198799Z) for header and outdoor sensor.

2-12 Lead Lag Operation

2-12.1 Sequencing

Factory default setting for sequencing is *Equal Runtime Algorithm* where boilers will be sequenced according to a runtime. Boiler with lower runtime will fire first to equalize the run time of all boilers in the system.

2-12.2 Rate Allocation Control

Factory default setting for rate allocation is the *Parallel Common Base Limited Rate Allocation* method to modulate the slave boilers. The method will limit the firing rate of all slave stages to the *Common Base Load Rate* (default 40%) until all stages are firing. Once all units are firing, there is no restriction on the slave's commanded firing rate. As load decreases, as long as all available stages are firing, there are no restrictions on

the slave's commanded firing rate. If at least one stage has been dropped, no stage is requested to exceed the *Common Base Load Rate*.

2-12.3 Add Stage Method

Factory default setting for adding a stage is *Error Threshold* method. A stage is added when the error becomes excessive based on the degrees away from setpoint and time. Add stage condition will occur when the modulating slaves are at their maximum rate per the rate allocation rules (base load rate or maximum firing rate) and header sensor is reading below the lead lag setpoint by amount greater than or equal to the *Add Stage Error Threshold* (Default 5F). Condition will have to continue for *Add Stage Interstate Delay* (Default 30 seconds) before stage can be added.

2-12.4 Drop Stage Method

Factory default setting for dropping stage is *Rate Threshold.* A drop stage condition will occur when the last stage is at the minimum modulation rate. Condition will have to continue for *Drop Stage Interstate Delay* (Default 30 seconds) before stage can be dropped.

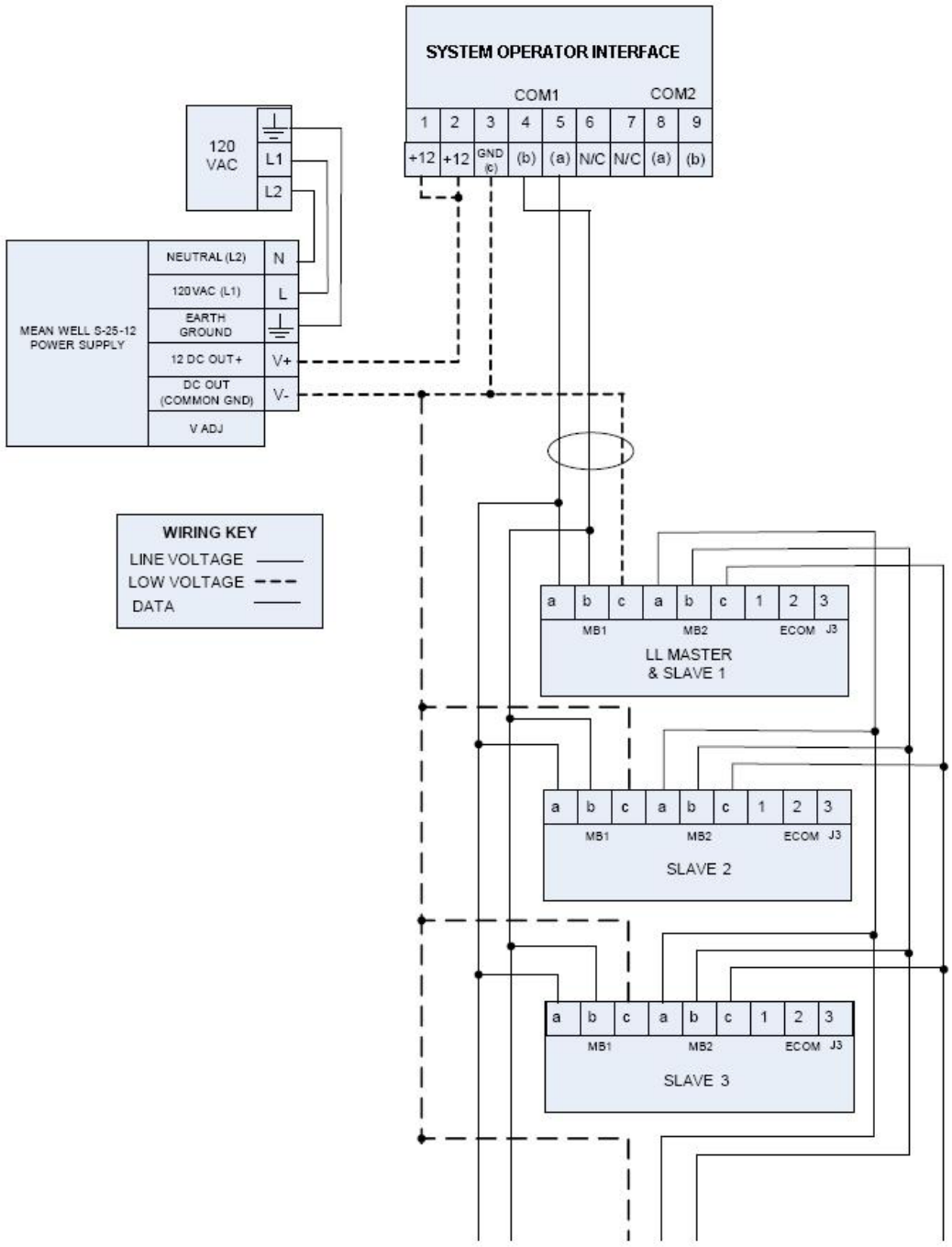
2-13 System Integrator Display Wiring and Lead Lag Bus Wiring

2-13.1 System Integrator Display Wiring

System operator interface panel will be preassembled from the factory with the 12V power supply. Installer will need to wire 120VAC and RS-485 communication connections.

Display communication is done over MB1 RS-485 bus on each boiler (MB1 A, B, and C Terminals on Honeywell Controller). Daisy chain network wiring to MB1 terminals is required if display is used with multiple boilers.

SYSTEM WIRING HOOKUP



System Operator Display with Lead Lag Slaves

2-13.2 Modbus Address Programming

Each boiler on the daisy chain network must have a unique address. Go to Section 3 for instructions to change modbus address using Basic Panel or Section 4 with Enhanced display or System integrator display.

2-13.3 Lead Lag Bus Wiring

Lead lag system function is communicated on the dedicated MB2 RS-485 bus on each boiler (MB2 A, B and C Terminals on Honeywell Controller) from the lead lag master to the slaves.

Daisy chain network wiring to MB2 terminals to each boiler is required.

Note Do not connect the System Operator Interface Panel to 1, 2 and 3 terminals on the green plug. This will render the display inoperable.

2-13.4 Enable Lead Lag Master

The lead lag system master is a software service that is hosted by and built in to every controller. This means any one boiler in the system can become the lead lag master.

Boiler with header sensor connected to multipurpose S5 sensor should be enabled as lead lag master.

2-13.5 Enable Lead Lag Master Using Basic Panel

1. Enter Service Mode by pressing both up/down buttons for 3 seconds.
2. Continue scrolling through set-up screen until "**LL**" is displayed on the screen.
3. Select "**Ldr**" and press enter button to enable the boiler to run lead lag master software and as one of lead lag slave boiler.

2-13.6 Enable Lead Lag Master Using Enhanced or System Operator Interface Panel

1. Refer to section 5-14 for instructions.

2-13.7 Enable Lead Lag Slave

All other boilers in the system will be enabled as lead lag slave to allow lead lag to communicate and allow the slave boiler to participate in the lead lag system operation.

2-13.8 Enable Lead Lag Slave Using Basic Panel

1. Enter Service Mode by pressing both up/down buttons for 3 seconds.
2. Continue scrolling through set-up screen until "**LL**" is displayed on the screen.
3. Select "**SLA**" and press the enter button to enable the boiler as one of lead lag slave boiler.

2-13.9 Enable Lead Lag Slave Using Enhanced or System Operator Interface Panel

1. Refer to section 5-13 for instructions.

2-14 Suggested Piping

2-14.1 Suggested Domestic Hot Water Piping Diagrams

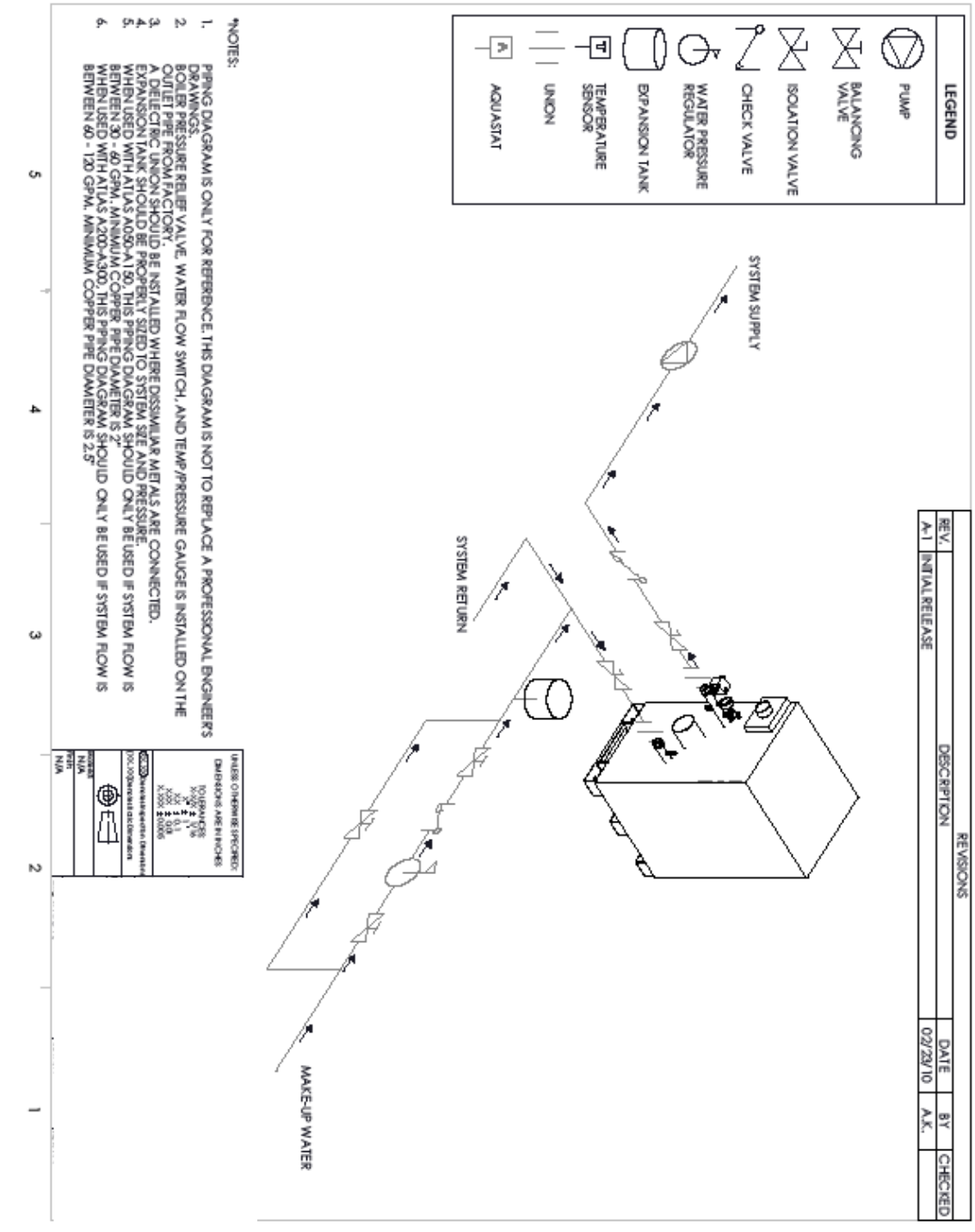


Figure 2.9. Atlas in Primary Loop Piping Diagram

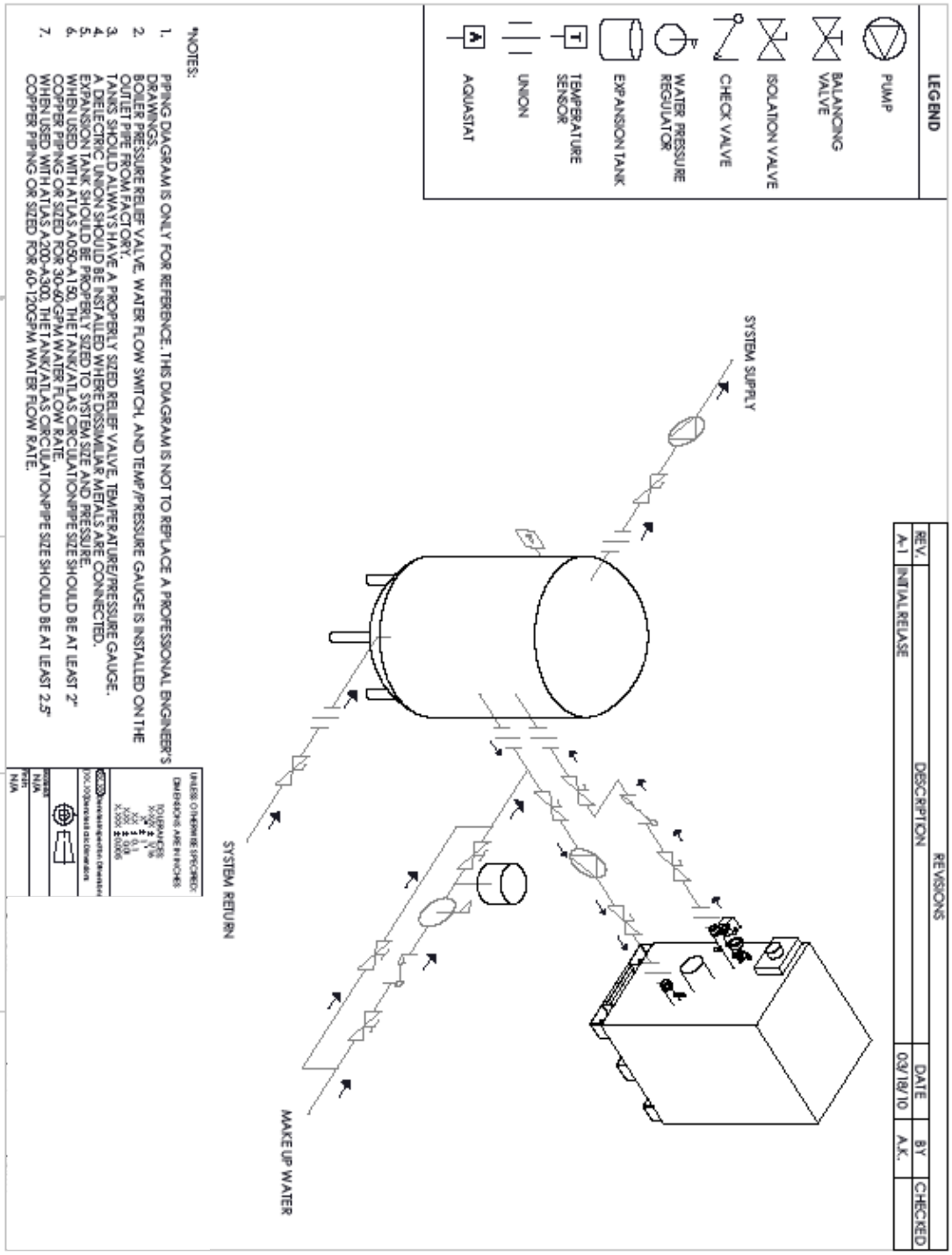


Figure 2.10. One Atlas One Tank Suggest Piping Diagram

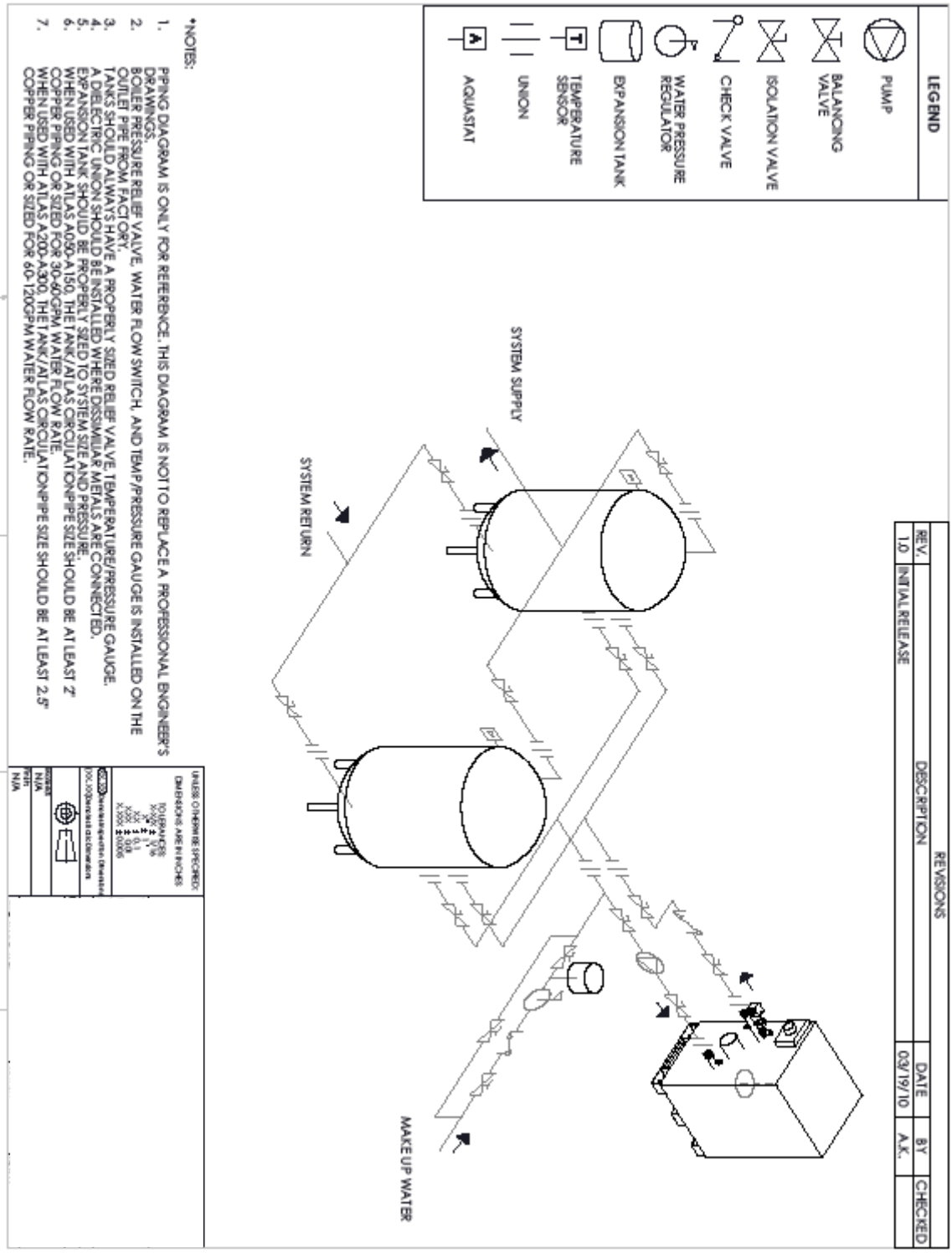


Figure 2.11. One Atlas Two Tank Piping Diagram

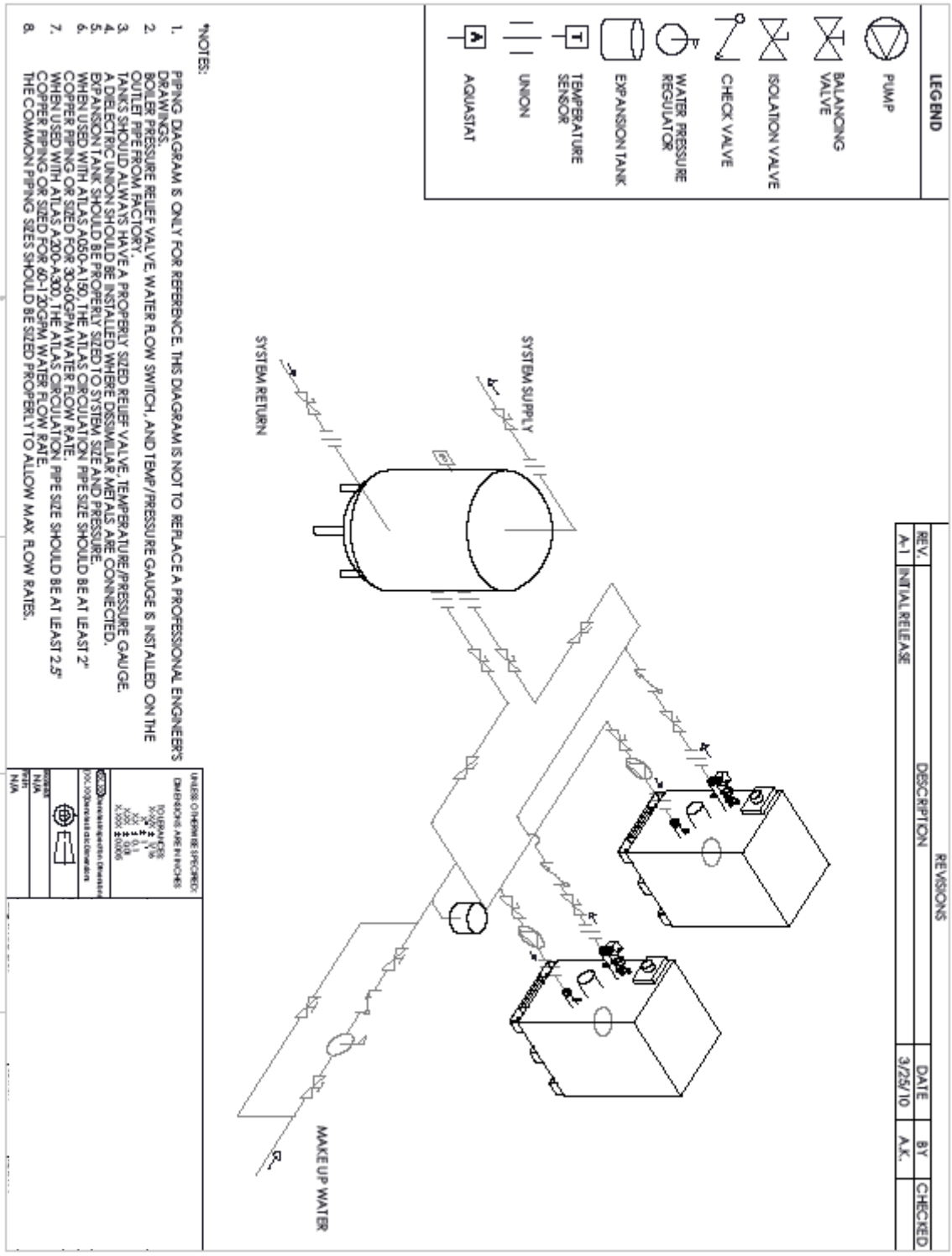


Figure 2.12. Two Atlas One Tank Piping Diagram

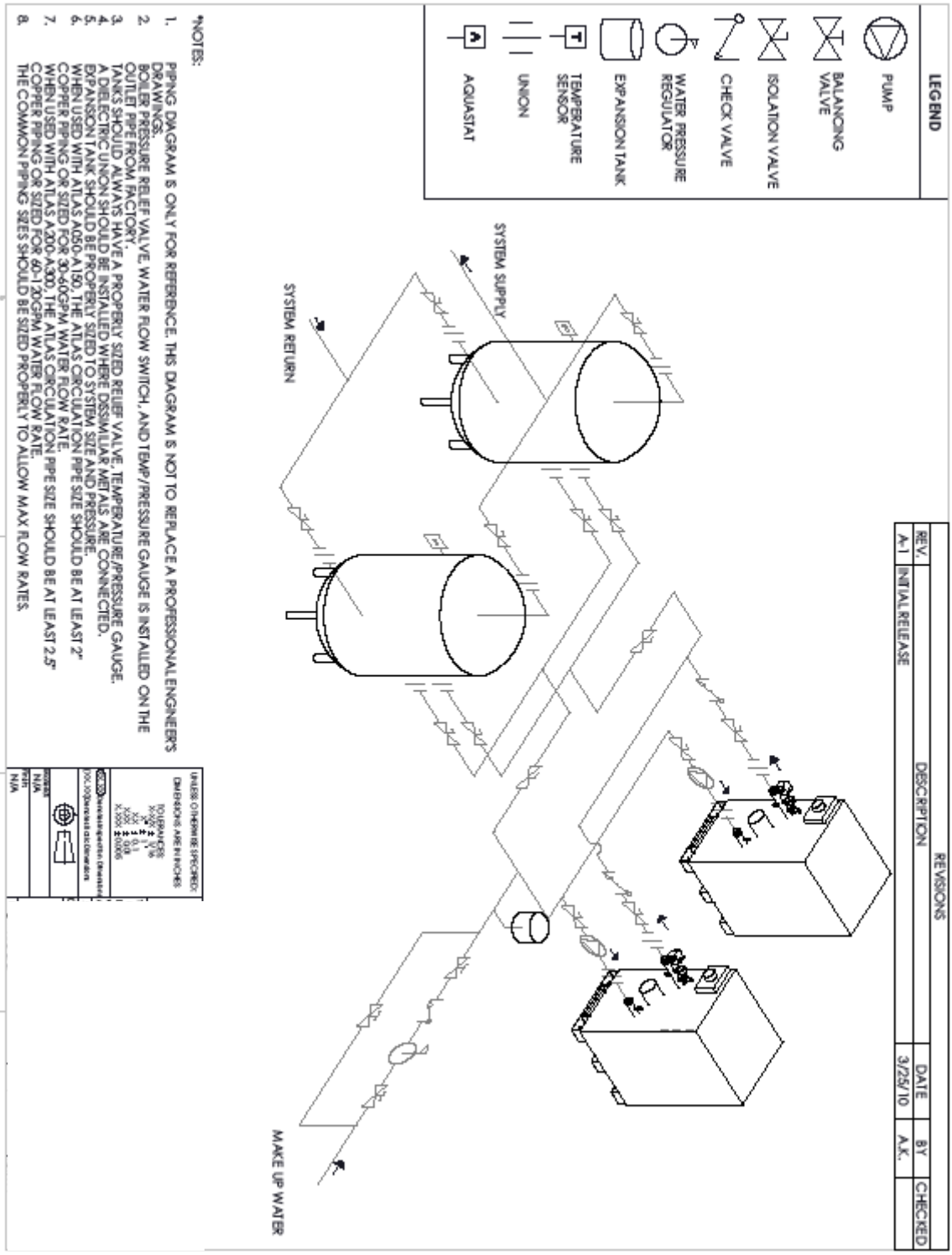


Figure 2.13. Two Atlas Two Tank Piping Diagram

2-14.2 Suggested Central Heating Piping Diagrams

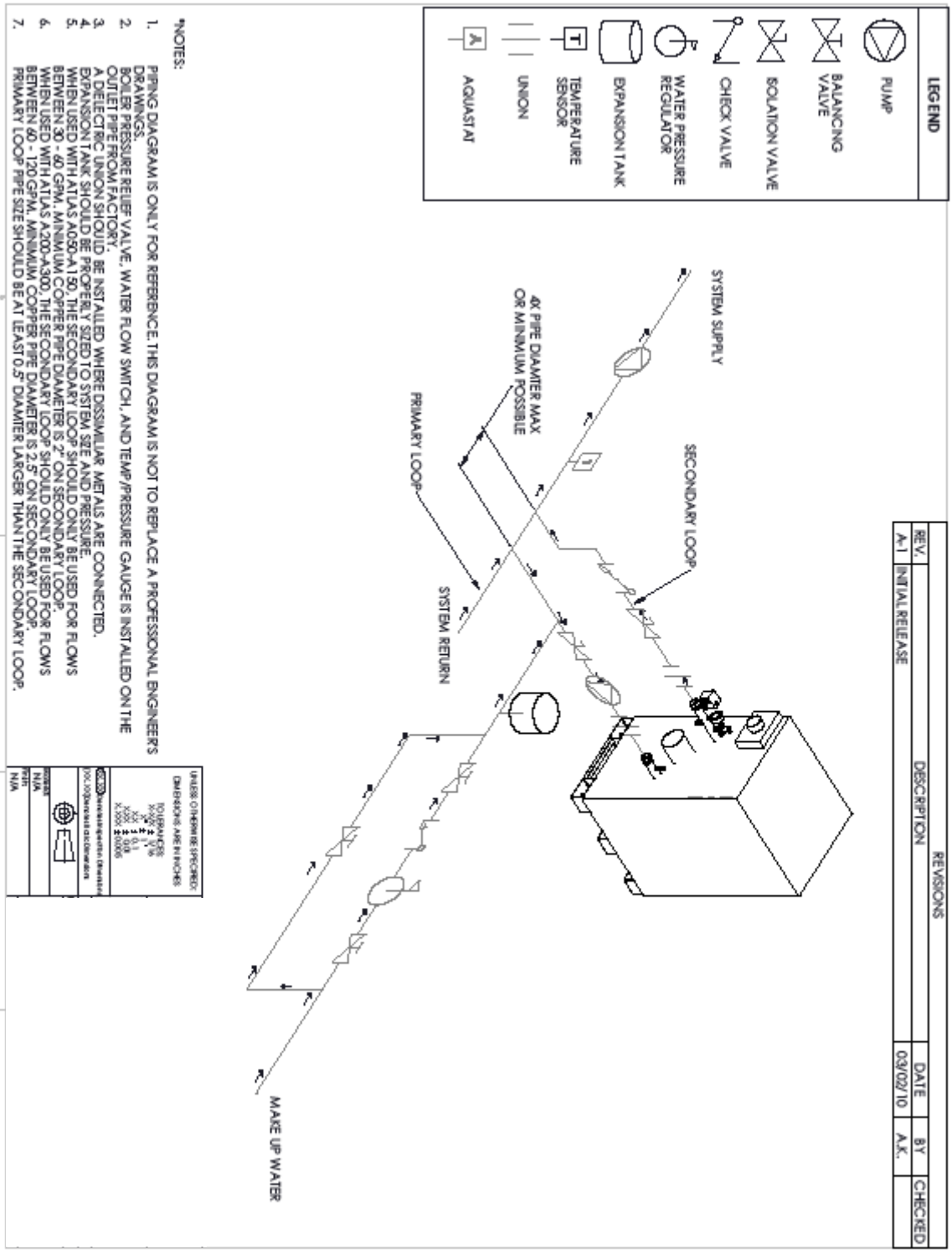


Figure 2.14. Atlas Primary Secondary Loop Piping Diagram

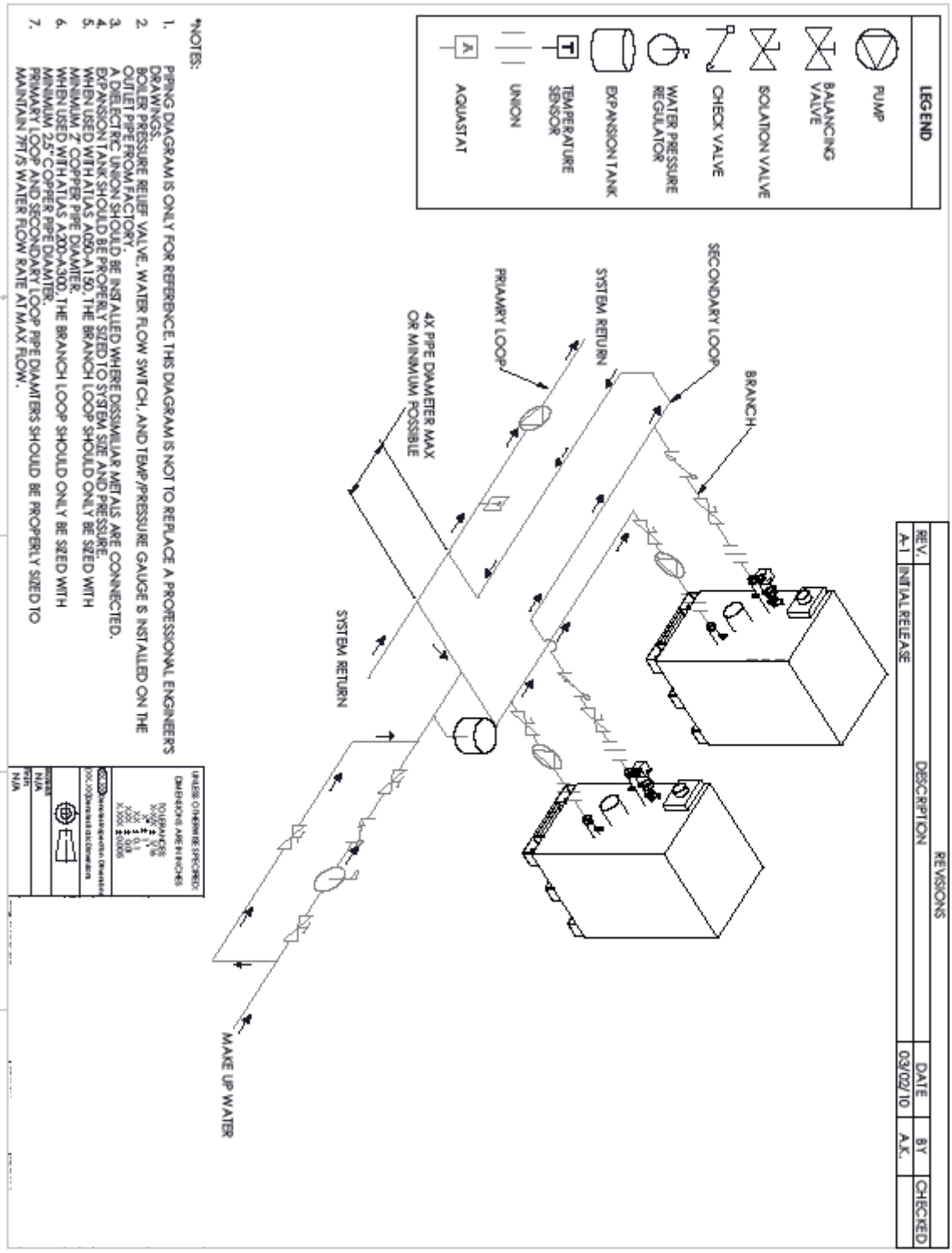


Figure 2.15. Two Atlas in Primary Secondary Loop Piping Diagram

3 Basic Panel Operating Procedures

3-1 Introduction

The information in this Chapter provides a guide to the operation of the boiler using the **Basic Panel** mounted on the front of the unit. It is imperative that the initial startup of this unit be performed by factory trained personnel. **Operation prior to initial startup by factory trained personnel will void the equipment warranty**. In addition, the following **WARNINGS** and **CAUTIONS** must be observed at all times.

CAUTION: All of the installation procedures in previous chapters must be completed before attempting to start the unit.

WARNING: ELECTRICAL VOLTAGES IN THIS SYSTEM MAY INCLUDE 120 AND 24 VOLTS AC. IT MUST BE SERVICED ONLY BY FACTORY CERTIFIED SERVICE TECHNICIANS

WARNING: DO NOT ATTEMPT TO DRY FIRE THE BOILER. MAKE SURE PROPER WATER FLOW IS SUPPLIED TO THE COIL. STARTING THE UNIT WITHOUT WATER CIRCULATION CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN INJURY TO PERSONNEL OR PROPERTY DAMAGE. **THIS SITUATION WILL VOID ANY WARRANTY**.

3-2 Basic Panel Description

The Basic panel shown in **Figure 3.1** contains all of the controls, indications necessary to operate, adjust and troubleshoot the boiler. Additional information on these items is provided in the individual operating procedures provided in this Chapter.

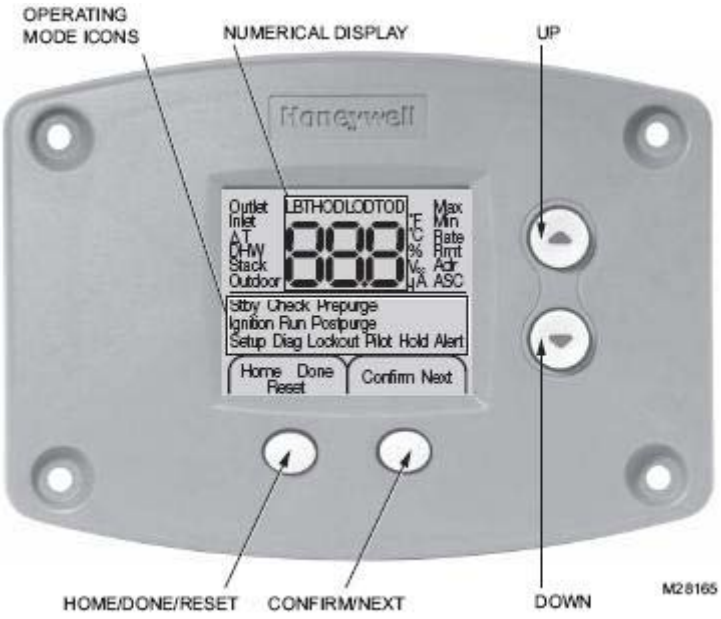


Figure 3.1 – Basic Panel Front View

3-3 Operation

All data from the Basic Panel is displayed on an LCD with backlight.

The LCD has two main zones:

- **Numerical Display** contains numbers (Temperatures in degrees, firing rate in percentages).
- **Operating Mode Icons** indicate what mode the Unit is in.

The Basic Panel includes four keys. The bottom two keys vary depending on what commands are displayed above them. The two keys on the right adjust the displayed information.
Three operation modes are available: **User Mode**, **Setup Mode**, and **Diagnostic Mode**.

3-4 User Mode

In User Mode, the Basic Panel displays operating data of the unit such as Outlet temperature, CH setpoint, or boiler firing rate. The user can change screens by pressing the **Next** button. Depending on unit's mode of operation, the Basic Panel distinguishes between two home screens:

- If CH call for heat is active, the Basic Panel considers Outlet temperature to be the home screen.
- If DHW call for heat is active, then DHW temperature will be the home screen.
- If LL call for heat is active, then Header temperature will be the home screen (If LL enabled).

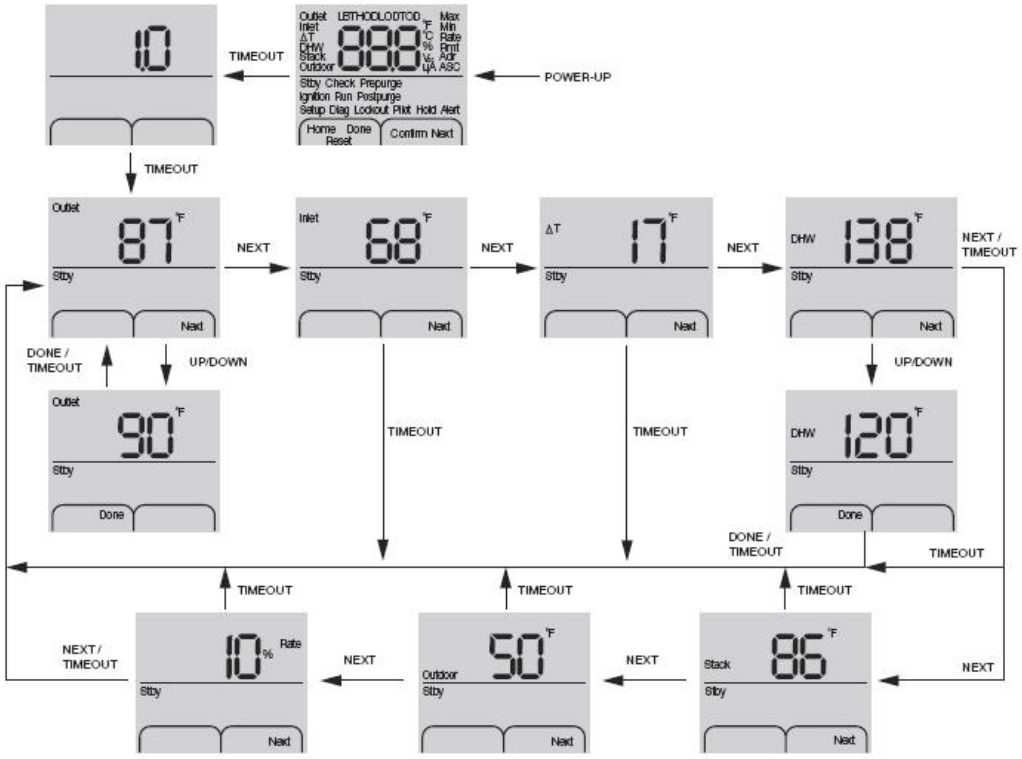


Figure 3.2 - User Mode Screen Flow

User Mode consists of the following items **Table 3.1**.
Pressing the **Next** button progresses through the User Mode screens.

When Outlet, DHW or Header temperature is shown, pressing the **Up** or **Down** button increase or decrease the setpoints. After approximately 10 seconds of user inactivity the Basic Panel times out and switches to the current home screen. Setpoint changes made prior to the timeout will be saved. Pressing the **Done** button after changing a setpoint also saves the new setpoint.

NOTE: When operating in Time-Of-Day (**TOD**) Mode, adjusted setpoint using the Basic Panel will not reflect current operation of the boiler. Boiler will operate to maintain setpoint when TOD is disabled. TOD setpoint can only be adjusted using Enhanced or System Operator Interface Panel.

Symbol	Value	Description
Outlet	**Outlet Temperature or Outlet Setpoint**	Display current outlet temperature and display and modify current Outlet (CH) setpoint temperature
Inlet	**Inlet Temperature**	Display current inlet temperature
∆ T	**Delta Temperature**	Display delta T temperature [outlet] - [inlet]
DHW	**DHW Temperature or DHW Setpoint**	Display current DHW temperature and Display and modify current DHW setpoint temperature (if equipped)
Stack	**Stack Temperature**	Display current stack temperature (if equipped)
Outdoor	**Outdoor Temperature**	Display current outdoor temperature (if equipped)
Rate	**Firing Rate**	Display current boiler firing rate value
Header	**Header Temperature**	Display current Header temperature (If LL enabled)

Table 3.1 – User Mode Descriptions

NOTE: Only install Ace approved temperature sensors with this equipment.

3-5 Setup Mode

Pressing and holding both the **Up** and **Down** simultaneously for 3 seconds from any of the User Mode Screen changes the Basic Panel from User Mode to Setup Mode. The **Setup** icon will be displayed in the Operating Mode portion of the display. The user can change screens by pressing the **Next** button.

NOTE: Entering Setup Mode will put the Honeywell Sola Controller into Standby. If the system is firing, the Honeywell Sola Controller will postpurge and go to Standby. The system will remain in Standby until the **Done** button is pressed or approximately 10 seconds of user inactivity time has elapsed.

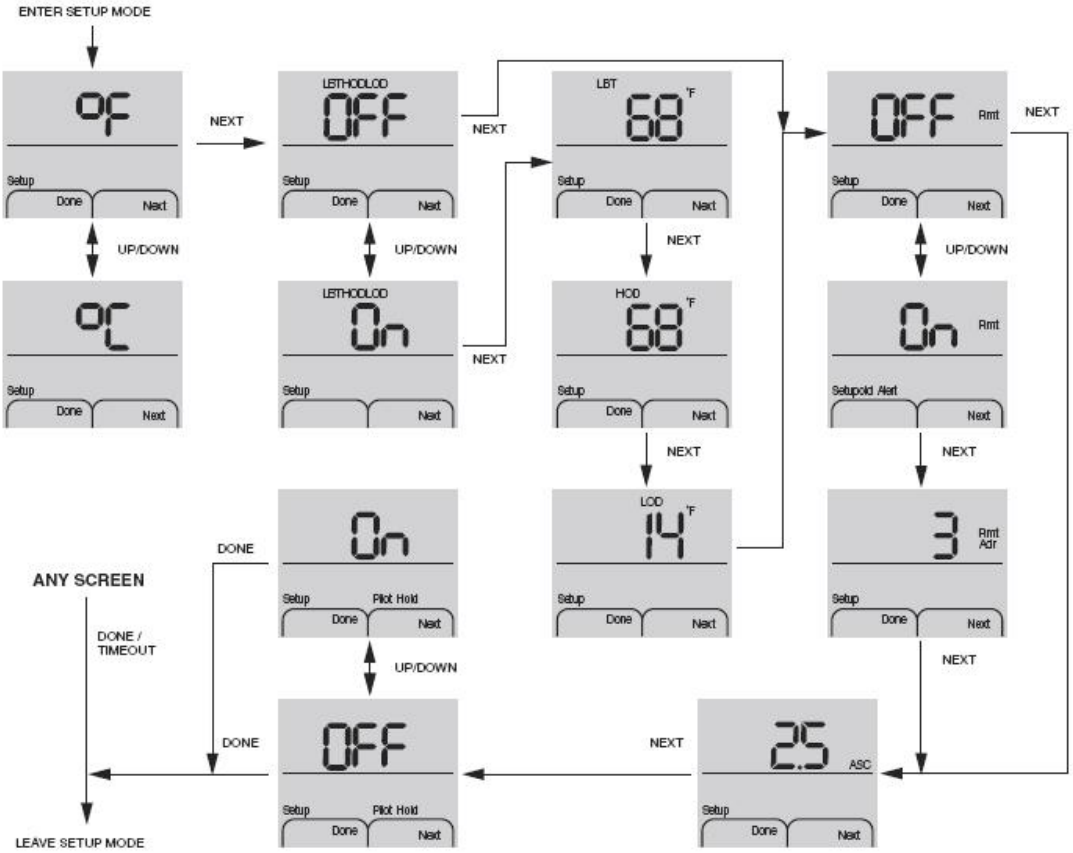


Figure 3.3 - Setup Mode Screen Flow

Setup Mode consists of the following items in **Table 3.2**. Pressing the **Next** button progresses through the Setup Mode screens.

Symbol	Value	Description
°F/°C	**Temperature Unit**	Set display to either degrees Fahrenheit or degrees Celsius.
LBTHODLOD	**Outdoor Reset Parameter**	Display and modify Outdoor Reset feature ON or OFF. If OFF go to Remote Firing Control. If ON go to Low Boiler Reset Temp.
LBT	**CH min water temperature**	Display and modify current **LBT** setpoint temperature.
HOD	**CH max outdoor temperature**	Display and modify current **HOD** setpoint temperature.
LOD	**CH min outdoor temperature**	Display and modify current **LOD** setpoint temperature.
Rmt and Rmt Adr	**Remote Firing Control & Remote Firing Address**	Display and modify current System Interface Monitoring On or OFF. If On, Set Modbus Address (1 to 250).
LL	**Lead Lag Operation**	Display and modify current Lead Lag settings
HS	**Lead Lag Hysteresis**	Display and modify current Lead Lag Hysteresis
BL	**Lead Lag Baseload**	Display and modify current Lead Lag Base load
Sd	**Lead Lag WWSD**	Display and modify current WWSD setpoint
ASC	**Anti Short Cycle**	Display and modify current anti short cycle time.
Pilot Hold	**Pilot Hold**	Display and modify pilot hold feature setting OFF or ON

Table 3.2 – Setup Mode Descriptions

Outdoor Reset
LBTHODLOD icon in the Numerical Display section refers to Outdoor Reset. When Outdoor Reset is **Off**, pressing the **Next** button will move to the **Rmt** icon. When Outdoor Reset is **On**, pressing the **Next** button will move into the **LBT**, **HOD**, and **LOD** displays, which will allow setting of the Low Boiler Reset Temperature, High Outdoor Reset Temperature, and Low Outdoor Reset Temperatures.

Anti Short Cycle
ASC icon in the Numerical Display section refers to Anti Short Cycle. Whenever the burner is turned off due to no demand, the anti short cycle timer is started and the burner remains in a Standby Delay condition waiting for this time to expire. To adjust the time, use the up and down keys to cycle through the time in minutes.

- When Anti Short Cycle is activated **ASC** icon will be displayed Numerical Display.

Pilot Hold
Hold icon in the Numerical Display section refers to Pilot Hold Test. If parameter is enabled, the burner control sequence will hold at 1 second into the Ignition state.

During Pilot Test Hold, a flame-out timer always starts at zero when the Ignition state is entered, then counts up toward 15 seconds while flame is off and down toward zero when flame is on. If it ever reaches 15 seconds of accumulated flame out time then a lockout occurs.

The pilot test hold should be enabled prior to entering Ignition, since changes to parameters may require some seconds to take effect. Similarly, when the hold is disabled the burner control may remain in the hold condition for a short time.

- When Pilot Hold Test is activated **Hold** icon will be displayed Numerical Display.

Lead Lag Operation
Slave Status

- **Rmt** and **Adr** icons are on to show slave (follower) has been enabled.
- Alternate **%** firing rate and actual (slave) Outlet temp to indicate slave CFH otherwise show the Home screen.

Master Status

- **Rmt** icon is on, **Adr** icon is off to show Master (Leader) has been enabled.
- Actual temperature LL (Header) temperature is shown at the end of the list of temperature in the **User Mode**. The **LL** is displayed in the number field and when the next button is pressed again header temperature is shown.
- Pressing the **up**/**down** buttons allows setpoint adjustment for LL-CH.
- Alternate **CH** or **LL** or **Hdr** in numbers field with the actual temperature to indicate LL CH Call for heat.

Lead Lag Configuration
Lead lag configuration parameter can be changed in the **Setup Mode**. Enter Setup Mode and continue scrolling until **Remote Firing Control** screen is reached. The following parameters are mapped to Modbus addresses screen.

LL - Lead Lag Operation
- **Ldr**: Master and slave enabled
- **SLA**: Slave only enabled
- **OFF**: Master and slave disabled

HS – On/Off Hysteresis (value used for all LL boilers)

BL –Baseload Common (User selection for 0 to 100%)

Sd – Warm Weather shut down setpoint

3-6 Diagnostic Mode

Pressing and Holding the **Next** button for 3 seconds from the Outlet screen of User Mode (or DHW screen when boiler is firing from DHW demand) changes the Basic Panel from User Mode to Diagnostic Mode. The **Diag** icon will be displayed in the Operating Mode portion of the display. The user can change screens by pressing the **Next** button. Approximately 5 minutes of user inactivity the Basic Panel times out and returns to initial screen of User Mode.

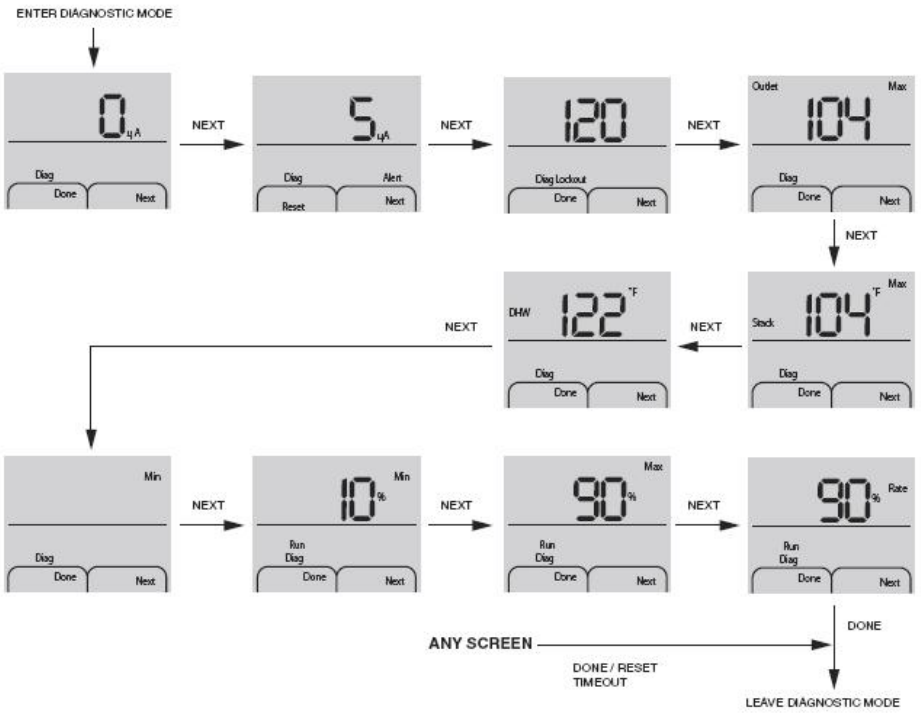


Figure 3.4 - Diagnostic Mode Screen Flow

Diagnostic Mode consists of the following items in **Table 3.3**. Pressing the **Next** button progresses through the Diagnostic Mode screens

Symbol	Value	Description
µA	**Flame Signal**	Display current flame signal strength value in VDC.
Alert	**Alert**	Display last Alert code number (See **Appendix A** for description).
Lockout	**Lockout**	Display last Lockout code number (See **Appendix B** for description).
Outlet	**Outlet Temp High Limit**	Display current outlet temperature high limit setting.
Stack	**Stack Temp High Limit**	Display current stack temperature high limit setting (if supplied with unit).
DHW	**DHW Temp High Limit**	Display current DHW temperature high limit setting (if supplied with unit).
Min & Max	**Firing Rate Adjustment**	Display and modify boiler firing rate value.

Table 3.3 – Diagnostic Mode Description

Alerts
Alerts are abnormal events that do not require manual intervention to reset the Honeywell Sola Controller. Alerts can be faults from non safety functions. The last received Alert number is displayed with the **Diag** icon. Pressing the **Reset** button clears the Alert number.

Lockouts
Lockouts cause the Honeywell Sola Controller to shutdown and require manual or remote reset to clear the lockout. Lockouts always cause the Alarm contacts to close. The last received Lockout number is displayed with the **Diag** icon. Pressing the **Reset** button clears the Lockout number and resets the Honeywell Sola Controller.

Firing Rate Adjustment — Initial Screen
The **Min** icon is displayed with the **Diag** icon. This screen indicates that the Honeywell Sola Controller is going to enter firing rate adjustment mode. Pressing the **Next** button forces the Honeywell Sola Controller to enter the state where all calls for heat are ignored and the Basic Panel switches to the next screen of the Diagnostic Mode.

Firing Rate Adjustment — Minimum Rate
The **Min** icon is flashing and the **Diag** icon is solid. In this mode a demand is sent to the Honeywell Sola Controller and is forced to run at 10% of firing rate. The Firing Rate value display is alternated with the Outlet Temperature display. After a certain period of user inactivity or when the **Done** button is pressed, the Honeywell Sola Controller is forced to accept all calls for heat and the Basic Panel leaves the Diagnostic Mode and switches to the User Mode's current home screen. If the **Next** button is pressed, it causes Basic Panel to display the next screen of the Diagnostic Mode.

Firing Rate Adjustment — Maximum Rate
The **Max** icon is flashing and the **Diag** icon is solid. In this mode a demand is sent to the Honeywell Sola Controller and is forced to run at 90% of firing rate. The Firing Rate value display is alternated with the Outlet Temperature display. After a certain period of user inactivity or when the **Done** button is pressed, the Honeywell Sola Controller is forced to accept all calls for heat and the Basic Panel leaves the Diagnostic Mode and switches to the User Mode's current home screen. If the **Next** button is pressed, it causes Basic Panel to display the next screen of the Diagnostic Mode.

Firing Rate Adjustment — Manual Rate
The **Rate** icon is flashing and the **Diag** icon is solid. In this mode a demand is sent to the Honeywell Sola Controller and is forced to run at 90% of firing rate. The Firing Rate value display is alternated with the Outlet Temperature display. Pressing the **Up** or **Down** buttons changes the displayed firing rate value in 1% increments within a range 10% to 90%. After certain period of user inactivity or when the **Done** button is pressed, the Honeywell Sola Controller is forced to accept all calls for heat and the Basic Panel leaves the Diagnostic Mode and switches to the User Mode's current home screen.

3-7 Error Mode

Hold
A Hold Code is displayed in the numerical part of the display when a Hold state is received. Burner state sequence icons reflect the current state of the Honeywell Sola Controller. There is no way to leave this state through user intervention on the Basic Panel.

Lockout
A Lockout code is displayed in the numerical part of the display when a Lockout state is received. When the **Reset** button is pressed, the Honeywell Sola Controller is forced to leave the Lockout state.

Communication Timeout
Alert code **981** is displayed as Basic Panel internal Alert when the Honeywell Sola Controller repeatedly does not respond to message queries sent by the Basic Panel.

3-8 Honeywell Sola Controller Start Sequence

When the Panel Burner Cutoff switch is set to the **ON** position, Honeywell Sola Controller checks all prepurge safety switches to ensure they are closed.

NOTE: Hold code along with **Hold** icon will be displayed on the Basic Panel when unit is in Hold state. Refer to **APPENDIX A – TROUBLESHOOTING AND HOLD/LOCKOUT CODE** for help.

Standard Interlock switches include:
- Burner Cutoff Switch
- High Gas Pressure Switch (if supplied with unit, standard on A300)
- Low Gas Pressure Switch (if supplied with unit, standard on A300)
- Blocked Drain Switch
- Water Flow Switch
- Air Flow Switch

Additional Interlock terminals supplied for field integration include:
- Recycle Interlock: Recycle interlocks typically include all the limits that cause a burner to hold or recycle. The burner will not fire if the recycle interlock input is open. If recycle interlock is opened during a burner run cycle, the system will return to standby.
- Delayed/Lockout Interlock: Delayed/Lockout interlocks must close within some seconds after demand is present during prepurge. This limit will cause a burner to lockout if the interlock opens during a run cycle on A300 only.

NOTE: Additional Interlocks terminals supplied for field integration are located in the Field Wiring Box placed in the rear of the unit. Remove the jumper installed from the factory to enable interlocks.

When all of the above interlock switches, including Pre-Ignition and Recycle Interlocks are closed, only the light on the Burner Cutoff switch would be on at this time and the boiler will be in the Standby mode.

When there is a demand for heat from Central Heating or DHW, following events will occur:

- Appropriate pump contact is closed to energize the boiler circulation pump.
- Blower relay energizes and turns on the Combustion Blower and the Auxiliary Blower.
- Combustion Air Flow switch close and combustion blower drives to prepurge speed.
- Prepurge rate is verified with blower feedback signal and initiates **7** second prepurge.
- After prepurge is completed, Combustion blower drives to light off rate.
- After light off rate is verified, **10** second PFEP (Pilot Flame Establishment Period) is initiated.
- During first half of PFEP, pilot valve solenoid and spark transformer are both energized.
- Spark transformer is de energized during second half of PFEP and only pilot valve is energized.
- When pilot flame is proofed, **4** second MFEP (Main Flame Establishment Period) is initiated.
- During MFEP, Main Safety Shutoff Valve and pilot valve solenoids are energized and firing rate is held at light off rate.
- After MFEP, pilot valve is de energized and main burner modulates its firing rate according to load demand.

When desired temperature is achieved, following events will occur:

- Main Safety Shutoff Valves are de-energized and Combustion Blower drives to postpurge rate and initiates **15** second postpurge.
- After postpurge, boiler will be in the Standby mode.

- Pump contact stays closed for **1** minute (configurable through Enhanced or System Operator Interface Panel) for boiler circulation pump to remove residual heat from heat exchanger.

3-9 Start/Stop Levels

Start/Stop levels are controlled by setpoint, On and Off Hysteresis. Central Heating and DHW have its own setpoint, On Off Hystersis.

Default Central Heating On and Off Hysteresis are set at **7ºF**.
Default DHW On and Off Hysteresis are set at **7ºF**.

Example
Central Heating setpoint is set at **180ºF**
Boiler starts at **173ºF** (setpoint – On Hysteresis) and stops at **187ºF** (setpoint + Off Hysteresis)

DHW setpoint is set at **140ºF**
Boiler starts at **133ºF** (Setpoint – On Hysteresis) and stops at **147ºF** (setpoint + Off Hysteresis)

3-10 High Limit Setpoint

Default Outlet high limit is factory set at **240ºF for H Stamp and 200ºF for HLW Stamp.**

Outlet and DHW high limit setpoint can be changed using Enhanced or System Operator Interface Panel. Refer to **5-6 HIGH LIMIT RELATED CONFIGURATION**

4 Enhanced/System Operator Interface Panel Operating Procedures

4-1 Introduction

The information in this Chapter provides a guide to the operation of the boiler using the **Enhanced Panel** or **System Operator Interface Panel**. It is imperative that the initial startup of this unit be performed by factory trained personnel. **Operation prior to initial startup by factory trained personnel will void the equipment warranty**. In addition, the following **WARNINGS** and **CAUTIONS** must be observed at all times.

CAUTION: All of the installation procedures in previous chapters must be completed before attempting to start the unit.

WARNING: ELECTRICAL VOLTAGES IN THIS SYSTEM MAY INCLUDE 120 AND 24 VOLTS AC. IT MUST BE SERVICED ONLY BY FACTORY CERTIFIED SERVICE TECHNICIANS

WARNING: DO NOT ATTEMPT TO DRY FIRE THE BOILER. MAKE SURE PROPER WATER FLOW IS SUPPLIED TO THE COIL. STARTING THE UNIT WITHOUT WATER CIRCULATION CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN INJURY TO PERSONNEL OR PROPERTY DAMAGE. **THIS SITUATION WILL VOID ANY WARRANTY**.

4-2 Enhanced Panel And System Operator Interface Panel Description

The Enhanced and System Operator Interface Display Panel shown in **Figure 4.1** is a microprocessor-based touch-screen display module. Additional information on these items is provided in the individual operating procedures provided in this Chapter.

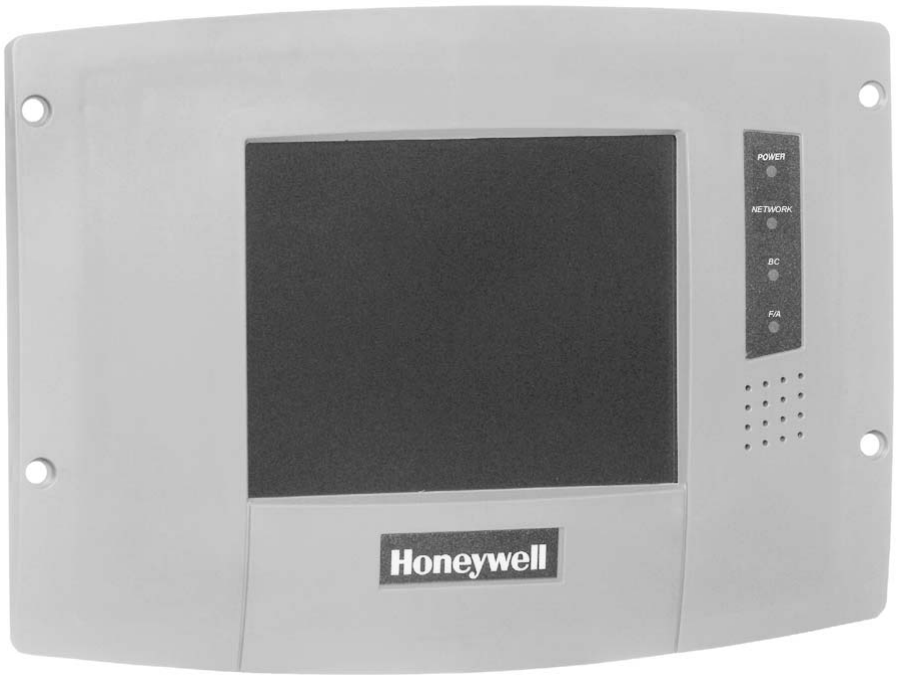


Figure 4.1 – System Operator Interface

Enhanced Panel is used for monitoring and configuring parameters of individual boilers whereas System Operator Interface Panel is use for monitoring and configuring parameters of up to 8 boilers.

4-3 Operation

Upon initial power up, Operator Interface Display will scan for each boiler connected on the Modbus daisy chain network. Once the scan is finished, Operator Interface updates status information from the boiler or each boiler on the system.

4-4 System Operator Interface Panel Home Page

For System Operator Interface multiple unit applications, each boilers is represented on the Home page by an icon and name. Pressing the icon allows the user to zoom in on that boiler and see specific details about it. These details are provided on a new page, which can include additional buttons that display additional detail and operation information, which itself leads to other pages.

The System Operator Interface **Boiler Icon** button will appear in one of four colors indicating the boiler status.

- **Blue**: Normal operation
- **Red**: Lockout condition
- **Gray**: Standby mode (burner switch off)
- **Gray and crossed out**: Communication error (disconnected or powered off)

Up to 8 boilers can be displayed on the System Operator Interface Home page. The name of each boiler is displayed next to each boiler icon. When Lead Lag is enabled, the system header temperature and firing rate are displayed for each icon. When the burner is in standby or not firing the firing rate is not displayed.

4-5 Page Navigation

The Operator Interface Display presents information and options in a paged manner. Pages are displayed in a tree structure in which the user navigates up and down to arrive at the desired Function. The page descriptions are provided below so that you can understand the purpose of each and view the selections, parameters, and information that is available or required on each.

Most pages have a **Home** button in the top-left corner of the screen and a **Back** button in the top-right corner of the screen.

- The **Home** button returns the user to the Home page and terminates any operation in progress.
- The **Back** button returns the user to the previous page.

Two other icons may be noticed near the boiler name.

- A **Bell** will be displayed if the system is in Lockout that reset will be required.
- A **Padlock** will be shown on screens that a password is needed to change the parameter. An unlocked padlock indicates the password has been entered to change the parameter depending on the security level entered.

4-6 Keyboard

Some pages request user entry of characters. When this type of input is required, a Keyboard Page appears, as shown **Figure 4.4**. The text box at the top of the screen displays the current or default setting of the user input. The user can add to this text, clear it, or change it.

The **Shift** key on the left side of the screen shifts between upper and lowercase characters. Pressing the **Shift** key toggles the keyboard from one mode to the other. The **OK** button should be pressed when the user is done entering the text input. The **Cancel** button on the bottom of the screen allows the user to ignore any text changes that have been made and keep the original text value. Pressing the **OK** or **Cancel** buttons returns the user to the page displayed prior to the keyboard page.

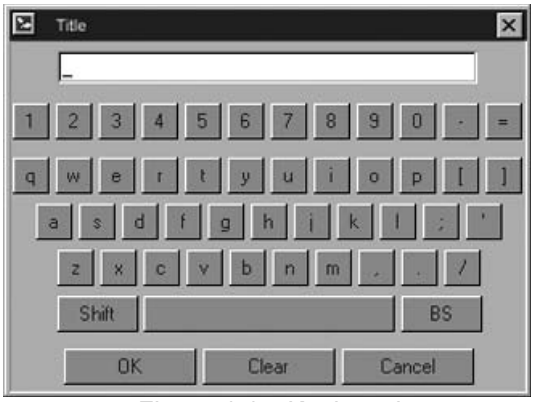


Figure 4.4 – Keyboard

4-7 Status Page

A Status Page as in **Figure 4.5** is displayed when a single boiler is selected on the Home Page or root page for equipment with Enhanced Panel. The Status Page displays the current condition of the unit and displays some of the more important configuration settings. The boiler name associated with the boilers is displayed in the title on the Status Page.

NOTE: When boiler has no boiler name defined, System Operator Interface displays the unit's Modbus address to identify the boiler.

The initial Status Page displayed for each boiler contains summary status information as shown in **Figure 4.5**. Any status information not applicable for the installation is grayed or blanked out on the screen.

Buttons on this screen include:

- **Configure:** Used to configure the boiler. See **4-8 CONFIGURATION PAGE** for more details.
- **Operation:** Used to perform daily/frequent functions with the boiler, such as setpoint adjustment, etc. See **4-13 OPERATION PAGE** for more details.
- **Diagnostic:** Used to view boiler diagnostic information. See **4-14 DIAGNOSTIC PAGE** for more details.
- **Details:** Used to view boiler detail status information. See **4-34 MONITORING** for more details.
- **History:** Used to view boiler history. See **4-12 HISTORY PAGE** for more details.
- **Modulation:** Used to toggle between three different status displays: **Pump**, **Modulation**, and **Setpoint**.

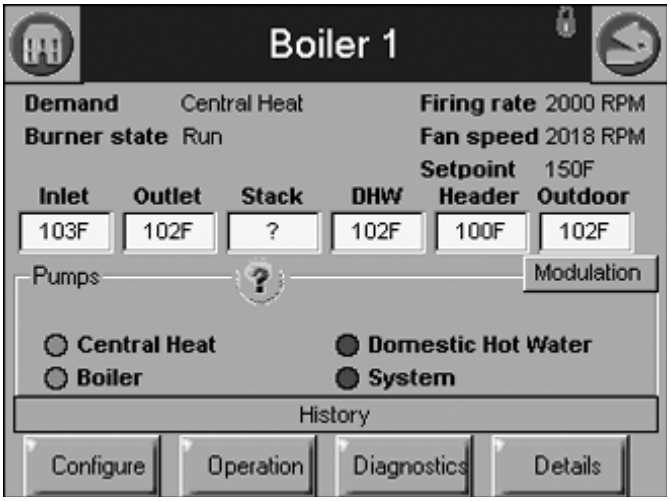


Figure 4.5 – Honeywell Sola Controller *Summary Status Page*

4-8 Configuration Page

The Configuration Page allows the user to view and set parameters that define how the boiler functions in the heating system.

Configuration parameters for the Honeywell Sola Controller (Flame Safe Guard and Operating Control) on any boiler connected in the Global Modbus™ network can be accessed from the System Operator Interface. Press the icon of the Honeywell Sola Controller on the Home Page to access the Status Page of each unit.

Pressing the **Configure** button on the Status Page starts a configuration session of the Honeywell Sola Controller. The Configuration Page contains a menu of parameters grouped into functional areas that the user selects for configuration as in **Figure 4.6**.

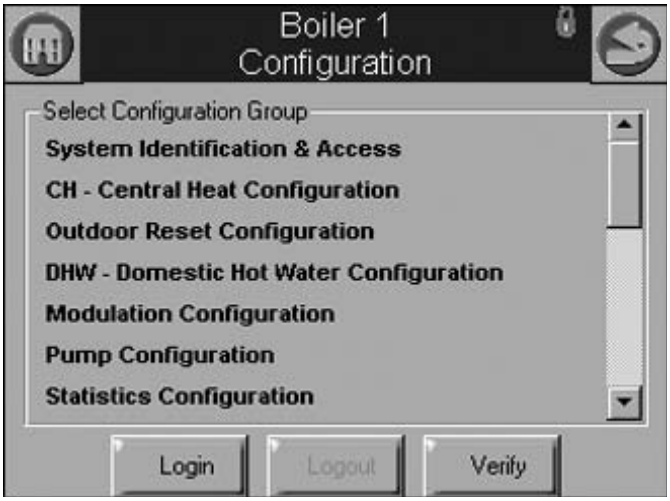


Figure 4.6 – Configuration Menu Page

Selecting a parameter group from the menu displays parameters exclusively applicable for the functional group on the page. These parameters can be edited, and when the user is finished, control returns back to the configuration menu page.

Each parameter is displayed in its group. If there are more parameters than will fit on the screen, a vertical scroll bar allows the user to scroll up and down to view all parameters. The parameter name is displayed on the left and the current setting is displayed in the text box on the right.

4-9 Configuration Password

Any user can view the configuration parameters. No access-level password is required to view the parameters. To change a parameter, a valid configuration password for that parameter's level must be entered by the user before the Installer or OEM level parameter can be changed. The password need only be entered once while the user remains on the Configuration pages. Leaving the Configuration Pages ends the scope of the password entry. The user is notified that a new password is needed upon the first attempt to change a parameter or until a password is entered successfully as seen in **Figure 4.8**. The user can continue viewing the configuration parameters regardless of whether a password is entered successfully.

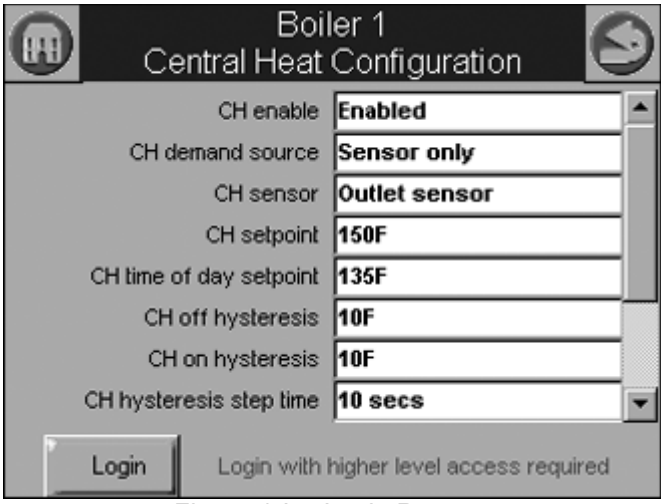


Figure 4.8 – Login Request

The Honeywell Sola Controller on each boiler also maintains a password time out that limits the scope of the password entry. Once a password is successfully entered the unit starts an internal timer that expires after 10 minutes of inactivity. After the timer expires, the user is required to re-enter a password before a parameter can be changed. The user is not required to enter a configuration password for a parameter that has a lower access level than the access level achieved by an earlier password entry for any configuration group as long as the user stays in the configuration pages. The user only needs to enter a password once until a parameter that has a higher access level is selected. The user enters the password from a keyboard. After the password is entered, the **OK** button is selected. The **Cancel** button aborts the password login.

Three levels of write access to boiler parameters are permitted. Each access level has defined rights when interfacing with configuration and status parameters.

- **End user**: The lowest access rights and no password login is needed. The end user can, in most cases, only read or view boiler parameters. In some instances the end user can change operation related parameters.
- **Installer**: The next highest level. The installer can read all the parameters and change installation related parameters for boiler parameters. This access level is used to customize the controls for a particular installation. Refer to **CHAPTER 5 – INSTALLER INTEGRATION GUIDE** for more detail.
- **OEM**: The highest access level. Ace OEM level parameters are not accessible by end user or installer.

Different passwords exist for each access level. The End User level requires no password, but the Installer and OEM levels have unique passwords defined for them.

WARNING - Explosion Hazard Improper configuration can cause fuel buildup and explosion. Improper user operation may result in PROPERTY LOSS, PHYSICAL INJURY or DEATH. The Operator Interface Display used to change parameters must be attempted by only experienced and/or licensed burner/boiler operators and mechanics.

4-10 Change Parameter Settings

Change parameter settings by selecting the parameter on the page. A dialog box displays for the parameter with controls allowing the user to change the value as in **Figure 4.10**. After changing the setting to a new value, press the **OK** button. Pressing the **Cancel** button leaves the parameter unchanged. The changed setting is reflected on the screen and sent to the controller when the **OK** button is pressed.

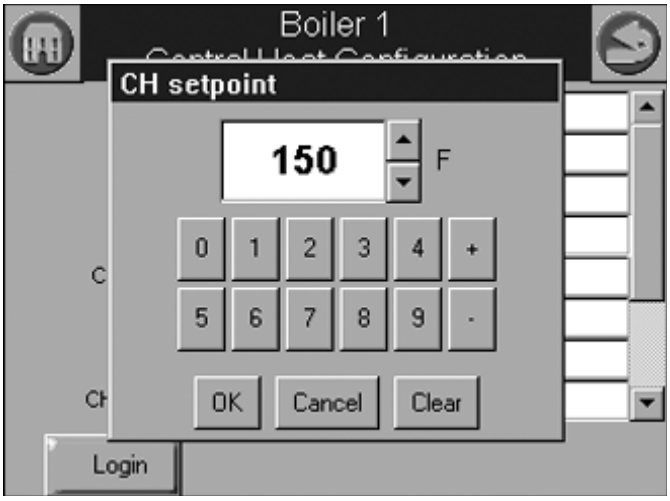


Figure 4.10 – Changing Configuration Parameter Page

For safety configuration parameters an additional verification step is required to commit the changes. Safety parameters are grouped into blocks that include only safety parameters, not a mixture of safety data and non-safety data. All parameters within the safety group undergo a verification process. A safety parameter group is identified on the Operator Interface Panel to indicate when the configuration parameters are safety-related. Each safety parameter group is verified one at a time until all have been verified as in **Figure 4.11**.

Figure 4.11 – Safety Verification Page

Safety parameters can be viewed the same way non-safety parameters can be viewed. If the user makes no attempt to change a safety parameter, the user isn't required to enter safety verification mode. A verification step is required for each safety parameter block that is changed. The verification steps do not have to be completed immediately; the user can traverse between parameter groups before the verifications are done.
A **Verify** button is enabled that allows the user to conduct verification sessions.

NOTE: When the user proceeds with the safety parameter configuration the Operator Interface requests that the controller enter this mode. In this mode the Control unlocks the safety parameters in this group and marks them unusable. Failure to complete the entire safety configuration procedure leaves the boiler in an un-runnable state.

All safety configuration parameters in the group should have the same access level. If this condition isn't so, the user is asked to enter another password when a higher access level is needed. Successful entry of the controller into safety verification mode is displayed and the lock icon will appear unlocked on the page with the first safety block displayed.

If the user terminates the safety configuration session after it has started, the controller is left in an un-configured and un-runnable state. The user can terminate the session by pressing the **Menu** button or by attempting to leave the Verification page with the **Home** or **Back** buttons top-left and -right screen corners, respectively. The user is warned that leaving the session at this point leaves the boiler in an un-runnable state and confirms whether the user still wants to do so.

The settings of all parameters in each safety block must be confirmed to commit them in the Honeywell Sola Controller. When the user is done changing safety parameters, pressing the **Confirm** button begins the confirmation stage.

The settings for all safety parameters in each changed block are presented and confirmed by the user as in **Figure 4.13**.

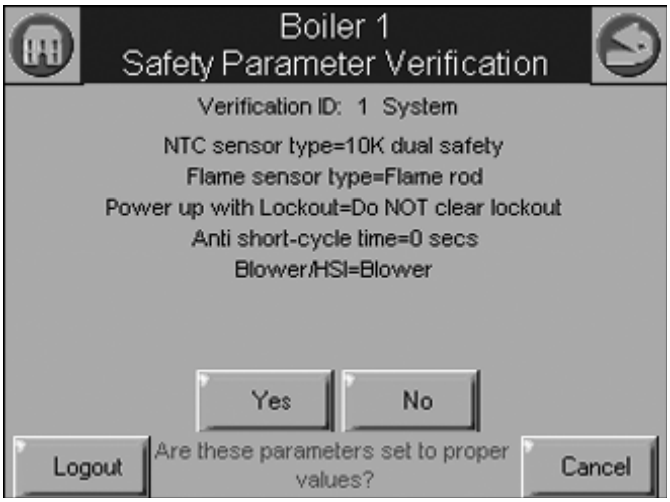


Figure 4.13 – Safety Parameter Confirmation Page

Press the **Yes** button to confirm each safety parameter block. If the user selects the **No** button, the safety parameter block remains unconfirmed and the Configuration Page is displayed. The boiler remains in an un-configured state in this case. After all safety parameter blocks have been confirmed, the user is asked to press and hold the **Reset** button on the Honeywell Sola Controller to complete the safety configuration session as seen in **Figure 4.14**.

Figure 4.14 – Safety Parameter Reset

When the **Reset** button at the Honeywell Sola Controller is pressed and held for 3 seconds the confirmed safety parameters are committed in the controller. The above Reset dialog box automatically closes when this step is completed if not already Okayed by the user. Operator Interface Display returns to the page where the **Confirm** button was pressed. If the user doesn't perform this step, the Honeywell Sola Controller remains in a locked state until the user resolves the un-confirmed safety parameters. Leaving the Configuration Page and returning later indicates that the Honeywell Sola Controller is in this mode.

4-11 Fault/Alarm Handling

Each Honeywell Sola Controller reports a fault code when a lockout condition occurs for one of the following annunciations:

- **Burner control**
- **Lockout**
- **Lead/Lag control**

A less serious alarm condition may also occur that is treated as warning instead of a fault. Active fault codes for each annunciation and a warning code can be reported by each Honeywell Sola Controller. Any new fault code detected in a Honeywell Sola Controller is indicated as a lockout condition at the Operator Interface Display. The notification method used depends on the page that is displayed. On the Home page, the **Boiler Icon** button for the Honeywell Sola Controller turns red. On the Status Page the **History** button turns red. On all other pages and when the user is looking at a different Honeywell Sola Controller, a notification dialog box displays indicating which boiler just locked out.

4-12 History Page

The **History** button serves not only as a button, but also displays Honeywell Sola Controller's lockouts, holds, and alerts as they occur. The **History** button can be selected at any time, regardless of which type of information is displayed, to view history information. Pressing the **History** button displays a dialog box that allows the user to select the type of history to view. The user can also silence an audible alarm generated by the Honeywell Sola Controller during a lockout or alert condition.

This History dialog box provides an exploded view of the status information displayed in the **History** button. One of the four buttons **OK**, **Lockouts**, **Alerts**, or **Silence** can be selected. If none of these buttons are selected the dialog box closes after 30 seconds.

Two types of historical data can be displayed on the history page: Lockout History and Alert Log. The entire 15 fault history is displayed in a scrollable list with the most recent fault displayed first followed by the next most recent fault. Summary information is displayed for each fault entry, including the burner cycle count, fault code, and fault number with description. Detailed information for a specific fault entry that also includes burner control sequence state, burner run-time hours, annunciation status, etc., is viewed by selecting the lockout entry in the list.

Figure 4.16 – Boiler Lockout History

The date and time that each fault occurred is displayed in the lockout history. The lockout time stamp displays in both the lockout summary and detail information. The Honeywell Sola Controller has no system time; the timestamp is assigned by the Operator Interface when it learns of the lockout from the Honeywell Sola Controller. When the Operator Interface first extracts the lockout history from the Honeywell Sola Controller, no time stamps are assigned since the times that the lockouts occurred are unknown. All new lockouts that occur after the extraction are assigned timestamps.

NOTE: The system time can be set in the Operator Interface to ensure that correct timestamps are given to the Honeywell Sola Controller lockouts. See **4-38 SYSTEM TIME** for additional information on setting the display clock.

The **Clear Lockout** button allows the user to acknowledge and clear the lockout when in lockout state.
The user can toggle between displaying the Honeywell Sola Controller lockout history and alert log. The **Alerts** or **Lockouts** button on the bottom of the pages toggles the history displayed to the type indicated by the button.

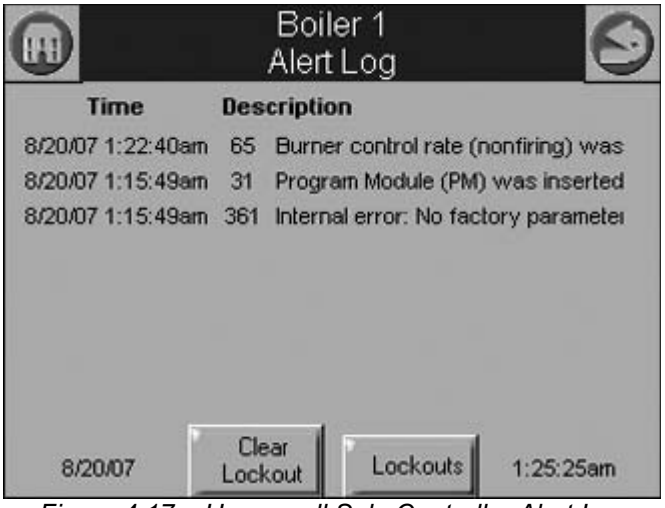


Figure 4.17 – Honeywell Sola Controller Alert Log

4-13 Operation Page

The Operation Page displays the boiler running operation, including setpoint and firing rate. From this page the user can change setpoints, view annunciation information, and switch between Central Heating or Domestic Hot Water loops, as shown in **Figure 4.20**. If a password is required to change any of the settings on this page, the user can press the **Login** button to enter the password.

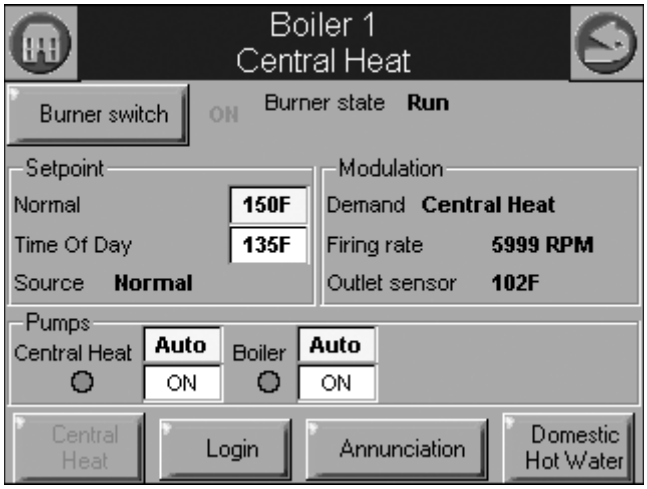


Figure 4.20 – Honeywell Sola Controller Operation Page

4-14 Diagnostic Page

The Diagnostic Page displays analog and digital I/O status of the Honeywell Sola Controller. A snapshot of the diagnostic status is displayed and updated once per second as it changes in the Honeywell Sola Controller.
See **4-36 HONEYWELL SOLA CONTROLLER DIAGNOSTICS** for more information.
The digital I/O data is displayed as LED that are either on **Green** light or off **Red** light. Not all digital I/O can be displayed at the same time on the page, so a horizontal scroll bar is used to move the view left and right to show all digital I/O data.

Honeywell Sola Controller's analog I/O can also be viewed on the Operator Interface. A snapshot of the diagnostic status is displayed and updated as it changes in the Honeywell Sola Controller.
The analog I/O data is displayed as bar charts with the I/O level represented in the I/O. Analog I/O that is not enabled for the installation displays a blank I/O level. Not all analog I/O can be displayed at the same time on the page, so a horizontal scroll bar is used to move the view left and right to show all analog I/O status.

A **Diagnostic Tests** button allows the user to conduct different diagnostics on the Honeywell Sola Controller.
See **4-37 INSTALLER CHECKOUTS – DIAGNOSTICS TESTS** for more details.

4-15 Trend Analysis Page

Trend analysis of boiler status data can be viewed on the Operator Interface. A graph displays a historical view of Honeywell Sola Controller status data over varying time periods.

A 2-dimensional graph with status data values shown on the Y axis over time specified on the X axis is displayed. Status for the most recent time is represented on the left side of the graph with older status running towards the right side of the graph.

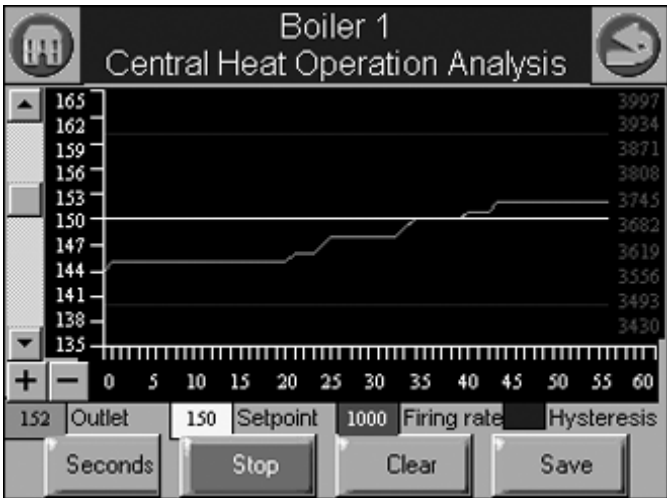


Figure 4.24 – Honeywell Sola Controller Trend Analysis Page

4-16 Configuration

Most of this configuration is performed by either the **contractor/installer**. Each functional group is displayed on the Configuration menu page. Parameters in functional groups that are not applicable for the installation can be ignored. In some cases, features in a functional group are disabled by default and are enabled when needed for the installation. Refer to **CHAPTER 5 – INSTALLER INTEGRATION GUIDE** for more detail.

Honeywell Sola Controller Configuration Parameters

The following pages list the configuration parameters available for each Honeywell Sola Controller installed on the system.

WARNING - Explosion Hazard Improper configuration can cause fuel buildup and explosion. Improper user operation may result in PROPERTY LOSS, PHYSICAL INJURY or DEATH. The Operator Interface Display used to change parameters must be attempted by only experienced and/or licensed burner/boiler operators and mechanics.

4-17 System Identification & Access Parameters

Table 4.3 displays System Identification & Access parameters.

Parameter	Comment	Password
Burner name	Name to identify boiler	None
Installation	Notes regarding installation	None
OEM identification	Boiler model number	Read Only
Installer password	Change installer password setting	Read Only

Table 4.3 – System Identification and Access Parameters

When the burner name is changed, the name is saved in the Honeywell Sola Controller and displayed in the title of all pages that zoom into the Honeywell Sola Controller.

Status	Comment	Password
Product Type	Honeywell Sola Controller product identification	Read Only
OS Number	Model number associated with Honeywell Sola Controller	Read Only
Software Version	Version of software running in Honeywell Sola Controller	Read Only
Date Code	Honeywell Sola Controller assembled date	Read Only
Application Revision	Version of application data in Honeywell Sola Controller	Read Only
Safety Revision	Revision of safety data in Honeywell Sola Controller	Read Only

Table 4.4 – Honeywell Sola Controller Identification Information

4-18 Central Heating Parameters

Table 4.5 displays Central Heat configuration parameters.
Refer to **5-1 CENTRAL HEAT RELATED CONFIGURATION** for Central Heat parameter programming.

Parameter	Comment	Password
CH enable	Disable or Enable Central Heating Loop	None
CH demand source	Source for Central Heat demand **Modulation sensor only**: CH loop is controlled only by selected sensor which provides pump demand, operating temperature and burner demand. **STAT terminal**: the STAT input in the On condition creates pump demand and it also must be on for burner demand to exist; if it is off there is no demand **LCI**: the Recycle Interlock input in the On condition creates pump demand and selected sensor provides operating temperature and burner demand.	Installer
CH outdoor reset	Disabled or enable CH outdoor reset	None
CH has priority over LL	This controls whether a local CH demand has priority over the control asserted by the LL master, when enabled as a slave.	Installer
CH setpoint source	**Local**: Local setpoint is used as CH setpoint. **4-20mA**: Remote 4-20mA signal is used as CH setpoint.	Installer
CH setpoint	Setpoint for normal Central Heat modulation 32 °F to 240 °F (0 °C to 115 °C) This setpoint is used when the time-of-day input is off	None
CH time of day setpoint	Time Of Day setpoint 32 °F to 240 °F (0 °C to 115 °C) This setpoint is used when the time-of-day input is on. If the Outdoor Reset function is inactive then the setpoint is used as-is. If the Outdoor Reset function is active then this setpoint provides one coordinate for the shifted outdoor reset curve.	None
CH off hysteresis	Differential above setpoint when boiler is turned off 2 °F to 30 °F (1 °C to 16 °C)	None
CH on hysteresis	Differential from setpoint when boiler is turned on 2 °F to 30 °F (1 °C to 16 °C)	None
CH 4 mA water temperature	CH setpoint when 4 mA is received from BMS System	Installer
CH 20 mA water temperature	CH setpoint when 20 mA is received from BMS System	Installer
CH modulation sensor	Sensor for Central Heating modulation **Outlet sensor**: Outlet sensor used as CH operating sensor. **Inlet sensor**: Inlet sensor used as CH operating sensor. **S5 sensor**: S5 sensor (Header/Outdoor) used as CH operating sensor.	Installer
CH P-gain	Proportional term of PID 0-400	Installer
CH I-gain	Integral term of PID 0-400	Installer
CH D-gain	Differential term of PID 0-400	Installer
CH hysteresis step time	Time needed for one step of hysteresis shift, when the off hysteresis threshold or on hysteresis threshold is shifted due to a burner on or burn off event. Zero disables this function.	Installer

Table 4.5 – Central Heat Configuration Parameters

4-19 Outdoor Reset Parameters

Table 4.6 displays Outdoor Reset configuration parameters.
Refer to **5-2 OUTDOOR RESET RELATED CONFIGURATION** for Outdoor Reset parameter programming.

Parameter	Comment	Password
CH maximum outdoor temperature	-40 °F to 266 °F (-40 °C to 130 °C)	None
CH minimum outdoor Temperature	-40 °F to 266 °F (-40 °C to 130 °C)	None
Low water temperature	32 °F to 240 °F (0 °C to 115 °C)	None
CH minimum water temperature	32 °F to 240 °F (0 °C to 115 °C)	None

Maximum off point	32 °F to 240 °F (0 °C to 115 °C)	None

Table 4.6 – Outdoor Reset Configuration Parameters

4-20 DHW Configuration Parameters

Table 4.7 displays Domestic Hot Water (DHW) configuration parameters.
Refer to **5-3 DOMESTIC HOT WATER RELATED CONFIGURATION** for Domestic Hot Water (DHW) parameter programming.

Parameter	Comment	Password
DHW enable	Disable or Enable Domestic Hot Water Loop	Installer
DHW demand Switch	**Modulation sensor only**: no other input is considered and pump demand is derived from burner demand **DHW switch**: a switch replaces the DHW sensor, DHW sensor in a shorted condition indicates pump demand, and this condition also must be present for burner demand to exist; Outlet Sensor is chosen then the outlet sensor will provide the control temperature. **STAT terminal**: the STAT input in the On condition creates pump demand and it also must be on for burner demand to exist; if it is off there is no demand. **Auto DHW or sensor only**: When DHW is open then use it as heat demand, and use modulation sensor selection for operation. Otherwise if DHW is providing a temperature, use it for heat demand and as the sensor for operation.	Installer
Priority method	Boost during priority time	Installer
Modulation sensor	**DHW (S6S7) sensor**: DHW loop operating sensor is the DHW sensor. **Outlet (S3S4) sensor**: DHW loop operating sensor is the Outlet sensor. **Inlet (S1) sensor**: DHW loop operating sensor is the Inlet sensor. **Auto DHW (S6) of Inlet (S1):** If the DHW demand switch is configured for auto, and if it detects that the DHW sensor is open or shorted then use the Inlet sensor for modulation. **Auto DHW (S6) of Outlet (S1):** If the DHW demand switch is configured for auto, and if it detects that the DHW sensor is open or shorted then use the Outlet sensor for modulation.	Installer
DHW setpoint	Setpoint for normal DHW modulation 32 °F to 240 °F (0 °C to 115 °C) This setpoint is used whenever the time-of-day switch is off or not connected	None
DHW time of day setpoint	Setpoint when Time Of Day switch is on 32 °F to 240 °F (0 °C to 115 °C) This setpoint is used when the time-of-day switch is on	None
DHW off hysteresis	Differential above setpoint when boiler is turned off 2 °F to 30 °F (1 °C to 16 °C)	None
DHW on hysteresis	Differential from setpoint when boiler is turned on. 2 °F to 30 °F (1 °C to 16 °C)	None
DHW priority override time	No DHW priority time (0), or DHW priority time	Installer
DHW hysteresis step time	Time between hysteresis step changes (0=Disable hysteresis stepping)	Installer
DHW priority source	System priority CH > DHW DHW > CH	Installer
DHW priority vs LL	System priority LL > DHW DHW > LL	Installer
DHW P-gain	Proportional term of PID 0-400	Installer
DHW I-gain	Integral term of PID 0-400	Installer
DHW D-gain	Differential term of PID 0-400	Installer

Table 4.7 – Domestic Hot Water (DHW) Configuration Parameters

4-21 Modulation Configuration Parameters

Table 4.8 displays Modulation configuration parameters.
Refer to **5-4 MODULATION RELATED CONFIGURATION** for Modulation parameter programming.

Parameter	Comment	Password
CH maximum modulation rate	RPM These parameters provide the limits of fan speed during modulation.	Installer
DHW maximum modulation rate	RPM These parameters provide the limits of fan speed during modulation.	Installer
Minimum modulation rate	RPM	Read Only
CH forced rate time	0-600 seconds This parameter determines the duration of the forced rate period, when firing for CH or LL demand. If it is set to zero then this forced rate period is disabled.	Installer
CH forced rate	RPM This parameter provides the firing rate during the CH forced rate time. It is also the initial rate for the CH slow start period.	Installer
DHW forced rate time	0-600 seconds This parameter determines the duration of the forced rate period, when firing for DHW demand. If it is set to zero then this forced rate period is disabled.	Installer
DHW forced rate	RPM This parameter provides the firing rate during the DHW forced rate time. It is also the initial rate for the DHW slow start period.	Installer
CH slow start enable	Disable or Enable CH slow start This parameter enables or disables the slow start limit function for CH and LL demand sources. It uses the CH forced rate parameter as the starting point for the slow start. If the forced rate parameter is invalid or zero and slow start is enabled, then the slow start function does not occur and an alert is issued.	Installer
DHW slow start enable	Disable or Enable DHW slow start This parameter enables or disables the slow start limit function for DHW demand source. It uses the DHW forced rate parameter as the starting point for the slow start. If this forced rate parameter is invalid or zero and slow start is enabled, then the slow start function does not occur and an alert is issued.	Installer
Slow start degrees	32 °F to 180 °F (0 °C to 100 °C) If slow start limiting is enabled and the outlet temperature is less than the temperature provided by subtracting this number of degrees from the setpoint, then slow start rate limiting is effective. Whenever the outlet temperature is above this value, slow start limiting has no effect.	Installer
Slow Start Ramp	RPM /minute When slow start limiting is effective, the modulation rate will increase no more than the amount per minute given by this parameter.	Installer
0-10/4-20 mA Output hysteresis	Value selects the amount of error (proportional error) needed to reverse direction.	Installer
4-20 mA input hysteresis	There is no resistance to change in the same direction as the last change, but to reverse directions; the input change must exceed the value provided here.	Installer

Table 4.8 – Modulation Configuration Parameter

4-22 Pump Configuration Parameters

Table 4.9 displays Pump configuration parameters.
Refer to **5-5 PUMP CONTROL RELATED CONFIGURATION** for Pump parameter programming.

Parameter	Comment	Password
CH pump control	Auto or On CH pump operation The CH pump can be turned on manually, or it can be set to operate automatically. If it is turned on, it remains on until changed back to Auto. In Auto mode it operates according to the demand sources listed for CH Pump Output and the overrun time.	Installer
CH pump overrun time	0-600 seconds (0 = Not configured) This time indicates how long the CH pump should continue to run after CH pump demand or LL slave demand ends.	Installer
DHW pump control	Auto or On DHW pump operation The DHW pump can be turned on manually, or it can be set to operate automatically. If it is turned on, it remains on until changed back to Auto.	Installer
DHW pump overrun time	0-600 seconds (0 = Not configured) This time indicates how long the DHW pump should remain on after DHW demand ends.	Installer
System pump control	Auto or On System pump operation The System pump can be turned on manually, or it can be set to operate automatically. If it is turned on, it remains on until changed back to Auto. In Auto mode it operates according to the LL master and slave demand and overrun time.	Installer
System pump overrun time	0-600 seconds (0 = Not configured) This time indicates how long the System pump should remain on after the LL master or slave pump demand with overrun ends.	Installer
System exercise interval	Days If set to zero, the exercise function is disabled. Otherwise this parameter provides the interval time between exercising the pumps. It is common to all three pump outputs.	Installer
Pump exercise time	0-600 seconds (0 = Not configured) If the time is zero then the exercise function is disabled. Otherwise this parameter provides the time that a pump should be on when it is exercised. It is common to all three pump outputs.	Installer

Table 4.9 – Pump Configuration Parameter

4-23 Statistics Configuration Parameters

Table 4.10 displays Statistics configuration parameters.

Parameter	Comment	Password
Burner cycles	0 to 999,999 cycles	Read only
Burner run time	Hours	Read only
CH pump cycles	0 to 999,999 cycles	Read only
DHW pump cycles	0 to 999,999 cycles	Read only
System pump cycles	0 to 999,999 cycles	Read only

Table 4.10 – Statistics Configuration Parameters

4-24 High Limit Configuration Parameters

Table 4.11 displays Outlet High Limit configuration parameters.
Refer to **5-6 HIGH LIMIT RELATED CONFIGURATION** for High Limit parameter programming.

Parameter	Comment	Password
DHW high limit	Disabled or enable DHW high limit This parameter enables or disables the DHW high limit function. It must be disabled when the DHW input is used as a switch to indicate DHW demand.	Installer
DHW high limit response	Recycle & hold or Lockout If lockout is selected then the burner control locks out. If Recycle & Hold is selected then the burner control recycles and holds until the DHW temperature falls below the DHW high limit temperature minus 5°F.	Installer
DHW high limit setpoint	32 °F to 240 °F (0 °C to 115 °C) If DHW high limit enable is enabled and the DHW temperature reaches the value given by this parameter,	Installer

	then a response defined by DHW high limit response will occur.	
Outlet high limit response	Lockout	Read only
Outlet high limit setpoint	32 °F to 240 °F (0 °C to 115 °C)	Installer

Table 4.11 – High Limit Configuration Parameters

4-25 Stack Limit Configuration Parameters

Table 4.12 displays Stack Limit configuration parameters.
Refer to **5-7 STACK LIMIT RELATED CONFIGURATION** for Stack Limit parameter programming.

Parameter	Comment	Password
Stack limit	Disabled or enable Stack limit If set to enable, the stack connector type MUST be 10K dual-safety NTC.	Installer
Stack limit delay	0-600 seconds (0 = Not configured) This parameter provides the delay time for the Stack limit.	Installer
Stack limit response	Recycle & delay or Lockout If the stack temperature exceeds the stack setpoint, then a response will occur. If the selected response is a lockout, then the burner control locks out. However, if the selected response is Recycle & Delay, the burner control recycles and holds while waiting for a delay to expire, and after the delay it tries again.	Installer
Stack limit setpoint	-40 °F to 266 °F (-40 °C to 130 °C) If the stack temperature reaches or exceeds the safety limit temperature given by this parameter then the response defined by Stack limit response will occur.	Installer

Table 4.12 – Stack Limit Configuration Parameters

4-26 Other Limit Configuration Parameters

Table 4.13 displays Other Limit configuration parameters.
Refer to **5-8 DELTA-T LIMIT RELATED CONFIGURATION** for Other Limit parameter programming.

Parameter	Comment	Password
Delta-T limit enable	Disabled or enable Delta-T limit	Installer
Delta-T limit degrees	No limit If the outlet temperature exceeds the inlet temperature and this difference exceeds the number of degrees given by this parameter, then the response defined by Delta-T limit response will occur. As the temperature approaches this limit, the Stepped Modulation Limiting function is active.	Installer
Delta-T limit delay	(0 = Not configured) This parameter provides the delay time for the Delta-T limit.	Installer
Delta-T limit response	Lockout, Recycle & delay or Recycle & delay with limit **Lockout**: If the temperature difference exceeds the limit, then a lockout will occur. **Recycle & delay**: The burner control recycles with an alert and holds while waiting for a delay to expire, and after the delay it tries again. **Recycle & delay with limit**: Same as above but with retry limit. If limit count is reached lockout will occur.	Installer
Delta-T retry limit	How many of retry will be tolerated. If demand is not satisfied and this number of recycles has happened, then lockout occurs.	Installer
Delta-T rate limit enable	Enabling this parameter causes Stepped Modulation to occur as Delta-T temperature limit is approached.	Installer
Delta-T inverse limit time	When temperature inversion detection is enabled for a pair of sensors, this parameter specifies a time during which this will be tolerated.	Installer
Delta-T inverse limit response	Lockout, Recycle & delay or Recycle & delay with limit **Lockout**: When temperature inversion is detected, then a lockout will occur. **Recycle & delay**: The burner control recycles with an	Installer

	alert and holds while waiting for a delay to expire, and after the delay it tries again. **Recycle & delay with limit**: Same as above but with retry limit. If limit count is reached lockout will occur.	

Table 4.13 – Other Limit Configuration Parameters

4-27 Frost Protection Configuration Parameters

Table 4.14 displays Frost Protection configuration parameters.
Refer to **5-9 FROST PROTECTION RELATED CONFIGURATION** for Frost Protection parameter programming.

Parameter	Comment	Password
CH frost protection enable	Disabled or enable CH frost protection The CH frost protection feature can be enabled to run pumps and possibly fire the burner whenever the CH input sensor is too cold.	Installer
DHW frost protection enable	Disabled or enable DHW frost protection The DHW frost protection feature can be enabled to run pumps and possibly fire the burner whenever the DHW input sensor is too cold.	Installer
LL frost protection enable	Disabled or enable LL frost protection.	Installer
Outdoor frost protection setpoint	No limit	Installer
LL frost protection rate	Rate used when LL frost protection is active.	Installer
CH pump frost overrun time	0-600 seconds (0 = Not configured)	Installer
DHW pump frost overrun time	0-600 seconds (0 = Not configured)	Installer

Table 4.14 – Frost Protection Configuration Parameters

4-28 DHW Storage Configuration Parameters

Table 4.15 displays DHW Storage configuration parameters.
Refer to **5-10 DHW STORAGE CONFIGURATION** for DHW Storage parameter programming.

Parameter	Comment	Password
DHW storage enable	Disabled or enable DHW Storage. If it is disabled then the other DHW storage parameters are ignored.	Installer
Storage time	This parameter provides the DHW storage time. When enabled and normal DHW call for heat is satisfied the DHW storage demand will persist for this time interval. If normal demand returns the timer is reset.	Installer
DHW storage setpoint	This parameter provides the setpoint used during DHW storage demand.	Installer
DHW storage on hysteresis	Differential above setpoint when boiler is turned on 2 °F to 30 °F (1 °C to 16 °C)	Installer
DHW storage off hysteresis	Differential above setpoint when boiler is turned off 2 °F to 30 °F (1 °C to 16 °C)	Installer

Table 4.15 – DHW Storage Configuration Parameters

4-29 Warm Weather Shutdown Configuration Parameters

Table 4.16 displays Warm Weather Shutdown configuration parameters.
Refer to **5-11 WARM WEATHER SHUTDOWN CONFIGURATION** for Warm Weather Shutdown parameter programming.

Parameter	Comment	Password
Enable	Disabled or enable WWSD. **Disable**: WWSD is not active. **Shutdown after demand ended**: Any current CH demand that is present prevents WWSD from becoming true. WWSD becomes true when CH demand is satisfied. **Shutdown immediately**: When WWSD becomes true, it immediately cause CH demand to end.	Installer
Setpoint	Setpoint temperature at which activates WWSD.	Installer

Table 4.16 – Warm Weather Shutdown Configuration Parameters.

4-30 T-Rise Limit Configuration Parameters

Table 4.17 displays T-Rise Limit configuration parameters.
Refer to **5-12 T-RISE LIMIT CONFIGURATION** for T-Rise Limit parameter programming.

Parameter	Comment	Password
Outlet T-rise enable	Disabled or enable T-rise limit.	Installer
T-rise degrees	If the T-rise limit is active and the outlet temperature rises faster than this number of degrees per minute, then the burner will recycle and delay for a specified time.	Installer
T-rise response	**Lockout**: lock out will occur when the T-rise limit is reached. **Recycle & delay**: Recycle and delay will occur when the T-rise limit is reached. **Recycle & delay with retry limit**: Recycle and delay with a retry limit will occur when the T-rise limit is reached.	Installer
T-rise retry limit	When the response to excessive temperature rise includes a retry limit, then this parameter provides the maximum number of retries that will occur.	Installer
T-rise delay	This parameter provides the delay time before the burner will again attempt to fire.	

Table 4.17 – T-Rise Limit Configuration Parameters

4-31 Lead Lag Slave Configuration Parameters

Table 4.18 displays Lead Lag Slave configuration parameters.
Refer to **5-13 LEAD LAG SLAVE CONFIGURATION** for Lead Lag Slave parameter programming.

Parameter	Comment	Password
Slave enabled	**Disabled**: The slave function is disabled. Commands from any of the communication will be ignored. **Enabled via Modbus**: The slave function is controlled by Modbus messages. **Slave**: The slave function is controlled by Boiler 1 master boiler.	Installer
Slave mode	**Use first**: Always fire this burner first, before firing any that are to have equalized run time. Use the Slave Sequence Order to determine which burner fires first for all of those that are set to the Use First condition. **Use Last**: Always fire this burner last, after firing any that are set to Use First of to equalize run time. Use the Slave Sequence Order for all of those that are set to the Use Last condition. **Equalize runtime**: Operate the slave burner to equalize their run time vs other slave	Installer
Base load rate	This parameter specifies the slave burner's preferred firing rate for use by the lead lag master, when it is set up to use the base load rate of each slave.	Installer
Slave sequence order	Slave sequence order is used to determine the order in which burner will be staged on. If slave sequence number is zero slave Modbus address will be used instead.	Installer
Demand to firing delay	Length of time to wait between requesting a stage to fire and detecting that it has failed to start.	Installer
Fan rate during off cycle	It provides the modulation rate that should be used when the LL master indicates this burner should be off but should run its fan at the off cycle rate.	Installer
Modbus port	MB1, MB2 or No Port Modbus port use for lead lag operation.	Installer
Modbus address	0-250 Modbus address used to communicate with the unit. This address number must be unique for each burner on the network.	Installer

Table 4.18 – Lead Lag Slave Configuration Parameters

4-32 Lead Lag Master Configuration Parameters

Table 4.19 displays Lead Lag Master configuration parameters.
Refer to **5-14 LEAD LAG MASTER CONFIGURATION** for Lead Lag Master parameter programming.

Parameter	Comment	Password
Master enabled	**Disabled**: The master function is disabled. **Enabled**: Enable the lead lag master.	Installer
LL CH setpoint	This parameter provides the setpoint used during LL CH demand.	Installer
LL CH TOD setpoint	This setpoint is used when the time-of-day switch is on.	Installer
Modbus port	MB1, MB2 or No Port Modbus port use for lead lag operation.	Installer
Modbus address	0-250 Modbus address used to communicate with the unit. This address number must be unique for each burner on the network.	Installer

Table 4.19 – Lead Lag Master Configuration Parameters

4-33 Lead Lag Master Configuration Parameters Advanced Settings

Following tables display Advanced Settings for Lead Lag Master configuration parameters.
Refer to **5-15 to 5-23 ADVANCED LEAD LAG CONFIGURATION** for Lead Lag Master parameter programming.

Parameter	Comment	Password
Modulation backup sensor	Select backup LL modulation sensor **Disable**: No backup sensor will be used. **Lead outlet**: Outlet temperature of the lead boiler will be used as the backup sensor. **Outlet average**: Average of the outlet temperatures of all slave boilers that are firing will be used as a backup.	Installer
Off hysteresis	Differential above setpoint when Last LL stage boiler is turned off 2 °F to 30 °F (1 °C to 16 °C)	Installer
On hysteresis	Differential below setpoint when First LL stage boiler is turned on 2 °F to 30 °F (1 °C to 16 °C)	Installer
Hysteresis step time	Time between hysteresis step changes (0=Disable hysteresis stepping)	Installer
P-gain	Proportional term of PID 0-400	Installer
I-gain	Integral term of PID 0-400	Installer
D-gain	Differential term of PID 0-400	Installer

Table 4.20 – Lead Lag Advanced Setting: Modulation Parameters

Parameter	Comment	Password
Demand switch	**STAT terminal**: the STAT input in the On condition creates lead lag demand and it also must be on for burner demand to exist; if it is off there is no demand. **Disable**: Demand switch input is not used.	Installer
Setpoint source	**Local:** Local setpoint is used as lead lag setpoint. **Modbus:** Setpoint source from modbus communication **4-20mA:** Setpoint is determined by the 4-20mA remote input. Two parameters that determine the temperature at the extremes (20mA and 4mA). If the 4-20mA signal is invalid, then the setpoint source reverts to Local until the 4-20mA signal is stable again.	Installer
Time of day setpoint	Setpoint when Time Of Day switch is on 32 °F to 240 °F (0 °C to 115 °C) This setpoint is used when the time-of-day switch is on If the Outdoor Reset function is active then this setpoint provides one coordinate for the shifted outdoor reset curve.	Installer
4 mA water temperature	-40 to 266F (-40 to 130C) This parameter provides the temperature for the interpolation of 4-20mA curve. This value determines the minimum possible value for the setpoint.	Installer

20 mA water temperature	-40 to 266F (-40 to 130C) This parameter provides the temperature for the interpolation of 4-20mA curve. This value determines the maximum possible value for the setpoint.	Installer
Outdoor reset	Enable or disable This parameter enables or disables the lead lag master outdoor reset operation.	Installer

Table 4.21 – Lead Lag Advanced Setting: CH Parameters

Parameter	Comment	Password
Priority source	**DHW heat demand** **Disabled**	Installer
Priority method	**Boost during priority time** **Drop after priority time**	Installer
DHW priority override time	If this parameter is non-zero then a DHW demand will shift its priority vs. other demand sources according to the specified time. The priority override timing is reset when demand from the DHW source turns off.	Installer

Table 4.22 – Lead Lag Advanced Setting: DHW Parameters

Parameter	Comment	Password
Enable	Enabled or disabled Allows use of frost protection	Installer
Outdoor setpoint	-40 to 266F (-40 to 130C) The outdoor temperature setpoint frost protection	Installer
Frost protection rate	% When Frost protection is enabled then for this parameter 0% or any value less than the boilers minimum firing rate represents the boilers minimum firing rate. 100% represents 100% firing of the boiler.	Installer

Table 4.23 – Lead Lag Advanced Setting: Frost Protection Parameters

Parameter	Comment	Password
Enable	Enabled or disabled Allows use of warm weather shutdown.	Installer
Setpoint	-40 to 266F (-40 to 130C) If outside temperature is greater than warm weather shutdown setpoint then it will cause the CH demand to end. If there is no outside temperature then WWSD is disabled.	Installer

Table 4.24 – Lead Lag Advanced Setting: Warm Weather Shutdown Parameters

Parameter	Comment	Password
Lead selection method	**Sequence order:** Lead boiler is ordered according to their LL – Slave sequence order or Modbus address if this value is zero. **Measured run time:** Lead boiler is ordered according to their reported run time. If two have the same measured run time, then either may be used.	Installer
Lag selection method	**Sequence order:** Lag boilers are ordered according to their LL – Slave sequence order or Modbus address if this value is zero. **Measured run time:** Lag boilers are ordered according to their reported run time. If two have the same measured run time, then either may be used.	Installer
Lead rotation time	If this parameter is a non-zero time, then it is used to trigger the rotation of lead boiler.	Installer
Forced rotation time	If this parameter is a non-zero time, then it is used to force the rotation of lead boiler if it stays on longer than the time specified.	Installer

Table 4.25 – Lead Lag Advanced Setting: Algorithms Parameters

Parameter	Comment	Password
Base load common	% If set to zero, this parameter is disabled. For any non-zero value, individual base load rates of each slave to be ignored by the LL master's routines and this common	Installer

	value to be used instead. Some rate allocation algorithms may specify the use of this parameter, and that the slave base load setting are ignored.	

Table 4.26 – Lead Lag Advanced Setting: Rate Allocation Parameters

Parameter	Comment	Password
Method	**Error threshold:** A stage is added when the error becomes excessive based on degrees away from setpoint and time. **Firing rate threshold:** Stage is added based on the firing rate of the last stage. **Disabled**	Installer
Detection time	This parameter determines how long criteria need to persist for add stage to occur.	Installer
Error threshold	0 to 234F (-17 to 112C) Stage is added when the error becomes excessive based on degrees away from setpoint, and time.	Installer
Rate offset	+- % Stage is added when the request firing rate is above the base rate by this amount and time.	Installer
Interstage delay	This parameter specifies the minimum time that the stager waits before adding a stage.	Installer

Table 4.27 – Lead Lag Advanced Setting: Add Stage Parameters

Parameter	Comment	Password
Method	**Error threshold:** A stage is dropped when the error becomes excessive based on degrees away from setpoint and time. **Firing rate threshold:** The firing rating based staging; a stage is dropped based on the firing rate of the last stage.	Installer
Detection time	This parameter determines how long criteria need to persist for a drop stage to occur.	Installer
Error threshold	0 to 234F (-17 to 112C) Stage is dropped when the error becomes excessive based on degrees away from setpoint, and time.	Installer
Rate offset	+- % Stage is dropped when the requested firing rate is below the minimum firing rate by this amount.	Installer
Interstage delay	This parameter specifies the minimum time that the stager waits before dropping a stage.	Installer

Table 4.28 – Lead Lag Advanced Setting: Drop Stage Parameters

4-34 Monitoring

Monitoring of each boiler on the system is accomplished through the System Status and Detail Status Pages. The Detail Status Page is shown below.

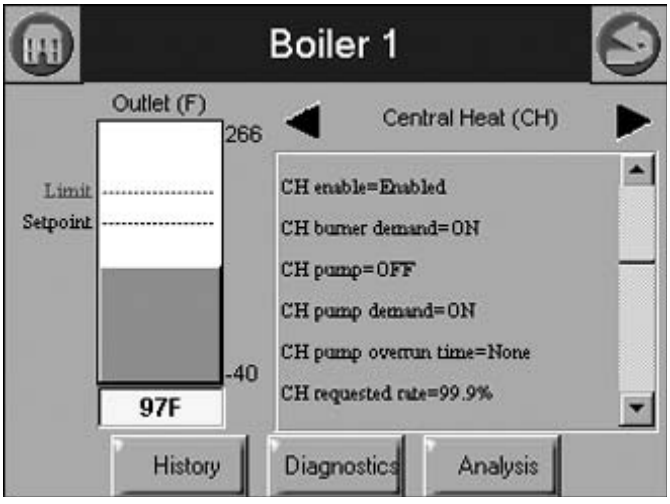


Figure 4.40 – Honeywell Sola Controller Detail Status Page

Status information on the Detail Status Page is organized into groups and displayed on the page one group at a time. The user moves from one group to another using the **Left** and **Right** arrow buttons.

Status data on the Detail Status Page is displayed in a menu for the group that is currently displayed. If more status items exist in the group than will fit on the screen, a vertical scroll bar allows the user to see all status data.

4-35 Trend Analysis Page

Trend analysis of Honeywell Sola Controller status data can be viewed on the Operator Interface. A graph displays a historical view of Honeywell Sola Controller status data over varying time periods.
A 2-dimensional graph with status data values shown on the Y axis over time specified on the X axis is displayed. Status for the most recent time is represented on the left side of the graph with older status running towards the right side of the graph.

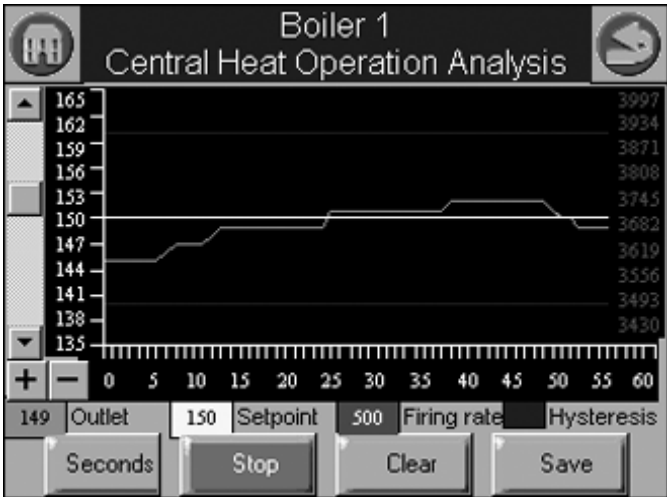


Figure 4.57 – Trend Analysis Page

Up to 4 Honeywell Sola Controller status variables can be viewed at the same time on one trend analysis graph. Select the status variables for the graph on the menu page. This menu displays when the **Trend Analysis** button is selected on the Honeywell Sola Controller status page.

As the status variables are selected they are listed in a trend variables list box. The user chooses the status variables from a drop down menu and then presses the **Add** button to add each status variable to the trend variable list as seen in **Figure 4.59**. After all status variables have been selected press the **Show** button to view the trend analysis graph.

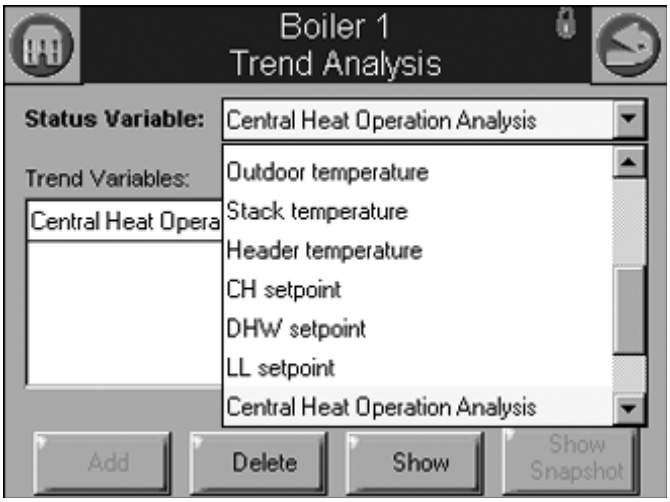


Figure 4.59 – Trend Analysis Menu Page

Each status variable displayed in the trend analysis is represented by a different colored line, as follows:

- **First status variable**: Green
- **Second status variable**: Yellow
- **Third status variable**: Red
- **Fourth status variable**: Blue

No more than two different measurement units (such as degrees), are allowed for the status variables selected in the trend analysis graph. Attempts to add a status variable with a third measurement unit are rejected.

Status older than the sample time period is dropped from the right end of the curve as newer status appears on the left end of the curve.

Trend data can be viewed in one-second (most recent 60 second time period), 15-second (most recent 15-minute time period), and hour (most recent 24 hour time period) intervals.

Pressing the **Stop** button will pause trend data updates of the graph. The graph freezes the view when stopped. However, trend data sampling from the Honeywell Sola Controller continues regardless whether the graph update is stopped or not. Restarting the updates causes the graph to be refreshed with the latest data samples.

Pressing the **Clear** button will clear the trend sample data for a Honeywell Sola Controller. All trend data for the Honeywell Sola Controller is cleared including status variables that are not included in the graph. The user is asked to confirm this action before proceeding.

Trend Analysis Snapshot
The trend analysis snapshot file is stored in Comma Separated Value (CSV) format in the System Operator Interface so it can be imported into a spreadsheet program such as Microsoft Excel.
The trend analysis snapshot file can be viewed in graph form on the System Operator Interface. It is also accessible in an Ethernet FTP session with the System Operator Interface. This FTP session can be used to export the trend analysis snapshot file.

4-36 Honeywell Sola Controller Diagnostics

The diagnostic page displays analog and digital I/O status of the Honeywell Sola Controller. The digital I/O data is displayed as LEDs that are either on (green) or off (red). Not all digital I/O can be displayed at the same time on the page, so a horizontal scroll bar is used to move the view left and right to show all digital I/O data.

Temperature sensors also display the current sensor state, i.e., whether there is a fault condition or the sensor is in a normal monitoring state. The user can toggle between displaying the Honeywell Sola Controller digital and analog I/O. The **Digital** or **Analog** button on the bottom of the diagnostic page changes the I/O displayed to the type indicated by the button. The following data is displayed on the Honeywell Sola Controller diagnostics page.

Data	Comment
Pump A	On/Off
Pump B	On/Off
Pump C	On/Off
Blower/HIS	On/Off
Pilot valve	On/Off
Main valve	On/Off
Load Control Input	On/Off
STAT	On/Off
Pre-ignition interlock	On/Off
Interlock	On/Off
Time Of Day	On/Off
Reset switch	On/Off
Pilot test hold	On/Off
DHW limit	On/Off
PM	None/Installed

Table 4.32 – Digital I/O Data

On status is indicated by a green LED and **Off** status is indicated by a red LED.

Data	Comment

Firing rate	RPM
Fan speed	RPM
Flame signal	V
Header temperature	If enabled
Outlet temperature	Degrees
Inlet temperature	If enabled
DHW temperature	If enabled
Stack temperature	If enabled
Outdoor temperature	If enabled

Table 4.33 – Analog I/O Data

Analog I/O data is displayed as bar charts depicting the I/O level. Analog I/O that is not enabled for the installation displays a blank I/O level. To see all analog I/O, use the horizontal scroll bar to move the view left and right.

4-37 Installer Checkouts – Diagnostics Tests

Pressing the **Diagnostics Test** button launches the diagnostic tests. The first test displayed on the right side of the screen is the last selected test shown.

This screen enables the user to perform the following tests:

- **Modulation Test:** Enables the user to verify that the burner is firing at the correct rate.
- **Pilot Test:** Enables the user to verify that the pilot valve is functioning properly. The user can also perform burner adjustments for the pilot flame.
- **Pump Test:** Enables the user to verify that the correct pump is on or off. The Start Test button will test all pumps; pressing an individual pump tests that pump only.
- **Burner Switch:** This button turns the burner on or off.

Start Test: Runs the test for 5 minutes.

4-38 System Time

System time can be configured in the Operator Interface and applied to all Honeywell Sola Controllers that exist in the installation. A date and time is entered by the user at the Operator Interface and any data that is time stamped is marked with the current time and date in the Operator Interface. The Operator Interface system clock is set by going to Setup on the Home Screen and then selecting the **System Time** button on the Advanced Setup page. A screen similar to the following **Figure 4.76** displays.

NOTE: It's important that the system time be set in the Operator Interface so correct time stamps are given to the Honeywell Sola Controller lockouts. The Operator Interface time and date need to be set each time the Operator Interface reboots.

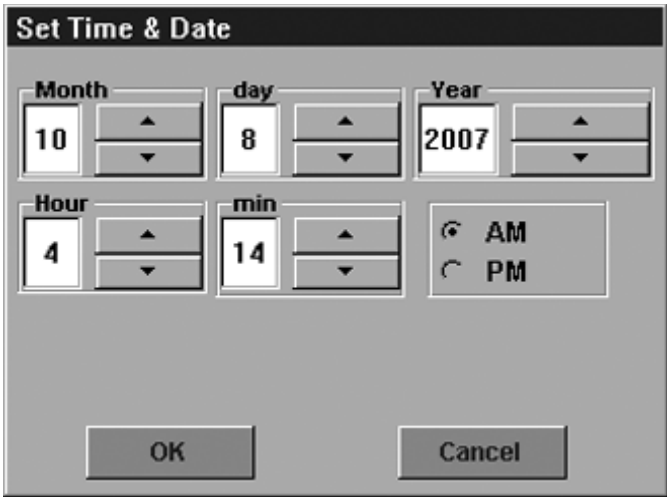


Figure 4.76 –Operator Interface Date and Time

Edit the date and time and press the **OK** button to set the new settings. Press the **Cancel** button to exit without changing the time or date.

5 Installer Integration Guide

5-1 Central Heat Related Configuration

5-1.1 To Enable or Disable CH Loop

Configure → CH – Central Heat Configuration → Central Heat → CH Enable Textbox
(CH Mode Default: Enable, Remote Mod Default: Enabled, DHW Mode Default: Enabled, Com Mode Default: Enabled)

- Select **Enable** to enable CH loop
- Select **Disable** to disable CH loop

This parameter determines whether the CH loop is enabled or disabled. When disabled the demand caused by the sensor assigned to the CH loop is ignored. It may be disabled to turn it off temporarily, or because the application does not use this feature.

5-1.2 To Change CH Loop Demand Switch

Configure → CH – Central Heat Configuration → Central Heat → Demand Switch Textbox
(Default: STAT Terminal)

- Select **Sensor only** for CH loop demand from selected sensor
- Select **LCI** for CH loop demand from recycle interlock
- Select **STAT** for CH loop demand from stat input

5-1.3 To Select CH Modulation Sensor

Configure → CH – Central Heat Configuration → Modulation → Modulation Sensor Textbox (Default: Outlet sensor)

- Select **Outlet Sensor** to modulate boiler firing rate with outlet sensor
- Select **Inlet Sensor** to modulate boiler firing rate with inlet sensor
- Select **S5 Header Sensor** to modulate boiler firing rate with header sensor
- Select **None**

Multipurpose S5 sensor (H1 & H2 terminals) will be used for header temperature if used. Outdoor sensor and outdoor reset is disabled when header sensor is used to CH sensor.

5-1.4 To Change CH Loop Setpoint

Configure → CH – Central Heat Configuration → Setpoint → Setpoint Textbox
(Default: 160^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This Setpoint is used when the time-of-day input is off. If the Outdoor Reset function is active, this Setpoint provides one coordinate for the outdoor reset curve, as described for the CH Outdoor Reset parameter.

5-1.5 To Change CH Loop Time Of Day Setpoint

Configure → CH – Central Heat Configuration → Setpoint → Time of Day Setpoint Textbox
(Default: 120^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This Setpoint is used when the time-of-day input is on. If the Outdoor Reset function is active, this Setpoint provides one coordinate for the shifted (because TOD is on) outdoor reset curve, as described for the CH Outdoor Reset parameter.

5-1.6 To Change CH Loop Off Hysteresis

Configure → CH – Central Heat Configuration → Setpoint → Off Hysteresis Textbox (Default: 7^0F)

- Type in desired temperature between 2^0F and 30^0F (1^0C and 16^0C)

The off hysteresis is added to the CH setpoint to determine the temperature at which this demand turns off

5-1.7 To Change CH Loop On Hysteresis

Configure → CH – Central Heat Configuration → Setpoint → On Hysteresis Textbox (Default: 7^0F)

- Type in desired temperature between 2^0F and 30^0F (1^0C and 16^0C)

The on hysteresis is subtracted from the Setpoint to determine the temperature at which demand turns on.

5-1.8 To Change CH Loop Hysteresis Step Time

Configure → CH – Central Heat Configuration → Modulation → Hysteresis Step Time Textbox (Default: 0M 0S)

- Type in desired time between 0 to 5 minutes

The CH, DHW and LL master each have similar setpoint and hysteresis functions. The parameters for each are separate and independent. Whenever the burner turns on, the turn-off threshold is raised by 18°Fand then it is decreased in steps. The time of each step is provided by the hysteresis step time parameter. If the time (T) is not-zero, then the following schedule is followed until the off threshold reaches its original value.

Whenever the burner turns off, the turn-on threshold is lowered by doubling the on hysteresis, and then increasing it by 2 degrees F per step until it reaches its original value. The time of each step is provided by the hysteresis step time parameter. The number of steps required to reach the original on hysteresis is the on hysteresis value divided by 2 degrees F.

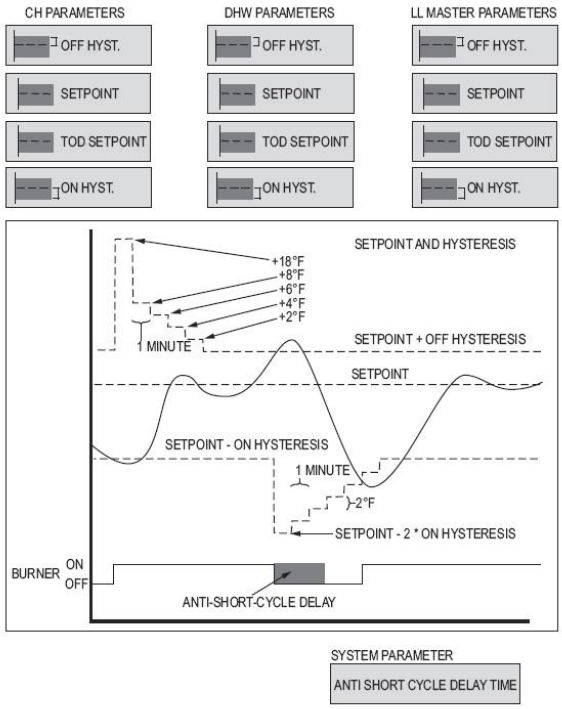


Figure 5.1 – Hysteresis Step Time Graph

The time needed for one step of hysteresis shift, when the off hysteresis threshold or on hysteresis threshold is shifted due to a burner-on or burner-off event, respectively. Zero disables this function.

5-1.9 To Enable Or Disable CH Loop Outdoor Reset

Configure → CH – Central Heat Configuration → Central Heat → CH Outdoor Reset Textbox (Default: Disable)

- Select **Enable** to enable CH loop outdoor reset
- Select **Disable** to disable CH loop outdoor reset

If outdoor reset is enabled then the current outdoor temperature is used to determine the Setpoint by interpolation using CH Setpoint (or CH Time-Of-Day Setpoint if TOD is on), the min water temperature, and the min and max outdoor temperatures.

5-1.10 To Change CH loop P-I-D parameters

Configure → CH – Central Heat Configuration → Modulation → P-Gain Textbox (Default: 50)

Configure → CH – Central Heat Configuration → Modulation → I-Gain Textbox (Default: 50)
Configure → CH – Central Heat Configuration → Modulation → D-Gain Textbox (Default: 0)

- Type in desired number between 0 to 400

P gain applied to the proportional term of the PID equation for the CH loop.
I gain applied to the Integral term of the PID equation for the CH loop.
D gain applied to the Differential term of the PID equation for the CH loop.

5-1.11 To Change CH Loop Setpoint Source

Configure → CH – Central Heat Configuration → Setpoint → Setpoint Source Textbox
(Default: 4-20mA setpoint)

- Select **Local** to use local setpoint as CH setpoint
- Select **4-20mA** to use remote setpoint as CH setpoint

5-1.12 To Change CH 4-20ma Setpoint Range

Configure → CH – Central Heat Configuration → Setpoint → 4 mA Water Temperature Textbox (Default: 40^0F)
Configure → CH – Central Heat Configuration → Setpoint → 20 mA Water Temperature Textbox (Default: 200^0F)

With CH 4-20mA remote setpoint enabled, CH setpoint is provided using the linear interpolation of the 4 mA (min setpoint) and 20 mA (max setpoint) range received from the building automation system.

5-1.13 To Change CH Priority Over Lead Lag

Configure → CH – Central Heat Configuration → Central Heat → CH has priority over LL Textbox (Default: No/False/Off)

This parameter sets whether a local CH demand has priority over the control asserted by the LL master, when enabled as a slave.

5-2 Outdoor Reset Related Configuration

5-2.1 To Change Maximum Outdoor Temperature

Configure → Outdoor Reset Configuration → Central Heat → Maximum Outdoor Temperature Textbox (Default: 80^0F)

- Type in desired temperature between -40^0F and 240^0F (-40^0C and 115^0C)

This parameter determines the maximum outdoor temperature for the CH outdoor reset graph. At the maximum outdoor temperature the setpoint will be the minimum water temperature.

5-2.2 To Change Minimum Outdoor Temperature

Configure → Outdoor Reset Configuration → Central Heat → Minimum Outdoor Temperature Textbox (Default: 50^0F)

- Type in desired temperature between -40^0F and 240^0F (-40^0C and 115^0C)

This parameter determines the X coordinate of one point on the Outdoor Reset graph. At this outdoor temperature the setpoint will be the CH setpoint (or the CH TOD setpoint, if TOD is on).

5-2.3 To Change Minimum Water Temperature

Configure → Outdoor Reset Configuration → Central Heat → Minimum Water Temperature Textbox (Default: 40^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This parameter provides the CH setpoint when the outdoor reset temperature is at its defined maximum.

5-2.4 Outdoor Reset Graph

Configure → Outdoor Reset Configuration → Show Line Button

If outdoor reset feature is enabled and the sensor is functioning properly, then the current outdoor temperature is used to determine the setpoint by interpolation. This lookup function uses two X and Y points to determine a line on the graph as shown in below.

The Y coordinate of the top-left point depends on the time-of-day input
If it is off then the CH setpoint is used.
If it is on the CH TOD setpoint provides the Y coordinate and the lower-right point is also re-calculated to shift the graph in a parallel way, as shown.

For outdoor temperatures lower than the minimum, the water temperature provided by the appropriate setpoint is used. For outdoor temperatures higher than the maximum, the minimum water temperature is used. For outdoor temperatures between the minimum and maximum, a linear interpolation is used to find the setpoint.

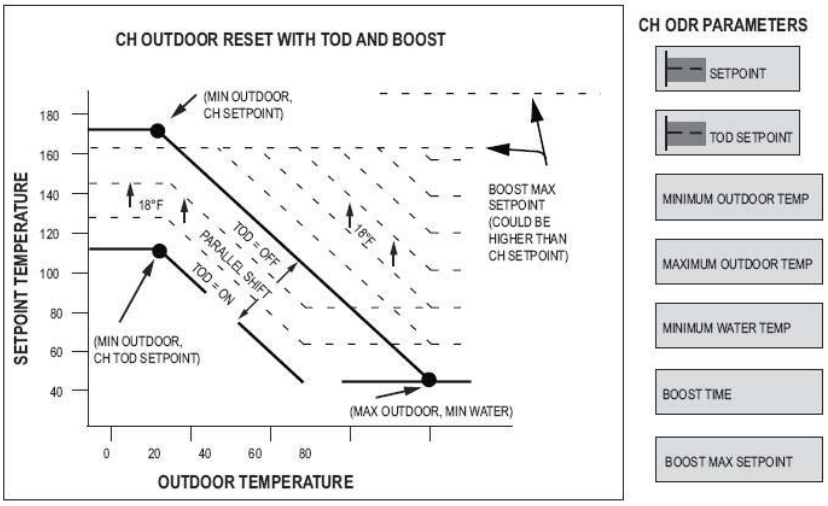


Figure 5.2 – Outdoor Reset Graph

5-2.5 To Change Low Water Temperature

Configure → Outdoor Reset Configuration → Central Heat →Low Water Temperature Textbox (Default: 40^{0}F)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

5-2.6 To Change Maximum Off Point

Configure → Outdoor Reset Configuration → Central Heat → Maximum Off Point Textbox
(Default: 90^{0}F)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

5-3 Domestic Hot Water Related Configuration

5-3.1 To Enable Or Disable DHW Loop

Configure → DHW – Domestic Hot Water Configuration → DHW Enable Textbox (CH Mode Default: Disabled, Remote Mode Default: Disabled, DHW Mode Default: Enabled, Com Mode Default: Enabled)

- Select **Enable** to enable DHW loop
- Select **Disable** to disable DHW loop

This parameter determines whether the DHW loop is enabled or disabled. When disabled the demand caused by the DHW sensor is ignored. It may be disabled to turn it off temporarily or because the application does not use this feature.

5-3.2 To Change DHW Loop Demand Switch

Configure → DHW – Domestic Hot Water Configuration → Demand Switch Textbox
(DHW Mode Default: STAT terminal, Com Mode Default: DHW (S6) switch)

- Select **Sensor only** for DHW demand from selected DHW modulation sensor
- Select **DHW (S6) Switch** for DHW demand from DHW switch (switch replaces the DHW sensor) When sensor input is shorted burner demand exist outlet sensor will provide the temperature control
- Select **STAT Terminal** for DHW demand from STAT input
- Select **Auto DHW (S6) or sensor only** for DHW demand from DHW switch and DHW sensor

5-3.3 To Change DHW Loop Priority Versus CH Loop

Configure → DHW – Domestic Hot Water Configuration → DHW Priority vs CH Textbox
(Default: DHW > CH)

- Select **CH > DHW** for no priority over CH loop
- Select **DHW > CH** for priority over CH loop

This parameters determines the priority of DHW vs. the CH call-for heat, when both of these are enabled and active. (If DHW has a lower priority, it may be boosted to the highest priority temporarily via the DHW Priority Time parameter.)

5-3.4 To Change DHW Loop Priority Time

Configure → DHW – Domestic Hot Water Configuration → DHW Override Priority Time Textbox (Default: 5m 0s)

- Type in desired time. No limits on this parameter.

If this parameter is non-zero then a DHW demand will take priority over other demand sources for the specified time. If this persists for longer than this time the priority will expire. The timer is reset when demand from the DHW source turns off.

5-3.5 To Change DHW Loop Setpoint

Configure → DHW – Domestic Hot Water Configuration → Setpoint Textbox (Default: 120^{0}F)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

This Setpoint is used whenever the time-of-day switch is off or not connected (unused).

5-3.6 To Change DHW Loop Time Of Day Setpoint

Configure → DHW – Domestic Hot Water Configuration → Time of Day Setpoint Textbox
(Default: 100^{0}F)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

This Setpoint is used when the time-of-day switch is on.

5-3.7 To Change DHW Loop Off Hysteresis

Configure → DHW – Domestic Hot Water Configuration → On Hysteresis Textbox (Default: 7^{0}F)

- Type in desired temperature between 2^{0}F and 30^{0}F (1^{0}C and 16^{0}C)

The on hysteresis is subtracted from the DHW Setpoint to determine the temperature at which DHW demand turns on.

5-3.8 To Change DHW Loop On Hysteresis

Configure → DHW – Domestic Hot Water Configuration → Off Hysteresis Textbox (Default: 7^{0}F)

- Type in desired temperature between 2^{0}F and 30^{0}F (1^{0}C and 16^{0}C)

The off hysteresis is added to the DHW Setpoint to determine the temperature at which DHW demand turns off.

5-3.9 To Change The DHW Hysteresis Step Time

Configure → DHW – Domestic Hot Water Configuration → Hysteresis Step Time Textbox
(Default: 0m0s)

- Type in desired time between 0 to 5 minutes

The time needed for one step of hysteresis shift, when the off hysteresis threshold or on hysteresis threshold is shifted due to a burner-on or burner-off event, respectively. Zero disables this function.

5-3.10 To Change DHW Loop P-I-D Parameters

Configure → DHW – Domestic Hot Water Configuration → P-Gain Textbox (Default: 50)
Configure → DHW – Domestic Hot Water Configuration → I-Gain Textbox (Default: 50)
Configure → DHW – Domestic Hot Water Configuration → D-Gain Textbox (Default: 0)

- Type in desired number between 0 to 400

P gain applied to the proportional term of the PID equation for the DHW loop.
I gain applied to the Integral term of the PID equation for the DHW loop.
D gain applied to the Differential term of the PID equation for the DHW loop.

5-3.11 To Change DHW Modulation Sensor

Configure → DHW – Domestic Hot Water Configuration → Modulation Sensor Textbox
(DHW Mode Default: DHW Sensor, Com Mode Default: Outlet Sensor (S1))

- Select **DHW sensor** for DHW modulation sensor
- Select **Outlet sensor** for DHW modulation sensor
- Select **Inlet sensor** for DHW modulation sensor
- Select **Auto DHW (S6) of Inlet (S1)** for Inlet modulation sensor when DHW switch is enabled
- Select **Auto DHW (S6) of Outlet (S1)** for outlet modulation sensor when DHW switch is enabled

5-3.12 To Change DHW Loop Priority Versus LL

Configure → DHW – Domestic Hot Water Configuration → DHW Priority vs Lead Lag Textbox (Default: DHW>LL)

- Select **LL>DHW** for no priority over LL loop
- Select **DHW>LL** for priority over LL loop

This parameters determines the priority of DHW vs. the LL call-for heat, when both of these are enabled and active. (If DHW has a lower priority, it may be boosted to the highest priority temporarily via the DHW Priority Time parameter.)

5-4 Modulation Related Configuration

5-4.1 To Change CH Loop Maximum Modulation Rate

Configure → Modulation Configuration → CH Maximum Modulation Rate Textbox
(Default: Varies based on model)

- Type in RPM rate between light off rate and maximum modulation rate

Provides the upper limit of modulation when firing for CH or LL slave mode.

5-4.2 To Change DHW Loop Maximum Modulation Rate

Configure → Modulation Configuration → DHW Maximum Modulation Rate Textbox
(Default: Varies based on model)

- Type in RPM rate between light off rate and maximum modulation rate

Provides the upper limit of modulation when firing for DHW.

5-4.3 To Change CH Loop Forced Rate Time

Configure → Modulation Configuration → CH Forced Rate Time Textbox (Default: 0m10s)

- Type in desired time between 0 to 5 minutes

For CH demand, if the CH forced rate time is non-zero, then the firing rate will be held at the rate specified here during that time. This parameter is also needed as the starting point for Slow State, even if the forced rate time is zero.

5-4.4 To Change CH Loop Forced Rate

Configure → Modulation Configuration → CH Forced Rate Textbox (Default: Varies based on model)

- Type in RPM rate between light off rate and maximum modulation rate

For CH demand, if this time is non-zero then, upon entry to Run, the firing rate will be held at the CH forced rate.

5-4.5 To Change DHW Loop Forced Rate Time

Configure → Modulation Configuration → DHW Forced Rate Time Textbox (Default: 0m10s)

- Type in desired time between 0 to 5 minutes

For DHW demand, if the DHW forced rate time is non-zero, then the firing rate will be held at the rate specified here during that time. This parameter is also needed as the starting point for Slow State, even if the forced rate time is zero.

5-4.6 To Change DHW Forced Rate

Configure → Modulation Configuration → DHW Forced Rate Textbox (Default: Varies based on model)

- Type in desired time between 0 to 5 minutes

For DHW demand, if this time is non-zero then, upon entry to Run, the firing rate will be held at the DHW forced rate.

5-4.7 To Enable Or Disable CH Loop Slow Start

Configure → Modulation Configuration → CH Slow Start Enable Textbox (Default: Disabled)

- Select **Enable** to enable CH loop slow start
- Select **Disable** to disable CH loop slow start

This parameter enables or disables the slow start limit function for CH (or LL slave) demand.

5-4.8 To Enable Or Disable DHW Loop Slow Start

Configure → Modulation Configuration → DHW Slow Start Enable Textbox (Default: Disabled)

- Select **Enable** to enable DHW loop slow start
- Select **Disable** to disable DHW loop slow start

This parameter enables or disables the slow start limit function for DHW demand.

5-4.9 To Change Slow Start Degrees

Configure → Modulation Configuration → Slow Start Degree Textbox (Default: 50^0F)

- Type in desired temperature between 0^0F and 180^0F (0^0C and 100^0C)

If slow start limiting is enabled and the outlet temperature is less than the setpoint minus the degrees provided by this parameter, then slow start rate limiting is effective.

5-4.10 To Change Slow Start Ramp

Configure → Modulation Configuration → Slow Start Ramp Textbox (Default: 400rpm)

- *Type in desired ramp rate between 100 to 2000 RPM*

When slow start limiting is effective, the modulation rate will increase no more than the amount per minute given by this parameter.

5-5 Pump Control Related Configuration

5-5.1 To Set CH Loop Pump Control On Or Auto

Configure → Pump Configuration → Central Heat Pump → Pump Control Textbox (Default: Auto)

- Select **Auto** for automatic control of CH loop pump
- Select **On** to turn on CH loop pump

The CH pump can be turned on manually, or it can be set to operate automatically. If it is turned on then it remains on until changed back to Auto. In Auto mode it operates according to the demand sources and the overrun time.

5-5.2 To Change CH Loop Pump Overrun Time

Configure → Pump Configuration → Central Heat Pump → Overrun Time Textbox (Default: 1m0s)

- Type in desired time between 0 to 5 minutes

This time indicates how long the CH pump should remain on after demand from any source ends. That is, whenever the pump has been on, but the last requests for the pump to be on ends, it always continues to run for the time given by this parameter.

5-5.3 To Set DHW Loop Pump Control On Or Auto

Configure → Pump Configuration → DHW Pump → Pump Control Textbox (Default: Auto)

- Select **Auto** for automatic control of DHW loop pump
- Select **On** to turn on DHW loop pump

The DHW pump can be turned on manually, or it can be set to operate automatically. If it is turned on then it remains on until changed back to Auto. In Auto mode it operates according to the DHW demand and the overrun time.

5-5.4 To Change DHW Loop Pump Overrun Time

Configure → Pump Configuration → DHW Pump → Overrun Time Textbox (Default: 1m0s)

- Type in desired time between 0 to 5 minutes

This time indicates how long the DHW pump should remain on after demand from any source ends. That is, whenever the pump has been on, but the last requests for the pump to be on ends, it continues to run for the time given by this parameter.

5-5.5 To Set System Loop Pump Control On Or Auto

Configure → Pump Configuration → System Pump → Pump Control Textbox (Default: Auto)

- Select **Auto** for automatic control of System loop pump
- Select **On** to turn on System loop pump

The Boiler pump can be turned on manually, or it can be set to operate automatically. If it is turned on then it remains on until changed back to Auto. In Auto mode it operates according to the demand and overrun time.

5-5.6 To Change System Loop Pump Overrun Time

Configure → Pump Configuration → System Pump → Overrun Time Textbox (Default: 1m0s)

- Type in desired time between 0 to 5 minutes

This time indicates how long the System pump should remain on after demand ends.

5-5.7 To Change System Pump Exercise Interval

Configure → Pump Configuration → Advanced Settings → Miscellaneous → Pump Exercise Interval Textbox (Default: 0)

- Type in desired number of days.

This parameter specifies the maximum number of days that a pump can be off. If this limit is reached then the pump is turned on for the specified exercise time. If the interval is zero then this exercise function is disabled.

5-5.8 To Change System Pump Exercise Time

Configure → Pump Configuration → Advanced Settings → Miscellaneous → Pump Exercise Time Textbox (Default: 0m0s)

- Type in desired time between 0 to 5 minutes

This parameter specifies the amount of time that a pump remains on, when it has been turned on due to the exercise interval. If this time is zero then the exercise function is disabled.

5-6 High Limit Related Configuration

5-6.1 To Enable Or Disable DHW High Limit

Configure → High Limits → DHW High Limit Textbox (Default: Disable)

- Select **Enable Dual Safety Sensor** to enable DHW loop high limit

- Select **Disable** to disable DHW loop high limit

This parameter enables or disables the DHW high limit function. It must be disabled when the DHW input is used as a switch to indicate DHW demand.

5-6.2 To Change DHW High Limit Setpoint

Configure → High Limits → DHW High Limit Setpoint Textbox (Default: 200^{0}F)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

If the DHW temperature reaches the value given by this parameter then a response will occur.

5-6.3 To Change Outlet High Limit Setpoint

Configure → High Limits → Outlet High Limit Setpoint Textbox
(Default: 240^{0}F for H and 200^{0}F for HLW)

- Type in desired temperature between 32^{0}F and 240^{0}F (0^{0}C and 115^{0}C)

If the outlet temperature reaches the value given by this parameter, a response will occur.

5-6.4 To Change DHW High Limit Response

Configure → High Limits → DHW High Limit Response Textbox (Default: Lockout)

- Select **Recycle & Hold** for DHW loop high limit response
- Select **Lockout** for DHW loop high limit response

If Recycle & Hold is selected then the burner control recycles and holds until the DHW temperature is falls below the DHW high limit setpoint minus 5F.

5-7 Stack Limit Related Configuration

5-7.1 To Enable Or Disable Stack Limit

Configure → Stack Limit → Stack Limit Textbox (Default: Disable)

- Select **Enable Dual Safety sensor** to enable Stack limit
- Select **Disable** to disable Stack limit

This parameter enables or disables the entire stack temperature limit function.

5-7.2 To Change Stack Limit Delay

Configure → Stack Limit → Stack Limit Delay Textbox (Default: 5m0s)

- Type in desired time between 0 to 5 minutes

This parameter provides the delay time for the Stack limit.

5-7.3 To Change Stack Limit Response

Configure → Stack Limit → Stack Limit Response Textbox (Default: Recycle & Delay)

- Select **Lockout** to lockout in event of Stack limit
- Select **Recycle & delay** to recycle and delay in event of Stack limit

For Recycle and Delay, the burner control recycles and holds while waiting for a delay (see the Stack Limit Delay parameter) to expire, and after the delay it tries again.

5-7.4 To Change Stack Limit Setpoint

Configure → Stack Limit → Stack Limit Setpoint Textbox (Default: No Valve)

- Type in desired temperature between 32^{0}F and 266^{0}F (0^{0}C and 130^{0}C)

If the stack temperature exceeds the temperature given by this parameter then the response defined for the Stack Limit Response parameter will occur. As the temperature approaches this limit, the Stepped Modulation Limiting function is active.

5-8 Delta-T Limit Related Configuration

5-8.1 To Enable Or Disable Delta-T Limit

Configure → Delta T → Inlet to Outlet Flow → Delta-T Enable Textbox (Default: No Delta-T)

- Select **Enable** to enable Delta-T limit
- Select **Disable** to disable Delta-T limit

This parameter enables or disables the entire delta-T limit function.

5-8.2 To Change Delta-T Limit Delay

Configure → Delta T → Inlet to Outlet Flow → Delta-T Delay Textbox (Default: 5m0s)

- Type in desired time between 0 to 5 minutes

This parameter provides the delay time for the Delta-T limit.

5-8.3 To Change Delta-T Limit Response

Configure → Delta T → Inlet to Outlet Flow → Delta-T Limit Response Textbox (Default: Lockout)

- Select **Lockout** to lockout in event of Delta-T limit
- Select **Recycle & delay** to recycle and delay in event of Delta-T limit
- Select **Recycle & delay with retry limit** to recycle and delay in event of Delta-T limit up to Delta-T retry limit

If the temperature difference exceeds the limit and Recycle and delay is selected then the burner control recycles and holds while waiting for a delay (see the Delta-T Limit Delay parameter) to expire.

5-8.4 To Change Delta-T Limit Degrees

Configure → Delta T → Inlet to Outlet Flow → Delta-T Degrees Textbox (Default: A050-A075: 47, A100: 63, A150: 94, A200: 63, A250: 79, A300: 94)

- Type in desired temperature

If the outlet is hotter than the inlet temperature by the amount given by this parameter, the response defined for the Delta-T Limit Response will occur. Stepped Modulation Limiting will occur as the temperature approaches this limit.

5-8.5 To Change Delta-T Retry Limit

Configure → Delta T → Inlet to Outlet Flow → Delta-T Retry Limit Textbox (Default: 10)

- Type in desired retry limit

How many of retry will be tolerated. If demand I not satisfied and this number of recycles had happened, then lockout occurs.

5-8.6 To Enable Delta-T Rate Limit

Configure → Delta T → Inlet to Outlet Flow → Delta-T Rate Limit Enable Textbox (Default: Disabled)

- Select **Enable** to enable Delta-T rate limit
- Select **Disable** to disable Delta-T rate limit

Enabling this parameter causes Stepped modulation to occur as Delta-T temperature limit approached.

5-8.7 To Change Delta-T Inverse Limit Time

Configure → Delta T → Inlet to Outlet Flow → Delta-T Inverse Limit Time Textbox (Default: 30m0s)

- Type in desired time

When temperature inversion detection is enabled for a pair of sensors, this parameter specifies a time during with this will be tolerated.

5-8.8 To Change Delta-T Inverse Limit Response

Configure → Delta T → Inlet to Outlet Flow → Delta-T Inverse Limit Response Textbox
(Default: Recycle & delay)

- Select **Lockout** to lockout in event of Delta-T inverse limit
- Select **Recycle & delay** to recycle and delay in event of Delta-T inverse limit

- Select **Recycle & delay with retry limit** to recycle and delay in event of Delta-T inverse limit up to Delta-T retry limit

5-9 Frost Protection Related Configuration

5-9.1 To Enable Or Disable CH Loop Frost Protection

Configure → Frost Protection Configuration → CH Frost Protection Enable Textbox
(Default: Disabled)

- Select **Enable** to enable CH loop frost protection
- Select **Disable** to disable CH loop frost protection

The CH frost protection feature can be enabled to turn the CH pump and possibly fire the burner whenever the CH input sensor is too cold.

5-9.2 To Enable Or Disable DHW Loop Frost Protection

Configure → Frost Protection Configuration → DHW Frost Protection Enable Textbox
(Default: Disable)

- Select **Enable** to enable DHW loop frost protection
- Select **Disable** to disable DHW loop frost protection

The DHW frost protection feature can be enabled to turn the DHW pump and possibly fire the burner whenever the DHW input sensor is too cold.

5-9.3 To Change Outdoor Frost Protection Setpoint

Configure → Frost Protection Configuration → Outdoor Frost Protection Setpoint Textbox
(Default: 32^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This parameter provides the setpoint for frost protection based on outdoor temperature. When the outdoor temperature falls below this threshold then frost protection will be active.

5-9.4 To Enable Or Disable Ll Frost Protection

Configure → Frost Protection Configuration → LL frost protection enable Textbox (Default: Disable)

- Select **Enable** to enable LL frost protection
- Select **Disable** to disable LL frost protection

The LL frost protection feature can be enabled to turn the pumps and possibly fire the burner whenever the input sensor is too cold.

5-9.5 To Change LL Frost Protection Rate

Configure → Frost Protection Configuration → LL Frost Protection Rate Textbox (Default: 0%)

- Type in desired firing rate for lead lag frost protection

Firing rate used when LL frost protection is active.

5-9.6 To Change CH Loop Pump Frost Protection Overrun Time

Configure → Frost Protection Configuration → CH pump frost overrun time Textbox (Default: 5m0s)

- Type in desired time between 0 to 5 minutes

This time indicates how long the CH pump should remain on after frost protection demand ends. That is, whenever the pump has been on due to frost protection and then this demand ends, it always continues to run for the time given by this parameter.

5-9.7 To Change DHW Loop Pump Frost Protection Overrun Time

Configure → Frost Protection Configuration → DHW pump frost overrun time Textbox

(Default: 5m0s)

- Type in desired time between 0 to 5 minutes

This time indicates how long the DHW pump should remain on after frost protection demand ends. That is, whenever the pump has been on due to frost protection and then this demand ends, it always continues to run for the time given by this parameter.

5-10 DHW Storage Configuration

5-10.1 To Enable DHW Storage Mode

Configure → DHW Storage Configuration → DHW Storage Enable Textbox (Default: Disable)

- Select **Enable** to enable DHW storage mode
- Select **Disable** to disable DHW storage mode

5-10.2 To Change DHW Storage Time

Configure → DHW Storage Configuration → Storage Time Textbox (Default: 0m0s)

- Type in desired DHW storage time

This parameter provides the DHW storage time. When enabled and normal DHW call for heat is satisfied the DHW storage demand will persist for this time interval. If normal demand returns the timer is reset.

5-10.3 To Change DHW Storage Setpoint

Configure → DHW Storage Configuration → Setpoint Textbox (Default: 140^{0}F)

- Type in desired DHW storage setpoint

This parameter provides the setpoint used during DHW storage demand.

5-10.4 To Change DHW Storage On Hysteresis

Configure → DHW Storage Configuration → On Hysteresis Textbox (Default: 7^{0}F)

- Type in desired DHW storage on hysteresis

5-10.5 To Change DHW Storage Off Hysteresis

Configure → DHW Storage Configuration → Off Hysteresis Textbox (Default: 7^{0}F)

- Type in desired DHW storage off hysteresis

5-11 Warm Weather Shutdown Configuration

5-11.1 To Enable Wwsd

Configure → WWSD Configuration → Enable Textbox (Default: Warm Weather Shutdown Disabled)

- Select **Disable** to disable WWSD
- Select **Shutdown after demand ended** to allow any current CH demand that is present prevents WWSD from becoming true
- Select **Shutdown immediately** to allow WWSD to become true immediately causing CD demand to end

5-11.2 To Change Wwsd Setpoint

Configure → WWSD Configuration → Setpoint Textbox (Default: 90^{0}F)

- Type in desired WWSD setpoint

Setpoint temperature at which activates WWSD to occur.

5-12 T-Rise Limit Configuration

5-12.1 To Enable Outlet T-Rise

Configure → T-Rise Limit Configuration → Outlet T-rise Enable Textbox (Default: Disable)

- Select **Enable** to enable Outlet T-rise
- Select **Disable** to disable Outlet T-rise

5-12.2 To Change T-Rise Degree

Configure → T-Rise Limit Configuration → T-rise Degree Textbox (Default: 50^0F/sec)

- Type in desired outlet T-rise degree

If the outlet temperature rises faster than this number of degrees per minute, then the T-rise response will occur.

5-12.3 To Change T-Rise Response

Configure → T-Rise Limit Configuration → T-rise Response Textbox (Default: Lockout)

- Select **Lockout** to lockout in event of outlet T-rise limit
- Select **Recycle & delay** to recycle and delay in event of outlet T-rise limit
- Select **Recycle & delay with retry limit** to recycle and delay in event of outlet T-rise limit up to Delta-T retry limit

5-12.4 To Change T-Rise Retry Limit

Configure → T-Rise Limit Configuration → T-rise Retry Limit Textbox (Default: 10)

- Type in desired retry limit

How many of retry will be tolerated. If demand I not satisfied and this number of recycles had happened, then lockout occurs.

5-12.5 To Change T-Rise Limit Delay

Configure → T-Rise Limit Configuration → T-rise Retry Delay Textbox (Default: 5m0s)

- Type in desired time between 0 to 5 minutes

This parameter provides the delay time for the outlet T-rise limit.

5-13 Lead Lag Slave Configuration

5-13.1 To Enable Lead Lag Slave

Configure → Lead Lag Slave Configuration → Slave Enable Textbox (Default: Disable)

- Select **Disable** to disable Lead lag slave
- Select **Enabled via Modbus (Modbus Slave)** to enable lead lag slave for third party lead lag equipment
- Select **Slave** to enable slave for lead lag master

5-13.2 To Change Lead Lag Slave Mode

Configure → Lead Lag Slave Configuration → Slave Mode Textbox (Default: Equalized Runtime)

- Select **Use First** to always fire this slave first before any that are to have equal run time
- Select **Use Last** to always fire this slave last after any that are to have equal run time
- Select **Equal runtime** to operate the slave to equalize their runtime vs. other slaves

5-13.3 To Change Base Load Rate

Configure → Lead Lag Slave Configuration → Base Load Rate Textbox (Default: 40%)

- Type in desired base load rate

This parameter specifies the slave's preferred firing rate for use by the lead lag master when it is setup to use the base load rate of each slave.

5-13.4 To Change Slave Sequence Order

Configure → Lead Lag Slave Configuration → Slave Sequence Order Textbox (Default: 0)

- Type in desired slave sequence order

Slave sequence order is used to determine the order in which slave will be staged on. If slave sequence number is zero than slave Modbus address is used instead.

5-13.5 To Change Demand To Firing Delay

Configure → Lead Lag Slave Configuration → Demand to Firing Delay Textbox (Default: 2m0s)

- Type in desired slave demand to firing delay

Length of time to wait between requesting a stage to fire and detecting that it has failed to start.

5-13.6 To Change Modbus Port

Configure → Lead Lag Slave Configuration → Modbus Port Textbox
(Default: Use MB2 port for Lead Lag Message)

- Select **MB1** or **MB2** Modbus port to use for lead lag operation
- No port

5-13.7 To Change Modbus Address

Configure → Lead Lag Slave Configuration → Modbus Address Textbox (Default: 1)

- Type in desired slave modbus address 0-250

Modbus address used to communicate with the unit. This address number must be unique for each slave on the network.

5-14 Lead Lag Master Configuration

5-14.1 To Enable Lead Lag Master

Configure → Lead Lag Master Configuration → Master Enable Textbox (Default: Disable)

- Select **Disable** to disable Lead lag master
- Select **Enable** to enable lead lag master

5-14.2 To Change Lead Lag CH Setpoint

Configure → Lead Lag Master Configuration → CH Setpoint Textbox (Default: 160^0F)

- Type in desired LL CH setpoint

5-14.3 To Change Lead Lag CH TOD Setpoint

Configure → Lead Lag Master Configuration → CH TOD Setpoint Textbox (Default: 120^0F)

- Type in desired LL CH TOD setpoint

5-14.4 To Change Modbus Port

Configure → Lead Lag Master Configuration → Modbus Port Textbox
(Default: Use MB2 port for Lead Lag Message)

- Select **MB1** or **MB2** Modbus port to use for lead lag operation
- No port

5-15 Lead Lag Advanced Setting: Modulation Parameter

5-15.1 To Change Lead Lag Modulation Backup Sensor

Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → Modulation Backup Sensor Textbox (Default: **Slave Outlet average**)

- Select **Disable** to not used backup sensor
- Select **Lead Outlet Sensor** to use outlet of the lead boiler as backup sensor
- Select **Slave Outlet average** to use average outlet temperature of all slave boilers that are firing

5-15.2 To Change Lead Lag Off Hysteresis

Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → Off Hysteresis Textbox (Default: 10^0F)

- Type in desired LL off hysteresis

Differential above setpoint when last LL stage boiler is turned off.

5-15.3 To Change Lead Lag On Hysteresis

Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → On Hysteresis Textbox (Default: 10^0F)

- Type in desired LL on hysteresis

Differential below setpoint when first LL stage boiler is turned on.

5-15.4 To Change Lead Lag Hysteresis Step Time

Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → Hysteresis Step Time Textbox (Default: 0m0s)

- Type in desired LL hysteresis step time

5-15.5 To Change Lead Lag P-I-D Parameters

Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → P-Gain Textbox (Default: 50)
Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → I-Gain Textbox (Default: 50)
Configure → Lead Lag Master Configuration → Advanced Setting → Modulation → D-Gain Textbox (Default: 0)

- Type in desired number between 0 to 400

P gain applied to the proportional term of the PID equation for the LL.
I gain applied to the Integral term of the PID equation for the LL.
D gain applied to the Differential term of the PID equation for the LL.

5-16 Lead Lag Advanced Setting: CH Parameter

5-16.1 To Change Lead Lag CH Demand Switch

Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → Demand Switch Textbox (Default: STAT terminal)

- Select **STAT terminal** for LL CH loop demand from stat input
- Select **Disable** to not use demand switch input for LL CH loop
- Enviracon Heat Remote STAT

5-16.2 To Change Lead Lag CH Setpoint Source

Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → Setpoint Source Textbox (Default: 4-20mA setpoint is used)

- Select **Local** to use local setpoint as CH setpoint
- Select **4-20mA** to use remote setpoint as CH setpoint

5-16.3 To Change Lead Lag CH Loop Time Of Day Setpoint

Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → Time of Day Setpoint Textbox (Default: 120^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This Setpoint is used when the time-of-day input is on. If the Outdoor Reset function is active, this Setpoint provides one coordinate for the shifted (because TOD is on) outdoor reset curve, as described for the LL CH Outdoor Reset parameter.

5-16.4 to change lead lag CH 4-20ma setpoint range

Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → 4 mA Water Temperature Textbox (Default: 40^0F)
Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → 20 mA Water Temperature Textbox (Default: 200^0F)

With LL CH 4-20mA remote setpoint enabled, setpoint is provided using the linear interpolation of the 4 mA (min setpoint) and 20 mA (max setpoint) range received from the building automation system.

5-16.5 To Enable Or Disable Lead Lag CH Loop Outdoor Reset

Configure → Lead Lag Master Configuration → Advanced Setting → Central Heat → Outdoor Reset Textbox (Default: Disabled)

- Select **Enable** to enable CH loop outdoor reset
- Select **Disable** to disable CH loop outdoor reset

If outdoor reset is enabled then the current outdoor temperature is used to determine the Setpoint by interpolation using LL CH Setpoint (or LL CH Time-Of-Day Setpoint if TOD is on), the min water temperature, and the min and max outdoor temperatures.

5-17 Lead Lag Advanced Setting: DHW Parameter

5-17.1 To Change Lead Lag DHW Priority Source

Configure → Lead Lag Master Configuration → Advanced Setting → DHW Parameter → Priority source Textbox (Default: Disabled)

- Select **DHW heat demand** for LL DHW heat demand priority
- Select **Disable** to LL DHW heat demand priority

5-17.2 To Change Lead Lag DHW Priority Method

Configure → Lead Lag Master Configuration → Advanced Setting → DHW Parameter → Priority method Textbox (Default: Boost DHW during priority time)

- Select **Boost during priority time**
- Select **Drop after priority time**

5-17.3 To Change Lead Lag DHW Priority Override Time

Configure → Lead Lag Master Configuration → Advanced Setting → DHW Parameter → DHW priority override time Textbox (Default: 5m0s)

- Type in desired time

If this parameter is non zero, then a DHW demand will shift. Its priority vs other demand sources according to the specified time. The Priority override timing is reset when demand from the DHW source turns off.

5-18 Lead Lag Advanced Setting: Frost Protection Parameter

5-18.1 To Enable Or Disable Lead Lag Frost Protection

Configure → Lead Lag Master Configuration → Advanced Setting → Frost Protection → Enable Textbox (Default: Disabled)

- Select **Enable** to enable CH loop frost protection
- Select **Disable** to disable CH loop frost protection

The LL frost protection feature can be enabled to turn the pump and possibly fire the burner whenever the input sensor is too cold.

5-18.2 To Change Lead Lag Frost Protection Setpoint

Configure → Lead Lag Master Configuration → Advanced Setting → Frost Protection → Outdoor Setpoint Textbox (Default: 32^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

This parameter provides the setpoint for frost protection based on outdoor temperature. When the outdoor temperature falls below this threshold then frost protection will be active.

5-18.3 To Change Lead Lag Frost Protection Rate

Configure → Lead Lag Master Configuration → Advanced Setting → Frost Protection → Frost Protection Rate Textbox (Default: 0%)

- Type in desired rate

This parameter represents the lead lag firing rate when frost protection is enabled.

5-19 Lead Lag Advanced Setting: WWSD Parameter

5-19.1 To Enable Or Disable Lead Lag WWSD

Configure → Lead Lag Master Configuration → Advanced Setting → WWSD → Enable Textbox (Default: Disabled)

- Select **Disable** to disable WWSD
- Select **Shutdown after demand ended** to allow any current CH demand that is present prevents WWSD from becoming true
- Select **Shutdown immediately** to allow WWSD to become true immediately causing CD demand to end

5-19.2 To Change WWSD Setpoint

Configure → Lead Lag Master Configuration → Advanced Setting → WWSD → Setpoint Textbox (Default: 90^0F)

- Type in desired temperature between 32^0F and 240^0F (0^0C and 115^0C)

When the outdoor temperature is greater than Warm Weather Shutdown setpoint then it will cause the CH demand to end. If there is no outdoor temperature then WWSD is disabled.

5-20 Lead Lag Advanced Setting: Algorithms Parameter

5-20.1 To Change Lead Selection Method

Configure → Lead Lag Master Configuration → Advanced Setting → Algorithms → Lead Selection Method Textbox (Default: Lowest measured run time)

- Select **Sequence order** to sequence the lead boiler according to their sequence order or Modbus address if this value is zero
- Select **Measured run time** to sequence the lead boiler according to reported run time.

5-20.2 To Change Lag Selection Method

Configure → Lead Lag Master Configuration → Advanced Setting → Algorithms → Lag Selection Method Textbox (Default: Measured run time)

- Select **Sequence order** to sequence the lag boiler according to their sequence order or Modbus address if this value is zero
- Select **Measured run time** to sequence the lag boiler according to reported run time.

5-20.3 To Change Lead Rotation Time

Configure → Lead Lag Master Configuration → Advanced Setting → Algorithms → Lead Rotation Time Textbox (Default: 1h0m)

- Type in desired time

This parameter is used to trigger the rotation of lead boiler. Note the rotation does not occur until the next heat demand cycle.

5-20.4 To Change Forced Lead Rotation Time

Configure → Lead Lag Master Configuration → Advanced Setting → Algorithms → Forced Lead Rotation Time Textbox (Default: 24h0m)

- Type in desired time

This parameter is used to trigger the forced rotation of lead boiler. Action is forced and is independent of the heat demand cycle.

5-21 Lead Lag Advanced Setting: Rate Allocation Parameter

5-21.1 To Change Base Load Common Rate

Configure → Lead Lag Master Configuration → Advanced Setting → Rate Allocation → Base Load Common Textbox (Default: 40%)

- Type in desired rate %

If this parameter is zero, this parameter is disabled. For any non zero value, individual base rate of each slave to be ignored by the LL master's routines and this common value will be used instead.

5-22 Lead Lag Advanced Setting: Add Stage Parameter

5-22.1 To Change Add Stage Method

Configure → Lead Lag Master Configuration → Advanced Setting → Add Stage → Method Textbox (Default: Use error threshold to add stage)

- Select **Error threshold** to add stage when the error become excessive based on degrees away from setpoint and time
- Select **Firing rate threshold** to add stage based on the firing rate threshold of the last stage
- Select **Disable** to disable add stage method

5-22.2 To Change Add Stage Detection Time

Configure → Lead Lag Master Configuration → Advanced Setting → Add Stage → Detection Time Textbox (Default: 0m30s)

- Type in desired time

This parameter determines how long add stage condition needs to persist for add stage to occur.

5-22.3 To Change Add Stage Error Threshold

Configure → Lead Lag Master Configuration → Advanced Setting → Add Stage → Error Threshold Textbox (Default: 5F)

- Type in desired degree

This parameter determines error based on degree away from setpoint for add stage condition to occur.

5-22.4 To Change Add Stage Rate Offset

Configure → Lead Lag Master Configuration → Advanced Setting → Add Stage → Rate Offset Textbox (Default: 0%)

- Type in desired rate %

This parameter determines LL master requested firing rate above the base common rate for add stage condition to occur.

5-22.5 To Change Add Stage Interstage Delay

Configure → Lead Lag Master Configuration → Advanced Setting → Add Stage → Interstage Delay Textbox (Default: 0m30s)

- Type in desired time

This parameter specifies the minimum time that the stager waits before adding a stage.

5-23 Lead Lag Advanced Setting: Drop Stage Parameter

5-23.1 To Change Drop Stage Method

Configure → Lead Lag Master Configuration → Advanced Setting → Drop Stage → Method Textbox (Default: Use firing rate to drop stage)

- Select **Error threshold** to drop stage when the error become excessive based on degrees away from setpoint and time
- Select **Firing rate threshold** to drop stage based on the firing rate threshold of the last stage
- Select **Disable** to disable drop stage method

5-23.2 To Change Drop Stage Detection Time

Configure → Lead Lag Master Configuration → Advanced Setting → Drop Stage → Detection Time Textbox (Default: 0m30s)

- Type in desired time

This parameter determines how long drop stage condition needs to persist for drop stage to occur.

5-23.3 To Change Drop Stage Error Threshold

Configure → Lead Lag Master Configuration → Advanced Setting → Drop Stage → Error Threshold Textbox (Default: 5F)

- Type in desired degree

This parameter determines error based on degree away from setpoint for drop stage condition to occur.

5-23.4 to change drop stage rate offset

Configure → Lead Lag Master Configuration → Advanced Setting → Drop Stage → Rate Offset Textbox (Default: 0%)

- Type in desired rate %

This parameter determines LL master requested firing rate below the minimum firing rate for drop stage condition to occur.

5-23.5 To Change Add Stage Interstage Delay

Configure → Lead Lag Master Configuration → Advanced Setting → Drop Stage → Interstage Delay Textbox (Default: 0m30s)

- Type in desired time

This parameter specifies the minimum time that the stager waits before dropping a stage.

5-24 Miscellaneous Configuration

5-24.1 To Change Alarm Silence Time

Configure → System Configuration → Alarm Silence Time Textbox (Default: 0m0s)

- Type in desired time between 0 to 5 minutes

5-24.2 To Enable Or Disable Pre-Ignition Interlock

Configure → Burner Control Interlocks → PII Enable Textbox (Default: Disabled)

- Select **Enable** to enable Pre-Ignition Interlock
- Select **Disable** to disable Pre-Ignition Interlock

5-24.3 To Change Anti Short Cycle Time

Configure → System Configuration → Anti Short Cycle Textbox (Default: 0m0s)

- Type in desired time between 0 to 5 minutes

Whenever the burner is turned off due to no demand the anti-short cycle timer is started and the burner remains in a Standby Delay condition waiting for this time to expire. Does not apply, however, to recycle events or DHW demand.

5-24.4 To Change Burner Name

Configure → System Identification & Access → Boiler Name Textbox (Default: Boiler 1)

This parameter allows each boiler to have a unique name of up to 20 characters.

5-24.5 To Change Installation Data

Configure → System Identification & Access → Installation Textbox (Default: Atlas)

The installer may edit this parameter to provide installation information of up to 20 characters.

5-24.6 To Change Temperature Units

Configure → System Configuration → Temperature Units Textbox (Default: Fahrenheit)

- Select **Fahrenheit** to show temperature in Fahrenheit
- Select **Celsius** to show temperature in Celsius

This parameter determines whether temperature is represented in units of Fahrenheit or Celsius degrees.

5-24.7 To Turn On And Off The Unit Using Burner Switch

Operation → Burner Switch Button (Default: Yes/True/On)

This parameter enables or disables the burner control. When it is off, the burner will not fire.

5-24.8 To Enable Pump Test

Diagnostics → Diagnostics Test→ Pump Test Button

Enables the installer to verify that the correct pump contacts are on or off. The Start Test button will test all pump contacts; pressing an individual pump tests that pump contact only.

5-24.9 To Enable Modulation Test

Diagnostics → Diagnostics Test→ Modulation Test Button

Enables the user to verify that the unit is firing at the correct rate.

5-24.10 To Enable Pilot Test

Diagnostics → Diagnostics Test → Pilot Test Button

Enables the user to verify that the pilot valve is functioning properly. The installer can also perform adjustments for the pilot flame.

6 Start Up Instructions

Your unit has been pressure tested in accordance with ASME CODE SECTION IV and fire tested in accordance with UL 795. A copy of the factory test report is included inside the unit behind the display panel, and a test report label is located on the inside of the top lid.

It is required that the boiler and the system into which it is installed be tested before operating the system. The exact natures of the tests are listed on the start-up fire test report located in the back of this manual. **This start-up fire test report must be filled out and a copy must be sent to Ace Heating Solutions, LLC in the pre-addressed envelope provided with the unit in order to register the unit for the warranty.** The description of each of the tests to be completed begins on the next page. This testing should be completed as part of the normal installation procedure by the installing company.

Once the entire installation is complete, the unit should have an operation test to ensure that the ignition system safety shut off device works properly. Instructions in the manufacturer's literature shall be followed in conducting this test.

Boilers are pre-wired at the factory, in accordance to the wiring diagram supplied with the unit. 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.

The boiler and the entire system should be cleaned and flushed prior to filling. After cleaning, fill the system. To prevent trapped air in the boiler tubing, open the relief valve located on the water outlet of the boiler and leave it open until a steady flow of water is observed. Once this is done, close the relief valve and complete the filling of the system.

The lighting instructions and the wiring diagram for the control system furnished with each boiler are attached to these installation and service instructions. After placing the boiler in operation, the ignition system safety shutoff device must be tested.

Although the boiler (coil) pressure vessel and the gas train are pressure tested prior to shipping, often times during shipment, items have a tendency to work loose. These items may include relief valves and gas train assemblies. These items should be checked prior to operating the boiler and tightened. All Atlas units are factory fire tested and adjusted. The Factory Test Report (FTR) is sent with each unit and must be used when starting the installed unit. Like Forced Draft burners, all Pre-Mix burners must be tested and adjusted, as necessary, to the factory settings.

Prior to Start-Up, check to make sure all the installation procedures have been followed as outlined in this manual. This includes compliance with all local and state codes as well as the manufacturer's requirements.

6-1 Factory Test Report (FTR)

Each condensing boiler unit is supplied with a Factory Test Report (FTR). The FTR details the actual factory test settings for this unit as tested prior to shipment.

AJAX BOILER INC.

ATLAS A SERIES

FACTORY FIRE TEST REPORT

INFORMATION

MODEL #		SERIAL #		ORDER #	
QUANTITY		DATE MANUFACTURED			

FIRE TEST REPORT

GAS VALVE MODEL	MODEL #			
VENTURI MODEL	MODEL #			
BLOWER MODEL	MODEL #			
VENTING OUTLET SIZE	SIZE		IN.	
VENTING INLET SIZE	SIZE		IN.	
GAS SUPPLY PRESSURE	MIN		MAX	
AIR FILTER SIZE	SIZE		IN.	
GAS LEAK TEST		PASSED		FAILED
PILOT SPARK PICK UP TEST				
GAS TRAIN LEAK TEST				
FIRING RATE CHECK		LOW FIRE		HIGH FIRE
AIR FLOW SWITCH TEST		PASSED		FAILED
BLOCKED DRAIN TEST		PASSED		FAILED
WATER FLOW SWITCH TEST		PASSED		FAILED
AIR FLOW TO UV SCANNER TEST (BLOWER OFF)		PASSED		FAILED
PILOT FLAME SIGNAL CHECK		LOW FIRE		HIGH FIRE
MAIN FLAME SIGNAL CHECK		LOW FIRE		HIGH FIRE
MANIFOLD PRESSURE (NEG READINGS)		LOW FIRE		HIGH FIRE
COMB CHAMBER PRESSURE AT SITE GLASS (HIGH FIRE)		PRESSURE		
OUTLET VENT PRESSURE (HIGH FIRE)		PRESSURE		

TESTED BY:		COMMENT:
APPROVED BY:	DATE:	COMMENT:

Figure 6.1.Sample Factory and Start-up Test Reports

When unit is started up, it is important to check the following parameters and adjust them to the values seen on the factory test report. Please record the values in the blank spaces below. The values must be within the range seen below.

Carbon Monoxide	_____	ppm (must be kept below 100 ppm)
Carbon Dioxide	_____	% (should be kept between 7-9%)
Excess Air	_____	% (should be kept between 30-45%)
NOx	_____	ppm (must be kept under 20 ppm)
Combustion Chamber Pressure	_____	in w.c. (must be kept under 0.5 in w.c.)

6-2 Verification

Check the boiler nameplate and verify the voltage, type of gas, gas pressure and regulator setting. A wind deflecting vent cap that prevents downdrafts must be securely fastened to the vent outlet.

Read and verify the flame safeguard system installed on the unit. All Atlas condensing units have a prepurge and a postpurge time cycle of 7 seconds.

6-3 Start-Up Detail

Verify and record the gas valve model, venturi model, blower model, venting inlet and outlet sizes, and air filter size. Verify, but do not record, the supply gas pressure, the electrical voltage, the vent stack and the free combustion air openings to the boiler room to ensure that they meet the requirements on the nameplate, local codes, gas industry standards and the O & M manual.

- Upon start-up, the flame safeguard will initialize and begin a prepurge cycle. Blower relay energizes and turns on the Combustion Blower and the Auxiliary Blower.
- Combustion Air Flow switch close and combustion blower drives to prepurge speed.
- Prepurge rate is verified with blower feedback signal and initiates **7** second prepurge.
- After prepurge is completed, Combustion blower drives to light off rate.
- After light off rate is verified, **10** second PFEP (Pilot Flame Establishment Period) is initiated.
- During first half of PFEP, pilot valve solenoid and spark transformer are both energized.
- Spark transformer is de energized during second half of PFEP and only pilot valve is energized.
- When pilot flame is proofed, **4** second MFEP (Main Flame Establishment Period) is initiated.
- During MFEP, Main Safety Shutoff Valve and pilot valve solenoids are energized and firing rate is held at light off rate.
- After MFEP, pilot valve is de energized and main burner modulates its firing rate according to load demand.

If steady flame is not established, check the flame failure signals on the flame safeguard and correct the condition causing the flame failure. Several tries for ignition may be required to purge the air from the gas line.

6-4 Start Up And Maintenance Tests

6-4.1 Gas Supply Piping Leak Test

Upon first installing the unit, it is important to check the gas line leading up to the Atlas for gas leaks. Follow the National Fuel Gas Code for instructions on proper gas line piping and gas leak tests. Measuring gas pressures can help detect leaks in isolated lines. Temporarily install a manometer or pressure gauge with an upper limit of no more than 5 times the testing pressure, 5 x 14" w.c. = 2.6psi for Atlas installations, between the manual gas shut off on the Atlas and supply line's regulator. Leaving the shut off valve closed on the Atlas, open the supply line momentarily until the installed manometer reads a stable pressure and record the pressure and ambient temperature. Close the supply line and monitor the gas pressure for a drop in pressure. The test should be monitored for at least 10 minutes or ½ hour per each 500 ft^3 of volume in the testing pipe. At the end of the monitoring period, record the gas pressure and temperature. If there is a drop in pressure, a gas leak may be present and should be further investigated (Note: significant temperature variations may cause changes in the gas pressure and should be retested).
*NOTE: Please refer to the latest National Fuel Gas Code for leak test details. If instructions differ, the Fuel Gas Code shall supersede the instructions in this manual.**

6-4.2 Pilot Turndown Test - *(Optional at Installation, Required Annually After)*

To test that the main burner can be lit by the smallest pilot flame the can be seen by the flame amplifier and energize the FLAME LED. Clean the flame detector to make sure that it detects the smallest acceptable pilot flame. This test should be performed annually.

1) Open the Master switch
2) Close the manual main fuel shut off valves.
3) Connect a manometer, or pressure gauge, to measure pilot gas pressure during the turndown test.
4) Open the manual pilot shutoff valves.
5) Close the master switch
    a. Go to Pilot Test Mode,
        i. If using the standard panel, refer to section **Pilot Test** under the section **3-5 Setup Mode**.
        ii. If using the enhanced panel, refer to section **5-10.10 TO ENABLE PILOT TEST**
6) Start the system with a call for heat. Raise the setpoint of the operating controller. The Flame Safeguard sequence should start, and the prepurge should begin. The sequence will hold in the pilot flame establishing period and the flame led comes on when the pilot flame ignites.
    *note: if the sequence does not stop, reset the system and make sure that the Pilot Test is selected.
7) Turn down the pilot gas pressure very slowly, reading the manometer as it drops. Stop instantly when the flame led turns off. Note the pressure reading. The pilot flame is at the minimum turndown position. Immediately turn up the pilot pressure until the flame led comes on again or the flame signal increases to above the flame threshold value, 0.8 Vdc.
    *Note: If there is no flame for 15 seconds in the TEST position, the Flame Safeguard locks out.
8) Repeat step 7 to verify the pilot gas pressure reading at the exact point the Flame LED turns off.
9) Increase the pilot gas pressure immediately until the flame LED turns on, then turn it down slowly to obtain a pressure reading just above the dropout point or until the flame signal increases to above the flame threshold value, 0.8 Vdc.
10) Turn the pilot hold test off and allow the Flame Safeguard to start a burner cycle. During the Main Flame Establishing Period, make sure the automatic main fuel valve opens. Then smoothly open the manual main fuel shutoff valve and watch for the main burner ignition. If the light off is not rough and the main burner flame is established, go on to step 17.
    *Note: this step requires 2 people, one to control the manual valve and one to watch for ignition.
11) If the main burner flame is not established within 5 seconds, close the manual main fuel shutoff valve and open the master switch. If the light off is rough, the pilot flame size is too small.
12) Close the master switch and perform another pilot hold test, see step 5.
13) Increase the pilot flame size by increasing its fuel flow until a smooth main flame light off is accomplished.
14) Use orifices in the flame scanner sight tube until the pilot flame signal voltage is in the range of 0.7Vdc above the flame threshold.
15) When the main burner lights reliably with the pilot at turndown, disconnect the manometer and turn up the pilot gas flow to normal pressure of between 1"- 2" w.c.
16) Run the system through another cycle to check for normal operation.
17) Return the system to normal operation.

6-4.3 Pilot Spark Pick Up Test - *(Optional at Installation, Required Annually After)*

Perform this pilot spark pick up test to check that the ignition spark is not actuating the Flame LED. This test should be performed annually.

1) Open the Master switch.
2) Close the pilot and main burner manual fuel shut-off valves, see figure 6.2.
3) Close the master switch.
    a. Go to the S7999 Operator Interface Module.
    b. Select Diagnostics Test button at the bottom of the display.
    c. Select Diagnostics Test button at the bottom of this new screen.
    d. Select Pilot Test at the bottom of this new screen
    e. Select Start Test at the bottom of this screen.
4) Start the system with a call for heat. Raise the setpoint of the operating controller. The Flame Safeguard sequence should start and the prepurge should begin. The sequence will hold in pilot flame establishing period with only the ignition on. Ignition spark should occur but the flame signal should not be more than .5 Vdc.

5) If the flame signal is higher than 0.5 Vdc and the flame LED does come on, contact your local Ace Heating Solutions, LLC. representative for more help.

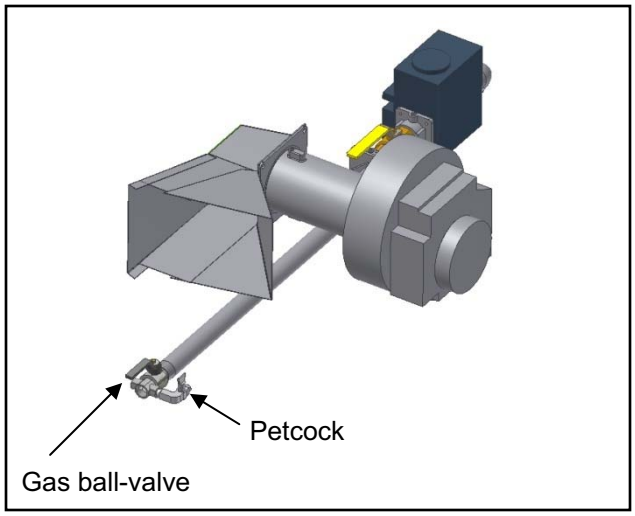


Figure 6.2. Atlas Combustion Assembly Without Burner

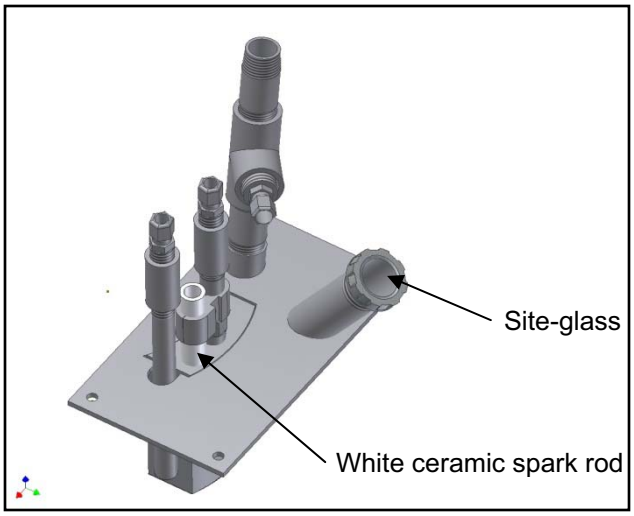


Figure 6.3. Pilot Assembly

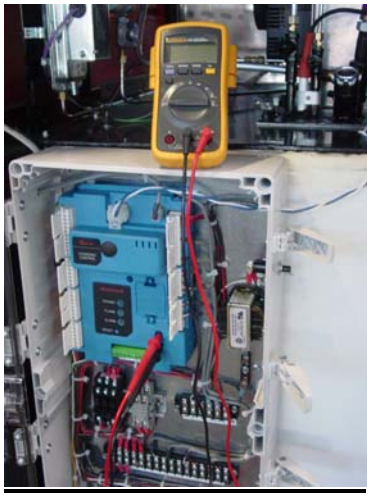


Figure 6.4. Voltmeter Connected to Control Panel

6-4.4 Gas Valve Leak Test

This test is to check the closure tightness of the gas shutoff valve. It should only be performed by trained, experienced, flame safeguard technicians during the initial start up of the burner system of whenever the valve is to be replaced. This test should also be included in the scheduled maintenance and inspection procedures. For the test below, refer to figures 6.6 and 6.7 below.

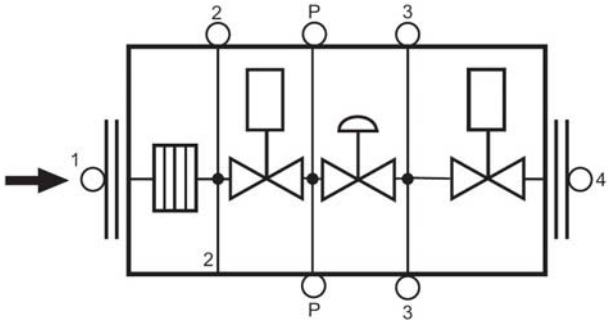


Figure 6.5 Vas Valve Diagram

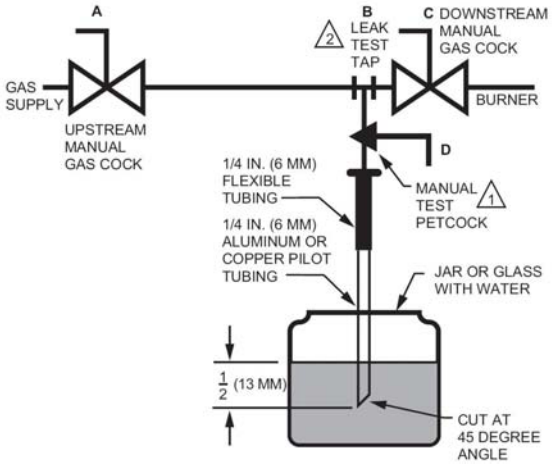


Figure 6.6 Test Setup Diagram

***WARNING- REMOVE POWER FROM THE SYSTEM BEFORE BEGINNING THE VALVE LEAK TEST TO PREVENT ELECTRICAL SHOCK.**

1) De-energize the control system to make sure no power goes to the valves.
2) Close the upstream manual gas cock
3) Make sure the manual test petcock (D) is closed in the leak test tap assembly
4) To test the first Safety shut off valve, remove the 1/8 in. plug from the pressure tap point P.
5) Install the leak test tap into pressure tap point P on the valve body.
6) Open the upstream manual gas cock (A) to re-pressurize the first safety shut off valve.
7) Immerse the 1/4in. tube vertically ½ in. in a jar of water, see figure 6.6.
8) Slowly open the manual test petcock (F).
9) When the rate of bubbles coming through the water stabilizes, count the number of bubbles appearing during a ten-second period. Each bubble appearing represents a flow rate of .001 cfh. See table below for allowable flow.

Pipe Size (in. NPT)	Maximum Seat Leakage (UL)	Maximum Number of Bubbles in 10 Seconds
1/2 - 3/4	235 cch	6
1	275 cch	7
1-1/4	340 cch	8

Table 6.1 Maximum Bubbles per Pipe Size

10) Close the upstream manual gas cock (A)
11) Remove the leak test tap from the valve body.
12) Using a small amount of pipe sealant on the 1/8 in. NPT plug, reinstall the plug in pressure tap point (P).
13) To test the second safety shut off valve, remove the 1/8" plug from the flange pressure tap point 4.
14) Install the leak test tap into pressure tap point 4.
15) Close the downstream manual gas cock (C).
16) Immerse the ¼ in. tube vertically ½ in. into a jar of water.
17) Slowly open the manual test petcock (D)
18) When the rate of bubbles coming through the water stabilizes, count the number of bubbles appearing during a ten-second period. Each bubble appearing during a 10 second period represents a flow rate of 0.001 cfh (28 cch). See table 6.1
19) Remove the leak test tap from the valve body.
20) Using a small amount of pipe sealant on the 1/8 in. plug, reinstall the plug in pressure tap point 4.
21) After completing the test, make sure the downstream manual gas cock (C)
22) Open the upstream manual gas cock (A) and energize the valve through the safety system.
23) Test with rich soap water solution to make sure there is no leak at the test tap (B) or any pipe adapter/valve mating surfaces.
24) De-energize the valve.
25) Open the downstream manual gas cock (C)
26) Restore the system to normal operation.

The gas train has been checked before shipping, but could come loose during shipping. Turn "OFF" all electric power and open the main gas valve. Turn the unit's switch to the "ON" position and open the main gas valve and the ball valve to the burner mixer tube (the one between the fuel-air ratio valve and the venturi). If you smell gas, shut the main gas valve to the boiler immediately and check for and eliminate all gas piping leaks! In addition to smelling for the natural gas, it is necessary to spray a soapy water mixture on all of the fitting connections on the gas train, around the pilot assembly, and around the connection between the blower and the top plate. If the soapy water mixture bubbles, then a gas leak is present. If a gas leak is present, tighten the fittings and retest until no more bubbles appear.

6-4.5 Safety Shutdown Tests (All Installations)

Perform these tests at the end of startup after all other tests are completed. If used, the external alarm should turn on. Press the RESET pushbutton on the Flame Safe Guard Module to restart the system.

1. Opening a Lockout Interlock during PREPURGE, PILOT IGN, MAIN IGN or RUN period
   a. Hold code 67 will be displayed on the Basic Panel or *Lockout ILK* fault is displayed on the Enhanced Panel.
   b. Safety shutdown occurs.
   c. For boiler size up to 2.5 MMbtu input will recycle after safety shutdown. For input greater than 2.5MMbtu boiler will lockout after safety shutdown.

2. Opening a safety limit switches (Gas Pressure, Water Flow, Drain switches and Recycle Interlock) during PREPURGE, PILOT IGN, MAIN IGN or RUN period
   a. Hold code 63 will be displayed on the Basic Panel or annunciation of opened limit switch is displayed on the Operator Interface Module.
   b. Safety shutdown occurs and recycle.

3. Detection of flame 240 seconds after entry to STANDBY from RUN or detection of flame from 10 seconds up to 30 seconds into PREPURGE time.
   a. Simulate a flame to cause the flame signal voltage level to rise above the flame threshold value for 240 seconds after entry to STANDBY from RUN and also simulate a flame signal for 10 seconds to 30 seconds for PREPURGE.
   b. Hold code 105 will be displayed on the Basic Panel or *Flame Detected out of sequence* fault is displayed on the Enhanced Panel.
   c. Safety shutdown occurs.

4. Failure to ignite main flame
   a. Open the manual pilot valve(s) and leave the main fuel manual shutoff valve(s) closed.
   b. Depress the RESET button.
   c. Start the system.
   d. The pilot should ignite and the flame signal should be above the flame threshold value but the main burner cannot light.
   e. The flame signal should drop below the flame threshold value within the FFRT after the interrupted pilot goes out.
   f. Hold code 109 will be displayed on the Basic Panel or *Ignition Failure* fault is displayed on the Enhanced Panel.
   g. Safety shutdown occurs and lockout.

5. Loss of flame during RUN
   a. Open the main fuel manual shutoff valve(s) and open manual pilot shutoff valve(s).
   b. Depress the RESET button.
   c. Start the system. Start-up should be normal and the main burner should light normally.
   d. After the sequence is in the normal RUN period for at least 10 seconds with the main burner firing, close the manual main fuel shutoff valve(s) to extinguish the main burner flame.
   e. The flame signal should drop below the flame threshold value within the FFRT of the Flame Safe Guard Module after the main flame and/or pilot goes out.
   f. Hold code 106, 107 or 108 will be displayed on the Basic Panel or *Main Flame Fail* fault is displayed on the Enhanced Panel.
   g. Safety shutdown and lockout.

6-4.6 Blocked Drain Test - *(Optional)*

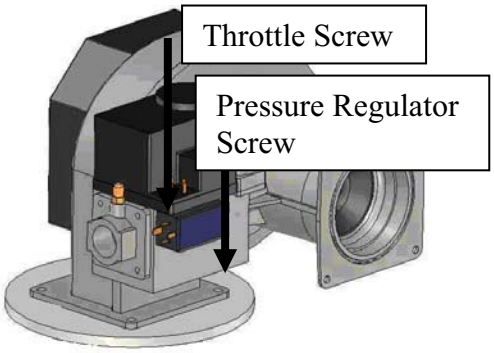
The blocked drain safety feature checks to make sure the drain does not have any blockage by ensuring the water level from the condensate does not exceed a specific level. This check is not necessary, but is recommended. To check if the safety device is operating properly:

1) Close off the end of the condensate pipe with a ½" ball valve.
2) Turn on the unit, and set the setpoint below 120 degrees.
3) When the water level becomes too high, a hold code of 63 will appear on the control panel screen.
4) When the hold code does appear, open the ball valve on the end of the condensate drain and press the blocked drain reset located on the top right on the outside of the control box.

6-5 Startup Component Adjustments

6-5.1 Firing Rate Check/Fuel Air Ratio Gas Valve ADJUSTMENT

All Atlas Series Condensing Boilers have been factory fire tested and tuned to operate at sea-level standard conditions with up to 60 ft of equivalent exhaust venting. Installations with a standard heating value fuel and at elevations below 2,000 feet will generally only require adjustment of the fuel-air ratio valve and air flow switch to correct firing rate at appropriate fuel-air ratios. These adjustments should be done for each fuel valve on combination fuel units.



Procedure for Atlas A Series High Efficiency Boiler equipped with Basic Panel

To adjust fuel air ratio valve at high-fire (90%):

1. Turn off unit by setting the burner cutoff switch to the off position.
2. Remove the plastic cover over the Throttle screw.
3. Using the Basic Panel, activate boiler demand temporally adjusting setpoint (about 40F) above normal operating setpoint.
4. Set the burner cutoff switch to **ON** position to start the unit.
5. Wait for the boiler to cycle on. **Run** icon will be displayed on the Basic Panel.
6. Enter **Diagnostic Mode** by pressing **Next** button on the Basic Panel for **3** seconds. Once in Diagnostic Mode and press **Next** button until **Max** icon is flashing and **Diag** icon is solid. Unit will now be running at 90% firing rate.
7. Using the combustion analyzer, adjust the Throttle screw to achieve 30%- 45% excess air, CO is less than 100 ppm, and NO_x is less than 15 ppm at 90% firing rate. Adjust c*ounter-clockwise for more gas and clockwise for less gas.* Make sure boiler is in manual firing mode throughout the adjustment period. In manual firing mode, firing rate value display is alternated with Outlet/DHW temperature display.
8. Press the **Done** button on the Basic Panel to exit the manual firing mode.
9. Readjust setpoint to normal operating setpoint.
10. Replace the plastic cover over the Throttle screw.

To adjust fuel air ratio valve at low-fire (10%):

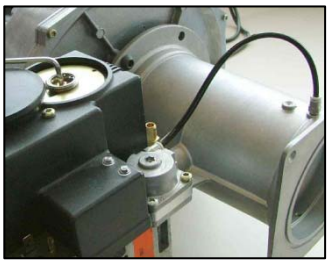
1. Turn off unit by setting the burner cutoff switch to the **OFF** position.
2. Remove aluminum protection screw on the pressure regulator.
3. Using the Basic Panel, activate boiler demand by temporally adjusting setpoint (about 40F) above normal operating setpoint.
4. Set the burner cutoff switch to **ON** position to start the unit.
5. Wait for the boiler to cycle on. **Run** icon will be displayed on the Basic Panel.

6. Enter **Diagnostic Mode** by pressing **Next** button on the Basic Panel for **3** seconds. Once in Diagnostic Mode and press **Next** button until **Min** icon is flashing and **Diag** icon is solid. Unit will now be running at 10% firing rate.
7. Using the combustion analyzer, adjust the Throttle screw to achieve 30% - 45% excess air, CO is less than 100 ppm, and NO_x is less than 15 ppm at 10% firing rate. Adjust *clockwise for more gas and counter-clockwise for less gas.* Make sure boiler in manual firing mode throughout the adjustment period. In manual firing mode, firing rate value display is alternated with Outlet/DHW temperature display.
8. Press the **Done** button on the Basic Panel to exit the manual firing mode.
9. Readjust setpoint to normal operating setpoint.
10. Replace the aluminum protection screw on the pressure regulator.

Procedure for Atlas A Series High Efficiency Boiler equipped with <u>Enhanced/System Operator Interface Panel</u>

To adjust fuel air ratio valve at high-fire (100%):

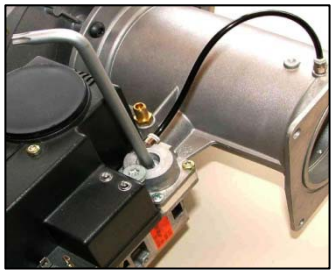
1. Turn off unit by setting the burner cutoff switch to the **OFF** position.
2. Remove the plastic cover over the Throttle screw.
3. Using Enhanced/System Operator Interface Panel, activate boiler demand by temporally adjusting setpoint (about 40F) above normal operating setpoint by pressing **Configure → CH – Central Heat Configuration → CH setpoint** Textbox.
4. Set the burner cutoff switch to **ON** position to start the unit.
5. Wait for the boiler to cycle on. Burner State **Run** will be displayed on Summary Statue Page.
6. Enter **Diagnostic Tests** by pressing **Diagnostics → Diagnostic Tests** on the Operator Interface. Once in diagnostic tests page, and press the **Maximum** button. RPM rate will be changed to reflect maximum firing rate. Press the **Start Test** button. Unit will now be running at 100% firing rate. Five minute timer will be started with press of **Start Test** button.



7. Using the combustion analyzer, adjust the Throttle screw to achieve 30% - 45%, CO is less than 100 ppm, and NO_x is less than 15 ppm at 100% firing rate. Adjust c*ounter-clockwise for more gas and clockwise for less gas.* Make sure boiler in manual firing mode throughout the adjustment period. Five minute timer will be started with press of **Start Test** button.
8. Press the **Stop Test** button again to exit the manual firing mode.
9. Readjust setpoint to normal operating setpoint.
10. Replace the plastic cover over the Throttle screw.

To adjust fuel air ratio valve at low-fire (0%):

1. Turn off unit by setting the burner cutoff switch to the **OFF** position.
2. Remove aluminum protection screw on the pressure regulator.
3. Using Enhanced/System Operator Interface panel, activate boiler demand by temporally adjusting setpoint (about 40F) above normal operating setpoint by pressing **Configure → CH – Central Heat Configuration → CH setpoint** Textbox.
4. Set the burner cutoff switch to **ON** position to start the unit.
5. Wait for the boiler to cycle on. **Run** state will be displayed on Summary Statue Page.
6. Enter **Diagnostic Tests** by pressing **Diagnostics → Diagnostic Tests** on the Operator Interface. Once in diagnostic tests page, and press the **Minimum** button. RPM rate will be changed to reflect minimum firing rate. Press the **Start Test** button. Unit will now be running at 0% firing rate. Five minute timer will be started with press of **Start Test** button.
11. Using the combustion analyzer, adjust the Throttle screw to achieve 30% - 45%, CO is less than 100 ppm, and NO_x is less than 15 ppm at 0% firing rate. Adjust *clockwise for more gas and counter-clockwise for less gas.* Make sure boiler in manual firing mode throughout the adjustment period. Five minute timer will be started with press of **Start Test** button.



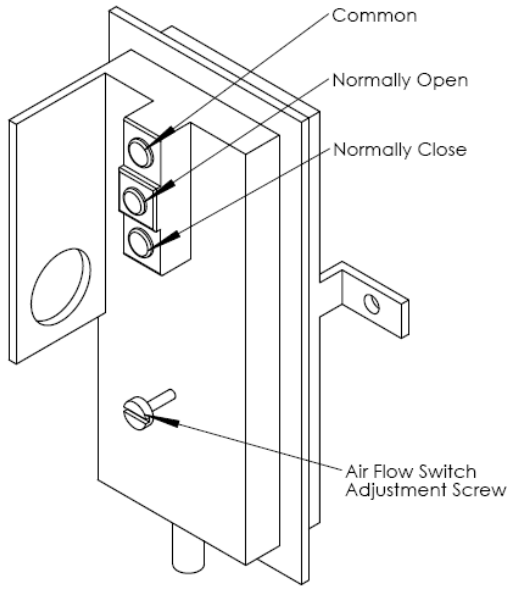
7. Press the **Done** button on the Basic Panel to exit the manual firing mode.
8. Readjust setpoint to normal operating setpoint.
9. Replace the aluminum protection screw on the pressure regulator.

IN SOME EXTREME CONDITIONS, SUCH AS HIGH ALTITUDES OR LOW HEATING VALUE GAS, IT MAY NOT BE POSSIBLE TO FIRE AT THE RATED MAXIMUM WITH THE APPROPRIATE AMOUNT OF EXCESS AIR. IN THIS CASE, REDUCE THE HIGH-FIRING RATE UNTIL THE DESIRED EXCESS AIR HAS BEEN OBTAINED AT THE MAXIMUM FIRING RATE.

6-5.2 Air Flow Switch Calibration

The air flow switch is a safety device that insures that there is adequate air flow through the blower. The switch is preset at the factory, in case air flow switch needs to be recalibrated:

1) Make sure the Atlas main switch is turned off.
2) Remove the Air flow switch cover.
3) Turn the flow switch adjustment screw counter clockwise until the switch is fully open.
4) Then make 4-1/2 full turns clockwise to set the switch to the appropriate setpoint.
5) Replace the air flow switch cover.



6-6 Combination Fuel Selection

On Combination Fuel Units, to switch between natural gas or propane:

1) Ensure the propane and natural gas inlet are properly and tightly connected, refer to Section 2-7, Figure 2.4.
2) If running, turn the unit off by switching the on/off switch on the control box.
3) Switch the fuel selection switch on the control box to the appropriate setting.
4) Open the manual shut off valve on the gas train for the fuel that is selected, and close the manual shut off valve for the supply not being used.
5) Select the proper fuel for the pilot, refer to section 2-7, figure 2.5 :
    a. If using a single pilot, make sure the manual valve for pilot gas is open on the natural gas supply line regardless of main fuel selection.
    b. If using a combination pilot,
        i. Open the pilot manual gas valve for the appropriate fuel supply.
        ii. Close the pilot manual gas valve for the fuel supply not being used.
6) Turn the unit on. Unit should turn on and resume normal operation.

6-7 Shutting Down The Unit

• Set the burner cutoff switch on the display panel to the off position.
• Wait for the unit to complete its postpurge.
• Turn off the power supply to the unit via the user installed disconnect switch.
• Close the unit's main gas valve.

WARNING

FAILURE TO FOLLOW THE SHUT DOWN PROCEDURE WILL RESULT IN EXCESSIVE WEAR AND WILL VOID YOUR WARRANTY.

6-8 After Startup Checklist

1. Check the gas line piping for gas leaks.
2. Check for leaks. Look for water on the floor. Check for water escaping from any part of the unit, valves or piping. Water will continue to flow out of the drain for a few minutes after the unit stops running. If the flow does not stop after 10 minutes, a leak may be present in the coil.
3. 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 ON THE REAR OF THE BOILER and
2) Turning off the electricity to the boiler.

7 Maintenance

Maintenance is an important part of keeping the Atlas boiler running efficiently and for a long period of time. Ace recommends that a maintenance schedule be kept. For extended warranty, schedule must be kept and made available to Ace if failure occurs. A document must be produced for every year of operation, so it is recommended that copies of the maintenance schedule be made before it is used. The Ace approved maintenance schedule with descriptions is listed below:

7-1 Maintenance Descriptions

Test operating temperature controls (should be done monthly):
Test operating controls by adjusting the temperature necessary to check burner operation.

Pilot and Main Flame Signal (should be done monthly):
Using a voltmeter, plug into the flame detection port on the flame safeguard. The voltage reading should be between 1-15 VDC. Additionally, remove the UV scanner and using soft cloth wipe the lens clean.

Air Filter (should be done monthly):
The air filter should be inspected and cleaned monthly, and should be replaced once it is restricting air flow. As the air filter restricts the air flow, it will limit the input possible for the boiler. A dirty filter is equivalent to adding on venting to the air intake. A single replacement filter is provided with the unit on shipment. To check air filter, remove two screws on the top of the air filter box and open door.

Check Condensate Drain System (should be done monthly):
Replace condensate treatment kit (if purchased) when filter expires.

Observe condition of main flame (should be done monthly):
Check to make sure high fire flame is blue. If the flame is yellow, adjust gas valve until blue flame is achieved following initial set up procedure. Normal low fire flame is a yellowish-orange.

Leak test for gas valve, pilot assembly and blower (Semiannually)
With the unit running, use soapy water to spray around the pilot assembly, blower, and gas train. If bubbles form, then a leak is present.

Cleaning the Burner/Coils (should be completed annually):

1) *Shut off the manual gas cock at gas inlet.*
2) *Remove electrical power to boiler*
3) *Remove top and front panel*
4) *Remove nuts connecting blower to the top plate*
5) *Remove combustion assembly*
6) *Remove burner*
7) *Use low pressure air to remove dust and a clean soft cloth to wipe the inside of the burner (do not wipe the mesh/outside of burner)*
8) *While burner is removed, check coils with flashlight for soot and remove with brush or vacuum*
9) *Spray coils with high pressure water to remove any foreign materials*
10) *Check for corrosion of burner, replace if necessary*
11) *Reassemble burner and combustion assembly as seen in figure 7*

Examine Vent System (Annually)
At all connections check for air leak while unit is on low fire so as not to burn yourself.

Examine Joint and Pipe Connections for Tightness (Annually)
Check all water pipe connections for leaks while unit is on low fire. If a leak is present around a fitting attempt to tighten the fitting. If a leak is present by a braze or in the middle of the pipe, contact factory.

Check Pipe for Corrosion/Deterioration (Annually)
Check all gas, water, and air pipes to for corrosion and deterioration. If any corrosion or deterioration is present, please contact factory.

Combustion Tests (should be completed semiannually):

If combustion readings are not between recommended values, then adjustments should be made to the gas valve until all readings are within these recommended values.

Carbon Monoxide	_____	ppm (must be kept below 100 ppm)
Carbon Dioxide	_____	% (should be kept between 7-9%)
Excess Air	_____	% (should be kept between 30-45%)
NOx	_____	ppm (should be kept under 15 ppm)
Combustion Chamber Pressure	_____	in w.c. (must be kept under 0.5 in w.c.)

After maintenance is complete refer to pre start checklist. Check gas pressure and perform combustion check adjusting gas valve if necessary. Before using the following schedule make copies for future use.

7-2 Maintenance Schedule

Atlas Model A Condensing Boiler Yearly Maintenance Schedule

Daily	Notes
Observe Op Temp	
Observe Noise	
Check for Water Leak	
Check Lockout Codes	

Monthly Check	1	2	3	4	5	6	7	8	9	10	11	12
Test Operating Control												
Pilot/Main Flame Sig												
Air Filter												
Condensate Drain System												
Observe Main Flame												
In each of the boxes write "P" for pass and "F" for fail. In the notes include changes made to fix failures.												
Notes:												

Semiannual 1	Result	Date	Initials	Notes
Leak Test for Gas				
Pilot Spark Test				

Semiannual 2	Result	Date	Initials	Notes
Leak Test for Gas				
Pilot Spark Test				
Annually	Result	Date	Initials	Notes
Lubricate Pilot Blower				
Clean the Burner				
Clean the Coils				
Clean Gas Inlet Screen				
Examine Vent System				
Examine Connections				
Corrosion/Det Check				
Combustion Test:				
Carbon Monoxide				
Carbon Dioxide				
Excess Air				
Nox				
Comb Cham Pressure				

IMPORTANT: FOR WARRANTY, THIS DOCUMENT MUST BE MADE AVAILABLE TO ACE HEATING SOLUTIONS, LLC.

Appendices

Appendix A - Troubleshooting And Hold/Lockout Code

To support the recommended troubleshooting, the Honeywell Sola Controller has a History File. Review the alert history for possible trends that may have been occurring prior to the actual Lockout.

Alert code and Hold/Lockout code can be accessed through Basic Panel, Enhanced or System Operator Interface Panel.

For instruction on accessing Alert and Hold/Lockout code using Basic Panel display, refer to **CHAPTER 3-6 DIAGNOSTIC MODE** for more information.
For instruction on accessing Alert and Hold/Lockout code using Enhanced or System Operator Interface display, refer to **CHAPTER 4-11 FAULT/ALARM HANDLING** for more information.

Code: H= Hold message; L=Lockout message

Code	Description	Recommended Troubleshooting of Lockout Codes	Code
1	Unconfigured safety data	1. New Device, complete device configuration and safety verification. 2. If fault repeats, consult factory.	L
2	Waiting for safety data verification	1. Device in Configuration mode and safety parameters need verification and a device needs reset to complete verification. 2. Configuration ended without verification, re enter configuration, verify safety parameters and reset device to complete verification. 3. If fault repeats, consult factory.	L
3	Internal fault: Hardware fault	Internal fault 1. Reset module. 2. If fault repeats, consult factory.	H
4	Internal fault: Safety Relay key feedback error		H
5	Internal fault: Unstable power (DCDC) output		H
6	Internal fault: Invalid processor clock		H
7	Internal fault: Safety relay drive error		H
8	Internal fault: Zero crossing not detected		H
9	Internal fault: Flame bias out of range		H
10	Internal fault: Invalid Burner control state		L
11	Internal fault: Invalid Burner control state flag		L
12	Internal fault: Safety relay drive cap short		H
13	Internal fault: PII shorted to ILK		L
14	Internal fault: HFS shorted to LCI		L
15	Internal fault: Safety relay test failed due to feedback ON		L
16	Internal fault: Safety relay test failed due to safety relay OFF		L
17	Internal fault: Safety relay test failed due to safety relay not OFF		L
18	Internal fault: Safety relay test failed due to feedback not ON		L
19	Internal fault: Safety RAM write		L
20	Internal fault: Flame ripple and overflow		H
21	Internal fault: Flame number of sample mismatch		H
22	Internal fault: Flame bias out of range		H
23	Internal fault: Bias changed since heating cycle starts		H
24	Internal fault: Spark voltage stuck low or high		H
25	Internal fault: Spark voltage changed too much during flame sensing time		H
26	Internal fault: Static flame ripple		H
27	Internal fault: Flame rod shorted to ground detected		H
28	Internal fault: A/D linearity test fails		H
29	Internal fault: Flame bias cannot be set in range		H
30	Internal fault: Flame bias shorted to adjacent pin		H
31	Internal fault: SLO electronics unknown error		H
32-46	Internal fault: SaHfety Key 0 through 14		L
47	Flame Rod to ground leakage		H
48	Static flame (not flickering)		H
49	24VAC voltage low/high	1. Check the Module and display connections.	H

		2. Check the Module power supply and make sure that frequency, voltage and VA meet the specifications.	
50	Modulation fault	Internal sub-system fault. 1. Review alert messages for possible trends. 2. Correct possible problems.	H
51	Pump fault		H
52	Motor tachometer fault		H
53	AC inputs phase reversed	1. Check the Module and display connections. 2. Check the Module power supply and make sure that both frequency and voltage meet the specifications.	L
58	Internal fault: HFS shorted to IAS	Internal Fault. 1. Reset Module. 2. If fault repeats, consult factory	L
59	Internal Fault: Mux pin shorted		L
60	Internal Fault: HFS shorted to LFS		L
61	Anti short cycle	Will not be a lockout fault. Hold Only.	H
62	Fan speed not Proved		H
63	LCI OFF	1.Check field installed Recycle Interlock switch and wiring to assure proper function. 2. Check all Limit switches (Burner Cutoff, Gas Pressure, Drain and Water Flow switches) switches to assure proper function. 3. Reset and sequence the module; monitor the LCI status. 4. If code persists, consult factory	H
64	PII OFF	1. Check field installed Pre-Ignition Interlock switch and wiring to assure proper functions. 2. Check PII configuration setting. 3. Reset and sequence the module; monitor the PII status. 4. If code persists, consult factory.	H or L
65	Interrupted Airflow Switch OFF	Internal Fault 1. Reset Module. 2. If fault repeats, consult factory	H or L
66	Interrupted Airflow Switch ON		H or L
67	ILK OFF	1. Check field installed Lockout Interlock switch and wiring to assure proper function. 2. Check Airflow switch to assure proper function. Adjust the air 3. Verify voltage through the interlock string to the interlock input with a voltmeter. 4. If steps 1-3 are correct and the fault persists, consult factory.	H or L
68	ILK ON		H or L
69	Pilot test hold	1. Verify Run/Test is changed to Run. 2. Reset Module. 3. If fault repeats, consult factory.	H
70	Wait for leakage test Completion	1. Internal Fault. Reset Module. 2. If fault repeats, consult factory.	H
78	Demand Lost in Run	1. Check for adequate gas supply at the gas inlet. 2. Remove the UV flame detector and clean the lens using a soft cloth. 3. If previous steps are correct and fault persists, consult factory.	L
79	Outlet high limit	1. Check wiring and correct any possible errors. 2. Replace the Outlet high limit. 3. If previous steps are correct and fault persists, consult factory.	H or L
80	DHW high limit	1. Check wiring and correct any possible errors. 2. Replace the DHW high limit. 3. If previous steps are correct and fault persists, consult factory.	H or L
81	Delta T limit	1. Check Inlet and Outlet sensors and pump circuits for proper operation. 2. Recheck the Delta T Limit to confirm proper setting. 3. If previous steps are correct and fault persists, consult factory.	H or L
82	Stack limit	1. Check wiring and correct any possible errors. 2. Replace the Stack high limit. 3. If previous steps are correct and fault persists, consult factory.	H or L
91	Inlet sensor fault	1. Check wiring and correct any possible errors. 2. Replace the Inlet sensor. 3. If previous steps are correct and fault persists, consult factory.	H
92	Outlet sensor fault	1. Check wiring and correct any possible errors. 2. Replace the Outlet sensor. 3. If previous steps are correct and fault persists, consult factory.	H
93	DHW sensor fault	1. Check wiring and correct any possible errors. 2. Replace the DHW sensor.	H

		3. If previous steps are correct and fault persists, consult factory.	
94	Header sensor fault	1. Check wiring and correct any possible errors. 2. Replace the header sensor. 3. If previous steps are correct and fault persists, consult factory.	H
95	Stack sensor fault	1. Check wiring and correct any possible errors. 2. Replace the stack sensor. 3. If previous steps are correct and fault persists, consult factory.	H
96	Outdoor sensor fault	1. Check wiring and correct any possible errors. 2. Replace the outdoor sensor. 3. If previous steps are correct and fault persists, consult factory.	H
97	Internal Fault: A2D mismatch.	Internal Fault. 1. Reset Module. 2. If fault repeats, consult factory.	L
98	Internal Fault: Exceeded VSNSR voltage tolerance		L
99	Internal Fault: Exceeded 28V voltage tolerance		L
105	Flame detected out of sequence	1. Check that flame is not present in the combustion chamber. Correct any errors. 2. Make sure the UV flame detector wires are protected from stray noise pickup. 3. Reset and sequence the module, if code reappears, replace the flame detector. 4. Reset and sequence the module, if code reappears, consult factory.	H or L
106	Flame lost in MFEP	1. Check pilot valve operation. Correct any errors. 2. Check the fuel supply. 3. Check fuel pressure and repeat Pilot tests. 4. Check pilot assembly ignition electrode and flame detector. 5. If steps 1 through 4 are correct and the fault persists, consult factory.	L
107	Flame lost early in Run		L
108	Flame lost in run		L
109	Ignition failed		L
110	Ignition failure occurred	Hold time of recycle and hold option. Will not be a lockout fault. Hold Only. Internal hardware test. Not a lockout.	H
111	Flame current lower than WEAK threshold		H
112	Pilot test flame Timeout	Interrupted Pilot application and flame lost when system in “test” mode. 1. Reset the module to restart.	L
113	Flame circuit timeout	Flame sensed during Initiate or off cycle, hold 240 seconds, if present after 240 seconds, lockout.	L
122	Light off rate proving failed	1. Check wiring and correct any potential wiring errors. 2. Check VFDs ability to change speeds. 3. Change the VFD 4. If the fault persists, consult factory.	L
123	Purge rate proving failed		L
124	High fire switch OFF	Internal Fault 1. Reset Module. 2. If fault repeats, consult factory	H
125	High fire switch stuck ON		H
126	Low fire switch OFF	Internal Fault 1. Reset Module. 2. If fault repeats, consult factory	H
127	Low fire switch stuck ON		H
128	Fan speed failed during prepurge	1. Check wiring and correct any potential wiring errors. 2. Check VFDs ability to change speeds. 3. Change the VFD 4. If the fault persists, consult factory.	
129	Fan speed failed during preignition		
130	Fan speed failed during ignition		
131	Fan movement detected during Standby		
132	Fan speed failed during run		
136	Interrupted Airflow Switch failed to Close	Internal Fault 1. Reset Module. 2. If fault repeats, consult factory	
137	ILK failed to close	1. Check wiring and correct any possible shorts. 2. Check Interlock (ILK) switches to assure proper function. 3. Verify voltage through the interlock string to the interlock input with a voltmeter. 4. If steps 1-3 are correct and the fault persists, consult factory.	
149	Flame detected	1. Holds if flame detected during Safe Start check up to Flame Establishing period.	
150	Flame not detected	1. Sequence returns to standby and restarts sequence at the beginning of Purge after the HF switch opens. If flame detected during Safe Start check up to Flame Establishing period.	
151	High fire switch ON	Internal Fault 1. Reset Module.	

		2. If fault repeats, consult factory	
152	Combustion pressure ON	1. Check wiring and correct any errors.	
153	Combustion Pressure Off	2. Inspect the Combustion Pressure Switch to make sure it is working correctly. 3. Reset and sequence the relay module. 4. During STANDBY and PREPURGE, measure the voltage between J6 terminal 5 and L2 (N). Supply voltage should be present. If not, the lockout switch is defective and needs replacing. 5. If the fault persists, replace the relay module.	
154	Purge Fan switch On	1. Purge fan switch is on when it should be off.	
155	Purge fan switch OFF	2. 3. Inspect the Purge Fan switch J6 terminal 3 and its connections. Make sure the switch is working correctly and is not jumpered or welded. 4. Reset and sequence the relay module. 5. If the fault persists, consult factory.	
156	Combustion pressure and Flame ON	1. Check that flame is not present in the combustion chamber. Correct any errors. 2. Make sure that the flame detector is wired to the correct terminal. 3. Make sure the G wires are protected from stray noise pickup. 4. Reset and sequence the module, if code reappears, replace the flame detector. 5. Reset and sequence the module, if code reappears, consult factory.	
157	Combustion pressure and Flame OFF		
158	Main valve ON	1. Check Main Valve terminal wiring and correct any errors. 2. Reset and sequence the module. If fault persist, consult factory.	
159	Main valve OFF		
160	Ignition ON	1. Check Ignition terminal wiring and correct any errors. 2. Reset and sequence the module. If fault persist, consult factory.	
161	Ignition OFF		
162	Pilot valve ON	1. Check Pilot Valve terminal wiring and correct any errors. 2. Reset and sequence the module. If fault persist, consult factory.	
163	Pilot valve OFF		
164	Block intake ON	Internal Fault 1. Reset Module. 2. If fault repeats, consult factory	
165	Block intake OFF		
172	Main relay feedback Incorrect	Internal Fault. 1. Reset Module. 2. If fault repeats, consult factory.	L
173	Pilot relay feedback incorrect		L
174	Safety relay feedback incorrect		L
175	Safety relay open		L
176	Main relay ON at safe start check		L
177	Pilot relay ON at safe start check		L
178	Safety relay ON at safe start check		L
184	Invalid BLOWER/ HSI output setting	1. Return to Configuration mode and recheck selected parameters, re-verify and reset module. 2. If fault repeats, verify electrical grounding. 3. If fault repeats, consult factory.	L
185	Invalid Delta T limit enable setting		L
186	Invalid Delta T limit response setting		L
187	Invalid DHW high limit enable setting		L
188	Invalid DHW high limit response Setting		L
189	Invalid Flame sensor type setting		L
190	Invalid interrupted air switch enable Setting		L
191	Invalid interrupted air switch start check enable setting		L
192	Invalid igniter on during setting		L
193	Invalid ignite failure delay setting		L
194	Invalid ignite failure response setting		L
195	Invalid ignite failure retries setting		L
196	Invalid ignition source setting		L
197	Invalid interlock open response setting		L
198	Invalid interlock start check setting		L
199	Invalid LCI enable setting		L
200	Invalid light off rate setting		L
201	Invalid light off rate proving setting		L
202	Invalid Main Flame Establishing Period time setting		L
203	Invalid MFEP flame failure response setting		L
204	Invalid NTC sensor type setting		L
205	Invalid Outlet high limit response setting		L
206	Invalid Pilot Flame Establishing Period setting		L
207	Invalid PII enable setting		L
208	Invalid pilot test hold setting		L

209	Invalid Pilot type setting		L
210	Invalid Postpurge time setting		L
211	Invalid Power up with lockout setting		L
212	Invalid Pre-ignition time setting		L
213	Invalid Prepurge rate setting		L
214	Invalid Prepurge time setting		L
215	Invalid Purge rate proving setting		L
216	Invalid Run flame failure response Setting		L
217	Invalid Run stabilization time setting		L
218	Invalid Stack limit enable setting		L
219	Invalid Stack limit response setting		L
220	Unconfigured Delta T limit setpoint setting		L
221	Unconfigured DHW high limit setpoint setting		L
222	Unconfigured Outlet high limit setpoint setting		L
223	Unconfigured Stack limit setpoint setting		L
224	Invalid DHW demand source setting		L
225	Invalid Flame threshold setting		L
226	Invalid Outlet high limit setpoint setting		L
227	Invalid DHW high limit setpoint setting		L
228	Invalid Stack limit setpoint setting		L
229	Invalid Modulation output setting		L
230	Invalid CH demand source setting		L
231	Invalid Delta T limit delay setting		L
232	Invalid Pressure sensor type setting		L
233	Invalid IAS closed response setting		L
234	Invalid Outlet high limit enable setting		L
235	Invalid Outlet connector type setting		L
236	Invalid Inlet connector type setting		L
237	Invalid DHW connector type setting		L
238	Invalid Stack connector type setting		L
239	Invalid Header connector type setting		L
240	Invalid Outdoor connector type setting		L

Alert Code Description

Code	Description
0	None (No alert)
1	Alert PCB was restored from factory defaults
2	Safety configuration parameters were restored from factory defaults
3	Configuration parameters were restored from factory defaults
4	Invalid Factory Invisibility PCB was detected
5	Invalid Factory Range PCB was detected
6	Invalid range PCB record has been dropped
7	EEPROM lockout history was initialized
8	Switched application annunciation data blocks
9	Switched application configuration data blocks
10	Configuration was restored from factory defaults
11	Backup configuration settings was restored from active configuration
12	Annunciation configuration was restored from factory defaults
13	Annunciation configuration was restored from backup
14	Safety group verification table was restored from factory defaults
15	Safety group verification table was updated
16	Invalid Parameter PCB was detected
17	Invalid Range PCB was detected
18	Alarm silence time exceeded maximum
19	Invalid safety group verification table was detected
27	Safety processor was reset
28	Application processor was reset
29	Burner switch was turned OFF
30	Burner switch was turned ON
31	Program Module (PM) was inserted into socket
32	Program Module (PM) was removed from socket
33	Alert PCB was configured
34	Parameter PCB was configured
35	Range PCB was configured
36	Program Module (PM) incompatible with product was inserted into socket
37	Program Module application parameter revision differs from application processor
38	Program Module safety parameter revision differs from safety processor
39	PCB incompatible with product contained in Program Module
40	Parameter PCB in Program Module is too large for product
41	Range PCB in Program Module was too large for product
42	Alert PCB in Program Module was too large for product
43	IAS start check was forced on due to IAS enabled
44	Low voltage was detected in safety processor
45	High line frequency occurred
46	Low line frequency occurred
47	Invalid subsystem reset request occurred
48	Write large enumerated Modbus register value was not allowed
49	Maximum cycle count was reached
50	Maximum hours count was reached
51	Illegal Modbus write was attempted
52	Modbus write attempt was rejected (NOT ALLOWED)
53	Illegal Modbus read was attempted
54	Safety processor brown-out reset occurred
55	Application processor watchdog reset occurred
56	Application processor brown-out reset occurred
57	Safety processor watchdog reset occurred
58	Alarm was reset by the user at the control
59	Burner control firing rate was > absolute max rate
60	Burner control firing rate was < absolute min rate
61	Burner control firing rate was invalid, % vs. RPM
62	Burner control was firing with no fan request
63	Burner control rate (nonfiring) was > absolute max rate
64	Burner control rate (nonfiring) was < absolute min rate
65	Burner control rate (nonfiring) was absent
66	Burner control rate (nonfiring) was invalid, % vs. RPM
67	Fan off cycle rate was invalid, % vs. RPM
68	Setpoint was overridden due to sensor fault

69	Modulation was overridden due to sensor fault
75	Absolute max fan speed was out of range
76	Absolute min fan speed was out of range
77	Fan gain down was invalid
78	Fan gain up was invalid
79	Fan minimum duty cycle was invalid
80	Fan pulses per revolution was invalid
81	Fan PWM frequency was invalid
90	Modulation output type was invalid
91	Firing rate control parameter was invalid
92	Forced rate was out of range vs. min/max modulation
93	Forced rate was invalid, % vs. RPM
94	Slow start ramp value was invalid
95	Slow start degrees value was invalid
96	Slow start was ended due to outlet sensor fault
97	Slow start was end due to reference setpoint fault
98	CH max modulation rate was invalid, % vs. RPM
99	CH max modulation rate was > absolute max rate
100	CH modulation range (max minus min) was too small (< 4% or 40 RPM)
101	DHW max modulation rate was invalid, % vs. RPM
102	DHW max modulation rate was > absolute max rate
103	DHW modulation range (max minus min) was too small (< 4% or 40 RPM)
104	Min modulation rate was < absolute min rate
105	Min modulation rate was invalid, % vs. RPM
106	Manual rate was invalid, % vs. RPM
107	Slow start enabled, but forced rate was invalid
108	Analog output hysteresis was invalid
109	Analog modulation output type was invalid
110	IAS open rate differential was invalid
111	IAS open step rate was invalid
115	Fan was limited to its minimum duty cycle
116	Manual rate was > CH max modulation rate
117	Manual rate was > DHW max modulation rate
118	Manual rate was < min modulation rate
119	Manual rate in Standby was > absolute max rate
120	Modulation commanded rate was > CH max modulation rate
121	Modulation commanded rate was > DHW max modulation rate
122	Modulation commanded rate was < min modulation rate
123	Modulation rate was limited due to outlet limit
124	Modulation rate was limited due to Delta-T limit
125	Modulation rate was limited due to stack limit
126	Modulation rate was limited due to anti-condensation
127	Fan Speed out of range in RUN
128	Modulation rate was limited due to IAS was open
129	Slow start ramp setting of zero will result in no modulation rate change
131	CH demand source was invalid
132	CH P-gain was invalid
133	CH I-gain was invalid
134	CH D-gain was invalid
135	CH OFF hysteresis was invalid
136	CH ON hysteresis was invalid
137	CH sensor type was invalid
138	CH hysteresis step time was invalid
139	CH remote control parameter was invalid
140	CH ODR not allowed with remote control
146	CH control was suspended due to fault
147	CH header temperature was invalid
148	CH outlet temperature was invalid
149	CH steam pressure was invalid
157	DHW demand source was invalid
158	DHW P-gain was invalid
159	DHW I-gain was invalid
160	DHW D-gain was invalid
161	DHW OFF hysteresis was invalid
162	DHW ON hysteresis was invalid
163	DHW hysteresis step time was invalid

164 DHW sensor type was invalid
165 Inlet sensor type was invalid for DHW
166 Outlet sensor type was invalid for DHW
171 DHW control was suspended due to fault
172 DHW temperature was invalid
173 DHW inlet temperature was invalid
174 DHW outlet temperature was invalid
183 Lead Lag P-gain was invalid
184 Lead Lag I-gain was invalid
185 Lead Lag D-gain was invalid
186 Lead Lag OFF hysteresis was invalid
187 Lead Lag ON hysteresis was invalid
188 Lead Lag slave enable was invalid
189 Lead Lag hysteresis step time was invalid
204 Lead Lag master was suspended due to fault
205 Lead Lag slave was suspended due to fault
206 Lead Lag header temperature was invalid
207 Lead Lag was suspended due to no enabled Program Module installed
208 Lead Lag slave session has timed out
222 CH frost protection temperature was invalid
223 CH frost protection inlet temperature was invalid
224 DHW frost protection temperature was invalid
231 LL setpoint was invalid
232 LL time of day setpoint was invalid
233 LL outdoor temperature was invalid
234 LL ODR time of day setpoint was invalid
235 LL ODR time of day setpoint exceeded normal setpoint
236 LL max outdoor setpoint was invalid
237 LL min outdoor setpoint was invalid
238 LL min water setpoint was invalid
239 LL outdoor temperature range was too small (minimum 12 C / 22 F)
240 LL water temperature range was too small (minimum 12 C / 22 F)
246 CH setpoint was invalid
247 CH time of day setpoint was invalid
248 CH outdoor temperature was invalid
249 CH ODR time of day setpoint was invalid
250 CH ODR time of day setpoint exceeds normal
251 CH max outdoor setpoint was invalid
252 CH min outdoor setpoint was invalid
253 CH min water setpoint was invalid
254 CH outdoor temperature range was too small (minimum 12 C / 22 F)
255 CH water temperature range was too small (minimum 12 C / 22 F)
261 DHW setpoint was invalid
262 DHW time of day setpoint was invalid
272 Abnormal Recycle: Pressure sensor fault
273 Abnormal Recycle: Safety relay drive test failed
274 Abnormal Recycle: Demand off during Pilot Flame Establishing Period
275 Abnormal Recycle: LCI off during Drive to Purge Rate
276 Abnormal Recycle: LCI off during Measured Purge Time
277 Abnormal Recycle: LCI off during Drive to Light off Rate
278 Abnormal Recycle: LCI off during Pre-Ignition test
279 Abnormal Recycle: LCI off during Pre-Ignition time
280 Abnormal Recycle: LCI off during Main Flame Establishing Period
281 Abnormal Recycle: LCI off during Ignition period
282 Abnormal Recycle: Demand off during Drive to Purge Rate
283 Abnormal Recycle: Demand off during Measured Purge Time
284 Abnormal Recycle: Demand off during Drive to Light off Rate
285 Abnormal Recycle: Demand off during Pre-Ignition test
286 Abnormal Recycle: Demand off during Pre-Ignition time
287 Abnormal Recycle: Flame was on during Safe Start check
288 Abnormal Recycle: Flame was on during Drive to Purge Rate
289 Abnormal Recycle: Flame was on during Measured Purge Time
290 Abnormal Recycle: Flame was on during Drive to Light off Rate
291 Abnormal Recycle: Flame was not on at end of Ignition period
292 Abnormal Recycle: Flame was lost during Main Flame Establishing Period
293 Abnormal Recycle: Flame was lost early in Run

294 Abnormal Recycle: Flame was lost during Run
295 Abnormal Recycle: Leakage test failed
296 Abnormal Recycle: Interrupted air flow switch was off during Drive to Purge Rate
297 Abnormal Recycle: Interrupted air flow switch was off during Measured Purge Time
298 Abnormal Recycle: Interrupted air flow switch was off during Drive to Light off Rate
299 Abnormal Recycle: Interrupted air flow switch was off during Pre-Ignition test
300 Abnormal Recycle: Interrupted air flow switch was off during Pre-Ignition time
301 Abnormal Recycle: Interrupted air flow switch was off during Main Flame Establishing Period
302 Abnormal Recycle: Ignition failed due to interrupted air flow switch was off
303 Abnormal Recycle: ILK off during Drive to Purge Rate
304 Abnormal Recycle: ILK off during Measured Purge Time
305 Abnormal Recycle: ILK off during Drive to Light off Rate
306 Abnormal Recycle: ILK off during Pre-Ignition test
307 Abnormal Recycle: ILK off during Pre-Ignition time
308 Abnormal Recycle: ILK off during Main Flame Establishing Period
309 Abnormal Recycle: ILK off during Ignition period
310 Run was terminated due to ILK was off
311 Run was terminated due to interrupted air flow switch was off
312 Stuck reset switch
313 Run was terminated due to fan failure
314 Abnormal Recycle: Fan failed during Drive to Purge Rate
315 Abnormal Recycle: Fan failed during Measured Purge Time
316 Abnormal Recycle: Fan failed during Drive to Light off Rate
317 Abnormal Recycle: Fan failed during Pre-Ignition test
318 Abnormal Recycle: Fan failed during Pre-Ignition time
319 Abnormal Recycle: Fan failed during Ignition period
320 Abnormal Recycle: Fan failed during Main Flame Establishing Period
321 Abnormal Recycle: Main Valve off after 10 seconds of RUN
322 Abnormal Recycle: Pilot Valve off after 10 seconds of RUN
323 Abnormal Recycle: Safety Relay off after 10 seconds of RUN
324 Abnormal Recycle: Hardware flame bias
325 Abnormal Recycle: Hardware static flame
326 Abnormal Recycle: Hardware flame current invalid
327 Abnormal Recycle: Hardware flame rod short
328 Abnormal Recycle: Hardware invalid power
329 Abnormal Recycle: Hardware invalid AC line
330 Abnormal Recycle: Hardware SLO flame ripple
331 Abnormal Recycle: Hardware SLO flame sample
332 Abnormal Recycle: Hardware SLO flame bias range
333 Abnormal Recycle: Hardware SLO flame bias heat
334 Abnormal Recycle: Hardware SLO spark stuck
335 Abnormal Recycle: Hardware SLO spark changed
336 Abnormal Recycle: Hardware SLO static flame
337 Abnormal Recycle: Hardware SLO rod shorted
338 Abnormal Recycle: Hardware SLO AD linearity
339 Abnormal Recycle: Hardware SLO bias not set
340 Abnormal Recycle: Hardware SLO bias shorted
341 Abnormal Recycle: Hardware SLO electronics
342 Abnormal Recycle: Hardware processor clock
343 Abnormal Recycle: Hardware AC phase
344 Abnormal Recycle: Hardware A2D mismatch
345 Abnormal Recycle: Hardware VSNSR A2D
346 Abnormal Recycle: Hardware 28V A2D
347 Abnormal Recycle: Hardware HFS IAS shorted
348 Abnormal Recycle: Hardware PII INTLK shorted
349 Abnormal Recycle: Hardware HFS LCI shorted
350 Abnormal Recycle: Hardware HFS LFS shorted
351 Abnormal Recycle: Invalid zero crossing
352 Abnormal Recycle: fault stack sensor
353 Abnormal Recycle: stack limit
354 Abnormal Recycle: delta T limit
355 Abnormal Recycle: fault outlet sensor
356 Abnormal Recycle: outlet high limit
357 Abnormal Recycle: fault DHW sensor
358 Abnormal Recycle: DHW high limit
359 Abnormal Recycle: fault inlet sensor

360 Abnormal Recycle: Check Parameters Failed
361 Internal error: No factory parameters were detected in control
362 Internal error: PID iteration frequency was invalid
363 Internal error: Demand-Rate interval time was invalid
364 Internal error: Factory calibration parameter for modulation was invalid
365 Internal error: CH PID P-scaler was invalid
366 Internal error: CH PID I-scaler was invalid
367 Internal error: CH PID D-scaler was invalid
368 Internal error: DHW PID P-scaler was invalid
369 Internal error: DHW PID I-scaler was invalid
370 Internal error: DHW PID D-scaler was invalid
371 Internal error: Lead Lag master PID P-scaler was invalid
372 Internal error: Lead Lag master PID I-scaler was invalid
373 Internal error: Lead Lag master PID D-scaler was invalid
460 LCI demand lost in run
461 Demand lost in run
462 STAT demand lost in run
463 Demand lost in run due to no flame
467 Internal error: EEPROM write was attempted before EEPROM was initialized
468 Internal error: EEPROM cycle count address was invalid
469 Internal error: EEPROM days count address was invalid
470 Internal error: EEPROM hours count address was invalid
471 Internal error: Lockout record EEPROM index was invalid
472 Internal error: Request to write PM status was invalid
473 Internal error: PM parameter address was invalid
474 Internal error: PM safety parameter address was invalid
475 Internal error: Invalid record in lockout history was removed
476 Internal error: EEPROM write buffer was full
477 Internal error: Data too large was not written to EEPROM
478 Internal error: Safety key bit 0 was incorrect
479 Internal error: Safety key bit 1 was incorrect
480 Internal error: Safety key bit 2 was incorrect
481 Internal error: Safety key bit 3 was incorrect
482 Internal error: Safety key bit 4 was incorrect
483 Internal error: Safety key bit 5 was incorrect
484 Internal error: Safety key bit 6 was incorrect
485 Internal error: Safety key bit 7 was incorrect
486 Internal error: Safety key bit 8 was incorrect
487 Internal error: Safety key bit 9 was incorrect
488 Internal error: Safety key bit 10 was incorrect
489 Internal error: Safety key bit 11 was incorrect
490 Internal error: Safety key bit 12 was incorrect
491 Internal error: Safety key bit 13 was incorrect
492 Internal error: Safety key bit 14 was incorrect
493 Internal error: Safety key bit 15 was incorrect
494 Internal error: Safety relay timeout
495 Internal error: Safety relay commanded off
496 Internal error: Unknown safety error occurred
497 Internal error: Safety timer was corrupt
498 Internal error: Safety timer was expired
499 Internal error: Safety timings

Appendix B- Replacement Parts

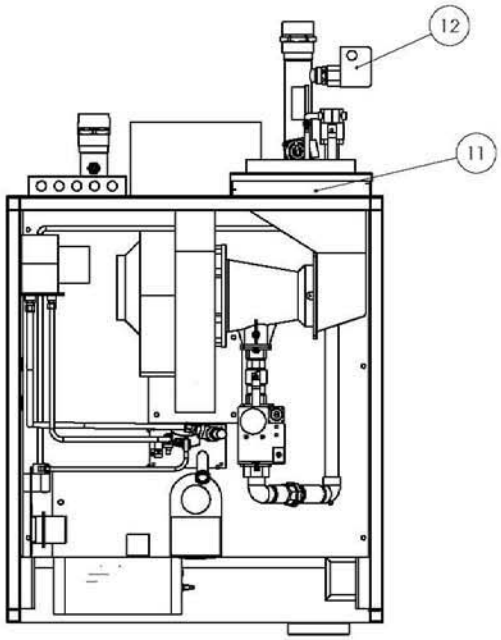
MODELS A050-A150

Description	*A050*	*A075*	*A100*	*A150*
Heat Exchanger	ATHX050	ATHX075	ATHX100	ATHX150
Water Flow switch	PPFIS-1	PPFIS-1	PPFIS-1	PPFIS-1
Temp Sensor Well	CHMANAQWL-1	CHMANAQWL-1	CHMANAQWL-1	CHMANAQWL-1
Outlet /Stack Temp Sensor	CAA50001464-007	CAA50001464-007	CAA50001464-007	CAA50001464-007
Inlet/Outdoor/DHW/ Header Temp Sensor	CAA198799Z	CAA198799Z	CAA198799Z	CAA198799Z
Relief Valve	RV075174A-125	RV075174A-125	RV075174A-125	RV075174A-125
Pilot Assembly(nat. gas)	ATPA-N	ATPA-N	ATPA-N	ATPA-N
Pilot Assembly(propane)	ATPA-P	ATPA-P	ATPA-P	ATPA-P
Pilot Assembly (comb.)	ATPA-C	ATPA-C	ATPA-C	ATPA-C
UV Scanner	CABRC7027A1023	CABRC7027A1023	CABRC7027A1023	CABRC7027A1023
Pilot Blower	BRBLOWERITDP7	BRBLOWERITDP7	BRBLOWERITDP7	BRBLOWERITDP7
Burner	BRBNIT075CYL	BRBNIT075CYL	BRBNIT100CYL	BRBNIT100CYL-1
Blower	BRBLOWRG175	BRBLOWRG175	BRBLOWG1G170	BRBLOWG3G200
Venturi	GSVENTURI150KW	GSVENTURI150KW	GSVENTURI300KW	GSVENTURI500KW
Fuel-Air Ratio Valve	GSGV4730C1022	GSGV4730C1022	GSGV4730C1022	GSGV4730C1030
Air Flow Switch	CASWAFS-398	CASWAFS-398	CASWAFS-398	CASWAFS-398
Ignition Trans	ELTRANS1092-F	ELTRANS1092-F	ELTRANS1092-F	ELTRANS1092-F
Transformer	ELTRANS40VA	ELTRANS40VA	ELTRANS40VA	ELTRANS40VA
Honeywell Sola Controller	CAAR7910A1027	CAAR7910A1027	CAAR7910A1027	CAAR7910A1027
Basic Panel	CAAS7910A1008	CAAS7910A1008	CAAS7910A1008	CAAS7910A1008
Enhanced Panel	GSCAS799C1008	GSCAS799C1008	GSCAS799C1008	GSCAS799C1008
Red Lamp	LAMPR	LAMPR	LAMPR	LAMPR
Green Lamp	LAMPG	LAMPG	LAMPG	LAMPG

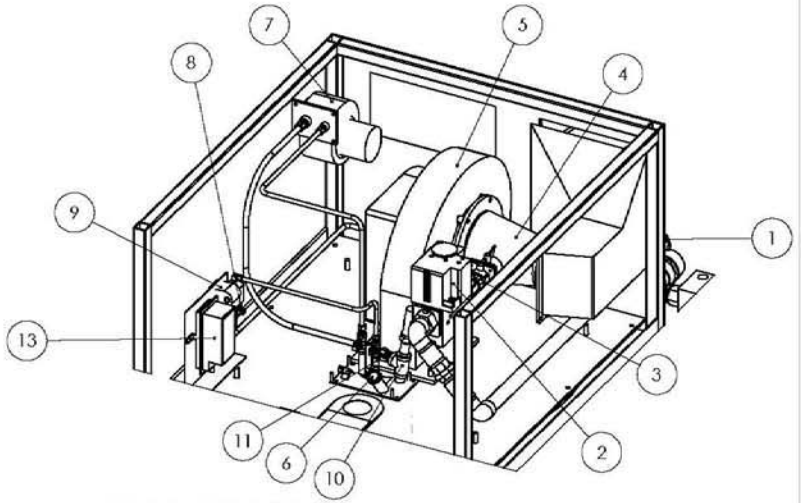
MODELS A200-A300

Description	*A200*	*A250*	*A300*
Heat Exchanger	ATHX200	ATHX250	ATHX300
Water Flow switch	PPFIS-1	PPFIS-1	PPFIS-1
Temp Sensor Well	CHMANAQWL-1	CHMANAQWL-1	CHMANAQWL-1
Outlet/Stack Temp Sensor	CAA50001464-007	CAA50001464-007	CAA50001464-007
Inlet/Outdoor/DHW/ Header Temp Sensor	CAA198799Z	CAA198799Z	CAA198799Z
Relief Valve	RV075174A-125	RV100174A-150	RV100174A-150
Pilot Assembly(nat. gas)	ATPA-N	ATPA-N	ATPA-N
Pilot Assembly(propane)	ATPA-P	ATPA-P	ATPA-P
Pilot Assembly (comb.)	ATPA-C	ATPA-C	ATPA-C
UV Scanner	CABRC7027A1023	CABRC7027A1023	CABRC7027A1023
Pilot Blower	BRBLOWERITDP7	BRBLOWERITDP7	BRBLOWERITDP7
Burner	BRBNIT075CYL	BRBNIT075CYL	BRBNIT100CYL
Blower	BRBLOWG3G250	BRBLOWG3G250	BRBLOWG3G250
Venturi	GSVENTURI680KW	GSVENTURI680KW	GSVENTURI680KW
Fuel-Air Ratio Valve	GSGV4730C1002	GSGV4730C1002	GSGV4730C1002
Air Flow Switch	CASWAFS-398	CASWAFS-398	CASWAFS-398
Ignition Trans	ELTRANS1092-F	ELTRANS1092-F	ELTRANS1092-F
Transformer	ELTRANS40VA	ELTRANS40VA	ELTRANS40VA
Honeywell Sola Controller	CAAR7910A1027	CAAR7910A1027	CAAR7910A1027
Basic Panel	CAAS7910A1008	CAAS7910A1008	CAAS7910A1008
Enhanced Panel	GSCAS799C1008	GSCAS799C1008	GSCAS799C1008
Red Lamp	LAMPR	LAMPR	LAMPR
Green Lamp	LAMPG	LAMPG	LAMPG

ITEM NO.	QTY	DESCRIPTION	MODEL NUMBER						
			A050	A075	A100	A150	A200	A250	A300
1	1	COMBU - BALL VALVE W/ PORT	1" #55-350			1-1/4" #55-360			
2	1	HONEYWELL - GAS VALVE	V4730C-1006	V4730C-1022		V4730C-1030	V4734C-1002		
3	1	HONEYWELL - MANUAL SHUT OFF VALVE	1" #50002653-001			1 1/4" #50002653-002			
4	1	HONEYWELL - VENTURI	VMU150A 1011	VMU300A 1046		VMU500A 1033	VMU680A 1017		
5	1	EBM - BLOWER	RGA175-55667.14002		G1G170-AB05-20	G3G200-GN26-01		G3G250-GN39-01	
6	1	ABRISIA - SIGHT GLASS	1/8"x1 1/8" ROBAX 1400						
7	1	DAYTON - PCS BLOWER	PCS- #ITDP7						
8	1	MAXITROL - GAS REGULATOR	1/4" #RV 20						
9	1	HONEYWELL - PILOT GAS VALVE	1/8" NC V4046C 1005						
10	1	HONEYWELL - UV SCANNER	#C7027A 1023						
11	1	AIR INTAKE FILTER	GSAIRFILTER01				GSAIRFILTER02		
12	1	TACO - WATER FLOWSWITCH	PPFIFS-1						
13	1	UNICONTROL - AIR FLOW SWITCH	CASWAFS-398						



TOP VIEW



ISOMETRIC VIEW

5 4 3 2 1

Atlas Warranty

Ace Atlas Condensing Boiler Limited Parts Warranty

Scope: Ace Heating Solutions, LLC warrants the original owner that all parts of this unit which are manufactured by Ace will be free from failure under normal use and service for the specified warranty periods and subject to the conditions set forth in this warranty. Labor charges and other costs associated with the removal or installation, shipping, and transportation are not covered by this warranty.

Standard Warranty: The Atlas heat exchanger shall carry a standard 1 year warranty from installation or 18 month warranty from ship date, whichever comes first. This unit is warranted against any failure due to material defects or workmanship. The Atlas also carries a standard 20 year warranty against thermal shock.

Conditions of Warranty: The Atlas must be started up in accordance with the O & M manual and a combustion test must be done at start-up and repeated yearly with adjustments being made to match the range of the original factory settings. In the event of a failure, these documents must be available to validate the warranty. In addition, all necessary service of the unit as outlined in the O & M manual must be performed as specified. Ace makes no warranty whatsoever on parts not manufactured by Ace, but Ace will apply any such warranty as may be provided to it by the parts manufacturer. In addition, any alterations done to the nameplate or heat exchanger will void the warranty. Ace will repair, rebuild or exchange the heat exchanger once the heat exchanger is sent back to the factory for inspection.

To Make a Warranty Claim: Should an Ace unit, Atlas Condensing boiler fail due to material defects or workmanship within the given time period from the original ship date, Ace shall have the option to modify, repair or exchange the defective item. Ace shall also have the option to have the item returned to the factory or to provide parts for a field repair/replacement. The failed item must be returned to the factory with pre-paid freight costs for inspection for validation of the warranty. Ace shall not be held responsible for labor charges or for shipping and handling costs.

Warranty is only valid if the Ace start-up sheet is completed and is made available to Ace Boiler for review. Settings outside of the allowable range could jeopardize warranty claim. For optional extended 7-year warranty, start-up and annual test reports must be made available to Ace for all warranty claims.

Claim for a warranty must be filled within 10 business days of when the failure occurs. This warranty cannot be extended for any reason except by Ace Heating Solutions, LLC and must be done in a written form. In order to make a warranty claim, a purchase order and national board number is required prior to any repairs or replacements being made. If the claim is determined to be covered by warranty then the amount of the purchase order will be returned to the customer. Also, the returned item must have a Returned Goods Authorization (RGA) label attached to the shipment which includes the item's return address, factory authorized RGA number, and purchase order number.

Extended Warranty: An extended 7-year heat exchanger warranty to the customer follows the same conditions as stated above and will be as follows:

Year	Discount
1-5	100%
6	50%
7	25%

Summary of Atlas Acceptable Conditions (per O & M manual)

Subjects	Condition
Min Velocity	Minimum flow is based on both firing rate and inlet water temperatures. Water should not be flashing to steam. If an audible popping sound is heard, increase the flow rate.
Max Velocity	8 ft/s 60 gpm on A050-A150 120 gpm on A200-A300
Chamber Pressure	Under +0.5 in WC
Filter	Inspected Monthly

N O T I C E

This owners & operation manual provides warnings of risk of harm from improper installation, operation and/or maintenance of Ace Products. Ace Heating Solutions, LLC. used ordinary care and complied with UL and ASME Standards in the design and manufacture of Ace Products. Proper installation, operation and maintenance are covered in the manual supplied with the product. All equipment must comply with local codes.

W A R N I N G

THIS PRODUCT CONTAINS CRYSTALLINE SILICA, A CHEMICAL KNOWN TO CAUSE CANCER. CONTAINS NO ASBESTOS.

Ace Heating Solutions, LLC
2701 S. Harbor Blvd. Santa Ana, CA 92704
714.540-2230 Fax 714.540-2239
www.aceheatingllc.com

SO # _____

Serial No. _____

Model No. _____