Installation and Operation Instructions for

OMNITHERM®

with Laars Linc®

Boiler	Water Heater
Model ONH1250 1,250 MBTU/h	Model ONV1250 1,250 MBTU/h
Model ONH1500 1,500 MBTU/h	Model ONV1500 1,500 MBTU/h
Model ONH1750 1,750 MBTU/h	Model ONV1750 1,750 MBTU/h
Model ONH2000 2,000 MBTU/h	Model ONV2000 2,000 MBTU/h
Model ONH2500 2,500 MBTU/h	Model ONV2500 2,500 MBTU/h

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler and heater installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other unit.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any unit.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby 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 gas supplier.

⚠ AVERTISSEMENT

Assurez-vous de bien suivres les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareils.
- Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dansle bâtiment où vous êtes.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le service des incendies.

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

H2376700B

LAARS® Heating Systems Company

Table of Contents

SECTION 8 (continued)

SECTION 9 Gas Valve Touchscreen, Menus and Descriptions

LAARS®
Heating Systems Company

SECTION 1 General Information

1.A Introduction

This manual provides information necessary for the installation, operation, and maintenance of LAARS Heating Systems OmniTherms. Read this manual carefully before starting the installation.

All application and installation procedures should be reviewed completely before proceeding with the installation. Consult the LAARS Heating Systems factory, or local factory representative, with any problems or questions regarding this equipment. Experience has shown that most operating problems are caused by improper installation.

OmniTherm is protected against over pressurization. A pressure relief valve is included with each OmniTherm. Some OmniTherms may require that the PRV be installed prior to filling the system. Refer to Section 1.E on page 8 for PRV locations.

1.B Warranty

LAARS Heating Systems OmniTherms are covered by a limited warranty. The owner should complete the warranty registration at www.Laars.com.

All warranty claims must be made to an authorized LAARS Heating Systems representative. Claims must include the serial number and model (this information can be found on the rating plate), installation date, and name of the installer. Shipping costs are not included in the warranty coverage.

1.C Model Identification

Consult the rating plate on the unit. The following information describes the model number structure.

1	2	3	4	5	6	7	8	9	10	11	12	13
O	N						N			1		

Series
ON- Cat I / III

Usage
H - Hydronic
V - Volume Water

Size / MBH

1	2	5	0
1	5	0	0
1	7	5	0
2	0	0	0
2	5	0	0

Fuel
N- Nat

Construction
X- Standard
J- CSD-1

Electrical System
A- 120V, single phase (1250-2000)
B- 220/240V, single ph (1500-2500)
C- 208V, single phase (1500-2500)
D- 208V, three phase (2500)
E- 480V, three phase (2500)
F- 600V, three phase (2500)

Revision
1- First

Waterway Options

X- std ONH, 75psi PRV, H-Stamp	N- ONV w/ H-Stamp, 30psi PRV
W- std ONV, 125psi PRV, HLW-Stamp	P- ONV w/ H-Stamp, 50psi PRV
A- 30psi PRV	R- ONV w/ H-Stamp, 60psi PRV
B- 50psi PRV	S- ONV w/ H-Stamp, 75psi PRV
C- 60psi PRV	T- ONV w/ H-Stamp, 125psi PRV
D- ONV 75psi PRV	U- ONV w/ H-Stamp, 150psi PRV
E- ONH 125psi PRV	2- Flange kit, ONV w/ H-Stamp, 30psi PRV
F- 150psi PRV	3- Flange kit, ONV w/ H-Stamp, 50psi PRV
G- Flange kit & 30psi PRV	4- Flange kit, ONV w/ H-Stamp, 60psi PRV
H- Flange kit & 50psi PRV	5- Flange kit, ONV w/ H-Stamp, 75psi PRV
J- Flange kit & 60psi PRV	6- Flange kit, ONV w/ H-Stamp, 125psi PRV
K- Flange kit & 75psi PRV	7- Flange kit, ONV w/ H-Stamp, 150psi PRV
L- Flange kit & 125psi PRV	
M- Flange kit & 150psi PRV	

Additional Options

X- None	H- Gateway LONworks & alarm bell
A- Gateway, BACnet IP	J- Gateway LONworks & high limits
B- Gateway, LONworks	K- Gateway LONworks & alarm bell & high limits
C- Alarm bell	L- Alarm & high limits
D- Auto & manual high limits	
E- Gateway BACnet IP & alarm bell	
F- Gateway BACnet IP & high limits	
G- Gateway BACnet IP & alarm bell & high limits	

1.D Safety Notes

Safety Notes are used thoughout this manual to bring attention to the presence of hazards with various risk levels and to offer important information concering the life of this product. There are 3 basic types.

1	**⚠ WARNING**	Indicates an imminently hazardous situation which, if not avoided, can or will result in death or serious injury and can or will result in catastrophic property damage.
2	**⚠ CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in moderate injury and/or property damage.
3	NOTE:	Indicates instructions that are important to that topic but not related to personal injury or property damage.

⚠ WARNING

- Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
- Children, disabled and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at the unit.
- Feel water before bathing or showering.
- If this unit is used to produce water that could scald if too hot, such as domestic hot water use, adjust the outlet control (limit) or use temperature limiting valves to obtain a maximum water temperature of 125°F (52°C).

⚠ WARNING

Fire or Explosion Hazard

Improper configuration can cause fuel buildup and explosion. Improper user operation may result in property loss, severe physical injury, or death.

Any changes to safety-related configuration parameters must only be done by experienced and/or licensed burner/boiler operators and mechanics.

If any odor of gas is detected, or if the gas burner does not appear to be functioning in a normal manner, close the main gas shutoff valve. Do not shut off the power switch. Contact your heating contractor, gas company, or factory representative.

NOTE: This unit is protected against hydronic over-pressurization. A pressure relief valve is included with each unit.

⚠ WARNING

The inlet gas pressure to the unit must not exceed 13" W.C. (3.2kPa).

⚠ WARNING

This unit must be installed in accordance with the procedures detailed in this manual, or the manufacturers warranty will be voided. The installation must conform to the requirements of the local jurisdiction having authority, and, in the United States, to the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA54. In Canada, the installation must conform to the latest edition of CSA B149.1 Natural Gas and Propane Gas Installation Code, and/or local codes. Where required by the authority having jurisdiction, the installation of these units must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1. Any modifications to the boiler, its gas controls, or wiring may void the warranty. If field conditions require modifications, consult the factory representative before initiating such modifications.

⚠ WARNING

Carbon Monoxide Hazard

Improper adjustment of the burners may lead to poor combustion quality, increasing the amount of carbon monoxide produced. Excessive carbon monoxide levels may lead to personal injury or death.

⚠ WARNING

CANCER AND REPRODUCTIVE HARM.
WWW.P65WARNINGS.CA.GOV.

AS REQUIRED BY THE STATE OF CALIFORNIA PROPOSITION 65.

⚠ WARNING

Electrical Shock Hazard

Electrical shock can cause severe injury, death or property damage. Disconnect the power supply before beginning installation or changing the wiring to prevent electrical shock or damage to the equipment. It may be necessary to turn off more than one power supply to disconnect.

All electrical wiring is to be done in accordance with local codes, or in the absence of local codes, with: 1) The National Electrical Code ANSI/NFPA No. 70 - latest Edition, or 2) CSA STD. C22.1 "Canadian Electrical Code - Part 1." This appliance must be electrically grounded in accordance with these codes.

NOTE: All installations must be made in accordance with 1) American National Standard Z223.1/NFPA54-Latest Edition "National Fuel Gas Code" or 2) CSA B149.1 "Natural Gas and Propane Installation Code" or in Canada reference the B149.1 latest edition and with the requirement of the local utility or other authorities having jurisdiction. Such applicable requirements take precedence over the general instructions contained herein. All electrical wiring is to be done in accordance with the local codes, or in the absence of local codes, with: 1) The National Electrical Code ANSI/NFPA No. 70-latest Edition, or 2) CSA STD. C22.1 "Canadian Electrical Code - Part 1". This appliance must be electrically grounded in accordance with these codes.

⚠ WARNING

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures above 180ºF, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

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

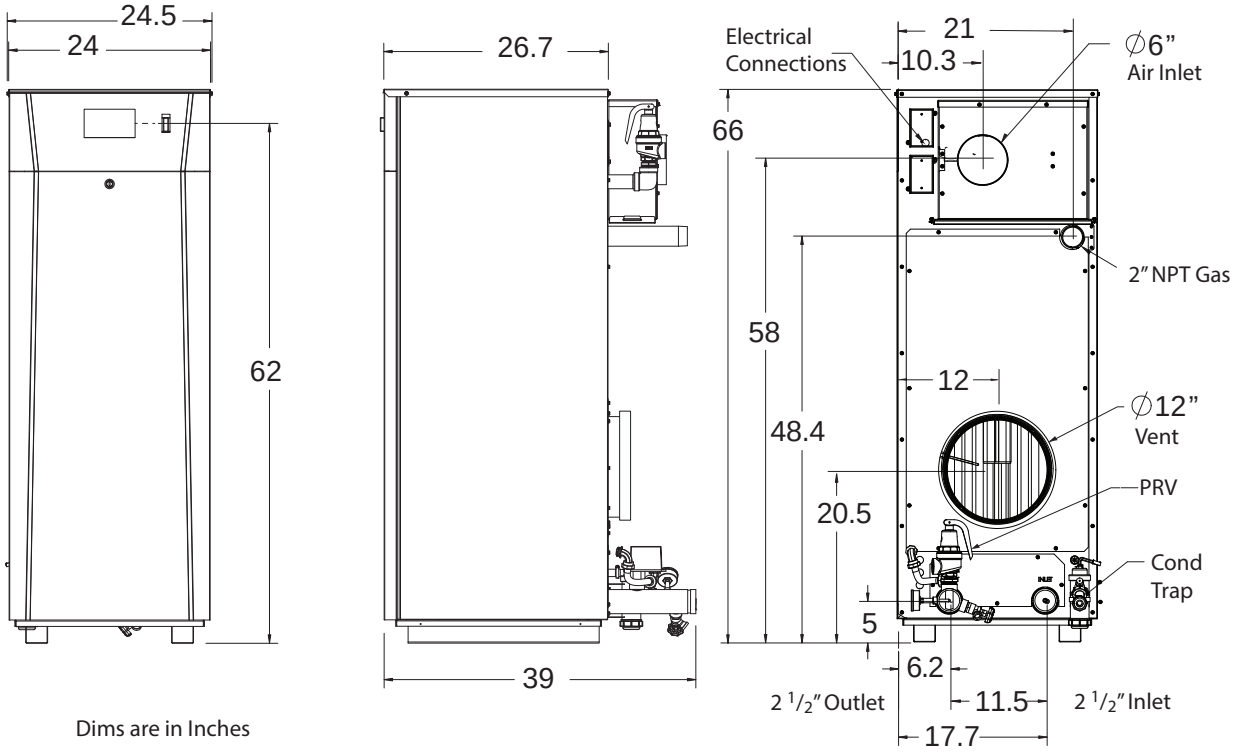
1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator.
2. Long sleeved, loose fitting clothing.
3. Gloves.
4. Eye Protection.

⚠ CAUTION

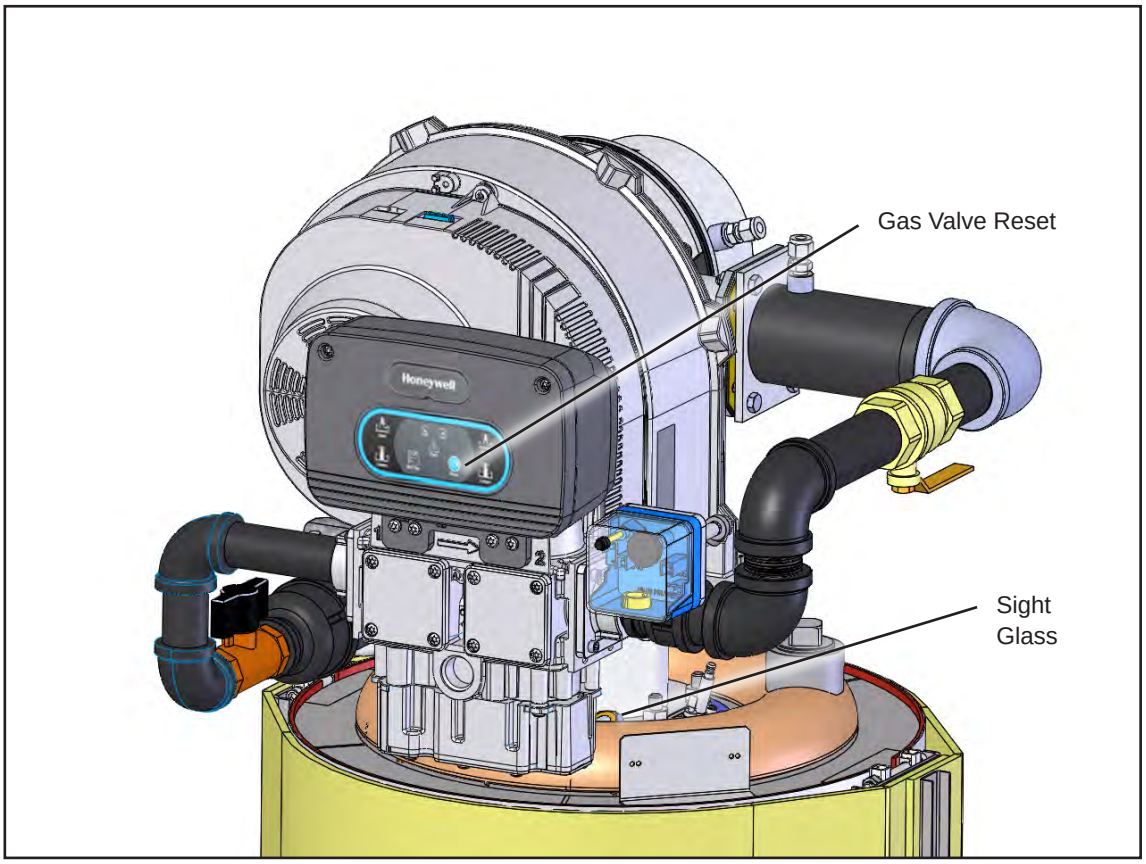
The supply voltage to this unit must not be disengaged, except for service or isolation, or unless otherwise instructed by procedures outlined in this manual. To signal a call for heat, use the correct terminals as instructed in the Electrical Connections, Field Wiring 7.E on page 36 of this manual.

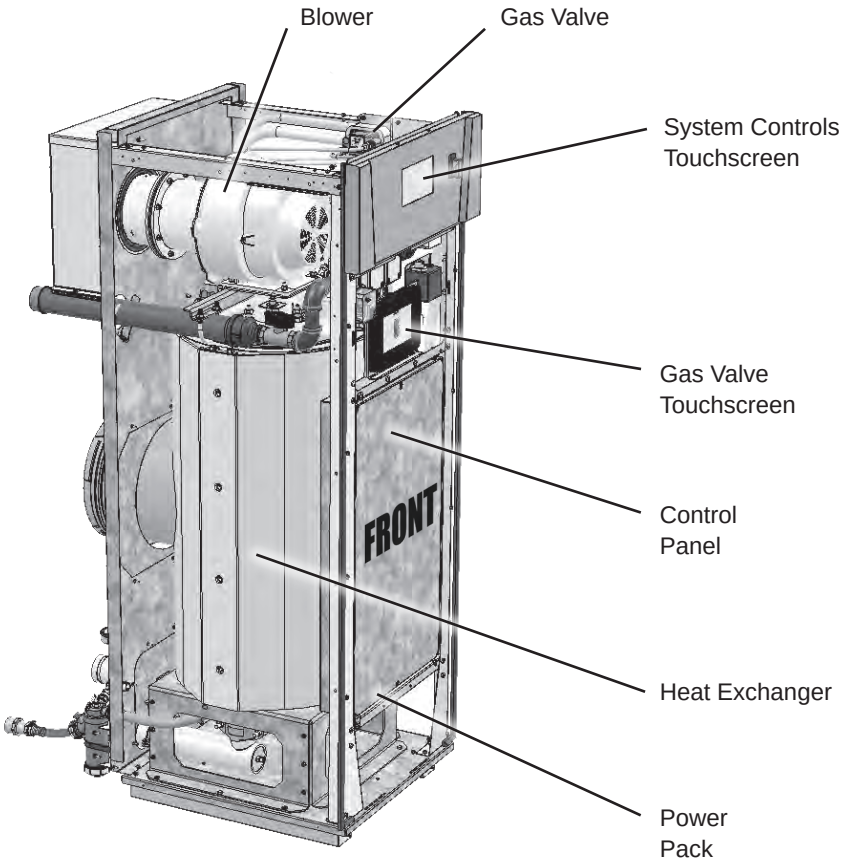
1.E Unit Dimensions and Components

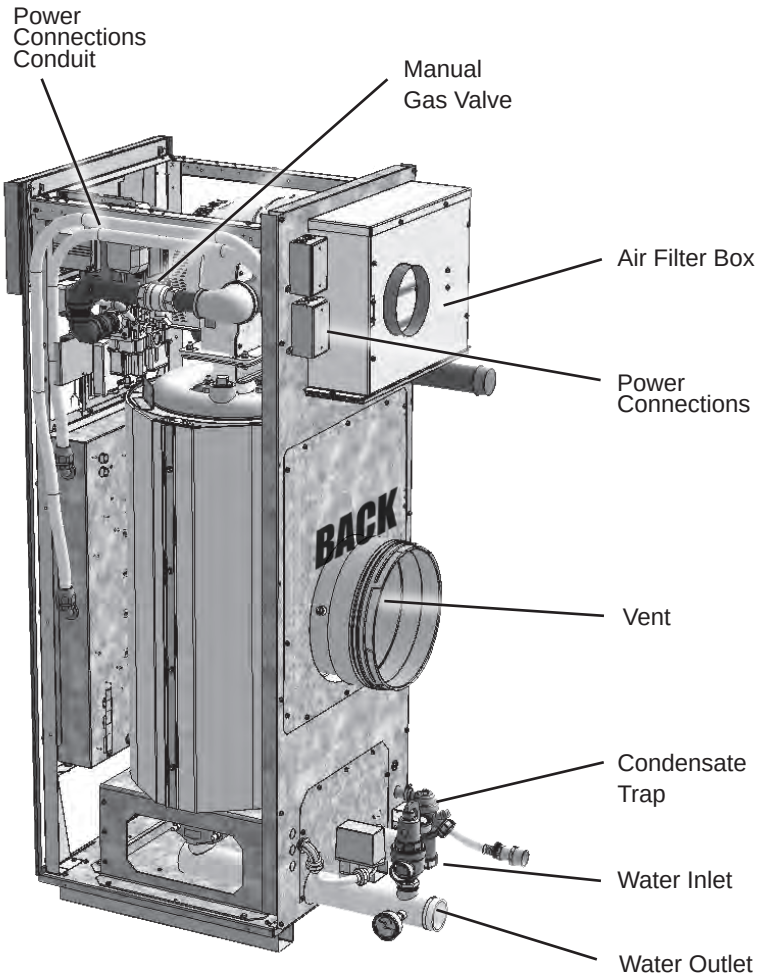
1.E.1 Model 1250 / 1500



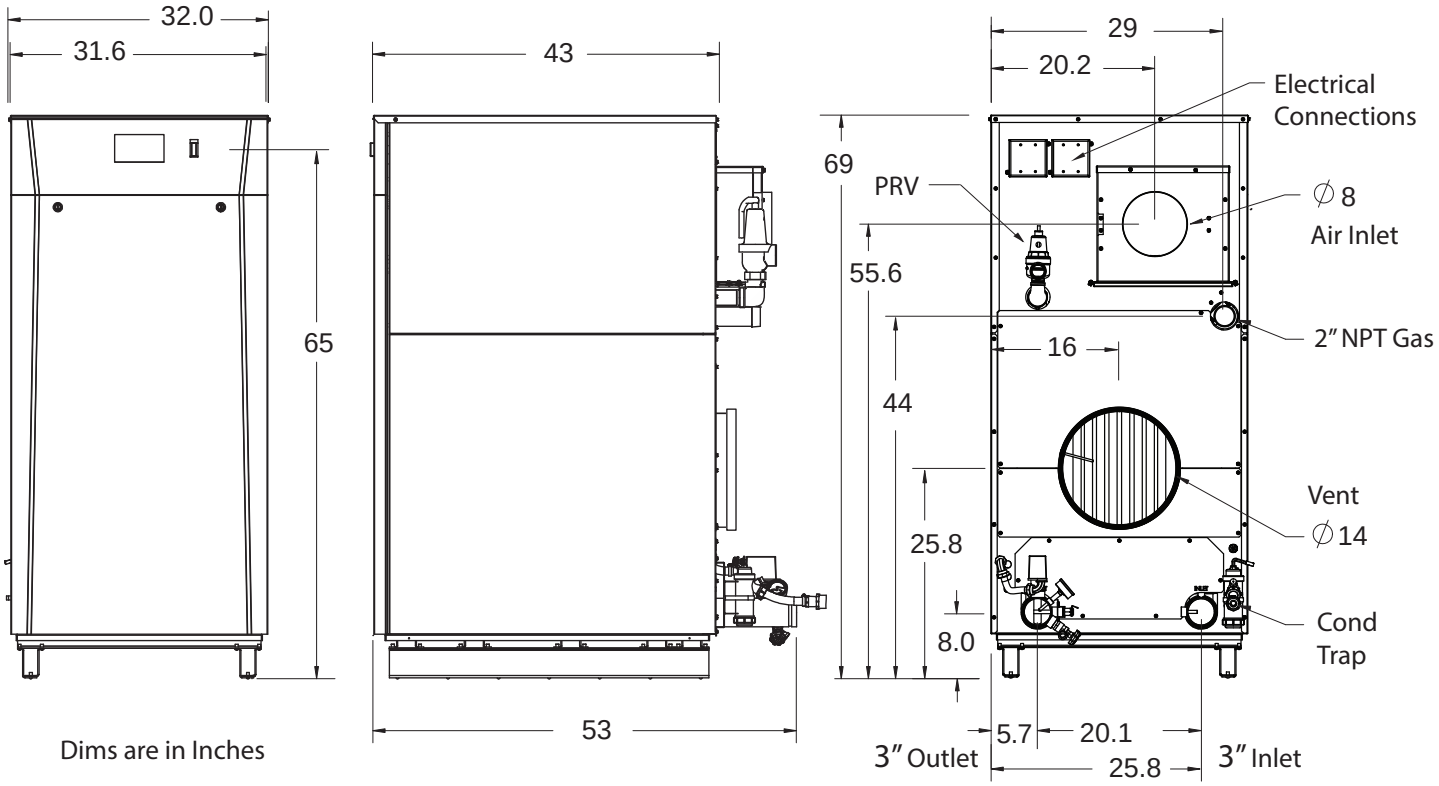
Dims are in Inches

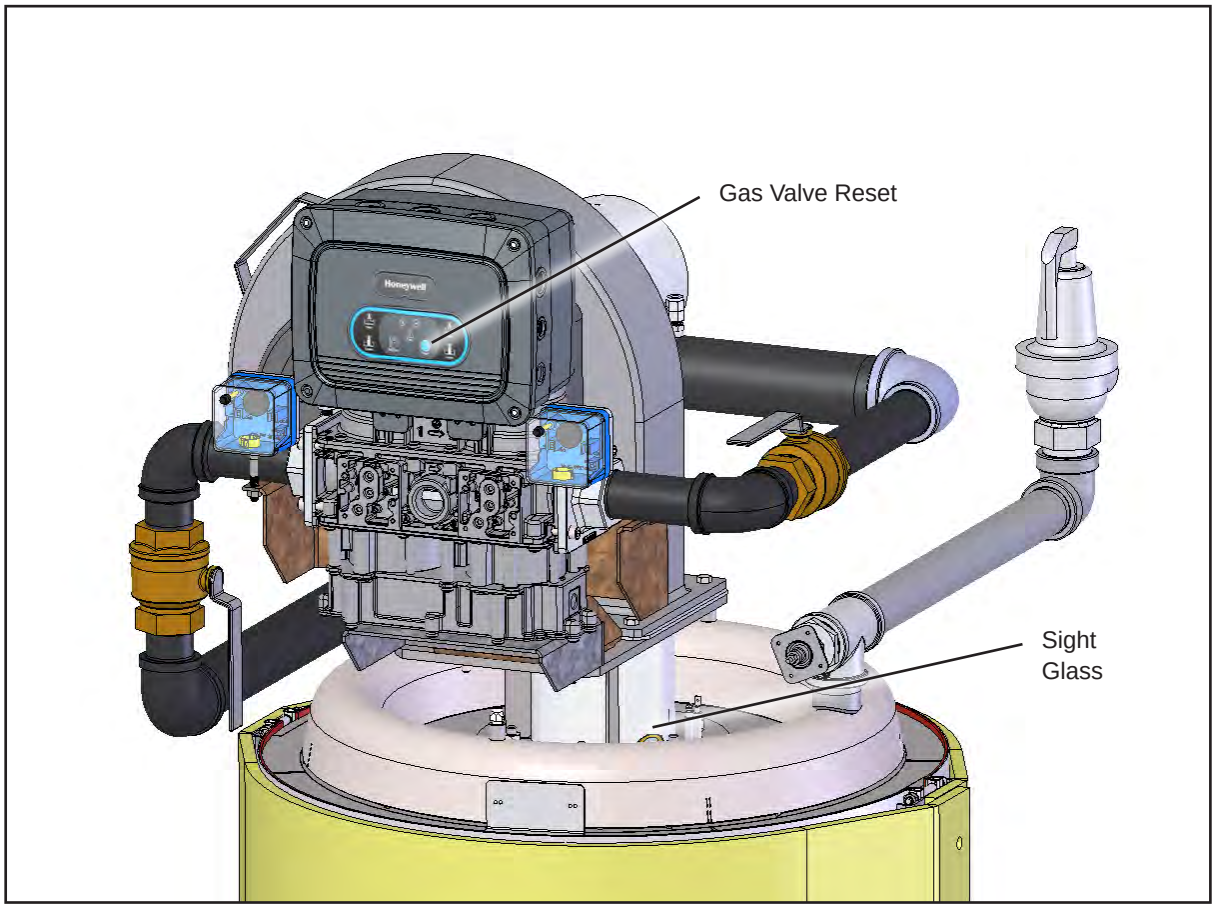


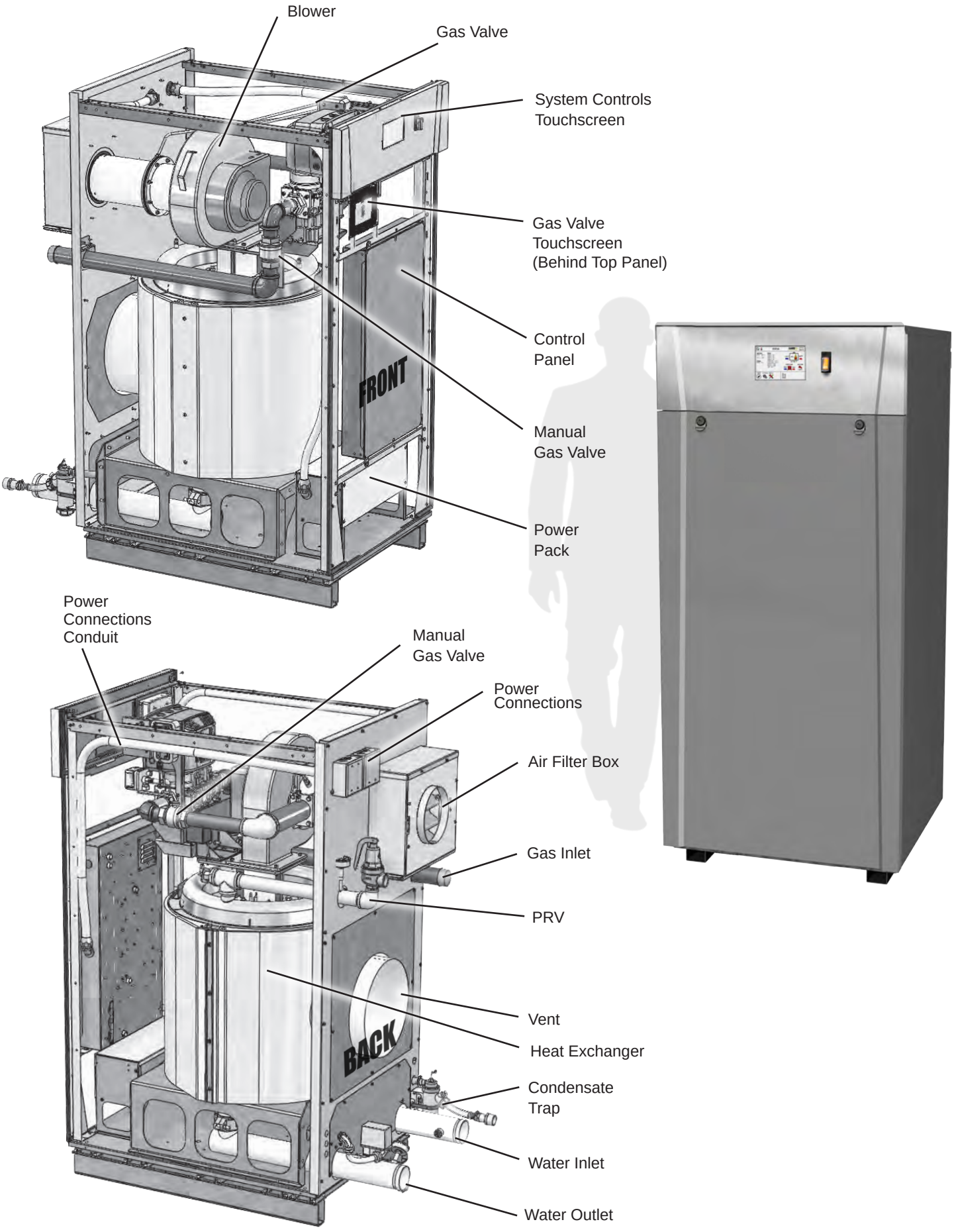

Blower
Gas Valve
System Controls
Touchscreen
Gas Valve
Touchscreen
Control
Panel
Heat Exchanger
Power
Pack
FRONT


Power
Connections
Conduit
Manual
Gas Valve
Air Filter Box
Power
Connections
BACK
Vent
Condensate
Trap
Water Inlet
Water Outlet

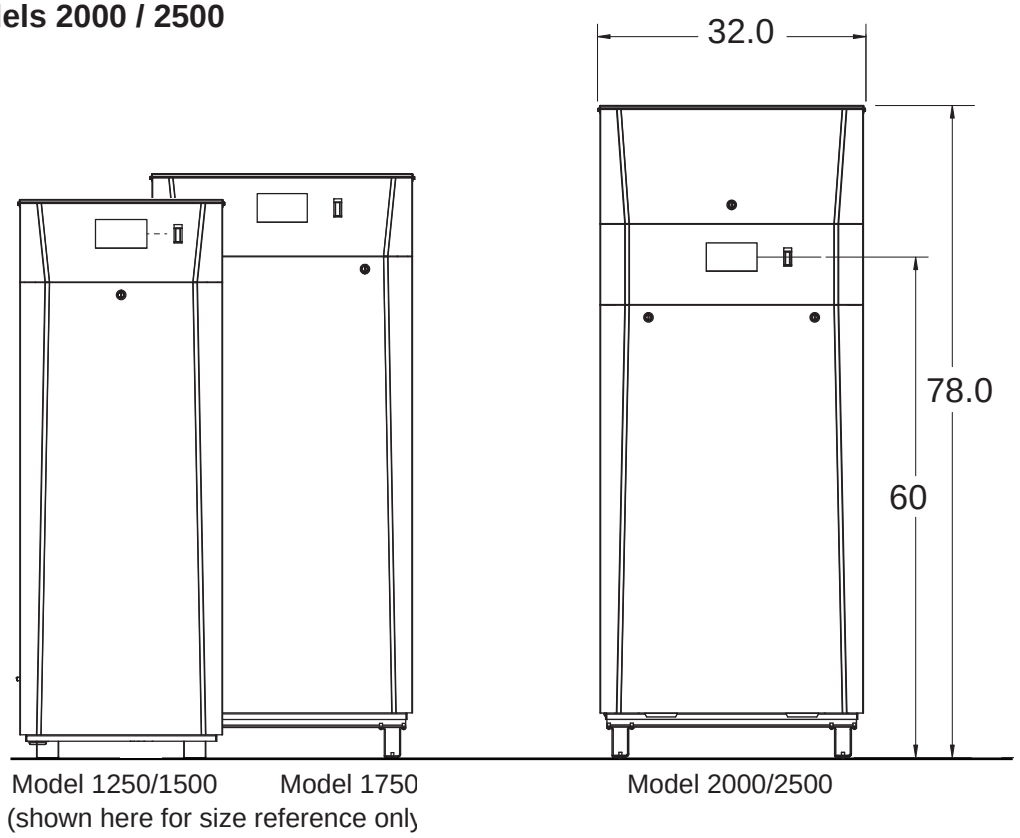
1.E.2 Model 1750

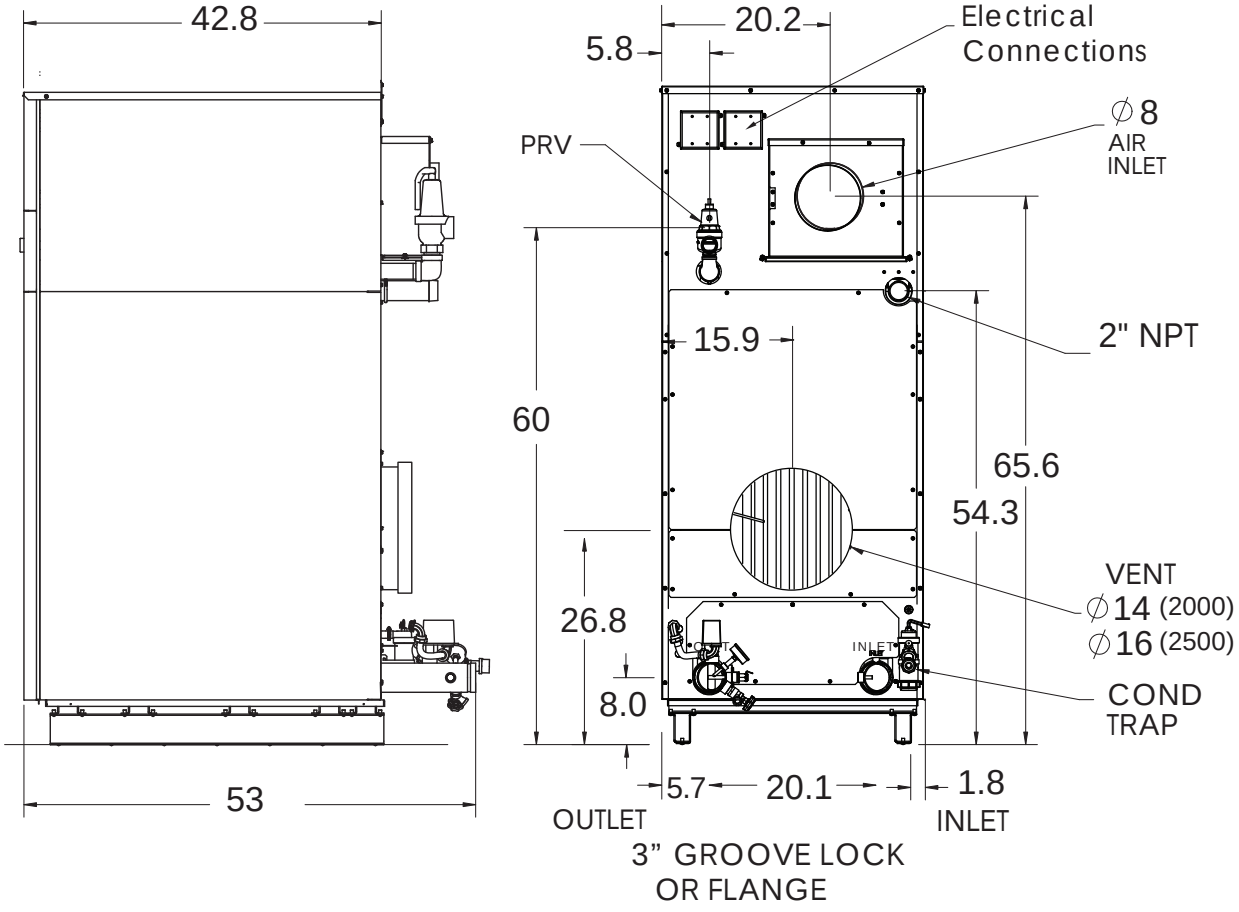


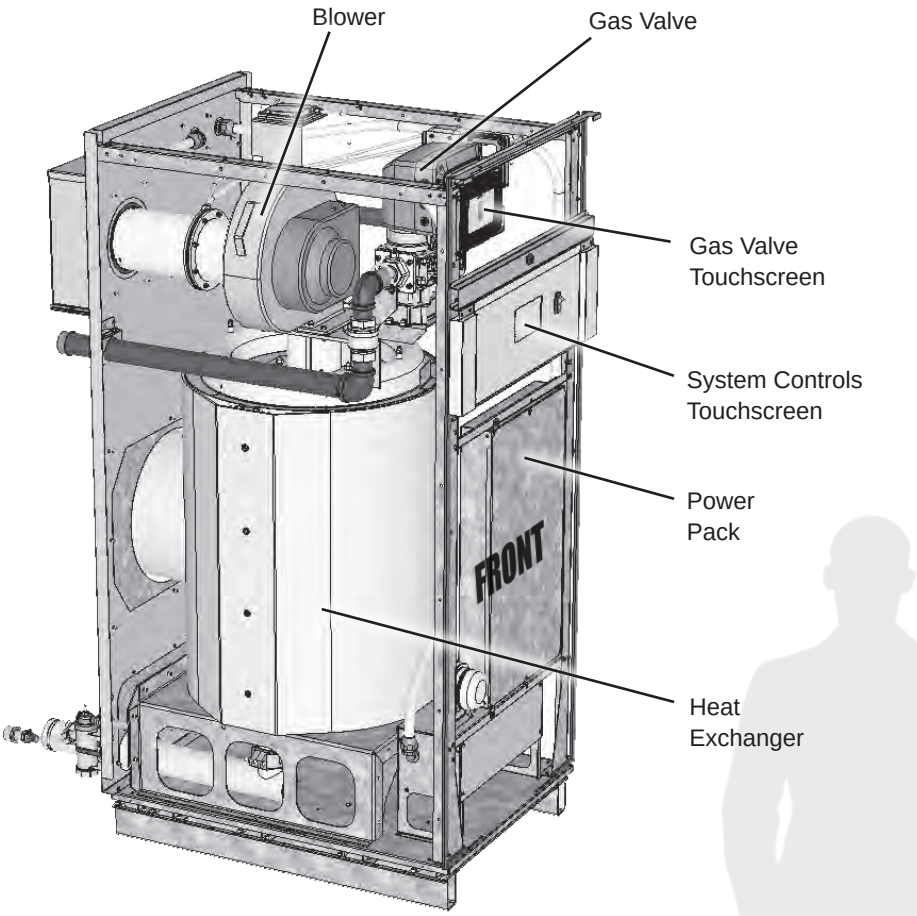


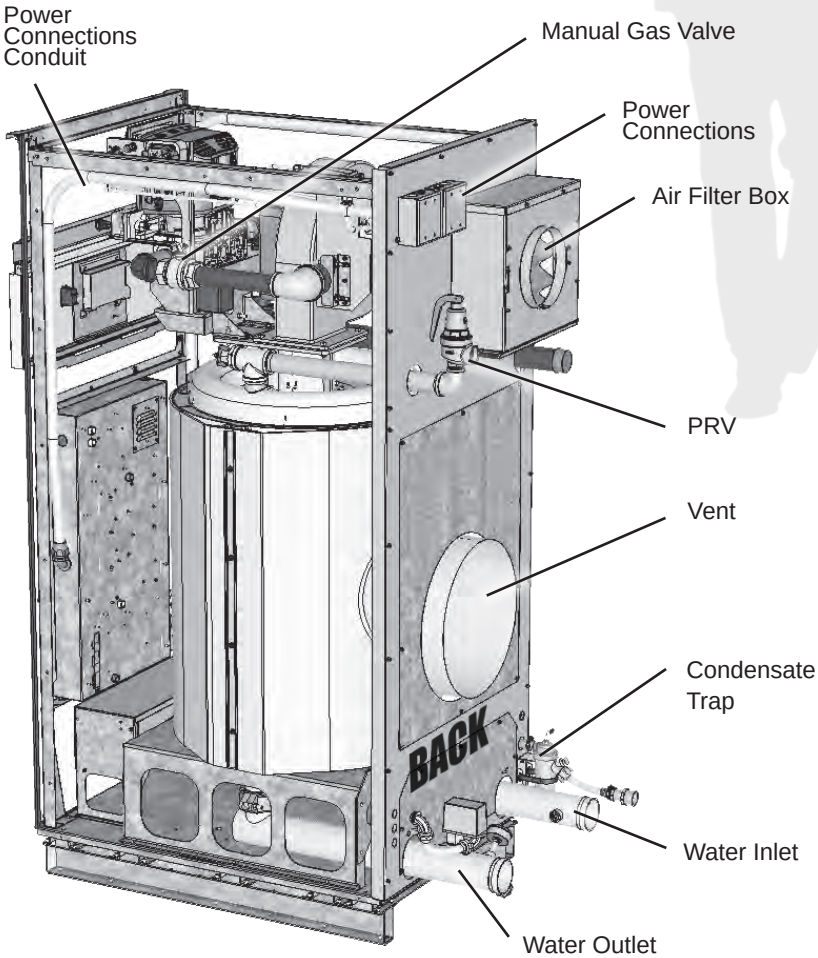

Blower
Gas Valve
System Controls
Touchscreen
Gas Valve
Touchscreen
(Behind Top Panel)
Control
Panel
Manual
Gas Valve
Power
Pack
FRONT
Power
Connections
Conduit
Manual
Gas Valve
Power
Connections
Air Filter Box
Gas Inlet
PRV
Vent
Heat Exchanger
Condensate
Trap
Water Inlet
Water Outlet
BACK

1.E.3 Models 2000 / 2500






Blower
Gas Valve
Gas Valve Touchscreen
System Controls Touchscreen
Power Pack
FRONT
Heat Exchanger


Power Connections Conduit
Manual Gas Valve
Power Connections
Air Filter Box
PRV
Vent
Condensate Trap
BACK
Water Inlet
Water Outlet

1.F Unpacking

This unit is shipped in a single crate. Carefully disassemble the crate and inspect the unit for any damage during shipping. Included in the crate and yet outside of the unit is the 'Installation Kit' box.

Inspect the contents of the the Installation Kit box, making sure that all parts are included and not damaged.

1. Installation Instructions for Sensors (3)
2. Box containing Outdoor Sensor
3. Box containing System Sensor
4. Tank Sensor
5. Spring Clip (used to hold tank sensor in sensor well)
6. Nylon Bushing
7. Cable Tie

NOTE: A condensate neutralizer is NOT included.

1.G Locating the Unit

This unit may be installed indoors or outdoors. If installing outdoors in a location that may experience freezing temperatures, precautions must be taken to prevent water in the heat exchanger and condensate inside and outside of the boiler from freezing. Damage due to freezing water or condensate is not covered by the warranty.

Choose a location for the unit which allows clearances on all sides for maintenance and inspection. See Table 1. Always install the unit on a firm, level surface. It is recommended that the unit is installed on a raised 4" pad so that there is elevation for a condensate neutralizer kit (not included with unit).

The unit should not be located in an area where leakage of any connections will result in damage to the area adjacent to the unit, or to lower floors of the structure.

When this type of location is not available, install a suitable drain pan, adequately drained, under the unit.

This unit is design-certified by CSA-International for installation on combustible flooring; in basements; in utility rooms, alcoves, or closets**. Boilers must never be installed on carpeting.** The location for the unit should be chosen with regard to the vent pipe lengths and external plumbing.

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

When vented vertically, the unit must be located as close as practical to the vertical section of the vent. If the vent terminal and/or combustion air terminal terminate through a wall, and there is potential for snow accumulation in the local area, both terminals should be installed at an appropriate level above grade or the maximum expected snow line.

The dimensions and requirements that are shown in Table 1 should be met when choosing the location for the unit.

Ensure the location takes into account the maximum allowable vent length shown in SECTION 2 of this manual.

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

1.H Clearances

Model	Certified Clearances to Combustibles									
	Front		Back		Left		Right		Top	
	inches	*cm*	inches	*cm*	inches	*cm*	inches	*cm*	inches	*cm*
1250-2500	closet*	-	0	*0*	0	*0*	0	*0*	0	*0*

*With required openings

Model	Suggested Service Clearances									
	Front		Back		Left		Right		Top	
	inches	*cm*	inches	*cm*	inches	*cm*	inches	*cm*	inches	*cm*
1250-1500	24	*61*	*24*	*61*	8	*20*	8	*20*	18	*46*
1750-2500	24	*61*	24	*61*	8	*20*	8	*20*	17	*43*

Table 1. Clearances

SECTION 2 Venting and Combustion Air

2.A General Venting Info, Cat I and Cat III

⚠ WARNING

Failure to use the appropriate vent material, installation techniques, or glues and sealants could lead to vent failure causing property damage, personal injury or death.

⚠ WARNING

Non-metallic venting systems are prohibited for use with this appliance

⚠ WARNING

All venting must be installed according to this manual and any other applicable local codes, including but not limited to, ANSI Z223.1/NFPA 54, CSA B149.1, CSAB149.2 and ULC S636. Failure to follow this manual and applicable codes may lead to property damage, severe injury, or death.

⚠ WARNING

Warning: When an existing Catagory I appliance is removed or replaced, the original venting system may no longer be sized to properly vent the attached appliances. Under no circumstances should an improperly sized vent be used. An improperly sized vent may cause operational and safety problems, and could result in serious injury, death, or property damage.

Depending upon desired unit venting, this unit may be considered a Category I or a Category III appliance. In general, a vertical vent system will be a Category I system. However, in rare instances, a unit's vertical vent system may be considered Category III. In the U.S., the National Fuel Gas Code (ANSI Z223.1-Latest Edition), or in Canada the CSA B149.1 (latest edition), defines a Category I vent system, and includes rules and tables to size these vent systems. If the unit's vertical vent system does not satisfy the criteria for Category I venting, it must be vented as a Category III system.

All vent systems which discharge horizontally (without the use of a power venter) are considered Category III vent systems.

All installations must be done following the vent supplier's recommended installation techniques. If these are not available, refer to the Manufacturer recommendations for the material used.

2.A.1 Vent and Air Pipe Sizing

See Table 2 on page 16

2.A.2 Combustion Air

Boilers and water heaters must have provisions for combustion and ventilation air in accordance with Section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1, or Sections 7.2, 7.3 or 7.4 of CSA B149.1, Installation Codes, or applicable provisions of the local building codes.

The unit may receive combustion air from the space in which it is installed, or it can be ducted directly to the unit from the outside. Ventilation air must be provided in either case.

2.A.2.a Combustion Air From Room

In the United States, the most common requirements specify that the space shall communicate with the outdoors in accordance with method 1 or 2, which follow. Where ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect.

Method 1: Two permanent openings, one commencing within 12 inches (30 cm) of the top and one commencing within 12 inches (30 cm) of the bottom, of the enclosure shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors. When directly communicating with the outdoors, or when communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4000 Btu/hr (5.5 square cm/kW) of total input rating of all equipment in the enclosure. When communicating to the outdoors through horizontal ducts, each opening shall have a minimum free area of not less than 1 square inch per 2000 Btu/hr (11 square cm/kW) of total input rating of all equipment in the enclosure. Table 3 shows data for this sizing method, for each model.

Method 2: One permanent opening, commencing within 12 inches (30 cm) of the top of the enclosure, shall be permitted. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that directly communicate with the outdoors and shall have a minimum free area of 1 square inch per 3000 Btu/hr (7 square cm/kW) of the total input rating of all equipment located in the enclosure. This opening must not be less than the sum of the areas of all vent connectors in the confined space.

Other methods of introducing combustion and ventilation air are acceptable, providing they conform to the requirements in the applicable codes listed above.

In Canada, consult local building and safety codes or, in absence of such requirements, follow CSA B149.1.

	Air Collar Size		Ducted Air Pipe Size		Minimum Ducted Air Pipe Length		Maximum Ducted Air Pipe Length		Vent Collar Size		Typical** Category I Vent Pipe Size		Category III Vent Pipe Size		Minimum Category III Vent Pipe Length		Maximum Category III Vent Pipe Length	
	inches	*cm*	inches	*cm*	ft*	*m*	ft*	*m*	inches	*cm*	inches	*cm*	inches	*cm*	ft*	*m*	ft*	*m*
1250	6	*15*	6	*15*	0***	*0*	100	*30.5*	12	*30*	12	*30*	6	*15*	*3*	*1*	100	*30.5*
1500	6	*15*	6	*15*	*0****	*0*	100	*30.5*	12	*30*	12	*30*	6	*15*	*3*	*1*	100	*30.5*
1750	8	*20*	8	*20*	*0****	*0*	100	*30.5*	14	*36*	14	*36*	8	*20*	*3*	*1*	100	*30.5*
2000	8	*20*	8	*20*	*0****	*0*	100	*30.5*	14	*36*	14	*36*	8	*20*	*3*	*1*	100	*30.5*
2500	8	*20*	8	*20*	*0****	*0*	100	*30.5*	16	*41*	16	*41*	8	*20*	*3*	*1*	100	*30.5*

*Equivalent Feet: To calculate, measure the linear feet of the pipe and add 5 ft (1.5m) for each elbow used.

**Category I vent must be sized in the U.S. per the National Fuel Gas Code ANSI Z223.1, or in Canada per CSA B149.1 as a fan-assisted Category I appliance. Pipe sizes shown are typical, but may not meet the requirements of every system.

***Appliance needs to vent outdoors using approved vent caps and following all guidelines asnoted in the Installation and Operating manual. Proper protection against debris in the air intake (through using a downwardspout and/or screen) to avoid debris pick-up / falling into the appliance is required.

Notes:

1. Category III vent pipe must be stainless steel complying with UL1738, and properly sealed.
2. Intake air pipe may be single-wall galvanized steel pipe, 24 gauge minimum, and properly sealed.

Table 2. Vent / Air Pipe Sizes

2.A.2.b Ducted Combustion Air

The combustion air can be taken through the wall, or through the roof. When taken from the wall, it must be taken from out-of-doors by means of manufacturer recommended horizontal wall terminal. When taken from the roof, a field-supplied rain cap or an elbow arrangement must be used to prevent entry of rain water (see Figure 2).

Use single-wall galvanized pipe of the appropriate size, for the combustion air intake. Route the intake to the heater as directly as possible. Seal all joints with tape. Provide adequate hangers. The unit must not support the weight of the combustion air intake pipe. Maximum linear pipe length allowed is 100 feet (30.4m). Subtract 5 allowable linear feet (1.5m) for every additional elbow used.

In addition to air needed for combustion, air shall also be supplied for ventilation, including all air required for comfort and proper working conditions for personnel. The unit loses less than 1 percent of its input rating to the room, but other heat sources may be present.

TERM	DESCRIPTION
Pipe	Single-wall galvanized steel pipe, 24 gauge minimum (either insulated or non-insulated)
Joint Sealing	Permanent duct tape or aluminum tape

Table 4. Required Combustion Air Piping Material.

Combustion Air Openings

Model Size	Area of Each Opening	
	Sq. in	Sq. cm
1250	313	2020
1500	375	2420
1750	438	2830
2000	500	3230
2500	625	4040

*Net Free Area in Square Inches / Square cm
Area indicated is for one of two openings; one at floor level and one at the ceiling, so the total net free area could be double the figures indicated.

This chart is for use when communicating directly with the outdoors. For special conditions and alternate methods, refer to the latest edition of ANSI Z223.1.

Note: Check with louver manufacturers for net free area of louvers. Correct for screen resistance to the net free area if a screen is installed. Check all local codes applicable to combustion air.

Table 3. Combustion Air Openings.

2.B Category I Venting

2.B.1 Category I Vent

WARNING

For indoor installations, as an additional measure of safety, the manufacturer strongly recommends installation of suitable Carbon Monoxide detectors in the vicinity of this appliance and in any adjacent occupied spaces.

⚠ AVERTISSEMENT

Pour des installations intérieures, fabricant recommande fortement, comme mesure de sécurité supplémentaire, l'installation de détecteurs de monoxyde de carbone adaptés dans le voisinage de l'appareil et dans chacune des pièces habitées adjacentes.

When vented as a category I appliance, the vent system must conform to the National Fuel Gas Code (ANSI Z223.1-Latest Edition) in the U.S., or in Canada, to CSA B149.1 (latest edition). The vent system must be sized and installed for a Category I Fan-Assisted Appliance.

If chimney height is greater than 25 feet, or if multiple units are vented into the same vertical vent, a barometric damper must be installed on each appliance, such that the flue draft does not exceed (negative) 0.1" w.c.

If using a power venter for any type of Category I venting, the draft should be set between (negative) 0.01 and 0.10" w.c.

2.B.2 Common Venting Systems

This unit is a Category I fan-assisted when vented vertically and adhering to all applicable codes. These units are not allowed to be vented into a common horizontal Cat III vent system (horizontal discharge or other configuration for Cat III), unless a properly sized vent fan is used, and the common vent system is properly designed by the vent fan manufacturer or a qualified engineer. When common venting a fan-assisted unit with other appliances through one shared vertical duct called a "common vent", special care must be taken by the installer to ensure safe operation. In the event that the common vent is blocked, it is possible, especially for fan-assisted devices, to vent backwards through non-operating appliances sharing the vent, allowing combustion products to infiltrate occupied spaces. **If the appliances are allowed to operate in this condition, serious injury or death may occur.**

It is for this reason that, in addition to following proper vent sizing, construction and safety requirements from the National Fuel Gas Code, ANSI Z223.1 or in Canada, from CSA B149.1 as well as all applicable local codes, it is required that installers provide some means to prevent operation with a blocked common vent. It is suggested that a blocked vent safety system be employed such that all appliances attached to the vent be locked out and prevented from operating under blockage conditions. As an additional precaution, it is recommended that a Carbon Monoxide (CO) alarm be installed in all enclosed spaces containing combustion appliances. If assistance is required in determining how a blocked vent safety system should be connected to this product, please call Applications Engineering at the Rochester phone number listed on back cover of this manual.

Refer to the installation and operating instructions on all appliances to be common vented for instructions, warnings, restrictions and safety requirements. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gasses into living spaces, common venting should not be applied, and appliances should each be vented separately.

⚠ WARNING

Operation of appliances with a blocked common vent may lead to serious injury or death. Safety devices must be implemented to prevent blocked common vent operation. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gasses into living spaces, common venting should not be applied, and appliances should each be vented separately.

⚠ AVERTISSEMENT

Le fonctionnement d'appareils connectés à un évent commun bouché peut provoquer de sérieuses blessures corporelles ou la mort. Des dispositifs de sécurité doivent être mis en place pour empêcher que les appareils soient utilisés avec un évent commun bouché. Si un fonctionnement sécuritaire de tous les appareils reliés à un évent commun et si la prévention des dégagements accidentels de gaz de combustion dans des zones habitées ne peuvent pas être assurés, un évent commun ne doit pas être mis en place et les appareils doivent être munis d'évents individuels séparés.

	Manufacturer model numbers (abrev)	
	Selkirk	Duravent
Component	B vent	B vent
90° elbow	*R90-S	*GVL90
45° elbow	*R45-S	*GVL45
Pipe	*R*-S	*GV**
Tee	*RT-S	*GVT
Vert Termination	*C-S	*GVDC
Boiler adapter	*RDC-S	*GVC

* Indicates the remainder of the part number is not shown.

Table 5. Category I, Vent Manufacturer's Model Numbers (abbreviated)

2.B.3 Common Vent Test — Boilers

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

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

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as it is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so that the installation conforms to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Installation Codes. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part II of the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Installation Codes.

2.B.3 Test d'évent Commun — *Chaudières*

Lorsqu'une chaudière existante est déconnectée du réseau d'évents commun, ce réseau d'évents commun devient probablement trop grand pour les appareils qui lui restent connectés. Lorsqu'une chaudière existante est retirée, les étapes suivantes doivent être accomplies pour chaque appareil qui reste connecté au réseau d'évents commun utilisé, alors que les autres appareils qui sont encore connectés au réseau commun d'évents ne sont pas en fonctionnement.:

1. *Sceller toutes les ouvertures non utilisées du système d'évacuation.*
2. *Inspecter de façon visuelle le système d'évacuation pour déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement, de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.*
3. *Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace où les appareils toujours raccordés au système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sécheuses, tous les appareils non raccordés au système d'évacuation common et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.*
4. *Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Réegler le thermostat de façon continue.*
5. *Faire fonctionner le brûleur principal pendant 5 min ensuite, déterminer si le coupe-tirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allumette ou d'une chandelle ou la fumée d'une cigarette, d'un cigare ou d'une pipe.*
6. *Une fois qu'il a été déterminé, selon la méthode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.*
7. *Tout mauvais fonctionnement du système d'évacuation commun devrait être corrigé de façon que l'installation soit conforme au National Fuel Gas Code, ANSI Z223.1/ NFPA 54 et (ou) aux codes d'installation CSA-B149.1. Si la grosseur d'une section du système devrait être modifié, le système devrait être modifié pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du National Fuel Gas Code, ANSI Z223.1/ NFPA 54 et (ou) les codes d'installation CSA-B149.1*

2.C Category III Venting

2.C.1 Category III Vent

When this unit is vented with horizontal discharge, it must be installed per this installation manual and the venting system manufacturer's installation instructions. The vent system must be sealed stainless steel. Approved manufacturers and Category lll vent component part numbers are shown in Table 6

Route the vent pipe to the heater as directly as possible. Seal all joints and provide adequate hangers as required

Example Components	Manufacturer Model Numbers (abbreviated)		
	Heatfab®	**Duravent®**	**Z-Flex®**
	Trade Name/Model		
	Saf-T Vent®	**FasNSeal®**	**Z-Vent®**
90° Elbow	9**D**14	FSELB90**DD**	2SVEE**DD**90
Pipe	9**DLL***	FSVL**LDD**	2SVEP**DDLL**
Boiler Adapter	9**D**01MAD	N/A	2SVAFN**DD**
Horizontal Termination (Bird Screen)	9**D**92	FSBS**D**	2SVSTPX**DD**
Vertical Termination (Rain Cap)	5**D**00CI	FSRC**D**	2SVSRC**DD**
Inlet Air Termination	9**D**14TERM	FSAIH06**	2SVEE**DD**90 with 2SVSTPX**DD**
Adapter, SS to CPVC	N/A	FSA-**D**FNSM-**D**PVCF	N/A
Manf. Approved Hanger Straps	Distance between Hanger Straps (Horizontal Run) = 6' MAX	Distance between Hanger Straps (Horizontal Run) = 6' MAX	Distance between Hanger Straps (Horizontal Run) = 4' MAX
	Distance between Hanger Straps (Vertical Run) = 30' MAX	Distance between Hanger Straps (Vertical Run) = 12' MAX	Distance between Hanger Straps (Vertical Run) = 16' MAX
	*Check Maf. Catalog for Pipe Length Code Options	**Only Avail. In 6"	

NOTES:
1. A bolded uppercase D (**D**) is used in place of the Diameter (inches) needed. In some cases a Single Digit Diameter is written with a 0 in front.
2. A bolded uppercase L (**L**) is used in place of the Length Needed. See Manufacturers Catalog for a particular application
3. The **D's** and **L's** refer to variations in nominal size. See Manufacturers Catalog for a particular application

Table 6. Category III, Vent Manufacturer's Model Numbers (abbreviated)

in the venting system manufacturer's Installation Instructions. Horizontal portions of the venting system must be supported to prevent sagging and may not have any low sections that could trap condensate. The unit must not support the weight of the vent pipe. Horizontal runs must slope downwards not less than ¼ inch per foot (2 cm/m) from the unit to the vent terminal. Reference Table 2 for the size of the Category III vent system. Up to 100 Ft of vent can be used. For each elbow subtract 5ft of vent length from the total allowable length of vent pipe.

2.C.2 Exhaust Vent Terminal

An exhaust vent terminal must be installed. If an exhaust vent terminal is not available with the certified vent system, the manufacturer suggests the use of a coupler fitting from the certified vent system into which the vent terminal screen can be installed. Be sure to install and terminate both vent and combustion air pipes per the instructions in this section. See Table 8.

2.C.3 Vent and Air Pipe Material

This unit requires a special venting system. Refer to venting supplier's instructions for complete parts list and method of installation. The manufacturers and product lines listed in Table 6 have been tested and authorized to safely operate with this equipment. Suppliers of stainless steel that are not listed on these tables are not permitted for use with this appliance. See Table 8.

Do not mix venting suppliers and models in venting systems. Failure to comply could result in personal injury, property damage, or death.

Installations must comply with applicable national, state and local codes.

2.C.4 Vent Adapters

The unit ships from the factory with a Category I, B vent connection. To convert to Category III select a vent adapter from the Cat III vent adapter table. This adapter will reduce the diameter and convert the vent pipe style to Cat II/IV FasNSeal vent pipe. If other vent manufacturers material will be used during installation the appropriate vent adapter must be purchased separately. All installed vent adapters must be sealed using gaskets or silicone. See Table 7.

Model Size	Vent adapter number	Description
1250	D2022100	12" to 6" vent
1500		
1750	D2022200	14" to 8" vent
2000		
2500	D2022300	16" to 8" vent

Table 7. Vent Adapters for Category III

Size	Exhaust vent Part number	Inlet air duct Part number
1250	D2012004	CA011904
1500	D2012004	
1750	D2012001	CA011901
2000	D2012001	
2500	D2012001	

Table 8. Horizontal Vent and Air Terminations

2.D Locating Vent & Combustion Air Terminals

2.D.1 Side Wall Vent Terminal Category lll only

An appropriate quality side wall vent terminal must be used.

The terminal provides a means of installing the vent piping through the building wall, and must be located in accordance with ANSI Z223.1/NFPA 54 and applicable local codes. In Canada, the installation must be in accordance with CSA B149.1 or .2 and local applicable codes. Consider the following when installing the terminal:

1. Figure 1 shows the requirements for mechanical vent terminal clearances for the U.S. and Canada.
2. Vent terminals for condensing appliances or appliances with condensing vents are **not** permitted to terminate above a public walkway, or over an area where condensate or vapor could create a nuisance or hazard.
3. Locate the vent terminal so that vent gases cannot be drawn into air conditioning system inlets.
4. Locate the vent terminal so that vent gases cannot enter the building through doors, windows, gravity inlets or other openings. Whenever possible, locations under windows or near doors should be avoided.
5. Locate the vent terminal so that it cannot be blocked by snow. The installer may determine that a vent terminal must be higher than the minimum shown in codes, depending upon local conditions.
6. Locate the terminal so the vent exhaust does not settle on building surfaces or other nearby objects. Vent products may damage such surfaces or objects.
7. If the boiler or water heater uses ducted combustion air from an intake terminal located on the same wall, locate the vent terminal at least 7 feet (213 cm) horizontally from the combustion air terminal, and locate the vent terminal at least 1 foot (0.3m) above the combustion air terminal.

2.D.2 Side-wall Combustion Air Terminal Category I and III

Consider the following when installing the terminal.

1. Do not locate the air inlet terminal near a source of corrosive chemical fumes (e.g., cleaning fluid, chlorine compounds, etc.).
2. Locate the terminal so that it will not be subject to damage by accident or vandalism. It must be at least 7 feet (2.1 m) above a public walkway.
3. Locate the combustion air terminal so that it cannot be blocked by snow. The National Fuel Gas Code requires that it be at least 12 inches (30 cm) above grade, but the installer may determine it should be higher, depending upon local conditions.

For Category lll only:

4. If the unit is side-wall vented to the same wall as it's ducted combustion air, use Figure 3 on page 22 to determine the proper mounting locations.
5. Multiple vent kits should be installed such that the horizontal distance between outlet group and inlet group is 84” (213 cm). (See Figure 3)
6. The vent outlet must be at least 12” above the top of the air inlet, and must be at least 84” (213 cm) horizontally from the air inlet. (See Figure 3).

2.D.3 Vertical Vent Terminal Category I and III

When the unit is vented through the roof, the vent must extend at least 3 feet (0.9 m) above the point at which it penetrates the roof. It must extend at least 2 feet (0.6 m) higher than any portion of a building within a horizontal distance of 10 feet (3.0 m), and high enough above the roof line to prevent blockage from snow. When the combustion air is taken from the roof, the combustion air must terminate at least 12” (30 cm) below the vent terminal.

2.D.4 Vertical Combustion Air Terminal Category I and III

When combustion air is taken from the roof, a field-supplied rain cap or an elbow arrangement must be used to prevent entry of rain water. The opening on the end of the terminal must be at least 12” (30 cm) above the point at which it penetrates the roof, and high enough above the roof line to prevent blockage from snow. When the vent terminates on the roof, the combustion air must terminate at least 12” (30 cm) below the vent terminal. See Figure 2 on page 22

NOTE:
For US installations, the vent for this appliance shall not terminate:
i) over public walkways; or
ii) near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
iii) where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.

		Canadian Installations[1]	U.S. Installations[2]
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)	12 in (30 cm)
B =	Clearance to window or door that may be opened	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW) • 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW) • 12 in (30 cm) for appliances >50,000 Btuh (15 kW)
C =	Clearance to permanently closed window	See Note 4	See Note 5
D =	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	See Note 4	See Note 5
E =	Clearance to unventilated soffit	See Note 4	See Note 5
F =	Clearance to outside corner	See Note 4	See Note 5
G =	Clearance to inside corner	See Note 4	See Note 5
H =	Clearance to each side of centerline extended above meter / regulator assy	3 ft (91 cm) within a height of 15 ft (4.6 m)	See Note 5
I =	Clearance to service regulator vent outlet	3 ft (91 cm)	See Note 5
J =	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 12 in (30cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW) • 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 9 in (23cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW) • 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m)†	7 ft (2.13 m) for mechanical draft systems (Category I appliances). Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard*
M =	Clearance under veranda, porch, deck, or balcony	12 in (30 cm)‡	See Note 5

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:
1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code.
2) In accordance with the current ANSI Z223.1/NFPA 54, Natural Fuel Gas Code.
3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
4) For clearances not specified in CAN/CSA-B149, clearance is in accordance with local installation codes and the requirements of the gas supplier.
5) For clearances not specified in ANSI Z223.1/ NFPA 54, clearance is in accordance with local installation codes and the requirements of the gas supplier.
6) IMPORTANT: Terminal must be placed such that it remains a minimum of 12" above maximum expected snow line. Local codes may have more specific requirements, and must be consulted.

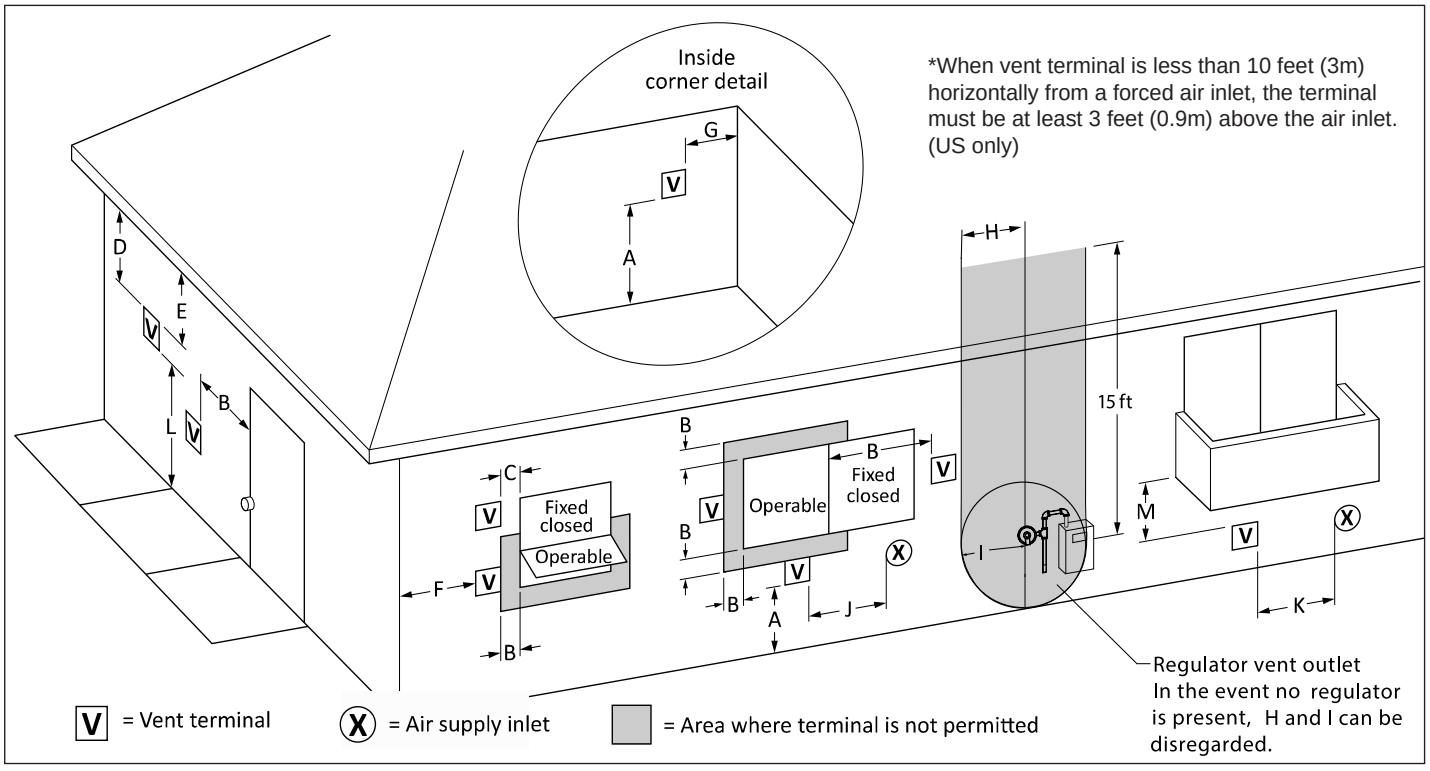


Figure 1. Combustion Air and Vent Through Side-wall.

2.E Outdoor Installation

NOTE: Outdoor Installation of OMV's (volume water heaters) is not permitted in Canada.

Precautions must be taken to prevent water in the heat exchanger and condensate inside and outside of the boiler from freezing. Damage due to freezing water or condensate is not covered by the warranty. For units installed outdoors, the minimum outdoor operating temperature is 5F (-15C).

For proper operation in outdoor installations, the boiler must be equipped with the inlet air and exhaust terminal kits listed in Table 9. Additional instructions are supplied with the terminal kits.

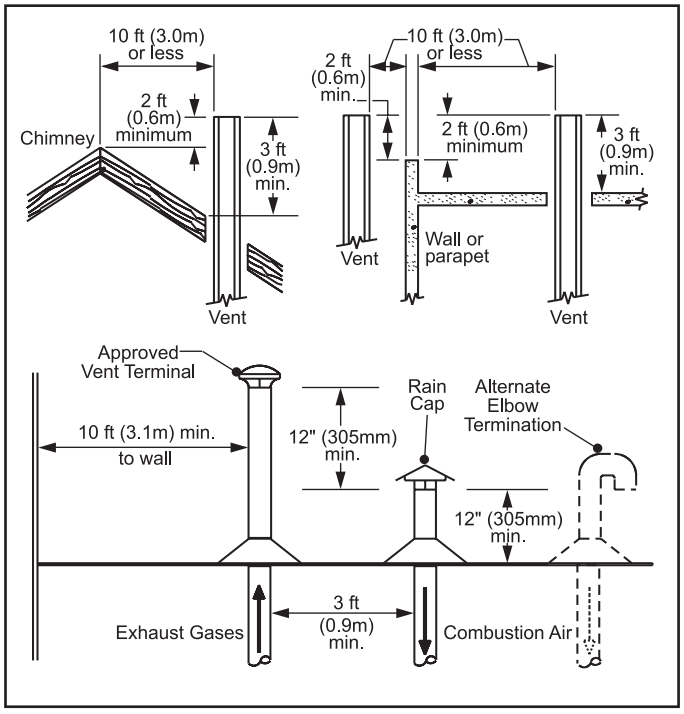


Figure 2. Combustion Air and Vent through Roof Category I and III

⚠ WARNING

If installing outdoors in a location that may experience freezing temperatures, provisions must be made to protect the unit from freeze damage. Manufacturer does not warranty damage caused by freezing temperatures. The unit must not operate if the outdoor temperature drops below 5F (-15C)

⚠ WARNING

The outdoor vent terminal gets hot. This unit must be installed in such a way as to reduce the risk of burns from contact with the vent terminal.

Size	Part Numbers	
	Exhaust Vent	Inlet Air
1250	CA016701	CA016900
1500		
1750	CA016801	CA017000
2000	CA017601	
2500	CA017701	

Table 9. Outdoor Terminals

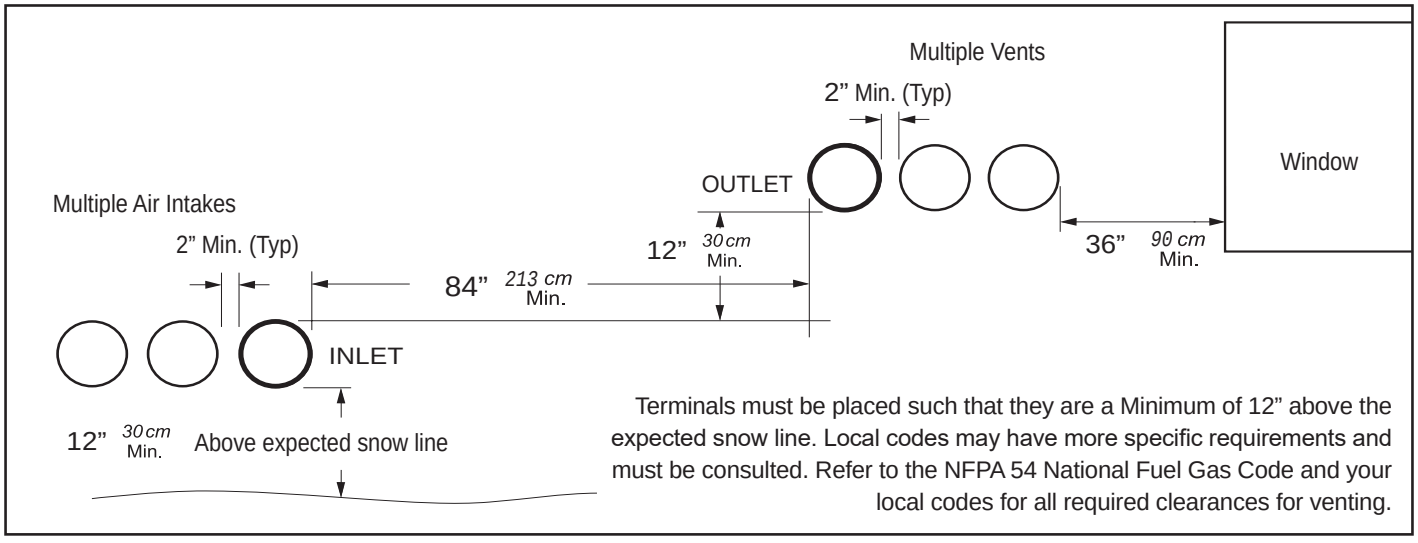


Figure 3. Minimum Venting Distance for Single and Multiple Units. Category III only

2.F Installations in the Commonwealth of Massachusetts

In Massachusetts the following items are required if the side-wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches. (From Massachusetts Rules and regulations 248 CMR 5.08.)

1. **Installation of Carbon Monoxide Detectors**

   At the time of installation of the side-wall vented gas fueled unit, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm battery back-up is installed on the floor level where the gas unit is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side-wall horizontally vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for installation of hard wired carbon monoxide detectors.

   a. In the event that the side-wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide with alarm and battery back-up may be installed on the next adjacent floor level.

   b. In the event that the requirements of the subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements, provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm be installed.

2. **Approved Carbon Monoxide Detectors**

   Each carbon monoxide detector shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. **Signage**

   A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for horizontally vented gas fueled heating unit or equipment. The sign shall read, in print no less than one-half (1/2) inch in size: “GAS VENT DIRECTLY BELOW, KEEP CLEAR OF ALL OBSTRUCTIONS.”

4. **Inspection**

   The state or local gas inspector of the side-wall horizontally vented gas fueled unit shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1-4.

SECTION 3 Gas Supply and Piping

3.A Gas Supply and Piping

All Installations must conform to the National Fuel Gas Code ANSI Z223.1/NFPA54, and/or local codes. In Canada, the installation must conform to the latest edition of CSA B149.1 Natural Gas and Propane Gas Installation Code, and/or local codes. Gas piping should be supported by suitable hangers or floor stands, not the unit.

⚠ WARNING

Do not use open flame to check for leaks. An open flame could lead to explosion, which could result in property damage, serious injury or death.

⚠ WARNING

If an inline high gas pressure regulator is used, it must be of the lockup type and located a minimum of 10 feet from the unit. Failure to do so may result in insufficient gas volume supplied to the unit.

NOTE: After placing the boiler in operation, the ignition system safety shutoff device must be tested. See 11.A on page 105

NOTE: This unit and all other gas units sharing the gas supply line must be firing at maximum capacity to properly measure the inlet supply pressure. The pressure can be measured at the supply pressure port on the gas valve. Low gas pressure could be an indication of an undersized gas meter, undersized gas supply lines and/or an obstructed gas supply line. The units may be equipped with low and high pressure gas switches that are integrally vent limited. These types of devices do not require venting to atmosphere.

Review the following instructions before proceeding with the installation.

1. Verify that the unit is fitted for the proper type of gas by checking the rating plate.

NOTE: This unit is equipped to operate at elevations up to 2000 feet (610m). However, the unit will function properly without the use of high altitude modification at elevations up to 10,000 feet (3050 m). For elevations above 2000 ft (600 m), the input gas rating shall be reduced at a rate of 4 percent for each 1000 ft (300 m) above sea level. This must be considered before selecting the equipment size.

2. The gas pressure must be 4.0-10.5 inches w.c.
3. Table 10 offers some gas pipe sizing information. Refer to the applicable gas code for more detailed sizing information.
4. Run gas supply line in accordance with all applicable codes.
5. Locate and install manual shutoff valves in accordance with state and local requirements.
6. A sediment trap must be provided upstream of the gas controls.
7. The unit and its individual shutoff valve must be disconnected from the gas supply piping during any pressure testing of that system at test pressures in excess of 1/2 PSIG (3.45kpa).
8. The unit must be isolated from the gas supply system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.45kpa).
9. The unit and its gas connection must be leak tested before placing it in operation.
10. Purge all air from gas lines.

3.B Gas Pipe Sizing

The following are gas line sizing examples from the National Fuel Gas Code. Size your gas lines properly, based on your installation and all applicable codes.

SCH 40 METAL PIPE CAPACITY FOR 0.60 SPECIFIC GRAVITY NATURAL GAS

NOMINAL PIPE SIZE @ 0.30" W.C. PRESSURE DROP					
Nominal:	2	2½	3	4	5
Actual ID:	2.067	2.469	3.068	4.026	5.047
Length (ft)	Capacity in Cubic Feet of Gas per Hour				
10	4,020	6,400	11,300	23,100	41,800
20	2,760	4,400	7,780	15,900	28,700
30	2,220	3,530	6,250	12,700	23,000
40	1,900	3,020	5,350	10,900	19,700
50	1,680	2,680	4,740	9,660	17,500
60	1,520	2,430	4,290	8,760	15,800
70	1,400	2,230	3,950	8,050	14,600
80	1,300	2,080	3,670	7,490	13,600
90	1,220	1,950	3,450	7,030	12,700
100	1,160	1,840	3,260	6,640	12,000
125	1,020	1,630	2,890	5,890	10,600
150	928	1,480	2,610	5,330	9,650
175	854	1,360	2,410	4,910	8,880
200	794	1,270	2,240	4,560	8,260
150	704	1,120	1,980	4,050	7,320
300	638	1,020	1,800	3,670	6,630
350	587	935	1,650	3,370	6,100
400	546	870	1,540	3,140	5,680

Table 10. Pipe Capacity for Natural Gas

NOTE:
1. Inlet pressure - Less than 2 psi
2. Pressure drop - 0.5 in w.c.
3. Specific gravity - 0.60
4. Schedule 40 metallic pipe

SECTION 4 Water Flow and Headloss Data

4.A General Water Flow Information

This appliance is a water-tube design that requires water flow for operation. Boilers are generally used in closed systems, so the manufacturer bases the water flow data on temperature rise (difference between boiler inlet and outlet temperature.) Water heaters are used in open systems, with new water constantly being introduced to the system. This brings a constant supply of new minerals into the system, as well. Minerals can cause scale to form on the inside surfaces of water heater systems (heaters, tanks, pipes, valves, and other components). Manufacturer uses the water-tube design to its advantage by basing the water flow data on water hardness, to assist in minimizing mineral buildup in the heater's waterways.

4.B Boiler Water Flow & Headloss Data

See Table 11 for water flow and boiler headloss, based on heat exchanger temperature rise.

Model	Temperature Rise 20°F		25°F		30°F		35°F		40°F	
	Flow gpm	Headloss* ft	Flow gpm	Headloss* ft	Flow gpm	Headloss* ft	Flow gpm	Headloss* ft	Flow gpm	Headloss* ft
1250	106	23.6	85	15.4	71	11.1	61	8.2	53	6.2
1500	126	33.0	101	21.9	84	16.1	72	12.0	63	9.0
1750	147	18.4	118	12.9	98	8.2	84	5.9	74	3.8
2000	167	24.4	133	15.7	111	11.2	95	7.8	83	5.9
2500	207	33.7	166	23.9	138	17.2	119	12.9	104	9.8

*Headloss is for boiler only (no piping)

Model	Temperature Rise *11°C*		*14°C*		*17°C*		*19°C*		*22°C*	
	Flow l/m	*Headloss* (m)*	*Flow l/m*	*Headloss* (m)*	*Flow l/m*	*Headloss* (m)*	*Flow l/m*	*Headloss* (m)*	*Flow l/m*	*Headloss* (m)*
1250	*401*	*7.2*	*321*	*4.7*	*268*	*3.4*	*229*	*2.5*	*201*	*1.9*
1500	*477*	*10.1*	*381*	*6.7*	*318*	*4.9*	*272*	*3.7*	*238*	*2.7*
1750	*557*	*5.6*	*446*	*3.9*	*371*	*2.5*	*318*	*1.8*	*279*	*1.2*
2000	*631*	*7.4*	*505*	*4.8*	*421*	*3.4*	*361*	*2.4*	*316*	*1.8*
2500	*786*	*10.3*	*628*	*7.3*	*524*	*5.2*	*449*	*3.9*	*393*	*3*

Table 11. Boiler Flow and Head Requirements

4.C Water Heater Water Flow and Headloss Data

Water flow and headloss for water heaters is based on the water's hardness, to help minimize scale (mineral) buildup inside the heater's water tubes. Table 12 shows water flow and headloss based on the hardness of the system's water. Temperature rise is shown for information and testing/troubleshooting purposes.

Model	1-10 Grains Per Gallon Hardness			11-15 Grains Per Gallon Hardness		
	Flow Rate (gpm)	Headloss* (ft)	Temp Rise (°F)	Flow Rate (gpm)	Headloss* (ft)	Temp Rise (°F)
1250	85	16.1	25	104	23.6	20
1500	90	17.9	28	110	26.3	23
1750	120	12.9	25	150	19.6	20
2000	135	16.1	25	170	24.4	20
2500	140	17.2	31	170	24.4	25
Model	*1-10 Grains Per Gallon Hardness*			*11-15 Grains Per Gallon Hardness*		
	Flow Rate (l/m)	*Headloss* (m)*	*Temp Rise (°C)*	*Flow Rate (l/m)*	*Headloss* (m)*	*Temp Rise (°C)*
1250	*322*	*4.9*	*14*	*394*	*7.2*	*11*
1500	*341*	*5.5*	*16*	*416*	*8.0*	*13*
1750	*454*	*3.9*	*14*	*568*	*6.0*	*11*
2000	*511*	*4.9*	*14*	*644*	*7.4*	*11*
2500	*530*	*5.2*	*17*	*644*	*7.4*	*14*

*Headloss is for the heater only (no piping)

Allowable pH is 6.5 to 9.5

Table 12. Volume Water Flow Rates

4.D Water Flow Recovery Data

	Temperature Rise						
	40°F	50°F	60°F	70°F	80°F	90°F	100°F
Model	gph	gph	gph	gph	gph	gph	gph
1250	3188	2550	2125	1821	1594	1417	1275
1500	3780	3024	2520	2160	1890	1680	1512
1750	4463	3570	2975	2550	2231	1983	1785
2000	5160	4128	3440	2948	2580	2293	2064
2500	6450	5160	4300	3686	3225	2867	2580

	Temperature Rise						
	22°C	*28°C*	*33°C*	*39°C*	*44°C*	*50°C*	*56°C*
Model	*L/h*	*L/h*	*L/h*	*L/h*	*L/h*	*L/h*	*L/h*
1250	*12049*	*9639*	*8033*	*6885*	*6024*	*5355*	*4820*
1500	*14288*	*11431*	*9526*	*8165*	*7144*	*6350*	*5715*
1750	*16868*	*13495*	*11246*	*9639*	*8434*	*7497*	*6747*
2000	*19504*	*15603*	*13003*	*11145*	*9752*	*8668*	*7802*
2500	*24380*	*19504*	*16253*	*13931*	*12190*	*10836*	*9752*

Table 13. Recovery Data

SECTION 5 Piping

5.A Boiler Water Piping

5.A.1 Boiler Water Connections

NOTE: This unit must be installed in a closed pressure system with a minimum of 12 psi (82.7 kPa) static pressure at the boiler.

The water piping should be supported by suitable hangers or floor stands. Do not support the piping with this unit. The hangers used should allow for expansion and contraction of pipe. Rigid hangers may transmit noise through the system resulting from the piping sliding in the hangers. We recommend that padding be used when rigid hangers are installed. Maintain 1” (2.5 cm) clearance to combustibles for all hot water pipes.

Suggested piping diagrams are shown in Figure 4 through Figure 7. These diagrams are meant only as guides. Components required by local codes must be properly installed.

Pipe the discharge of the relief valve (full size) to a drain or in a manner to prevent injury in the event of pressure relief. Install an air purger, air vent, expansion tank, hydronic flow check valve in the system supply loop, and any other devices required by local codes. The minimum fill pressure must be 12 psig (82.7 kPa). Install shutoff valves where required by code.

5.A.2 Cold Water Make-Up

1. Connect the cold water supply to the inlet connection of an automatic fill valve.
2. Install a suitable back flow preventer between the automatic fill valve and the cold water supply.
3. Install shut off valves where required.

In some installations, a hot water heating boiler is connected to heating coils located in an air handling unit where the coils may be exposed to refrigerated air circulation. In these cases, the boiler piping system must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

A boiler installed above radiation level, or as required by the authority having jurisdiction, must be provided with a low water cutoff device either as a part of the boiler or at the time of boiler installation.

5.A.3 Freeze Protection

This unit may be installed indoors or outdoors. If installing outdoors in a location that may experience freezing temperatures, precautions must be taken to prevent water in the heat exchanger and condensate inside and outside of the boiler from freezing. Damage due to freezing water or condensate is not covered by the warranty. The unit must not be operated in conditions below 5F (-15C).

If installed outdoors, and there is an event such as a power outage, interruption of gas supply, failure of system components, activation of safety devices, etc., this may prevent a boiler from firing. **Any time a boiler is subjected to freezing conditions, and the boiler is not able to fire, and/or the water is not able to circulate, there is a risk of freezing in the boiler or in the pipes in the system.** When water freezes, it expands. This may result in bursting of pipes, or damage to the boiler, and this could result in leaking or flooding conditions.

Do not use automotive antifreeze. To help prevent freezing, The manufacturer recommends the use of inhibited glycol concentrations between 20% and 35% glycol. Typically, this concentration will serve as burst protection for temperatures down to approximately -5°F (-20°C). If temperatures are expected to be lower than -5°F (-20°C), glycol concentrations up to 50% can be used. **When concentrations greater than 35% are used, water flow rates must be increased to maintain the desired temperature rise through the boiler.**

⚠ WARNING

Glycol must not be used in domestic hot water applications. Refer to 5.C.4 on page 32 for instructions on freeze protection for units (domestic hot water).

Different glycol products may provide varying degrees of protection. Glycol products must be maintained properly in a heating system, or they may become ineffective. Consult the glycol specifications, or the glycol manufacturer, for information about specific products, maintenance of solutions, and set up according to your particular conditions.

The following manufacturers offer glycols, inhibitors, and anti foamants that are suitable for use in the unit.

Please refer to the manufacturers instructions for proper selection and application.

- Sentinel Performance Solutions Group
- Hercules Chemical Company
- Dow Chemical Company

The boiler control offers some assistance with freeze protection, as long as the boiler is energized, and able to fire.

1. If the outlet sensor detects less than 45°F, the control energizes the boiler pump.
2. If the outlet sensor detects less than 35°F, the control will fire the boiler.
3. Once in freeze protect mode, the boiler will remain in that state until the outlet sensor detects greater than 50°F.

5.A.4 Suggested Boiler Piping Schematics

Figure 4 on page 28 through Figure 7 on page 31 show suggested piping configurations for boilers. These diagrams are only meant as guides. All components or piping required by local code must be installed.

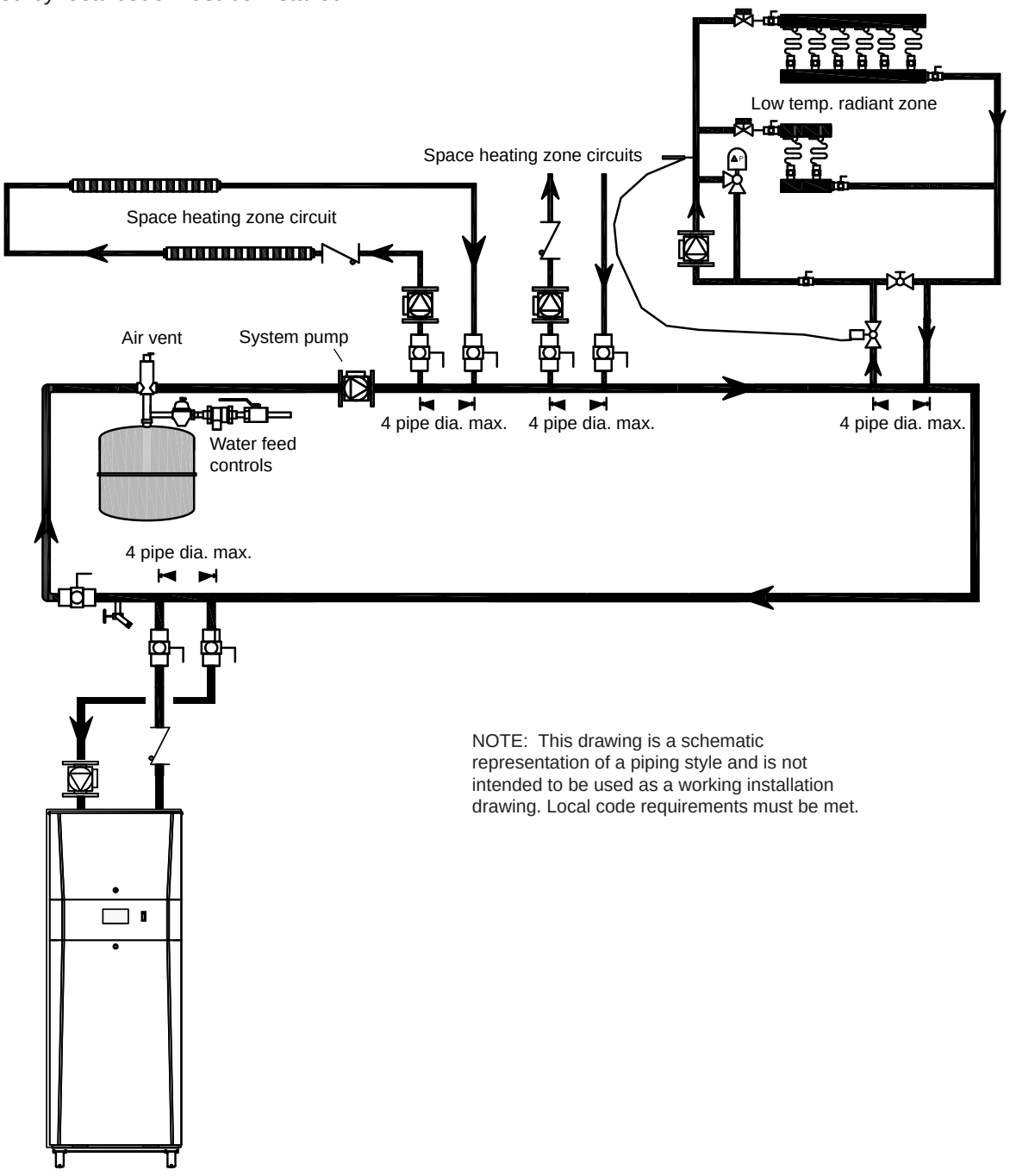


Figure 4. Boiler Piping — Single Boiler, Multiple Temperature Zones
Zoning with circulators

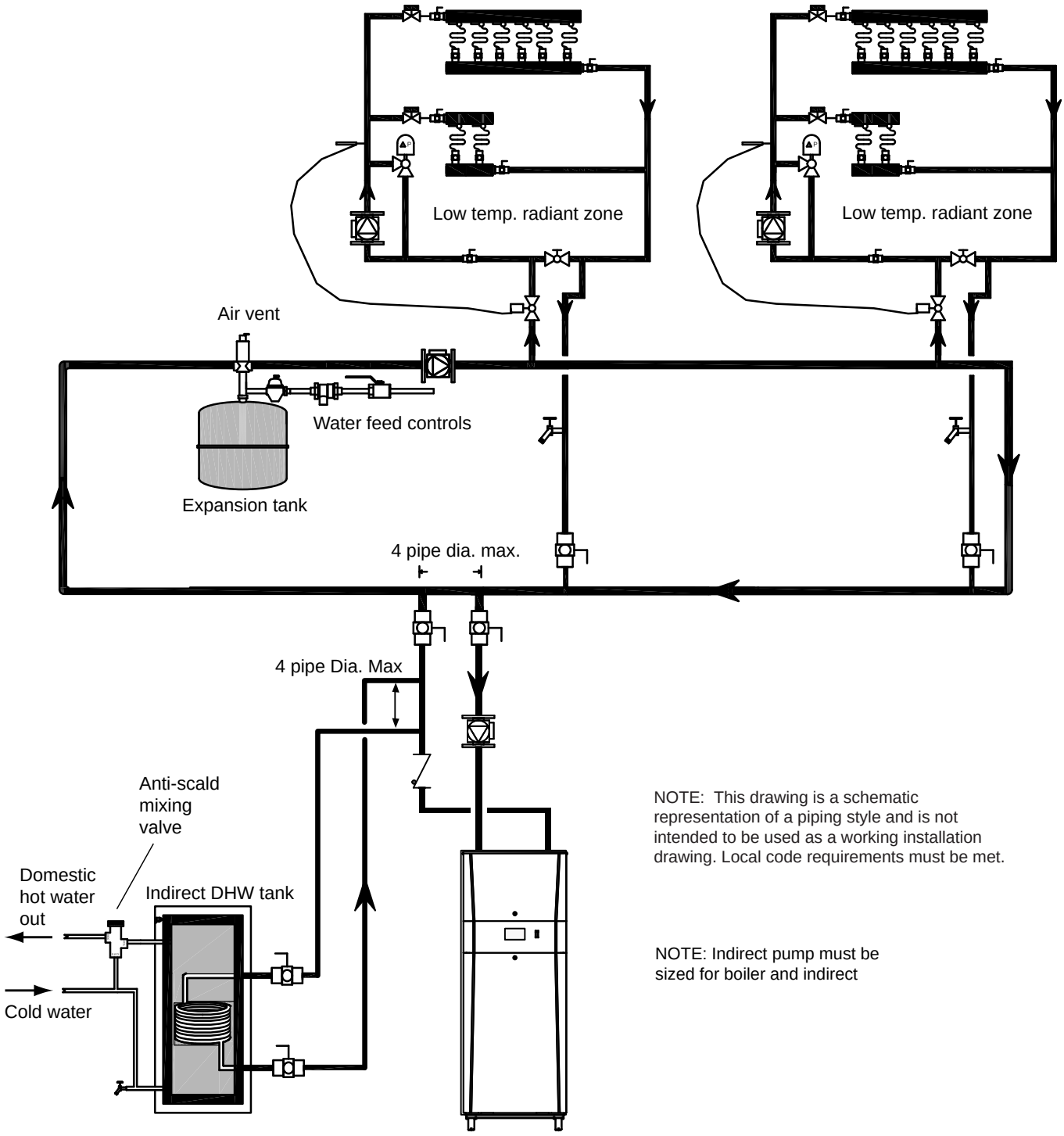


Figure 5. Boiler Piping — Single Boiler with Low Temperature Zones and Indirect DHW Tank Indirect tank directly off of boiler

Suggested Boiler Piping Schematics (continued)

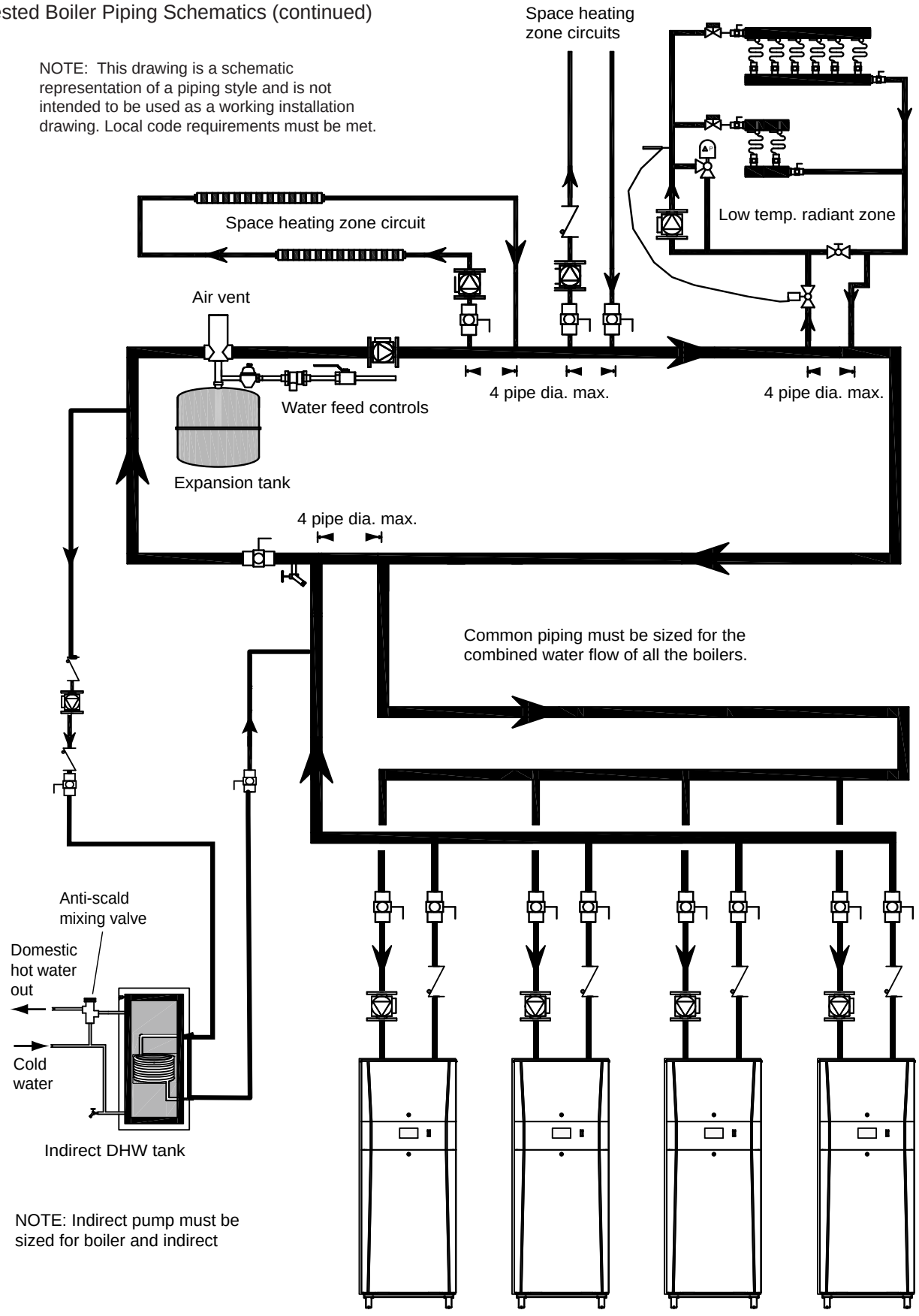


Figure 6. Boiler Piping — Multiple Boilers, Multiple Temperature Zones, Reverse Return. Zoning with circulators and DHW Cascade Option.

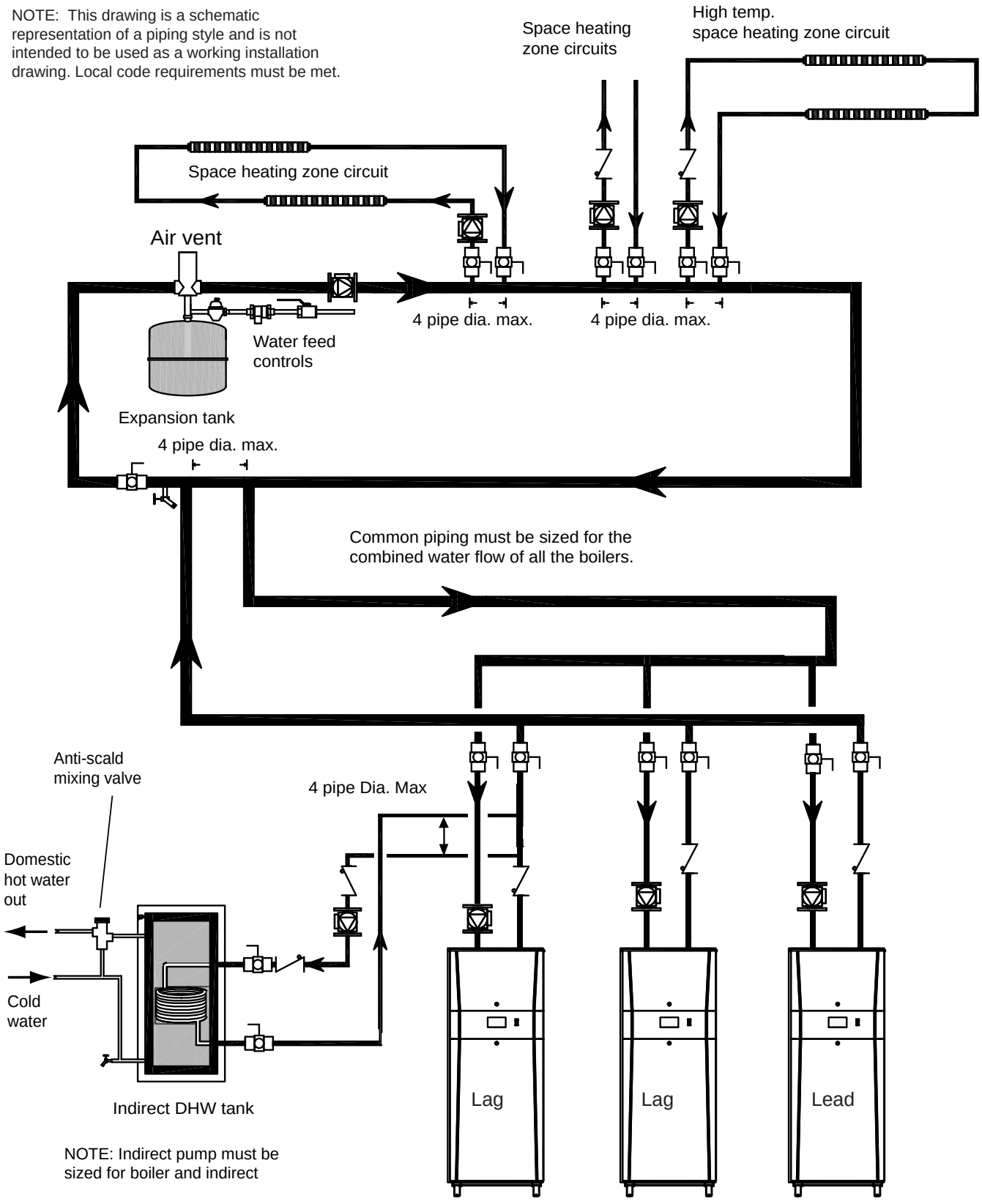


Figure 7. Boiler Piping — Multiple Boilers, Indirect DHW Off of One Boiler

5.B Water Heaters

5.B.1 Water Quality

Water heaters must be installed in water conditions of 15 gpg hardness or less, with a pH range of 6.5 to 9.5 pH. Values outside of this range may reduce the life expectancy of the product. Operating at higher water hardness levels will cause heat exchanger fouling, erosion, or corrosion, leading to premature component failure, reduced efficiency, heat exchanger failure or system failure. Failure of this type will not be warranted. If the water in use exceeds the conditions recommended, water softeners or other devices should be installed to improve water quality.

5.B.2 Heater Water Connections

The water piping should be supported by suitable hangers and floor stands. Do not support the piping with this unit. The hangers used should allow for expansion and contraction of copper pipe. Rigid hangers may transmit noise through the system resulting from piping sliding in the hangers. We recommend that padding be used when rigid hangers are installed. Maintain 1" (2.5 cm) clearance to combustibles for hot water pipes.

Pipe the discharge of the relief valve (full size) to the drain or in a manner to prevent injury in the event of pressure relief. Install a diaphragm-type expansion tank, flow check, and shutoff valves where needed or as required by code.

5.B.3 Cold Water Make-Up

The cold water make-up may be connected to the tank as shown in Figure 8 through Figure 10. If the tank does not have a tapping for the cold water supply, the supply may be run to the pipe between the tank and boiler outlet. Install back-flow preventers and shut-offs where needed or required by code.

5.B.4 Freeze Protection

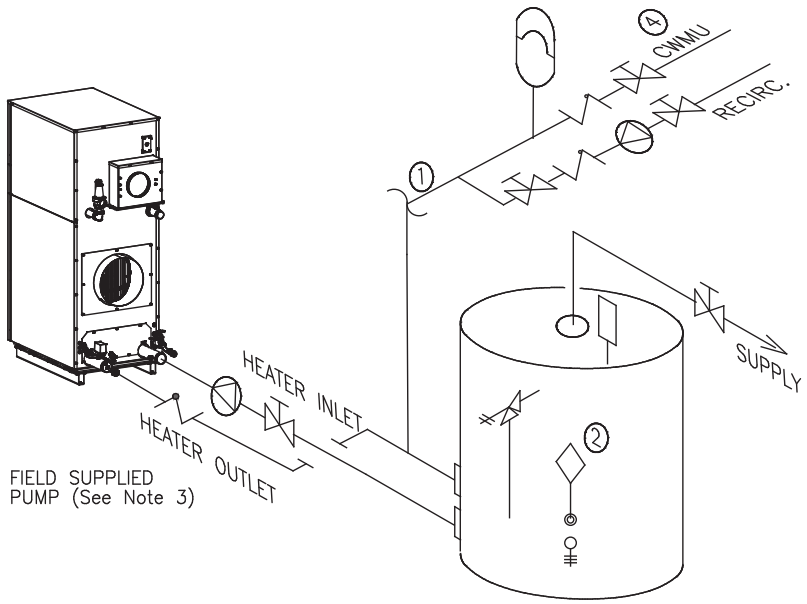
If installing outdoors in a location that may experience freezing temperatures, precautions must be taken to prevent water in the heat exchanger and condensate inside and outside of the boiler from freezing. Damage due to freezing water or condensate is not covered by the warranty.

If installed indoors and there is an event such as a power outage, component failure or other issue when freezing is likely, the heater and system must be drained to avoid the risk of damage due to freezing. Glycol must ***not*** be used in volume water heating applications.

5.B.5 Suggested Piping Schematics

Figure 8 through Figure 10 shows suggested piping configurations for water heaters. These diagrams are only meant as guides. All components or piping required by local code must be installed.

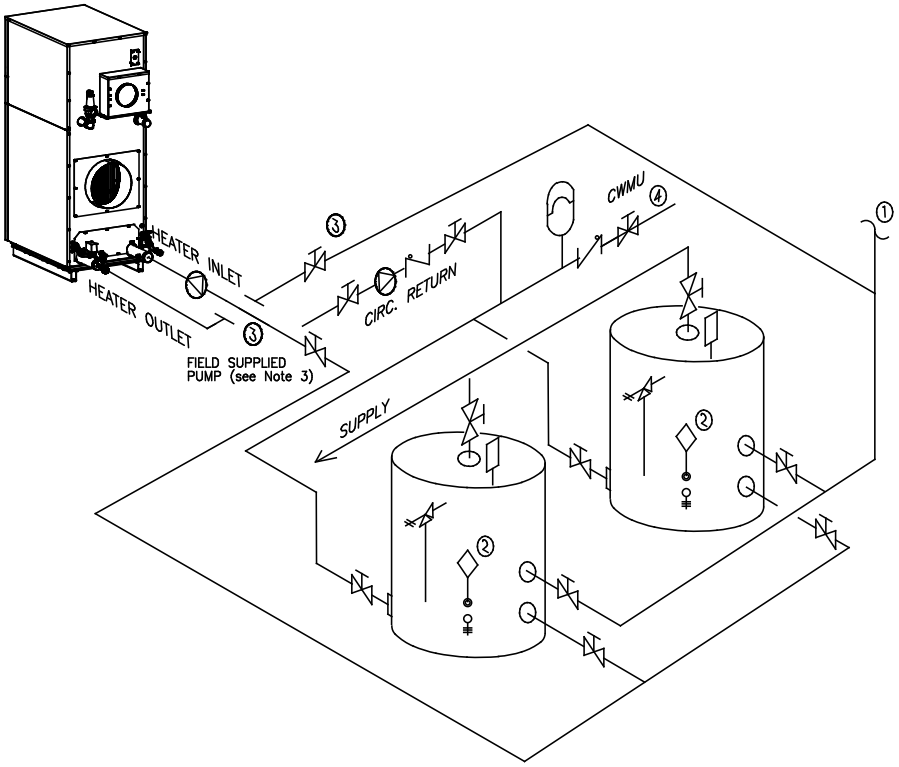
NOTE: This drawing is a schematic representation of a piping style and is not intended to be used as a working installation drawing. Local code requirements must be met.



NOTES:
1. Locate DHW sensor or remote aquastat well in lower 1/3 of tank.
2. Backflow preventer may be required - check local codes.
3. Thermal expansion tank may be required - check local codes.
4. **Caution: Pump sizing must be based upon water hardness at job site.**
5. If the tank does not have a tapping for the cold water supply, the supply may be run to the pipe between the tank and boiler inlet.

Figure 8. DHW Piping - One Heater, One Vertical Tank

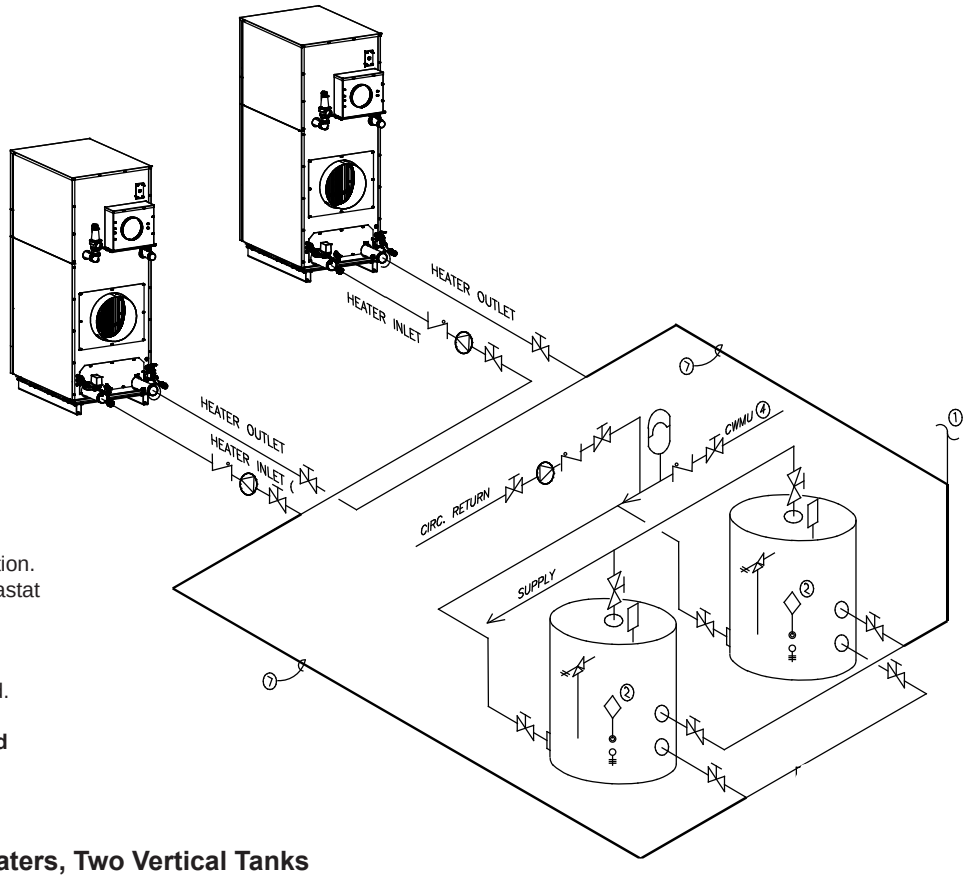
NOTE: This drawing is a schematic representation of a piping style and is not intended to be used as a working installation drawing. Local code requirements must be met.



NOTES:
1. Locate the DHW sensor or remote aquastat well in lower 1/3 of tank.
2. Backflow preventer may be required - check local codes.
3. Thermal expansion tank may be required - check local codes.
4. **Caution: Pump sizing must be based upon water hardness at job site.**
5. If the tank does not have a tapping for the cold water supply, the supply may be run to the pipe between the tank and boiler inlet.

Figure 9. DHW Piping - One Heater, Two Vertical Tanks

NOTE: This drawing is a schematic representation of a piping style and is not intended to be used as a working installation drawing. Local code requirements must be met.



NOTES:
1. Optional CWMU & recirculation line location.
2. Locate NTV DHW sensor or remote aquastat well in lower 1/3 of tank.
3. Back Flow Preventer may be required. Check local codes.
4. Thermal expansion tank may be required. Check local codes.
5. **CAUTION: Pump sizing must be based upon water hardness at job site.**

Figure 10. DHW Piping - Two Heaters, Two Vertical Tanks

SECTION 6 Condensate Drain Trap

This appliance creates condensation at some operating conditions as a by-product of cold water supply conditions. A condensate drain trap is pre-installed at the back of the unit and is used to drain the condensate from the heat exchanger. See Figure 11. This condensate drain trap must be connected to a condensate disposal system, to prevent the accumulation of condensate. Connect a ¾" PVC pipe between the drain connection and a floor drain. The PVC pipe must continuously slope downward toward the drain, with no spiraling. If there is no accessible floor drain, or if the drain pipe cannot be installed with the proper slope, a condensate pump will be needed to ensure that condensate is removed.

Consult local codes for direction on disposal of condensate. In some cases (code requirements or drain material), condensate will need to be neutralized. A condensate neutralizer is not included with the unit, but is available from the manufacturer as an accessory. If a neutralizer is required, it is helpful to install the boiler or water heater on a raised 4" (minimum) concrete platform. This will generally allow sufficient elevation for the condensate neutralizer to be installed below the condensate trap. See Figure 11.

If the unit is installed outdoors in a location that may experience freezing temperatures, precautions must be taken to prevent condensate from freezing. Damage due to freezing condensate is not covered by the warranty.

⚠ CAUTION

Condensate is mildly acidic (pH=5) and may harm some floor drains and/or pipes, particularly those that are metal. Ensure that the drain, drainpipe, and anything that will come in contact with the condensate can withstand the acidity, or neutralize the condensate before disposal. **Damage caused by failure to install a neutralizer kit or to adequately treat condensate will not be the manufacturer's responsibility.**

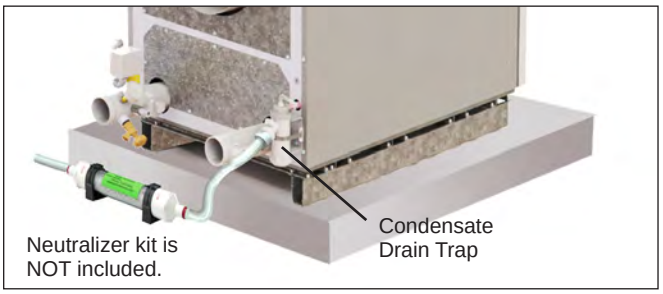


Figure 11. Raised Concrete Platform. 4" Min

SECTION 7 Electrical Connections

7.A Installation Warnings

⚠ CAUTION

The supply voltage to this unit must not be disconnected, except for service or isolation, or unless otherwise instructed by procedures outlined in this manual. To signal a call for heat, use the heat demand inputs, as shown in the wiring diagram.

DO NOT MAKE AND BREAK THE LINE VOLTAGE TO THE UNIT TO SIGNAL A CALL FOR HEAT. A call for heat/end call for heat MUST be connected to the heat demand terminals. Some components are designed to have constant voltage during normal operation. If the units supply voltage is toggled as a call for heat signal, premature failure of these components may result.

⚠ CAUTION

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

⚠ ATTENTION

Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Les erreurs de câblage peuvent nuire au bon fonctionnement et être dangereuses. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien terminé.

⚠ WARNING

The unit must be electrically grounded in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code, ANSI/NFPA 70, in the U.S. and with the latest edition of CSA C22.1 Canadian Electrical Code, Part 1, in Canada. Do not rely on the gas or water piping to ground the metal parts of the unit. Plastic pipe or dielectric unions may isolate the unit electrically. Service and maintenance personnel, who work on or around the unit, may be standing on wet floors and could be electrocuted by an ungrounded unit. Electrocution can result in severe injury or death.

Single pole switches, including those of safety controls and protective devices, must not be wired in a grounded line.

All electrical connections are made on the terminal blocks that are located inside the control panel.

All internal electrical components have been prewired. No attempt should be made to connect electrical wires to any other location except the terminal blocks.

7.B Main Power Connections

This unit is provided with an electrical junction box on the rear panel for main power connections. See Figure 12. All power wires are factory installed between this junction box and the main high voltage box at the front of the unit. The unit is available with multiple voltage packages to adapt to customer needs ranging from 120-600 volts with single or 3 phase versions. Refer to the rating plate and Table 14 for appropriate voltage and current ratings.

On all models, the incoming voltage must be protected by an appropriately sized circuit breaker, installed by qualified/authorized personnel. The 120-volt and 24-volt systems will be protected with resettable fuses mounted in the top of the high voltage box. The 24-volt transformer is also redundantly protected by its integrated 4 amp resettable fuse.

On three phase models, a step down transformer (which is protected using an appropriate din rail mounted circuit breaker) generates 120-volt single phase to power the 24-volt transformer. The 120-volt and 24-volt outputs of either transformer are protected with resettable fuses mounted in the top of the high voltage box. The 24-volt transformer is also redundantly protected by its integrated 4 amp resettable fuse.

All power connections must be run through the back panel as shown in Figure 12.

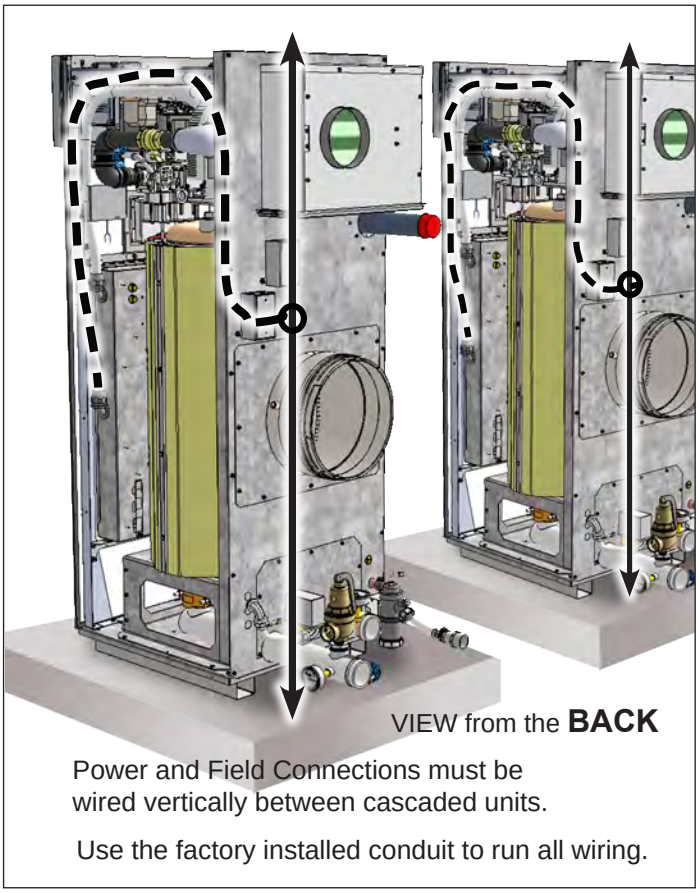


Figure 12. Wiring Access

7.C Main Power Data

Voltage	1250 Current			1500 Current			1750 Current			2000 Current			2500 Current		
	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP	FLA	MCA	MOP
120V, 1 phase	9.4	11.8	20	9.4	11.8	20	9.2	11.5	20	9.2	11.5	20	N/A	N/A	N/A
208V, 1 phase	N/A	N/A	N/A	4.8	6.0	15	5.0	6.3	15	5.0	6.3	15	5.0	6.3	15
220/240V, 1 phase	N/A	N/A	N/A	4.8	6.0	15	4.8	6.0	15	4.8	6.0	15	4.8	6.0	15
208V, 3 phase	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.2	6.5	15
480V, 3 phase	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.2	2.8	15
600V, 3 phase	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.8	2.3	15

FLA - Full Load Amperage MCA - Minimum Circuit Ampacity MOP - Maximum Over-current Protection

Table 14. Electrical Data

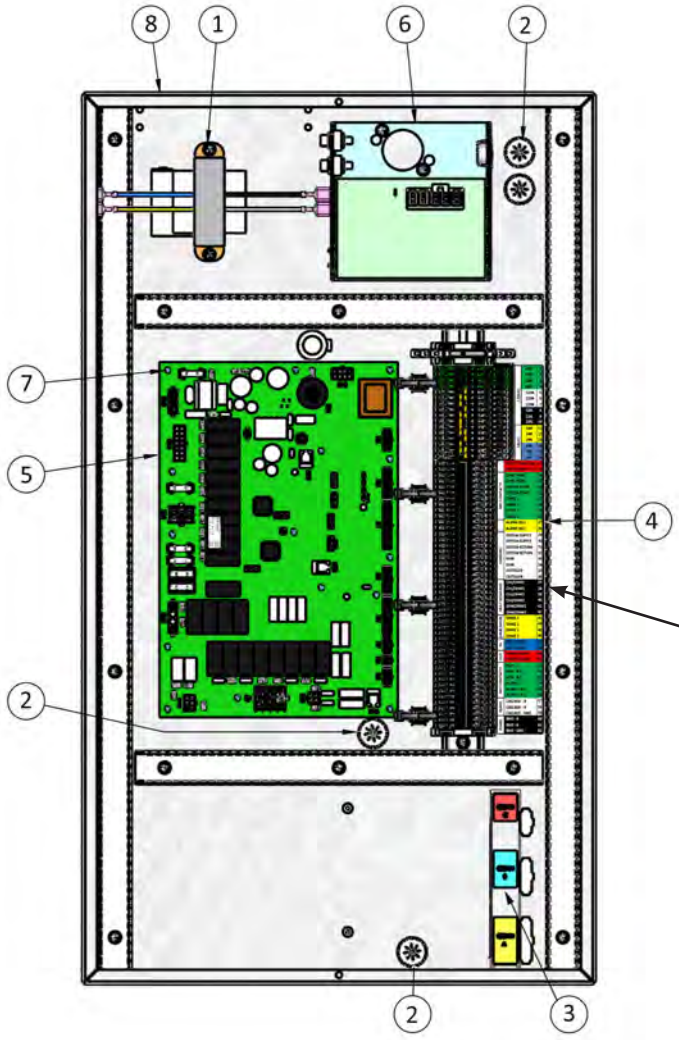
Single Phase				Three Phase			
	120	240	208		600	480	208
L1	Blk	Blk	Blk	L1	P	BR	Blk
L2/N	Wht	Red	Red	L2	V	O	Red
				L3	T	Y	BL

Table 15. Phase Voltage Color Identification

⚠ CAUTION

The supply voltage to the unit must not be disengaged, except for service or isolation, or unless otherwise instructed by procedures outlined in this manual. To signal a call for heat, use the correct terminals as instructed in Figure 14

7.D Control Panel Layout



QTY.	DESCRIPTION	ITEM NO.
1	TRANSFORMER ASSY, 120-24V, 75 VA	1
5	BUSHING, NYLON, 7/8, SLIT	2
1	LABEL, CONTROL PANEL, MGT	3
1	LABEL, TERMINAL BLOCK, CONTROL PANEL, OMT	4
1	BOARD, CONTROL, COMMERCIAL BOILER, SIT	5
1	SWITCH, CUTOFF, LOW WATER	6
15	STANDOFF, PCB	7
1	PANEL, CONTROL	8

Figure 13. Control Panel Layout and Components

7.E Field Connections

Wiring for all field connections must be run through the available electrical conduit to the back of the unit. See Figure 12.

When running the field connection wiring between the units in a cascading installation, always exit and enter the unit through the lower back panels so that during future servicing, the wires do not have to be disconnected in order to remove the top and side panels.

It is up to the electrician to install all power and system wiring as per codes and best practices.

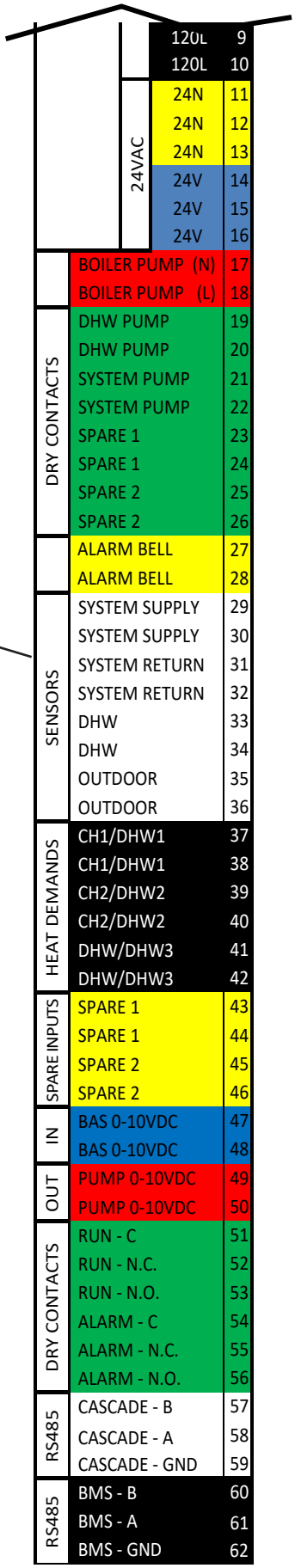


Figure 14. Field Connections (on Terminal Block 1)

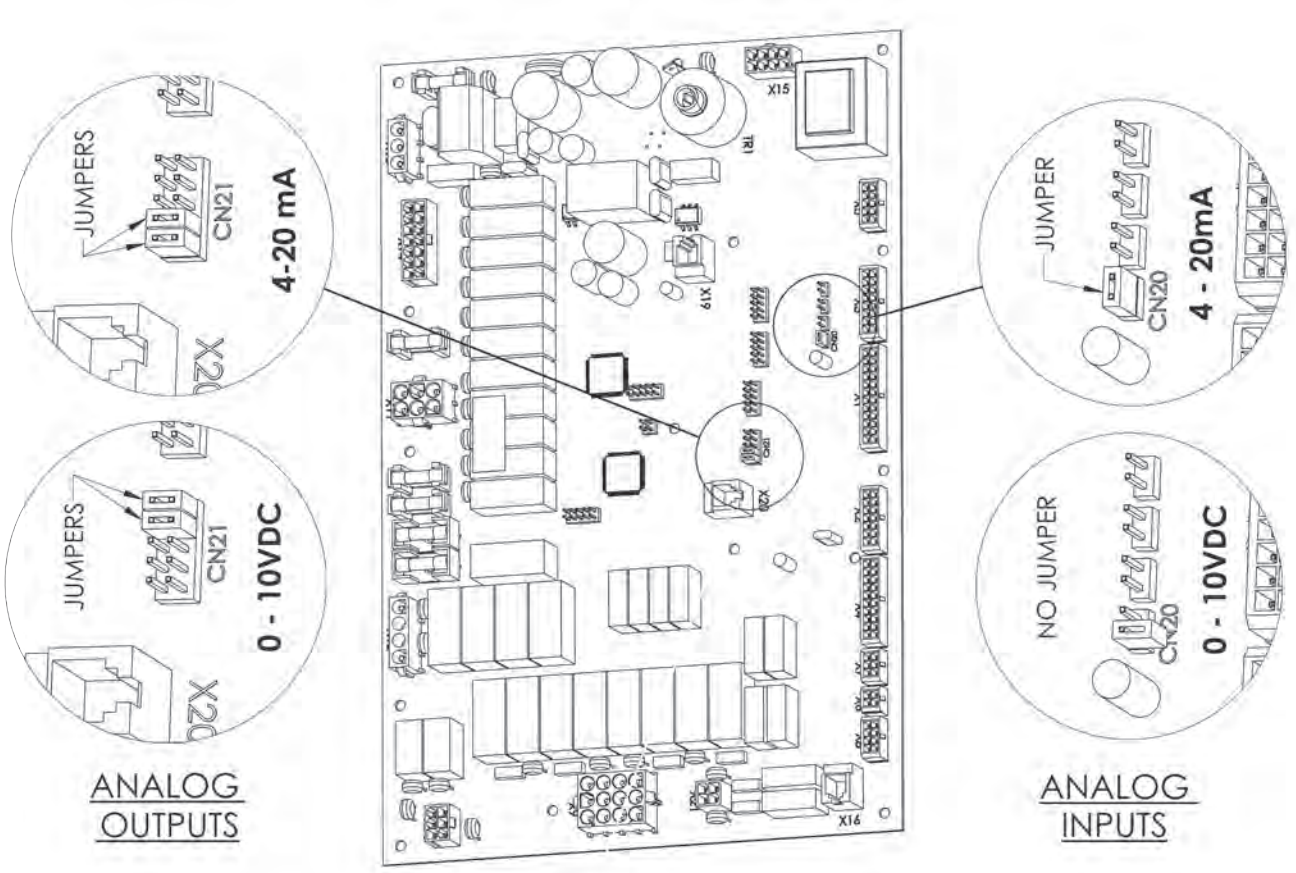


Figure 15. Jumper locations at the Inputs and Outputs

7.E.1 Power

7.E.2 Boiler Pump

If connecting a boiler contactor or pump, use terminals 17 (neutral) and 18 (line voltage). The output of these terminals is 120VAC with a maximum output current of 1.5 amps. Boiler pump functionality is configured using the touch screen. (See 8.D.6 on page 70).

The controller energizes the appropriate pump contacts when it receives a call for heat. Once the call for heat is satisfied, the pumps will remain on for the defined pump overrun time.

The boiler pump is fed 120VAC internally from the main power feed. The current rating of this output is 2.5A maximum at 250VAC. The system and DHW pump outputs are dry contacts, both with current ratings of 1.5A maximum at 250VAC. An appropriately sized contactor must be supplied and installed by a qualified technician for each of these outputs. Pump functionality is configured using the touchscreen.

7.E.3 Dry Contacts

DHW Pump - when connecting a domestic hot water (DHW) pump, use terminals 19 and 20. As this is a dry contact, the DHW pump supply voltage or DHW pump relay coil voltage would be applied at terminal 19, and when the DHW pump is activated, would be available at terminal 20. Contact ratings are 250VAC, 1.5A maximum. DHW pump functionality is configured using the touch screen.

System Pump - if connecting a system pump, use terminals 21 and 22. As this is a dry contact, the system pump supply voltage or system pump relay coil voltage would be applied at terminal 21, and when the system pump is activated, power will be available at terminal 22. Contact ratings are 250VAC, 1.5A maximum. System pump functionality is configured using the touch screen.

Spare 1 and **Spare 2** - no functionality available on this unit.

7.E.4 Alarm Bell

If connecting an alarm bell, use terminals 27 and 28. As this is a dry contact, the alarm bell supply voltage is applied at terminal 27, with the alarm bell connected to terminal 28.

7.E.5 Sensors

System Supply - if used, is connected to terminals 29 and 30. When connected, the controller automatically detects the presence of this sensor and the temperature is shown on the home screen above the red system supply arrow. When installed, the unit controls the firing rate to maintain the system supply temperature to the heat demand set point (or CSP) and hysteresis.

System Return - if used, is connected to terminals 31 and 32. When connected, the controller automatically detects the presence of this sensor and the temperature is shown on the home screen above the blue system output arrow.

Domestic Hot Water (DHW) - if a tank sensor is used, connect to terminals 33 and 34. When connected, the unit will automatically detect the presence of this sensor and perform the DHW thermostat function based on the settings selected at DHW or DHW3 parameter screens. The temperature is displayed on the home screen below the faucet icon. The controller initiates a call for heat, maintaining the set point within the on and off hysteresis selected at DHW or DHW3 demand screen, without any need for jumpers.

Note: The Heat Demands at 33 to 34 are used for sensors only, aquastats would be applied to the "Heat Demand" terminals 41 and 42 (see Heat Demands section below).

Outdoor - if used, is connected to terminals 35 and 36. When connected, the controller automatically detects the presence of this sensor and the temperature is shown on the home screen as the Outdoor Ambient Temperature (OAT). If installed, options such as outdoor reset and warm weather shutdown can be enabled through the display. Always install the Outdoor Sensor at an outdoor location that is not affected by false temperature readings such as sunlight or hot equipment.

7.E.6 Heat Demands

(Boiler / Water Heater)

CH1/DHW1 - if a thermostat/aquastat or end switch (isolated contact only) is used as a heat demand, connect to terminals 37 and 38 . CH1/DHW1 functionality is configured on the touch screen on the CH1/DHW1 screens.

CH2/DHW2 – if an additional thermostat/aquastat or end switch (isolated contact only) is required as a heat demand, connect to terminals 39 and 40. CH2/DHW2 functionality is configured on the touch screen on CH2/DHW2 screens.

⚠ WARNING

When servicing the controls, label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

DHW – if an aquastat, end switch (isolated contact only), or flow switch is used as a DHW heat demand, connect to terminals 41 and 42. If preferred, a DHW tank sensor can be used in lieu of an aquastat to generate a heat demand (see Sensors section above).

NOTE: CH1/DHW1, CH2/DHW2, and DHW heat demand contacts must be dry contacts. The controllers heat demand voltage is 24VDC.

7.E.7 Spare Inputs

There is no functionality associated with these inputs.

7.E.8 Inputs, BMS

BMS – if an analog input (0-10VDC or 4-20mA) from a Building Management System is used as a remote set point or remote firing rate command, wire to terminals 47 and 48 (See Figure 14 on page 36). Polarity is shown on the terminal label. Selecting voltage or current input is accomplished through jumper placement on the control board. Analog BMS functionality is configured using the touch screen.

7.E.9 Outputs, Pump

Pump – when using Vari-Prime pump control, wire the pump speed wires to terminals 49 and 50. Polarity is shown on the terminal label. Selecting voltage or current output is accomplished through jumper placement on the control board. Vari-Prime functionality is configured using the touch screen.

7.E.10 Dry Contacts (Run & Alarm)

Run - when used, is connected to terminals 51 (common), 52 (normally closed), and 53 (normally open) (See Figure 14 on page 36). The controller closes the normally open set of contacts whenever the unit is running. Contact ratings are 250VAC, 0.6A maximum.

Alarm - when used, is connected to terminals 54 (common), 55 (normally closed), and 56 (normally open). The controller closes the normally open set of contacts whenever the unit is locked out. Contact ratings are 250VAC, 0.6A maximum.

RS485 NOTE: RS485 Grounding & Shielding

Grounding: To ensure that common mode voltage does not compromise the date, or damage the equipment, an extra wire should always be used to connect the signal grounds. This means that a "two-wire" system actually requires three conductors. Although it is possible to obtain cable with a twisted pair and a third conductor, it is simpler to use a cable with an extra twisted pair and use one or both conductors for the signal ground.

Shielding: It is often difficult to make a clear determination as to whether shielded cable is required in an application. Since the added cost of shielded cable is usually minimal, in most cases it is worth installing. If shielded cable is used, the shield should be grounded at one end only, preferably to earth ground. It is not recommended to use a shield drain wire as the signal ground.

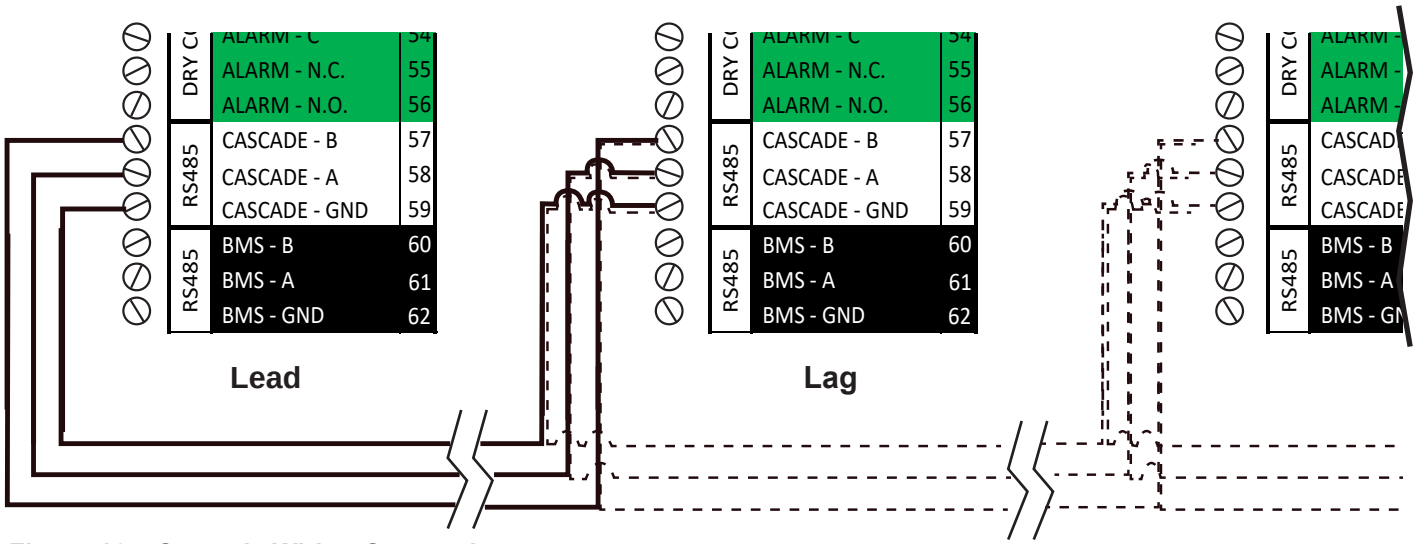


Figure 16. Cascade Wiring Connections

7.E.11 RS 485 for Cascade (Lead Lag)

This commercial unit can be connected in Lead Lag up to a total of 8 units (controllers). One as the Lead control and up to 7 more as the Lag controllers.
Prior to wiring units for cascade operations, select one unit as the lead boiler/heater. Other units connected to the lead boiler/heater will be referred to as lag units. Communication between lead and lag units is accomplished using RS485. When wiring these units for cascade operations, use terminals 57, 58, and 59 (See Figure 14 on page 36). Use 2-wire twisted pair, shielded w/drain (communication cable) between units. Connect one wire of the communication cable to A (-), terminal 58, and the other wire to terminal B (+), terminal 57, and a third conductor to GND, terminal 59 (see RS485 NOTE: Grounding). Connect the other end of the cable to the next unit, matching the termination wiring on the previous unit. If more than two units are cascaded together, daisy chain the wiring from unit to unit, keeping the cables as short as possible. A system supply sensor must be installed and connected to the lead boiler. The lead boiler will use this system supply sensor as the temperature control sensor for cascade operations.

Section 8.D.4.a on page 67 shows how these systems are configured in the touchscreen controls. Any heat demand at the lead boiler/heater will be treated as a cascade heat demand.

7.E.12 RS 485 BMS

BMS – if communicating to the unit via RS485 serial communications, either Modbus or BACnet MSTP, connect to terminals 60, 61, and 62 (Figure 14 on page 36.

For Cascading RS485 BMS, see Figure 17 on page 40. Use 2-wire twisted pair, shielded w/drain (communication cable) between units. Connect one wire of the communication cable to A (-), terminal 61, and the other wire to terminal B (+), terminal 60, and a third conductor to GND, terminal 62 (see RS485 NOTE: Grounding & Shielding).

Section 8.D.11.d on page 79 shows how these systems are configured in the touchscreen controls.

RS 485 BMS (continued)

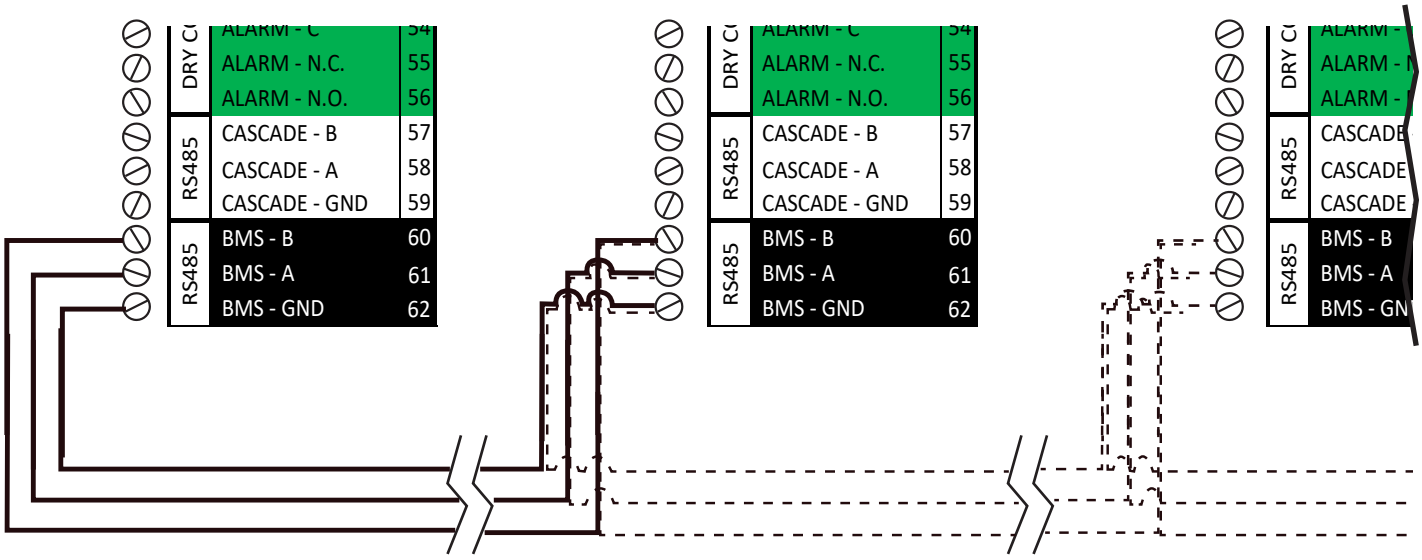


Figure 17. BMS Wiring Connections

7.F Modbus/BACnet Memory Map

Modbus Address	R/W	Map Descriptor Name	BACnet Data	BACnet Object	Read/Write	Notes
0	Read	Inlet sensor	AI	0	Read	
1	Read	Outlet sensor	AI	1	Read	
2	Read	Flue Sensor	AI	2	Read	
3	Read	DHW sensor	AI	3	Read	
4	Read	System Inlet Sensor	AI	4	Read	
5	Read	System Outlet Sensor	AI	5	Read	
6	Read	Outdoor Sensor	AI	6	Read	
7	Read	Flue Sensor	AI	7	Read	
12	Read	Flame Signal 1	AI	12	Read	
14	Read	0-10VDC (4-20mA) Input for BMS	AI	14	Read	
18	Read	Safety Chain Status	AI	18	Read	bit0 = Flow Switch bit1 = LWCO bit2 = MRHL bit3 = SV2 Valve Interlock bit4 = High Gas Pressure bit5 = Low Gas Pressure bit6 = ARHL bit7 = Condensate Level
19	Read	Non-safety Chain Status	AI	19	Read	bit0 = Field Input 1 bit1 = Field Input 2
20	Read	Demand source	AI	20	Read	0=None 1=Anti-Short Cycle 2=Service 3=DHW 4=Cascade 5=External 6=CH1 7=CH2 10=Anti-Frost 11=Warm Weather Shutdown

(continued on next page)

Modbus Address	R/W	Map Descriptor Name	BACnet Data	BACnet Object	Read/Write	Notes
						10=Anti-Frost
						11=Warm Weather Shutdown
21	Read	Digital Output Status	AI	21	Read	bit0 = Run Contact bit1 = Alarm Contact bit2 = DHW Pump bit3 = System Pump bit5 = Aux Dry Contact 1 bit6 = Aux Dry Contact 2 bit7 = Boiler Pump bit8 = Aux Powered Contact
22	Read	Gas and Pilot Valve Status	AI	22	Read	bit 0 = N/A bit 1 = Burner 1 Gas valve 1
23	Read	0-10VDC (4-20mA) Output for Pump Spee	AI	23	Read	mV
27	Read	Modulating Fan 1 - Speed	AI	27	Read	RPM
33	Read	Modulating Burner1 Firing rate	AI	33	Read	%
35	Read	Lockout Code	AI	35	Read	LOW FLOW ERROR = 0 LOW WATER CUT OFF ERROR = 1 MANUAL RESET HIGH LIMIT ERROR = 2 BLOCKED FLUE ERROR = 3 HIGH GAS PRESSURE ERROR = 4 LOW GAS PRESSURE ERROR = 5 AUTO RESET HIGH LIMIT ERROR = 6 SPARE SAFETY CHAIN ERROR = 7 OUTLET PROBE ERROR = 8 OUTLET PROBE DRIFT ERROR = 9 OUTLET PROBE HIGH LIMIT ERROR = 10 FLUE PROBE ERROR = 11 FLUE PROBE DRIFT ERROR = 13 FLUE PROBE HIGH LIMIT ERROR = 14 INLET PROBE ERROR = 15 DELTA T ERROR = 16 GENERIC LOCKOUT = 17 BURNER1 MAX TRIALS ERROR = 22 BURNER1 MAX FLAME LOST ERROR = 24 BURNER1 FAN SPEED ERROR = 28 NO LOCKOUT = 255
36	Read	Error Code	AI	36	Read	24VDC ERROR = 30 24VAC ERROR = 31 DHW PROBE ERROR = 32 SYSTEM SUPPLY PROBE ERROR = 33 SYSTEM RETURN PROBE ERROR = 34 OUTDOOR PROBE ERROR = 35 FLUE PROBE ERROR = 36 HIGH LIMIT AUTO ERROR = 41 HIGH DELTA T ERROR = 42 FAN SPEED ERROR = 43
38	Read	History - DHW Demand Cycles	AI	38	Read	x 10
39	Read	History - CH1 Demand Cycles	AI	39	Read	x 10
40	Read	History - CH2 Demand Cycles	AI	40	Read	x 10
43	Read	History - Cascade Demand Cycles	AI	43	Read	x 10
44	Read	History - Burner Stage 1 Cycles	AI	44	Read	x 10
48	Read	History - Boiler Pump Cycles	AI	48	Read	x 10
49	Read	History - DHW Pump Cycles	AI	49	Read	x 10
50	Read	History - System Pump Cycles	AI	50	Read	x 10
51	Read	History - Average Boiler Outlet Temperatu	AI	51	Read	° F
52	Read	History - Maximum Boiler Outlet Temperat	AI	52	Read	° F
53	Read	History - Minimum Boiler Outlet Temperatu	AI	53	Read	° F
54	Read	History - Boiler Average Firing Temperatur	AI	54	Read	° F
55	Read	History - Boiler Maximum Firing Time	AI	55	Read	Hours
56	Read	History - Boiler Minimum Firing Time	AI	56	Read	Hours
64	Read	Modulation Sensor	AI	64	Read	0 = None 1 = Outlet 2 = DHW 3 = System 4 = Inlet 5 = Flue 6 = System Return

(continued on next page)

Modbus/BACnet Memory Map (continued)

Modbus Address	R/W	Map Descriptor Name	BACnet Data	BACnet Object	Read/Write	Notes
65	Read	Active Service	AI	65	Read	%ENERIC LOCKOUT – 17
66	Read	Lag 1 State	AI	66	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
67	Read	Lag 1 Firing Rate	AI	67	Read	Current firing rate (0-100%)
68	Read	Lag 2 State	AI	68	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
69	Read	Lag 2 Firing Rate	AI	69	Read	Current firing rate (0-100%)
70	Read	Lag 3 State	AI	70	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
71	Read	Lag 3 Firing Rate	AI	71	Read	Current firing rate (0-100%)
72	Read	Lag 4 State	AI	72	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
73	Read	Lag 4 Firing Rate	AI	73	Read	Current firing rate (0-100%)
74	Read	Lag 5 State	AI	74	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
75	Read	Lag 5 Firing Rate	AI	75	Read	Ccrrent firing rate (0-100%)
76	Read	Lag 6 State	AI	76	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
77	Read	Lag 6 Firing Rate	AI	77	Read	Ccrrent firing rate (0-100%)
78	Read	Lag 7 State	AI	78	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
79	Read	Lag 7 Firing Rate	AI	79	Read	Current firing rate (0-100%)
80	Read	Lead 0 State	AI	80	Read	0 = Not Present 1 = Not Available 2 = Available 3 = Running 4 = Locked Out
81	Read	Lead 0 Firing Rate	AI	81	Read	Current firing rate (0-100%)
82	Read	Lead Firing Rate	AI	82	Read	Current firing rate of the Cascade Lead (0-100%)
83	Read	Active CH Setpoint	AI	83	Read	
84	Read	Burner Status 1	AI	84	Read	0=None 5 = Start 24 = Error Block 160 = Standby 165 = Check Safety Swtich 166 = Run 177 = Prepurge Open 181 = Parameter Block 183 = Lockout 188 = Testmode 194 = Prepurge Closed 195 = Wait for HIS Free 196 = HIS Preheat/Prespark 200 = Verify Primary SF 217 = interpurge 241 = Postpurge 245 = Trial for Ignition 250 = Trial for Ignition Main 52=Post Purge

(continued on next page)

Modbus Address	R/W	Map Descriptor Name	BACnet Data	BACnet Object	Read/Write	Notes
86	Read	CH Set Point Source	AI	86	Read	0 = No CH Source 1 = CH1 2 = CH2 5 = External Demand
89	Read	Boiler Pump Status	AI	89	Read	
90	Read	Cascade Master Heat Demand	AI	90	Read	
91	Read	Burner 1 Run Time	AI	91	Read	
128	Read/Write	CH1 Enable/Disable	AV	0	Read/Write	0 = Disable; 1 = Enable;
129	Read/Write	CH1 Set Point	AV	1	Read/Write	
130	Read/Write	CH1 P	AV	2	Read/Write	
131	Read/Write	CH1 I	AV	3	Read/Write	
132	Read/Write	CH1 D	AV	4	Read/Write	
133	Read/Write	CH2 Enable/Disable	AV	5	Read/Write	0 = Disable; 1 = Enable;
134	Read/Write	CH2 Set Point	AV	6	Read/Write	
135	Read/Write	CH2 P	AV	7	Read/Write	
136	Read/Write	CH2 I	AV	8	Read/Write	
137	Read/Write	CH2 D	AV	9	Read/Write	
148	Read/Write	DHW Enable/Disable	AV	20	Read/Write	0 = Disable; 1 = Enable;
149	Read/Write	DHW Set Point	AV	21	Read/Write	
150	Read/Write	DHW P	AV	22	Read/Write	
151	Read/Write	DHW I	AV	23	Read/Write	
152	Read/Write	DHW D	AV	24	Read/Write	
155	Read/Write	Cascade CH Set Point	AV	27	Read/Write	
156	Read/Write	Cascade CH P	AV	28	Read/Write	
157	Read/Write	Cascade CH I	AV	29	Read/Write	
158	Read/Write	Cascade CH D	AV	30	Read/Write	
163	Read/Write	Hybrid Set Point	AV	35	Read/Write	
164	Read/Write	Hybrid Differential Temperature	AV	36	Read/Write	
165	Read/Write	Vari-Prime P - Proportional Term	AV	37	Read/Write	
166	Read/Write	Vari-Prime I - Integral Term	AV	38	Read/Write	
167	Read/Write	Vari-Prime D - Derivative Term	AV	39	Read/Write	
168	Read/Write	Vari-Prime Delta T	AV	40	Read/Write	
174	Read/Write	DHW Demand switch	BV	0	Read/Write	0 = No Heat Demand; 1 = Heat Demand
175	Read/Write	CH 1 Demand switch	BV	1	Read/Write	0 = No Heat Demand; 1 = Heat Demand
176	Read/Write	CH 2 Demand switch	BV	2	Read/Write	0 = No Heat Demand; 1 = Heat Demand
179	Read/Write	Modbus Parameter Write Enable				

7.G Wiring Diagrams - High Voltage

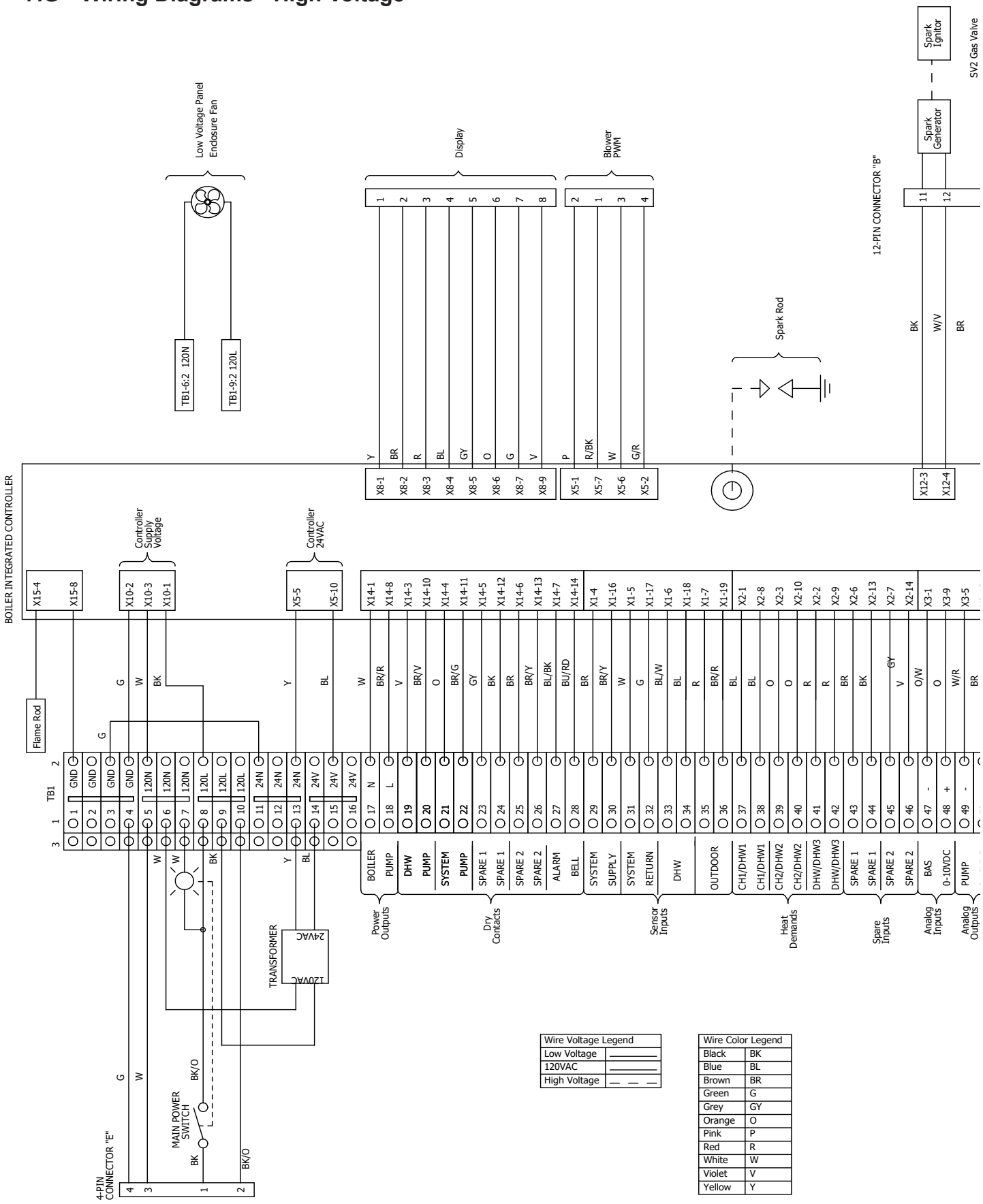
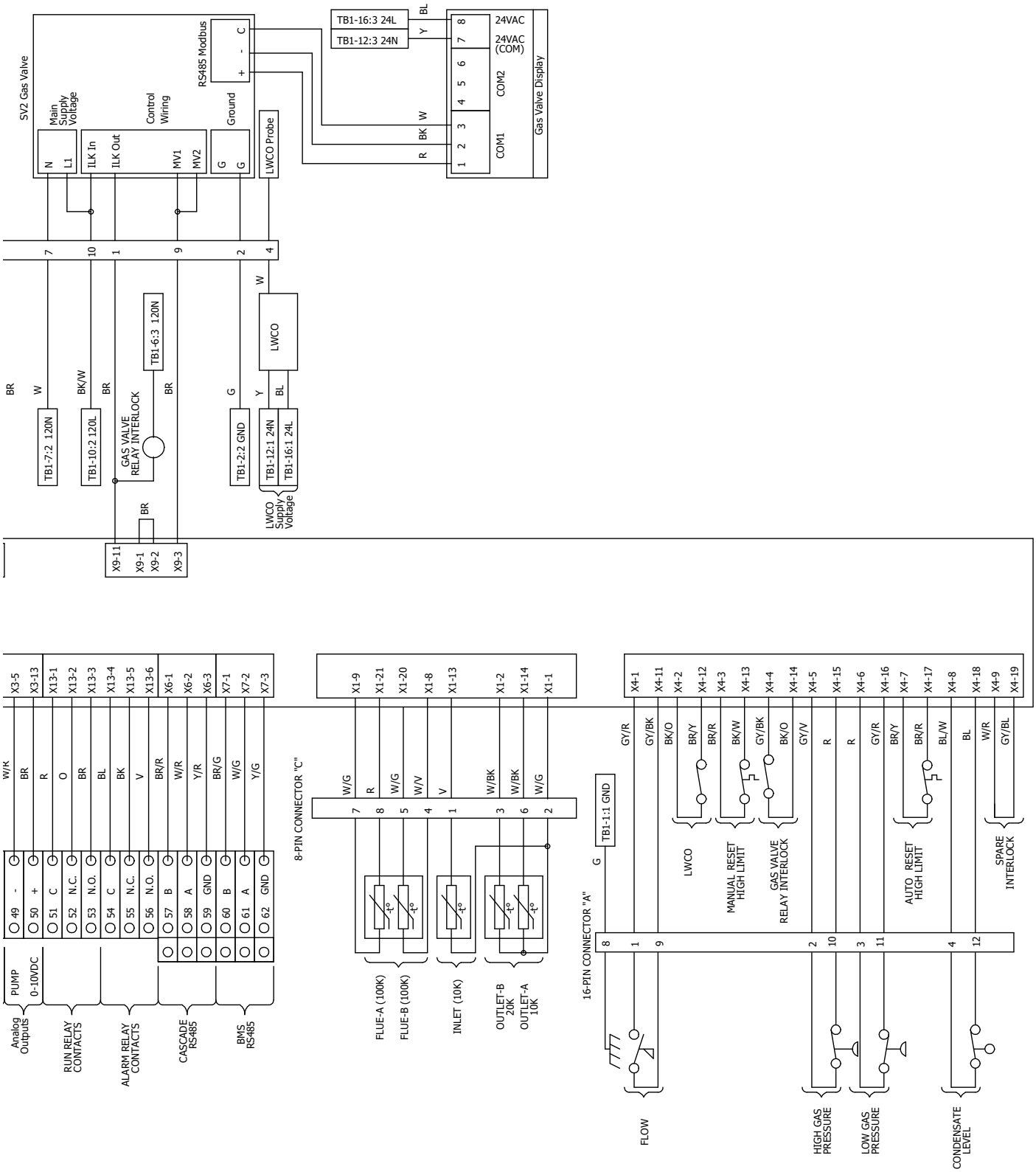


Figure 18. Wiring Diagram, All Sizes


SV2 Gas Valve
Main Supply Voltage
Control Wiring
Ground
RS485 Modbus
N
L1
ILK In
ILK Out
MV1
MV2
G
G
LWCO Probe
TB1-16:3 24L
TB1-12:3 24N
24VAC
24VAC (COM)
COM2
COM1
Gas Valve Display
TB1-7:2 120N
TB1-10:2 120L
GAS VALVE RELAY INTERLOCK
TB1-6:3 120N
TB1-2:2 GND
TB1-12:1 24N
TB1-16:1 24L
LWCO
LWCO Supply Voltage
X9-11
X9-1
X9-2
X9-3
8-PIN CONNECTOR "C"
16-PIN CONNECTOR "A"
TB1-1:1 GND
PUMP
0-10VDC
Analog Outputs
RUN RELAY CONTACTS
ALARM RELAY CONTACTS
CASCADE RS485
BMS RS485
FLUE-A (100K)
FLUE-B (100K)
INLET (10K)
OUTLET-B 20K
OUTLET-A 10K
LWCO
MANUAL RESET HIGH LIMIT
GAS VALVE RELAY INTERLOCK
AUTO RESET HIGH LIMIT
SPARE INTERLOCK
FLOW
HIGH GAS PRESSURE
LOW GAS PRESSURE
CONDENSATE LEVEL

Wiring Diagrams (continued)

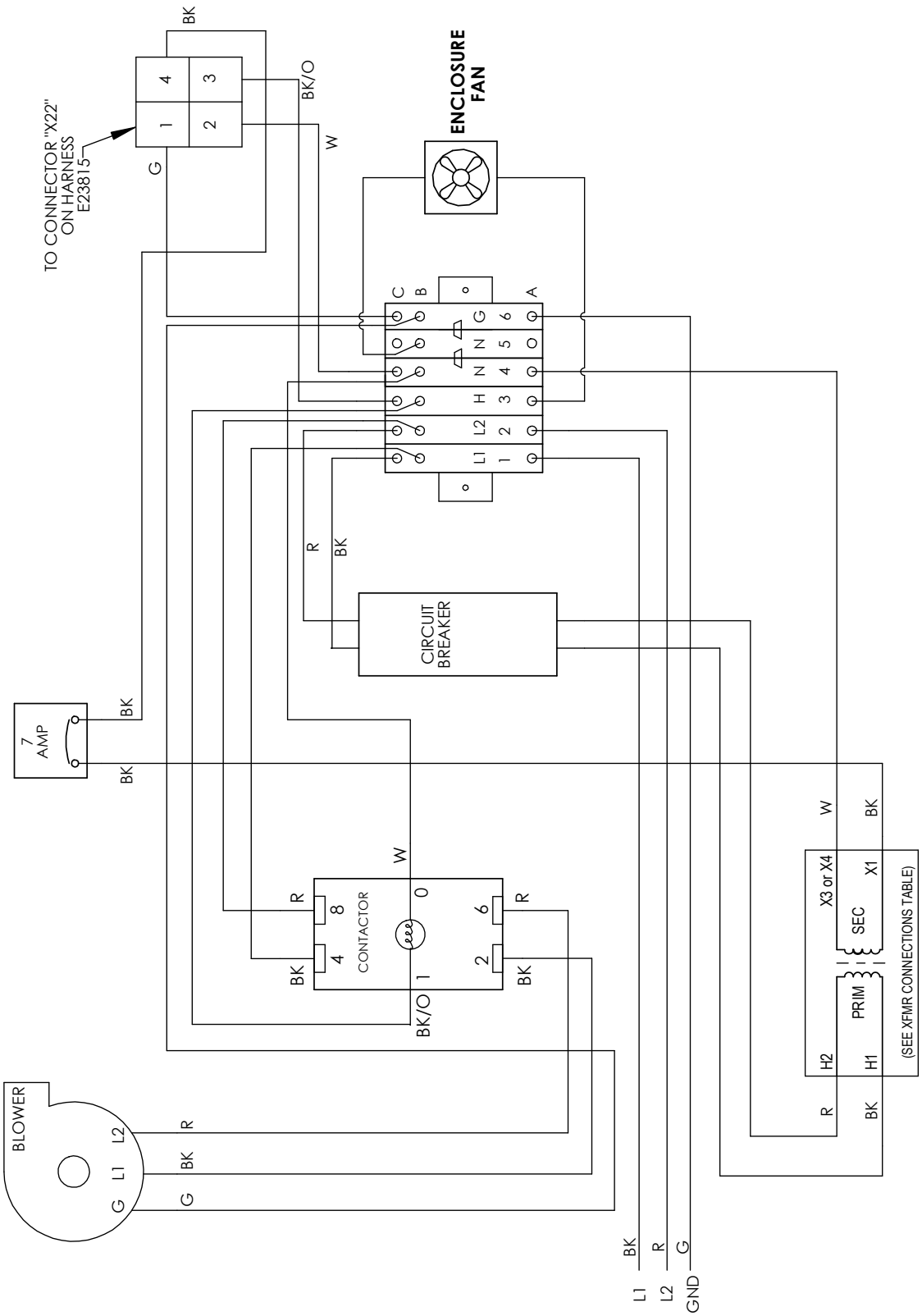


Figure 19. Wiring Diagram, 208, 240V 1 Phase 1250 to 2500

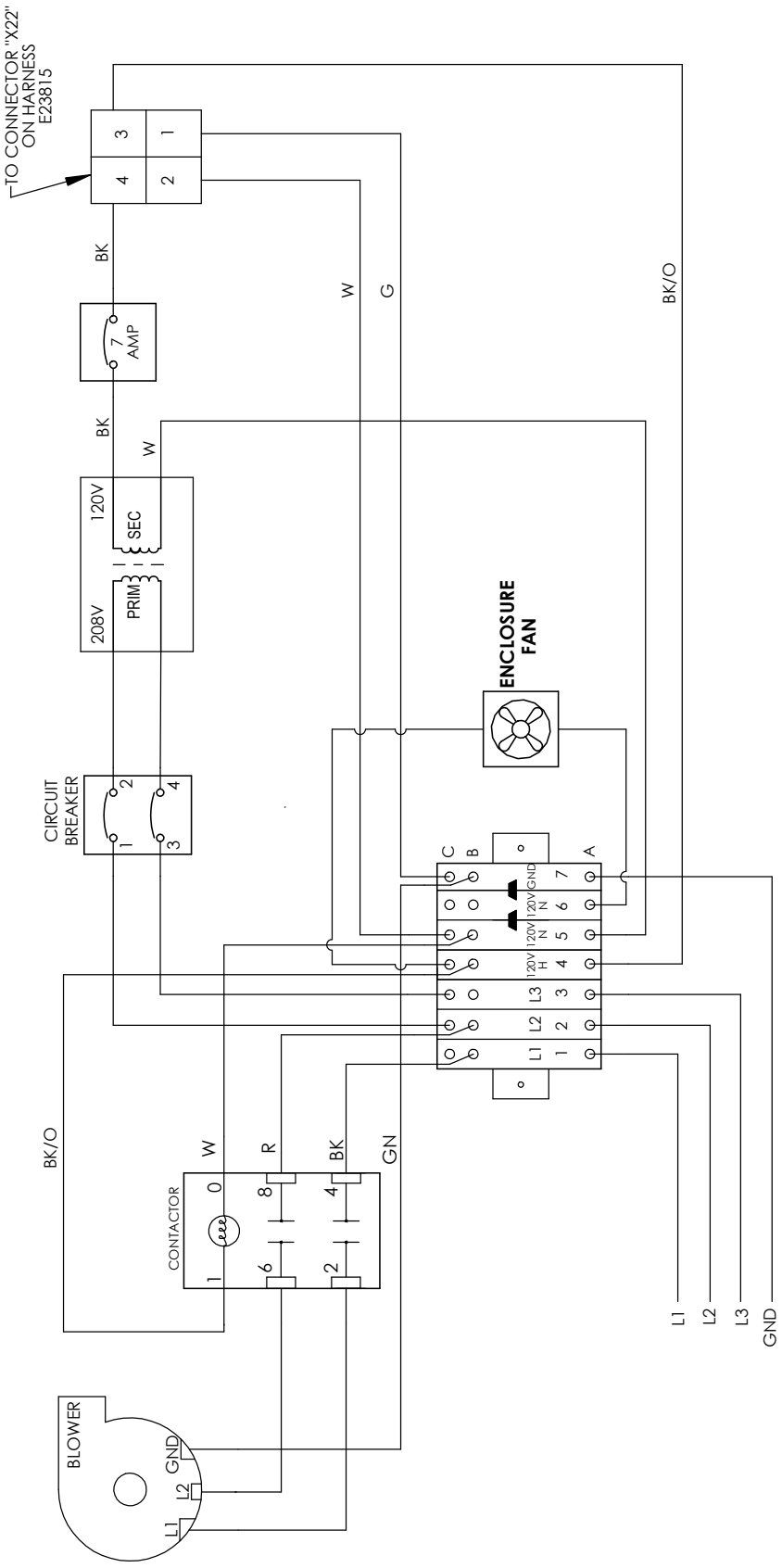


Figure 20. Wiring Diagram, 208V 3 Phase 2500

Wiring Diagrams (continued)

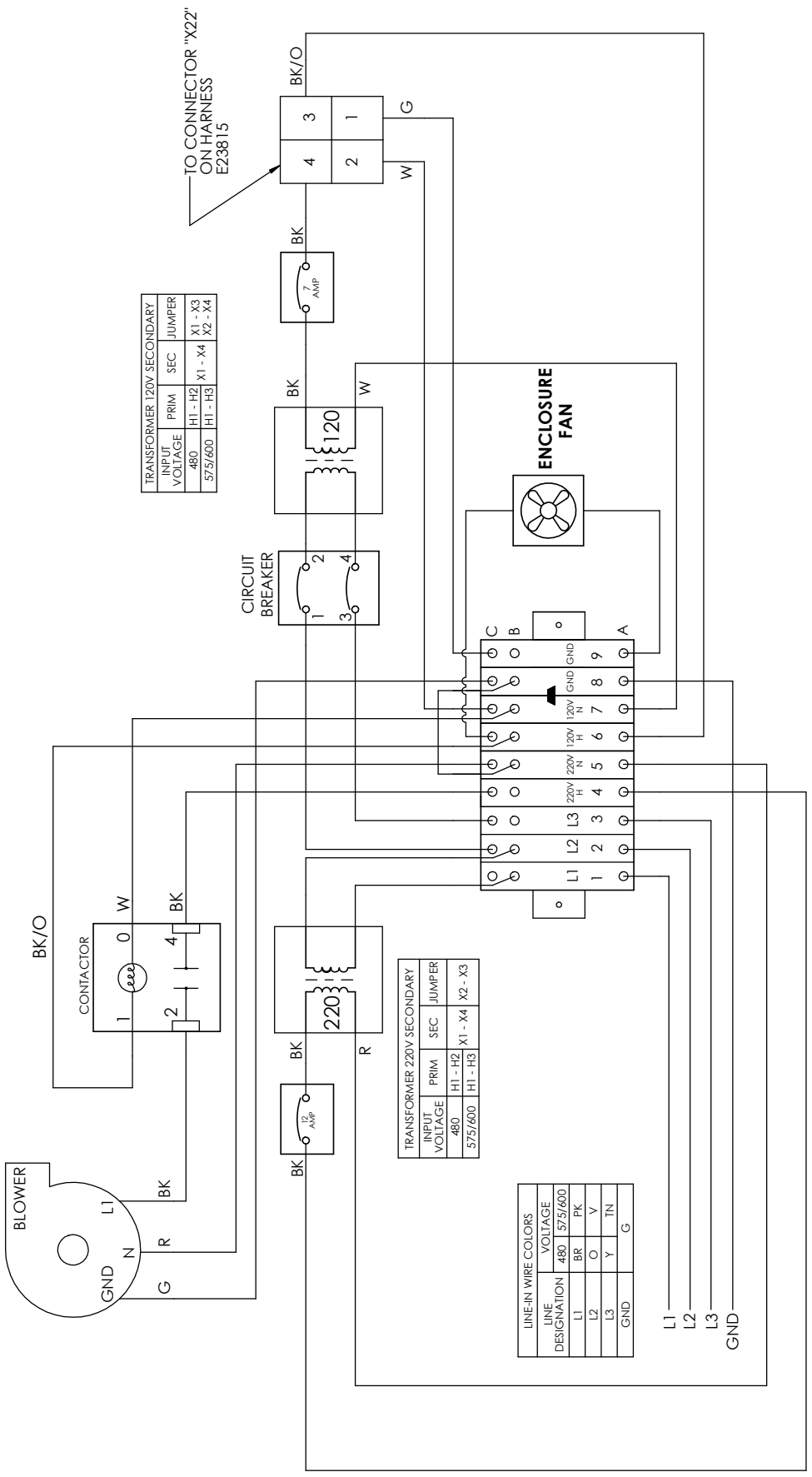


Figure 21. Wiring Diagram, 480 - 600V, 3 Phase 2500

7.H Logic Diagrams

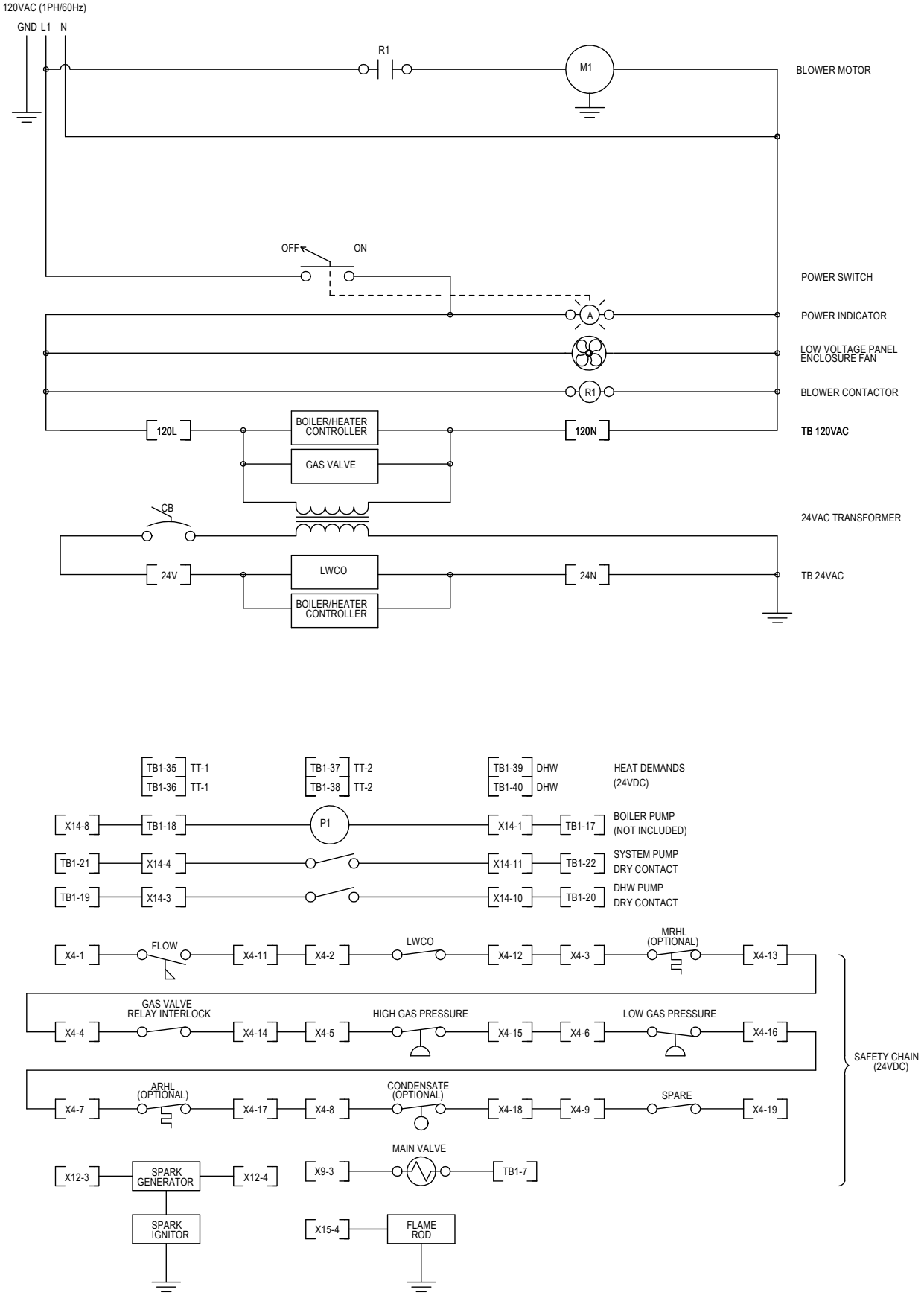


Figure 22. Logic Diagram 120V 1 Phase up to 2000

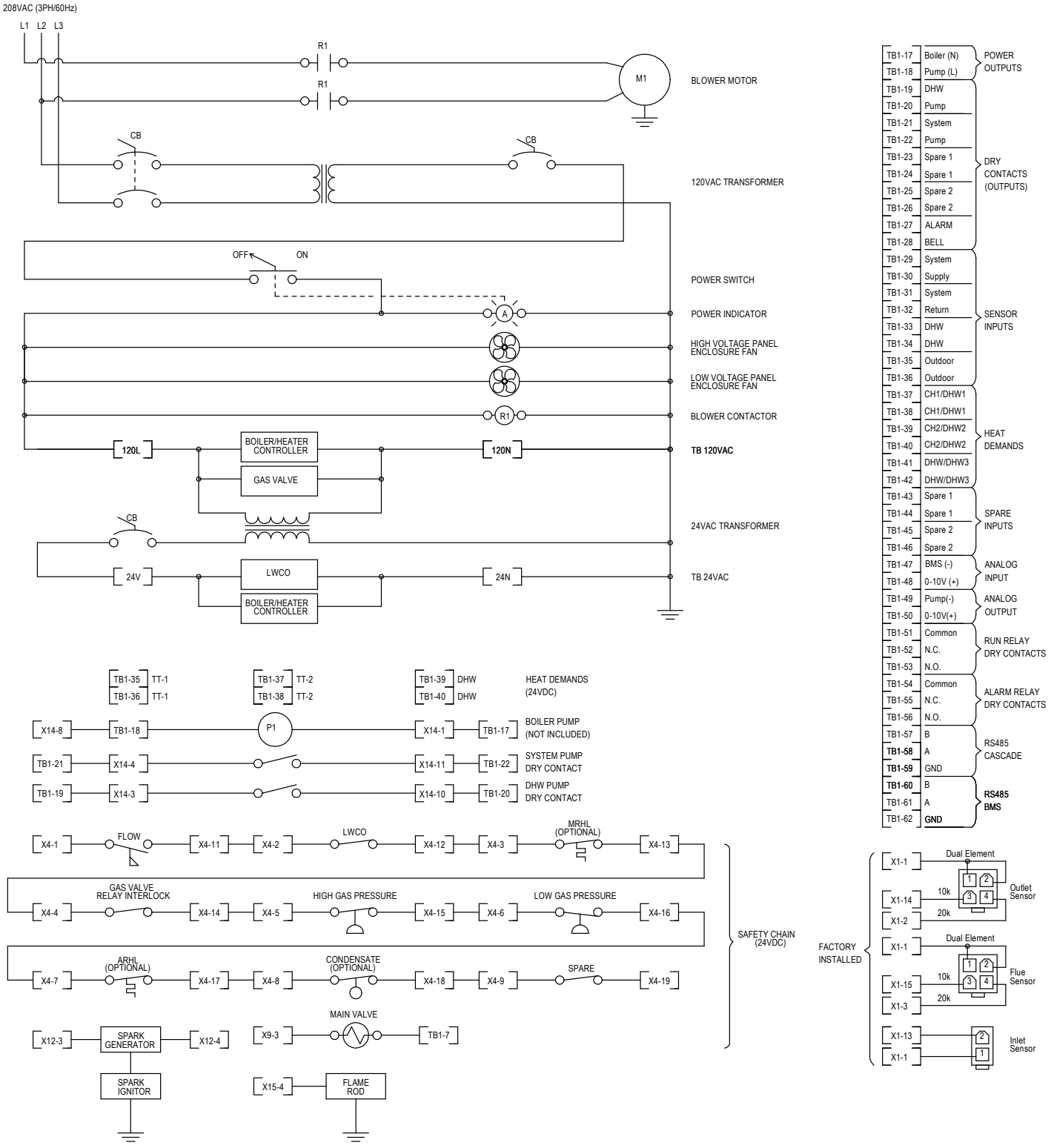


Figure 23. Logic Diagram 208V 3 Phase up to 2500

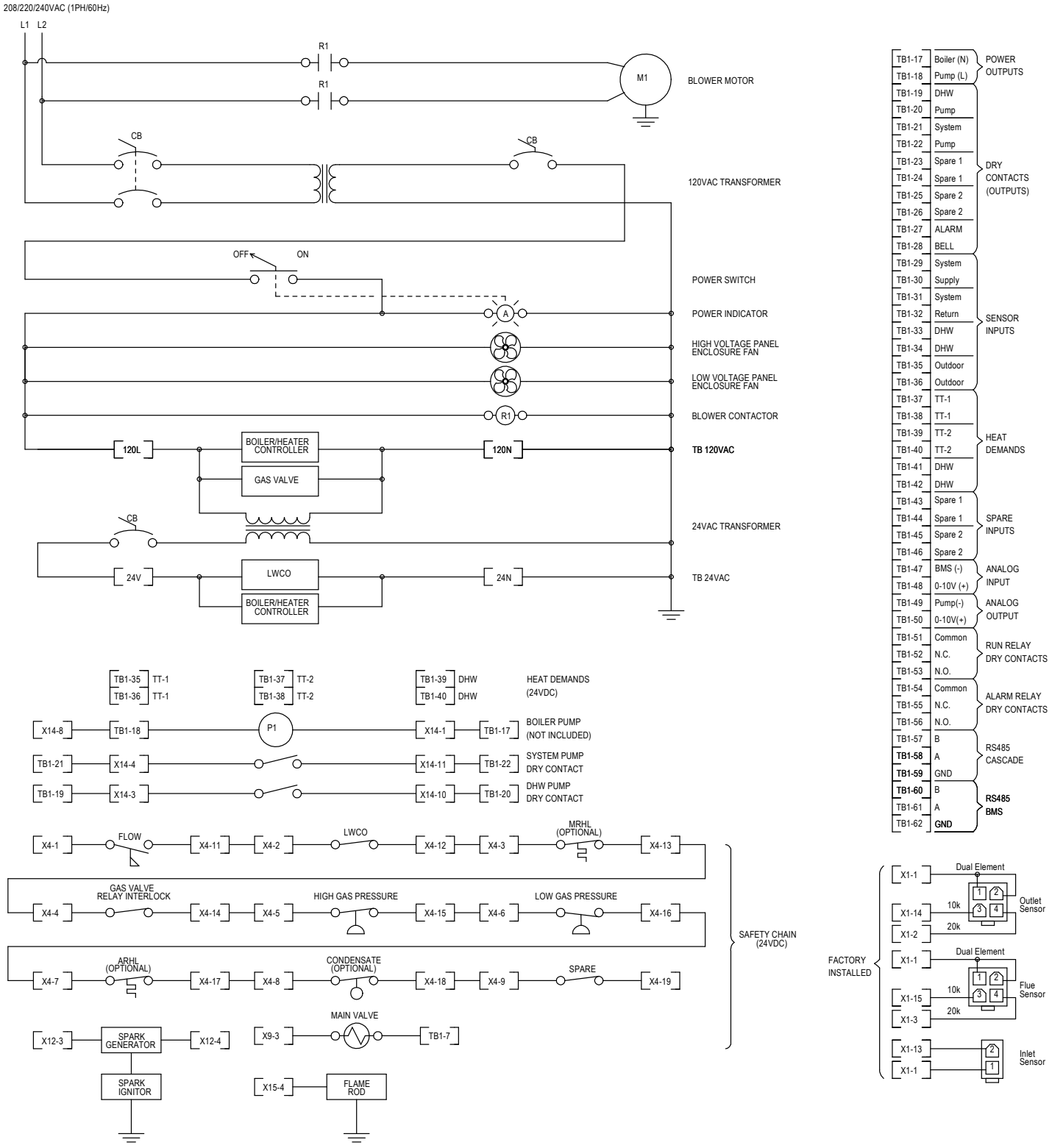


Figure 24. Logic Diagram 220V 1 Phase 1500 to 2500

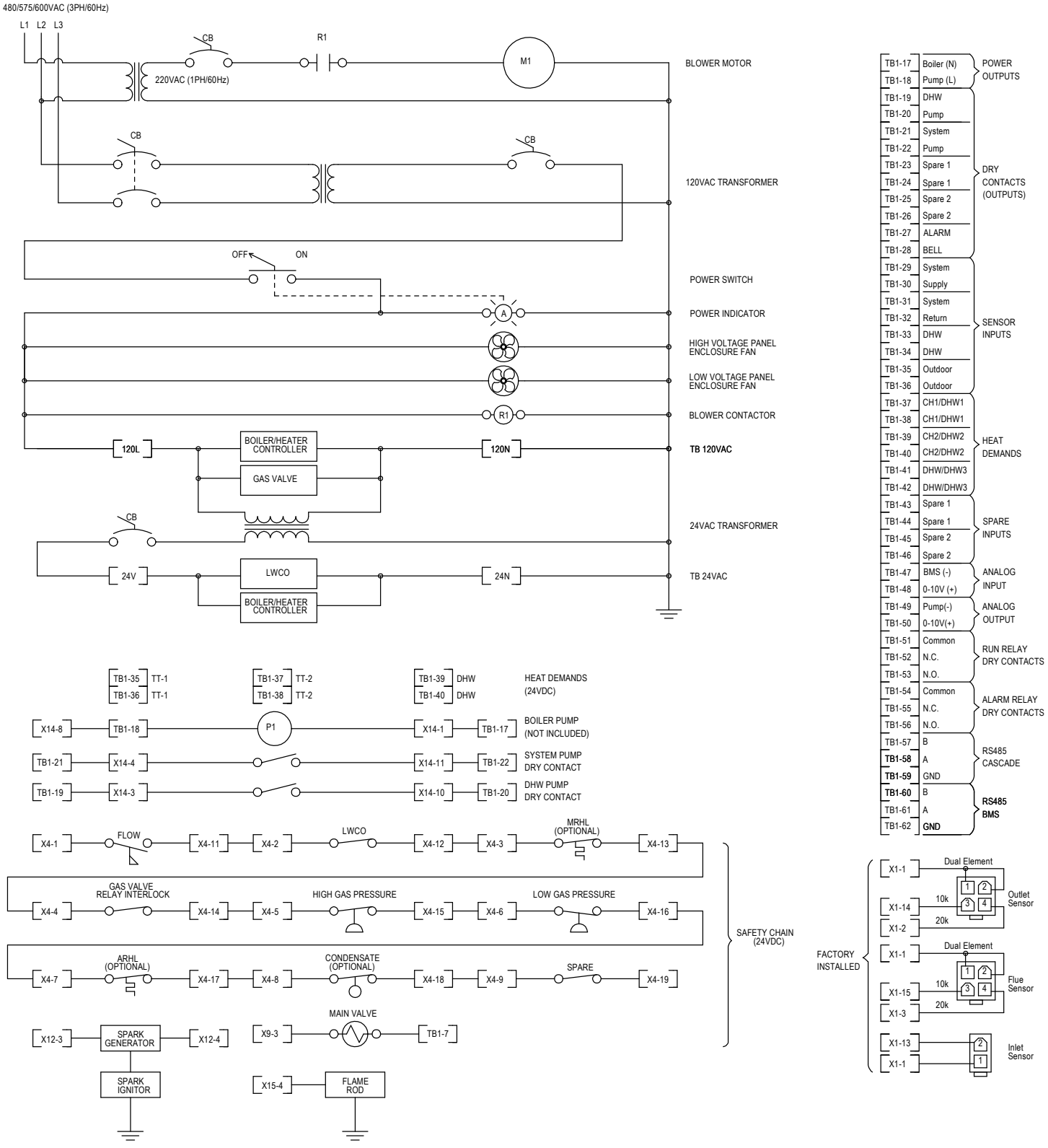
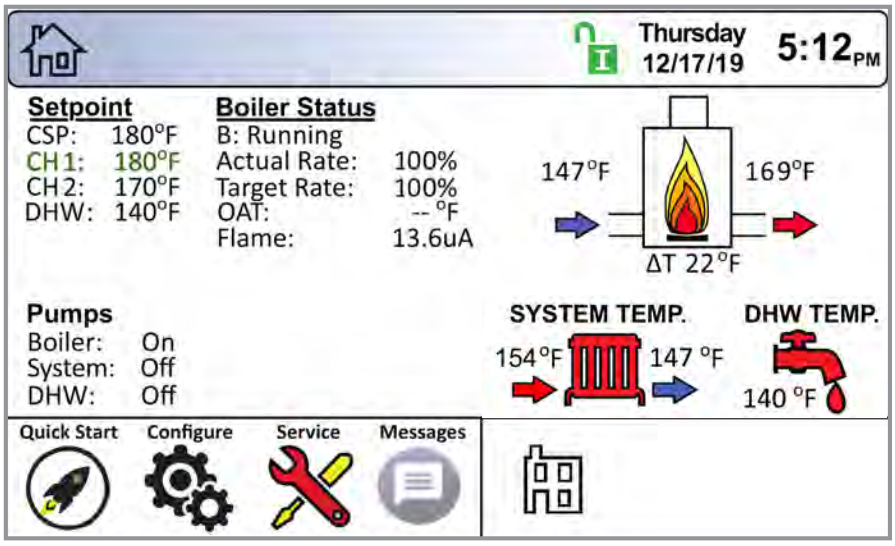


Figure 25. Logic Diagram 480, 600V 3 Phase 2500

This page intentionally left blank.

SECTION 8 Control Operation

8.A The Home Screen



8.A.1 Home Screen Active Icons

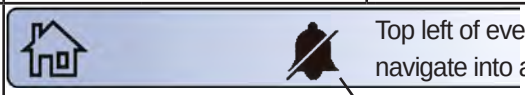
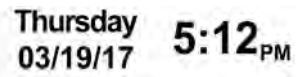
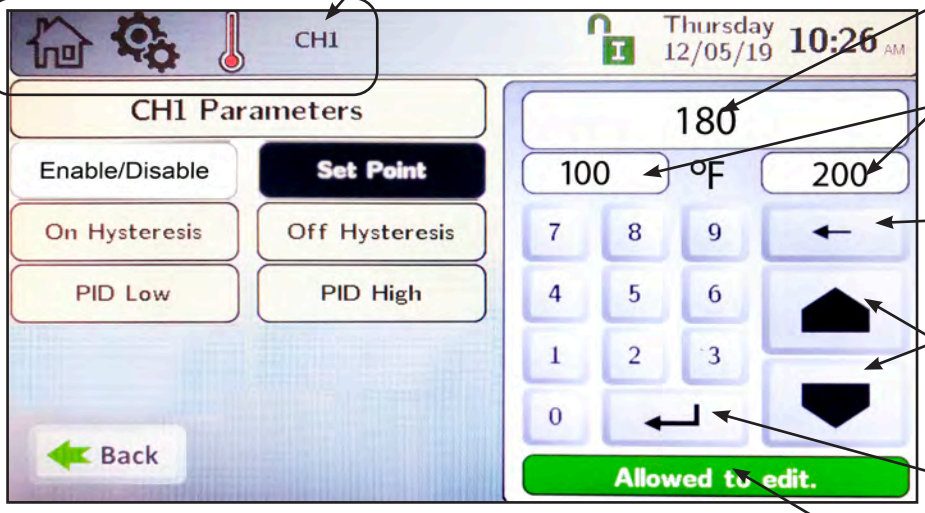
Name	Icon	Description
Security		Displays the current lock status icon. Touch the lock icon to lock or unlock the Touchscreen Display. See **Section 8.B on page 56**
Quick Start		Provides quick access to the most commonly used parameters for easy installation. See **Section 8.C on page 57**
Configure		Provices access to ALL of your configurations for a detailed setup of the unit. See **Section 8.D on page 61**
Service		Allows the service technician to access the basic diagnostic and troubleshooting information. See **Section 8.E on page 82**
Messages		Will show an 'Exclamation Point' when there is a message. Clicking onto the Message icon will take you to the message itself. The USB functionality will show the USB Icon at this location, if being used. See **Section 8.F on page 87** 
Active Demands		Will show icons that indicate the active parameters that are currently in demand. **See Section 8.G on page 88**
Navigation Bar		Top left of every menu. The constant indicator of where you are as you navigate into and out of the touchscreens. **The alarm bell icon indicates that the units alarm has been silenced.** **LOCKOUTS and ERROR** Codes are also show in the ***Navigation Bar*** when there is one of several unit Lockouts, Errors or Shut-downs that have occured. See **SECTION 12 on page 109** 
Date & Time		To change date and time, simply touch the date or time and follow the directions. **Section 8.D.10 on page 75**

Figure 26. Active Areas of the Home Screen

8.A.2 Keypad Operations

NOTE: You can always tell exactly where you have navigated to by looking at the icons in the ***Navigation Bar.***

In this example you are in
Home / Configure / Central Heat / Central Heat One



Shows the current setting of the parameter.

These windows will reflect the allowable ranges of the parameter.

To delete the current setting before entering in the new value.

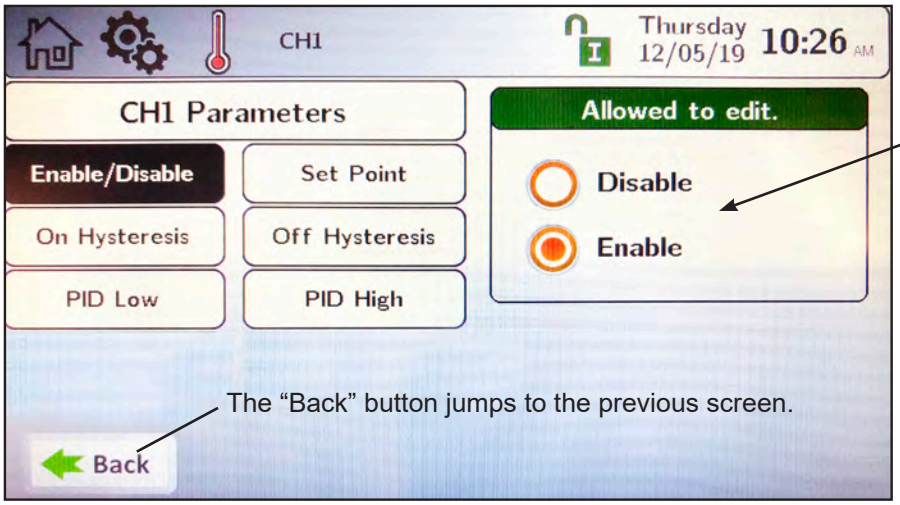
"Up and Down" arrows are used to increment the setting accordingly.

The "Enter" button is used to accept the new value.

This is the indicator that will be shown when the correct password has been entered to allow the setting to change.

A Typical Numeric Keypad Entry Screen.

Remember to always save the new setting with the button.



The highlighted button (orange) shows which one is selected. Some screens may only allow you to set one or the other, while some other screens (example: pump selection) will allow you to select any or all of the options.

The "Back" button jumps to the previous screen.

A Typical Selection Screen.

8.B Login to Lock / Unlock the Display Screen

Password Protection:

To change configuration or parameters, a password is required. The control system includes three levels of password protection. Touch the 'Current Lock Status' icon at the top of the screen.

1- USER password is lhs. This password is for 'Safe' access 'Non-Critical' adjustments and functions. Use this password if you want to make adjustments without fear of altering the critical configuration of the system. When unlocked in the User mode, the icon will change to

2- INSTALLER password is 17. This password is for the trained Installer / Technician for configuration and parameter changes made during the initial setup and commissioning. Be aware that in this level of password protection, changes to the configuration setup may result in lock-outs or conflicts with your system setup, resulting in technical issues.
When unlocked in the Installer mode, the icon will change to

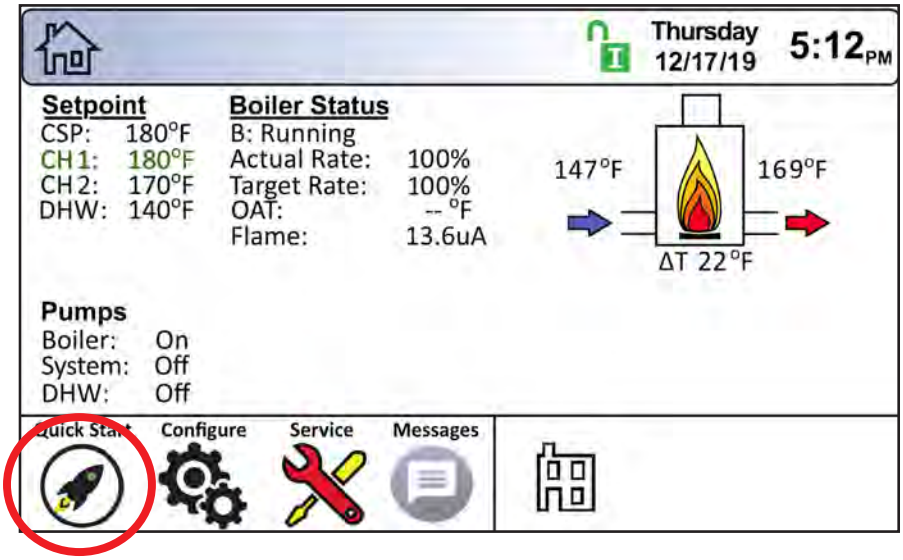
3- OEM: Configuration and parameter changes available only to the factory. When unlocked in the OEM mode, the icon will change to

Logout. If the Installer is done and wants to lock the display immediately, tap the Logout icon to exit Installer or User Mode. Exiting the Installer or User Mode will lock the unit.

Walk-Away Result. The user can choose how long the control will remain unlocked after interaction with the control has stopped. After this time (default is 5 minutes), the screen will lock itself. See "8.E.4 Screen (Settings Timeout)" on page 85.

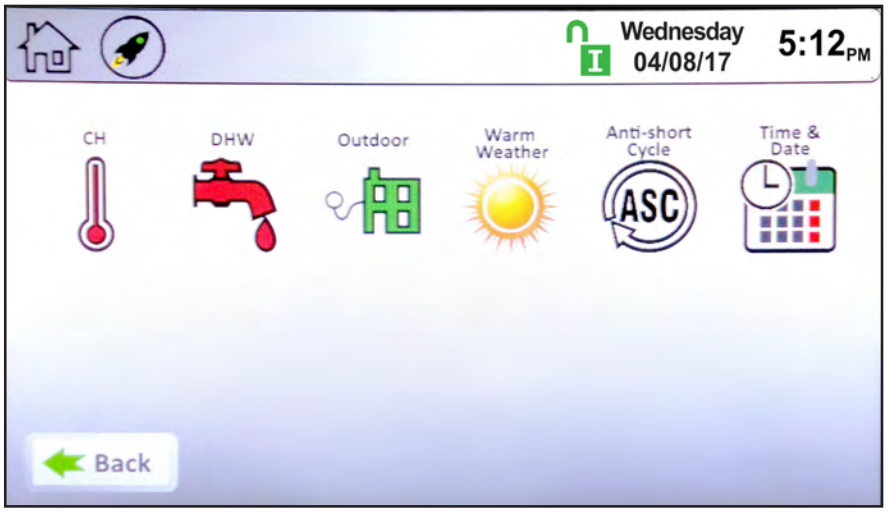
8.C Quick Start

Quick Start will allow a user to configure the basic functionality of the control, without going through all of the parameters that are available.



The 6 basic functionalites are

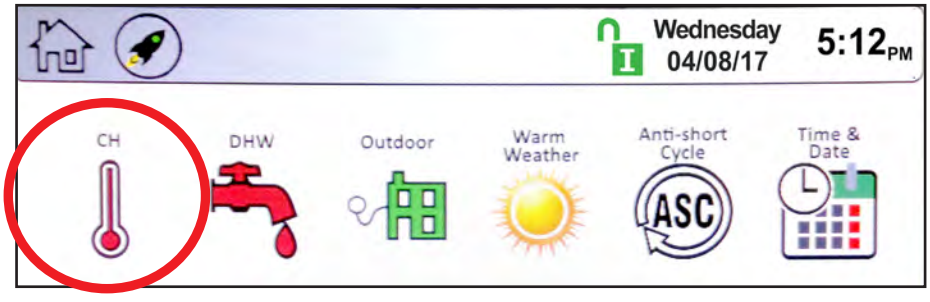
- **Central Heat**
- **Domestic Hot Water**
- **Outdoor Reset**
- **Warm Weather Shutdown**
- **Anti-short Cycle**
- **Time & Date**



8.C.1 CH (Central Heat)

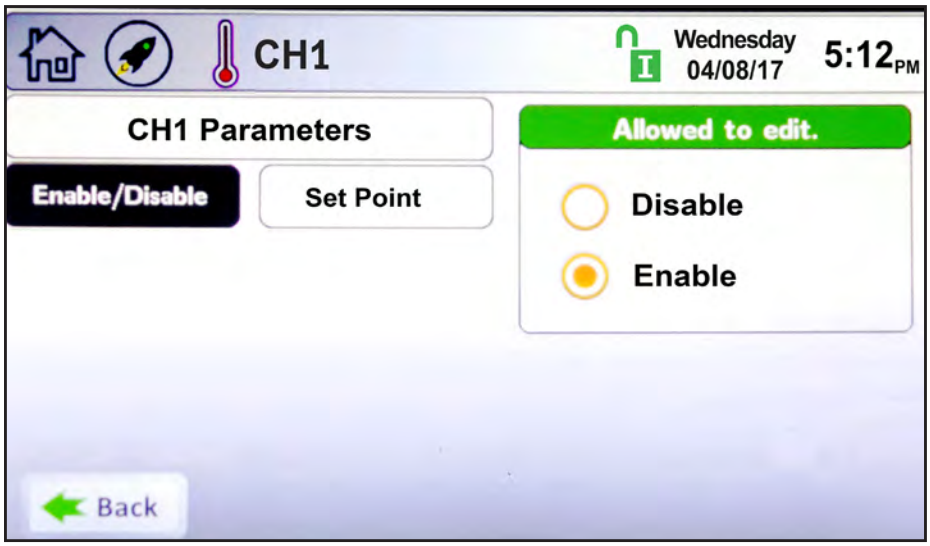
"CH" stands for "central heat." It is used for space heating demands. On the Quick Start Screen, touch the CH thermometer icon to navigate to the CH Selection Screen.
There are two identical heat demands, CH1 and CH2, each with independent control algorithms and independent inputs on the input terminal strip, see "8.D Configuration" on page 61.
Touching CH1 navigates to the CH1 Quick Start Screen.

NOTE: Grey Icons indicate **'Non-Applicable'**



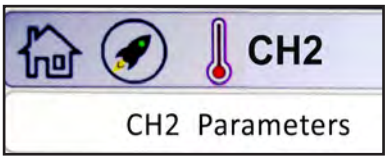
8.C.1.a CH1 (Central Heat, One)

• **Enable/Disable** – This allows CH1 to be enabled/disabled. The default setting is Enabled.
• **Set Point** – This is the set point temperature.



8.C.1.b CH2 (Central Heat, Two)

To navigate to the CH2 Quick Start Screen, touch the CH2 Icon on the CH Quick Start Selection Screen. The CH2 screen will have the same look and functionality as the CH1 Screen.

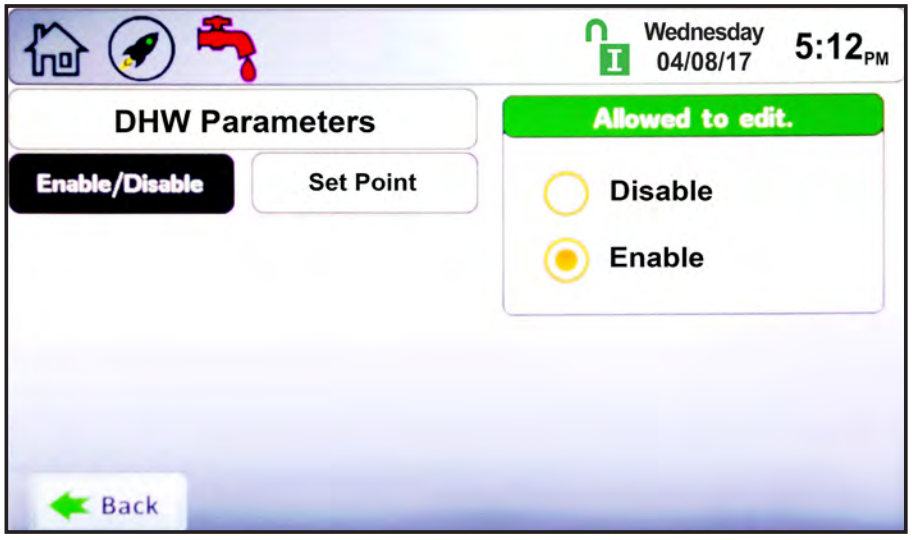


8.C.2 DHW (Domestic Hot Water)

"DHW" stands for "domestic hot water." To navigate to the DHW/DHW3 Quick Start Screen, touch the DHW icon on the Quick Start Screen.

The DHW/DHW3 Quick Start Screen allows adjustment of the following parameters:

• **Enable/Disable** – This allows DHW/DHW3 to be enabled/disabled. The default setting is Enabled.
• **Set Point** – This is the hot water set point temperature.



NOTE: A DHW/DHW3 heat demand can be initiated by an aquastat or sensor , while CH1-2(DHW1-2) are activated by aquastat only.

See Section SECTION 7 on page 34

8.C.3 Outdoor Reset

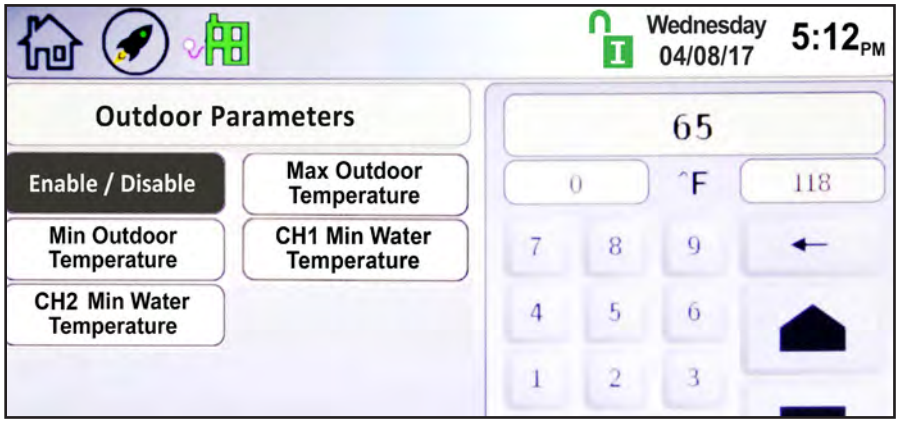
Outdoor reset adjusts a boiler's setpoint based on outdoor air temperature. This is for boilers only, and is not used for domestic water.

To navigate to the Outdoor Quick Start Screen, touch the Outdoor Icon on the Quick Start Screen.

The Outdoor Quick Start Screen allows the adjustment of the following parameters:

- **Enable/Disable** – Enables and disables the outdoor reset functionality.
- **Maximum Outdoor Temperature** – The outdoor temperature at which the unit will use the minimum water temperature as the set point.
- **Minimum Outdoor Temperature** – The outdoor temperature at which the unit will use the maximum water temperature as the set point.
- **CH1 Minimum Water Temperature** – The minimum boiler CH1 outlet temperature based on the Maximum Outdoor Temperature.
- **CH2 Minimum Water Temperature** – The minimum boiler CH2 outlet temperature based on the Maximum Outdoor Temperature.

Also see Outdoor Reset Curve, Figure 28 on page 65

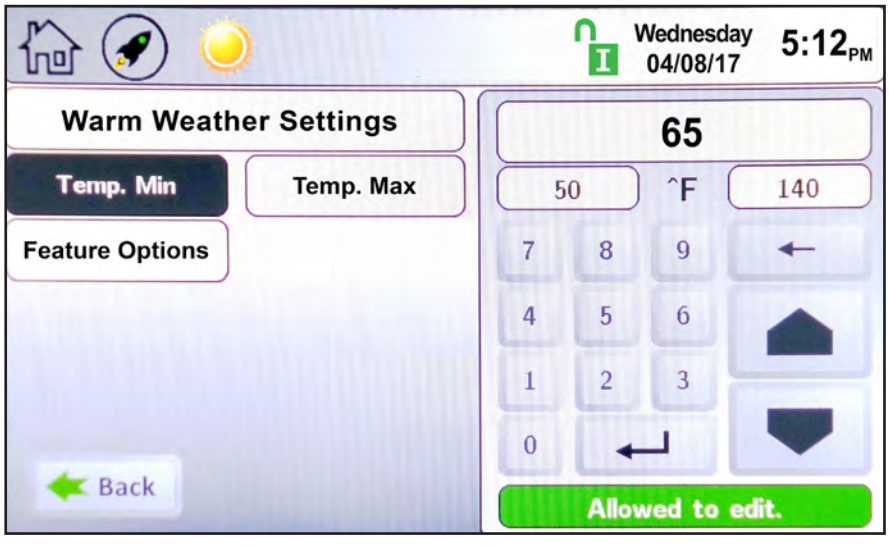


8.C.4 Warm Weather Shut Down

Warm weather shut down allows the user to disable the heating system based on outside air temperature. It is used for boilers only. To navigate to the Warm Weather Quick Start Screen, touch the Warm Weather Icon on the Quick Start Screen.

The Warm Weather Quick Start Screen allows adjustment of the following parameters:

- **Temp Min** – If the unit is in warm weather shutdown mode, it will resume normal operation when the air temperature drops to this value.
- **Temp Max** – The temperature at which the warm weather shutdown condition will occur.
- **Feature Options** – This allows the shutdown to be enabled or disabled. When enabled, and the outside air temperature rises to the shut down (temp max) value, this tells the controller whether to shut down immediately or satisfy the current call for heat before shutting down.



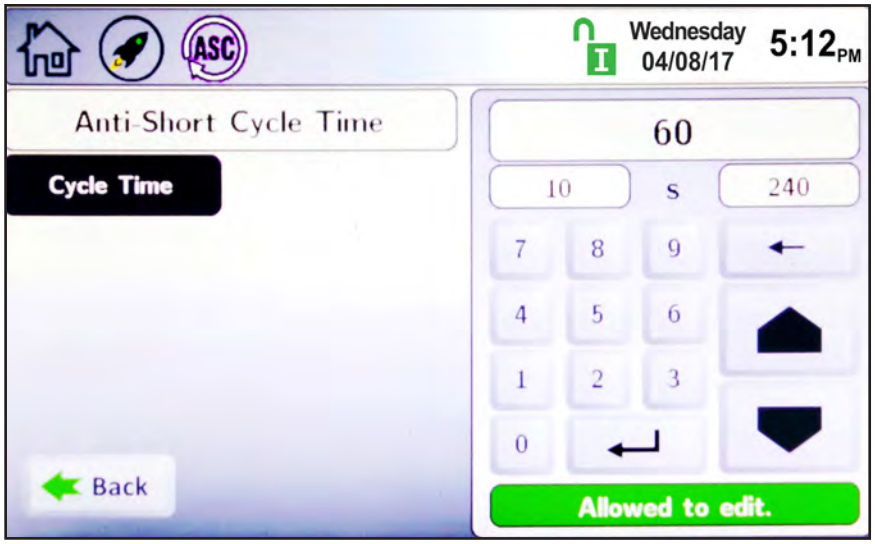
8.C.5 Anti-Short Cycle

To navigate to the Anti-Short Cycle Quick Start Screen, touch the Anti-Short Cycle Icon on the Quick Start Screen.

The Anti-Short Cycle Quick Start Screen allows adjustment of the following parameter:

- **Cycle Time** – The amount of time after a heat demand is satisfied that the unit will wait to satisfy the next active heat demand.

NOTE: Anti-Short Cycle Time does not apply to DHW/DHW3 heat demands.



8.C.6 Time & Date

To navigate to the Time & Date Quick Start Screen, touch the Time & Date area on any screen.

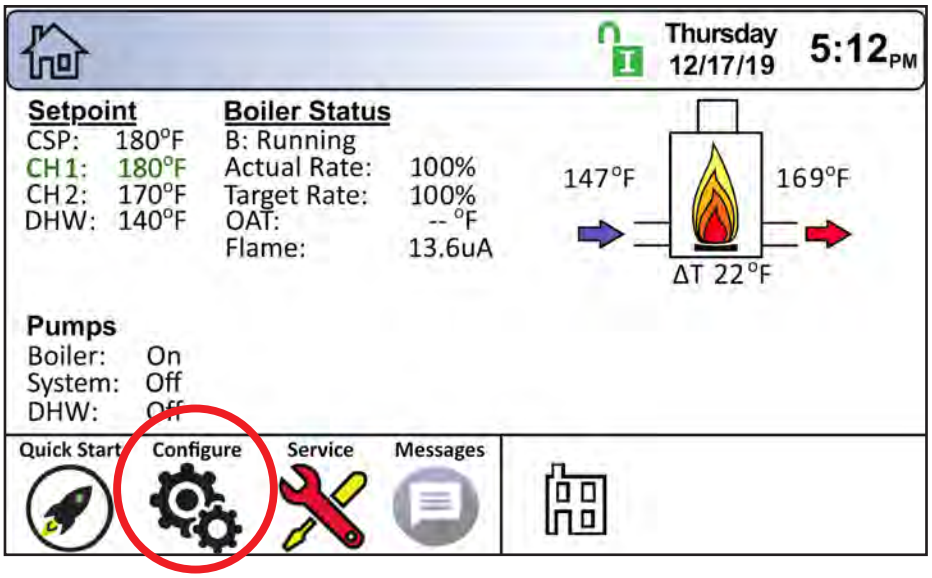
NOTE: The Time is set in a 24 hour parameter, but displays only as a 12 hour clock with the AM / PM automatically added.

The Time & Date Quick Start Screen allows adjustment of the following parameters:

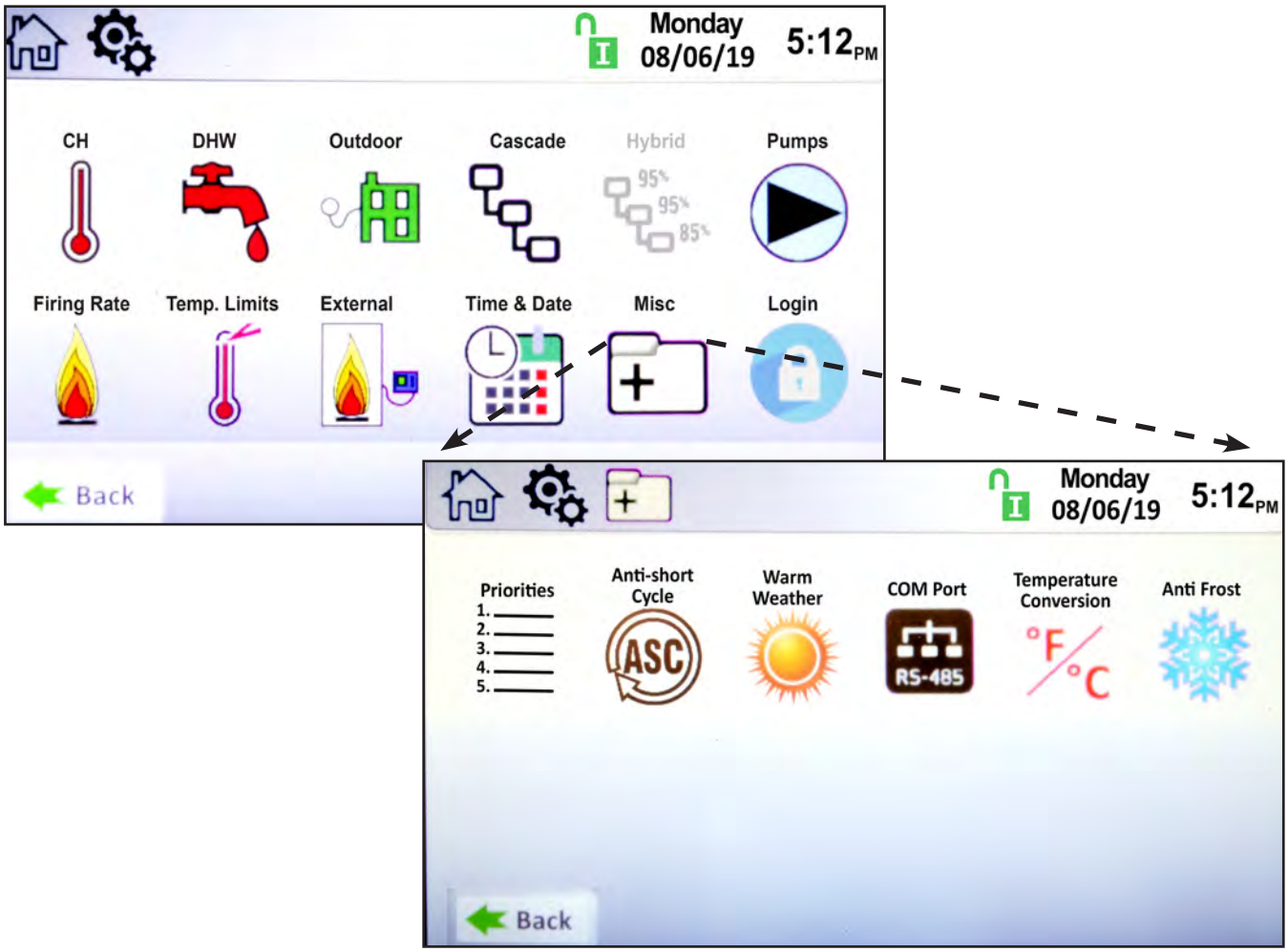
- **Hour**
- **Minute**
- **Month**
- **Day**
- **Year**

8.D Configuration

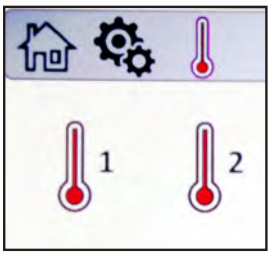
This area of the controller allows access to all parameters available, based on the access level that is unlocked.
To navigate to the Configuration Screen, touch the Configure Icon in the lower left portion of the Home Screen.



The Configuration Screen shows all configurable parameters.



8.D.1 CH (Central Heat)



"CH" stands for "central heat." It is used for space heating demands.
On the Configure Screen, touch the CH thermometer icon to navigate to the CH Selection Screen.

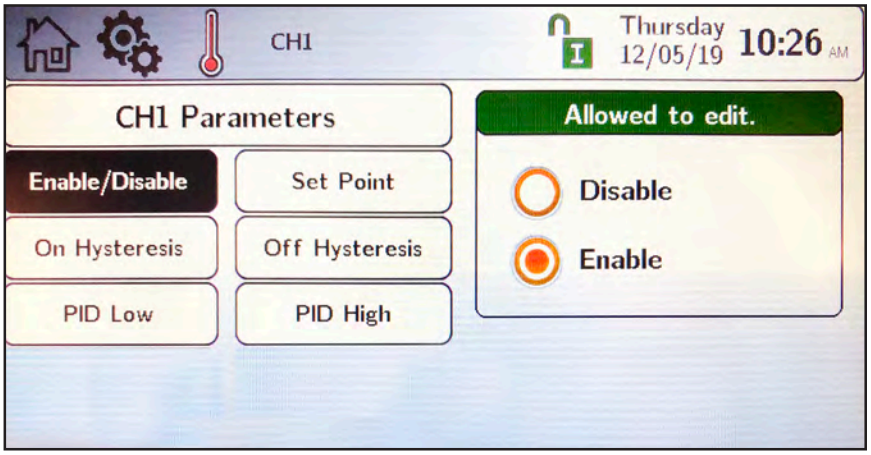
There are two identical heat demands, CH1 and CH2, each with independent control algorithms and independent inputs on the input terminal strip, see SECTION 7.

From the CH Selection Screen, touching CH1 navigates to the CH1.

8.D.1.a CH1 (Central Heat, One)

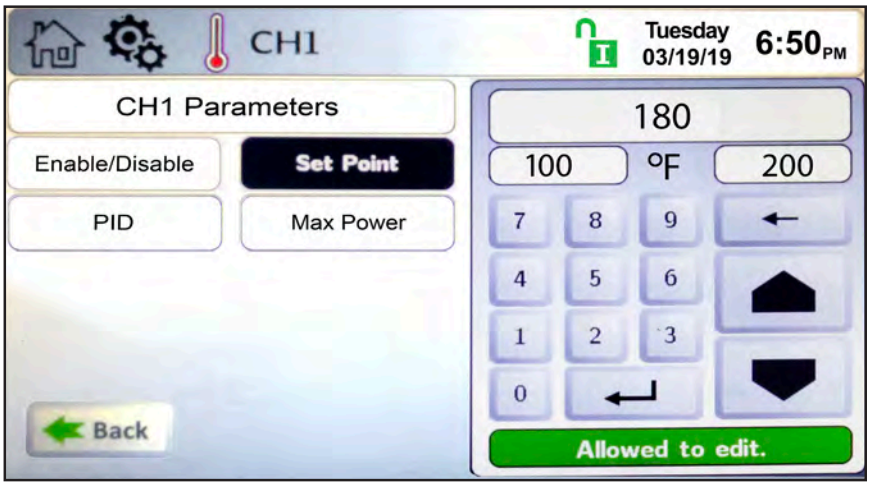
CH1 is one of the heat demands available. The CH1 Configuration Screen allows adjustment of the following parameters:

- **Enable/Disable** - This allows CH1 to be enabled or disabled. The default setting is Enabled.
- **Set Point** - This is the temperature set point for CH1.
- **On Hysteresis** - The temperature at which the hysteresis will turn on.
- **Off Hysteresis** - The temperature at which the hysteresis will turn off.
- **PID Low** - controls the firing rate whenever the temperature is below the set point. Lower values in P and I will reduce overshoot.
- **PID High** - controls the firing rate between the set point and the off Hysteresis. Higher values in P and I will reduce overshoot.



Set Point

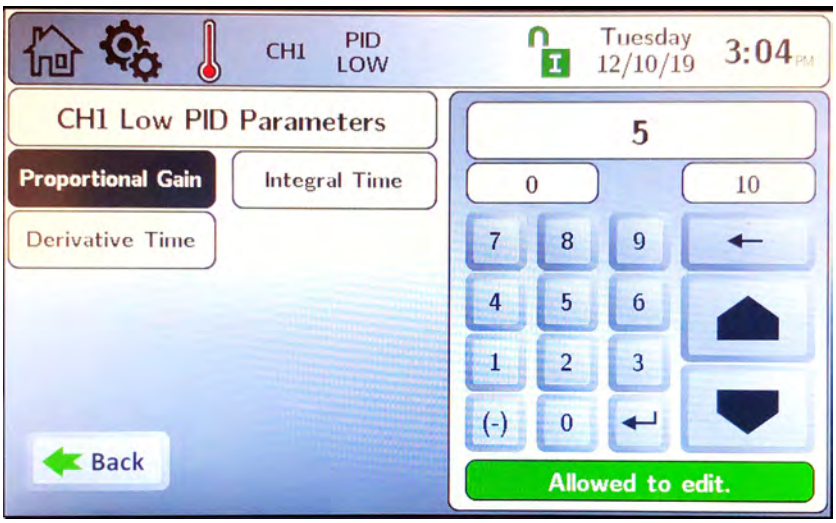
On the Set Point screen, use the keypad on the right or the up/down arrows to enter the desired temperature set point for CH1. Press the "Enter" button to save the setting. Set Point range is 40-210°F, and default is 180°F.



8.D.1.a.1 PID Low

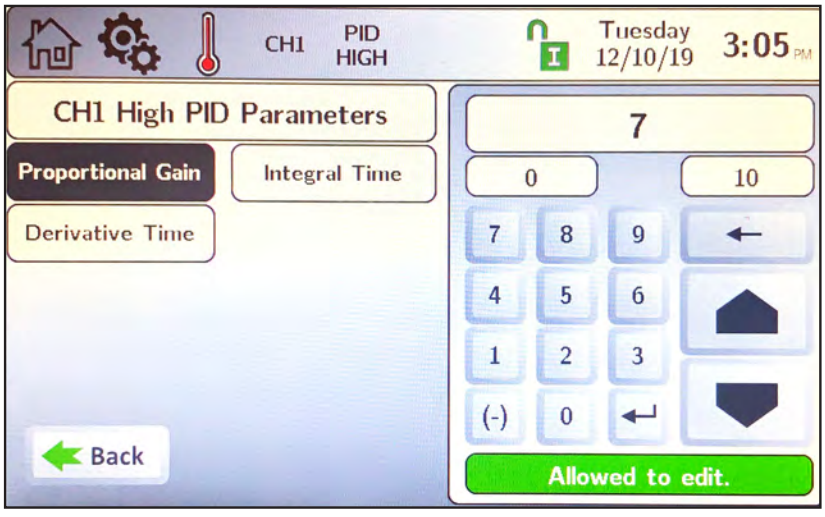
Active below Setpoint.
Note that in most cases, PID parameters will not need to be changed. The PID Parameters Screen allows adjustment to the following parameters:

- **Proportional Gain** – This value is the corrective action that is proportional to the error (set point – control temperature).
- **Integral Time** – This value is applied to the sum of the error over a period of time.
- **Derivative Time** – This value is applied to the rate of change of the error.



8.D.1.a.2 PID High

Active from Setpoint to Off Hysteresis of demand.



8.D.1.b CH2- (Central Heat, Two)

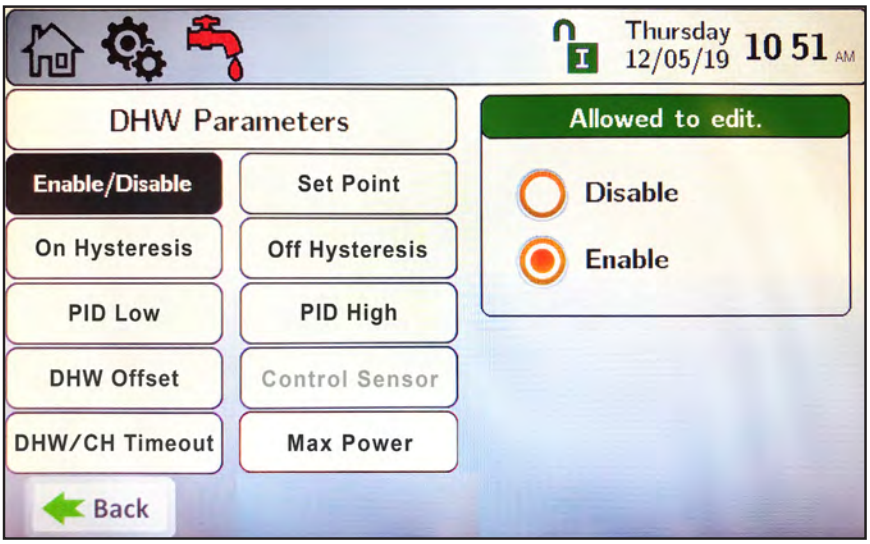
Additional heat demand CH2 is available and is set up in the same manner as CH1.

8.D.2 DHW (Domestic Hot Water)

NOTE: Only a DHW/DHW3 heat demand can be initiated by an aquastat or sensor, see 7.E on page 36.

To navigate to the DHW/DHW3 Screen, touch the DHW faucet icon on the Configure Screen.

DHW/DHW3 has all the same parameters as CH1/DHW1 and CH2/DHW2 with a few exceptions. DHW/DHW3 has the following additional parameters for adjustment:

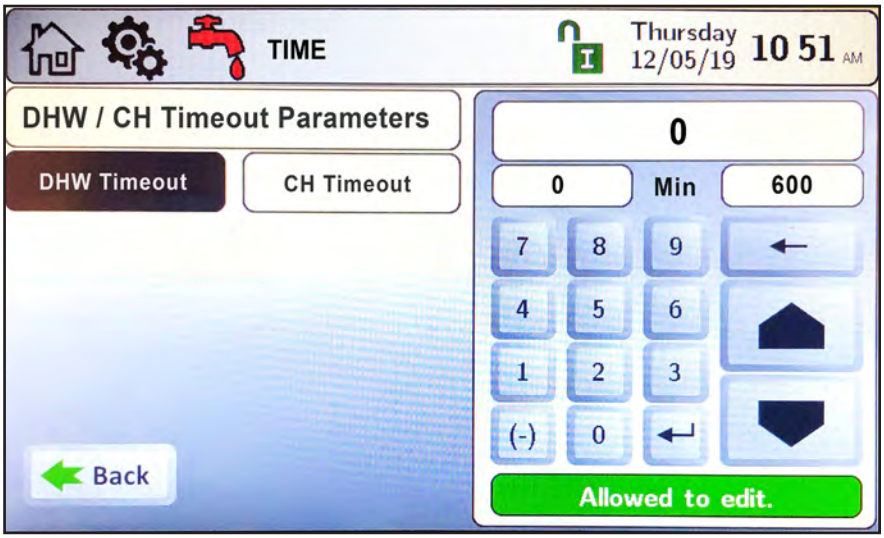


DHW Offset - Upon a DHW heat demand, the unit will control the outlet temperature to the DHW Set Point plus the DHW Offset (set point + DHW Offset).
For example, with a DHW Set Point of 140°F and a DHW Offset of 40°F, the unit will control the boiler/heater outlet temperature to 180°F (140°F + 40°F) to satisfy the heat demand.

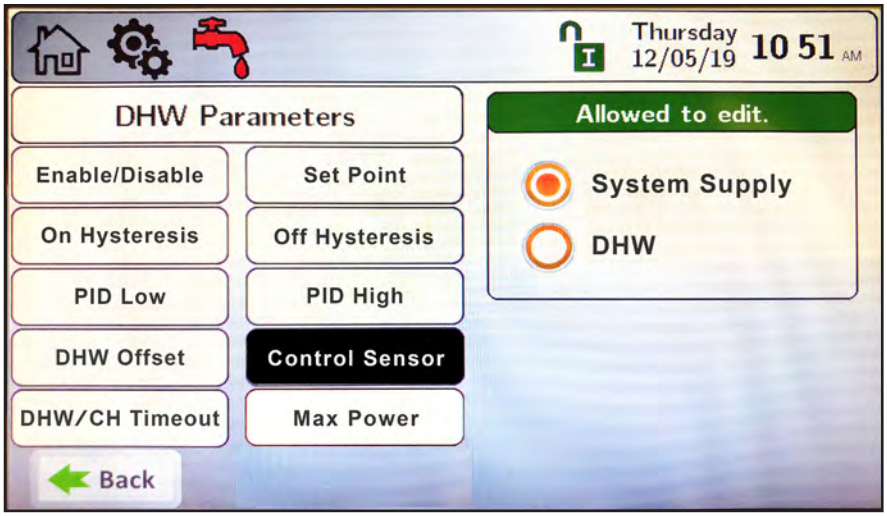
DHW/CH Timeout

DHW Timeout - When there is both a DHW and CH heat demand, DHW Timeout is the amount of time the boiler will satisfy the higher priority DHW heat demand before timing out and swapping over to the CH heat demand. A DHW Timeout value of 0 means this feature is disabled.

CH Timeout - When there is both a CH and DHW heat demand, the CH Timeout is the amount of time the boiler will satisfy the CH heat demand before swapping over to the DHW heat demand.



NOTE: If DHW has a higher priority than CH, and only CH Timeout has a non-zero value, the DHW heat demand will always be satisfied before swapping over to CH. In order to use CH Timeout, DHW Timeout must be a non-zero value.



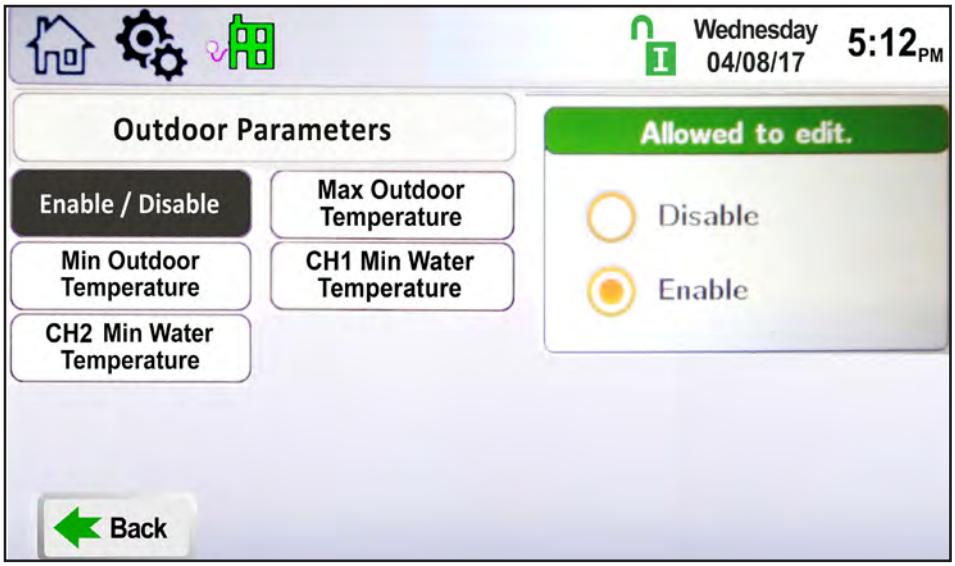
Control Sensor - This button is only selectable if the boiler is configured as the lead boiler in a cascade configuration. If configured as the lead boiler, this button allows the installer to select if a DHW heat demand applied at the lead boiler will control to the system sensor or the DHW sensor.

8.D.3 Outdoor Reset

Outdoor reset adjusts a boiler's setpoint based on outdoor air temperature. This is for boilers only, and is not used for domestic water. The Outdoor Parameters Screen allows the adjustment of the following parameters:

- **Enable/Disable** – Enables and disables the outdoor reset functionality.
- **Maximum Outdoor Temperature** – The outdoor temperature at which the unit will use the minimum water temperature as the set point.
- **Minimum Outdoor Temperature** – The outdoor temperature at which the unit will use the maximum water temperature as the set point.
- **CH1 Minimum Water Temperature** – The minimum CH1 boiler outlet temperature based on the Maximum Outdoor Temperature.
- **CH2 Minimum Water Temperature** – The minimum CH2 boiler outlet temperature based on the Maximum Outdoor Temperature.

When there is an active outdoor reset condition, the set point will be a calculated value (CSP) based on the outdoor reset settings. The example in Figure 27 and Figure 28, shows that the Outdoor Air Temperature is 42°F. Based on this, and without a call for DHW, the set point (CSP) is 160°F. As the outdoor air temperature increases, the CSP decreases.



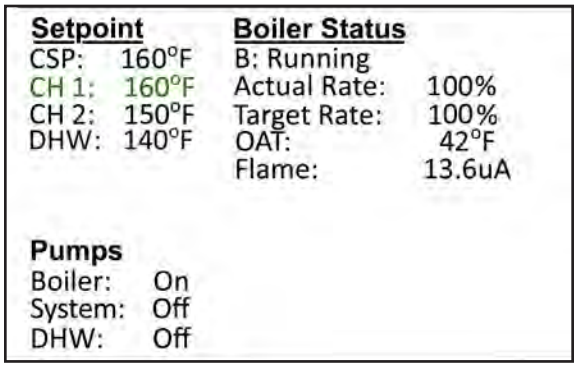


Figure 27. Status Window, Outdoor Reset Example

CH1 and CH2 use the set points on the Parameter screen as the "Max Hot Water Temp" allowing two distinct curves based on the demand in use.

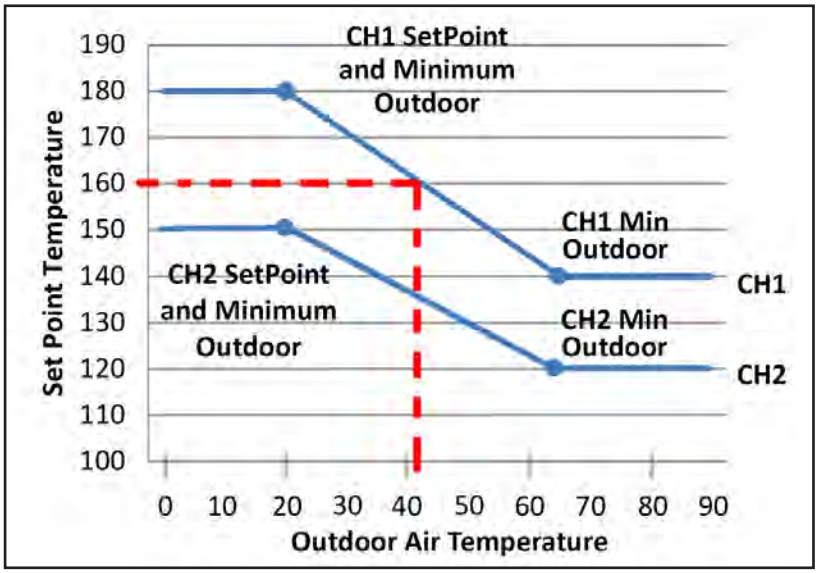


Figure 28. Outdoor Reset Example

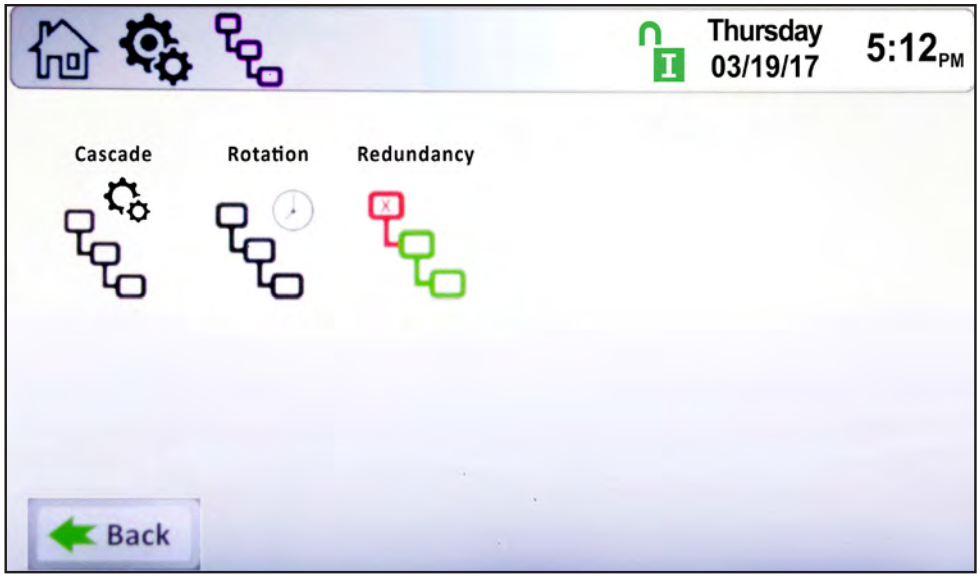
8.D.4 Cascade

An installation with two or more units may be configured for cascade operation. Up to eight units can be cascaded and controlled together.

To navigate to the Cascade Screen, touch the Cascade Icon on the Configuration Screen.

The Cascade Screen provides four navigation icons to configure the system for cascade operations. These navigation icons are:

- **Cascade** – This icon navigates to the Cascade Parameters screen.
- **Rotation** – This icon navigates to the cascade rotation screen.
- **Redundancy** – This icon navigates to the setup screen for cascade leader redundancy options.



NOTE: Cascading Category I & III unit's is possible only with other Category I & III of the same manufacture and using the same control system.

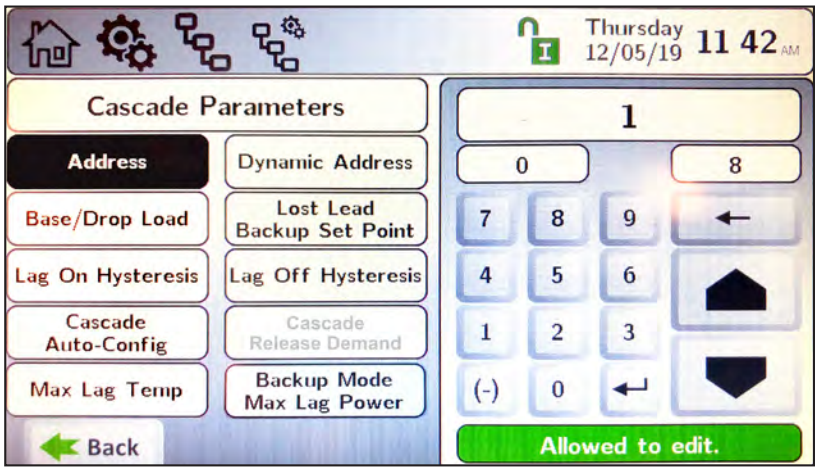
.

8.D.4.a Cascade Parameters

To navigate to the Cascade Parameters Screen, touch the Cascade Icon on the Configuration Screen, then touch the Cascade Parameters Icon.

The Cascade Parameters Screen allows adjustment of the following parameters:

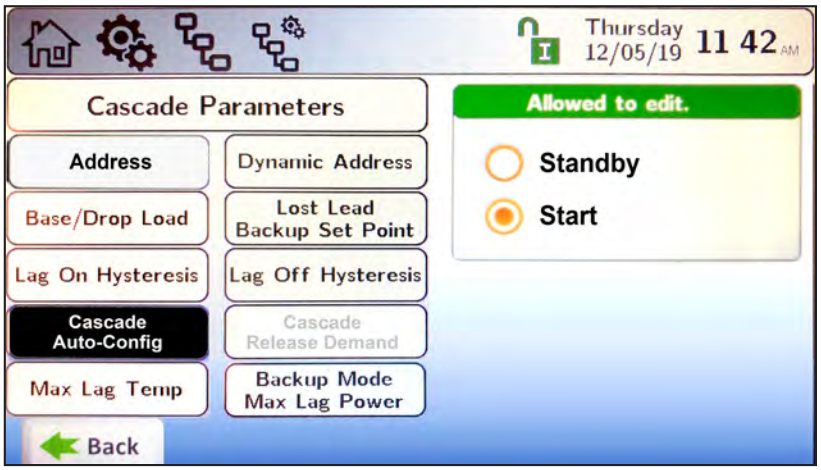
- **Address** – When manually addressing each boiler/heater for cascade operations, this parameter is used to set the local boiler/heater address. Each boiler/heater must have a unique address. A boiler/heater with a value of 1 is the lead boiler/heater. Lag boilers/heaters use values 2 through 8. When automatically addressing each boiler/heater, set the lead boiler/heater to a value of 1. With a value of 1, the Cascade Auto-Config button is available to use, refer to this parameter below for instructions for automatic addressing the lag boilers/heaters.
- **Dynamic Address** – This reflects the address of the local boiler/heater after it has been manually or automatically addressed. After a boiler/heater has been manually/automatically addressed, setting this parameter to 0 will remove the boiler/heater from cascade operations.
- **Base / Drop Load** – This button will get you to the Base / Drop Load screen which allows you to manually enter the base firing percentage of the next cascading boiler as well as the firing point at which this boiler will drop the remaining load to the next cascaded boiler.
- **Lost Lead Backup Setpoint** – When configured for Cascade Redundancy - Boiler Internal Set Point, this parameter is the maximum outlet temperature the local boiler/heater is allowed to supply the system.
- **Lag On Hysteresis** - The value below the Max Lag Temp (Max Lag Temp – Lag On Hysteresis) that the boiler/heater will turn on to satisfy an active cascade demand based on the local boiler/heater outlet water temperature. Max Lag Temp is set at the Lead boiler/heater.
- **Lag Off Hysteresis** - The value above the Max Lag Temp (Max Lag Temp + Lag Off Hysteresis) that the boiler/heater will turn off when satisfying an active cascade heat demand based on the local boiler/heater outlet water temperature. Max Lag Temp is set at the Lead boiler/heater.
- **Cascade Auto-Config** – Once configured as the lead boiler / heater, you can initiate automatic addressing by pressing the 'Start' option. This is only adjustable at the lead boiler/heater. Once configured as the lead boiler/heater, pressing this button will initiate the lead boiler/heater to find and address all lag boilers automatically.
- **Cascade Release Demand -** When communications with the master is lost and the lag units continue to satisfy the cascade heat demand, pressing this button will remove the heat demand.



NOTE: This only applies when configured for cascade - Boiler Internal Set Point Control.
See Section 8.D.4.c on page 69

- **Max Lag Temp** – The maximum outlet temperature a lag unit is allowed to supply the system.
- **Backup Mode Max Lag Power** – The maximum firing rate cascaded boilers will run at if the system sensor is lost on the master.

NOTE: All boilers/heaters must be wired for cascade operations prior to performing Cascade Auto-Config.



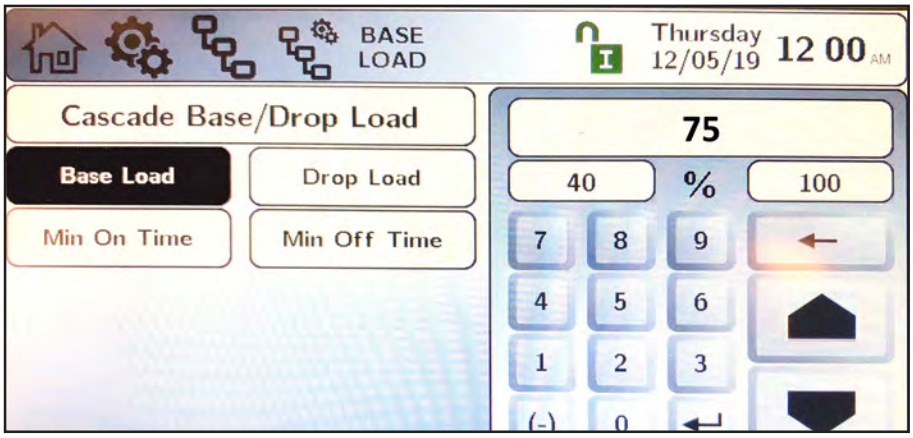
8.D.4.a.1 Base / Drop Load

Base Load – Is the firing rate that must be achieved prior to adding another unit to satisfy the heat demand.

Drop Load – As the demand for heat decreases, this is the firing rate that units turn off. The last unit to fire is the first to get turned off.

Min On Time – As the demand for heat increases, this is the delay time prior to firing additional units.

Min Off Time – As the demand for heat decreases, this is the delay time prior to turning off additional units.



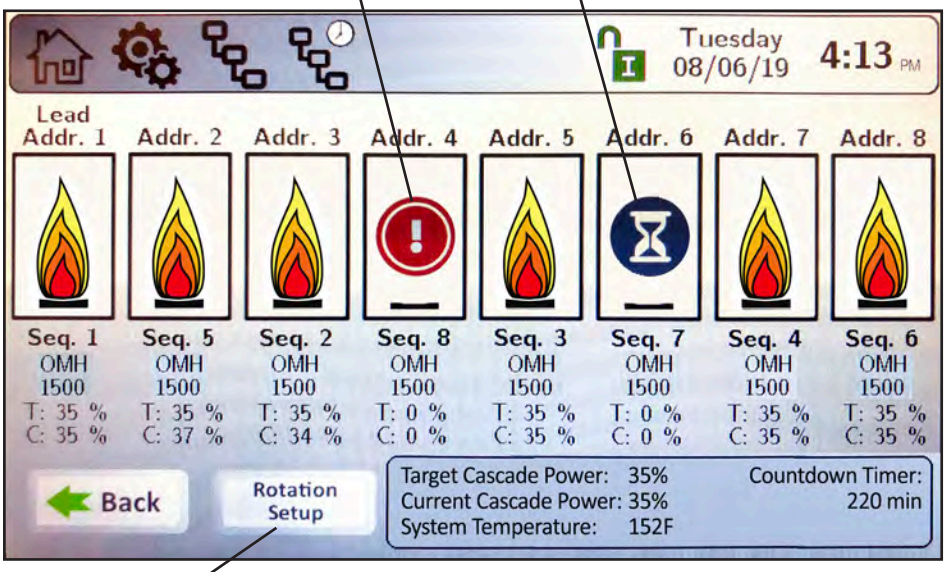
8.D.4.b Rotation

To navigate to the Cascade Rotation Screen, touch the Cascade Icon on the Configure Screen, then touch the Rotation Icon on the Cascade Configuration Screen.

The Cascade Rotation Screen is a view only screen. This screen indicates how many units are connected in a cascade configuration, the order in which each unit will run, and the percent at which each unit is running.

The red circle with the exclamation mark means that that boiler is locked out and will need to be manually reset to return to operations.

The blue circle means that that boiler has a soft or auto-reset condition and the lead boiler has placed it later in the queue to attempt to re-fire.

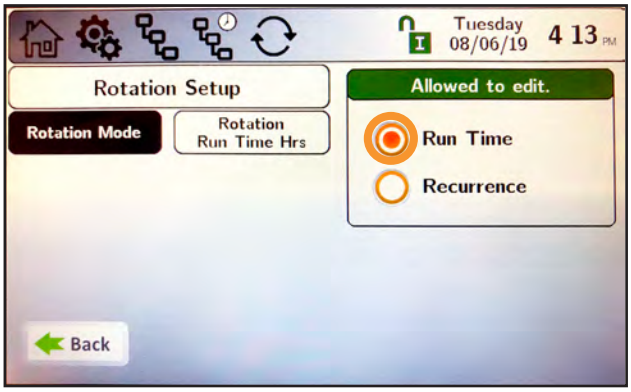


The Rotation Setup button is found only on the boiler that is assigned as 'Lead' and appears only when the lead boiler is in the Installer Mode.

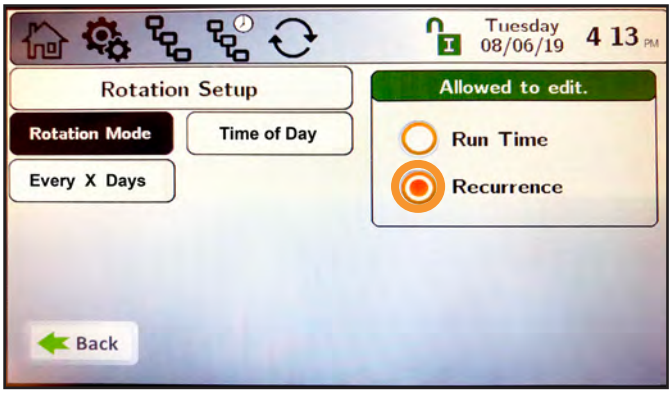
8.D.4.b.1 Rotation Setup

There are two options for cascade Rotation Setup, Rotation 'Mode':

1. **Run Time**
2. **Recurrence**



In the **Run Time** Mode, you can adjust only the Rotation Run Time Hours. This chooses which unit will fire first based on run time hours.



For **Recurrence** Mode, there are two parameters:

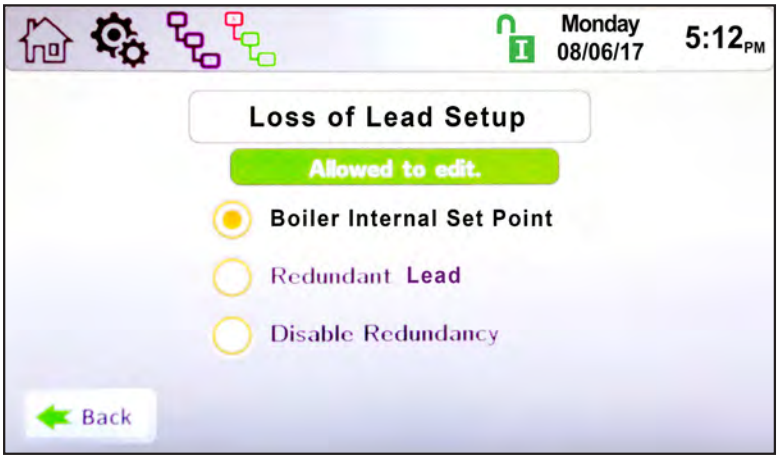
1. **Time of Day.** You can adjust the hour and minute of the day for rotation.
2. **Every X Days**. You can select how many days you want to wait until rotation, and then it will rotate at the hour and minute of the day previously selected.

8.D.4.c Redundancy

To navigate to the Cascade Redundancy Screen, touch the Cascade Icon on the Configuration Screen, then touch the Redundancy Icon on the Cascade Configuration Screen.

The Cascade Redundancy Screen allows the selection of one of three options for redundancy in cascade systems. These options are:

- **Boiler Internal Set Point** – In a cascade configuration, upon loss of communication with the lead unit, the lag units will all ignite, controlling to the 'Lost Lead Backup Set Point' without an external call for heat. This mode of operation will continue until communication with the lead unit is restored or until this mode is turned off by pressing the 'Release Demand' button on the Cascade Parameters screen.
- **Redundant Lead** – In a cascade configuration, upon loss of communication with the lead unit, a second unit will assume lead responsibilities. This requires the 2nd lead to have a manual address of 2 and a 2nd system sensor installed at that unit.
- **Disable Redundancy** – In a cascade configuration, upon loss of communication with the lead unit, lag units will no longer satisfy the cascade heat demand.



NOTE: The redundant lead unit should have a system sensor and be connected to the system pump (if / where applicable). If the lead boiler maintains communication with the lag units, but loses connectivity with the system sensor, the cascaded units will run at the calculated set point (CSP) provided by the lead unit, but will control to their individual outlet sensor. In this mode, the temperature can be limited using the Backup Mode Max Lag Power parameter.

8.D.5 Hybrid

8.D.6 Pumps

The Pump Configuration Screen allows adjustment of the following 7 parameters:

- **Boiler Pump Control –** This parameter provides the ability to set the boiler pump functionality to be:
  Auto – the pump will turn on automatically upon a call for heat.
  Always On – the pump will run continuously.
  Off During DHW – the pump will not turn on during a DHW heat demand.
  Auto/Off When Temp. Lim. Reach - When the system temperature limit is reached, the pump will turn off.

- **Boiler Pump Post Circulation –** This parameter is the amount of time the boiler/heater pump will continue to run after a heat demand has been satisfied or after a lock-out condition has occurred.

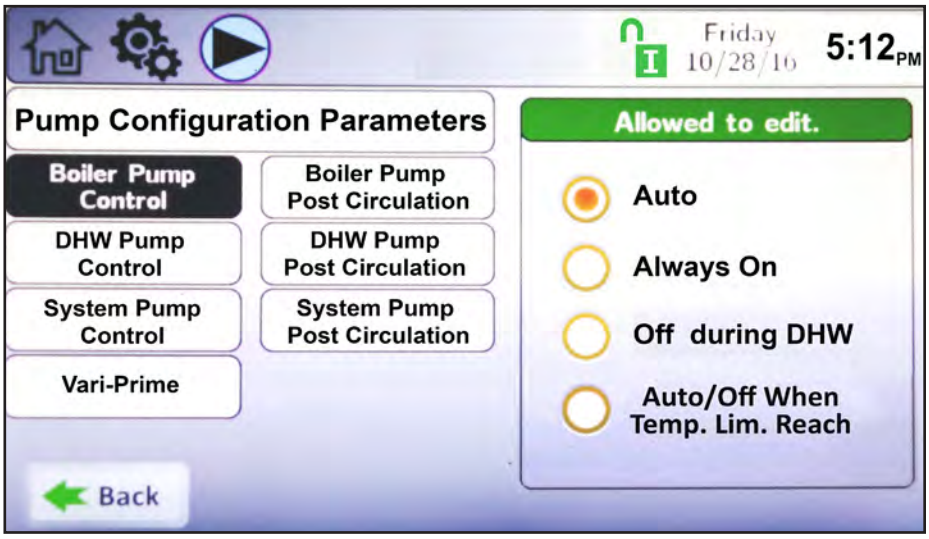
- **DHW Pump Control –** This parameter provides the ability to set the DHW pump functionality to be:
  Auto – the pump will turn on automatically upon a call for heat.
  Always On – the pump will run continuously.
  Disable – the pump will not turn on upon a DHW heat demand.

- **DHW Pump Post Circulation –** This parameter is the amount of time the DHW pump will continue to run after a heat demand has been satisfied or after a lock-out condition has occurred.

- **System Pump Control** – This parameter provides the ability to set the system pump functionality to be:
  Auto – the pump will turn on automatically upon a call for heat.
  Always On – the pump will run continuously, with or without a heat demand.
  Off During DHW – the pump will not turn on during a DHW heat demand.
  Disable – the pump will not turn on during a call for heat.

- **System Pump Post Circulation** – This parameter is the amount of time the System pump will continue to run after a heat demand has been satisfied or after a lock-out condition has occurred.

- **Vari-Prime -** Select Vari-Prime to get to the controls of the variable speed pump.

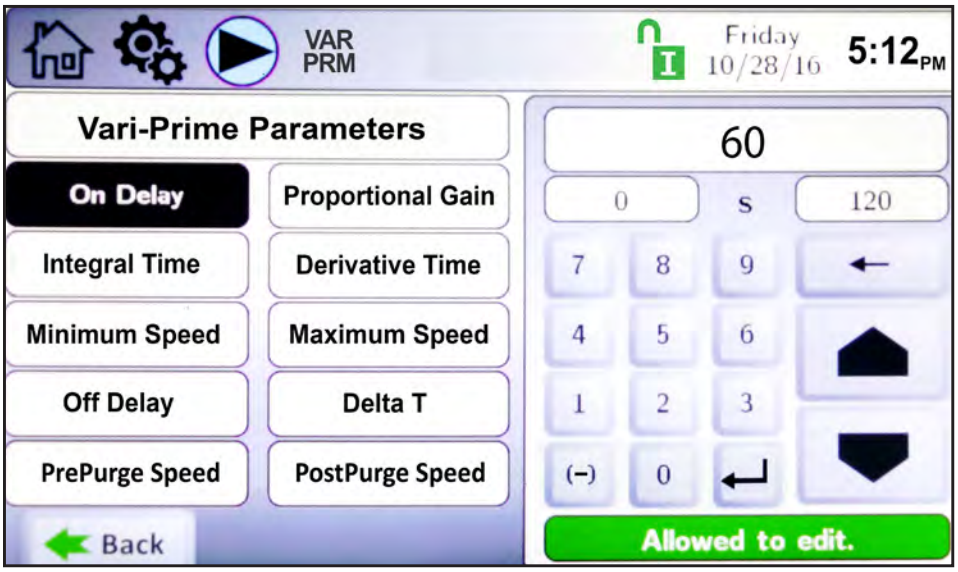


8.D.6.a Vari-Prime

Vari-Prime is the variable speed pump control and the Vari-Prime Screen allows the adjustment of the following parameters:

The Vari-Prime Parameters Screen allows the adjustment of the following parameters:

- **On Delay** – Upon a call for heat, once the unit ignites, this is the amount of time the unit will wait prior to modulating the pump speed.
- **Proportional Gain** – This value is the corrective action that is proportional to the error (Set Point – Control Temperature).
- **Integral Time** – This value is applied to the sum of the error over a period of time.
- **Derivative Time** – This value is applied to the rate of change of the error.
- **Minimum Speed** – This is the minimum speed to which Vari-Prime will control the pump.
- **Maximum Speed** – The is the maximum speed to which the Vari-Prime will control the pump.
- **Off Delay** – Once the heat demand is satisfied, Vari-Prime will control to the maximum pump speed until the Off Delay time expires.
- **Delta T** – Vari-Prime will control the pump to maintain this delta T (temperature rise) across the unit.
- **PrePurge Speed -** When using Vari-Prime, when there is an active heat demand but the burner is not yet lit, this parameter allows the adjustment of pump speed during this time.
- **PostPurge Speed** - When using Vari-Prime, when the boiler goes into post purge, this parameter allows the adjustment of pump speed during this time.



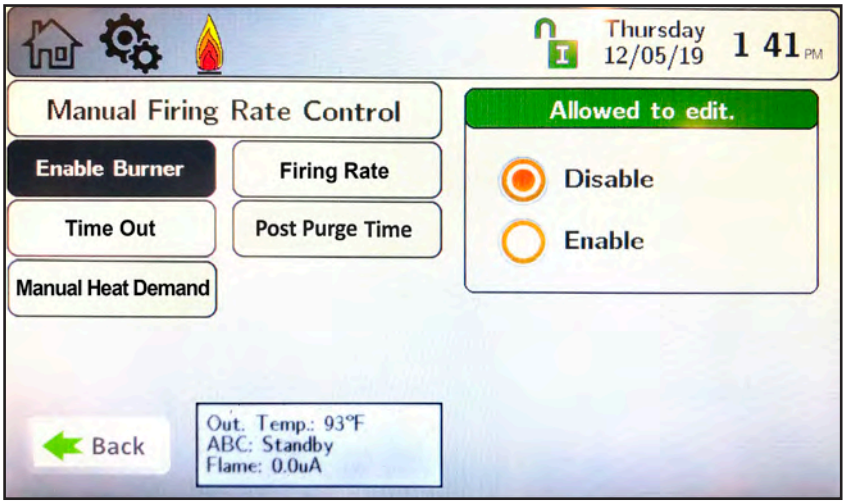
NOTE: Vari-Prime applies only to boilers

8.D.7 Manual Firing Rate

To navigate to the Manual Firing Rate Screen, touch the Manual Firing Rate Icon on the Configuration Screen.

The Manual Firing Rate Control Screen allows the adjustment of the following parameters:

- **Enable/Disable** – Enables and disables the manual firing rate functionality.
- **Firing Rate** – With the manual firing rate functionality enabled, an operator can manually set the firing rate. This functionality is used for combustion adjustment purposes. With the manual firing rate functionality enabled, and the desired fan speed set, apply a heat demand using the 'Manual Heat Demand' button on this screen and the boiler/heater will step through the ignition process and run at the set fan speed.
- **Time Out** – Is the setable amount of time that the operator has to adjust the Manual Firing Rate before the control will go back to automatic. It's a walkaway timer and safety feature.
- **Post Purge Time** - Adjust the amount of time the blower continues to run after a heat demand has been satisfied.
- **Manual Heat Demand** - The 'Manual Heat Demand' button allows an installer to initiate a digital heat demand, eliminating the need for a physical heat demand. This digital heat demand is treated as a local heat demand only. This means that, in a cascade system, if the digital heat demand is applied at the lead boiler, the lead boiler will treat the digital heat demand as a local only heat demand.

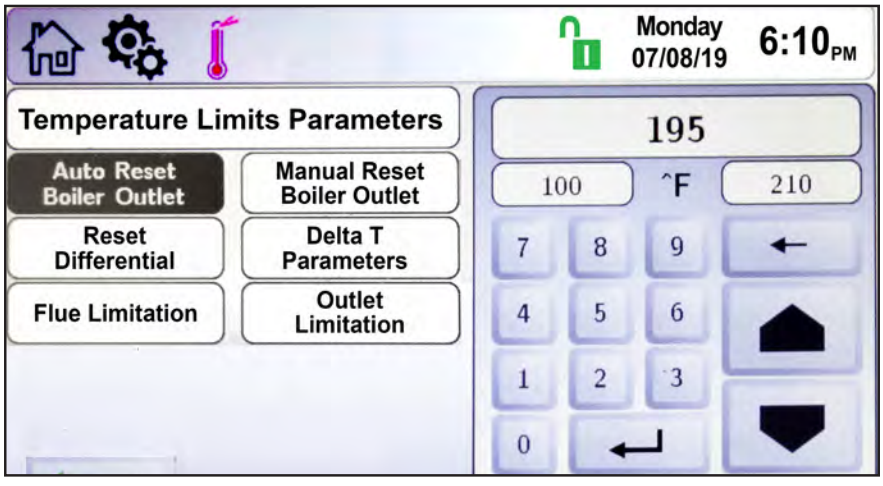


8.D.8 Temp Limits

To navigate to the Temp Limits Screen, touch the Temp Limits Icon on the Configuration Screen.

The Temp Limits Configuration Screen allows adjustment of the following parameters:

- **Auto Reset CH–** The temperature at which the unit will shut down when outlet temperature exceeds its maximum auto reset set point. The control will automatically reset, based on the reset differential.
- **Manual Reset CH –** The temperature at which the unit will shut down when outlet temperature exceeds its maximum manual reset set point. The control will require manual reset in this condition.
- **Reset Differential –** The value below the Auto Reset temperature at which the unit will automatically reset itself and resume functionality.
- **Delta T Parameters–** The MIN and MAX Temperature between which your system will fire.
- **Flue Limitation –** Sets the flue temp limitations.
- **Outlet Limitation Parameters –** Allows for the adjustment of Min and Max Outlet Temps.

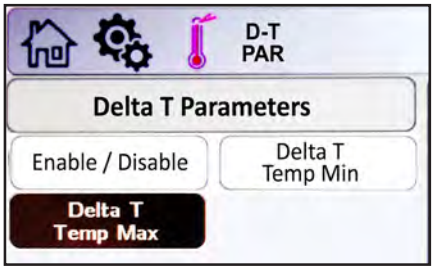


8.D.8.a Delta T Parameters

To navigate to the Delta T Parameters Screen, touch the Temp Limits Icon on the Configuration Screen, then touch the Delta T Parameters button on the Temperature Limits Parameters Screen.

The Delta T Parameters Screen allows adjustment of the following parameters:

- **Enable/Disable** – Enables/disables the Delta T temperature functionality.
- **Delta T Temp Max** – The Delta T temperature at which the boiler/heater will shut down due to a high Delta T temperature condition.
- **Delta T Temp Min** – Not adjustable on CAT I / III

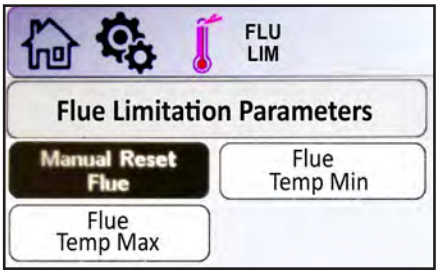


8.D.8.b Flue Limitation Parameters

To navigate to the Flue Limitation Parameters Screen, touch the Temp Limits Icon on the Configuration Screen, then touch the Flue Limitation button on the Temperature Limits Parameters Screen.

The Flue Limitation Parameters Screen allows adjustment of the following parameters:

- **Manual Reset Flue** – The temperature at which the unit will shut down due to exceeding a flue temperature manual reset condition.
- **Flue Temp MIN** – The flue temperature at which the unit will begin to de-rate, in an attempt to prevent a manual reset high flue temperature condition.
- **Flue Temp Max** – The flue temperature at which the unit will run at minimum firing rate conditions.

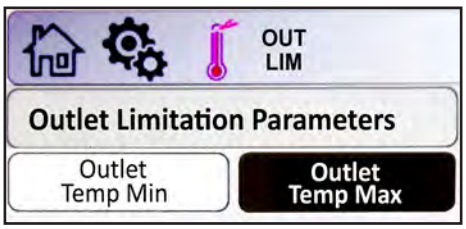


8.D.8.c Outlet Limitation Parameters

To navigate to the Outlet Limitation Parameters Screen, touch the Temp Limits Icon on the Configuration Screen, then touch the Outlet Limitation button on the Temperature Limits Parameters Screen.

The Outlet Limitation Parameters Screen allows adjustment of the following parameters:

- **Outlet Temp Min** – Not applicable to CAT I / III.
- **Outlet Temp Max** – The outlet temperature at which the boiler/heater will shut down on a manual reset high temperature outlet condition.



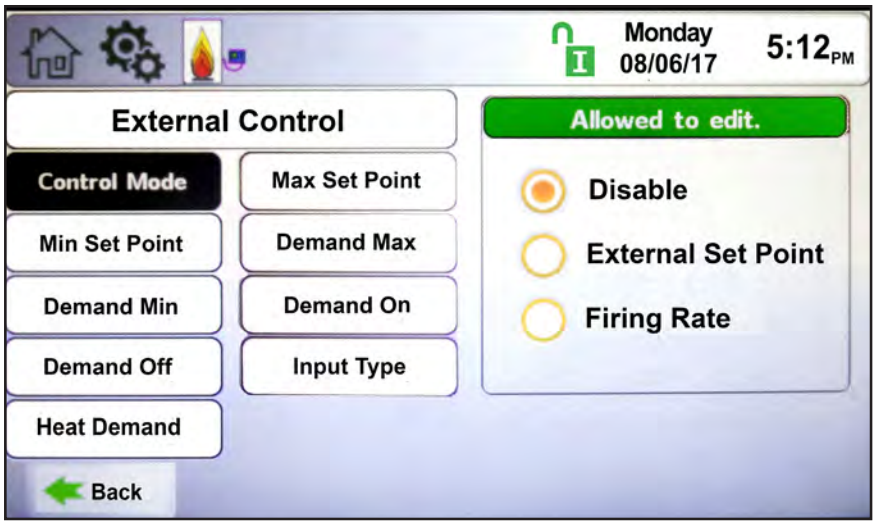
8.D.9 External

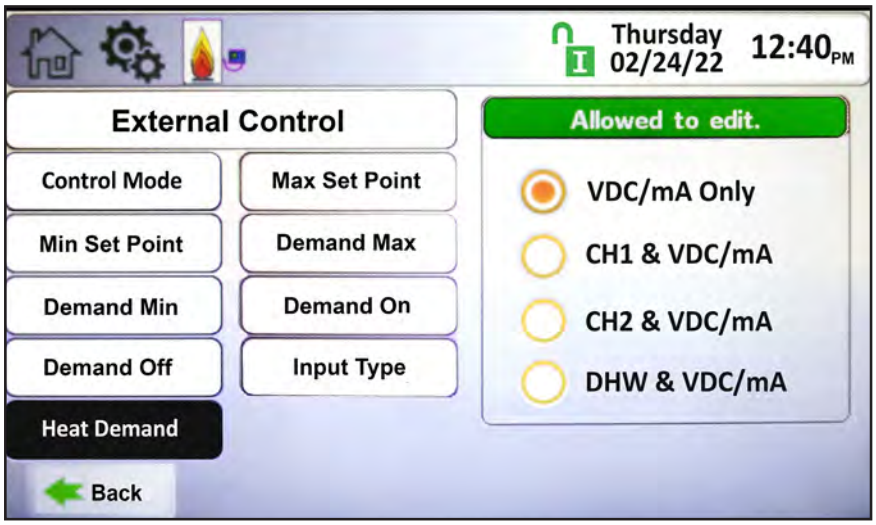
The External Configuration Screen applies to the 0-10VDC (4-20mA) analog input BAS signal, and allows adjustment of the following parameters:

To navigate to the External Configuration Screen, touch the External Icon on the Configuration Screen.

- **Control Mode –** This parameter provides the ability to either disable external control or configure the unit for Boiler Set Point or Firing Rate control mode.
- **Max Set Point –** When the Control Mode is set to Boiler Set Point, this is the maximum value that corresponds to the Demand Max value.
- **Min Set Point –** When the Control Mode is set to Boiler Set Point, this is the minimum value that corresponds to the Demand Min value.
- **Demand Max –** This is the maximum value that corresponds to the control mode selected. With Firing Rate control mode selected, this is the maximum rate at which the boiler/heater will run. The unit of this parameter is %, so if the value of this parameter is 10000, or 100.00%, this equates to 10.0VDC or 20mA.
- **Demand Min –** This is the minimum value that corresponds to the control mode selected. With Firing Rate control mode selected, this is the minimum rate at which the boiler/heater will run. The unit of this parameter is %, so if the value of this parameter is 2000, or 20.00%, this equates to 2.0VDC or 4.8mA.
- **Demand On –** This is the threshold (VDC/mA) at which the input signal will initiate the selected control mode behavior. The unit of this parameter is %, so if the value of this parameter is 1500, or 15.00%, this equates to 1.5VDC or 4.6mA.
- **Demand Off –** This is the threshold (VDC/mA) at which the input signal will deactivate the selected control mode behavior. The unit of this parameter is %, so if the value of this parameter is 1000, or 10.00%, this equates to 1.0VDC or 4.4mA.
- **Input Type –** This parameter allows the user to select between voltage (0-10VDC) or current (4-20mA) input. Jumpers will need to be configured accordingly.
- **Heat Demand -** Allows an installer to use the VDC/mA signal as the heat demand signal as well as the external firing rate/set point signal OR to use an external heat demand (CH1/DHW1, CH2/DHW2, DHW/DHW3) as the heat demand while the VDC/mA only provides the external firing rate/set point signal.

NOTE: If an external heat demand option is chosen, the 'Demand On' and 'Demand Off' buttons will be grayed out.





8.D.9.a External – Remote Set Point.

External (0 – 10VDC or 4 – 20mA)

- An External heat demand can be initiated by a Building Management System (BMS) using a 0-10VDC or 4-20mA signal. This input can be configured for Remote Set Point or Remote Firing Rate operations.
- With Remote Set Point selected, the unit will initiate a heat demand once the analog input signal exceeds the Demand On value. Once the demand is initiated, the analog input signal must be lower than Demand Off to remove the heat demand. With an active demand, the unit will locate the set point according to the analog input signal.
- Using the default values for Boiler Max Set Point (180°F), Boiler Min Set Point (140°F), Demand Minimum (2.5VDC), Demand Maximum (10.0VDC), the unit will linearize the set point, as shown in **Figure 29**.

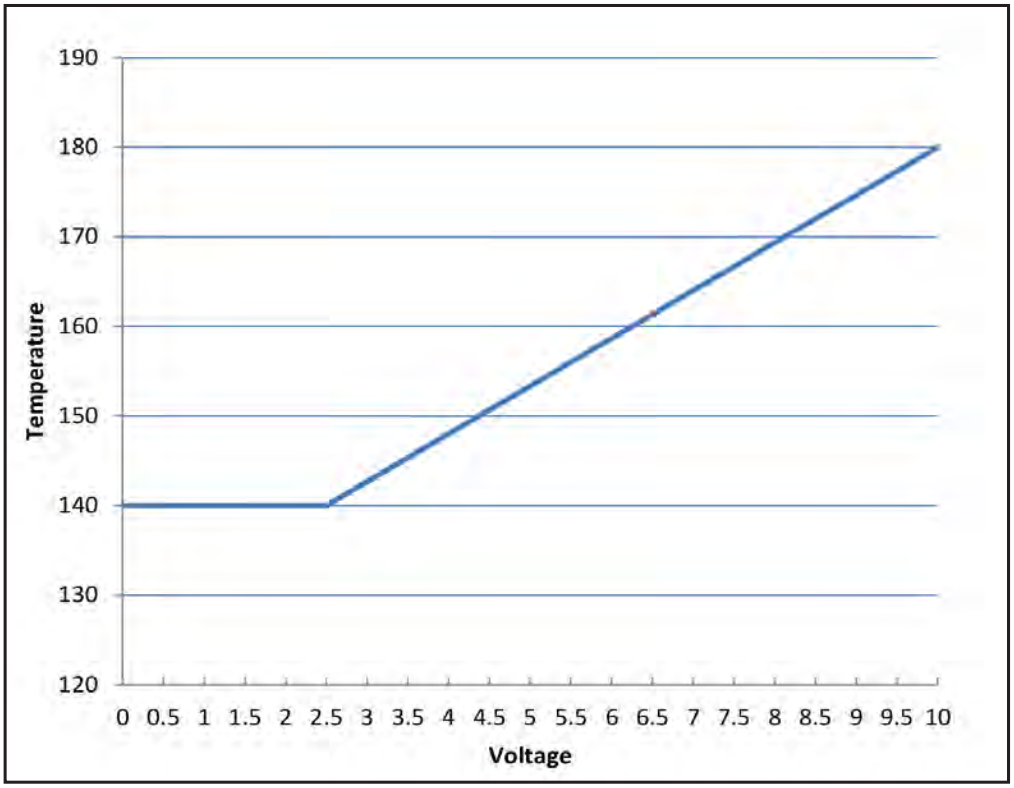


Figure 29. External Set Point Example

8.D.10 Time & Date

To navigate to the Time & Date Screen, touch the Time and Date area of ANY Screen.

The Time & Date Quick Start Screen allows adjustment of the following parameters:

- **Hour**
- **Minute**
- **Month**
- **Day**
- **Year**

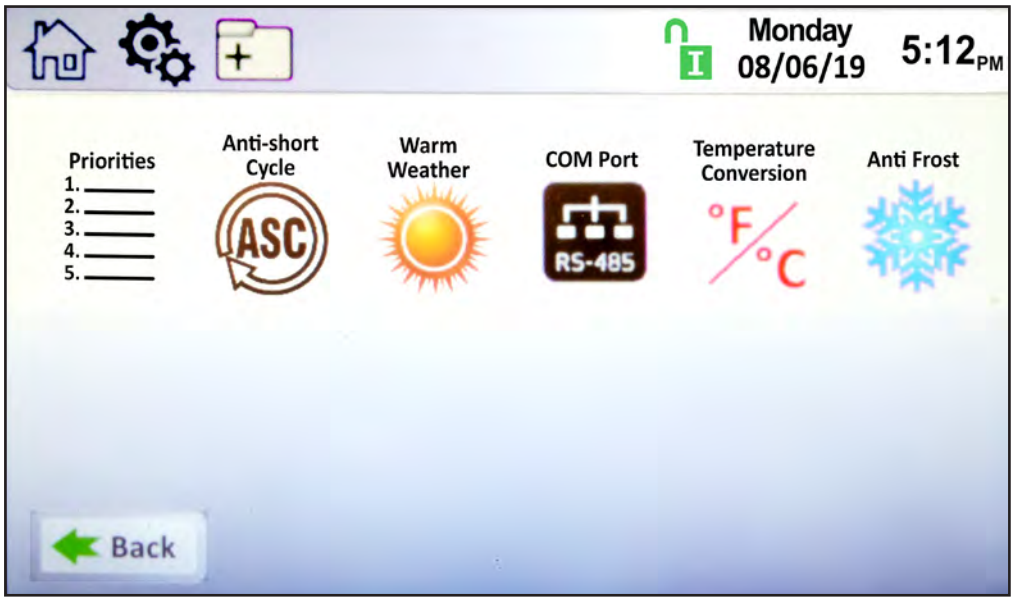
NOTE: The Time is set in a 24 hour parameter but displays only as a 12 hour clock with the AM / PM automatically added.

8.D.11 Miscellaneous Features

To navigate to the Miscellaneous Features Screen, touch the Miscellaneous Features Icon on the Configuration Screen.

The Miscellaneous Features screen provides navigation for the following items:

- **Demands Priorities –** To set priorities for all configured CHW or DHW heating demands.
- **Anti-short Cycle –** To navigate to the Anti-short Cycle Configuration Screen. The higher the number, the higher the priority it is assigned.
- **Warm Weather –** To navigate to the Warm Weather Configuration Screen.
- **COM Port –** To navigate to the Communication Port (Modbus / BACnet MSTP) Configuration Screen.
- **Temperature Conversion –** To navigate to the Temperature Conversion Configuration Screen.
- **Anti-Frost –** To navigate to the Anti-Frost Configuration Screen.

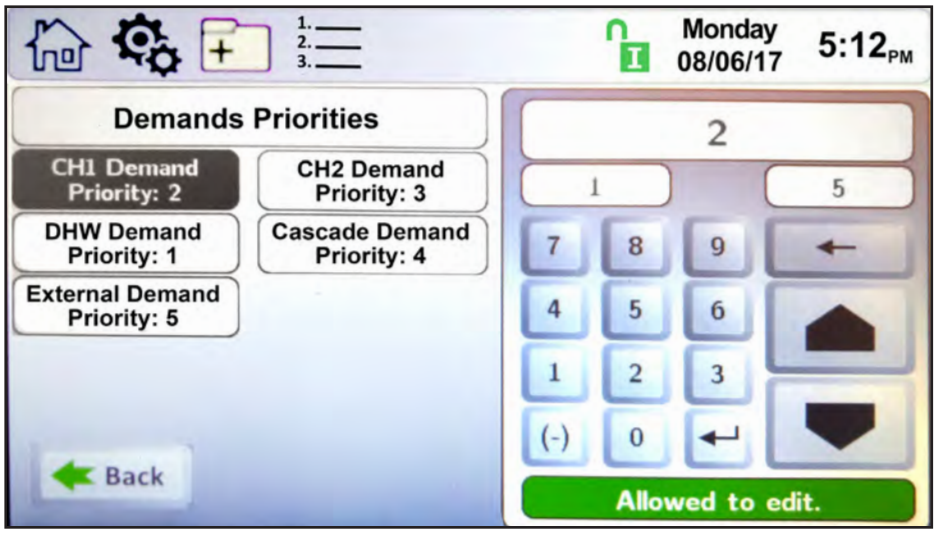


8.D.11.a Demands Priorities

To navigate to the Demands Priorities Screen, first go to the Miscellaneous folder.

At the Demands Priorities screen select each configured demand and assign a priority number.

NOTE: Demands Priorities is only active on the lag or stand alone boilers.



Remember to always save the new setting with the button.

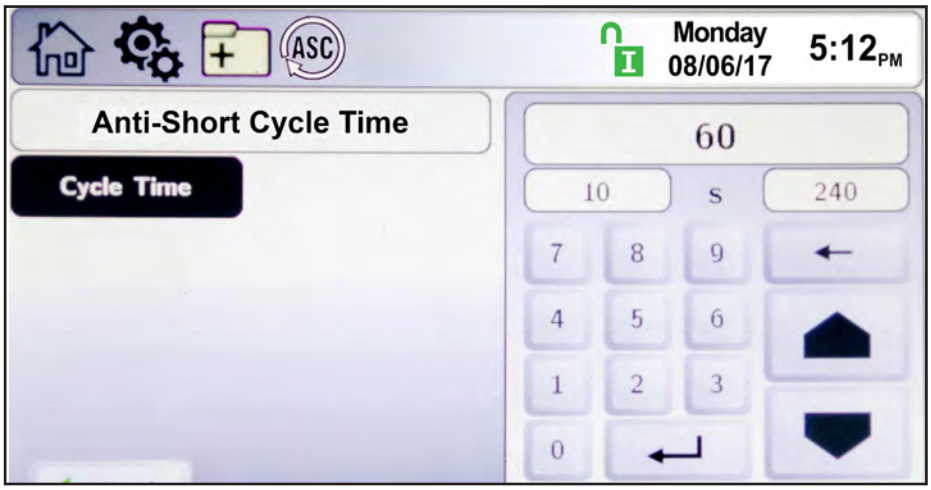
8.D.11.b Anti-Short Cycle

To navigate to the Anti-Short Cycle Configuration Screen, touch the Miscellaneous Features Icon on the Configuration Screen, then touch the Anti-Short Cycle Icon on the Miscellaneous Features screen.

The Anti-Short Cycle Configuration Screen allows adjustment of the following parameter:

- **Cycle Time –** The amount of time after a heat demand is satisfied that the unit will wait to initiate the next active heat demand.

NOTE: Anti-Short Cycle Time does not apply to DHW/DHW3 heat demands.



Remember to always save the new setting with the button.

8.D.11.c Warm Weather

To navigate to the Warm Weather Configuration Screen, touch the Miscellaneous Features on the Configuration Screen, then touch the Warm Weather Icon on the Miscellaneous Features screen. The Warm Weather Configuration Screen allows adjustment of the following parameters:

- **Temp Min –** Upon an active warm weather shutdown condition, this is the temperature at which the unit will reset the shutdown condition to satisfy a heat demand.
- **Temp Max –** This is the temperature at which the warm weather shutdown condition will occur.
- **Feature Options –** This parameter provides the ability to either disable warm weather shutdown or upon a warm weather condition, configure the unit to shut down immediately or to shut down after the current heat demand is satisfied.
- **Summer Kick CH –** The amount of time the unit pump is energized if it hasn't cycled for an extended period of time.
- **Summer Kick DHW –** The amount of time the DHW pump is energized if it hasn't cycled for an extended period of time.
- **Summer Kick SYS –** The amount of time the SYS pump is energized if it hasn't cycled for an extended period of time.
- **Summer Kick Period –** The duration of time between heat demands that the boiler will wait before exercising the boiler, DHW, and system pumps.

There are three options for Warm Weather Shutdown (WWSD). WWSD is only applicable to boilers. It is not mandatory, so it can be enabled/disabled on the WWSD configuration screen.

1 - WWSD - Shutdown Immediately

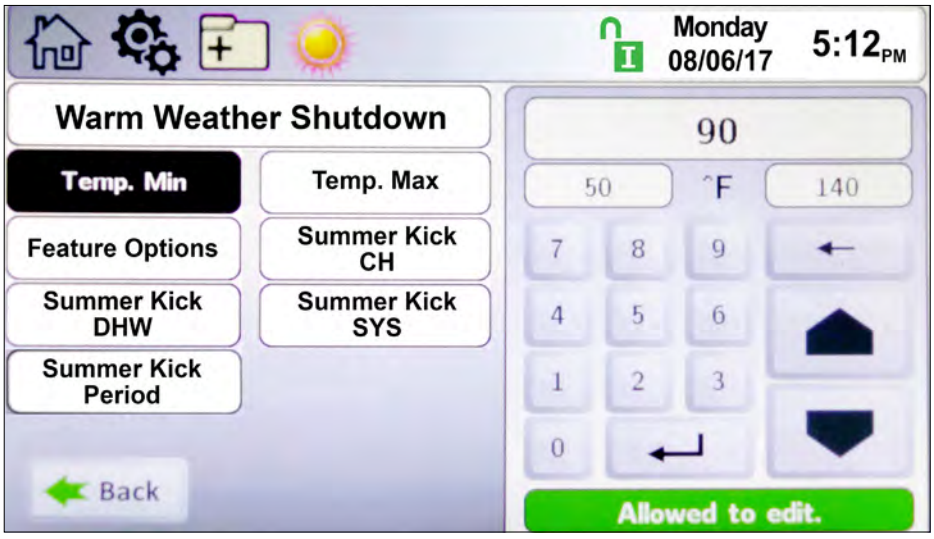
When the outdoor sensor measures an outdoor air temperature that exceeds the WWSD set point, one of the following two conditions will occur. If the unit is idle, upon a call for heat, the unit will not turn on to satisfy a heat demand. If the unit is running to satisfy a call for heat, the unit will immediately shutdown. In either case, the WWSD icon will appear on the home screen.

2 - WWSD – Shutdown After Demand is Satisfied

When the outdoor sensor measures an outdoor air temperature that exceeds the WWSD set point, one of the following two conditions will occur. If the unit is idle, upon a call for heat, the unit will not turn on to satisfy a heat demand, and the WWSD icon will be shown on the home screen. If the unit is running to satisfy a call for heat, the unit will satisfy the heat demand and then the WWSD shutdown icon will appear. As long as the unit is in a WWSD condition, no additional heat demands will be satisfied.

3 - WWWD – Disabled

Control ignores any WWSD set points, and operates normally.



8.D.11.d COM Port, BMS

The control has Modbus and BACnet MSTP (RS485) protocols on board, for use with Building Management Systems. Gateways can be used for other communication protocols.

To navigate to the COM Port Configuration Screen, touch the Misc Icon on the Configuration Screen, then touch the COM Port Icon on the Misc Configuration Screen. The COM Port Configuration Screen allows adjustment of the following parameters:

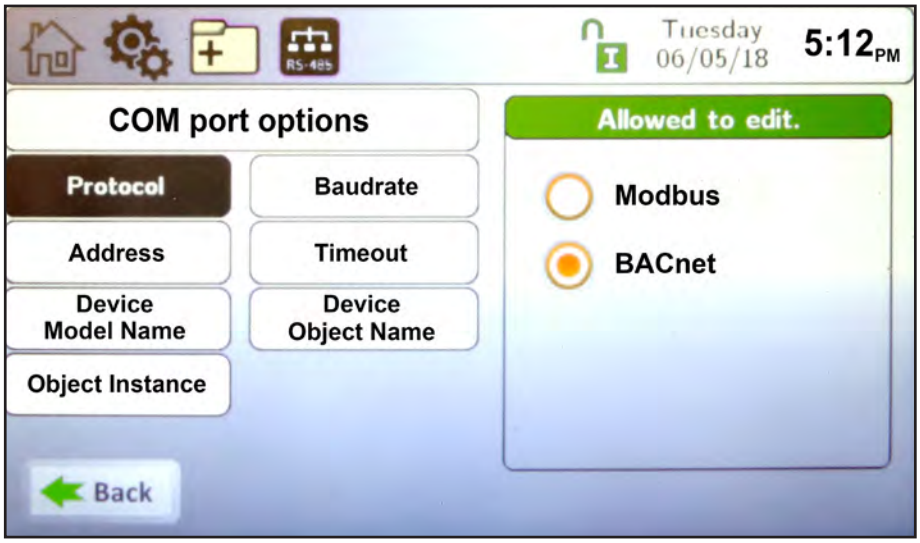
With Modbus protocol selected, the following parameters are adjustable on this screen:

- **Baudrate –** Modbus can be configured for the following standard baudrates: 9600, 19200, 38400, and 57600.
- **Address –** The address of the unit on the Modbus network.
- **Timeout –** Upon loss of communication, this is the duration of time in which the unit will wait prior to timeout conditions occurring.

With BACnet protocol selected, the following parameters are adjustable on this screen:

- **Baudrate –** BACnet can be configured for the following standard baudrates: 9600, 19200, 38400, and 76800.
- **Address –** The address of the unit on the BACnet network.
- **Timeout –** Upon loss of communication, this is the duration of time in which the unit will wait prior to timeout conditions occurring.
- **Device Model Name –** The name of the unit Model on the BACnet network.
- **Device Object Name –** The name of the unit Object on the BACnet network.
- **Object Instance –** The object number of the unit on the BACnet network.

NOTE: Changing the protocol requires a power cycle of the unit for the change to take effect.



8.D.11.e Temperature Conversion °F/°C

To navigate to the Temperature Conversion Configuration Screen, touch the ***Temperature Conversion*** Icon on the Miscellaneous Features screen.

The Temperature Conversion Configuration Screen allows adjustment of the following parameter:

- **Conversion unit –** This parameter can be set to Fahrenheit or Celsius.

8.D.11.f Anti-Frost

To navigate to the Anti-Frost Configuration Screen, touch the Miscellaneous Features Icon on the Configuration Screen, then touch the Anti-Frost Icon on the Miscellaneous Features screen.

The Anti-Frost Configuration Screen allows adjustment of the following parameters:

- **Anti-Frost –** This parameter provides the ability to either disable anti-frost or upon an anti-frost condition, configure the unit to only turn on the pump or to turn on the pump and fire the burner.
- **Set Point –** The unit will enter anti-frost mode when the unit's inlet sensor reads the set point minus the hysteresis value. It will leave anti-frost mode at the set point plus the hysteresis value.
- **Hysteresis –** This parameter is a +/- offset of the Anti-Frost Set Point used to turn on/off the Anti-Frost mode.
- **Pump Control –** This parameter provides the ability to select which pump(s) are used in Anti-Frost Mode.

The Set Point parameter is the temperature at the boiler inlet sensor to which the boiler/heater will apply the Hysteresis value to enable the Anti-Frost mode.

For example, if the Set Point is 44°F, and the Hysteresis is 4, Anti-Frost will initiate at 40°F (set point – hysteresis) and then will end at 48°F (set point + hysteresis). If Pump Only or Pump and Burner mode is selected, the Pump Control parameter allows configuration of which pump(s) will run during an anti-frost condition. At least one pump must be selected, but all three pumps (unit, DHW, or System) can be selected. If Anti-Frost mode is active, a snow flake icon will appear above the unit inlet temperature on the home screen. As shown in Figure 30.

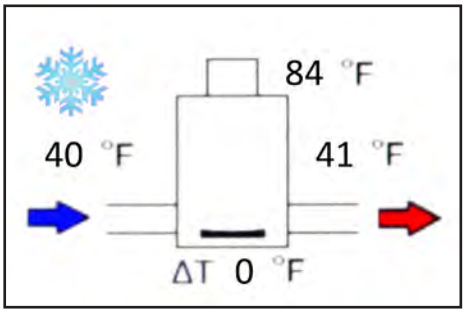
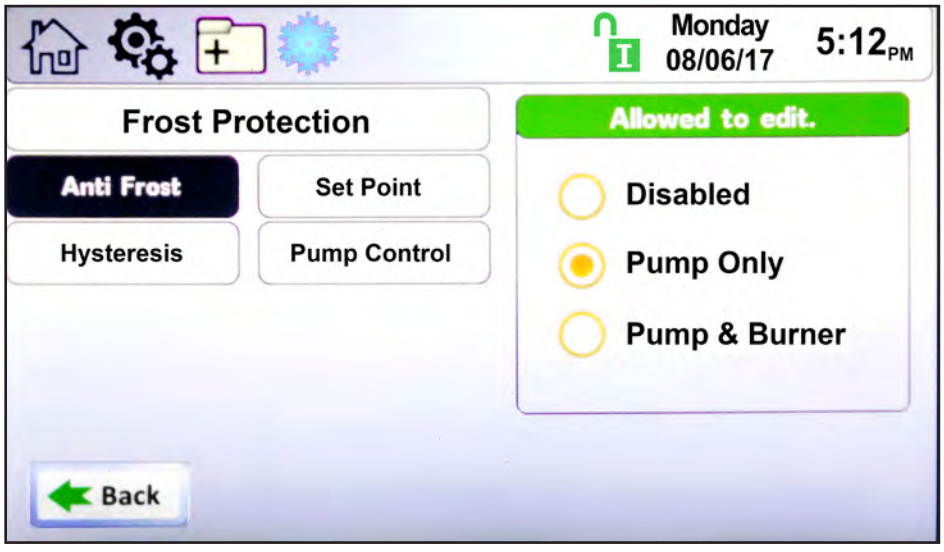


Figure 30. Active Anti Frost Condition



8.D.12 Login

To navigate to the Login Screen, touch the Lock Icon on any screen.

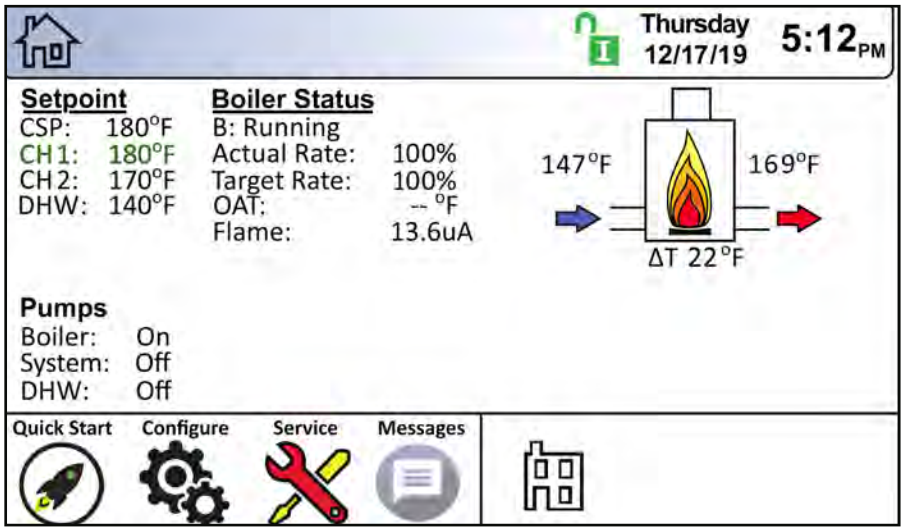
The Login Screen allows the operator to make parameter adjustments based on the level of the login credentials.

See Section 8.B on page 56.

Table 17 on page 101 indicates which parameters are available with each login level.

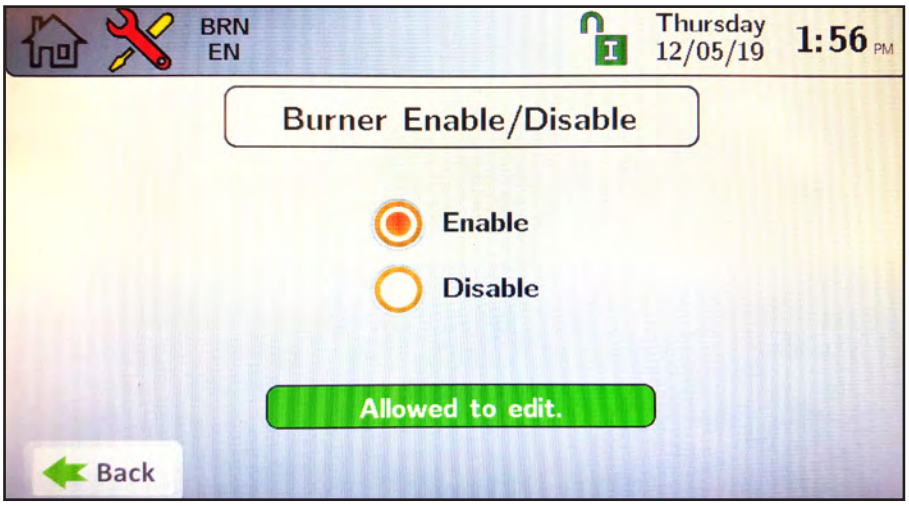
8.E Service Screens

To navigate to the Service Screen, touch the Service Icon in the lower left portion of the Home Screen.



Available only to the factory or technician qualified at the OEM level.

8.E.1 Burner (Enable/Disable)



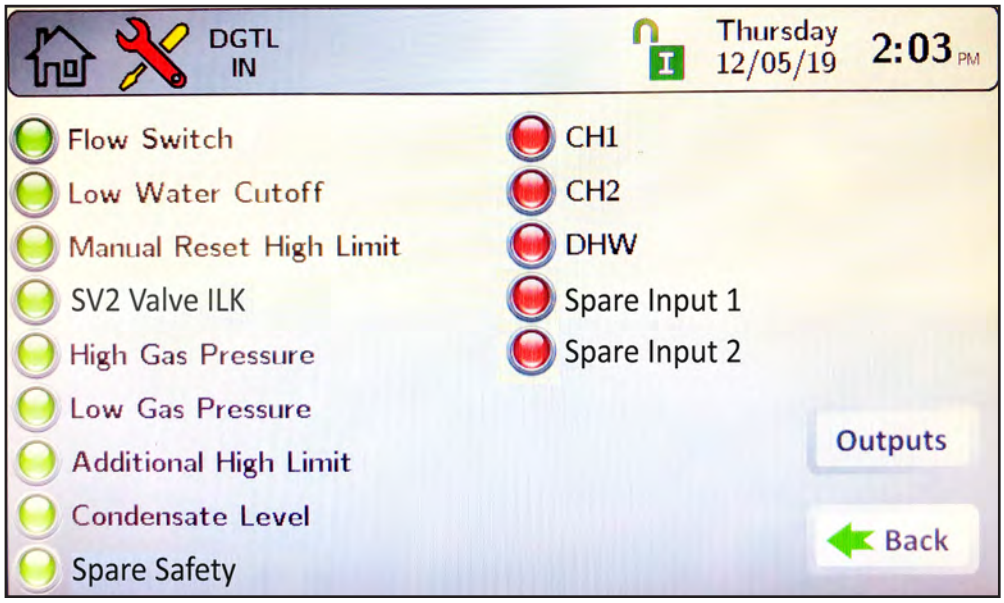
8.E.2 Digital I/O Inputs

There are two screen associated with the Digital I/O: Digital I/O Screen-Inputs; Digital I/O Screen-Outputs.

Navigate to the Digital I/O Screen by touching the Digital I/O Button on the Service Screen.

Digital I/O Inputs: The indicator light associated with the input is green when the input is satisfied. For example, if there is adequate flow, the flow switch is satisfied, and the flow switch digital input indicator light is green. The indicator light associated with the input is red, when the input is not satisfied. For example, if the blower is off, the air proving switch is not satisfied and the air proving switch digital input indicator light is red.

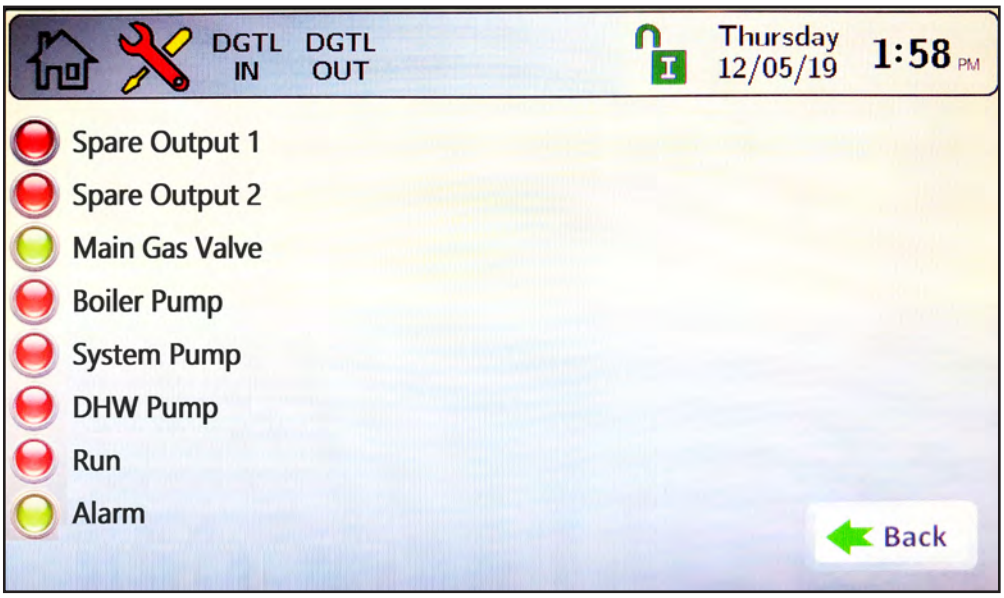
Inputs



8.E.2.a Digital Outputs

Digital I/O Outputs: The output is on, the indicator light associated with that output is green. For example, if the boiler pump is running, the boiler pump output indicator light is green. If the output is off, the indicator light associated with that output is red. For example, if there is no call for heat, the gas valves are off, and the gas valve indicator lights are red.

Outputs



8.E.3 Analog I/O

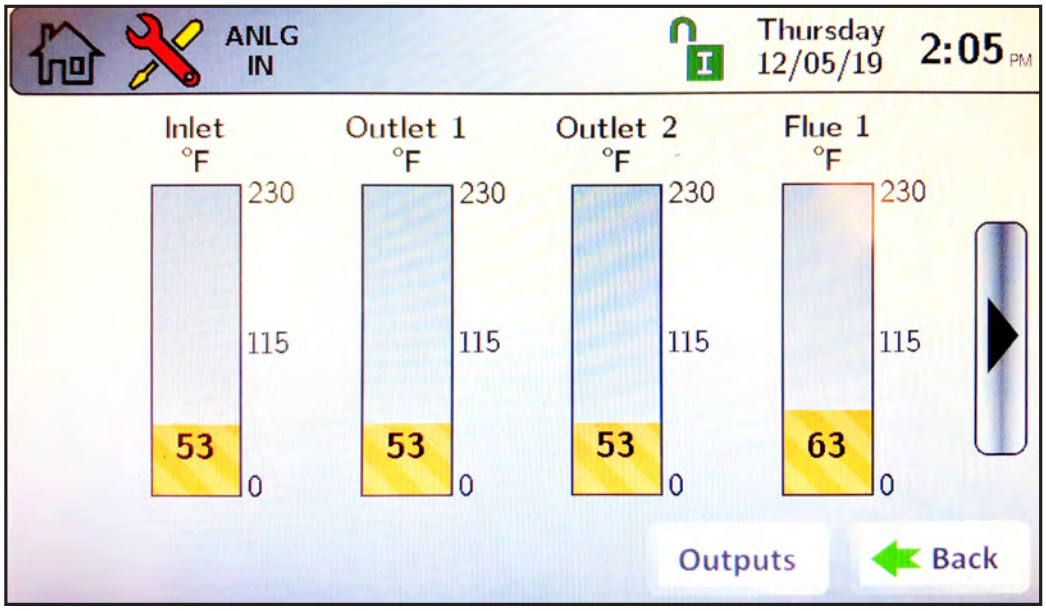
Navigate to the Analog I/O Screen by touching the Analog I/O Button on the Service Screen.

There are two screens associated with the Analog I/O: Analog I/O Inputs; Analog I/O Outputs.

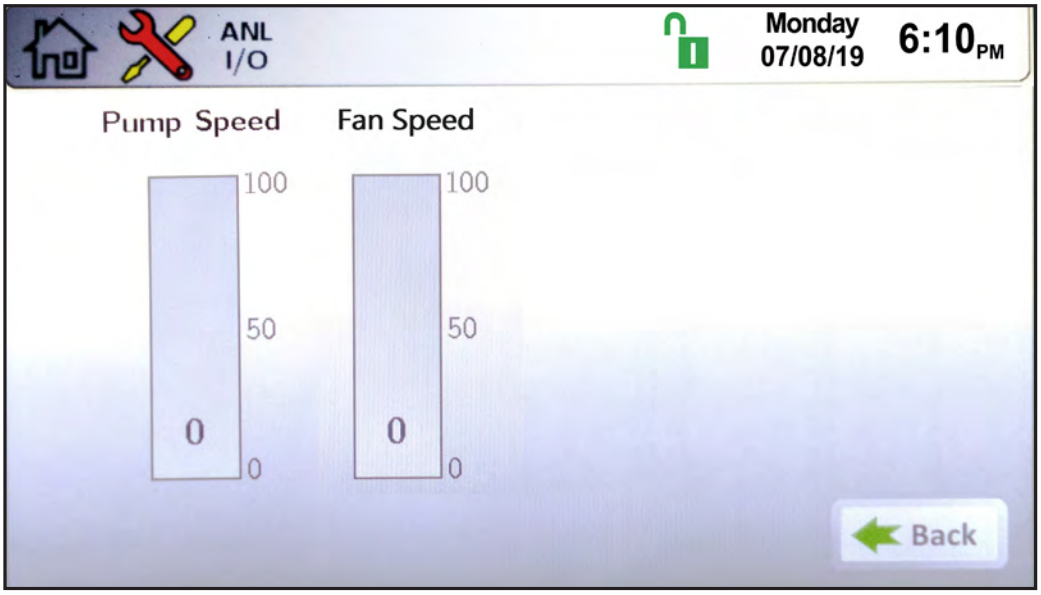
Analog I/O Input: There are three types of analog inputs; temperature sensors, flame signal, and voltage/current (VDC/mA). Wiring of these inputs are covered in SECTION 7.

NOTE: If the input is not attached, the value will be zero

Inputs



Outputs

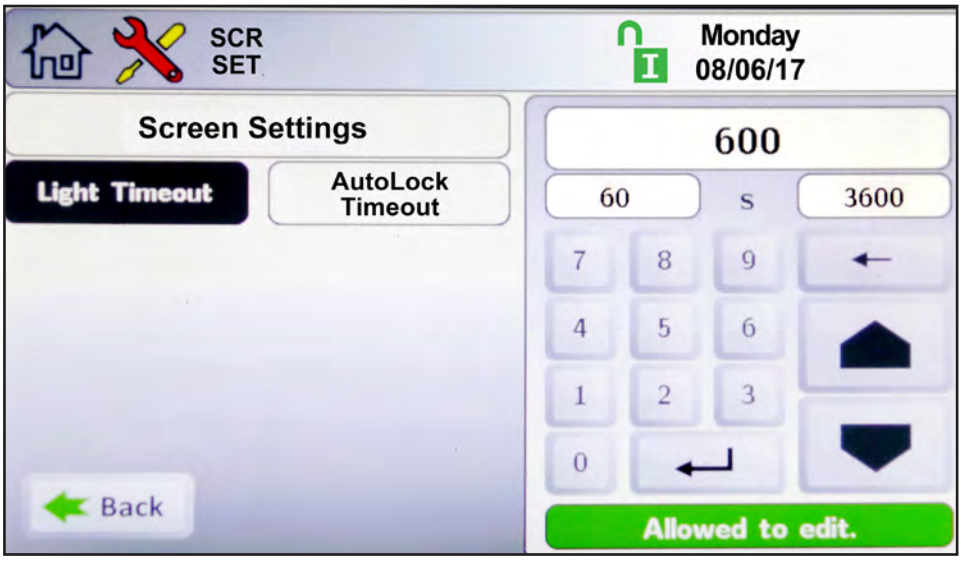


8.E.4 Screen (Settings Timeout)

Navigate to Screen Settings by touching the Screen Button on the Service Screen.

There are two adjustable screen settings: Light Timeout and AutoLock Timeout.

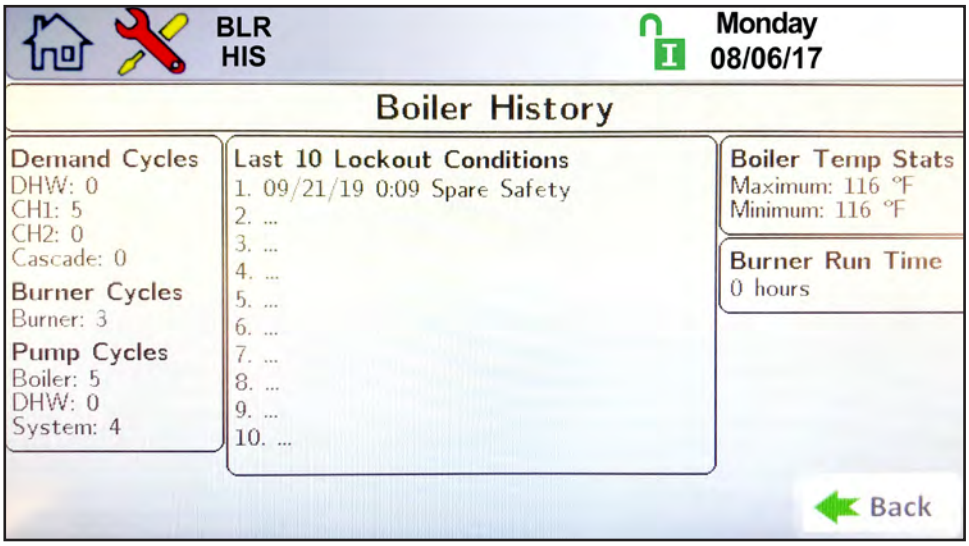
- Light Timeout allows the user to adjust the amount of time the touch screen backlight will remain lit after user interaction has ceased.
- AutoLock Timeout allows the user to adjust the amount of time the touch screen will remain unlocked with no user interaction.



8.E.5 History

Navigate to the History Screen by touching the History Button on the Service Screen.

The History Screen provides information on boiler operations and cycle counts. The control accumulates and displays the number of heat demand cycles, burner cycles, and pump cycles. It displays the 10 most recent lock-out conditions, unit temperatures, and firing statistics.



8.E.6 Restart (Touchscreen & Recalibrate)

Touching the Restart Button on the Service Screen reboots the display. If the touchscreen seems to be out of alignment, it can be recalibrated by pressing the Restart Button, promptly touching (and holding) the touch screen. Follow the calibration procedure as shown on the touch screen.

8.E.7 Factory Reset

Touching the Factory Reset Button on the Service Screen resets all touch screen adjustable parameters back to the factory default setting.

8.E.8 HMI Model OEM only.

8.E.9 BIC Model OEM only

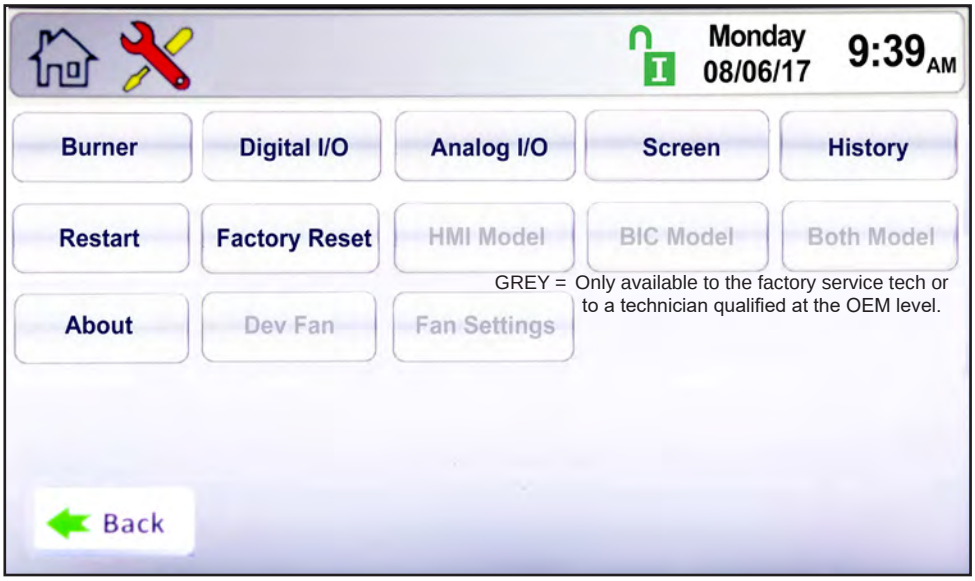
.

8.E.10 Both Model. OEM only.

8.E.11 About About the Firmware version of the touchscreen.

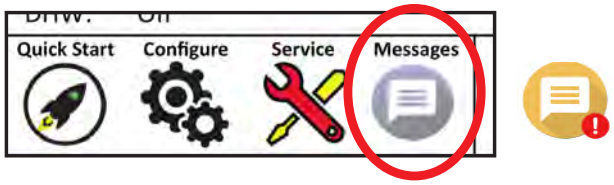
8.E.12 Dev Fan OEM only.

8.E.13 Fan Settings OEM only.



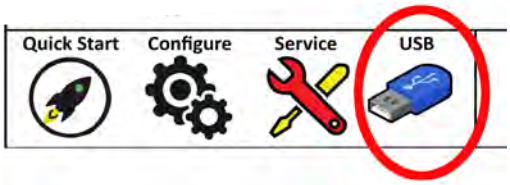
8.F Messages and USB

8.F.1 Messages

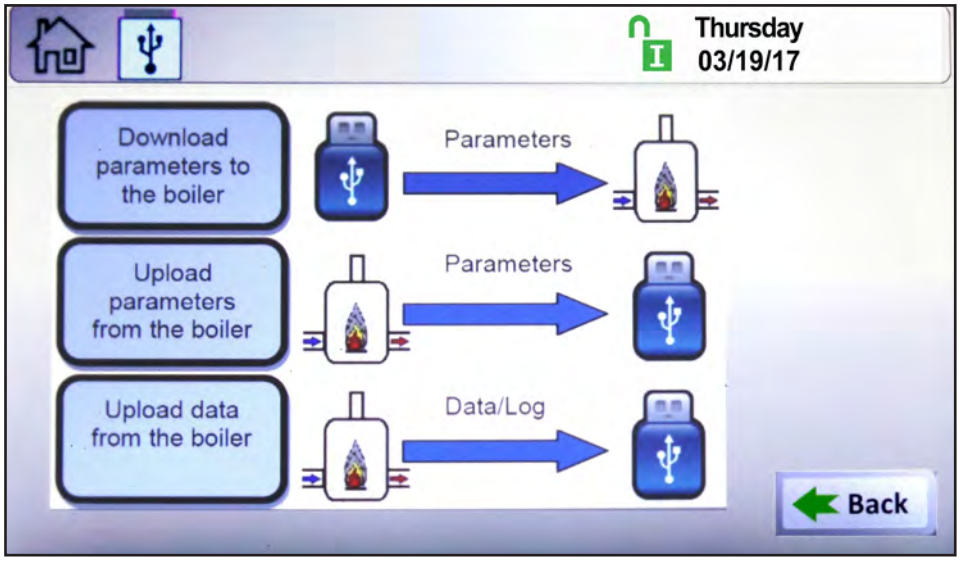


The ‘Messages’ icon at the bottom of the home screen displays an ‘Exclamation Point’ when messages are present. Press the icon to see the message(s).

8.F.2 USB Functionality



The USB port is on the back of the display. To access it, the control display can be lifted off of the front of the unit and the USB port is found behind the touchscreen. See Figure 31.



When the USB icon has appeared over the Message icon, press the USB icon to access the USB menu. The following three tasks will be available:

- **Download Parameters from the boiler:** During a cascade setup or a control replacement, enter the values in one unit, to copy into the others.
- **Upload Parameters from the boiler:** Uploads all parameters and settings into a thumb drive for documentation purposes, or copies these settings from unit to unit.
- **Upload Data from the boiler:** This is used to retrieve runtime data, and history. It captures all settings in a tab delimited text file, for use with spreadsheet programs.

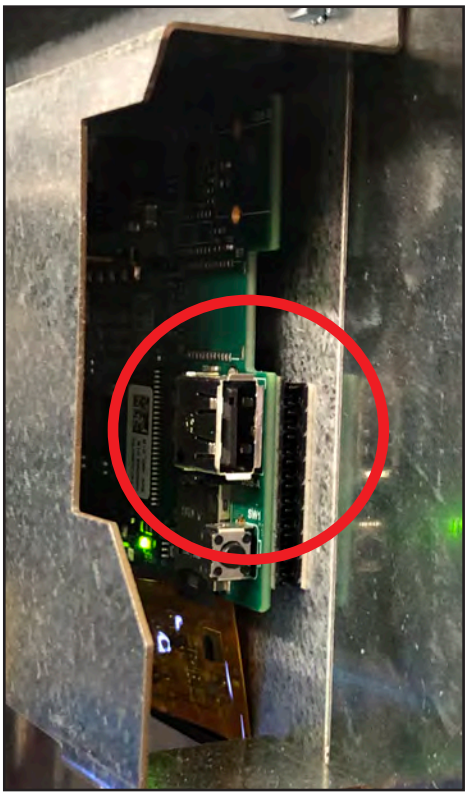
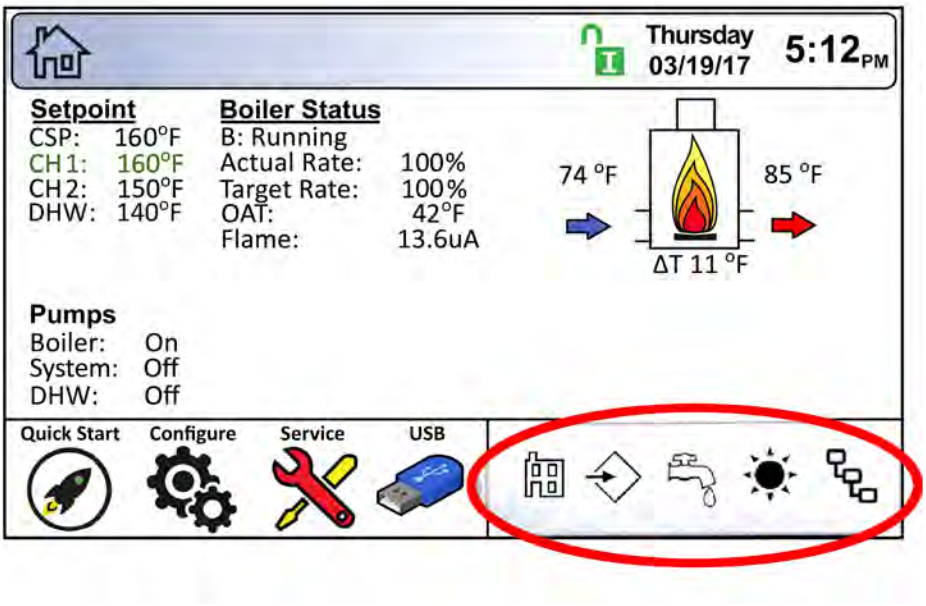


Figure 31. Photo of USB Slot on the back of touchscreen display.

8.G Active Demands

The Active Demand Window indicates the status of active heat demands.



A black heat demand icon indicates the heat demand that is currently being satisfied. A "grayed out" heat demand icon is either lower in priority than the heat demand that is currently being satisfied, or the heat demand has reached set point, but remains active.

Icon	Demand
	CH1/2 Central Heat Demand
	DHW or DHW3 Volume Water Heat Demand
	External Demand
	Warm Weather Shutdown **NOTE:** Warm Weather Shutdown is not a heat demand. This icon indicates that a space heating demand is disabled due to high outdoor ambient temperature.
	Cascade

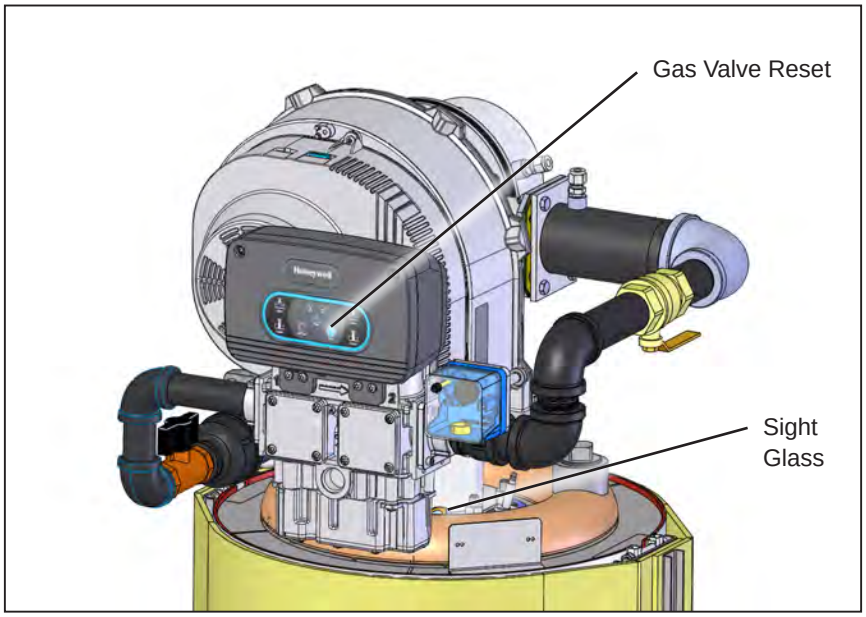
Table 16. Demand Examples

SECTION 9 Gas Valve Touchscreen, Menus and Descriptions

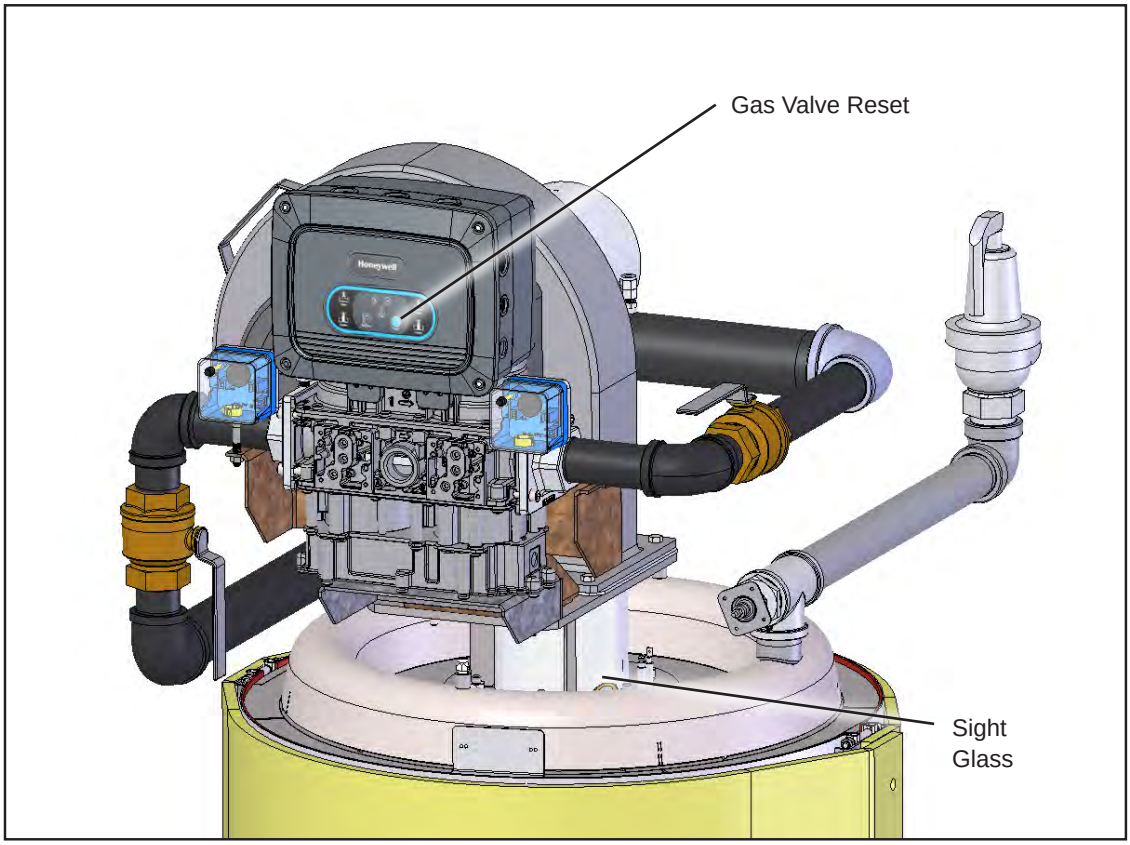
9.A About the Gas Valve

This unit utilizes a Honeywell Gas Valve with a touchscreen display.

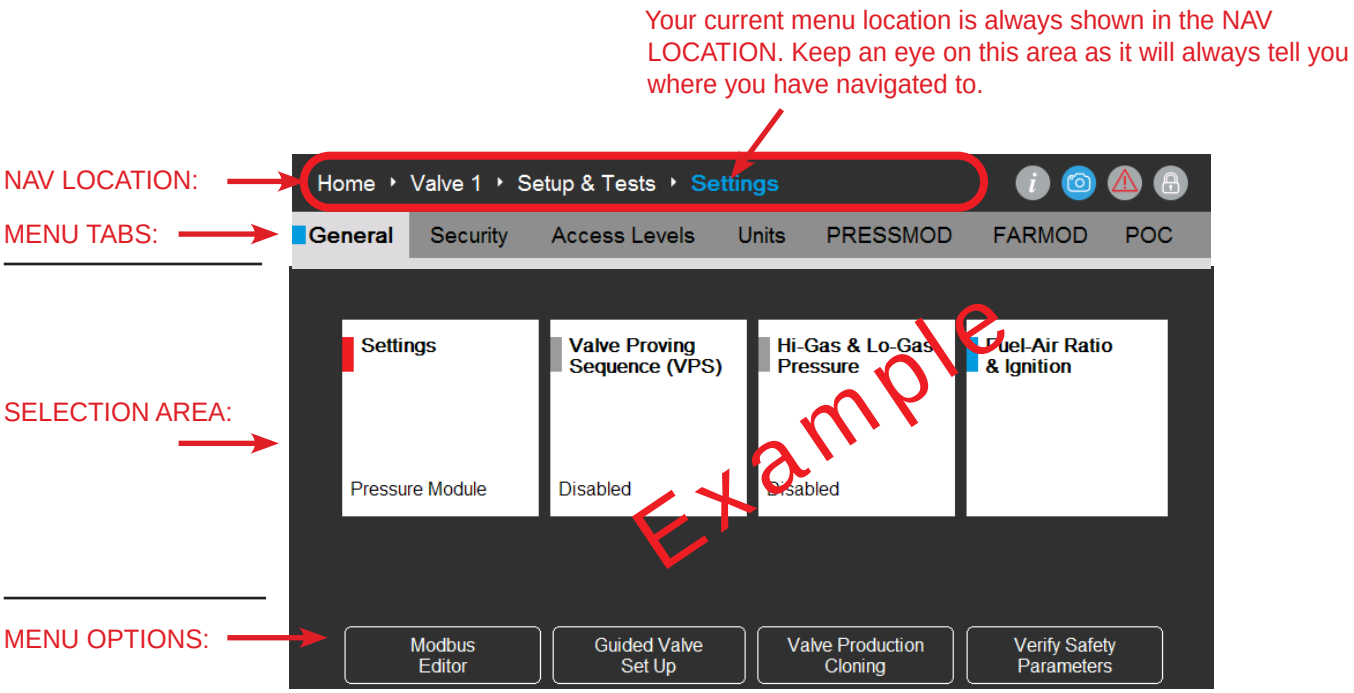
Models 1250 and 1500



Models 1750, 2000 and 2500

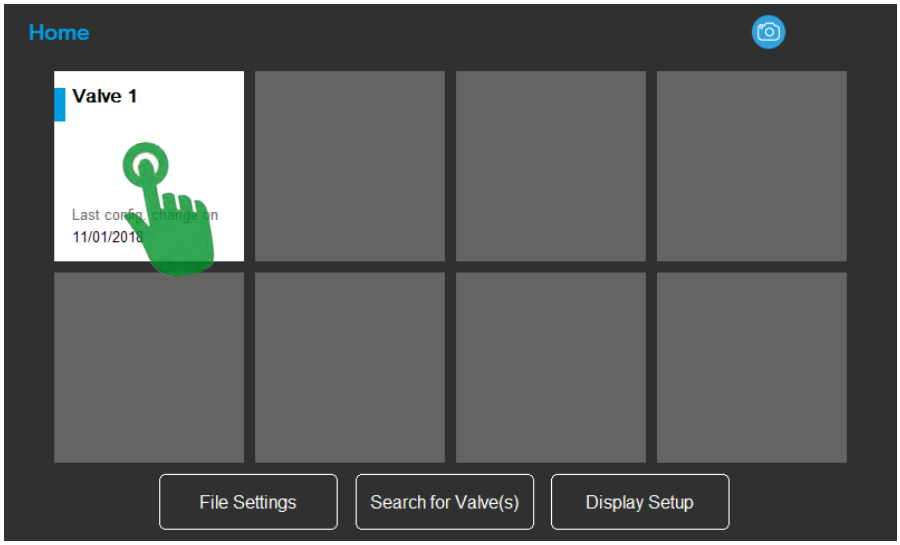


9.B Menu Structure (Example)



9.C Gas Valve Display Navigation and Menus

From Home, select Valve 1.

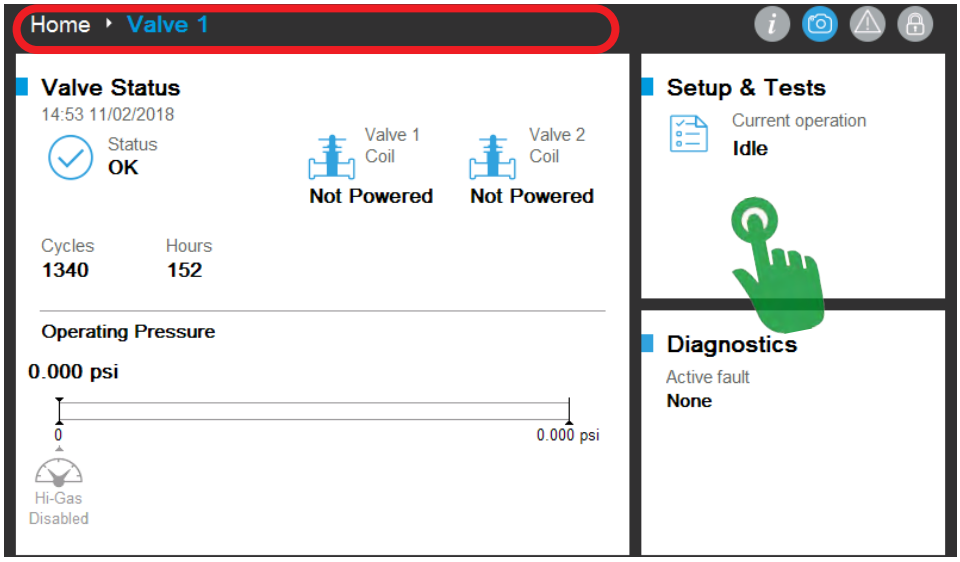


Menu Options

- **File Settings** – files to be saved to a USB device or be loaded to the system memory from a USB device. File types that can be saved or loaded include A/F curve, valve configuration data, and log files.
- **Search for Valves** – If for some reason Valve 1 doesn't appear on the display may need to search for the valve by pressing search for Valve.
- **Display Setup** – Allows the date and time to be set, volume and brightness adjustments, screen calibration, modbus address settings and display port setup.

From Valve 1, select Setup & Tests.

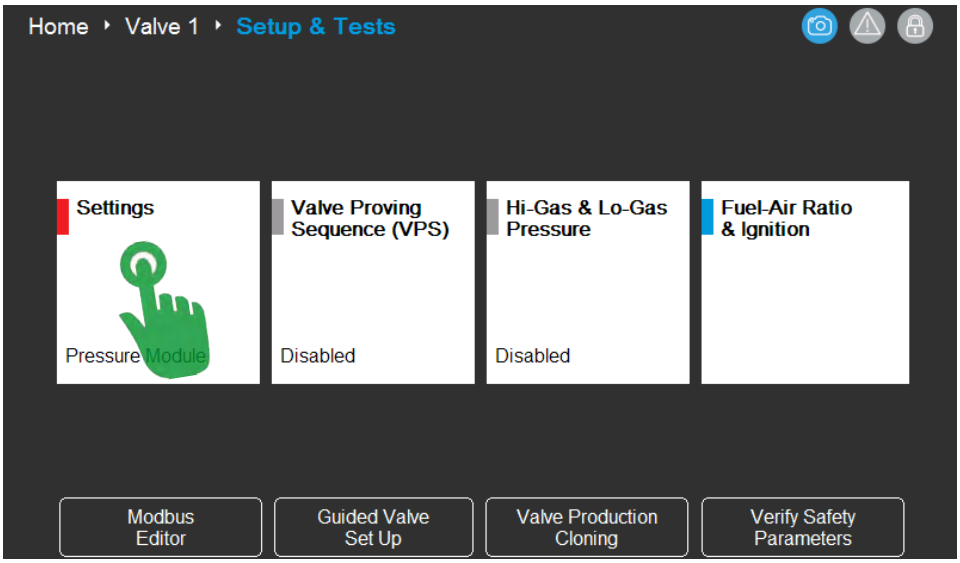
Note your location.



Selections

- **Valve Status** - This section gives general information about valve operation and hours and cycles.
- **Setup & Tests** – Allows for valve settings adjustment, configuration of optional components on the boiler and combustion setup of the boiler.
- **Diagnostics** – Displays lockout history and detailed information on current valve lockouts.

From Setup & Tests, Select Settings.



Selections

Settings – The sub-menus found in 'Settings' allow for configuration of the gas valve and the devices that can be incorporated into the boiler. All of these items are set at the factory, so these menus will only be needed if a valve or component is replaced or a units change is desired. When changes are made it is likely that that the changes will need to be verified before the valve will operate using the changes.

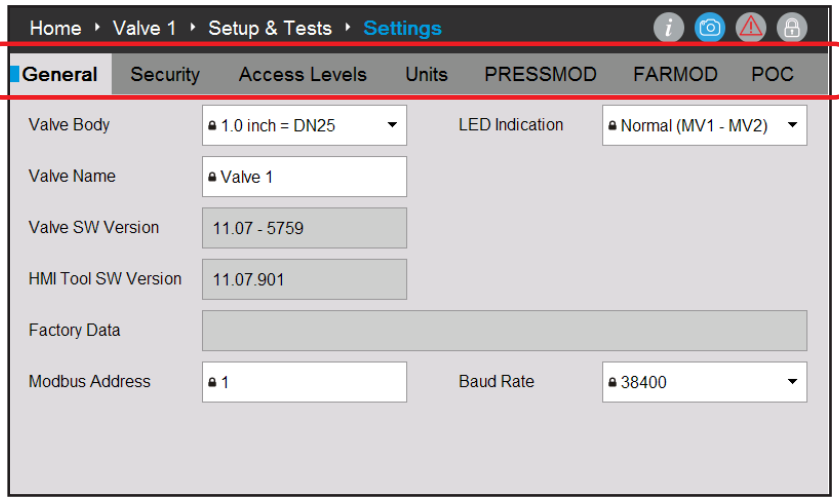
Valve Proving Sequence – Not available

Hi-Gas & Lo-Gas Pressure – Not available

Fuel Air Ratio & Ignition – The sub-menus found in 'Fuel Air Ratio & Ignition' allow for combustion setup, ignition characteristics modification, loading and saving A/F curves and valve configurations.

You are now in the Settings menu.

MENU TABS:



Menu Tabs.

General: This menu displays these current settings (as shown).

Valve body: Allows the selection of the proper valve body size. This should be done at the factory. No adjustments necessary.

Valve Name: The valve can be given a unique name if need to suit application requirements. In rare cases this may be a benefit with Building Management System.

Valve SW version: Software revision of the valve. This might be needed if troubleshooting of the valve system is required for diagnostic purposes.

HMI Tool SW version: Identifies the SW revision of the display that is attached to the valve.

Modbus address: This address can be changed if the valve is going to be added to a BAS that will be communicating with the valve.

Baud rate: Sets the communication speed of the Modbus network.

Security: This menu allows the installer and OEM passwords to be reset if needed. If the passwords are changed the installer/building owner is responsible for remembering the password to gain access to the system. The manufacterur does not have access to the installer password once changed.

Access Levels: Controls the password level access to the settings of the gas valve. This menu lists out each section of the display and assigns a password level to each. The installer can limit access to items that don't require installer level access if desired.

Units: Allows the units of pressure, volume and flow rate to be set to the desired engineering units.

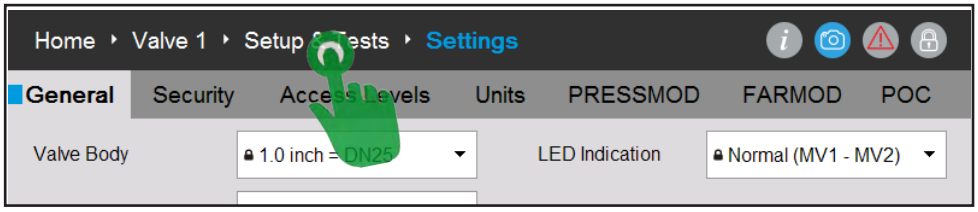
PRESSMOD: Not available at this time.

FARMOD: Lists the factory data from the FARMOD and the current status of the FARMOD. IF the FARMOD is replaced in the field the new FARMOD will need to be accepted in this menu to allow for proper combustion setup.

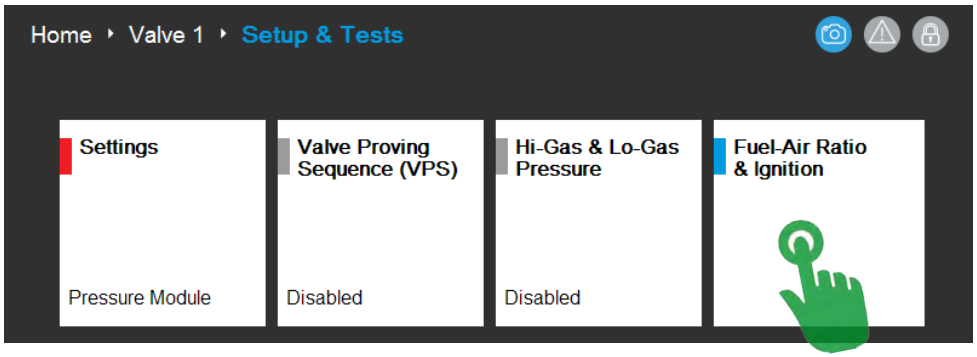
POC: Not available

9.D Fuel Air Ratio & Ignition, Menus

Click back to Setup & Tests

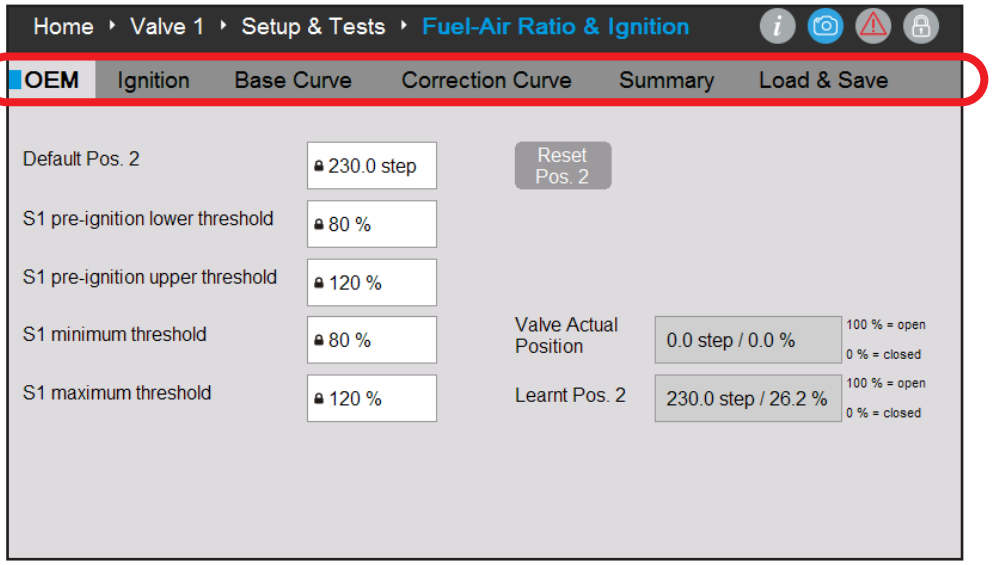


From Setup & Tests, select Fuel-Air Ratio & Ignition.



Fuel Air Ratio & Ignition has several menus that allow for combustion setup, Ignition characteristics modification, Loading and saving A/F curves and valve configurations.

MENU TABS:

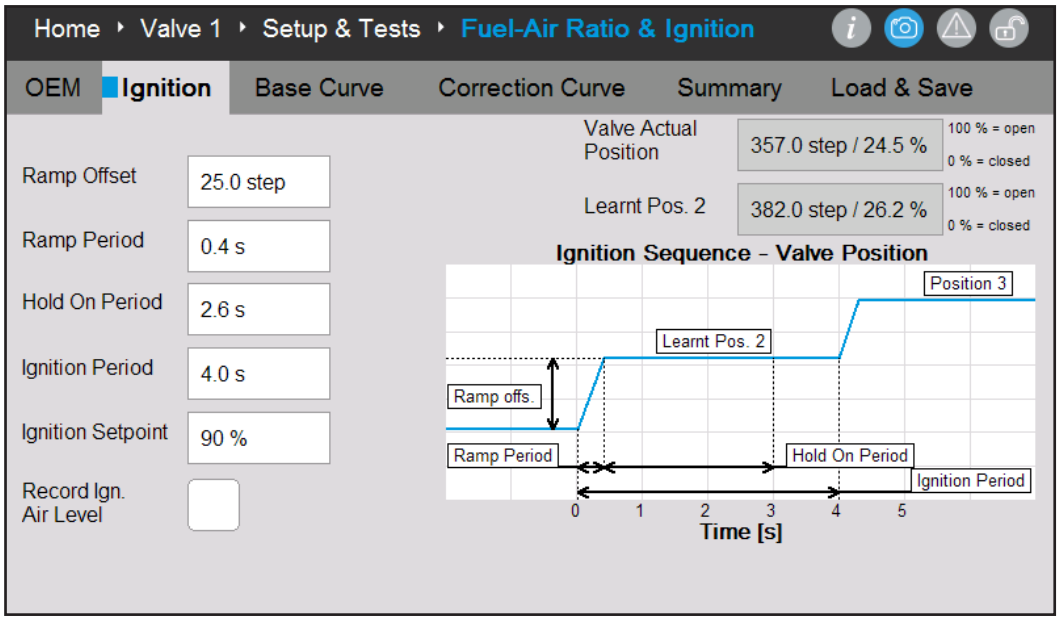


9.D.1 OEM

The OEM menu sets several safety parameters that can not be adjusted in the field. The default position 2 value and Learned Pos. 2 values can be used for troubleshooting.

9.D.2 Ignition Menu

The settings in the ignition tab allow the ignition characteristics of the boiler to be customized to fit the boiler application if needed. In most cases customization will not be necessary. The ignition graph shown is a representation of how the gas valve will react during the trial for ignition process. In the graph position 3 is the normal operating combustion level for the boiler at the ignition fan speed. Valve positions below position 3 indicate that the boiler combustion will be lean during ignition. Valve positions higher than position 3 indicate combustion will be rich during ignition.



Ramp offset – defines the starting position of the valve during the ignition period. Sets the amount of valve steps below the learned position the valve starts from during the ignition process. This can be used to start from a lean starting point if needed.

Ramp period – the amount of time it takes the valve to open through the ramp offset. This can be used to fast or slow open the valve to tune the ignition if pulsing occurs at ignition.

Hold on period – during the hold on period the gas valve will not make adjustments based on feedback from the system. This allows the system to stabilize after ignition before the valve starts to make adjustments.

Ignition period – The ignition period must be set to 4 seconds to match the actual ignition period of the boiler control. If this is changed to something other than 4 seconds the valve may not make the proper adjustments to the learned position for proper ignition.

Ignition setpoint – defines the learned position 2 identified on the graph. When set to 100% the boiler will try to ignite with combustion settings the same as position 3. With values less than 100% the boiler will ignite in a lean condition. With values greater than 100% the boiler will ignite in a rich condition.

Record Ign. Air Level – is an air proving setting at ignition that determines if the boiler has the correct amount of air flow. If the air flow is low due to blockage or other condition the valve will lockout. When first installing the boiler and getting the boiler setup the record ign. air level button should be selected, so that the proper air level can be recorded for the application.

Learned Position 2 – the learned position defines the A/F ratio during ignition. The learned position is defined by the settings made in the ignition menu and the installation characteristics such as gas supply pressure. The learned position will adjust automatically within a range from the default position to maintain the proper A/F ratio at ignition. During this process it is likely that the first few ignitions will be more noticeable than later ignitions. This is a normal part of the boiler adjusting to the installation.

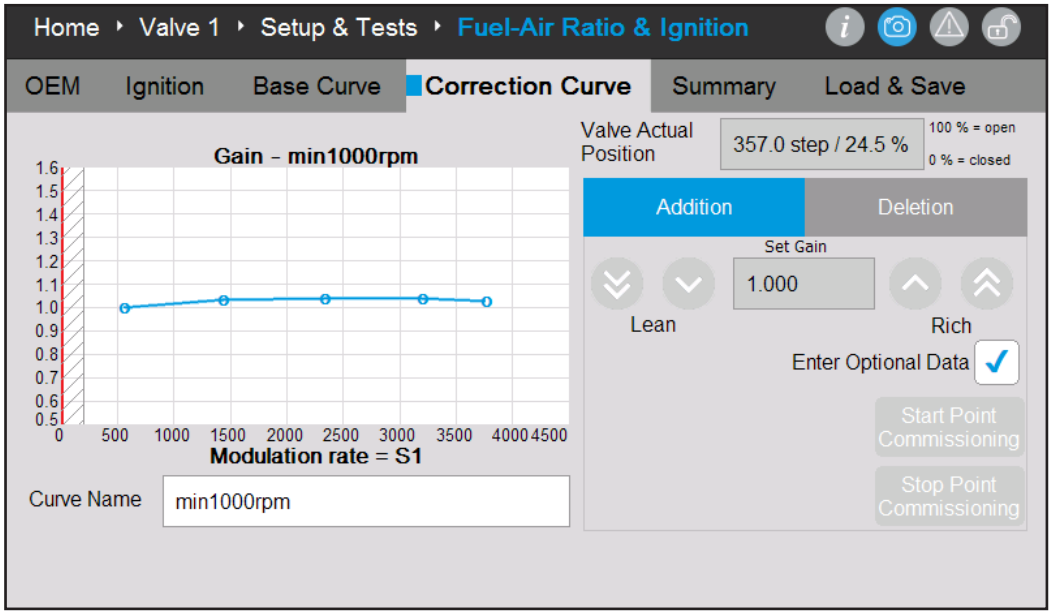
CAUTION: If the boiler runs through several ignitions with the gas off the Learned position will be adjusted to richen up the A/F ratio. When the gas is then turned on the ignition might be more noticeable than after the boiler has gone through several ignitions and the learned position is adjusted correctly.

9.D.3 Base Curve Menu

Controls the base A/F ratio curves. These values are set at the factory and can not be adjusted in the field.

9.D.4 Correction Curve Menu

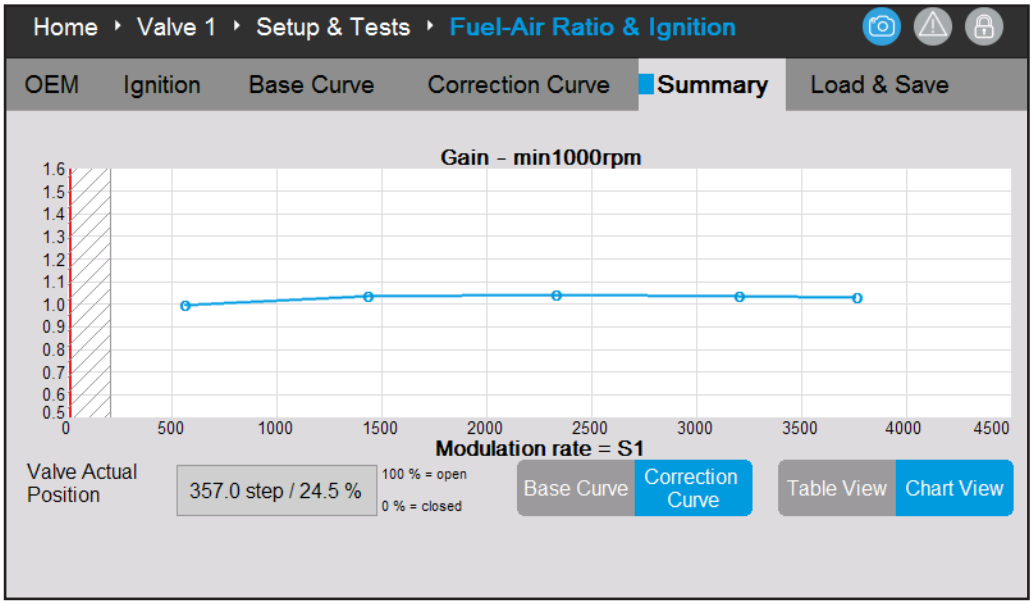
Allows for adjustment of the A/F ratio by the installer. To adjust the A/F curves follow the steps provided.



1. Set the desired fan speed.
2. Measure the CO_2 with an analyzer.
3. Start point commissioning.
4. Adjust CO_2 levels. Touch the lean arrows to decrease CO_2. Touch Rich arrows to increase CO_2. Double arrows move the CO_2 richer or leaner faster than single arrows. In most cases touching the double arrows is acceptable when adjusting the CO_2.
5. When the CO_2 level is set correctly press set min if setting the min modulation point, press set max if setting the maximum point, or commission point if setting a point between min and max.
6. Repeat this process until five points have been setup through the modulation range.

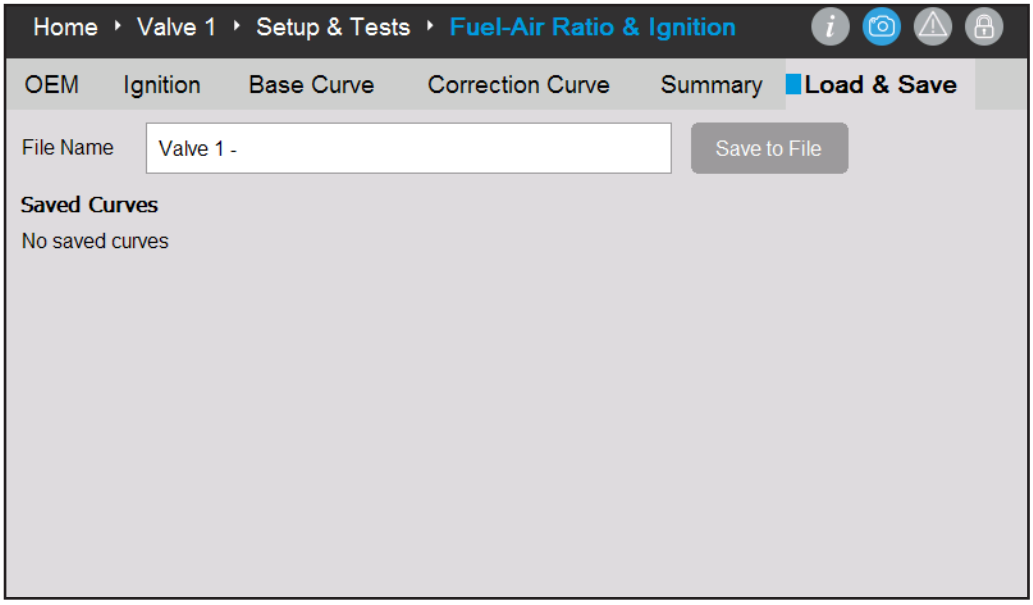
9.D.5 Summary Menu

The Summary tab shows the A/F curves for the base curve and correction curve, so each curve can be reviewed. The summary tab doesn't allow the A/F curves to be adjusted, so there is not a risk of making unintended changes.

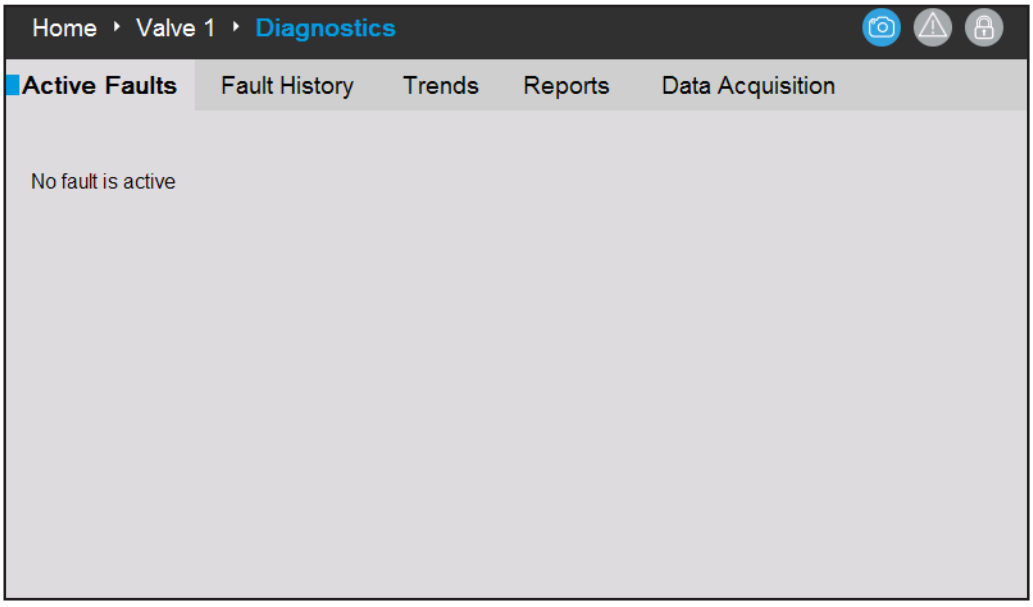


9.D.6 Load & Save Menu

Allows for valve configurations, A/F curves and log files to be saved or loaded from system memory. Saving the original A/F curves to memory before starting to make adjustments will allow the installer to revert back to previous A/F curves without having to make manual adjustments. When loading valve configurations or A/F curves the correction curve will be cleared, so the correction curve will need to be setup for the boiler to operate correctly.



9.E Diagnostics



Home > Valve 1 > Diagnostics – The diagnostics section is broken up into several menus and will help to diagnose issues if they occur.

Active faults - lists the faults that are currently active preventing or limiting boiler function.

Fault History – lists the faults that have occurred and are no longer active.

Trends – variables can be added to a graph to create a trend. The time scale and variables to monitor can be selected from pulldown menus.

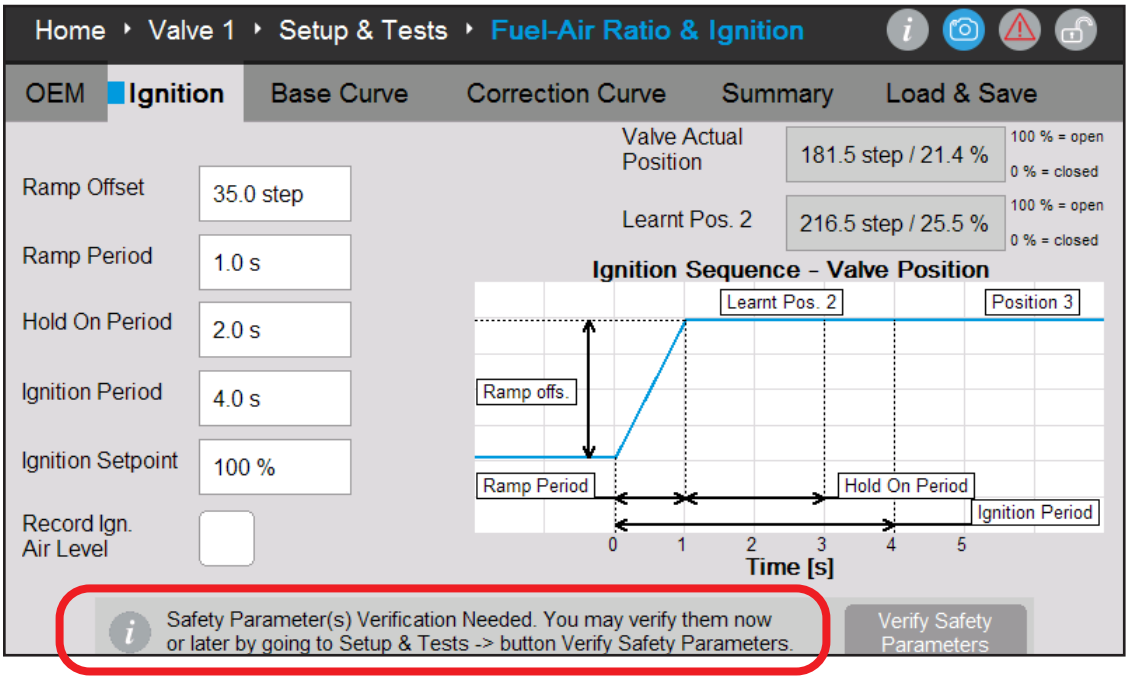
Reports – creates a report of all of the gas valve settings, A/F curves, faults, ignition settings and OEM settings that can be used when trouble shooting the boiler. This report is something that you may be asked to collect when requesting application support, so settings and adjustments can be confirmed.

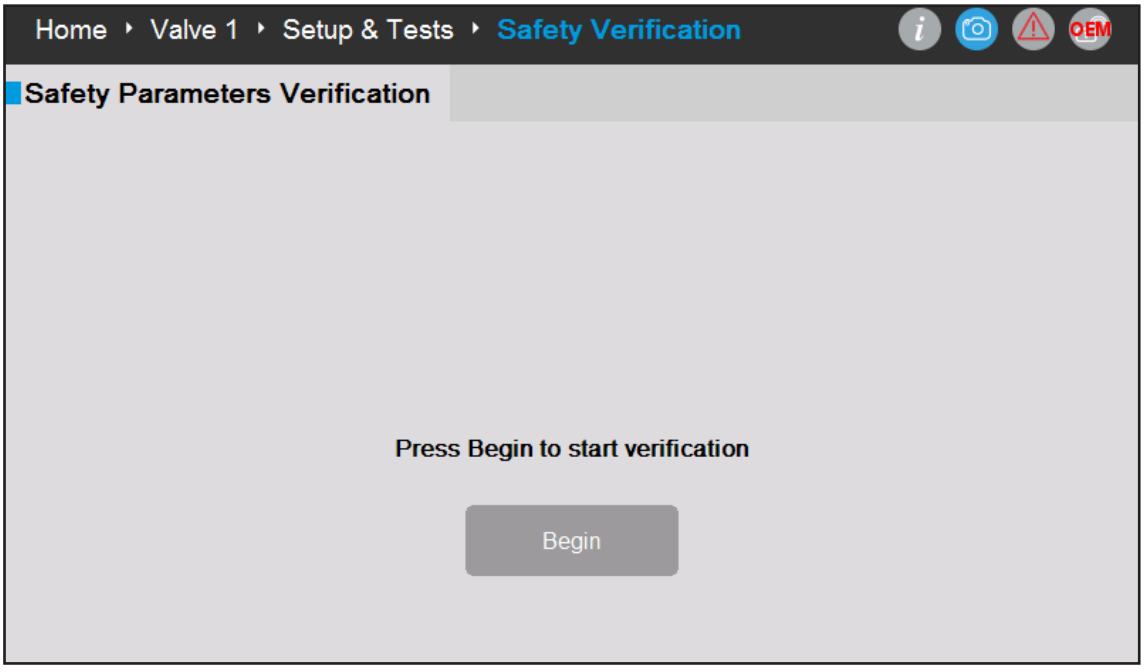
Data Acquisition – Only available during BETA. Allows for the collection of data specific to valve operation for diagnostic and troubleshooting purposes.

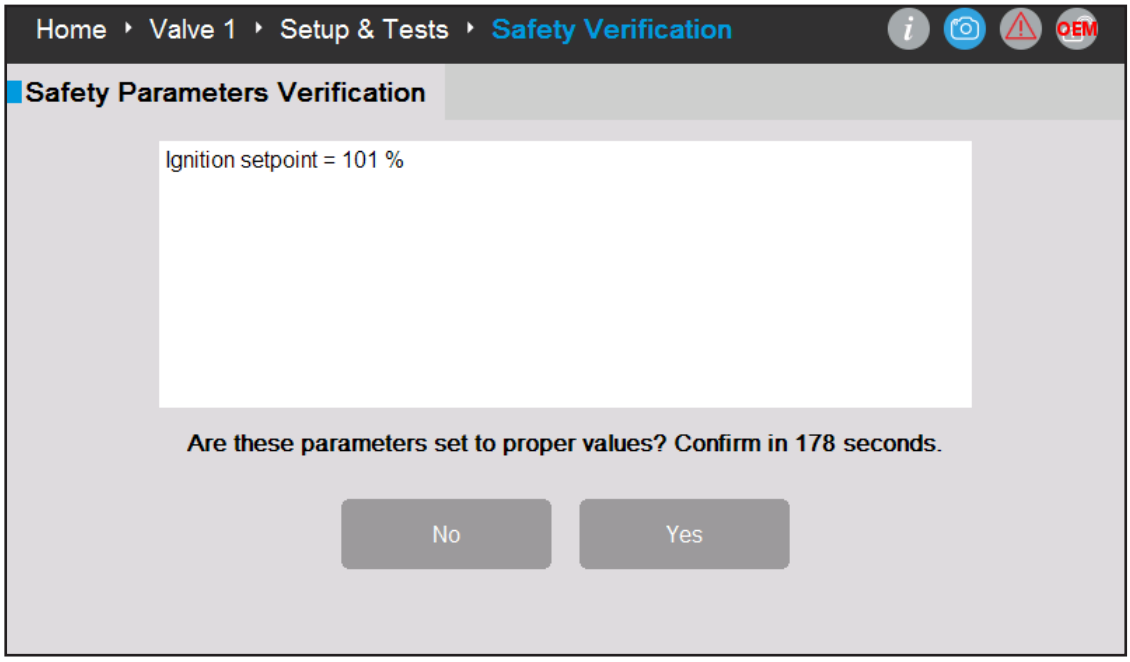
9.F Verification Menu

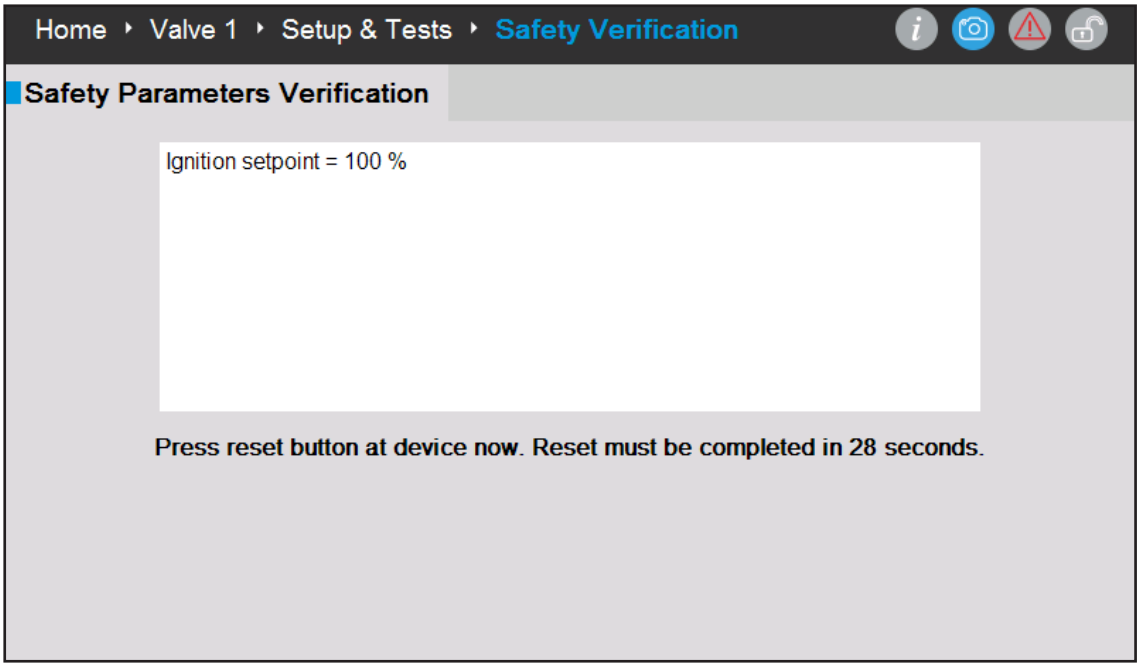
Verification is a required process when changes to safety parameters are made. Verification forces a review of the changes made and allows those changes to be accepted.

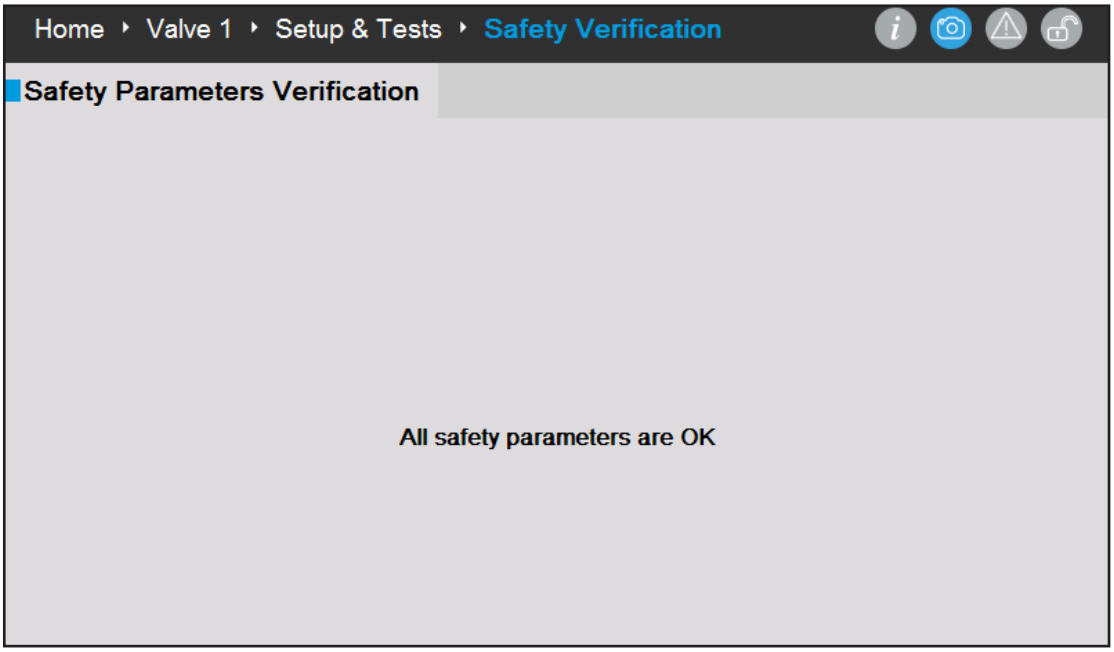
1. When a setting is changed that requires verification a notification will appear at the bottom of the screen. Press the Verify Safety Parameters button to proceed to the verification process.
2. Select begin to start the verification process.
3. Select yes if the parameter change is correct. Select No if the parameter change is incorrect. If No is selected the parameter must be changed to the correct setting and the verification process started again.
4. If yes is selected, press the reset button on the gas valve face when prompted to complete the verification process.





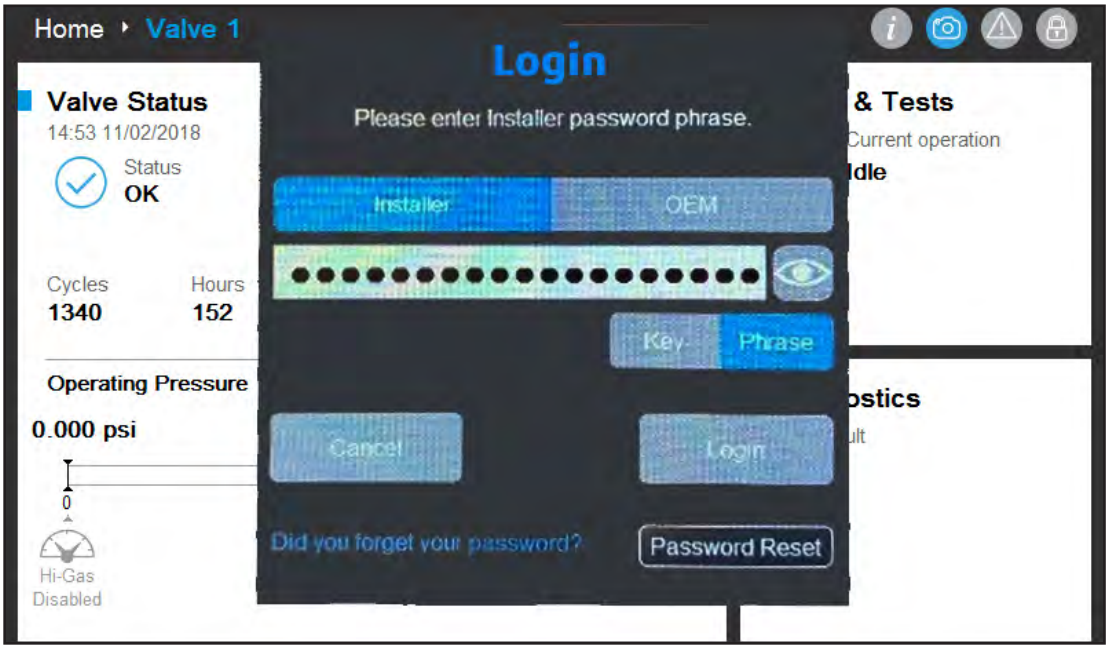

Home ‣ Valve 1 ‣ Setup & Tests ‣ Safety Verification
OEM
Safety Parameters Verification
Ignition setpoint = 101 %
Are these parameters set to proper values? Confirm in 178 seconds.
No
Yes


Home ‣ Valve 1 ‣ Setup & Tests ‣ Safety Verification
Safety Parameters Verification
Ignition setpoint = 100 %
Press reset button at device now. Reset must be completed in 28 seconds.



9.G Gas Valve Password & Login Menu

The login screen will appear with an attempt to make changes to a password protected parameter. The login screen can also be accessed by pressing the login icon at the top of the gas valve display. When entering a password select the installer tab and then enter the password LaarsOmt2018. Passwords are case sensitive.



SECTION 10 Parameter Tables

Table 17. ONH (BOILER) Parameter and Range Table (2 pages)

ONH	User	Installer	OEM	Minimum	Maximum	Default
Time & Date						
Hour	x	x	x	NA	NA	NA
Minute	x	x	x	NA	NA	NA
Month	x	x	x	NA	NA	NA
Day	x	x	x	NA	NA	NA
Year	x	x	x	NA	NA	NA
CH1						
CH1 Enable/Disable		x	x	Disable	Enable	Enable
CH1 Setpoint	x	x	x	50 F	210 F	180 F
CH1 On Hysteresis		x	x	0 F	60 F	10 F
CH1 Off Hysteresis		x	x	0 F	20 F	10 F
CH1 PID Low - Proportional Gain		x	x	0	10	5
CH1 PID Low - Integral Time		x	x	0	10	2
CH1 PID Low - Derivative Time		x	x	0	10	0
CH1 PID High - Proportional Gain		x	x	0	10	7
CH1 PID High - Integral Time		x	x	0	10	7
CH1 PID High - Derivative Time		x	x	0	10	0
CH2						
CH2 Enable/Disable		x	x	Disable	Enable	Enable
CH2 Setpoint	x	x	x	50 F	210 F	170 F
CH2 On Hysteresis		x	x	0 F	60 F	10 F
CH2 Off Hysteresis		x	x	0 F	20 F	10 F
CH2 PID Low - Proportional Gain		x	x	0	10	5
CH2 PID Low - Integral Time		x	x	0	10	2
CH2 PID Low - Derivative Time		x	x	0	10	0
CH2 PID High - Proportional Gain		x	x	0	10	7
CH2 PID High - Integral Time		x	x	0	10	7
CH2 PID High - Derivative Time		x	x	0	10	0
DHW						
DHW Enable/Disable		x	x	Disable	Enable	Enable
DHW Setpoint	x	x	x	50 F	210 F	120 F
DHW On Hysteresis		x	x	0 F	60 F	10 F
DHW Off Hysteresis		x	x	0 F	20 F	10 F
DHW PID Low - Proportional Gain		x	x	0	10	5
DHW PID Low - Integral Time		x	x	0	10	2
DHW PID Low - Derivative Time		x	x	0	10	0
DHW PID High - Proportional Gain		x	x	0	10	7
DHW PID High - Integral Time		x	x	0	10	7
DHW PID High - Derivative Time		x	x	0	10	0
DHW Offset	x	x	x	0 F	70 F	0 F
Control Sensor		x	x	System Supply	DHW	System Supply
DHW Timeout		x	x	0 minutes	600 minutes	0 minutes
CH Timeout		x	x	0 minutes	600 minutes	0 minutes
Outdoor Reset						
Outdoor Reset Enable/Disable		x	x	Disable	Enable	Disable
Maximum Outdoor Temperature		x	x	0 F	120 F	65 F
Minimum Outdoor Temperature		x	x	- 40 F	65 F	0 F
Minimum Water CH1 Temperature		x	x	50 F	200 F	120 F
Minimum Water CH2 Temperature		x	x	50 F	200 F	120 F
Cascade CH						
Address		x	x	0	8	0
Dynamic Address		x	x	0	8	0
Minimum On Time		x	x	30 s	600 s	60 s
Minimum Off Time		x	x	30 s	600 s	60 s
Lost Lead Backup Setpoint		x	x	100 F	200 F	140 F
Lag On Hysteresis		x	x	0 F	20 F	10 F
Lag Off Hysteresis		x	x	0 F	20 F	10 F
Maximum Lag Temperature		x	x	100 F	200 F	140 F
Backup Mode Max Lag Power		x	x	20%	100%	100%
Cascade Rotation						
Rotation Mode		x	x	Run Time	Recurrence	Run Time
Run Time Hours		x	x	12 hrs	744 hrs	24 hrs
Time of Day - Hour		x	x	0	23	2
Time of Day - Minutes		x	x	0	59	0
Every X Day		x	x	1	365	1
Cascade Redundancy						
Loss of Lead Setup		x	x	Disable	Boiler Internal Setpoint/ Redundant Lead	Disable
Hybrid						
Hybrid Enable/Disable		x	x	Disable	Enable	Disable
Hybrid Lag Mode		x	x	Disable	Enable	Disable
Hybrid Setpoint	x	x	x	80 F	180 F	130 F
Hybrid Differential		x	x	5 F	20 F	10 F
Hybrid Delay		x	x	0 min	720 min	30 min
Pump Configuration						
Boiler Pump Control		x	x	Auto	Always On/ Off During DHW/Auto - Off When Temperature Reached	Auto
Boiler Pump Post Circulation		x	x	0 secs	600 secs	60 secs
DHW Pump Control		x	x	Disable	Auto/ Always On	Auto
DHW Pump Post Circulation		x	x	0 secs	600 secs	60 secs

ONH (BOILER) Parameter and Range Table (continued)

ONH	User	Installer	OEM	Minimum	Maximum	Default
System Pump Control		x	x	Disable	Auto/ Always On/ Off During DHW	Auto
System Pump Post Circulation		x	x	0 secs	600 secs	60 secs
Vari-Prime						
Pump On Delay Timer		x	x	1 secs	120 secs	1 secs
Proportional Gain		x	x	0	10	5
Integral Time		x	x	0	10	2
Derivative Time		x	x	0	10	0
Pump Minimum Speed		x	x	0 mV	10000 mV	2000 mV
Pump Maximum Speed		x	x	2000 mV	10000 mV	10000 mV
Pump Off Delay Timer		x	x	0 secs	600 secs	60 secs
Delta Temperature		x	x	0 F	60 F	20 F
PrePurge Speed		x	x	2000 mV	10000 mV	10000mV
PostPurge Speed		x	x	2000 mV	10000 mV	10000mV
Firing Rate						
Enable Burner		x	x	Disable	Enable	Disable
Fan speed		x	x	800 rpm	5400 rpm	800 rpm
Time Out		x	x	60 secs	3600 secs	1200 secs
Postpurge Time		x	x	15.0 secs	360.0 secs	15.0 secs
Manual Heat Demand		x	x	Disable	Enable	Disable
Temperature Limits						
Auto Reset Boiler Outlet		x	x	100 F	210 F	195 F
Manual Reset Boiler Outlet		x	x	100 F	210 F	200 F
Reset Differential		x	x	1 F	30 F	20 F
Manual Reset Flue		x	x	50	500	500
Flue Temp Min		x	x	50	500	450
Flue Temp Max		x	x	50	500	500
Delta T Maximum Temperature		x	x	50 F	70 F	60 F
Delta T Enable/Disable		x	x	Disable	Enable	Enable
Outlet Temp Minimum		x	x	180	195	190
Outlet Temp Maximum		x	x	190	210	195
External Control						
Control Mode		x	x	Disable	External Setpoint	Disable
Maximum Setpoint		x	x	120 F	200 F	150 F
Minimum Setpoint		x	x	50 F	200 F	130 F
Demand Max		x	x	0%	100%	100%
Demand Min		x	x	0%	100%	20%
Demand On		x	x	0%	25%	15%
Demand Off		x	x	0%	25%	10%
Input Type		x	x	0-10 Volt	4-20 mA	0-10 Volt
Heat Demand		x	x	VDC-mA Only	CH1&VDC-mA/ CH2&VDC-mA/ DHW&VDC-mA	CH1&VDC-mA
Demand Priorities						
CH1 Demand Priority		x	x	1	5	2
CH2 Demand Priority		x	x	1	5	3
DHW Demand Priority		x	x	1	5	1
Cascade Demand Priority		x	x	1	5	4
External Demand Priority		x	x	1	5	5
Anti- Frost						
Anti Frost Mode		x	x	Disable	Pump Only/ Pump & Burner	Pump Only
Anti- Frost Setpoint		x	x	32 F	120 F	40 F
Anti- Frost Hysteresis		x	x	4 F	11 F	5 F
Anti- Frost Pump Control		x	x	Boiler	DHW/ System	Boiler
Warm Weather Shutdown						
Temperature Minimum		x	x	50 F	140 F	90 F
Temperature Maximum		x	x	50 F	140 F	95 F
Feature Options		x	x	Disable	Shutdown Immediately/ Shutdown After Demand is Satisfied	Shutdown Immediately
Summer Kick CH		x	x	0 secs	600 secs	30 secs
Summer Kick DHW		x	x	0 secs	600 secs	30 secs
Summer Kick System		x	x	0 secs	600 secs	30 secs
Summer Kick Period		x	x	10 min	2000 min	1440 min
Anti- Short Cycle Time						
Cycle Time		x	x	10 secs	240 secs	60 secs
Temperature Conversion						
Conversion Unit		x	x	Celsius	Fahrenheit	Fahrenheit
COM port Options						
Protocol		x	x	Modbus	BACnet	BACnet
Baudrate		x	x	9600	19200/38400/76800	76800
Address		x	x	0	255	127
Device Model Name		x	x	NA	NA	NA
Device Object Name		x	x	NA	NA	NA
Object Instance		x	x	0	4194303	600000
Timeout		x	x	0 secs	300 secs	300 secs
Service						
Burner Enable/Disable		x	x	Disable	Enable	Enable
Screen Settings						
Light Timeout	x	x	x	60 secs	3600 secs	600 secs
AutoLock Timeout	x	x	x	60 secs	3600 secs	600 secs

Table 18. ONV (WATER HEATER) Parameter and Range Table (2 pages)

ONV	User	Installer	OEM	Minimum	Maximum	Default
Time & Date						
Hour	x	x	x	NA	NA	NA
Minute	x	x	x	NA	NA	NA
Month	x	x	x	NA	NA	NA
Day	x	x	x	NA	NA	NA
Year	x	x	x	NA	NA	NA
DHW1						
DHW1 Enable/Disable		x	x	Disable	Enable	Enable
DHW1 Setpoint	x	x	x	50 F	210 F	180 F
DHW1 On Hysteresis		x	x	0 F	60 F	10 F
DHW1 Off Hysteresis		x	x	0 F	20 F	10 F
DHW1 PID Low - Proportional Gain		x	x	0	10	5
DHW1 PID Low - Integral Time		x	x	0	10	2
DHW1 PID Low - Derivative Time		x	x	0	10	0
DHW1 PID High - Proportional Gain		x	x	0	10	7
DHW1 PID High - Integral Time		x	x	0	10	7
DHW1 PID High - Derivative Time		x	x	0	10	0
DHW2						
DHW2 Enable/Disable		x	x	Disable	Enable	Enable
DHW2 Setpoint	x	x	x	50 F	210 F	170 F
DHW2 On Hysteresis		x	x	0 F	60 F	10 F
DHW2 Off Hysteresis		x	x	0 F	20 F	10 F
DHW2 PID Low - Proportional Gain		x	x	0	10	5
DHW2 PID Low - Integral Time		x	x	0	10	2
DHW2 PID Low - Derivative Time		x	x	0	10	0
DHW2 PID High - Proportional Gain		x	x	0	10	7
DHW2 PID High - Integral Time		x	x	0	10	7
DHW2 PID High - Derivative Time		x	x	0	10	0
DHW3						
DHW3 Enable/Disable		x	x	Disable	Enable	Enable
DHW3 Setpoint	x	x	x	50 F	210 F	140 F
DHW3 On Hysteresis		x	x	0 F	60 F	10 F
DHW3 Off Hysteresis		x	x	0 F	20 F	10 F
DHW3 PID Low - Proportional Gain		x	x	0	10	5
DHW3 PID Low - Integral Time		x	x	0	10	2
DHW3 PID Low - Derivative Time		x	x	0	10	0
DHW3 PID High - Proportional Gain		x	x	0	10	7
DHW3 PID High - Integral Time		x	x	0	10	7
DHW3 PID High - Derivative Time		x	x	0	10	0
DHW3 Offset	x	x	x	0 F	70 F	0
Control Sensor		x	x	System Supply	DHW	System Supply
DHW Timeout		x	x	0 minutes	600 minutes	0 minutes
CH Timeout		x	x	0 minutes	600 minutes	0 minutes
Outdoor Reset (NOT Available on Volume Water Units)						
Cascade DHW						
Address		x	x	0	8	0
Dynamic Address		x	x	0	8	0
Minimum On Time		x	x	30 s	600 s	60 s
Minimum Off Time		x	x	30 s	600 s	60 s
Lost Lead Backup Setpoint		x	x	100 F	200 F	140 F
Lag On Hysteresis		x	x	0 F	60 F	10 F
Lag Off Hysteresis		x	x	0 F	20 F	10 F
Maximum Lag Temperature		x	x	120 F	200 F	180 F
Cascade Rotation						
Rotation Mode		x	x	Run Time	Recurrence	Run Time
Run Time Hours		x	x	12 hrs	744 hrs	24 hrs
Time of Day - Hour		x	x	0	23	2
Time of Day - Minutes		x	x	0	59	0
Every X Day		x	x	1	365	1
Cascade Redundancy						
Loss of Lead Setup		x	x	Disable	Boiler Internal Setpoint/ Redundant Lead	Disable
Pump Configuration						
Boiler Pump Control		x	x	Disable	Auto/ Always On/ Off During DHW/Auto - Off When Temperature Reached	Auto
Boiler Pump Post Circulation		x	x	0 secs	600 secs	60 secs
DHW Pump Control		x	x	Disable	Auto/ Always On	Auto
DHW Pump Post Circulation		x	x	0 secs	600 secs	60 secs

ONV (HEATER) Parameter and Range Table (continued)

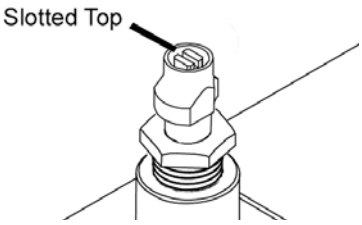
ONV	User	Installer	OEM	Minimum	Maximum	Default
System Pump Control		x	x	Disable	Auto/ Always On/ Off During DHW	Auto
System Pump Post Circulation		x	x	0 secs	600 secs	60 secs
Variprime (NOT Available on Volume Water Units)						
Firing Rate						
Enable Burner		x	x	Disable	Enable	Disable
Fan speed		x	x	800 rpm	4400 rpm	800 rpm
Time Out		x	x	60 secs	3600 secs	1200 secs
Postpurge Time		x	x	15.0 secs	360.0 secs	15.0 secs
Manual Heat Demand		x	x	Disable	Enable	Disable
Temperature Limits						
Auto Reset Boiler Outlet		x	x	100 F	210 F	195 F
Manual Reset Boiler Outlet		x	x	100 F	210 F	200 F
Reset Differential		x	x	1 F	30 F	20 F
Manual Reset Flue		x	x	50	500	500
Flue Temp Min		x	x	50	500	450
Flue Temp Max		x	x	450	500	500
Delta T Maximum Temperature		x	x	50 F	70 F	60 F
Delta T Enable/Disable		x	x	Disable	Enable	Enable
Outlet Temp Minimum		x	x	180	195	190
Outlet Temp Maximum		x	x	190	210	195
External Control						
Control Mode		x	x	Disable	External Setpoint	Disable
Maximum Setpoint		x	x	120 F	200 F	150 F
Minimum Setpoint		x	x	50 F	200 F	130 F
Demand Max		x	x	0%	100%	100%
Demand Min		x	x	0%	100%	20%
Demand On		x	x	0%	25%	15%
Demand Off		x	x	0%	25%	10%
Input Type		x	x	0-10 Volt	4-20 mA	0-10 Volt
Heat Demand		x	x	VDC-mA Only	DHW1&VDC-mA/ DHW2&VDC-mA/ DHW3&VDC-mA	DHW1&VDC-mA
Demand Priorities						
DHW1 Demand Priority		x	x	1	5	2
DHW2 Demand Priority		x	x	1	5	3
DHW3 Demand Priority		x	x	1	5	1
Cascade Demand Priority		x	x	1	5	4
External Demand Priority		x	x	1	5	5
Anti- Frost						
Anti Frost Mode		x	x	Disable	Pump Only/ Pump & Burner	Pump Only
Anti- Frost Setpoint		x	x	32 F	120 F	40 F
Anti- Frost Hysteresis		x	x	4 F	11 F	5 F
Anti- Frost Pump Control		x	x	Boiler	DHW/ System	Boiler
Warm Weather Shutdown (NOT Available on Volume Water Units)						
Anti- Short Cycle Time						
Cycle Time		x	x	10 secs	240 secs	60 secs
Temperature Conversion						
Conversion Unit		x	x	Celsius	Fahrenheit	Fahrenheit
Com Port Options						
Protocol				Modbus	BACnet	BACnet
Baudrate		x	x	9600	19200/38400/76800	76800
Address		x	x	0	255	127
Device Model Name		x	x	NA	NA	NA
Device Object Name		x	x	NA	NA	NA
Object Instance		x	x	0	4194303	600000
Timeout		x	x	0 secs	300 secs	300 secs
Service						
Burner Enable/Disable		x	x	Disable	Enable	Enable
Screen Settings						
Light Timeout	x	x	x	60 secs	3600 secs	600 secs
AutoLock Timeout	x	x	x	60 secs	3600 secs	600 secs

SECTION 11 Initial startup Instructions

11.A Filling the Boiler System

1. Ensure the system is fully connected. Close all bleeding devices and open the make-up water valve. Allow the system to fill slowly.
2. If a make-up water pump is employed, adjust the pressure switch on pumping system to provide a minimum of 12 psi (81.8 kPa) at the highest point in the heating loop.
3. If a water pressure regulator is provided on the make-up water line, adjust the pressure regulator to provide at least 12 psi (81.8 kPa) at the highest point in the heating loop.
4. Open any bleeding devices on all radiation units at the high points in the piping throughout the system, unless automatic air bleeders are provided at those points.
5. To remove all air from the heat exchanger, cycle the boiler pump on and off 10 times (10 seconds on and 10 seconds off). Then run the system and boiler pumps for a minimum of 30 minutes with the gas shut off.

NOTE - There are three (3) air bleeds located on top of the water manifolds.



⚠ WARNING

Failure to remove all air from the heat exchanger could lead to property damage, severe injury or death.

6. Open all strainers in the circulating system, check the operation of the flow switch (if equipped), and check for debris. If debris is present, clean out the strainers to ensure proper circulation.
7. Check the liquid level in the expansion tank. With the system full of water and under normal operating pressure, the level of water in the expansion tank should not exceed ¼ of the total with the balance filled with air.
8. Start up the boiler following the procedure in this manual. Operate the entire system, including the pump, boiler, and radiation units for one hour.
9. Recheck the water level in the expansion tank. If the water level exceeds ¼ of the volume of the expansion tank, open the tank drain, and drain to that level.
10. Shut down the entire system and vent all radiation units and high points in the system piping, as described in Step 4.
11. Close the make-up water valve. Check the strainer in the pressure reducing valve for sediment or debris from the make-up water line. Reopen the make-up water valve.
12. Check the gauge for correct water pressure and also check the water level in the system. If the height indicated above the boiler ensures that water is at the highest point in the circulating loop, then the system is ready for operation.
13. Refer to local codes and the make-up water valve manufacturer's instructions as to whether the make-up water valve should be left open or closed.
14. Press the reset on the low pressure switch.
15. After placing the unit in operation, the ignition system safety shutoff device must be tested.

    First, shut off the manual gas valve, and then call the unit for heat. The main gas terminals will be energized and attempting to light for five seconds and then will de-energize. The unit will go into lockout after the required number of trials for ignition periods.

    Second, press the manual reset button on the boiler control, or the user display, open the manual gas valve and allow the unit to light. While the unit is operating, close the manual gas valve and ensure that power to the main gas valve has been cut.
16. Within three (3) days of start up, recheck all air bleeders and the expansion tank as described previously in Steps 4 and 8.

NOTE - The installer is responsible for identifying to the owner/operator the location of all emergency shutoff devices.

⚠ WARNING

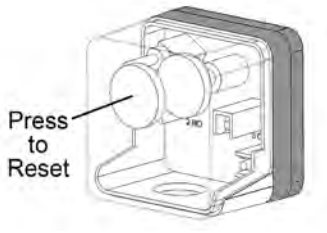
Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control that may have been under water.

11.B Initial Operation

The initial setup must be checked before the unit is put into operation. Problems such as failure to start, rough ignition, strong exhaust odors, etc. can be due to improper setup. Damage to the boiler resulting from improper setup is not covered by the limited warranty.

11.B.1 Initial Burner Operation

1. Using this manual, make sure the installation is complete and in full compliance with the instructions and all local codes.
2. Determine that the unit and system are filled with water and all air has been bled from both. Open all valves.
3. Observe all warnings on the Operating Instructions label and turn on gas and electrical power to the unit. It may be necessary to reset the low pressure switch.



4. The unit will enter the start sequence. The blower and pump will energize for pre-purge, then the ignition sequence will start. After all safety devices are verified, the gas valve will open.
   If ignition doesn't occur, turn off the unit. Check that there is proper supply of gas. Wait five minutes and start the unit again.
5. If ignition starts normally, leave the unit turned on.
6. After placing the unit into operation, the burner safety shutoff device must be tested:
   (a) Close the gas shutoff valve with the burner operating.
   (b) The flame will go out, and the blower will continue to run for the post purge cycle. A few additional attempts to light will follow including pre-purge, ignitor on, valve/flame on and post purge. Ignition will not occur because the gas is turned off. The ignition control will lockout.
   (c) Open the gas shutoff valve. Reset the boiler control by pressing the Reset button on the control. Restart the unit. The ignition sequence will start again and the burner will start. The unit will return to its previous mode of operation.

⚠ WARNING

If any odor of gas is detected, or if the gas burner does not appear to be functioning in a normal manner, ***close the main gas shutoff valve***. Do not shut off the power switch. Contact your heating contractor, gas company, or factory representative.

⚠ WARNING

Improper adjustment may lead to poor combustion quality, increasing the amount of carbon monoxide produced. Excessive carbon monoxide levels may lead to personal injury or death.

11.C Shutting Down the Unit

This step must be performed by a qualified service person.

1. Turn off the main electrical disconnect switch.
2. Close all manual gas valves.
3. If freezing is anticipated, drain the unit and be sure to also protect the building piping from freezing. All water must be removed from the heat exchanger or damage from freezing may occur.

11.D Restarting the Unit

If the system has been drained, see 11.A for instructions on proper filling and purging.

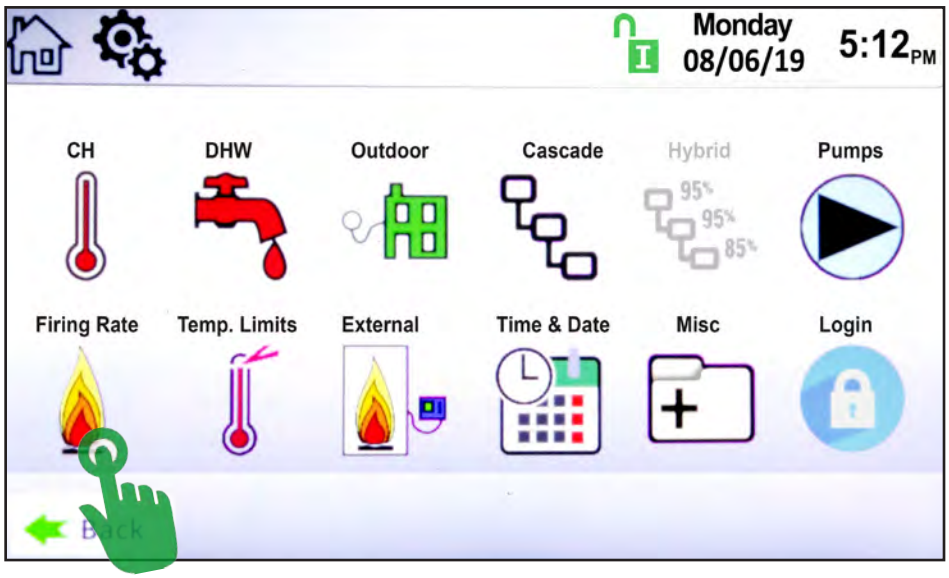
1. Turn off the main electrical disconnect switch.
2. Close all manual gas valves.
3. ***Wait five minutes.***
4. Set the aquastat or thermostat to its lowest setting.
5. Open all manual gas valves.
6. Reset all safety switches (pressure switch, manual reset high limit, etc.).
7. Set the temperature controller to the desired temperature setting and switch on the electrical power.
8. The unit will go through a prepurge period and ignitor warm-up period, followed by ignition.

11.E Combustion setup

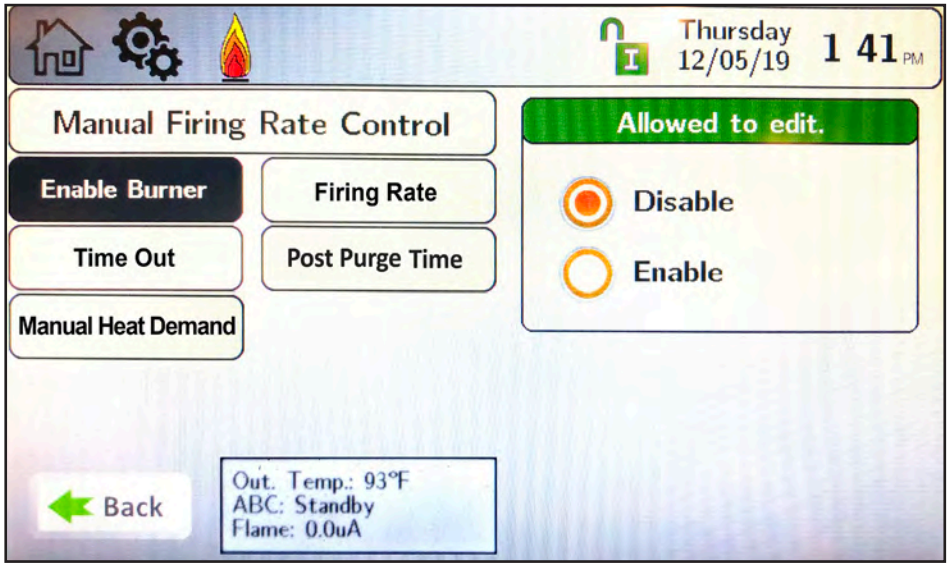
The OmniTherm uses a sophisticated gas control system that monitors the gas air ratio and automatically adjusts to maintain proper operating conditions. On initial installation and subsequent inspections, the CO_2 levels should be checked and if outside the allowable range, adjustments made. To make adjustments to the gas air ratio use the gas valve display inside the boiler jacket and follow the process below.

A Service Video is available YouTube

11.E.1 Firing Rate for Boiler

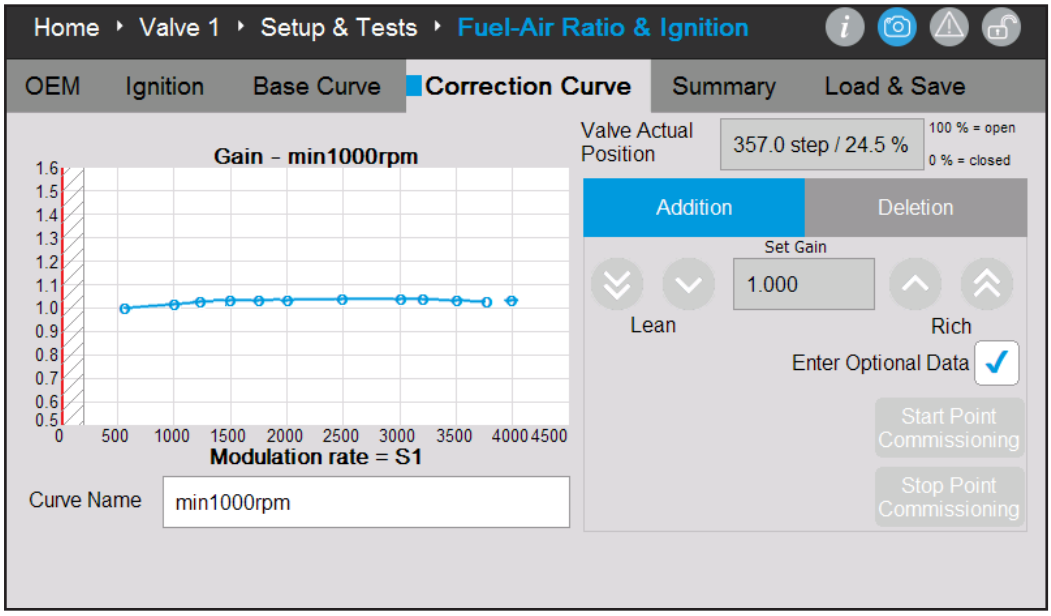


1. Boiler display>Configure>Firing rate. Force the fan speed to the desired RPM by navigating through the boiler display and setting the Fan RPM. Enable fan speed and set the fan speed to desired RPM. Use the following RPMs to set combustion, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, and maximum fan speed.



Firing Rate. See Section 8.D.7 on page 72

11.E.2 Combustion at the Gas Valve Display



2. Measure the combustion product to determine if the CO_2 levels fall in the ranges listed in the table. If the CO_2 level is out of range adjust the CO_2 by using the gas valve display and the process below.
   a. Using the gas valve display Navigate to Home > Valve 1 > Settings > Fuel Air Ratio & Ignition > Correction curve.
   b. Login to the gas valve. See Gas valve password and login section for detailed instructions.
   c. Press Start point commissioning.
   d. Adjust CO_2 levels according to Table 19. Touch lean arrows to decrease CO_2. Touch Rich arrows to increase CO_2. Double arrows move the CO_2 richer or leaner faster than single arrows. In most cases touching the double arrows is acceptable when adjusting the CO_2.
   e. When the CO_2 level is set correctly **press set min** if setting the min modulation point, **press set max** if setting the maximum point or Add Generic if setting a point between min and max. If the point added or modified is close to another point on the correction curve the system will ask if overwriting the existing point is ok.
   f. In some cases it may be necessary to delete the original curve points. To do this select the Deletion tab. Select the point that should be deleted. The point selected will be highlighted on the correction curve. Press Delete point.

3. Repeat this process until all RPMs identified have been setup.

	Air supply temperature		CO_2 level	CO level
	F°	C°	%	ppm
Between	40 - 100	4 - 38	8.5	Less than 150
Below	39	4	8	
Above	101	38	9	

Table 19. CO_2 levels at various air supply temperatures

NOTE: CO levels should not be above 150ppm under normal setup conditions. If CO levels exceed 150ppm consult the factory.

SECTION 12 Maintenance

12.A System Maintenance

Do the following once a year:

1. Lubricate all the pumps in the system, per the instructions on the pump.
2. Inspect the venting system for obstruction or leakage. Periodically clean the screens in the vent terminal and combustion air terminal (when used).
3. Remove and inspect the air filter. Clean with soapy water if needed. Be sure that filter is dry before re-inserting back into air filter box. Replace air filter if damaged.
4. Keep the area around the unit clear and free of combustible materials, gasoline, or other flammable vapors or liquids.
5. If the unit is not going to be used for extended periods in locations where freezing normally occurs, it should be isolated from the system and completely drained of all water.
6. Low water cutoffs should be cleaned and inspected annually.
7. Inspect and clean the condensate collection, float switch and disposal system yearly.
8. Ensure that the condensate is being neutralized properly if a neutralizer is being used.
9. Inspect the flue passages and clean them using brushes or vacuums, if necessary. Sooting in flue passages indicates improper combustion. Determine the cause of the problem and correct it.
10. Inspect the vent system and air intake system and ensure that all joints are sealed properly. If any joints need to be resealed, follow venting manufacturer's instructions to clean and reseal vent system.
11. The pressure relief valve should be inspected and tested every year.
12. Once a year, the items listed below should be inspected by a qualified service technician:

    a. Controls and Displays
    b. Automatic gas valve
    c. Air filter
    d. Pressure switches
    e. Blower
    f. Pump
    g. Flow switch
    h. Low water cutoff
    i. Burner
    j. Heat exchanger
    k. Ignitor

13. Replace FARMod air filter. The filter is located in the top right hand corner of the boiler and can be accessed by removing the front upper panel. On some models this will require the removal of the lower panel first.

Do the following once every six (6) months:

1. If a strainer is employed in a pressure reducing valve or the piping, clean it every six months.

12.B Maintenance Notes

Use only genuine manufacturers replacement parts.

⚠ CAUTION

When servicing the controls, label all wires before disconnecting them. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

⚠ WARNING

Disconnect all power to the unit before attempting any service procedures. Contact with electricity can result in severe injury or death.

NOTE - The Warranty does not cover damage caused by lack of required maintenance, lack of water flow, or improper operating practices.

The gas and electric controls are engineered for long life and dependable operation, but the safety of the equipment depends on their proper functioning.

12.B.1 Burner

Check the burner for debris. Remove the blower assembly to access the blower adapter plate. Remove the 4 bolts connecting the blower to the arm. Remove the blower adapter plate to access the burner. Pull the burner up and out. Clean the burner, if necessary, by blowing compressed air from the outside of the burner into the center of the burner, and wipe the inside of the burner clean with glass cleaner. A dirty burner may be an indication of improper combustion or dirty combustion air. Determine the cause of the problem and correct it. If the burner gaskets are damaged, replace them when replacing the burner.

12.B.2 Gas Valve / Venturi

The gas valve consists of a valve body that incorporates the On/Off gas flow control and a fuel-air ratio controlled pressure regulator. It provides the air/gas ratio control in combination with the fuel/air mixer to the unit. It is designed to operate with gas supply pressure at 4-10.5" W.C. Natural Gas.

To remove the gas valve or fuel/air mixer, shut off the power supply to the boiler. Turn off all manual gas valves connecting the boiler to the main gas supply line. Remove the front doors of the boiler and the top panels to gain access to the gas valve and fuel/air mixer. Disconnect the four (4) flange bolts connecting the gas manifold pipe to the gas valve. Remove the electrical connections to the gas valve. Remove the bolts connecting the fuel/air mixer flange to the blower. This

allows the entire gas valve and fuel/air mixer assembly to be removed as an assembly to facilitate inspection and cleaning.
After the valve has been removed, reassemble in reverse order making sure to include all gaskets and O-rings. Turn on the manual gas valves and check for gas leaks. Turn on the main power. Place the unit in operation following the instructions in SECTION 11. Once the boiler is operating, check for leaks again and confirm all fasteners are tight.

Check the setup for the unit according to the instructions in SECTION 14.

12.B.3 Main Controller

Each unit has an integrated controller that incorporates manual reset high limit control, operating temperature control, ignition control, outdoor reset control, pump control and many other features. If any of these features are thought to be defective, please consult the factory for proper troubleshooting practices before replacing a control.

If it is necessary to replace a controller, turn off all power to the unit and shut off all manual gas valves to the unit. Open the front doors to the unit. Remove all wire connections from the control board. The control board connections are keyed to only allow connection in the proper location, but proper handling techniques should be used to avoid damage to the wiring or connectors. To remove the control, press the mounting tab on each standoff while gently pulling the control board forward. Repeat this process for all standoffs and then remove the control. To replace the control repeat the steps listed above in the reverse order making sure to connect all wires in the proper locations. Place the unit in operation following the steps outlined in SECTION 11.

12.B.4 Valve Control / Display

Each unit has a valve control display that is used to adjust all operating parameters of the gas valve and combustion characteristics of the unit. If it is necessary to replace the display turn all power off to the unit. Remove the wire connector from the back of the display. Do NOT remove the individual wires from the connector. Remove the 4 mounting screws holding the display to the mounting bracket. To replace the display, repeat the steps above in the reverse order. The wiring connector is keyed, so proper alignment and orientation is required when installing the wiring connector. Turn the power to the unit back on and confirm proper display operation.

12.B.5 Spark Ignition & Flame Sensors Electrodes

The spark ignition and flame sensor electrode is a three rod assembly. The ground rod is fastened to the mounting bracket. The spark and sensor electrodes pass through ceramic insulators and then align with the ground rod. In order for a proper spark to form, the mounting bracket must be grounded to the boiler chassis. To remove the electrodes, shut off the power to the unit, turn off the main gas supply and open the front door of the boiler to gain access to the top portion of the unit. Remove the high tension ignition wire from the spark electrode. Remove the flame sensor wire. Remove the two (2) nuts and spacers holding the spark electrode assembly in place. Pull the spark ignition electrodes out of the boiler slowly making sure to move the assembly as needed, so the electrodes are not bent as they are being removed. If the old assembly is determined to be defective, install a new electrode assembly in the reverse order, replacing the gasket if necessary.

⚠ CAUTION

The igniters and sensors can become very hot. If you touch these parts accidentally, this can cause burns or injury.

12.B.6 Blower

The combustion air blower is a high pressure centrifugal blower with a variable speed motor. The blower is driven by the control system using a PWM signal.

If it is necessary to service, remove or replace the blower, the Main Power MUST be disconnected and the main gas supply to the unit must be turned off. Remove the doors. Remove the top and side jacket panels. Remove the fasteners holding the fuel/air mixer to the blower inlet. Remove the hardware that is connecting the blower outlet to the unit's adapter plate. If the blower is determined to be defective, replace the existing blower with a new one and assemble in the reverse order. Be sure to install all of the required gaskets and O-rings between the blower adapter plate and air/fuel mixer.

12.B.7 Heat Exchanger Tubes

Black carbon soot build-up on the external surfaces of the heat exchanger is caused by one or more of the following: incomplete combustion, combustion air problems, venting problems or heater short-cycling. Soot buildup or other debris on the heat exchanger may restrict the flue passages.

⚠ CAUTION

Black carbon soot buildup on a dirty heat exchanger can be ignited by a random spark or flame. To prevent this from happening, dampen the soot deposits with a wet brush or fine water spray before servicing the heat exchanger.

If black carbon soot buildup on the heat exchanger is suspected, disconnect the electrical supply to the unit and turn off the gas supply by closing the manual gas valve on the unit. Access the heat exchanger through the heat exchanger shrouds. Removal of the outer baffles may be required for proper inspection. Use a flashlight. If there is a buildup of black carbon soot or other debris on the heat exchanger, clean per the following:

1. Shut off the main power supply to the boiler.
2. Turn off all manual gas valves connecting the boiler to the main gas supply line.
3. Remove the blower assembly and burner from the heat exchanger.
4. Disconnect the condensate drain line.
5. Attach a longer hose to the drain and run it to a bucket.
6. Clean the heat exchanger by brushing away any light accumulations of soot and debris. Use a non metallic brush with soft bristles to avoid damaging the surfaces of the heat exchanger tubes.
7. Once the tubes have been brushed clean, rinse the tubes and combustion chamber with a small amount of water to rinse all of the debris out of the bottom of the flue collector and into the longer condensate trap line which is being diverted into a separate container.

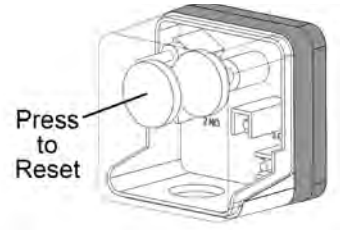
⚠ WARNING

Failure to rinse the debris from the heat exchanger and temporary drain line may lead to clogged condensate lines, traps and neutralizers. Condensate pumps (if used) may also be damaged from the debris left behind, possibly causing property damage.

8. To place the unit back in operation, install all removed components in the reverse order. Be sure all gaskets are in place as the components are installed. Replace any damaged gaskets. Do ***not*** reuse damaged gaskets.
9. Place the unit into operation, checking all gas connections for leaks. Confirm all fasteners are tight.

12.B.8 Gas Pressure Switches

The high and low pressure gas switches are manual reset switches that act to cut power to the interlock circuit if the gas pressure is too low or too high for proper operation. There is a manual reset on both.



The gas pressure switches used are integrally vent limited and do not require venting to atmosphere. To remove a switch, remove the screw on the plastic housing and pull the clear cover off. Disconnect the three (3) wires from the screw terminals. Twist the switch off the pipe nipple. Reassemble in reverse order.
Set the low pressure gas switch to 3” w.c.
Set the high pressure gas switch to 15”w.c.”

SECTION 13 Troubleshooting

13.A Error Codes

Condition	Information	Corrective Action
Flow Switch 	• Insufficient flow at the outlet of the boiler/heater • Auto-reset Condition • Annunciation – "Warning Flow switch open" on Message Screen	• Faulty boiler/heater pump – replace pump. • Faulty pump contactor – replace contactor. • Blown boiler/heater pump fuse – replace fuse F14 on the control board.
Low Water Cut Off	• Insufficient water level in the boiler/heater heat exchanger. • Manual-reset Condition • Annunciation – on Navigation Bar Lockout: Low Water Cut Off	• Reset the LWCO from the reset button on the LWCO module. • Verify the system is full of water and all air has been purged from the system. • Check for loose jumpers if the LWCO is not installed.
Manual Reset High Limit	• Outlet water temperature has exceeded the manual reset high limit setting • Manual-reset Condition • Annunciation – on Navigation Bar Lockout: Man Reset High Limit	• Verify the system is full of water and all air has been purged from the system. • Verify the boiler/heater is piped properly into the heating system. • Check for proper pump operations. • Check the manual reset high limit set point.
Auto Reset High Limit 	• Outlet water temperature has exceeded the auto reset high limit setting • Auto-reset Condition • Annunciation – "Warning High limit auto error" on Message Screen	• Verify the system is full of water and all air has been purged from the system. • Verify the boiler/heater is piped properly into the heating system. • Check for proper pump operations. • Check the manual reset high limit set point.
Gas Valve Lockout	• SV2 Gas Valve Lockout refer to gas valve display for detailed diagnostic information • Annunciation – on Navigation Bar Lockout: Open Safety Chain • Annunciation – "Safety Chain open SV2 Valve ILK" on Message Screen Boiler	• Refer to Gas valve Diagnostic menu active lockouts for detailed troubleshooting information.
High Gas Pressure	• The high gas pressure switch has tripped • Manual-reset Condition • Annunciation – on Navigation Bar Lockout: High Gas Pressure	• Refer to Section 3 for Gas Supply and Piping information. • Verify supply and manifold gas pressures satisfy installation requirements.
Low Gas Pressure	• The low gas pressure switch has tripped • Manual-reset Condition • Annunciation – on Navigation Bar	• Refer to Section 3 for Gas Supply and Piping information.

<table>
<tr><th>Condition</th><th>Information</th><th>Corrective Action</th></tr>
<tr><td></td><td>Lockout: Low Gas Pressure</td><td>• Verify supply and manifold gas pressures satisfy installation requirements.</td></tr>
<tr><td>Condensate Level</td><td>• Condensate trap water level is high
• Auto-reset Condition
• Annunciation – “Warning Condensate level” on Message screen</td><td>• Check condensate trap for proper drainage
• Check condensate trap for stuck level switch</td></tr>
<tr><td>Outlet Sensor</td><td>• Outlet probe is not connected
• Manual-reset Condition
• Annunciation – on Navigation Bar
Lockout: Outlet Probe</td><td>• Check the sensor and wiring. Repair or replace as needed.
• The outlet probe is a dual element probe with 10K and 20K thermistors. A quick test is to measure resistance and verify one resistance is double the other. Replace if necessary.
• Measure the resistance of each element of the sensor and compare to the resistance table below. Replace if necessary.
<table>
<tr><td rowspan="2">Temp (°F)</td><td>10K</td><td>20K</td></tr>
<tr><td>Resistance (Ω)</td><td>Resistance (Ω)</td></tr>
<tr><td>68</td><td>12555</td><td>25099</td></tr>
<tr><td>86</td><td>8025</td><td>16057</td></tr>
<tr><td>104</td><td>5279</td><td>10569</td></tr>
<tr><td>122</td><td>3563</td><td>7139</td></tr>
<tr><td>140</td><td>2463</td><td>4937</td></tr>
<tr><td>158</td><td>1739</td><td>3489</td></tr>
<tr><td>176</td><td>1253</td><td>2514</td></tr>
<tr><td>194</td><td>919</td><td>1845</td></tr>
<tr><td>212</td><td>685</td><td>1376</td></tr>
</table></td></tr>
<tr><td>Outlet Sensor Drift</td><td>• Dual element sensor readings do not agree.
• Manual-reset Condition
• Annunciation – on Navigation Bar
Lockout: Outlet Probe Drift</td><td>• Check the sensor and wiring. Repair or replace as needed.
• The outlet probe is a dual element probe with 10K and 20K thermistors. A quick test is to measure resistance and verify one resistance is double the other. Replace if necessary.
• Measure the resistance of each element of the sensor and compare to the resistance table below. Replace if necessary.
<table>
<tr><td rowspan="2">Temp (°F)</td><td>10K</td><td>20K</td></tr>
<tr><td>Resistance (Ω)</td><td>Resistance (Ω)</td></tr>
<tr><td>68</td><td>12555</td><td>25099</td></tr>
<tr><td>86</td><td>8025</td><td>16057</td></tr>
<tr><td>104</td><td>5279</td><td>10569</td></tr>
</table></td></tr>
</table>

Error Codes (continued)

<table>
<tr><th>Condition</th><th>Information</th><th>Corrective Action</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>122</td><td>3563</td><td>7139</td></tr>
<tr><td>140</td><td>2463</td><td>4937</td></tr>
<tr><td>158</td><td>1739</td><td>3489</td></tr>
<tr><td>176</td><td>1253</td><td>2514</td></tr>
<tr><td>194</td><td>919</td><td>1845</td></tr>
<tr><td>212</td><td>685</td><td>1376</td></tr>
</table>
</td></tr>
<tr><td>Inlet Sensor</td><td>• Inlet sensor is damaged or not connected.
• Manual-reset condition
• Annunciation – on Navigation Bar
Lockout: Inlet Probe</td><td>• Check the sensor and wiring. Repair or replace as needed.
• Measure the resistance of the sensor and compare to the resistance table below. Replace if necessary.
<table>
<tr><td>Temp (°F)</td><td>Temp (°C)</td><td>Resistance (Ω)</td></tr>
<tr><td>68</td><td>20</td><td>12555</td></tr>
<tr><td>86</td><td>30</td><td>8025</td></tr>
<tr><td>104</td><td>40</td><td>5279</td></tr>
<tr><td>122</td><td>50</td><td>3563</td></tr>
<tr><td>140</td><td>60</td><td>2463</td></tr>
<tr><td>158</td><td>70</td><td>1739</td></tr>
<tr><td>176</td><td>80</td><td>1253</td></tr>
<tr><td>194</td><td>90</td><td>919</td></tr>
<tr><td>212</td><td>100</td><td>685</td></tr>
</table>
</td></tr>
<tr><td>Burner Parasitic Flame</td><td>• Sensing flame on burner prior to ignition.
• Manual-reset Condition
• Annunciation – on Navigation Bar
Lockout: Burner Parasitic Flame</td><td>• Inspect flame and wiring for damage and continuity. Replace if necessary.</td></tr>
<tr><td>Burner Max Trials</td><td>• The maximum attempts for ignition has occurred, without sensing flame.
• Manual-reset Condition
• Annunciation – on Navigation Bar
Lockout: Burner Max Trials</td><td>• Verify supply and manifold gas pressures satisfy installation requirements.
• Verify the proper intake and venting.
• Inspect the burner.
• Check pilot and main valve wiring and operation.
• Check ignition transformer electrode, flame detector wiring and position.</td></tr>
<tr><td>Additional High Limit</td><td>• Outlet water temperature has exceeded the additional high limit setting
• Auto-reset Condition
• Annunciation – “Warning Additional high limit” on Message Screen</td><td>• Verify the system is full of water and all air has been purged from the system.
• Verify the boiler/heater is piped properly into the heating system.
• Check for proper pump operations.
• Check the additional high limit set point.</td></tr>
</table>

<table>
<tr><th>Condition</th><th>Information</th><th>Corrective Action</th></tr>
<tr>
<td>Stack Sensor
  </td>
<td>

Stack sensor disconnected
Stack sensor wiring bad
Thermistor elements bad

Lockout: Stack Sensor Drift
Lockout: Stack Sensor Probe
</td>
<td>

Check the sensor and wiring. Repair or replace as needed.
The stack probe is a dual element probe with 100K thermistors. Measure the resistance of each element of the sensor and compare to the resistance table below. Replace if necessary.

<table>
<tr><th>Temp (°F)</th><th>Temp (°C)</th><th>Resistance (Ω)</th></tr>
<tr><td>32</td><td>0</td><td>334000</td></tr>
<tr><td>50</td><td>10</td><td>201660</td></tr>
<tr><td>68</td><td>20</td><td>125500</td></tr>
<tr><td>77</td><td>25</td><td>100000</td></tr>
<tr><td>86</td><td>30</td><td>80220</td></tr>
<tr><td>104</td><td>40</td><td>52590</td></tr>
<tr><td>122</td><td>50</td><td>35270</td></tr>
<tr><td>140</td><td>60</td><td>24160</td></tr>
<tr><td>158</td><td>70</td><td>16870</td></tr>
<tr><td>176</td><td>80</td><td>12000</td></tr>
<tr><td>194</td><td>90</td><td>8674</td></tr>
<tr><td>212</td><td>100</td><td>6369</td></tr>
<tr><td>248</td><td>120</td><td>3581</td></tr>
<tr><td>284</td><td>140</td><td>2117</td></tr>
<tr><td>320</td><td>160</td><td>1307</td></tr>
<tr><td>356</td><td>180</td><td>839</td></tr>
<tr><td>392</td><td>200</td><td>558</td></tr>
<tr><td>428</td><td>220</td><td>382</td></tr>
<tr><td>464</td><td>240</td><td>269</td></tr>
<tr><td>500</td><td>260</td><td>194</td></tr>
<tr><td>536</td><td>280</td><td>143</td></tr>
</table>
</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>

Auto reset condition
Annunciation – “Flow switch error” on Message Screen

</td>
<td>

Verify the system is full of water and all air has been purged from the system.
Verify the boiler/heater is piped properly into the heating system.
Check to see if the pump is on and rotating in the proper direction.
Confirm all ball valves are open
Check wiring to the flow switch
Check flow switch operation to confirm paddle movement and switch operation.

</td>
</tr>
</table>

13.B SV2 Fault Codes

Data Error	23	EEPROM corrupt	Main electronics EEPROM is corrupted.	1.) Reset valve and burner management system then cycle power. 2.) If fault persists replace main electronics. 3.) Recommission all valve parameters.
Data Error	24	EEPROM lockout code mis-match	Main electronics EEPROM lockout code storage value incorrect.	1.) Reset valve and burner management system then cycle power. 2.) If fault persists replace main electronics.
Data Error	48	Valve body parameter missing	Valve body parameters not defined in electronics memory. This may occur when the valve main electronics have been replaced in the field.	Set valve body parameters by accessing the valve guided setup screens.
Fuel/Air	18	Air flow sensor (S1) out of range	The airflow sensor signal is/was outside the sensor measuring range (-8000 to 8000).	1.) Reset valve and burner management system. 2.) If fault persists, replace Fuel/Air Module. 3.) Reset valve and burner management system. 4.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 5.).Recommission partially or fully as desired.
Fuel/Air	25	FARMOD communication fault	The bus communication between the Fuel/Air Module and the valves electronics was/is interrupted.	**Remove power and shut-off gas supply.** 1.) Remove valve front electrical enclosure and inspect Fuel/Air module wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Replace cover and reset valve and burner management system when corrected. 3.) Check for a nearby source of strong electro-magnetic interference. Reset valve and burner management system when corrected. 4.) If fault persists, replace Fuel/Air module. 5.) Reset valve and burner management system. 6.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 7.).Recommission partially or fully as desired.
Fuel/Air	26	Air flow sensor (S1) frozen	The air flow sensor returns a fixed value to the valve electronics. During normal operation the signal is fluctuating. The missing fluctuation of the signal indicates an fault in the sensor.	1.) Replace Fuel/Air Module. 2.) Reset valve and burner management system. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 4.). Recommission partially or fully as desired.
Fuel/Air	27	FARMOD flow sensor (S2a) frozen	The Fuel/Air flow sensor returns a fixed value to the valve electronics. During normal operation the signal is fluctuating. The missing fluctuation of the signal indicates an fault in the sensor.	1.) Replace Fuel/Air Module. 2.) Reset valve and burner management system. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 4.).Recommission partially or fully as desired.
Fuel/Air	28	FARMOD flow sensor (S2a) out of range	The S2a airflow sensor signal is/was outside the sensor measuring range (-8000 to 8000).	1.) Reset valve and burner management system. 2.) If fault persists, replace Fuel/Air Module 3.) Reset valve and burner management system. 4.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 5.).Recommission partially or fully as desired.
Fuel/Air	30	FARMOD control valve has reached its lower limit	The stepper motor position has reached zero position during run mode. This can happen if the inlet pressure is relatively high for the requested minimum gas volume. Lower the gas inlet pressure to SV2 Series valve or increase minimum capacity. Practically, the stepper motor position should be above 80 steps for the 1.5in and 2in valves and above 50 steps for the 1in valve. Below these values the gas	**Fault indicates gas supply pressure is too high and minimum load is too low.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) If fault persists, replace Fuel/Air Module. 5.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 6.) Recommission partially or fully as desired. 7.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	31	FARMOD control valve has reached its upper limit	The Fuel/Air Ratio stepper motor position has reached maximum open position during run mode. This can happen if the inlet pressure is relatively low for the requested maximum gas volume. Increase the gas inlet pressure to SV2 Series valve or decrease maximum capacity. Practically, the stepper motor position should be below 1100 steps for the 1.5in and 2in (DN40-50) valves and below 550 steps for the 1in (DN25) valve. Above these values the gas flow will change very little with changing motor position.	**If this occurs with fault 34 (FARMOD target (S2b) not reached), its an indication the gas supply pressure is too low and the maximum load is too high.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) If fault persists, replace Fuel/Air Ratio Module. 5.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 6.) Recommission partially or fully as desired. 7.) Reset valve and burner management system, monitoring for proper operation. 8.) If fault persists, replace valve and re-commission.
Fuel/Air	32	FARMOD sensor - drift of flow sensors	The safety check on the Fuel/Air Ratio Module sensor signals has failed. If this fault occurs shortly after commissioning adding points to the correction curve of 4 points or recommissioning the 4 points can help to improve the performance of the safety check.	1.) Check Fuel/Air Module reference signal connection for proper engagement. 2.) Reset valve and burner management system, monitoring for proper operation. 3.) If fault persists, replace Fuel/Air Module. 4.) Reset valve and burner management system. 5.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 6.) Recommission partially or fully as desired. 7.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	33	FARMOD mismatch	The Fuel/Air Module has been replaced by a used Fuel/Air Module that already contains commissioning data. **NOTE: If this FARMOD is Accepted and used, any existing data in it will be over-written with the Base Curve and stepper motor full stroke data from valve. The Correction Curve and Ign. Air Level will be erased and must be re-commissioned.**	1.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. Any data in the attached FARMOD will be over-written by data from the valve main electronics. 2.) Recommission partially or fully as desired.
Fuel/Air	34	FARMOD target (S2b) not reached	The Fuel/Air Ratio controlled gas pressure was not within the control setpoint window within the specified time of 30 seconds. Lower the modulation speed of the appliance/burner to avoid this fault. This fault can occur independently or in combination with fault 38.	**If this occurs with fault 38 (FARMOD target (S2a) not reached), it is an indication the gas supply pressure is too low.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) Check/lower appliance/burner modulation speed (by decreasing fan control P factor or limiting its RPM change per time unit) 5.) If fault persists, replace Fuel/Air Ratio Module 6) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 7.) Recommission partially or fully as desired. 8.) Reset valve and burner management system, monitoring for proper operation. 8.) If fault persists, replace valve and re-commission.
Fuel/Air	35	FARMOD rough target (S2b) not reached	The Fuel/Air Ratio controlled gas pressure was not within the control setpoint rough window within the specified time of 10 seconds. Lower the modulation speed of the appliance/burner to avoid this fault. This fault can occur independently or in combination with fault 70.	**If this fault occurs with fault 70 (FARMOD rough target (S2a) not reached), it is an indication the modulation speed is too high.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) Check/lower appliance/burner modulation speed (by decreasing fan control P factor or limiting its RPM change per time unit) 5.) If fault persists, replace Fuel/Air Module. 6.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 7.) Recommission partially or fully as desired. 8.) Reset valve and burner management system, monitoring for proper operation. 9.) If fault persists, replace valve and re-commission.

Fuel/Air	38	FARMOD target (S2a) not reached	The Fuel/Air Ratio redundant gas pressure signal was not within the control setpoint window within the specified time of 30 seconds. This fault can occur independently or in combination with fault 34.	**If this fault occurs directly after commissioning:** 1.) Recommission the 4 points of the correction curve and/or add additional points to the correction curve. **If the fault persists or if it occurs in combination with fault 34 (FARMOD target (S2b) not reached), it indicates low gas supply pressure for the asked capacity.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement.. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) If fault persists, replace Fuel/Air Module. 5.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 6.) Recommission partially or fully as desired. 7.) Reset valve and burner management system, monitoring for proper operation. **If this fault occurs independently, the Fuel/Air Module is corrupt:** 1.) Replace Fuel/Air Module. 2.) Accept new Fuel/Air Module on the FARMOD tab in the Setup & Tests menu. 3.) Recommission partially or fully as desired. 4.) Reset valve and burner management system, monitoring for proper operation. **If fault persists, replace valve and re-commission.**
Fuel/Air	39	FARMOD EEPROM communication	Fuel/Air Module has separate storage which is does not respond to read request. Storage contains module-specific calibration data essential for correct device operation. This can be caused by incorrect wiring or Fuel/Air Module damage.	1.) Check the electrical connection of main and Fuel/Air modules. 2.) Reset the valve and the burner management system. 3.) If fault persists replace Fuel/Air Ratio module. 4.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 5.).Recommission partially or fully as desired.
Fuel/Air	42	FARMOD S1 pre-ignition air level	The S1 pre-ignition air level is below or above the Recorded Ign. Air Level by the threshold values. The S1 pre-ignition threshold values are programmed as X% below and Y% above the Recorded Ign. Air Level on the OEM Setup screen. X%=S1 pre-ignition lower threshold. Default=80%. Y%=S1 pre-ignition upper threshold. Default=120%. This can be caused by a change in ignition load, change in ignition fan speed, wind attack or blockage of the appliance air supply.	**If ignition load has changed:** 1.) Recommission light off sequence. 2.) If fault persists, perform steps below. **If ignition fan speed change is known/suspected:** 1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check Fuel/Air Module signal connections for proper engagement. 4.) Reset valve and burner management system. 5.) If fault persists, recommission light off sequence. Record new pre-ignition air proving values by checking the Record Ign. Air Level box on the Ignition Setup page once system is stabilized. 6.) If fault persists, replace Fuel/Air Ratio Module. 7.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 8.).Recommission partially or fully as desired. 9.) If fault persists, replace valve and re-commission.
Fuel/Air	43	FARMOD light-off S2a level	The Fuel/Air Ratio Module S2a value was outside the commissioned window. This can be caused by a change in ignition load or ignition fan speed.	**When combined with fault 42 and/or 44 its an indication the fan speed is wrong or there are flue system issues.** **High values=fan speed wrong or flue disconnected** **Low values=fan speed too low, HX blocked or flue blocked** 1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check Fuel/Air Module signal connections for proper engagement. 4.) Reset valve and burner management system. 5.) If fault persists, recommission light off sequence. Record new pre-ignition air proving values by checking the Record Ign. Air Level box on the Ignition Setup page once system is stabilized. 6.) If fault persists, replace Fuel/Air Module. 7.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 8.).Recommission partially or fully as desired. 9.) If fault persists, replace valve. **If fault appears independently, the likely cause is a corrupt S2a sensor inside the FARMOD.** 1.) Reset valve and burner management system. 2.) If fault persists, replace Fuel/Air Ratio Module. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 4.).Recommission partially or fully as desired. 5.) If fault persists, replace valve and re-commission.
Fuel/Air	44	FARMOD light-off S2b level	The Fuel/Air Ratio Module S2b value was outside the commissioned window. This can be caused by a change in ignition load or ignition fan speed.	**When combined with fault 42 and/or 44 its an indication the fan speed is wrong or there are flue system issues.** **High values=fan speed wrong or flue disconnected.** **Low values=fan speed too low, HX blocked or flue blocked.** 1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check Fuel/Air Module signal connections for proper engagement. 4.) Reset valve and burner management system. 5.) If fault persists, recommission light off sequence. Record new pre-ignition air proving values by checking the Record Ign. Air Level box on the Ignition Setup page once system is stabilized. 6.) If fault persists, replace Fuel/Air Ratio Module. 7.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 8.).Recommission partially or fully as desired. 9.) If fault persists, replace valve. **If fault appears independently, the likely cause is a corrupt S2b sensor inside the FARMOD.** 1.) Reset valve and burner management system. 2.) If fault persists, replace Fuel/Air Module. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 4.).Recommission partially or fully as desired. 5.) If fault persists, replace valve and re-commission.
Fuel/Air	45	FARMOD EEPROM factory data corrupted	The factory stored data inside the Fuel/Air Module is corrupted, contact your OEM for advice.	1.) Replace Fuel/Air Ratio Module. 2.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 3.).Recommission partially or fully as desired. 4.) Reset valve and burner management system.
Fuel/Air	50	Fuel/Air Correction Curve Max not defined	This fault is ignored when the Installer or OEM are logged into the valve. If the curve maximum was not defined during commissioning and commissioning mode is exited, the valve will lockout on this fault.	Commission the Fuel/Air curve, ensuring the maximum firing rate is entered.

SV2 Fault Codes (continued)

Fuel/Air	52	Fuel/Air Correction Curve Min not defined	This fault is ignored when the Installer or OEM are logged into the valve. If the curve minimum was not defined during commissioning and commissioning mode is exited, the valve will lockout on this fault.	Commission the Fuel/Air curve, ensuring the minimum firing rate is entered.
Fuel/Air	54	Fuel/Air motor driver	Fuel/Air stepper motor fault signal is active due to possible overheat or electrical short.	1.) Remove power from valve and allow fuel/air stepper motor to cool down for a minimum of 5 minutes in case of an overheat situation. 2.) Reset valve and burner management system, observing valve / burner operation. Remove power and shut-off gas supply as necessary. 3.) Remove valve front electrical enclosure and verify the stepper motor terminating connector is fully inserted in the socket labeled 'MOTOR' in the electrical enclosure. Replace electrical enclosure. 5.) Reset valve and burner management system, observing valve / burner operation. 6.) If fault persists, replace valve main electronics. 7.) If fault persists, replace valve and re-commission.
Fuel/Air	55	Fuel/Air Control Valve	Fuel/Air Control valve is stuck. This means that gas regulation does not work correctly.	**Remove power and shut-off gas supply.** 1.) Remove valve front electrical enclosure and inspect Motor connection for wire engagement, seating, pin engagement and cleanliness. Correct any errors. Replace electrical enclosure. 2.) Verify ambient temperature meets valve specifications. 3.) Restore power and gas supply. Reset valve and burner management system, monitoring for proper operation. 4.) If fault persists, replace valve and re-commission. 5.) If fault persists, replace valve electronics.
Fuel/Air	56	FARMOD fuel sensor is stuck	The Fuel/Air Ratio Module flow sensor returns a fixed value to the valve electronics. During normal operation the signal is fluctuating. The missing fluctuation of the signal indicates a fault in the sensor.	1.) Replace Fuel/Air Module. 2.) Reset valve and burner management system. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 4.). Recommission partially or fully as desired.
Fuel/Air	60	FARMOD light-off not commissioned	No values were recorded for the Fuel/Air Ratio pre-ignition air proving values. This fault is ignored during commissioning if the Record Ign. Air Level box is checked on the Ignition Setup screen.	1.) Commission the light-off sequence by logging in as OEM or Installer. Record new pre-ignition air proving values by checking the Record Ign. Air Level box on the Ignition Setup page once system is stabilized. 2.) Reset valve and burner management system.
Fuel/Air	61	Burner load maximum threshold	During curve commissioning, the S1 threshold is hard-coded at 6000. If S1 rises above 6000, this fault occurs, but does not cause a lockout. During normal run mode, the S1 threshold is programmed as Y (or at least 25 counts) above the S1 maximum commissioned Installer Correction Curve value. Y is programmed in the OEM Setup parameters via the S1 maximum threshold (%) parameter. The default is 120%.	1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check Fuel/Air Module signal connections for proper engagement. 4.) Reset valve and burner management system. 5.) Recommission Fuel/Air curve. 6.) If fault persists, replace Fuel/Air Module. 7.) Reset valve and burner management system. 8.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 9.) Recommission partially or fully as desired. 10.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	70	FARMOD rough target (S2a) not reached	The Fuel/Air Ratio Module redundant gas pressure signal was not within the control setpoint rough window within the specified time of 10 seconds. This fault can occur independently or in combination with fault 35.	**If this fault occurs directly after commissioning:** 1.) Recommission the 4 points of the correction curve and/or add additional points to the correction curve. **If the fault persists or if it occurs with fault 35 (FARMOD rough target (S2a) not reached), it is an indication the modulation speed is too high.** 1.) Check gas supply pressure to appliance. 2.) Check Fuel/Air Module signal connections for proper engagement. 3.) Reset valve and burner management system, 4.) Check/lower appliance/burner modulation speed (by decreasing fan control P factor or limiting its RPM change per time unit). 5.) If fault persists, replace Fuel/Air Module. 6.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 7.) Recommission partially or fully as desired. 8.) Reset valve and burner management system, monitoring for proper operation. 9.) If fault persists, replace valve and re-commission.
Fuel/Air	71	FARMOD EEPROM image revision	Fuel/Air Ratio Module EEPROM image revision does not match valve firmware.	1.) Replace Fuel/Air Ratio Module with a correct version. 2.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 3.) Recommission partially or fully as desired.
Fuel/Air	72	Motor connection	Stepper motor is not connected, or motor current is outside its specified range.	1.) Check the stepper motor and valve main electronics board connection. 2.) Reset the valve and the burner management system, monitoring for proper operation. 3.) If fault persists, replace valve main electronics board. Perform Valve Production Cloning procedure first, accessed via Setup & Tests menu. 4.) If fault persists replace the valve and re-commission.
Fuel/Air	73	FARMOD EEPROM write	Fuel/Air Ratio Module EEPROM write error has occurred unexpectedly.	1.) Reset the valve, monitoring for proper operation 2.) If fault persists replace Fuel/Air Ratio Module. 3.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface.. 4.).Recommission partially or fully as desired.
Fuel/Air	79	FCV Failure	Fuel Control Valve has failed to calibrate.	**Remove power and shut-off gas supply.** 1.) Remove valve front electrical enclosure and inspect Motor connection for wire engagement, seating, pin engagement and cleanliness. Correct any errors. Replace electrical enclosure. 2.) Restore power and gas supply. 3.) Reset valve and burner management system, monitoring for proper operation. 4.) If fault persists, replace valve and re-commission.
Fuel/Air	83	FARMOD flow sensor (S2b) out of range	Fuel/Air Ratio Module flow S2b sensor value out of range	1.) Reset valve and burner management system, monitoring for proper operation. 2.) Check system filter for clogging and replace as necessary**.** 3.) If fault persists, replace Fuel/Air Ratio Module. 4.) Reset valve and burner management system. 5.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 6.). Recommission partially or fully as desired.
Fuel/Air	84	FARMOD EEPROM (commissioning) data corrupted	Fuel/Air Ratio Module EEPROM (commissioning) data corrupted	1.) Attempt a complete Fuel/Air valve commissioning. 2.) If fault persists, replace Fuel/Air Module. 3.) Reset valve and burner management system. 4.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 5.) Recommission partially or fully as desired. 6.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	86	FARMOD Factory Calibration data invalid	Fuel/Air Ratio Module does not contain valid factory calibration data.	1.) Replace Fuel/Air Ratio Module. 2.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 3.) Recommission partially or fully as desired. 4.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	88	Control Valve Full Stroke Undefined	The full stroke of the control valve is not defined.	Replace the valve and re-commission.

Fuel/Air	89	Control Valve Full Stroke Mismatch	The recorded full stroke of the control valve does not match valve size.	Replace the valve and re-commission.
Fuel/Air	91	Fuel/Air Base Curve Min not defined	Fuel/Air Ratio base curve minimum value has not been defined. In installer mode this fault is ignored.	Commission or load the base fuel/air curve, ensuring the minimum firing rate is entered.
Fuel/Air	92	Fuel/Air Base Curve Max not defined	Fuel/Air Ratio base curve maximum value has not been defined. In installer mode this fault is ignored.	Commission or load the base fuel/air curve, ensuring the maximum firing rate is entered.
Fuel/Air	93	Fuel/Air Base Curve not commissioned	Fuel/Air Ratio base curve initial amplification setting/value has not been defined. Enter a value for the initial amplification of the base curve and reset the valve in in OEM commissioning mode.	Commission or load the base fuel/air curve.
Fuel/Air	94	Burner load minimum threshold	During curve commissioning, the S1 threshold is hard-coded at 200. If S1 falls below 200, this fault occurs, but does not cause a lockout. During normal run mode, the S1 threshold is programmed as X (or at least 25 counts) below the S1 minimum commissioned Installer Correction Curve value. X is programmed in the OEM Setup parameters via the S1 minimum threshold (%) parameter. The default is 80%. **NOTE:** During subsequent start attempts, if the pre-purge air level is outside the commissioned window, the valve will lockout on fault 42.	1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check Fuel/Air Module signal connections for proper engagement. 4.) Reset valve and burner management system. 5.) Recommission Fuel/Air curve. 6.) If fault persists, replace Fuel/Air Module. 7.) Reset valve and burner management system. 8.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 9.) Recommission partially or fully as desired. 10.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	103	New FARMOD detected	New Fuel/Air Ratio Module detected, which has to be accepted and programmed before use.	1.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 2.) Recommission partially or fully as desired. 3.) Reset valve and burner management system, monitoring for proper operation.
Fuel/Air	106	S1 raw count low	During valve operation with MV1 and MV2 opened, the S1 value dropped below -100 raw counts for longer than 2 seconds. A soft lockout was caused and both valves were closed. The fault will automatically resolve when the s1 air value is higher than -100.	1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check air signal tube for kinks or blockages. 4.) Check Fuel/Air Ratio Module signal connections for proper engagement. 5.) Reset valve and burner management system. 6.) If fault persists, replace Fuel/Air Ratio Module. 7.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 8.).Recommission partially or fully as desired.
Fuel/Air	107	S1 raw count low	During valve idle mode with MV1 and MV2 closed, the S1 value dropped below -200 raw counts for longer than 6 seconds. A soft lockout was caused and both valves were closed. The fault will automatically resolve when the s1 air value is higher than -200.	1.) Check that air duct is clear free of any foreign bodies and pollution. 2.) Check that blower is running at a proper rate. 3.) Check air signal tube for kinks or blockages. 4.) Check Fuel/Air Ratio Module signal connections for proper engagement. 5.) Reset valve and burner management system. 6.) If fault persists, replace FARMOD. 7.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 8.).Recommission partially or fully as desired.
ILK	9	Valve Interlock Out (ILK OUT) signal fault	Valve ILK OUT terminal signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect ILK OUT and ILK IN wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper operation in conjunction with burner management system inputs. 3.) Measure ILK voltage for proper tolerance per valve nameplate and documentation. 4.) If fault persists, repeat above steps for L1 and N connections. 5.) If fault persists, replace valve main electronics.
ILK	13	Valve Interlock Out (ILK OUT) signal mis-match	Valve Interlock Out (ILK OUT) terminal energized while valve internal ILK relay is not energized. Possible internal valve fault, stuck/welded relay or jumper present.	1.) Measure ILK OUT voltage and verify it does not exist during lockout. 2.) Reset valve and burner management system, observing valve / burner operation. Measure ILK IN and ILK OUT voltages and verify proper values during a burner/valve run state. 3.) Remove power and shut-off gas supply as necessary. 4.) Verify no jumpers exist between L1 and valve ILK OUT terminals or ILK IN and ILK OUT terminals. 5.) Verify that ILK IN and ILK OUT are not reversed; check against wiring diagrams in valve installation instructions, 32-00018. 5.) Replace cover and restore power and gas. Cycle valve and burner and monitor for proper operation in conjunction with burner management system inputs as in step 2.). 6.) If fault persists, replace valve main electronics.
ILK	14	Valve Interlock In (ILK IN) not energized	Valve Interlock In (ILK IN) terminal not energized while MV1 and MV2 are energized. Possible improper burner management timing/wiring, jumper or internal valve fault.	⚠ **WARNING - Explosion Hazard.** **Can cause severe injury, death or property damage** 1.) Remove power and shut-off gas supply. 2) Remove valve front electrical enclosure and a.) Verify no jumpers exist between L1 and MV1 / MV2 and any wiring errors that could provide power to MV1 / MV2 terminals. Correct any errors. b.) Verify proper ILK IN and ILK OUT wire routing from and to burner management system; check against wiring diagrams in valve installation instructions, 32-00018. c.) Inspect wiring connections for wire engagement, seating, pin engagement and cleanliness. d.) Check for voltage between L2 / neutral and earth ground at the valve and at the burner management system. Correct any wiring errors providing a powered ground, floating neutral or improper ground reference. 3.) Replace cover and restore power (NOT gas). Reset valve and burner management system, monitoring for proper operation in conjunction with burner management system inputs. 4.) Verify valve ILK IN voltage exists when a call for heat demand is present to burner management system. Verify valve ILK OUT voltage exists during a burner/valve run state. 5.) If fault persists, replace burner management system or contact manufacturer for advice. 6.) If fault persists, replace valve main electronics. 7.) When fault is corrected, restore gas supply.
ILK	16	Valve Interlock Out (ILK OUT) relay fault	Valve Interlock Out (ILK OUT) safety relay internal drive fault detected.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Main Electronics	17	NA - not shown on HMI	NA - not shown on HMI	Upon fault detection an immediate reset of electronics follows. If the fault goes away after the reset, it would be most likely undetected. Otherwise if it persists the electronics would continuously go through the reset. In that case replace the main electronics.
Main Electronics	36	Reset button fault	Reset button has been pressed too long or is stuck.	1.) Attempt valve reset by depressing and holding button for 2 seconds. 2.) If fault persists, replace valve main electronics.
Main Electronics	40	Solenoid internal VAC feedback	Solenoid 1 and/or solenoid 2 internal feedback VAC signal shorted as sensed by valve main electronics.	1.) Reset valve and burner management system. 2.) If fault persists, replace valve main electronics.
Main Electronics	46	Analog to digital test failure	The valve main electronics low voltage supply or AD (analog to digital) converter has failed.	1.) Reset valve and burner management system. 2.) If fault persists, replace valve main electronics.
Main Electronics	49	PRESSMOD or FARMOD power supply fault	There is a power supply fault on the valve main electronics assembly for the Pressure Module and/or Fuel/Air Ratio Module.	**Remove power and shut-off gas supply.** 1.) Remove valve front electrical enclosure and disconnect Pressure Module and Fuel/Air Ratio Module connections, if present. 2.) Restore power. 3.) Reset valve and burner management system. 4.) If fault persists, replace valve main electronics. 5.) Reconnect Pressure Module (if present) to valve main electronics. 6.) If fault persists, replace Pressure Module. 7.) Reconnect Fuel/Air Ratio Module (if present) to valve main electronics. 8.) If fault persists, replace Fuel/Air Ratio Module. 9.) Accept new Fuel/Air Ratio Module on the FARMOD tab in the Setup & Tests menu of user interface. 10.). Recommission partially or fully as desired. 11.) Replace electrical enclosure cover, restore power and gas supply and reset valve and burner management system.

SV2 Fault Codes (continued)

Main Electronics	68	K1 internal relay is stuck closed	MV1 internal K1 relay is stuck closed unexpectedly	1.) Reset valve and attempt system restart. 2.) If fault persists, replace valve main electronics board. Perform Valve Production Cloning procedure first, accessed via Setup & Tests menu.
Main Electronics	69	K2 internal relay is stuck closed	MV2 internal K2 relay is stuck closed unexpectedly	1.) Reset valve and attempt system restart. 2.) If fault persists, replace valve main electronics board. Perform Valve Production Cloning procedure first, accessed via Setup & Tests menu.
Main Electronics	90	POC Failure	Proof of Closure output shorted to MV Input.	1.) Check for proper wiring between valve and burner controller. Verify the valve POC output terminal is not shorted to an MV input terminal. Refer to the installation instructions, 32-00018. 2.) If problem persists, replace the valve main electronics board. Perform Valve Production Cloning procedure first, accessed via Setup & Tests menu. 3.) Reset valve and burner management system, monitoring for proper operation
MV1	11	MV1 signal fault	MV1 (Main Valve 1) terminal signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect MV1, L1 and N wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Ensure MV1 is wired to proper terminals on burner management system. 3.) Replace cover and restore power and gas. Reset valve and burner management system. 4.) If fault persists, repeat above steps for L1 and N connections on the burner management system. 5.) If fault persists, replace valve main electronics.
MV2	12	MV2 signal fault	MV2 (Main Valve 2) terminal signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect MV2, L1 and N wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Ensure MV2 is wired to proper terminals on burner management system. 3.) Replace cover and restore power and gas. Reset valve and burner management system. 4.) If fault persists, repeat above steps for L1 and N connections on the burner management system. 5.) If fault persists, replace valve main electronics.
Phase	15	Incoming voltages out of phase	Valve incoming L1 VAC to POC or VPS or L1 VAC from burner management system to valve ILK IN, MV1 / MV2 is out of phase.	1.) Reset valve and burner management system, monitoring for proper operation. 2.) Check the valve power supply to make sure that both frequency and voltage meet the specifications. 3.) Verify that the valve, burner management system and associated devices are fed from the same phase. If a VFD (variable frequency drive) is present, ensure that it does not share a common neutral or ground.
POC	10	POC (proof of closure) switch(es) signal fault	Valve POC (proof of closure) switch(es) signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect L1, Neutral, and POC wiring connection for proper seating, pin engagement and cleanliness. Correct any errors. 2.) Check the valve power supply to make sure that both frequency and voltage meet the specifications. 3.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 4.) If fault persists, replace valve main electronics.
POC	74	POC output signal mis-match	Valve POC (proof of closure) output terminal to burner management control energized while internal POC relay is not energized. Or POC output terminal to burner management control not energized while POC relay is energized. Possible internal fault, malfunction of relay or external miswiring of valve.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure. 2.) Inspect external wiring between valve POC terminal and burner management system for proper seating, pin engagement and cleanliness. Ensure the valve POC terminal is not externally powered. Correct any errors. 3.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 4.) If fault persists, replace valve main electronics.
POC	75	POC (proof of closure) fault for MV1	Fault detected in POC 1 switch or its connection to valve circuit board. Possible internal fault in electronics interface to POC 1 switch.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical and rear solenoid enclosures. 2.) Inspect internal wiring between solenoid proof of closure switch 1 and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (1) in the valve casting. Ensure the appropriate solenoid proof of closure connector is placed in the appropriate terminal (POC 1) on the valve electronics assembly and is properly seated and the wires are not loose. 3.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 4.) If fault persists, replace valve main electronics. 5.) If fault persists, replace entire valve.
POC	76	POC (proof of closure) fault for MV2	Fault detected in POC 2 switch or its connection to valve circuit board. Possible internal fault in electronics interface to POC 2 switch.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical and rear solenoid enclosures. 2.) Inspect internal wiring between solenoid proof of closure switch 2 and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (2) in the valve casting. Ensure the appropriate solenoid proof of closure connector is placed in the appropriate terminal (POC 2) on the valve electronics assembly and is properly seated and the wires are not loose. 3.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 4.) If fault persists, replace valve main electronics. 5.) If fault persists, replace entire valve.
POC	77	POC (proof of closure) of MV1 not verified	Proof of closure verification procedure not completed.	1.) Ensure the Proof of Closure setup/acceptance procedure has been performed. Go to the Setup & Tests screen, select the Settings menu and the Proof of Closure tab. Follow the prompts and 'i' page information. 2.) Perform the Safety Parameters Verification procedure. Go to Setup & Tests screen, press the button labeled Verify Safety Parameters and follow the prompts. If this procedure is not completed while logged in, the valve will lockout when the login times out and the valve will not be operational. **NOTE: The Proof of Closure setup/acceptance and Safety Parameters Verification procedures validate the POC(s) exist and are properly wired to the valve electronics assembly. They also validate proper procedure was followed if the valve electronics orientation was swapped or the valve electronics assembly was replaced in the field.**
POC	78	POC (proof of closure) of MV2 not verified	Proof of closure verification procedure not completed.	1.) Ensure the Proof of Closure setup/acceptance procedure has been performed. Go to the Setup & Tests screen, select the Settings menu and the Proof of Closure tab. Follow the prompts and 'i' page information. 2.) Perform the Safety Parameters Verification procedure. Go to Setup & Tests screen, press the button labeled Verify Safety Parameters and follow the prompts. If this procedure is not completed while logged in, the valve will lockout when the login times out and the valve will not be operational. **NOTE: The Proof of Closure setup/acceptance and Safety Parameters Verification procedures validate the POC(s) exist and are properly wired to the valve electronics assembly. They also validate proper procedure was followed if the valve electronics orientation was swapped or the valve electronics assembly was replaced in the field.**
POC	80	POC 1 (proof of closure) incorrect position detected	POC 1 switch output does not match valve seat 1 powered/not powered status. Could be due to swapped internal SOLENOID 1/SOLENOID 2 connections or swapped internal POC 1/POC 2 connections. Can occur if valve electronics orientation is swapped in field or electronics is replaced in field. May also be due to failures of POC switch, solenoid or electronics.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical and rear solenoid enclosures. 2.) Inspect internal wiring between solenoids and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (1) in the valve casting. Ensure the appropriate solenoid connector is placed in the appropriate terminal (SOLENOID 1) on the valve electronics assembly. 3.) Inspect internal wiring between solenoid proof of closure switch(es) and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (1) in the valve casting. Ensure the appropriate solenoid proof of closure connector is placed in the appropriate terminal (POC 1) on the valve electronics assembly. 4.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 5.) If fault persists, replace valve main electronics. 6.) If fault persists, replace entire valve.

POC	81	POC 2 (proof of closure) incorrect position detected	POC 2 switch output does not match valve seat 2 powered/not powered status. Could be due to swapped internal SOLENOID 1/SOLENOID 2 connections or swapped internal POC 1/POC 2 connections. Can occur if valve electronics orientation is swapped in field or electronics is replaced in field. May also be due to failures of POC switch, solenoid or electronics.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical and rear solenoid enclosures. 2.) Inspect internal wiring between solenoids and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (2) in the valve casting. Ensure the appropriate solenoid connector is placed in the appropriate terminal (SOLENOID 2) on the valve electronics assembly. 3.) Inspect internal wiring between solenoid proof of closure switch(es) and valve electronics. The solenoid number is indicated by the direction of flow arrow and number (2) in the valve casting. Ensure the appropriate solenoid proof of closure connector is placed in the appropriate terminal (POC 2) on the valve electronics assembly. 4.) Replace cover and restore power and gas. Reset valve and burner management system, monitoring for proper POC operation in conjunction with valve LEDs and burner management system inputs. 5.) If fault persists, replace valve main electronics. 6.) If fault persists, replace entire valve.
Pressure Limits	20	Lo-Gas pressure lockout	Low gas pressure below threshold.	1.) Reset valve and burner management system, observing burner operation for proper pressures. 2.) Adjust appliance regulator as necessary. 3.) Recommission Low gas pressure setting as necessary. Warning indication for SV2 Series valve.
Pressure Limits	21	Hi-Gas pressure lockout	High gas pressure above threshold.	1.) Reset valve and burner management system, observing burner operation for proper pressures. 2.) Adjust appliance regulator as necessary. 3.) Recommission High gas pressure setting as necessary. Warning indication for SV2 Series valve.
Pressure Limits	22	Lo-/Hi-Gas pressure not configured	Pressure Module not configured for low and high gas pressure functions.	**NOTE: Low and High gas pressure settings must be configured before valve will be operational.** 1.) Commission Low and High gas pressure settings as necessary. Warning indication for SV2 Series valve.
Pressure Limits	53	Pressure out of range	Pressure out of allowed range.	1.) Verify the Pressure Module rating is correct for the application. 2.) If the pressure module is correct, reset valve and burner management system, observing burner operation for proper pressures. 3.) Adjust appliance regulator as necessary. 4.) If inlet pressure is higher than Pressure Module rating, remove power and shut off gas supply and replace Pressure Module with higher rated model. Warning indication for SV2 Series valve.
Pressure Module	19	Pressure Module reading fault	Pressure Module communication fault or pressure measurement reading error.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and verify the Pressure Module terminating connector is fully inserted in the socket labeled 'PRESSURE' in the electrical enclosure. 2.) Check for a nearby source of strong electro-magnetic interference. Reset valve and burner management system when corrected. 3.) Remove Pressure Module from valve body. 4.) Inspect the O-ring provided on the Pressure Module to ensure that it is clean and fully seated in its oval groove. 5.) Verify the Pressure Module is correctly seated on the valve body locating posts, is flush against the valve casting and the O-ring is compressed. 6.) Verify the correct mounting location and pressure port are being used for the valve model - refer to documents 32-00017 and 32-00029. 7.) Recommission Low and High gas pressure settings as necessary.
Pressure Module	37	Pressure Module over pressure	System pressure above Pressure Module rating.	1.) Verify the Pressure Module rating is correct for the application. 2.) If the Pressure Module rating is correct, reset valve and burner management system, observing burner operation for proper pressures. 3.) Adjust appliance regulator as necessary. 4.) Recommission Low and High gas pressure settings as necessary. 5.) Test Low and High gas pressure trip points as necessary. 6.) If inlet pressure is higher than Pressure Module rating, remove power and shut off gas supply and replace Pressure Module with higher rated version.
Security	95	Factory keys are corrupt	Factory Key storage is corrupt. Internal micro memory flash corrupted or factory initial key installation missed. Field recovery not possible.	Replace valve main electronics board.
Security	96	Installer password is not configured.	Installer password is not configured (set to default value).	Configure Installer password to non-default value.
Security	97	OEM password is not configured.	OEM password is not configured (set to default value).	Configure OEM password to non-default value.
Security	98	Installer account temporarily disabled	Installer account is temporarily locked down due to too many login attempts with wrong password.	Wait at least 1 minute before new attempt to login. If message is present with no attempts to login, another device on network might be trying to login. Find this device and disable it before trying to login.
Security	99	OEM account temporarily disabled	OEM account is temporarily locked down due to too many login attempts with wrong password.	Wait at least 1 minute before new attempt to login. If message is present with no attempts to login, another device on network might be trying to login. Find this device and disable it before trying to login.
Security	100	Installer password reset feature temporarily disabled	Installer password reset feature is temporarily disabled due to too many unsuccessful reset attempts.	Wait at least 1 minute before new attempt to reset password. If message is present with no attempts to reset password, another device on network might be trying to reset password. Find this device and disable it before trying to reset password.
Security	101	OEM password reset feature temporarily disabled	OEM password reset feature is temporarily disabled due to too many unsuccessful reset attempts.	Wait at least 1 minute before new attempt to reset password. If message is present with no attempts to reset password, another device on network might be trying to reset password. Find this device and disable it before trying to reset password.
Security	102	OEM reset password is not set.	OEM reset password is not configured although the feature is enabled.	Configure OEM reset password **OR** disable the OEM password reset feature.
Solenoid 1	0	Solenoid 1 relay fault	Solenoid 1 relay was detected closed during SSOV cycle test.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Solenoid 1	1	Solenoid 1 feedback fault	Solenoid 1 feedback sensed at valve main electronics while MV1 terminal is not energized. Possible internal valve electronics fault.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Solenoid 1	2	Solenoid 1 not powered	Solenoid 1 feedback not sensed at valve main electronics while MV1 terminal is energized. Possible internal valve electronics fault.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Solenoid 1	3	Solenoid 1 mode fault	Solenoid 1 expected and detected mode do not match.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Solenoid 1	4	Solenoid 1 signal fault	Solenoid 1 terminal signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect SOLENOID 1 and MV1 wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Ensure MV1 is wired to proper terminals on burner management system. 3.) Replace cover and restore power and gas. Reset valve and burner management system.. 4.) Measure MV1 voltage for proper tolerance per valve nameplate and documentation. 5.) If fault persists, repeat above steps for L1 and N connections. 6.) If fault persists, replace valve main electronics.
Solenoid 2	5	Solenoid 2 feedback fault	Solenoid 2 feedback sensed at valve main electronics while MV2 terminal is not energized. Possible internal valve electronics fault.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Solenoid 2	6	Solenoid 2 not powered	Solenoid 2 feedback not sensed at valve main electronics while MV2 terminal is energized. Possible internal valve electronics fault.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.

SV2 Fault Codes (continued)

Solenoid 2	7	Solenoid 2 signal fault	Solenoid 2 terminal signal is not valid. Frequency or duty is out of expected range.	**Remove power and shut-off gas supply as necessary.** 1.) Remove valve front electrical enclosure and inspect SOLENOID 2 and MV2 wiring connections for wire engagement, seating, pin engagement and cleanliness. 2.) Ensure MV2 is wired to proper terminals on burner management system. 3.) Replace cover and restore power and gas. Reset valve and burner management system. 4.) Measure MV2 voltage for proper tolerance per valve nameplate and documentation. 5.) If fault persists, repeat above steps for L1 and N connections. 6.) If fault persists, replace valve main electronics.
Solenoid 2	8	Solenoid 2 mode fault	Solenoid 2 expected and detected mode do not match.	1.) Reset valve and burner management system, observing valve / burner operation. 2.) If fault persists, replace valve main electronics.
Verification Needed	47	Safety parameter verification	One or more safety parameters have been modified and/or waiting for verification procedure.	Perform safety parameters verification procedure. Go to Setup & Tests screen, press button Verify Safety Parameters.
VPS	62	VPS Test Failure	Valve 1 proving sequence has failed. Warning indication for SV2 Series valve. But this condition will likely cause a burner controller lockout.	1.) Check the piping train (is MSOV closed, piping flanges tight, O-ring leakage), main electronics wiring and Pressure Module connection to it. For wiring, refer to the installation instructions, 32-00018. Reset valve and repeat the VPS test. 2.) If fault persists, check system gas pressure and repeat the VPS test. 3.) If fault persists, replace Pressure Module. 4.) Accept new Pressure Module on the PRESSMOD tab in the Setup & Tests menu. 5.) Recommission the Hi-Gas and Lo-Gas pressure limits. Repeat leak detection test. 4.) If fault persists, replace valve.
VPS	63	VPS Test Failure	Valve 2 proving sequence has failed. Warning indication for SV2 Series valve. But this condition will likely cause a burner controller lockout.	1.) Check the piping train (is MSOV closed, piping flanges tight, O-ring leakage), main electronics wiring and Pressure Module connection to it. For wiring, refer to the installation instructions, 32-00018. Reset valve and repeat the VPS test. 2.) If fault persists, check system gas pressure and repeat the VPS test. 3.) If fault persists, replace Pressure Module. 4.) Accept new Pressure Module on the PRESSMOD tab in the Setup & Tests menu. 5.) Recommission the Hi-Gas and Lo-Gas pressure limits. Repeat leak detection test. 4.) If fault persists, replace valve.

SECTION 14 Replacement Parts

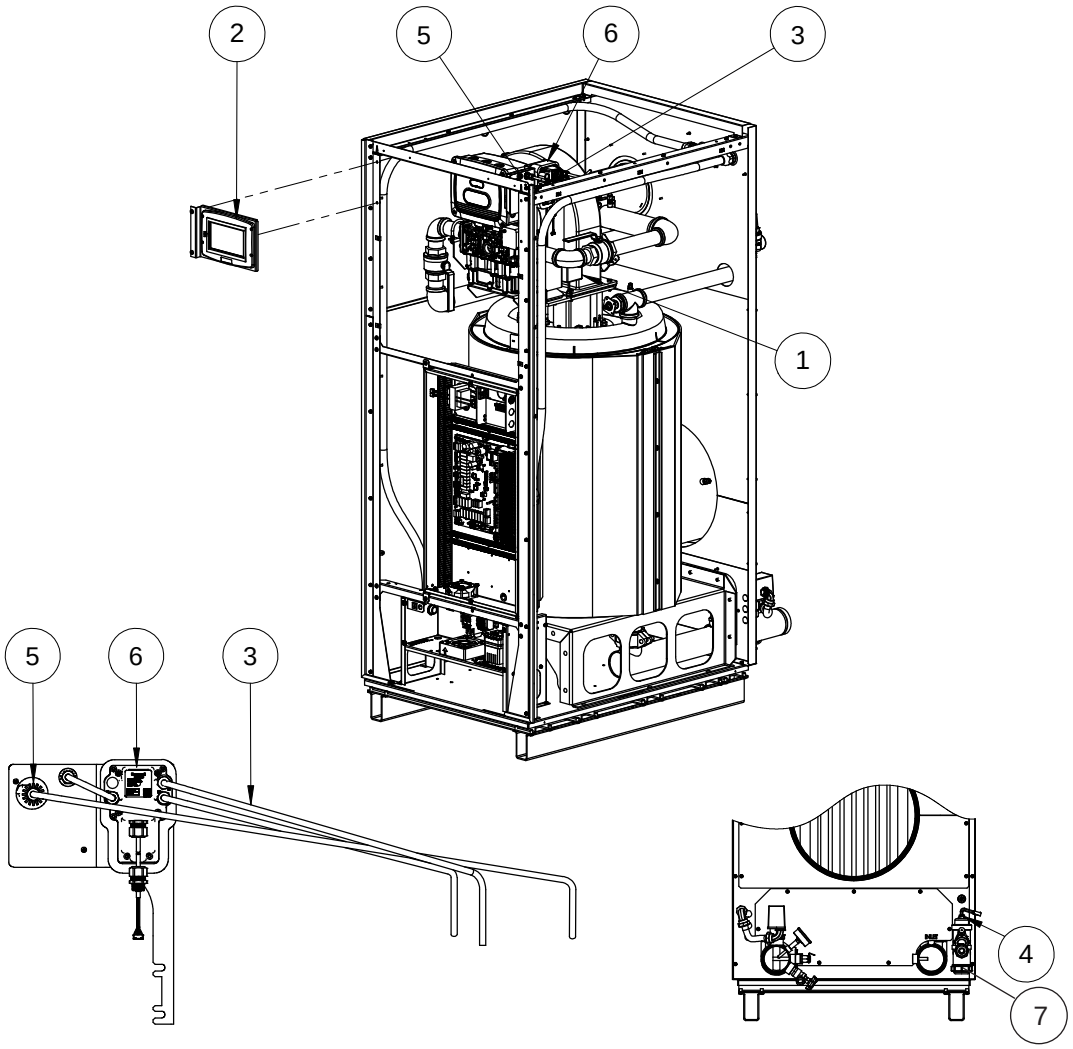
Use only genuine Manufacturer replacement parts.

14.A General Information

To order or purchase parts, contact your nearest manufacturers dealer or distributor. (See the back cover of this manual for the manufacturers website).

14.B Component Illustrations, Parts Lists, and Part Numbers

Final Assembly Models (All Sizes)

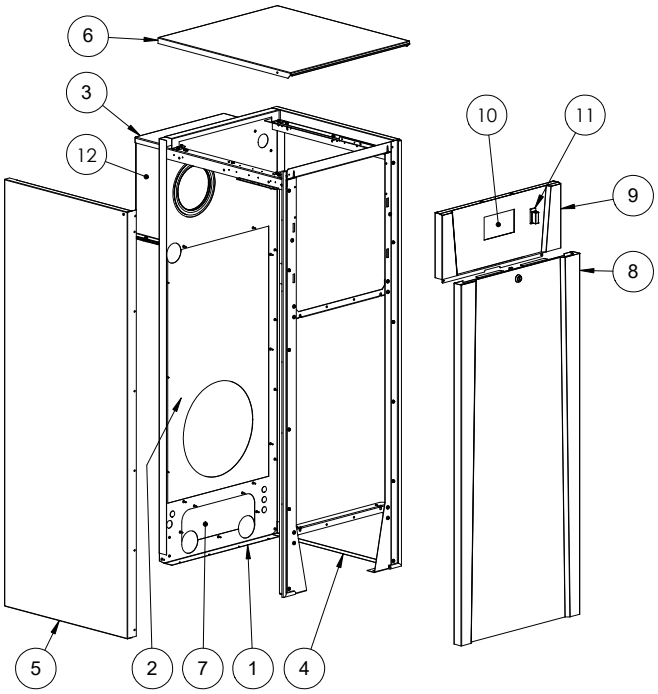


FARMOD & FILTER BACK VIEW

Item No.	Description	1250	1500	1750	2000	2500
1	Spark Generator	R2086900	R2086900	R2086900	R2086900	R2086900
2	Valve Display	R2082600	R2082600	R2082600	R2082600	R2082600
3	FARMod, Tubes	R2084500	R2084500	R2084600	R2084600	R2084600
4	Condensate Switch	40N2008	40N2008	40N2008	40N2008	40N2008
5	FARMod, Filter	R2084700	R2084700	R2084700	R2084700	R2084700
6	FARMod	R2084800	R2084800	R2084800	R2084800	R2084800
7	Condensate Trap	R150S2049	R150S2049	R150S2049	R150S2049	R150S2049

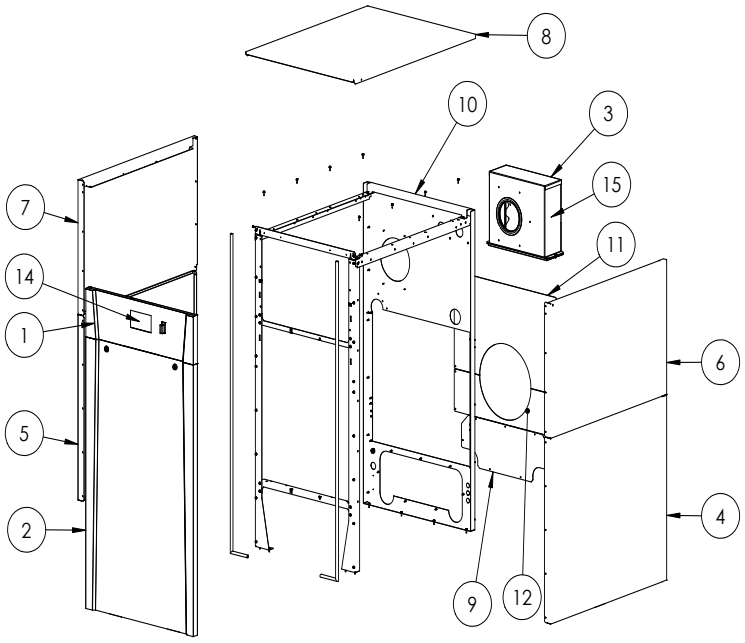
Jacket Parts (Models 1250 and 1500)

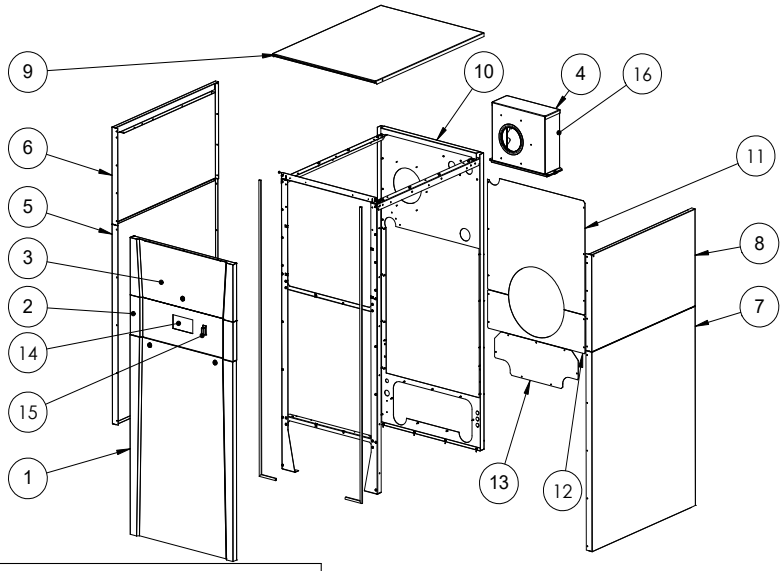
Parts List		
ITEM NO.	DESCRIPTION	PART NUMBER
1	PANEL, JACKET, REAR	150S3005
2	PANEL, ACCESS, FLUE	150S302600
3	FILTER ASSY, AIR INTAKE	150S2610
4	PANEL, JACKET, RIGHT	150S3006
5	PANEL, JACKET, LEFT	150S3007
6	PANEL, JACKET, TOP	150S3008
7	ACCESS PANEL	150S3013
8	DOOR ASSY, LOWER	150S3024
9	DISPLAY, PANEL	R2083400
10	DISPLAY, CONTROL	R2082800
11	POWER SWITCH	R2083200
12	FILTER, AIR REPLACEMENT	A2121700



Jacket Parts (Model 1750)

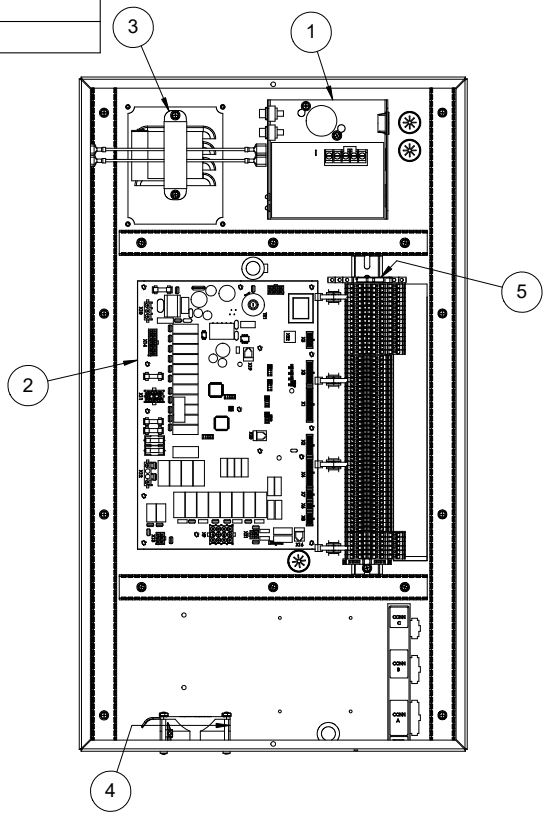
PARTS LIST		
ITEM NO.	DESCRIPTION	PART NO.
1	DOOR ASSY, DISPLAY	175S3102
2	DOOR ASSY, LOWER	175S3104
3	FILTER ASSY, AIR INTAKE	250S2500
4	PANEL, JACKET, RIGHT, LOWER	175S3002
5	PANEL, JACKET, LEFT, LOWER	175S3018
6	PANEL, JACKET, RIGHT, UPPER	175S3004
7	PANEL, JACKET, LEFT, UPPER	175S3016
8	PANEL, JACKET, TOP	300S3005
9	ACCESS PANEL	300S3013
10	PANEL, JACKET, REAR	175S3001
11	PANEL, ACCESS, FLUE, TOP	175S302400
12	PANEL, ACCESS, FLUE, BOTTOM	175S302500
13	SWITCH, POWER	R2083200
14	DISPLAY, TOUCHSCREEN, SIT	R2082800
15	FILTER, AIR REPLACEMENT	A2121700





Jacket Parts (Models 2000 and 2500)

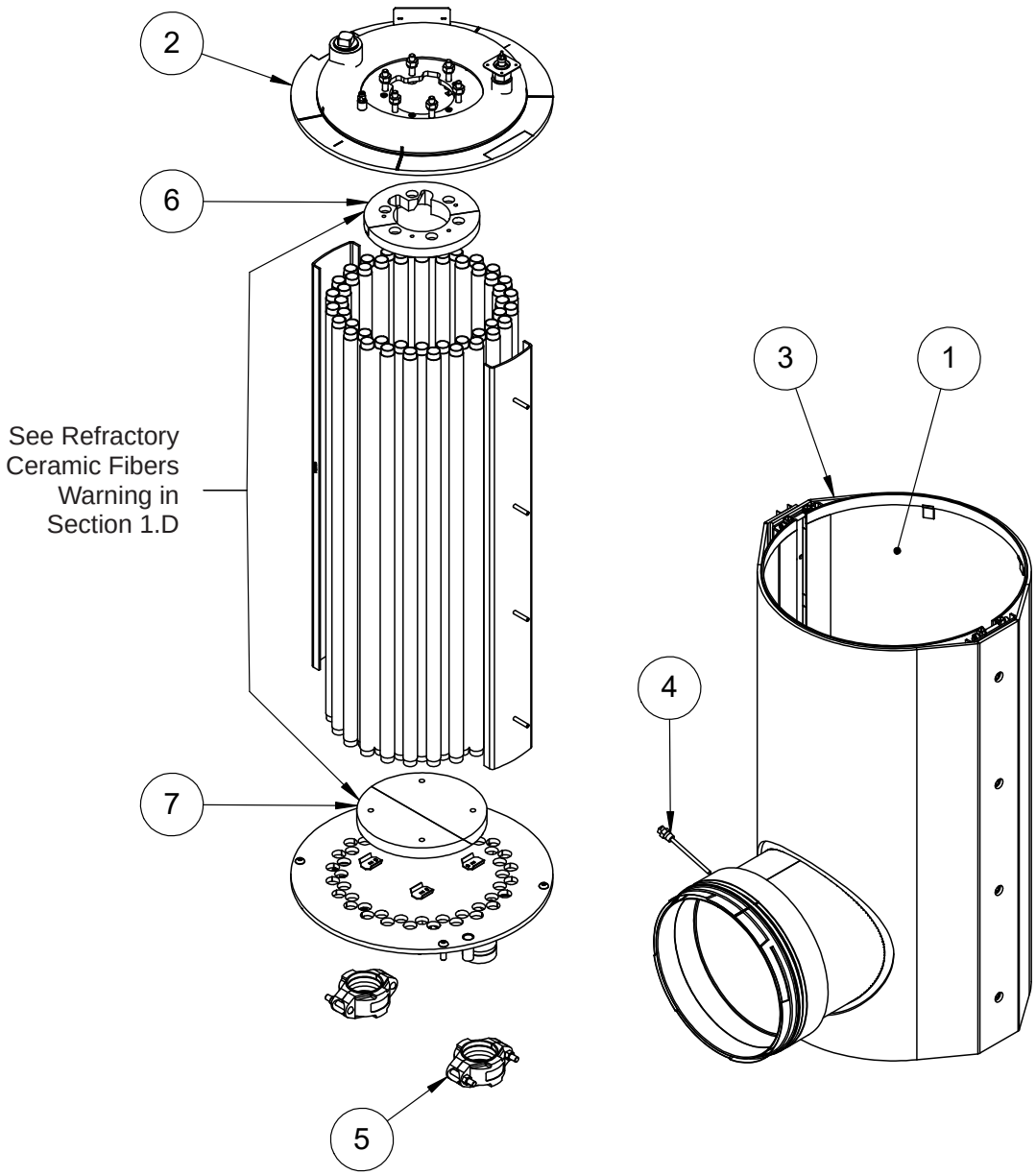
PARTS LIST		PART NO.	
ITEM NO.	DESCRIPTION	2000	2500
1	DOOR ASSY, LOWER	300S3104	
2	DOOR ASSY, DISPLAY	300S3102	
3	DOOR ASSEMBLY UPPER	250S3023	
4	FILTER ASSY, AIR INTAKE	250S2500	
5	PANEL, JACKET, LEFT, LOWER	300S3018	
6	PANEL, SIDE, UPPER LEFT	250S3021	
7	PANEL, JACKET, RIGHT, LOWER	300S3002	
8	PANEL, SIDE, UPPER RIGHT	250S3004	
9	PANEL, JACKET, TOP	300S3005	
10	PANEL, JACKET, REAR	250S3001	
11	PANEL, ACCESS, FLUE, TOP	250S302402	250S302400
12	PANEL, ACCESS, FLUE, BOTTOM	250S302502	250S302500
13	ACCESS PANEL	300S3013	
14	DISPLAY, SIT	R2082800	
15	SWITCH, POWER	R2083200	
16	FILTER, AIR	A2121700	



Control Panel Assembly (All Sizes)

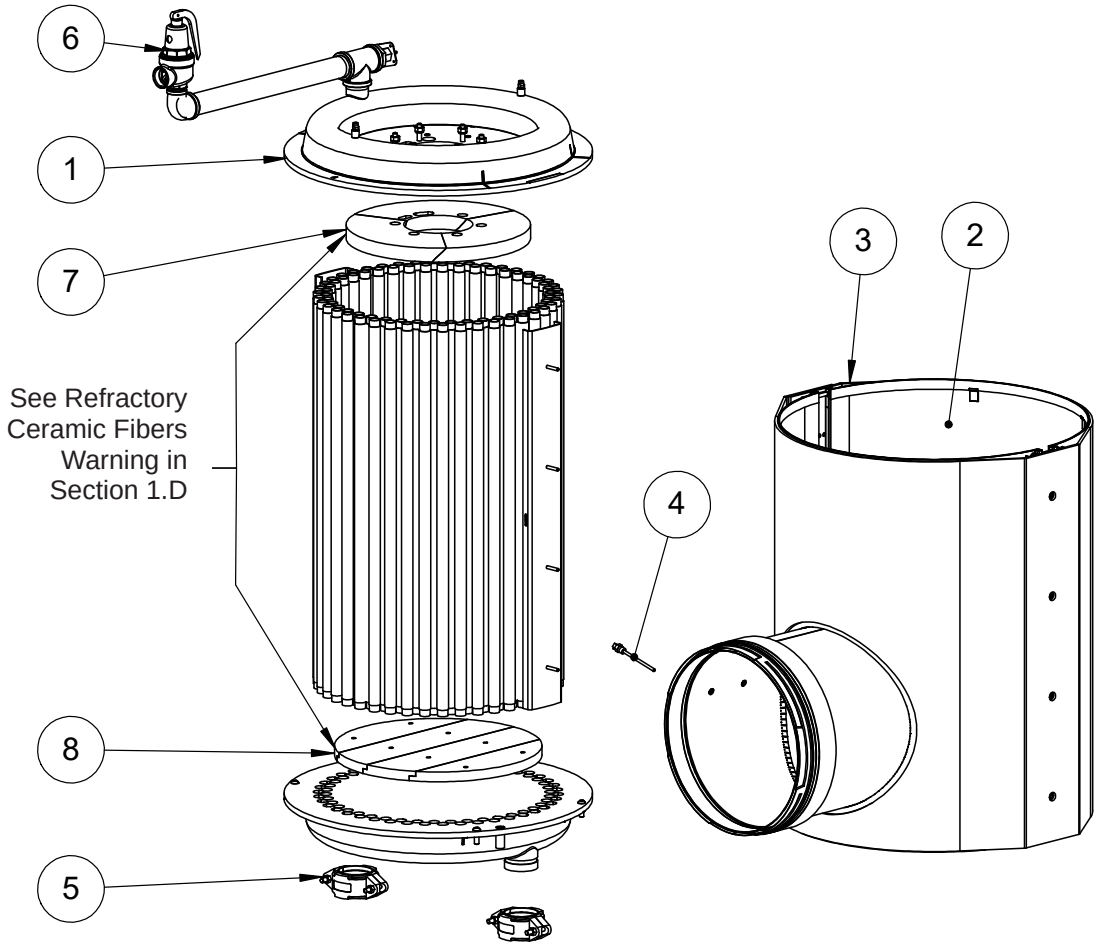
PARTS LIST		
ITEM NO.	DESCRIPTION	PART NO.
1	SWITCH, CUTOFF, LOW WATER	E2387600
2	BOARD, CONTROL	R2082700
3	TRANSFORMER ASSY, 120-24V, 75 VA	150S7019
4	FAN, COMPACT AC AXIAL	E2392600
5	RELAY, REPLACEMENT, 110V, SLIM	E2385500

Heat Exchanger Assembly (Models 1250 and 1500)



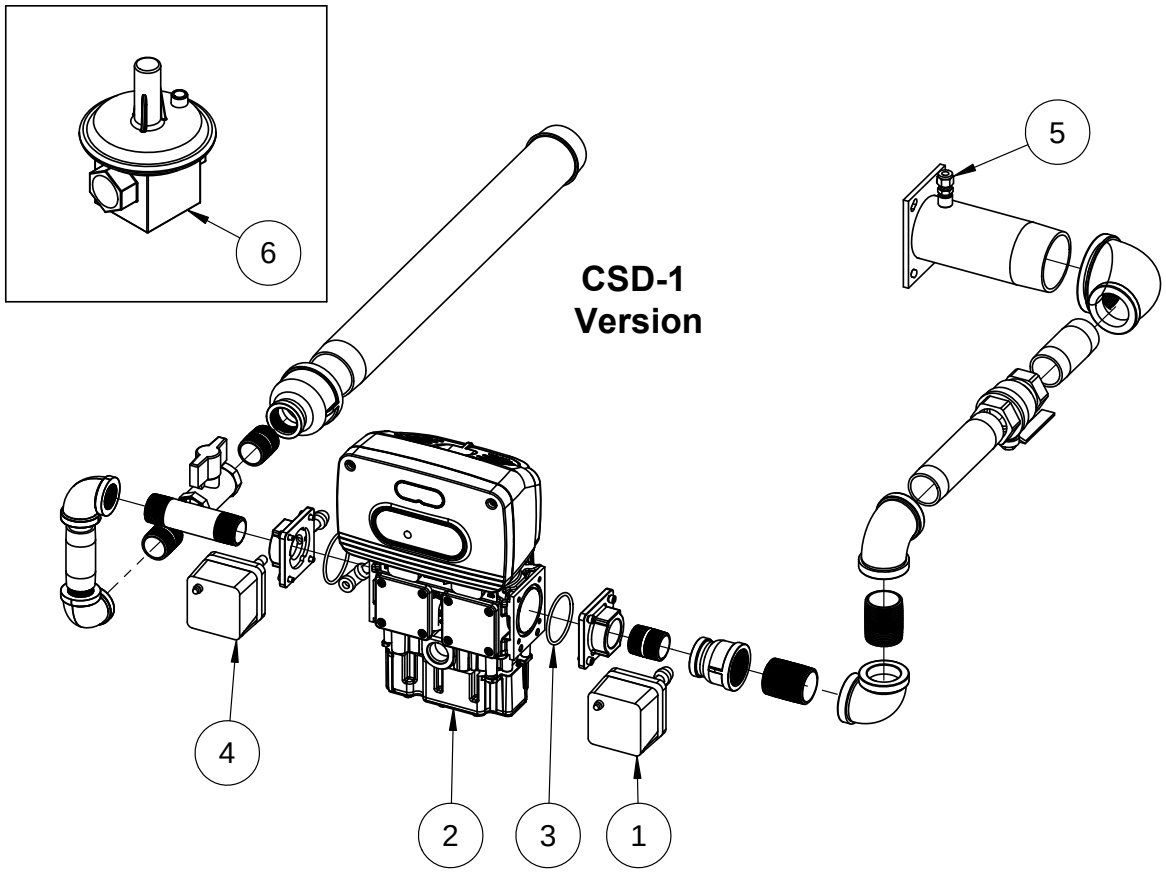
PARTS LIST				
ITEM NO.	DESCRIPTION	1250	1500	PART NO.
1	SHROUD ASSEMBLY	1	1	R2082900
2	HEAT EXCHANGER	1	-	125S2141
		-	1	150S2141
3	BLANKET, INSULATION	1	1	150S2182
4	TEMPERATURE SENSOR	1	1	E2387700
5	VITAULIC COUPLING	2	2	P2101300
6	RFC TILE ASSY, TOP	1	1	R2085600
7	RFC TILE ASSY, BOTTOM	1	1	R2085700

Heat Exchanger Assembly (Models 1750, 2000 and 2500)



PARTS LIST				
ITEM NO.	DESCRIPTION	QTY	PART NO.	SIZE
1	HEAT EXCHANGER	1	175S2050	1750
			250S2050	2000 & 2500
2	SHROUD ASSEMBLY	1	R2083700	1750
		1	R2083800	2000 & 2500
3	BLANKET, INSULATION	1	175S217900	1750
		1	250S222900	2000 & 2500
4	TEMPERATURE SENSOR	1	E2387700	1750-2500
5	VITAULIC COUPLING	2	P2109800	1750-2500
6	PRV, 30 PSI	1	A2124000	1750 - 2500
	PRV, 50 PSI	1	A2124005	
	PRV, 60 PSI	1	A2124004	
	PRV, 75 PSI	1	A2124009	
	PRV, 125 PSI	1	A2124013	
	PRV, 150 PSI	1	A2124014	
7	RFC TILE ASSY, TOP	1	R2085800	1750 - 2500
8	RFC TILE ASSY, BOTTOM	1	R2085900	1750 - 2500

Gas Train Assembly (Models 1250 and 1500)

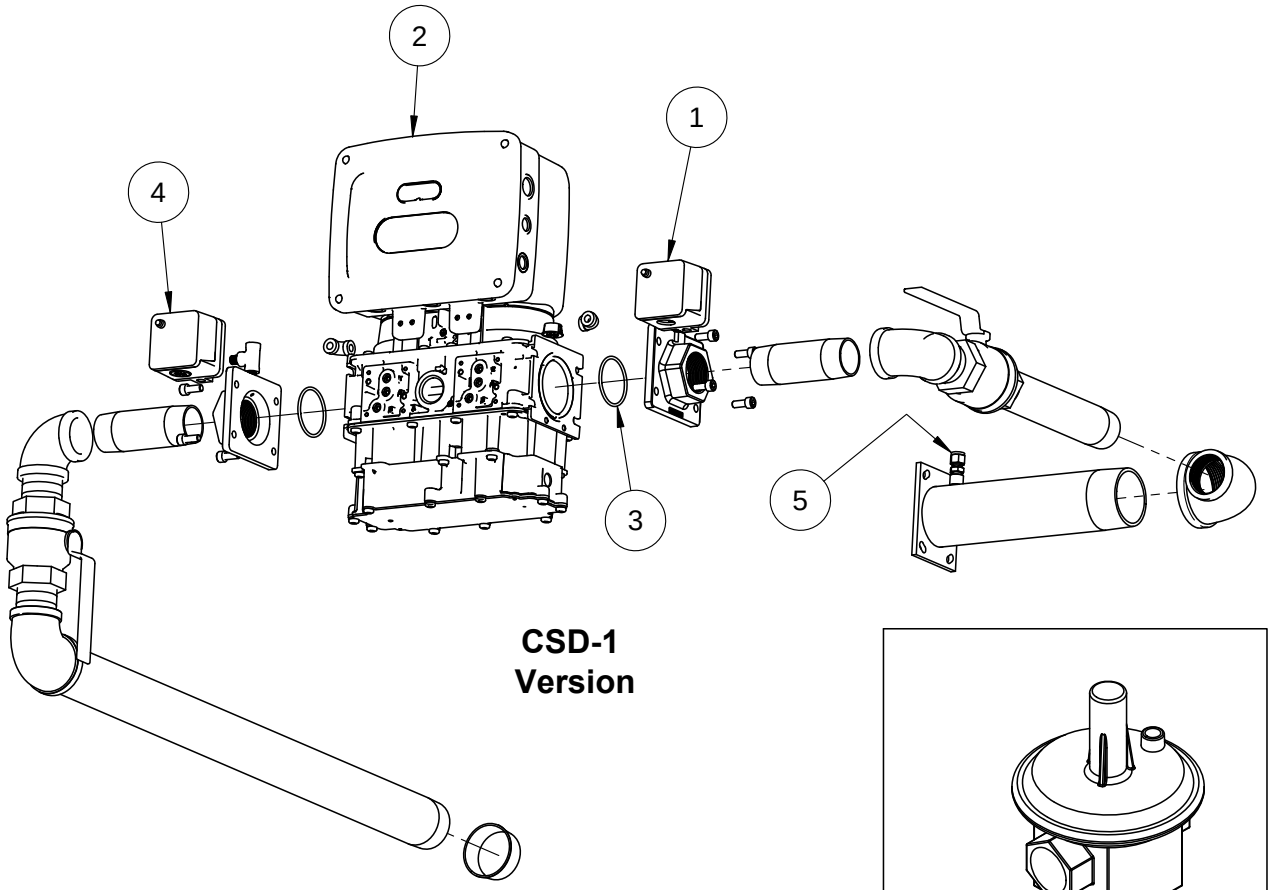


NOTES:

1. Apply thread sealant to all male NPT threads before assembly.
2. O-rings included with gas valve.
3. Item 6 for use in Massachusetts.

Parts List			
QTY	PART NO.	DESCRIPTION	ITEM NO.
1	R2004000	SWITCH, HIGH GAS PRESSURE	1
1	R2088201	GAS VALVE, REPLACEMENT, CAT 1/3, 1250	2
1	R2088203	GAS VALVE, REPLACEMENT, CAT 1/3, 1500	
2	R2085100	O-RING	3
1	R2004100	SWITCH, LOW GAS PRESSURE	4
1	P2112100	FITTING, ADAPTER, 8mm TUBE TO 1/8" NPT, 316 SST	5
1	KM008800	REGULATOR, GAS, 210E, 2" X 2", MAXITROL	6

Gas Train Assembly (Models 1750, 2000 and 2500)



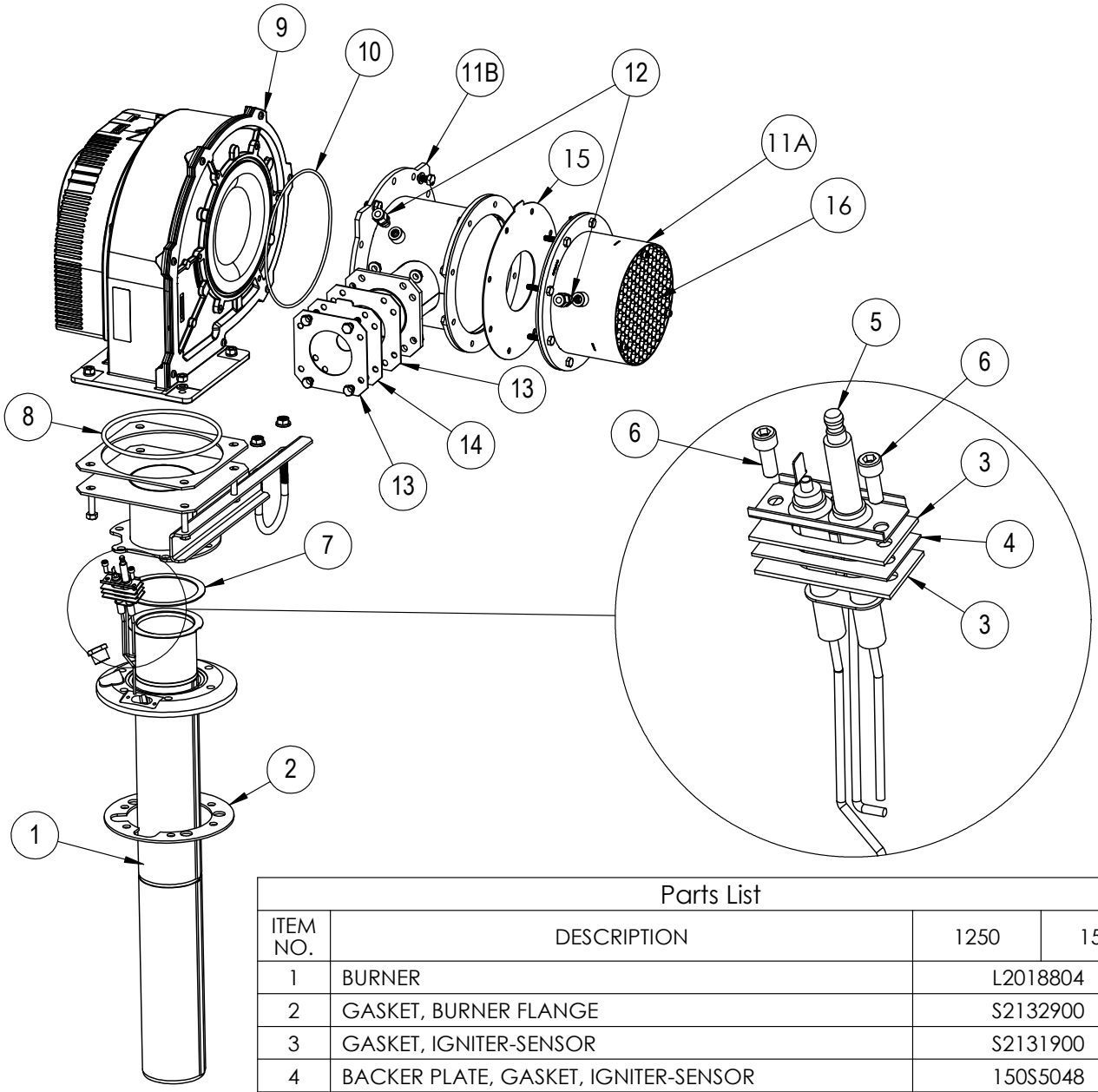
CSD-1 Version

NOTES:

1. Apply thread sealant to all male NPT threads before assembly.
2. O-rings included with gas valve.
3. Item 6 for use in Massachusetts.

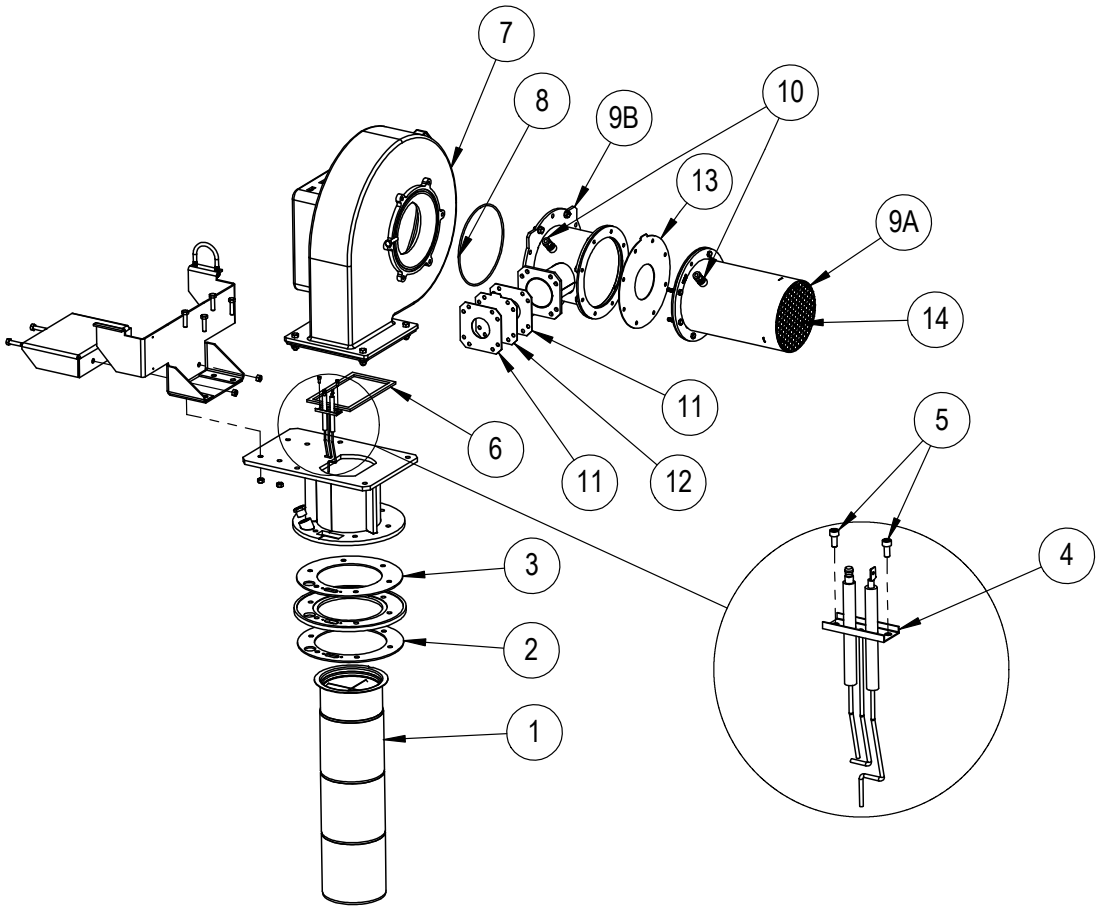
INPUT RATE			PARTS LIST		
2500 QTY	2000 QTY	1750 QTY	PART NUMBER	DESCRIPTION	ITEM
1			R2004000	SWITCH, HIGH GAS PRESSURE	1
		1	R2088205	REPAIR KIT, GAS VALVE, OMT 1750, CATEGORY 1/3	2
	1		R2088207	REPAIR KIT, GAS VALVE, OMT 2000, CATEGORY 1/3	
1			R2088209	REPAIR KIT, GAS VALVE, OMT 2500, CATEGORY 1/3	
1			R2085200	O-RING	3
1			R2004100	SWITCH, LOW GAS PRESSURE	4
1			P2112100	FITTING, ADAPTER, 8MM TUBE TO 1/8" NPT, 316 SS	5
1			KM008800	REGULATOR, GAS, 210E, 2" X 2", MAXITROL	6

Blower Burner Assembly (Models 1250 and 1500)



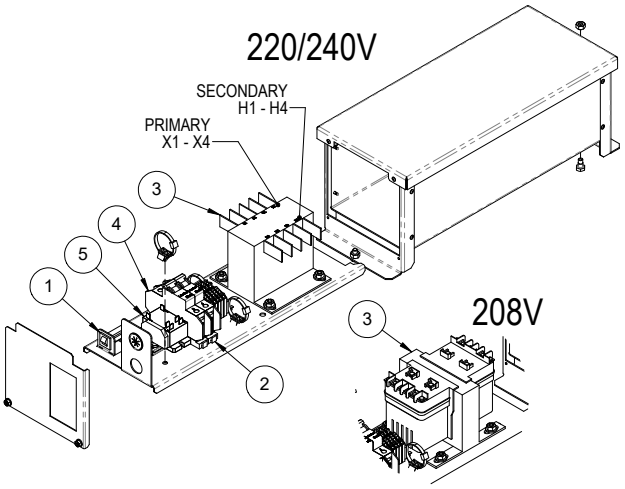
Parts List			
ITEM NO.	DESCRIPTION	1250	1500
1	BURNER	L2018804	
2	GASKET, BURNER FLANGE	S2132900	
3	GASKET, IGNITER-SENSOR	S2131900	
4	BACKER PLATE, GASKET, IGNITER-SENSOR	150S5048	
5	IGNITER-FLAME SENSE (includes gaskets and hardware)	R2083000	
6	SCREW, 10-32 x 1/2" SHCS, ZINC	F2057200	
7	GASKET, BURNER	S2131100	
8	O-RING, 3/16, 5 7/8 ID, EPDM	150S5010	
9	BLOWER, 120V MODELS	A2124400	
	BLOWER, 208 & 220/240V MODELS	A2134400	
10	O-RING, BLOWER, OMT	300S5039	
11A	MIXER ASSEMBLY, FRONT	R2084301	
11B	MIXER ASSEMBLY, REAR	R2084400	
12	FITTING, ADAPTER, 8mm TUBE TO 1/8" NPT, 316 SST	P2112100	
13	GASKET, GAS MIXER	S2132800	
14	ORIFICE, INSERT, GAS (INCLUDES GASKETS)	R2084001	R2084002
15	ORIFICE, INSERT, AIR (INCLUDES GASKETS)	R2084101	R2084102
16	AIR STRAIGHTENER	R2084200	

Blower Burner Assembly (Models 1750, 2000 and 2500)



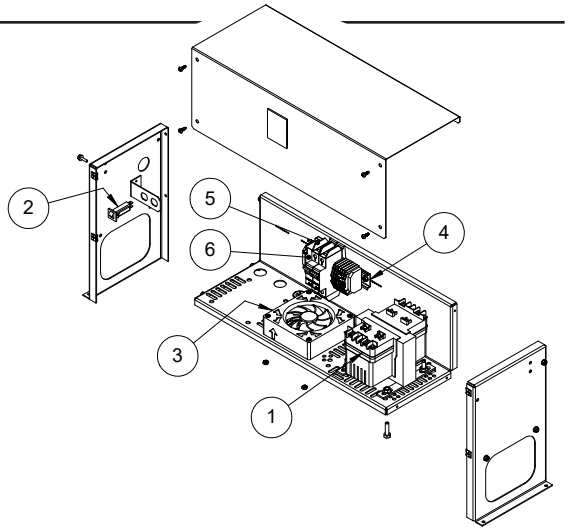
PART NUMBERS				
ITEM NO.	DESCRIPTION	SIZE 1750	SIZE 2000	SIZE 2500
1	BURNER	L2021803	L2021801	L2021801
2	GASKET, BURNER	300S2020		
3	GASKET, ADAPTER FLANGE	300S2019		
4	IGNITOR, SPARK, WITH FLAME SENSOR	R2083100		
5	SCREW, 8-32 x .375", SHCS, ZINC	F2057300		
6	GASKET, BLOWER OUTLET FLANGE	400S6904		
7	BLOWER, 120V MODELS	A2134500	A2134500	N/A
	BLOWER, 208-600V MODELS	A2132700		
8	O-RING, BLOWER	300S5039		
9A	MIXER ASSY, FRONT	R2084302		
9B	MIXER ASSY, REAR	R2084400		
10	FITTING, ADAPTER, 8mm TUBE TO 1/8" NPT	P2112100		
11	GASKET, GAS MIXER	S2132800		
12	ORIFICE INSERT, GAS (INCLUDES GASKETS)	R2084002	R2084003	R2084004
13	ORIFICE, INSERT, AIR (INCLUDES GASKETS)	R2084102	R2084103	R2084104
14	AIR STRAIGHTENER	R2084200		

AC Distribution Box (Models 1250 and 1500)

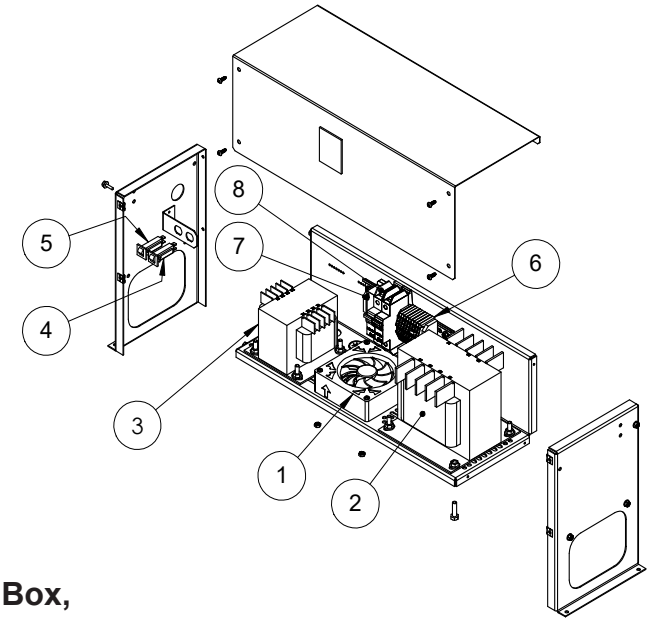


ITEM NO.	DESCRIPTION	PART NO.	208V 1Ø QTY	220/240V 1Ø QTY
1	CIRCUIT BREAKER, 7 AMP, PANEL MOUNT	E2378600	1	1
2	DIN RAIL ASSY, 208/220/240V 1Ø	300S731702	1	1
3	TRANSFORMER, 208 X 416 PRIM, 120 X 240 SEC, 500 VA, 50/60HZ	E2385300	1	-
	TRANSFORMER, 240 X 480 PRIM, 120 X 240 SEC, 500 VA, 50/60HZ	E2384000	-	1
4	CIRCUIT BREAKER, 2 POLE, 3.0A, DIN RAIL MNT	E2355100	1	1
5	POWER RELAY, COMBO, FLANGE/DIN RAIL MOUNT	E2367900	1	1
6	WIRE HARNESS ASSY, 208-220-240V 1Ø (not shown)	150S7402	1	1

AC Distribution Box, Single Phase (Models 1750, 2000 and 2500)



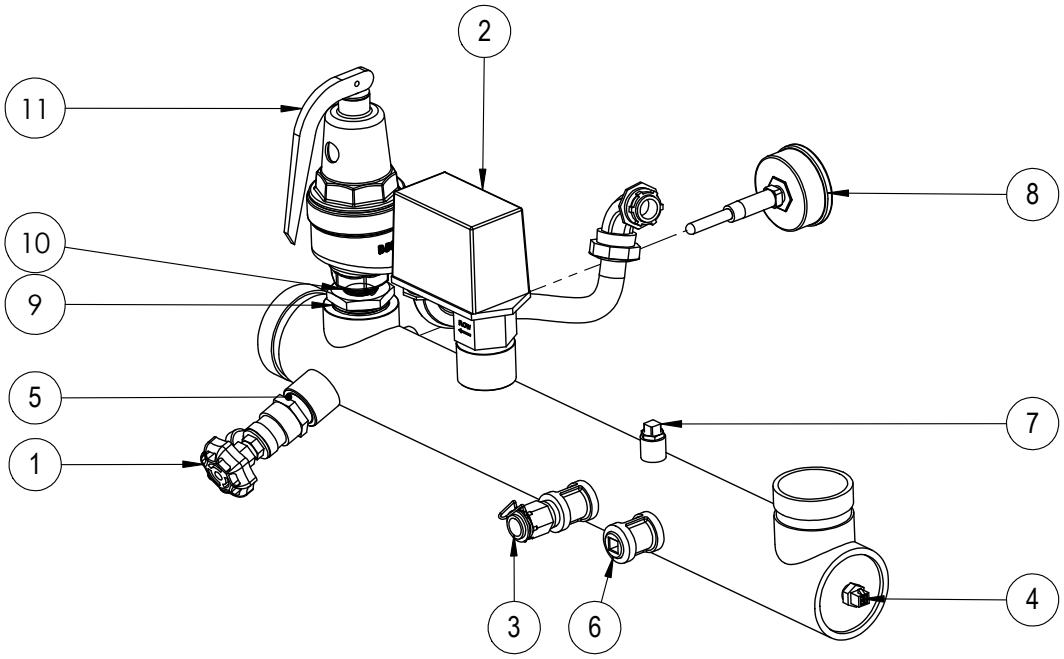
ITEM NO.	DESCRIPTION	120V QTY	208V QTY	220/240V QTY	PART NO.
1	TRANSFORMER, 208 X 416 PRIM, 120 X 240 SEC, 500 VA, 50/60HZ	-	1	-	E2385300
	TRANSFORMER, 240 X 480 PRIM, 120 X 240 SEC, 500 VA, 50/60HZ	-	-	1	E2384000
2	CIRCUIT BREAKER, 7 AMP, PANEL MOUNT	-	1	1	E2378600
3	FAN, AXIAL, 4-11/16" SQUARE, 1-1/12" DEEP, 115VAC	-	1	1	E2376300
4	DIN RAIL ASSY, 208/220/240V 1Ø	-	1	1	300S731702
5	CIRCUIT BREAKER, 2 POLE, 3.0 A, DIN RAIL MNT	-	1	1	E2355100
6	POWER RELAY, COMBO, FLANGE/DIN RAIL MOUNT	-	1	1	E2367900
7	CORD SET, AXIAL FAN, 90 DEG HEAD, 24" LEAD (not shown)	-	1	1	E2376500
8	WIRE HARNESS ASSY, 120V, 1Ø (not shown)	1	-	-	250S7401
	WIRE HARNESS ASSY, 208-220-240V 1Ø (not shown)	-	1	1	250S7402



AC Distribution Box, Three Phase (Model 2500)

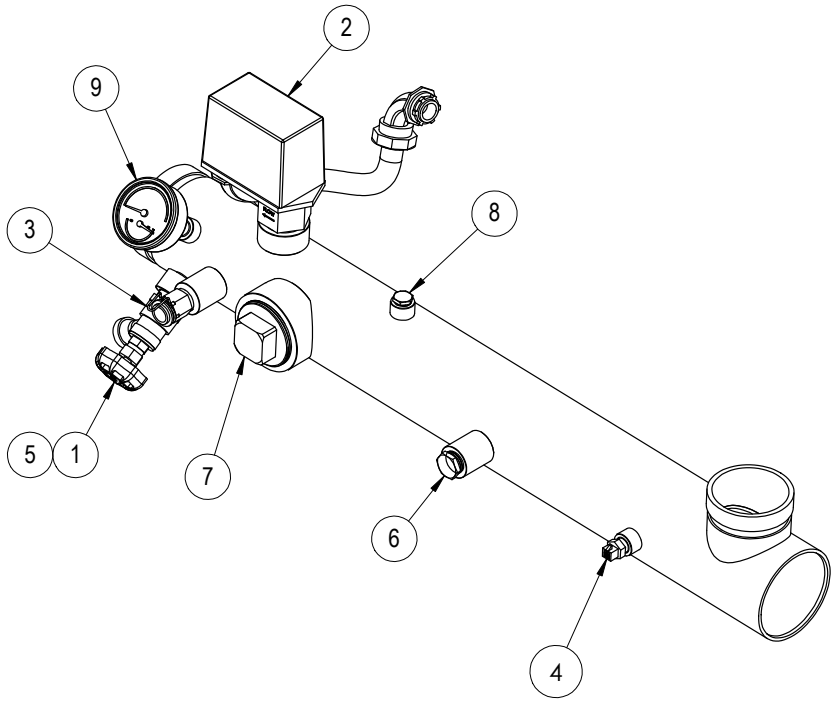
PARTS TABLE AC DISTRIBUTION BOX, 3Ø, MODELS 2500					
ITEM NO.	DESCRIPTION	208V QTY	480V QTY	575/600V QTY	PART NO.
1	FAN, AXIAL, 4-11/16" SQUARE, 1-1/2" DEEP, 115VAC	1	1	1	E2376300
2	TRANSFORMER, 208 X 416 PRIM, 120 X 240 SEC, 500 VA, 50/60HZ	1	-	-	E2385300
	TRANSFORMER, HPS, SP2000ACP, Prim 600/480V, Sec 120x240	-	1	1	E2382900
3	TRANSFORMER, HPS, SP500ACP, Prim 600/480V, Sec 120x240	-	1	1	E2383000
4	CIRCUIT BREAKER, 12 APM, PANEL MOUNT	-	1	1	E2383400
5	CIRCUIT BREAKER, 7 AMP, PANEL MOUNT	1	1	1	E2378600
6	DIN RAIL ASSY, 208V 3Ø	1	-	-	300S731703
	DIN RAIL ASSY, 480V 3Ø	-	1	-	300S731704
	DIN RAIL ASSY, 575-600V 3Ø	-	-	1	300S731705
7	POWER RELAY, COMBO, FLANGE/DIN RAIL MOUNT	1	1	1	E2367900
8	CIRCUIT BREAKER, 2 POLE, 3.0A, DIN RAIL MNT	1	-		E2355100
	CIRCUIT BREAKER, 2 POLE, 1.6A, DIN RAIL MNT	-	1	-	E2382700
	CIRCUIT BRKR, 2 POLE, 600Y/277VAC, 1-1.5A, DIN RAIL MT	-	-	1	E2382800
9	CORD SET, AXIAL FAN, 90 DEG HEAD, 24" LEAD (not shown)	1	1	1	E2376500
10	WIRE HARNESS ASSY, 208V 3Ø (not shown)	1	-	-	250S7403
	WIRE HARNESS ASSY, 480V 3Ø (not shown)	-	1	-	250S7404
	WIRE HARNESS ASSY, 575/600V 3Ø (not shown)	-	-	1	250S7405

Water Outlet Assembly (Models 1250 and 1500)



PARTS LIST				
ITEM NO.	DESCRIPTION	HYDRONIC QTY	VOL WAT QTY	PART NO.
1	VALVE, SHUT OFF, 3/4" NPT, BRASS	1	1	R10-143
2	FLOW SWITCH KIT	1	1	150S4030
3	WELL, IMMERSION, 1/2" NPT	1	1	RE2058300
4	SENSOR, TEMPERATURE	1	1	E2371200
5	NIPPLE, CLOSE, SS, 3/4" NPT	-	1	P2070700
	NIPPLE, CLOSE, BLK, 3/4" NPT	1	-	P0014100
6	PLUG, PIPE, 1/2 NPT, HEX HEAD, SST 316 ASME	-	1	P2084800
	PLUG, 1/2" STEEL	1	-	P2016000
7	PLUG, 1/4" NPT, 316 SS, CLASS 150	-	1	P2104000
	PLUG, HD. 1/4" NPT, SQ SOCKET, BLK	1	-	P2014200
8	GAUGE, TEMP/PRESSURE, 70°F MAX LO-320°F MIN HI, 0-230 PSI	1	1	30, 50, 60 psi - RA0079000
	GAUGE, TEMP/PRESSURE, 70°F MAX LO-320°F MIN HI, 0-90 PSI	1	1	75, 125, 150 psi - R0060600
9	BUSHING, 1 1/4" NPT X 3/4", 316 SS	1	1	P2072200
	BUSHING, 1 1/4 NPT X 1 NPT, 316 SS	1	1	P2069000
10	NIPPLE, PIPE 3/4 NPT CLOSE 316 SS	1	1	P2070700
	NIPPLE, 1" NPT X CLOSE, SS	1	1	P2081500
	NIPPLE, 1 1/4 NPT X 1 5/8 CLOSE, 316 SS	1	1	P2069202
11	VALVE, PRV, APOLLO 10-604-34 150 PSI 3/4 X 3/4 NPT 3,116 KBTU/HR	1	1	A2124014
	VALVE, PRV, APOLLO 10-604-25 125 PSI 3/4 X 3/4 NPT 2,639 KBTU/HR	1	1	A2124013
	VALVE, PRV, APOLLO 10-604-15 75 PSI 3/4 X 3/4 NPT 1,686 KBTU/HR	1	1	A2124012
	VALVE, PRV, APOL LO 10-615-12 60 PSI 1 X 1-1/4 NPT 2,657 KBTU/HR	1	1	A2124004
	VALVE, PRV, APOLLO 10-615-10 50 PSI 1 X 1-1/4 NPT 2,295 KBTU/HR	1	1	A2124010
	VALVE, PRV, APOLLO 10-616-05 30 PSI 1-1/4 X 1-1/2 NPT 2,716 KBTU/HR	1	1	A2124000

Water Outlet Assembly (Models 1750, 2000 and 2500)



PARTS LIST				
ITEM NO.	DESCRIPTION	HYDRONIC QTY.	VOL WAT QTY	PART NO.
1	VALVE, SHUT OFF, 3/4" NPT, BRASS	1	1	R10-143
2	FLOW SWITCH KIT	1	1	250S4030
3	WELL, IMMERSION, 1/2" NPT	1	1	RE2058300
4	SENSOR, TEMPERATURE	1	1	E2371200
5	NIPPLE, CLOSE, BLK, 3/4" NPT	1	-	P0014100
	NIPPLE, 3/4 NPT, CLOSE, 316 SS	-	1	P2070700
6	PLUG, PIPE, 1/2 NPT, HEX HEAD, SST 316 ASME	-	1	P2084800
	PLUG, 1/2" STEEL	1	-	P2016000
7	PLUG, 2" NPT, 316 SS, CLASS 150	-	1	P2103300
	PLUG, PIPE, 2" NPT, STEEL	1	-	P2109300
8	PLUG, 1/4" NPT, 316 SS, CLASS 150	-	1	P2104000
	PLUG, HD. 1/4" NPT, SQ SOCKET, BLK	1	-	P2014200
9	GAUGE, TEMP/PRESSURE, 70°F MAX LO-320°F MIN HI, 0-230 PSI	1	1	30, 50, 60 psi - RA0079000
	GAUGE, TEMP/PRESSURE, 70°F MAX LO-320°F MIN HI, 0-90 PSI	1	1	75, 125, 150 psi - R0060600

Notes:

All Manuals (Install & Operate, Start Up, and Service Manuals) can be downloaded at

www.laars.com

For Laars Product and Service VIDEOS

https://www.youtube.com/user/LaarsHeating

Dimensions and specifications subject to change without notice in accordance with our policy of continuous product improvement.

H2376700B

LAARS Heating Systems Company

Customer Service and Product Support: **800.900.9276 • Fax 800.559.1583**

Headquarters: **20 Industrial Way, Rochester, NH, USA 03867 • 603.335.6300 • Fax 603.335.3355**

9 Brigden Gate, Halton Hills, Ontario, Canada L7G 0A3 (905) 203-0600 Fax: (905) 636-6666

www.Laars.com

Litho in U.S.A. © Laars 22-06 Document 1353B