



Specification Rev. 01/17/2022
ALTA Condensing Boilers and Combi
with Gas-adaptive Technology

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1-GENERAL

1.1 Description

- a. Boiler. An appliance for space heating. A wall-hung, gas-fired, automatically-adapting, high efficiency, condensing watertube boiler including controls and required safety devices.

OR

- b. Boiler. A combination space heating and domestic hot water heating (DHW) appliance (Combi). A wall-hung, gas-fired, automatically-adapting, high efficiency, condensing watertube boiler including controls and required safety devices.

2-SOURCING

2-1 Approved Manufacturer and Models

- a. Boiler shall be manufactured by U.S. Boiler Company, Lancaster, PA
- b. Installed boiler model shall be an (select model from list at right) Heating-only models: ALTA-120, ALTA-150, ALTA-180. Combi models: ALTAC-136, ALTAC-200.
- c. The contractor shall insure that any substituted equipment is equivalent in fit, form and function to the equipment in this specification. The cost and responsibility of any additional work caused by the substitution of equipment shall be borne by the Contractor.
- d. Also refer to Equipment Schedule in the Contract Drawings.

3-DOCUMENTATION

3.1 Documentation

- a. This specification is accompanied by additional documents including a current submittal package with boiler literature, Installation, Operating and Service instructions, shop drawings, site application specifications, wiring diagrams, piping diagrams and other related work materials.
- b. This specification is not an instructions document, but refers to the “manual” which serves as the official INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS (I,O&S) document.

4-PRODUCT SPECIFICATIONS

4-1 References and Requirements

- a. Boiler shall be used in forced circulation hot water heating systems requiring supply water temperatures of 180°F or less.
- b. Boiler shall be expertly installed by a qualified heating installer or service technician in accordance with the installation regulations and installer credentials enforced in the area of the installation site. The City of New York requires a Licensed Master Plumber to supervise the installation of this product. The Commonwealth of Massachusetts requires this product to be installed by a licensed Plumber or Gas fitter.
- c. Boiler shall comply with ANSI Z21.13 test standards for the United States and be AHRI-listed to verify compliance to the minimum efficiencies required by the U.S. Department of Energy (DOE).
- d. Installers shall consult authorities having jurisdiction at the installation site. Without an authority having jurisdiction, installation shall be per the manual and the National Fuel Gas Code, ANSI Z223.1/NFPA 54. In Canada, installation shall be in accordance with the CAN/CSA B149.1 Installation Code. Where required by authority having jurisdiction, this installation shall conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers (ANSI/ASME CSD-1).
- e. Boiler shall be approved by the Massachusetts Board of Plumbers and Gas Fitters, if required by project.
- f. All wiring and grounding shall be done in accordance with the authority having jurisdiction and with the National Electrical Code (ANSI/NFPA 70. In Canada, all wiring and grounding must be done in accordance with the Canadian Electrical Code, Part 1 (CSA C22.1 - latest edition).
- g. Boiler shall meet the ENERGY STAR® guidelines for energy efficiency established by the United States Environmental Protection Agency (EPA).
- h. Boiler shall be mounted, vented, piped and wired properly per exact clearances, requirements and qualified materials documented in the manufacturer manual. Gas piping and connections shall also follow the manual and lawfully conform to safety requirements.
- i. A boiler installed above radiation level or as required by the authority having jurisdiction shall be installed with low water cutoff device ([Select U.S. Boiler optional accessory item number at right](#)) [Auto reset LWCO- 105591-01](#) or [Manual reset LWCO- 108182-01](#)
- j. Boiler shall be capable of installation with exhaust venting made with either CPVC, PVC or Polypro material as specified, assembled and listed in the manufacturer instructions.
- k. PVC material shall never be used in exhaust venting, except for installations outside of Canada, when a field-supplied schedule 80 CPVC 90° elbow and a 30-inch length of schedule 40 CPVC pipe are installed, per manufacturer instructions, as a transition from the boiler vent connection to traditional solid core schedule 40 PVC vent material (ASTM D2665). CPVC starter vent kit from U.S. Boiler Company ([Select either 107039-01 \(2" diameter\) or 107039-02 \(3" diameter\)](#)) shall be used for this purpose or equivalent CPVC starter components shall be selected as substitutes all complying with manufacturer instructions and component listings.
- l. Cellular core PVC (ASTM F891), cellular core CPVC and Radel (polyphenolsulfone) are prohibited and shall never be used for exhaust or intake piping.
- m. Canadian jurisdictions that require venting be listed to ULC S636-2008 must use listed ULC S636 Class IIB venting.

- n. This boiler needs fresh air for safe operation and shall be installed with intake vent piping for adequate combustion and ventilation air. Intake vent terminations shall not be in an area exposed to chemicals or other contaminants on the avoidance list in the boiler installation manual.
- o. Boiler installation shall always include a safety relief valve installed in the boiler supply piping as specified in the manufacturer's instruction manual.
- p. Boiler shall operate properly with a minimum gas pressure of 2.5 inch w.c. (0.62 kPa) for natural gas or 8.0 inch w.c (1.99 kPa) for LP gas and a maximum gas pressure of 14.0 inch w.c. (3.48 kPa) for natural gas or LP gas. Installing contractors should verify this gas pressure with and without appliance fuel draw.
- q. Boiler shall be listed for 0 to 2,000 ft. This boiler shall not be installed over 2000 feet.
- r. Boiler shall not be used in gravity hot water systems or systems containing significant amounts of dissolved oxygen.

4-2 Construction and Components

- a. Boiler shall be a high efficiency, gas-fired direct vent, sealed combustion heating boiler appliance conforming to the specifications and component listings described, pictured and in tables throughout this document.
- b. Boiler shall include a high efficiency, condensing, stainless steel, watertube pressure vessel as a primary heat exchanger bearing the ASME "H" stamp. It shall be a deep-cleaning, quick-access design. The maximum allowable working pressure (MAWP) for this heat exchanger shall be 50 PSI.
- c. Each combi model shall also include a DHW hydro block including a pre-installed boiler loop circulator with 3-way valve to switch the boiler loop to run through the boiler's pre-installed domestic hot water flat-plate heat exchanger. This flat plate heat exchanger shall be detachable with two screws for easy service.
- d. Boiler shall have an intelligent, scalable Alta Boiler Control (ABC) configured on a fuse-protected printed circuit board that includes an LCD display and adjacent oversized user interface buttons.
- e. Boiler control shall monitor flame ionization to automatically set the gas valve to a correct air-fuel ratio and allow "No touch" adaptive combustion setup without manual throttle or offset adjustments. Automatic self-calibration shall also provide continuous, safe, clean combustion by adapting to many levels of component wear, variations in fuel, environment, and vent air pressure
- f. Boiler shall include an electronic gas valve and a variable speed blower system to precisely control fuel/air mixture for maximum efficiency and be capable of fully modulating firing rates exceeding 8.8:1 for Heating-only boilers and 10:1 turndown on DHW for Combi Boilers.
- g. Boiler shall be fabricated with a non-plastic metal jacket including a finished front panel. Boiler finish shall be a rust resistant powder coat on selected surfaces.
- h. Boiler shall include a sensor-less, rate-based reset function requiring no mechanical field installation. This feature shall assess necessary environmental conditions, and continually adjust boiler operation for comfort, efficiency, and to reduce boiler wear and tear caused by short-cycling.
- i. Boiler front and side panels shall be removable using a total of six fasteners to enable full-service access through the vacant panel space if recommended clearance is provided.
- j. Boiler protection shall include electrical component separation from incoming combustion air and gas, likely to contain excess humidity, dust and other contaminants brought through ducted combustion air.

- k. Boiler shall include a UL-353 listed heating water flow switch and high limit protection provided with the boiler. This limit causes boiler shutdown if the boiler water temperature exceeds the set point of the limit control.
- l. On each combi model, the boiler combi block shall include a precision DHW flow sensor to detect DHW demand quickly. A DHW flow switch shall not be used in place of this precision DHW flow sensor.
- m. Each combi model shall include an air vent to help remove air from the system.
- n. Boiler shall include an air pressure switch to prove that the exhaust vent is unobstructed.
- o. Boiler shall include a universal vent connector, heat exchanger gasket, and jacket vent gasket inside the boiler crate for attachment in the field by installation technicians. This universal vent shall be connectable to approved CPVC or Polypro venting.
- p. Boiler shall include an integral condensate trap.
- q. Boiler shall be shipped from the factory configured for natural gas. This factory-built boiler shall not require a conversion kit to complete a simple natural gas-to-LP conversion. Instead this conversion shall be completed in two steps with a: 1- 2.5mm hex wrench tool at the gas valve accompanied by a 2- Control display setting change.
- r. Combi boiler shall have an integral Flow Limiter (6 GPM) to limit an undesirable DHW water temperature drop during high DHW demand. .
- s. Boiler shall be equipped with a wiring diagram attached to the boiler jacket in a documentation packet.
- t. Boiler shall be factory-assembled, fire-tested and shipped as a factory-packaged unit.
- u. Boiler shall include these additional components in separate packaging inside the boiler crate for final field assembly or use by installation technicians.
 - Vent connector and test port
 - Wall-mounting bracket, retaining clips and hardware
 - Temperature/pressure gage
 - 30 psi safety relief valve
 - Drain valve
 - Gas connection adapter
 - Gas shutoff valve
 - (Heating-only models) Grundfos 26-99 circulator or equivalent.
 - (Combi only) Alta FastPipe pre-made primary/secondary manifold
 - (Combi only) Domestic hot water connectors, G 1/2" (BSSP) to 3/4" (Quantity: 2) (for use with field-supplied 3/4" sweat elbows to turn water piping toward the boiler wall.)

4.3 Heating-only Boiler Product Specifications

- a. Ratings- Installed heating-only boiler models shall meet the performance characteristics shown in the rating table below:

					
Model Number	Input ¹ (MBH)		DOE Heating Capacity (MBH)	AHRI Net Rating ² (MBH)	AFUE
	Min	Max			
ALTA-120	13.6	120	112	97	95
ALTA-150	20	150	141	123	95
ALTA-180	20	180	169	147	95

¹ Input for elevations up to 2,000 ft. (610 m) with min vent length. See Table 3-3 for derate at max vent length.

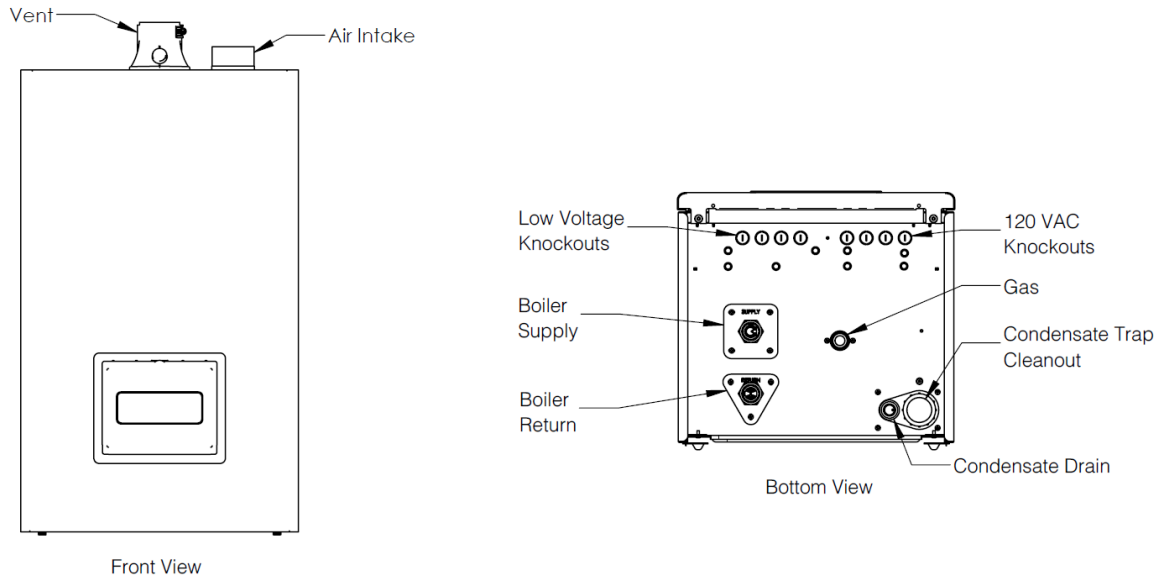
² Net AHRI Water Ratings shown are based on a piping and pickup allowance of 1.15. The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent operation, extensive piping systems, etc.

- b. Dimensions- Each heating-only boiler shall be installed per the manufacturer's instructions and meet the corresponding criteria shown in the tables and figures below.

Model Number	Depth in. (mm)	Width in. (mm)	Height in. (mm)	Space Heating Water sweat, in.	Gas NPT	Maximum Allowable Working Pressure psig (kPa)
ALTA-120	16.3 (413)	17.8 (453)	29.8 (757)	1	1/2	50 (345)
ALTA-150	20.4 (518)	17.8 (453)	29.8 (757)	1	1/2	50 (345)
ALTA-180	20.4 (518)	17.8 (453)	29.8 (757)	1	1/2	50 (345)

Table 3-3: Air Intake and Vent Lengths

Model Number	Intake/Vent Size in. (mm)		Min Length ft. (m)	Max Length ft. (m)	Approx. Derate at Max. Length (%)
ALTA-120	Standard	2 (60)	2.5 (0.76)	70 (21.3)	7
	w/ increaser	3 (80)	2.5 (0.76)	135 (41.1)	1
ALTA-150 ALTA-180	Standard	2 (60)	2.5 (0.76)	70 (21.3)	9
	w/ increaser	3 (80)	2.5 (0.76)	135 (41.1)	5



4.4 Combi Boiler Product Specifications

- a. Ratings-Installed combi boiler models shall meet the performance characteristics shown in the rating table below:

Space Heating Ratings						Domestic Hot Water (DHW) Ratings ¹					
C AHRI CERTIFIED® www.ahridirectory.org											
Model Number	Input ² (MBH)		DOE Heating Capacity (MBH)	AHRI Net Rating ³ (MBH)	AFUE	Input ² (MBH)		Hot Water Draw Limits GPM (L/min) ²			
	Min	Max				Min	Max	Max			Min ⁴
								70°F (39°C) Rise	77° (43°C) Rise	90°F (50°C) Rise	
ALTAC-136	13.6	120	112	97	95.0	13.6	136	3.7 (14)	3.4 (13)	2.9 (11)	0.5 (2)
ALTAC-200	20	150	141	123	95.0	20	200	5.2 (19.6)	4.7 (17.8)	4.0 (15)	0.5 (2)

¹ DHW ratings are not AHRI certified.

² Input and DHW draw limits for elevations up to 2,000 ft. (610 m) with min vent length. See Table 3-3 for derate at max vent length.

³ Net AHRI Water Ratings shown are based on a piping and pickup allowance of 1.15. The manufacturer should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent operation, extensive piping systems, etc.

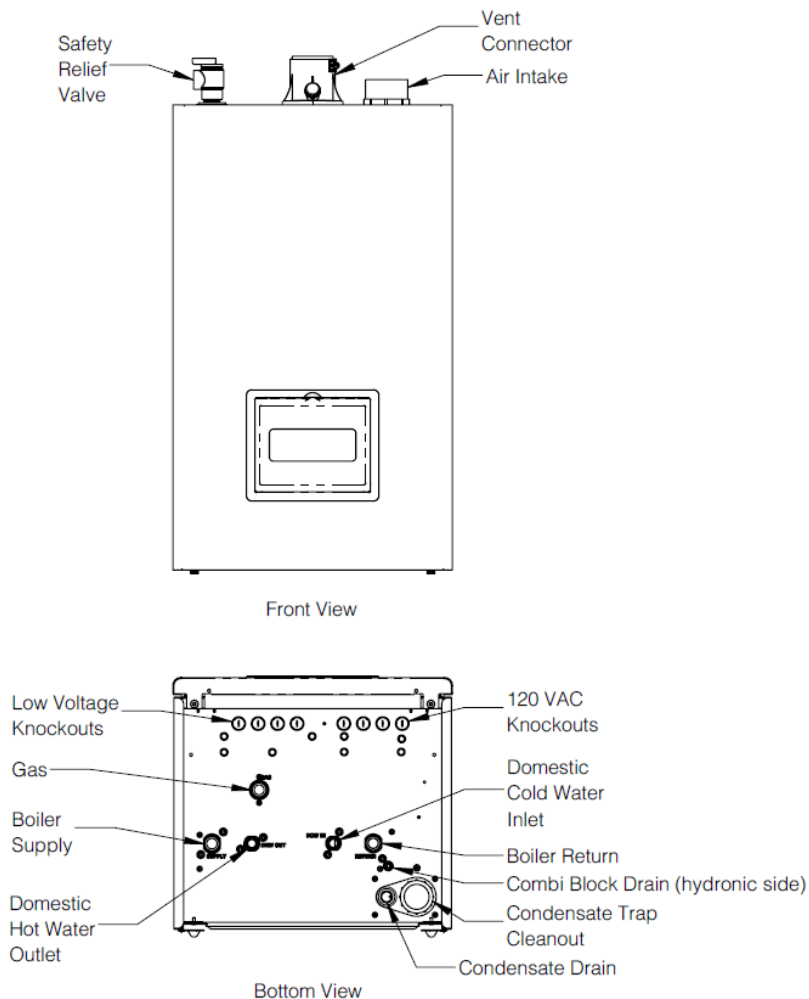
⁴ Min DHW flow rate required through boiler to initiate DHW demand. Higher flow rate through fixture may be require due to mixing at tempering valve and/or fixture itself.

- b. Dimensions- Each combi boiler shall be installed per the manufacturer's instructions and meet the corresponding criteria shown in the tables and figures below.

Model Number	Depth in. (mm)	Width in. (mm)	Height in. (mm)	Space Heating Water sweat, in.	Domestic Water sweat, in.	Gas NPT	Relief Valve NPT	Maximum Allowable Working Pressure psig (kPa)
ALTAC-136	16.3 (413)	17.8 (453)	29.8 (757)	1-1/4	3/4	1/2	3/4	50 (345)
ALTAC-200	20.4 (518)	17.8 (453)	29.8 (757)	1-1/4	3/4	1/2	3/4	50 (345)

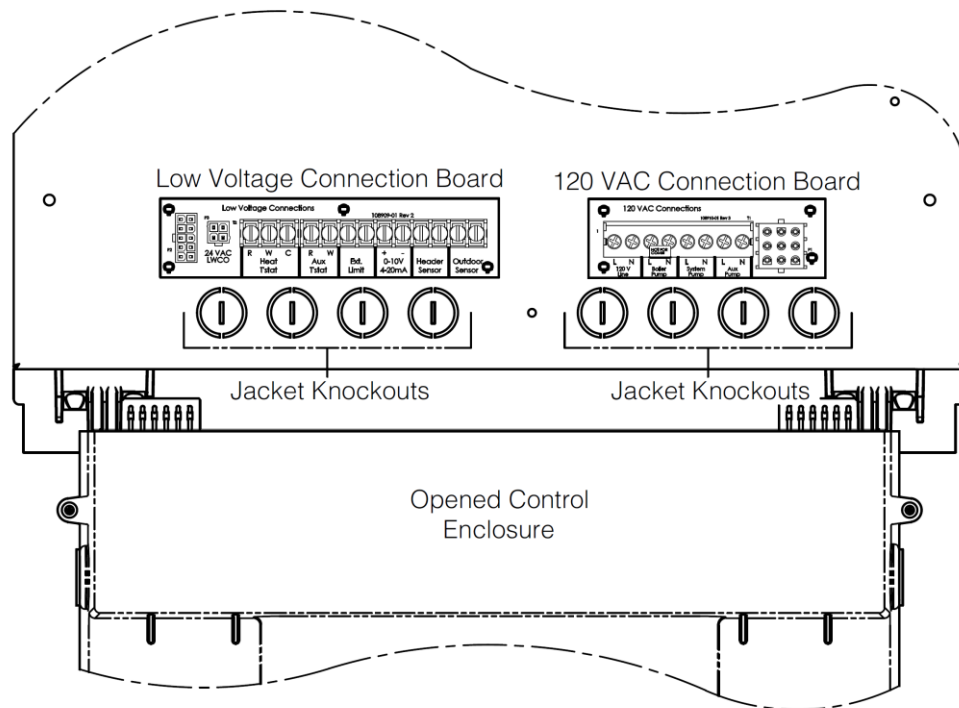
Table 3-3: Air Intake and Vent Lengths

Model Number	Intake/Vent Size in. (mm)		Min Length ft. (m)	Max Length ft. (m)	Approx. Derate at Max. Length (%)
ALTAC-136	Standard	2 (60)	2.5 (0.76)	70 (21.3)	7
	w/ increaser	3 (80)	2.5 (0.76)	135 (41.1)	1
ALTAC-200	Standard	2 (60)	2.5 (0.76)	70 (21.3)	9
	w/ increaser	3 (80)	2.5 (0.76)	135 (41.1)	5



4.5 Wiring and Sensors

- a. 120 VAC Line Voltage Connection Board- All line voltage field connections shall be connected to "120VAC Connections" terminal strip pictured.
- b. Low Voltage Connection Board- Commonly used low voltage field connections shall be connected to the "Low Voltage Connections" terminal strip pictured on the left.



4.6 Boiler Control; Capability and Functionality

- a. The control shall have the functions outlined below.

Control System Overview

The control manages all of the following boiler functions:

1. **Boiler Control**
Control simultaneously modulates blower speed and gas valve position to control firing rate and sequences up to three pumps to respond to DHW and CH demands.
2. **Flame Supervision/Air-Fuel Ratio Control**
Control is a "Gas-Adaptive system" that regulates air and gas flow mixture by measuring flame ionization and adjusting gas valve to achieve target air fuel ratio. This eliminates need to make throttle screw or offset adjustments. This system is self-calibrating and continuously maintains air fuel ratio at desired value.
3. **Domestic Hot Water**
When there is a DHW demand, system pump will operate per *P01* setting. Priority protection is provided to ensure heating system is also serviced.
4. **Central Heat**
CH demand is detected by a heating thermostat call for heat. When CH demand is detected, control starts boiler pump and modulates firing rate based on measured supply sensor and CH setpoint. Control can accept a second heating thermostat wired to the Aux T'stat input. CH demands have separate setpoint and maximum modulation rates.
5. **Sensorless Reset**
Control system monitors recent firing rate and burner cycle data to infer current building heat loss. Target supply water temperature is then adjusted to match this heat load. No outdoor sensor mounting or wiring is required. Boost feature increases operating temperature setpoint by 10°F (5.6°C) every 20 minutes CH demand is not satisfied. This process will continue until heat demand is satisfied (indoor air is at desired temperature), or CH setpoint is reached. Once heat demand is satisfied, operating setpoint reverts to value determined by the Outdoor Reset settings.
6. **Pump Exercise**
Connected pumps are automatically run for a 20 second exercise period after not being used for longer than 7 days. This helps prevent pump rotor seizing.
7. **Pump Air Elimination (Pump Purge)**
Pump purge is entered when power is cycled or when there has been an over temperature hold. During this state boiler pump cycles on and off every 5 seconds for two minutes to help remove air from boiler water piping. This may be interrupted by pressing the  **reset** button.
8. **Built-in Safety Control**
Control includes functions designed to ensure safe and reliable operation. In addition to flame supervision, control monitors supply water temperature, differential water temperature, and flue temperature safety limits. Boiler modulation is adjusted when required to help avoid loss of boiler operation due to exceeding limits. Additionally, control accepts field installation of external limits.
9. **Fuel Conversion**
The conversion from Natural Gas to LP Gas (or vice versa) is made by changing gas valve setting and a control parameter change on display; no external fuel conversion kit is required.
10. **Plug & Play" Multiple Boiler Control Sequencer**
When multiple boilers are installed, the Control's Sequencer may be used to coordinate and optimize the operation of up to eight (8) boilers. Boilers are connected into a "network" by simply "plugging in" standard ethernet cables into each boiler's "Boiler-To-Boiler Communication" RJ45 connection.
11. **Priority Demand**
Control accepts a call for heat from multiple places and responds to its "Priority". When more than one demand is present, higher priority demand is used to determine active boiler settings. For example, when DHW has priority, setpoint, "Diff Above", "Diff Below" and pump settings are taken from DHW selections. Active "Priority" is displayed on the Diagnostic Menu, item "C02", see Table 15-9.

4.7 User Interface/Resident LCD Display

- b. The control display screen shall display these characteristics below:

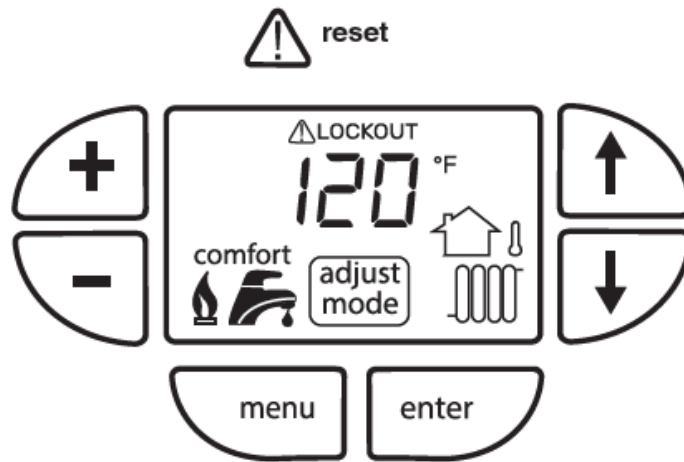


Figure 16-1: Display Icons

Table 16-2: Display descriptions

120°F	When not flashing or alternating display temperature is: • DHW outlet temperature during DHW priority. • Boiler supply temperature at all other times.
	Visible when Central Heating demand is present.
	Visible when DHW heating demand is present. Icon will flash if DHW setpoint is being adjusted.
	Visible when burner is firing. Icon adjacent to active priority.
comfort	Visible when DHW Comfort Mode is selected.
	Visible when Central Heating setpoint reset is enabled.
adjust mode	Visible when adjust mode is active. Icon will flash if manual mode is enabled.
LOCKOUT	Visible when manual reset lockout is active.

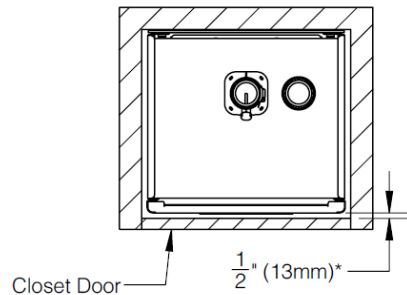
5- INSTALLATION SITE REQUIREMENTS

5-1 Clearance Requirements

- a. The boiler shall only be commissioned after satisfying the following ventilation air requirements and clearances.

Ventilation Air

- Combustion air must be obtained directly from outdoors, however ventilation openings may still be required to prevent overheating of boiler components if boiler is installed in small space such as a closet.
- If a 24" clearance from boiler sides, front, and bottom can be maintained with all doors to the boiler room closed, no ventilation openings are required.
- If 24" clearances described in (2) cannot be maintained, provide two openings into room, one near floor and other near ceiling. Top of upper opening to be within 12 in. (305 mm) of ceiling and bottom of lower opening within 12 in. (305 mm) of floor. Minimum free area 100 in.² (650 cm²) for each opening. This free area takes into account blocking effect of grills and louvers. If using screens, minimum screen size 1/4 in. (6.4 mm).



This boiler is listed for closet installation with the following clearances from the boiler jacket to combustible construction:

Top: 8 1/4" (210mm), Sides: 1/2" (13mm),

Front: 1/2" (13mm), Bottom: 6" (150mm)

Clearances also apply to non-combustible walls, doors, ceilings and floors.

Clearances from piping to combustible construction:

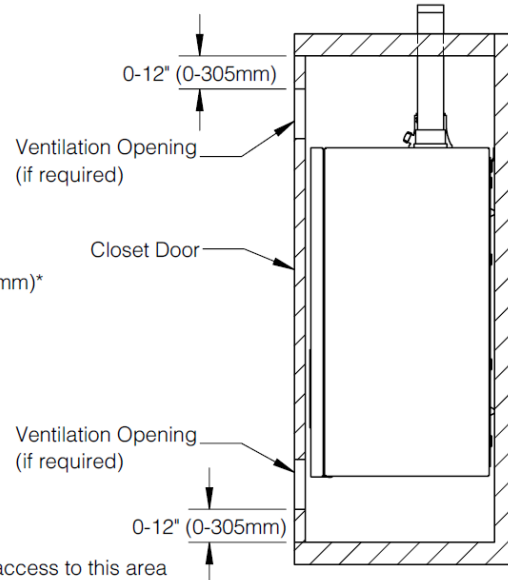
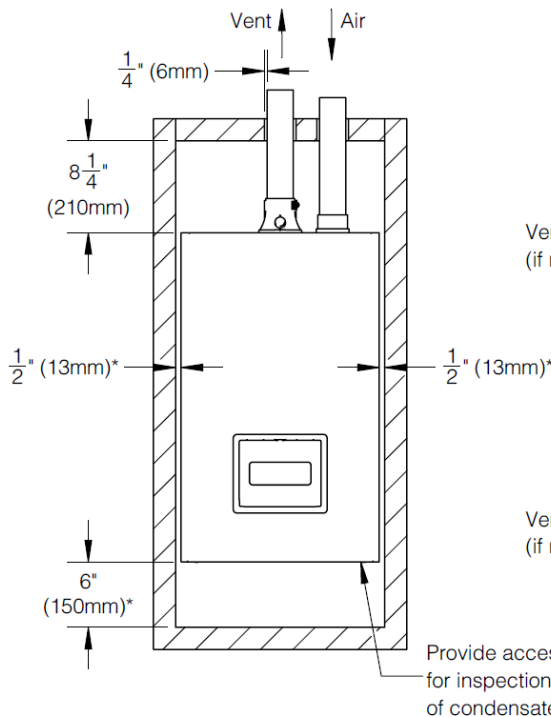
Non-Concentric Vent (exhaust): 1/4" (6mm)

Concentric Vent or Air Intake Piping: 0"

Hot Water Piping: 1/4" (6mm)

*Recommended Service Clearances:

Sides, Front and Bottom: 24" (610mm)



5-2 Water Chemistry Criteria and Recommendations.

- a. The boiler shall be installed and function using water with the following characteristics.

The heat exchanger used in this boiler is made from stainless steel coils having relatively narrow waterways. Once filled with water, it will be subjected to effects of corrosion as well as fouling from any debris introduced from the system. Take the following precautions to minimize chance of severe heat exchanger damage caused by corrosion and/or overheating.

1. **Flush system before connecting boiler.**

In a replacement installation, flushing system will remove impurities, such as sediment, solder flux, metal shavings and traces of old boiler additives. Even if system is new, do not omit this step – new systems will contain flux and may even contain other impurities listed above. Flush system completely and repeat if necessary to completely remove these contaminants. If necessary, a cleaning agent may be used to assist in system cleaning. See Section 14 Start-up and Checkout for recommended cleaners.

2. **Make sure the system is tight-**

this is the single most important guideline.

Tap water contains dissolved oxygen which causes corrosion. In a tight system, this oxygen comes out of solution and is quickly removed from system through automatic air vent. System then remains essentially free of oxygen.

If system is not tight, however, frequent additions of make-up water can expose heat exchanger to oxygen on a continuous basis. In addition, frequent additions of hard make-up water can cause calcium deposits to collect in heat exchanger, causing severe damage. To minimize additions of make-up water.

- A. Inspect system thoroughly for leaks before putting it into service.
- B. If system includes underground piping or other piping in which a leak might go undetected, consider isolating boiler from the system with a heat exchanger.
- C. Make sure expansion tank is properly sized and in good condition, if it is not, safety relief valve may open frequently, resulting in regular additions of make-up water.
- D. If an automatic fill valve is installed, installation of a water meter in fill line is strongly recommended so routine additions of make-up water can be detected and their cause corrected.

3. **Non-metallic tubing** - even if system is tight, oxygen can be introduced into system through some types of non-metallic tubing used in radiant or snow melt systems.

Other non-metallic tubing is equipped with an oxygen barrier to prevent migration of oxygen into water. If boiler is to be installed in a system containing non-metallic tubing without an oxygen barrier, it must be isolated from boiler with a heat exchanger.

4. Water chemistry, antifreeze, and boiler water additives – improper boiler water chemistry can cause the heat exchanger damage described above, as well as deterioration.
5. Avoid use of petroleum based boiler additives and ester-based oils/lubricants. These can attack seals in both boiler and system.

Freeze Protection

If this freeze protection is required, use the following or its equivalent:

- A. Fernox Alphi-11
- B. Sentinel X500 Inhibited Polypropylene Glycol

1. Refer to antifreeze manufacturer's instructions for required dosage. In general these products are a blend of glycol (for freeze protection) and inhibitors (to protect glycol from attacking metallic system components).
2. Do not add any more antifreeze than is necessary to protect system from freeze damage.
3. Maximum antifreeze concentration 50%.
4. Test antifreeze and inhibitor concentration annually.
 - A. Inhibitor concentration test kit for Fernox Protector F1, 25 tests per kit. P/N 101148-01.
 - B. Inhibitor, Fernox Protector F1, 1 pint (500 mL) P/N 101147-01.
5. Allowance must be made for additional expansion of glycol solution.
6. Fernox products are available from:
Alent PLC Consumer Products Division
4100 6th Avenue
Altoona, PA 16602
Tel: (972) 547-6002
Email: fernox_usa@alent.com
7. Sentinel products are available from:
Douglas Products and Packaging
1550 E. Old 210 Highway
Liberty, MO 64068
Tel: (877) 567-2560 (Toll Free) and/or selected HVAC distributors