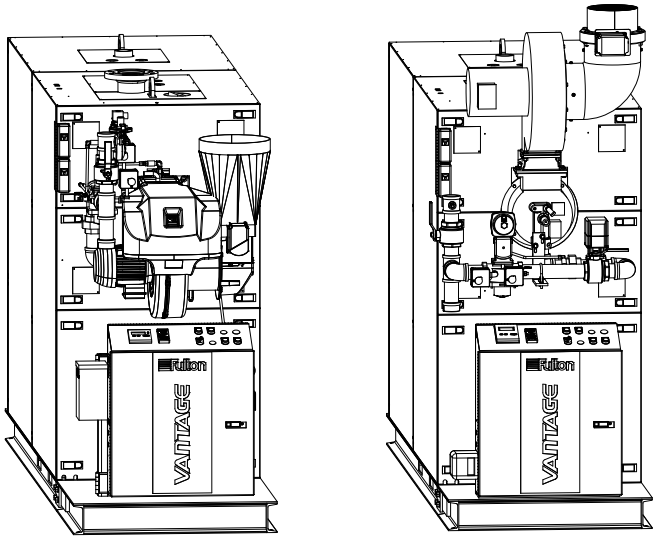
INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

Vantage (VTG)

Condensing Hydronic Boilers
2,000,000 - 6,000,000 BTU/HR



Serial/ National Board Number _____

Model _____

Fulton Order _____

Owner _____

Site Name _____

Date _____

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US GREEN BUILDING COUNCIL MEMBER

VTG-IOM-221024

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Overview

Prior to shipment, the following inspections and tests are made to ensure the highest standards of manufacturing for our customers:

- Material inspections
- Manufacturing process inspections
- American Society of Mechanical Engineers (ASME) welding inspection
- ASME hydrostatic test inspection
- Electrical components inspection
- Operating test
- Final engineering inspection
- Crating inspection

This manual is provided as a guide to the correct operation and maintenance of your Fulton equipment, and should be read in its entirety and be made permanently available to the staff responsible for the operation of the boiler. It should not, however, be considered as a complete code of practice, nor should it replace existing codes or standards which may be applicable. Fulton reserves the right to change any part of this installation, operation and maintenance manual.

Installation, start-up, and maintenance of this equipment can be hazardous and requires trained, qualified installers and service personnel. **Trained personnel are responsible for the installation, operation, and maintenance of this product, and for the safety assurance of installation, operation, and maintenance processes. Do not install, operate, service or repair any component of this equipment unless you are qualified and fully understand all requirements and procedures. Trained personnel refers to those who have completed Fulton Service School training specific to this product.**

When working on this equipment, observe all warnings, cautions, and notes in literature, on stickers and labels, and any additional safety precautions that apply. Follow all safety codes and wear appropriate safety protection. Follow all jurisdictional codes and consult any jurisdictional authorities prior to installation.

Warnings & Cautions

WARNINGS and CAUTIONS appear in various chapters of this manual. It is critical that all personnel read and adhere to all information contained in WARNINGS and CAUTIONS.

- WARNINGS must be observed to prevent serious injury or death to personnel.
- CAUTIONS must be observed to prevent damage or destruction of equipment or loss of operating effectiveness.

All Warnings and Cautions are for reference and guidance purposes, and do not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes or regulations.

Disclaimers and Local Codes

Installation of the equipment shall conform to all the requirements or all national, state and local codes established by the authorities having jurisdiction or, in the absence of such requirements, in the US to the National Fuel Gas Code ANSI Z223.1/NFPA 54 latest edition, and the specific instructions in this manual. Authorities having jurisdiction should be consulted prior to installation.

When required by local codes, the installation must conform to the American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1).

The boiler heat exchanger is manufactured and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section IV for a maximum allowable working pressure and operating temperature of 160 psig (1103 kPa) and 210˚ F (99˚ C) respectively. Aquastats are set at 200˚ F (93˚ C). Operating > 190˚ F (88˚ C) is not recommended.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

⚠ CAUTION

This boiler is certified for indoor installation only.

This boiler is not designed for use in systems where water is continuously replenished. The warranty is valid for closed loop systems only.

Fulton cannot be held responsible for the selection, engineering, installation, or sizing of any additional equipment or components of the hydronic heating system.

Custom-built and off-standard configurations may deviate from the installation, operation and maintenance requirements detailed in this manual. Refer to submittal documents or consult with your local Fulton representative for details.

Product Overview

Prior to the performance of installation, operation, or maintenance procedures, personnel should become familiar with the equipment (Table 1) and its components.

The Fulton Vantage hot water boiler is an automatic, fuel-fired, ultra high-efficiency boiler. The boiler can either be of the sealed combustion/direct vent type or utilize conventional combustion air intake and flue methods.

The boiler is capable of sidewall venting when the appropriate venting materials are used, and when permitted by local code requirements.

The Fulton Vantage boiler is certified to Underwriters Laboratories (UL) 795 Issue 2006/10/27 Edition 6 UL Standard for Safety Commercial-Industrial Gas Heating Equipment. The boiler heat exchanger is manufactured and stamped in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section IV for a maximum allowable working pressure and temperature of 160 psi (1103 kPa) and 210 F (99 C) respectively. All Vantage boilers are hydrostatically tested, test fired and shipped as a complete packaged unit.

Fuel, water and electrical connections are similar to other boilers of this type.

There are various burner and control configurations available with the Vantage boiler. Please be aware of which burner and control configuration has been designed specifically for your application.

This Vantage boiler is to be installed as part of a hydronic heating system. A qualified engineer must be consulted for the selection of the equipment and components of the heating system. Various system conditions can result in incorrect heat distribution to users of the heating system.

Each Vantage Boiler is supplied with the following:

- Integrated combustion supervision and temperature operating control
- Operating and high temperature probes in pressure vessel
- Low water probe in pressure vessel
- ASME safety relief valve
- Installation and Operation Manual
- Test fire report
- Wiring diagram
- Combustion Air Adapter
- Temperature and pressure (T&P) gauge

The customer should examine the equipment for any damage. It is the responsibility of the installer to ensure all parts supplied with the equipment are fitted in a correct and safe manner.

Placement & Rigging

Proper placement of your Fulton product is essential. Attention paid to the following points will save a great deal of difficulty in the future. Correct placement is the first step to trouble-free installation, operation, and maintenance.

Adhere to the following for placement and rigging:

1. Check building specifications for permissible floor loading. Use Table 1 for unit reference.
2. Conform to all the requirements of all national, state and local codes established by the authorities having jurisdiction and/or the U.S. to the National Fuel Gas Code, latest edition. Authorities having jurisdiction should be consulted before installations are made. Where required by local codes, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers (ASME CSD-1).
3. Since an external electrical source is utilized, the boiler, when installed, must be electrically ground in accordance with the National Electric Code, American National Standards Institute (ANSI) National Fire Protection Association (NFPA) 70, latest edition.
4. Standard Vantage boilers are certified for indoor installation only.
5. Install so that all system components are protected from water (dripping, spraying, rain, etc.) and debris (dry wall dust, insulation particles, etc.) during boiler operation and service.
6. Install on a level, non-combustible surface. Concrete is strongly recommended. Recommended minimum pad height is 4" (102mm) above the floor. Do not install the boiler on springs.
7. Provide combustion and ventilation air in accordance with applicable provisions of local building codes or: USA – NFPA 54/ANSI Z223.1, Section 5.3, Air for Combustion and Ventilation.
8. Locate the boiler so that the air supply and exhaust piping between the boiler and outside wall/roof are within the maximum lengths for horizontal or vertical venting if sealed combustion will be used. See **Clearances and Serviceability section** of this manual.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Competent personnel in accordance with all applicable local codes should carry out the installation of the Fulton equipment. All state and jurisdictional codes beyond the scope of the applicable ASME Boiler and Pressure Vessel Codes, for its corresponding classification, should be followed in all cases. Jurisdictional authorities must be consulted prior to installation.

A competent rigger experienced in handling heavy equipment should handle rigging your equipment into position.

The equipment must be installed on a non-combustible surface.

Failure to provide required and safe access to the equipment could impede commissioning and maintenance. Service technicians are instructed not to commence commissioning if hazardous conditions exist.

Failure to provide proper minimum clearances between equipment and combustible materials may result in fire.

⚠ CAUTION

Do not allow weight to bear on equipment components to prevent damage.

Do not use to directly heat swimming pool.

TABLE 1 - BOILER DIMENSIONS AND OPERATING REQUIREMENTS

MODEL VTG		2000	2000DF	3000	3000DF	4000	4000DF	5000	5000DF	6000	6000DF
Specifications											
Input	Million BTU/Hr.	2	2	3	3	4	4	5	5	6	6
	kW	586	586	879	879	1172	1172	1465	1465	1758	1758
Fuel Cons. @ rated cap: (Nat. Gas)	FT_3/Hr.	2,000	2,000	3,000	3,000	4,000	4,000	5,000	5,000	6,000	6,000
	M_3/Hr	56.6	56.6	84.9	84.9	113.2	113.2	141.5	134.5	169.9	169.9
Fuel Cons. @ rated cap.: (#2 Oil)	GPH	NA	14.3	NA	21.4	NA	28.6	NA	35.8	NA	42.8
(See Table 4 for supply)	LPH	NA	54.1	NA	81.0	NA	108.2	NA	135.5	NA	162.0
Output at AHRI Test Condition	BHP	57	57	86	86	116	116	138	138	168	168
	KCal/h	4.8	4.8	7.25	7.25	9.7	9.7	11.6	11.6	14.1	14.1
Nat. Gas Pressure Req.*	"w.c.	14 - 42	14 - 42	14 - 42	14 - 42	14 - 42	14 - 42	14 - 42	14 - 42	18 - 42	18 - 42
Electrical Req. (FLA)** 208V, 60Hz, 3 Phase		11	18	14	18	21	18	28	32	18	32
460V, 60Hz, 3 Phase		5	8	7	8	9	8	13	15	13	15
Water Content	Gal	147	147	215	215	275	275	275	275	480	480
	Liters	556.4	556.4	813.8	813.8	1041	1041	1041	1041	1817	1817
Dry Weight	LB	3,800	3,800	5,300	5,300	6,600	6,600	6,900	6,900	10,800	10,900
	KG	1724	1724	2404	2404	2994	2994	3130	3130	4899	4944
Operating Weight	LB	5,100	5,100	7,100	7,100	8,900	8,900	9,200	9,200	14,800	14,900
	KG	2314	2314	3221	3221	4037	4037	4173	4173	6713	6759
Dimensions											
Overall Boiler Width	IN	30.5	30.5	34.5	34.5	40.5	40.5	40.5	40.5	50.5	50.5
	CM	77.5	77.5	87.6	87.6	102.8	102.8	102.8	102.8	128.2	128.2
Overall Boiler Height	IN	75.6	64	90.4	72.3	92	77.9	98.7	77.9	88.2	88.2
	CM	192.0	162.5	229.6	183.6	233.6	197.8	250.6	197.8	224.0	224.0
Overall Boiler Depth	IN	108	122	120	132	124	136	136	142	155	155
	CM	274.3	309.8	304.8	335.2	314.9	345.4	345.4	360.6	393.7	393.7
Flue Outlet Diameter	IN	10	10	12	12	14	14	14	14	14	14
	CM	25.4	25.4	30.4	30.4	35.5	35.5	35.5	35.5	35.5	35.5
Combustion Air Inlet Diameter	IN	8	10	10	10	12	12	12	12	12	12
	CM	20.3	25.4	25.4	25.4	30.4	30.4	30.4	30.4	30.4	30.4
Water Inlet/Outlet Diameter	IN	4	4	4	4	6	6	6	6	6	6
	CM	10.1	10.1	10.1	10.1	15.2	15.2	15.2	15.2	15.2	15.2

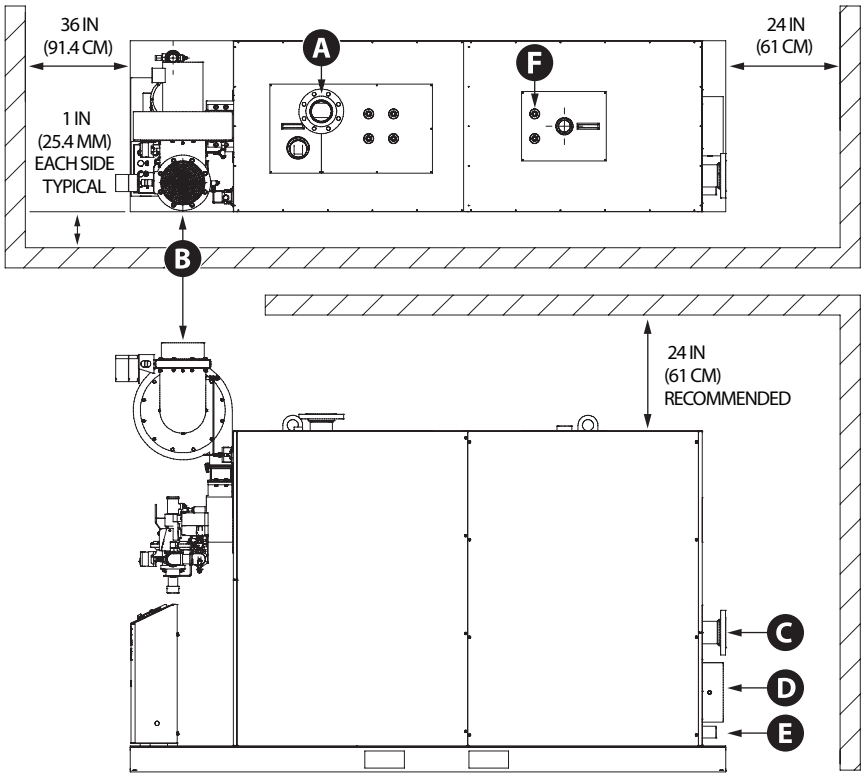
*Alternate gas pressure arrangements may apply. Please verify gas pressure ratings for your boiler by viewing the boiler name plate.
**Standard configurations. Alternate voltages available as an option; please consult factory.
Note: All dimensions are approximate and are subject to change without notice.
The use of propane may be allowable with concentrations up to 5% propylene, also referred to as HD5. Off-standard grades of propane are not permitted. Contact factory for more information.

Clearances and Serviceability

Adhere to the following for clearances and serviceability:

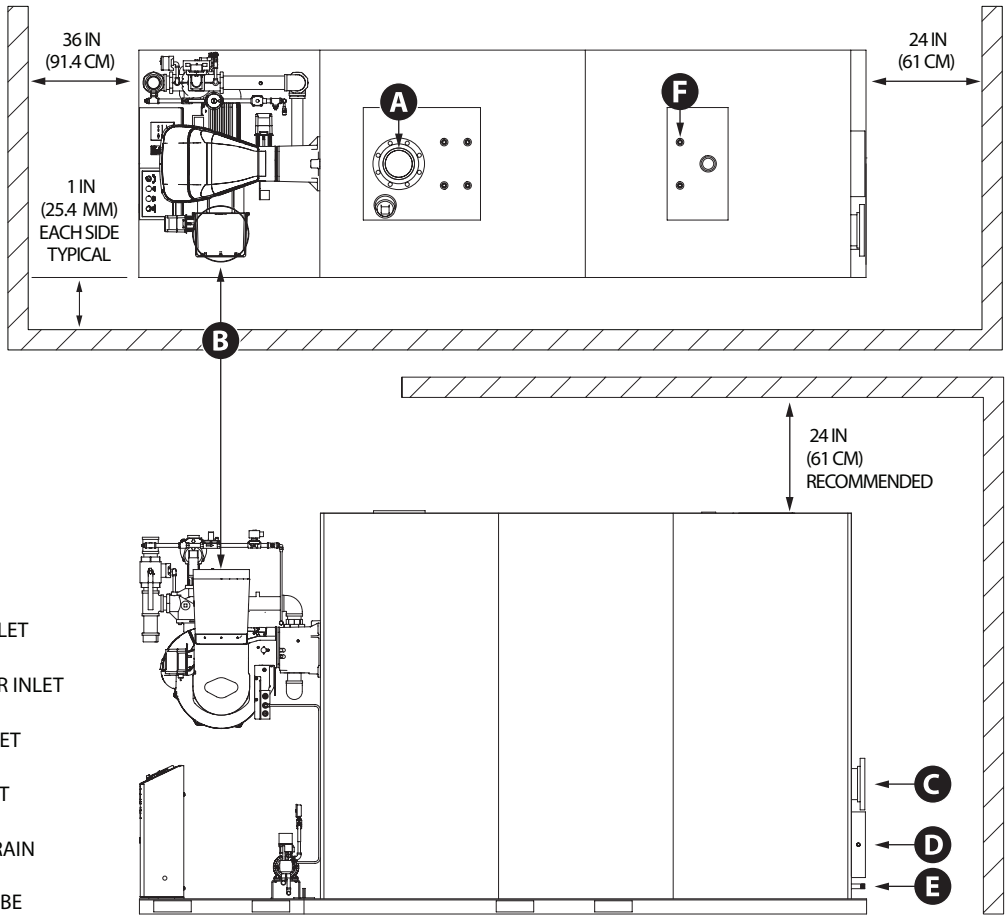
1. All local and national codes (NFPA, ANSI, UL, CSA, ASME) must be followed for proper clearances and serviceability for your boiler or heater. Authorities having jurisdiction should be consulted before installations are made.
2. Appropriate front, back, side and top clearances must be maintained (Figure 1). This will allow access around the equipment to facilitate maintenance and a safe work environment. A 1 inch (25.4 mm) side clearance is acceptable between all boilers, with the exception of the VTG-5000 which requires an 8 inch (203.2 mm) side clearance. Custom configurations may not allow 1 inch (25.4 mm) side clearance.
3. Ensure all labels on the boiler will be fully visible for maintenance and inspection.
4. Do not place any boiler room accessories, or other components, on the Vantage skid.

Standard / Low Emissions Models



A HOT WATER OUTLET
B COMBUSTION AIR INLET
C COLD WATER INLET
D EXHAUST OUTLET
E CONDENSATE DRAIN
F LOW WATER PROBE

Dual Fuel Models



A HOT WATER OUTLET
B COMBUSTION AIR INLET
C COLD WATER INLET
D EXHAUST OUTLET
E CONDENSATE DRAIN
F LOW WATER PROBE

FIGURE 1 - VIEWS OF VANTAGE HYDRONIC BOILER (STANDARD, LOW EMISSIONS AND DUAL FUEL MODELS)

Install Boiler Trim

Each Vantage boiler is supplied with a safety relief valve sized in accordance with ASME requirements. Adhere to the following installation requirements:

1. The safety relief valve (Figure 2) must:
   - » Be connected to the coupling located in the top of the boiler.
   - » Be installed in the upright vertical position.

➨ *NOTE: Safety relief valve size is determined by trim pressure and is supplied in the trim kit along with appropriate bushing. For inlet and outlet sizes, see Table 2.*

2. The discharge pipe must:
   - » Not have a diameter less than the full area of the valve outlet.
   - » Be as short and straight as possible and so arranged as to avoid undue stress on the valve.
   - » Be supported by means other than the safety valve itself.
   - » Be piped to avoid danger of scalding personnel.

➨ *NOTE: Each boiler is equipped with a pressure-temperature gauge to be installed in the outlet piping section of the boiler. Gauge must not be isolated from the boiler by any valve*

TABLE 2 - SAFETY RELIEF VALVE INLET AND OUTLET SIZES

Model	Trim Pressure PSI (kPa)	Inlet Size inch (mm)	Outlet Size inch (mm)
VTG-2000 (DF)	30 (206.84)	1 1/4 (31.75)	1 1/2 (38.1)
	60 (413.69)	1 (25.4)	1 1/4 (31.75)
	100 (689.48)	3/4 (19.05)	1 (25.4)
	125 (861.84)	3/4 (19.05)	1 (25.4)
	160 (1103.16)	3/4 (19.05)	1 (25.4)
VTG-3000 (DF, LE)	30 (206.84)	1 1/2 (38.1)	2 (50.8)
	60 (413.69)	1 1/4 (31.75)	1 1/2 (38.1)
	100 (689.48)	1 (25.4)	1 1/4 (31.75)
	125 (861.84)	1 (25.4)	1 1/4 (31.75)
	160 (1103.16)	3/4 (19.05)	1 (25.4)
VTG-4000, 5000 (DF, LE)	30 (206.84)	2 (50.8)	2 1/2 (63.5)
	60 (413.69)	1 1/2 (38.1)	2 (50.8)
	100 (689.48)	1 1/4 (31.75)	1 1/2 (38.1)
	125 (861.84)	1 (25.4)	1 1/4 (31.75)
	160 (1103.16)	1 (25.4)	1 1/4 (31.75)
VTG-6000 (DF)	30 (206.84)	1 1/2 (38.1) 1 1/4 (31.75)	2 (50.8) 1 1/2 (38.1)
	60 (413.69)	1 1/2 (38.1)	2 (50.8)
	100 (689.48)	1 1/4 (31.75)	1 1/2 (38.1)
	125 (861.84)	1 1/4 (31.75)	1 1/2 (38.1)
	160 (1103.16)	1 (25.4)	1 1/4 (31.75)

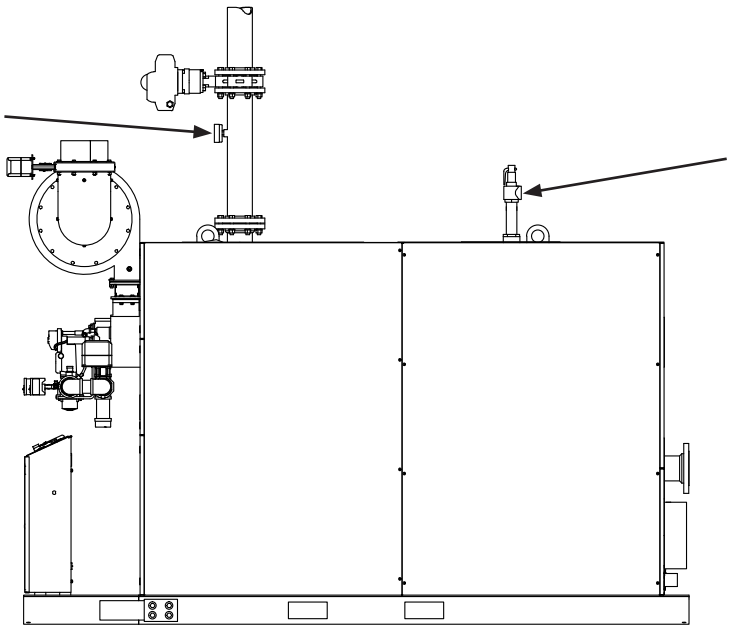


FIGURE 2 - SAFETY VALVE AND GAUGE LOCATION (FIELD PIPING)

Install Water Piping

All water supplies contain some solids, dissolved gases or dissolved minerals. These may cause corrosion, deposition and/or fouling of equipment. To prevent these contaminants from impacting boiler performance, valve operation and general pipe longevity, each location must be analyzed and treated accordingly.

Adhere to the following for water piping installation (See Figure 3 - 4):

1. Manual isolation valves are recommended on both water connections for ease of service.
2. Install piping so that the boiler is not supporting any additional piping.
3. Install manual purging valves in all loops and zones.
4. Install a pressure-reducing (automatic fill) valve in the cold water fill line to the boiler system. Check that the proposed operation of zone valves, zone circulator(s) and diverting valves will not isolate air separator(s) and/or expansion tank(s) from the boiler. Clearance from hot water pipes to combustibles must be at least 6 inches (152 mm).
5. When used in conjunction with a refrigeration system, install the boiler so that the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler. If the boilers are connected to heating coils (located in air handling units where they may be exposed to refrigerated air circulation) such boiler piping systems must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.
6. Include the following in the mechanical equipment in the hydronic heating system:
    - » *An automatic pressure activated water make up valve with back flow preventer.* It must be set to maintain required Net Positive Suction Head (NPSH) for re-circulating pumps, a positive system pressure at the highest point of at least 5-10 PSIG (34.5 - 69 kPa), and make up water valve should be designed to add water to the system at the outlet of the boiler and should not be fed directly into the boiler.
    - » *Air removal equipment, including an air separator and automatic breather valves, along with a functioning expansion tank* . Each must be designed to system specifications.
    - » Boiler connection dimensions are for reference and not for construction purposes. Pre-fabricating boiler piping is not recommended.
7. Install filtration to remove particulates if appropriate. A #4 or finer mesh size is required.
8. Install bypass chemical feeder for corrosion inhibitor maintenance if appropriate.

⚠ WARNING

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The discharge from the safety relief valve must be arranged to ensure no danger of scalding personnel, or equipment damage.

Provisions must be made to properly pipe the safety relief discharge away from the boiler to the point of discharge.

No shutoff of any kind shall be placed between the safety relief valve and the boiler, or in the discharge pipe between the valve and the atmosphere. Doing so may cause an explosion from overpressure.

The hydronic system should never be flushed while the boiler is attached to the system since the debris could accumulate in the boiler and block water from passing through the heat exchanger.

Ensure all labels on the boiler are legible. All connections and safety devices, both mechanical and electrical, must be kept clean, with ease of access for inspection, use and maintenance.

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

ⓘ NOTE

The upper water connection is the boiler supply (outlet). The lower water connection is the boiler return (inlet).

9. Install corrosion coupon holder to assess corrosion inhibitor performance if appropriate.

10. Before installing a Vantage boiler into a hydronic loop, be sure that the system piping and any other components of the system are clean and free of debris, ferrous oxide (magnetite), and any foreign matter. The hydronic system is completely flushed prior to installing the boiler itself.

■ Variable Primary Piping Arrangement

This boiler is designed for installation in variable primary flow piping arrangements (see Figure 3), sometimes referred to as full flow systems. This arrangement eliminates temperature mixing associated with primary-secondary piping, thereby delivering the lowest temperature water directly to the boiler return connections and optimizing thermal efficiency potential of the condensing boiler plant.

Adhere to the following for variable primary piping arrangements:

- Select secondary (system) pump(s) with sufficient total dynamic head for the pressure drop of the loop at design flow. See Figure 3 for the boiler water pressure drop. This boiler will automatically perform a safe shutdown in the event of a low flow condition; however, proper design flow is required to deliver heat to the users and prevent nuisance lockouts.
- Install a motorized isolation valve per boiler. This eliminates flow through idle boilers in accordance with ASHRAE 90.1-2013 (6.5.4.3.2). Blending of unheated supply water impacts temperature control and can cause manual reset high temperature lockouts. Use only one motorized isolation valve per boiler; two-position type actuator, open or closed. It is acceptable to install the valve on either the inlet or the outlet piping of each boiler, but never both. Select a valve actuator with a cycle time of 45 seconds or less. Do not install modulating isolation valves on boiler piping.
- Ensure flow paths in the hydronic loop and residual heat in the pressure vessel is adequately dispersed for sufficient time after the burner is disabled. The valve control system must be capable of leaving the lead boiler valve open at all times.
- Use a reverse return header to balance flow across the boilers. Where reverse return cannot be used, it is recommended to install a balancing valve per boiler.
- Do not install three-way mixing valves or minimum temperature protection. This boiler does not have a minimum return water temperature requirement.
- Install system bypass valve(s) at or after the last coil(s), do not install bypass valves directly after the secondary (system) pump(s).

■ Primary-Secondary Piping Arrangement

It is acceptable to install this boiler in a primary-secondary arrangement, although this arrangement is not required. See Figure 4. Primary-secondary arrangements are used to decouple the water flow of the primary (boiler) loop from the secondary (system) loop. Blending occurs in the shared piping region.

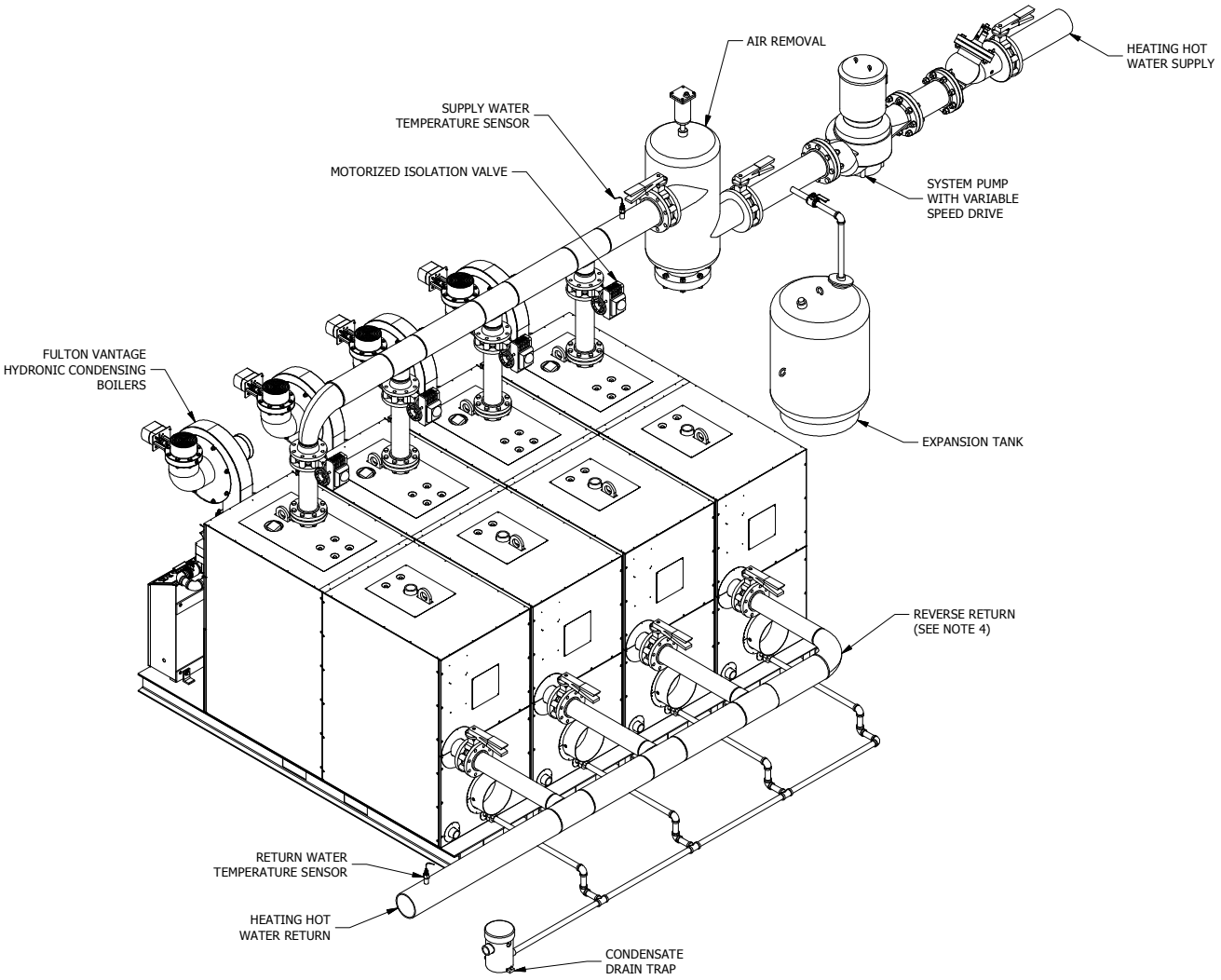
Adhere to the following for primary-secondary piping arrangements:

- Typical decoupling methods include closely spaced tees, a buffer tank, or a hydraulic separator. Where using closely spaced tees, separate by four pipe diameters or less.
- Install the dedicated boiler circulator on the inlet side of the boiler, pumping into the return connection. Select pump(s) with sufficient total dynamic head for the pressure drop of the loop at design flow.

In addition to the above, adhere to the following for multiple boiler systems:

- A check valve is required per boiler. Motorized isolation valves are not an acceptable substitute for check valves.
- Use a single common supply connection and a single common return connection into the secondary (system) piping. Do not use separate connections for each boiler into the secondary piping.

Use a reverse return primary header to balance flow across the boilers. Where reverse return cannot be used, it is recommended to install a balancing valve per boiler.



NOTES:
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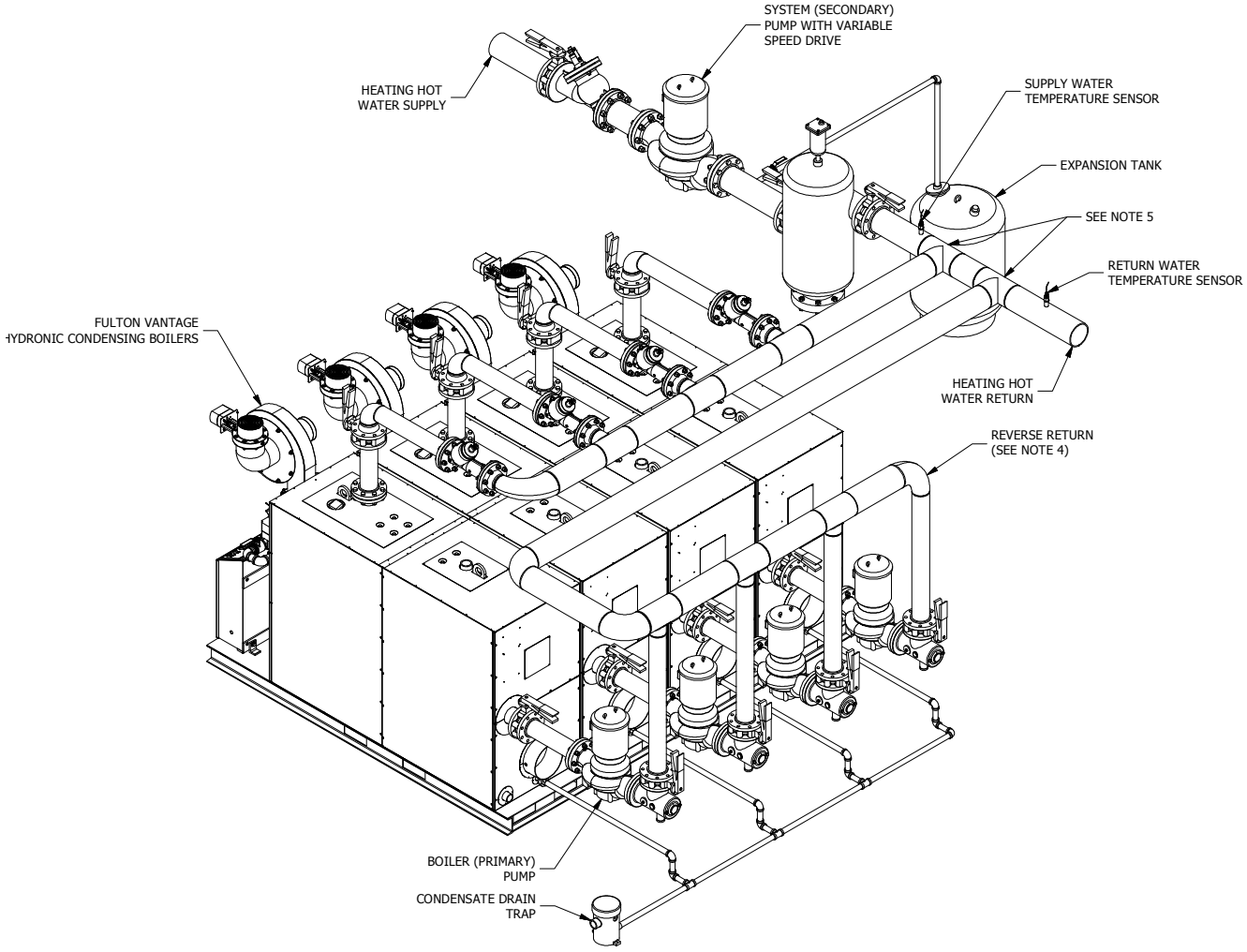
2. THIS DRAWING IS NOT FOR CONSTRUCTION PURPOSES.
3. REFER TO THE INSTALLATION AND OPERATION MANUALS FOR INFORMATION REGARDING CLEARANCES AND INSTALLATION REQUIREMENTS.
4. THE PIPING CONFIGURATION SHOULD UTILIZE A REVERSE RETURN HEADER TO PROPERLY BALANCE FLOW ACROSS THE BOILERS. WHERE REVERSE RETURN CANNOT BE USED, IT IS RECOMMENDED TO INSTALL A BALANCING VALVE PER BOILER.

FIGURE 3 - MULTIPLE VANTAGE BOILERS IN A COMMON HYDRONIC LOOP, PRIMARY ONLY VARIABLE FLOW ARRANGEMENT WITH MOTORIZED ISOLATION VALVES (RECOMMENDED)

Note: Sample piping layout (P&ID) is a general representation of system installation. Good practice should be used in system design, including but not limited to adequate pipe/valve sizing and natural flow path for system water.



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5. CENTER TO CENTER DISTANCE BETWEEN BOILER (PRIMARY) SUPPLY AND RETURN MANIFOLDS SHOULD BE 4 PIPE DIAMETERS OR LESS.

FIGURE 4 - MULTIPLE VANTAGE BOILERS IN A COMMON HYDRONIC LOOP, PRIMARY-SECONDARY FLOW ARRANGEMENT

Note: Sample piping layout (P&ID) is a general representation of system installation. Good practice should be used in system design, including but not limited to adequate pipe/valve sizing and natural flow path for system water.

Meet Water Chemistry Requirements

System water chemistry requirements are as follows:

- pH: Range of 8.5 - 10.5
- Oxygen: Less than 250 ppb (operating condition)
- Total Iron/Copper: Less than 5 ppm

1. Refer to your water conditioning or chemical treatment supplier for analysis and recommendations for proper.
   - Corrosion Inhibitor: Capable of maintaining iron corrosion rates <2 mpy. Due to changing environmental restrictions a non-heavy metal ALL ORGANIC inhibitor is recommended which is designed for multi metal systems including ferrous metals and yellow metals such as copper and brass.
   - Chloride: Less than 200 ppm
   - Hardness: Less than 3.5 grains per gallon (60 ppm) in make-up/ fill water. Calcium build-up on the heating surfaces is not covered under warranty.

Adhere to the following:

1. Refer to your water conditioning or chemical treatment supplier for analysis and recommendations for proper system conditions.
2. Follow a program with appropriate monitoring and maintenance of system water conditions as provided by your water conditioning or chemical treatment supplier.
3. If RO/DI water is used as a source for hydronic loop water or makeup water, it must be neutralized to a pH of 8.5 - 10.5 prior to entering the boiler. Failure to neutralize the RO/DI water will void the pressure vessel warranty and may cause high general corrosion rates.
   - The system must have an automatic pH controller to monitor and log the levels. This must be independent of other chemical feed systems.
   - Makeup water pH range must be 7.5 - 8.8; the boiler water must be maintained within pH range of 8.5 - 10.5.
4. Operate the boiler in a closed-loop system using water or water/glycol (not requiring a make-up water supply). A large amount of improperly treated make-up water can cause premature failure of the heat exchanger resulting from scale build up. Scale build up will reduce the efficiency and useful life of the boiler and is not covered under warranty.
5. For freeze protection, and inhibited propylene glycol is recommended. The maximum concentration is 60% glycol by volume. Use only solutions formulated for hydronic heating systems. Do not use automotive glycol.
6. At a minimum, the hydronic fluid should be checked for glycol concentration and pH once per year, or per glycol manufacturer schedule. A refractometer is recommended.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

Failure to ensure the use of uncontaminated air in this equipment may be a safety hazard and damage burner components. Refer to current codes and standards on the safe installation and operation of this equipment, including NFPA 54, National Gas Fuel Code, CAN/CSA B149 and other jursidictional codes.

△ CAUTION

Some soap used for leak testing is corrosive to certain types of metals. Clean all piping thoroughly after completing the leak check.

Care needs to be taken to eliminate oxygen from the water system, as excess oxygen in the system will reduce the life of any boiler. The boiler warranty does not cover heat exchanger replacement due to oxygen contamination of boiler water.

Heat exchanger failure due to inappropriate water quality, foreign matter or debris damage is not covered under the warranty.

If the piping system attached to this unit will be chemically cleaned, the boiler must be disconnected from the system and a bypass installed so that the chemical cleaning solution does not circulate through the boiler. If cleaning is desired, flush the boiler with clean domestic water only.

⚠ WARNING

Do not terminate venting into an enclosed area.

Never use open flame or smoke from a cigarette, cigar, or pipe as a testing method during boiler installation, operation, or maintenance.

Foreign substances, such as combustible volatiles in the combustion system can create hazardous conditions. If foreign substances can enter the air stream, the boiler combustion air inlet must be piped to an outside location.

Regular maintenance of the filter is required (as per the filter manufacturer's recommendations) to maintain the Vantage warranty.

■ Prevent Oxygen Contamination

There are several ways to prevent boiler water oxygen contamination:

- Minimize system leaks to minimize make up water requirement
- Do not use open tanks or fittings
- Do not use oxygen permeable materials anywhere in the water system
- Repair leaks in the system quickly
- Eliminate fittings wherever possible
- Use air elimination devices in system piping

■ Eliminate System Air

➨ *NOTE: There are no built-in boiler air eliminating features.*

Adhere to the following for air elimination:

1. The installation of an air separator and air eliminator (air vent) is required.
2. To prevent scale corrosion in boiler and associated piping, make up water must be kept to a minimum. This is best achieved by ensuring immediate repair of all leaks and that system pressure is maintained.
3. If a sealed diaphragm-type expansion tank is used, install an air eliminator in the hot water piping at the air separator on the suction side of the system circulators.
4. If an air cushion type expansion tank is used, pipe tank directly into boiler supply on the suction side of the system circulators.
5. On multi-zoned systems (or a system with both space and domestic water heating), air elimination must be provided either in the common piping or on every loop.
6. When the boiler is installed at a higher level than baseboard radiation (if used), air elimination must be provided directly above the unit.

Fill the Boiler With Water

To be sure that the boiler is not air-bound, open the pressure-relief valve located at the rear of the boiler. Leave the relief valve open until a steady flow of water is observed. Close the valve and finish filling the system.

Install Gas Piping

This boiler features a gas fired fully modulating burner requiring gas delivery at a relatively constant pressure and calorific content. This ensures efficient and reliable combustion.

The gas train pressure requirements are detailed on the boiler data plate, located at the rear of the boiler.

Field gas piping must be installed in accordance with NFPA 54 National Fuel Gas Code, ANSI Z223.1, and any other local codes which may apply.

Adhere to the following for gas piping installation:

1. See Table 3 for required natural gas pipe size, based on overall length of pipe from the meter plus equivalent length of all fittings. Approximate sizing may be based on 1,020 BTU for 1 cubic foot of natural gas.
2. Piping must be of the proper size to ensure adequate gas supply. It is typical for the gas delivery piping to be upsized one of several diameters larger than the boiler gas inlet size.
3. The pipe and the fittings used must be new and free of dirt or other deposits.
4. When making gas-piping joints, use a sealing compound resistant to the fuel gas type serving the boiler.
5. Install a manual gas shutoff valve and union (not supplied) prior to the boiler. See Figure 5.

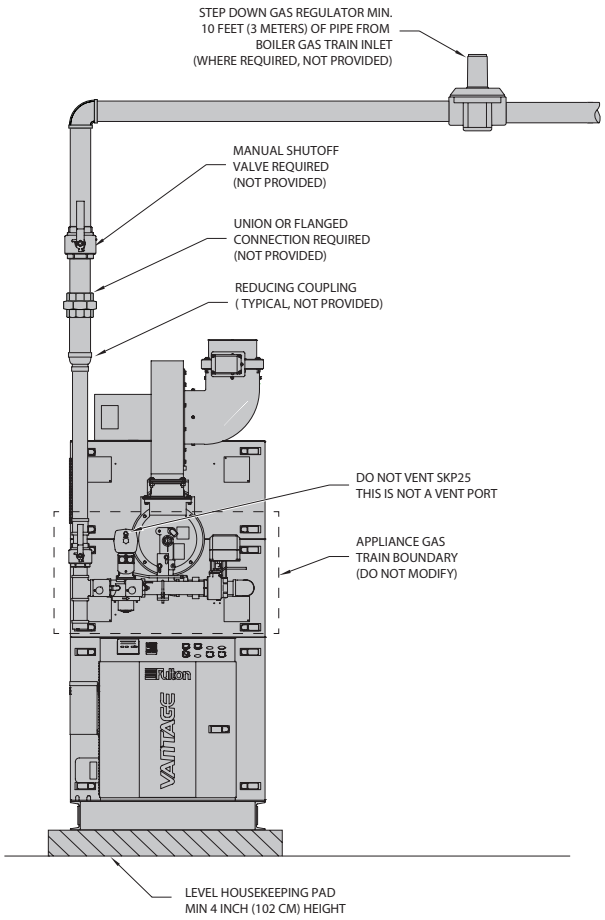


FIGURE 5 - GAS PIPING

6. Piping must be installed such that no piping stresses are transmitted to the boiler. The boiler cannot be used as a pipe anchor.
7. Where incoming gas pressure exceeds the boiler data plate maximum, a line gas pressure regulator is required. Provide adequate volume to prevent hunting by installing pressure regulators a recommended minimum of 10 feet (3 meters) of linear pipe from the boiler. Appliance regulators are not a substitution for line gas pressure regulators and must not be used.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

DO NOT USE GASOLINE, CRANKCASE OIL OR ANY OIL CONTAINING GASOLINE. If in doubt, contact your Fulton representative prior to operation.

Do not store or use gasoline or other flammable vapors and liquids or corrosive materials in the vicinity of this or any other appliances. Cements for plastic pipe should be kept away from all sources of ignition. Proper ventilation should be maintained to reduce the hazard and to minimize breathing of cement vapors.

Damage to the pump seal will occur immediately if it is run with the return line closed and the by-pass screw inserted.

If the water supply must be temporarily disconnected from the condensate drain trap, the boilers must be turned off to prevent accidental flue gas emission into the boiler room.

⚠ WARNING

Cements for plastic pipe are flammable liquids and should be kept away from all sources of ignition. Proper ventilation should be maintained to reduce the hazard and to minimize breathing of cement vapors. Avoid contact of cement with skin and eyes.

Assure all electrical connections are powered down prior to attempting replacement or service of electrical components or connections of the boiler.

Do not use the boiler/burner as support for ducted air piping. Ducted piping must be supported independently of the boiler.

Particulate matter or chemicals in the combustion air supply to the boiler will cause damage or failure to the burner and is not covered under warranty.

8. A gas pressure relief valve may be required for overpressure protection, refer to the local code(s) adopted by the AHJ.
9. Maximum inlet gas pressure drop from static to dynamic must not exceed 15%, or the maximum allowable by local code (CSA B149 clause 6.3.2 for Canada). The stricter of the two shall apply.
10. The boiler and all gas piping connections must be pressure-tested and checked for leaks before being placed into service. Test with compressed air or inert gas if possible.
11. The boiler must be disconnected at the boiler manual shutoff valve from the gas supply piping system during any pressure testing of the system at pressures in excess of 1.5 PSIG (42 inch W.C.).
12. After completing pressure testing and obtaining any necessary approvals from the AHJ, introduce gas service and purge gas piping in accordance with local codes. Do not purge their contents into a confined space or where fuel gas can accumulate.
13. The boiler gas train has been factory leak tested, however, fittings may loosen during shipment or installation. After gas piping is completed and before wiring installation is started, all piping connections (factory and field) must be carefully checked for gas leaks. Use a soap and water solution or combustible gas detector. A GAS-Mate® 0119 or equivalent is recommended.
14. Please note that custom configurations may utilize alternate fuel trains. For these situations, refer to submittal drawings.

■ Components Requiring Ventilation to the Outdoors

The following do not require ventilation to the outdoors, as there is a vent limiter in use:

- Regulator on the gas pilot line (when applicable only)

The SKP25 regulating gas valve has independent certification as a ventless regulator and does not require ventilation to the outdoors. The port marked "AIR" on the actuator is not a gas vent connection, connecting a vent line to this port may cause operational issues.

An authority having jurisdiction (AHJ) may not permit the use of a vent limiter on some or all components. If venting is required, use the following general guidelines:

- Each component must have a separate vent line to the outdoors. Vent lines must not be manifolded or combined with any other vent or exhaust systems.
- Start with the vent connection size and as soon as it is practical, increase the pipe size one diameter. For every ten feet of vent, increase the pipe size one diameter. Never reduce the vent size.
- Protect the vent termination from debris, dust and insects. Install the vent termination above the snow line and point down to prevent ingress of water. The termination must be a minimum of 3 ft (0.9 m) from a source of ignition.

TABLE 3 - NOMINAL PIPE SIZE

Nominal Pipe Size	ID	Equivalent Pipe Length		Max Capacity in ft3 of natural gas per hour. Pressure drop of 0.5"wc/ Equivalent length of pipe (feet); incoming pressure of 14"W.C.						
Inch (mm)	Inch (mm)	90 Elb Feet (meter)	Tee Feet (meter)	20	40	60	80	100	150	200
1-1/4 (31.75)	1.380 (35.05)	3.45 (1.05)	6.9 (2.10)	950	-----	-----	-----	-----	-----	-----
1-1/2 (38.1)	1.610 (40.89)	4.02 (1.22)	8.04 (2.45)	1460	990	810	-----	-----	-----	-----
2 (50.8)	2.067 (52.50)	5.17 (1.57)	10.3 (3.13)	2750	1900	1520	1300	1150	950	800
2-1/2 (63.5)	2.469 (62.71)	6.16 (1.87)	12.3 (3.74)	4350	3000	2400	2050	1850	1500	1280
3 (76.2)	3.068 (77.92)	7.67 (2.33)	15.3 (4.66)	7700	5300	4300	3700	3250	2650	2280
4 (101.6)	4.026 (102.26)	10.10 (3.07)	20.2 (6.15)	15800	10900	8800	7500	6700	5500	4600
6 (152.4)	6.07 (154.17)	10.10 (3.07)	23.60 (7.19)	-----	-----	-----	-----	20200	16503	12766
8 (203.2)	7.98 (202.69)	13.30 (4.05)	29.10 (8.86)	-----	-----	-----	-----	41200	33660	29128

Install Condensate Drain

A condensate drain trap is intended for use with the Fulton Vantage boiler.

■ Single Boiler Drain Trap

The single boiler condensate drain trap is Fulton Part Number 4-57-005500. The drain trap must be configured one per boiler, with a maximum capacity of 4.0 MM BTU/hr. See Figures 6 and 10.

Adhere to the following for installation:

1. The 1 inch (25.4 mm) boiler condensate drain outlet will be reduced and connected to the 3/4 inch (19.05 mm) inlet on the top of the drain trap.
2. A condensate collecting tank and condensate pump will be required if a floor drain is not available to collect condensate (collecting tank and pump are not supplied with the boiler).
3. All piping (Figure 6) must be galvanized or stainless steel, and be free of leaks. Copper, carbon steel/iron pipe, PVC or CPVC are not acceptable.
4. The 3/4 inch (19.05 mm) drain outlet must remain below the 1 inch (25.4 mm) boiler condensate drain.
5. Connect the 3/4 inch (19.05 mm) drain outlet to an appropriate waste line following applicable codes. The 3/4-inch (19.05 mm) drain connection on the drain tank must be the highest point prior to going to the drain. Failure to keep drain piping lower than this point will result in overflow of the drain tank. Slope the drain pipe away at a minimum pitch of 1 inch (25.4 mm) for every 12 feet (3.65 m).

➨ *NOTE: Ensure condensate drain piping will not be exposed to freezing temperatures.*

⚠ WARNING

The exhaust vent installer should be familiar with Federal Codes as well as local codes and regulations.

⚠ CAUTION

An uninterruptible water supply is required and shall be connected to the ¼" (U.S. only) compression fitting on the condensate drain. The water supply maintains a water level in the drain kit to prevent accidental flue gas emission into the boiler room.

The minimum return water temperature to the boiler is 140 F (60 C) when firing on standard #2 fuel oil. Failure to maintain this will void the warranty.

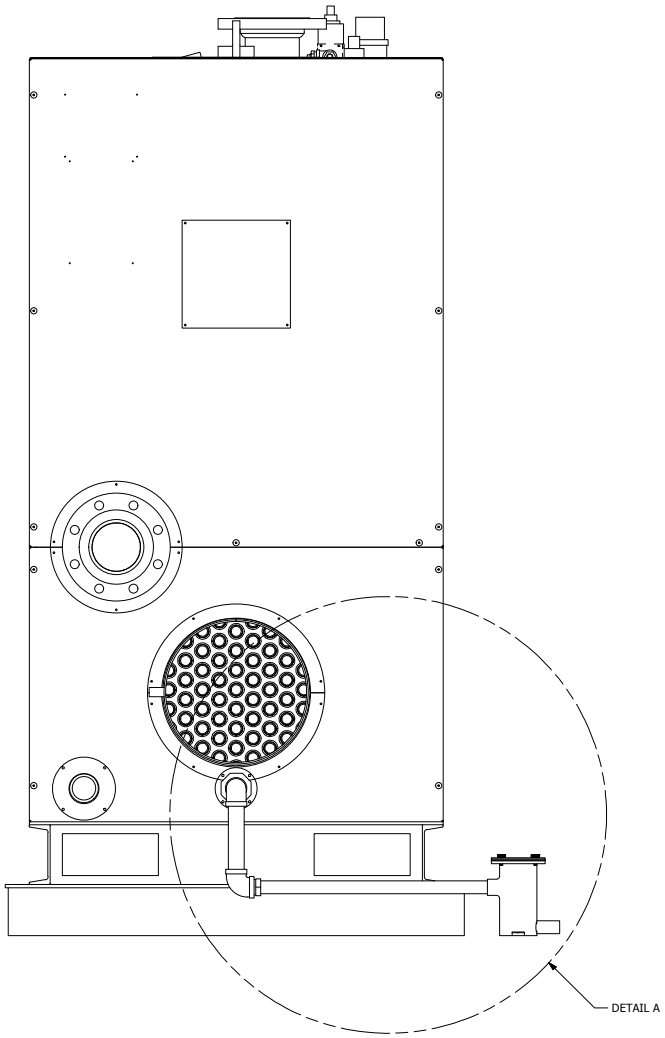
■ Multiple Boilers Sharing A Common Drain Trap

The multiple boiler condensate drain trap is Fulton Part Number 4-57-000440. The maximum capacity to attach per condensate drain trap is 12 MM BTU/hr total. See Figures 7 and 9.

Adhere to the following for installation:

1. The 1 inch (25.4 mm) boiler condensate drain will be connected to the 1 inch (25.4 mm) inlet on the drain trap. One or more drain lines may be connected to this inlet (max of 12 MM BTU/hr per drain) using a common header pipe.
2. If the water supply must be temporarily disconnected, the boilers must be turned off to prevent accidental flue gas emission into the boiler room.
3. The condensate drain cover must be kept on at all times, except during maintenance of the drain. This drain should be checked regularly in your boiler maintenance schedule.
4. A condensate collecting tank and condensate pump will be required if a floor drain is not available to collect condensate (collecting tank and pump are not supplied with the boiler).
5. All piping (Figure 7) must be galvanized or stainless steel, and be free of leaks. Copper, carbon steel/iron pipe, PVC or CPVC are not acceptable.
6. Connect 1 inch (25.4 mm) condensate drain(s) (at the rear of the boiler), to the 1 inch (25.4 mm) inlet at the base of the drain tank. The header must be below the condensate outlet of the individual boiler, and must remain flooded during operation.
7. Connect the 1.5 inch (38.1 mm) drain outlet to an appropriate waste line following applicable codes. The 1.5 inch (38.1 mm) drain connection on the drain tank must be the highest point prior to going to the drain. Failure to keep drain piping lower than this point will result in overflow of the drain tank. Slope the drain pipe away at a minimum pitch of 1 inch (25.4 mm) for every 12 feet (3.65 m).
8. Attach a ¼" water supply to the compression fitting on the float. The water line must be connected to an uninterruptible supply. Fulton recommends connecting it before the "fast fill" valve to the hydronic system, but after the back flow preventer, to avoid contamination of a potable water supply. Maximum allowable water pressure to the compression fitting is 100 PSI (689.5 kPa).

➨ *NOTE: Ensure condensate drain piping will not be exposed to freezing temperatures.*



REAR VIEW

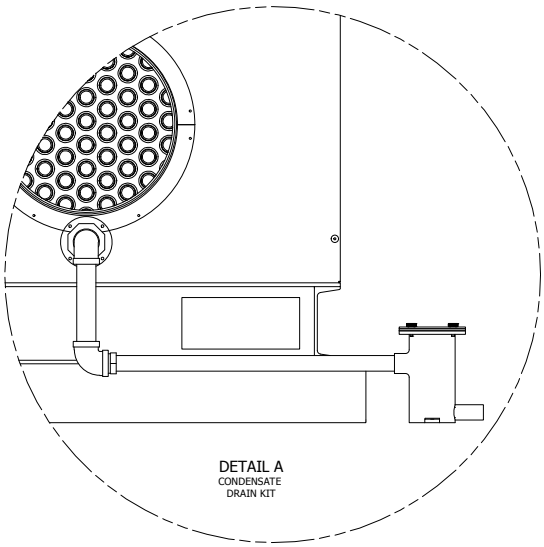


Figure 6 Notes:

- Header must be level or slightly pitched toward the drain.
- Header material to be galvanized steel or 316L stainless.
- 0.75 inch (19 mm) condensate drain kit/trap outlet is never to be above 1 inch boiler condensate outlet.
- The maximum capacity to attach, per condensate drain kit, is 4 MMBH total.
- Housekeeping pad recommended minimum 4-inch (102mm).

FIGURE 6 - CONDENSATE DRAIN PIPING FOR VANTAGE BOILERS - SINGLE BOILER

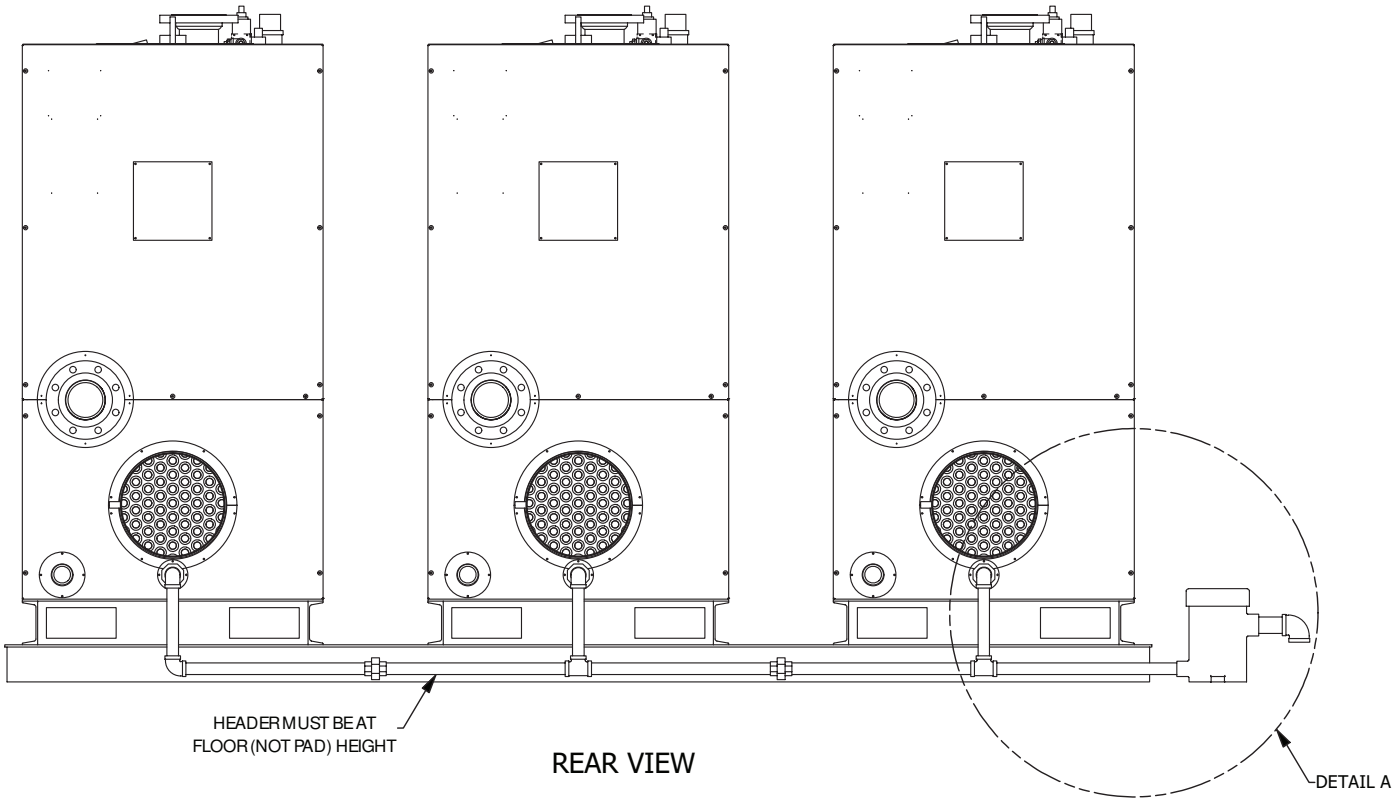


Figure 7 Notes:

- Header must be level or slightly pitched toward the drain.
- Header material to be galvanized steel or 316L stainless.
- Header should be taken to the lowest point possible and remain flooded during operating.
- 1.5 inch (38.1 mm) condensate drain kit/trap outlet is never to be above 1 inch boiler condensate outlet.
- For multiple boiler installation, maintain a minimum pipe size of 1 inch (25.4 mm) for the header piping.
- The maximum number of units to attach per condensate drain kit is 12mm BTU total.
- Housekeeping pad recommended minimum 4-inch (102mm).

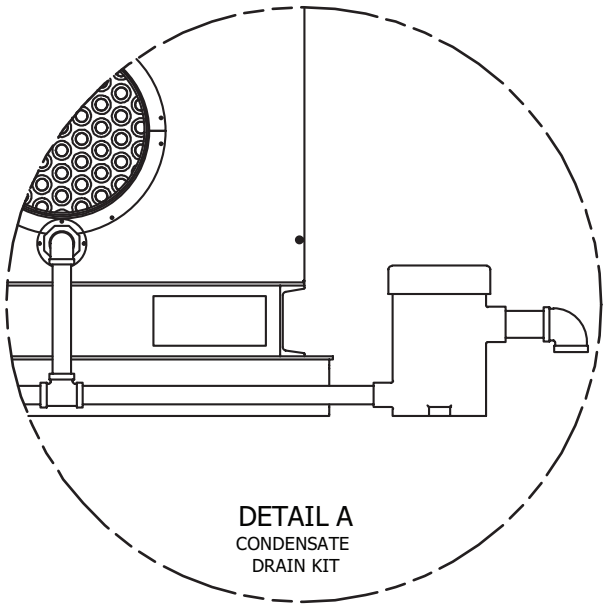


FIGURE 7 - CONDENSATE DRAIN PIPING FOR MULTIPLE VANTAGE BOILERS

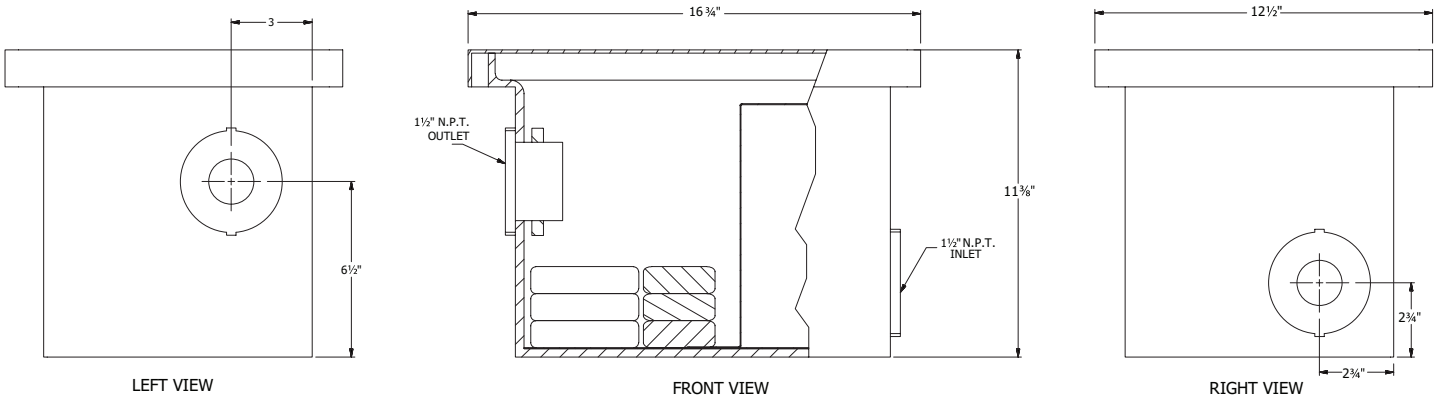


FIGURE 8 - FULTON PH NEUTRALIZING KIT

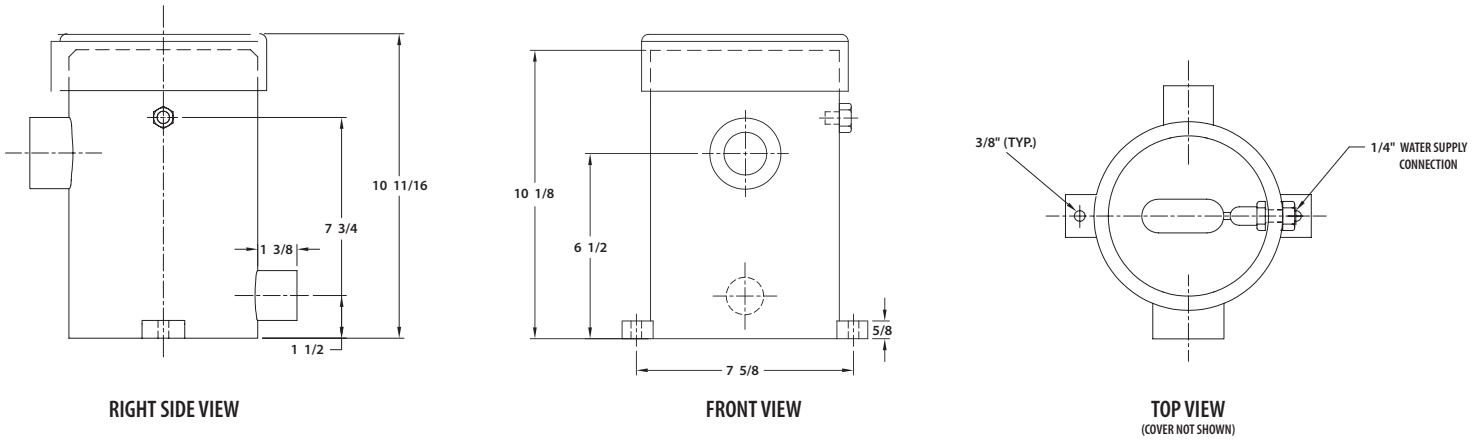


FIGURE 9 - MULTIPLE BOILER CONDENSATE DRAIN TRAP

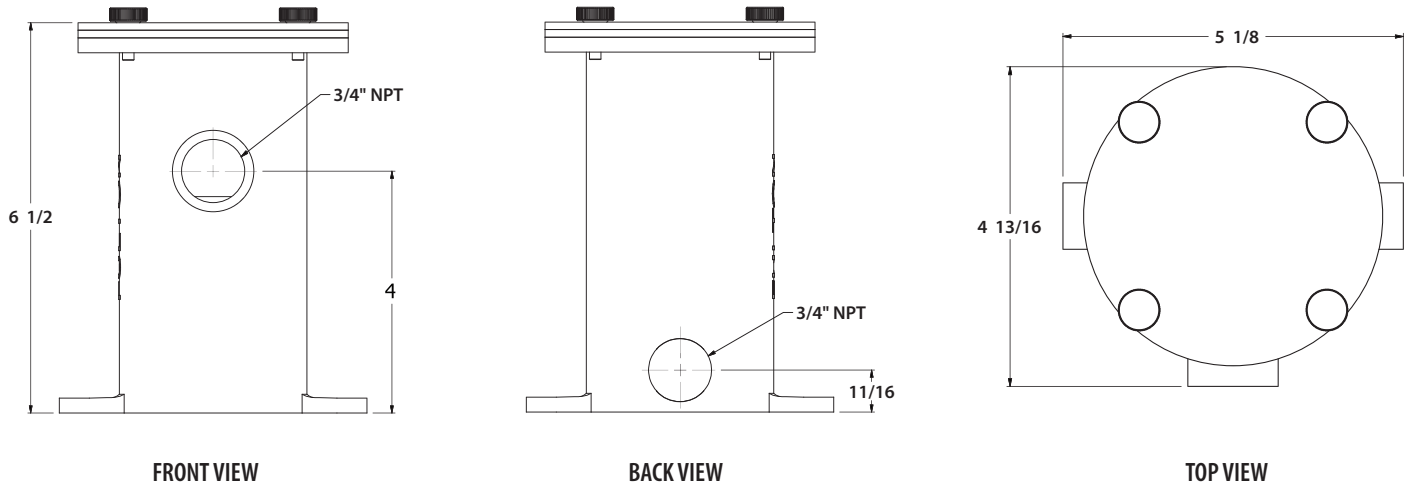
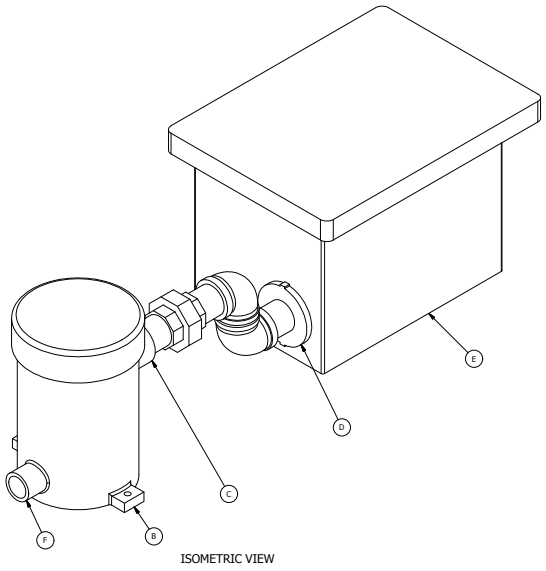
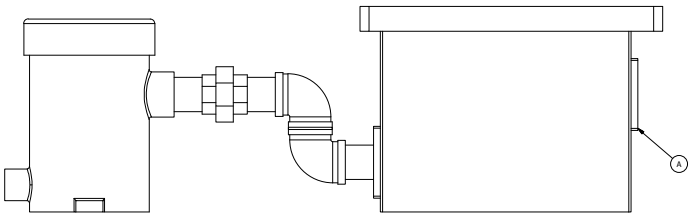


FIGURE 10 - SINGLE BOILER CONDENSATE DRAIN TRAP

Multiple Boiler Assembly

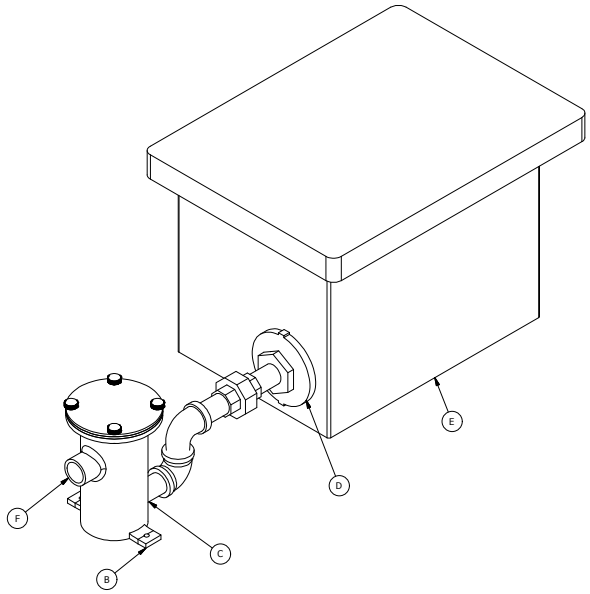


ISOMETRIC VIEW

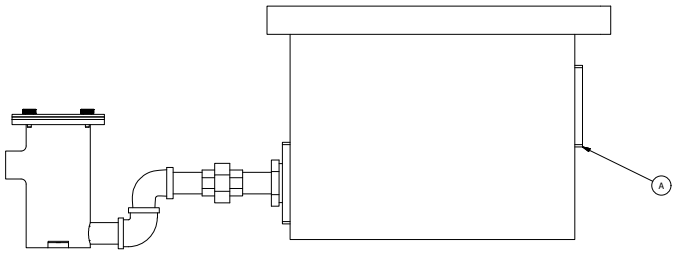


FRONT VIEW

Individual Boiler Assembly



ISOMETRIC VIEW



FRONT VIEW

FIGURE 11 - FIELD CONNECTIONS FOR CONDENSATE DRAIN TO PH NEUTRALIZATION TANK

	Multiple Boilers	Individual Boiler
(A) pH Kit Outlet	1 1/2″	1 1/2″
(B) Condensate Drain Trap	4-57-000440	4-57-005500
(C) Drain Outlet	1 1/2″	3/4″
(D) pH Kit Inlet	1 1/2″	1 1/2″
(E) pH Neutralization Kit	4-50-000008	4-50-000008
(F) Drain Inlet	1″	3/4″
Neutralizing Media	2-30-001580	2-30-001580

Install pH Neutralization Kit

The pH Neutralization Kit uses a consumable medium to bring the pH level of the boiler's condensate to a neutral level. It is not a replacement or alternative for the Condensate Drain Trap. See Figures 7 and 11.

Adhere to the following for installation:

1. Use stainless or galvanized pipe and fittings to connect condensate drain to kit.
2. Connect kit downstream of Condensate Drain Trap. See Figure 11.
3. Pipe outlet to appropriate drain. It is acceptable to use PVC or CPVC on the outlet to drain.
4. Check condensate pH periodically.

➨ *NOTE: Replacement bags are available from your Fulton Representative. The medium in the container will neutralize the condensate of 12 MM Btu's for approximately 6 months (Fulton Part No. 2-30-001580).*

Install #2 Fuel Oil Piping

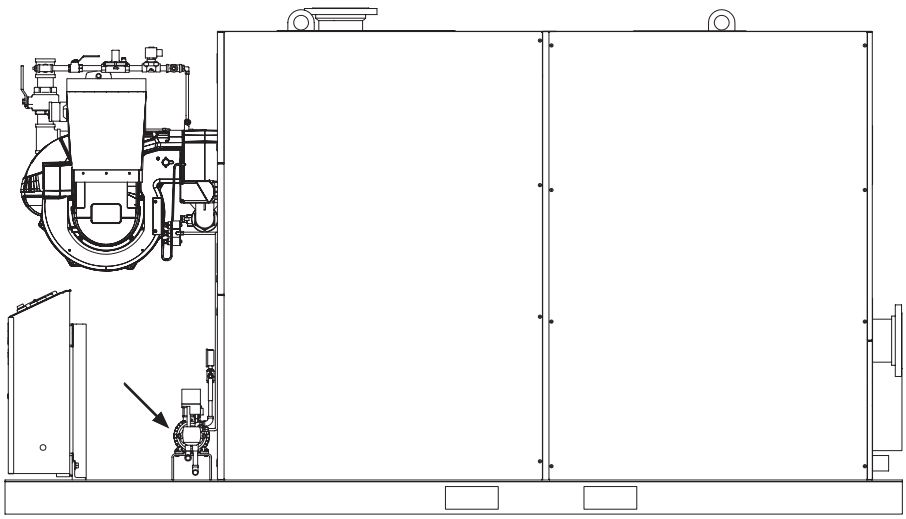


FIGURE 12 - OIL PUMP LOCATION

■ #2 Fuel Oil Piping (For Dual Fuel Gas/Oil Burner)

Adhere to the following for Vantage boilers with the dual fuel gas/oil Burner (see Figure 12):

1. The Vantage dual fuel boiler is suitable for firing light distillate fuel oil conforming to ASTM D396 only, commonly known as #2 fuel oil. DO NOT USE GASOLINE, CRANKCASE OIL OR ANY OIL CONTAINING GASOLINE. If in doubt, contact your Fulton representative prior to operation.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

The minimum return water temperature to the boiler is 140 F (60 C) when firing on standard #2 fuel oil. Failure to maintain this will void the warranty.

See Table 8 in the Operation section for operating requirements for #2 fuel oil.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/ professional codes and regulations.

DO NOT USE JP-8, GASOLINE, CRANKCASE OIL OR ANY OIL CONTAINING GASOLINE in the operation of your Vantage boiler.

2. Fuel pipes must be of approved materials and of a diameter suitable for the quantity of oil being delivered to the burner and the static head available. A fusible link valve and a stop valve and fire valve assembly should be supplied by the client/contractor. In addition a check valve must be fitted into the return pipe.

3. Be sure to install a foot valve as indicated in Figure 16. The foot valve is a check valve for the oil line between the oil pump on the boiler and the supply tank. The foot valve keeps the oil line charged at all times.

4. Install a filter on the suction side of the burner pump. A 50 micron or better filter is required. Verify the filter is approved for the fuel oil supply flow rates in Table 4.

5. The maximum pressure allowed at the burner fuel oil pump suction side inlet is limited to 3 PSIG (20.68 kPa) by the National Fire Protection Association (NFPA-31). If the fuel supply can exceed this maximum, a pressure reducing regulator must be installed. The minimum pressure at the pump inlet should never exceed 13" Hg of vacuum.

6. Reference the Factory Test Fire Report for pump pressure setting. This pressure must be checked and adjusted (if required) after the burner has been ignited. There is a pressure gauge provided with the oil pump assembly on the boiler so pressure can be monitored. See Figures 13 and 14.

7. The oil piping system is a 2-pipe system. The delivery rate of oil to the burner will be greater than the fuel consumption rate of the burner. The oil that is not consumed is returned to storage. See Table 4.

TABLE 4 - #2 FUEL OIL FLOW RATES

Vantage Model Number	Max Burner Consumption Gal/Hour	Supply Flow Rate Gal/Hour
VTG-2000DF	14.3	54.0
VTG-3000DF	21.4	54.0
VTG-4000DF	28.6	54.0
VTG-5000DF	35.8	150.0
VTG-6000DF	42.8	150.0

8. The suction line must be longer than the return line in the tank to minimize air being pulled into the oil suction piping system. See Figure 16.

9. Fuel Supply: The pumping unit of the burner is equipped with a self-priming pump, which is capable of feeding itself within the limits listed in the table in Figure 13 and 14.

10. The tank is higher than the pumping unit (A): The distance "P" must not exceed 33 ft (10 m) in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 13 ft (3.94 m) in order to permit pump self priming even when the tank is almost completely empty. See Figure 16.

11. The tank is lower than the pumping unit (B): Pump suction pressures higher than 13"Hg for Suntec oil pump must not be exceeded. This is because at higher levels, gas is released from the fuel and the pump starts making noise and its working life-span decreases. See Figure 17.
12. It's good practice to ensure that the return and suction lines enter the pump from the same height to reduce risk that the suction line fails to prime or stops priming.
13. Consult a qualified professional for assistance in designing and installing oil delivery systems. See Figures 17 and 18.

Multiple Burner Installations

For installations with multiple Vantage dual fuel boilers sharing common supply and return oil piping, it is recommended to use a "flooded loop". See Figure 18.

Adhere to the following:

1. Constant pressure must be maintained at each burner pump regardless of the number of burners operating. This arrangement generally requires auxiliary oil pumps, a pressure relief valve, and a back pressure regulator. These devices are not provided with the boiler.
2. Auxiliary oil pumps run continuously during oil operation, and are typically each sized for 1-1/2 to 2 times the total combined supply flow rate of all burner pumps. Consult your fuel oil delivery system supplier for pipe sizing. See Table 4 for supply flow rates.
3. A pressure relief valve is installed on the discharge side of the auxiliary oil pumps for the purpose of protecting the pumps and serves no regulatory function.
4. A back pressure regulator is located downstream of the supply pipes to each burner pump and upstream of the return pipes from each burner pump, with the purpose of maintaining a setpoint pressure in the supply header.
5. The oil return header should be sized for the minimal friction loss such that the burner pump return line pressure is as close to 0 psi as possible.

Hydraulic Connections

Adhere to the following for hydraulic connections:

1. The oil pumps are equipped with a bypass that separates the return line and suction line. The pumps are installed on the pumping unit with the bypass closed. It is necessary to connect both hoses to the pump.
2. Damage to the pump seal will occur immediately if it is run with the return line closed and the bypass screw inserted.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

The minimum return water temperature to the boiler is 140 F (60 C) when firing on standard #2 fuel oil. Failure to maintain this will void the warranty.

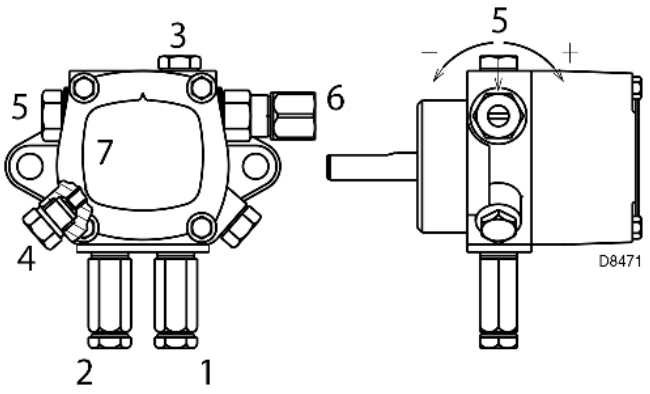


FIGURE 13 - OIL PUMP DETAILS (VTG-2000DF TO VTG-4000DF)

Figure 13 Notes

	Characteristic	Connection/Detail
1	Suction	3/8" NPT (Piped in the Field)
2	Return	3/8" NPT (Piped in the Field)
3	Pressure Gauge Attachment	G 1/8" (Completed at Factory)
4	Vacuum Gauge Attachment	G 1/8" (Completed at Factory)
5	Pressure Regulator	
6	Outlet to Burner	¼" NPT (Completed at Factory)
	Minimum Delivery Rate at 174 PSI Pressure	54 GPH (204.41 LPH)
	Delivery Pressure Range	145 – 290 PSI (997.7 - 1999.5 k Pa)
	Maximum Suction	13 " Hg
	Oil Viscosity Range	2.8 – 75 cSt
	Maximum Fuel Oil Temperature	140 F (60 C)
	Pressure Calibration at the Factory	198-200 PSI (1365 - 1379 kPa)

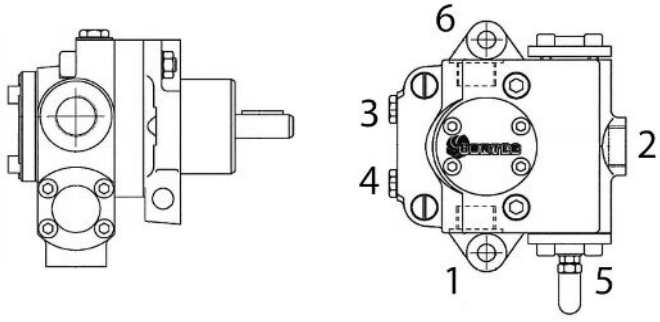


FIGURE 14 - OIL PUMP DETAILS (VTG-5000DF/VTG-6000DF)

Figure 14 Notes

	Characteristic	Connection/Detail
1	Suction	1/2" NPT (Piped in the Field)
2	Return	1/2" NPT (Piped in the Field)
3	Pressure Gauge Attachment	G 1/4" (Completed at Factory)
4	Vacuum Gauge Attachment	G 1/4" (Completed at Factory)
5	Pressure Regulator	
6	Outlet to Burner	1/2" NPT (Completed at Factory)
	Minimum Delivery Rate at 174 PSI Pressure	132 GPH (500 LPH)
	Delivery Pressure Range	102-435 PSI (703 - 3000 k Pa)
	Maximum Suction	13 " Hg
	Oil Viscosity Range	3 – 75 cSt
	Maximum Fuel Oil Temperature	302 F (150 C)
	Pressure Calibration at the Factory	365-385 PSI (2516.6 - 2654.5 kPa)

Burner Fuel Oil Train Piping Detail

The Vantage DF boiler includes a factory mounted and tested fuel oil train. Do not modify the fuel oil train. Connections and fittings may loosen during shipment and rigging; verify connections prior to operating the oil burner.

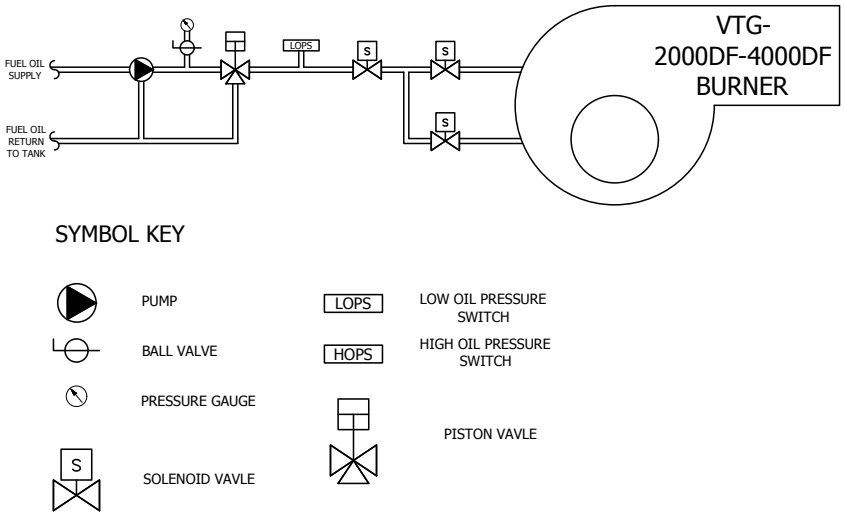


FIGURE 15 - FUEL OIL TRAIN VTG-2000DF-4000DF (FACTORY MOUNTED)

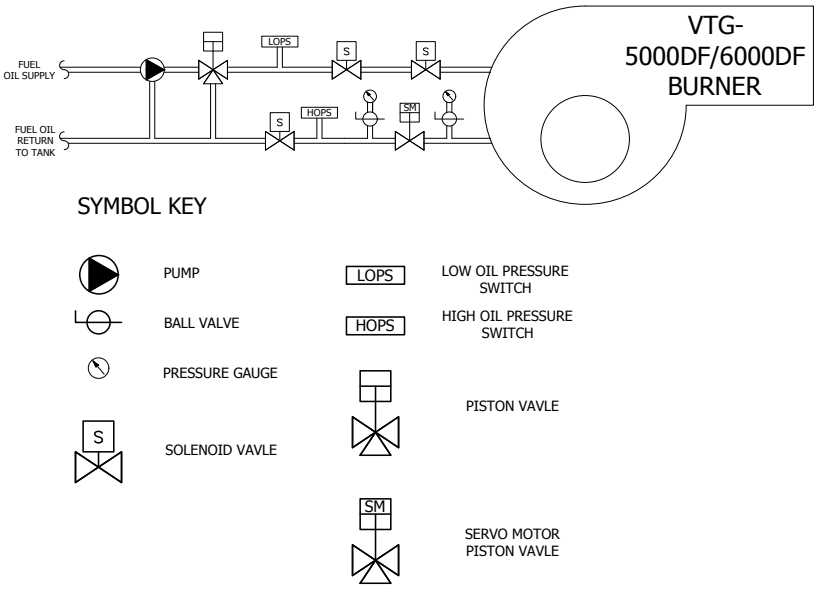


FIGURE 16 - FUEL OIL TRAIN VTG-5000DF/6000DF (FACTORY MOUNTED)

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/ professional codes and regulations.

Never install a barometric damper on flue systems designed with positive pressure.

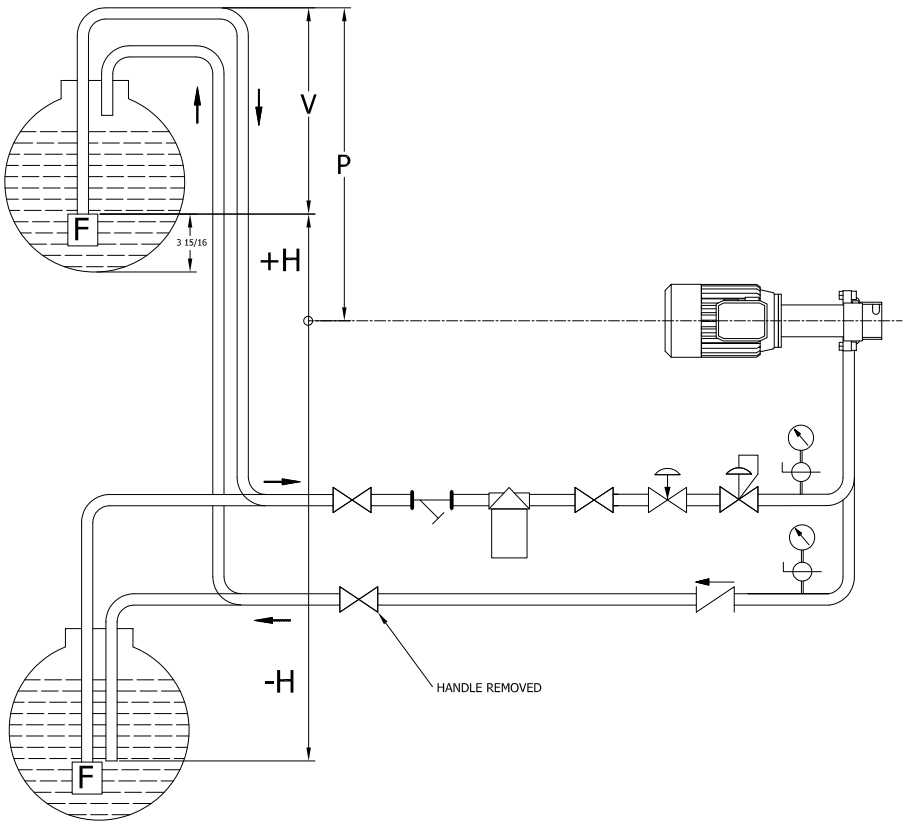
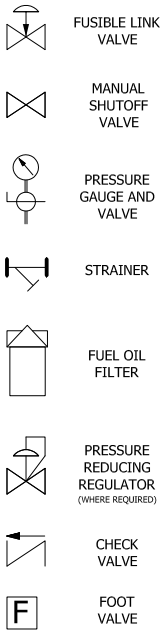


Figure 17 Symbol Key



➨ *NOTE: Pipe sizing charts are for the Type L copper and Sch 40 steel pipe only. Sch 80 pipe will require larger diameters.*

VTG-5000DF/VTG-6000DF		
+H	L(ft)	
-H	O (inch)	
(ft)	1/2"	5/8"
+13	197	263
+10	164	230
+6.6	132	197
+4.8	115	181
+3.3	99	164
+1.6	82	148
0	66	132
-1.6	59	115
-3.3	49	99
-4.8	43	82
-6.6	33	66
-10	16	33
-13	-	20

VTG-2000DF to VTG-4000DF			
+H	L(ft)		
-H	O (inch)		
(ft)	3/8"	1/2"	5/8"
+13	100	210	320
+10	88	180	320
+6.6	75	155	320
+3.3	68	140	320
+1.6	52	110	270
0	45	98	240
-1.6	39	85	200
-3.3	26	55	140
-6.6	19	42	104
-10	-	13	36

FIGURE 17 - FUEL SUPPLY FOR SINGLE BOILER (FIELD SUPPLIED)

➨ *NOTE: All installations must be in compliance with local and national codes.*
Typical installation diagrams contained in this manual are for reference purposes only.

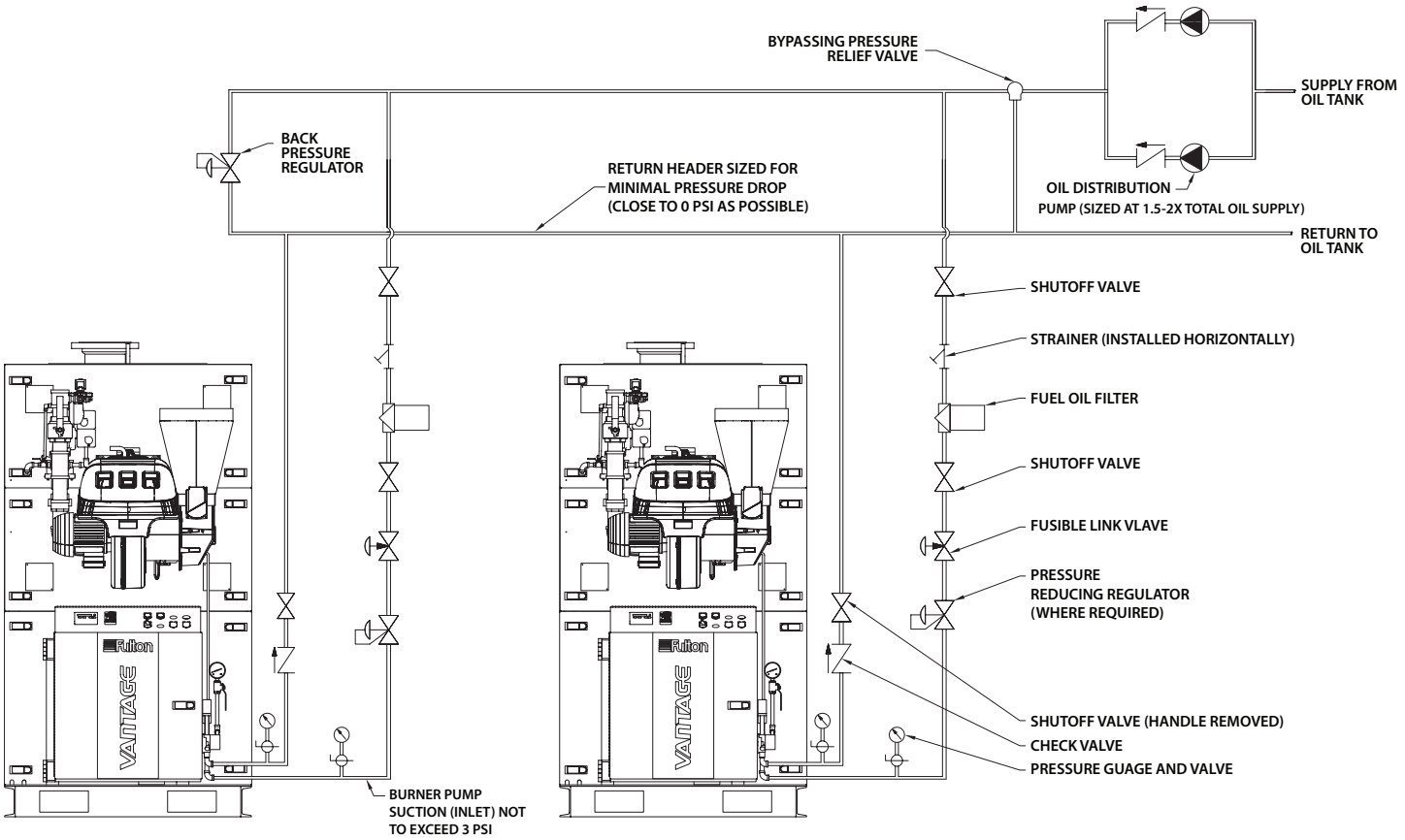


FIGURE 18 - SYSTEM USING COMMON OIL PIPING FOR MULTIPLE BOILERS (FIELD SUPPLIED)

⚠ WARNING

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Never install a barometric damper on flue systems designed with positive pressure.

Oil Pump Priming

Adhere to the following for pump priming:

1. Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause damage to the pump seal.
2. The pump leaves the factory with the bypass closed. Check to make sure that the valves located on the suction line are open and that there is sufficient fuel in the tank. Priming operation is possible because the pump is already full of fuel when it leaves the factory. If pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise the pump will seize.
3. For self-priming to take place, one of the screws of the pump must be loosened in order to bleed off the air contained in the suction line.
4. Whenever the length of the suction piping exceeds 66-98 ft (20-29.8 m), the supply line must be filled using a separate pump.

Oil Filtration

The oil supply to the Vantage boiler should be filtered and be free of debris. Regular maintenance of the filter is required (as per the filter manufacturer's recommendations) to maintain the Vantage warranty. It is the responsibility of the installing contractor to provide adequate filtration for the oil supply system.

Venting Requirements

Adhere to the following venting requirements.

1. The Vantage boiler can operate to the combined intake and flue exhaust pressure drops without altering standard capacities: See Table 5.
2. The venting system draft pressure readings at the boiler exhaust connection and air intake connection cannot exceed the maximum values stated in Table 5; and must remain relatively stable throughout all operating conditions, including the ignition sequence.

➨ *NOTE: Venting pressure is the combined result of frictional pressure drop and natural draft (stack effect) in the combustion air intake piping (if used) and flue gas exhaust system.*

3. Drastic draft changes during operation may result in the generation of excessive carbon monoxide or soot, which may affect operational reliability and condition of burner, ignition assembly, or other combustion system components leading to increased maintenance or replacement of these items.
4. The equivalent length method is not an approved engineering method for determining acceptability of a vent system due to varying burner

modulation rates, ambient air temperatures, and flue gas temperatures, among other factors. Combustion air intake piping (if used) must be accounted for in an analysis of the venting system.

5. If the maximum positive pressure is exceeded, the boiler may have to be de-rated or require the installation of draft accessories such as a properly selected exhaust assist fan to prevent operational issues from occurring. If the maximum negative pressure is exceeded due to excessive natural draft (stack effect), the exhaust system may require the use of draft accessories such as a fixed-position balancing baffle or modulating overdraft damper. Draft accessories must be appropriate for Category II/IV installations and are not included with the boiler. Consult your venting supplier for recommendations.
6. Adhere to local and jurisdictional codes and regulations, which may differ from recommendations and diagrams contained in this manual.
7. Site specific conditions not addressed in this manual may require additional precautions or design considerations. Consult your local Fulton Representative and venting supplier for recommendations.

➨ *NOTE: Consult your venting pipe supplier for assistance with sizing of vent materials and other potentially required accessories.*

8. The layout of the piping used for air intake and exhaust must be done in a way that facilitates smooth travel and natural flow.

TABLE 5 - GENERAL VENTING REQUIREMENTS

Vantage Model Number	Maximum Negative Draft	Maximum Positive Draft
VTG-2000	-0.04 " W.C.	+0.35 " W.C.
VTG-3000	-0.04 " W.C.	+0.35 " W.C.
VTG-4000	-0.04 " W.C.	+0.35 " W.C.
VTG-5000, 5000DF	-0.04 " W.C.	+0.35 " W.C.
VTG-6000, 6000DF	-0.04 " W.C.	+0.35 " W.C.
VTG-2000DF	-0.1 " W.C.	+0.40 " W.C.
VTG-3000DF	-0.1 " W.C.	+0.50 " W.C.
VTG-4000DF, 4000LE	-0.1 " W.C.	+0.50 " W.C.
VTG-3000LE	-0.04" W.C.	+0.50 " W.C.

9. A pressure drop calculation is an acceptable method for evaluating theoretical draft, but is not enough information to fully validate combustion air intake and flue gas exhaust vent systems. The designer and installer must use good practice and remain cognizant of important factors that cannot be captured by a pressure drop calculation such as local code requirements, accessibility for inspection and maintenance, aesthetic concerns, flue gas recirculation, stagnant vapor plumes, prevailing wind direction, nearby mechanical equipment and other design considerations as detailed in this manual. Some recommendations:

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Never install a barometric damper on flue systems designed with positive pressure.

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- Avoid sharp turns, boot tees, bullhead tees, back-to-back 90 degree elbows, short radius elbows especially right at the connections to the boilers.
- Avoid extensive direction changes (flue gases being required to turn around).
- Never direct flue stacks in a downward direction.

Combustion Air Intake

1. It is the responsibility of the designer and installer of the venting system to guarantee the prevention of flue gas recirculation (flue gases being drawn into a boiler's combustion air supply, or flue gases moving backward through an idle boiler).
2. The installation of room exhaust fans in a boiler room is not recommended. An exhaust fan or similar equipment can create down draft in the stack or restrict the burner's air supply which will result in poor combustion.
3. It is essential that only fresh air is allowed to enter the combustion air system. Foreign substances, such as combustible volatiles in the combustion system can create hazardous conditions.
4. Particulate matter (example: sheetrock, fiberglass, cement, plaster board, dirt, dust, lint) or chemicals (example: chlorine, sulfur, freon, fluorine, perchlorethylene, halogenated compounds) in the combustion air supply to the boiler will cause damage or failure to the heat exchanger and/ or burner, and is not covered under warranty. High-risk situations for particulate matter to be in the air include construction and maintenance activities. See Table 6.

➨ *NOTE: Pool and laundry area air may be contaminated with chlorine and fluorine compounds. If allowed to enter the combustion air supply, these contaminants will significantly increase the acidity of flue gas condensate, potentially damaging heat transfer surfaces. Damage to the heat exchanger due to poor combustion air quality is not covered under warranty.*

TABLE 6 - PRODUCTS/CONTAMINANTS TO AVOID

Products to Avoid	Products containing chloro/flourocarbons; chlorine based products; calcium chloride products, sodium chloride products, paint and varnish removers, hydrochloric acid, muriatic acid, cements, glues, antistatic fabric softeners, freon, drywall particles, dirt, fiberglass
Areas with the potential to have contaminants	Dry cleaning/laundry areas; swimming pools; repair shops; processing plants; manufacturing plants, active construction sites; chemical storage; food processing plants; farms; chillers; cooling towers.

■ Combustion Air Supply From the Boiler Room

Adhere to the following for installation:

1. Adequate free access of combustion air and ventilation must be supplied to the boiler room in accordance with local codes and NFPA 54/ANSI Z233.1, Section 9.3, Air for Combustion and Ventilation or CSA-B149.1 for Canada. The minimum net free area requirements in Table 7 may not supersede local and jurisdictional codes and regulations where these codes and regulations require an opening of greater net free area. The boiler room must meet the NFPA criteria for a non-confined space. See Figure 22.
2. Verify combustion air is taken from the outdoors and not from inhabited or occupied spaces within the building. Ensure space and nearby products are evaluated for the potential of combustion air contaminants. See Table 6.
3. For installations providing two permanent openings directly communicating with the outdoors, the minimum net free area of each opening is 1 in^2 per 4,000 BTU/hr of the total input capacity of the combined burners located in the boiler room. Ensure a high opening commences within 12 inches of the ceiling, and a low opening commences within 12 inches of the floor. See Table 7.
4. For installations providing a single permanent opening directly communicating with the outdoors, the minimum net free area is 1 in^2 per 3,000 BTU/hr of the total input capacity of the combined burners located in the boiler room. See Table 7.

TABLE 7 - COMBUSTION AIR OPENINGS NET FREE AREA

Boiler Input Capacity MBTU/HR	Two Openings Min. Net Free Area of Each SQFT Low	High	Single Opening Only Min. Net Free Area SQFT
2,000	3.5	3.5	4.6
3,000	5.2	5.2	6.9
4,000	6.9	6.9	9.3
5,000	8.7	8.7	11.6
6,000	10.4	10.4	13.9

5. For multiple boiler installations, multiply the number of boilers by required net free area per boiler.
6. The net free area required for the boiler(s) is in addition to the combustion or ventilation air supply requirements of other equipment sharing the same space such as water heaters, generators, air compressors, or other boilers. The boiler room must have an opening or openings not less than the total net free area required for all types of equipment.
7. Consider the blocking effects of louvers, grills, and screens on the net free area of each opening. Ensure ventilation openings are unobstructed.

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Never install a barometric damper on flue systems designed with positive pressure.

8. Ensure there is not negative pressure in the boiler room. The boiler room pressure must be neutral relative to the outdoors.
9. Where mechanical combustion air supply systems are used, such as a combustion air supply fan or a motorized louver, they must be interlocked with the boiler control panel to prove operation prior to burner ignition and during burner operation. Where manual louvers are used, ensure they are fully open prior to operating the boiler(s).
10. A 90° elbow is recommended on the air inlet to prevent debris from falling into the blower.

■ Air Piped From Outside Boiler Room

The combustion air supply can be piped directly to the air inlet of the boiler for sealed combustion. Adhere to the following for installation:

1. A rubber air intake coupling is supplied with boilers for installation with ducted air supply. It must be used to connect the intake piping to the boiler air inlet.

➨ *NOTE: The weight of the combustion air intake piping must not be supported by the boiler. Ensure air intake piping is externally supported on hanger or straps.*

2. The air intake must be piped out of the building if the boiler room contains contaminated air.
3. The combustion air intake termination must be located as to not be subjected to the intake/exhaust effects of other mechanical equipment such as other fuel fired heating equipment, loading docks, generators, air handling systems, and cooling towers.
4. Ensure the boiler room air is maintained at a dew point temperature below the temperature of combustion air. Failure to provide adequate ventilation or control of dew point temperature may result in water or ice build-up on the combustion air piping, leading to increased maintenance or damage to boiler components.
5. The air intake system must be designed to prevent any moisture from draining to the boiler.
6. Air Intake pipes and fittings shall be Schedule 40 PVC pipe or smooth-walled galvanized steel. Corrugated duct materials should not be used. All Schedule 40 PVC pipe, fittings, primer and cement must conform to American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM standards.)
7. Intake PVC piping must be assembled using cement. This will ensure that the intake is air tight and will not allow contaminates from the boiler room into the boiler. The cement must be free flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement must not show gelation, stratification, or separation that cannot be removed by stirring.

8. Adhere to procedure for cementing joints (per ASTM D2855).

9. Avoid sidewall exhaust with roof terminated intake air. This can lead to reverse stack effect when the boiler is idle.

Flue Gas Exhaust Venting

The Vantage is equipped with a vent connection at the lower rear of the boiler.

Adhere to the National Fuel Gas Code (ANSI Z223.1) and the following for installation:

1. The Vantage is a Category IV appliance, thus venting material must be appropriate for condensing, positive pressure applications. Any venting material supplied for the Vantage boiler must be AL29-4C or 316L/444 SS, listed and labeled to UL1738, and guaranteed appropriate for the application by the manufacturer and supplier of the venting. It is also acceptable to vent the Vantage Cat. II (negative pressure, condensing); an upsized diameter is typically required.

2. Do not use boot tees or bullhead tees. Use inline condensate drains in place of boot tees at the bottom of a vertical rise.

3. Barometric dampers are physically open to the mechanical space. When used in a condensing boiler application with negative pressure exhaust vent, the design must prevent flue gas condensate from draining down the outside of the stack or dripping into the space. For installation using a barometric damper, verify the air openings meet the requirements in Table 7, and a spill switch and a Carbon Monoxide detector are installed and interlocked with the boiler. Barometric dampers must never be used in a positive pressure (Category IV) exhaust or direct vent sealed combustion application.

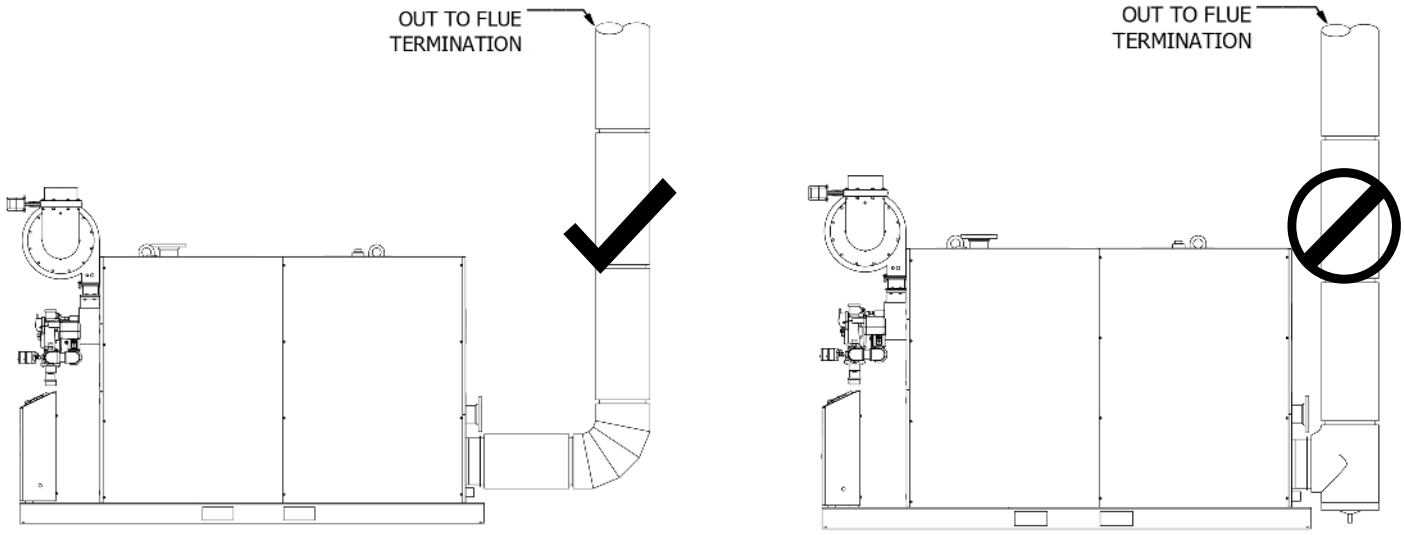
4. Horizontal runs must allow for flue gas condensate to drain back with a minimum upward pitch of ¼" (7 mm) per foot (300 mm) run. Failure to do so can create a condensate pocket, which can result in an inoperative boiler. There must be no low spots in the exhaust vent, as this can also result in a condensate pocket.

5. Connect to the boiler exhaust using an appropriate appliance adapter (not supplied). A minimum 1 ft (305mm) straight length before the first elbow is recommended. Do not use boot tees or bullhead tees. See Figure 19.

6. Adequate provision must be made to support the weight of the exhaust venting. It cannot be supported by the boiler exhaust connection.

7. Follow vent manufacturer's instructions for installation of exhaust venting.

8. If stack drains are installed, they must be pitched back to the condensate drain trap, with a minimum pitch of ¼" (7mm) per foot (300mm) run.



Recommended **Not Recommended**

FIGURE 19 - EXHAUST VENT CONNECTION

⚠ WARNING

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Common Flue Gas Venting Layouts for Vantage

It is possible to combine the air intake and/or exhaust venting of multiple Vantage boilers. The pressure drop across the entire common system, the combined total of both air intake and exhaust, must comply with the draft pressure requirements for an individual boiler, see Table 5.

Refer to Figure 20 and adhere to the following for installation:

1. Consult your venting supplier for guidance in designing common vented installations. The system must be thoroughly evaluated by a professional using accepted engineering practices to prevent backflow of exhaust gases through idle boilers.
2. Vantage boilers are not approved for combined venting with other equipment such as steam boilers, water heaters, generators, and other types of Fulton equipment.
3. The AHJ may require the installation of a CO dectector interlocked with the boiler(s), this is recommended best practice even where not required.
4. A constant diameter common header is recommended. Do not use the static regain method.
5. A minimum 1/4" rise per foot run is required for horizontal sections.
6. Where individual stacks transition into the common header, a 45 degree reducing tee or elbow in the direction of flow is recommended. Straight-in or 90 degree tees must not be used.
7. Precautions must be taken to ensure that the draft pressure at each boiler is maintained within in the required range (refer to Table 5) throughout all conditions while also maintaining a slight negative draft pressure in the common exhaust header. Consider all possible operating conditions of the exhaust system specific to the application, including:
   - Low and high flue gas temperatures
   - Low and high ambient air temperatures
   - All boilers operating at their maximum input rating capacity
   - One boiler in the system operating at the low fire position
   - No boilers on, pre-purge and ignition
8. Consider the natural draft effects associated with vertical exhaust vent rise. Over-draft control accessories, such as modulating stainless steel dampers, may be required depending on the variety of conditions experienced in the draft system. An undersized common exhaust vent or pressure drop due to the horizontal run can create a positive pressure common exhaust situation which may require a mechanical draft assist (exhaust fan) system.

When designing a draft system for a quantity of two or more Vantage boilers, the following items must be considered and addressed by the parties responsible for designing and providing that system:

COMMON VENTING EXHAUST BACKFLOW PREVENTION

1. When combining the exhaust vents of multiple Vantage boilers, the system must be designed to guarantee flue gas and exhaust will not backflow through an idle boiler. This requires appropriately sizing a Category II common exhaust vent to maintain a slight negative draft pressure of -0.01 to -0.04" w.c. throughout all operating conditions when one or more boilers are idle.
2. It is recommended to install individually piped intake vents or neutral pressure boiler room air with a common exhaust system. For common exhaust vent applications also combining combustion air intake (CAI) vents are also combined into a common pipe, it is necessary to upsize the common CAI pipe for a negligible pressure loss.
3. If the common exhaust configuration does not allow for a stable negative pressure under all operating conditions then a mechanical draft assist system, such as a variable speed exhaust fan, may be required.

Venting Terminations

Adhere to the following for installation:

1. Do not terminate the venting in an enclosed area. Care must be taken when selecting the type and orientation of the terminations.
2. All vent pipes and fittings must be installed with appropriate air space clearances to combustibles. These air space clearances apply to indoor or outdoor vents—whether they are open, enclosed, horizontal or vertical or pass through floors, walls, roofs, or framed spaces (See Figures 21, 22 and 23). The air space clearances should be observed to joists, studs, sub floors, plywood, drywall or plaster enclosures, insulating sheathing, rafters, roofing, and any other material classed as combustible.
3. To prevent the possible re-circulation of flue gases, the vent designer must take into consideration such things as prevailing winds, eddy zones, building configurations, etc. Fulton cannot be held responsible for the effects such adverse conditions may have on the operation of the boilers.
4. The required minimum air space clearances also apply to electrical wires and any kind of building insulation.
5. Listed termination parts must be used.
6. Select the air intake point of penetration where a minimum of 1/4" per foot (6.35 mm per .3 m) upward pitch can be maintained.
7. It is recommended to install a mesh bird screen, with minimum 1/2" by 1/2" openings, at the combustion air intake termination. Climates subject to extreme cold may require alternate configurations to provide an increased surface area, such a cylindrical basket screens. Consult your venting supplier for recommendations.
8. It is important to locate the exhaust termination in such a way that it does not become blocked due to snow, ice, and other natural or man-made obstructions. If terminating into a prevailing wind, direct elbow upward. Avoid areas (example: courtyards) where swirling high winds may be present.
9. Fulton does not recommend the use of rain caps on the flue termination. Rain caps contribute to ice buildup, stagnant vapor plumes, flue gas recirculation (FGR), and additional vent pressure drop. See Figure 21 and 22.

⚠ WARNING

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⚠ CAUTION

To prevent the possible re-circulation of flue gases, the vent designer must take into consideration such things as prevailing winds, eddy zones, building configurations, etc. It is the responsibility of the installer to locate the exhaust duct in such a way that it does not become blocked due to snow, ice, and other natural or man-made obstructions.

Do not locate the vent termination too close to shrubbery as flue products may stunt their growth or kill them.

The port marked "air" on the SKP25 actuator cannot be used as a gas vent connection. Connecting a vent line to this port may cause operational issues.

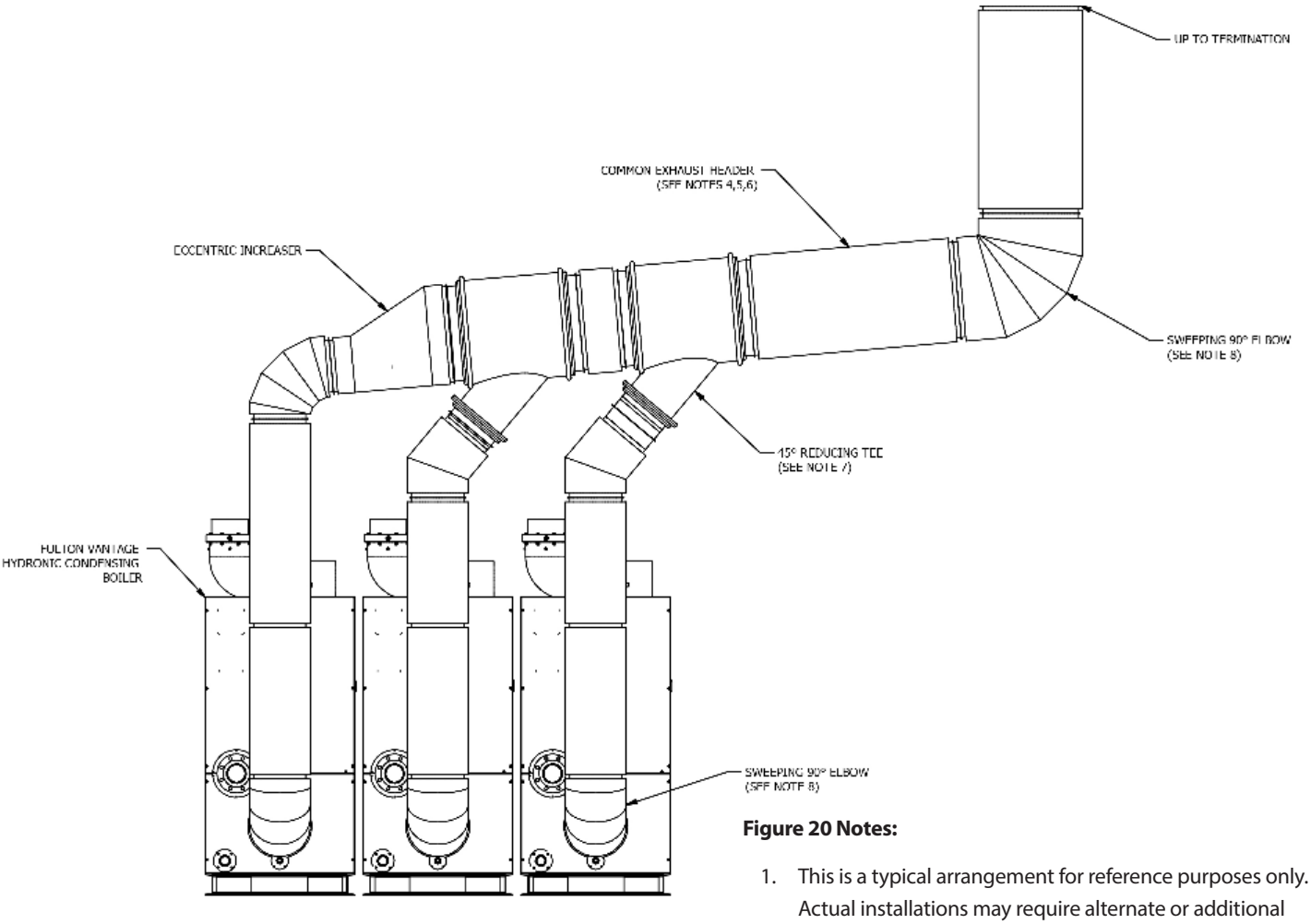


Figure 20 Notes:

1. This is a typical arrangement for reference purposes only. Actual installations may require alternate or additional components which are not shown for clarity.
2. This drawing is not for construction purposes.
3. Adhere to clearance and installation requirements.
4. The common exhaust header should be maintained at a slight negative pressure within the requirements of the boiler when one or more boilers are idle. A positive pressure common header will require accessories to guarantee flue gases cannot travel backward through an idle boiler.
5. A constant diameter common header is recommended. Do not use the static regain method.
6. A minimum 1/4" rise per foot run is required.
7. A 45° reducing tee or elbow in the direction of flow is recommended. Straight or 90° tees must not be used.
8. Do not use boot tees or bull head tees.
9. Vantage boilers cannot be common vented with other equipment.

FIGURE 20 - TYPICAL COMMON EXHAUST LAYOUT

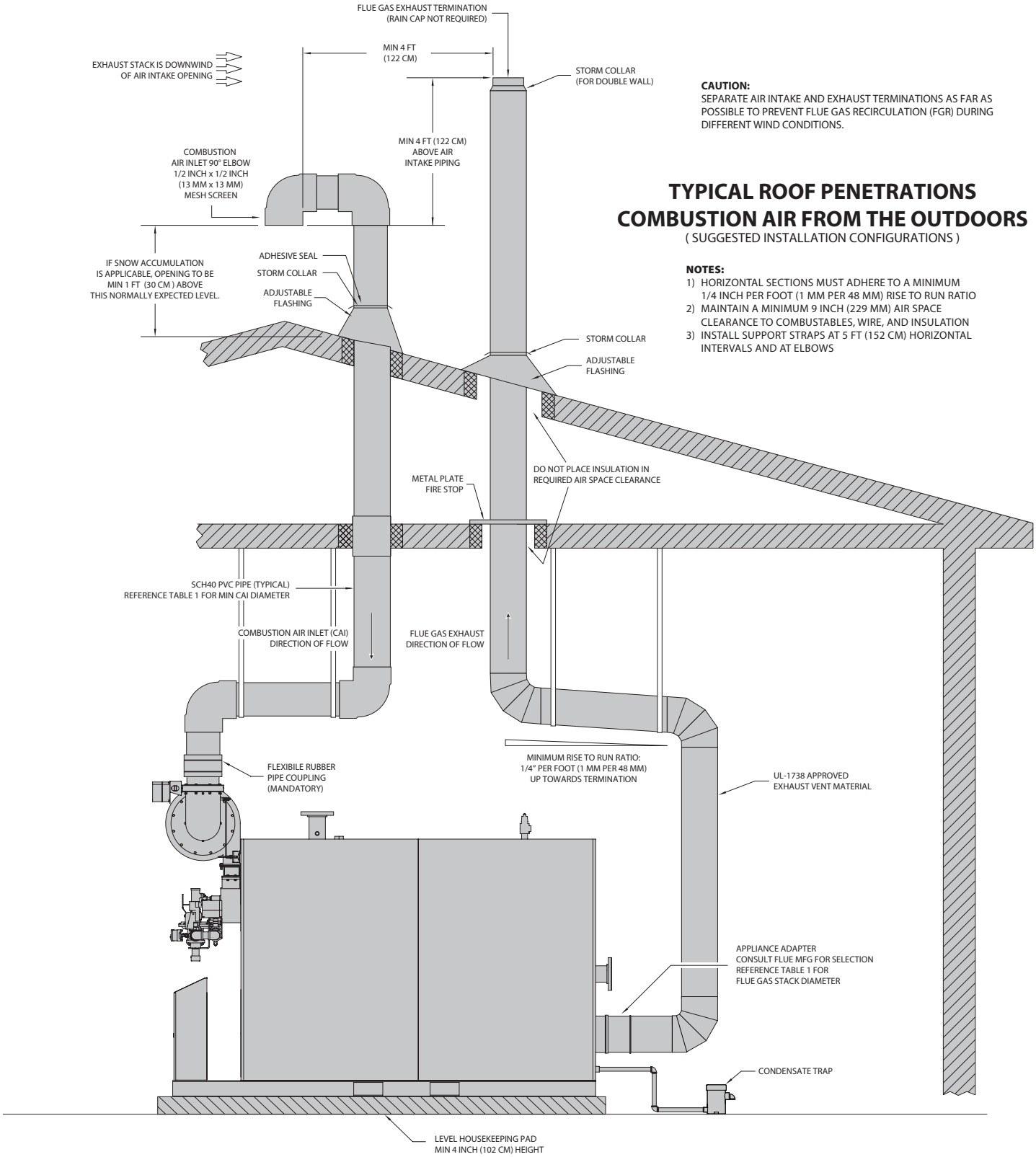


FIGURE 21 - ROOF PENETRATION DETAIL

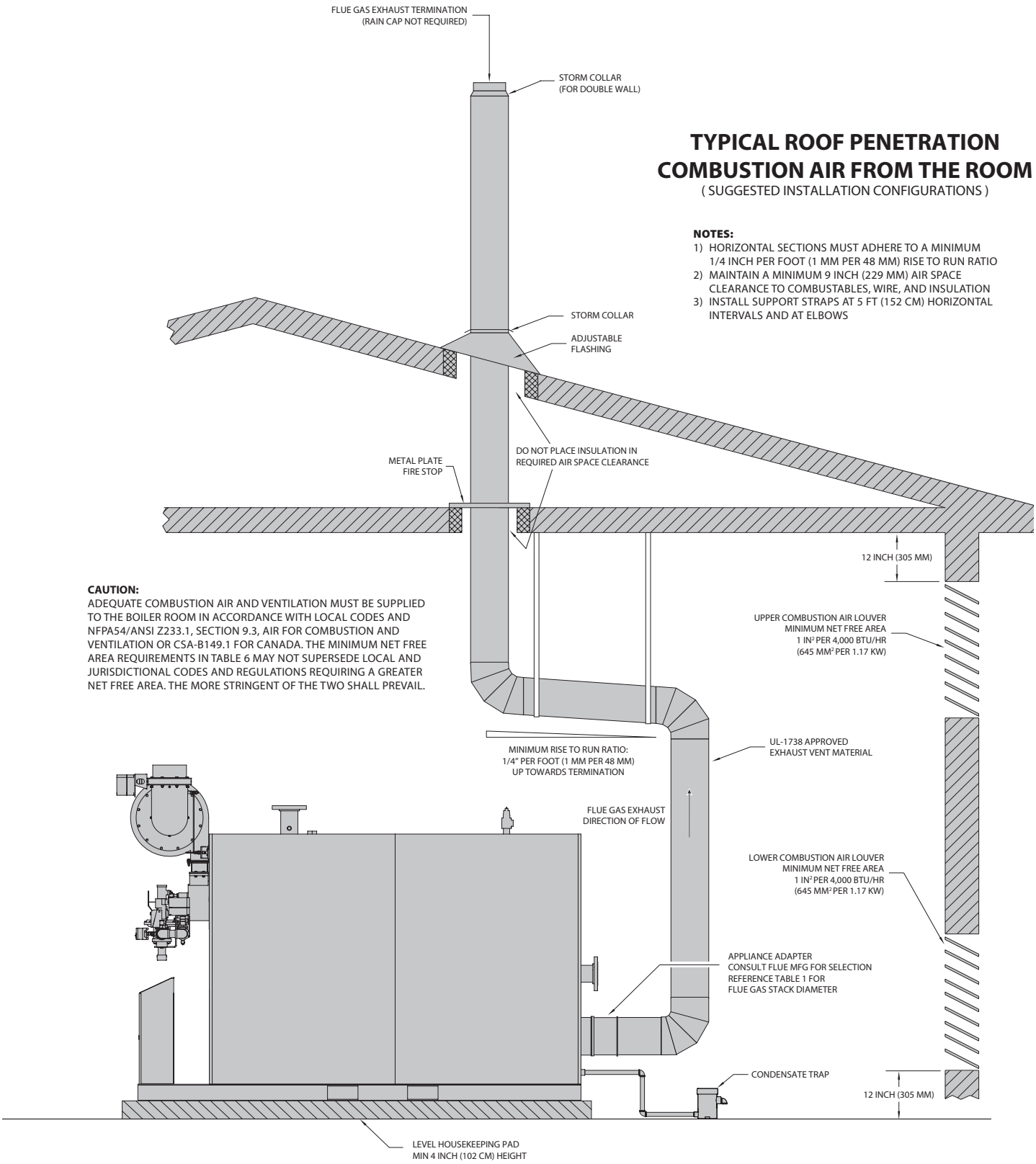


FIGURE 22 - ROOF PENETRATION WITH COMBUSTION AIR LOUVERS DETAIL

TYPICAL SIDE WALL PENETRATIONS

(SUGGESTED INSTALLATION CONFIGURATIONS)

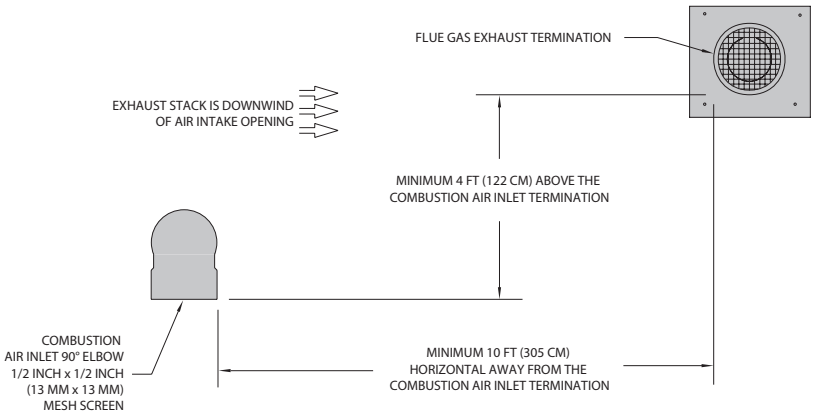
NOTES:

1) HORIZONTAL SECTIONS MUST ADHERE TO A MINIMUM 1/4 INCH PER FOOT (1 MM PER 48 MM) RISE TO RUN RATIO
2) MAINTAIN A MINIMUM 9 INCH (229 MM) AIR SPACE CLEARANCE TO COMBUSTABLES, WIRE, AND INSULATION
3) INSTALL SUPPORT STRAPS AT 5 FT (152 CM) HORIZONTAL INTERVALS AND AT ELBOWS

CAUTION:

SEPARATE AIR INTAKE AND EXHAUST TERMINATIONS AS FAR AS POSSIBLE TO PREVENT FLUE GAS RECIRCULATION (FGR) DURING DIFFERENT WIND CONDITIONS.

WALL TERMINATIONS DETAIL VIEW



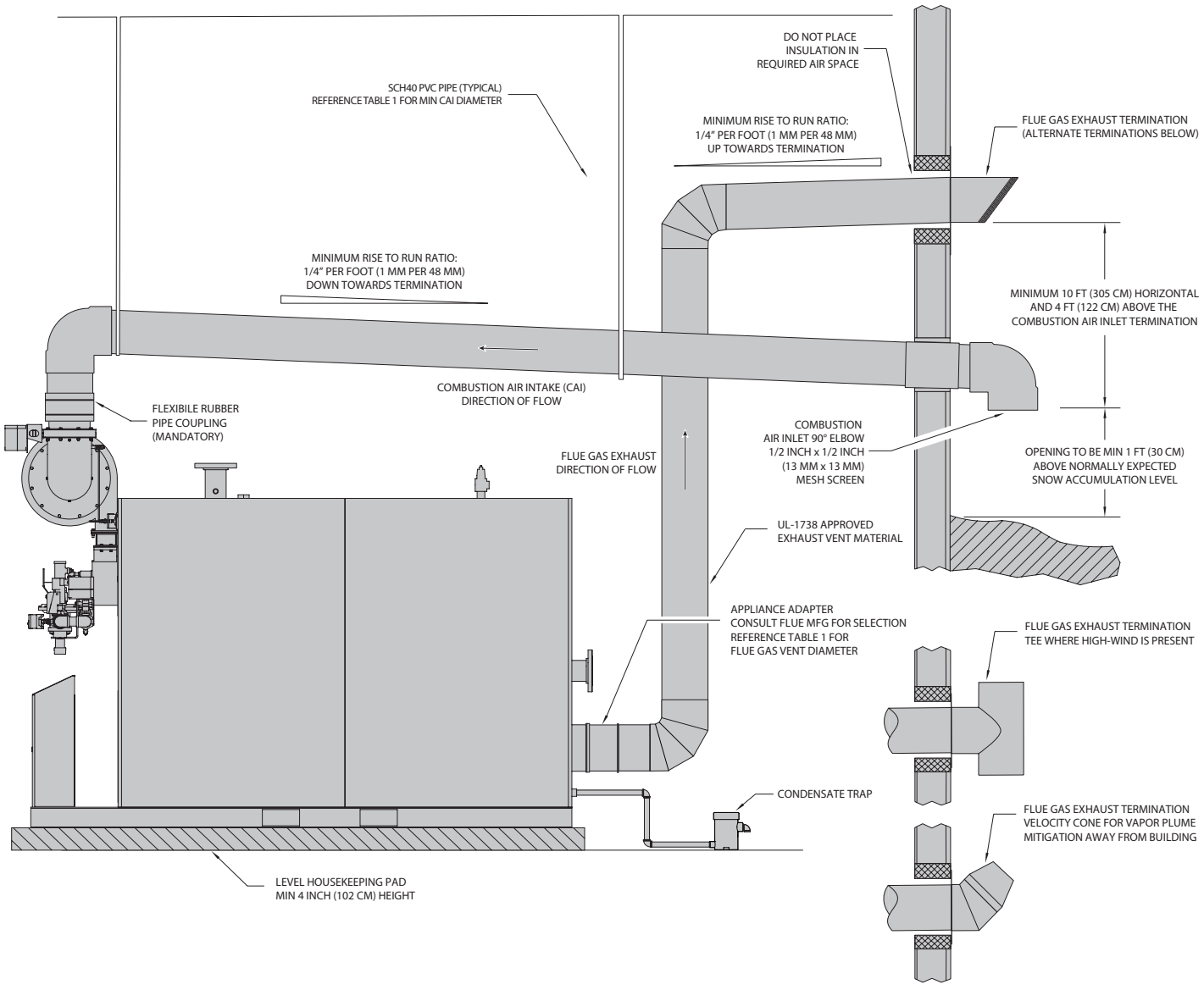


FIGURE 23 - SIDEWALL PENETRATION DETAIL

■ Wall Thimble Installation

Adhere to the following for installation (see Figure 24):

1. The thimble is inserted through the wall from the outside.
2. Secure the outside flange to the wall with nails or screws, and seal with adhesive material.
3. Install the inside flange to the inside wall, secure with nails or screws, and seal with adhesive material.
4. Pass the vent pipe through the thimble from the outside and join to the rest of the vent system. Seal the pipe to the thimble flange with adhesive material.
5. Install two pipe retaining clamps around the intake as well as vent pipes on both ends of the wall thimble (on the inside and outside of the wall) through which intake and vent pipes are passed. They will prevent the intake and vent pipes from being pushed or pulled.

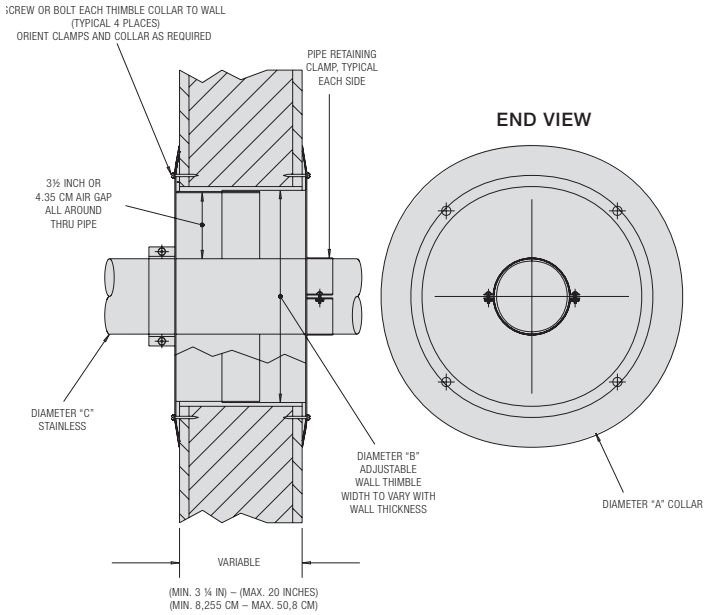


FIGURE 24 - WALL THIMBLE INSTALLATION

■ Roof Vent Termination

Adhere to the following for installation:

1. The minimum vent height should extend at least 3 feet (0.9 m) above the roof, or at least 2 feet (0.6 m) above the highest part of any structure within 10 feet of the vent.
2. When installing inlet and exhaust terminations above the roof, the exhaust outlet must be installed 4 feet (1.22 m) minimum above and 4 feet (1.22 m) minimum downwind from air supply inlet to prevent exhaust recirculation. Greater separation is strongly recommended.
3. The termination of the vent system must be at least 12 inches (30.48 cm) above the finished grade, or at least 12 inches (30.48 cm) above normal snow accumulation level (for applicable geographical areas).
4. The termination of the vent system shall not be located over traffic areas such as public walkways, or over an area where condensate or vapor could create a nuisance or hazard.
5. Do not terminate below operable windows or building openings unless exception is granted by the authority having jurisdiction.
6. The vent terminations must be at least 4 ft (1.22 m) horizontally from electric meters, gas meters, regulators, and relief equipment.
7. When installing inlet and exhaust terminations on the same wall, the exhaust outlet must be installed 4 feet (1.22 m) minimum above and 10 feet (3.05 m) minimum downwind from air supply inlet to prevent exhaust recirculation. Greater separation is strongly recommended.
8. Under certain wind conditions, some building materials may be affected by flue products expelled in close proximity to unprotected surfaces. Sealing or shielding of the exposed surfaces with a corrosion resistant material (such as an aluminum sheet) may be required to prevent staining or deterioration. Flue should be directed away from surfaces, if possible.

■ Side Wall Vent Termination

Adhere to the following for installation:

➨ *NOTE: The vent termination is joined to the vent pipe outside the wall. Use the same joining procedures for vent pipe and fittings.*

1. When penetrating a non-combustible wall, the hole through the wall must be large enough to maintain the pitch of the vent and provide sealing. Use adhesive material to seal around the vent on both sides of the wall. When penetrating a combustible wall, a wall thimble must be used.
2. High-wind areas may require special termination consideration. See Figure 23.

Removing an Existing Boiler

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, while the other appliances remaining connected to the common venting system are not in operation, the following steps should be followed with each appliance remaining connected to the common venting system placed 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 that there is no blockage or restriction, leakage, corrosion or other deficiency, which could cause an unsafe condition.
3. As far as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliances 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 the appliance being inspected in operation. Follow the lighting instructions. Adjust the thermostat so that the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Do not 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 the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common vent system should be resized to approach the minimum size as determined using the appropriate tables.

Electrical Connections

Motors are designed to operate within the following limits at the motor terminals:

- AC power supplied is within +/- 10% of the motor rated voltage with the rated frequency applied; or AC power supplied is within +/- 5% of the rated frequency and with the rated voltage; or a combined variation in voltage and frequency of +/-10% (sum of absolute values) of rated values provided the frequency variation does not exceed +/-5% of rated frequency.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/ professional codes and regulations.

575V rated boilers cannot be operated at voltages above 600V.

- For 3-phase motors, the line to line full voltage must be balanced within 1% of the rated motor voltage. If the motor is rated 360-440V, the voltage deviations must be calculated from 400V. Operation outside these limits will degrade motor performance. If the motor is rated 208-230V, the voltage deviations must be calculated from 230V. Operation outside these limits will degrade motor performance. 575V rated motors cannot be operated at voltages above 600V.
- Depending on motor manufacturer, a 208V rated motor may not be able to run below the design voltage.

Adhere to the following when making electrical connections:

1. Install wiring and ground in boiler in accordance with authority having jurisdiction or in absence of such requirements National Electrical Code, ANSI/NFPA 70.

➨ *NOTE: Connect a ground wire to green colored ground lug in electrical control box.*

2. Review the electrical schematic diagram. Vantage boilers are available with a variety of 3 phase electrical configurations. Step-down transformers are provided as standard with every boiler. Each boiler is shipped with its own unique electrical schematic diagram, a copy of which is located in an envelope on the inside door of the panel box.
3. Connect power to the terminal strip as supplied on the inside of the panel box.

Assembly of Fulton Multi-Skid Systems

Adhere to the following for multi-skid engineered systems:

1. Refer to the Fulton mechanical/electrical drawings during assembly.
2. Ensure that equipment orientation allows for operation interface and maintenance.
3. Align the skids as shown on the drawings ensuring that skid fasteners (skid joint angles) are matched. The skid joint angles are a matched set and the edges of the fasteners should be exactly aligned.

➨ *NOTE: Do not bolt the skids to the housekeeping pad/floor until all of the piping has been reassembled and tightened.*

4. Ensure the skids are level and flat before fastening the skids together with the supplied bolts. The skids should be leveled front to back, side to side and corner to corner. Failure to properly level the skids will result in piping misalignment. A level or laser level should be used to verify skid alignment (when a standard level is used, the length should be appropriate for the skid). If assembling multi-component support stands, attach sections using the supplied bolts through the tank frame mounting plates. These should be hand tight until all of the piping is assembled. Note: skids are leveled at the factory using a laser level.
5. Connect the piping between the skids by matching the union connections and/or flange stamps and tightening. Refer to the mechanical drawing as necessary to confirm location of spool pieces etc. as the flange stamps are shown on the drawing in hexagonal callouts. The flange stamps should matched and aligned (the flange stamps should be directly across from one another. Rotating a flange will result in piping misalignment). Bolts should be hand tight until all of the piping is assembled. Refer to the appropriate instructions to tighten the flanges to the required torque specifications. Support pipe runs as required.
6. Ensure that a low point drain is installed in the piping.
7. Connect the conduit runs between the skids and tighten conduit connectors.
8. Locate the supplied wiring for the equipment and pull wiring through the appropriate conduit runs. Electrical wires are labeled for easy landing. Connect all wiring per the Fulton supplied electrical drawings.
9. If a header is supplied, mount the header as shown in the mechanical drawing.

➨ *NOTE: For piping supplied in sections, make up and connect hand tight until all sections are in place to ensure sections align properly. Sections are match marked for reassembly.*

10. Tighten all connections, including threaded and flanged factory connections which may loosen during shipment.
11. Pneumatically test the piping (at 15 PSIG [103 kPa] maximum) prior to filling the systems.
12. Check bolts and connections for tightness after the first heat up cycle. Retorquing may be required.

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations. Failure to follow instructions may result in a fire or explosion, causing property damage, personal injury, or loss of life.

This boiler is equipped with an ignition device, which automatically lights the burner. Do not try to light the burner by hand.

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

Use only your hand to turn the valve handle. Never use tools. If the knob will not turn by hand, don't try to repair it. Call a qualified service technician. FORCE OR ATTEMPTED REPAIR MAY RESULT IN A FIRE OR EXPLOSION.

WHAT TO DO IF YOU SMELL GAS • Do not try to light any appliance. • Do not touch any electrical switch; do not use any phone in your building. • Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. • If you cannot reach your gas supplier, call the fire department. -A qualified installer, service agency or the gas supplier, must perform installation and service.

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

Perform Pre-Start-Up Inspection

Prior to start-up, perform the following:

1. Smell all around the boiler area for gas. Be sure to smell next to the floor, as some gas is heavier than air and will settle. If you smell gas:

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

2. Ensure the boiler is located with the proper clearances as shown in the **Clearances and Serviceability** section of this manual.
3. Ensure that relief valves have been properly piped to floor drains.
4. Ensure flue gas from the boiler is properly vented.
5. Ensure the water system has been flushed and is free of debris.
6. Ensure combustion air openings are not obstructed in any way and have adequate capacity.
7. Ensure there are no flammable liquids, materials or hazardous fumes present in the environment.
8. Ensure nothing was damaged or knocked loose during installation and/or shipment.
9. Inspect the main gas train and trim assembly to be sure they were not damaged during shipment and/or installation.

Fill and Purge the System

Completely fill and purge the heating system as follows:

1. Close combination shutoff/purge valve in supply, all drain cocks, the shutoff valve for the pressure reducing (fill) valve, and all manual air vents.
2. Open all other system shutoff valves and one of the zone valves, the vent on the combination shutoff / purge valve and the shutoff valve to the pressure-reducing (fill) valve.
3. Water will now begin to fill the system. Air will escape through the vent on the combination shutoff/ purge valve. Continue filling until a constant stream of water (no bubbling) is discharged from the vent.
4. Close the zone valve on the purged loop, and open the zone valve on the next loop to be purged. When all air has escaped and only water is discharged, close the zone valve. When all zones have been purged (one at a time), close the vent on the combination shutoff/purge valve.

5. At this point, the system has been initially filled. However, air pockets may still remain at high points in the system and in heating loops above the level of the combination shut/off purge valve. It is quite possible, depending on the particular system that all piping above the combination shutoff/purge valve still contains air. If manual vents are installed on the system high points, these should be opened to vent these locations. When only water is discharged from all vents, the initial purging is complete.
6. Open the combination shutoff/ purge valve (keep the vent closed). With the gas shutoff valve closed, turn on power to the boiler and operate the circulator. Circulate the system water for approximately 30 minutes to move all air to the automatic air separation point.
7. Again, open manual air vents at high points of heating loop until a constant stream of water is discharged from the vent. Close the vent and make sure it's watertight. Repeat procedure for all high points and for every zone.
8. Check temperature/pressure indicator reading, which should equal the pressure-reducing (fill) valve set pressure. No more water should be entering the system. Close the shutoff valve on the cold-water fill line.
9. Visually inspect all pipe joints and equipment connections for leaks. If necessary, drain system, repair leaks and refill/purge the system. If no pressure drop is detected for a period of two hours under pressure, the system may be considered watertight.
10. When purging is completed, make sure the following are open—combination shut-off/purge valve, shutoff valve to pressure reducing (fill valve), shutoff valve in cold water fill line, and shutoff valve in return line.
11. Make sure the following are closed - all drain cocks, the vent on the combination shutoff-purge valve, & all manual vents. Reset zone valves to normal mode of operation and turn off power to boiler.
12. Open fuel shutoff valve, allowing fuel to flow to boiler.

Commission The Boiler

Adhere to the following when commissioning the boiler:

1. Verify with authorized personnel that the gas lines have been purged. Do not proceed without verification.
2. Familiarize all personnel on all aspects of boiler use, safety, and contents of this manual. This includes, but is not limited to, the use of the controls, lighting, and shutdown procedures.
3. Review the unit-specific burner and control schematics, and follow appropriate instructions.

➨ *NOTE: Warranty coverage is valid only if the boiler is commissioned ("started up") by a factory authorized service technician with a valid Vantage Certificate of Authorization. The commissioning agency must successfully complete and return the Fulton Installation and Operation Checklist report ("Start-up Report") to Fulton within twelve (12) weeks of start-up. Combustion and maintenance records detailing compliance with the Installation, Operation and Maintenance manual must be produced for warranty consideration.*

⚠ WARNING

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

Do not attempt to start the boiler for any testing before filling and purging the boiler. A dry fire will seriously damage the boiler and may result in property damage or personnel injury and is not covered by warranty.

Before commissioning the boiler, verify with authorized personnel that the gas lines have been purged.

Never attempt to operate a boiler that has failed to pass all the safety checks.

Never leave an opened manual air vent unattended. In the event an opened vent is left unattended, water damage could occur.

⚠ CAUTION

Do not use this equipment if any part has been under water (or subjected to heavy rains/water if the equipment does not have NEMA 4 wiring, controls and instrumentation). Immediately call a qualified service technician to inspect the equipment and to replace any part of the control system and/or gas control(s) which have been under water.

⚠ WARNING

Non-Fulton product information is for reference purposes only. No Fulton document should substitute for full review of documentation available from the component manufacturer.

⚠ CAUTION

After checking controls by manual adjustment, make sure they are always reset to their proper settings.

Commissioning/Start up by a non-Fulton authorized person will void the product warranty.

Please read these instructions and post in an appropriate place near the equipment. Maintain in good legible condition.

Maximum allowable working pressure and operating temperature are 160 psig (1103 kPa) and 210 F (99 C) respectively. Aquastats are set at 200 F (93 C). Operating > 190 F (88 C) is not recommended.

The thermal shock warranty does not cover damage due to cyclic fatigue.

■ System Design and Boiler Operation

The Vantage boiler must be installed in an appropriately designed system per **Installation** section of this manual. The boiler shall be operated/controlled to ensure the boiler does not cycle more than 12,000 times per year and the temperature differential across the boiler does not exceed 100°F (56°C).

Operating Temperatures and Fuel Selection

Use Table 8 to determine minimum return water temperature requirements:

TABLE 8 - MINIMUM RETURN WATER TEMPERATURES

Fuel	Minimum Return Water Temperature
Natural Gas	No minimum return water temperature
Propane	No minimum return water temperature
#2 Fuel Oil	140°F (60°C)
B100 Bio-Diesel	100°F (38°C)
ULS (S15) #2 Fuel Oil with guaranteed <15 ppm Sulfur (Ultra-Low Sulfur)	100°F (38°C)
Digester Gas/Alternative Fuels	Consult Factory

➨ *NOTE: When firing on fuels with ≥ 15 ppm sulfur such as low sulfur (S500) or regular (S5000) #2 fuel oil, a minimum return water temperature of 140°F (60°C) is required, and flue gas condensate corrosion is not warranted.*

Siemens LMV3 Control

■ Operating Points on the Siemens LMV Control

Parameter 545 requires setup specific to job site operating conditions when the boiler is commissioned by an authorized service technician. See Table 9.

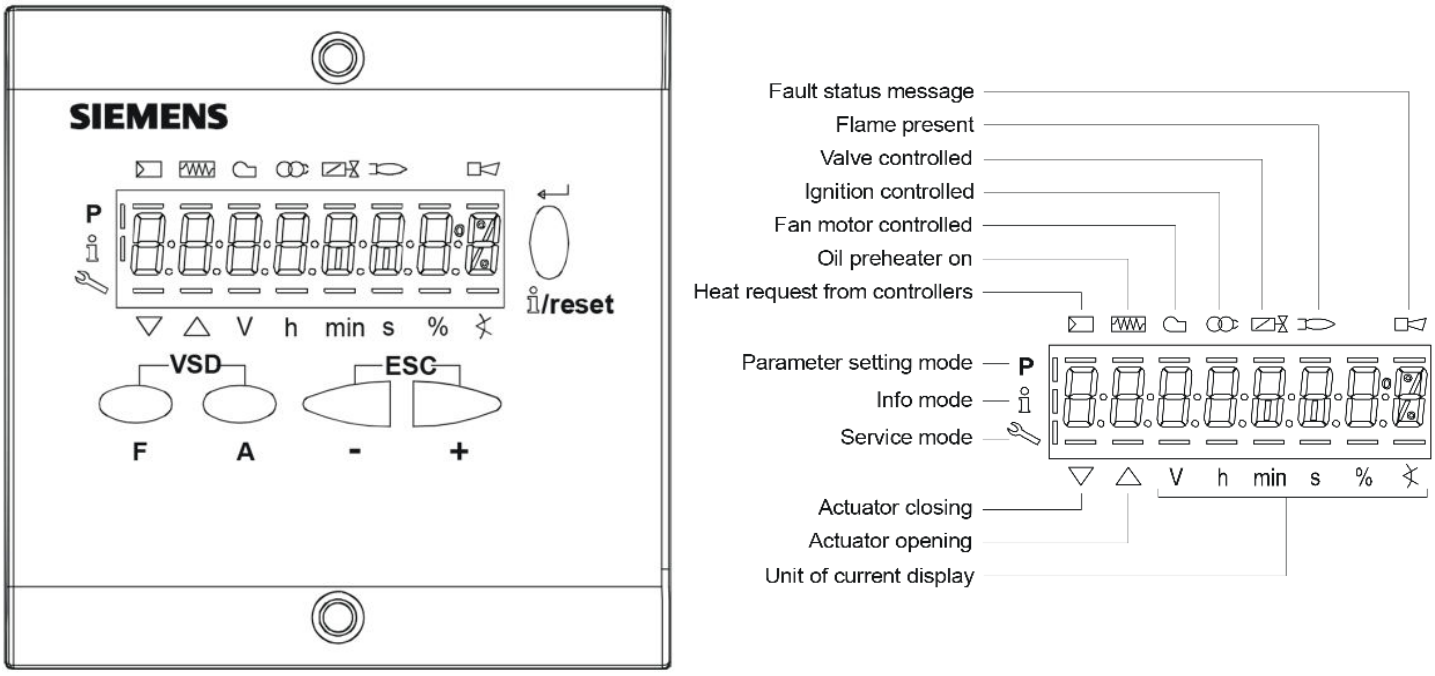
TABLE 9 - LMV PARAMETER 545

Hydronic System Setpoint	Parameter 545 Setting
Systems with setpoints greater than 100°F (38°C)	20
Systems with setpoints less than 100°F (38°C), including those operating on an outdoor reset schedule where the setpoint can fall below 100°F (38°C)	30

■ Normal Operation

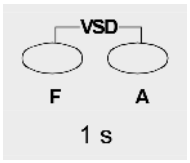
The Siemens LMV37 system is a fully packaged burner management system, linkageless control and first out annunciator. When operating Siemens LMV systems, all changes are made through the Siemens AZL display. The left and right arrow keys are used for scrolling through the menu and changing controller parameters. Enter accepts the menu and parameter changes. It is possible to return to the main menu at any time by repeatedly pressing Escape. When running the boiler, the status of the burner is to be monitored with the Siemens AZL display. See Figure 25.

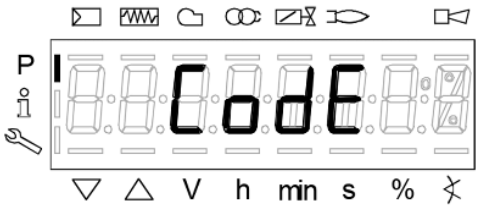
FIGURE 25 - SIEMENS AZL DISPLAY

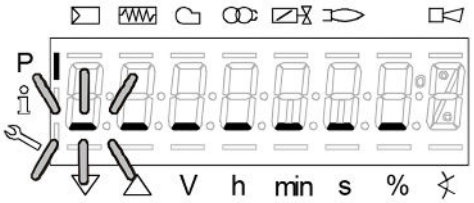


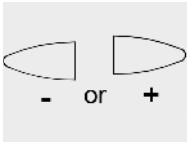
Button	Function
F	**Button F** - For adjusting the fuel actuator (keep F depressed and adjust the value by pressing - or +)
A	**Button A** - For adjusting the air actuator (keep A depressed and adjust the value by pressing - or +)
VSD F A	**Buttons A and F: VSD function** - For changing to parameter setting mode **P** (press simultaneously F and A plus - or +)
i/reset	**Info and Enter button** - For navigating in info or service mode * Selection (symbol flashing) (press button for <1 s) * For changing to a lower menu level (press button for 1…3 s) * For changing to a higher menu level (press button for 3…8 s) * For changing the operating mode (press button for >8 s) - **Enter** in parameter setting mode - **Reset** in the event of fault - One menu level down
-	**- button** - For decreasing the value - For navigating during curve adjustments in info or service mode
+	**+ button** - For increasing the value - For navigating during curve adjustments in info or service mode
ESC - +	**+ and - button: Escape function** (press - and + simultaneously) - No adoption of value - One menu level up

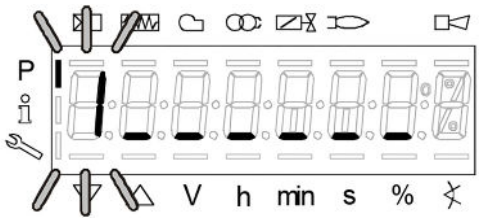
■ Steps to Enter Parameters

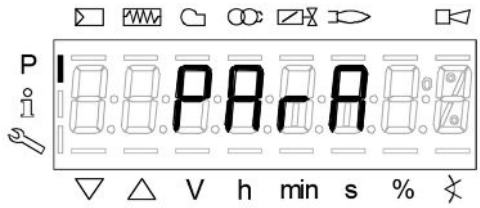


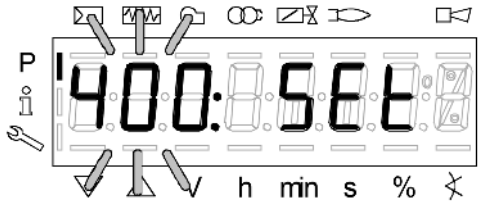












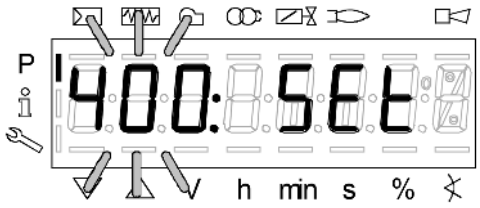
1) Press and hold the "F" and "A" buttons simultaneously.
   a. "Code" will be displayed.
2) When releasing "F" and "A", 7 bars appear the first of which flashes.
3) Press the "-" or "+" button to select the first number of the national board number and press enter (i/reset) button after each selected number.
   a. **Note – The boiler National Board number is the 4 digit service level password.**
4) After entry of the last number, the password must be confirmed by pressing enter (i/reset) button.
5) After correct entry of password, PArA appears for a maximum of 2 seconds.
6) Parameter 400 will flash.
   a. Use the "-"or "+" button for scrolling to the desired parameter.
   b. Press the enter (i/reset) button to enter the selected parameter level.

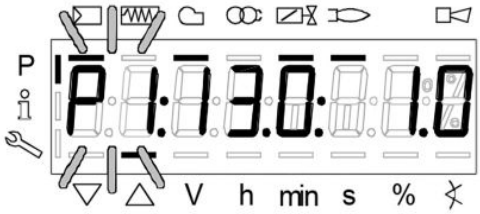
■ Adjusting Fuel/Air Curve (Natural Gas or Propane or Modulating #2 Fuel Oil)

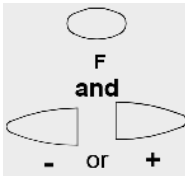
➨ *NOTE: Fulton Vantage boilers are factory test fired and pre-programmed with values in the fuel/air curve (P0- ignition to P9-high fire).*

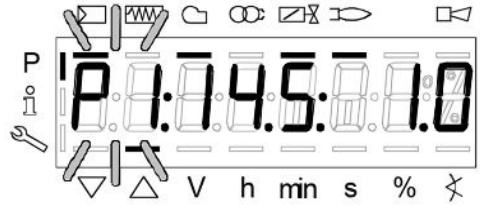
➨ *NOTE: Modulating #2 Fuel Oil applies to models VTG-5000DF/VTG-6000DF only.*

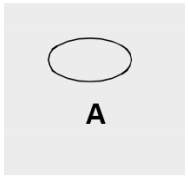
With the burner on follow the below steps for making field changes to the fuel/air curve points. A calibrated flue gas analyzer is required to complete these steps and must be properly inserted into the boiler flue exhaust vent while making changes to the fuel/air curve points.

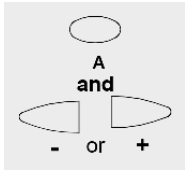


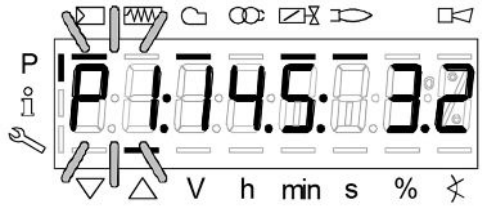












1) Confirm position of the fuel selection switch where applicable.
2) Enter the password and parameter "400" will flash.
3) Press the enter (i/reset) button 2 times.
   a. "P1" will flash and the curve point will be displayed.

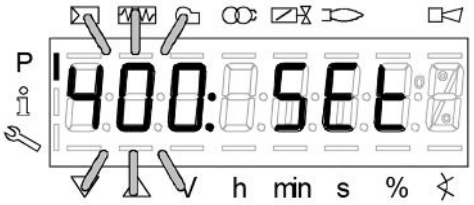
➨ *NOTE: P0 is the ignition position. Verify proper combustion at the ignition position.*

4) With "P1" flashing the fuel or air actuator may be individually selected for combustion adjustments.
   a. For the fuel actuator keep the "F" button depressed and press the "-" or "+" button to adjust the fuel actuator.
      i. Any changes are automatically saved.
      ii. Release the "F" button.
   b. For the air actuator keep the "A" button depressed and the press the "-" or + button to adjust the air actuator.
      i. Any changes are automatically saved.
      ii. Release the "A" button.
   c. With "P1" flashing use the "+" for the next curve point and the "-" for going back to the previous curve point.
   d. Repeat steps "a." and "b." above if changes are required at any other curve point.

■ Adjusting Fuel/Air Curve (Multistage #2 Fuel Oil – VTG-2000DF to VTG-4000DF)

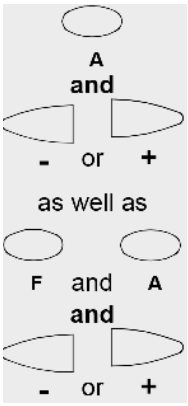
➨ *NOTE: Fulton Vantage boilers are factory test fired and pre-programmed with values in the fuel/air curve (P0- ignition to P9-high fire).*

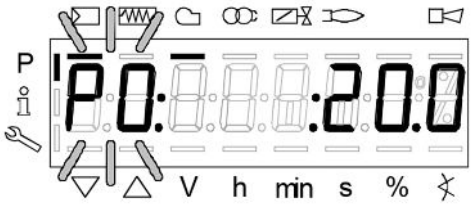
With the burner on follow the below steps for making field changes to the fuel/air curve points. A calibrated flue gas analyzer is required to complete these steps and must be properly inserted into the boiler flue exhaust vent while making changes to the fuel/air curve points.



1) Enter the password and parameter "400" will be flashing.
2) Press the enter (i/reset) button 2 times.
   a. "P1" will be flashing and the curve point will be displayed.

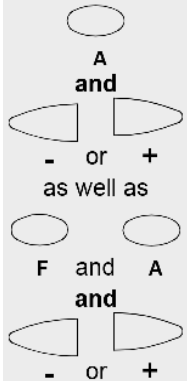
➨ *NOTE: P0 is the ignition position. Verify proper combustion at the ignition position.*

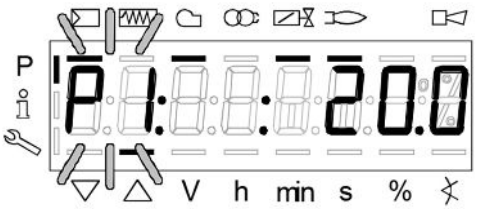




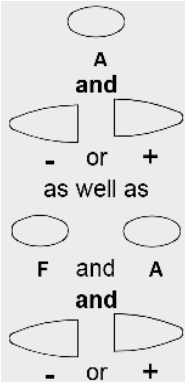
Oil – Multistage Operation

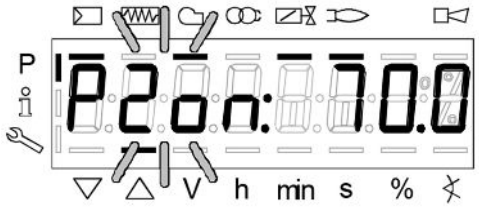
3) Set/verify oil pump pressure first - it is the constant.
   a. The air actuator is the only actuator adjustable when firing on oil.
      i. There air actuator may be changed as needed at the following five positions:
         1. P0 – ignition position
         2. P1 – stage one, low fire position
         3. P2on – switch on to stage P2
         4. P2d - manual stage P2 air
         5. P2 – stage two, high fire position
         6. P2of – switch off from stage P2
   b. For the air actuator keep the "A" button depressed and the press the "-" or + button to adjust the air actuator.
      i. Any changes are automatically saved
      ii. Release the "A" button





4) Stage "P0" to "P1" press the "+" button to change to the next stage.
   c. "P1" is Stage 1 on, oil flowing through one oil nozzle.



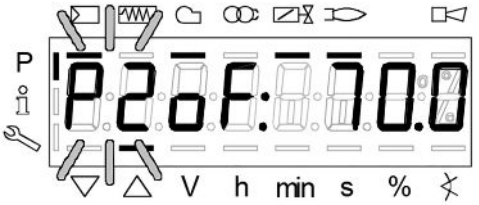


5) Stage "P1" to "P2on" press the "+" button to change to the next stage.

   d. "P2on" is the switch on point for stage two. When the angle (actuator) exceeds this point, the fuel oil valve for the 2nd stage is switched on.

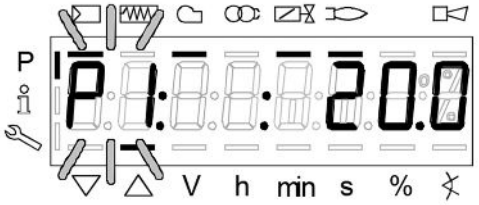
6) Stage "P2on" to "P2" press the "+" button to change to the next stage.

   e. "P2" is stage 2 on, oil flowing through both oil nozzles.

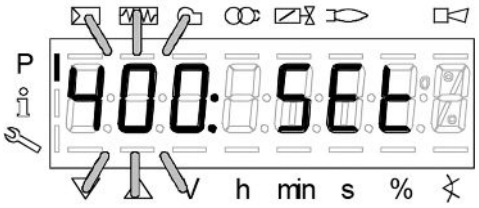


7) Stages "P2" to "P2of" press the "-" button to change to the next stage.

   f. "P2of" is the switch-off point for stage. When the angle falls below this point the fuel oil valve for the 2nd stage is switched off.



■ Viewing Flame Signal Intensity

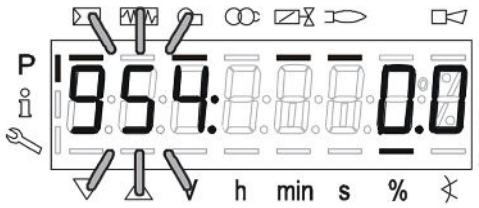


1) If in automatic mode (op % is displayed) perform the following:

   a. Press and hold the "i/reset" button until "SEr" appears.

   b. Release "i/reset."

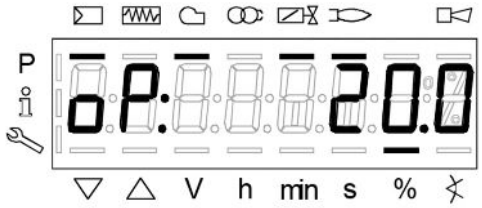
   c. 954 parameter will appear; strength is displayed at the far right.



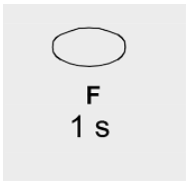
2) When setting the curve and the curve point is displayed, you may press the enter (i/reset) button to show the flame intensity.

   a. When pressing the enter button for >1s, a change to parameter 954 is made. When you release the enter button, you return to the curve point.

■ Manual Control (Manual Request for Output)

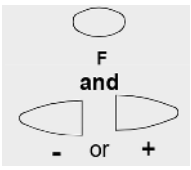


1) Burner is in operation mode.
   a. The display shows oP: on the left, the percentage of the current output on the right.

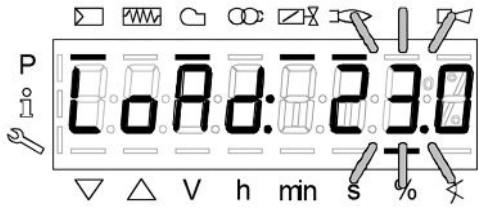


2) Press and Hold the F button for 1 second.
   a. The display shows LoAd:, the current output flashes.

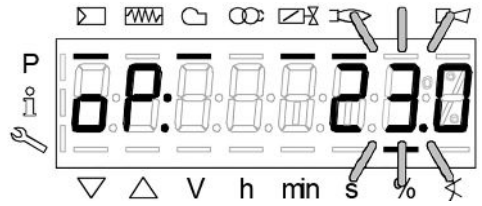
3) Still holding the F button press the – or + to adjust the required output in manual.
   a. The display shows LoAd:, still holding the F button the new output flashes.

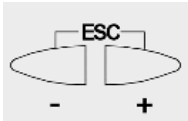


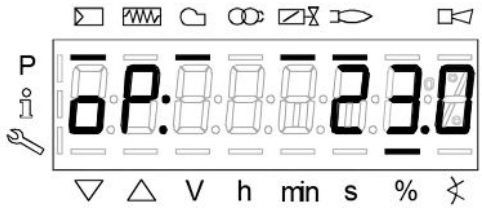
4) Release the F button.
   a. The current manual output flashes; oP: is still displayed on the left solid indicating that manual control is activated.



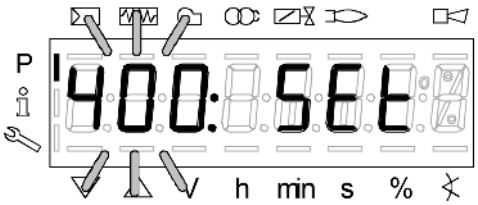
5) Press and hold the – and + for 3 seconds to return to automatic mode.
   a. The output will no longer flash, oP: will be displayed on the left solid and the operating percentage will be displayed on the right.

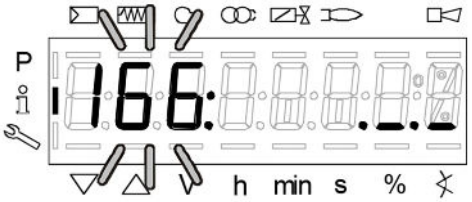


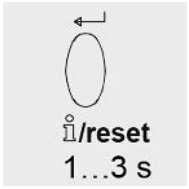


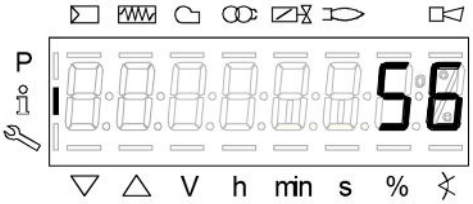


■ Viewing Total Burner Start-ups



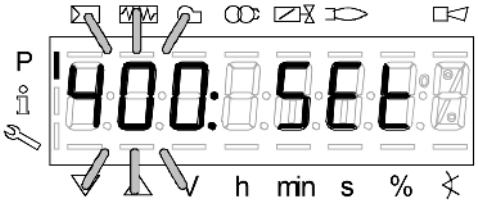


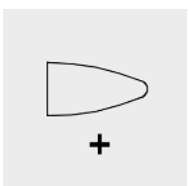


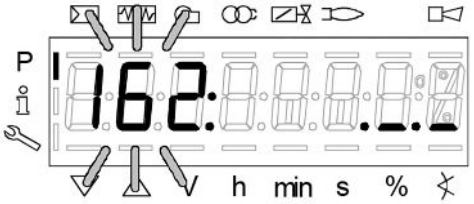


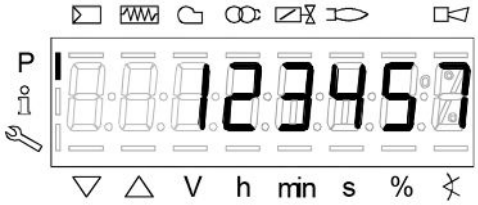
1) Press and hold the "F" and "A" buttons simultaneously.
2) "400" will flash. Press the "-"button to scroll to "100".
   a. Press the enter i/reset button
   b. Press the "+" button until parameter 166 is flashing, press the enter i/reset button.
   c. Press the enter i/reset button to view the total number of startups.

■ Viewing Total Burner Hours



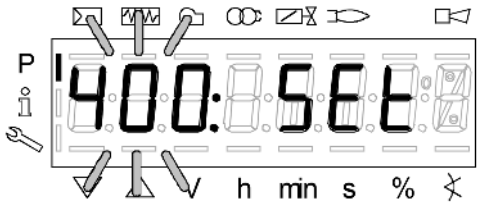


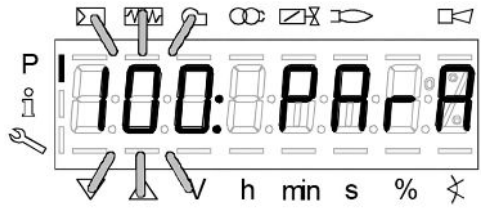




1) Press and hold the "F" and "A" button simultaneously.
2) "400" will flash. Press the "-"button to scroll to "100".
   a. Press the enter i/reset button.
   b. Press the "+" button until parameter 162 is flashing, press the enter i/reset button.
   c. Press the enter i/reset button to view the total number of burner operation hours.

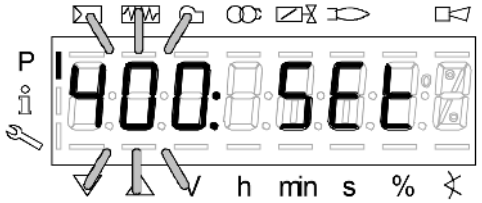
■ Changing Modbus Address

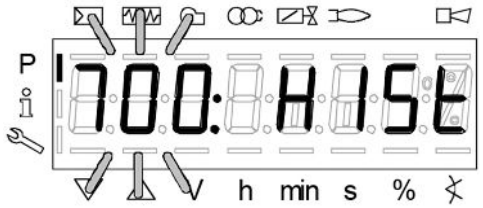


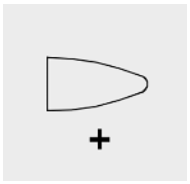


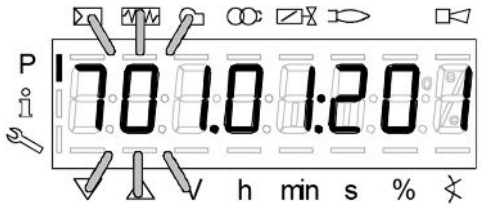
1) Press and hold the "F" and "A" button simultaneously.
2) "400" will flash. Press the "-" button to scroll to "100".
   a. Press the enter i/reset button
   b. Press the "+" button until parameter 145 is flashing, press the enter i/reset button.
   c. Press the enter i/reset button and use the "+" button to scroll to the desired number. Once the desired number is reached, press the enter i/reset button.

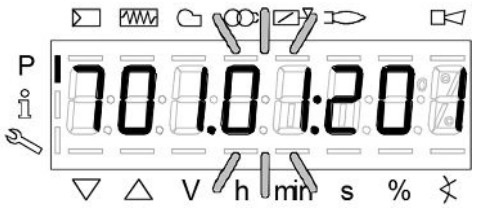
■ Viewing Lockout History



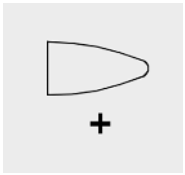


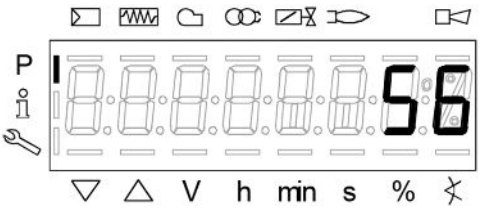


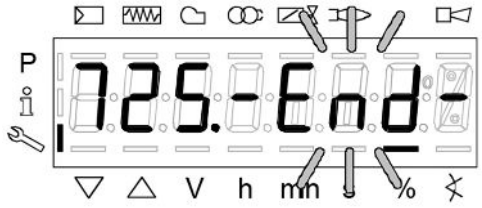




1) Press and hold F and A until Code is displayed.
   a) Then enter the national board number.
   b) Press enter once password has been completed.
   c) 400: Set will be displayed
1) Press the + arrow three times to 700 parameter the display will read 700: HISt.
   a) Press the Enter button and it will bring 701 flashing on the display.
   b) Press the Enter button and .01 will be flashing. The number to the right is your error code.
   c) Press the + arrow and .02 will be flashing. The number to the right is the diagnostic code.
   d) Press the + arrow and .03 will be flashing. The number to the right is the error class.
   e) Press the + arrow and .04 will be flashing. The number to the right is the Phase in which the error occurred.
   f) Press the + arrow and .05 will be flashing. IMPORTANT: "._._" will be displayed to the right of .05. To access the Startup Counter (cycle) you must
   i) PRESS ENTER and the value will now be displayed. Press ESC (hold – and + arrows together) to return to the flashing .05.





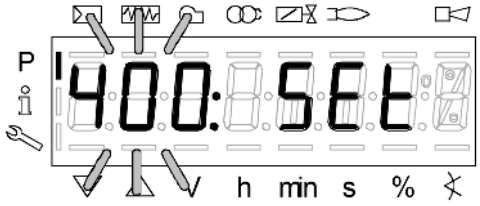


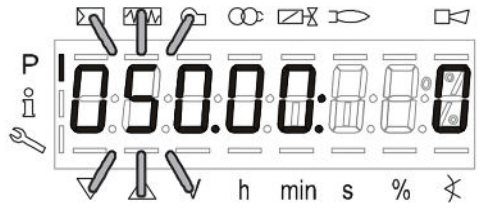
g) Press the + arrow and .06 will be flashing. IMPORTANT: "._._" will be displayed to the right of .06. To access the Output you must PRESS ENTER and the value will now be displayed. Press ESC (hold – and + arrows together) to return to the flashing .06. You have now viewed the data for one error history.

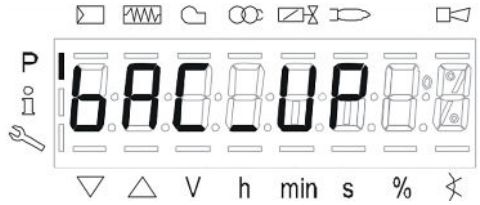
h) With .06 flashing press ESC (hold – and + arrows together), now 701 will be flashing. With 701 flashing press the "+" arrow and 702 will be flashing. Repeat the above steps for each error history up to the parameter 725.

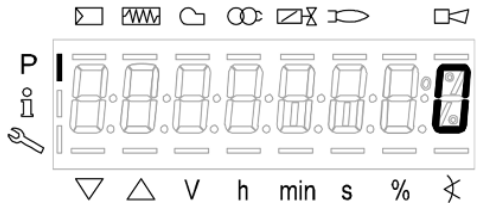
i) Refer to the Error Code List in the manual.

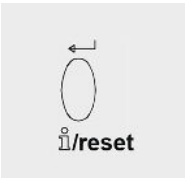
■ Parameter Backup

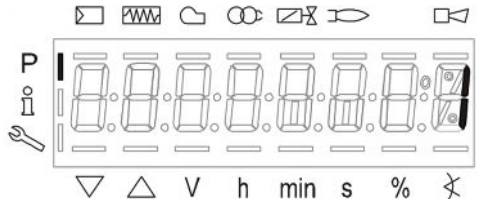




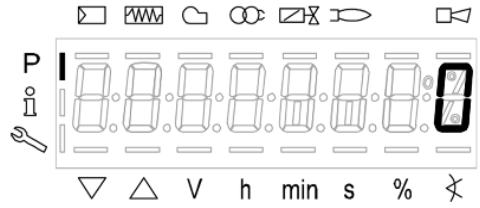






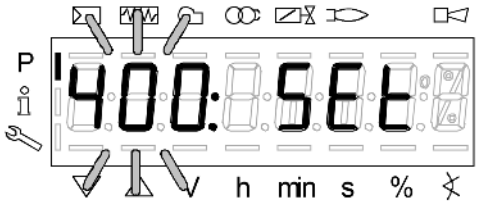


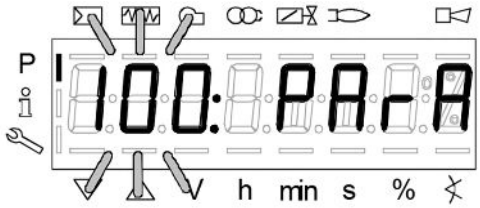
Approx. 5 s

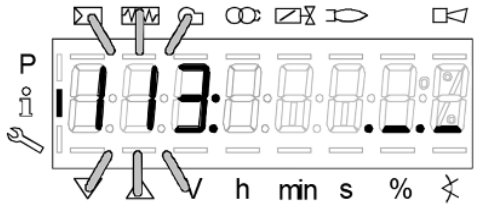


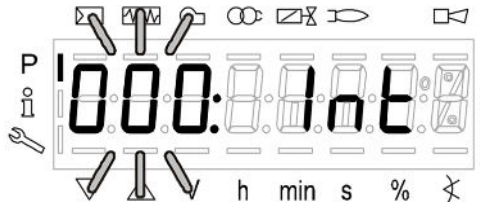
1. Press and hold "F" and "A" until Code is displayed
   a. Then enter unit national board number press enter once complete.
2. "400: Set" will be displayed
   a. Press the"-"arrow three times until "000: Int" is displayed.
   b. Press the Enter button to get into "000: Int" parameters.
3. Backup procedure:
   a. Press the "+" button and go to P-050 (050 will be flashing).
   b. Press enter > bAC_uP is displayed.
   c. Press enter > 0 is displayed.
   d. Press "+" button and 1 is flashing.
   e. Press enter, after about 5 seconds a 0 appears on the display indicating the end of the backup process.
   f. **Note: If an error occurs during the backup process, a negative value is displayed. For troubleshooting go to error code 137 to view diagnostic code.**

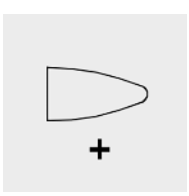
■ Parameter Restore

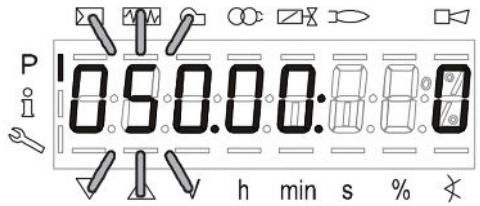


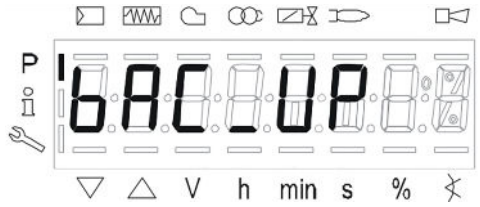


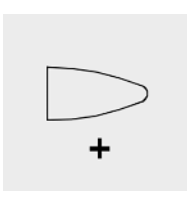


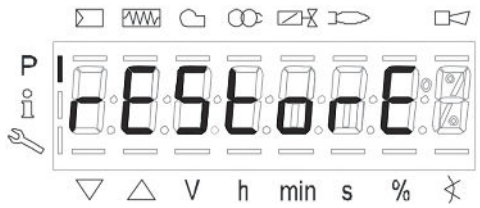












1. Press and hold "F and A" until Code is displayed
   a. Then enter unit national board number press enter once complete.
2. "400: Set" will be displayed
   a. Press the "-"arrow two times until "100: PArA" is displayed.
   b. Press the Enter button to get into "100" parameters.
   c. Press the "+" arrow until parameter 113 is reach enter into the parameter and record the Burner ID#.
   d. This is required for performing the Restore process.
3. Restore procedure:
   a. Go to "000: Int" parameter enter in and go to P-050 (050 will be flashing).
   b. Press enter > bAC_uP is displayed.
   c. Press "+" button to select "rEStorE".
   d. Press enter > 0 is displayed.
   e. Press "+" button and 1 is flashing
   f. Press enter, after about 5 seconds a 0 appears on the display indicating the end of the backup process.
   g. **Note: If an error occurs during the Restore process, a negative value is displayed. For troubleshooting go error code 137 to view diagnostic code.**

⚠ WARNING

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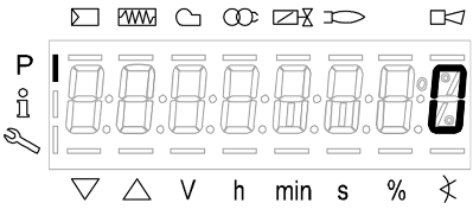

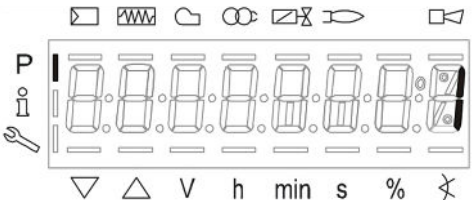

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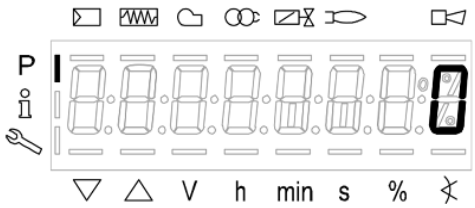

Temperature Controller Instructions

The Siemens LMV3 Series controls are paired with a temperature controller. Types include the Fulton SC-500 Temperature Controller, or the Yokogawa UT 32A.

■ SC-500 Temperature Controller Basic Programming

▶ CHANGE SET POINT

1. Set Point Mode is accessed through the switch selection or BMS screen selection.

- Min. Loop Temp: Minimum setpoint temperature at which the boiler can operate.
- Max. Loop Temp: Maximum setpoint temperature at which the boiler can operate.
- SC-500 Setpoint: Boiler setpoint when SC-500 setpoint mode is selected.

▶ SET BOILER ON TEMPERATURE

1. From Main Menu screen, select System Config.
2. Select Sensor Config and set.

▶ SET PROPORTIONAL BAND, INTEGRAL AND DERIVATIVE VALUES

The Proportional Band, Integral, and Derivative Values are accessed via the PID Configuration Screen.

- Proportional Band: This is the percentage of change in proportion to the difference between setpoint (SP) and process output (PV).
- Integral: The integral is a variable time period used to adjust an output.
- Derivative: This variable allows the anticipation of whether the PV will overshoot the SP, and reduces the output as needed.
- Manual Reset: This value will offset the PID.

⚠ WARNING

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Non-Fulton product information is for reference purposes only. No Fulton document should substitute for full review of documentation available from the component manufacturer.

⚠ CAUTION

The minimum return water temperature to the boiler is 140°F (60°C) when firing on standard oil. Failure to maintain this will void the warranty.

Unburned oil, unlike gas, does not leave the combustion chamber during purge.

*A temperature exceeding 120°F** (48 C) in the boiler room may cause premature failure of electrical components. Provisions should be made to maintain an ambient temperature of 120°F** (48 C) or less (the panel box interior should not exceed 125°F** [51 C]).*

***Pumps, PLC or ModSync panels may require lower ambient temperatures or additional cooling.**

⚠ WARNING

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■ Yokogawa UT 32A Basic Programming:

▶ CHANGE SET POINT

1. SP (set point) display reads current set point in degrees F.
2. Press the SET/ENTER button to change the set point. Use left and right arrows to navigate to digit you wish to change. Press up/down arrow to change digit. When complete, press SET/ENTER again to set the new value.

▶ SET BOILER ON/OFF TEMPERATURE

1. There are two parameters that are required to set up the hysteresis around the set point. These parameters are HY1 and A1.
2. **To access HY1:** Press the DISP button until HY1 appears. Factory default setting is 10.
3. **To navigate to A1:** Press the DISP button until A1 appears. Factory default setting is -5.

➨ *NOTE: The following is an example. With these default settings and a set point of 140°F, the boiler would turn on at 135°F and turn off at 145°F.*

▶ SET PROPORTIONAL BAND, INTEGRAL AND DERIVATIVE VALUES

1. To navigate to PID press the Fn button. Use the down arrow to scroll from (P) to (I) and to (D)
2. To make a Proportional (P) value change press SET/ENTER and use the left/right and up/down arrows to change the digits. Press SET/ENTER to set the new valve.

➨ *NOTE: The higher the Proportional (P) value, the sooner the boiler will begin to drop to low fire near set point. The smaller this value, the longer the boiler will remain at high fire before dropping to low fire near set point.*

3. Use the up/down arrows to navigate to Integral (I). To make a value change press SET/ENTER and use the left/right and up/down arrows to change the digits. Press SET/ENTER to set the new value.

➨ *NOTE: The smaller the Integral (I) value, the more quickly the boiler will react to a change in temperature.*

4. Use arrows to navigate to Derivative (d). Default setting is "OFF". Alteration is not recommended.
5. Pressing DISP will take return you to front screen.

Perform Test of Ignition Safety System

Test the ignition system safety shutoff as follows:

1. With the main gas cock (inlet manual gas valve) open, the burner should be cycled on. After all the safety limits such as gas pressure, water flow and temperature are satisfied, the blower will run and pre-purge the boiler.
2. Once the purge is complete (30 seconds), the ignition transformer will be energized. There will be a 4 second trial for ignition period. During this period, indicator lights on the flame safeguard (pilot and main).
3. The main gas valve will not open because there is no power to the valve due to the disconnected wires. Hence, no flame will be established and the flame safeguard will not receive a flame signal from the UV scanner.
4. After 4 seconds, the flame safeguard programmer will assume a "Flame Failure" condition and go to a "lockout" mode. Lockout will require manual reset of the flame safeguard.
5. After completing this test, turn off the boiler and reconnect the wires to the main gas valve.

Perform Test of Low Water Cut Off

Once the boiler is full of water the following test can be accomplished:

1. Turn the boiler on, this will start the Call for Heat sequence.
2. Press and hold the Low Water Test button for 3 seconds. The Low Water light should illuminate and the boiler should shut down the Call for Heat sequence.
3. Reset the Low Water condition by pressing the Low Water reset button and the LMV Reset button. Boiler should start the Call for Heat sequence again.
4. Perform appropriate test for any secondary Low Water controls.

Perform Test of Limit Controls

Fire the boiler and test the high limit control as follows:

1. Alter high temperature limit to a value lower than the anticipated loop temperature. Turn the boiler on. Water temperature will rise until the boiler locks out. This condition has to be manually reset.
2. Alter the high limit cut off temperature to normal level, typically 10-20 degrees above set point.

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⚠ WARNING

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Perform Test of Low Gas Pressure Switch

Test the low gas pressure switch as follows:

1. With the boiler running turn down the low gas pressure switch until a lock out is annunciated.
2. Reset the switch to normal level, re-start the boiler.

Perform Test of High Gas Pressure Switch

Test the high gas pressure switch as follows:

1. Close the downstream main gas cock and start the boiler.
2. Once the trial for ignition period is reached, the main gas valve will open, pressurizing the line. This will trip the high gas pressure switch.
3. Manually reset the high gas pressure switch after it trips.

General Operation of the Boiler

Excessive cycling will reduce the useful life of any piece of mechanical equipment. Vantage boilers should be operated and controlled so the boiler cycles less than 12,000 times per year. Vantage boilers should be operated and controlled so that the temperature differential across the boiler does not exceed 100°F (38°C).

⚠ WARNING

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Prior to any maintenance concerning electrical components of this equipment, ensure electrical supply to the equipment is disconnected. Label all wires prior to disconnection; wiring errors may cause improper and hazardous operation.

Follow all proper lockout/tagout procedures for service.

Before beginning any maintenance, ensure area is free of any combustible materials and other dangers.

What to do if you smell gas:
Do not try to light the appliance.
Do not touch any electrical switch.
Do not use any phone in the building.
Leave building and contact gas supplier from neighbor's phone. If you cannot reach gas supplier, phone the fire department.

After initial start-up by qualified personnel, linkage, control settings, and fuel pressures should not be readjusted.

⚠ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Heating Solutions Representative.

In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

General

Your Vantage boiler has been designed to provide years of trouble free performance. To ensure continued safety and efficiency of the boiler, please follow the maintenance and inspection directions outlined in this section of the manual.

Daily, Weekly and Monthly Maintenance and Inspection (Fulton considers the following to be good practice for any boiler, and is applicable to the full line of Vantage boilers). It is also good practice for any boiler installation to perform a thorough review of the overall system on a regular basis, and after any maintenance procedures. Any potential issues should be noted and followed up on to ensure safety and reliability of all relevant equipment. System review items may include:

- Looking for discoloration of any painted equipment, boiler jacket panels, and/or insulation used in system piping.
- Carefully checking for gas leaks using a combustible gas detector during commissioning and regular inspections; a GASMate® 0119 or equivalent is recommended. This includes, but is not limited to, gas delivery system, gas train fittings, pressure switches, gas valves, regulators, conduit connections to gas devices, and pre-mix delivery components.
- Looking for evidence of leaks including the air intake/exhaust systems, boilers, hydronic system piping, pumps, valves and other system components.
- Once boilers are running, making sure there are no flue gases around the boilers, or in the boiler room.

➨ *NOTE: Combustion analysis and adjustment schedule can vary based on boiler application and seasonal conditions. Biannual or quarterly adjustment may be required in is some applications—for example, systems operating as both winter heat and summer reheat.*

Daily Maintenance and Inspection Schedule

Daily maintenance and inspection must include the following:

1. Observe operating temperature and general conditions.
2. Make sure that the flow of combustion and ventilating air to the boiler is not obstructed.
3. Boiler area is free and clear of any combustible materials, including flammable vapors and liquids.

Weekly Maintenance and Inspection Schedule

Weekly maintenance and inspection must include the following:

1. Observe the conditions of the main flame. Correct air adjustment is essential for the efficient operation of this boiler. If an adjustment to the combustion is necessary, the flue gas composition should be checked with a carbon dioxide (CO2) or oxygen (O2) analyzer to set conditions.

Monthly Maintenance and Inspection Schedule

Monthly maintenance and inspection must include the following:

1. Test high-limit control by reducing setting below the operating temperature. Burner should shut off. After readjusting the thermostat, press the button to reset the switch.
2. Test operating temperature control by reducing temperature setting as necessary to check burner operation.
3. Check flue gas temperature at outlet. If there is a temperature increase over previous readings, the probable cause is soot or water-scale build-up on the tubes. Consult Fulton Heating Solutions immediately if there is a concern.
4. Test low gas pressure switch and high gas pressure switch utilizing the procedure in operation section.
5. For Low Emissions model boilers, inspect the air inlet filter. If any dust, lint or debris has accumulated, clean or replace the filter.

Annual Maintenance and Inspection Schedule

Annual maintenance and inspection must be performed prior to each heating season, and includes but is not limited to the following tasks, which must be done by a factory trained technician:

1. Inspect the fuel train, burner and control panel to be sure components are free of debris and are properly attached to the boiler.

➨ *NOTE: There is no need to disassemble the fuel train, burner or control panel unless the technician suspects damage or malfunction.*

2. Examine the venting system (air intake and exhaust piping).
    - Check all joints and pipe connections for tightness.
    - Check piping for corrosion or deterioration.
    - Check that the piping is clear of debris.
    - Check that the condensate drain system is functioning.

⚠ WARNING

Crystalline silica may be present in components of this equipment. Exposure to crystalline silica may pose significant health hazards, including but not limited to eye and respiratory system damage. Per the Centers for Disease Control and Prevention (CDC) and Occupational Safety and Health Administration (OSHA), appropriate Personal Protective Equipment must be worn to minimize exposure to hazardous substances. Refer to most current guidelines offered by the CDC and OSHA for more information, including Personal Protective Equipment recommendations.

All information in this manual is for reference and guidance purposes, and does not substitute for required professional training, conduct, and strict adherence to applicable jurisdictional/professional codes and regulations.

Never use open flame or other sources of ignition to check for gas leaks.

Ensure boiler is off and cooled, with proper lockout-tagout per local codes prior to service and maintenance.

△ CAUTION

Use caution when using any cleaning solutions. Refer to local regulations for proper cleaning solution disposal.

Do not allow oil leaks, dust, or dirt to accumulate around the boiler.

⚠ CAUTION

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All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Heating Solutions Representative.

In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

3. Inspect the hydronic heating system for other problems.
4. Test all safety devices for proper operation.
5. Perform combustion analysis and adjust if necessary.
6. Leak test the gas valves.
7. Test relief valve per manufacturer instructions by lifting the lever for 5 seconds and allowing the valve to snap shut. Please see the manufacturer's recommendations on the relief valve tag.

■ Annual Removal and Inspection of LE Mesh Burner Head

1. Disconnect power.
2. Shut off gas supply.
3. Disconnect the gas union and properly support the gas train. With some configurations, it may be possible to remove just the gas actuator from the valve body to gain access to the burner.
4. Remove 8 bolts from the burner plate. This will allow the removal of the burner plate and the gas injector in one piece.
5. Remove 8 nuts and washers from the burner mounting flange and remove the burner. When removing the burner be careful to not scrape burner against the refractory.
6. Check burner and carefully clean (do not scrub or use wire brush) any soot or foreign material that may have accumulated. Use compressed air to clear the knitted mesh material.
7. Replace burner gaskets with new. Never re-use gaskets.
8. Reinstall burner and components. Torque specifications are 23 ft/lbs.
9. Replace the combustion air filter with new.

Verification of Torque Settings on Fireside Access Doors

➨ *NOTE: This section applies to Models VTG-2000 and VTG-3000 with National Board #s of 8275 and higher, or ship dates after July 10, 2013. It also applies to all VTG-4000 and VTG-5000 units starting with National Board # 7603 and higher, or ship dates after June 14, 2012, and all VTG-6000 units. This includes ALL configurations: Standard, DF, and LE; in all model sizes. Please read carefully.*

There are two access doors to the fireside of the heat exchanger of the above referenced Vantage models. There are a series of nuts on each door that must be checked for torque every 2,500 operating hours, or once per heating season (whichever is more frequent). Complete procedures while boiler is NOT operational/powered on.

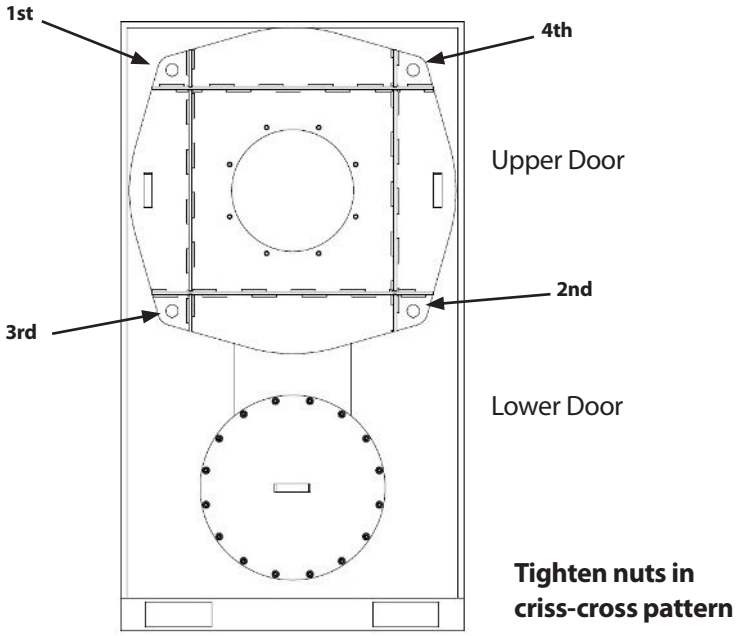

FIGURE 26 - VERIFYING TORQUE SETTINGS (FRONT VIEW, PANELS REMOVED) VTG-2000 THROUGH VTG-5000

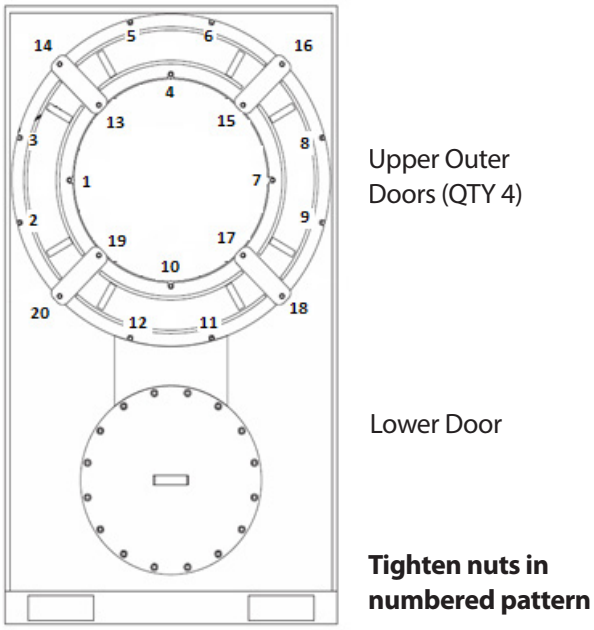

FIGURE 27 - VERIFYING TORQUE SETTINGS (FRONT VIEW, PANELS REMOVED) VTG-6000

Proceed as follows:

1. Remove the boiler jacket panels (upper and lower) on the front of the boiler.
2. Verify settings of the upper door. The upper door is retained by (4) 1-1/8" nuts. Tools required for upper door setting verification:

⚠ CAUTION

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All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Heating Solutions Representative.

In order to meet warranty conditions, ensure all appropriate maintenance activities are performed.

⚠ WARNING

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⚠ CAUTION

All maintenance procedures should be completed by trained personnel. Appropriate training and instructions are available from the Fulton Service Department at (315) 298-5121 or your local Fulton Heating Solutions Representative.

- The VTG-2000 through VTG-5000 Fulton part numbers are 2-22-000570 (1-13/16" socket) and 2-22-000571 (3/4" x 1/2" adapter). For VTG-6000, the socket part number is 2-22-000572 (1 1/16" Deep Well Socket).
- ½" drive torque wrench and extension.

➨ *NOTE: Do not loosen or remove the upper doors without guidance from the factory with regards to proper procedures for accessing the fireside of the heat exchanger.*

3. Proceed as follows based on model size:

VTG-2000 through VTG-5000 Sizes Only:	Evenly tighten all 4 nuts on the upper door in five stages, in a criss-cross pattern: top left, bottom right, bottom left, top right (see Figure 26), in the following order: ▪ 20 ft/lbs (27.1 NM) ▪ 35 ft/lbs (47.4 NM) ▪ 50 ft/lbs (67.8 NM) ▪ 100 ft/lbs (135.5 NM) ▪ 130 ft/lbs (176.2 NM) Recheck all nuts in a circular pattern, and proceed to step 4.
VTG-6000 Size Only:	See Figure 27. Evenly tighten all 5/8 numbered nuts (1-20) as follows, in the sequence illustrated: ▪ 25 ft/lbs (33.9 NM) ▪ 50 ft/lbs (67.8 NM) ▪ 75 ft/lbs (101.6 NM) ▪ 100 ft/lbs (135.5 NM) Recheck all at 100 ft/lbs (135.5 NM), and proceed to step 4.

4. Verify settings of the lower door. The lower door is retained by (16) 3/8" bolts. Tools required for lower door setting verification:
   - 9/16" socket and 3/8" drive wrench.
5. Evenly tighten all nuts on the lower door to 23 ft/lbs (31.2 NM) in a criss-cross pattern. See Figure 24 and Figure 25. Do not over torque, as this can result in damaging of the door seal.
6. Do not replace any of the bolts, nuts, washers, gaskets or other boiler components without consulting the factory. Any replacement components must be to factory specifications.

7. Once all bolts are tightened to proper torque, replace the boiler jacket panels.
8. To confirm proper seal on the door after this procedure has been conducted, ensure there are no flue gases present around the boiler once unit is running.

Inspecting/Cleaning the Flue Passages

For boilers firing on Natural Gas or Propane, there is no need to inspect the flue passages of the boiler unless the technician suspects damage or malfunction.

■ Boilers Firing on #2 Oil, B100 Bio-Diesel, Digester Gases or Any Other Substance Besides Natural Gas or Propane

Inspect the third pass duplex stainless steel flue passages every 4,000 hours of operation (not including hours operating on Natural Gas or Propane). This is the bottom section of the heat exchanger and will not require removal of the burner or fuel train.

■ Procedure for Accessing the Third Pass Duplex Stainless Steel Flue Passages (all models)

1. Lock out the power supply to the boiler and isolate the fuels supplied to the unit. Allow the boiler to cool.
2. Remove the front lower jacket panel from the boiler.
3. Remove the flue passage cover and turbulators.
4. If deemed necessary, clean the flue passages with the proper equipment for stainless steel tubes, such as a Fulton tube brush kit Part# 4-50-003003. Do not use steel brushes.
5. Use a wet/dry shop vacuum or soot vacuum system to clean the third pass front and rear chambers.
6. Insert the turbulators back into position.
7. The third pass tube bundle access door gasket must be replaced. Do not reuse the gasket.
8. Reinstall the flue passage cover. Confirm torque to 23 ft/lbs (31.2 NM) on all bolts. Do not replace any bolts, nuts, washers or other components without consulting the factory.
9. Restore power to the unit and restore fuel to the unit.
10. Fire the boiler and set combustion to proper levels.
11. To confirm proper seal on the door after this procedure has been conducted, ensure there are no flue gases present around the boiler once unit is running.
12. If evidence of extensive soot, scaling or corrosion is present in the duplex stainless steel flue passages, this may indicate that removal of the burner and cleaning of the furnace and upper flue passages is required. Please contact Fulton's service department for more information and instructions, as requirements vary by model and burner selection.

Ignition Pilot Adjustment - Dual Fuel Burners

■ Models VTG-2000DF through VTG-4000DF

Ensure pilot and electrode are positioned and adjusted as shown in Figures 28 and 29.

■ Models VTG-5000DF through VTG-6000DF

Ensure pilot and electrode are positioned and adjusted as show in Figures 30, 31, and 32.

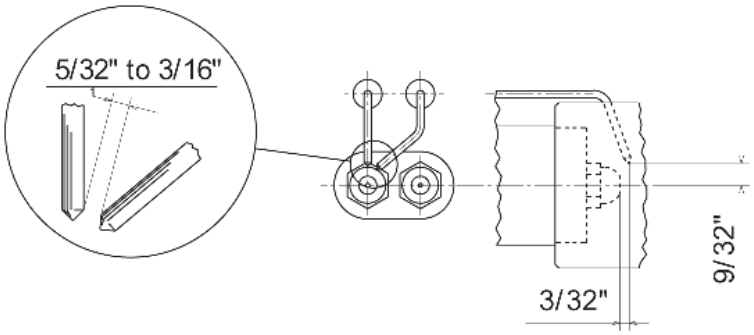
After All Repairs and Maintenance

1. Follow "Pre-Start Check List" provided with the unit, and all Safety Checks.
2. Fire the Boiler and perform combustion check.
3. Make any necessary adjustments.

➨ *NOTE: Accurate and complete combustion and maintenance records detailing compliance with the Installation, Operation and Maintenance Manual must be produced for warranty consideration.*

Troubleshooting

Use the tables on the following pages as a guide to troubleshooting your boiler.



Model	Nozzle A	Nozzle B
VTG-2000DF	5 GPH 60° B	5 GPH 45° B
VTG-3000DF	7.5 GPH 45° W	7.5 GPH 45° W
VTG-4000DF	11 GPH 60° B	11 GPH 60° B

FIGURE 28 - 2–4MM BURNER ELECTRODE POSITION FOR OIL OPERATION

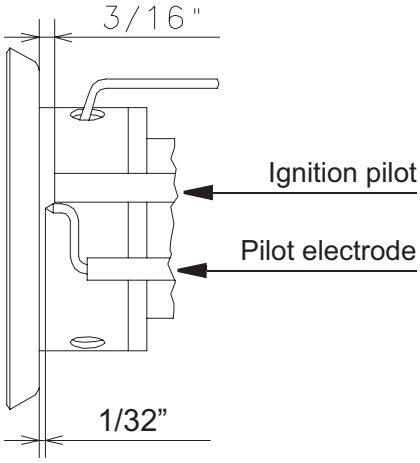


FIGURE 29 - 2–4MM BURNER ELECTRODE POSITION FOR GAS OPERATION

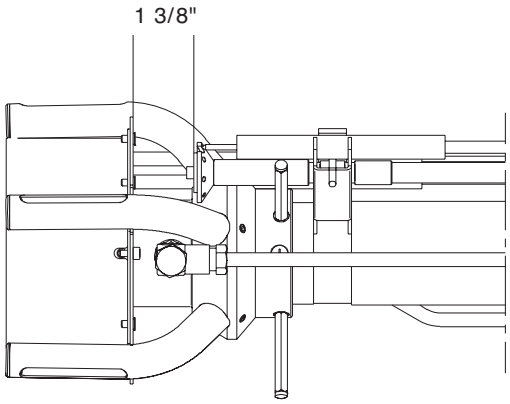


FIGURE 31 - 5–6MM BURNER ELECTRODE POSITION FOR GAS OPERATION

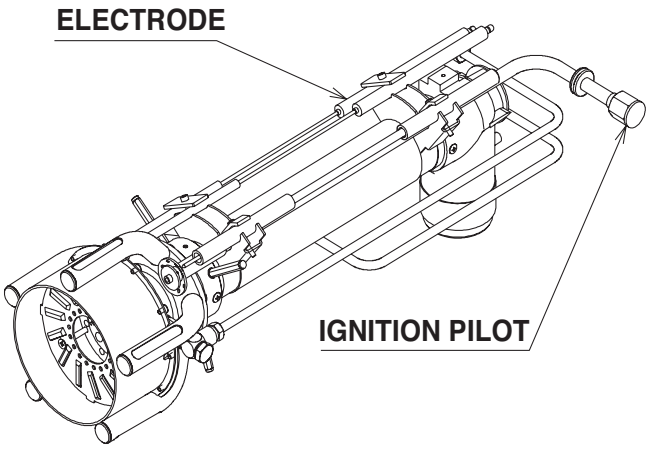


FIGURE 30 - 5–6MM BURNER ELECTRODE AND IGNITION PILOT LOCATIONS

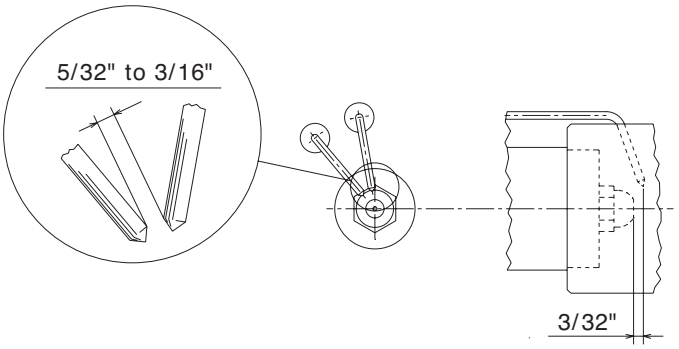


FIGURE 32 - 5–6MM BURNER ELECTRODE POSITION FOR OIL OPERATION

TROUBLESHOOTING

PROBLEM	CAUSE	CHECK
Control does not illuminate	Power supply	Check fuse or circuit breaker. Reset or replace as necessary.
Fan will not start	High temperature is tripped	1. Reset switch 2. Replace switch
	Low gas is tripped	1. Reset switch 2. Replace switch
	High gas is tripped	1. Reset switch 2. Replace switch
	UT32A incorrectly set/no heat	Adjust UT32A
	Flame detector has detected light/scanner	1. Identify light source, remove 2. Replace flame detector
	Air switch is made when fan is not on	1. Reset switch 2. Replace switch
	Blower contactor made when fan not on	Replace motor contactor
	Gas valve proof of closure defective	Replace valve
	Loose wire connection	Check wiring
Pilot Fails	Insufficient gas supply	1. Verify the manuals shut off valves are open allowing gas flow to the pilot tube. 2. Adjust incoming gas pressure to match the start up report. 3. Adjust pilot gas pressure regulator to match the start up report.
	Pilot valve fails to open	1. Check pilot gas pressure at the burner. 2. Verify operation of the valve. If pressure does not increase when the valve is supposed to open, replace valve.
	Air in pilot gas line	Have the boiler attempt to light up to three times. If the boiler fails to light, call Fulton.
	Ignitor failure	1. Check the gap between the top of the electrode and the pilot tube wall. The gap should be 1/16" (1.59 mm). Adjust the gap. 1. Check for cracked porcelain. Replace electrode.
	Combustion air not sufficient	1. Verify the over burner pressure matches the start up report. Adjust the servo setting. 2. Verify there is enough make up air in the room. 3. (For direct vent only) Verify venting is not obstructed.
	Flame Detector Defective	1. Visually verify the flame through the site glass. 2. Remove flame detector and visually verify flame through the scanner tube. 3. Verify the flame detector eye is not dirty. 4. Replace flame detector.

PROBLEM	CAUSE	CHECK
Main flame fails	Gas actuator not set properly	1. Verify the last elbow gas pressure matches the start up report. 2. Adjust actuator setting.
	Air actuator not set properly	1. Verify the over burner pressure matches the start up report. 2. Adjust actuator motor.
	Flame detector failure	1. Visually verify the flame through the sight glass. 2. Remove flame detector and visually verify the flame through the scanner tube. 3. Verify the flame detector eye is not dirty. 4. Replace scanner.
	Insufficient Gas Supply	1. Verify the manual shut down valves are open, allowing gas flow through the gas train. 2. Adjust incoming gas pressure to match the start up report.
	Air supply blocked (direct vent only)	Verify venting is not obstructed.
Boiler fails while modulating	Gas actuator not set properly	1. Verify the last elbow matches the start up report. 2. Adjust actuator setting.
	Air actuator not set properly	1. Verify the over burner pressure matches the start up report. 2. Adjust actuator setting.
	Air supply blocked (direct vent only)	Verify venting is not obstructed.
Poor combustion	Gas actuator not set properly	Adjust actuator setting.
	Air actuator not set properly	Adjust actuator setting.
Manual Reset limit device trips	Manual Reset Limits include: Flame safeguard, high or low gas pressure, high temperature limit	DO NOT reset without determining and correcting the cause.
Power outage to the boiler room	Entire boiler system is disabled and de-energized.	When power has returned, the boiler will have to be manually reset, as it will be in the lockout position
Gas Pressure alarm is annunciated	Insufficient gas pressure for safe and proper operation of the boiler. This shuts down the burner. When gas pressure is restored, the annunciated alarm will remain on and the boiler will remain locked out until the gas pressure switch is manually reset.	Locate cause and correct. Qualified service personnel must correct the problem before restarting the boiler.
High water temp alarm is annunciated	Boiler water has exceeded both the operating and high-limit temperature. When the water temperature falls below the high-limit temperature, the boiler will remain locked out until the controller is manually reset.	Locate cause and correct. Once the control is reset, the sequence returns to normal operation provided that the other limits are satisfied.

PROBLEM	CAUSE	CHECK
Low Air Flow Supply indicated on low air switch	Low Air is annunciated if the airflow switch detects low airflow through the boiler.	The air switch has been factory set and should not be adjusted in the field. An extended low air indication does not mean that the low air switch is defective. Check that blower is power and feedback plugs are clipped into the blower. Check that the burner is clean by observing through the venturi. Check the blower purge speed and low fire speed is correctly displayed on the touch screen. Check for obstructions in the vent. Check for obstructions in the air inlet.
Main flame failure during firing period	Main gas control valve is de-energized and the control goes into “lockout” mode. Flame failure occurs and the indicator is illuminated.	The programmer must be manually reset.
Ignition Failure	If UV scanner/flame rod does not detect the flame during the 4-second trial-for-ignition period, the gas valve and spark ignition are de-energized. At this time a safety lockout occurs.	Identify and correct.

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PRE-COMMISSIONING INSTALLATION CHECKLIST

NOTE:
TO BE COMPLETED BY INSTALLING CONTRACTOR.

DATE		JOB SITE NAME	
CONTACT NAME		PHONE NUMBER	
BOILER MODEL		BOILER NB/SERIAL #(s)	

ELECTRICAL & COMMUNICATION:

Electrical wiring to the boiler terminated and tested?	☐ YES	☐ NO	
Voltage matches the data plate on the rear of the boiler?	☐ YES	☐ NO	
Control wiring for lead/lag is terminated and tested?	☐ YES	☐ NO	☐ N/A
Building automation wiring is terminated and tested?	☐ YES	☐ NO	☐ N/A

SYSTEM PIPING

All hydronic piping to the boiler is completed and leak tested?	☐ YES	☐ NO	
All hydronic piping has been fully flushed? ***Note:*** *Chemical cleaning must bypass the boiler; clean water flush must have strainers at the boiler inlet*	☐ YES	☐ NO	
Circulating pumps are wired, tested, and ready for operation?	☐ YES	☐ NO	
Motorized boiler isolation valves are wired, tested, and fully operational?	☐ YES	☐ NO	☐ N/A

FLUE GAS EXHAUST VENT AND COMBUSTION AIR INTAKE:

Flue vent meets material type and requirements detailed in the IOM?	☐ YES	☐ NO	
Flue and combustion air terminations meet minimum separation requirements **and** are installed to prevent flue gas recirculation?	☐ YES	☐ NO	
Condensate drain is completed and meets IOM installation requirements?	☐ YES	☐ NO	
Combustion air louvers meet minimum SQFT detailed in IOM?	☐ YES	☐ NO	☐ N/A
Mechanical draft controls are powered, tested, and fully operational?	☐ YES	☐ NO	☐ N/A

FUEL PIPING

Supply gas piping and regulators are properly sized to ensure adequate gas supply under all operating conditions? (Idle, Light Off, High Fire, etc.)	☐ YES	☐ NO	
Use a manometer to measure the gas pressure at the fuel train inlet:	_____ INCHES WC		
Does the measured gas pressure meet the requirement listed on the data plate on the rear of the boiler?	☐ YES	☐ NO	
Gas vents are individually run, properly upsized every 10 feet, and terminated to atmosphere if required by Authority Having Jurisdiction?	☐ YES	☐ NO	☐ N/A
Gas regulators installed minimum 10 feet of pipe from the boilers?	☐ YES	☐ NO	☐ N/A
#2 Fuel Oil supply and return piping completed and leak tested?	☐ YES	☐ NO	☐ N/A
#2 Fuel Oil filtration installed per IOM requirements?	☐ YES	☐ NO	☐ N/A
Foot valve has been installed in the supply line in the #2 Fuel Oil tank?	☐ YES	☐ NO	☐ N/A

SITE SIGN-OFF		DATE:	
PRINT NAME		TITLE:	

When complete, return a copy to your Fulton Representative and/or the service organization performing commissioning ("start-up") services.

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INSTALLATION & OPERATION "START-UP" REPORT

NOTE:
TO BE COMPLETED BY A FACTORY AUTHORIZED TECHNICIAN HOLDING A VALID VTG CERTIFICATE OF REGISTRATION. WARRANTY COVERAGE IS VALID ONLY IF THIS FORM IS SUCCESSFULLY COMPLETED AND RETURNED TO FULTON WITHIN TWELVE WEEKS OF START-UP.

DATE		FULTON REP.	
TECHNICIAN		CUSTOMER	
TECH. COMPANY		CONTACT NAME	
TECH CERTIFICATE #		CITY, STATE	
BOILER MODEL		PHONE NUMBER	
NATIONAL BOARD #		E-MAIL	

GENERAL:

Boiler room pressure (Note: Must be neutral pressure)	_____ INCHES WC
Condensate trap height	_____ INCHES
For setpoints <100°F is LMV parameter 545 set to "30"?	☐ YES ☐ NO ☐ N/A
Is boiler motor rotation correct?	☐ YES ☐ NO
Is an oil filter, check valve and shut-off valve installed per Figure 17/18?	☐ YES ☐ NO ☐ N/A
Oil pump inlet (suction side) pressure	_____ PSI ☐ N/A

COMBUSTION AIR SUPPLY FROM BOILER ROOM ONLY:

If boiler room, what is the Upper Louver Size? (In inches)	LENGTH _____ HEIGHT
If boiler room, what is the Lower Louver Size?	LENGTH _____ HEIGHT _____
Combustion air louver type	☐ FIXED ☐ MOTORIZED
If motorized, are they interlocked with the boilers?	☐ YES ☐ NO ☐ N/A

COMBUSTION AIR SUPPLY DUCTED DIRECTLY TO BOILER ONLY:

Combustion air intake material type (ie: PVC, Spiral Metal Duct, etc.)	_____
Air intake termination location	☐ ROOFTOP ☐ SIDEWALL
Intake configuration	☐ INDIVIDUAL ☐ COMMON
Combustion air intake ducting diameter	_____ INCHES
Combustion air intake ducting length	_____ FEET
Combustion air intake elbow quantity	45'S _____ 90'S _____
Horizontal separation between intake and exhaust termination	_____ FEET
Vertical separation between intake and exhaust termination	_____ FEET

FLUE GAS EXHAUST VENT CONFIGURATION:

Flue Gas Exhaust Venting (ie: CAT II/IV, AL29 - 4C or 316L SS)	_____
Exhaust termination location	☐ ROOFTOP ☐ SIDEWALL
Exhaust configuration	☐ INDIVIDUAL ☐ COMMON
Venting inside diameter	_____ INCHES
Total Venting length (Rise + Run)	_____ FEET
Vertical rise only	_____ FEET
Elbows quantity	45'S _____ 90'S _____
If common vented, is an exhaust fan installed?	☐ YES ☐ NO
What Is The Set Pressure Of The Fan?	_____ INCHES WC
Common vent pressure with all the boilers on at...	HIGH FIRE _____ LOW FIRE _____
Does the boiler have a modulating draft damper?	☐ YES ☐ NO
Does the common exhaust have a modulating draft damper?	☐ YES ☐ NO

SAFETY CHECKS: *Check all safeties below for proper operation and document the final settings.*

DEVICE	SETTING	OPERATIONAL
Low Water Safety		
Air Switch		
Low Gas Pressure Switch		
High Gas Pressure Switch		
Low Oil Pressure Switch		
High Oil Pressure Switch		

DEVICE	SETTING	OPERATIONAL
Blower Motor Overload		
Oil Pump Overload		
High Temperature Limit		
Temperature Controller		
Fuel Train Leak Test		
Proof of Closure (POC)		

MOTOR MEASUREMENTS:

	Amperage			Voltage		
LEGS :	L1	L2	L3	L1-L2	L1-L2	L1-L3
Blower Motor @ High Fire						
Oil Pump Motor						

PRIMARY FUEL COMBUSTION SETTINGS: *Natural Gas*

FIRING POSITION:	P0 LIGHT	P1 5:1	P2 3:1	P3	P4	P5	P6	P7	P8	P9 100%
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
O2 %										
CO2 %										
CO ppm										
NOx @ 3%										
Excess Air %										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC) *										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal **										

** Use only a Slack Tube® Manometer or equivalent. The use of a digital manometer is not recommended.*

*** Where applicable*

ALARM HISTORY (SIEMENS LMV3)

Parameter	Error Code	Diagnostic Code	Error Class	Error Phase	Startup Counter	Output	Description of Fault
701							
702							

OPERATING HISTORY (SIEMENS LMV3)

P-161 Total Faults	
P-162 Operating Hours	
P-166 Number of Startups	

LO-HI-LO SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Lo-Hi-Lo (Staged)*

FIRING POSITION:	P0 LIGHT	P1 STAGE 1	P2 ON	P2 STAGE 2	P2 OFF
Oil Pump Pressure (psi)					
Oil Return Pressure (psi)					
Combustion Head Setting					
Air Position					
Fan Discharge Pressure (InWC)					
Smoke Spot (Scale Number)					
O2 %					
CO2 %					
CO ppm					
Boiler Room Ambient Temp. ºF					
Combustion Air Temp. ºF					
Stack Temperature ºF					
Stack Draft (InWC)					
Outlet Water Temp. ºF					
Main Flame Signal					

MODULATED SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Modulated or Propane (Circle One)*

FIRING POSITION:	P0 LIGHT	P1	P2	P3	P4	P5	P6	P7	P8	P9 100%
Oil Pump Pressure (psi)										
Oil Return Pressure (psi)										
Combustion Head Setting										
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
Smoke Spot (Scale Number)										
O2 %										
CO2 %										
CO ppm										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC)										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal										

When complete, please return a copy to Fulton:

The Fulton Companies
ATTN: FHS Service Coordinator
972 Centerville Road
Pulaski, New York 13142

Phone: (315) 298-5121 • Fax: (315) 298-6390

NOTE: ***Submission of this report is not an acceptance or approval of the technician's work and recorded data. Recieved reports will be filed but may not be reviewed by technical service.***

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Fulton®

ANNUAL MAINTENANCE CHECKLIST

NOTE:
TO BE COMPLETED BY A FACTORY AUTHORIZED TECHNICIAN HOLDING A VALID VTG CERTIFICATE OF REGISTRATION.

DATE		TECH CERTIFICATE #	
TECHNICIAN		BOILER MODEL	
TECH. COMPANY		NATIONAL BOARD #	

ANNUAL MAINTENANCE:

Pilot and ignition electrode position verified	☐ COMPLETE
Low water probe(s) removed, cleaned, and reinstalled	☐ COMPLETE
Special gas vent system inspected	☐ COMPLETE
Combustion air intake system inspected	☐ COMPLETE
Safety relief valve tested, replace if it does not fully reseat	☐ COMPLETE
Open factory Service Bulletin(s) addressed (where applicable)	☐ COMPLETE
Third pass (lower section) inspected, cleaned if necessary (oil fired only)	☐ COMPLETE
Safety checks table completed	*(fill in table below)*
Combustion verification completed, adjust as necessary	*(fill in tables on reserve side)*
Upper Door (first/second pass) hardware torque verified	☐ COMPLETE
Lower Door (third pass) hardware torque verified	☐ COMPLETE

WATER CHEMISTRY:

pH (8.5-10.5)	_____
Oxygen (<250 ppb)	_____ ppb
Iron/Copper (<5 ppm)	_____ ppm
Chloride (<200 ppm)	_____ ppm
Hardness (<60 ppm)	_____ ppm
Gylcol %	_____ %

SAFETY CHECKS: *Check all safeties below for proper operation and document the final settings.*

DEVICE	SETTING	OPERATIONAL
Low Water Safety		
Air Switch		
Low Gas Pressure Switch		
High Gas Pressure Switch		
Low Oil Pressure Switch		
High Oil Pressure Switch		

DEVICE	SETTING	OPERATIONAL
Blower Motor Overload		
Oil Pump Overload		
High Temperature Limit		
Temperature Controller		
Fuel Train Leak Test		
Proof of Closure (Doc)		

PRIMARY FUEL COMBUSTION SETTINGS: *Natural Gas*

FIRING POSITION:	P0 LIGHT	P1 5:1	P2 3:1	P3	P4	P5	P6	P7	P8	P9 100%
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
O2 %										
CO2 %										
CO ppm										
NOx @ 3%										
Excess Air %										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC) *										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal **										

** Use only a Slack Tube® Manometer or equivalent. The use of a digital manometer is not recommended.*
*** Where applicable*

ALARM HISTORY (SIEMENS LV3)

Parameter	Error Code	Diagnostic Code	Error Class	Error Phase	Startup Counter	Output	Description of Fault
701							
702							

OPERATING HISTORY)SIEMENS LMV3)

P-161 Total Faults	
P-162 Operating Hours	
P-166 Number of Startups	

(Continued on next page for second fuel parameters)

LO-HI-LO SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Lo-Hi-Lo (Staged)*

FIRING POSITION:	P0 LIGHT	P1 STAGE 1	P2 ON	P2 STAGE 2	P2 OFF
Oil Pump Pressure (psi)					
Oil Return Pressure (psi)					
Combustion Head Setting					
Air Position					
Fan Discharge Pressure (InWC)					
Smoke Spot (Scale Number)					
O2 %					
CO2 %					
CO ppm					
Boiler Room Ambient Temp. ºF					
Combustion Air Temp. ºF					
Stack Temperature ºF					
Stack Draft (InWC)					
Outlet Water Temp. ºF					
Main Flame Signal					

MODULATED SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Modulated or Propane (Cirlce One)*

FIRING POSITION:	P0 LIGHT	P1	P2	P3	P4	P5	P6	P7	P8	P9 100%
Oil Pump Pressure (psi)										
Oil Return Pressure (psi)										
Combustion Head Setting										
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
Smoke Spot (Scale Number)										
O2 %										
CO2 %										
CO ppm										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC)										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal										

When complete, please keep this form with the boiler and store a record copy in a safe location. Accurate and complete combustion and maintenance records detailing compliance with the Installation, Operation, and Maintenance Manual must be produced for warranty consideration. Please use photocopies or consult your local Fulton Representative for additional copies of this form.

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Fulton®

ANNUAL MAINTENANCE CHECKLIST

NOTE:
TO BE COMPLETED BY A FACTORY AUTHORIZED TECHNICIAN HOLDING A VALID VTG CERTIFICATE OF REGISTRATION.

DATE		TECH CERTIFICATE #	
TECHNICIAN		BOILER MODEL	
TECH. COMPANY		NATIONAL BOARD #	

ANNUAL MAINTENANCE:

Pilot and ignition electrode position verified	☐ COMPLETE
Low water probe(s) removed, cleaned, and reinstalled	☐ COMPLETE
Special gas vent system inspected	☐ COMPLETE
Combustion air intake system inspected	☐ COMPLETE
Safety relief valve tested, replace if it does not fully reseat	☐ COMPLETE
Open factory Service Bulletin(s) addressed (where applicable)	☐ COMPLETE
Third pass (lower section) inspected, cleaned if necessary (oil fired only)	☐ COMPLETE
Safety checks table completed	*(fill in table below)*
Combustion verification completed, adjust as necessary	*(fill in tables on reserve side)*
Upper Door (first/second pass) hardware torque verified	☐ COMPLETE
Lower Door (third pass) hardware torque verified	☐ COMPLETE

WATER CHEMISTRY:

pH (8.5-10.5)	_____
Oxygen (<250 ppb)	_____ ppb
Iron/Copper (<5 ppm)	_____ ppm
Chloride (<200 ppm)	_____ ppm
Hardness (<60 ppm)	_____ ppm
Gylcol %	_____ %

SAFETY CHECKS: *Check all safeties below for proper operation and document the final settings.*

DEVICE	SETTING	OPERATIONAL
Low Water Safety		
Air Switch		
Low Gas Pressure Switch		
High Gas Pressure Switch		
Low Oil Pressure Switch		
High Oil Pressure Switch		

DEVICE	SETTING	OPERATIONAL
Blower Motor Overload		
Oil Pump Overload		
High Temperature Limit		
Temperature Controller		
Fuel Train Leak Test		
Proof of Closure (Doc)		

PRIMARY FUEL COMBUSTION SETTINGS: *Natural Gas*

FIRING POSITION:	P0 LIGHT	P1 5:1	P2 3:1	P3	P4	P5	P6	P7	P8	P9 100%
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
O2 %										
CO2 %										
CO ppm										
NOx @ 3%										
Excess Air %										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC) *										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal **										

** Use only a Slack Tube® Manometer or equivalent. The use of a digital manometer is not recommended.*
*** Where applicable*

ALARM HISTORY (SIEMENS LV3)

Parameter	Error Code	Diagnostic Code	Error Class	Error Phase	Startup Counter	Output	Description of Fault
701							
702							

OPERATING HISTORY)SIEMENS LMV3)

P-161 Total Faults	
P-162 Operating Hours	
P-166 Number of Startups	

(Continued on next page for second fuel parameters)

LO-HI-LO SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Lo-Hi-Lo (Staged)*

FIRING POSITION:	P0 LIGHT	P1 STAGE 1	P2 ON	P2 STAGE 2	P2 OFF
Oil Pump Pressure (psi)					
Oil Return Pressure (psi)					
Combustion Head Setting					
Air Position					
Fan Discharge Pressure (InWC)					
Smoke Spot (Scale Number)					
O2 %					
CO2 %					
CO ppm					
Boiler Room Ambient Temp. ºF					
Combustion Air Temp. ºF					
Stack Temperature ºF					
Stack Draft (InWC)					
Outlet Water Temp. ºF					
Main Flame Signal					

MODULATED SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Modulated or Propane (Cirlce One)*

FIRING POSITION:	P0 LIGHT	P1	P2	P3	P4	P5	P6	P7	P8	P9 100%
Oil Pump Pressure (psi)										
Oil Return Pressure (psi)										
Combustion Head Setting										
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
Smoke Spot (Scale Number)										
O2 %										
CO2 %										
CO ppm										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC)										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal										

When complete, please keep this form with the boiler and store a record copy in a safe location. Accurate and complete combustion and maintenance records detailing compliance with the Installation, Operation, and Maintenance Manual must be produced for warranty consideration. Please use photocopies or consult your local Fulton Representative for additional copies of this form.

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ANNUAL MAINTENANCE CHECKLIST

NOTE:
TO BE COMPLETED BY A FACTORY AUTHORIZED TECHNICIAN HOLDING A VALID VTG CERTIFICATE OF REGISTRATION.

DATE		TECH CERTIFICATE #	
TECHNICIAN		BOILER MODEL	
TECH. COMPANY		NATIONAL BOARD #	

ANNUAL MAINTENANCE:

Pilot and ignition electrode position verified	☐ COMPLETE
Low water probe(s) removed, cleaned, and reinstalled	☐ COMPLETE
Special gas vent system inspected	☐ COMPLETE
Combustion air intake system inspected	☐ COMPLETE
Safety relief valve tested, replace if it does not fully reseat	☐ COMPLETE
Open factory Service Bulletin(s) addressed (where applicable)	☐ COMPLETE
Third pass (lower section) inspected, cleaned if necessary (oil fired only)	☐ COMPLETE
Safety checks table completed	*(fill in table below)*
Combustion verification completed, adjust as necessary	*(fill in tables on reserve side)*
Upper Door (first/second pass) hardware torque verified	☐ COMPLETE
Lower Door (third pass) hardware torque verified	☐ COMPLETE

WATER CHEMISTRY:

pH (8.5-10.5)	_____
Oxygen (<250 ppb)	_____ ppb
Iron/Copper (<5 ppm)	_____ ppm
Chloride (<200 ppm)	_____ ppm
Hardness (<60 ppm)	_____ ppm
Gylcol %	_____ %

SAFETY CHECKS: *Check all safeties below for proper operation and document the final settings.*

DEVICE	SETTING	OPERATIONAL
Low Water Safety		
Air Switch		
Low Gas Pressure Switch		
High Gas Pressure Switch		
Low Oil Pressure Switch		
High Oil Pressure Switch		

DEVICE	SETTING	OPERATIONAL
Blower Motor Overload		
Oil Pump Overload		
High Temperature Limit		
Temperature Controller		
Fuel Train Leak Test		
Proof of Closure (Doc)		

PRIMARY FUEL COMBUSTION SETTINGS: *Natural Gas*

FIRING POSITION:	P0 LIGHT	P1 5:1	P2 3:1	P3	P4	P5	P6	P7	P8	P9 100%
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
O2 %										
CO2 %										
CO ppm										
NOx @ 3%										
Excess Air %										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC) *										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal **										

** Use only a Slack Tube® Manometer or equivalent. The use of a digital manometer is not recommended.*
*** Where applicable*

ALARM HISTORY (SIEMENS LV3)

Parameter	Error Code	Diagnostic Code	Error Class	Error Phase	Startup Counter	Output	Description of Fault
701							
702							

OPERATING HISTORY)SIEMENS LMV3)

P-161 Total Faults	
P-162 Operating Hours	
P-166 Number of Startups	

(Continued on next page for second fuel parameters)

LO-HI-LO SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Lo-Hi-Lo (Staged)*

FIRING POSITION:	P0 LIGHT	P1 STAGE 1	P2 ON	P2 STAGE 2	P2 OFF
Oil Pump Pressure (psi)					
Oil Return Pressure (psi)					
Combustion Head Setting					
Air Position					
Fan Discharge Pressure (InWC)					
Smoke Spot (Scale Number)					
O2 %					
CO2 %					
CO ppm					
Boiler Room Ambient Temp. ºF					
Combustion Air Temp. ºF					
Stack Temperature ºF					
Stack Draft (InWC)					
Outlet Water Temp. ºF					
Main Flame Signal					

MODULATED SECOND FUEL COMBUSTION SETTINGS: *#2 Fuel Oil Modulated or Propane (Cirlce One)*

FIRING POSITION:	P0 LIGHT	P1	P2	P3	P4	P5	P6	P7	P8	P9 100%
Oil Pump Pressure (psi)										
Oil Return Pressure (psi)										
Combustion Head Setting										
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
Smoke Spot (Scale Number)										
O2 %										
CO2 %										
CO ppm										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC)										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal										

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Fulton®

ANNUAL MAINTENANCE CHECKLIST

NOTE:
TO BE COMPLETED BY A FACTORY AUTHORIZED TECHNICIAN HOLDING A VALID VTG CERTIFICATE OF REGISTRATION.

DATE		TECH CERTIFICATE #	
TECHNICIAN		BOILER MODEL	
TECH. COMPANY		NATIONAL BOARD #	

ANNUAL MAINTENANCE:

Pilot and ignition electrode position verified	☐ COMPLETE
Low water probe(s) removed, cleaned, and reinstalled	☐ COMPLETE
Special gas vent system inspected	☐ COMPLETE
Combustion air intake system inspected	☐ COMPLETE
Safety relief valve tested, replace if it does not fully reseat	☐ COMPLETE
Open factory Service Bulletin(s) addressed (where applicable)	☐ COMPLETE
Third pass (lower section) inspected, cleaned if necessary (oil fired only)	☐ COMPLETE
Safety checks table completed	*(fill in table below)*
Combustion verification completed, adjust as necessary	*(fill in tables on reserve side)*
Upper Door (first/second pass) hardware torque verified	☐ COMPLETE
Lower Door (third pass) hardware torque verified	☐ COMPLETE

WATER CHEMISTRY:

pH (8.5-10.5)	_____
Oxygen (<250 ppb)	_____ ppb
Iron/Copper (<5 ppm)	_____ ppm
Chloride (<200 ppm)	_____ ppm
Hardness (<60 ppm)	_____ ppm
Gylcol %	_____ %

SAFETY CHECKS: *Check all safeties below for proper operation and document the final settings.*

DEVICE	SETTING	OPERATIONAL
Low Water Safety		
Air Switch		
Low Gas Pressure Switch		
High Gas Pressure Switch		
Low Oil Pressure Switch		
High Oil Pressure Switch		

DEVICE	SETTING	OPERATIONAL
Blower Motor Overload		
Oil Pump Overload		
High Temperature Limit		
Temperature Controller		
Fuel Train Leak Test		
Proof of Closure (Doc)		

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Fan Discharge Pressure (InWC)										
O2 %										
CO2 %										
CO ppm										
NOx @ 3%										
Excess Air %										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC) *										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal **										

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Oil Pump Pressure (psi)					
Oil Return Pressure (psi)					
Combustion Head Setting					
Air Position					
Fan Discharge Pressure (InWC)					
Smoke Spot (Scale Number)					
O2 %					
CO2 %					
CO ppm					
Boiler Room Ambient Temp. ºF					
Combustion Air Temp. ºF					
Stack Temperature ºF					
Stack Draft (InWC)					
Outlet Water Temp. ºF					
Main Flame Signal					

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Oil Pump Pressure (psi)										
Oil Return Pressure (psi)										
Combustion Head Setting										
Fuel Position										
Air Position										
Supply Gas Pressure (InWC)										
Manifold Gas Pressure (InWC)										
Pilot Gas Pressure (InWC)										
Fan Discharge Pressure (InWC)										
Smoke Spot (Scale Number)										
O2 %										
CO2 %										
CO ppm										
Room Ambient Temp. ºF										
Combustion Air Temp. ºF										
Stack Temperature ºF										
Stack Draft (InWC)										
Outlet Water Temp. ºF										
Main Flame Signal										
Pilot Flame Signal										

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