Peerless® Combi 160™

Gas Boiler

As an ENERGY STAR® Partner, PB Heat, LLC has determined that this product meets the ENERGY STAR guidelines for energy efficiency.

WARNING!!!
This manual must be used by a qualified heating installer/service technician. Read all instructions, including this manual, before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death, or substantial property damage.

Save this manual for future reference.

Installation, Operation & Maintenance Manual

PeerlessBoilers.com

INSTALLER, THESE INSTRUCTIONS TO BE AFFIXED ADJACENT TO THE BOILER.

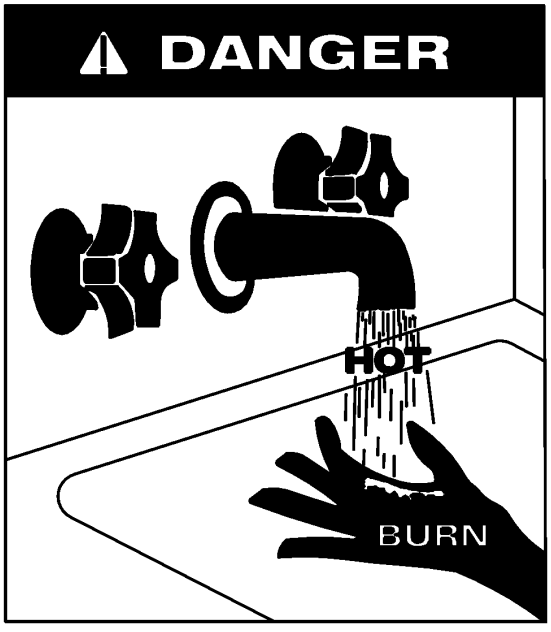
SAFETY INSTRUCTIONS

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

- **Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.**
- **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.**
- **Installation and service must be performed by a qualified installer, service agency or the gas supplier.**

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

- **Ne pas entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables à proximité de cette appareil ou de tout autre appareil.**
- **QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:**
  - **Ne pas tenter d'allumer l'appareil.**
  - **Ne touchez à aucun interrupteur, ne pas vous servir des téléphones se trouvant dans le bâtiment**
  - **Appelez immédiatement votre fournisseur de gas de puis un voisin. Suivez les instructions du fournisseur.**
  - **Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies**
- **L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.**



Water temperature over 125°F can cause severe burns instantly or death from scalds.

Children, disabled and elderly are at highest risk of being scalded.

See instruction manual before setting temperature of water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

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SAFETY INSTRUCTIONS

FOR YOUR SAFETY READ BEFORE OPERATING

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

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

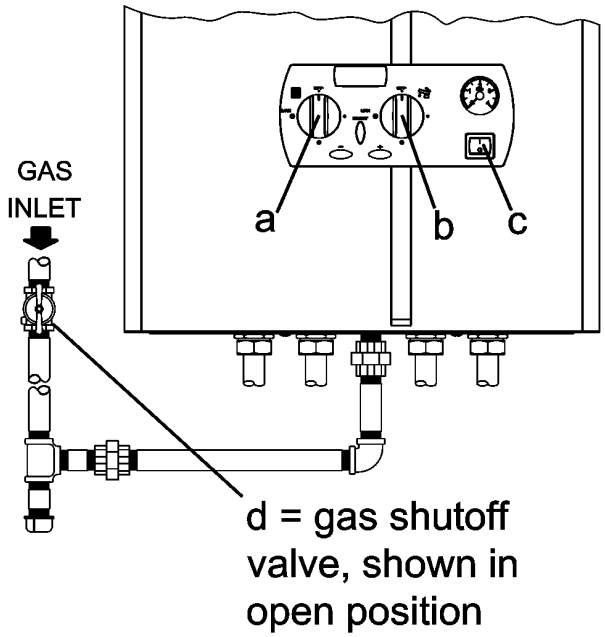
B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

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

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

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

OPERATING INSTRUCTIONS



a) Central heating regulation knob
b) D.H.W. regulation knob
c) Main electrical switch
d) Gas control knob

1. STOP! Read the safety information above on this label.
2. Turn off all electric power to the appliance.
3. Set the main switch "C" to zero and turn the two knobs "a" and "b" to their OFF position.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Close the manual gas shutoff valve "d" turning the knob "d" clockwise. Do not force.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Open the manual gas shutoff valve turning the knob "d" counterclockwise.
8. Turn on all electric power to the appliance, and set the main switch "c" to the "one" position.
9. Set knobs "a" and "b" to desired setting.
10. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Turn off all electric power to the appliance if service is to be performed.
2. Set the main switch "c" to zero and turn the two knobs "a" and "b" to their OFF position.
3. Close the manual gas shutoff valve turning the knob "d" counterclockwise. Do not force.

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SAFETY INSTRUCTIONS

WARNING!!! These instructions must be read prior to installation. If the information in these instructions is not followed exactly, a fire or explosion may result, causing property damage, personal injury, or death.

☞ **Liability**
The manufacturer declines all liability, contractual or otherwise, for damages resulting from the incorrect installation of this boiler. This includes the failure to comply with the instructions provided by the manufacturer or from a failure to comply with the applicable local and national regulations in force. The manufacturer declines all liability, contractual or otherwise, for any damage to people, animals or property caused by the incorrect use of this boiler or inadequate or incorrect service or maintenance.

☞ **Hazards and Your Safety - Hot Water Can Scald!**
Water temperature over **125°F** (52°C) can cause severe burns instantly, or death from scalds. Children, the disabled, and the elderly are at highest risk of being scalded; see instruction manual before setting temperature at boiler! Feel water before bathing or showering.

☞ **If there is a smell of combustion products**, turn the unit off, air out the room and call a licensed authorized technician. Failure to take proper precautions can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

☞ **Qualified Technicians:**
Qualified technicians are individuals with specific, technical training in space heating systems, domestic hot water systems, fuel gas systems and electrical systems. These individuals must have the legally required qualifications.

☞ **Installation and Alterations:**
Licensed, authorized personnel must carry out the installation and calibration of the boiler. Never modify the boiler or its flue gas carrying components in any way. This boiler must be properly vented. Failure to follow these instructions could result in personal injury or death!

☞ **For safety and environmental reasons,** the packing materials must be properly disposed of. Any replaced part or packaging should never be left within the reach of children. Failure to follow these instructions could result in severe personal injury

☞ **Maintenance:**
At least once a year the user must call in a licensed authorized technician for routine maintenance.

☞ **In the event of a breakdown and/or malfunction of the boiler**, turn off the unit and do not make any attempt to repair it. The boiler must be serviced exclusively by a qualified technician using original spare parts. Failure to comply with this requirement may compromise the safety of the unit and void its warranty.

☞ **Use the service switch to disconnect the boiler from the electrical circuit** before carrying out any service or maintenance operations.

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

☞ ***ATTENTION:*** *Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretirn terminé.*

☞ **Correct Use:**
This boiler must only be used for the purpose for which it has been expressly designed: heating of water for closed circuit systems for central heating and the production of domestic hot water.

☞ **Should overheating occur or the gas supply fail to shut off**, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the appliance.

☞ ***En cas de surchauffe ou si l'alimentation de gaz ne peut être coupée****, ne pas couper ni débranch l'alimentation électrique de la ponpe. Fermer plutôt le robinet d'admission de gaz à l'extérieur de l'appareil*

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

☞ ***N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement.*** *Faites inspecter l'appareil par un tecnicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.*

☞ **Do not obstruct the air intake or vent pipe terminals.** Failure to take proper precautions can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

☞ **Any optional extras or kit fitted subsequently must be original Cosmogas parts.**

SAFETY INSTRUCTIONS

☞ **Local approval:** of the flue system and the condensate connection to the public sewer system may be required.

☞ **Local approval:** The local building regulations stipulating the installation rules at the time of installation should be followed.

☞ **Defects:** If you find any defects you must inform the owner of the system of the defect and associated hazard in writing.

☞ **When servicing the boiler, to avoid severe burns**, allow the boiler to cool before performing maintenance.

☞ **When calling or writing about the boiler-** Please have the boiler model and serial number from the boiler rating plate.

☞ **Any claims for damage or shortage in shipment** must be filed immediately against the transportation company by the consignee.

☞ **Factory warranty (shipped with unit) does not apply** to units improperly installed or improperly operated.

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1 - INSTALLATION - CODE REQUIREMENTS

1.1 - National installation legislation

- The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the latest edition of the ***National Fuel Gas Code, ANSI Z223.1/NFPA 54*** and or ***CAN/CSA B149.1, Natural Gas and Propane Installation Code.***

- Where required by the authority having jurisdiction, the installation must conform to the Standard for ***Controls and Safety Devices for Automatically Fired Boilers, ANSI/ ASME CSD-1.***

NOTICE!
This boiler meets the safety and other performance requirements as specified in ANSI Z21.13 standard
- Per DOE mandate, the operator control incorporates an automatic means (outdoor reset) of adjusting the boiler hot water temperature for hot water heating. The boiler must not operate without the automatic means enabled.

IMPORTANT!
In accordance with Section 325 (f)(3) of the energy policy and conservation Act, this boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external management system that serves the same function. THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITIONS IS TRUE:

- ☞ An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- ☞ This boiler is not used for any space heating.
- ☞ This boiler is part of a modular multiple boiler system having a total input of 300,000 BTU/hr or greater.
- ☞ This boiler is equipped with a tankless coil.

1.2- Commonwealth of Massachusetts Installation Requirements

In the Commonwealth of Massachusetts, the installation must be performed by a licensed plumber or gas fitter.

WARNING!!! Improper venting can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade, in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equip-ment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors.
   a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
   b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.
2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.
3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, **“GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS”.**
4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

(b) Exemptions
The following equipment is exempt from 248 CMR 5.08(2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled “Equipment Not Required To Be Vented” in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT - VENTING SYSTEM PROVIDED.
When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS – GAS EQUIPMENT - VENTING SYSTEM NOT PROVIDED.
When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies “special venting systems”, the following requirements shall be satisfied by the manufacturer:

1. The referenced “special venting system” instructions shall be included with the appliance or equipment installation instructions; and
2. The “special venting systems” shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/ or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

2 - GENERAL INFORMATION

2.1 - Key to symbols used

WARNING!!! Failure to follow these indications can causing an explosion, extensive property damage, severe personal injury or death!

CAUTION!!!
Electrical caution! Risk of electric shock: failure to observe this warning may compromise the smooth running of the appliance or cause serious damage to individuals, animals or property.

CAUTION!!!
General caution. Failure to observe this warning may compromise the smooth running of the appliance or cause serious damage to individuals, animals or property.

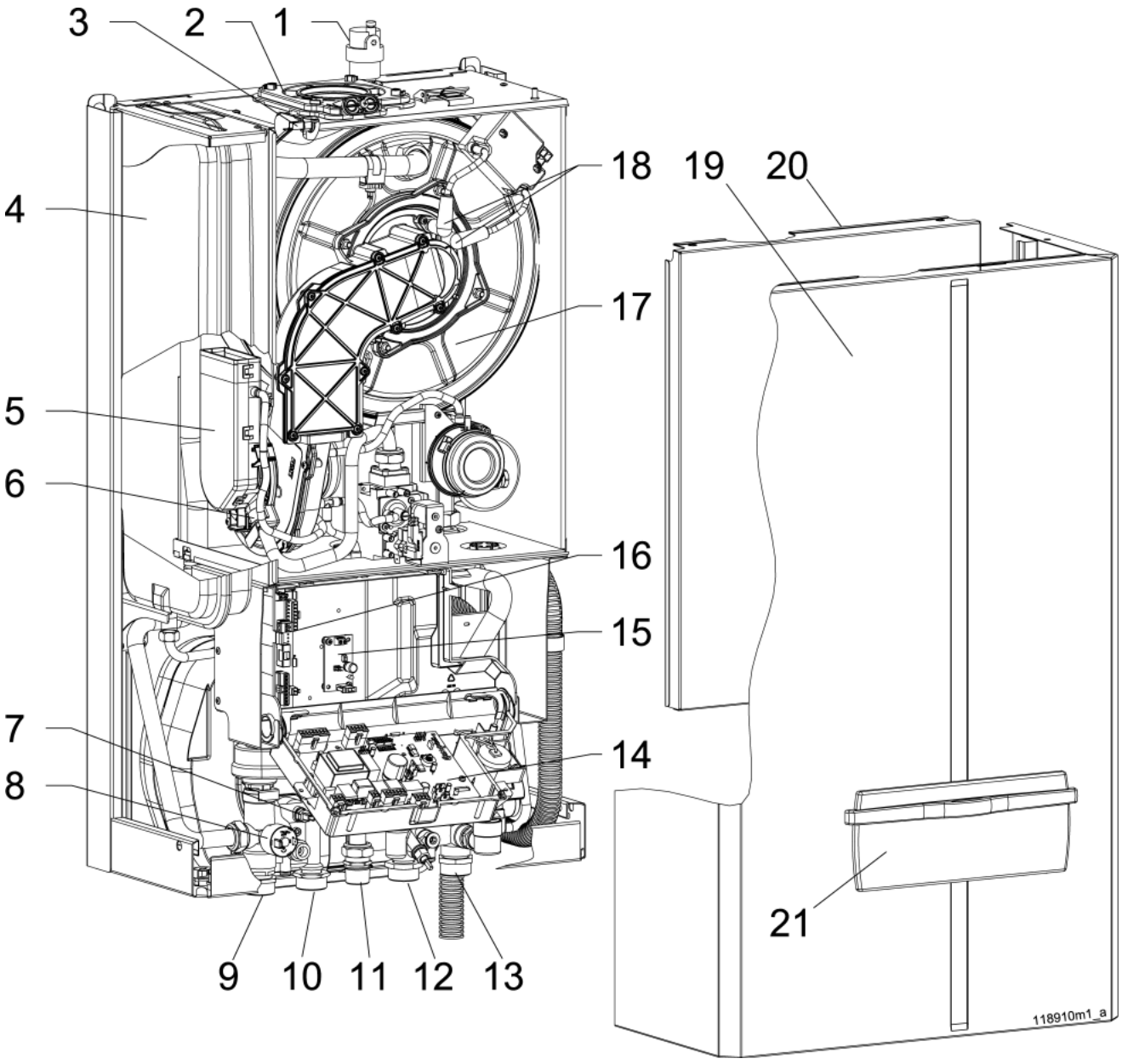
- Operation symbol

☞ Important indication symbol

2.2 - Description of the Peerless® Combi 160™:

Combi version (space heating and instantaneous D.H.W. production).
Modulating gas-fired, condensing hot water boiler, with sealed combustion chamber and pre-mix burner, with maximum power input of 160,000 Btu/hr (47 kW) and minimum of 30,000 Btu/hr (9 kW)

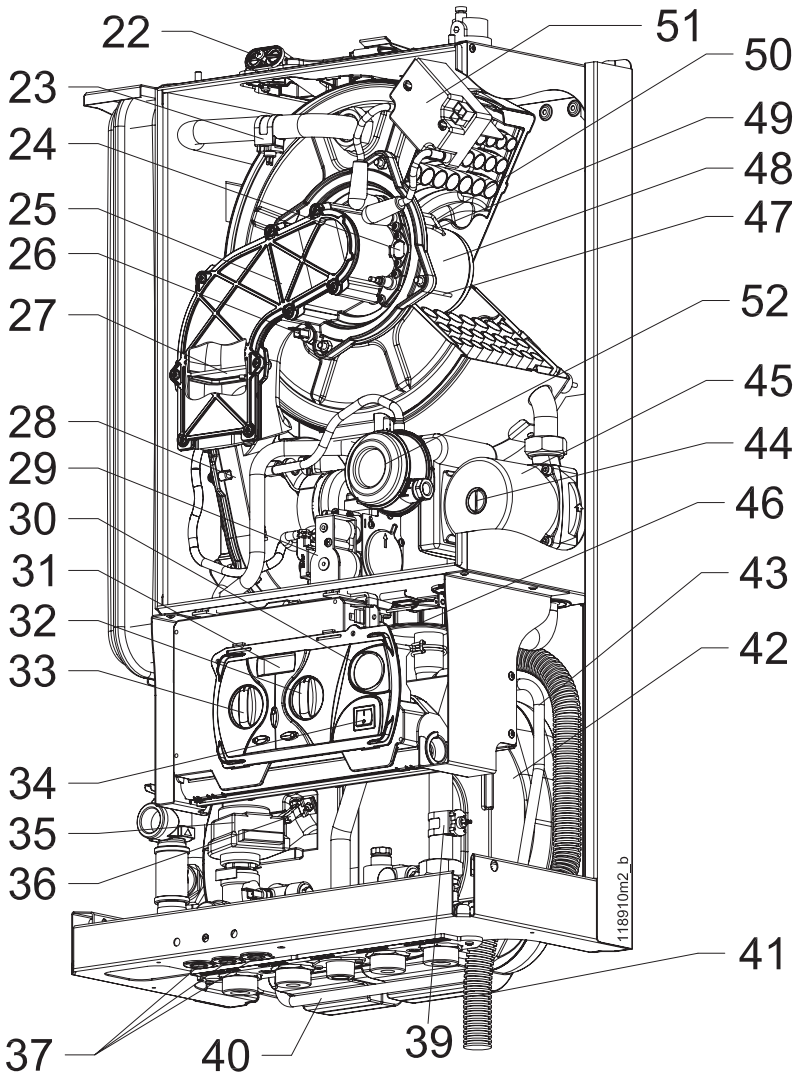
3 - MAIN COMPONENTS



1 - Automatic air vent
2 - Air intake and flue gas discharge fitting (venting system)
3 - U7 flue gas temp. sensor and flue safety switch
4 - Expansion tank
5 - Inlet air plenum
6 - Air/gas mixer device
7 - U2 d.h.w. temp. sensor
8 - Heating pressure switch (low water cut-off)
9 - Heating supply connection
10 - DHW connection
11 - Gas inlet connection
12 - Cold water connection
13 - Heating return connection
14 - Power Control Board
15 - Openterm interface board (optional)
16 - Connection board
17 - Primary heat exchanger
18 - Spark cable
19 - External jacket
20 - Combustion chamber door
21 - Instrument panel door

Figure 1 - Main components

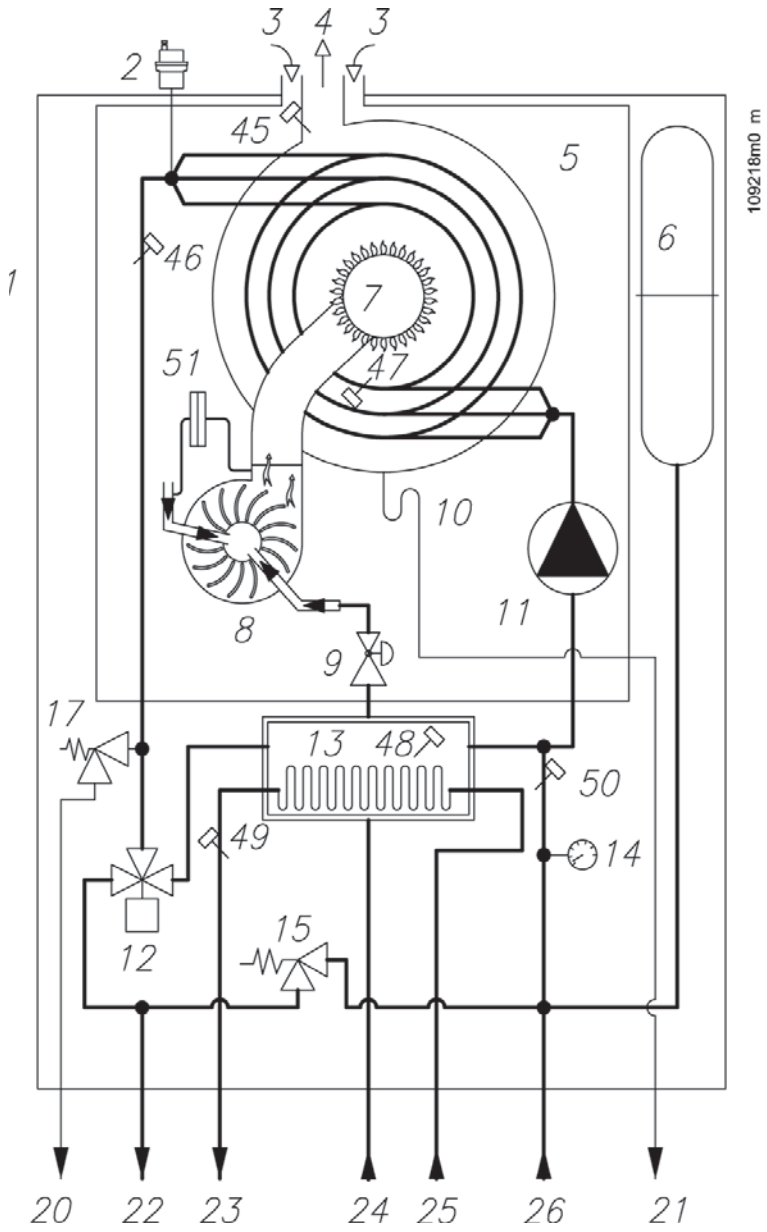
3 - MAIN COMPONENTS



22 - Combustion analysis tap
23 - U1 supply temperature sensor
24 - Burner window
25 - Air/gas manifold
26 - U6 high temperature limit sensor
27 - Flue gas back flow preventer
28 - Fan
29 - Gas valve
30 - Heating pressure gauge
31 - Display
32 - Domestic hot water temperature control
33 - Heating temperature control
34 - On/off power switch
35 - Three way valve
36 - U3 domestic cold water temp. sensor
37 - Cable clamp
38 - ASME Safety relief valve
39 - U8 return temperature sensor
40 - By-pass pipe
41 - Condensation discharge pipe
42 - Secondary heat exchanger for domestic hot water production (For P/N see Section 15)
43 - Expansion tank connection pipe
44 - Circulator pump screw
45 - Circulator pump
46 - Condensation discharge trap
47 - Flame-proving electrode
48 - Burner
49 - Right ignition electrode
50 - Left ignition electrode
51 - Spark generator
52 - Flue pressure switch

Figure 1 - Main components

4 - FUNCTION OVERVIEW



Key to figure 2:
1 = boiler
2 = automatic air vent
3 = air intake
4 = flue gases discharge
5 = sealed combustion chamber
6 = expansion tank
7 = burner
8 = fan
9 = gas valve
10 = condensate discharge trap
11 = circulator pump
12 = 3-way valve
13 = secondary heat exchanger for d.h.w.
14 = pressure gauge
15 = by-pass valve
17 = safety relief valve
21 = condensate discharge pipe
22 = heating supply pipe
23 = domestic hot water outlet
24 = gas inlet
25 = cold water inlet
26 = heating return pipe
45 = U7 = flue gas temperature sensor
46 = U1 = boiler temperature sensor
47 = U6 = high limit temperature sensor
48 = U3 = domestic cold water sensor/storage tank sensor
49 = U2 = domestic hot water temperature sensor
50 = U8 = return temperature sensor
51 = flue pressure switch

Figure 2 - PC160™ Hydronic functional schematic

4 - FUNCTION OVERVIEW

4.1 - Intended use and functions of the boiler

This gas-fired condensing boiler, is designed to be used for central heating and producing domestic hot water.
The maximum output heat is always guaranteed for the production of domestic hot water since it is given priority over space heating demands. Follow the specific procedure in section 12.7 for the adjustment of the domestic hot water temperature.
Using a PC160™ boiler you can create a system for the production of instantaneous domestic hot water and a heating system with heating elements functioning at temperatures ranging between 68°F (20°C) and 189°F (87°C).
The boiler can also function directly with a radiant floor panel, see section 5.10.
When connecting the boiler to the heating system the installer must consider the head loss of the heating system to verify that the boiler pump is adequate. Pump curve is shown in figure 4. The same verification must be done for the domestic installation, see figure 5.

The PC160™ can be connected to an indirect storage tank for the production of domestic hot water, section 7.1.

The PC160™ boiler can be connected to a room thermostat, section 6.3 and 6.4.

An outdoor air temperature sensor can also be connected to the boiler for an outdoor reset supply temperature control for maximum fuel efficiency and comfort (see section 6.5). In this configuration the room thermostat will compensate by adjusting the room temperature. The room temperature compensation can be of an ON / OFF type or two-stage. For further information on the outdoor-air reset, refer to section 12.10.

- ☞ The boiler must be connected to a heating system and a domestic hot water supply with compatible specifications, performance and power rating.
- ☞ Before installation, thoroughly flush the heating and plumbing systems of any residue or impurities which might compromise the smooth running of the boiler.
- ☞ This boiler is designed for indoor installation.
- ☞ Refer to figure 6 for minimum clearance distances for installation and future maintenance.
- ☞ Refer to section 5.2 for minimum clearance distances from combustible material.

4.2 - Setting of the boiler

Section 16 details the setting changes that should be made to best match the boiler's operation to the needs of each application.

4.3 - Efficiency up to 98%

When the outdoor reset is activated (see section 12.10) and an outside sensor is connected, this boiler is designed to always work at the maximum efficiency. It will automatically change the supply temperature in relation with the outdoor temperature (Outdoor reset). The graph in figure 3 shows an example on how it can work.
This graph is an example where is represented an installation where the supply and return temperatures are 139°F and 115°F respectively , and the outside temperature is 23°F. The outdoor reset drives the boiler, to progressively reduce the supply temperature and thereby optimize the efficiency. It changes from 87% when outside is -10°F, to 94.8% when outside is 23°F and up to 98% when the outside temperature rises up to 67°F.

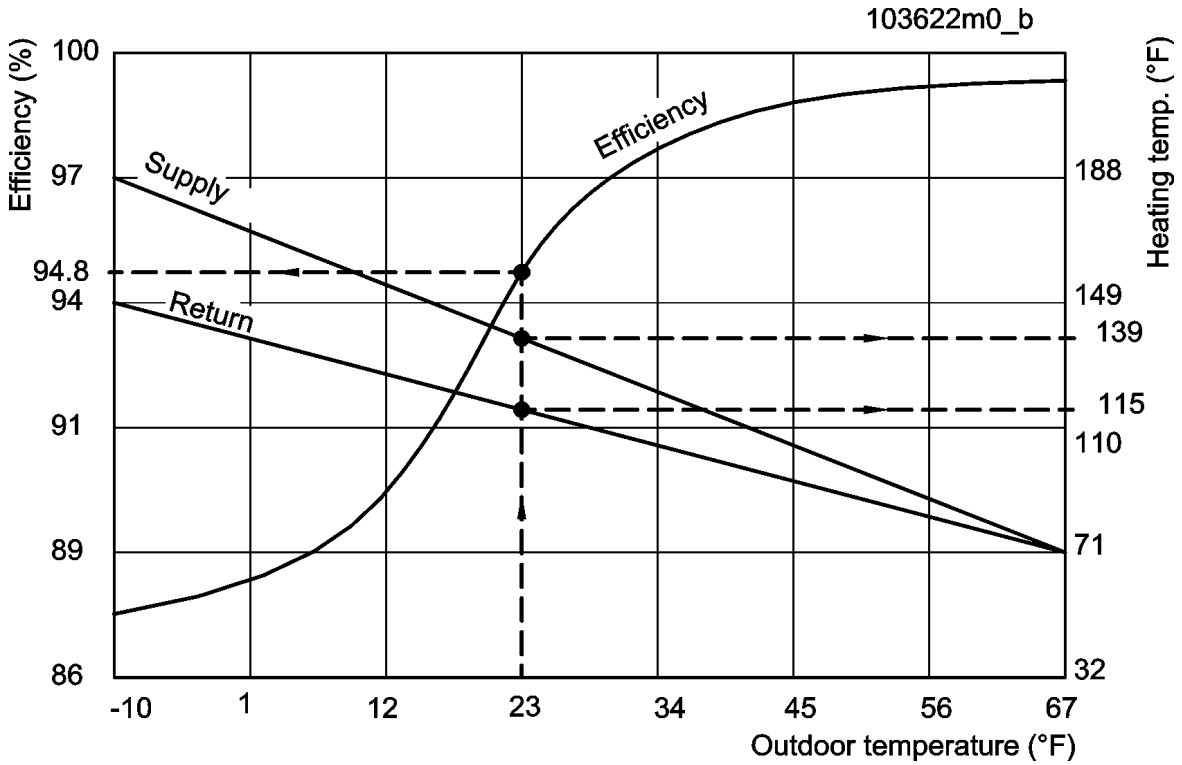


Figure 3 - Outdoor reset control to optimize the efficiency

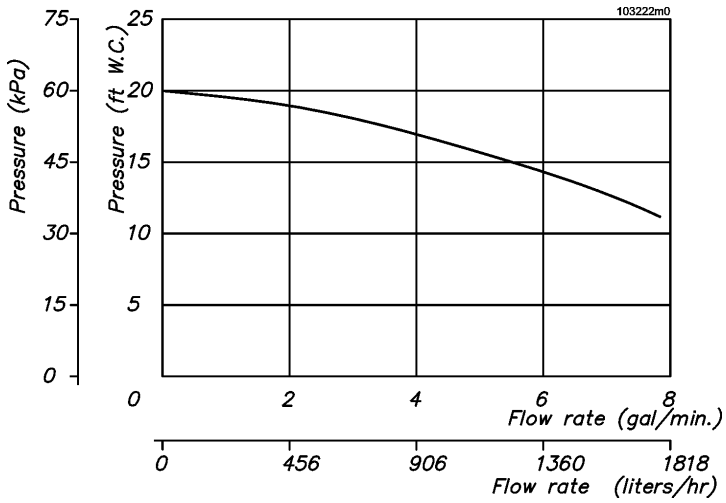


Figure 4 - Available Head for heating circuit

4.4 - Characteristic curves of heating system's residual head

The PC160™ boiler is fitted with a Grundfos circulator pump. The head available to supply flow through the heating system at the boiler connections is shown in graph form in figure 4.

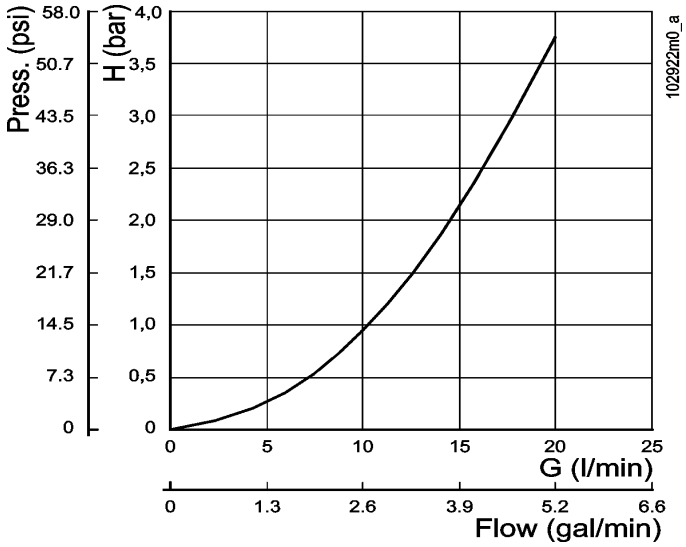


Figure 5 - Domestic Water Coil Head Loss

4.5 - Characteristic curve of the domestic side

The PC160™ boiler, offers resistance to the passage of domestic water (see graph flow/pressure of figure 5). The installer or the engineer must take account of this in order to ensure the correct domestic water flow to the utilities.

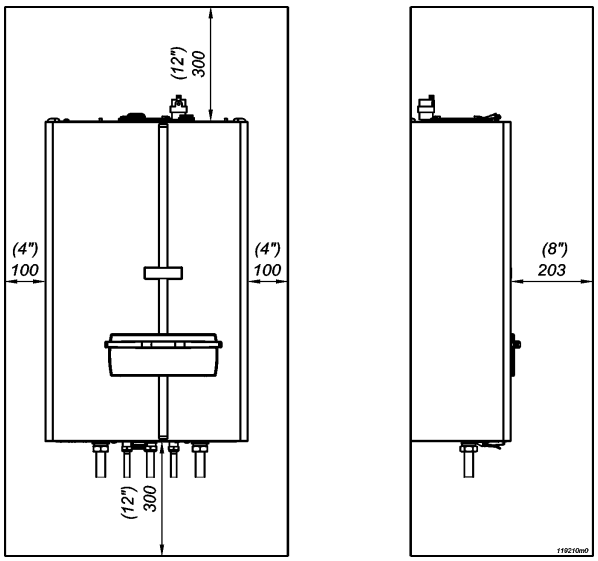


Figure 6 - Recommended minimum clearance distances for proper installation and servicing

5.1 - Clearances for installation and servicing

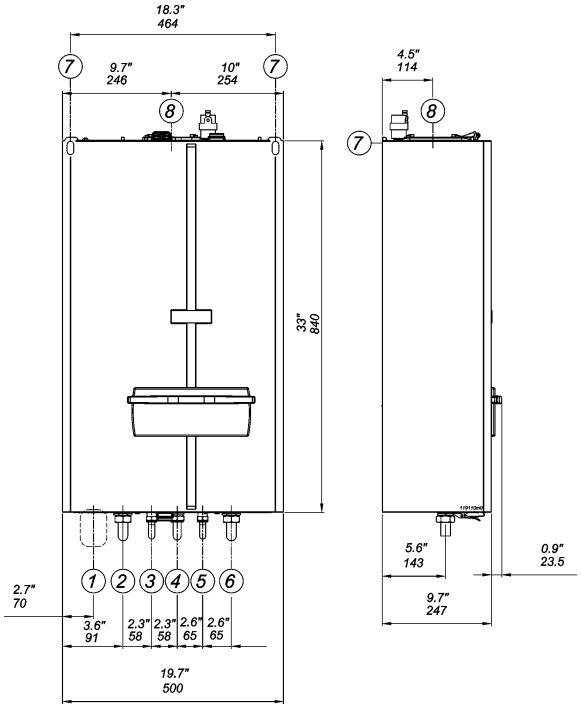
Figure 6 shows the clearances required for installation and servicing.

NOTE: Service clearances are not mandatory, but are recommended to ensure ease of service should it be required.

5.2 - Clearances from combustible material

This boiler may be installed directly onto a wall of combustible material with the following clearance:

Ceiling: 2 inches (51 mm)
Front: 2 inches (51 mm)
Rear: 0 inches (0 mm)
Sides: 2 inches (51 mm)
Floor: 2 inches (51 mm)
Concentric vent: 0 inches (0 mm)
Split vent (first 12” from the boiler): 1 inch (25 mm)
Split vent (after 12” from the boiler): 0 inches (0 mm)



1 = Area for power supply cable
2 = Heating supply connection (3/4”)
3 = Domestic hot water connection (3/4”)
4 = Gas connection (3/4”)
5 = Domestic cold water connection (3/4”)
6 = heating return connection (3/4”)
7 = positions for boiler support
8 = Flue discharge/air intake connection

Figure 7 - Dimensions for the PC160™

5.3 - Choosing the installation location

WARNING!!! Do not store any flammable materials or liquids in the immediate vicinity of the boiler. A fire or explosion can result, causing severe personal injury, death or substantial property damage.

WARNING!!! LIQUEFIED PETROLEUM (L.P.) PROPANE GAS-FIRED BOILER LOCATION REQUIRES SPECIAL ATTENTION: 1994 UNIFORM MECHANICAL CODE section 304.6: "LGP Appliances. Liquefied petroleum gas-burning appliances shall not be installed in a pit, basement or similar location where heavier than air gas might collect. Appliances so fueled shall not be installed in above-grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas." Failure to comply with this provision could result in severe personal injury or substantial property damage.

CAUTION!!! The boiler must be installed on a vertical wall constructed to bear its weight or the boiler and building may be damaged.
NOTE: The boiler must never be installed on carpeting.

CAUTION!!! This boiler is not designed for direct outdoor installation. If installed outside of the structure that it supplies hot water too, it must be sheltered so it is protected from rain, wind, sun and frost. NEVER place this boiler in a location that would subject it to temperatures at or near freezing. Failure to properly locate this boiler can result in premature failure voiding the warranty.

When locating the boiler the following factors must be considered:

- the location of vent/air intake terminals;
- connection to the gas supply;
- connection to the water supply;
- connection to the heating system;
- connection to the domestic hot water system;
- connection to the electrical supply;
- disposal of the condensation produced by the boiler;
- connection to the room thermostat;
- piping of the safety relief valve discharge;
- possible connection of the outdoor temperature sensor;
- possible connection of an indirect storage tank, see section 7.1.

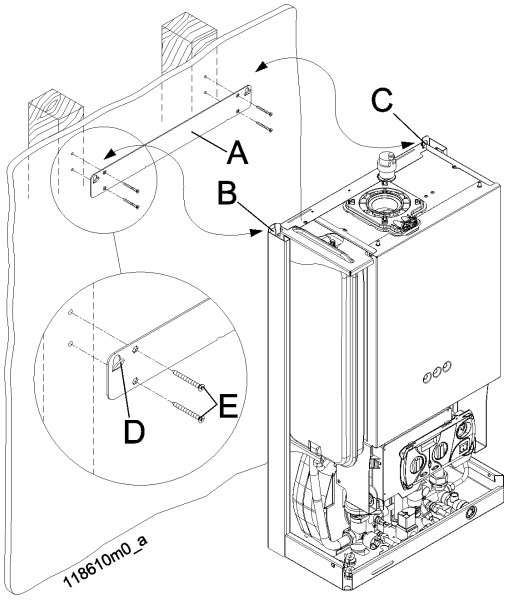


Figure 8 - Wall bracket installation

5.4 - Mounting the boiler

Refer to figure 8:

1. place the cardboard template, provided with the boiler, against the wall;
2. ensure that the template is plumb and the screw holes line up with the wall studs;

CAUTION!!! The wall bracket screws must be screwed into the buildings framing or other material capable of supporting the weight of the boiler or the boiler and building may be damaged.

3. mark the screw holes for the wall bracket, “A”;
4. remove the cardboard template;
5. install the wall bracket “A”, using the screws “E”, provided;
6. hang the boiler on the wall bracket, “A”, by hanging connections “B” and “C” on tabs “D”.

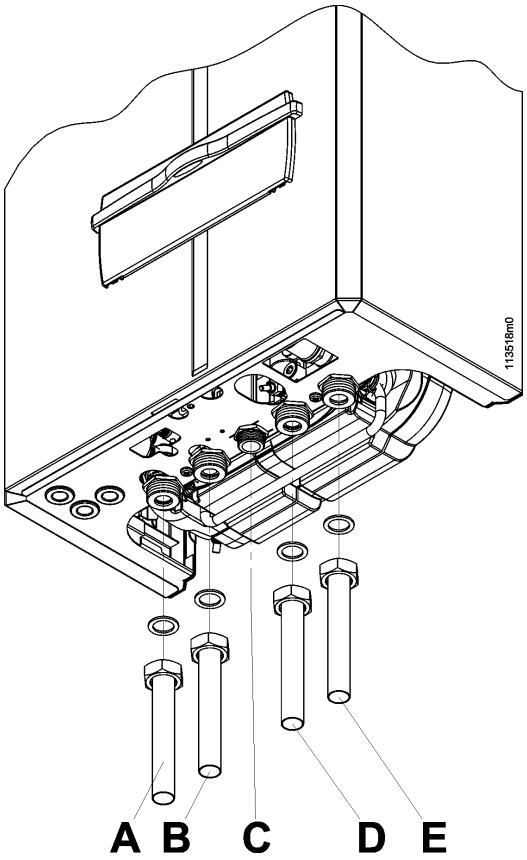


Figure 9 - Fittings supplied with the boiler

5.5 - Gas and water connections

The boiler comes with the fittings shown in figure 9.

A = heating system supply (3/4”)
B = domestic hot water supply (3/4”)
C = Inlet gas connection (3/4”)
D = domestic cold water (3/4”)
E = heating system return (3/4”)

5.6 - Condensate disposal

WARNING! The condensate trap must be connected to the boiler per the following instructions or combustion gases will enter the room. This can result in excessive levels of carbon monoxide which can cause severe personal injury or death!

This boiler produces water as a byproduct of combustion. The boiler is equipped with a condensate trap, figure 1, item 46, for the evacuation of condensate and to prevent the leakage of combustion products. The condensate trap drains through pipe “C” shown in Figure 10. The condensation disposal system must:

- ☞be connected to the domestic waste disposal system by means of an appropriate trap capable of preventing the pressurization of the condensate system and the return of sewer gases (see figure 11);
- ☞comply with national and/or local codes for condensate neutralizer between pipe “C” of figure 10 and the waste disposal system;
- ☞be carried out with a pipe with an internal diameter equal to or greater than **1/2 in**, *13 mm*;
- ☞be installed in such a way so as to avoid the freezing of the liquid;
- ☞never discharge into gutters or rain collectors;
- ☞be properly pitched towards the point of discharge avoiding high points, which could place the condensate system under pressure;

CAUTION!!! The condensate drainage system is designed to empty all the condensate produced by one boiler only. Each boiler must be equipped with its own condensate drainage system or the drainage system may malfunction.

5.7 - Near boiler heating piping components

1. Boiler system piping: boiler system piping must be properly sized. Reducing the pipe size can restrict the flow rate through the boiler, causing inadvertent high limit shutdowns and poor system performance.
2. Boiler system pump: Factory Installed. Circulators must be sized to meet the specified flow requirements of 5 GPM.
3. Indirect water heater circulating pump: Field supplied. The pump must be sized to meet the specified minimum flow requirements of 5 GPM. Consult the indirect water heater operating guide to determine the flow characteristics of the selected product used.
4. Boiler isolation valves: Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in restricted flow rate through the boiler.
5. Domestic indirect hot water isolation valves: Field supplied. Full port ball valves are required. Failure to use full port ball valves could result in a restricted flow rate through the boiler.
6. Anti scald mixing valves: Field supplied. An anti scald mixing valve is recommended (see Figure 16). It is recommended also when an indirect water heater is present.
7. Unions: Field supplied. Recommended for unit serviceability.
8. Pressure relief valve: Factory supplied. The pressure relief valve is sized to ASME specifications.
9. Indirect Water heaters: Field supplied. This boiler may be piped to an indirect water heater to heat domestic hot water with the space to heat transfer medium. There are two options when utilizing an indirect water heater.
   a. The space heating piping will branch off to flow the space heat transfer medium through a single wall heat exchanger coil inside the indirect water heater.
   b. The indirect water heater is connected to the system supply piping. A pump controlled by the boilers control will regulate the flow of water through the indirect water heater. The indirect water heater’s temperature will be regulated by the boiler’s control. The boiler is pre-configured to control the operation of the DHW pump with Domestic Hot Water Prioritization programming.

CAUTION!- It is up to the installer to ensure the minimum system flow is not less then 5 GPM at any time.

WARNING!!! The National Standard Plumbing Code, the National Plumbing Code of Canada and the Uniform Plumbing Code limit the pressure of the heat transfer fluid to less then the minimum working pressure of the potable water system up to 30 psi maximum. Also, the heat transfer fluid must be water or other non-toxic fluid having a toxicity of Class 1, as listed in the Clinical Toxicology of Commercial Products, 5th Edition.

10. Filter: Field supplied. A Filter or equivalent multipurpose strainer is recommended at the return pipe of the boiler to remove system particles from older hydronic systems and protect newer systems.

5.8 - Relief valve

Each boiler is equipped with a safety relief valve set at ***30 psi*** *(2 bar)* which must be piped in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV, to prevent scalding in the event of a discharge, see Figures 1, item “38” and figure 10.

WARNING!!! Failure to properly pipe the relief valve discharge can result in scalding of individuals and animals. Never install any type of valve between the boiler and the relief valve or an explosion causing extensive property damage, severe personal injury or death may occur!

5.9 - Supply and return piping

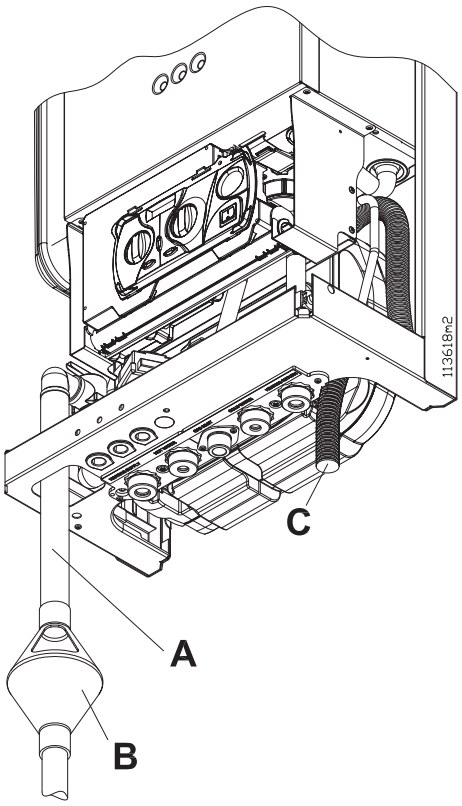
CAUTION!!! All heating system piping must be installed in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV. All applicable local codes and ordinances must also be followed. If the boiler is installed above any radiation elements it must be fitted with a low water cutoff device installed above the normal boiler water level! Failure to do this can result in damage the unit and void the warranty!

CAUTION!!! This boiler must have adequate water flowing through it whenever the burner is on. Failure to do this will damage the unit and void the warranty!

CAUTION!!! Before connecting the boiler to the heating system the heating system must be thoroughly flushed to remove sediment, flux, filings and other foreign matter. An approved inhibitor should be added to the heating system water to prevent limestone and magnetite deposits from forming and to protect the boiler from galvanic corrosion.

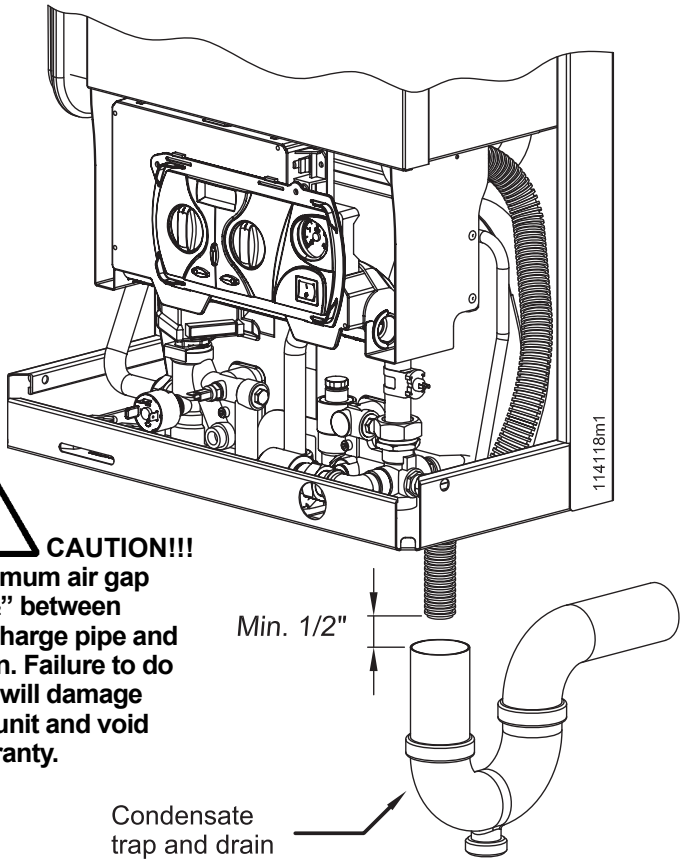
CAUTION!!! This boiler is equipped with an ASME safety relief valve set at 30 psi *(2 bar)*. The heating system must be designed so that no piping or radiation elements are higher than 65 ft (*20 m)* or else the hydraulic head of the system will cause the relief valve to open.

CAUTION!!! The manufacturer cannot be held responsible for any damage caused by incorrect use of additives in the heating system.



A = 3/4” pipe extension (not provided)
B = Discharge device open to the atmosphere (not provided)
C = Condensate discharge pipe

Figure 10 - Relief valve connection



CAUTION!!! Minimum air gap of ½” between discharge pipe and drain. Failure to do this will damage the unit and void warranty.

Figure 11 - Condensate trap and drain

⚠ CAUTION!!! This boiler can supply heating water at a temperature up to 190°F (88°C). If the heating system is built with materials not able to resist to this temperature, you must to install a device that shut-off the boiler before the material's limit temperature.

☞Figure 9 illustrates the position of the supply and return pipes.

☞Install a metallic mesh filter on the return pipe to prevent any residue from the system returning to the boiler.

☞Do not use the appliance for adding any type of additive to the system.

5.9.1 - Converting a combi boiler into a heating only boiler

If you are in possession of a PC160™ boiler you can use it as a heating system only without using the domestic hot water circuit. To do so, simply plug the two fittings, items "3" and "5" of figure 7, and move switch No. 5 (see figure 21) from OFF position to ON position. Now knob "32" of figure 1 is disabled.

5.10 - Low temperature heating systems

⚠ CAUTION!!! When the boiler is installed in a low temperature system, the switch No. 6 in figure 21 must be placed in the ON position to prevent the supply water temperature from exceeding 113°F (45°C) or damage to the low temperature system components could occur (see section 5.9).

With switch No. 6 in figure 21, in the ON position, the boiler will maintain the supply water temperature between 68°F (20°C) and 113°F (45°C). No setting changes made from the control panel will cause the supply water temperature to exceed 113°F (45°C).

⚠ CAUTION!!! To protect the floor panel against over heating you must to install a safety device that shut-off the boiler before it reach the floor panel's limit temperature.

⚠ CAUTION!!! If the boiler is installed in a radiant panel heating system using plastic piping, precautions must be taken against corrosion caused by water oxygenation. If the piping does not incorporate an oxygen barrier, the radiant panel circuit must be isolated from the boiler using a titanium plate heat exchanger.

5.11 - Use of glycol and other chemicals

WARNING!!! Never use non-approved additives or toxic boiler treatment chemicals in the heating system as they can cause serious health problems or possibly death. Any additives introduced into the heating system must be recognized as safe by the United States Food and Drug Administration.

If glycol is used, it must be used in accordance with the instructions supplied with the product.

⚠ CAUTION!!! Any additives added to the heating system must not be added directly inside the boiler but through the heating system piping to prevent damage to the boiler.

5.12 - Domestic hot and cold water

⚠ CAUTION!!! If the water hardness is greater than 9 gr/gal (150 mg/l) we recommend installing a water softener with filter.

☞Figure 9 illustrates the positioning of the domestic hot and cold water pipes.

☞For servicing purposes, install an isolation valve upstream from the cold water inlet.

☞To correctly set the domestic water flow, install an adjustable flow restrictor upstream the cold water inlet (see figure 16 item "12")

☞ The PC160™ boiler can also be used as heating only boilers. No connection is needed to the domestic pipes "B" and "D" of figure 9.

5.13 - Gas supply piping

WARNING!!! Check that the type and the pressure of the gas supplied correspond with those required for the boiler as stated on the rating plate. Never use a gas different than that stated on the boiler rating plate. Failure to comply with this warning can result in a fire or explosion causing extensive property damage, severe personal injury or death!

☞If the gas type and/or the supply pressure do not match those stated on the boiler rating plate the boiler must be converted to the type of gas and/or supply pressure available. A conversion kit is supplied together with the boiler.

☞The boiler comes from the factory ready to be piped to the gas supply. The National Fuel Gas Code, ANSI Z223.1/NFPA 54 and local codes for gas piping requirements and sizing must be followed.

☞Install a manual gas shutoff valve and drip leg as shown in Figure 12.

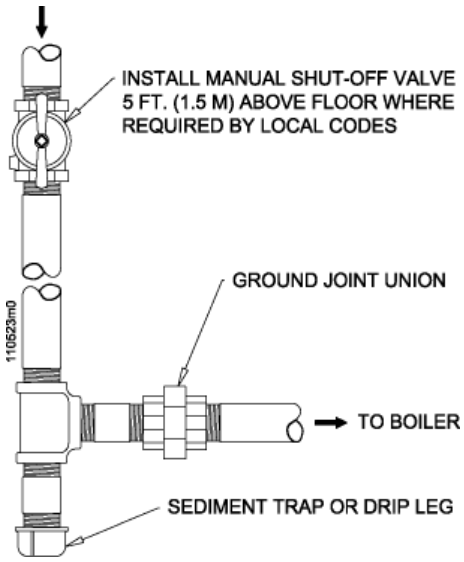


Figure 12 - Gas supply piping

The gas supply piping to the boiler must be properly sized to guarantee that the gas supply meets the maximum requirements. If more than one appliance is supplied by the same gas supply pipe, the gas supply piping must be sized based on the maximum possible demand. Do not neglect the pressure drop due to pipe fittings. Table 1 below, should be used in conjunction with Table 2 below, to ensure that the gas supply piping is sized properly. See section 14 for values of “maximum gas supply pressure” and “minimum gas supply pressure” and also section 11.7.

☞Before installation a thorough internal cleaning of the gas supply line should be performed. Figure 9 shows the positioning of the gas connection on the heater.

☞The boiler and its gas connection must be leak tested before placing the boiler in operation.

☞To avoid damaging the gas control, perform a leak test at a pressure of no greater than 20 in W.C. *(50 mbar)*.

WARNING!!! Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this WARNING could result in an explosion!

☞The boiler and its individual shutoff valve must be disconnected from the gas supply piping during any pressure testing at test pressures in excess of 1/2 psi (*3.5 kPa)*.

☞The boiler must be isolated from the gas supply piping by closing its individual manual shutoff valve during any pressure testing at test pressures equal to or less than 1/2 psi (*3.5 kPa)*.

☞Install 100% lockup gas pressure regulator in supply line if inlet pressure can exceed 13”W.C. at any time. Adjust lockup regulator for 13”W.C. maximum.

☞Use pipe sealing compound compatible with propane gas. Apply sparingly only to male threads of the pipe joints so that pipe dope does not block gas flow.

5.14- Propane gas

⚠ WARNING!!! These boilers are typically shipped ready to fire on natural gas. Check boiler rating plate to determine which fuel the boiler is set for. If set to natural gas, it may be converted to LP by following the instructions in Section 5.17. Failure to comply could result in severe personal injury, death, or substantial property damage.

Pipe sizing for propane gas
Contact gas supplier to size pipes, tanks and 100% lockup gas pressure regulator.

Propane supply pressure requirements:

1. Adjust propane supply regulator provided by the gas supplier for 13”W.C. maximum pressure.
2. Pressure required at gas valve inlet port:
   a. Maximum 13”W.C. with no flow (lockup) or with boiler on.
   b. Minimum 3”W.C. with gas flowing (verify at high fire).

⚠ WARNING!!! Ensure that the high pressure gas regulator is at least 6-10ft upstream of the appliance.

5.15 - Operating at high altitudes

For installations in the United States, the boiler is rated for operation at altitudes up to 2,000 ft (609 m). For installations at higher altitudes in the United States, follow local codes or, in the absence of local codes, follow ANSI Z223.1/NFPA No. 54, *The National Fuel Gas Code*. For installations in Canada, the boiler is rated for installations up to 2,000 ft (609 m). For installations above this altitude, follow local/provincial codes.

TABLE 1 GAS PIPE CAPACITY

Nominal Iron Pipe Size	Pipe length								
	10'	20'	30'	40'	50'	60'	80'	100'	150'
	Gas Pipe Capacity (ft3/hr)								
3/4"	278	190	152	130	115	105	90	79	64
1"	520	350	285	245	215	195	170	150	120
1 1/4"	1050	730	590	500	440	400	350	305	250
1 1/2"	1600	1100	890	760	670	610	530	460	380

Note: Maximum pipe capacity in ft3/hr is based on a 0.60 specific gravity gas at a pressure of 0.5 psig and a 0.3"WC pressure drop

TABLE 2 EQUIVALENT PIPE LENGTH CHART

Nominal Iron Pipe Size	Type of Pipe Fitting			
	90°	Tee (branch flow)	Gas Valve (full port)	Gas Cocks
	Equivalent length of pipe fittings in feet			
3/4"	2.06	4.12	0.48	1.25
1"	2.62	5.24	0.61	1.60
1 1/4"	3.45	6.90	0.81	2.15
1 1/2"	4.02	8.04	0.94	2.50

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5.16- Convert the boiler from Natural Gas to Propane Gas or vice versa

⚠ WARNING!!! The gas conversion shall be performed by a qualified service agency in accordance with this instructions and all applicable codes and requirements of the authority having jurisdiction. The information in these instructions must be followed to minimize the risk of fire or explosion or to prevent property damage, personal injury or death. The qualified service agency is responsible for the proper conversion of the boiler. The installation is not proper and complete until the operation of the converted appliance is checked as specified in this instructions.

⚠ WARNING!!! The conversion shall be carried out in accordance with the requirements of the provincial authorities having jurisdition and in accordance with the requirements of the *CAN-B149.1* and *CAN1-B149.2 installation code*.

Contents:
The conversion kit (supplied with the boiler) is composed of the following elements, which are necessary for the gas change:
- a label rating the new gas setting;
- an instruction sheet;
- an orifice;

Installing:
in order to make the gas change please follow the instructions below:

1 - turn off power to the boiler;

2 - open the boiler's casing (Follow Section 14.2);

3 - open the instrument panel (Follow Section 9.2);

4 - Move switch #7 (see Figure 9-2) from OFF position to ON position;

5 - turn on power to the boiler;

6 - on the boiler's display you'll see ty followed by a number;

7 - using the push buttons + and − set the input ty to:
- **61** to convert the boiler **from** L**P GAS to NATURAL GAS**
or
- **62** to convert the boiler **from NATURAL GAS to LP GAS**,

8 - push Reset button to save the new value;

9 - turn off power to the boiler;

10 - Move switch #7 (see Figure 9-2) from ON position to OFF position;

11 - Replace the orifice item "C" of Figure 13 for the correct one for the type of gas used. Verify that the stamping on the orifice matches the gas type (See Table 3).

11 - turn on power to the boiler;

12 - Turn completely counter clockwise the screw E of Figure 13;

13 - Checking gas supply pressure following Section 12.7. The Gas supply pressure must be between the maximum and minimum value as stated in Table 3.

14 - Verifying the CO2 rate and its eventual adjustment following Section 12-9: The boiler during its normal operation, within a maximum altitude of 2000 ft, has a CO2 exhaust rate as shown in Table 3. If not within range of value shown, malfunctions will occur.

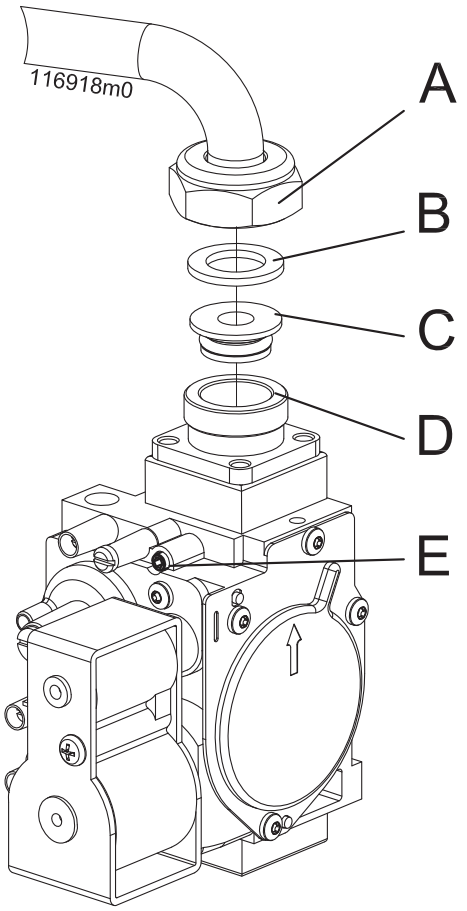
⚠ WARNING!!! The CO (carbon monoxide) level should not exceed values given in Table 3, when combustion is correct. Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

⚠ WARNING!!! All combustion measurements must be performed with calibrated equipment to ensure proper reading and accuracy. Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

TABLE 3 **SETTINGS OF THE BOILER FOR NATURAL GAS AND LP GAS**

Gas Type	TY value setting	Min. supply pressure	Max. supply pressure	Orifice	CO2 content at high fire	CO2 content at low fire	O2 content at high fire	O2 content at low fire	CO content at high and low fire
/	/	in.W.C.	in.W.C.	Stamping	%	%	%	%	ppm
Natural gas	61	3	13	9.1	9.2 ± 0.1	8.7 ± 0.3	4.5 ± 0.1	5.4 ± 0.3	less than 150
LP gas	62	3	13	5.7	9.5 ± 0.2	9.5 ± 0.3	6.4 ± 0.2	6.4 ± 0.3	less than 250

5 - INSTALLATION - Mounting & gas and water connections



A = Fixing nut
B = Gasket
C = Orifice
D = Brass fitting
E = CO2 / O2 regulator

Figure 13 - Gas valve

⚠ WARNING!!! If the combustion levels are not within the range given in Table 3 for the firing rate, shut the boiler down and contact your distributor or the boiler manufacturer (see reference in the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

15 - Attach to the front of the boiler the appropriate conversion label, found in the conversion kit (see Figure 14 or Figure 15), stating the new type of gas adjustment of the boiler.

a - Apply the label in Figure 15 if the boiler has been converted to **LP GAS**;

b - Apply the label in Figure 14 if the boiler has been converted to **NATURAL GAS**.

ATTENTION!!!
This heater has been converted for use with
NATURAL GAS
- Maximum inlet gas pressure: 13 In.W.C.
- Minimum inlet gas pressure: 3 In.W.C.
- Manifold pressure: (see rating plate)
- Input rating: (see rating plate)

This water heater was converted on (day-month-year)
_____to _____ gas
with kit nº_____
by_____
_____
(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).

Figure 14 - Label for Natural gas boiler

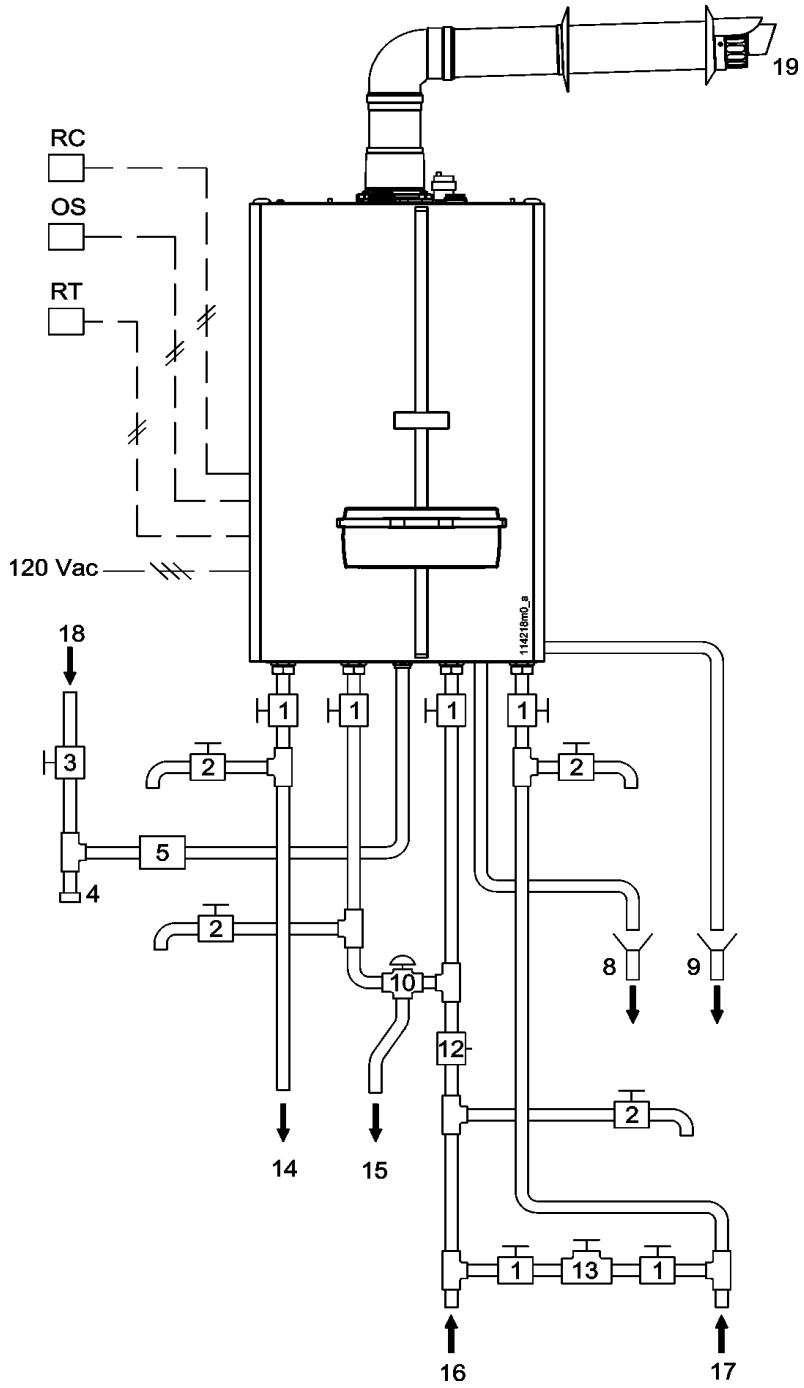
ATTENTION!!!
This heater has been converted for use with
LP GAS
- Maximum inlet gas pressure: 13 In.W.C.
- Minimum inlet gas pressure: 3 In.W.C.
- Manifold pressure: (see rating plate)
- Input rating: (see rating plate)

This water heater was converted on (day-month-year)
_____to _____ gas
with kit nº_____
by_____
_____
(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).

Figure 15 - Label for LP gas boiler

5.17 - Suggested piping and wiring connections

Figure 16 shows the suggested piping and wiring connection for the PC160™. All component listed below, except the flue terminal must be field supplied.



1 = ball valve
2 = drain valve
3 = Manual gas shut-off valve
4 = sediment trap
5 = ground joint union
8 = Relief valve drain
9 = Condensate drain
10 = Domestic mixing valve
12 = Flow restrictor
13 = Fill valve
14 = Heating supply
15 = Domestic Hot Water
16 = Cold water
17 = Heating return
18 = Gas supply
19 = Concentric vent/air intake terminal
OS = Outdoor sensor (optional)
RC = Remote command (optional)
RT = Room thermostat
120 Vac = Electrical supply

Figure 16 - Typical piping and wiring connections

6 - INSTALLATION - Electrical connections

6.1 - Electrical connections: overview

WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation!

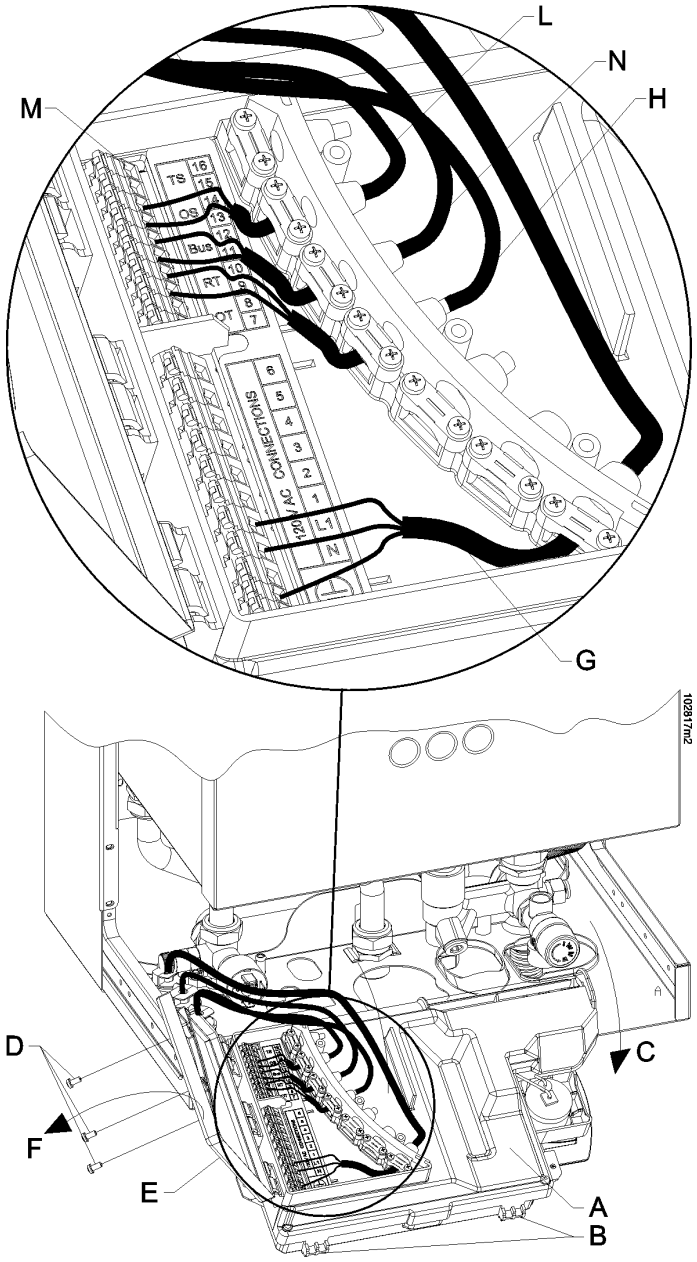
ATTENTION!!! Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonction-nement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretirn terminé.

WARNING!!! The boiler must be electrically wired to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the *National Electrical Code, ANSI/NFPA 70* and/or the *Canadian Electrical Code Part I, CSA C22.1, Electrical Code*. This is an essential safety requirement which must be checked.

- ☞ Check that the electrical system is adequate for the power consumption indicated on the rating plate.
- ☞ Line voltage field wiring of any controls or other devices must conform to the temperature limitation of type T wire at 95 °F (*35 °C)*, above room temperature. Use copper conductors with a minimum size of #14 AWG. Low voltage wiring must not be less than #18 AWG with a neoprene, thermoplastic or other equivalent insulation having a minimum insulation thickness of 0.012 in, *(3 mm)*.
- ☞ A properly rated shut-off switch shall be located at the boiler.
- ☞ Ensure that the polarity between live and neutral wires is maintained when connecting the boiler.

CAUTION!!! Ensure that heating and water piping is not used as a ground connections for the electric and telephone systems. This piping is completely unsuitable for this purpose and, could rapidly lead to serious corrosion damage to the boiler, piping and radiators, voiding the warranty

CAUTION!!! The boiler is not provided with any protection against lightening strikes.



A = Junction box
B = Plastic spring
C = Opening direction
D = Screws for junction box cover
E = Junction box cover
F = Junction box cover opening direction
G = Electrical supply cable
H = Room thermostat cable (optional)
L = Outside temperature sensor cable (optional)
M = Storage tank temperature sensor
N = Remote command cable (optional)

Figure 17- Junction box

6 - INSTALLATION - Electrical connections

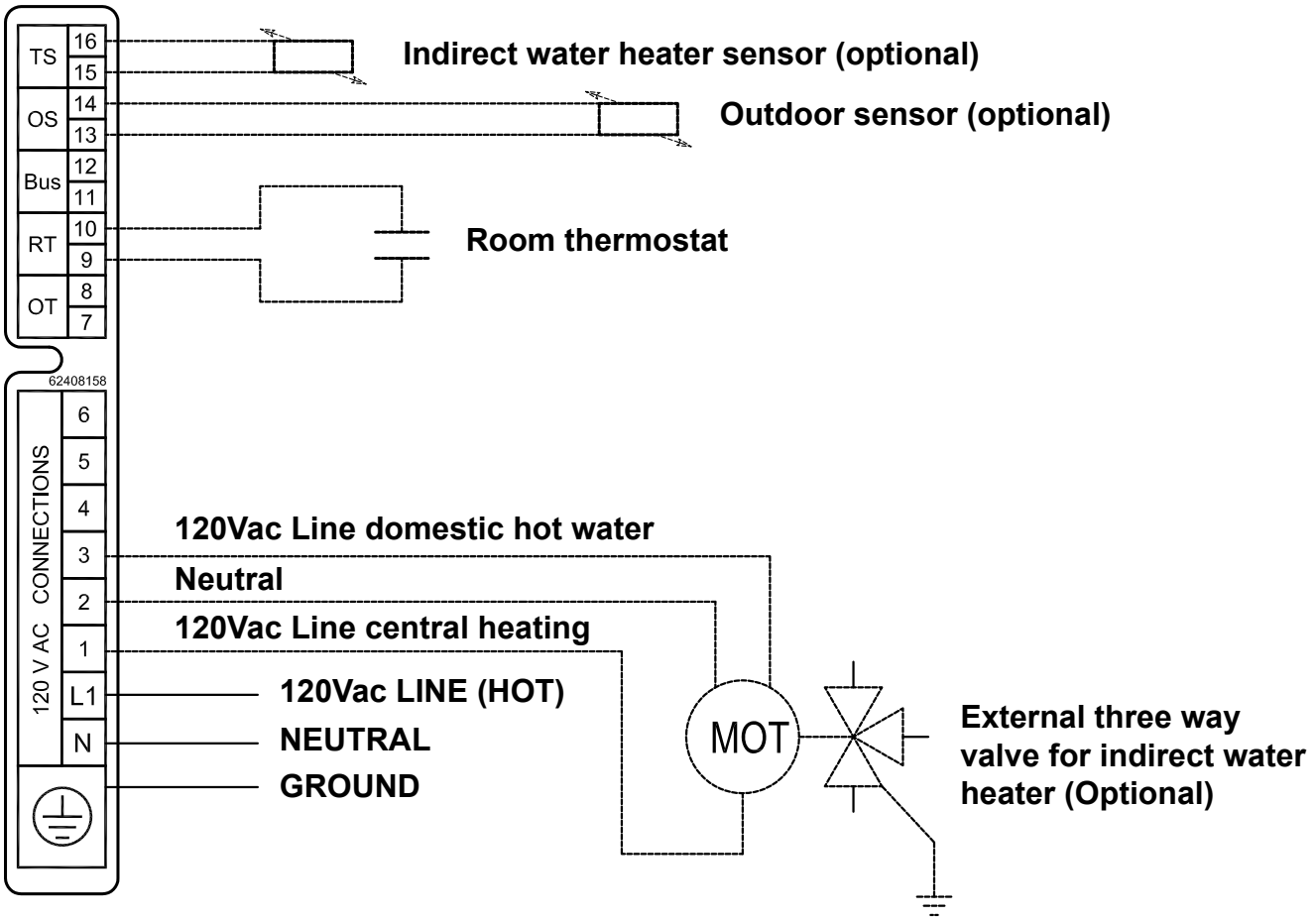


Figure 18 - Electrical connections

6.2 - Connecting the power supply cable

To connect the electrical power supply cable, follow the steps below while referring to figures 17 and 18:

- remove the boiler casing following the instructions given in section 13.2;
- press the two plastic springs tabs labeled “B” on the bottom side;
- open panel “A” in the “C” direction;
- remove the three screws labeled “D”;
- open door “E” in the “F” direction;
- install the power supply wires, “G” as shown;
- strip the power supply wires being careful to leave the ground wire 1in (25 mm) longer than the other two;
- connect the ground wire to the ground terminal;
- connect the 120 volt hot wire to terminal “L1”;
- connect the 120 volt neutral wire to terminal “N”.

NOTICE! If the 120 volt power wires are inverted, the boiler will block, displaying error code E21.

NOTICE! If the boiler is not properly grounded, the boiler will block, displaying error code E23

6.3 - Choosing the room thermostat

This boiler is designed to function with any type of room thermostat which has an electrical contact with the following specifications:
- open (end call for heat); closed (call for heat);
- clean dry contact (not powered);
- electrical capacity of 24Vac, 1A.

6.4 - Thermostat wiring

Install the room thermostat in a part of the house where the temperature is as near to average as possible. Avoid areas subject to sudden temperature changes such as outside windows or doors, above radiation elements, near lamps, etc., (see figure 19).

Connect the room thermostat to the boiler by following the steps below:

- remove the boiler casing according to the instructions given in section 13.2 and open the junction box per section 6.2;
- use a two conductor cable with a minimum cross section of # 18 AWG between the boiler and the room thermostat;
- route the cable through an empty cable clamp in the junction box
- connect the cable leads to the “RT” terminals as shown in figures 17 and 18.

NOTICE! the maximum room thermostat cable length permitted is 65 ft (*20 m)*. For longer lengths, up to 300ft (100 m) a shielded cable, with the shield connected to the ground, must be used.

WARNING!!! Since the room thermostat wires conduct 24 Vac, they must never be run through conduits containing 120Vac power wires or an electrical shock hazard will exist

6.5 - Installing the outdoor temperature sensor (optional)

Install the outdoor temperature sensor, on an exterior wall of the building facing NORTH or NORTH-EAST, at a height of between 4 ft (1.2 m) and 6 ft (1.8 m) from the ground level. On multi story buildings, install the sensor near the upper half of the second floor. Do not install the sensor above doors, windows or ventilation outlets nor directly under balconies or gutter pipes. Do not shield the outdoor temperature sensor. Do not install the sensor on walls without overhangs, or not protected from rain. To connect the outdoor temperature sensor to the boiler proceed as follows:

1. remove the boiler casing according to the instructions given in section 13.2 and open the junction box per section 6.2;
2. use a two conductor cable with a minimum cross section of # 18 AWG. between the boiler and the outdoor temperature sensor.

NOTICE! the maximum outdoor temperature sensor cable length permitted is 65 ft (20 m). For longer lengths, up to 300 ft (100 m) a shielded cable, with the shield connected to the ground, must be used;

WARNING!!! Since the outdoor temperature sensor wires conduct 24 Vac, they must never be run through conduits containing 120 Vac power wires or an electrical shock hazard will exist.

3. connect the outdoor temperature sensor cable leads to terminals OS as shown in figures 17 and 18;
4. connect the outdoor temperature sensor cable leads to the ends of the external temperature sensor.

Set the boiler so that it detects the outdoor temperature sensor, as follows:

1. press down the Reset button for 12 seconds until the display starts blinking and shows U 1;
2. then press and release the Reset button several times until the following CH parameter appears;
3. using the + and − keys, change the parameter value from 00 to 01 or 02 in relation to the type of outdoor reset desired as explained in section 12.10;
4. press the Reset button repeatedly until exiting the menu; the display will no longer flash.

6.6 - Alarm output

Inside the electrical box (see 13.15 and 13.16) there is an electrical connection for a 120Vac output that is energized each time the boiler goes into a lock-out or error condition. The Installer can use this output to activate any kind of external signalization devices such an audible alarm, phone, or other devices.

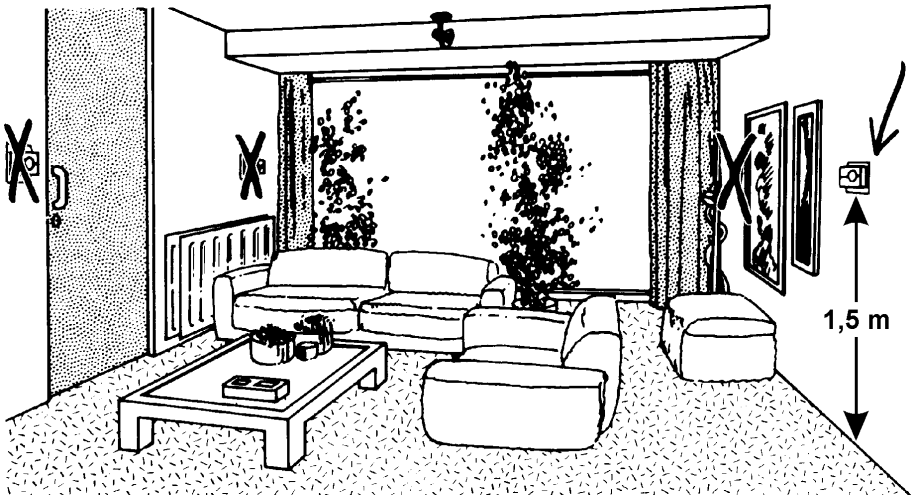
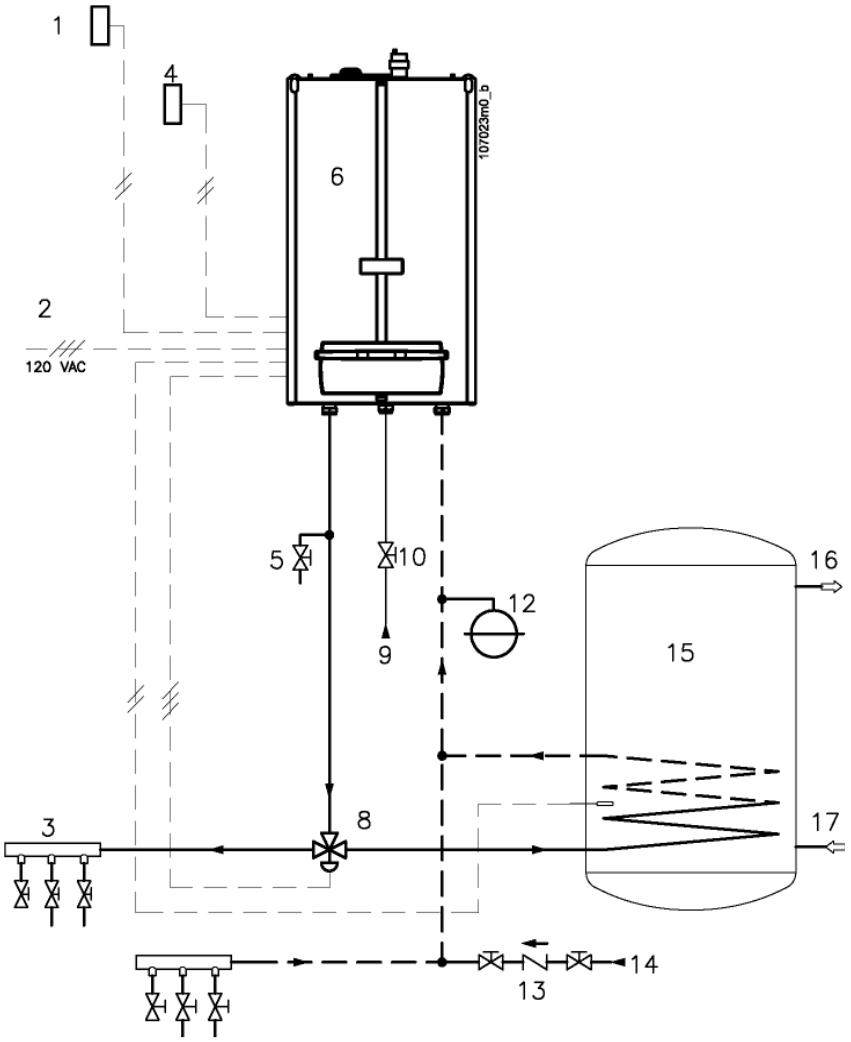


Figure 19 - Room thermostat location

7 - INSTALLATION - Indirect storage tank connections



1 Outdoor temperature sensor (optional)
2 120Vac electrical supply
3 Heating system supply circuit
4 Room thermostat (field supplied)
5 Heating circuit drain valve (field supplied)
6 Boiler
7 -
8 Three way valve (field supplied)
9 Gas supply
10 Manual gas shutoff valve (field supplied)
11 -
12 - Expansion vessel (if the inside one is not sufficient)
13 Automatic fill valve (field supplied)
14 Cold water inlet connection
15 Indirect storage tank (field supplied)
16 Domestic hot water outlet
17 Domestic cold water inlet

Figure 20 - Indirect storage tank connections

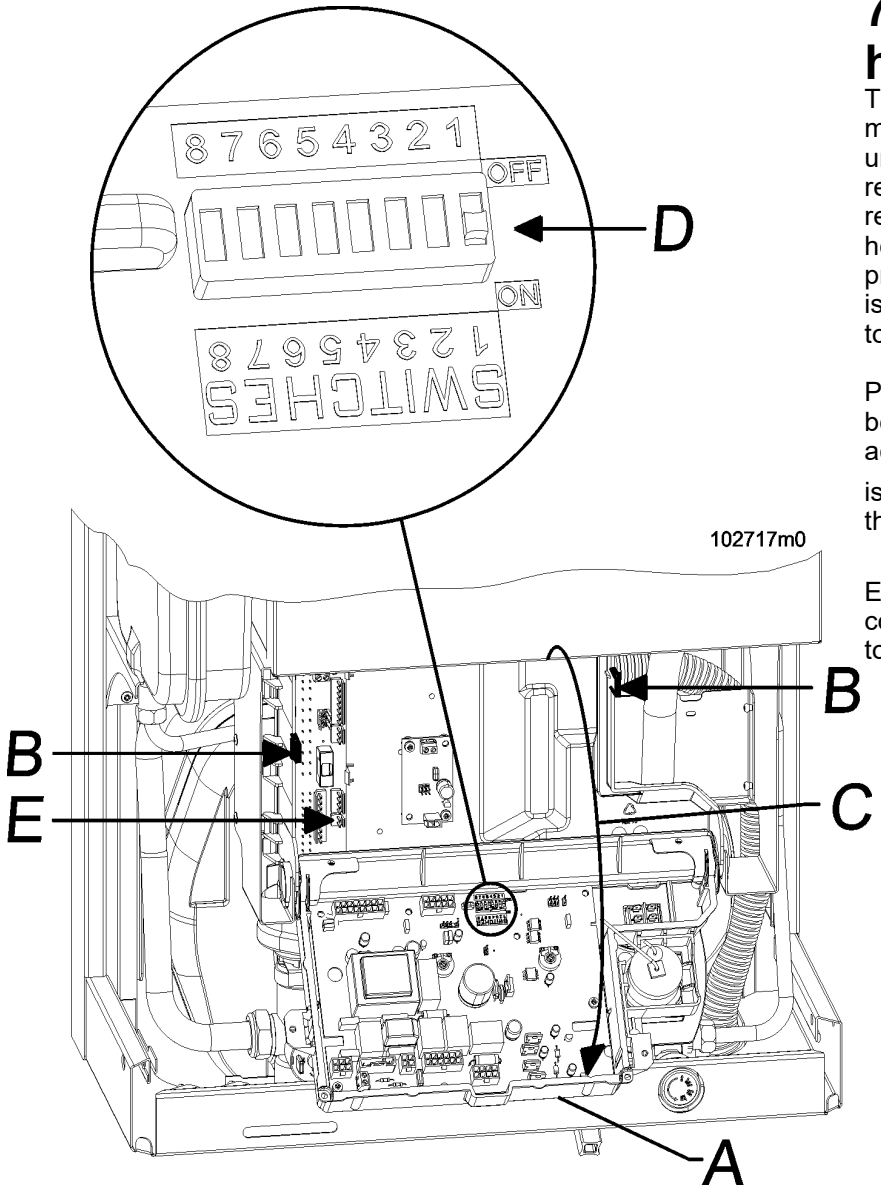
7.1 - Connecting the boiler to an indirect storage tank

This boiler, can be connected to an indirect storage tank as follows (the water and electrical connections must be made per figure 20): To make the electrical connections, follow the steps below while refering also to figure 20:

1. disconnect the boiler from the electrical supply;
2. remove the boiler casing according to the instructions given in section 13.2;
3. push the plastic spring tabs “B” shown in figure 21;
4. open the front half of the electrical box in the “C” direction as shown in figure 21;
5. move switch #1, item “D” in figure 21, to its “ON” position as marked on the control board;
6. ensure that switch #5 is in the OFF position;
7. on the rear side of the electrical junction box board, if present, disconnect the plug with two wires (see figure 21, item “E”), corresponding to wires #44 and #45.
8. on the rear side of the electrical box, disconnect the plug from the diverter valve (see figure 1, item “35”). When you disconnect the plug you must be sure the boiler is doing heating. If you are not sure, light the boiler ON, wait the display show “F” and then light-off the boiler. Now you can disconnect the plug from the diverter valve.
9. use a # 18 AWG two wire cable to connect the indirect storage tank temperature sensor to terminals “TS”, item “M”, as per figures 17 and 18;
10. insert the probe of the tank temperature sensor into the socket of the storage tank.
11. use a #18 AWG four wire cable to connect the three way valve to terminals “1”, “2”, “3” and Ground as per figures 17 and 18, where:
    “1” = 120Vac Line for heating side
    ”2” = Neutral
    “3” = 120Vac Line for domestic side

WARNING!!! Since the indirect storage tank temperature sensor wires conduct 24 Vac, they must never be run through conduits containing 120 Vac power wires or an electrical shock hazard will exist.

WARNING!!! Once the boiler is connected to an indirect storage tank, it will perform a weekly antilegionella cycle. This cycle raises the storage tank temperature to 140°F one time per week.



7.2 - Indirect water heater priority selection

The boiler is factory set for DHW priority. This means that the boiler will stay in DHW mode until the capacity of the indirect water heater reaches temperature. In some cases this will result in house cooling because the central heating function was stopped by the DHW priority mode. Once the indirect water heater is satisfied the boiler will automatically return to central heating.

Priority selection is a functionality that toggles between CH and CHW when they are both active at the same time. The priority selection is set with the **dP** (DHW priority) parameter in the “installer menu” (see section 12.17)

Each value set into the **dP** parameter will correspond to the minutes delay the boiler toggles between CH and DHW demand.

A = front cover of the electrical box
B = plastic spring to open the electrical box
C = Direction to open the electrical box
D = Switches for the functional setting of the boiler

Figure 21 - Control board and junction box board details

8.1 - Removing of a boiler from a common venting system

WARNING!!! DO NOT connect this boiler or any other appliance using a positive pressure, in a common vent system! Failure to comply with this WARNING could result in the accumulation of carbon monoxide gas which can cause severe personal injury or death!

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it. At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

(a) Seal any unused openings in the common venting system.

(b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

(c) Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

(d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

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

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

(g) Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 /NFPA 54 and/or CAN/CSA B149.1, Natural Gas and Propane Instal-lation Code. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1 /NFPA 54 and/or CAN/CSA B149. 1, Natural Gas and Propane Installation Code.

Au moment du retrait d'une chaudière existante, les mesures suivantes doivent être prises pour chaque appareil toujours raccordé au système d'évacuation commun et qui fonctionne alors que d'autres appareils toujours raccordés au système d'évacuation ne fonctionnent pas: système d'évacuation

(a) Sceller toutes les ouvertures non utilisées du système d'évacuation.

(b) Inspecter de façon visuelle le système d'évacuation pour déter-miner la grosser et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étrangle-ment de fruite, de corrosion et autres défaillances qui pourraient présenter des risques.

(c) Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace où les appareils toujours raccordés du système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sécheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinère et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.

(d) Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Régler le thermostat de façon que l'appareil fonctionne de façon continue.

(e) Faire fonctionner le brûleur principal pendant 5 min ensuite, déterminer si le coupe-tirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allunette ou d'une chandelle ou la fumée d'une cigarette, d'un cigare ou d'une pipe.

(f) Une fois qu'il a été déterminé, selon la métode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façor adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.

(g) Tout mauvais fonctionnement du systéme d'évacution commun devrait étré corrigé de façon que l'installation soit conforme au National Fuel Gas Code, ANSI Z223.1/NFPA 54 et (ou) aux codes d'installation CSA-B149. Si la grosseur d'une section du système d' évacuation doit étré modifiée, le système devrait étré modifié pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du National Fuel Gas Code, ANSI Z223.1/ NFPA 54 et (ou) des codes d'installation CSA-B149.

8.2 - Venting systems

WARNING!!! The vent installation must be in accordance with Part 7, *Venting of Equipment*, of the latest edition of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 or section 7, *Venting Systems and Air Supply for Appliances*, of the CAN/CSA B149.1, *Natural Gas and Propane Installation* code or applicable provisions of the local building codes. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

- ☞Horizontal vent runs must be sloped upwards not less than 1/4 in/ft (*21 mm/m)*, from the boiler to the vent terminal.
- ☞The vent system shall be installed so as to prevent the accumulation of condensate. When horizontal vent runs exceed 5 ft *(1.5m)*, they must be supported at 3 ft *(0.98 m)*, intervals with overhead hangers.
- ☞Horizontal vent systems shall terminate at least 4 ft *(1.22 m)* below, 4 ft *(1.22 m)* horizontally from any door, window or gravity air inlet into any building. It must not terminate less than 4 ft *(1.22 m)* horizontally from, and in no case above or below, unless a 4 ft *(1.22 m)*, horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment and not less than 7 ft *(2.3 m)* from any adjacent public walkway. The bottom of the vent terminal(s) shall be located at least 5 ft *(1.5 m)* above the air intake terminal(s). Avoid terminal locations likely to be affected by winds, snowdrifts, people and pets. **Item unique to CANADA: vent system shall terminate at least 6 ft from electrical and gas meters.**
- ☞Due to the high efficiency of the boiler it may discharge what looks like white smoke especially when the outside air temperature is cold. This is a simply water vapor, a purely natural phenomenon and not a reason for concern.
- ☞The minimum clearance measurement between two vent end terminations of this kind of boilers shall be not less than 18" *(1 m)*.

WARNING!!! The exhaust vent and the air inlet lines (also in the coaxial version) must be supported to prevent sagging. To do this, use a suitable pipe clamp to support the lines. Pipe clamps shall support the line every 3 ft (1 m). Pipe clamp shall be fixed in correspondance of a wall stud. Improper supporting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

This Boiler requires a special vent system, designed for pressurized venting.

You must install air piping from outside to the boiler air intake. The resultant installation is Direct Vent (sealed combustion).

The boiler is to be used for either Direct Vent installation or for installation using room combustion air. When room air is considered see Section 8.6.

Vent and air must terminate near one another and may be vented vertically through the roof or out of a side wall, unless otherwise specified. You may use any of the vent/air piping methods from Figure 22 thru Figure 27. Do not attempt to install boiler using any other means.

⚠ WARNING!!! DO NOT mix components from different systems. The vent system could fail, causing leakage into the living space. Use only approved materials listed on 8.1 and 8.2. Improper materials or mixing materials can result in excessive levels of carbon monoxide which can cause several personal injury or death!

Be sure to locate the boiler such that the vent and air piping can be routed through the building and properly terminated. The vent/air piping lengths, routing and termination method must all comply with the methods and limits given in Section 8.3.

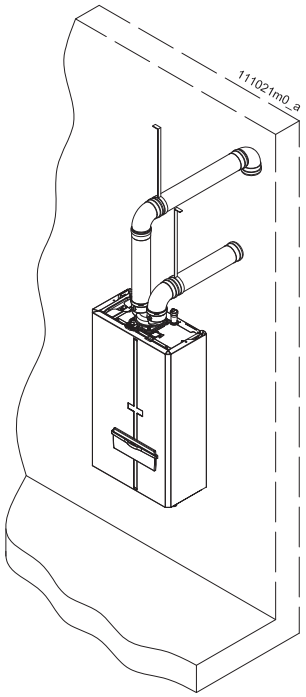


Figure 22 - Side wall two pipes (Direct venting).

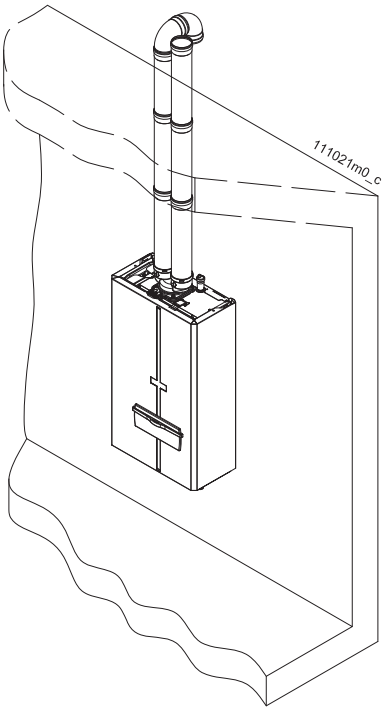


Figure 23 - Vertical two pipes (Direct venting).

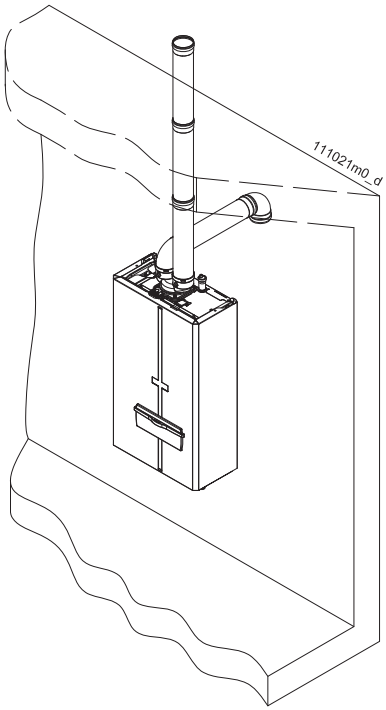


Figure 24 - Side wall air intake, vertical vent (Direct venting).

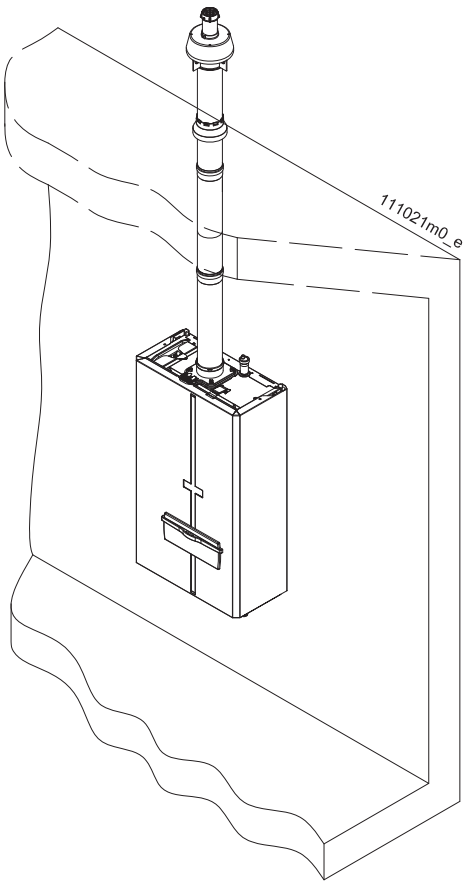


Figure 25 - Vertical concentric (Direct venting).

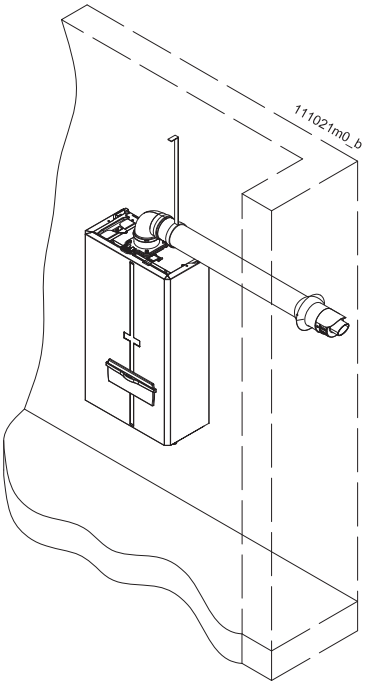


Figure 26 - Side wall concentric (Direct venting).

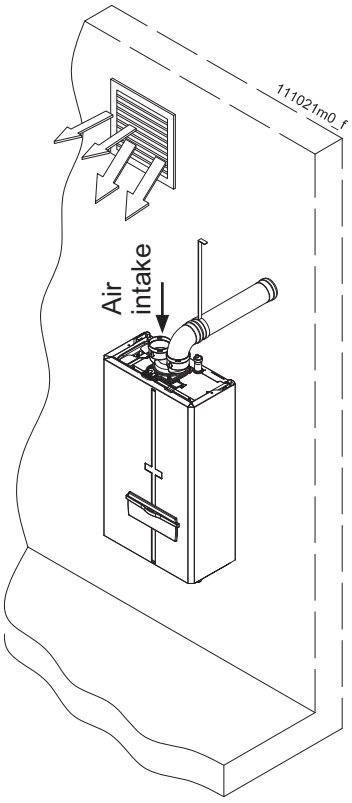


Figure 27 - Side wall one pipe venting, combustion air from room (Direct venting).

8.3 - Design of the venting system

This boiler can be fitted with a very long venting system. However there is a relationship between the length of the venting system and the power input of the boiler. Figure 28 shows this relation which and installer must consider when in the designing stage of the venting.

The maximum length of the Split vent system is 300 ft (Air intake plus flue exhuast).

The maximum length of the concentric system is 70 ft.

Each 45° elbow inserted in the concentric or split venting system, has a loss of pressure equivalent to 2.5 ft of linear pipe.

Each 90° elbow inserted in the concentric or split venting system, has a loss of pressure equivalent to 5 ft of linear pipe.

The minimum length of the venting system (two pipes or concentric) is 1 ft with one elbow.

8.4 Prevent Combustion air contamination

Install air inlet piping as described in Section 8. You must pipe combustion air to the boiler air intake. Do not terminate vent/air in locations that can allow contamination of combustion air.

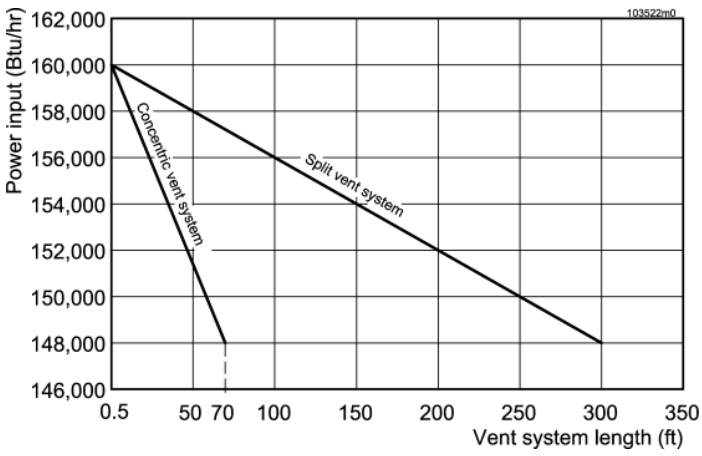


Figure 28 - Relation between Power input and Vent system length

⚠ WARNING!!! Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

Ensure that that combustion air will not contain any of the following contaminants.
- Permanent wave solutions
- Chlorinated waxes/cleaners
- Chlorine based swimming pool chemicals
- Calcium Chloride used for thawing
- Sodium Chloride used for water softening
- Refrigerant leaks
- Paint or varnish removers
- Hydrochloric acid/muriatic acid
- Cements and glues
- Antistatic fabric softeners used in clothes dryers.
- Chlorine-type bleaches, detergents and cleaning solvents found in household laundry rooms
- Adhesives used to fasten building products and other similar products.

Do not pipe combustion air near sources of products that may contaminate the air combustion, like:
- Dry cleaning/laundry areas and establishments
- Swimming pools
- Metal fabrication Plants
- Beauty shops
- Refrigeration repair shops
- Photo processing plants
- Auto body shops
- Plastic manufacturing plants
- Furniture refinishing areas and establishments
- Remodeling areas
- Garages with workshops

8.5- Install Vent and Combustion air piping

⚠ WARNING!!! This boiler must be vented and supplied with combustion and ventilation air as described in this section. Ensure the vent and combustion air supply comply with these instructions regarding vent system, air system and combustion air quality. Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all applicable codes. Failure to provide a properly installed vent and air system will cause severe personal injury or death.

⚠ WARNING!!! Using vent materials other than those listed in Table (4) and Table (5), failure to properly seal all seams and joints, mixing of venting materials a or failure to follow vent pipe and fittings manufacturers instructions can result in personal injury, death or property damage.

⚠ WARNING!!! Never use cellular (foam) core pipe in vent pipe lines and fittings. Failure to comply can result in personal injury, death or property damage.

⚠ WARNING!!! Increasing or decreasing combustion air or vent piping is not authorized. Failure to comply can result in personal injury, death or property damage.

NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for US installations or CSA B149.1 for Canadian installations.

For installation in Canada, vent pipe system must be certified to ULC-S636.

TABLE 4

Vent pipe materials and fittings must comply with the following standards			
Item	Material	Standard for installation in USA	Standard for installation in Canada
Vent pipe and fittings	PVC Schedule 40, 80	ANSI/ASTM D1785	ULC-S636
	CPVC schedule 40/80	ANSI/ASTM F441	
	Polypropylene	ULC-S636	
	Stainless steel AL29-4C	UL1738	
Pipe cement/primer	PVC	ANSI/ASTM D2564	
	CPVC	ANSI/ASTM F493	

WARNING!!! USE OF CELLULAR CORE PVC, CPVC AND RADEL FOR VENTING SYSTEM IS NOT ALLOWED.

TABLE 5 APPROVED VENT MANUFACTURERS AND ITEMS

Approved vent manufacturers and items			
Item	Materials	Manufacturer/supplier	Manufacturer/supplier part number
Concentric roof or wall terminal	PVC	IPEX (System 636)	196006
Two pipes wall terminal	PVC	IPEX (System 636)	081219 or 196985
Single pipe wall terminal (90°elbow)	PVC	IPEX (System 636)	196025
Boiler adapter (80mm to 3” PVC)	Polypropylene	COSMOGAS	62617303 (PB Part 54516)
Bird Screen	PVC	IPEX (System 636)	196051
Two pipes roof terminal	Polypropylene	COSMOGAS	62617306 and 61302003
Two pipe wall terminal	Polypropylene	COSMOGAS	61302004 and 61302003
Single pipe roof terminal	Polypropylene	COSMOGAS	62617306
Single pipe wall terminal	Polypropylene	COSMOGAS	61302004
Two or single pipe boiler adapter (80mm to 80mm Polypropylene)	Polypropylene	COSMOGAS	62617286
Bird Screen	Polypropylene	COSMOGAS	61302003
Concentric boiler adapter	Polypropylene	COSMOGAS	62617224
Concentric roof terminal	Polypropylene	COSMOGAS	62617304
Concentric wall terminal	Polypropylene	COSMOGAS	62617232
Single pipe wall or roof terminal	Polypropylene	Centrotherm (Innoflue System)	IESP0339
Two pipes wall or roof terminal	Polypropylene	Centrotherm (Innoflue System)	ASEP0339 and ISEL0387UV
Bird screen	Polypropylene	Centrotherm (Innoflue System)	IASPP03
Single pipe wall or roof terminal	Polypropylene	Duravent (PolyPro)	3PPS36B
Two pipes wall or roof terminal	Polypropylene	Duravent (PolyPro)	3PPS36B and 3PPS-E90B
Bird Screen	Polypropylene	Duravent (PolyPro)	3PPS-BG
Single pipe wall or roof terminal	Stainless Steel	Duravent (FasNSeal)	FSVL3603
Two pipes wall or roof terminal	Stainless Steel	Duravent (FasNSeal)	FSVL3603 and FSELB8803
Boiler adapter (80mm to 3” stainless steel)	Stainless Steel	Duravent (FasNSeal)	FSA-80MM3
Bird Screen	Stainless Steel	Duravent (FasNSeal)	FSBS3
Single pipe wall or roof terminal	Stainless Steel	Heat Fab (SGV)	SGV03L36
Two pipes wall or roof terminal	Stainless Steel	Heat Fab (SGV)	SGV03L36 and FSEL8803
Boiler adapter (80mm to 3” stainless Steel)	Stainless Steel	Heat Fab (SGV)	SGV03AD80
Bird screen	Stainless Steel	Heat Fab (SGV)	SGV03TM

8.6 - Air inlet pipe materials

WARNING!!! The air inlet pipe(s) must be sealed. Improper sealed can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

Choose acceptable combustion air inlet pipe materials from the following list:
- PVC, CPVC or ABS Dryer Vent or Sealed Flexible Duct (not recommended for rooftop air inlet)
- Galvanized steel vent pipe with joints and seams sealed as specified in this section.
- Type “B” double-wall vent with joints and seams sealed as specified in this section.
- AL29-4C, stainless steel material to be sealed to specification of its manufacturer.
- Polypropylene material to be sealed to specification of its manufacturer.

NOTICE! PVC, CPVC, ABS Dryer Vent and stainless steel pipe may require an adapter (not provided) to transition between the air inlet connection on the appliance and the air inlet pipe

WARNING!!! Using vent or air intake materials other than those specified, mixing the specified materials, failure to properly seal all seams and joints or failure to follow the manufacturer’s instructions can result in personal injury, death or property damage.

NOTICE The use of double-wall vent or insulated material for the combustion air inlet pipe is recommended in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

8.6.1 - Sealing of Type “B” double-wall or galvanized air inlet pipe material

Sealing of Type “B” double-wall or galvanized air inlet pipe material used for air inlet piping on a sidewall or vertical rooftop Combustion Air Supply System:

a. Seal all joints and seams of the air inlet pipe using either Aluminum Foil Duct Tape meeting UL Standard 723 or 181A-P or a high quality UL Listed silicone sealant.
b. Do not install seams of vent pipe on the bottom of horizontal runs.
c. Secure all joints with a minimum of three sheet metal screws or pop rivets. Apply Aluminum Foil Duct Tape or silicone sealant to all screws or rivets installed in the pipe.
d. Ensure that the air inlet pipes are properly supported.

WARNING!!! Failure to properly seal all joints and seams as required in the air inlet piping may result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing severe personal injury or death.

8.6.2 - Sealing of PVC, CPVC or ABS air inlet pipe

The PVC, CPVC, or ABS air inlet pipe should be cleaned and sealed with the pipe manufacturer’s recommended solvents and standard commercial pipe cement for the material used.
The PVC, CPVC, ABS Dryer Vent or Flex Duct air inlet pipe should use a silicone sealant to ensure a proper seal at the appliance connection and the air inlet cap connection. Dryer vent or Flex Duct should use a screw type clamp to seal the pipe to the appliance air inlet and the air inlet cap. Proper sealing of the air inlet pipe ensures that combustion air will be free of contaminants and supplied in proper volume.
When a sidewall or vertical rooftop combustion air supply system is disconnected for any reason, the air inlet pipe must be resealed to ensure that combustion air will be free of contaminants and supplied in proper volume.

WARNING!!! Failure to properly seal all joints and seams as required in the air inlet piping may result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing severe personal injury or death.

8.7 - PVC/CPVC vent piping materials

⚠ WARNING!!! Use only the materials listed in Tables 4 and 5 for vent pipe, and fittings. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! This appliance requires a special venting system. The field provided vent fittings must be connected to the boiler following Section 8.7.1. Use only the vent materials, primer, and cement specified in this manual to make the vent connections. Failure to follow this warning could result in fire, personal injury, or death.

⚠ WARNING!!! Do not insulate PVC/CPVC exhaust pipe nor install into an enclosure, closet, alcove or any other obstruction thereby preventing the cooling of the exhaust pipe. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

⚠ WARNING!!! Improper installation of PVC or CPVC systems may result in injury or death.

NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

NOTICE The installer must use a specific vent starter adapter at the flue collar connection, supplied by the vent manufacturer to adapt to its vent system. See Table 5 for approved vent adapters.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 4).

NOTICE All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the boiler (to allow drainage of condensate).

NOTICE Installation of a PVC/CPVC vent system should adhere to the PVC/ CPVC vent manufacturer's installation instructions supplied with the vent system.

NOTICE The installer must use a specific vent starter adapter at the flue collar connection, supplied by the vent manufacturer to adapt to its vent system. See Table 5 for approved vent adapters.

8.7.1 - Installing PVC/ CPVC vent and air piping

NOTICE Use only cleaners, primers, and solvents that are approved for the materials which are joined together.

1. Work from the boiler to vent or air termination. Do not exceed the lengths given in Section 8.3.
2. Cut pipe to the required lengths and deburr the inside and outside of the pipe ends.
3. Bevel outside of each pipe end to ensure even cement distribution when joining.
4. Clean all pipe ends and fittings using a clean dry rag (Moisture will retard curing and dirt or grease will prevent adhesion).
5. Dry fit vent or air piping to ensure proper fit up before assembling any joint. The pipe should go a third to two-thirds into the fitting to ensure proper sealing after cement is applied.
6. Priming and Cementing:
   a. Handle fittings and pipes carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of primer to the fitting socket.
   c. Apply a liberal even coat of primer to the pipe end to approximately 1/2" beyond the socket depth.
   d. Apply a second primer coat to the fitting socket.
   e. While primer is still wet, apply an even coat of approved cement to the pipe equal to the depth of the fitting socket.
   f. While primer is still wet, apply an even coat of approved cement to the fitting socket.
   g. Apply a second coat of cement to the pipe.
   h. While the cement is still wet, insert the pipe into the fitting, if possible twist the pipe a 1/4 turn as you insert it. NOTE: If voids are present, sufficient cement was not applied and joint could be defective.
   i. Wipe excess cement from the joint removing ring or beads as it will needlessly soften the pipe.

8.7.2 - PVC/CPVC air intake/vent connections

Combustion Air Intake connection (see Figure 29 Item "C").

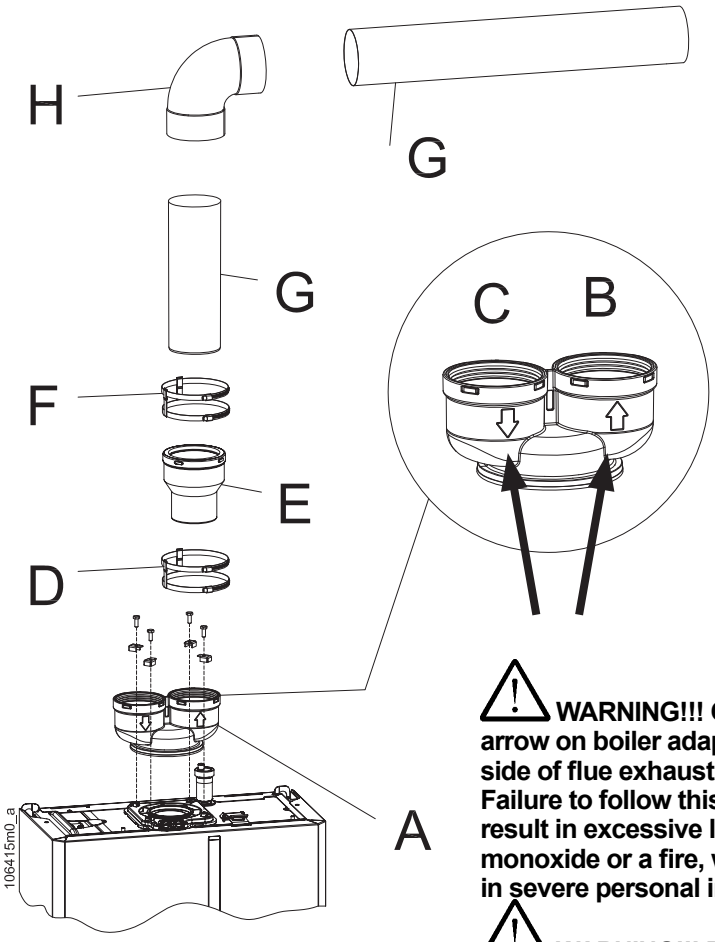
This connection is used to provide combustion air directly to the boiler from outdoors. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate. To connect a PVC/CPVC pipe to the air intake connection proceed as follow while referring to Figure 29:

1. install boiler adapter "A" above boiler. Rotate boiler adapter "A" so as air intake and vent connections are in the desired left or right side. Check stamped arrow to understand which is the vent and air intake connection.

⚠ WARNING!!! Check stamped arrow on boiler adapter for the correct side of air intake. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

2. insert the clamp "D" into convertor "A" in the "C" side.
3. insert the adapter "E" into connection "C" of the convertor "A";

4. use the precedent clamp “D” to mechanically secure the adapter “E” to the adapter “A”. To do this tighten the half clamp on the adapter “A” and half clamp on the adapter “E”. Tight the clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).
5. insert the clamp “F” into convertor “E”.
6. insert the air inlet PVC/CPVC pipe, for 2” into the adapter “E”;
7. use the precedent clamp “F” to mechanically secure the pipe to the adapter “E”. To do this tighten the half clamp on the pipe and half clamp to the adapter “E”. Tight the clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).



⚠ WARNING!!! Check stamped arrow on boiler adapter for the correct side of flue exhaust and air intake. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

⚠ WARNING!!! Do not insulate PVC/CPVC exhaust pipe nor install into an enclosure, closet, alcove or any other obstruction thereby preventing the cooling of the exhaust pipe. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

A = Two pipes boiler adapter
B = Flue exhaust connection
C = Air intake connection
D = Fixing clamp
E = PVC/CPVC adapter (PB Part 54516)
F = Fixing clamp
G = PVC/CPVC pipe
H = 90° elbow

Figure 29 - PVC/CPVC Venting connection

Vent connection (see Figure 29 Item “B”).

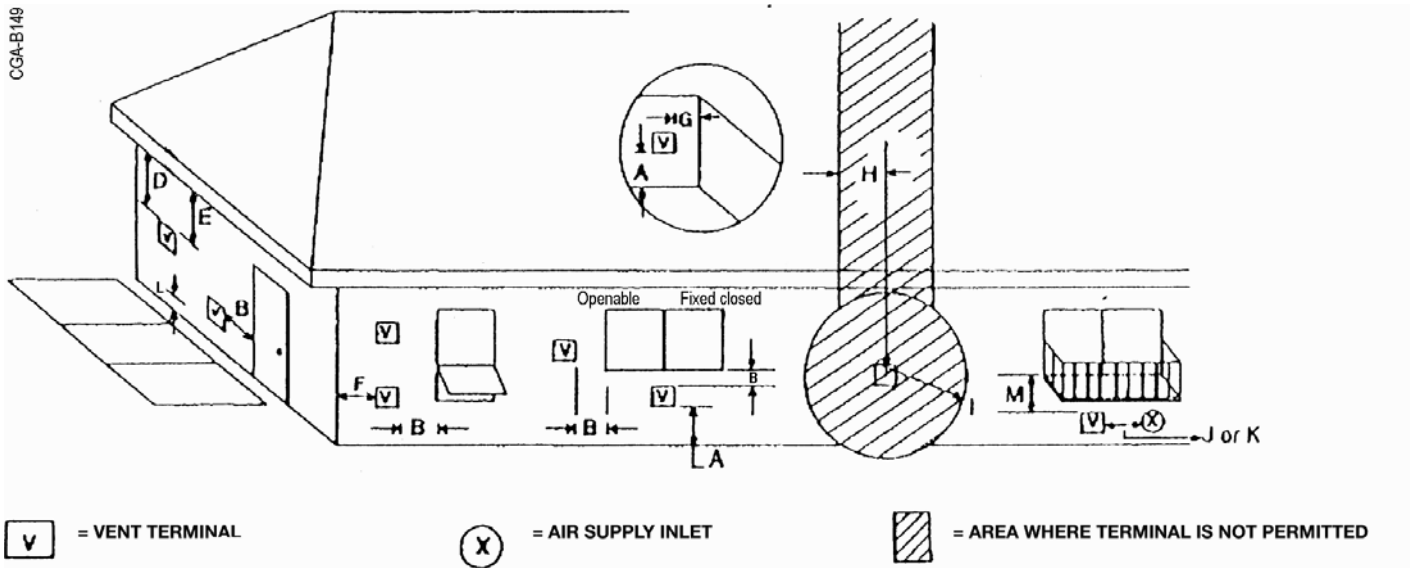
This connection is used to provide a passageway for conveying combustion gas to the outside. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate. To connect a PVC/CPVC pipe to the vent connection proceed as follow while referring to Figure 29:

1. install boiler adapter “A” above boiler. Rotate boiler adapter “A” so as air intake and vent connections are in the desired left or right side. Check stamped arrow to understand which is the vent and air intake connection.

⚠ WARNING!!! Check stamped arrow on boiler adapter for the correct side of vent. Failure to follow this warning could result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

2. Insert one side of clamp “D” onto the air intake of boiler adapter “A” (side C).
3. Insert adapter “E” into side “C” of boiler adapter “A”;
4. Use clamp “D” to mechanically secure adapter “E” to boiler adapter “A”. To do this, tighten one side of clamp “D” onto boiler adapter “A” and the other half of clamp “D” onto adapter “E”. Tight the clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).
5. Insert clamp “F” into adapter “E”.
6. Insert the PVC/CPVC pipe “G”, into adapter “E” for at least 2”;
7. Use clamp “F” to mechanically secure pipe “G” to adapter “E”. To do this, tighten one side of clamp “F” onto pipe “G” and the other side of clamp “F” to the adapter “E”. Tight the clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).

8.8 - Flue terminal location in compliance with CAN/CSA B149



Vent Termination Minimum Clearances

A = 12” clearances above grade, veranda, porch, deck or balcony
B = 12” clearances to window or door that may be opened
D = 18” vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (0.6 m) from the centre line of the terminal
E = 18” clearance to unventilated soffit
F = 9” clearance to outside corner
G = 6” clearance to inside corner
H = 4 ft (USA) not to be installed above a gas meter/regulator assembly within H horizontally from the centre line of the regulator
H = 3 ft (CANADA) not to be installed above a gas meter/regulator assembly within H horizontally from the centre line of the regulator
I = 3 ft (USA) clearance to service regulator vent outlet
I = 6 ft (CANADA) clearance to service regulator vent outlet
J = 9” (USA) clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance
J = 12” (CANADA) clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance
K = 3 ft (USA) clearance to a mechanical air supply inlet
K = 6 ft (CANADA) clearance to a mechanical air supply inlet
L = 7 ft clearance above paved side-walk or a paved driveway located on public property (a vent shall not terminate directly above a side-walk or paved driveway which is located between two single family dwellings and serves both dwellings unless terminated 7ft above sidewalk)
M = 18” clearance under veranda, porch, deck or balcony (only permitted if veranda, porch, deck or balcony is fully open on a minimum of 2 sides beneath the floor

8.9 - Single pipe vent (not sealed combustion)

⚠ WARNING!!! When utilizing the single pipe method, provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes.

Commercial applications utilizing this boiler may be installed with a single pipe carrying the flue products to the outside while using combustion air from the equipment room. In this case the following conditions and considerations must be followed.

⚠ WARNING!!! The equipment room MUST be provided with properly sized openings to assure adequate combustion air from outside. Failure to comply could result in severe personal injury, death, or substantial property damage.

- There will be a noticeable increase in the noise level during normal operation from the inlet air opening.
- Vent system and terminations must comply with the venting instructions set forth in sections 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8.

⚠ WARNING!!! Use only the materials, vent systems, and terminations listed in Tables 4 and 5. DO NOT mix vent systems of different types or manufacturers, unless listed in this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! Fire danger due to flammable materials or liquids. Do not store flammable materials and liquids in the immediate vicinity of the boiler.

⚠ WARNING!!! Boiler must be clear and free from combustible materials, gasoline and other flammable vapors and liquids, and corrosive liquids and vapors. Never use chlorine and hydrocarbon containing chemicals (such as spray chemicals, solution and cleaning agents, paints, glues etc.) in the vicinity of the boiler. Do not store and use these chemicals in the boiler room. Avoid excessive dust formation and build-up.

⚠ WARNING!!! Where exhaust fans, clothes dryers, and kitchen ventilation systems interfere with the operation of appliances, makeup air shall be provided.

NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 4).

NOTICE All vent pipes connections must be secured following manufacturer instruction, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the boiler (to allow drainage of condensate).

8.9.1 - Combustion Air and Ventilation openings

⚠ WARNING!!! Make sure that combustion air and ventilation openings are sufficiently sized and no reduction or closure of openings takes place. Please note these restrictions and its dangers to the operator of the boiler and to the homeowner. Failure to comply could result in severe personal injury, death, or substantial property damage.

Outdoor combustion air shall be provided through opening(s) to the outdoors. The minimum dimension of air openings shall not be less than 3 in. (80 mm) diameter.

Two Permanent Openings Method.
Two permanent openings, one commencing within 12 in. (300 mm) of the top and one commencing within 12 in. (300 mm) of the bottom, of the room shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors, as follows:

1. Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 in2 each 4000 Btu/hr (550 mm2/kW) of total input rating of all appliances located in the room.
2. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 in2 each 2000 Btu/hr (1100 mm2/kW) of total input rating of all appliances located in the room.

One Permanent Opening Method.
One permanent opening, commencing within 12 in. (300 mm) of the top of the room, shall be provided. The appliances shall have clearances of at least 1 in. (25 mm) from the sides and back and 6 in. (150 mm) from the front of the appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that freely communicate with the outdoors and shall have a minimum free area of 1 in2 each 3000 Btu/hr (700 mm2 / kW) of the total input rating of all appliances located in the room.

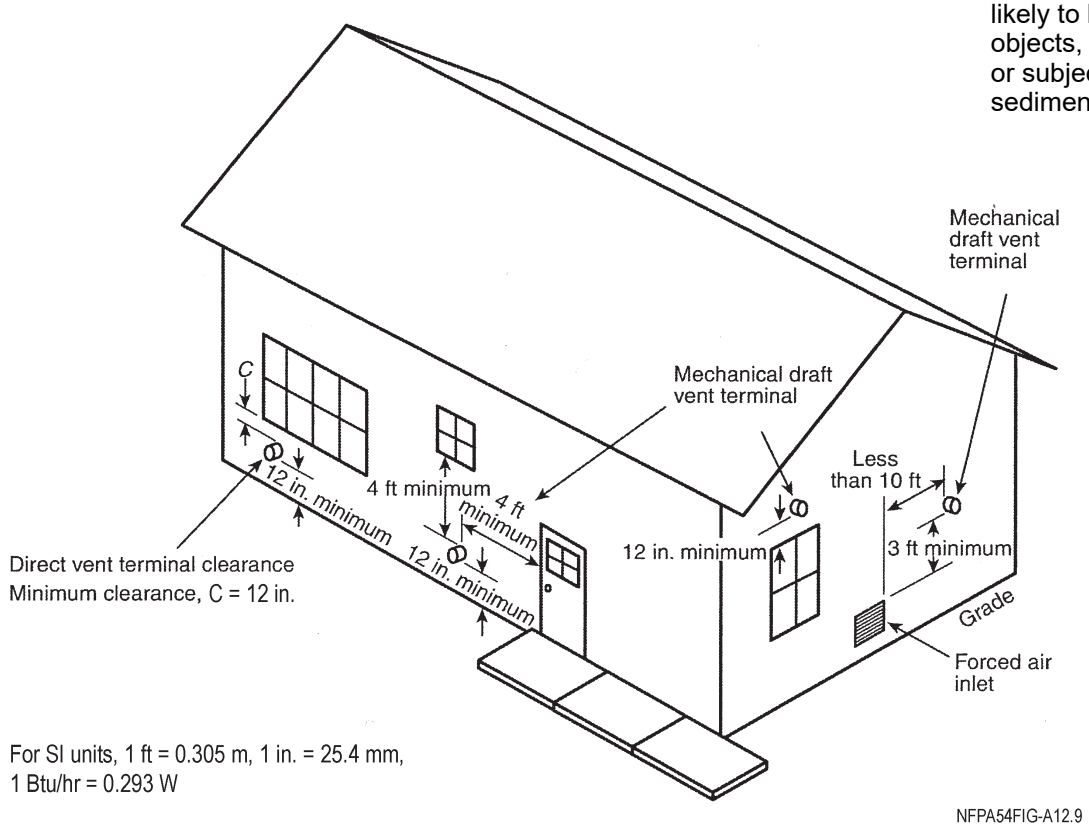
8.9.2 - Determine location

Locate the vent termination using the following guidelines:

1. The total length of piping for vent must not exceed the limits given in the Section 8.3.
2. You must consider the surroundings when terminating the vent:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals.
   e. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
   f. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   g. Locate or guard vent to prevent condensate damage to exterior finishes.
4. The vent piping must terminate in an elbow pointed outward as shown in Figure 46 or 49.

⚠ WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 46 or 49. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown.

5. Maintain clearances as shown in Figure 45 (get references to “Mechanical draft vent terminal” only). Also maintain the following:
   a. Vent must terminate:
      • At least 6 feet from adjacent walls.
      • No closer than 12 inches below roof overhang.
      • At least 7 feet above any public walkway.
      • At least 3 feet above any forced air intake within 10 feet.
      • No closer than 4 feet below or horizontally from any door or window or any other gravity air inlet.
   b. Do not terminate closer than 4 feet horizontally from any electric meter, gas meter, regulator, relief valve, or other equipment. Never terminate above or below any of these within 4 feet horizontally. **Item unique to CANADA: vent system shall terminate at least 6 ft from electrical and gas meters.**
6. Locate termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.



CAUTION!!! Increase the grade clearances of the snow line quote

Figure 30 - Vent position of a Direct vent boiler and of a Mechanical draft boiler (not sealed)

8.10 - Sidewall termination - Two pipes

8.10.1 - Vent/air termination

⚠ WARNING!!! A gas vent extending through an exterior wall shall not terminate adjacent to a wall or below building extensions such as eaves, parapets, balconies, or decks. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING!!! Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

8.10.2 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in the Section 8.3.
2. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals.
   e. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
   f. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   g. Locate or guard vent to prevent condensate damage to exterior finishes.

8 - INSTALLATION - Vent & combustion air

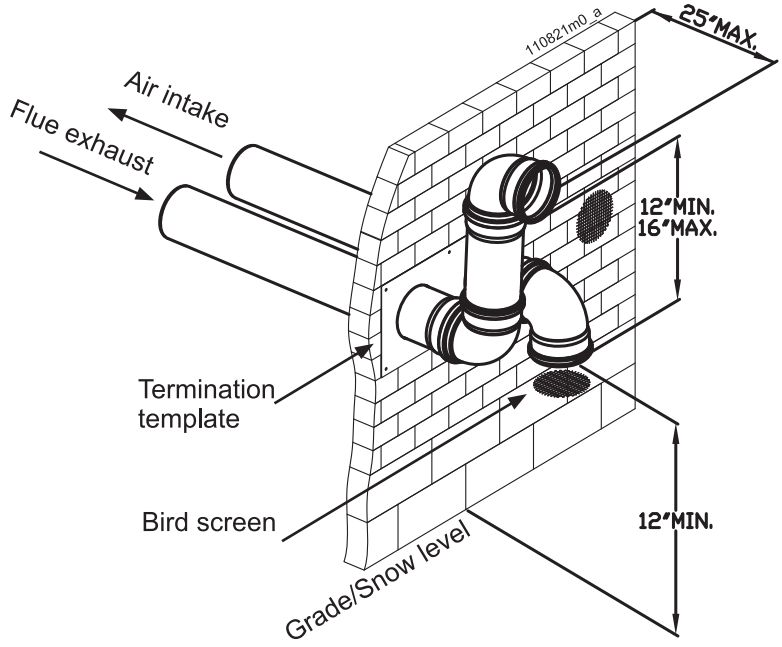


Figure 31 - Two pipes sidewall termination of air and vent

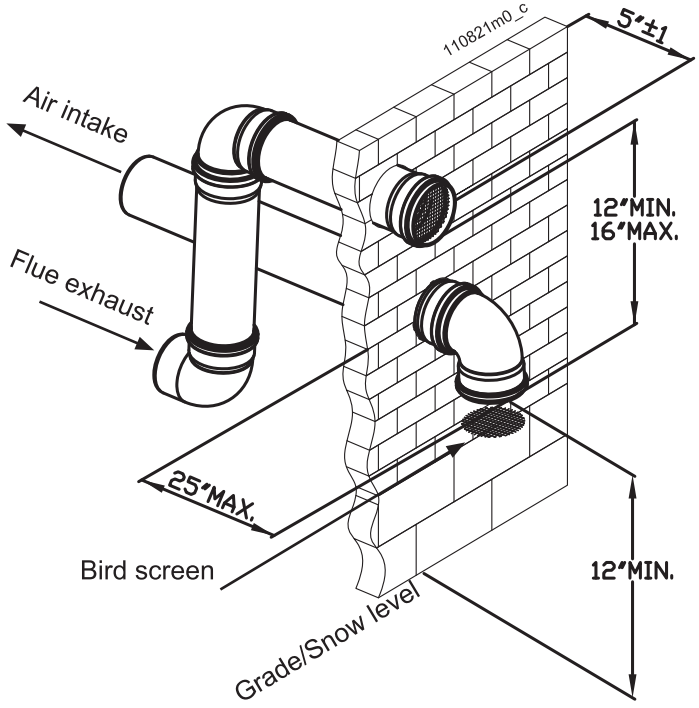


Figure 32 - Two pipes sidewall termination of air and vent (if space permits)

3. The air piping must terminate in a down-turned elbow as shown in Figures 31 and 32. This arrangement avoids recirculation of flue products into the combustion air stream.
4. The vent piping must terminate in an elbow pointed outward or away from the air inlet, as shown in Figures 31 and 32.

⚠ WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 31 and 32. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown.

5. Maintain clearances as shown in Figures 31 and 32. Also maintain the following:
   a. Vent must terminate:
      - At least 6 feet from adjacent walls.
      - No closer than 12 inches below roof overhang.
      - At least 7 feet above any public walkway.
      - At least 3 feet above any forced air intake within 10 feet.
      - No closer than 12 inches below or horizontally from any door or window or any other gravity air inlet.

   b. Air inlet must terminate at least 12 inches above grade or snow line; at least 12 inches below the vent termination;
   c. Do not terminate closer than 6 feet horizontally from any electric meter, gas meter, regulator, relief valve, or other equipment. Never terminate above or below any of these within 6 feet horizontally.
6. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

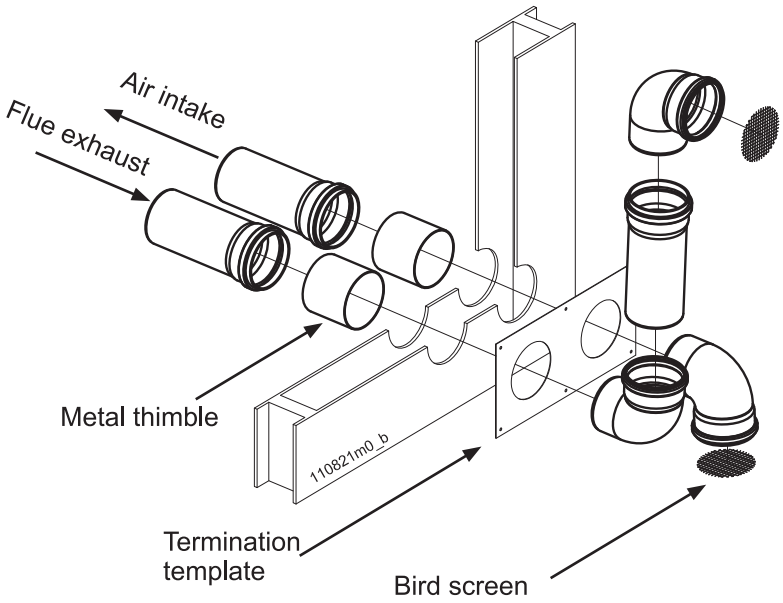
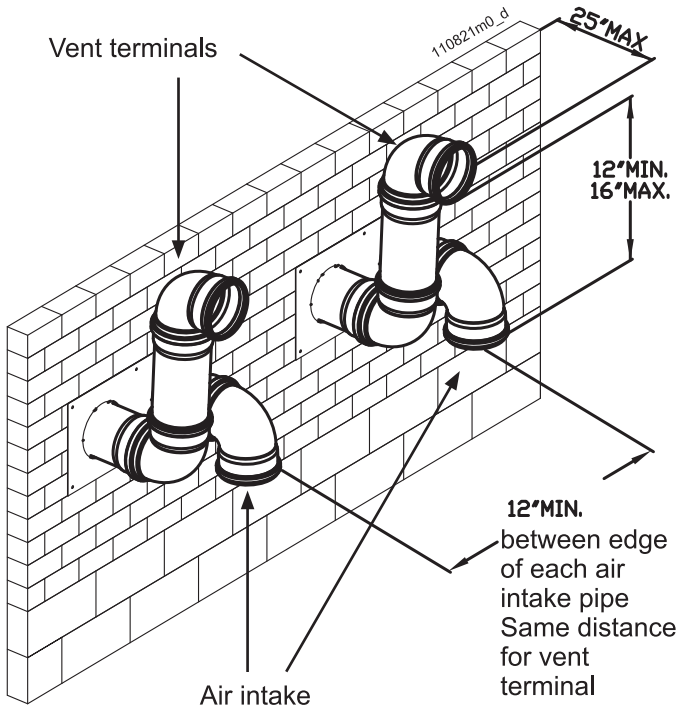


Figure 33 - Two pipes sidewall termination assembly



NOTE: keep the air intake at min. 12" from grade or snow line. Provide vent and air intake with bird screen

Figure 34 - Two pipes multiple boilers vent terminations

8.10.3 - Prepare wall penetrations

1. Air pipe penetration:
   a. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter (4½ inch hole for 3 inch vent pipe)
   b. Insert a galvanized metal thimble in the vent pipe hole as shown in Figure 33.
3. Use a sidewall termination plate as a template for correct location of hole centers.
4. Follow all local codes for isolation of vent pipe when passing through floors or walls.
5. Seal exterior openings thoroughly with exterior caulk.

8.10.4 - Termination and fittings

1. The air termination coupling must be oriented at least 12 inches above grade or snow line as shown in Figures 31 and 32.
2. Maintain the required dimensions of the finished termination piping as shown in Figures 31 and 32.
3. Do not extend exposed vent pipe outside of the building more than what is shown in Figures 31 and 32. Condensate could freeze and block vent pipe.

8.10.5 - Multiple vent/air terminations

1. When terminating multiple boilers terminate each vent/air connection as shown in Figure 34.

⚠ WARNING!!! All vent pipes and air inlets must terminate at the same height to avoid possibility of severe personal injury, death, or substantial property damage.

2. Place wall penetrations to obtain minimum clearance of 12 inches between edge of air inlet and adjacent vent outlet, as shown in Figure 34 for U.S. installations. For Canadian installations, provide clearances required by CSA B149.1 Installation Code.
3. The air inlet is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

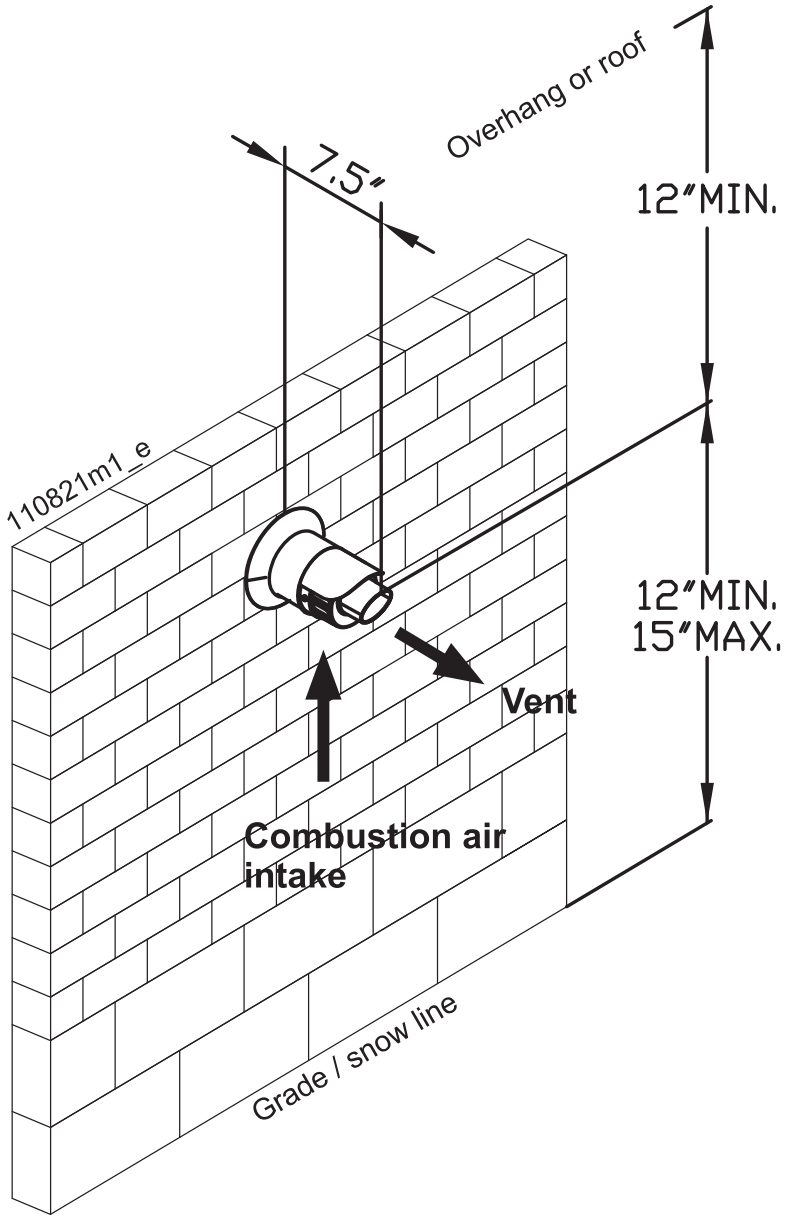


Figure 35- Concentric sidewall termination clearances

8.11 - Sidewall termination – Concentric vent

8.11.1 - Description and usage

The termination kit must terminate outside the structure and must be installed as shown in Figure 35. The required concentric termination kit as well as combustion air and vent pipe materials are listed in Tables 4 and 5.

8.11.2 - Sidewall termination installation

1. Determine the best location for the termination kit (see Figure 35).
2. The total length of piping for vent or air must not exceed the limits given in Section 8.3.
3. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals
   e. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   f. Locate or guard vent to prevent condensate damage to exterior finishes.
4. Cut one (1) hole 5 inch diameter into the structure to install the termination kit.
5. Install the Concentric vent kit following the concentric kit manufacturer's instruction.

NOTICE Ensure termination location clearance dimensions are as shown in Figure 35.

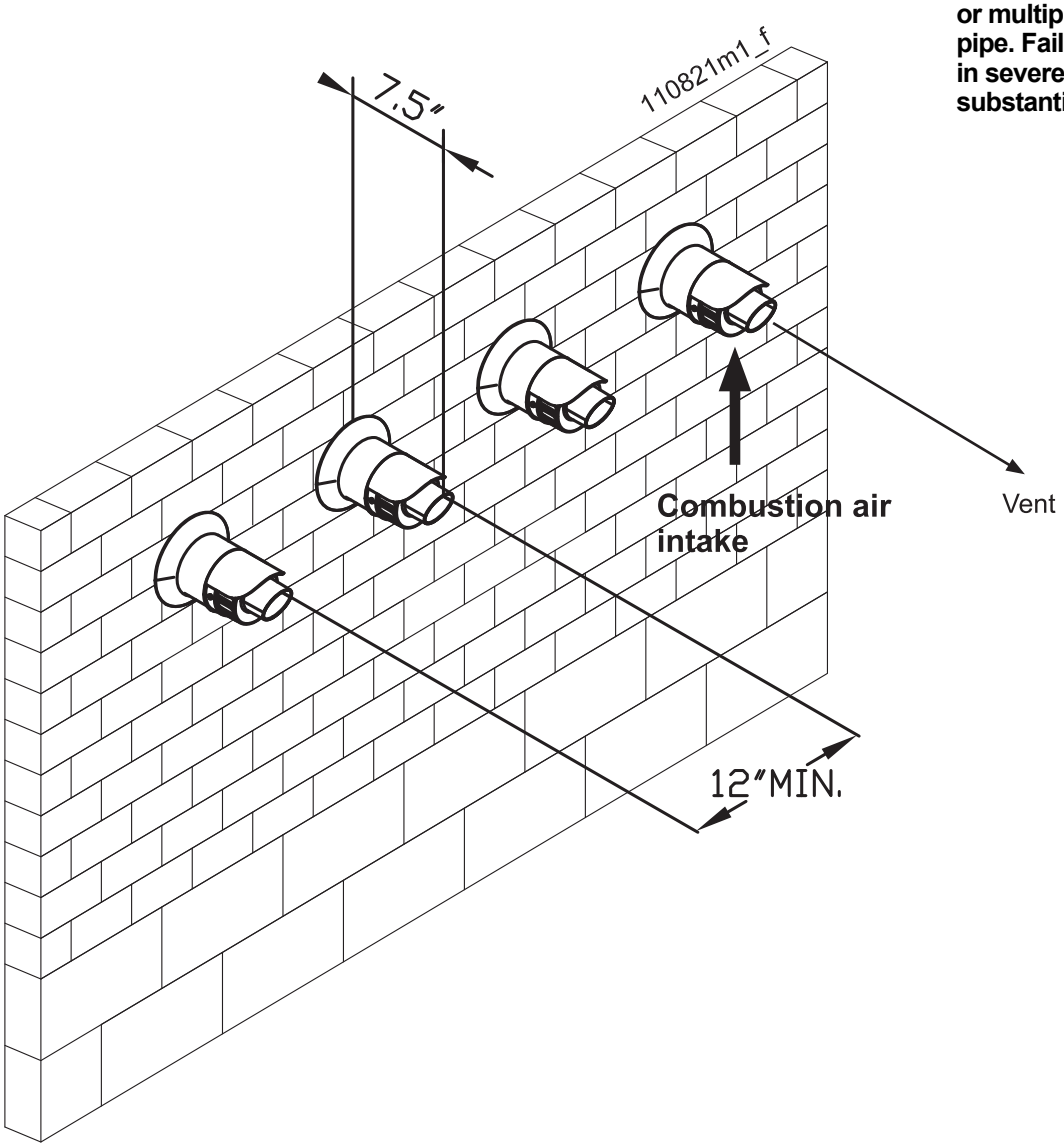
CAUTION!!! DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.

6. Operate the appliance one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

8.11.3 - Multiventing sidewall terminations

When two or more direct vent appliances are vented near each other, each appliance must be individually vented and vent terminations may be installed as shown in Figure 36. It is important that vent terminations be made as shown to avoid recirculation of flue gas.

WARNING!!! Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe. Failure to comply could result in severe personal injury, death, or substantial property damage.



NOTE: keep the terminals horizontally in the same line and at min. 12" from grade or snow line.

Figure 36 - Concentric sidewall multiple boilers terminations

8.12 - Vertical termination - Two pipes

⚠ WARNING!!! Follow instructions below when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

⚠ WARNING!!! Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe. Failure to comply could result in severe personal injury, death, or substantial property damage.

Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

8.12.1 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in the Section 8.3.
2. The vent must terminate at least 3 feet above the highest place in which the vent penetrates the roof and at least 2 feet above any part of a building within 10 horizontal feet.
3. The air piping must terminate in a down-turned 180° return pipe no further than 2 feet from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream.
4. The vent piping must terminate at least 1 foot above the air intake. The air inlet pipe and vent pipe can be located in any desired position on the roof, but must always be no further than 2 feet apart and with the vent termination at least 1 foot above the air intake.
5. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

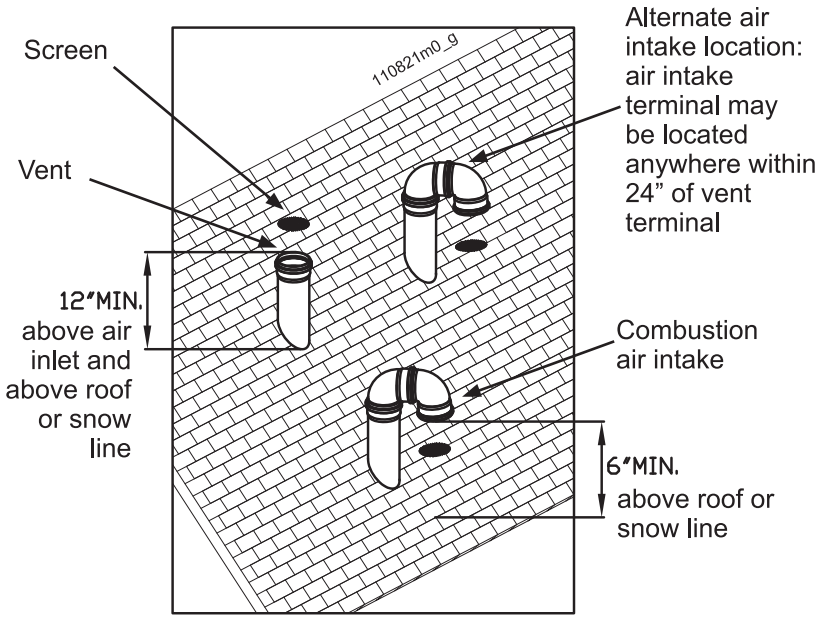


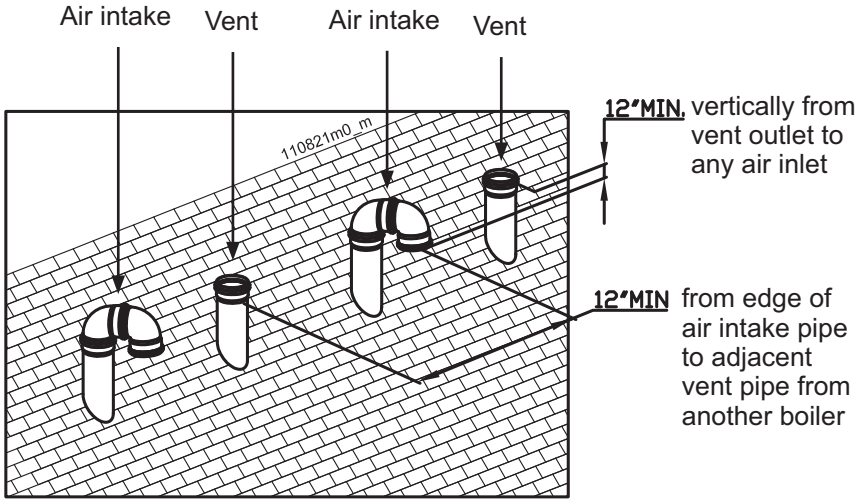
Figure 37 - Two pipes vertical terminations of air and vent

8.12.2 - Prepare roof penetrations

1. Air pipe penetration: cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Vent pipe penetration:
   a. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter: 4 inch hole for 3 inch vent pipe
   b. Insert a galvanized metal thimble in the vent pipe hole.
3. Space the air and vent holes to provide the minimum spacing shown in Figure 37 and listed in section 10.13.1.
4. Follow all local codes for isolation of vent pipe when passing through floors, ceilings, and roofs.
5. Provide flashing and sealing boots sized for the vent pipe and air pipe.

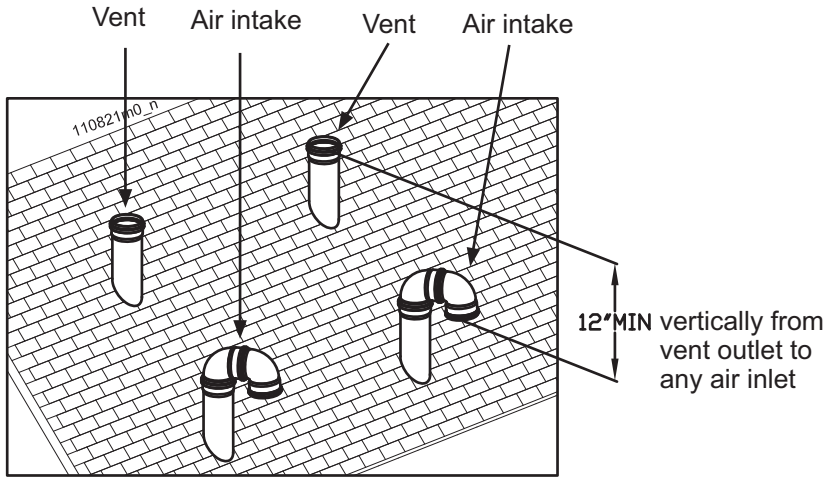
8.12.3 - Termination and fittings

1. Prepare the vent termination and the air termination elbow (Figure 37) by inserting bird screens.
2. The air piping must terminate in a down-turned 180° return bend as shown in Figure 37. Locate the air inlet pipe no further than 2 feet from the center of the vent pipe. This placement avoids recirculation of flue products into the combustion air stream.
3. Maintain the required dimensions of the finished termination piping as shown in Figure 37.
4. Do not extend exposed vent pipe outside of building more than shown in Figure 37. Condensate could freeze and block vent pipe.



NOTE: keep the terminals at min. 12” from grade or snow line. Provide vent and air intake with bird screen.

Figure 38 - Two pipes Multiple boilers vertical terminations



NOTE: keep the terminals at min. 12” from grade or snow line. Provide vent and air intake with bird screen.

Figure 39 - Alternate vertical terminations with multiple boilers

8.12.4 - Multiple vent/air terminations

1. When terminating multiple boilers, terminate each vent/air connection as shown in Figures 38 and 39.

⚠ WARNING!!! Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death, or substantial property damage.

2. Place roof penetrations to obtain minimum clearance of 12 inches between edge of air intake elbow and adjacent vent pipe of another boiler for U.S. installations (see Figure 38). For Canadian installations, provide clearances required by CSA B149.1 Installation Code.
3. The air inlet is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

8.13 - Vertical termination – Concentric vent

8.13.1 - Description and usage

Both combustion air and vent pipes must attach to the termination kit. The termination kit must terminate outside the structure and must be installed as shown in Figure 40.

8.13.2 - Determine location

Locate the vent/air terminations using the following guidelines:

1. The total length of piping for vent or air must not exceed the limits given in Section 8.3.
2. The concentric terminal must terminate at least 3 feet above the highest place in which the vent penetrates the roof and at least 2 feet above any part of a building within 10 horizontal feet.
3. Locate termination so it is not likely to be damaged by foreign objects, such as stones or balls, or subject to buildup of leaves or sediment.

8.13.3 - Vertical termination installation

1. Determine the best location for the termination kit (see Figure 40).
2. The total length of piping for vent or air must not exceed the limits given in Section 8.3.
3. You must consider the surroundings when terminating the vent and air:
   a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
   b. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
   c. Prevailing winds could cause freezing of condensate and water/ice buildup where flue products impinge on building surfaces or plants.
   d. Avoid possibility of accidental contact of flue products with people or animals
   e. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
   f. Locate or guard vent to prevent condensate damage to exterior finishes.
4. Cut one (1) hole 6 inch diameter into the structure to install the termination kit.
5. Install the Concentric vent kit following the concentric kit manufacturer's instruction.

NOTICE Ensure termination location clearance dimensions are as shown in Figure 40.

NOTICE Ensure termination height is above the roof surface or anticipated snow level (12 inches in U.S.A. or 18 inches in Canada) as shown in Figures 40.

CAUTION!!! DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.

6. Operate the appliance one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

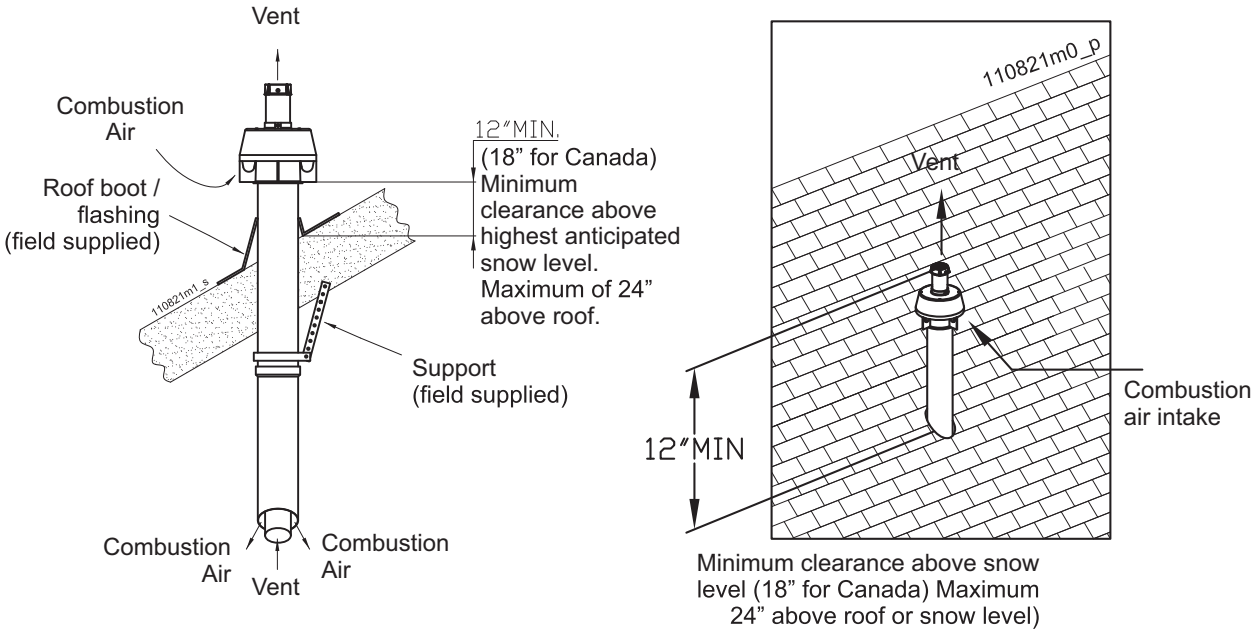


Figure 40 - Concentric vertical termination

8.13.4 - Multiventing vertical terminations

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see Figure 41).

⚠ WARNING!!! NEVER common vent or breach vent this appliance to avoid possibility of severe personal injury, death, or substantial property damage.

When two or more direct vent appliances are vented near each other, two vent terminations may be installed as shown in Figure 41. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

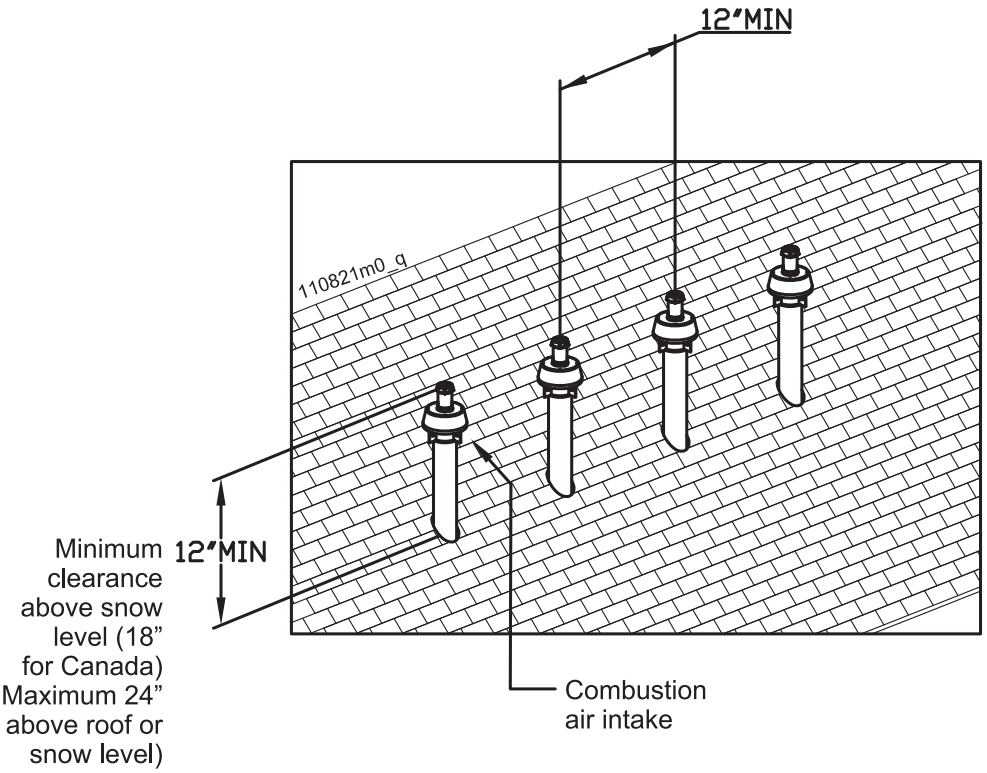


Figure 41 - Concentric multiple boilers vertical terminations

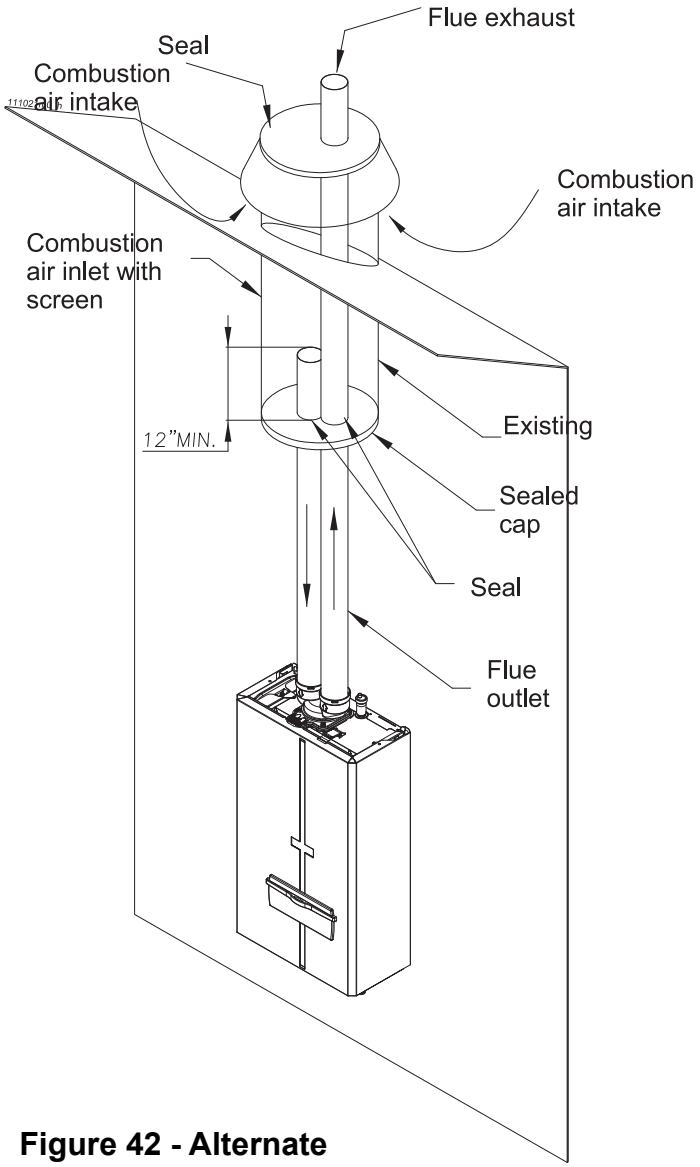


Figure 42 - Alternate concentric vertical venting (Example n°2)

Approved venting materials must be used as specified in Tables 4 and 5.
Follow all vent / air termination and clearance requirements per this section to the appropriate example. Installation must comply with local requirements and with the National Fuel Gas Code. The maximum allowable equivalent vent and air intake lengths for this venting arrangement are to be determined from Section 8.3.
If an existing unused venting system is converted for use with this method of concentric venting, the installer must ensure that the existing venting system is clean and free from particulate contamination that will harm this appliance and cause increased nuisance calls or maintenance. See Section 8.4 for a list of corrosive contaminants and sources. Two example scenarios of a concentric venting arrangement are shown for illustrative purposes in Figures 42 and 43.

8.13.5 - Alternate vertical concentric venting

This appliance may be installed with a concentric vent arrangement where the vent pipe is routed through an existing unused venting system; or by using the existing unused venting system as a chase for vent and combustion air routing.

Concentric Venting Arrangement

The venting is to be vertical through the roof. The annular space between the O.D. of the vent pipe and the I.D. of the existing unused venting system is utilized for the combustion air source. The minimum size of the existing vent system required to achieve enough annular space for combustion air is 7 inches.
The upper and lower termination as well as any other unsealed joints in the existing vent system must be sealed to ensure that all combustion air is drawn from under the vent cap as shown in Figures 42 and 43.

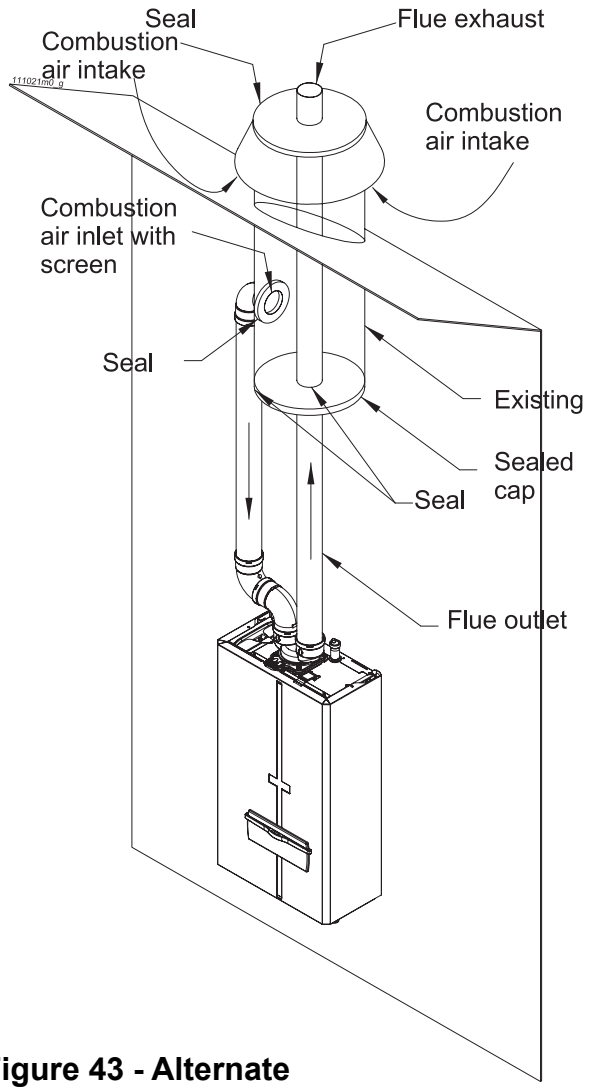


Figure 43 - Alternate concentric vertical venting (Example n°1)

8.14 - Existing vent as a chase

Follow all existing termination and clearance requirements of section 8.12.
The maximum allowable equivalent vent and air intake lengths for this venting arrangement are to be determined from Section 8.3.

Use only approved venting materials listed in Tables 4 and 5.

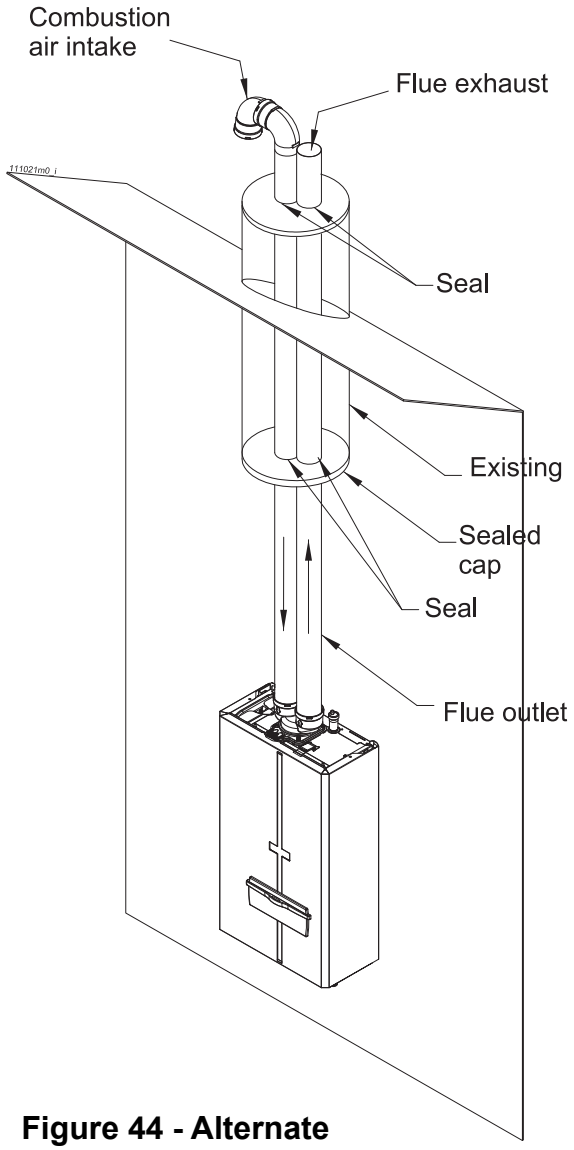


Figure 44 - Alternate concentric vertical venting (Example n°3)

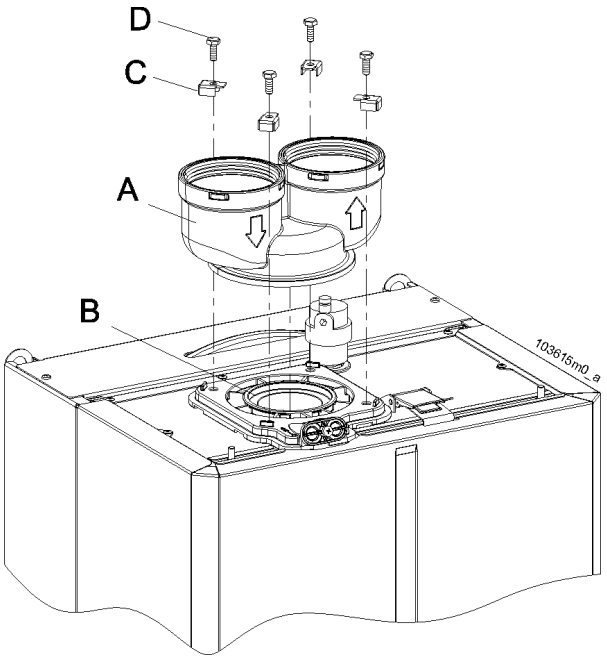


Figure 45 - Installation of Split fitting system

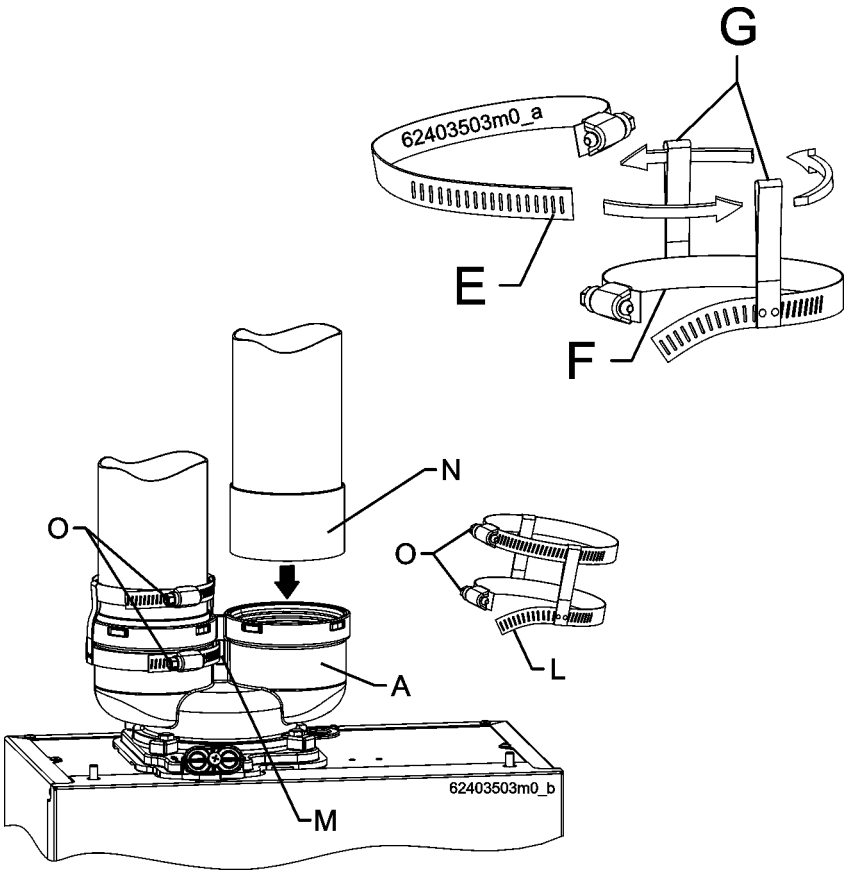


Figure 46 - Connecting the pipes to the fitting

9.1 - Split system (polypropylene) or AL29-4C (UL 1738/UL C 636) system

The boiler is not supplied with the fittings needed for separate vent and combustion air systems. A special kit must be ordered to connect the boiler to separate vent and combustion air systems. Figure 45 shows fitting “A” that can freely turn 360 degrees for optimum installation versatility.

Pipes or elbows connected directly to the boiler, must be mechanically secure. Follow these instructions (make reference to figure 46):

1. prepare the two collars “G” with springs “E” and “F”;
2. insert the collars “L” in hole “M”;
3. insert pipe “N” inside fitting “A”
4. tight the two collars “O” in a manner to mechanically secure pipe “N” to fitting “A”, **DO NOT FORCE.**

☞Horizontal vent sections must always be pitched by at least 1/4 in/ft (21 mm/m) towards the boiler. Horizontal combustion air sections must always be pitched away from the boiler by at least 1/4 in/ft (21 mm/m) to prevent rain from entering the boiler. The vent and combustion air intake systems can be extended up to 300 ft. Each 90° elbow has is equivalent to 5 ft (1,5m), of straight pipe. Each 45° elbow has is equivalent to 2.5 ft (0.75 m), of straight pipe.

9 - INSTALLATION - Split venting system

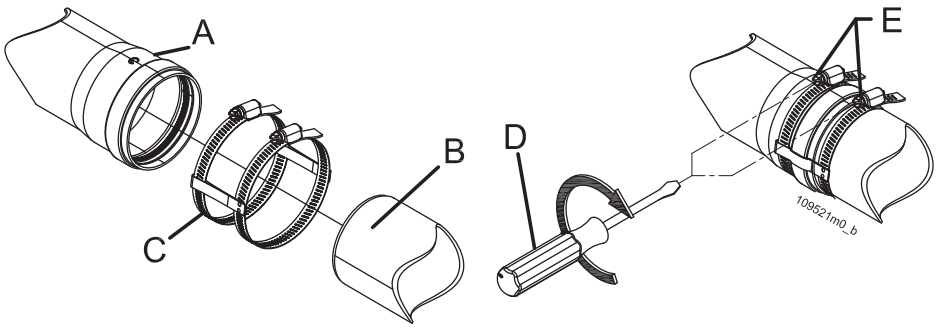


Figure 47 - Connecting extensions and elbows

☞Horizontal vent systems should be as short and straight as possible. The vent system must be both gas tight and watertight. All seams and joints must be joined and sealed in accordance with the vent system manufacturer's instructions.

WARNING!!! Carefully follow the installation steps below for the assembling the split pipe venting system (elbows and extensions), as illustrated in figure 47. it is necessary to properly insert the male side onto the female side and mechanically secure them by using the proper clamps. Improper venting can result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

☞Mechanically secure each joint with the supplied clamps as shown in figure 47. Follow this procedure:

1. insert the Male side "B" into the Female side "A";
2. use clamp "C" to keep the two pipes together;
3. use screws "E" to tighten the clamp onto both pipes; **DO NOT** force.

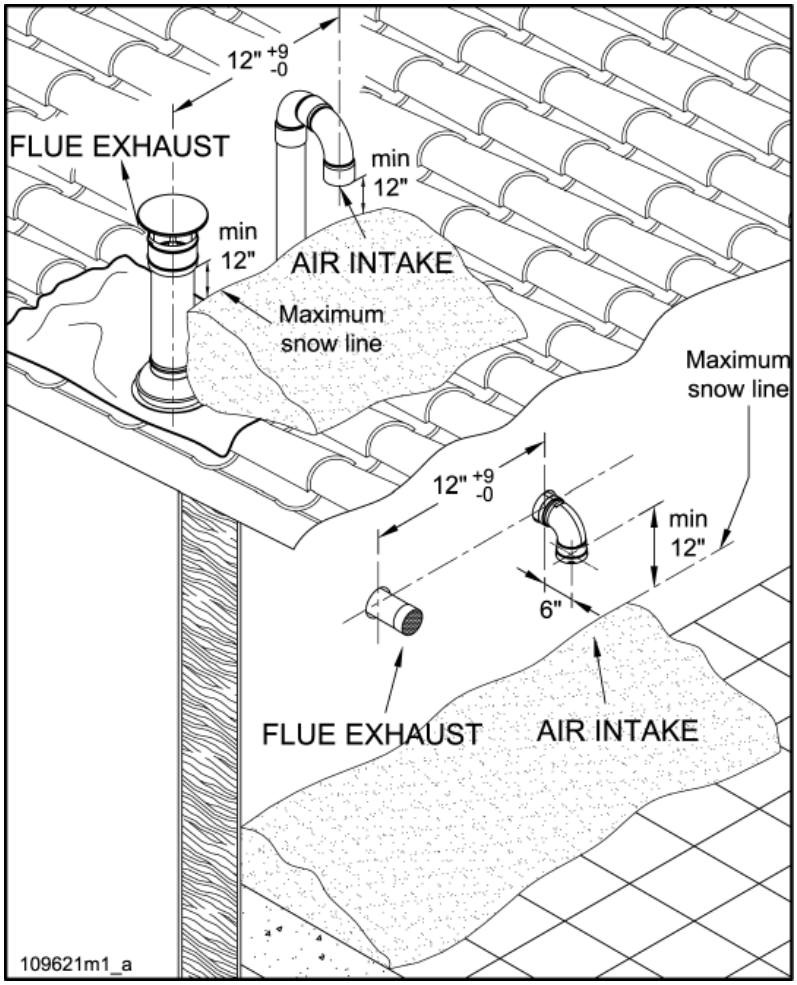


Figure 48 - Clearances of Split system

CAUTION!!! If vent and air intake terminals are located on the same wall or on the same roof,maintain the distances given in figure 48, between the vent and air intake, or flue gas recirculation may occur, causing improper boiler operation!

CAUTION!!! The air intake terminal must be protected from wind by a 90° elbow, see figure 48.

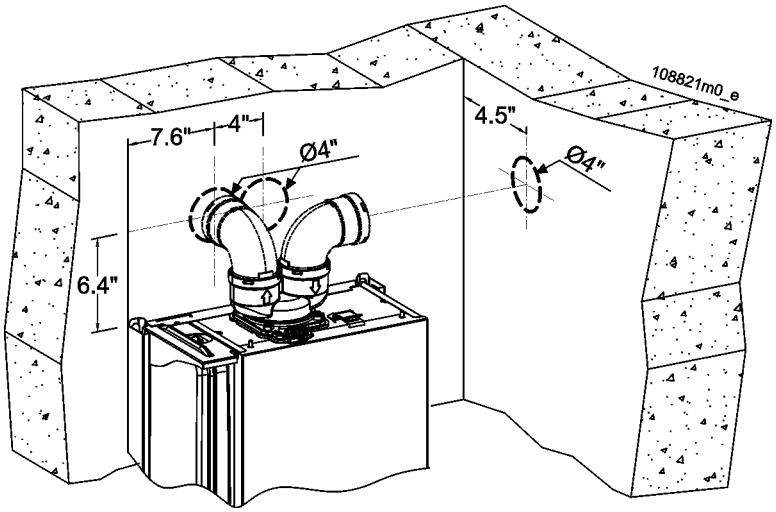


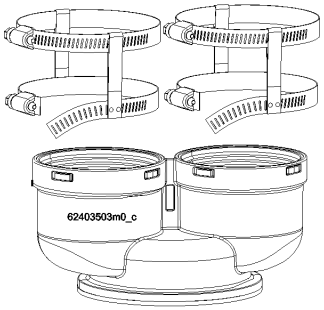
Figure 49 - Interaxes of Split system

9.2 - Split system components

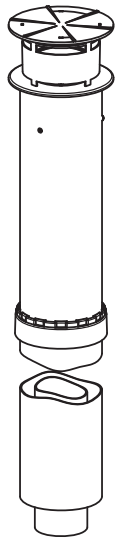
Some of the most commonly used components for installing the Split polypropylene vent and combustion air systems are listed below:

54301 - No. 1 - Split adaptor 80/80 PP
54344 - No. 2 - 3ft PP M/F extension
54387 - 60 ft PP flexible extension
54388 - Spacer for PP flexible extension
54345 - No. 3 - 90° PP M/F in line elbow
54346 - 45° PP M/F in line elbow
54347 - No. 4 - Secure clamp for PP extensions
54352 - No. 5 - Split vertical terminal
54389 - No. 6 - Air intake grid
54417 - No. 7 - Flue exhaust grid

Note: the numbers after the codes correspond to the numbers in figure 50



54301



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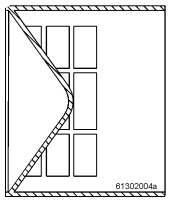

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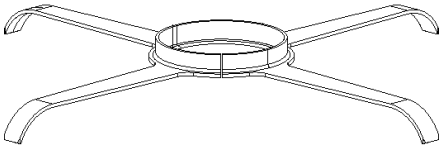

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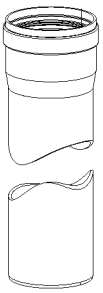

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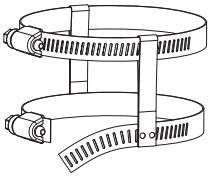

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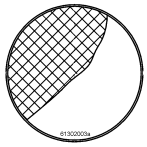

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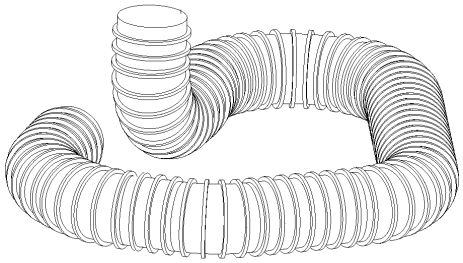

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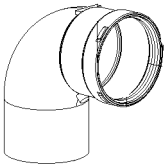

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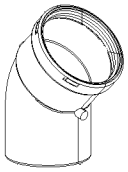


54346

9.3 - Split system components

Some of the most commonly used components for installing the Split stainless steel vent and combustion air systems are listed below:

Terminal Type	Heatfab Saf T Vent Part Number	Pro Tech FasNSeal Part Number	Z FLex Part Number
Elbow Termination w/ Screen	9314TERM	n/a	2SVSTEX0390
Tee Termination w/ Screen	9330TEE	FSTT3	2SVSTTF-3
Mitered Termination w/ Screen	9390	n/a	n/a
Screen Termination	9392	FSBS3	2SVSTPF-3
Air Intake Tee	SC03TAD3	n/a	n/a

9.4 - Split system: installation examples

Some installation examples can be seen in figure 50:

1. the first example shows the vent system directly penetrating the roof with the collection of condensation inside the boiler itself. The combustion air system must be pitched outward 1/4 in/ft *(21 mm/m)* to prevent rainwater from entering the boiler.

WARNING!!! Roof penetrations must be made according to the vent manufacturer's instructions and prevailing codes. Failure to comply with this warning can result in a fire causing severe personal injury or death!

2. the second example shows the vent system run through a vertical wall. Condensation is collected inside the boiler itself. The horizontal section of the vent system must be pitched 1/4 in/ft *(21 mm/m)* towards the boiler. The intake combustion air system must be pitched outward 1/4 in/ft *(21 mm/m)* to prevent rainwater from entering the boiler.

WARNING!!! Under no conditions, shall this boiler vent gases directly into a masonry chimney, nor can an active chimney be used as a chase. Failure to comply with this warning can result in chimney or vent system failure causing excessive levels of carbon monoxide which can cause severe personal injury or death!

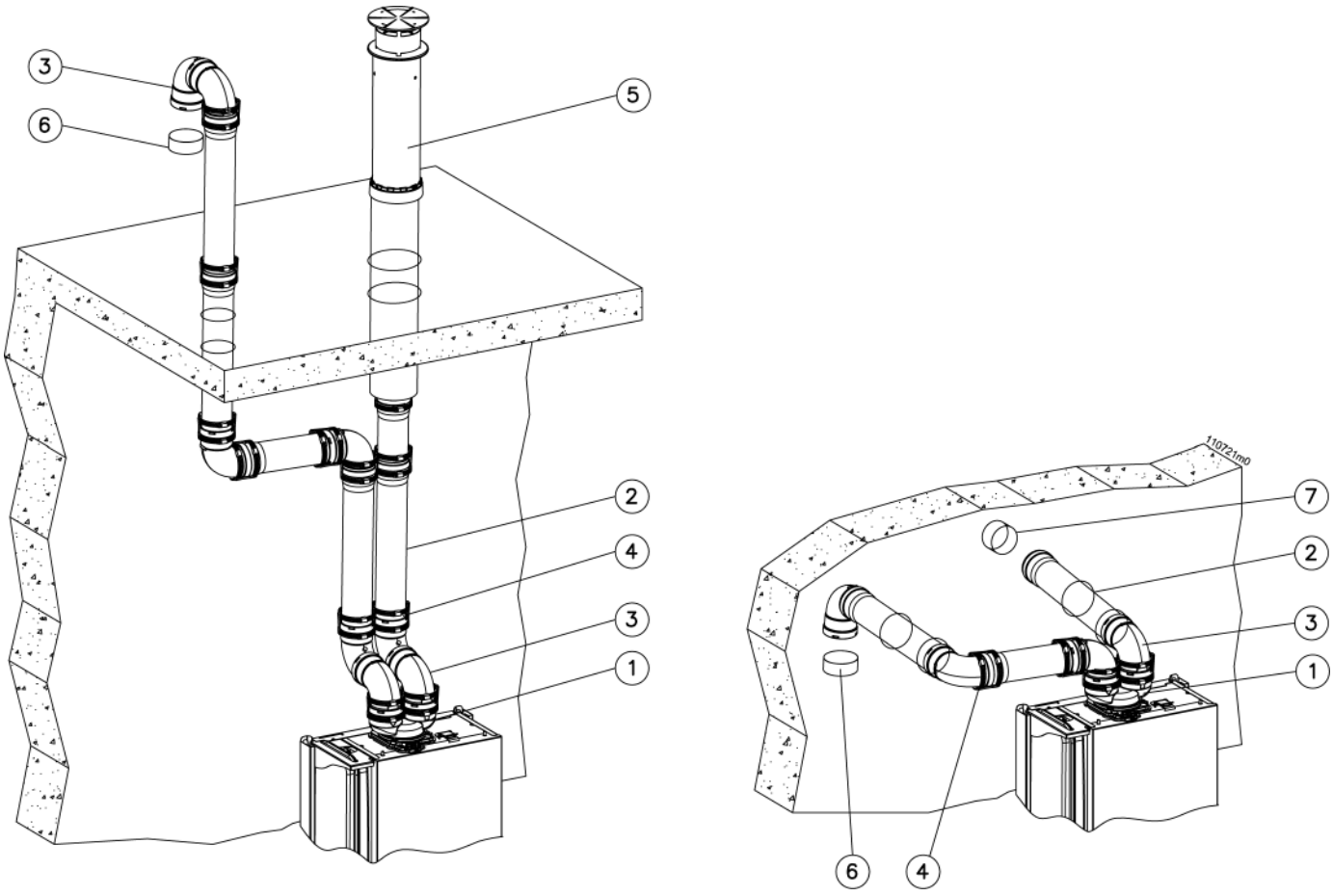
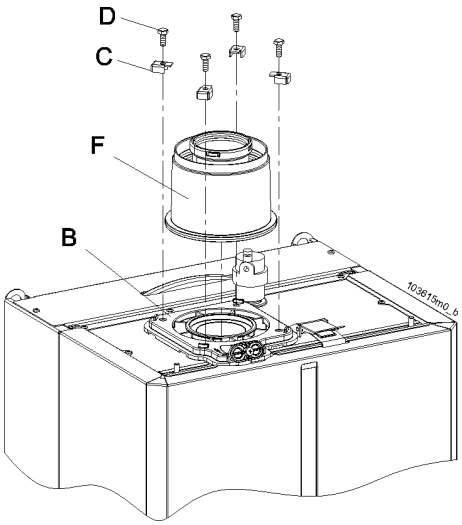


Figure 50 - Installation examples of the Split system (see section 9.2 for the reference of the numbers)

10 - INSTALLATION - Coaxial venting system



B = Connection flange
C = Fixing feet
D = Fixing screw
F = Coaxial vertical adaptor

Figure 51 - Installation of the coaxial fitting

10.1 - Coaxial system

The boiler is not supplied with the fitting needed for connecting a coaxial vent/combustion air system. A special kit must be ordered to connect the boiler with the Coaxial polypropylene vent. Figure 51 shows how to install the Coaxial fitting above the boiler:

WARNING!!! Carefully follow installation steps below, for the coaxial pipe assembly (elbows and extensions), as illustrated in figure 52. it is necessary to properly insert the internal and external pipe and mechanically secure them by using a stainless steel self tapping screw. Improper venting can result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

In particular:
1. slip-fit the extension “1” and “2” (see figure 52) together;
2. drill a suitable hole “3” with a drill “4” (see figure 52) in a position where the two pipes “1” and “2” are overlapped;
3. insert a suitable stainless steel self tapping screw “5” and tight it with a screwdriver “6”

☞It is recommended that wall sleeve be used when installing the coaxial system through an exterior wall. This will allow the system to be easily slipped out for access during routine maintenance.

☞Horizontal coaxial systems must always be pitched by at least 1/4 in/ft, *(21 mm/m)* towards the boiler.

☞The Coaxial system should extend out of the wall to the dimensions shown in figure 54.

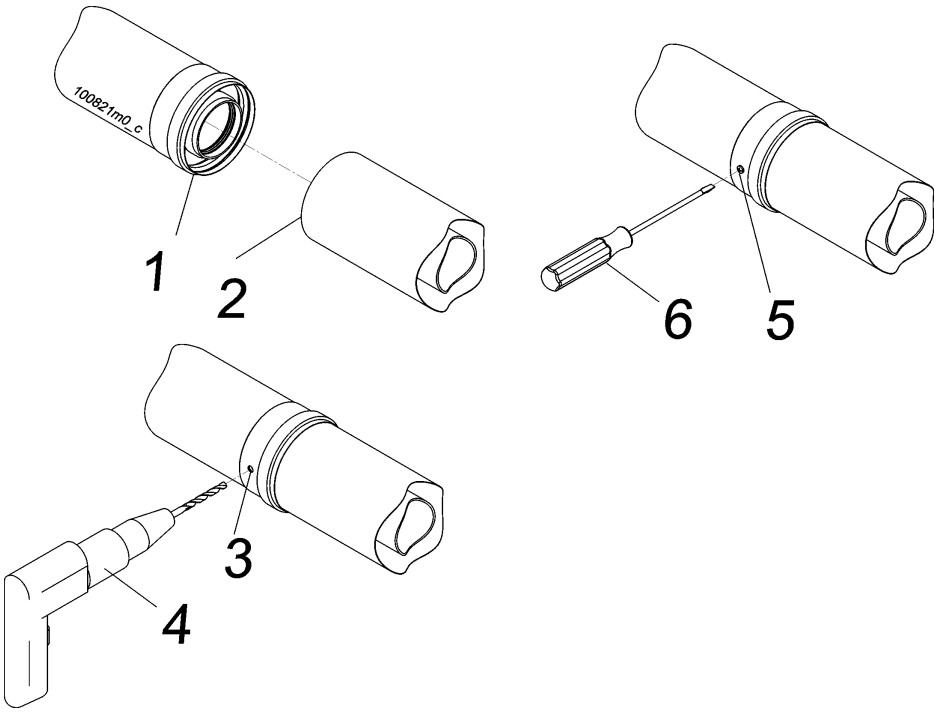
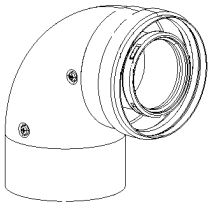


Figure 52 - Secure fixing extensions and elbows together

10.2 - Coaxial system components

The following coaxial polypropylene vent and combustion air system components are available, on request, for installing the Coaxial system

54303 - No. 1 - In line 90° PP coaxial M/F elbow
54304 - No. 6 - In line 45° PP coaxial M/F elbow
54302 - No. 7 - 3ft (1m) PP coaxial extension
54348 - No. 3 - PP coaxial roof end piece
54342 - No. 5 - PP Coaxial wall end piece
54340 - No. 8 - PP straight coaxial adaptor
Note: the numbers after the codes correspond to the numbers in figure 53.



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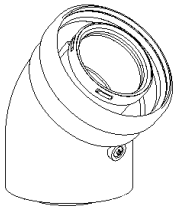
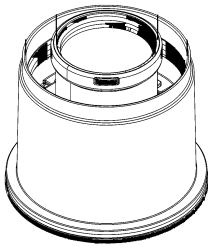


54304



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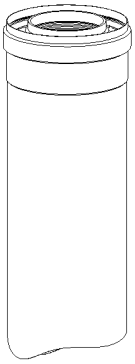
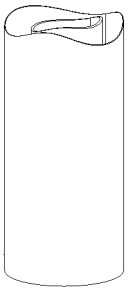
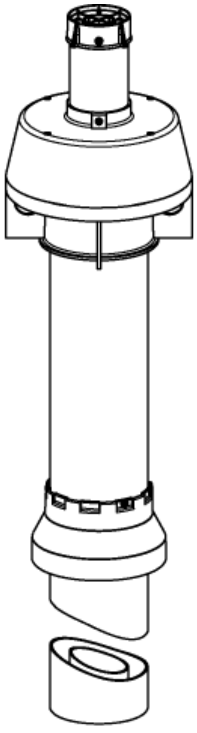
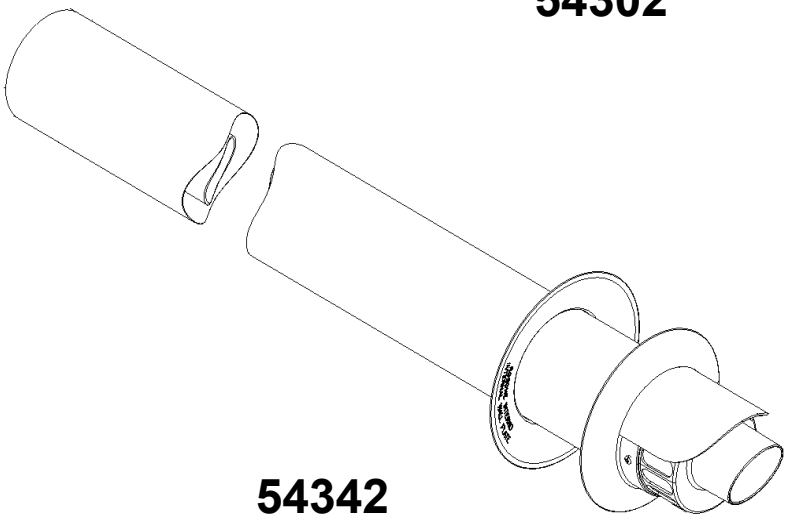




54302



54348



54342

10.3 - Coaxial system components

Some of the most commonly used components for installing the coaxial stainless steel vent and combustion air system are listed below.

Terminal Type	Heatfab Saf T Vent Part Number	Pro Tech FasNSeal Part Number	Z FLex Part Number
Elbow Termination w/ Screen	9314TERM	n/a	2SVSTEX0390
Tee Termination w/ Screen	9390TEE	FSTT3	2SVSTTF-3
Mitered Termination w/ Screen	9390	n/a	n/a
Screen Termination	9392	FSBS3	2SVSTPF-3
Horizontal Termination Adapter	SC03HT	n/a	n/a

10.4 - Coaxial system: installation examples

When a coaxial vent and combustion air system is installed, figure 53, whether vertical or horizontal, it must be sloped 1/4 in/ft, *(21 mm/m)* towards the boiler.

CAUTION!!! Maintain the distances given in figure 54, between the vent terminal and the wall and also between the vent terminal and the ground level (snow line).
Maintain 3ft distance also between the vent terminals of two or multiple boilers (see figure 54).

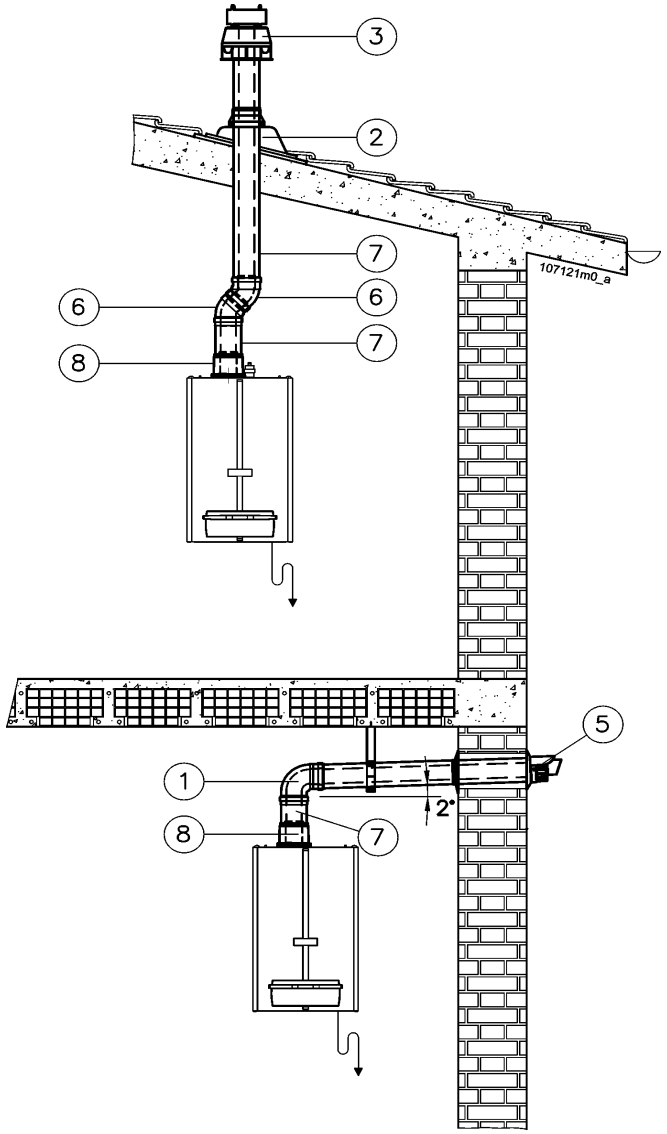


Figure 53 - Installation examples for the coaxial pipe (see section 10.2 for the reference of the numbers)

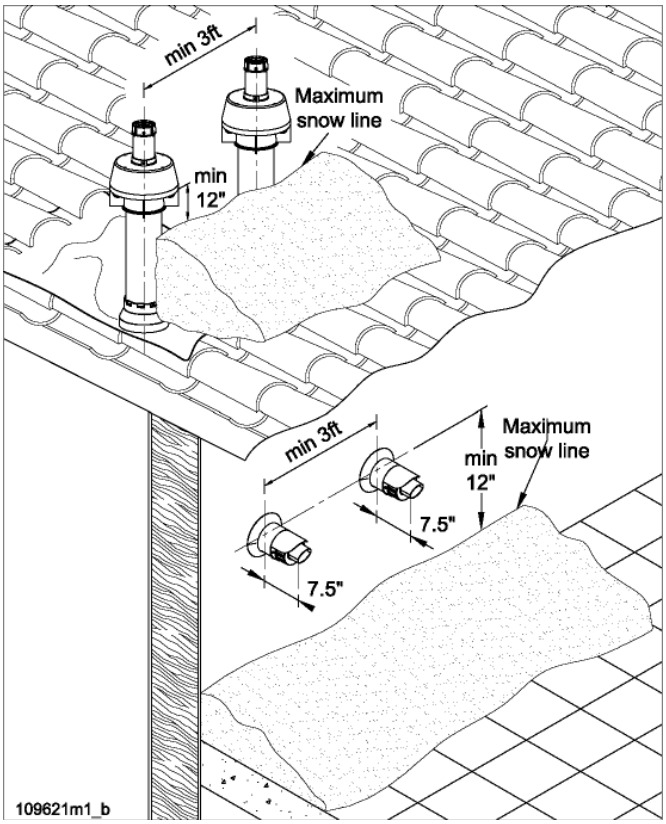


Figure 54 - Clearances for the coaxial vent terminals of two boilers, in a vertical wall or in a roof

11.1 - Operating

Before starting the boiler, the following must be done.

11.1.1 - User instructions

The user must be correctly instructed by the installer, on how to operate the boiler, in particular:

- ☞Make sure that the user keeps this manual and all other documentation included with the boiler.
- ☞Make sure that the user understands never to tamper with gas control settings and the risk of CO poisoning should an unauthorized individual do so
- ☞Make sure that the user is informed of all the special measures to be taken for combustion air inlet and discharging flue gases, and that these must not be modified.
- ☞Make sure that the user knows how to adjust temperatures, controls and the room thermostats for maximum efficiency.

11.1.2 - Filling the condensate trap

The condensate trap is positioned inside the boiler as shown in figure 1, item “46”. It must be filled with water to prevent the leakage of flue gases from the condensate drainpipe, item “41” in figure 1. To fill the condensate trap proceed as follows:

1. unscrew “E” screw (Figure 55);
2. remove flange “D” and O-Rings “C” (Figure 55)
3. With a rubber tube and a funnel, slowly pour approximately 4 oz. (100 ml), of water into the “B” opening - DO NOT put water into the “A” opening (Figure 55);
4. re-install flange “D” and O-Rings “C” and reinstall screw “E” (Figure 55);

WARNING!!! If boiler stays off for more than 3 months, repeat the above operation to again fill the condensate trap.

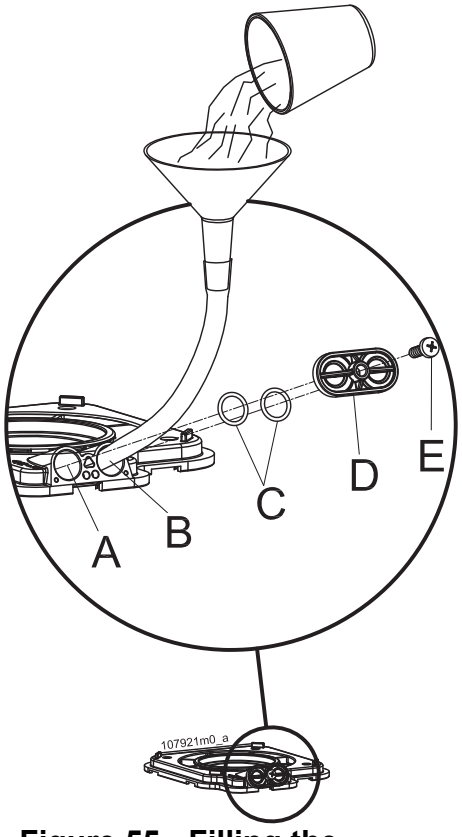


Figure 55 - Filling the condensate trap

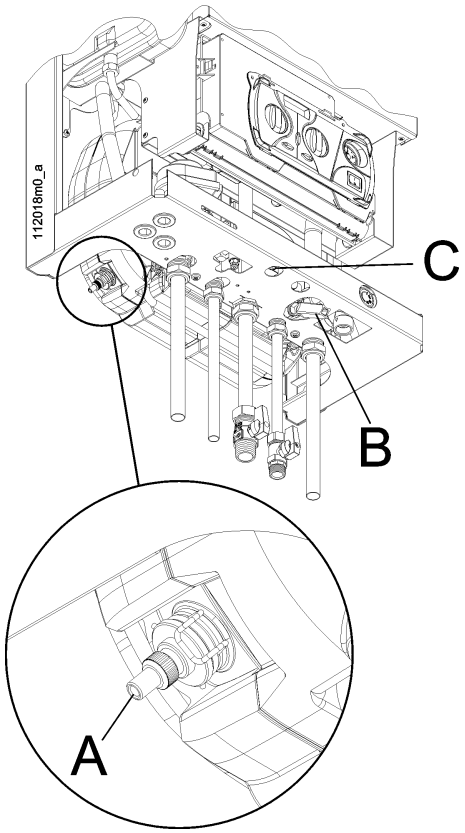


Figure 56 - A = Purge screw for the domestic hot water heat exchanger

11.1.3 - Filling the heating system

WARNING!!! Never use non-approved additives or toxic boiler treatment chemicals in the heating system as they can cause serious health problems or possibly death. Any additives introduced into the heating system must be recognized as safe by the United States Food and Drug Administration.

CAUTION!!! The heating system must be filled with clean water from the domestic water system. Contaminated water can damage the boiler voiding its warranty.

CAUTION!!! The addition of any chemical substances, such as anti-freeze, must be carried out according to the product instructions. Read and follow instructions in sections 13.10 and 13.11 to prevent problems.

To fill the heating system, proceed as follows:

1. open the automatic air vent, shown as item “1” in figure 1, two turns;
2. open the fill valve located under the boiler and proceed to fill the heating system and boiler until the pressure gauge, item “30” in figure 1, reads 20 psi (*1.5 bar)* and “FILL” disappears from the display;
3. check that there is no water leaking from the fittings. If there is the leaks must be eliminated;
4. close the fill valve;
5. check the pressure gauge during the purging process. If the pressure has dropped, re-open the fill valve to bring the pressure back up to 20 psi *(1.5 bar)*.

11.1.4 - Filling the domestic hot water heat exchanger

Once the heating system has been filled and purged, the domestic hot water heat exchanger must be filled as follows:

1. connect a rubber tube to the pressure coupling “A” shown in figure 56 and place the end in an empty bucket or sink;
2. loosen screw “A” as shown in figure 56 until air can be heard escaping;
3. once the water runs clear of air bubbles tighten screw “A”;
4. remove the tube and check that there are no water leaks.

11.1.5 - Auto-purging the heating system

Each time the on/off power switch, item “34” in figure 1, is switched on, an auto-purging cycle lasting 3 minutes begins. The auto-purging process involves the turning the pump on and off in order to remove any air trapped in the heating system. Before starting the auto-purging cycle the automatic air vent, item “1” shown in figure 1 must be opened.

11.2 - General warnings concerning gas supply

When starting up the boiler for the first time the following must be checked:

- ☞ That the boiler is supplied with the type of fuel that it is configured to use. Read sections 11.3 and 11.4
- ☞ That the gas supply pressure is within the maximum and minimum values given in listed on the boiler rating plate. The gas supply pressure must be checked with boiler on and the boiler off.
- ☞ That the gas supply system is provided with all the safety devices and controls required under current national and local codes.
- ☞ That the vent and combustion air terminals are free from any blockages.
- ☞ That the condensate drain tube is properly connected.

WARNING!!! 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.**

Failure to follow the above steps can result in a fire or explosion causing property damage, personal injury or loss of life!

11.3 - Confirming the boiler’s gas type

The type of gas and the gas supply pressure that the boiler is set up for is listed on the rating label.

The boiler can operate using one of the following two gases:

NATURAL GAS

Maximum supply pressure = 11 in.W.C. (*27.5 mbar).*
Minimum supply pressure = 1.5 in.W.C. (*3.8 mbar)*.

LP Gas

Maximum supply pressure = 13 in.W.C. *(32.5 mbar)*.
Minimum supply pressure = 8 in.W.C. *(20 mbar)*.

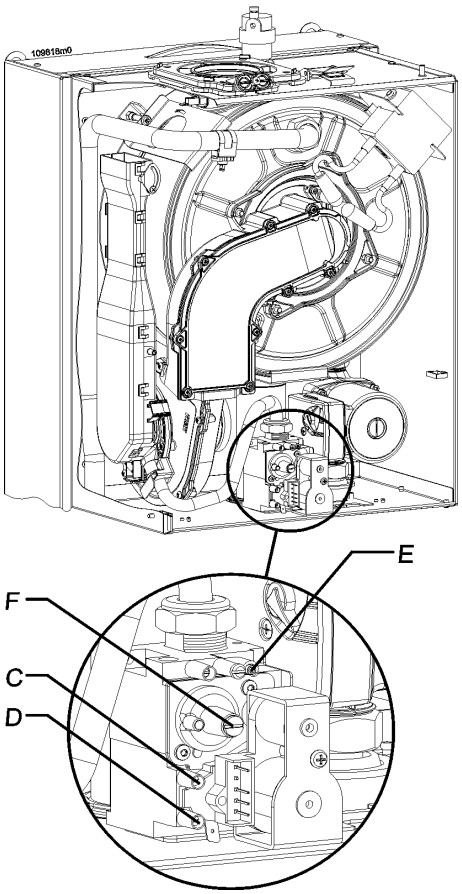
11.4 - Gas type conversion

If the gas available at the installation site is not the type the boiler is configured to use, the boiler must be converted. Special conversion kits are available for this purpose. The instruction inside the conversion kit must be followed.

WARNING!!! Conversion of the boiler to use another type of gas must be carried out by a qualified technician. Improper conversion of the gas valve could result in a fire or an explosion causing severe personal injury or death!

11.5 - Start-up

1. Open the manual gas shut off valve, figure 16, item “3”.
2. Switch the on/off power switch, item “34” in figure 1, to “on”.
3. If the display shows code E 21, it means that the polarity has not been observed between the hot and neutral wires. If this happens the wires must be switched.
4. Upon start-up, an F is shown for 3 minutes while the boiler goes through its heating system purge cycle as described in section 11.1.5. To by-pass this stage, press the + and − keys together until a blinking F appears. Then press the Reset button.
5. Rotate knobs “32” and “33” shown in figure 1 to the desired temperature.
6. The boiler will fire only when the room thermostat calls for heat. If an external temperature sensor is connected, check that the temperature calculated is higher than the minimum running temperature as explained in section 12.10.
7. If the pump indicator is illuminated, item “6” in figure 64, but the pump is not running, item “45” in figure 1, it may be stuck. If this is the case it can be released by removing screw “44” shown in figure 1 and turning the screw underneath.
8. If the pump indicator is illuminated but the heating system does not heat up, repeat the air purging operations on both the boiler and the heating system.



C - Service pressure port
D - Inlet gas pressure port
E - High fire, CO2 adjusting screw
F - Low fire, CO2 adjusting screw

Figure 57 - Gas valve

11.6 - Ignition control testing

After placing the boiler in operation, the ignition control's safety shutoff function must be tested as follow:

1. turn the power switch (item "34" in figure 1) to on;
2. close the room thermostat to create a call for heat;
3. turn knobs "32" and "33" in figure 1 to their maximum position;
4. wait a few minutes for the burner to light-up as indicated when light "3" shown in figure 64 stays illuminated.
5. close the manual gas shutoff valve, see figure 16, item "3";
6. after 40 seconds, the display must show L01;
7. open the manual gas shutoff valve, see figure 16, item "3";
8. verify your gas meter, gas flow must be zero.

WARNING!!! If gas flow occurs, close the manual gas shutoff valve and troubleshoot the system to determine why there is gas flow when the gas valve should be deenergized. Do not operate the boiler until the problem is resolved or a fire or explosion causing property damage, personal injury or loss of life may occur!

11.7 - Gas supply pressure checking and adjustment

The gas supply pressure must match that listed on the boiler rating label. Check the gas supply pressure by following the steps below:

1. close the manual gas shut off valve, figure 16, item "3";
2. follow the steps in section 13.2 to remove the front cover;
3. turn the screw in pressure port "D" shown in figure 57 three turns counterclockwise;
4. connect a manometer with graduations of at least 0.1 in.W.C. *(0.25 mbar)* to the inlet gas port "D" shown in figure 57;
5. open the manual gas shut off valve, figure 16, item "3";
6. check that the gas supply pressure does not exceed the "maximum gas supply pressure" as stated in section 14;
7. turn the power switch to on and generate a heat demand by turning knob "33" shown in figure 1 to its maximum setting. Also ensure that the room thermostat is calling for heat;
8. press the (+) and (−) keys at the same time for more than 10 seconds, the display will show F ;
9. press the (+) key until the display shows t . Now the boiler will run for 10 minutes at maximum input;
10. check the manometer to make sure the gas supply pressure does not drop below the "minimum gas supply pressure" as stated on section 14. If the gas supply pressure does not fall within the above values, adjust the upstream gas pressure regulator to bring the gas supply pressure within the maximum and minimum range listed on section 14.

After verifying the correct gas pressures disconnect the manometer, turn the screw in pressure connection "D" in figure 57, clockwise until snug and check for any gas leaks.

CAUTION!!! Never force the pressure connection screw or the gas valve will be damaged!

WARNING!!! Never use an open flame to check for gas leaks, a fire or an explosion could result causing severe personal injury or death!

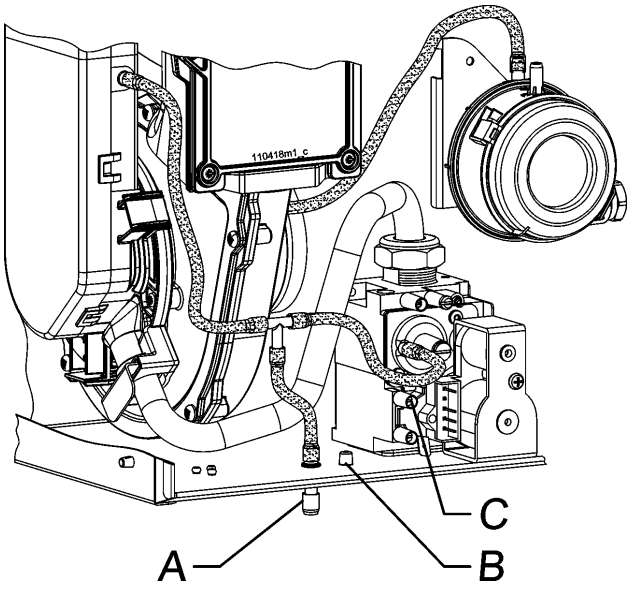


Figure 58 - Combustion air pressure probes

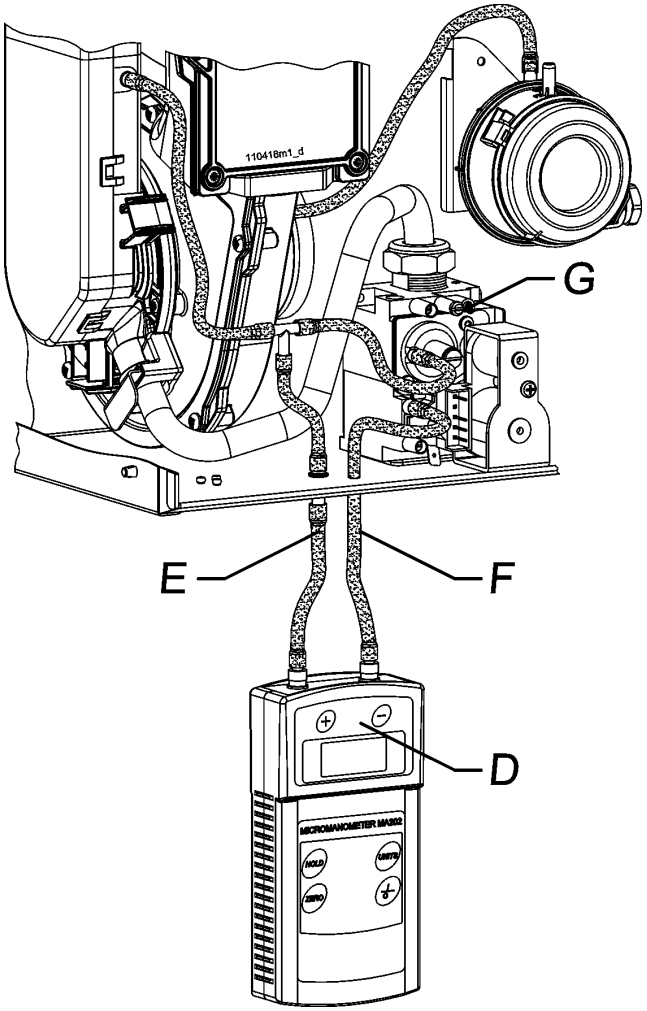


Figure 59 - Checking the combustion air pressure

11.8 - Check the combustion air pressure

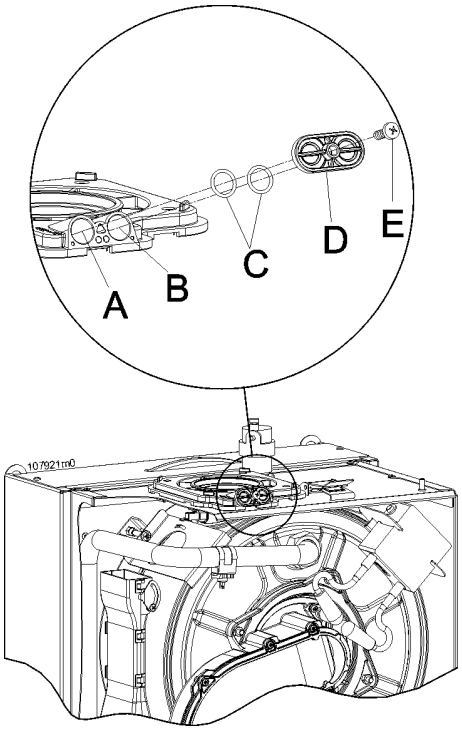
The boiler has a factory-set air/gas ratio. The pressure of the gas at the burner is indirectly controlled by the blower. The combustion air pressure must be checked as follows while refering to figures 58 and 59:

1. use a differential manometer with a precision of at least 0.1 in.W.C. (*0.25 mbar)*;
2. close the manual gas shut off valve, figure 16 item “3”;
3. open the boiler casing following section 13.2;
4. press the two plastic spring tabs labeled “B” shown in figure 21 and rotate the electrical box;
5. remove plug “B”;
6. turn pressure probe screw “C” one turn counterclockwise;
7. insert tube “F”, from the negative side of the manometer, through the opening of plug “B”, and connect it to pressure probe “C” as shown in figure 59;
8. remove plug “A” from the pressure probe and connect the differential positive side of the manometer to it;
9. the manometer connections must be made as shown in figure 59, to get the correct pressure reading;
10. replace panel “H” of figure 65 and latch it closed. If panel “H” is not properly in place the manometer reading will not be accurate;
11. turn the power switch to on, item “34” in figure 1;
12. press the (+) and (−) keys together for more than 10 seconds, until a blinking F− is displayed;
13. the combustion blower will run at maximum speed for 10 minutes. During this time the burner will not light;
14. compare the pressure on the manometer with the table in section 14, “Combustion air pressure”.;
15. if the combustion air pressure is too low, check that there are no obstructions in the combustion air and vent systems. Also make sure that panel “H” is properly sealed;
16. if the combustion air pressure is within tolerance press the Reset button to return the boiler to its normal running mode;
17. once the combustion air pressure check has been performed, disconnect the manometer, close pressure probe screw “C”, close the boiler casing, turn the manual gas shut off valve on and proceed with the check and adjustment of CO2, section 11.9.

11.9 - Checking and adjusting CO2 levels

Section 14 lists the correct CO2 ranges for a boiler running at normal operating conditions at an altitude below 3000 ft *(1000m)*. CO2 values outside of the ranges given in section 14 may lead to malfunctioning of the boiler and cause it to prematurely fail. To check the CO2 value, carry out a combustion analysis as follows while referencing figure 60:

1. carefully remove items “E”, “D” and “C” from the combustion air/ vent fitting:
2. generate a call for heat or, if this is not possible, fully open a hot water faucet;



A = air probe
B = flue gases probe
C = O-ring gaskets
D = probes cap
E = fixing screw

Figure 60 - Combustion analysis probes

3. press the + and − keys for more than 10 seconds, the display will show a blinking F -;
4. press the + key until the display shows t - if a call for heat has been generated or until S - is displayed if a domestic hot water demand has been generated. The boiler will now run for 10 minutes at low fire input.
5. wait 2 to 3 minutes for the CO2 to stabilize;
6. insert the probe of a calibrated combustion analyzer into port “B” and take a flue gas sample;
7. compare the CO2 reading with the low fire range given in section 14 making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted.

To adjust the low fire CO2 proceed as follows:

1. use a screwdriver to remove the gas valve cap, item “F” in figure 57;
2. turn the regulator screw found under cap “F” clockwise to increase the CO2, counter-clockwise to decrease the CO2;
3. turn the regulator screw in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value:
4. replace the gas valve cap, item “F” in figure 57;
5. seal screw “F” with red paint or nail polish to discourage tampering.

WARNING!!! Compare also CO (carbon monoxide) reading, with the value given in section 14. If this is higher STOP the boiler and call the service department (see phone number on the last cover page)

Now check and, if necessary, adjust high fire CO2:

6. press the + key until the display shows t - if a call for heat has been generated or until S - is displayed if a domestic hot water demand has been generated. The boiler will now run for 10 minutes at high fire input;
7. wait 2 to 3 minutes for the CO2 to stabilize;
8. insert the probe of a calibrated combustion analyzer into port “B” and take a flue gas sample;
9. compare the CO2 reading with the high fire range given in section 14 making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted.

To adjust the CO2 proceed as follows:

1. use a screwdriver to turn screw “E” shown in figure 57;
2. turn screw “E” clockwise to reduce the CO2, counter-clockwise to increase the CO2;
3. turn screw “E” in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value:
4. seal screw “E” with red paint or nail polish to discourage tampering.
5. press the Reset button to return the boiler to its normal operating mode.

WARNING!!! Compare also CO (carbon monoxide) reading, with the value given in section 14. If this is higher STOP the boiler and call the service department (see phone number on the last cover page

NOTE: During the 10 minutes override mode, if the demand on the boiler is low causing the flue gas temperature to increase rapidly, boiler will go into lock out code L06. To reactivate it, press Reset button.

11.10 - Adjusting the heating capacity

This boiler has been engineered with an “intelligent” micro-processor control that will adjust the heating output to match the system demand. To maximize the effectiveness of the system, the parameters P found in the “Installers menu”, in section 12.17, can be adjusted set the maximum heating output to the effective maximum load necessary for the system. The P parameter can be adjusted from 100 (factory set value), to 1. The correspondence between P value and heating output is given by table in figure 61.

NOTE: This setting, adjusts the heating input only. The domestic output is always 160,000 btu/hr for every P value.

"P" parameter value	Correspondent heat input (btu/hr)
100	160,000
92	150,000
85	140,000
77	130,000
69	120,000
62	110,000
54*	100,000
46	90,000
38	80,000
31	70,000
23	60,000
15	50,000
8	40,000
1	30,000

103122m0_b

***Factory set heat input. To adjust see section 11.10**

Figure 61 - Correspondence table to set space heating input

11.11 - Domestic hot water flow rate adjustment

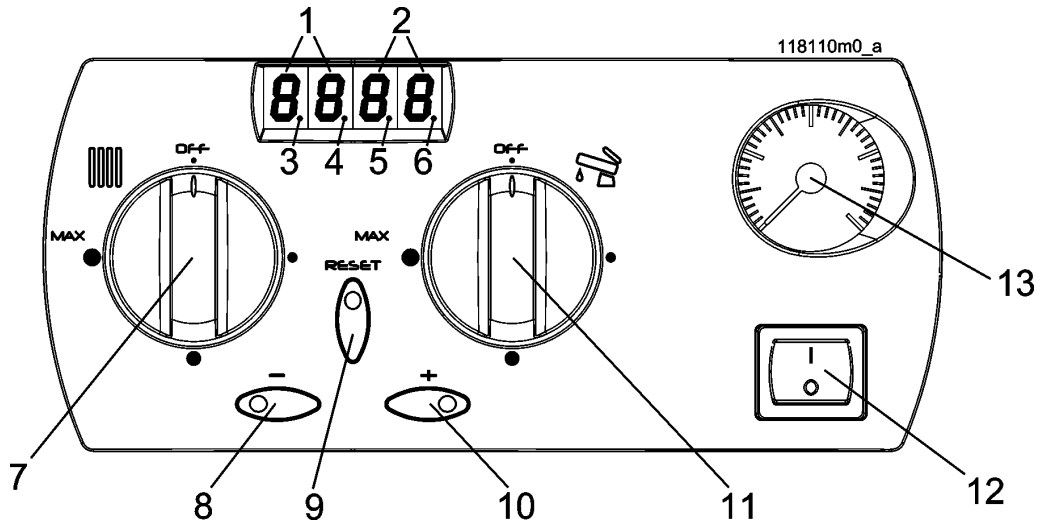
The volume of domestic hot water that the boiler can produce, depends on the flow rate of the domestic water system. If the flow rate is too high, the water will move through the heat exchanger without being adequately heated. It is therefore advisable to carry out the following adjustments:

1. switch the on/off power switch, item “34” in figure 1, to “on”;
2. adjust control “32” as shown in figure 1, to 130 °F *(50 °C)*;
3. fully open a hot water faucet. If a mixing type faucet with single lever is opened, the position must be fully to HOT;
4. set the mixing valve (item “10” of figure 16 to its maximum values)
5. wait 5 minutes for the temperature to stabilize;
6. if the water temperature is too low, reduce the water flow using a flow restrictor (item “12” of figure 16) until reaching the desired temperature (turn the flow restrictor in small increments and wait for the temperature to stabilize to prevent overshooting the desired value) .

NOTE: Water flow should generally be regulated according to the values given in section 14, under the heading “instantaneous d.h.w. production (rise 75 °F *(42 °C))*”.

11.12 - Cold start boiler

The boiler has a “cold start” mode. Any time the room thermostat opens, (no call for heat) the burner stops immediately. However even with the room thermostat contact open, the boiler will still run for freeze protection as described in section 12.14.



1 - Display of the parameters
2 - Display of the paramenters value.
3 - Light indicates the burner state: Light-on = Burner ON; Blinking = Burner OFF.
4 - Light indicating DHW service: Light-on = DHW service ON; Light-off = DHW service OFF.
5 - Light indicates the decimal.
6 - Light indicates CH service: Light-on = CH service in function; Light-off = CH service not function.
7 - Heating temperature control.
8 - Key for decreasing parameter values.
9 - Key for resetting shutdowns and for scrolling the list of parameters.
10 - Key for increasing parameter values.
11 - Domestic hot water temperature control.
12 - On/off power switch.
13 - Heating circuit pressure gauge.

Figure 62 - Instrument panel

12.1 - Check heating system pressure

If the pressure inside the heating circuit falls below 7psi (0,5 bar), the appliance switches off and the display “1” as per figure 62, shows FILL to indicate that it is necessary to restore the correct pressure. Proceed as follows:

1. open the filling cock;
2. check the pressure on the pressure gauge “13” of figure 62, it must reach a pressure of 20 psi (1,5 bar) and the indication FILL must disappear;
3. close the filling cock.

CAUTION!!! During normal operations, the filling cock must always remain in the closed position.

If, with time, the pressure drops, restore the correct value. This operation may have to be repeated several times during the first month of operations to remove any gas bubbles present.

12.2 - Overview

The boiler is pre-set with standard parameters. However, it is possible to make a number of changes or consult the parameters by means of using the “Users’ Menu” (see section 12.16).
During functioning display “1” of figure “62” displays the status of the boiler and display “2” (see figure 62) shows the value of the parameter. The various operating statuses are shown in section 12.18.
Within the “Users’ Menu” (see section 12.16) it is possible to check the last lock-out or error which have occurred.
In addition to the operating modes, the instrument panel provides important information on the current functioning of the boiler, via the indicators “3”, “4”, “5” and “6” of figure 62. In particular:
- the indicator “3” displays whether the burner is functioning (on) or whether it is off (blinking);
- the indicator “4” displays whether the domestic hot water service is on or off;
- the indicator “6” displays whether a heating service request is active (on) or nor (off).

12.3 - Displays

During normal operations, the parameters’ display “1” and the values’ display “2” (see figure 62) remain permanently on, if the ”Energy Saving” mode has not be activated (See section 12.15).
The parameters which can be displayed are shown with their meaning in the table shown in section 12.18.

12.4 - Start-up procedure

1. Open the manual shutoff gas valve;
2. switch on electric power to the boiler;
3. If the display shows code E21, it means that the polarity has not been observed between phase and neutral;
4. on initial start-up, the appliance carries out an auto-purging cycle lasting two minutes. This is indicated by the appearance of F on the display;
5. wait two minutes until the end of the auto-purging cycle;
6. turn knob “7” of figure 62 until it reaches the heating temperature desired. Turn knob “11” of figure 62 until it reaches the domestic water temperature desired.

The flame control appliance will start-up the burner.
If the burner fails to ignite within 15 seconds, the boiler will automatically attempt ignition another three times, after which if it fails to start-up, it will shut down and the display will show L01.

Press the Reset button in order to re-set normal operating conditions. The boiler will automatically attempt another start-up.

CAUTION!!! If the appliance frequently shuts down, contact a qualified technician to restore normal running conditions.
Now the boiler will continue to operate in relation to the service requested and will indicate the following on display “1”:

- d if a domestic water request is active;
- C if a heating request is active;
- 0 if there is no domestic water or heating request active.

12.5 - Summer mode

To disable the heating functions for a prolonged period, leaving only the domestic hot water function, switch OFF the heating temperature, until the wording OFF appears, by turning knob “7” of figure 62 to the minimum.

12.6 - Winter mode

In Winter mode, by means of the pump, the boiler sends the water to the system at the temperature set using knob “7” of figure 62.
When the temperature inside the boiler reaches the temperature set, the burner starts to modulate the flame so as to reduce the output to a minimum. If the temperature rises further, the burner shuts down. Simultaneously, the pump which sends the water to the system is switched on and off by the room thermostat. This can be noted, because indicator “6” of figure 62 switches on and off in correspondence with the on and off of the pump.
At first the pump may make a noise. This is due to the presence of residual air in the hydraulic system which will soon disappear on its own.
We recommend keeping the temperature set using knob “7” at the point shown by the symbols on the panel for a rational use of the boiler. If it is a particularly cold Winter and it is difficult to maintain the desired temperature, turn knob “7” to gradually higher values.

12.7 - Adjusting the domestic hot water temperature

The domestic hot water temperature is adjusted by turning knob “11” shown in figure 62. When the knob is turned, the display, item “1” in figure 62, shows a flashing d and the temperature being selected. The range within which the domestic hot water can be set is 104°F (40°C) to 140°F (60°C) or from 104°F (40°C) to 158°F (70°C) when an indirect storage tank is used.

12.8 - Heating system temperature adjustment

The boiler provides hot water to the heating system at the temperature set by adjusting knob “7” as shown in figure 62. The room thermostat turns the boiler’s circulator pump on in order to satisfy the heat demand of the rooms controlled by the thermostat. To maximize the boilers’ performance, temperature knob “7”, should be set at a value that is just sufficient to maintain the desired temperature of the rooms. As the weather gets colder, progressively increase the water temperature by adjusting knob “7”. When the weather gets milder turn the water temperature down. This extremely simple method is suitable for the following types of systems:

1. small systems with radiators where the thermostat is installed in a room whose temperature is characteristic of all the other rooms;
2. large systems with radiators, where each zone is controlled by its own room thermostat. Where zone valves are used the boiler pump is shutdown only when all the room thermostats are satisfied.
3. large systems with low temperature radiant panels , where each zone is controlled by its own room thermostat. Where zone valves are used the boiler pump is shutdown only when all the room thermostats are satisfied.

CAUTION!!! If the boiler is installed in a low temperature system follow the settings specified in section 5.10 or the heating system may be damaged.

12.9 - Heating system type selection

The boiler is factory set for wall stat control as per section 12.8.
The heating system type can be changed by going to the “Installers’ Menu” in section 12.17 and changing the CH parameter. One of the three following heating modes can be selected:
-CH = 00 “Wall stat control”: follow section 12.8;
-CH = 01 “Outdoor reset control”: follow section 12.10 (an outdoor temperature sensor is required);
-CH = 02 “Outdoor reset control with room compensation control”: follow section 12.10 to 12.10.6 (an outdoor temperature sensor is required):

12.10 - Outdoor reset adjustment

While in the “Installers’ Menu”, set the CH parameter to 01. In this mode the heating supply water temperature, calculated temperature in figures 63 and 64, will be adjusted automatically based on the input from the outdoor temperature sensor. The relationship between the outdoor temperature and the supply water temperature, corresponds with the graphs shown in figures 63 and 64. In order to change the relationship between the supply water temperature and the outdoor temperature, all the parameters listed in the sections below must be set.

12.10.1 - Outdoor reset applications

Outdoor reset is a sophisticated way to maximize comfort and boiler efficiency. It is suitable for the following system types:

A - small systems, with radiators where the thermostat is installed in a room whose temperature is characteristic of all the other rooms. The room thermostat is used to turn the boiler on and off.

B - large systems, with radiators, where each zone is controlled by its own room thermostat. Where zone valves are used the boiler pump is shutdown only when all the room thermostats are satisfied (see to an appropriate electrical system).

C - small systems, with low temperature radiant panels where the thermostat is installed in a room whose temperature is characteristic of all the other rooms. The room thermostat is used to turn the boiler on and off. In this type of system it is necessary to consider that the radiant panel systems sometimes have long lag times. It may be necessary to adapt the heating system and use the “Reaction” Cn parameter in order to compensate, see section 12.17.

D - large systems with low temperature radiant where each zone is controlled by its own room thermostat. Where zone valves are used the boiler pump is shutdown only when all the room thermostats are satisfied.

CAUTION! If the boiler is installed in a low temperature system, follow the settings specified in section 5.10 or the heating system may be damaged.

12.10.2 - Outdoor reset adjustment precautions

When making adjustments to change the supply temperature, it is advisable to first set the suggested default values for the desired curves shown in figures 63 and 64. If these default values do not produce a satisfactory result, then proceed to make the appropriate adjustments bearing in mind that:

A - each parameter must be varied gradually;

B - after each parameter change, wait at least 24 hours in order to see the result;

C - the closer the adjustment curve matches the actual load of the building, the greater the comfort and the energy savings will be;

D - knob “7” in figure 62 can be used to make the small line shifts, “b”, shown in figures 63 and 64. These shifts will change the supply water temperature up to 18 °F *(10 °C)*.

12.10.3 - Outdoor reset: setting parameters

Refer to section 12.16 and set:

- OA = “The angle of the curve”, which can be adjusted between 0.1 and 5.0. Suggested starting values are: 0.6 for “low temperature” systems; 1.6 for “high temperature” systems;

- Ob = “Minimum heating temperature”. When the calculated temperature drops below this value the heating service stops. The range of adjustment is between 68 °F (*20 °C)* and 140 °F *(60 °C)*. The suggested starting values are: 86 °F *(30 °C)* for “low temperature” systems; 104 °F *(40 °C)* for “high temperature” systems;

- Oc = “Maximum heating temperature”. This parameter is the limit of the supply heating temperature. Its range of adjustment is between 86 °F *(30 °C)* and 194 °F *(90 °C)*. The suggested starting values are: 113 °F *(45 °C)* for “low temperature” systems; 176 °F *(80 °C)* for “high temperature” systems.

Refer to section 12.11and set:

- Cn = “Reaction” of the calculated temperature with respect to the outdoor temperature input. The range of adjustment is between 1 °F *(1 °C)* and 18 °F *(10 °C)*. A low “Reaction” value results in a constant dwelling temperature but extended time in reaching full running conditions and responding to outdoor temperature changes. A high “Reaction” value results in reaching full running conditions quickly, but may cause oscillations in the dwelling temperature.
It is advised to maintain a “Reaction” value between 1 and 2;

- br = “Fix point” is the heating calculated temperature, when the outdoor temperature is 68 °F *(20 °C)*. It is called “Fix Point” because it is also the angle fulcrum of the curve. The suggested starting values are: 92 °F *(33 °C)* for “low temperature” systems 122 °F *(50 °C)* for “high temperature” systems.

12.10.4 - Outdoor reset: zone adjustments

The default values previously suggested are for boilers using an outdoor temperature sensor installed in dwellings with average heat loss in areas where the outside temperature for the calculation of the heat requirement is 23 °F *(-5°C)*. In the event that the climatic zone is different, adjust the gradient of the curve, parameter OA, to obtain a calculated temperature of 176 °F *(80 °C)* for high temperature systems, see figure 63. For “Low Temperature” systems adjust the gradient of the curve, parameter OA, to obtain a calculated temperature of 113 °F *(45°C)*, see figure 64.

12.10.5 - Outdoor reset activation

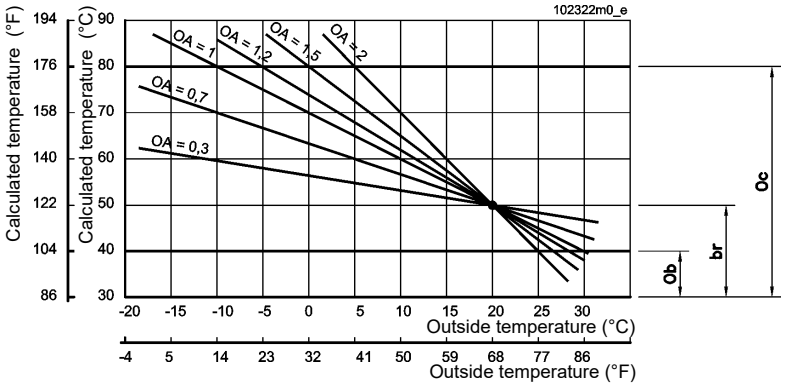
Once selected, reset adjustment is completely automatic and will switch off at the end of the heating season and switch back on at the beginning of the heating season. When the “Calculated temperature” is lower than the “Minimum heating temperature”, parameter Ob, the heating service switches off. When the “Calculated temperature” exceeds the “Minimum heating temperature”, parameter Ob, the heating service switches back on. If for some reason the heating service doesn’t match the load, use knob “7” in figure 62, to raise or lower the calculated temperature and match the “Minimum heating temperature” on an advanced or delayed basis.

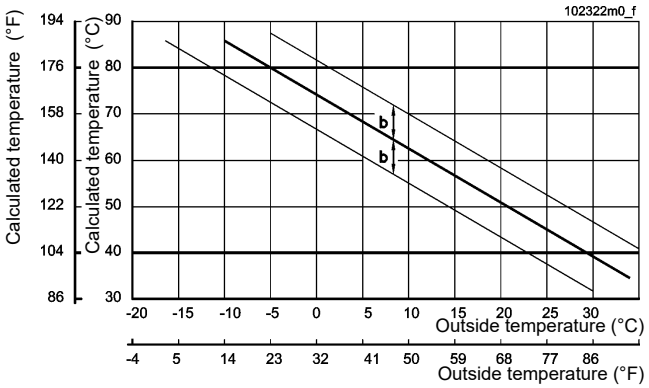
12.10.6 – Outdoor reset with room compensation

While in the “Installers’ Menu” set the CH parameter to 02, see section 12.17. The system will function exactly as described in the previous “Outdoor reset adjustment” sections except that now the boiler pump will stay on permanently. The opening of the room thermostat contacts will translate into a parallel downward movement of the curve in figure 63 or 64. The value by which the curve moves downwards can be adjusted by the tn parameter present in the “Installers’ Menu”, see section 12.17. The tn parameter can range from 1 °F *(1 °C)* to 36 °F, *(20°C)*. The suggested values for this parameter are:

- 18 °F *(10°C)* for high temperature radiator systems;
- 6 °F *(3°C)* for low temperature radiant panel systems

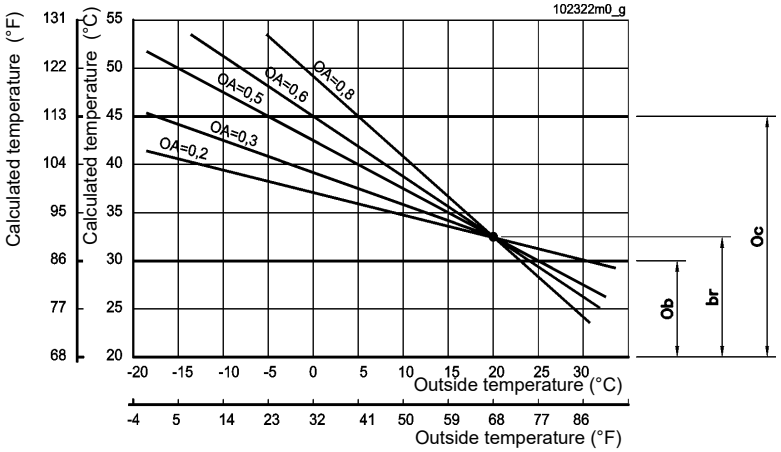
Values of this parameter that are too high may translate into room temperature instability. Values that are too low may make the action of the room thermostat ineffective. Climatic adjustment with room compensation can be used in all the systems described in section 12.10.1. The advantage being that the constant running of the pump will stabilize and standardize the room temperatures. This is especially true when some loops in the heating system have considerably greater volume than others.

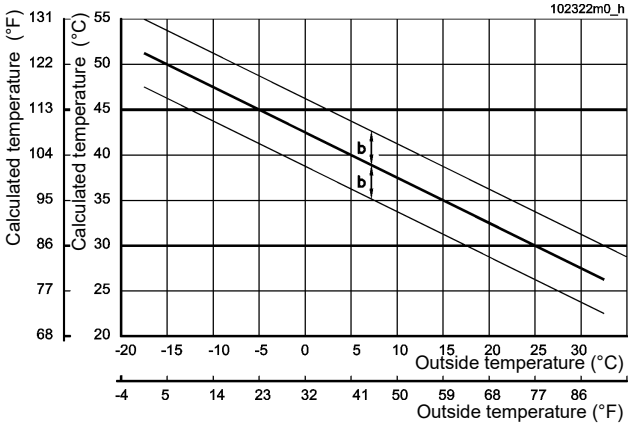




OA = Slope of the line
Ob = Minimum heating temperature
Oc = Maximum heating temperature
br = “Fix point” of the angle fulcrum of the line
b = parallel shift of the line (adjusted by the heating knob, item “7” of figure 62)

Figure 63 - Graphs of the outdoor reset adjustment for “high temperature” systems





OA = Slope of the line
Ob = Minimum heating temperature
Oc = Maximum heating temperature
br = “Set point” of the angle fulcrum of the line
b = parallel shift of the line (adjusted by the heating knob, item “7” of figure 62)

Figure 64 - Graphs of the outdoor reset adjustment for “low temperature” systems

12.11 - Boiler switch settings

The control board shown in figure 1, item “14”, and figure 21, contains a series of switches that allow the boiler to be configured to match the application. The table below lists each switch and its corresponding funtions.

CAUTION!!! Improper setting of these switches could cause the boiler to malfunction resulting in improper system performance. Only a qualified technician, with an in-depth knowledge of the boilers’ control system, should change them.

SWITCH	Position	Description
1	OFF	Boiler with production of instantaneous D.H.W.
	ON	Boiler with production of D.H.W. via storage tank
2	OFF	Boiler with production of instantaneous D.H.W.
	ON	Position not available for this series of boilers
3	OFF	Heating pressure switch, Low Water Cut Off, disabled
	ON	Heating pressure switch, Low Water Cut Off, enabled
4	OFF	EBM PAPST brand fan
	ON	FIME brand fan
5	OFF	Combination boiler for heating and D.H.W.
	ON	Boiler for heating only
6	OFF	High temperature heating service. Range from 86°F (30°C) up to 176°F (80°C)
	ON	Low temperature heating service. Range from 68°F (20°C) up to 113°F (45°C)
7	OFF	Boiler configuration change, disabled
	ON	Boiler configuration change, enabled
8	OFF	Maximum heating supply water temperature of 176°F (80°C)
	ON	Maximum heating supply water temperature of 189°F (87°C)

12.12 - Delays, alarms and protective actions

To protect the life of the appliance, improve comfort, and maximize energy savings, the following timings have been incorporated into the control logic:

a - Pump delay: each time the room thermostat is satisfied, the circulator pump continues to run for 1 minute;

b - DHW delay: each time the domestic hot water demand is satisfied, a 2 minutes delay must pass before the heating service is allowed to restart;

c - Protection against legionnaires bacteria: if the boiler is connected to a DHW storage tank the boiler will increase the tank temperature to 140 °F *(60 °C)* every seven days, prevent the formation of legionnaires bacteria. This function is displayed by AL.

d - DHW alarm: if the call for domestic hot water lasts for longer than two hours, an A 01 alarm is generated. This function is only for boilers set up to provide instantaneous DHW.

e - Time delay in restarting the burner: in its normal functioning state, except when providing domestic water, every time the burner stops, there is a delay time of 3 minutes before the burner restarts again.

12.13 - Circulator pump and three way valve protection

During the summer months, the circulator is run once a day for around 15 seconds to prevent it from seizing. At the same time, the three way valve (if present) is activated for the same reason.

12.14 - Freeze protection

CAUTION!!! For the freeze protection function to work, the boiler must remain connected to the electrical and gas supplies with knobs “7” and “11” in figure 62, in the OFF position.

Once the boiler has reached a temperature of 45 °F *(7 °C)*, the heating pump will automatically comes on. Boiler is built in with its own by-pass valve (see figure 2, item “15”, against any closed zone vale). If the temperature falls below 35 °F *(2 °C)*, the burner will light to prevent the boiler from freezing.

If the boiler will not be used for more than a year it should be drained per sections 13.10 and 13.11.

12.15 - Display in energy saving mode

If desired, the display, items “1” and “2” in figure 62, can be switched permanently off, with the exception of when it displays errors or settings. To switch the display off, access the “Installers’ Menu”, in section 12.17 and set the S parameter at a value other than zero. Keep in mind that each value will correspond to a delay in minutes until the display goes into Energy Saving mode.

12.16 - “Users’ menu”

When entering the “Users’ menu”, the display, item “1” in figure 62, will start blinking indicating that a change of mode has taken place. To access the “Users’ menu” (see also section 16 to better understand the several menus):

- press the Reset button for 2 seconds until the display starts blinking;
- press and release the Reset button several times until the desired parameter is displayed;
- use the + or − keys, to change the value of the selected parameter.
- press Reset to save the parameter change before going to the next parameter.

When the last parameter has been reached and the Reset button pressed, the display will stop blinking indicating exit from the menu.

NOTE: If no key is pressed for more than 60 seconds, the control automatically exits the “Users’ menu”. Any parameter change not saved using the Reset button, will be lost.

The table below lists each “Users’ menu” parameter, what it affects and its adjustment range.

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” of figure 62
0A	Adjustment of the curve angel as shown in figures 63 and 64 when outdoor reset is active per section 12.9.	Setting range: 0,1 to 5,0
0b	Adjustment of the “Minimum heating temperature” as shown in figures 63 and 64 when outdoor reset is active per section 12.9.	Setting range: see section 12.10.3
0c	Adjustment of the “Maximum heating temperature” as shown in figures 63 and 64 when outdoor reset is active per section 12.9.	Setting range: see section 12.10.3
b	Adjustment of the parallel shift of the curve as shown in figures 63 and 64 when outdoor reset is active per section 12.9.	The adjustment is made by turning knob “7” shown in figure 62. The selected curve can be shifted up or down by 18 °F *(10 °C)*.
c	Display of the calculated heating temperature when outdoor reset is active per section 12.9, or display of the temperature set by knob “7” shown in figure 62.	Temperature display only with a range between 68 °F *(20 °C)* and 189 °F *(87 °C)*.
d	Display of the domestic hot water temperature when set by knob “11” shown in figure 62.	Temperature display only with a range between 104 °F *(40 °C)* and 158 °F *(70 °C)*, see section 12.7
E	Display of last error code registered, section 12.18.2	Error code display per section 12.18.2
L	Display of last lockout occurred, section 12.18.1	Fault code per section 12.18.1

12.17 - “Installer’s menu”

CAUTION!!! Changing these parameters could cause the boiler and therefore the system to malfunction. For this reason, only a qualified technician who has in-depth knowledge of the boiler should change them.

The boiler’s micro-processor makes this menu of parameters available to the qualified technician for the analysis of the functioning and adjustment of the appliance to the system. When entering the “Installers’ Menu”, the display item “1” in figure 62, will start to blink indicating that a change of mode has taken place. To access the “Installers’ Menu” just (see also section 16):

- press the Reset button down for 12 seconds until the U 1 parameter is displayed;
- press and release the Reset button to scroll through the list of the parameters;
- once the parameter has been displayed, it can be changed using the + or − keys;
- press and release the Reset button to confirm the amended data before moving to the next parameter.

When the last parameter has been reached and the Reset button pressed, the display will stop blinking indicating an exit from the menu.

NOTE: If no key is pressed for more than 60 seconds, the control automatically exits the “Installers’ menu”. Any parameter change not saved using the Reset button, will be lost.

The next table lists each “Installers’ menu” parameter, what it affects and its adjustment range.

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” OF Figure 62
U 1	Boiler and heating supply temperature, measured by U1 sensor	Value in °F (cannot be changed)
U2	Domestic hot water temperature, measured by U2 sensor	Value in °F (cannot be changed)
U3	Domestic cold water (or storage tank) temperature, measured by U3 sensor	Value in °F (cannot be changed)
U4	Outdoor temperature, measured by U4 sensor	Value in °F (cannot be changed) (displayed only if outdoor reset is active, as per section 12.9)
U5	Ionization current value	Value from 0 to 99 (cannot be changed) (30 corresponds to a current of 1uA) (99 corresponds to a current of 5.5 uA)
U6	High limit temperature, measured by U6 sensor	Value in °F (cannot be changed)
U7	Flue gas temperature, measured by U7 sensor	Value in °F (cannot be changed)
U8	Heating return temperature, measured by U8 sensor	Value in °F (cannot be changed)
tY	Type of basic setting of control board	Can be changed in accordance with the instructions indicated in the gas conversion kit
rt	Status of room thermostat contact	00 = contact open (heating service off) 01 = contact closed (heating service on)
F	Measurement of fan speed rotation	Value in g/1’/100 (rpm/100) (cannot be changed)
P	BTU input for heating service	Adjustable according to the instructions of section 11.10

Continue

Continued

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” OF Figure 62
CH	Heating service functioning mode	Can be changed: 00 = thermostatic adjustment (see section 12.8); 01 = outdoor reset (see section 12.10); 02 = outdoor reset with room compensation (see section 12.10.6);
Cn	Reaction to external temperature	Can be changed from 1 to 10 (active only with outdoor reset). See section 12.10.1 for its adjustment.
br	Angle fulcrum of climatic adjustment	Can be changed from 16°F (-9°C) to 149°F (65°C) (active only with outdoor reset). See section 12.10.3 for its adjustment.
tn	Reduction of temperature generated by the opening of the room thermostat	Can be changed: from 1°F (1°C) to 36°F (20°C) (active only with outdoor reset featuring room compensation) See section 12.10.6 for its adjustment.
L	Boiler knobs’ status	Can be changed: 01 = knobs presents; 00 = knobs absent.
S	Display “1” and “2” as per figure 62 energy saver	Can be changed: 00 = display always on; any other value, corresponds to a delay in the switching off of the display, expressed in minutes (see also section 12.15)
PS	Parameter disabled for this kind of boiler	
dE	Domestic sensitivity setting	Can be changed between 1 and 10°F. Default value is 4°F. To increase the sensitivity set it to 2°F
St	Minimum domestic setpoint during sleep mode	Can be changed between 104 and 122°F. Default value is 104°F. **Never** set domestic setpoint (see section 12.7) at a value lower than this parameter).
CP	Proportional band of the heating PID modulation	Can be changed between 1 and 99. Default value is 15. Can be modified only in conjunction with factory technicians.
C I	Integral of the heating PID modulation	Can be changed between 1 and 99. Default value is 30. Can be modified only in conjunction with factory technicians.
AC	Burner Anticycling: minimum delay from a burner light-off to the sequent light-on. Value expressed in sec x 10	Can be changed between 1 and 54. Default value is 18 (180 sec). Can be modified only in conjunction with factory technicians.

12.18 - Diagnostics

During the normal operation of the boiler, the display “1” and “2” of figure 62, continually shows the operating status of the boiler as shown below (see also section 16):

PARAMETER DISPLAY (ITEM “1”, Figure 62)	PARAMETER REFERENCE	DISPLAY READ OUT (ITEM “2”, Figure 62)
0	Boiler in stand-by mode or pause (no request for heating or domestic hot water)	Boiler temperature (°F)
P	Anti-freeze function active	Boiler temperature (°F)
A	Boiler not in lock-out mode but in Attention mode.	01 = Domestic hot water service active for more than 120 minutes. Turn domestic hot water to OFF position to reinstate heating. 02 = Connection interrupted between boilers on a cascade boilers
FILL	System pressure too low, system must be filled. See section 11.1.3.	No display
d	Domestic hot water service on	Domestic hot water temperature (°F)
C	Heating service on	Heating temperature (°F)
L	Boiler in lock-out mode. To reset it, press the Reset button. If the lock-out occurs frequently, contact a professionally qualified technician.	Lock-out code (see section 12.18.1 for decodification).
E	Blocking error. Contact a professionally qualified technician. Blocking errors automatically reset if the condition causing the block disappears	Error code (see section 12.18.2 for decodification).
F	Auto-purging procedure that last 3 minutes in progress (see section 11.1.5).	Boiler temperature (°F)
AL	Boiler in Anti-legionella functioning (see section 12.12)	Storage tank temperature (°F)

12.18.1 - Diagnostics: “L” lock-outs

“L” Code	Lock-out description	Checks to make	Solutions
L01	No flame detected after three ignition attempts.	Check: a-correct gas supply pressure (see section 11.7); b-ignition spark (see section 13.4); c-correct combustion air pressure (see section 11.8); d-120Vac at the gas valve; e-resistance of the two gas valve coils should be 0.18 kohm and 1.1 kohm; f- If the burner lights, but goes out at the end of the ignition attempt, check: that the ionization current is set at a value greater than 60 (follow procedure in section 13.12.4)	a-If the gas supply pressure is incorrect, it must be adjusted to the correct pressure; b-If spark is not present, check for correct ignition ectrode position and gap as per section 13.4; If position is correct, check for 120Vac at the supply of the spark generator. c-if the combustion air pressure is incorrect, inspect the vent system and eliminate any obstructions; d-if the voltage to the gas valve is not 120Vac the power control board must be replaced; e-if the resitance of the gas valve coils is not 0.18 kohm and/or 1.10 kohm, the gas valve must be replaced. f-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 11.9). Check the flame detection electrode (section 13.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.
L02	Flame extinguishes three times.	Check: a-that the ionization current is set at a value greater than 60 (follow procedure in section 13.12.4); b-check that vent terminal is not being adversely affected by wind;	a-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 11.9). Check the flame detection electrode (section 13.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires. b-If vent terminal is being adversely affected by wind it must be relocated.
L03	Boiler temperature is over 203° F (95°C).	Check that the circulator pump is working	If the circulator pump is bad, replace it, if is good, replace the power control board
L04	Gas valve command relay		Replace the power control board
L05	Safety relay	Check for correct polarity of the wires to the pump. Try to switch the wires.	If the pump won’t run replace it. If the pump is good try to replace the power control board.
L06	Flue gas sensor over 230°F (110°C)	Check: a - that the electrical resistance of the flue gas sensor complies with the graph in section 13.13; b - that the efficiency of the boiler is over 86%	a-If the flue gas sensor resistance does not correspond with the correct values, replace it; b-if the boiler efficiency is less than 86% and the CO2 content is correct, the primary heat exchanger has to be replaced and proper water treatment methods employed to prevent mineral build up on the water side
L07	Electrical circuit of flue gas sensor is interrupted	Check that the electrical resistance of the flue gas sensor corresponds with the graph in section 13.13;	If the sensor resistance does not correspond with the correct values, replace it;
L08	Spark generator relay		Replace the power control board
L09	RAM memory		Replace the power control board
L10	E2prom memory damaged		Replace the power control board
L12	E2prom memory damaged		Replace the power control board
L13	Program error		Replace the power control board
L14	Program error		Replace the power control board
L15	Program error		Replace the power control board
L16	Program error		Replace the power control board
L17	The temperature difference between the U1 and U6 sensors is too great	Check that: a - the electrical resistance of the two sensors corresponds with the graph in section 13.13; b -check that the heating water flow is not too low.	a-If one or both sensors does not have the correct resistance value, it must be replaced; b-If temperature difference between U1 and U8 is higher than 55°F at maximum input, the heating water flow rate is too low. The heating water flow rate must be corrected.

12.18.1 - Diagnostics: “L” lock-outs (continued)

“L” Code	Lock-out description	Controls	Solutions
L18	Program error		Replace the power control board
L19	Flame sensed for 10 seconds, after the closure of the gas valve		Call technical service
L20	Flame sensed before opening of the gas valve.		Call technical service
L25	U1 or U6 sensor increase its temperature too fast	Check: a - that the heating water flow is not too low; b - that the circulator pump is working	a - If temperature difference between U1 and U8 is higher than 55°F (13°C), at maximum input, the heating water flow rate is too low. The heating water flow rate must be corrected. b - If the pump works, replace the power control board.
L32	Program error		Replace the power control board
L33	Fan rotation error	Check that the voltage to the fan is 163(±10)Vdc.	If the fan is powered with 163Vdc, replace the fan. If the voltage to the fan is not 163 Vdc, replace the board.
L45	Heating circuit filling time longer than 10 minutes.	Check: a - that the heating pressure switch setting pressure, FILL appears when the pressure drops below 8.7 psi (0,6 bar), and disappears when the pressure rises above 22 psi (1.5 bar); b - check that there are no water leaks in the heating system.	a -If the heating pressure switch is not correctly set, it must be replaced; b - if the system has a leak, it must be fixed.
L46	Filling of heating circuit repeated 16 times in 24 hours		
L47	Flue pressure switch open time longer than 60 minutes	Check: a - that no obstructions are in the flue discharge/air intake line b - check the flue pressure switch setting point, setting is 4.5 in.W.C c - check that the electrical resistance of the flue gas sensor corresponds with the graph in section 13.13; d - check that the electrical connection cables between the flue pressure switch, the flue sensor and the power control board.	a -If ther’is an obstruction, it must be removed; b - If the flue pressure switch is not correctly set, it must be replaced; c - If the flue sensor resistance does not correspond, it must be replaced; d - if the electrical circuit is damaged, it must be repaired; if the previous four cases do not apply, replace the power control board

12.18.2 - Diagnostics: “E” blocking errors

“E” Code	Blocking description	Checks to make	Solutions
E01	U1 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E02	U2 domestic hot water temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E04	U8 return temperature sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E07	U3 cold water temperature or storage tank sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that te electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E08	U6 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E11	U1boiler temperature sensor circuit short-circuited.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E12	U2 domestic hot water temperature sensor circuit short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E13	Erroneous temperature reading.		Replace the power control board

12.18.2 - Diagnostics: “E” blocking errors (continued)

“E” Code	Blocking description	Checks to make	Solutions
E14	U8 return temperature sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E15	U4 outside sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E16	Erroneous temperature reading.		Replace the power control board
E17	U3 cold water temperature or storage tank sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E18	U6 boiler temperature sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.13; check that the electrical connection cables between the sensor and the power control board have continuity and carry current	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E19	E2prom memory damaged		Replace the command and control board
E20	Flame presence with gas valve closed		Replace the gas valve
E21	Phase and neutral inverted	Invert phase and neutral	If phase and neutral are correctly wired, replace the power and control board
E22	Electrical supply frequency other than 60Hz	Check the electrical frequency of the system. Check if CS parameter is at 03 (see section 16)	If the electrical supply frequency is other than 60Hz, contact the electric company; if the mains frequency is 60Hz, replace the command and control board. Make sure that the CS parameter is at 03.
E23	Ground connection is absent	Check if the boiler is properly grounded	if the boiler is properly grounded, replace the power control board
E30	Erroneous temperature reading.		Replace the power control board
E31	Erroneous temperature reading.		Replace the power control board
E32	Erroneous temperature reading.		Replace the power control board
E33	Erroneous temperature reading.		Replace the power control board
E42	Program error		Replace the power control board
E50	Error in the boiler tY parameter selection	Push ON switches 7 an set again the correct tY value (see section 16).	If tY value is correct, change the power control board
E51	Reset button pressed too often in a short period time		
E52	Heating flow switch closed	Check if heating pump is running. Check if flow switch contact is stuck.	The pump should not run and the contact should be open The contact must be open
E53	Heating flow switch is open	Check if heating pump is running. Check if flow switch contact is broken.	The pump should run and the contact should be closed The contact must be closed

13 - MAINTENANCE

13.1 - General precaution

WARNING!!! Never store combustible materials, gasoline or any product containing flammable vapors and liquids in the vicinity of the boiler. Failure to comply with this warning can result in extensive property damage, severe personal injury or death!

WARNING!!! Never obstruct the flow of combustion and ventilation air. Failure to provide adequate combustion air for this boiler can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

CAUTION!!! Before performing any maintenance operations, shut the boiler off, close the manual gas shut-off valve, figure 16 item "3", and shut off electrical power to the boiler. Follow the Operating Instructions outlined in the section "SAFETY INSTRUCTION".

WARNING!!! If maintenance is performed on the vent-air intake system it must be properly reassembled and sealed. Failure to properly maintain the vent-air system can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

WARNING!!! Servicing, inspection and adjustment must be done by a trained technician in accordance with all applicable local and national codes. Improper servicing or adjustment could damage the boiler! Failure to comply with this warning can result in a fire or explosion causing property damage, personal injury or loss of life!

Service and maintenance schedules

Service Technician

Annual Startup:

- Address reported problems
- Check all piping for leaks
- Verify flue and air lines in good condition and sealed tight
- Check system water pressure/system piping/ expansion tank
- Check control settings
- Check ignition and flame sense electrodes
- Check wiring and connections
- Perform Performance verification
- Flame Inspection
- Check flame signal
- Clean the heat exchanger if flue temperature is more than 72°F (40°C) above return water temperature.
- Clean condensate trap
- Check combustion air pressure
- Check relief valve
- Check for any air inside the domestic heat exchanger
- Check any domestic water softener for any needed maintenance (follow softener's manufacturer instructions)

User maintenance

Daily:

- Check boiler area
- Check Pressure gauge

Monthly:

- Check vent piping
- Check air piping
- Check condensate drain system

Every six month:

- Check boiler piping (gas and water) for leaks

End of season months:

- Shut boiler down (unless boiler is used for domestic hot water)

13.2 - Removing the casing

In order to remove the casing, follow the steps below while refering to figure 65:

1. remove screws “A”;
2. raise latch “C”;
3. remove the front cover;
4. press the two plastic springs, item “L”, down;
5. lower the electrical box;
6. lift latch “G”;
7. pull the bottom of cover “H” out by around 4 in (10 cm);
8. lift cover “H” up by around 1in (2 cm) and remove it.

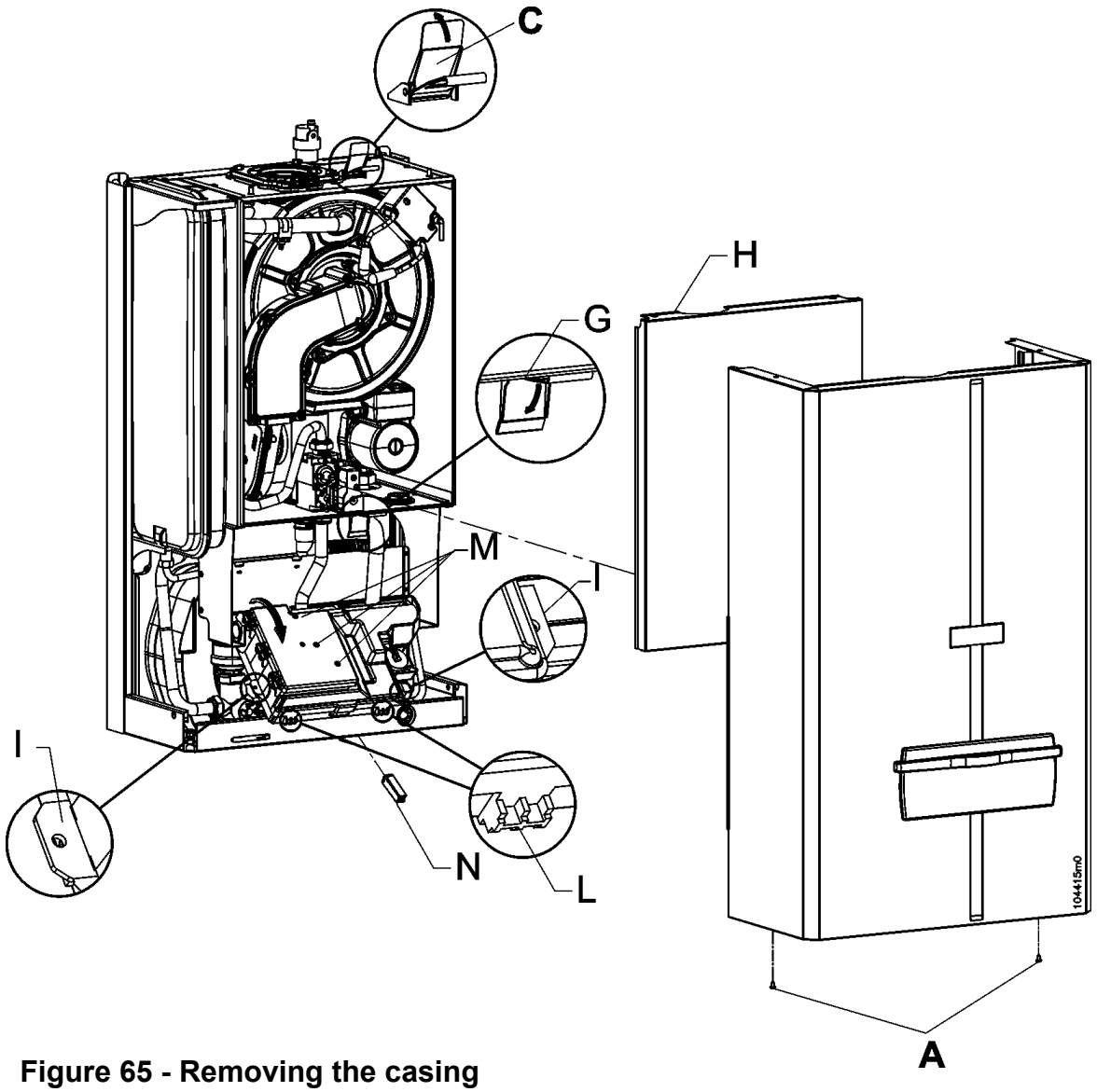


Figure 65 - Removing the casing

13.3 - Cleaning the burner and primary heat exchanger, flue gas side

The burner and primary heat exchanger must be cleaned every year. To correctly clean the burner and the flue gas side of the heat exchanger follow the steps below:

1. follow the steps in section 13.2 to gain access the internal components;
2. unscrew nut “D” from the gas valve (taking care not to loose gasket “E” in figure 68);
3. disconnect the two wires from the ignition electrodes and the wire from the flame detection electrode, figure 1, details “18” and “47”;
4. disconnect the wire from safety sensor “F” in figure 66;
5. unscrew the four nuts “C” in figure 66;
6. prepare a suitable cover for the gas valve outlet under nut “D” so that no dirt, water, or other foreign objects can fall into the gas valve during cleaning;
7. remove the entire fan - burner assembly, detail “A” in figure 66;
8. use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, detail “H” in figure 66;
9. use a vacuum cleaner to remove any unburned residue from the combustion chamber, detail “H” in figure 66;
10. using the same vacuum cleaner, clean the surfaces of the burner and around the electrodes;

WARNING!!! Before proceeding to the next step, verify that the electrical supply to the boiler, and any other electrical supply near the boiler, is off. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

WARNING!!! while performing the next step, carefully wash only the inside of the combustion chamber “H” of figure 66, and do not get water on the outside of the combustion chamber opening. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

11. using only water, wash the inside of the combustion chamber, detail “H” in figure 66. The water, will drain into the condensate drain. Clean the condensate trap (see section 13.6) before reassembling components;
12. reassemble the components by proceeding in reverse order;
13. open the manual gas shutoff valve;
14. restore electrical power to the boiler;
15. check that there are no gas leaks.

WARNING!!! Never use an open flame to test for gas leaks. Always use an approved leak detection method. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

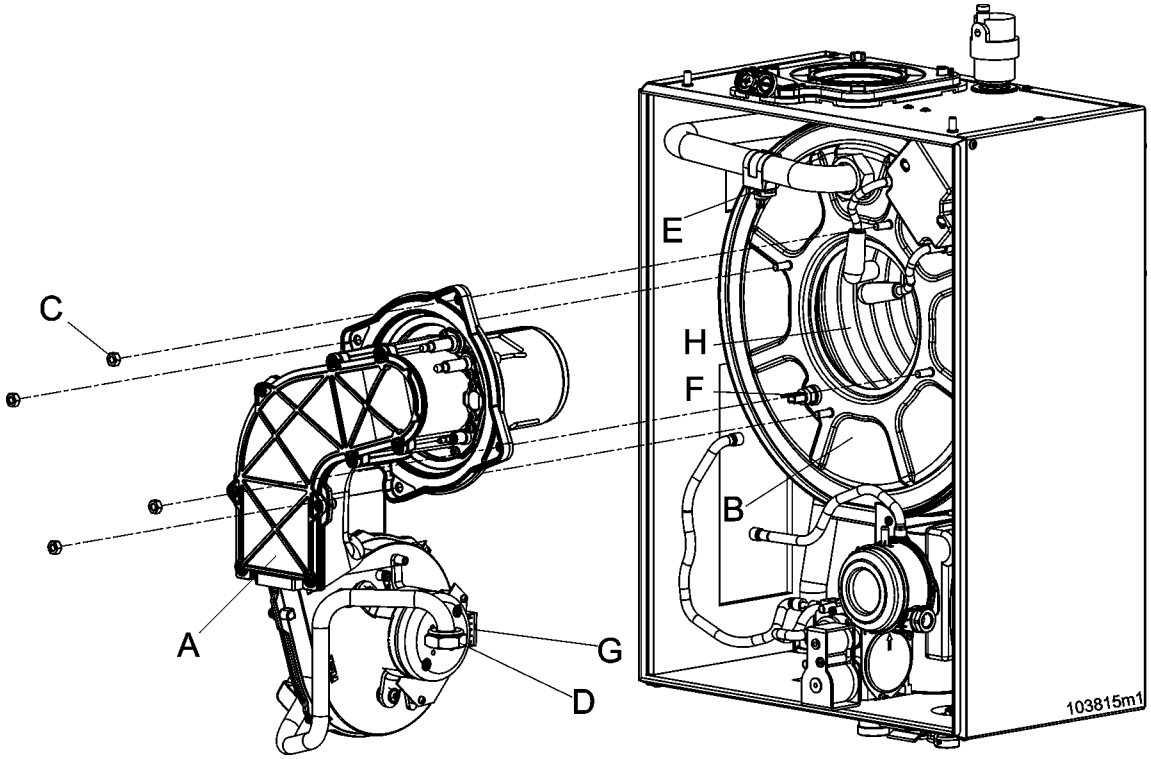
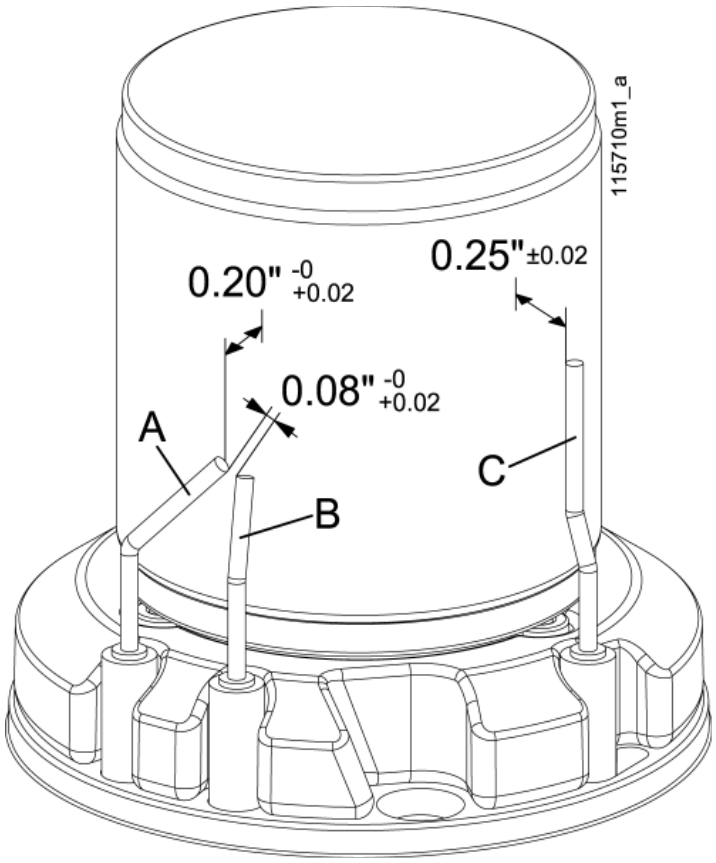


Figure 66 - Remove the fan-burner assembly unit



A = Left ignition electrode
B = Right ignition electrode
C = Flame detection electrode

Figure 67 - Positioning electrodes on burner (Use an hand caliper to verifie the distances of the electrodes)

13.4 - Correct positioning of the ignition and flame detection electrodes

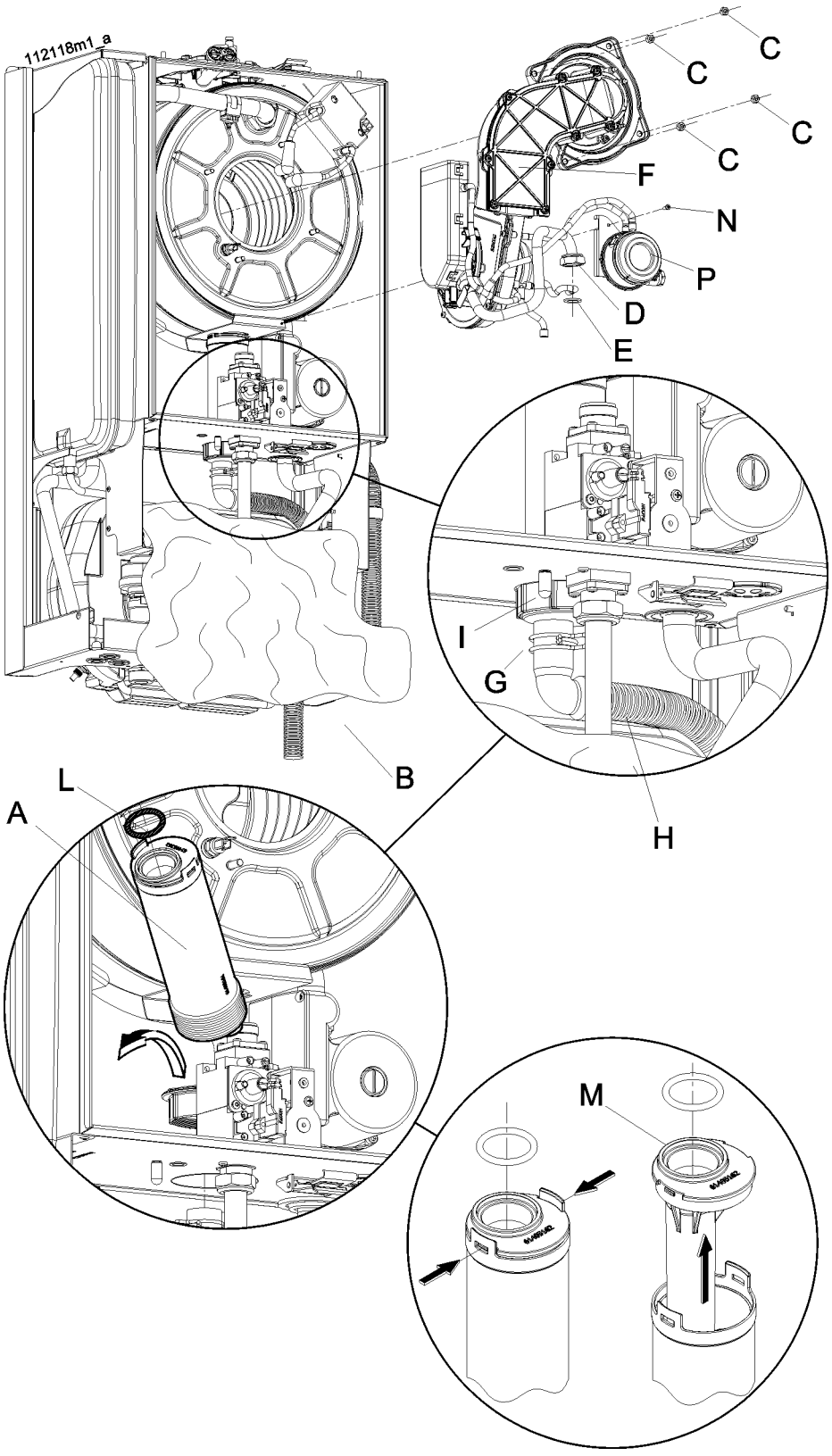
For the boiler to work properly the electrodes must be positioned as shown in figure 67:

- ☞the distance between the ignition electrodes “A” and “B”, must be between 0.08 in *(2 mm)*, and 0.10 in *(2.5 mm)*;
- ☞the distance of the ignition electrodes to the burner surface must be between 0.20 in *(5.0 mm)*, and 0.22 in (*5.5 mm)*;
- ☞the distance of the flame detection electrode to the burner surface must be between 0.23 in *(6.0 mm)*, and 0.27 in *(7.0 mm)*.

For a correct functioning of the boiler the below distances shall be verified with an hand caliper.

13.5 - Domestic hot water heat exchanger

The production of DHW takes place in the secondary heat exchanger, detail “42” in figure 1. If this heat exchanger looses efficiency over time, it may be necessary to clean or replace it.



13.6 - Condensate trap cleaning

The condensate trap must be cleaned every year. Follow the steps below to properly clean the condensate trap and its associated components while refering to figure 68:

1. run the fan as described in section 13.12.2, to minimize the amount of liquid present in the trap, item “A”;
2. follow the steps in section 13.2 to gain access the internal components;
3. carefully cover the electrical panel with a waterproof material, “B”, to prevent water from entering the electrical system;
4. grip spring clamp “G” with a pair of pliers and slide it downwards;
5. pull the condensation trap hose “H” off the trap;
6. remove the fan-burner assembly unit, follow steps of section 13.3;
7. protect the gas valve outlet, from entering any object or condensing water;
8. unscrew nut “I” from the bottom of the trap, “A”, and pull it upwards, taking care not to spill the condensation;
9. open the condensate trap taking care not to loose o ring “L” and clean the inside “M”;
10. re-assemble everything in reverse order, taking care that oring “L” is placed in the proper location;
11. refill the condensate trap per section 11.1.2.

Figure 68 - Removing the condensing trap

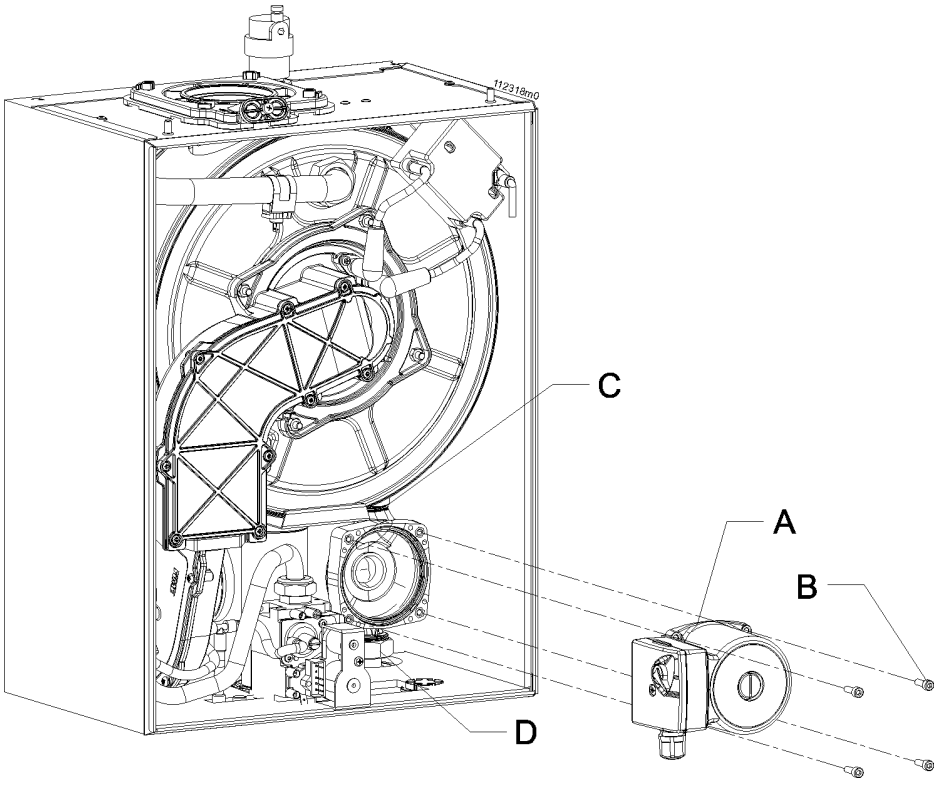


Figure 69 - Replacing the pump motor

13.7 - Circulator pump motor replacement

To replace the circulator pump follow the steps below while, refering to figure 69:

1. follow the steps in section 13.10 to isolate and drain the water from the boiler;
2. follow the steps in section 13.2 to gain access the internal components;
3. remove screws “B”;
4. remove the circulator pump motor “A”;
5. label the electrical wires of the circulator pump motor, phase and neutral must be respected;
6. disconnect the electrical wires from the circulator pump motor
7. install the new circulator pump motor and reassemble the boiler
8. open the heating system isolation valves and heating system fill valve
9. follow the steps in section 11.1.3 to bleed the air from the heating system.

NOTE: If display shows L05 reverse polarity (phase and neutral) to the pump

13.8 - Expansion tank pressure

To check the expansion tank pressure follow the steps below:

1. follow the steps in section 13.10 to isolate and drain the water from the boiler
2. follow the steps in section 13.2, to gain access the internal components;
3. check the pressure of the expansion tank, item “4” of figure 1 (The air inlet probe is on the top of the expansion tank). It must be 14 psi (*1 bar)*. If the pressure is lower recharge the expansion tank while letting the water run out of the heating system drain valve.

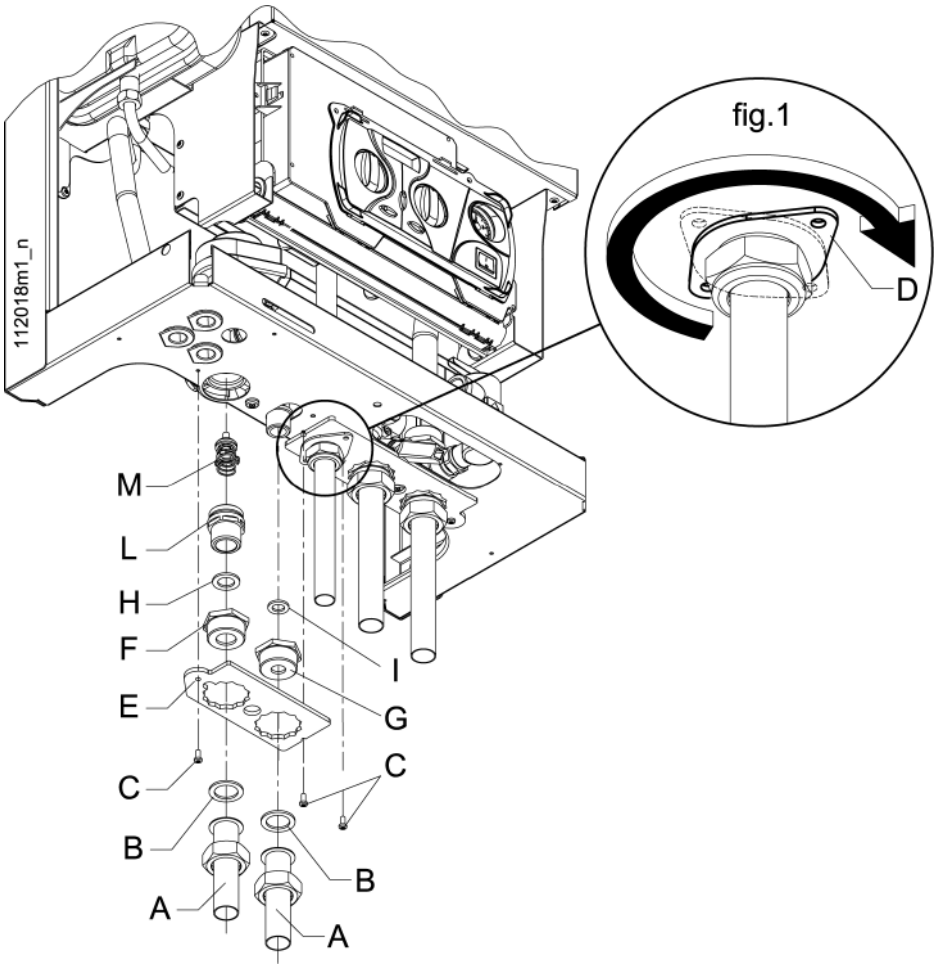


Figure 70 - Supply fittings removal (only for 160-C model)

13.9 - 3-way valve removal

The 3-way valve, details “M” and “Q” in figures 70 and 71, directs hot water produced by the primary heat exchanger to the heating circuit or to the secondary heat exchanger for the production of D.H.W. To replace or clean it, follow the steps below while referring to figures 70 and 71:

1. follow the steps in section 13.10 to isolate and drain the water from the boiler;
2. follow the steps in section 13.2, to gain access the internal components;
3. disconnect fittings “A”;
4. remove screws “C”;
5. rotate “D” flange in the sense of the black arrow (See particular fig. 1);
6. remove the bracket “E”;
5. remove fitting “F”;
6. remove fitting “L”;
7. remove fitting “M” and check its state.
8. remove spring “N”;
9. remove servomotor “O”;
10. remove the fitting “P”
11. remove the spring “Q” and check for any dirty.

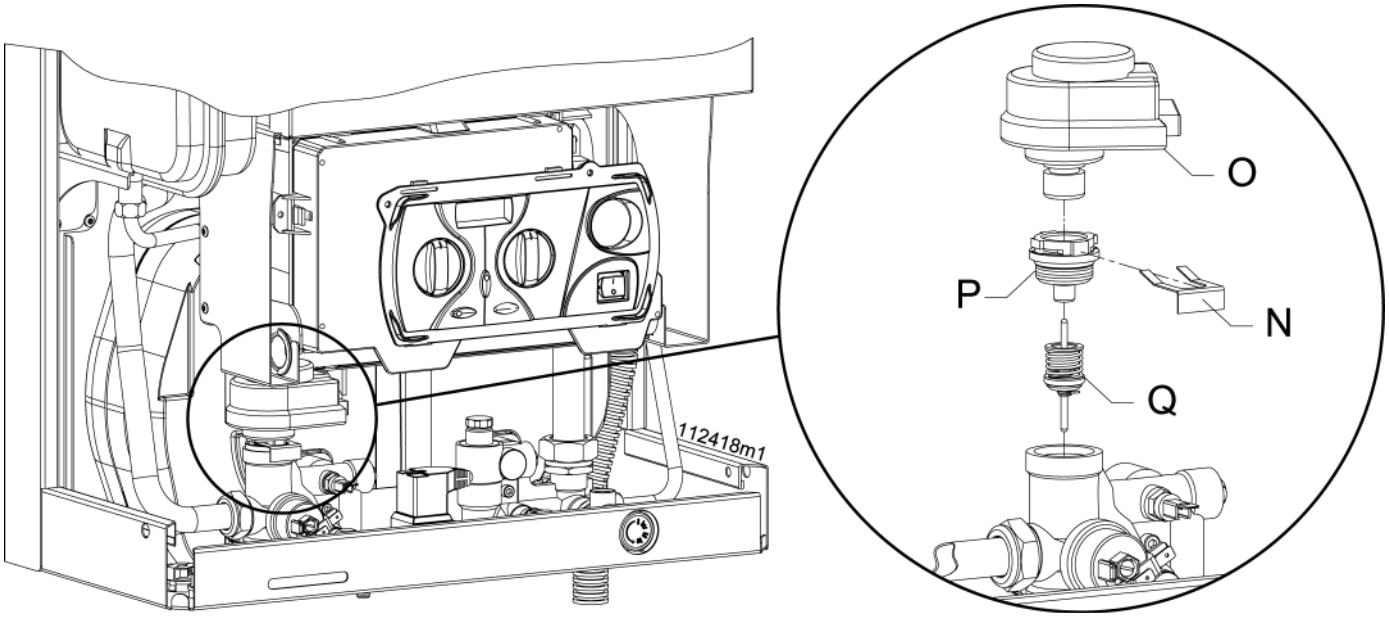


Figure 71 - 3-way valve servomotor removal

13.10 - Draining the heating side of the boiler

To drain the heating side of the boiler follow the steps below:

1. allow the water inside to cool by switching off the room thermostat and turning knob “7” in figure 62 to minimum. Wait until the display, item “2” in figure 62, shows a temperature less than 104°F *(40°C)*;
2. turn off the boiler;
3. shut off electrical power to the boiler;
4. close the manual gas shutoff valve, figure 16 item “3”;
5. close the boiler isolation valves in the heating system. If isolation valves haven’t been installed, the entire heating system will have to be drained.
6. close the heating system fill valve;
7. follow the steps in section 13.2, to gain access the internal components;
8. connect a hose to the boiler drain valve and place the other end in a sink or some other suitable drain;
9. open the boiler drain valve and drain the boiler;
10. if boiler isolation valves have not been installed in the heating system open any bleed valves at the highest point of the system;
11. after draining out all the water, close the bleed valves and the boiler drain valve;

WARNING!!! Do not recover and/ or re-use water drained from the heating circuit for any purpose as it could be contaminated. Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

13.11 - Draining the domestic hot water side of the boiler

To drain the domestic hot water side of the boiler follow the steps below:

1. turn off the boiler;
2. close the valve in the water main supplying the DHW system;
3. open all the hot and cold faucets in the building;
4. if there isn’t a faucet or drain valve below the boiler level, disconnect DHW connections “10” and “12” in figure 1.

13.12 – Overrides

To carry out specific checks covered in the manual, it is possible to override the control logic of the boiler. See the next:

13.12.1 - Auto-purging

To reset the auto-purging procedure press the + and − keys together for 10 seconds. When the blinking F appears on the display,- press Reset.

13.12.2 - Fan

To run just the fan at full speed press the + and − keys together for 10 seconds, until the blinking F appears on the display. The fan will run at full speed for 10 minutes. To shut the fan off before the 10 minutes is up press the Reset key.

13.12.3 – Minimum and maximum output

The boiler can be run at its minimum or maximum output in both the heating and domestic hot water modes by following the steps below:

1. generate a demand for the mode to be overridden:
   - for heating turn up the room thermostat and turn knob “7” in figure 62 to its maximum;
   - for domestic hot water turn knob “11” in figure 62 to its maximum and fully open a hot water faucet;
2. press the + and − keys together for more than 10 seconds, until a blinking F appears on the display;
3. press the + key until the display shows:
   - t _ for minimum heating output;
   - t - for maximum heating output adjusted by P parameter, see section 11.10;
   - t - for maximum heating output;
   - S _ for minimum DHW output;
   - S - for maximum DHW output;
4. press the Reset key in order to restore the boiler to normal running conditions.

13.12.4 – Checking the flame current

While running at the minimum and maximum output described in section 13.12.3, the display will show the letter of the mode checked. In the second part of the display the value of the ionization current will be shown. 30 corresponds to a current of 1 uA, 99 to a current of 5.5 uA. The flame current must always be at the correspondent value as shown in section 14, header “ionisation current”. If the value is not within the above values, check:

a - positioning of the flame sensor electrod as per section 13.4;
b - CO_2 content as per section 11.9;
c - combustion air pressure as per section 11.8.

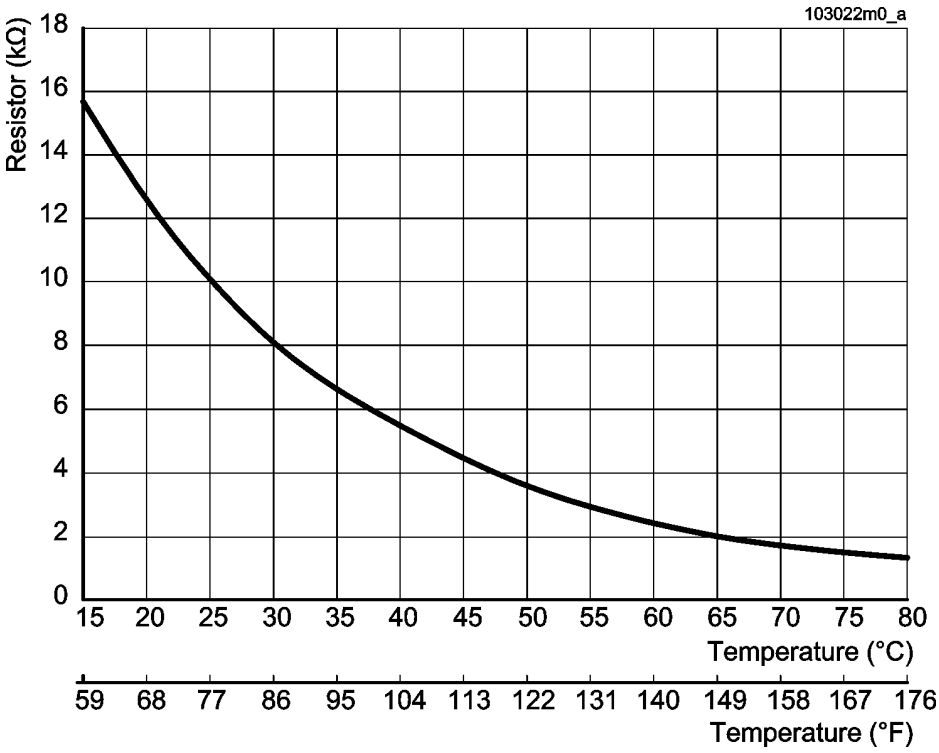


Figure 72 - Water temperature sensor's curve

13.13 - Water and flue temperature sensor

The boiler has a number of sensors that measure temperature. The electrical resistance between the sensor wires must correspond with the values shown in figure 72.

The temperature sensors are: U1; U2, U3, U6, U7 and U8. The location of each sensor can be found in figure 1 and sections 13.15 and 13.16.

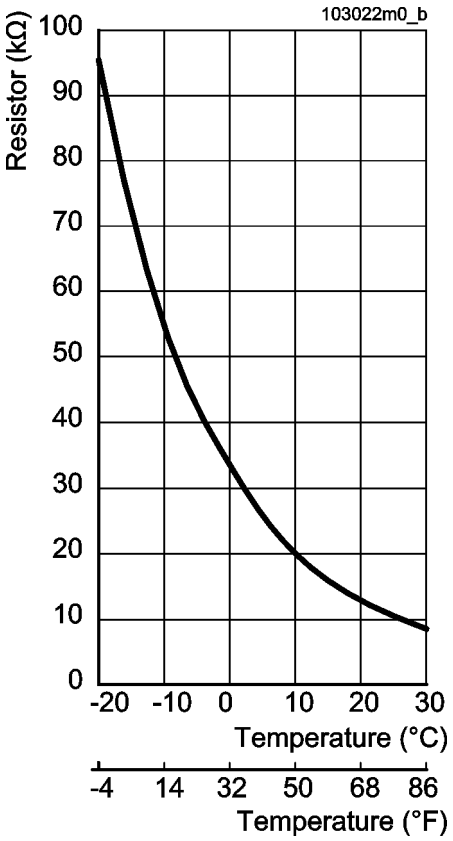


Figure 73- Outdoor temperature sensor's curve

13.14 - Outdoor temperature sensor (optional)

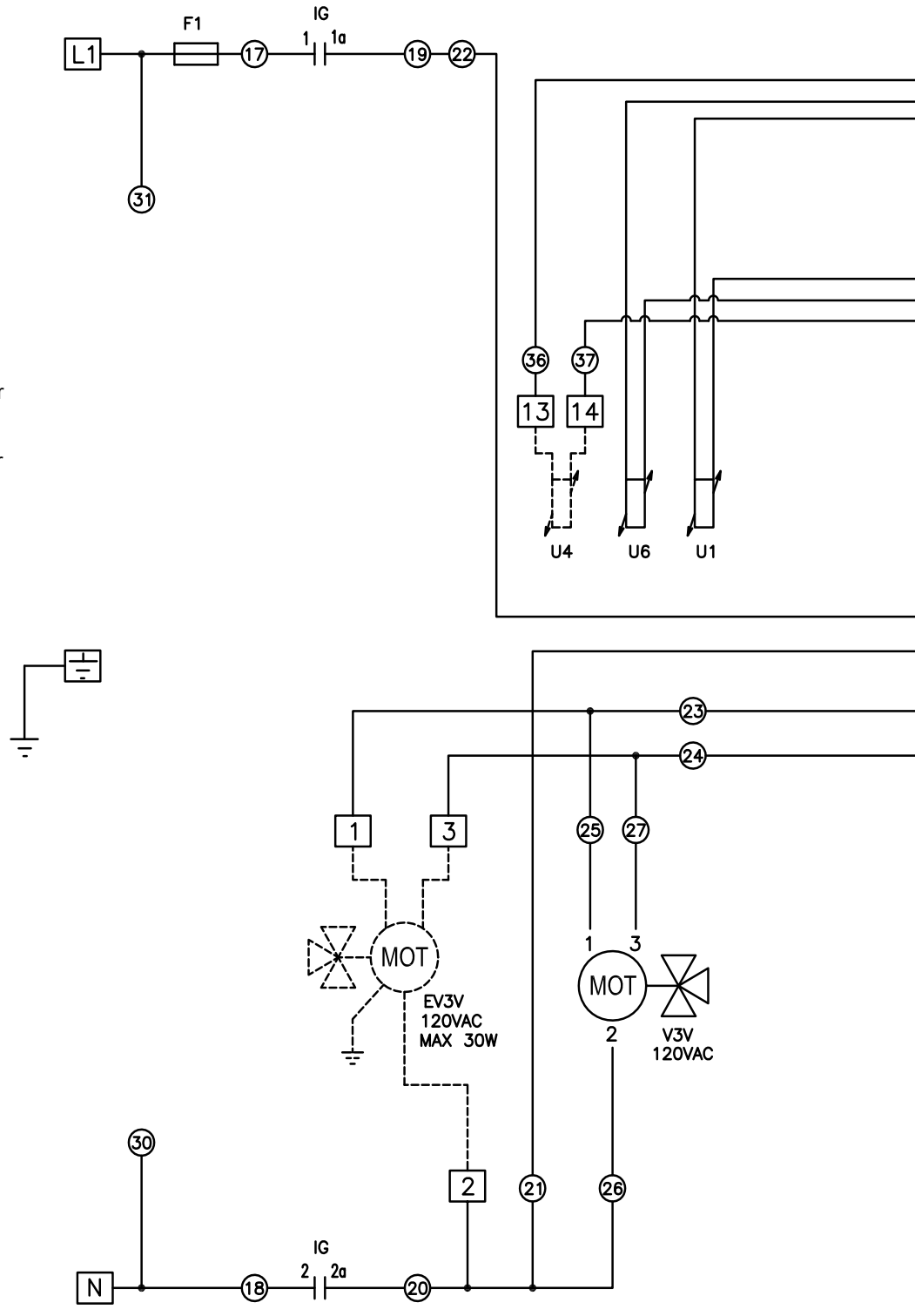
An outdoor temperature sensor (U4) can be connected to the boiler (see section 6.5). The electrical resistance existing between the sensor wires must correspond with the values shown in figure 73.

13.15 - Functional wiring diagram

WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

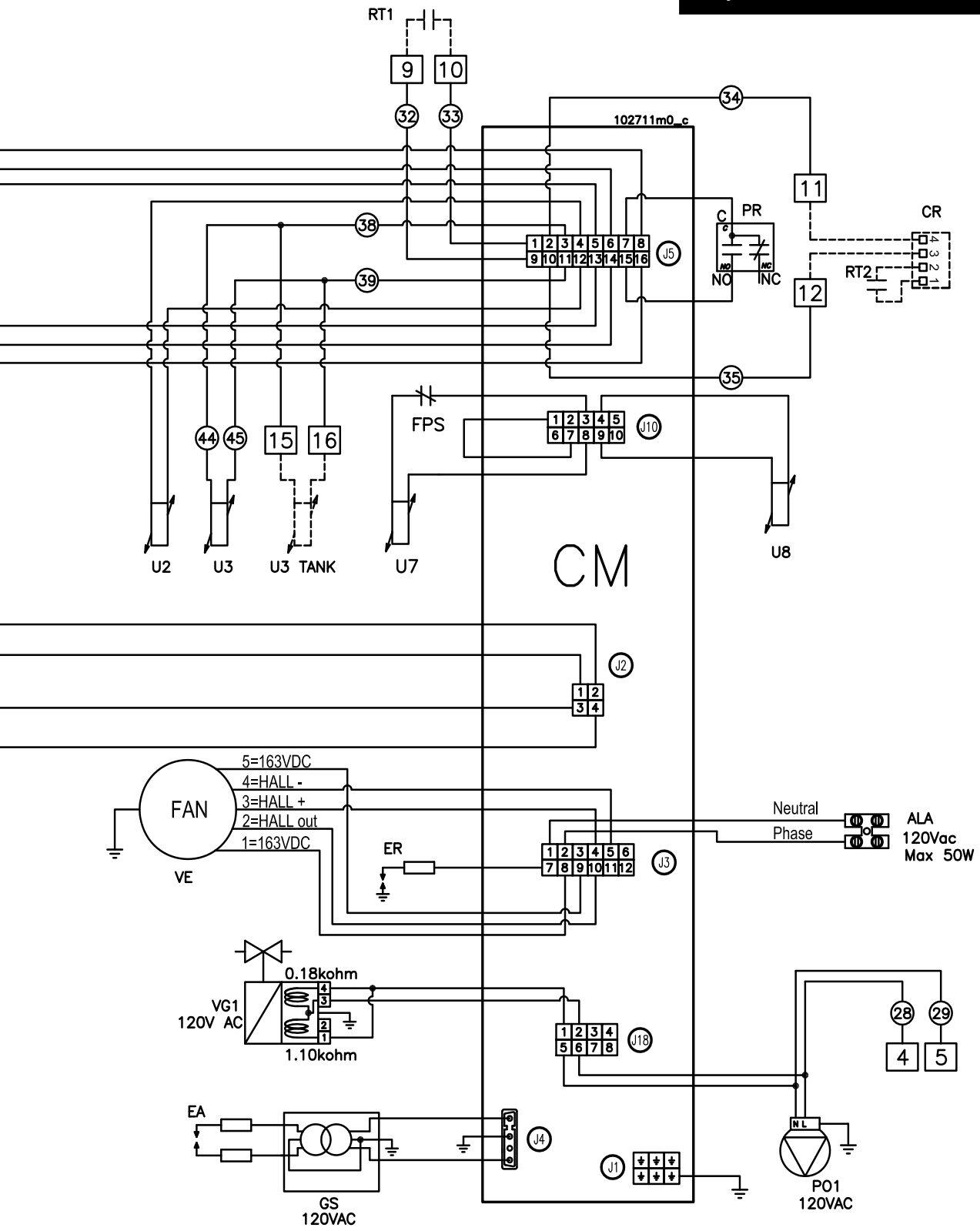
LEGEND:

ALA - Alarm output
CM - Power control board
CR - Remote command (optional)
EA - Ignition electrode
ER - Flame detection electrode
EV3V - External three way valve (optional)
F1 - Fuse 2Amps
FPS - Flue pressure switch
GS - Spark generator
IG - Main electrical switch
J1 - Six poles connector
J2 - Four poles connector
J3 - Twelve poles connector
J4 - Four poles connector
J5 - Sixteen poles connector
J10 - Ten poles connector
J18 - Height poles connector
U1 - Supply temperature sensor
U2 - Domestic hot water temperature sensor
U3 - Domestic cold water temperature sensor
U3 TANK - Storage tank temperature sensor (optional)
U4 - Outside temperature sensor (optional)
U6 - Heating Safety high limit temperature sensor
U7 - Flue gas temperature sensor
U8 - Return temperature sensor
PO1 - Heating pump
PR - Heating pressure switch
SDC - Electrical connection board
RT1 - Room thermostat connection
RT2 - Room thermostat connection on remote control “CR” (optional)
VE - Fan
VG1 - Gas valve
V3V - Three way valve



13 - MAINTENANCE

ATTENTION!!! Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.



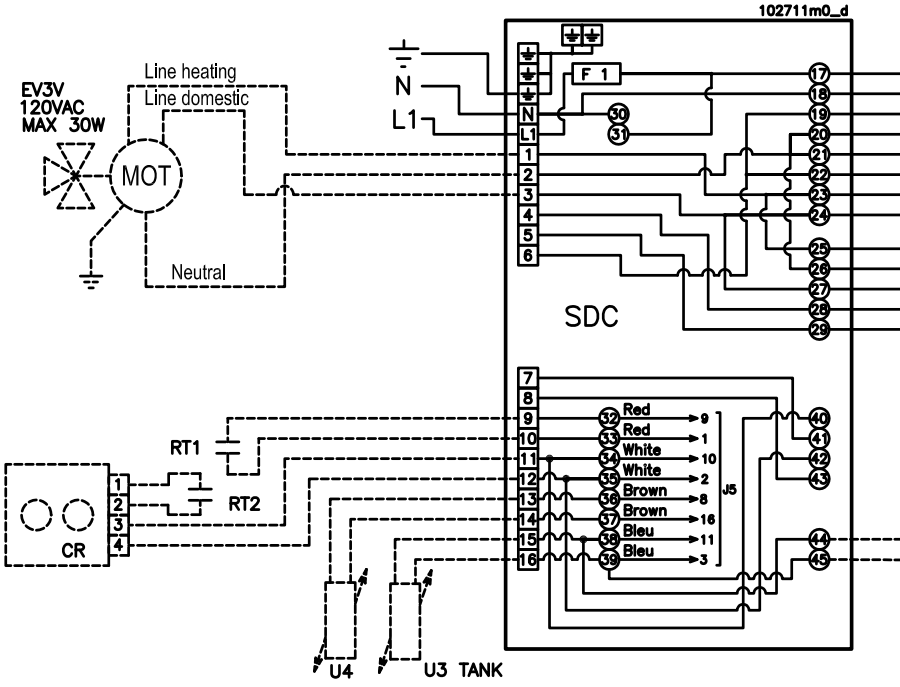
13.16 - Multiwire wiring diagram

WARNING!!! Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation! Verify proper operation after servicing Failure to comply with this warning can cause extensive property damage, severe personal injury or death!

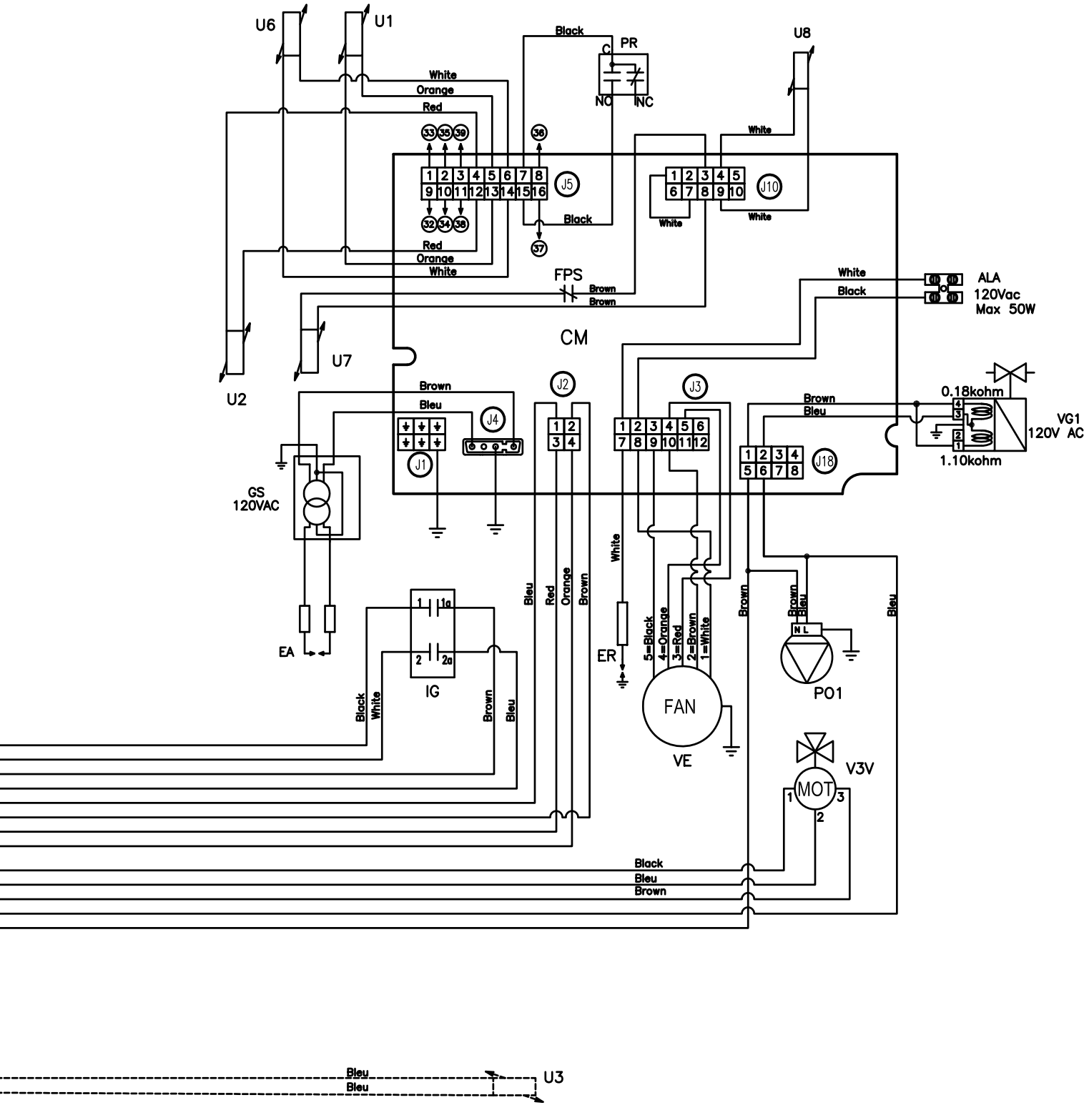
ATTENTION!!! Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.

LEGEND:

ALA - Alarm output
CM - Power control board
CR - Remote command (optional)
EA - Ignition electrode
ER - Flame detection electrode
EV3V - External three way valve (optional)
F1 - Fuse 2Amps
FPS - Flue pressure switch
GS - Spark generator
IG - Main electrical switch
J1 - Six poles connector
J2 - Four poles connector
J3 - Twelve poles connector
J4 - Four poles connector
J5 - Sixteen poles connector
J10 - Ten poles connector
J18 - Height poles connector
U1 - Supply temperature sensor
U2 - Domestic hot water temperature sensor
U3 - Domestic cold water temperature sensor
U3 TANK - Storage tank temperature sensor (optional)
U4 - Outside temperature sensor (optional)
U6 - Heating Safety high limit temperature sensor
U7 - Flue gases temperature sensor
U8 - Return temperature sensor
PO1 - Heating pump
PR - Heating pressure switch
SDC - Electrical connection board
RT1 - Room thermostat connection
RT2 - Room thermostat connection on remote control "CR" (optional)
VE - Fan
VG1 - Gas valve
V3V - Three way valve



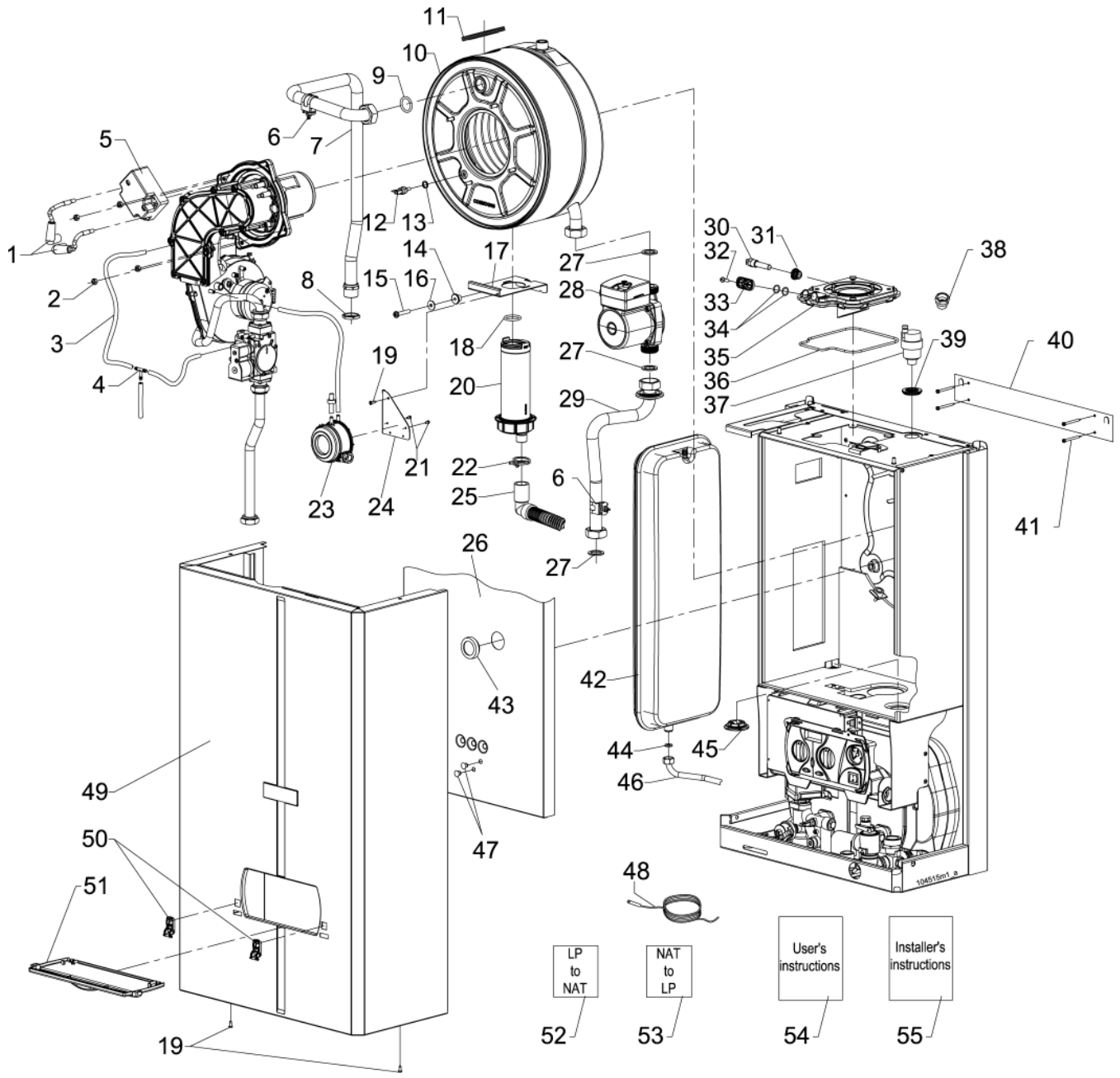
13 - MAINTENANCE



14 - TECHNICAL DATA

MODEL			**PC-160-C**
Country of destination			USA and Canada
Type of boiler			Direct Vent boiler
Category of discharge chimney			IV
CSA certificate N°			2045300 (114696)
Maximum Heat input		Btu/hr	160,000
Minimum heat input		Btu/hr	30,000
Annual Fuel Utilization Efficiency (AFUE)		%	91.1
Maximum Heat output (160°F/140°F)		Btu/hr	148,800
Steady State Efficiency at minimum heat input (122°F/86°F)		%	97
Minimum heat output (122°F/86°F)		Btu/hr	29,100
Gas flow rate	Natural gas	cu. ft./hr	156
	LP Gas	gal/hr	1.75
Gas supply pressure	Natural gas	In.W.C.	7
	LP Gas	In.W.C.	11
Minimum gas supply pressure	Natural gas	In.W.C.	1.5
	LP Gas	In.W.C.	8
Maximum gas supply pressure	Natural gas	In.W.C.	11
	LP Gas	In.W.C.	13
Combustion air pressure with min. length	Natural gas	In.W.C.	2.5 to 3.1
	LP Gas	In.W.C.	2.1 to 2.7
Combustion air pressure with max. length	Natural gas	In.W.C.	2.1 to 2.7
	LP Gas	In.W.C.	1.8 to 2.4
Instantaneous d.h.w production (rise 75°F)		gal/min	4.32
Maximum heating temperature		°F	189
Minimum heating temperature		°F	68
Maximum heating pressure		PSI	30
Minimum heating pressure		PSI	8
Maximum pressure of domestic hot water circuit		PSI	150
Minimum pressure of domestic hot water circuit		PSI	1
Capacity of expansion tank		gal	2.64
Supply voltage			120Vac - 60Hz
Absorbed electric power		W	170
Flue gas pipes diameter (split)		“ (mm)	3.15 (80)
Max. length flue gas pipes (split)		ft	300
Flue gas pipes diameter (coaxial)		“ (mm)	2.36/3.94 (60/100)
Max. length flue gas pipes (coaxial)		ft	70
Equivalent length of one elbow		ft	45° elbow = 3ft, 90° elbow = 5ft
CO (Carbon monoxide) with natural gas		ppm	<150
CO (Carbon monoxide) with LP gas		ppm	<250
NOx (0% O2 with natural gas)		ppm	<30
CO2 (Carbon dioxide) for Natural gas at high fire		%	8.6 to 9.2
CO2 (Carbon dioxide) for Natural gas at low fire		%	8.2 to 8.6
CO2 (Carbon dioxide) for LP gas at high fire		%	9.7 to 10.6
CO2 (Carbon dioxide) for LP gas at low fire		%	9.2 to 9.8
Ionisation current for Natural gas at high fire			74 to 80
Ionisation current for Natural gas at low fire			81 to 87
Ionisation current for LP gas at high fire			71 to 77
Ionisation current for LP gas at low fire			83 to 89
Maximum flue gas temperature		°F	230
Flue gas flow-mass		lb/hr	160
Head pressure available for flue vent/air intake line		In.W.C.	3.6
Maximum condensation flow rate		gal/hr	1.32
Average acidity of condensation		PH	4
Boiler weight		lb	100

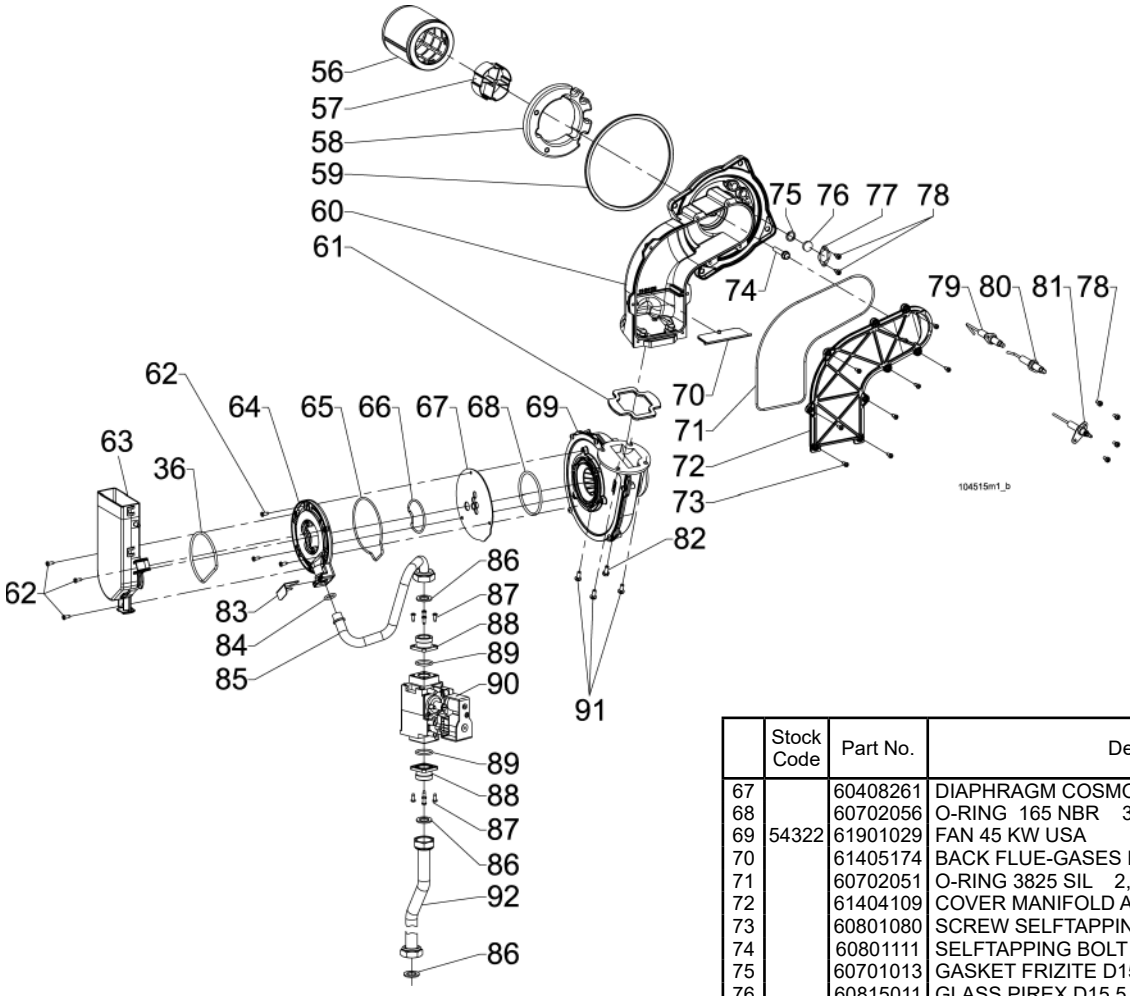
15 - SPARE PARTS



	Stock Code	Part No.	Description
1		60504206	CABLE UL IGNITOR CONN 90° L155
2		60802005	NUT ZINC COATED 6MA
3		60320001	SILICONE PIPE D 4 X 8
4		61405036	TEE FOR DRY WATER CONDENSATION
5	54311	60510022	SPARK GENERATOR NO CABLE UL
6	54328	62111016	SENSOR NTC 10 KOHM A KLIP DIAM.22
7		62622011	COPPER PIPE D22 M/F 3/4"G-1"G
8		60802018	3/4" RING NUT
9		60702030	O-RING NBR 2,62 X 20,63
10		62649004	PRIMARY HEAT EXCHANGER C.R.R ASME
11		60702047	GASKET EPDM X OSSIDO D84 H7
12	54329	62111017	SENSOR NTC 10 KOHM 1/8"
13		60803027	GASKET COPPER 1/8" SP.1,5
14		61405025	SILICONE TAP
15		60801116	SCREW 6 X 35 ZINC TC-CR
16		60803011	WASHER 6 X 18 X 1,5 PIA-ZIN-LAR UNI6593
17		60406074	BRACKET SIPHON L84 H130 P32
18		60702055	O-RING 134 EPDM 3,53 X 25,8
19		60801043	SCREW SELFTAPPING 3.9 X 9.5 CROSS HEAD

	Stock Code	Part No.	Description
20		62630136	SIPHON
21		60801100	SCREW SELFTAPPING 2.9 X 6.5 CROSS HEAD
22		60806020	SPRING 28,7
23	54331	62113041	PRESSURE SWITCH ON 4,5 INWC
24		60406092	BRACKET PRESSURE SWITCH
25		60322012	POLIETYLENE PIPE L=1000
26		60402037	SEALING CHAMBER DOOR
27		60701001	1"G GASKET
28	54344	62301031	PUMP GRUNDFOS UP 15/58U BRUTE USA
29		62622012	COPPER PIPE D22 RETURN SEALING CHAMBER
30	54327	62111015	SENSOR NTC 10K BAIO
31		XXX	#N/D
32		60801132	SCREW 4,8 X 19 ZINC AF TC-CR UNI6954
33		61405164	PLUG FOR FLUE AIR FITTING
34		60702052	O-RING 2050 EPDM 1,78 X 12,42
35		61405160	DISCHARGE RACCORD PP
36		60702035	GASKET ROUND SPONGE D.3,5 MM IP44 S3
37		61206001	AUTOMATIC AIR VENT
38		60101119	3/8G MALE to 1/8NPT FEMALE BUSHING

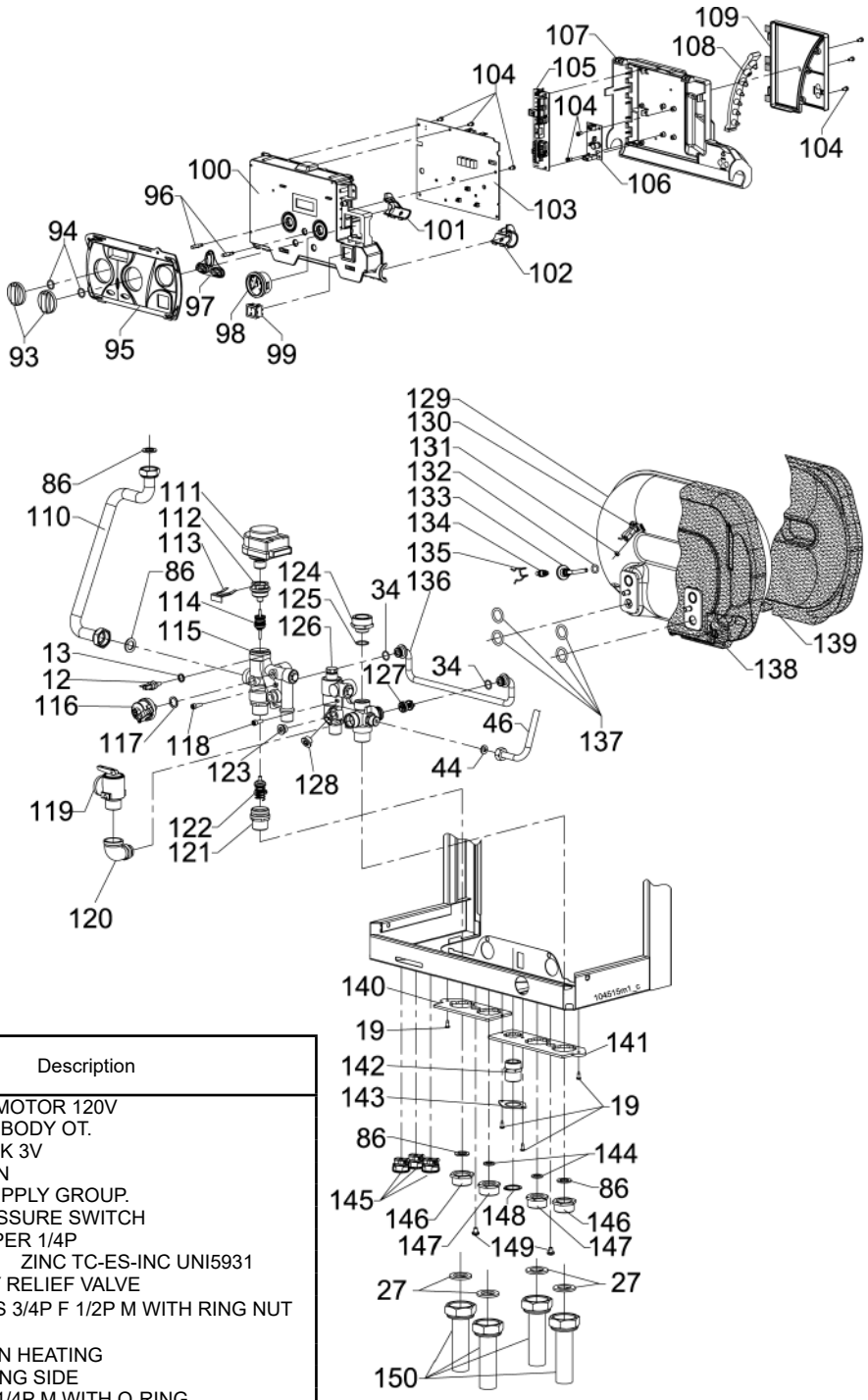
15 - SPARE PARTS



	Stock Code	Part No.	Description
39		60703033	GASKET EPDM D38 F20 SP6
40		60411085	45xx WALL MOUNTING BRACKET
41		60801097	SCREW SELFTAPPING 5 X 50 WOOD
42	54333	62201005	EXP TANK LT. 8 561 X 203 X 80 RETT.
43		60815012	GLASS WINDOW WITH GASKET
44		60701005	3/8" G GASKET
45		61102006	FAIRLEAD 6 POLES SILICONE
46		62625064	EXP TANK PIPE
47		61405219	PLASTIC CAP TPP 8.5
48		62110071	TANK SENSOR
49		62610067	EXTERNAL JACKET 500 X 840 X 245
50		61405167	DOOR SUPPORT
51		62610065	DOOR ABS
52		62630152	LP TO NATURAL CONVERSION KIT
53		62630167	NATURAL TO LP CONVERSION KIT
54		62630166	USER'S INSTRUCTIONS
55	PC8000		INSTALLER'S INSTRUCTIONS
56	54338	62629036	BURNER HEAD
57		61504029	EXTRUSION L.25MM
58		60909008	THERM. INSULATION VERMICULITE D117 F74 SP21,5
59		60703032	GASKET. SIL. D157 F145 H6,7
60		61404108	BASE MANIFOLD AIR ALUMINUM
61		60703030	GASKET SIL.MANIFOLD FAN D83 SP3,5
62		60801136	SCREW SELFTAPPING 4 X 12 TC S-TT UNI-8112
63		62651016	MANIFOLD AIR CUTTED
64	54321	61404114	MIXER AIR/GAS "COSMOMIX"
65		60702049	O-RING 3350 NBR 2,62 X 88,57
66		60702048	O-RING 3200 NBR 2,62 X 50,47

	Stock Code	Part No.	Description
67		60408261	DIAPHRAGM COSMOMIX 9 HOLES D.10
68		60702056	O-RING 165 NBR 3,53 X 61,91
69	54322	61901029	FAN 45 KW USA
70		61405174	BACK FLUE-GASES PREVENTER
71		60702051	O-RING 3825 SIL 2,62 X 209,22
72		61404109	COVER MANIFOLD AIR ALUMINUM
73		60801080	SCREW SELFTAPPING 4 X 10 TC S-TT UNI-8112
74		60801111	SELFTAPPING BOLT 6.3 X 38
75		60701013	GASKET FRIZITE D15,5 F11,5 SP1,5
76		60815011	GLASS PIREX D15,5 SP3,3
77		60404253	FLANGE L21,2 H34
78		60801081	SCREW SELFTAPPING 4 X 8 TC S-TT NI-8112
79	54307	60505022	LEFT IGNITION ELECTRODE
80	54308	60505023	RIGHT IGNITION ELECTRODE
81	54309	60505024	DETECTION ELECTRODE
82		60801102	SCREW 5X12 EXAGONAL HEAD
83		60406069	SPRING MIXER
84		60702050	O-RING 3056 NBR (118) 2,62 X 13,95
85		62624125	GAS PIPE (SIT) USA
86		60701006	GASKET 3/4P 24 X 15 X 2 KLINSIL
87		60801014	SCREW 4X10 ZINC TC-CR
88		60101224	FLANGE GAS 32 X 32 3/4P
89		60702029	O-RING 130 2,62 X 22,22
90	54312	61201040	GAS VALVE SIGMA848 120V
91		60801021	BOLT 5X12 CROSS HEAD
92		62623249	PIPE D18 F/F 3/4P-3/4P SIT USA
93		62103009	CONTROL KNOB S3
94		60702041	O-RING NBR 1,6 X 11,1
95		61405203	FRONT INTERFACE
96		61405151	TREE POTMETER-KNOB
97		61405190	KEYS RUBBER 3 POSITIONS
98	54323	62102009	PRESSURE GAUGE DIAM.38 - 1/4" PSI
99		60506019	GAS VALVE SERVICE SWITCH
100		61405184	BASE ELECTRICAL BOX
101		61405186	FAIRLEAD SX
102		61405188	FAIRLEAD DX
103	54326	62110076	POWER CONTROL BOARD PHC 120V
104		60801138	SCREW 4 X 8 ZINC TC-CR DIN4042
105	54310	60507056	JUNCTION BOARD 45
106	54332	62118015	INTERFACE OPENTERM
107		61405185	COVER ELECTRICAL BOX
108		61103011	FAIRLEAD 7 EXIT
109		61405189	COVER JUNCTION BOX
110		62623246	PIPE SUPPLY SEALING CHAMBER

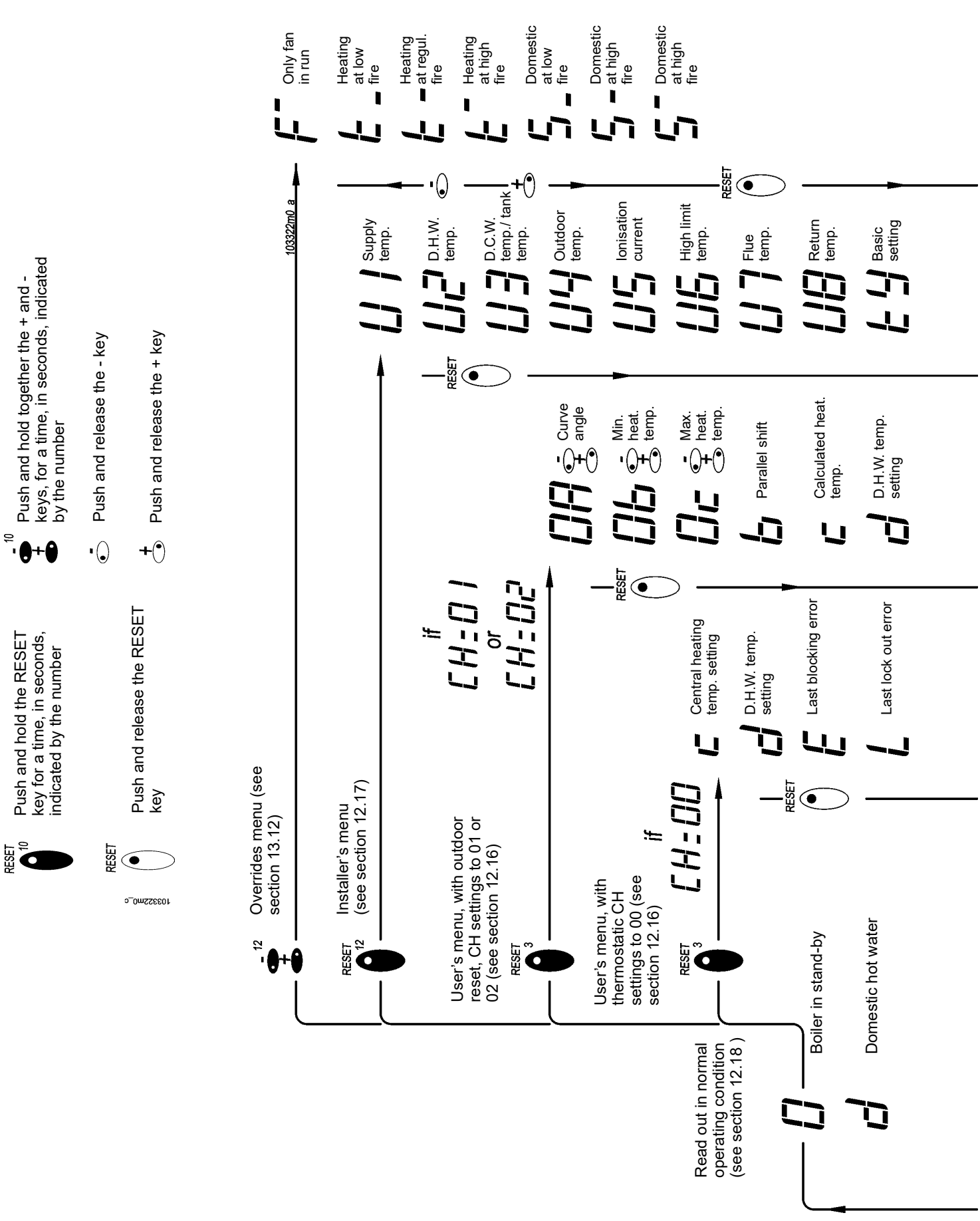
15 - SPARE PARTS



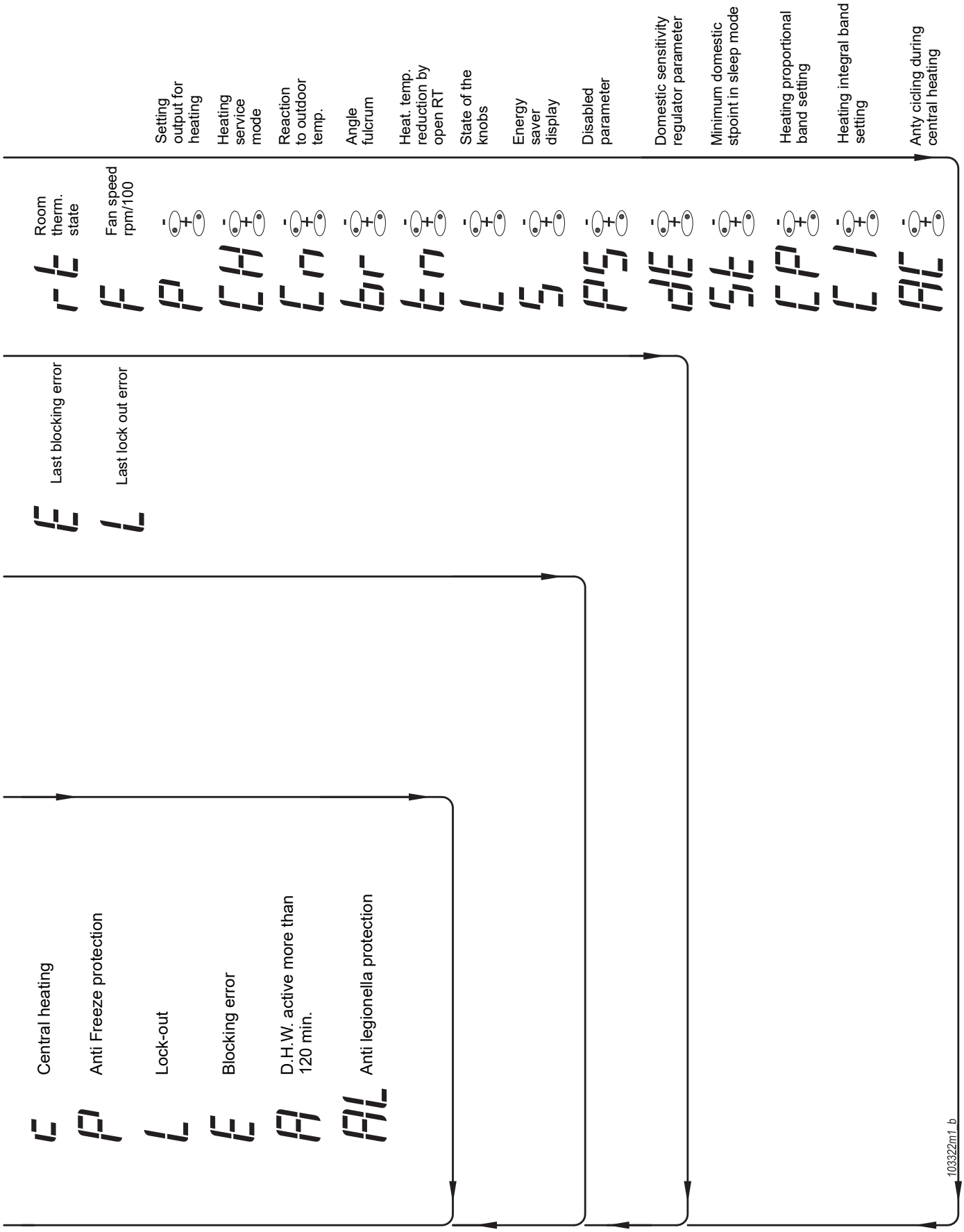
	Stock Code	Part No.	Description
111	54318	61203015	3 WAY VALVE MOTOR 120V
112	54313	61202024	PLUG PISTON BODY OT.
113		60808002	SPRING FORCK 3V
114	54316	61202027	UPPER PISTON
115		61408005	HYDRONIC SUPPLY GROUP.
116		62113034	HEATING PRESSURE SWITCH
117		60704003	GASKET COPPER 1/4P
118		60801134	SCREW 5 X 18 ZINC TC-ES-INC UNI5931
119	54386	61205010	ASME SAFETY RELIEF VALVE
120		60101247	ELBOW BRASS 3/4P F 1/2P M WITH RING NUT AND O-RING
121	54314	61202025	COVER PISTON HEATING
122	54317	61202028	PISTON HEATING SIDE
123		60107005	PLUG BRASS 1/4P M WITH O-RING
124		60110028	NIPPLE OT 1”-22 X 1,5 MM
125		60702036	O-RING 2075 EPDM 1,78 X 18,77
126	54422	61408007	HYDRONIC RETURN GROUP
127	54315	61202026	BY-PASS VALVE
128		60701006	3/8” MALE CAP
129	54339	62653003	DOMESTIC HEAT EXCHANGER “ACQUAJET”
130	54325	62110052	SENSOR NTC 10 KOHM KLIP WITH SCREW
131		60802008	NUT ZINC COATED 4MA
132		60702053	O-RING 3037 EPDM 2,62 X 9,19
133		62628001	PURGING PIPE
134	54320	61206011	PURGING VALVE M10X1
135		60808003	FORCK BY-PASS PIPE
136		60305073	BY-PASS PIPE
137		60702054	O-RING 4075 EPDM 3,53 X 18,64
138		60901022	FRONT THERM. INSULATION “ACQUAJET”
139		60901023	REAR THERM. INSULATION “ACQUAJET”

	Stock Code	Part No.	Description
140		60440008	BRACKET EXAGONAL HOLES SHORT
141		60440009	BRACKET EXAGONAL HOLES LONG
142		60110025	NIPPLE OTT 3/4NPT-3/4P USA
143		60411117	BRACKET EXAGONAL HOLE SMALL
144		60701004	1/2” G GASKET
145		61101001	FAIRLEAD PA 107 SCREW HILO 3,5 X 14,5
146		60101011	CONNECTION BRASS 3/4P TO 1P
147		60101225	CONNECTION BRASS 1/2P TO 1P
148		60802018	3/4” NUT
149		60801135	SCREW 6 X 8 ZINC TC-CR DIN7985
150		60310002	COPPER PIPE 1”GAS TO 3/4”

16 - READ OUT FLOW CHART



16 - READ OUT FLOW CHART



16 - READ OUT FLOW CHART

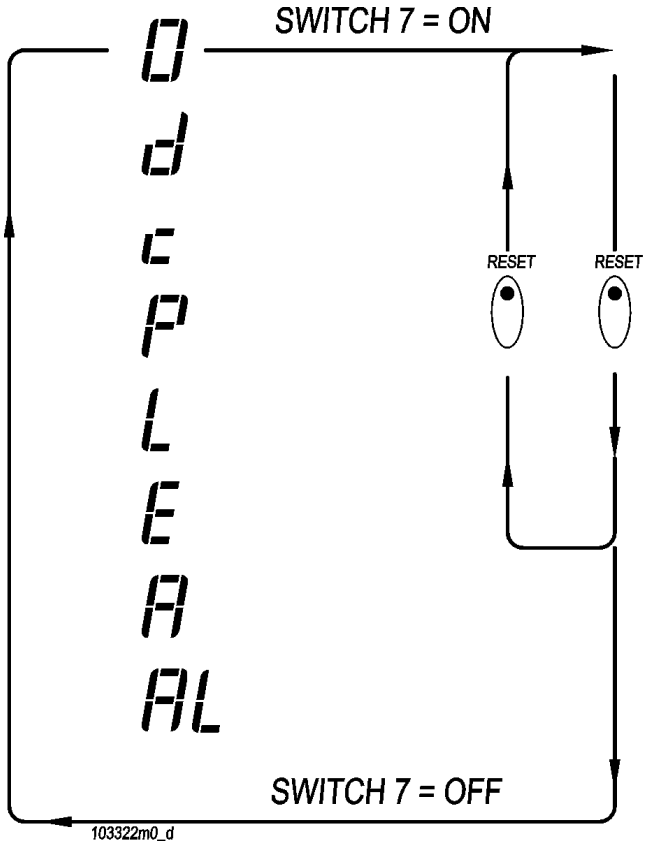
CAUTION!!! Changing these parameters could cause the boiler and therefore the system to malfunction. For this reason, only a qualified technician who has in-depth knowledge of the boiler should change them.

The boiler's micro-processor makes this menu of parameters available to the qualified technician for the setting of the appliance .

To enter this menu you must:
1. turn the main electrical supply Off;
2. move the switch n° 7 (see figure 21, item "D") to the ON position;
3. turn the main electrical supply On.

Now "ty" is displayed. Use plus and minus keys to change the value; use RESET key to save the value and swap to the next parameter.

To exit this menu you must:
1. turn the main electrical supply Off;
2. move the switch n° 7 (see figure 21, item "D") to the Off position;

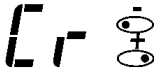


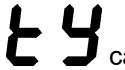

Basic functionalities selection and Speed blower selection (see below for more explications)

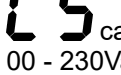

Main electrical supply and temperature unit selection (see below for more explication)


Domestic functionalities selection. Must be always at 00

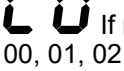

Master or slave selection in a batterie configuration. Must be always at 00.

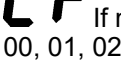

Rotating selection in a batterie configuration. Must be always at 00.

 can assume the follow values:
61 - for boiler at NATURAL gas;
62 - for boiler at LP gas;

 can assume the follow values:
00 - 230Vac, 50Hz, °C;
01 - 230Vac, 50Hz, °F;
02 - 120Vac, 60Hz, °C;
03 - 120Vac, 60Hz, °F

 can assume the follow values:
00, 01 and 02. Must be always at 00.

 If readable, can assume the follow values:
00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.

 If readable, can assume the follow values:
00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.

NOTES

NOTES

Peerless® Combi 160™

Gas Boiler

Installation, Operation & Maintenance Manual

TO THE INSTALLER:

This manual is the property of the owner and must be affixed near the boiler for future reference.

TO THE OWNER:

This boiler should be inspected annually by a Qualified Service Agency.

PeerlessBoilers.com

PB HEAT, LLC
131 S. CHURCH STREET • BALLY, PA 19503

PC8000 R3 (9/16-500C)
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