

Slant/Fin® VSL Boiler

This manual must be left with owner and should be hung on or adjacent to the boiler for reference.

**DIRECT-VENT SEALED COMBUSTION CONDENSING BOILER
HOT WATER MODEL VSL-160B & VSL-160C (COMBI BOILER)
GAS-FIRED BOILER FOR NATURAL AND L.P. PROPANE GASES**

INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS



Heating Contractor

Boiler Model Number

Address

Boiler Serial Number

Phone Number

Installation Date

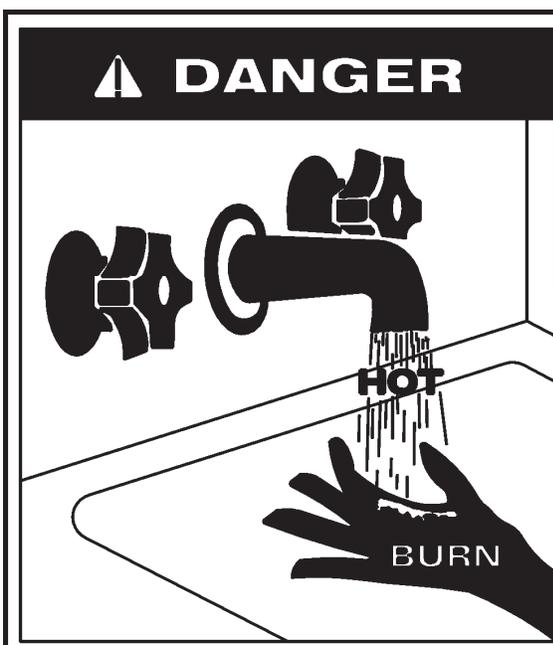
SAFETY INSTRUCTIONS

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.

AVERTISSEMENT: 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 gaz 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.

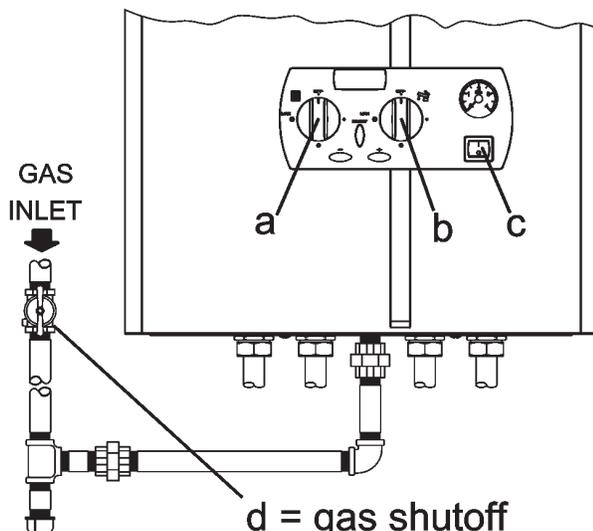
SAFETY INSTRUCTIONS

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



d = gas shutoff valve, shown in open position

- 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.

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.

- ☞ **Installer:** Read all instructions, including this manual, before installing. Perform steps in the order given.
- ☞ **User:** Refer to the User's Information Section for your reference.
- ☞ **Qualified installer:** Qualified installer is an individual with specific, technical training in space heating systems, domestic hot water systems, fuel gas systems and electrical systems. This individual must have the legally required qualifications.
- ☞ **Installation and Alterations:** Only a Qualified installer 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!
- ☞ **Flue gas/air intake:** You are only permitted to operate the condensing gas boiler with the combustion air/ flue gas system that has been specifically designed and approved for this type of boiler.
- ☞ **Flue gas/air intake:** If boiler installation is provided as replacement heater, DO NOT connect new boiler venting to an existing vent system, if it is shared with other appliances.
- ☞ **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.
- ☞ **Installation location:** The boiler must be located in an area where leakage of the tank or connections will not result in damage to the area adjacent to the boiler or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the boiler. The pan must not restrict combustion air flow.
- ☞ **Installation location:** The boiler must not be installed on carpeting.
- ☞ **Air intake and outlets:** Do not restrict or seal any air intake or outlet openings.
- ☞ **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.
- ☞ **Defects:** If you find any defects, you must inform the owner of the system of the defect and the associated hazard in writing.
- ☞ **Maintenance:** at least once a year the user must call a Qualified installer 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 installer using original spare parts. Failure to comply with this requirement may compromise the safety of the unit and void its warranty.
- ☞ **When servicing boiler, to avoid electric shock,** disconnect electrical supply before performing maintenance.

SAFETY INSTRUCTIONS

- ☞ **When servicing boiler, to avoid severe burns**, allow boiler to cool before performing maintenance.
- ☞ **Electrical:** 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'entretien 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, turn off the manual gas shut-off valve external to the appliance.
- ☞ **En cas de surchauffe ou si l'alimentation de gaz ne peut être coupée**, ne pas couper ni débrancher l'alimentation électrique de la pompe. 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 licensed authorized 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 technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.
- ☞ **Ensure the boiler and its controls are protected from dripping or spraying water** during normal operation or service.
- ☞ **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!
- ☞ **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.
- ☞ **Only use the boiler in the combinations and with the accessories and spares listed in this manual.**
- ☞ **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
- ☞ **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.

TABLE OF CONTENTS

SAFETY INSTRUCTIONS	2
TABLE OF CONTENTS	6
1 - INSTALLATION - CODE REQUIREMENTS	8
1.1 - Regulations and guidelines	8
1.2 - Commonwealth of Massachusetts Installation Requirements	8
2 - GENERAL INFORMATION	9
2.1 - Key to symbols used	9
2.2 - Description of model:	9
3 - MAIN COMPONENTS	10
4 - FUNCTION OVERVIEW	12
4.1 - Intended use and functions of the boiler	13
4.2 - Efficiency up to 98%	13
5 - INSTALLATION - Location	14
5.1 - Choosing the installation location	14
5.2 - Transporting the boiler	15
6 - INSTALLATION - Mounting the boiler	16
6.1 - Mounting the boiler	16
7 - INSTALLATION - Water connection	17
7.1 - Water connections	17
7.2 - Supply and return piping	17
7.3 - Converting a combi boiler into a heating only boiler	20
7.4 - Domestic hot and cold water (only for 160-C model)	21
7.5 - Condensate disposal	24
8 - INSTALLATION - Electrical connections	25
8.1 - Electrical connections: overview	25
9 - INSTALLATION - Connecting to an indirect water heater	28
9.1 - Connecting the boiler to an indirect water heater	28
9.2 - Opening the instrument panel	29
10 - INSTALLATION - Vent and combustion air	30
10.1 - Removing of a boiler from a common venting system	30
10.2 - Prevent combustion air contamination	31
10.3 - Venting and air piping systems	31
10.4 - Minimum / Maximum allowable combustion air and vent piping lengths	33
10.5 - Install vent and combustion air piping	33
10.6 - Air inlet pipe materials:	35
10.7 - PVC/CPVC vent piping materials	36
10.8 - Stainless steel vent piping materials	38
10.9 - Polypropylene vent piping materials	40
10.10 - Single pipe vent (not sealed combustion)	45
10.11 - Sidewall termination - Two pipes	47
10.12 - Sidewall termination – Concentric vent	50
10.13 - Vertical termination - Two pipes	52
10.14 - Vertical termination – Concentric vent	54
10.15 - Existing vent as a chase	57
11 - INSTALLATION - Gas supply	58
11.1 - Gas supply piping	58
11.2 - Pipe sizing for natural gas	59
11.3 - Propane Gas	59
11.4 - Check inlet gas supply	59
11.5 - Operating at high altitudes	59
11.6 - Convert the boiler from Natural Gas to Propane gas or viceversa	60

TABLE OF CONTENTS

12 - START-UP	62
12.1 - Operating	62
12.2 - General warnings concerning gas supply	64
12.3 - Confirming the boiler's gas type.....	64
12.4 - Gas type conversion	64
12.5 - Start-up of the boiler.....	64
12.6 - Ignition control testing	64
12.7 - Gas supply pressure checking	65
12.8 - Check the combustion air pressure.....	66
12.9 - Checking and adjusting CO2 levels	67
12.10 - Adjusting the heating capacity.....	68
12.11 - Domestic hot water flow rate adjustment (160-C model only).....	68
12.12 - Cold start boiler	68
13 - USE	69
13.1 - Check heating system pressure.....	69
13.2 - Overview	69
13.3 - Displays.....	69
13.4 - Start-up procedure	70
13.5 - Summer mode.....	70
13.6 - Winter mode	70
13.7 - Adjusting the domestic hot water temperature	71
13.8 - Heating system temperature adjustment	71
13.9 - Heating system type selection	71
13.10 - Outdoor reset adjustment.....	71
13.11 - Boiler switch settings	74
13.12 - Delays, alarms and protective actions	74
13.13 - Circulator pump and three way valve protection	74
13.14 - Boiler's Freeze protection	74
13.15 - Display in energy saving mode	75
13.16 - "Users' menu".....	75
13.17 - "Installer's menu".....	76
13.18 - Diagnostics.....	78
14 - MAINTENANCE	83
14.1 - Care and maintenance.....	83
14.2 - Removing the casing	86
14.3 - Cleaning the burner and primary heat exchanger, flue gas side.....	87
14.4 - Correct positioning of the ignition and flame detection electrodes	88
14.5 - Domestic hot water heat exchanger (only for 160-C model).....	88
14.6 - Condensate trap cleaning	89
14.7 - Circulator pump motor replacement (only for 160-C model).....	90
14.8 - Expansion tank pressure (only for 160-C model).....	90
14.9 - 3-way valve removal (only for 160-C model).....	91
14.10 - Draining the heating side of the boiler.....	92
14.11 - Draining the domestic hot water side of the boiler	92
14.12 - Overrides	92
14.13 - Water and flue temperature sensor.....	93
14.14 - Outdoor temperature sensor (optional).....	93
14.15 - Functional wiring diagram	94
14.16 - Multiwire wiring diagram.....	96
15 - TECHNICAL DATA	98
16 - SPARE PARTS	99
17 - READ OUT FLOW CHART	104

1 - INSTALLATION - CODE REQUIREMENTS

1.1 - Regulations and guidelines

- 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;**

- the latest edition of the **National Electric Code ANSI/NFPA 70** and or **Canadian Electrical Code Part 1 CSA C22.1.**

- 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! Install CO detectors per local regulations.

NOTICE! This boiler meet the safe and other performance requirements as specified in ANSI Z21.13 standard.

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 equipment. 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!

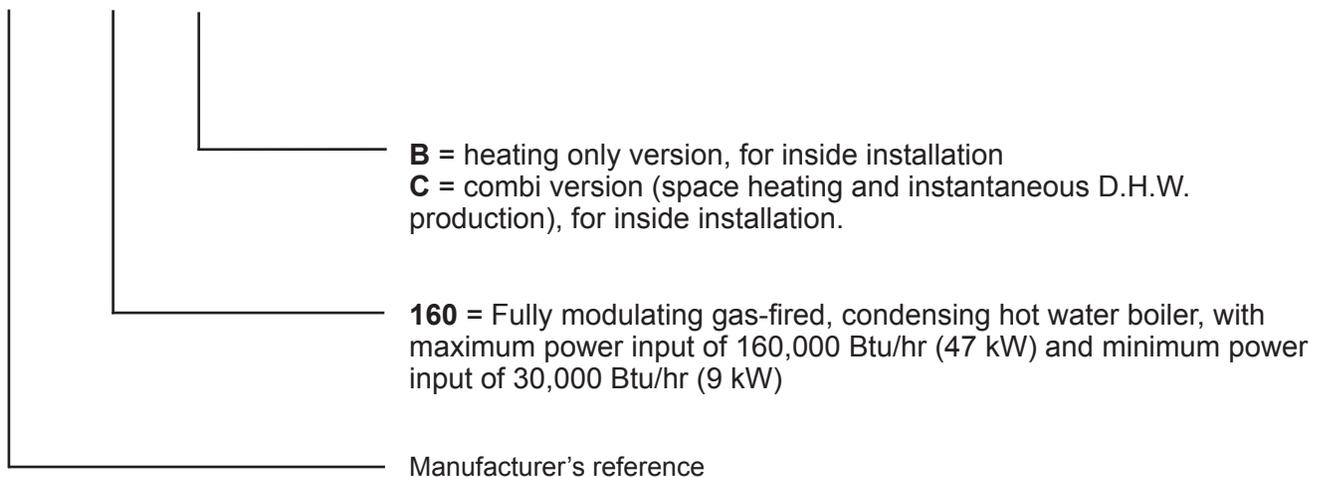
CAUTION!!! Failure to observe this indication may compromise the smooth running of the appliance or cause serious damage to individuals, animals or property.

NOTICE indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.

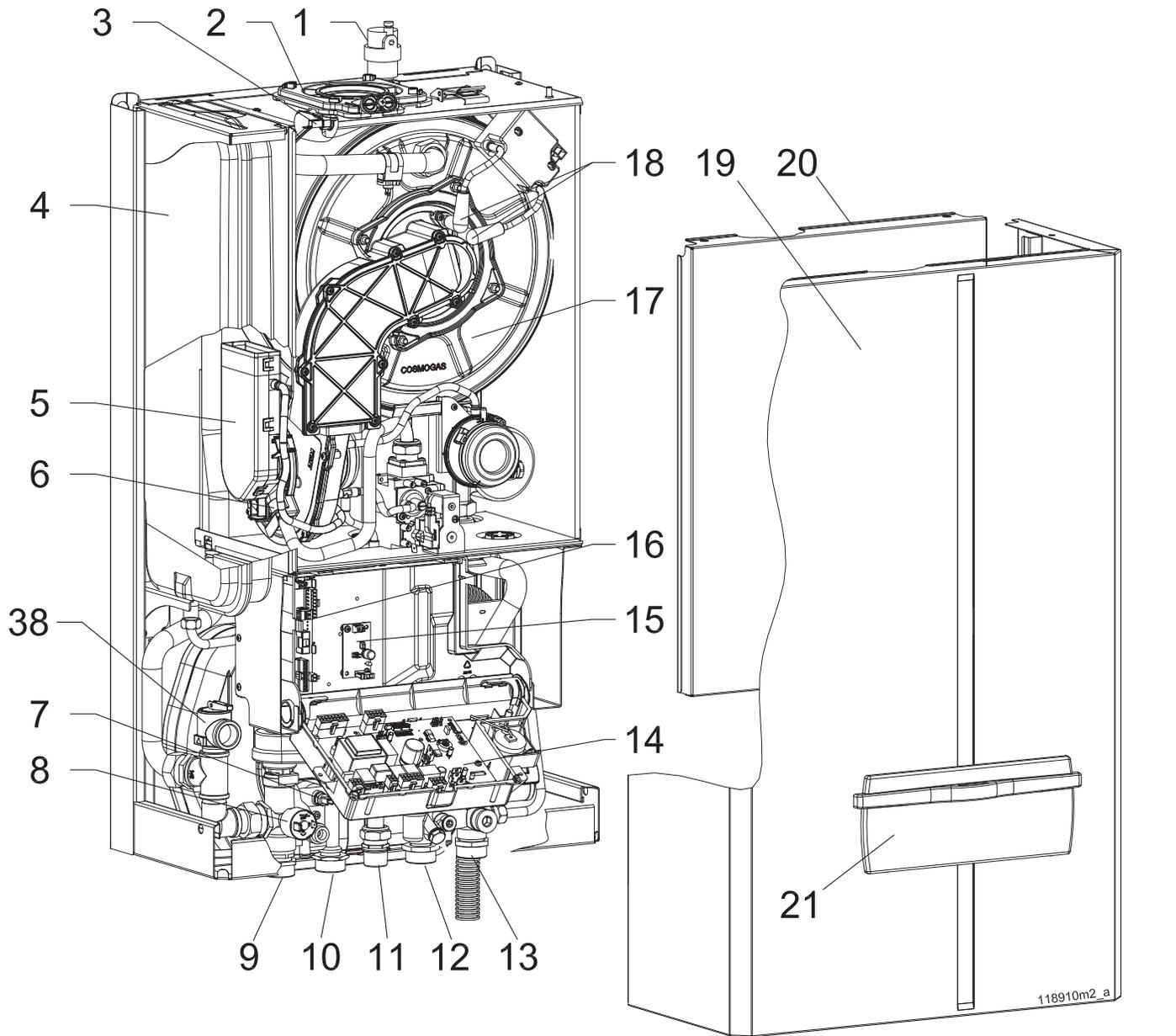
☞ Important indication symbol

2.2 - Description of model:

XX - 160 - X



3 - MAIN COMPONENTS

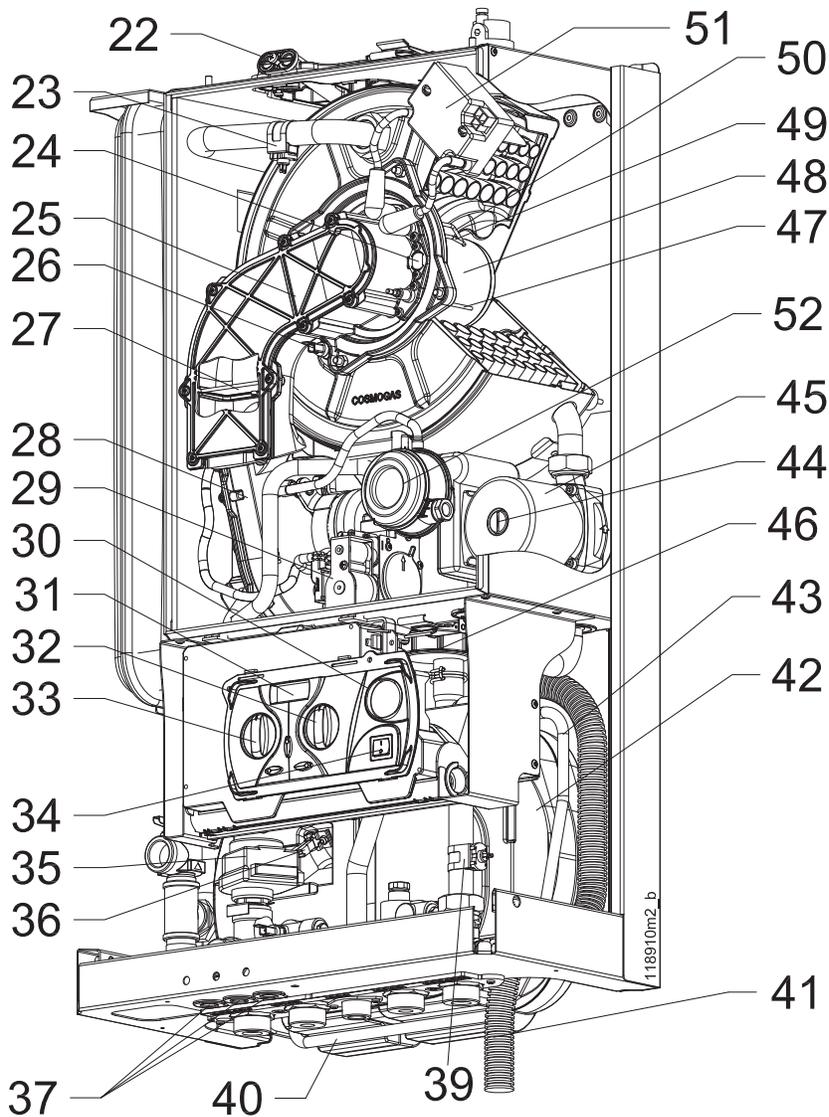


- 1 - Automatic air vent
- 2 - Air intake and flue gas discharge fitting (venting system)
- 3 - U7 flue gas temp. sensor and flue safety switch
- 4 - Expansion tank (not present on 160-B model)
- 5 - Inlet air plenum
- 6 - Air/gas mixer device
- 7 - U2 d.h.w. temp. sensor (not present on 160-B model)
- 8 - Heating pressure switch (low water cut-off)
- 9 - Heating supply connection
- 10 - DHW connection (not present on 160-B model)
- 11 - Gas inlet connection
- 12 - Cold water connection (not present on 160-B model)
- 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 (in some customized models may be not present)

Figure 3-1 Main components (continued)

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 (not present on 160-B model)
- 36 - U3 domestic cold water temp. sensor (not present on 160-B model)

- 37 - Cable clamp
- 38 - ASME Safety relief valve
- 39 - U8 return temperature sensor
- 40 - By-pass pipe (not present on 160-B model)
- 41 - Condensation discharge pipe
- 42 - Secondary heat exchanger for domestic hot water production (not present on 160-B model) (For P/N see Section 15)
- 43 - Expansion tank connection pipe (not present on 160-B model)
- 44 - Circulator pump screw (not present on 160-B model)
- 45 - Circulator pump (not present on 160-B model)
- 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 3-1 Main components

4 - FUNCTION OVERVIEW

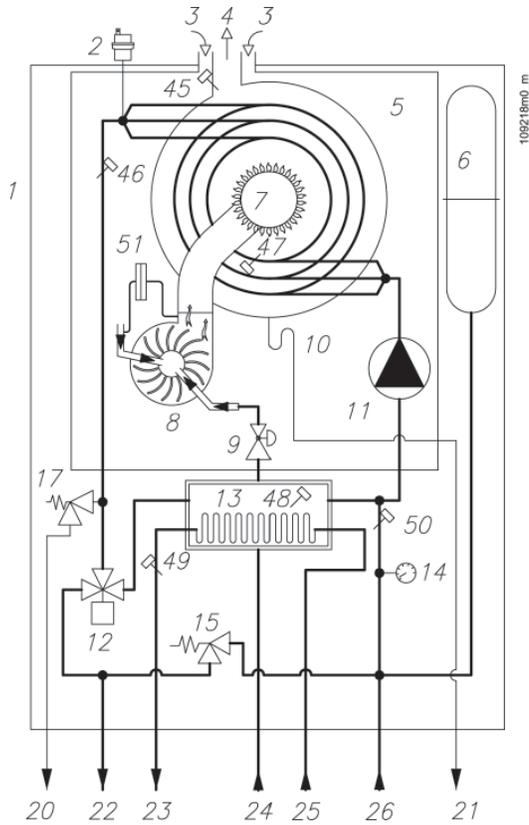


Figure 4-1 160-B Hydronic functional schematic

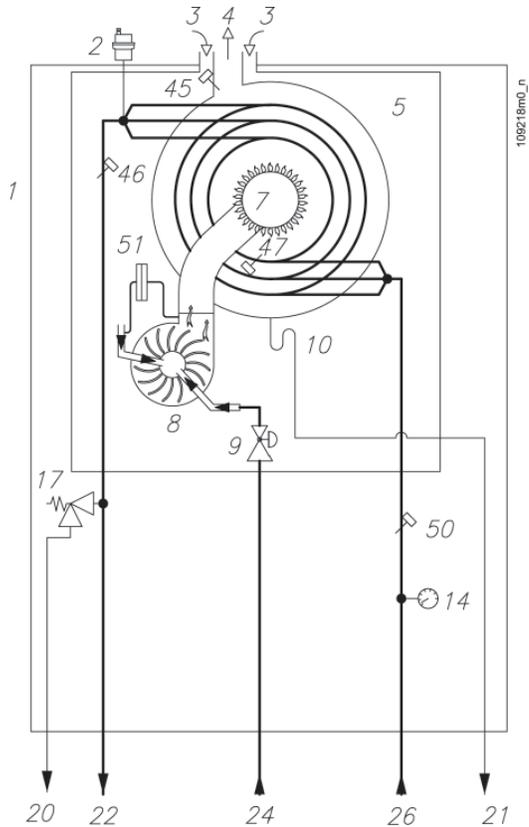


Figure 4-2 - 160-C Hydronic functional schematic

Key to figures 4-1 and 4-2:

- 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

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 13.7 for the adjustment of the domestic hot water temperature.

This boiler can be installed with a Direct Venting system or with a one pipe vent system and getting combustion air from room.

The quality of the system water is very important. Poor water quality can damage heating systems due to scale formation and corrosion.

This boiler can be connected to an indirect storage tank for the production of domestic hot water (Section 9).

Depending on the model chosen, the following system types can be created:

160-C. Using this boiler model, 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 176°F (80°C). The boiler can also function directly with a radiant floor panel, see section 7.2. 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 7-3. The same verification must be done for the domestic installation, see Figure 7-5.

160-B. Using this boiler model, you can create a system with heating elements functioning at temperatures ranging between 68°F (20°C) and 176°F (80°C) can be configured. The boiler can also function directly with a radiant floor panel, see section 7.2. The 160-B model is not equipped with the components required for the production of domestic hot water. Also not included is the expansion tank and circulator pump, see Figure 4.2. To connect the boiler to the heating system, the installer must consider the loss of pressure generated by the boiler (see Figure 7-4), and choose a pump capable of overcoming the head loss of both the boiler and the heating system.

160-C and 160-B models can be connected to a room thermostat, Section 8.1.3.

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 8.1.4). 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 13.10.

☞ The boiler must be connected to a heating system and a domestic hot water supply with compatible specifications, performance and power rating.

4.2 - Efficiency up to 98%

When the outdoor reset is activated (an outside sensor is connected), this boiler is designed to always work at the maximum efficiency (see Section 13.10). It will automatically change the supply temperature in relation with the outdoor temperature (Outdoor reset). The graph in Figure 4-3 shows an example on how it can work. This graph represents 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.

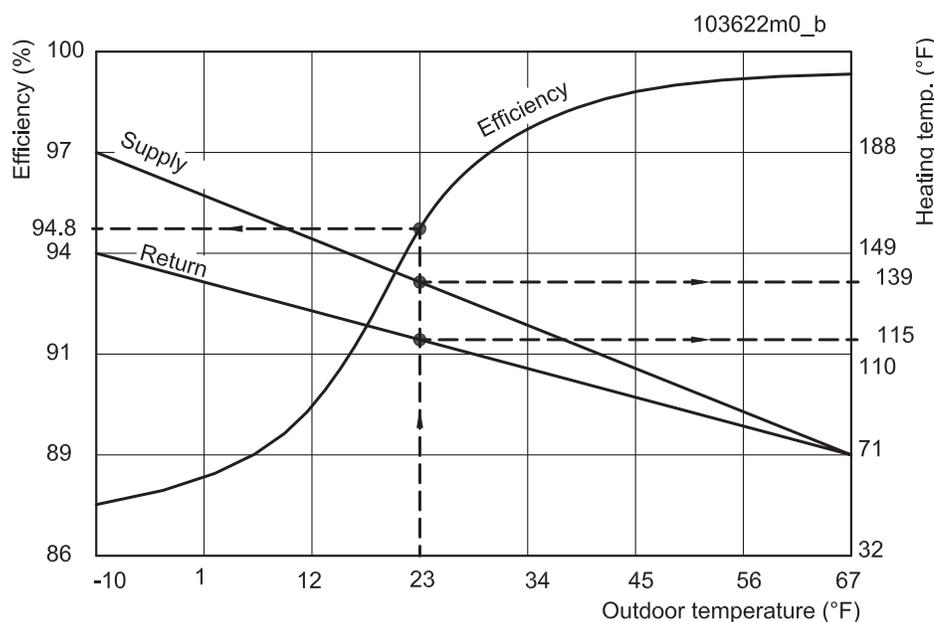


Figure 4-3 Outdoor reset control to optimize the efficiency

5 - INSTALLATION - Location

5.1 - 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!!! If the boiler is installed on a wall, this must be vertical and constructed to bear the boiler's weight or the boiler and building may be damaged causing severe personal injury, death, or substantial property damage.

! WARNING!!! Do not install the boiler on carpeting. Fire can result, causing severe personal injury, death, or substantial property damage.

! WARNING!!! Do not install the boiler in an attic. Failure to comply with this provision could result in severe personal injury, death, or substantial property damage.

! WARNING!!! Provisions for combustion air and ventilation of the boiler room are always required, regardless whether the combustion air is taken from the outside (Direct Vent, sealed combustion) or inside (room air for combustion). Insufficient ventilation of the boiler room can lead to high air temperatures. Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of openings takes place. When the problem is not resolved, do not operate the boiler. Please note these restrictions and its dangers to the operator of the boiler. Failure to comply with this provisions could result in 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: "LPG 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 an abovegrade 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, death, or substantial property damage.

CAUTION!!! This boiler is not designed for direct outdoor installation. If installed outside of the structure, 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 or temperature that exceed 100°F (38°C). Failure to properly locate this boiler can result in premature failure voiding the warranty.

CAUTION!!! This boiler should be installed in a location so that any water leaking from the boiler or piping connections or relief valve openings will not cause damage to the area surrounding the unit or any lower floors in the structure.

CAUTION!!! When installed in a room with thin walls or a thin floor, resonating noise may occur. Install noise reducing parts if required.

CAUTION!!! Do not allow too much dust to collect on the boiler.

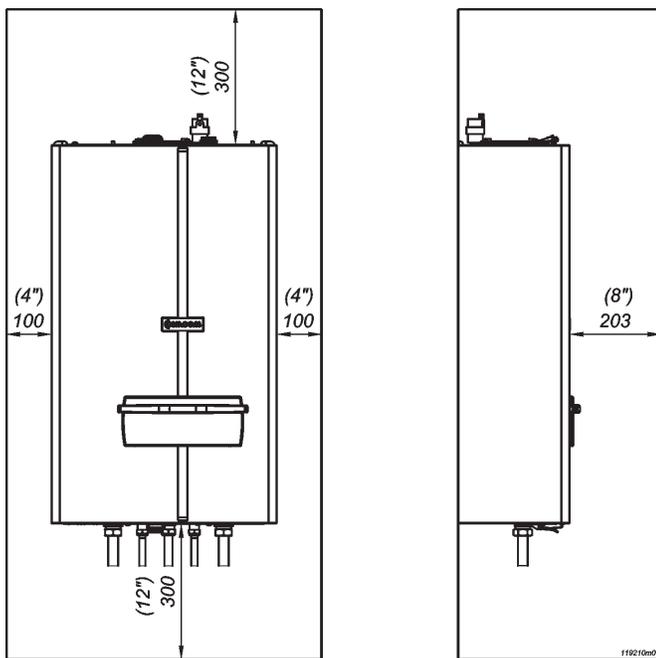


Figure 5-1 Recommended minimum clearance distances for proper installation and servicing

5 - INSTALLATION - Location

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 or equivalent device;
- ☞ piping of the safety relief valve discharge;
- ☞ possible connection of the outdoor temperature sensor;
- ☞ possible connection of an indirect water heater.

5.1.1 - Closet and alcove installations is forbidden

⚠ WARNING!!! It is forbidden the installation of this boiler in a closet or alcove room. Fire can result, causing severe personal injury, death, or substantial property damage.

A closet is any room the boiler is installed in which is less than 100 ft³. An alcove is any room the boiler is installed in which is less than 100 ft³ that it does not have a door.

5.1.2 - Clearances for installation and servicing

Figure 5-1 shows the minimum clearances required for installation and servicing.

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

5.1.3 - 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 (two pipes), first 3ft from the boiler: 1 inch (25 mm)
- Split vent (two pipes), after 3ft from the boiler: 0 inches (0 mm)
- Boiler piping: 1/4 inch (7 mm)

5.1.4 - Vent and air piping

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

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 10-10.

Vent and air may be vented vertically through the roof or out a side wall, unless otherwise specified. You may use any of the vent/air piping methods covered in Section 10. Do not attempt to install the boiler using any other means.

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 10.

5.1.5 - Prevent combustion air contamination

Install air inlet piping for the boiler as described in Section 10. Do not terminate vent/air in locations that can allow contamination of combustion air. Refer to Section 10.2, for products and areas which may cause contaminated combustion air.

⚠ WARNING!!! Ensure that the combustion air will not contain any of the contaminants listed in Section 10.2. Contaminated combustion air will damage the boiler, resulting in possible severe personal injury, death or substantial property damage.

5.2 - Transporting the boiler

⚠ WARNING!!! Always lift and carry the boiler with a hand truck or special equipment Failure to comply with this provisions could result in severe personal injury or death.

⚠ CAUTION!!! The boiler may be damaged when it is improperly secured and transported.

⚠ CAUTION!!! The unpacked boiler may be damaged when not protected against contamination

- ☞ Only transport the boiler using the right transportation equipment, such as a hand truck with a fastening belt or special equipment for maneuvering steps.
- ☞ During transportation the boiler must be secured on the transportation equipment to prevent it from falling off.
- ☞ Protect all parts against impacts if they are to be transported.
- ☞ Observe the transportation markings on the packaging.
- ☞ Leave the protective covers on the connections.
- ☞ Cover the flue gas and air intake connections at the top of the boiler with plastic film

6 - INSTALLATION - Mounting the boiler

6.1 - Mounting the boiler

Refer to Figure 6-1:

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;

⚠ WARNING!!! 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 causing severe personal injury, death, or substantial property damage.

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".

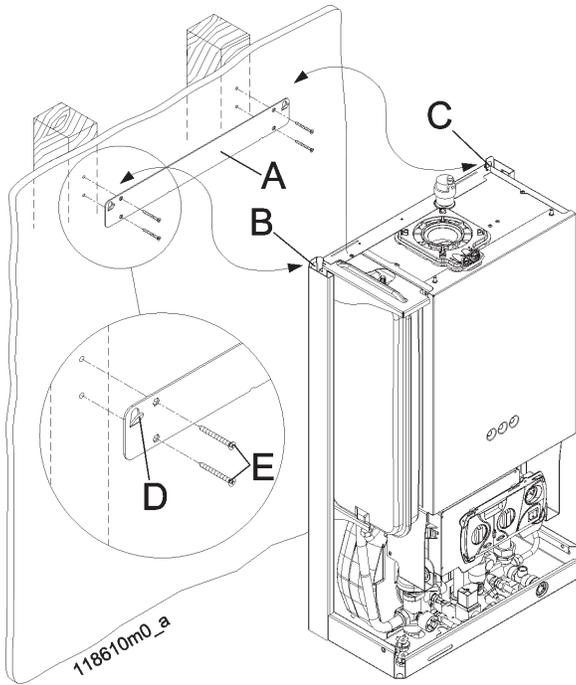
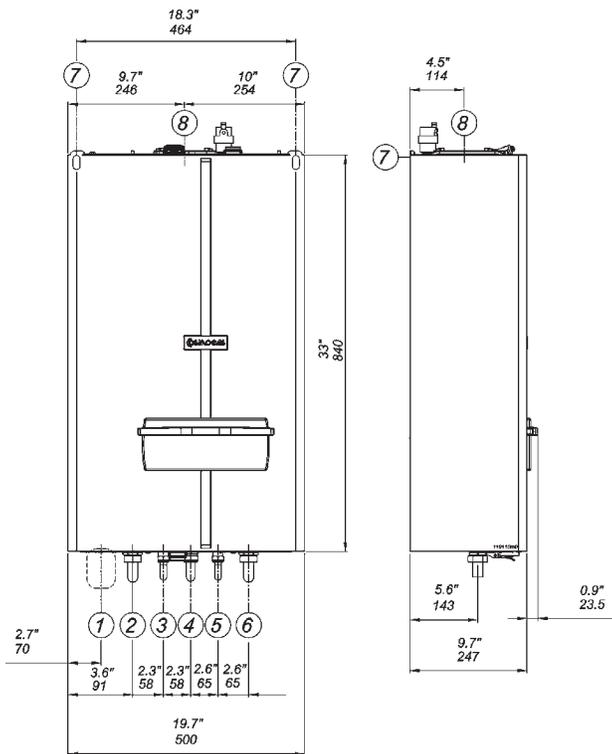


Figure 6-1 Wall bracket installation



- 1 = Area for power supply cable
- 2 = Heating supply connection (3/4")
- 3 = Domestic hot water connection (3/4") (absent on 160-B model)
- 4 = Gas connection (3/4")
- 5 = Domestic cold water connection (3/4") (absent on 160-B model)
- 6 = heating return connection (3/4")
- 7 = positions for boiler support
- 8 = Flue discharge/air intake connection

Figure 6-2 Dimensions

7 - INSTALLATION - Water connection

7.1 - Water connections

The boiler comes with the fittings shown in Figure 7-1.

7.2 - 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.

CAUTION!!! This boiler must have adequate water flowing of 5 GPM 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.

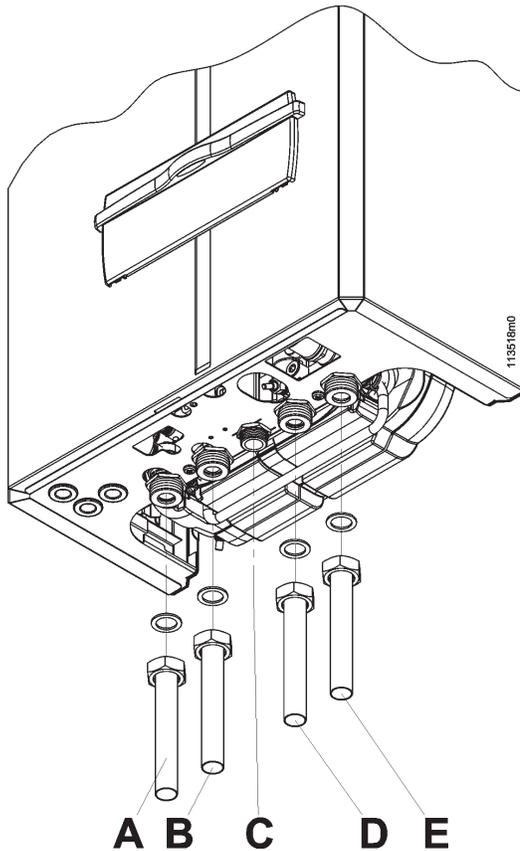
CAUTION!!! Any dirt or foreign matter which is present in the heating circuit, might accumulate inside the secondary domestic heat exchanger, limiting the heat exchange and reducing the production of domestic hot water

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

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!!! Continual fresh make-up water will reduce boiler life. Mineral buildup in the heat exchanger reduces heat transfer, overheats the stainless steel heat exchanger, and causes failure. Addition of oxygen carried in by makeup water can cause internal corrosion in system components. Leaks in boiler or piping must be repaired at once to prevent makeup water entering the boiler.

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.



- A = heating system supply (3/4")
- B = domestic hot water supply (3/4")
(Absent on 160-B model)
- C = Inlet gas connection (3/4")
- D = domestic cold water (3/4") (Absent on 160-B model)
- E = heating system return (3/4")

Figure 7-1 Fittings supplied with the boiler

7 - INSTALLATION - Water connections

CAUTION!!! Risk of system damage due to unsuitable heating system water. If oxygen-permeable pipes are used, e.g. for under floor heating systems, the systems must be separated from one another by plate heat exchangers. Unsuitable heating system water promotes sludge and corrosion formation. This can result in heat exchanger damage and malfunction, which is not covered by warranty.

CAUTION!!! Do not use the boiler to directly heat swimming pool or spa water.

System water piping methods

This boiler is designed to function in a closed loop pressurized system not less than 8 psi (0,5 bar). A pressure gauge is included to monitor system pressure. It is important to note that the boiler version 160-B has a minimal amount of pressure drop (see Figure 7-4) and must be figured in when sizing the circulators. Each boiler installation must have an air elimination device, which will remove air from the system. Install the boiler so the gas ignition system components are protected from water (dripping, spraying, etc.) during appliance operation for basic service of circulator replacement, valves, and others. Observe a minimum of 1/4" (7mm) clearance around all un-insulated hot water pipes when openings around the pipes are not protected by non-combustible materials.

Low water cutoff device

On a boiler installed above radiation level, some states and local codes require a low water cutoff device at the time of installation.

Freeze protection

Freeze protection for new or existing systems must use glycol that is specially formulated for this purpose. This includes inhibitors, which prevent the glycol from attacking the metallic system components. Make certain to check that the system fluid is correct for the glycol concentration and inhibitor level. The system should be

tested at least once a year and as recommended by the producer of the glycol solution. Allowance should be made for the expansion of the glycol solution in the system piping.

! 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.

! WARNING!!! Use only inhibited propylene glycol solutions, which are specifically formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.

CAUTION!!! 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.

CAUTION!!! This boiler is capable of servicing multiple temperature loop systems. It is the responsibility of the installer to protect the loops with lower temperature requirements from higher temperatures that may be required by other loops

Floor radiant heating systems

With switch #6 in Figure 9-2, 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!!! If the boiler is installed in a low temperature system, the switch #6 in Figure 9-2 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).

CAUTION!!! To protect the radiant floor panel against over heating you must install a safety device that shuts-off the boiler before it reaches the floor panel's limit temperature.

CAUTION!!! Risk of system damage due to unsuitable heating system water. If oxygen-permeable pipes are used, e.g. for under floor heating systems, the systems must be separated from one another by plate heat exchangers. Unsuitable heating system water promotes sludge and corrosion formation. This can result in heat exchanger damage and malfunction, which is not covered by warranty.

7.2.1 - Near boiler heating piping components

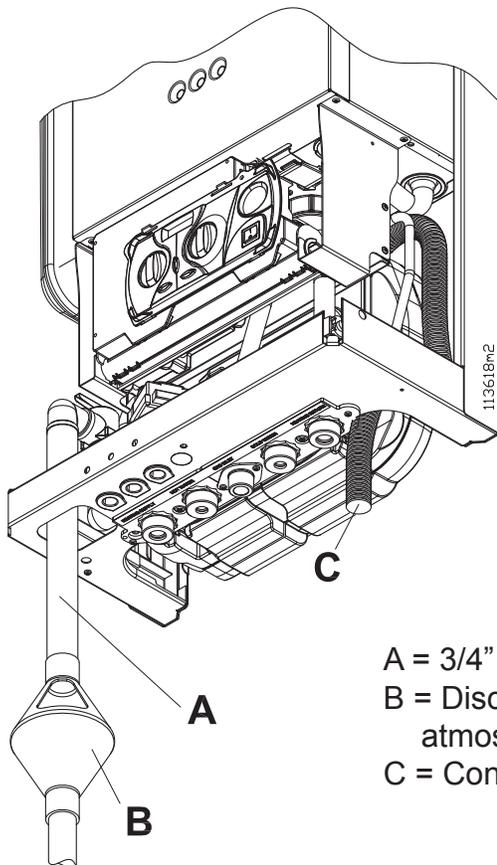
1. Boiler system piping: boiler system piping MUST be properly sized. Reducing the pipe size can restrict the flow rate through the boiler, causing inadvertent high limit shutdowns and poor system performance.
2. Boiler system pump: field supplied for 160-B model. Factory installed for 160-C model. Circulators MUST be sized to meet the specified minimum 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 flow characteristics for the selected product used.

7 - INSTALLATION - Water connections

4. Boiler 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.
5. Back flow preventer: Field supplied. Back flow preventer valves are recommended for installation as shown in Figures 7-6 and 7-7. Failure to install these valves could result in a reverse flow condition during pump(s) off cycle.
6. 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.
7. Anti-scald mixing valve: Field supplied. An anti-scald mixing valve is recommended (see Figure 7-6). It is recommended also when an indirect water heater is present.
8. Unions: Field supplied. Recommended for unit serviceability.
9. Pressure relief valve: Factory installed. The pressure relief valve is sized to ASME specifications.

10. Indirect water heaters: field supplied. This boiler may be piped to an indirect water heater to heat domestic hot water with the space 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 boiler's 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 than 5 GPM at any time.



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

Figure 7-2 Relief valve discharge piping

! 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 than 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 Clinical Toxicology of Commercial Products, 5th Edition

11. 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.

7.2.2 - Relief valve

This 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. Pipe the discharge to a drain (See Figure 7-2). Provide piping that is the same size as the safety relief valve outlet

! 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!

! WARNING!!! Never block the outlet of the safety relief valve or an explosion causing extensive property damage, severe personal injury or death may occur!

7 - INSTALLATION - Water connections

7.2.3 - Expansion Tank and Makeup Water

Boiler model 160-C is factory equipped with its expansion tank with 2 gals volume. Ensure this volume is sufficient for the heating system you are designing. If not, install an additional external expansion tank. For boiler model 160-B, ensure the expansion tank is properly sized for the boiler volume (1,5 gallons [6 litres]) and the system volume, temperature and pressure.

CAUTION!!! Undersized expansion tanks will cause system water to be lost through the pressure relief valve and cause additional makeup water to be added to the system. Eventual boiler heat exchanger failure can result due to this excessive makeup water addition, compromising the functionality of the unit and void its warranty.

For model 160-B (and for 160-C if needed), the expansion tank must be located as shown in Figures 7-6 and 7-7 when using a primary/secondary piping arrangement or as per recognized design methods. Refer to the expansion tank manufacturer instructions for additional installation details.

Connect the expansion tank to an air separator only if the air separator is located on the suction side (inlet) of the system circulator. Always locate and install the system fill connection at the same location as the expansion tank connection to the system.

7.2.4 - Heating pump

160-C boiler is fitted with a circulator pump. The head available to supply flow through the heating system at the boiler connections is shown in graph form in Figure 7-3. The internal pump is sufficient to run the water into the primary looping.

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

To connect a system pump on the secondary looping see Figure 7-6 and electrically connect the pump follow Figure 8-2

160-B boiler is not fitted with an internal pump. The installer needs to install an external heating pump as illustrated in Figure 7-7. To size the pump, together the system head loss, consider also the graph in Figure 7-4. The minimum allowable flow rate through the boiler is 5 gpm (1,135 l/h).

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

To wire the heating pump to the boiler, refer to Section 9.1. Because the pump is normally used in conjunction with an indirect water heater, see Figure 7-7 which shows a typical installation with a typical rise of 35°F and using the follow heating pump:

- GRUNDFOS model UPS15-58FC
- TACO model 008/0010
- B&G model NRF-36
- Armstrong model Astro 30

For different installations, size the pump using recognized design methods.

7.2.5 - Sizing heating system

Size the piping and system components required in the space heating system, using recognized design methods.

7.2.6 - Domestic Hot Water System Piping when using an indirect water heater

See Figure 7-7 , for recommended piping to an indirect water heater. This recommended piping configuration ensures priority is given to the production and recovery of DHW. Install the heating pump (item “9”, Figure 7-7) only if you are using a 160-B boiler model. Refer to Figure 9-1 to wire the indirect water heater pump, the system pump and the heating pump (if present).

7.3 - Converting a combi boiler into a heating only boiler

If you are in possession of a combi boiler (160-C) you can use it as a heat only boiler without using the domestic hot water circuit. To do so, simply plug the two fittings, items “3” and “5” of Figure 6-2, and move switch N°5 (see Figure 9-1) from OFF position to ON position. Now knob “11” of Figure 13-1 is disabled.

7 - INSTALLATION - Water connections

7.4 - Domestic hot and cold water (only for 160-C model)

160-C boiler, offers resistance to the passage of domestic water (see graph flow/pressure of Figure 7-5). The installer or the engineer must take account of this in order to ensure the correct domestic water flow to the utilities.

CAUTION!!! If the domestic water hardness is greater than 9 gr/gal (150 mg/l) we recommend installing a water softener with filter. Failure to comply with this requirement may compromise the functionality of the unit and void its warranty.

- ☞ Figure 11 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 7-6 item "17")
- ☞ 160-C boiler can be used as heat only boiler (see Section 7-3).

Anti-scald mixing valve: Field supplied. An anti-scald mixing valve is recommended (see Figure 7-6). It is recommended also when an indirect water heater is present.

! WARNING!!! Install an anti scald mixing valve downstream domestic hot water piping. Failure to comply with this provision can result in scalding of individuals and animals causing, severe personal injury or death!

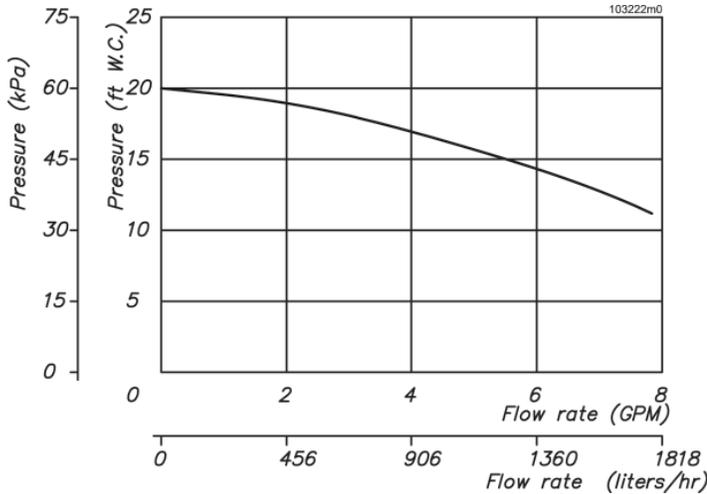


Figure 7-3 Available Head for heating circuit for models "160-C"

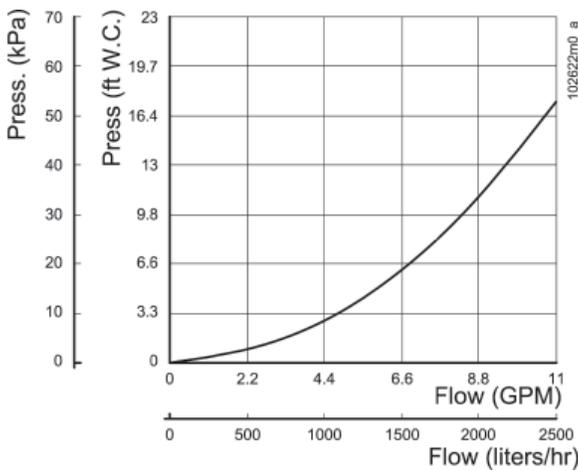


Figure 7-4 Internal Boiler Head Loss for model "160-B"

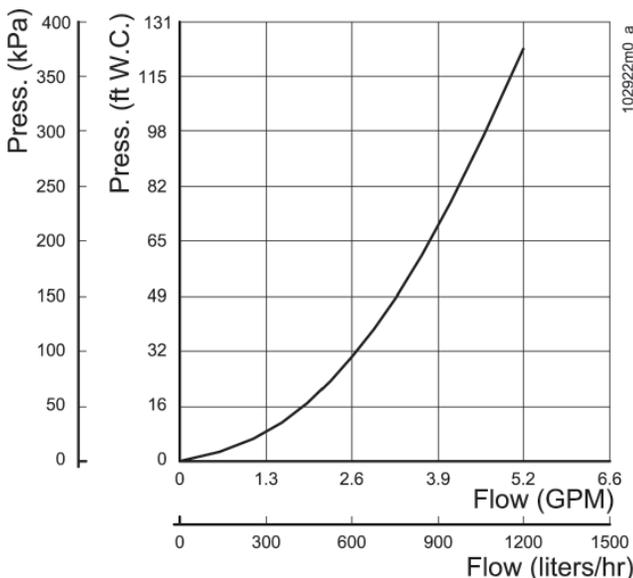


Figure 7-5 Domestic Water Coil Head Loss for model "160-C"

7 - INSTALLATION - Water connections

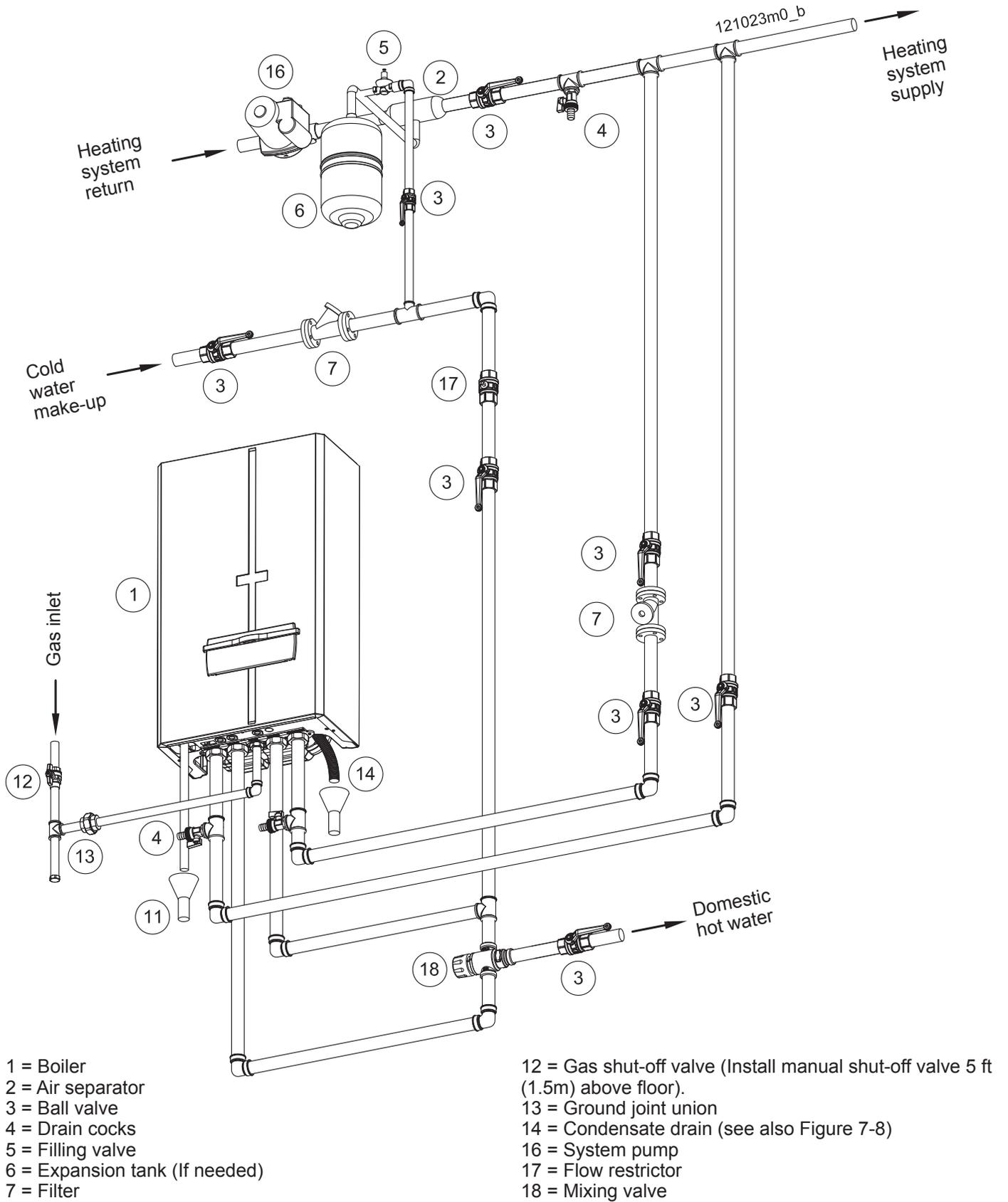
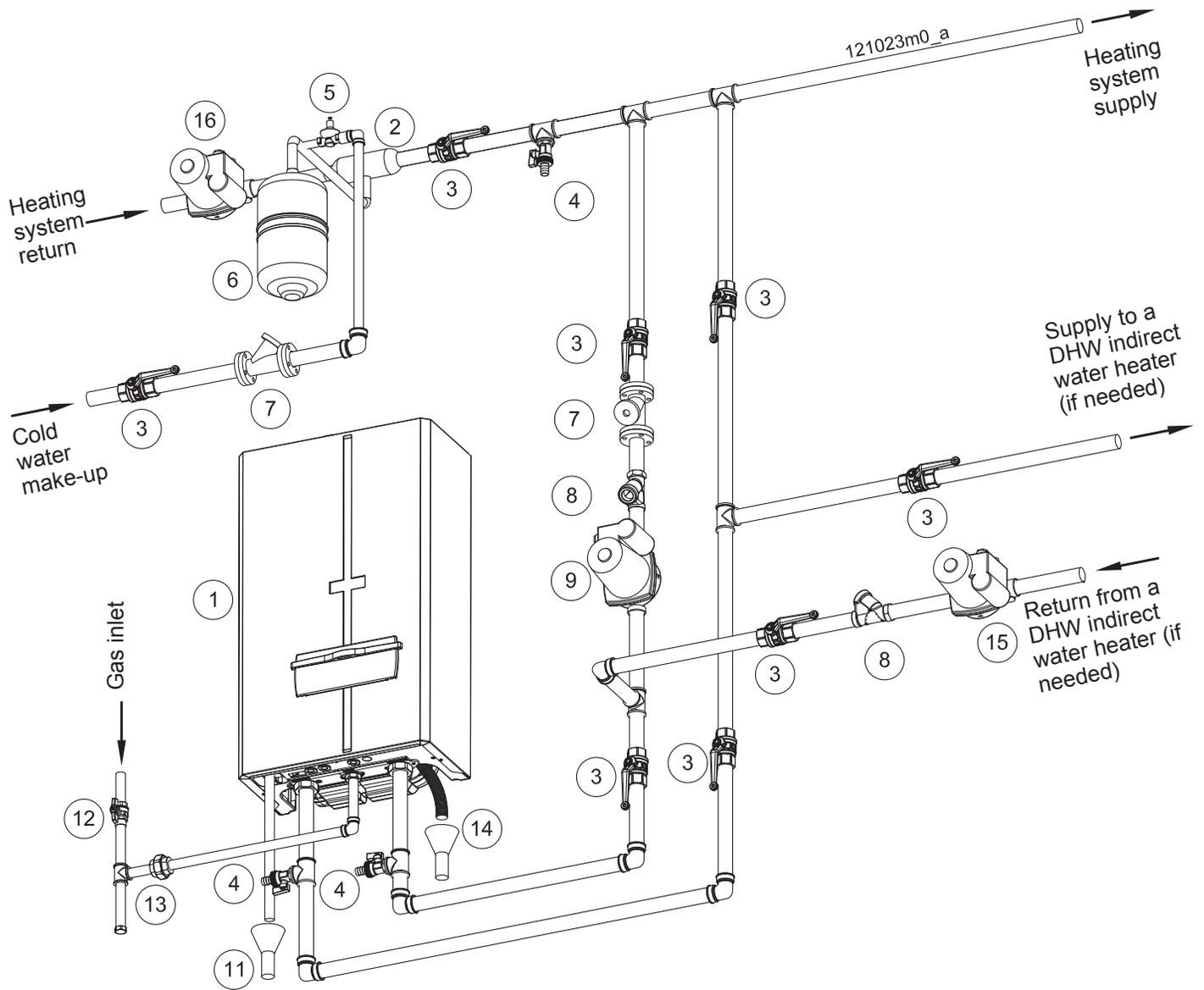


Figure 7-6 Piping of the boiler model 160-C

7 - INSTALLATION - Water connections



- 1 = Boiler
- 2 = Air separator
- 3 = Ball valve
- 4 = Drain cocks
- 5 = Filling valve
- 6 = Expansion tank
- 7 = Filter
- 8 = Back flow preventer

- 9 = Heating pump
- 11 = Relief valve drain
- 12 = Gas shut-off valve (Install manual shut-off valve 5 ft (1.5m) above floor)
- 13 = Ground joint union
- 14 = Condensate drain (see also Figure 7-8)
- 15 = Indirect water heater pump (if needed)
- 16 = System pump

Figure 7-7 Piping of the boiler 160-B

7 - INSTALLATION - Water connections

7.5 - 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 3-1, item "46", for the evacuation of condensate and to prevent the leakage of combustion products. The condensate trap drains through pipe shown in Figure 7-2 item "C". The condensation disposal system must:

- ☞ be connected by means of an appropriate trap capable of preventing the pressurization of the condensate system and the return of sewer gas (see figure 7-8);
- ☞ slope condensate tubing down and away from the boiler into a drain or condensate neutralizing filter. Condensate from the boiler will be slightly acidic (around pH 4). Install a neutralizing filter if required by local codes.

! CAUTION!!!

Use materials approved by the authority having jurisdiction. In the absence of other authority, PVC and CPVC pipe must comply with ASTM D1785 or D2845. Cement and primer must comply with ASME D2564 or F493. For Canada use CSA or ULC certified PVC or CPVC pipe, fittings, and cement.

- ☞ comply with national and/or local codes for condensate neutralizer between pipe "C" of figure 7-2 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.

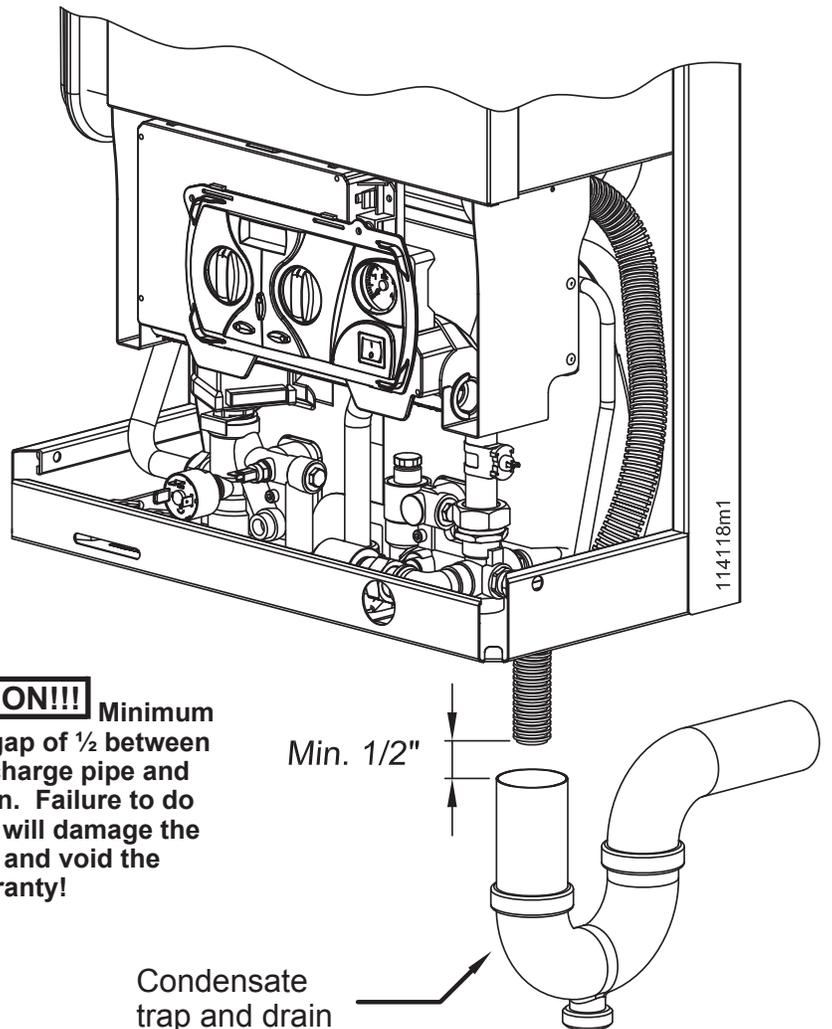
! CAUTION!!!

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.

A condensate removal pump is required if the boiler is below the drain. When installing a condensate pump, select one approved for use with condensing boilers and furnaces. The pump should have an overflow switch to prevent property damage from condensate spillage.

COMMONWEALTH OF MASSACHUSETTS SPECIAL REQUIREMENT

When the boiler is installed and used in the Commonwealth of Massachusetts, a neutralization unit **MUST** be installed in the condensate removal system.

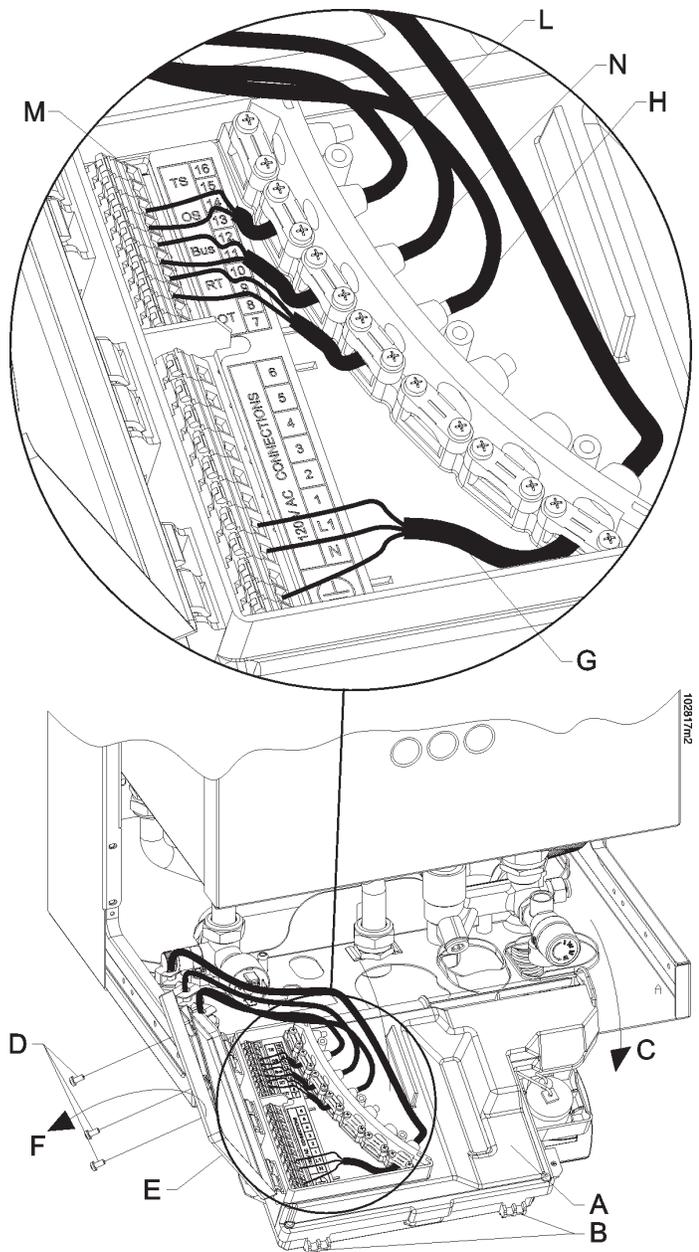


! CAUTION!!!

Minimum air gap of 1/2 between discharge pipe and drain. Failure to do this will damage the unit and void the warranty!

Figure 7-8 Condensate trap and drain connection

8 - INSTALLATION - Electrical connections



- 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 = Indirect water heater temperature sensor terminals
- N = Remote command cable (optional)

Figure 8-1 Junction box

8.1 - Electrical connections: overview

⚠ WARNING!!! **ELECTRICAL SHOCK HAZARD**
 – For your safety, turn off electrical power supply before making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

⚠ 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 fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien 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*.

NOTICE! Wiring must be N.E.C. Class 1. Use only type 105°C wire or equivalent.

Installation must comply with:

1. National Electrical Code and any other national, state, provincial, or local codes, or regulations.
 2. In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any local codes.
- ☞ 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. (0.3 mm).
 - ☞ A properly rated shut-off switch shall be located nearest to the boiler.
 - ☞ Ensure that the polarity between live and neutral wires is maintained when connecting the boiler.

8 - INSTALLATION - Electrical connections

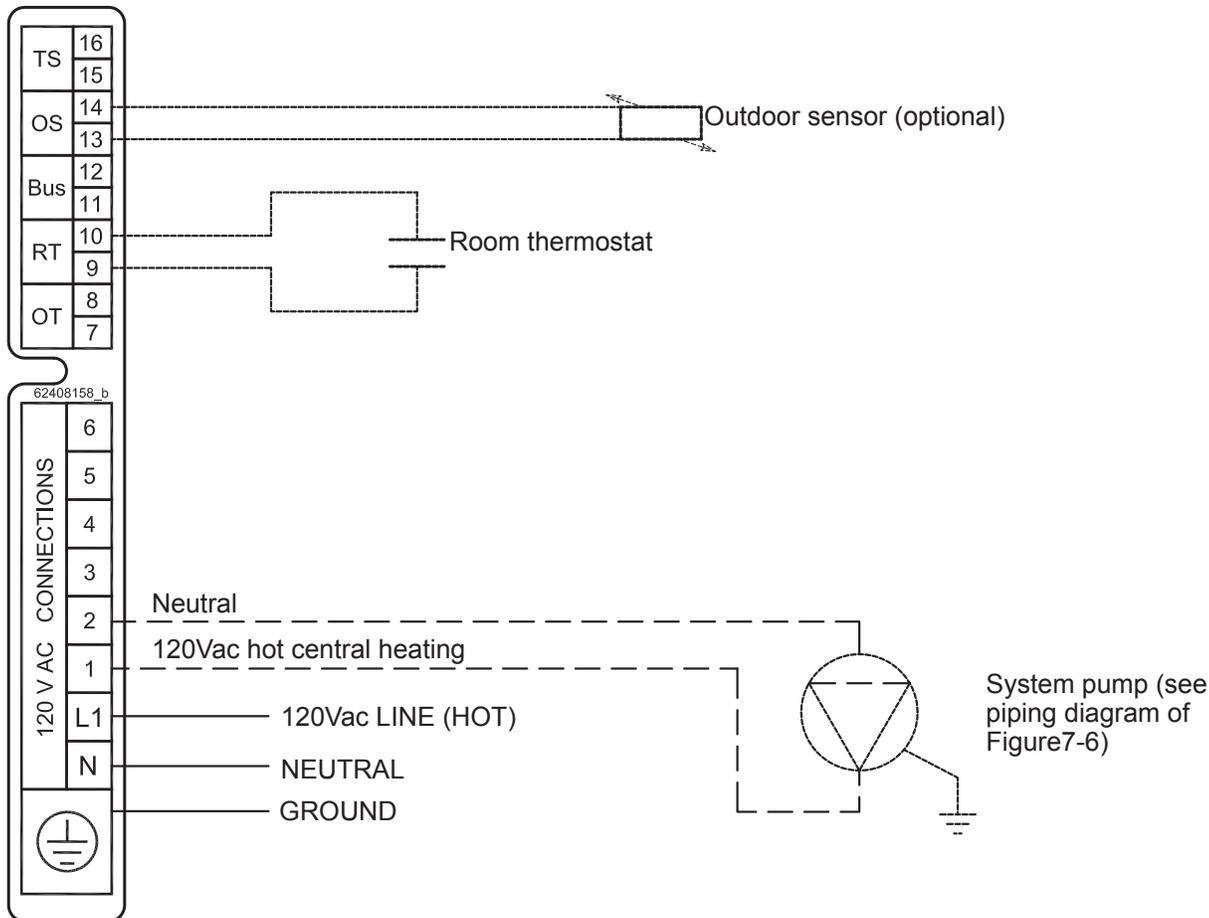


Figure 8-2 Electrical connections for 160-C model (Refer to Figure 7-6)

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 lightning strikes.

8.1.1 - Connecting the power supply cable

Provide and install a fused disconnect or service switch (15 amp recommended) as required by the code. To connect the electrical power supply cable, follow the steps below while referring to Figures 8-1 and 8-2:

1. remove the boiler casing following the instructions given in Section 14.2 and open the junction box cover;
2. press the two plastic springs tabs labeled "B" on the bottom side;
3. open panel "A" in the "C" direction;
4. remove the three screws labeled "D";
5. open door "E" in the "F" direction;
6. install the power supply wires, "G" as shown;
7. strip the power supply wires being careful to leave the ground wire 1in (25 mm) longer than the other two;
8. connect the ground wire to the ground terminal;
9. connect the 120 volt hot wire to terminal "L1";
10. 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

8.1.2 - Wiring the heating pump for 160-B model

On 160-B model the heating pump is not supplied with the boiler. Install the heating pump following Section 7.2.4. If the boiler is not connected to an indirect water heater, wire the heating pump to the boiler following the steps below while referring to Figures 8-1 and 8-2:

1. remove the boiler casing according to the instructions given in section 14.2 and open the junction box cover;
2. use a three wire cable with a minimum cross section of # 14 AWG between the boiler and the circulator pump;
3. route the circulator cable through an empty cable clamp in the junction box;
4. connect the Hot and Neutral cable wires respectively to the "4 and 5" terminals in the junction box;
5. connect the Ground wire to an empty "Ground" connection inside the junction box.

8 - INSTALLATION - Electrical connections

CAUTION!!! If the pump is larger than 1 hp or 1 amps, you must isolate with a relay.

6. Connect the electrical supply cable to the electrical connections into the pump. Follow manufacturer's instruction of the pump.

NOTICE! If the 120 volt power wires are inverted, the boiler will lock-out, displaying error code L05.

8.1.3 - 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 8-3).

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

1. remove the boiler casing according to the instructions given in Section 14.2 and open the junction box cover;
2. use a two conductor cable with a minimum cross section of #18 AWG between the boiler and the room thermostat;
3. route the cable through an empty cable clamp "E" in the junction box;
4. connect the cable leads to the "9" and "10" terminals as shown in Figure 8-2.

NOTICE! the maximum room thermostat cable length permitted is 32 ft (10 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.

8.1.4 - Installing the outdoor temperature sensor (optional)

The outdoor temperature sensor is supplied with the boiler. 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 14.2 and open the junction box;

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 32 ft (10 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 "13" and "14" as shown in Figure 8-2;
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 I**;
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 climatic heat adjustment desired as explained in Section 13.10;
4. press the **Reset** button repeatedly until exiting the menu; the display will no longer flash.

8.1.5 - Alarm output

Inside the electrical box (see Figure 9-2) 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, indirectly, any kind of external signal to devices such as an audible alarm, phone, or other devices.

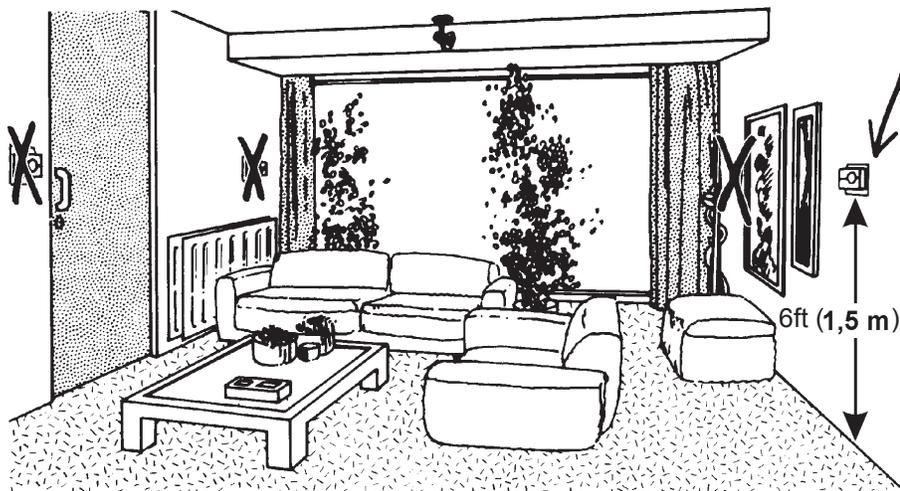


Figure 8-3 Room thermostat location

9 - INSTALLATION - Connecting to an indirect water heater

9.1 - Connecting the boiler to an indirect water heater

This boiler, can be connected to an indirect water heater. The water connection must be made per figure 7-7. Heating pump item "9" of Figure 7-7 is mandatory for boiler model 160-B. The electrical connections must be made per figure 9-1. To change the logic of the boiler, to drive and load an indirect water heater, follow the steps below while referring to Figure 9-2:

1. disconnect the boiler from the electrical supply;
2. remove the boiler casing according to the instructions given in section 14.2;
3. push the plastic spring tabs "B";
4. open the front half of the electrical box in the "C" direction;

5. move switch #1, item "D" to its "ON" position as marked on the control board;
6. move switch #5 in the OFF position;
7. on model 160-C, on the rear side of the electrical junction box board, if present, disconnect the plug with two wires, item "E", corresponding to wires #44 and #45.
8. on model 160-C, on the rear side of the electrical box, disconnect the electrical plug from the diverter valve (see Figure 3-1, item "35"). When you disconnect the plug you must insure that the boiler is in the heating mode. 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 water heater temperature sensor to terminals "15" and "16", as per Figure 9-1
10. insert the probe of the indirect water heater sensor into the socket of the indirect water heater.

! WARNING!!! Since the indirect water heater 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 water heater, it will perform a weekly antilegionella cycle. This cycle raises the water heater temperature to 140°F one time per week.

NOTE! A few cable conduit holes are provided on the bottom right side of the boiler

CAUTION!!! If the pump is larger than 1 hp or 2 amps, you must isolate with a relay.

11. reinstall all dismantled parts.

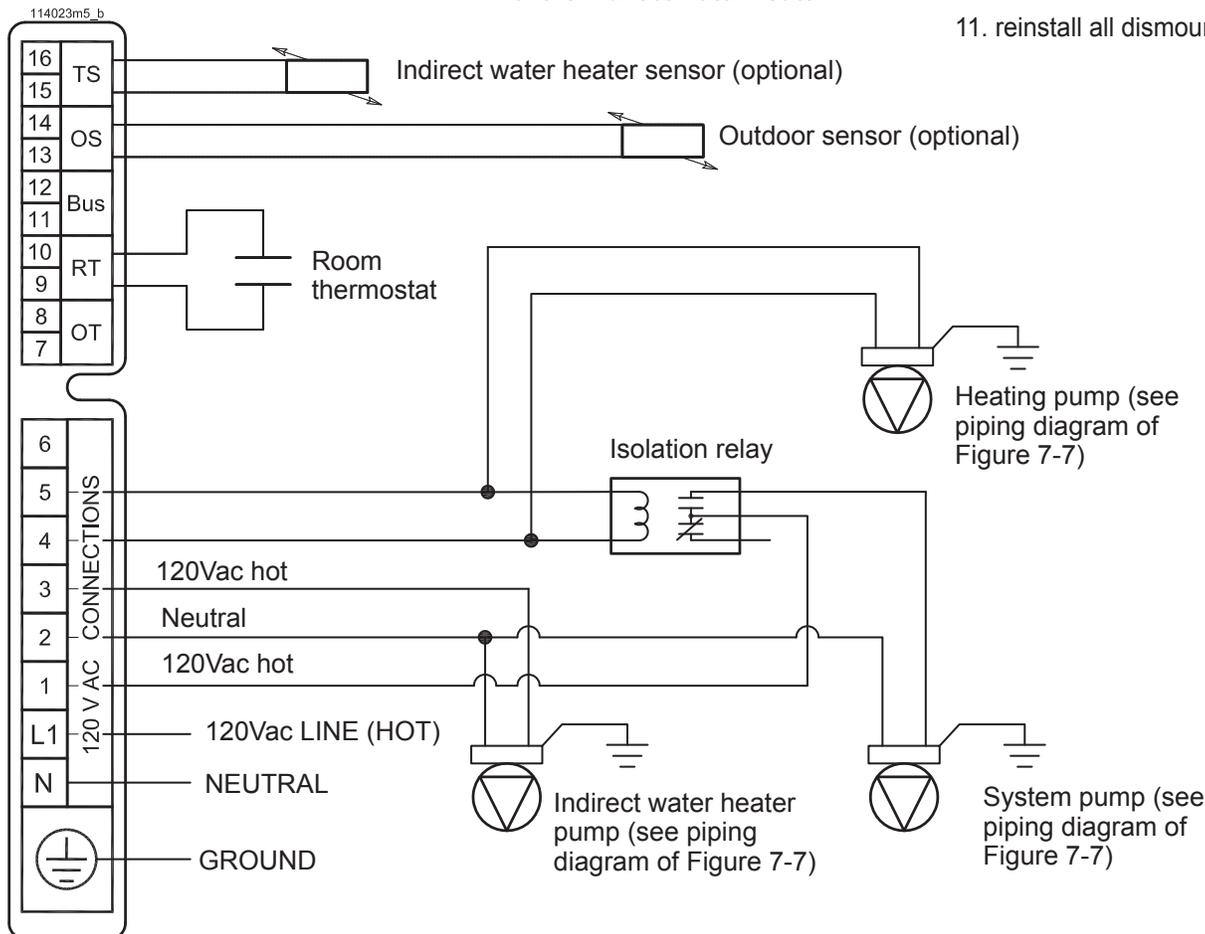


Figure 9-1 Electrical connections for 160-B model (see Figure 7-7)

9 - INSTALLATION - Connecting to an indirect water heater

9.1.1 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 the 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 DHW demand when they are both active at the same time. The priority selection

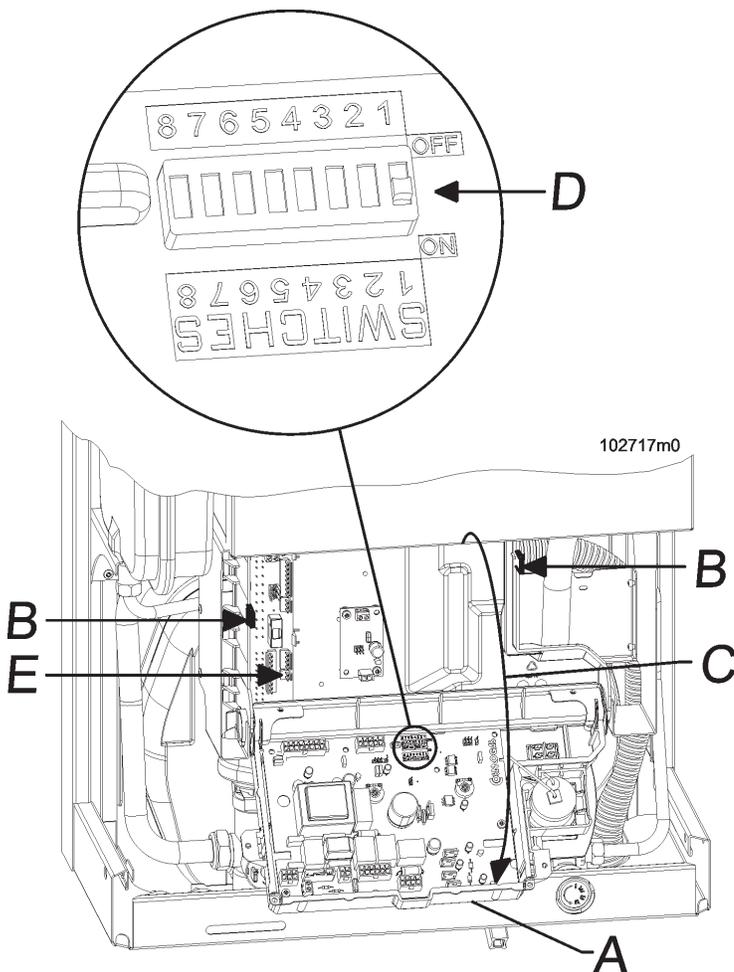
is set with the **dp** (DHW Priority) parameter in the “Installer menu” (see Section 13.17).

Each value set into the **dp** parameter will correspond to the minutes delay boiler toggles between Central Heating and DHW demand.

9.2 - Opening the instrument panel

To open the instrument panel and gain access to the boiler control board, follow this procedure:

1. disconnect the boiler from the electrical supply;
2. remove the boiler casing according to the instructions given in Section 14.2;
3. push the plastic spring tabs “B” shown in Figure 9-2;
4. open the front half of the electrical box in the “C” direction as shown in Figure 9-2;



- 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 9-2 Control board and unit electrical box details

10 - INSTALLATION - Vent and combustion air

10.1 - 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 Installation 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 Annex G 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 déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.*

(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 au système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sècheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.*

(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 allumette 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 méthode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.*

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

10 - INSTALLATION - Vent and combustion air

10.2 - Prevent combustion air contamination

Install air inlet piping as described in this Section 10. You must pipe combustion air to the boiler air intake. Do not terminate vent/air in locations that can allow contamination of combustion air.

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

Ensure that the combustion air will not contain any of the follow contaminants.

Products that may contaminated the air combustion:

- 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.

10.3 - Venting and air piping systems

! WARNING!!! The vent installation must be in accordance with part *Venting of Appliances*, of the latest edition of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 or section, *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!

NOTICE! All vent pipes must be mechanically fixed, 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! The vent system shall be installed so as to prevent the accumulation of condensate.

NOTICE! 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.

! WARNING!!! The exhaust vent and the air inlet lines, 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 10-10.

Vent and air must terminate near one another and may be vented vertically through the roof or out a side wall, unless otherwise specified. You may use any of the vent/air piping methods from Figure 10-1 to Figure 10-6. Do not attempt to install this boiler using any other means.

! WARNING!!! DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Use only approved materials listed on Tables 10-1 and 10-2. Improper materials or mixing materials can result in excessive levels of carbon monoxide which can result in severe 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 10.4

10 - INSTALLATION - Vent and combustion air

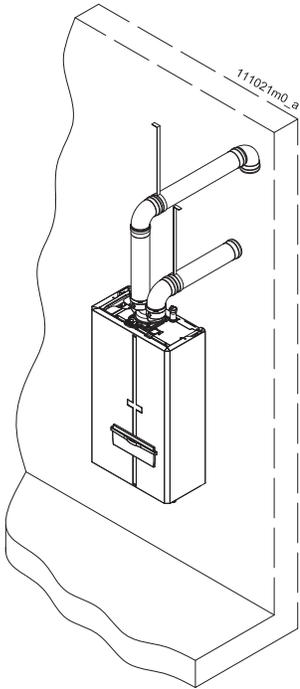


Figure 10-1 Side wall two pipes (Direct venting).

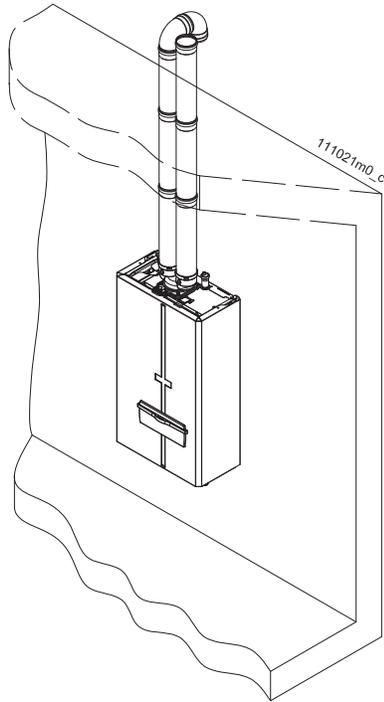


Figure 10-2 Vertical two pipes (Direct Venting).

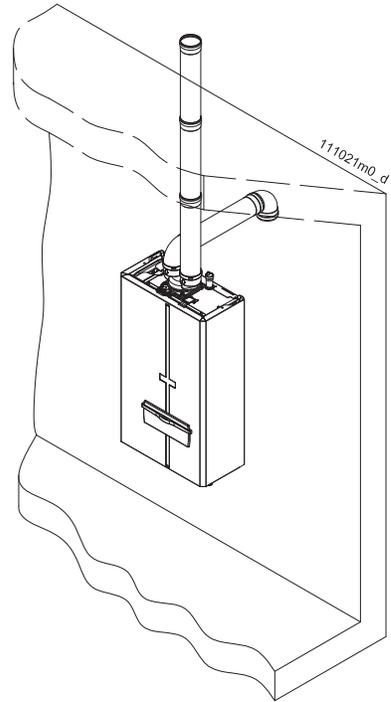


Figure 10-3 Side wall air intake, vertical vent (Direct venting).

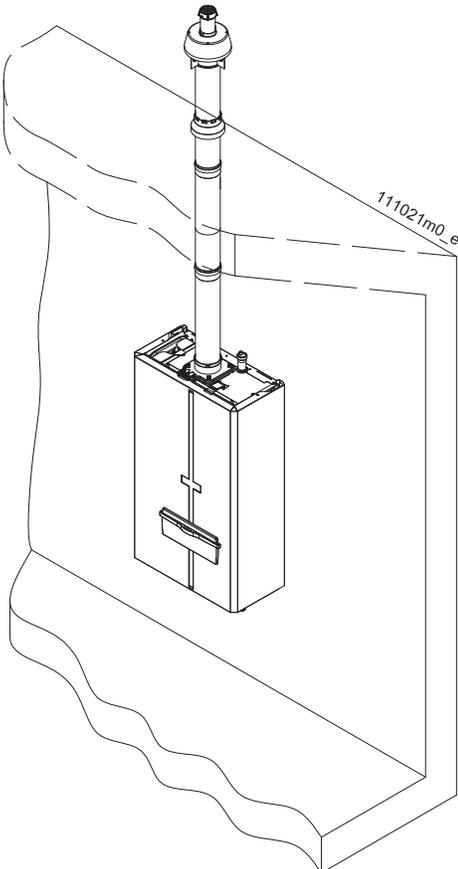


Figure 10-4 Vertical concentric (Direct venting).

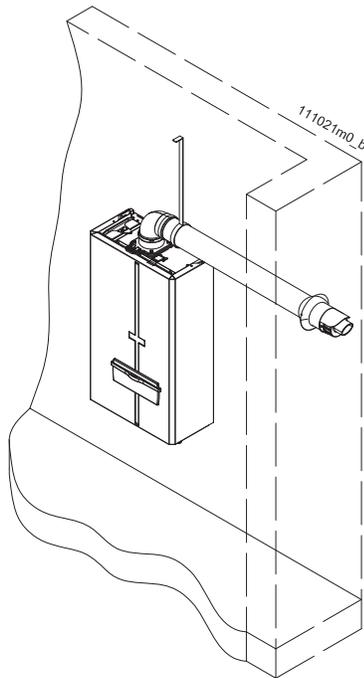


Figure 10-5 Side wall concentric (Direct venting).

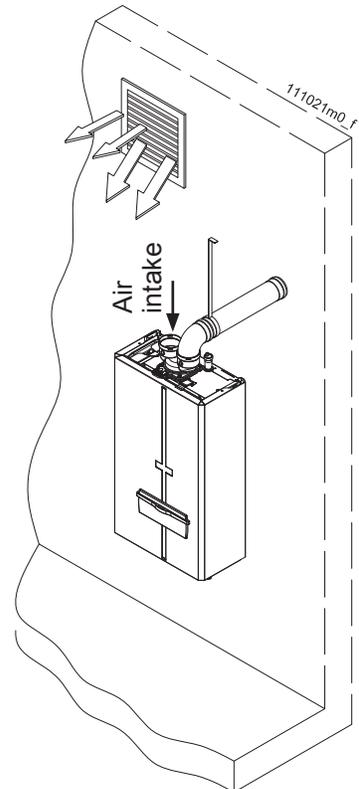


Figure 10-6 Side wall one pipe venting, combustion air from room (not Direct venting).

10 - INSTALLATION - Vent and combustion air

10.4 - Minimum / Maximum allowable combustion air and vent piping lengths

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 10-7 shows this relation which an installer must consider when in the designing stage of the venting.

The maximum length of the two pipes vent system is 300 equivalent ft (Air intake plus flue exhaust). However, each single pipe can't be longer than 150 ft.

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 (357 mm) with one elbow.

10.5 - 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 air piping and the combustion air supply comply with these instructions regarding vent system, air system, and combustion air quality. See also Section 10.2 of this manual. Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of 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 10-1 and Table 10-2, failure to properly seal all seams and joints, mixing of venting materials or failure to follow vent pipe and fittings manufacturer's instructions can result in personal injury, death or property damage.

! WARNING!!! Never use cellular (foam) core pipe in vent pipe line and fittings. Failure to comply could result in severe personal injury, death, or substantial property damage.

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

! WARNING!!! Use only the materials listed in Tables 10-1 and 10-2 for vent pipe, and fittings. 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.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 10-1).

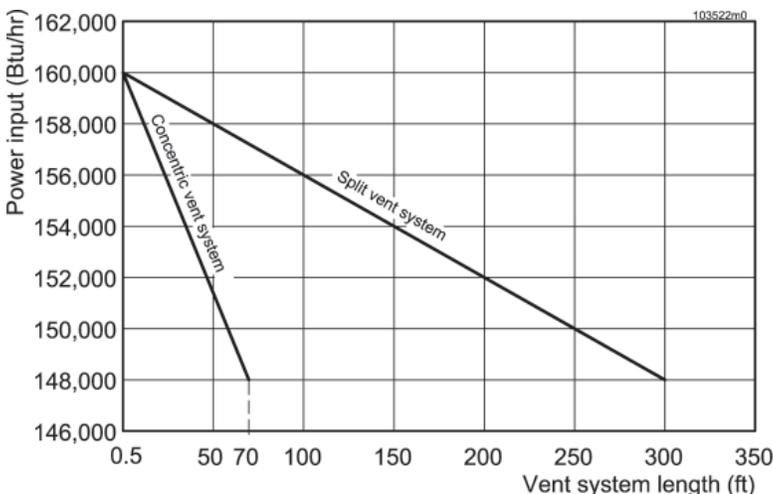


Figure 10-7 Relation between Power input and Vent system length

10 - INSTALLATION - Vent and combustion air

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	

Table 10-1 Approved vent materials

Approved vent manufacturers and items			
Item	Material	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	Slant Fin	81 9002 000
Bird screen	PVC	IPEX (System 636)	196051
Two pipes roof terminal	Polypropylene	Slant Fin	81 9177 000 and 81 9181 000
Two pipes wall terminal	Polypropylene	Slant Fin	81 9182 000 and 81 9181 000
Single pipe roof terminal	Polypropylene	Slant Fin	81 9177 000
Single pipe wall terminal	Polypropylene	Slant Fin	81 9182 000
Two or single pipe boiler adapter (80mm to 80mm Polypropylene)	Polypropylene	Slant Fin	81 9001 000
Bird screen	Polypropylene	Slant Fin	81 9181 000
Concentric boiler adapter	Polypropylene	Slant Fin	81 9185 000
Concentric roof terminal	Polypropylene	Slant Fin	81 9005 000
Concentric wall terminal	Polypropylene	Slant Fin	81 9184 000
Single pipe wall or roof terminal	Polypropylene	Centrotherm (Innoflue System)	ISEP0339
Two pipes wall or roof terminal	Polypropylene	Centrotherm (Innoflue System)	ISEP0339 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 SGV03E90
Boiler adapter (80mm to 3" stainless steel)	Stainless steel	Heat Fab (SGV)	SGV03AD80
Bird screen	Stainless steel	Heat Fab (SGV)	SGV03TM

Table 10-2 Approved vent manufacturers and items

10 - INSTALLATION - Vent and combustion air

10.6 - 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.

10.6.1 - Sealing of Type "B" double-wall vent material or galvanized vent pipe

Sealing of Type "B" double-wall vent material or galvanized vent 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.

10.6.2 - 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.

10 - INSTALLATION - Vent and combustion air

10.7 - PVC/CPVC vent piping materials

! WARNING!!! Use only the materials listed in Tables 10-1 and 10-2 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 10.7.1. 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 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 10-2 for approved vent adapters.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 10-1).

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 10-2 for approved vent adapters.

10.7.1 - 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 10-4.
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

- a. 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.

10.7.2 - PVC/CPVC air intake/vent connections

Combustion Air Intake connection (see Figure 10-8 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 10-8:

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!

10 - INSTALLATION - Vent and combustion air

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".
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).

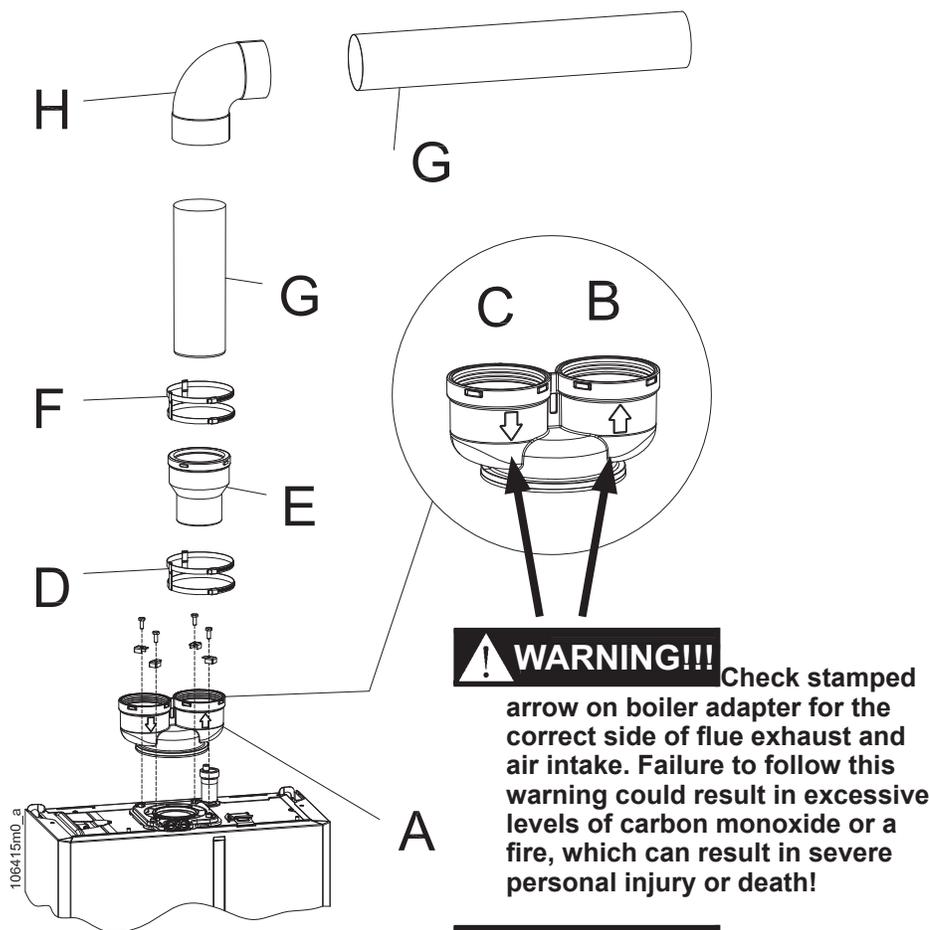
Vent connection (see Figure 10-8 Item "B"). This connection is used to provide a passageway for conveying combustion gas to the outside. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.

To connect a PVC/CPVC pipe to the vent connection proceed as follow while referring to Figure 10-8:

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).



! 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 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
- F = Fixing clamp
- G = PVC/CPVC pipe
- H = 90° elbow

Figure 10-8 PVC/CPVC Venting connection

10 - INSTALLATION - Vent and combustion air

10.8 - Stainless steel vent piping materials

! WARNING!!! Use only the materials, vent systems, and terminations listed in Tables 10-1 and 10-2. 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 10.8.1. Failure to follow this warning could result in fire, personal injury, or death.

! WARNING!!! Improper installation of Stainless steel systems may result in injury or death.

! WARNING!!! Use only water-based lubricants on joints. Never use hydrocarbons-based lubricants because they would destroy gaskets. Failure to follow this warning could result in excessive levels of carbon monoxide, which can result in severe personal injury or death!

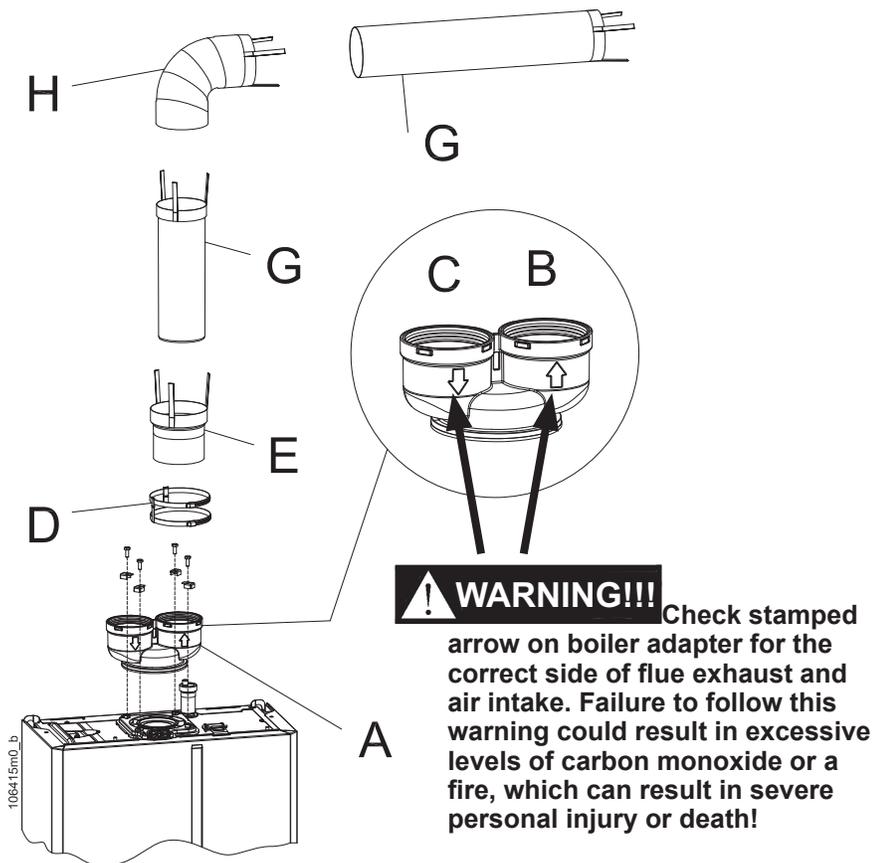
NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 10-1).

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).

NOTICE Installation of a stainless steel vent system should adhere to the stainless steel 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 10-2 for approved vent adapters.



- A = Flue exhaust connection
- B = Combustion air intake connection
- C = Fixing clamp
- D = Stainless steel elbow
- E = Stainless steel adaptor
- F = Stainless steel extension
- G = Air intake pipe

Figure 10-9 Stainless Steel Venting connection

10 - INSTALLATION - Vent and combustion air

10.8.1 - Stainless steel air intake/vent connections

Combustion Air Intake connection (see Figure 10-9 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 follow section 10.7.2.

Vent connection (Figure 10-9 item "A") is used to provide a passageway for conveying combustion gases 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 stainless steel pipe to the vent connection proceed as follow: while referring to Figure 10-9:

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 clamp "D" onto side "B" of boiler adapter "A" .
3. Insert adapter "E" into side "B" 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 vent pipe "G", into adapter "E", following instruction of stainless steel pipe manufacturer.

10 - INSTALLATION - Vent and combustion air

10.9 - Polypropylene vent piping materials

! WARNING!!! Use only the materials listed in Tables 10-1 and 10-2 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 10.9.1. Failure to follow this warning could result in fire, personal injury, or death.

! WARNING!!! Improper installation of Polypropylene systems may result in injury or death.

! WARNING!!! Use only water-based lubricants on joints. Never use hydrocarbons-based lubricants because they would destroy gaskets. Failure to follow this warning could result in excessive levels of carbon monoxide, which can result in severe personal 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.

For installation in Canada, vent pipe system must be certified to ULC-S636 (see Table 10-1).

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).

NOTICE Installation of a Polypropylene vent system should adhere to the polypropylene vent manufacturer's installation instructions supplied with the vent system.

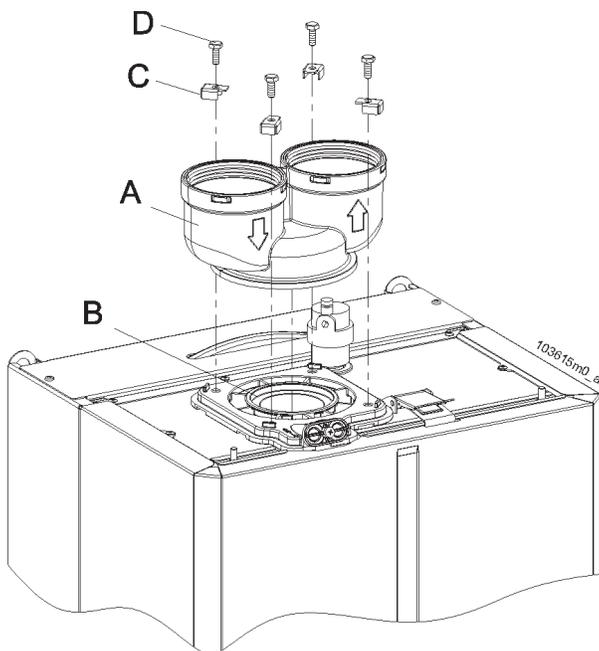


Figure 10-10 Polypropylene boiler adaptor

10 - INSTALLATION - Vent and combustion air

10.9.1 - Polypropylene two pipes air intake/vent connections

Combustion air piping and vent piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.

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 10-10 shows fitting "A" that can freely turn 360 degrees for optimum installation versatility (see section 10.9.2 for P/N of "A" fitting).
Tork screws "D" at 2 lbf ft (3 Nm).

Pipes or elbows connected directly to the boiler, must be mechanically secure. Follow these instructions to connect pipes to the boiler (make reference to Figure 10-11):

1. Prepare the two collars "G" with Band Clamps "E" and "F";
2. Insert the end of Band Clamp "L"

3. Insert vent pipe "N" into boiler adapter "A"
4. Tight the two Band Clamps "O" to mechanically secure vent pipe "N" to boiler adapter "A". Tight band clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).

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 two pipes venting system (elbows and extensions), as illustrated in Figure 10-12. 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 band clamps as shown in Figure 10-12. Follow this procedure:
 1. Insert the Male side ("B") of a vent pipe into the Female side "A" of another;
 2. Use Band Clamp "C" to keep the two pipes together;
 3. Use screws "E" to tighten the Band Clamp onto both pipes. Tight band clamps with a tork of 1.5 - 2 lbf ft (2-3 Nm).

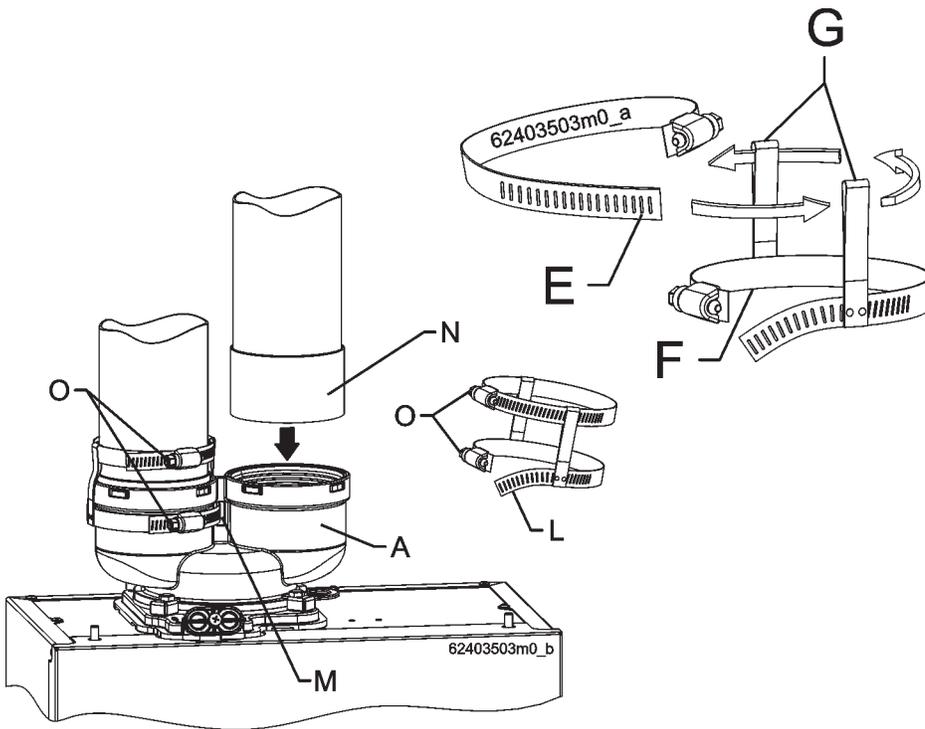


Figure 10-11 Polypropylene Venting connection

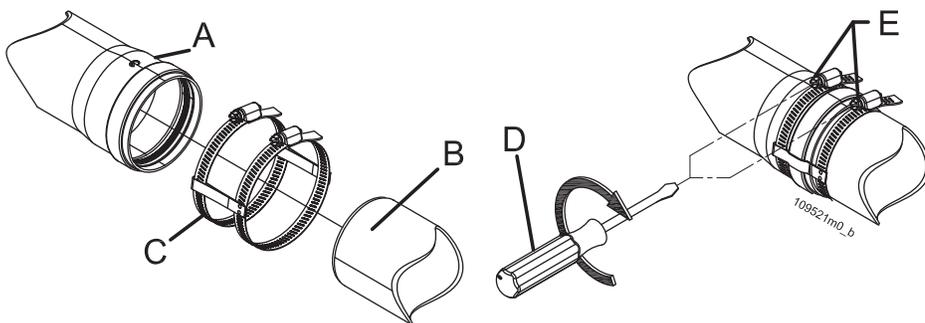
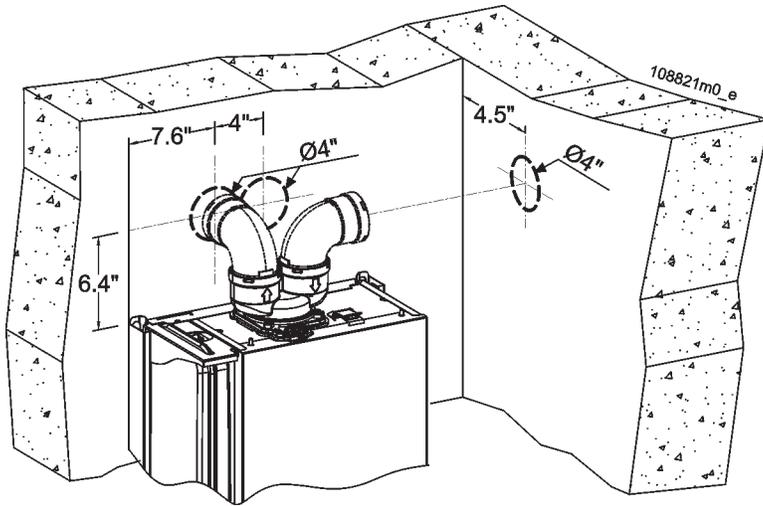


Figure 10-12 Connecting extensions and elbows

10 - INSTALLATION - Vent and combustion air

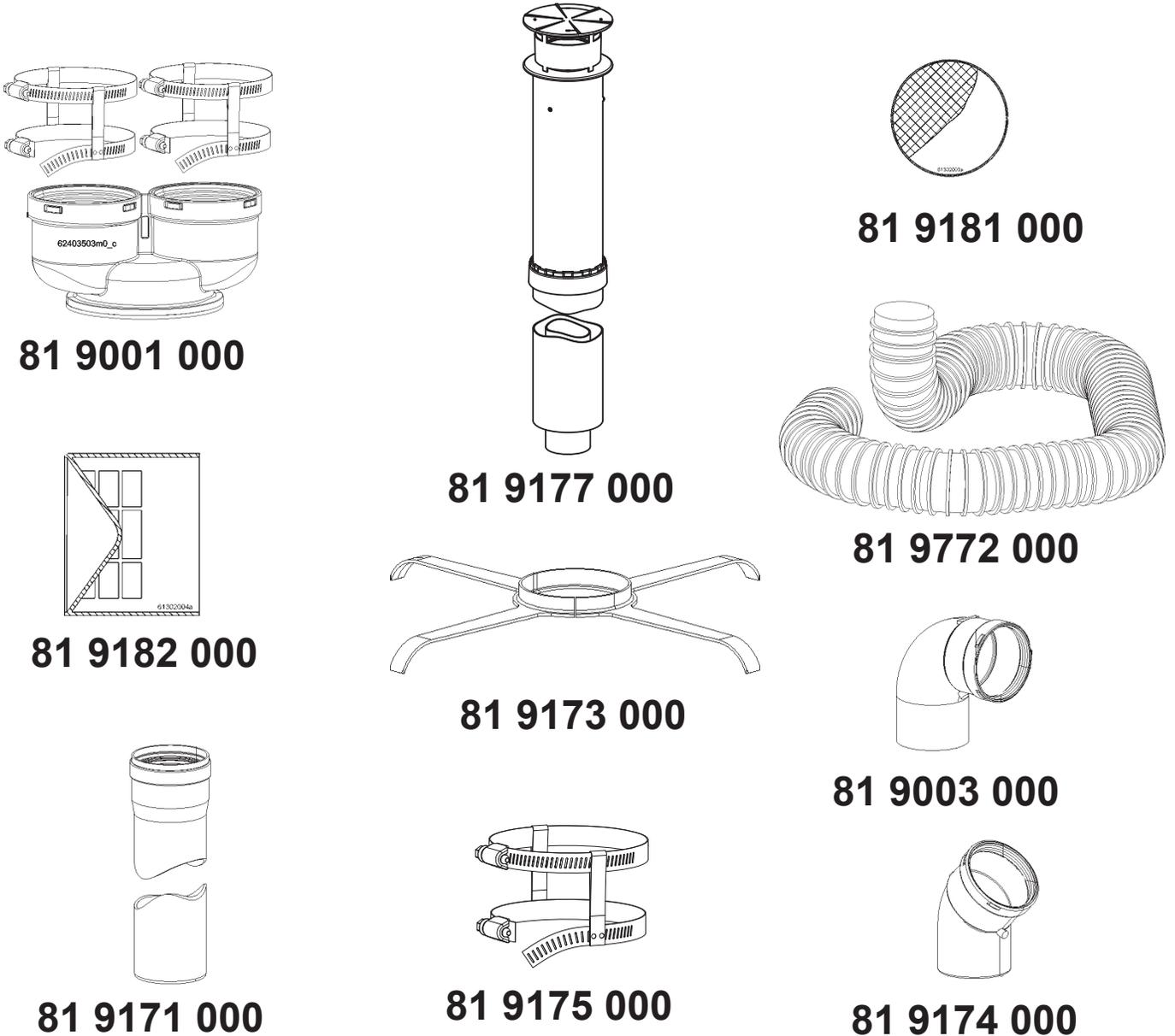


10.9.2 - Polypropylene two pipes system components

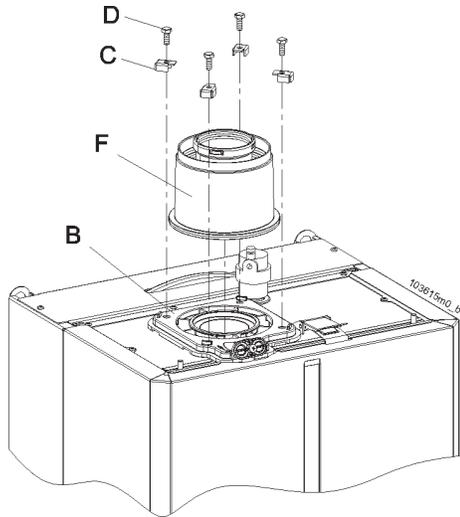
Some of the most commonly used components for installing the two pipes polypropylene vent and combustion air systems are listed below:

- P/N 81 9001 000 - Two pipes adaptor 80/80 PP
- P/N 81 9171 000 - 3ft PP M/F extension
- P/N 81 9772 000 - 60 ft PP flexible extension
- P/N 81 9173 000 - Spacer for PP flexible extension
- P/N 81 9003 000 - 90° PP M/F in line elbow
- P/N 81 9174 000 - 45° PP M/F in line elbow
- P/N 81 9175 000 - Secure clamp for PP extensions
- P/N 81 9177 000 - Split vertical terminal
- P/N 81 9181 000 - Air intake grid
- P/N 81 9182 000 - Flue exhaust grid

Figure 10-13 Dimensions of two pipes system



10 - INSTALLATION - Vent and combustion air



- B = Connection flange
- C = Fasten clip
- D = Fasten clip screw
- F = Coaxial vertical adaptor

Figure 10-14 Installation of the coaxial fitting

10.9.3 - Polypropylene concentric system

The boiler is not supplied with the fittings 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 10-14 shows how to install the Coaxial fitting above the boiler. Tight the screws "D" of Figure 10-14 with a tork of 2 lbf ft (3 Nm)

! WARNING!!! Carefully follow installation steps below, for the coaxial pipe assembly (elbows and extensions), as illustrated in Figure 10-15. 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 10-15) together;
2. drill a suitable hole "3" with a drill "4" (see Figure 10-15) 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.

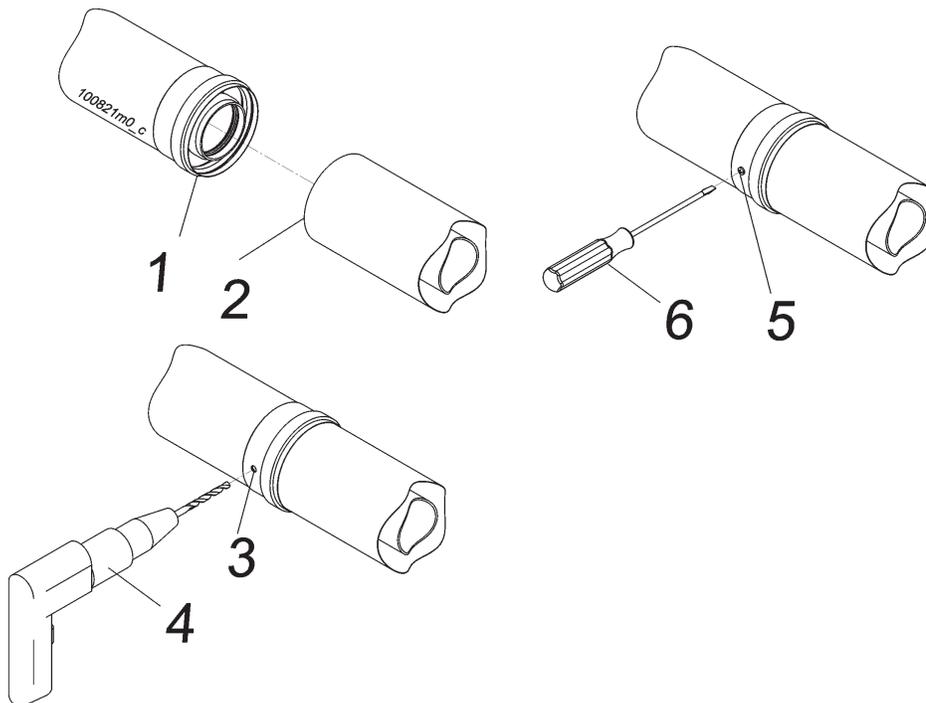
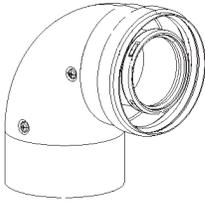


Figure 10-15 Securing extensions and elbows together

10 - INSTALLATION - Vent and combustion air



81 9183 000

10.9.4 - Polypropylene concentric system components

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

P/N 81 9183 000 - In line 90° PP coaxial M/F elbow

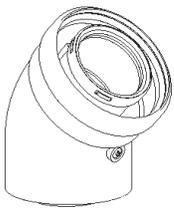
P/N 81 9176 000 - In line 45° PP coaxial M/F elbow

P/N 81 9170 000 - 3ft (1m) PP coaxial extension

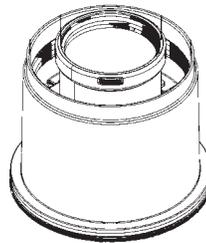
P/N 81 9005 000 - PP coaxial roof end piece

P/N 81 9184 000 - PP Coaxial wall end piece

P/N 81 9185 000 - PP straight coaxial adaptor



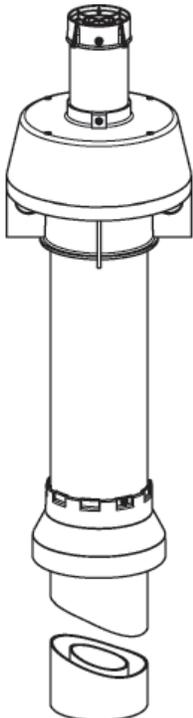
81 9176 000



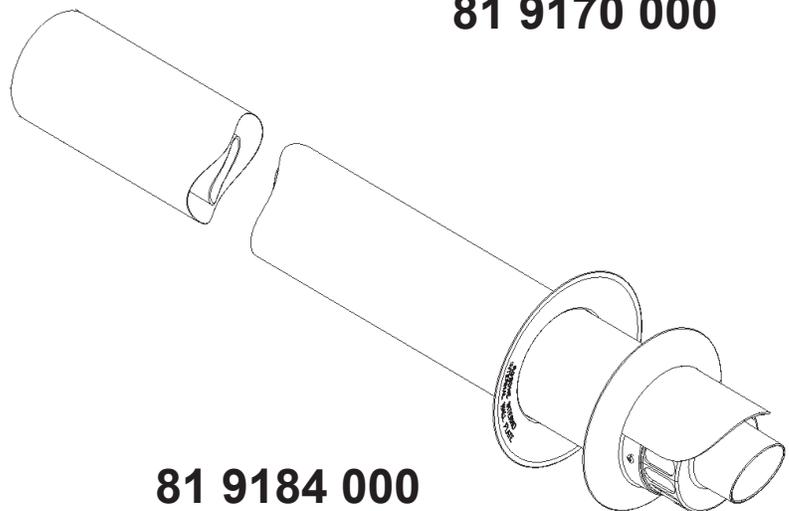
81 9185 000



81 9170 000



81 9005 000



81 9184 000

10 - INSTALLATION - Vent and combustion air

10.10 - 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 10.1, 10.2, 10.3, 10.4, 10.5, 10.7, 10.8 and 10.9.

! WARNING!!! Use only the materials, vent systems, and terminations listed in Tables 10-1 and 10-2. **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 10-1).

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).

10.10.1 - 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

10 - INSTALLATION - Vent and combustion air

10.10.2 - Determine location

Locate the vent termination using the following guidelines:

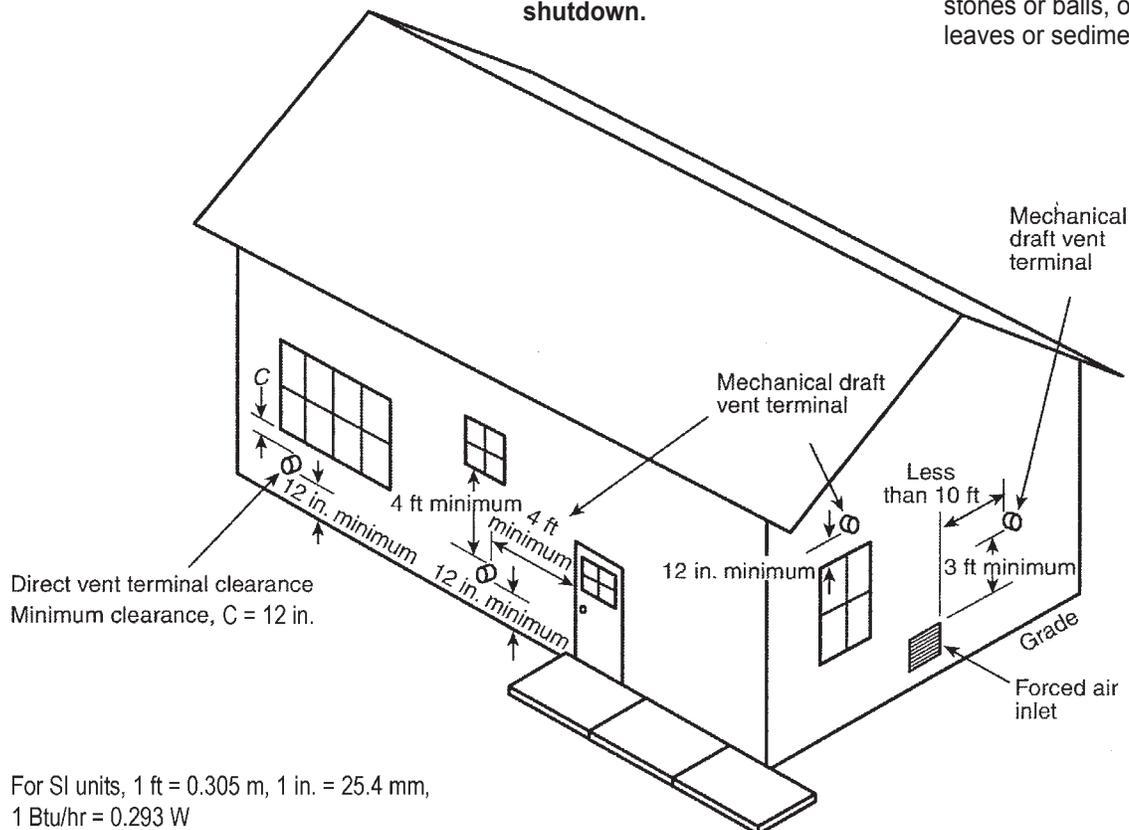
1. The total length of piping for vent must not exceed the limits given in the Section 10.4.
2. You must consider the surroundings when terminating the vent:
 - a. Position the vent termination where vapors will not damage nearby shrubs, plants or air conditioning equipment or be objectionable.
 - b. 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 10-12 or 10.13.

5. Maintain clearances as shown in Figure 10-11 (**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.



WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 10-12 or 10-13. Excessive length exposed to the outside could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown.



For SI units, 1 ft = 0.305 m, 1 in. = 25.4 mm,
1 Btu/hr = 0.293 W

NFPA54FIG-A12.9

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

Figure 10-16 Vent position of a Direct vent boiler and of a Mechanical draft boiler (not sealed)

10 - INSTALLATION - Vent and combustion air

10.11 - Sidewall termination - Two pipes

10.11.1 - 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.

10.11.2 - 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 10.4.
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.

10 - INSTALLATION - Vent and combustion air

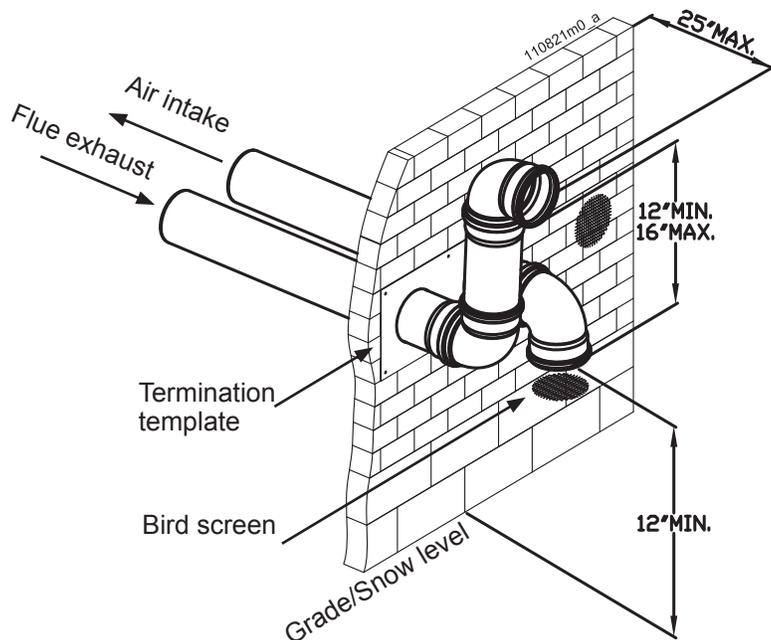


Figure 10-17 Two pipes sidewall termination of air and vent

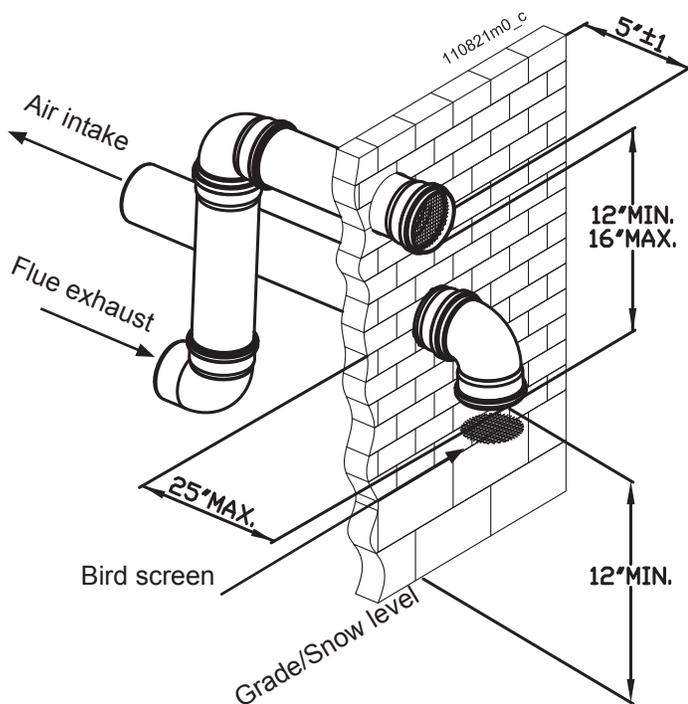


Figure 10-18 Two pipes sidewall termination of air and vent (if space permits)

3. The air piping must terminate in a down-turned elbow as shown in Figures 10-17 and 10-18. 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 10-17 and 10-18.

! WARNING!!! Do not exceed the maximum lengths of the outside vent piping shown in Figures 10-17 and 10-18. 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 10-17 and 10-18. 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.

10 - INSTALLATION - Vent and combustion air

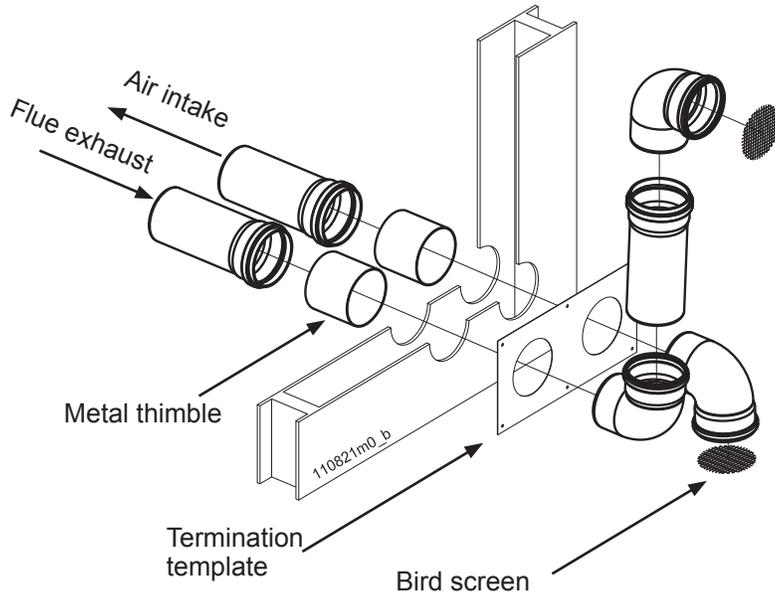
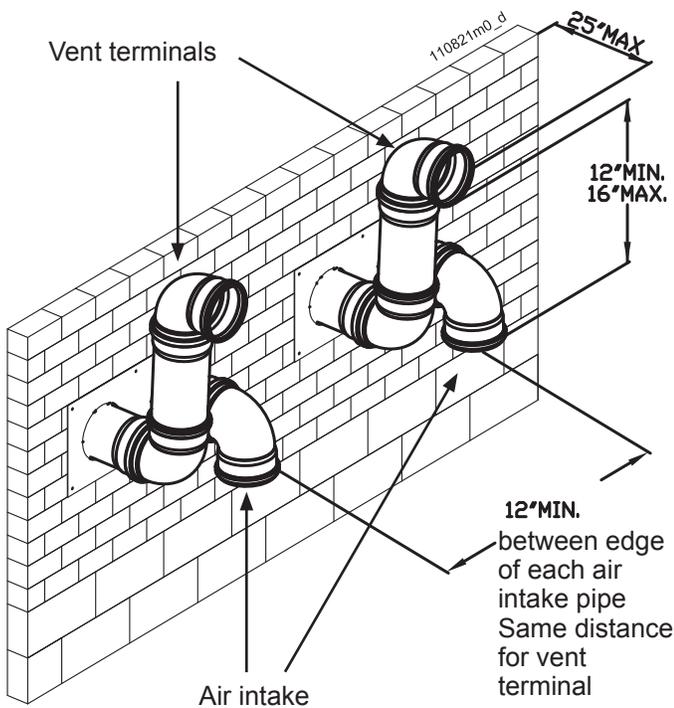


Figure 10-19 Two pipes sidewall termination assembly



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

Figure 10-20 Two pipes multiple boilers vent terminations

10.11.3 - 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 10-19.
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.

10.11.4 - Termination and fittings

1. The air termination coupling must be oriented at least 12 inches above grade or snow line as shown in Figures 10-17 and 10-18.
2. Maintain the required dimensions of the finished termination piping as shown in Figures 10-17 and 10-18.
3. Do not extend exposed vent pipe outside of the building more than what is shown in Figures 10-17 and 10-18. Condensate could freeze and block vent pipe.

10.11.5 - Multiple vent/air terminations

1. When terminating multiple boilers terminate each vent/air connection as shown in Figure 10-20.

! 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 10-20 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.

10 - INSTALLATION - Vent and combustion air

10.12 - Sidewall termination – Concentric vent

10.12.1 - Description and usage

The termination kit must terminate outside the structure and must be installed as shown in Figure 10-21. The required concentric termination kit as well as combustion air and vent pipe materials are listed in Tables 10-1 and 10-2.

10.12.2 - Sidewall termination installation

1. Determine the best location for the termination kit (see Figure 10-21).
2. The total length of piping for vent or air must not exceed the limits given in Section 10-4.
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.

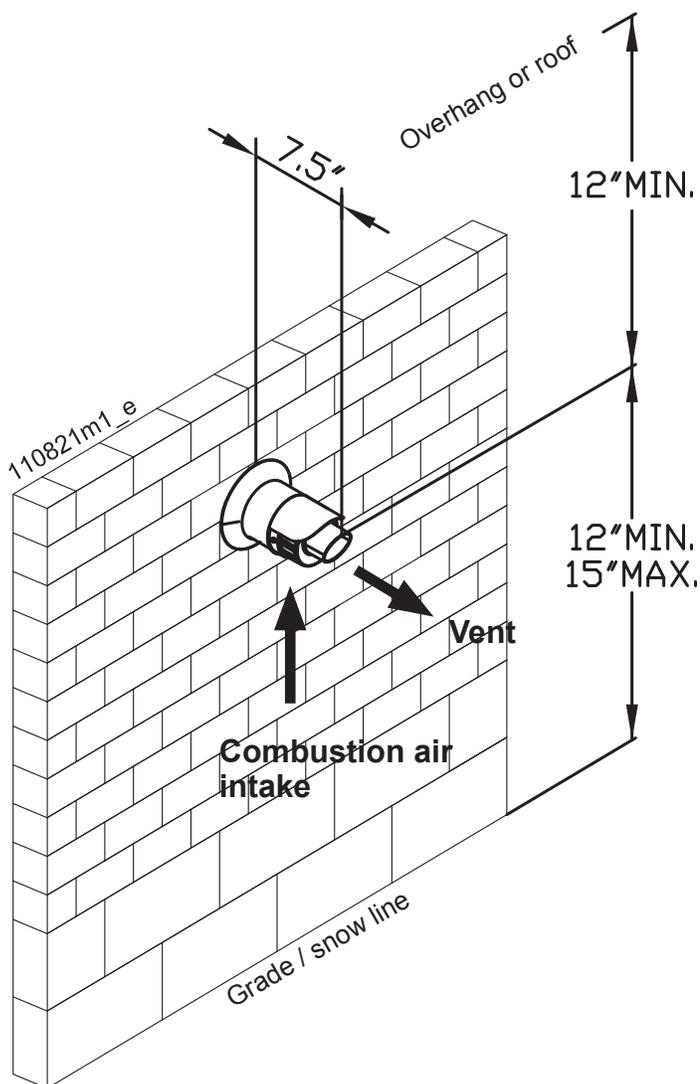


Figure 10-21 Concentric sidewall termination clearances

NOTICE Ensure termination location clearance dimensions are as shown in Figure 10-21.

10 - INSTALLATION - Vent and combustion air

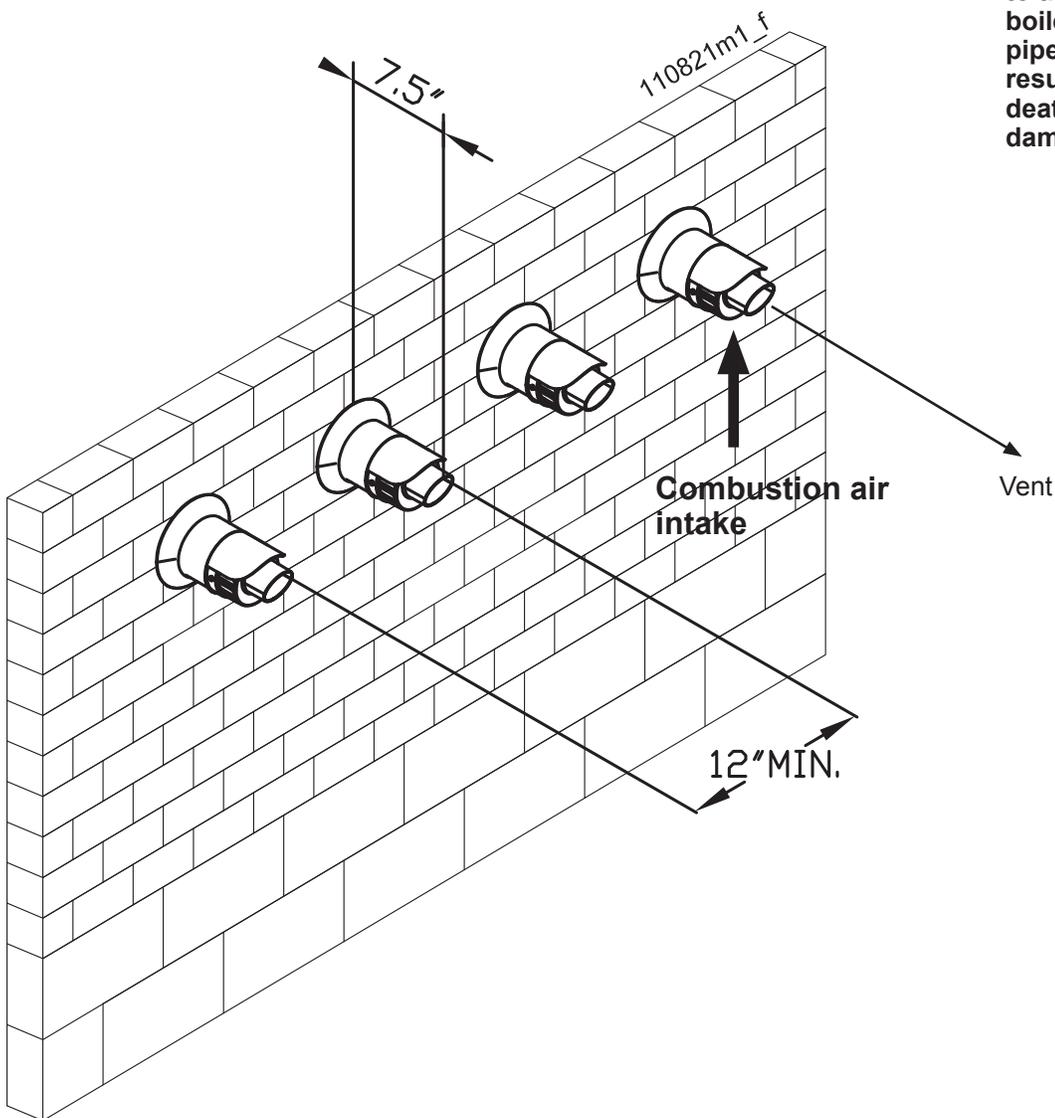
CAUTION!!! DO NOT use field-supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.

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

10.12.3 - 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 10-22. 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 10-22 Concentric sidewall multiple boilers terminations

10 - INSTALLATION - Vent and combustion air

10.13 - 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.

10.13.1 - 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 10-4.
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.

10.13.2 - 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 10-23 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.

10.13.3 - Termination and fittings

1. Prepare the vent termination and the air termination elbow (Figure 10-23) by inserting bird screens.
2. The air piping must terminate in a down-turned 180° return pipe as shown in Figure 10-23. 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 10-23.
4. Do not extend exposed vent pipe outside of building more than shown in Figure 10-23. Condensate could freeze and block vent pipe.

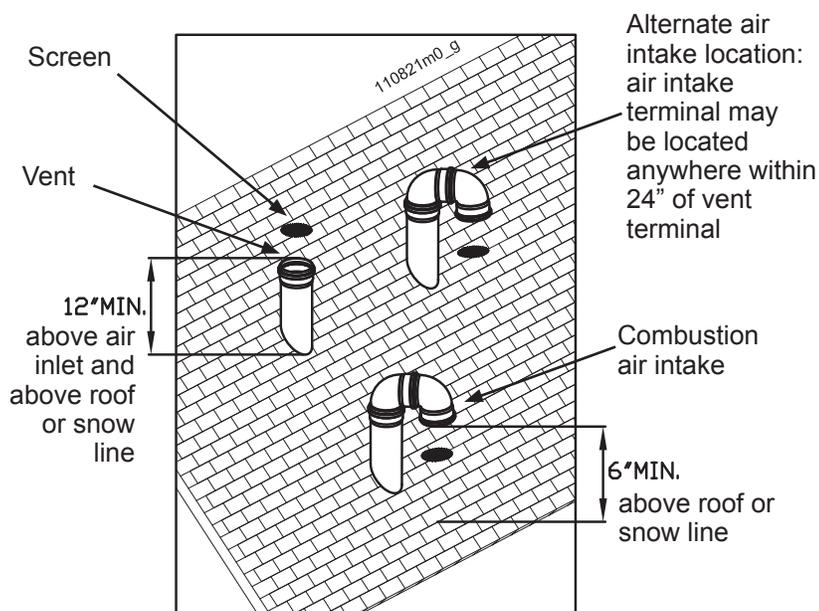


Figure 10-23 Two pipes vertical terminations of air and vent

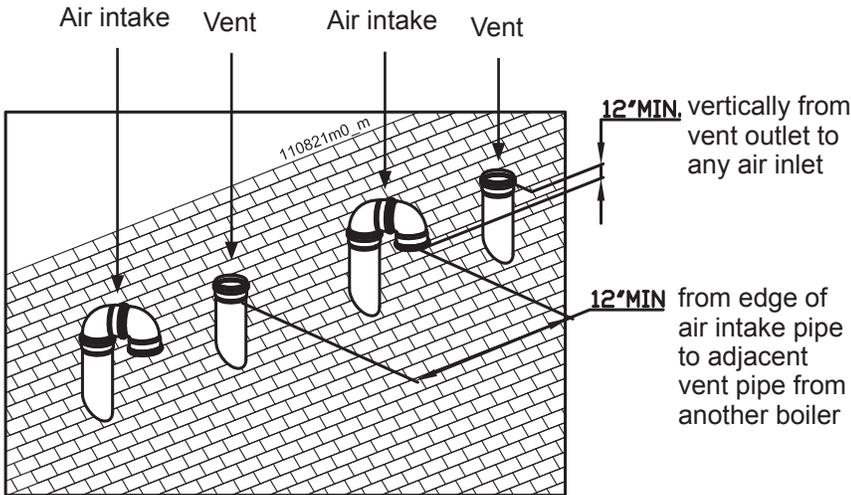
10 - INSTALLATION - Vent and combustion air

10.13.4 - Multiple vent/air terminations

1. When terminating multiple boilers, terminate each vent/air connection as shown in Figures 10-24 and 10-25.

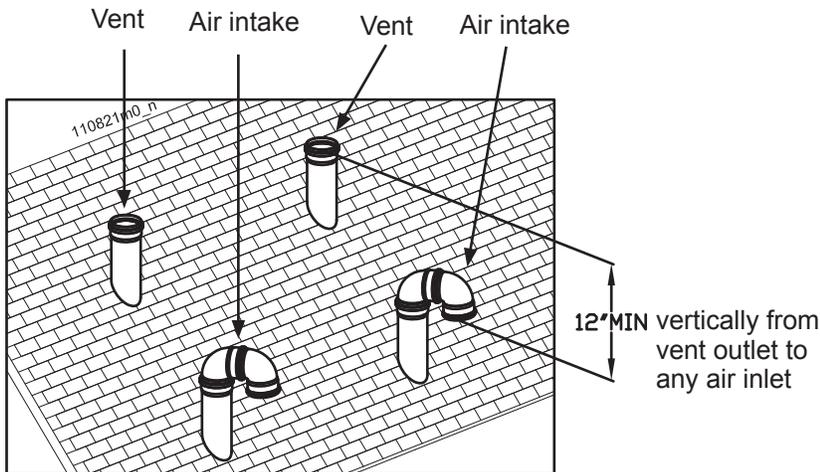
! WARNING!!! Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death, or substantial property damage.

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 10-24). 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.



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

Figure 10-24 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 10-25 Alternate vertical terminations with multiple boilers

10 - INSTALLATION - Vent and combustion air

10.14 - Vertical termination – Concentric vent

10.14.1 - 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 10-26.

10.14.2 - 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 10-4.
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.

10.14.3 - Vertical termination installation

1. Determine the best location for the termination kit (see Figure 10-26).
2. The total length of piping for vent or air must not exceed the limits given in Section 10-4.
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 vent kit manufacturer's instruction.

NOTICE Ensure termination location clearance dimensions are as shown in Figure 10-26.

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 10-26.

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.

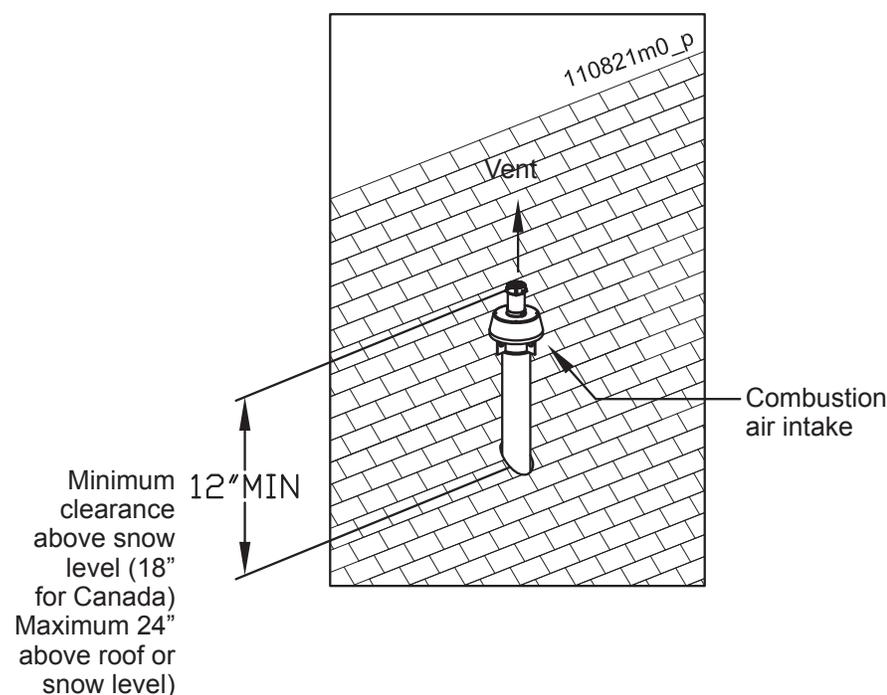


Figure 10-26 Concentric vertical termination

10 - INSTALLATION - Vent and combustion air

10.14.4 - Multiventing vertical terminations

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see Figure 10-27).

! 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 10-27. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

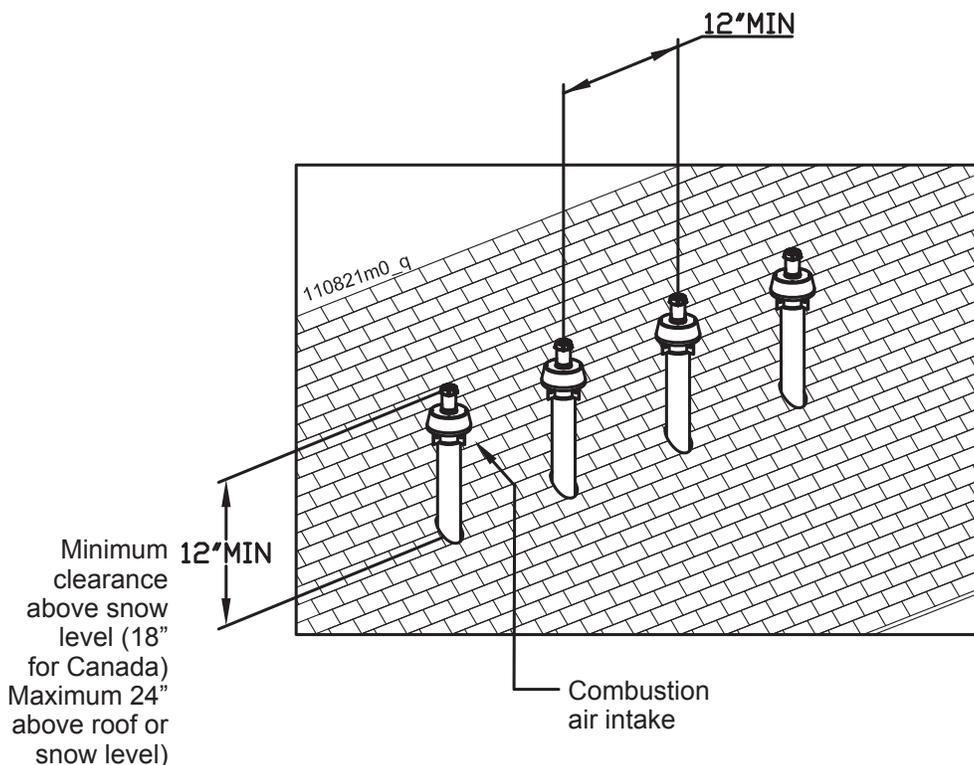


Figure 10-27 Concentric multiple boilers vertical terminations

10 - INSTALLATION - Vent and combustion air

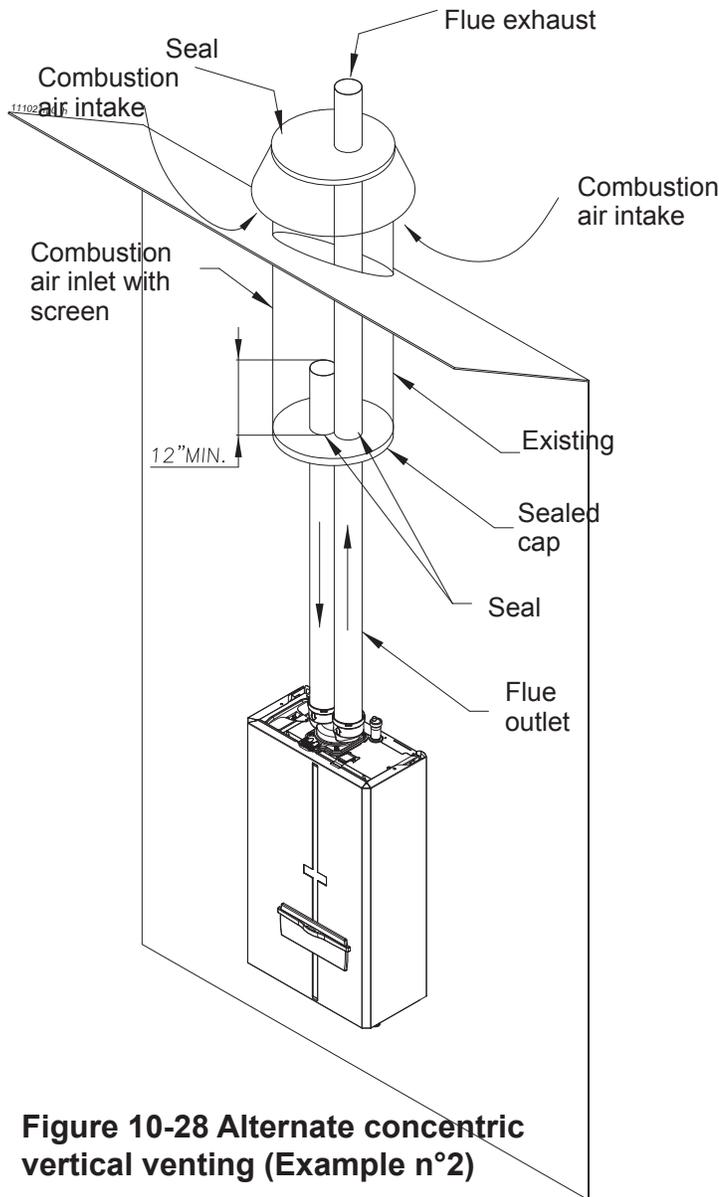


Figure 10-28 Alternate concentric vertical venting (Example n°2)

Approved venting materials must be used as specified in Tables 10-1 and 10-2. 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 10-4. 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 10.2 for a list of corrosive contaminants and sources. Two example scenarios of a concentric venting arrangement are shown for illustrative purposes in Figures 10-28 and 10-29.

10.14.5 - 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 10-28 and 10-29.

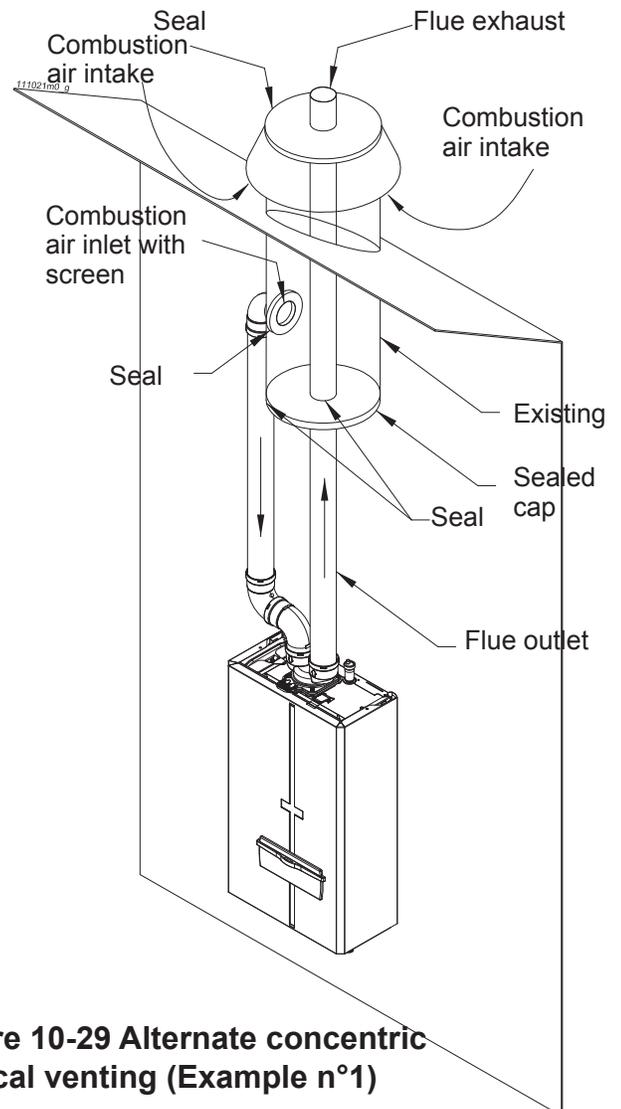


Figure 10-29 Alternate concentric vertical venting (Example n°1)

10 - INSTALLATION - Vent and combustion air

10.15 - Existing vent as a chase

Follow all existing termination and clearance requirements of section 10-13.

The maximum allowable equivalent vent and air intake lengths for this venting arrangement are to be determined from Section 10-4.

Use only approved venting materials listed in Tables 10-1 and 10-2.

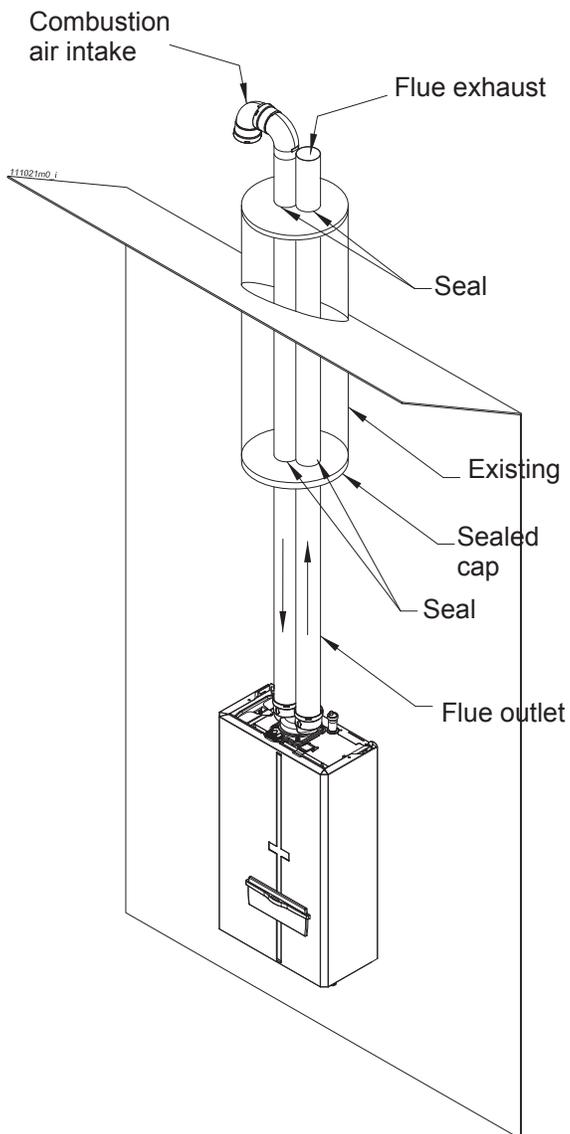


Figure 10-30 Alternate concentric vertical venting (Example n°3)

11 - INSTALLATION - Gas supply

11.1 - 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!

Connecting gas supply piping:

1. Refer to Figure 11-1 to pipe gas to the boiler.
 - a. Install ground joint union for servicing, when required.
 - b. Install a manual shutoff valve in the gas supply piping, outside boiler jacket
 - c. Manual main shutoff valves, must be identified by the installer.
2. Install sediment trap / drip leg. (see Figure 11-1).
3. Support piping with hangers, not by the boiler or its accessories.

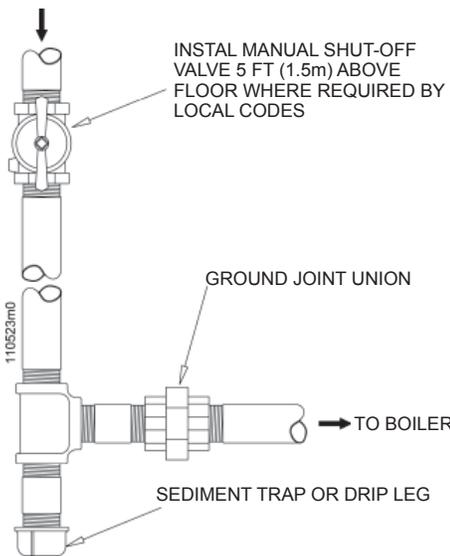


Figure 11-1 Gas supply piping

! WARNING!!! Do not attempt to support the weight of the piping with the boiler or its accessories. Failure to comply could result in severe personal injury, death, or substantial property damage.

4. Purge all air from the gas supply piping.
5. Before placing the boiler in operation, check the boiler and its gas connection for leaks.
 - a. The appliance must be disconnected from the gas

supply piping system during any pressure testing of that system at a test pressure in excess of 1/2 PSIG (3.5 kPa).

- b. The appliance must be isolated from the gas supply piping system by closing a manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.5 kPa).
- c. The appliance and its gas connection must be leak tested before placing it in operation.

! 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!

6. 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.

! WARNING!!! Failure to apply pipe sealing compound can result in severe personal injury, death, or substantial property damage.

! WARNING!!! This boiler is 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 following instruction on Section 11.6. Failure to comply could result in severe personal injury, death, or substantial property damage.

TABLE 11-1 GAS PIPE CAPACITY

Nominal Iron Pipe Size	Pipe length								
	10'	20'	30'	40'	50'	60'	80'	100'	150'
	Gas Pipe Capacity (ft ³ /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 11-2 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

103422m0

11 - INSTALLATION - Gas supply

11.2 - Pipe sizing for natural gas

Refer to Tables 11-1 and 11-2 for pipe length and diameter. Based on rated boiler input (divide by 1,000 to obtain ft³/hr). For additional gas pipe sizing information, refer to ANSI Z223.1 (or B149.1 for Canadian installations).

Natural gas supply pressure requirements

1. Pressure required at the gas valve inlet pressure port:
 - Maximum 13"W.C. with no flow (lockup) or with boiler on.
 - Minimum 3"W.C. with gas flowing (verify during high fire).
2. 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.

11.3 - 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 instruction on Section 11-6. 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 pressure port:
 - Maximum 13"W.C. with no flow (lockup) or with boiler on.
 - Minimum 3"W.C. with gas flowing (verify during high fire).

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

11.4 - Check inlet gas supply

! WARNING!!! DO NOT adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

The gas piping must be sized for the proper flow and length of pipe, to avoid excessive pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1"W.C., the meter, regulator, or gas line is undersized or in need of service.

1. Follow Section 12.7 to check the inlet gas supply pressure.
2. If gas supply pressure is within normal range and no adjustments are needed, proceed on to step 4.
3. If the gas pressure is out of range, contact the gas utility, gas supplier, qualified installer or service agency to determine the necessary steps to provide proper gas pressure to the boiler.
4. Turn the power switch to the "OFF" position.
5. Shut off the gas supply at the manual gas valve in the gas piping to the appliance.
6. After verifying the correct gas pressures disconnect the manometer, turn the screw in pressure connection "D" in Figure 12-3, 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!

11.5 - 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*, and check and adjust the CO₂ level following Section 12-9.

For installations in Canada, the boiler is rated for installations up to 2,000 ft (609 m).

11 - INSTALLATION - Gas supply

11.6 - Convert the boiler from Natural Gas to Propane gas or viceversa

! 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 jurisdiction 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 LP 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 11-2 for the correct one for the type of gas used. Verify that the

stamping on the orifice matches the gas type (See Table 11-3).

- 11 - turn on power to the boiler;
- 12 - Turn completely counter clockwise the screw E of Figure 11-2;
- 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 11-3.
- 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 11-3. If not within range of value shown, malfunctions will occur.

! WARNING!!! The CO (carbon monoxide) level should not exceed values given in Table 11-3, 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.

Gas Type	TY value setting	Min. supply pressure	Max. supply pressure	Orifice	CO ₂ content at high fire	CO ₂ content at low fire	O ₂ content at high fire	O ₂ 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

Table 11-3 Settings of the boiler for NATURAL GAS and LP GAS

11 - INSTALLATION - Gas supply

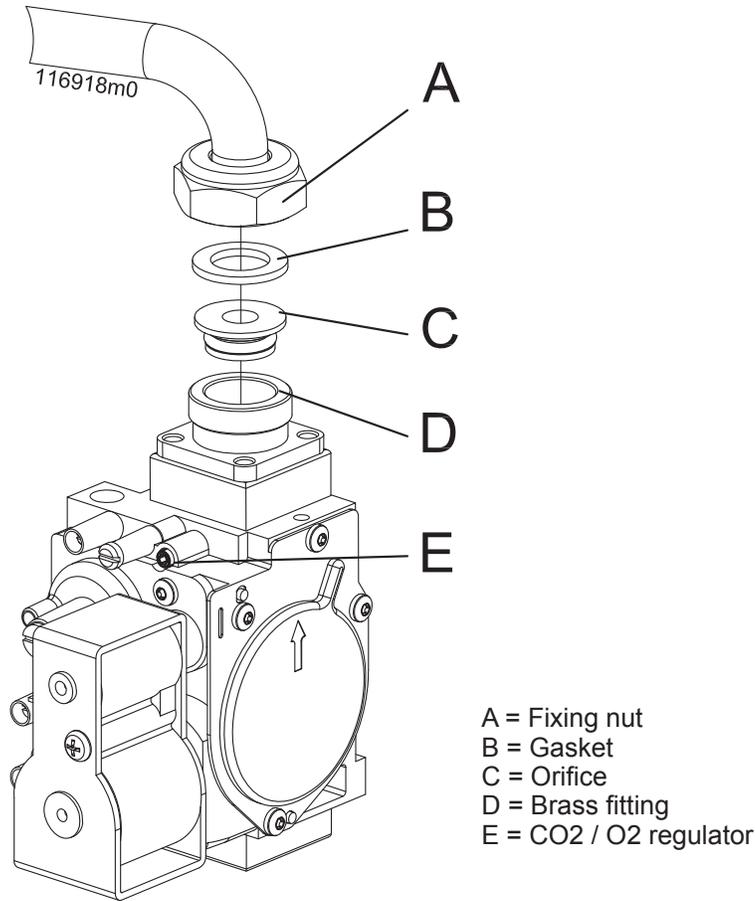


Figure 11-2 Gas valve

! WARNING!!! If the combustion levels are not within the range given in Table 11-3 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 11-3 or Figure 11-4), stating the new type of gas adjustment of the boiler.

a - Apply the label in Figure 11-4 if the boiler has been converted to **LP GAS**;

b - Apply the label in Figure 11-3 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 n° _____ by _____

(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).

62408125.r01

Figure 11-3 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 n° _____ by _____

(name and address of organization making this conversion, who accepts the responsibility for the correctness of this conversion).

62408139.r01

Figure 11-4 Label for LP gas boiler

12 - START-UP

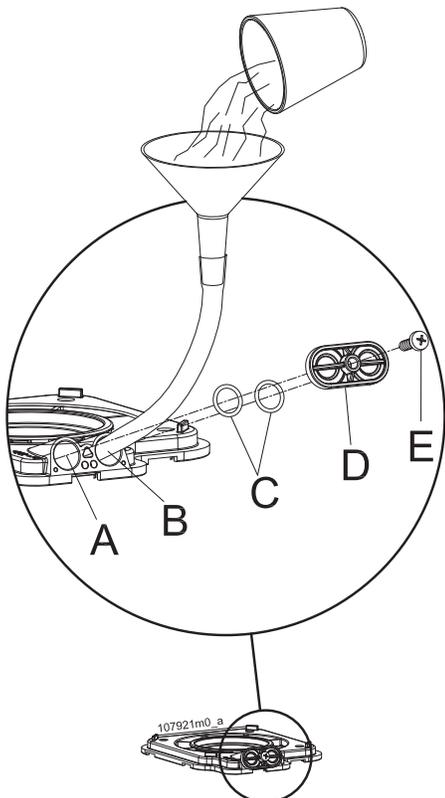
12.1 - Operating

Before starting the boiler, the following must be done.

12.1.1 - User instructions

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

- ☞ Make sure that the user understands that combustion air and ventilation openings must not be restricted/closed/ or modified in any way.
- ☞ 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 in any way.
- ☞ Make sure that the user keeps this manual and all other documentation included with the boiler.



- A = Combustion air probe
- B = Flue exhaust probe
- C = Gaskets
- D = Probe cap
- E = Screw

Figure 12-1 Filling the condensate trap

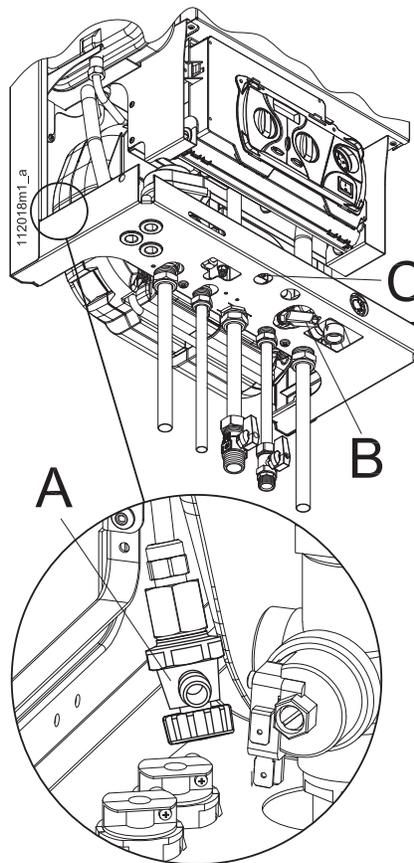
☞ Make sure that the user understands never to tamper with gas control settings and the risk of CO poisoning should an unauthorized individual do so.

☞ Make sure that the user knows how to adjust temperatures, controls and the room thermostats for maximum efficiency.

12.1.2 - Filling the condensate trap

The condensate trap is positioned inside the boiler as shown in Figure 3-1, item "46". It must be filled with water to prevent the leakage of flue gases from the condensate drainpipe, item "41" in Figure 3-1. To fill the condensate trap proceed as follows:

1. unscrew "E" screw (Figure 12-1);
2. remove flange "D" and O-Rings "C" (Figure 12-1);



- A = Purging valve for the domestic hot water heat exchanger

Figure 12-2 Domestic heat exchanger

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 12-1);
4. re-install flange "D" and O-Rings "C" and reinstall screw "E" (Figure 12-1);

! WARNING!!! If boiler stays off for more than 3 months, repeat the above operation to again fill the condensate trap. Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

12.1.3 - 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.

To fill the heating system, proceed as follows:

1. open the automatic air vent, shown as item "1" in Figure 3-1, 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 "13" in Figure 13-1, 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).

12.1.4 - Filling the domestic hot water heat exchanger (160-C model only)

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 air purging cock "A" shown in Figure 12-2 and place the end in an empty bucket or sink;
2. open the cock "A" shown in Figure 12-2 until air can be heard escaping;
3. once the water runs clear of air bubbles close the cock "A" shown in Figure 12-2;
4. remove the tube and check that there are no water leaks.

12.1.5 – Auto-purging the heating system

Each time the on/off power switch, item "12" in Figure 13-1, 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 3-1 must be opened.

12.1.6 – Delay to light-on

Each time the on/off power switch, item "12" in Figure 13-1, is switched on, a delay timing sequence of 3 minutes begin.

12 - START-UP

12.2 - 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.
- ☞ 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!

12.3 - 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 = 13 in.W.C. (33.0 mbar).
Minimum supply pressure = 3 in.W.C. (7.6 mbar).

LP Gas

Maximum supply pressure = 13 in.W.C. (33.0 mbar).
Minimum supply pressure = 3 in.W.C. (7.6 mbar).

12.4 - 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 inside the boiler. Follow instruction on Section 11.6.

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

12.5 - Start-up of the boiler

1. Open the manual gas shut off valve (Figure 11-1).
2. Switch the on/off power switch, item "12" in Figure 13-1, to "on".
3. Upon start-up, an **F** is shown for 3 minutes while the boiler goes through its heating system purge cycle. To by-pass this stage, press the  and  keys together until a blinking **F** appears. Then press the  button.
4. Rotate knobs "7" and "11" shown in Figure 13-1 to the desired temperature.
5. 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 13.10.
6. If the pump indicator is illuminated, item "6" in Figure 13-1, but the pump is not running, it may be stuck. If this is the case, shut-off the boiler and release the pump.

7. 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.

12.6 - 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 "12" in Figure 13-1) to on;
2. close the room thermostat to create a call for heat;
3. turn knobs "7" and "11" in Figure 13-1 to their maximum position;
4. wait a few minutes for the burner to light-up as indicated when light "3" shown in Figure 13-1 stays illuminated.
5. close the manual gas shutoff valve, see Figure 11-1;
6. after 2 minutes, the display must show L01;
7. open the manual gas shutoff valve, see Figure 11-1;
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!

12.7 - Gas supply pressure checking

! WARNING!!! DO NOT

adjust or attempt to measure gas valve outlet pressure. The gas valve is factory-set for the correct outlet pressure. This setting is suitable for natural gas and propane, requiring no field adjustment. Attempting to alter or measure the gas valve outlet pressure could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

! WARNING!!! DO NOT

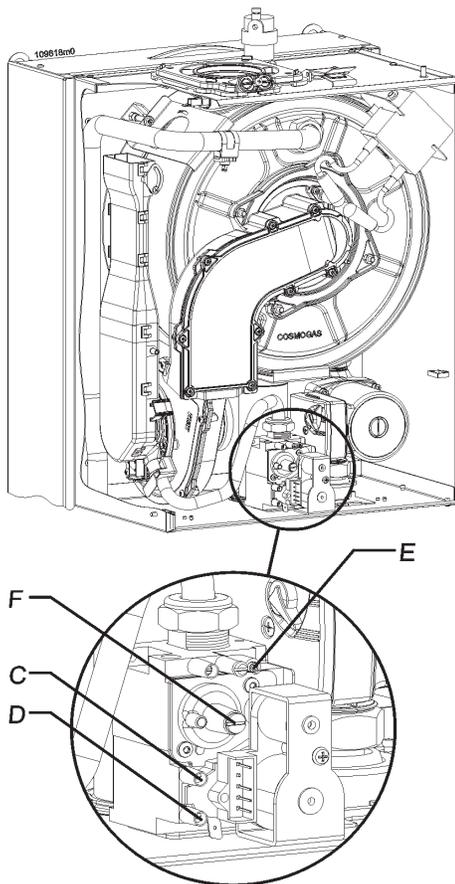
adjust the screws "E" and/or "F" (Figure 12-3). These screws are factory-set for the correct gas flow and outlet pressure. Attempting to alter the gas valve setting could result in damage to the valve, causing potential severe personal injury, death, or substantial property damage.

After verifying the correct gas pressures:

1. close the manual gas shut-off valve, Figure 11-1;
2. disconnect the manometer;
3. turn the screw in pressure connection "D" in Figure 12-3, clockwise until snug;
4. 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!



C - Service pressure probe
 D - Inlet gas pressure probe
 E - CO2 adjusting screw
 F - Factory adjusted regulator (Should never be touched)

Check the gas supply pressure by following the steps below:

1. close the manual gas shut-off valve, Figure 11-1;
2. follow the steps in Section 14.2 to remove the front cover;
3. turn the screw in pressure port "D" shown in Figure 12-3 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 12-3;
5. open the manual gas shut off valve, Figure 11-1;
6. check that the gas supply pressure does not exceed 13 in.W.C.;
7. turn the power switch to on and generate a heat demand by turning knob "7" shown in Figure 13-1 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 3 in.W.C. (7.6 mbar).

If the gas supply pressure does not fall within 3 and 13 in.W.C. adjust the

Figure 12-3 Gas valve

12 - START-UP

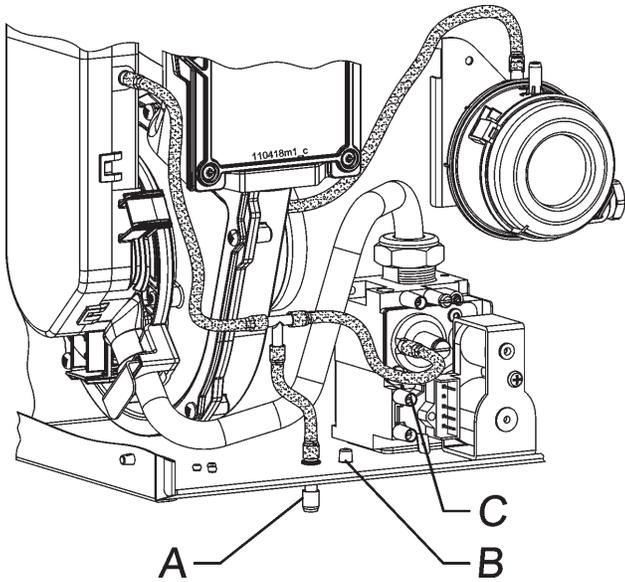


Figure 12-4 Combustion air pressure probes

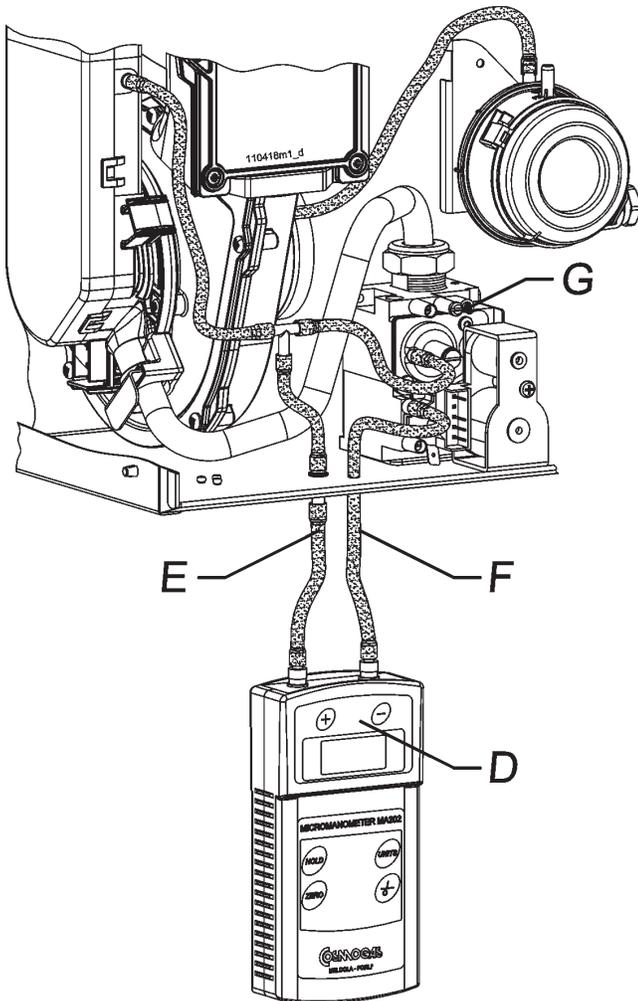


Figure 12-5 Differential pressure gauge connections to checking the combustion air pressure

12.8 - 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 referring to Figures 12-4 and 12-5:

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 11-1;
4. open the boiler casing following Section 14.2;
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 12-5;
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 12-5, to get the correct pressure reading;
10. replace panel "H" of Figure 14-1 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 "12" in Figure 13-1;
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 15, row "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 and check that the flue and air intake length meet with the rules of Section 10.4.;
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", re-install everything like on Figure 12-4. Close the boiler casing and turn the manual gas shut off valve on.

12.9 - Checking and adjusting CO2 levels

Table 11-3 lists the correct CO2 ranges for a boiler running at normal operating conditions at an altitude below 2000 ft (600m). CO2 values outside of the ranges given in Table 11-3 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 12-6:

! WARNING!!! During this procedure compare also CO (carbon monoxide) reading, with the value given in Table 11-3. If this is higher, STOP the boiler and call the Factory service department (see phone number on the last cover page). Failure to comply with this requirement could result in severe personal injury, death or substantial property damage.

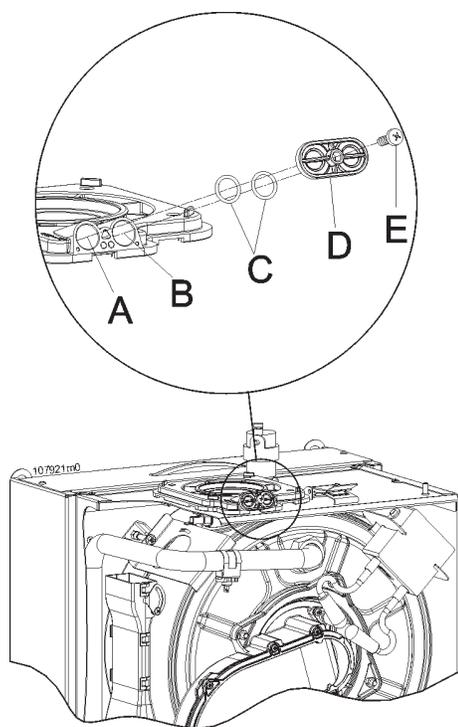
NOTE: During the 10 minutes override mode, if the demand on the boiler is low causing the flue gas temperature to increase rapidly, boiler will go into lock out code L06.

To reactivate it, press **Reset** button.

- carefully remove items "E", "D" and "C" from the combustion air/ vent fitting;
- generate a call for heat; and wait up the boiler is light-on;
- press the **+** and **-** keys for more than 10 seconds, the display will show a blinking **F** ;
- 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;
- wait 2 to 3 minutes for the CO2 to stabilize;
- insert the probe of a calibrated combustion analyzer into port "B" and take a flue gas sample;
- compare the CO2 reading with the high fire range given in Table 11-3,

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 operating on the "E" screw of Figure 12-3. Use a 2.5mm Allen Wrench to turn the screw (clockwise to reduce the CO2 level, counter-clockwise to increase the CO2 level) in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value;

- When CO2 level match the value of Table 11-3, seal screw "E" with red paint or nail polish to discourage tampering.
- 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;
- wait 2 to 3 minutes for the CO2 to stabilize;
- compare the CO2 reading with the low fire range given in Table 11-3, making sure to use the range for the gas type in use. The CO2 reading must be inside the specified range; If not, STOP the boiler and call the Factory service department (see phone number on the last cover page).
- press the **Reset** button to return the boiler to its normal operating mode.
- close flue and air probe "A" and "B" of Figure 12-6.
- turn knob "7" and "11" of Figure 13-1 to the OFF position.



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

Figure 12-6 Combustion analysis probes

12.10 - 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 “Installer’s menu”, in Section 13.17, 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 12-1.

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

12.11 - Domestic hot water flow rate adjustment (160-C model only)

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 “12” in figure 13-1, to “on”;
2. adjust control “11” as shown in Figure 13-1, 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 domestic hot water mixing valve (field installed), to its maximum value);
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 (Field installed) 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 15, under the heading “instantaneous d.h.w. production [rise 75 °F (42 °C)]”.

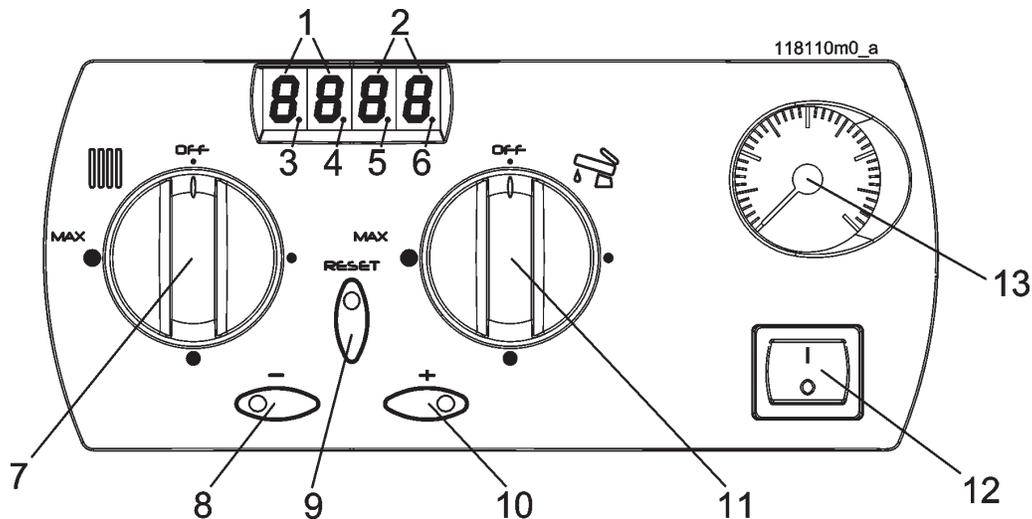
12.12 - Cold start boiler

The boiler has a “cold start” working 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 run for freeze protection as described in Section 13.14.

“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

Table 12-1 - Correspondence table to set space heating input



- 1 - Display of the parameters
- 2 - Display of the parameters 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 out of 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 13-1 Instrument panel

13.1 - 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 13-1, shows **FILL** to indicate that it is necessary to restore the correct pressure. Open the filling cock and check the pressure on the pressure gauge “13” of Figure 13-1, it must reach a pressure of 20 psi (1,5 bar) and the indication **FILL** must disappear; 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 air bubbles present.

13.2 - 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 13.16). During functioning display “1” of Figure 13-1, displays the status of the boiler and display “2” (see Figure 13-1) shows the value of the parameters. The various operating statuses are shown in Section 13.18. Within the “Users’ Menu” (see Section 13.16) 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 13-1. 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).

13.3 - Displays

During normal operations, the parameters’ display “1” and the values’ display “2” (see Figure 13-1) remain permanently on, if the “Energy Saving” mode has not been activated (See Section 13.15). The parameters which can be displayed are shown with their meaning in the table shown in Section 13.18.

13.4 - 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 (Call service department, do not attempt to repair it);
4. on initial start-up, the appliance carries out a light-on delay lasting 3 minutes. This is indicated by the appearance of **F** on the display;
5. wait 3 minutes until the end of the **F**;
6. turn knob "7" of Figure 13-1 until it reaches the heating temperature desired. Turn knob "11" of Figure 13-1 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 two times, after which if it fails to start-up, it will shut down and the display will show **L** 01.

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 (Load of an indirect water heater);
- **C** if a heating request is active;
- **0** if there is no domestic water or heating request active.

13.5 - 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 13-1 to the minimum.

13.6 - 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 13-1. 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 13-1 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 room temperature, turn knob "7" to gradually higher values.

CAUTION!!! do not demandate the antifreeze protection of your house to the boiler. Because the boiler's function depends from the electrical supply and from the gas supply and because a trouble can stops the boiler, if you live your house, it is mandatory install a safety device that alarm the user in a case the house will reach a temperature near 50°F (10°C).

13 - USE

13.7 - Adjusting the domestic hot water temperature

The domestic hot water temperature is adjusted by turning knob “11” shown in Figure 13-1. When the knob is turned, the display, item “1” in Figure

13-1, 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.

13.8 - 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 13-1. 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:

- A - small systems with radiators where the thermostat is installed in a room whose temperature is characteristic of all the other rooms;
- 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.
- C - 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.

13.9 - Heating system type selection

The boiler is factory set for wall stat control as per Section 13.8.

The heating system type can be changed by going to the “Installers’ Menu” in Section 13.17 and changing the **CH** parameter. One of the three following heating modes can be selected:

- CH = 00 “Wall stat control”: follow Section 13.8;
- CH = 01 “Outdoor reset control”: follow Section 13.10 (an outdoor temperature sensor is required);
- CH = 02 “Outdoor reset control with room compensation control”: follow Section 13.10.1 to 13.10.6 (an outdoor temperature sensor is required):

13.10 - 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 13-2 and 13-3, 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 13-2 and 13-3. 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.

13.10.1 - 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.
- 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.

13.10.2 - 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 13-2 and 13-3. 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 very 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 13-1 can be used to make the small line shifts, “b”, shown in Figure 13-3. These shifts will change the supply water temperature up to 18 °F (10 °C).

13.10.3 - Outdoor reset: setting parameters

Refer to Section 13.16 and set:

- **OR** = "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 high 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 or 176 °F (80 °C) for "high temperature" systems.

Refer to Section 13.17 and set:

- **Cn** = This parameter must always be at value of 1.
- **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.

13.10.4 - 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 design outside winter temperature is 23 °F (-5°C). In the event that the climatic zone is different, adjust the parameter **OR**, to obtain a calculated temperature of 176 °F (80 °C) for the typical design outside winter temperature, see Figure 13-2.

13.10.5 - 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 13-1, to raise or lower the calculated temperature and match the "Minimum heating temperature" on an advanced or delayed basis.

13.10.6 – Outdoor reset with room compensation

While in the “Installers’ Menu” (section

13.17) set the **CH** parameter to 02. 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 Figures 13-2 and 13-3. The value by which the curve moves downwards can be adjusted by the

Ln parameter present in the “Installers’ Menu”, see section 13.17.

The **Ln** 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 13.10.1. 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 13-1)

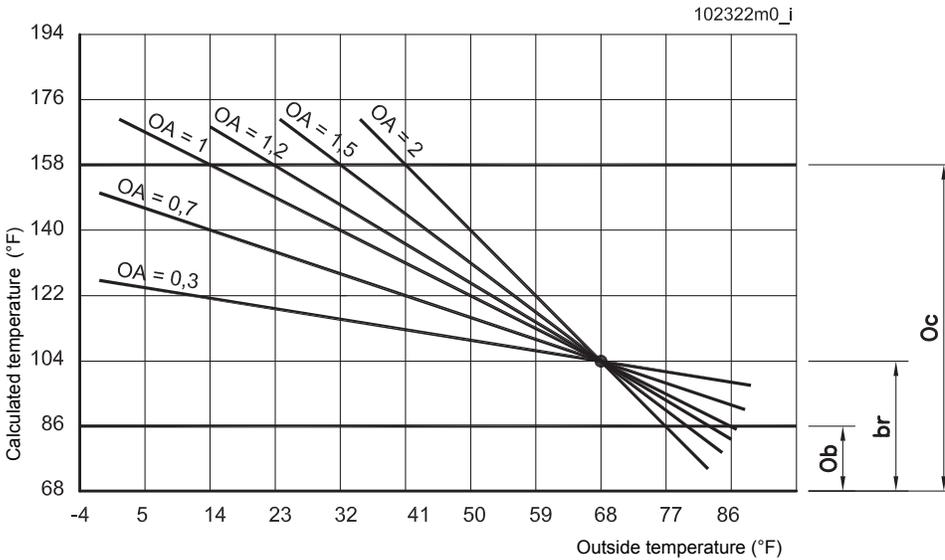


Figure 13-2 - Graph of the outdoor reset adjustment (influence of parameters “br”, “OA”, “Ob” and “Oc”)

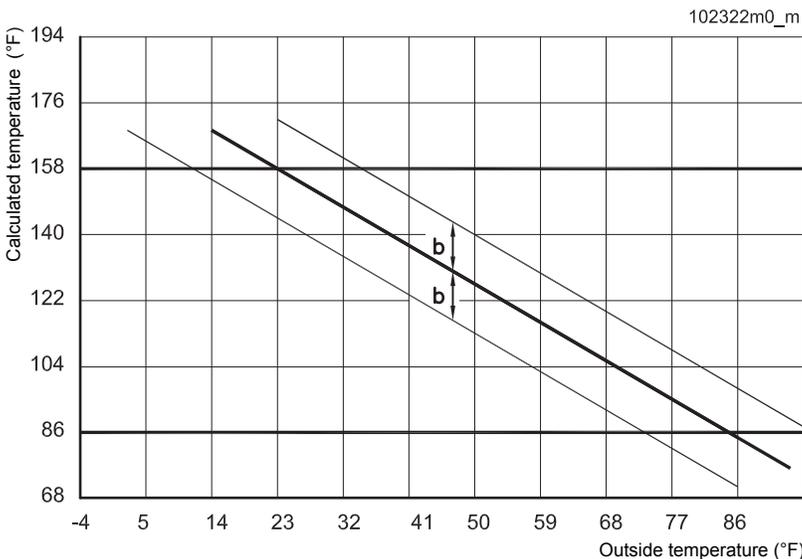


Figure 13-3 - Graphs of the outdoor reset adjustment (influence of parameter “b”)

13 - USE

13.11 - Boiler switch settings

The control board shown in Figure 3-1, item "14", 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 functions.

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 without production of 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 serie of boilers
3	OFF	Heating pressure switch, disabled
	ON	Heating pressure switch, enabled
4	OFF	EBM PAPST brand fan
	ON	Position not available for this serie of boilers
5	OFF	Combination boiler for heating and D.H.W.
	ON	Boiler for heating only
6	OFF	High temperature heating service, 86°F (30°C) to 176°F (80°C)
	ON	Low temperature heating service, 68°F (20°C) 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	Position not available for this kind of boilers

13.12 - 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 **A01** 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 boiler restarts again.

CAUTION!!! This freeze protection function is conceived to protect the boiler only, not the heating system.

13.13 - 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.

CAUTION!!! Because the boiler's freeze protection function depends from the electrical supply and from the gas supply, it is mandatory install a safety device that alarm the user in a case the boiler room will reach a temperature near 35°F (2°C)

13.14 - Boiler's 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 13-1, in the OFF position.

Once the boiler has reached a temperature of 45 °F (7 °C), the heating pump will automatically comes on. 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 long time it should be drained per Sections 14.10 and 14.11.

13 - USE

13.15 - Display in energy saving mode

If desired, the display, item “1” and “2” in Figure 13-1, 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 13.17

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.

13.16 - “Users’ menu”

When entering the “Users’ menu”, the display, item “1” in Figure 13-1, will start blinking indicating that a change of mode has taken place. To access the “Users’ menu” (see also Section 17 to better understand the several menus):

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

4. 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 13-1
0A	Adjustment of the curve angel as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: 0,1 to 5,0
0b	Adjustment of the “Minimum heating temperature” as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: see section 13.10.3
0c	Adjustment of the “Maximum heating temperature” as shown in Figure 13-2 when outdoor reset is active per section 13.9.	Setting range: see section 13.10.3
b	Adjustment of the parallel shift of the curve as shown in Figure 13-3 when outdoor reset is active per section 13.9.	The adjustment is made by turning knob “7” shown in Figure 13-1. The selected curve can be shifted up or down by 36 °F (20 °C).
c	Display of the calculated heating temperature when outdoor reset is active per section 13.9, or display of the temperature set by knob “7” shown in Figure 13-1.	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 13-1.	Temperature display only with a range between 104 °F (40 °C) and 158 °F (70 °C), see section 13.7.
E	Display of last error code registered, Section 13.18.2	Error code display per section 13.18.2
L	Display of last lockout occurred, Section 13.18.1	Lockout code per section 13.18.1

13 - USE

13.17 - “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 13-1, will start to blink indicating that a change of mode has taken place. To access the “Installers’ Menu” just (see also Section 17 to better understand the several menus):

1. press and hold the **Reset** button down for 12 seconds until the **U 1** parameter is displayed;
2. press and release the **Reset** button to scroll through the list of the parameters;
3. once the parameter has been displayed, it can be changed using the **+** or **-** keys;
4. 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 the 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 13-1
U 1	Boiler temperature, measured by U1 sensor	Value in °F (cannot be changed)
U 2	DHW temperature, measured by U2 sensor	Value in °F (cannot be changed)
U 3	Domestic cold water (or ind. water heater) temperature , measured by U3 sensor	Value in °F (cannot be changed)
U 4	Outdoor temperature, measured by U4 sensor	Value in °F (cannot be changed) (displayed only if outdoor reset is active, as per section 13.9)
U 5	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)
U 6	High limit temperature, measured by U6 sensor	Value in °F (cannot be changed)
U 7	Flue gas temperature, measured by U7 sensor	Value in °F (cannot be changed)
U 8	Heating return temperature, measured by U8 sensor	Value in °F (cannot be changed)
t y	Type of basic setting of control board	Can be changed in accordance with Section 11.6
r t	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 12.10

Continue

13 - USE

Continued

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM "2" OF FIGURE 13-1
CH	Heating service functioning mode	Can be changed (see Section 13.9): 00 = thermostatic adjustment; 01 = outdoor reset; 02 = outdoor reset with room compensation;
Cn	Reaction to external temperature	Keep always at value of 1
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 13.10.3 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 13.10.6 for its adjustment.
L	Boiler knobs' status	Can be changed: 01 = knobs presents; 00 = knobs absent.
S	Display "1" and "2" as per figure 13-1 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 13.15)
PS	Parameter disabled for this kind of boiler	
dE	Domestic sensitivity setting	No influence in this kind of boiler
St	Minimum domestic setpoint during sleep mode	No influence in this kind of boiler
CP	Proportional band of the heating PID modulation	Must be maintained at 20 value
CI	Integral of the heating PID modulation	Must be maintained at 40 value
RC	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.
dP	Indirect water heater priority selection: Value expressed in minutes.	Can be changed between 00 (function disabled) and 99 minutes. Default value is 00 (See also section 9.1.1).

13.18 - Diagnostics

During the normal operation of the boiler, the display, of Figure 13-1, continually shows the operating status of the boiler as shown below (see also section 17):

PARAMETER	PARAMETER REFERENCE	DISPLAY READ OUT (ITEM "2", FIGURE 13-1)
O	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 = Boiler temperature (°F) Domestic hot water service active for more than 120 minutes. Turn domestic hot water to OFF position to reinstate heating. 02 = Data connection interrupted between cascade boilers
FILL	System pressure too low, system must be filled. See section 13.1.	No display
d	Domestic hot water service active	Domestic hot water temperature (°F)
C	Heating service active	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 13.18.1 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 13.18.2 for decodification).
F	Auto-purging procedure that last 3 minutes in progress (see section 13.4).	Boiler temperature (°F)
AL	Boiler in Anti-legionella functioning (see section 13.12)	Storage tank temperature (°F)

13 - USE

13.18.1 - Diagnostics: “L” lock-outs

“L” Code	Lock-out description	Checks to make	Solutions
L01	No flame detected after three ignition attempts.	<p>Check:</p> <ul style="list-style-type: none"> a-correct gas supply pressure (see section 12.7); b-ignition spark (see section 14.4); c-correct combustion air pressure (see section 12.8); 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 14.12.4) 	<ul style="list-style-type: none"> 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 electrode position and gap as per section 14.4; 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 resistance 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 12.9). Check the flame detection electrode (section 14.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.
L02	Flame extinguishes three times.	<p>Check:</p> <ul style="list-style-type: none"> a-that the ionization current is set at a value greater than 60 (follow procedure in section 14.12.4); b-check that gas valve open fast enough; 	<ul style="list-style-type: none"> a-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 12.9). Check the flame detection electrode (section 14.4) and if necessary replace it, check the integrity of the flame detection electrode electrical wires. b-Following procedure as per Section 14.12.4, check few times if passing from low fire to high fire the flame extinguish. If extinguish, change the gas valve.
L03	Boiler temperature is over 203° F (95°C).	<ul style="list-style-type: none"> a-Check that the circulator pump is working; b-Check if the water flow is not less than 5 GPM 	<ul style="list-style-type: none"> a-If the circulator pump is bad, replace it, if is good, replace the power control board. b-If the water flow is less than 5 GPM check for any zone valves that must be opened.
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 210°F (99°C)	<p>Check:</p> <ul style="list-style-type: none"> a - that the electrical resistance of the flue gas sensor complies with the graph in Section 14.13; b - that the efficiency of the boiler is over 86% 	<ul style="list-style-type: none"> 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 14.13;	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	<p>Check that:</p> <ul style="list-style-type: none"> a - the electrical resistance of the two sensors corresponds with the graph in section 14.13; b -check that the heating water flow is not too low. 	<ul style="list-style-type: none"> 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.

13 - USE

13.18.1 - 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
L21	Boiler in blocking state for more than 20 hours		Press RESET button and check the blocking error “E” on Section 13.18.2
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 (31°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);	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	b - check that there are no water leaks in the heating system.	
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 14.13; d - check that the electrical connection cables between the flue pressure switch, the flue sensor and the power control board.	a -If there 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

13 - USE

13.18.2 - 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 14.13; 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 14.13; 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 14.13; 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 or indirect water heater sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; 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
E08	U6 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; 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	U1 boiler temperature sensor circuit short-circuited.	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; 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 14.13; 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

13 - USE

13.18.2 - 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 14.13; 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 14.14; 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 indirect water heater temperature sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 14.13; 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 14.13; 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 17)	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	Move ON switches 7 an set again the correct tY value (see section 17)	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 the heating pump is running. Check if the flow switch contact is stuck	The pump should not run and the contact should open The contact must be open
E53	Heating flow switch open	Check if the heating pump is running. Check if the flow switch contact is broken	The pump should run and the contact should closed The contact must be closed

14 - MAINTENANCE

14.1 - Care and maintenance

This section must be brought to the attention of the user by the installer so that the user can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of the boiler. User must check its boiler follow Table 14-1 column "User maintenance".

The installer must also inform the user that the lack of proper care and maintenance of this boiler and any fuel burning equipment may result in a hazardous condition.

Installer should discuss contents of the Section 13 (User's section) with the user.

A trained and qualified service technician should perform the inspection listed in these instructions before each heating season and at regular intervals.

! 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!

! 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!

Service and maintenance schedules

Service Technician	User maintenance
<p>Annual Startup:</p> <ul style="list-style-type: none"> - Address reported problems (Follow section 14.1.1); - Check all piping for leaks (Follow section 14.1.2) - Verify flue and air lines in good condition and sealed tight (Follow section 14.1.3); - Check system water pressure/system piping/ expansion tank (Follow section 14.1.4); - Check control settings (Follow section 14.1.5); - Check ignition and flame sense electrodes (Follow section 14.1.6); - Check wiring and connections (Follow section 14.1.7); - Perform performance verification (Follow section 14.1.8); - Flame inspection (Follow section 14.1.9); - Check flame signal (Follow section 14.1.10); - Clean the heat exchanger if flue temperature is more than 72°F (40°C) above return water temperature (Follow section 14.3). - Clean condensate trap (Follow section 14.5). - Check combustion air pressure (Follow section 12.8). - Check relief valve (Follow section 14.1.11); - Check for any air inside the domestic heat exchanger (Follow section 12.1.4); - Check any domestic water softener if need any maintenance (follow softener's manufacturer instructions) 	<p>Daily:</p> <ul style="list-style-type: none"> - Check boiler area (Follow section 14.1.12); - Check pressure gauge (Follow section 14.1.13); <p>Monthly:</p> <ul style="list-style-type: none"> - Check vent piping (Follow section 14.1.14); - Check air piping (Follow section 14.1.15); - Check condensate drain system (Follow section 14.1.16); <p>Every six month:</p> <ul style="list-style-type: none"> - Check boiler piping (gas and water) for leaks (Follow section 14.1.17); <p>End of season months:</p> <ul style="list-style-type: none"> - Shut boiler down (unless boiler used for domestic hot water) (Follow section 14.1.18);

Table 14-1 - Service and Maintenance Schedules

14 - MAINTENANCE

! 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!

! 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!!! Before performing any maintenance operations, shut the boiler off, close the manual gas shut-off valve (Figure 11-1) and shut off electrical power to the boiler. Follow the Operating Instructions outlined in the section "SAFETY INSTRUCTIONS" (Beginning of the manual).

14.1.1 - Address reported problems

Inspect any problems reported by the owner and correct before proceeding.

14.1.2 - Check all piping for leaks

CAUTION!!! Eliminate all system or boiler leaks. Continual fresh makeup water will reduce boiler life. Minerals can build up in sections, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking lines and correct any problems found.

3. Check for gas leaks: using soap solution, check for gas leaks from meter to boiler including all pipes and fittings and boiler connections. Use liquid soap solution for all gas testing.

! WARNING!!! Do not check for gas leaks with an open flame. Use the bubble test. Failure to use the bubble test or check for gas leaks with an open flame can cause explosion, severe personal injury, death, or substantial property damage.

14.1.3 - Verify flue and air lines in good condition and sealed tight;

1. Check for obstruction, condensation, corrosion and physical damage, water stains, any signs of rust, other corrosions or separation of the vent and air intake piping.
2. Check outside terminations. Screens and louvers should be free of any debris and must be cleaned as required.

14.1.4 - Check system water pressure/system piping/expansion tank;

1. Check water piping and accessories for leaks. Slightest leaks should be corrected.
2. Check the system to be full of water and pressure to remain stable at correct setting on gauge.

14.1.5 - Check control settings

1. Thermostat Test (control knobs items "7" and "11", Figure 13-1): Set knobs setting to low enough to end call for heat. Gas valve should close and burner should stop firing. Fan go into a post purge, then shuts off.
2. Control Safety Shutdown test: with the burner firing, close the manual gas shut off valve (Figure 11-1) . Gas valve should close and burner should stop firing. The boiler will try for ignition three times after this, then should lock out with an "L 01" error shown on the display. Open the manual gas shut-off valve, and press the "Reset" button to return to normal operation.

14.1.6 - Check ignition and flame sense electrodes

1. Remove the fan-burner assembly unit (see section 14.3)
2. Remove any deposits accumulated on the ignition/flame sense electrode using sand paper.
3. Check electrodes positioning meet Section 14.4

14.1.7 - Check wiring and connections

Inspect all boiler wiring, making sure wires are in good condition and securely attached.

14.1.8 - Perform performance verification.

1. Start boiler and perform a combustion test as per section 12.9.
2. Verify cold fill pressure is correct and that operating pressure does not go too high (could be a problem on the expansion tank).

14.1.9 - Flame inspection

1. Inspect flame through observation window.
2. If the flame is unsatisfactory at either high fire or low fire, clean the burner following section 14.3.

14.1.10 - Check flame signal

1. Follow section 14.12.4 to check the flame signal.
2. At high fire and low fire the flame signal shown on the display should be within values given in Section 15, header "ionisation current". A lower flame signal may indicate a fouled or damaged flame sense electrode. If cleaning the flame sense electrode does not improve, ground wiring is in good condition, and ground continuity is satisfactory, replace the flame sense electrode.

14.1.11 - Check relief valve

Inspect the relief valve and lift the lever to verify flow. Before operating any relief valve, ensure that it is piped with its discharge in a safe area to avoid severe scald potential. Read Section 7.2.2 before proceeding further. Relief valve should be re-inspected at least once every three years, by a licensed

14 - MAINTENANCE

plumbing contractor or authorized inspection agency, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally.

Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. This inspection must only be conducted by a plumbing contractor or authorized inspection agency – not by the user.

⚠ WARNING!!! Failure to re-inspect the boiler relief valve as directed could result in unsafe pressure buildup, which can result in severe personal injury, death, or substantial property damage.

14.1.12 - Check boiler area

⚠ WARNING!!! To prevent potential of severe personal injury, death, or substantial property damage, eliminate all materials discussed below from the boiler vicinity and the vicinity of the boiler combustion air inlet.

If contaminants are found: Remove products immediately from the area. If they have been there for an extended period, call a qualified service technician to inspect the boiler for possible damage from acid corrosion.

If products cannot be removed, immediately call a qualified service technician to re-pipe vent and air piping and locate vent termination/air intake away from contaminated areas.

1. Combustible/flammable materials -- Do not store combustible materials, gasoline or any other flammable vapors or liquids near the boiler. Remove immediately if found.

2. Air contaminants -- Products containing chlorine or fluorine, if allowed to contaminate the boiler intake air, will cause acidic condensate in the boiler. This will cause significant damage to the boiler if allowed to continue. Read the list of potential materials listed in Section 10.2. If any of these products are in the room from which the boiler takes its combustion air, they must be removed immediately or the boiler combustion air (and vent termination) must be relocated to another area.

14.1.13 - Check pressure gauge

1. Make sure the pressure reading on the boiler pressure gauge does not exceed 25 psi. Higher pressure may indicate a problem with the expansion tank.
2. Contact a qualified service technician if problem persists.

14.1.14 - Check vent piping

1. Visually inspect the flue gas vent piping for any signs of blockage, leakage, or deterioration of the piping. Notify your qualified service technician at once if you find any problems.

⚠ WARNING!!! Failure to inspect the vent system as noted above and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

14.1.15 - Check air piping

1. Visually inspect the air inlet termination to be sure it is unobstructed. Inspect the entire length of air piping to ensure piping is intact and all joints are properly sealed.
2. Call your qualified service technician if you notice any problems.

14.1.16 - Check condensate drain system

1. Inspect the condensate drain line, condensate fittings and condensate trap for signs of weeping or leakage.
2. If you detect signs of leakage, immediately contact your qualified service technician to inspect the boiler and system.

14.1.17 - Check boiler piping (gas and water)

1. If gas odor or leak is detected, immediately shut down the boiler following the procedures on page 3. Call a qualified service technician.
2. Visually inspect for leaks around water piping. Also inspect the circulators, relief valve, and fittings. Immediately call a qualified service technician to repair any leaks.

⚠ WARNING!!! Have leaks fixed at once by a qualified service technician. Failure to comply could result in severe personal injury, death, or substantial property damage.

14.1.18 - Shut boiler down (unless boiler is used for Domestic Water)

1. Follow "To Turn Off Gas to Appliance" on page 3 of this manual.
2. Do not drain the system unless exposure to freezing temperatures will occur.
3. Do not drain the system if it is filled with an antifreeze solution.
4. DO NOT shut down boilers used for domestic water heating, they must operate year-round.

14.2 - Removing the casing

In order to remove the casing, follow the steps below while referring to Figure 14-1:

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.

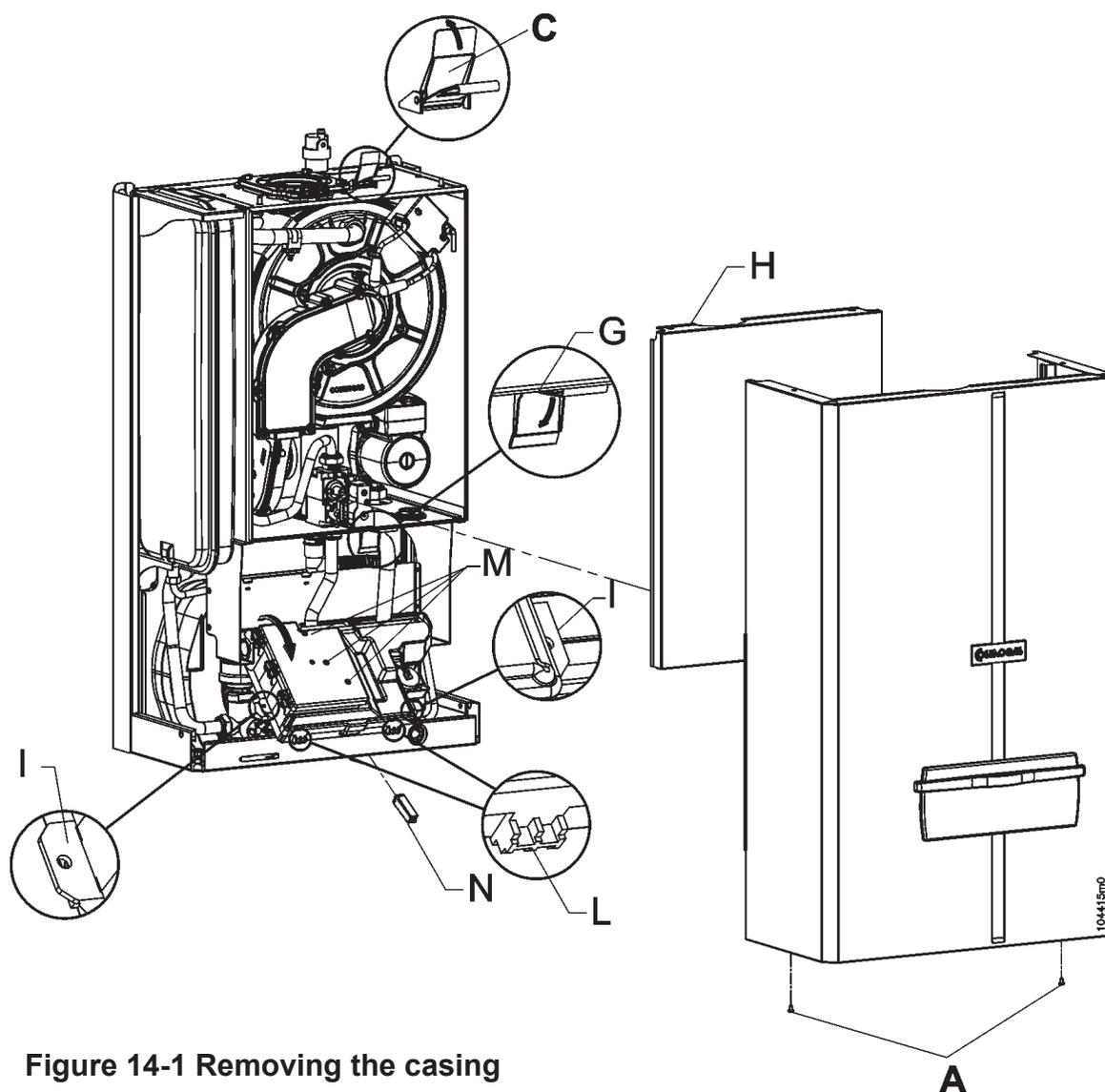


Figure 14-1 Removing the casing

14 - MAINTENANCE

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

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

! 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!

1. follow the steps in Section 14.2 to gain access to the sealing chamber;
2. unscrew nut "D" (Figure 14-2) from the gas valve (taking care not to lose gasket "E" in Figure 14-4);
3. disconnect the two wires from the ignition electrodes and the wire from the flame detection electrode, Figure 3-1, details "47" and "50";
4. disconnect the wire from safety sensor "F" in Figure 14-2;
5. unscrew the four nuts "C" in Figure 14-2;

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 14-2;
8. use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, detail "H" in Figure 14-2;
9. use a vacuum cleaner to remove any unburned residue from the combustion chamber "H" in figure 14-2;
10. using the same vacuum cleaner, clean the surfaces of the burner and around the electrodes;

! WARNING!!! while performing the next step, carefully wash only the inside of the combustion chamber "H" of Figure 14-2, 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 14-2. The water, will drain into the condensate drain. Clean the condensate trap (see Section 14.6) 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!

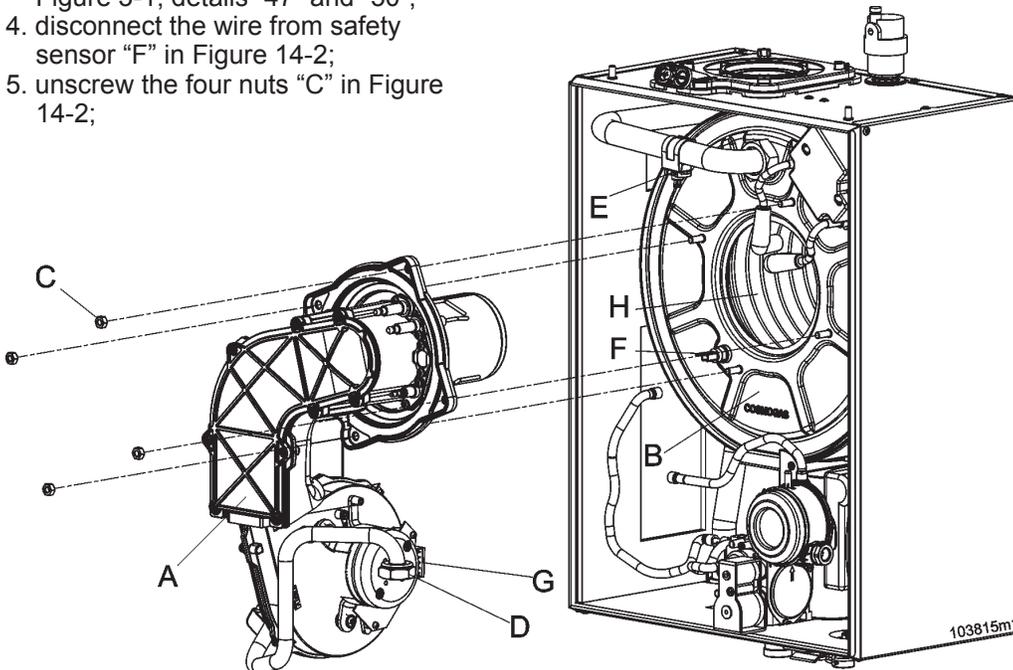
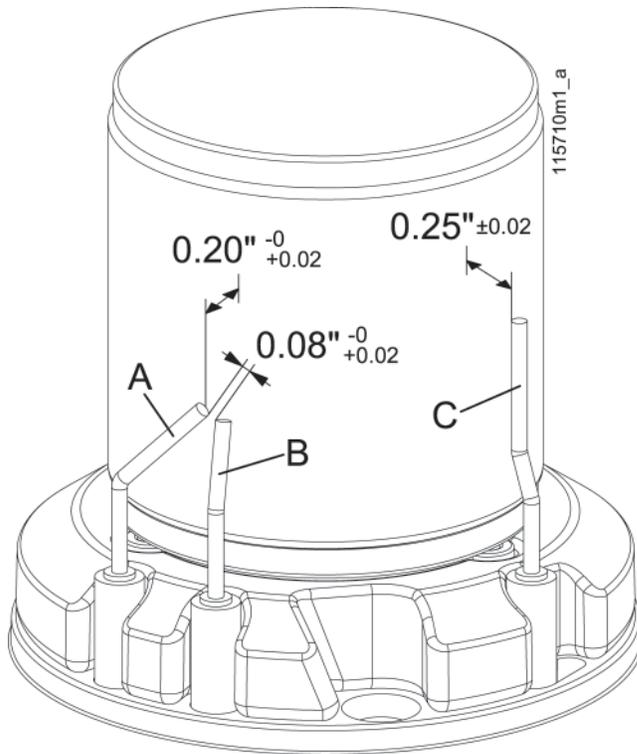


Figure 14-2 Remove the fan-burner assembly unit

14 - MAINTENANCE



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

Figure 14-3 Positioning electrodes on burner
(Use a hand caliper to verify the distances of the electrodes)

14.4 - Correct positioning of the ignition and flame detection electrodes

For the boiler to work properly the electrodes must be positioned as shown in Figure 14-3:

- ☞ 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).

NOTE: To insure correct functioning of boiler the distances listed above shall be verified with a hand caliper.

14.5 - Domestic hot water heat exchanger (only for 160-C model)

The production of DHW takes place in the secondary heat exchanger, detail "42" in Figure 3-1. If this heat exchanger loses efficiency over time, it may be necessary to clean or replace it.

14 - MAINTENANCE

14.6 - Condensate trap cleaning

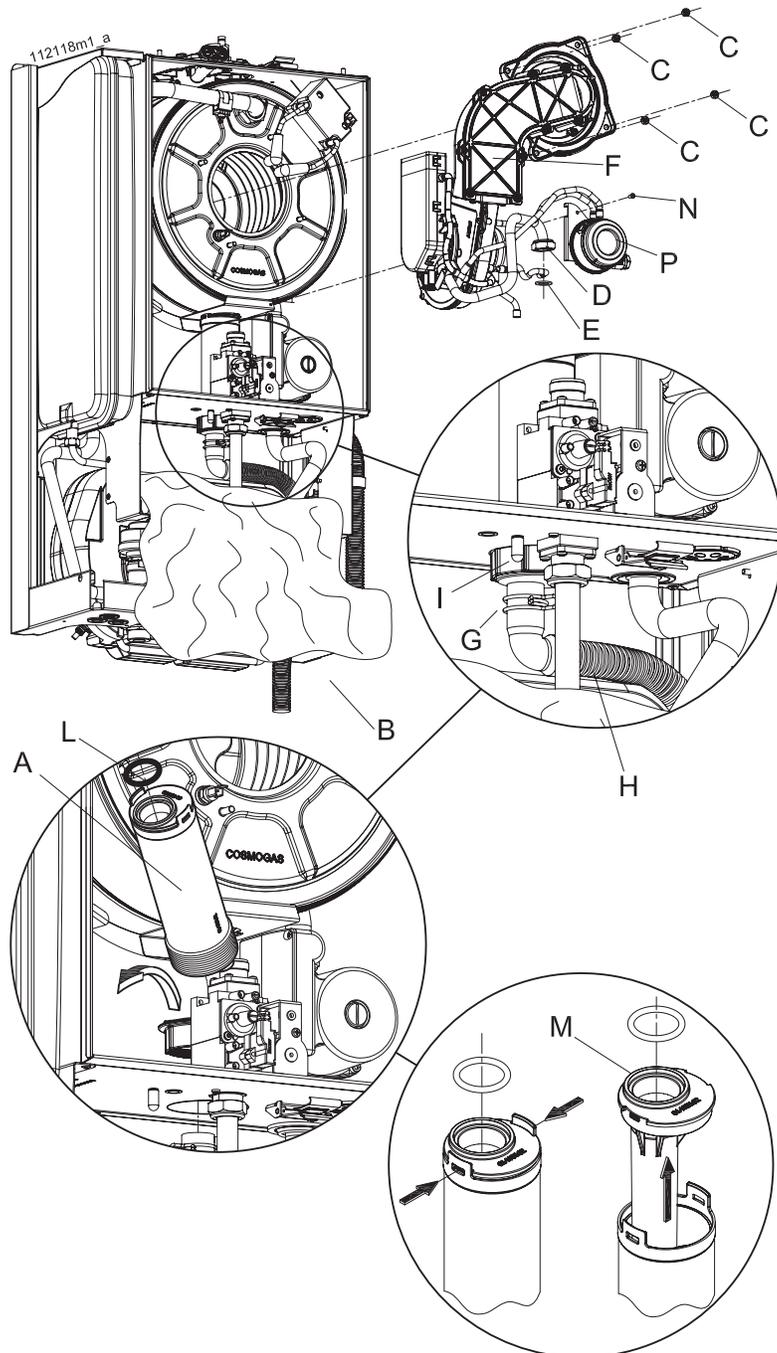
The condensate trap must be checked every year and cleaned if required. Follow the steps below to properly clean the condensate trap and its associated components while referring to Figure 14-4:

1. turn the power switch to on, item "12" in Figure 13-1;

2. press the **+** and **-** keys together for more than 10 seconds, until a blinking **F** is displayed;

3. the combustion blower will run at maximum speed for 10 minutes. During this time the burner will not light. This will minimize the amount of liquid present in the trap, item "A";

4. press the **Reset** button



! 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!

5. follow the steps in Section 14.2 to gain access the internal components;
6. carefully cover the electrical panel "B" with a waterproof material to prevent water from entering the electrical system;
7. grip spring clamp "G" with a pair of pliers and slide it downwards;
8. pull the condensation trap hose "H" off the trap;
9. remove the fan-burner assembly unit, follow steps of section 14.3;
10. cover the gas valve outlet to ensure that no objects or condensate water enters the gas valve;
11. disconnect the condensate hose "O" from the condensate trap "A".
12. unscrew nut "I" from the bottom of the trap, "A", and pull it upwards, taking care not to spill the condensation;
13. open the condensate trap taking care not to lose o ring "L" and clean the inside "M";
14. re-assemble everything in reverse order, taking care that oring "L" is placed in the proper location;
15. refill the condensate trap per Section 12.1.2.
16. open the manual gas shutoff valve;
17. restore electrical power to the boiler;
18. 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 14-4 Removing the condensating trap

14 - MAINTENANCE

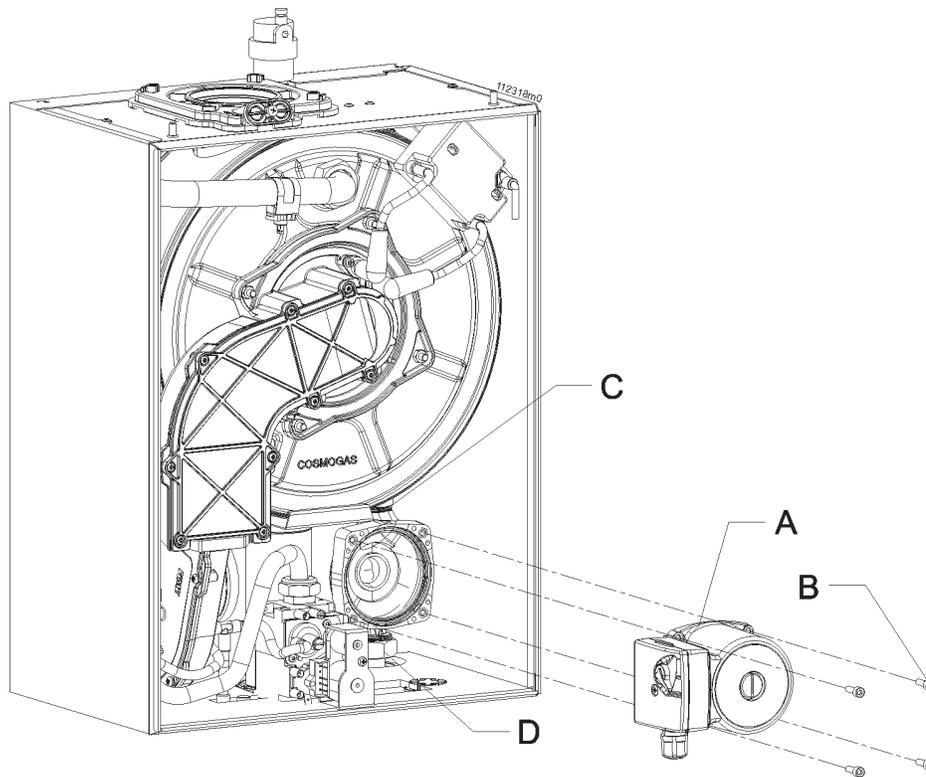


Figure 14-5 Replacing the pump motor (only for 160-C model)

14.7 - Circulator pump motor replacement (only for 160-C model)

To replace the circulator pump follow the steps below while, referring to Figure 14-5:

1. follow the steps in Section 14.10 to isolate and drain the water from the boiler;
2. follow the steps in Section 14.2 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 12.1.3 to bleed the air from the heating system.

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

14.8 - Expansion tank pressure (only for 160-C model)

To check the expansion tank pressure follow the steps below:

1. follow the steps in Section 14.10 to isolate and drain the water from the boiler
2. follow the steps in Section 14.2, to gain access the internal components;
3. check the pressure of the expansion tank, item "4" of Figure 3-1 (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.

14 - MAINTENANCE

14.9 - 3-way valve removal (only for 160-C model)

The 3-way valve, details "M" and "Q" in Figures 14-6 and 14-7, 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 14-6 and 14-7:

1. follow the steps in Section 14.10 and 14-11 to isolate and drain the water from the boiler;
2. follow the steps in Section 14.2, to gain access the internal components;
3. disconnect fittings "A";
4. remove screws "C";
5. rotate "D" flange in the direction 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 dirt.

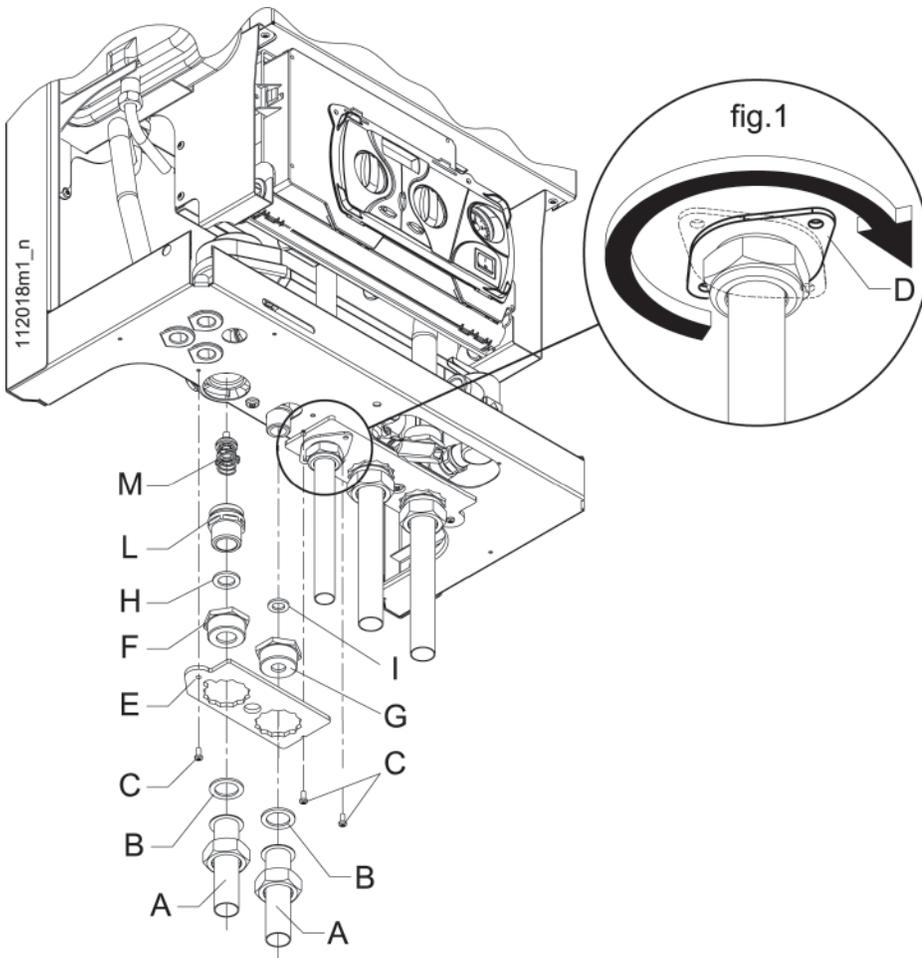


Figure 14-6 Supply fittings removal (only for 160-C model)

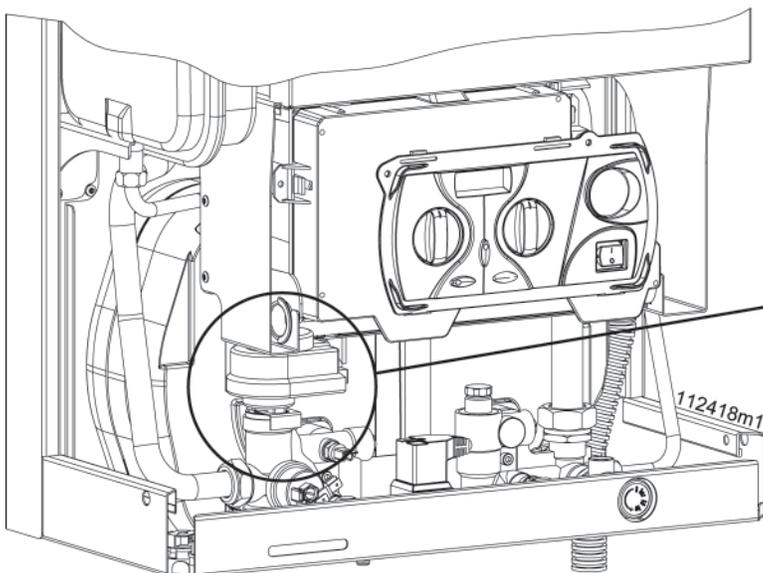


Figure 14-7 3-way valve servomotor removal

14 - MAINTENANCE

14.10 - Draining the heating side of the boiler

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

1. cool boiler turning knob "7" in Figure 13-1 to 114°F (45°C). Wait until the display, item "1" in Figure 13-1, shows a temperature less than 114°F (45°C);
2. turn off the boiler;
3. shut off electrical power to the boiler;
4. close the manual gas shutoff valve, Figure 11-1;
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 14.2, to gain access the internal components;
8. connect a hose to the boiler drain valve item "4" in Figure 7-6 and 7-7, 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;

NOTICE: The boiler cannot be drained completely of water without purging the unit with an air pressure of 15 psi.

⚠ 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!

14.11 - 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 3-1.

14.12 – Overrides

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

14.12.1 - 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**.

14.12.2 - 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.

14.12.3 – 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 13-1 to its maximum;

- for domestic hot water turn knob "11" in Figure 13-1 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:

- **ℓ** - for minimum heating output;

- **ℓ** - for maximum heating output adjusted by P parameter, see section 12.10;

- **ℓ** - 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.

14.12.4 – Checking the flame current

While running at the minimum and maximum output described in Section 14.12.3, 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 15, header "ionisation current". If the value is not within the above values, check:

- a - positioning of the flame sensor electrode as per section 14.4;
- b - CO2 content as per section 12.9;
- c - combustion air pressure as per section 12.8.

14 - MAINTENANCE

14.13 - 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 14-8.

The temperature sensors are: U1; U2, U3, U5, U6, U7 and U8. The location of each sensor can be found in Figure 3-1 and Section 14.15 and 14.16.

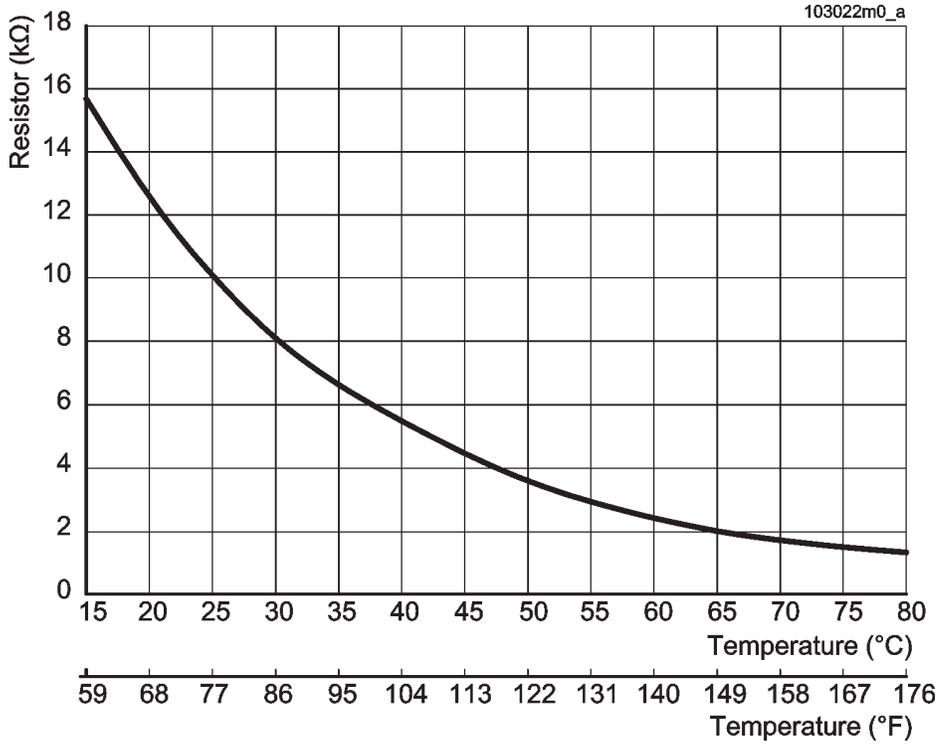


Figure 14-8 Water temperature sensors' curve

14.14 - Outdoor temperature sensor (optional)

An outdoor temperature sensor can be connected to the boiler (see section 8.1.4). The electrical resistance existing between the sensor wires must correspond with the values shown in Figure 14-9.

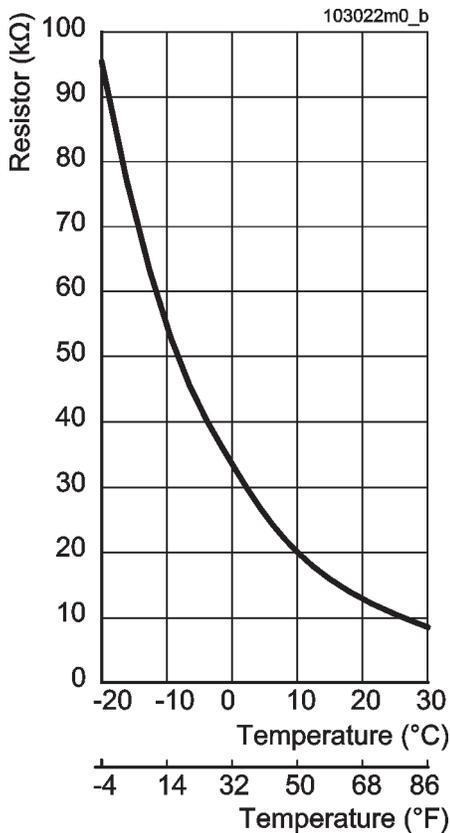


Figure 14-9 Outdoor temperature sensor curve

14 - MAINTENANCE

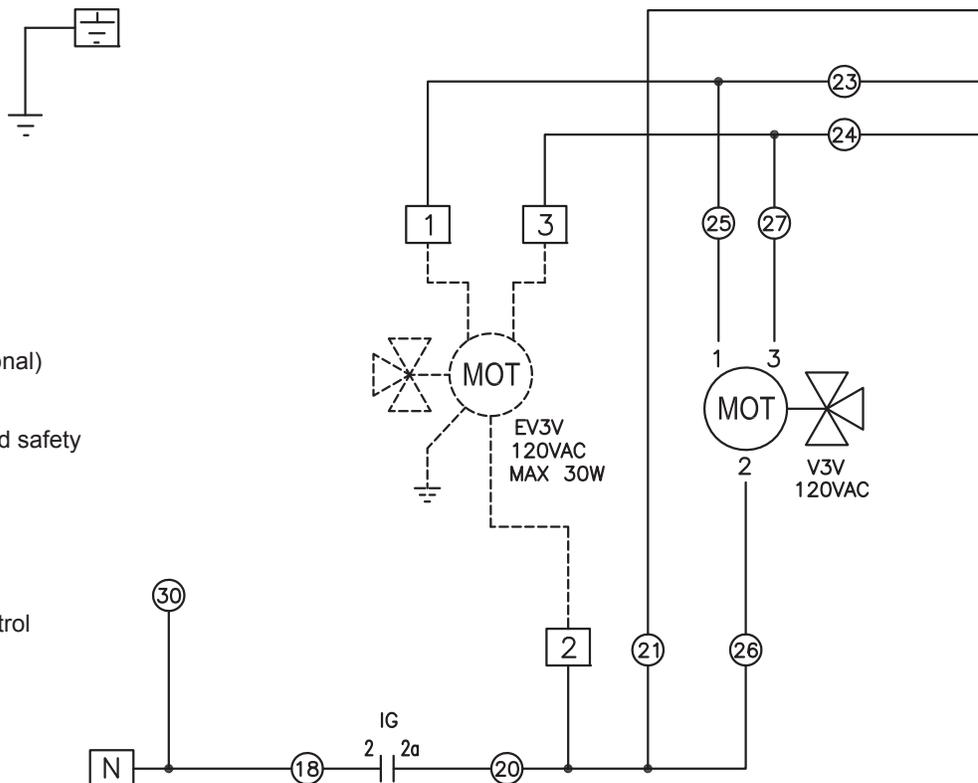
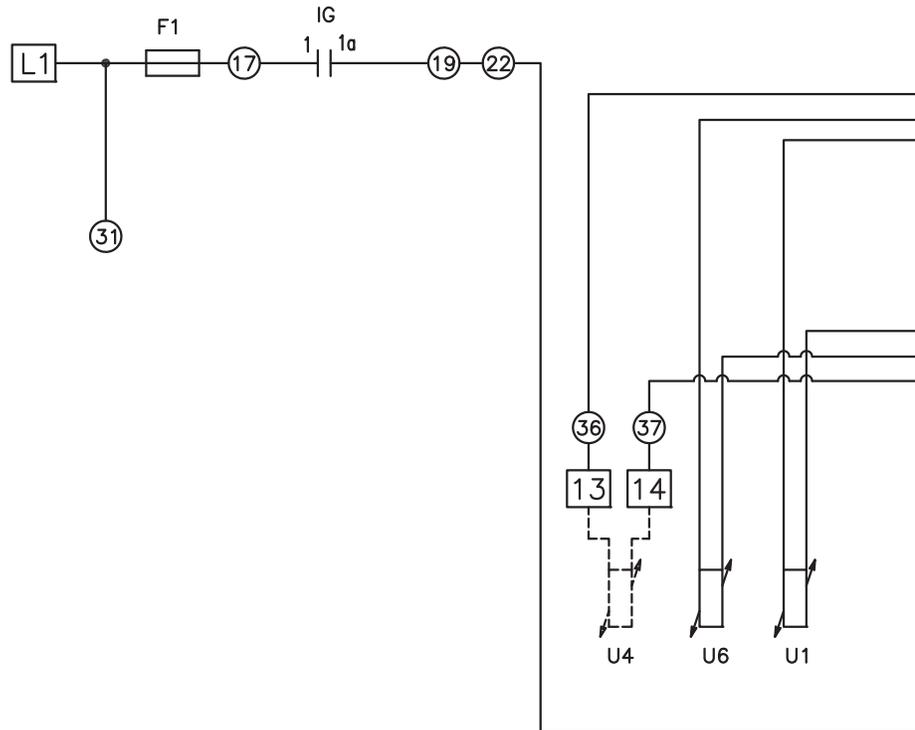
14.15 - Functional wiring diagram

⚠ 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!

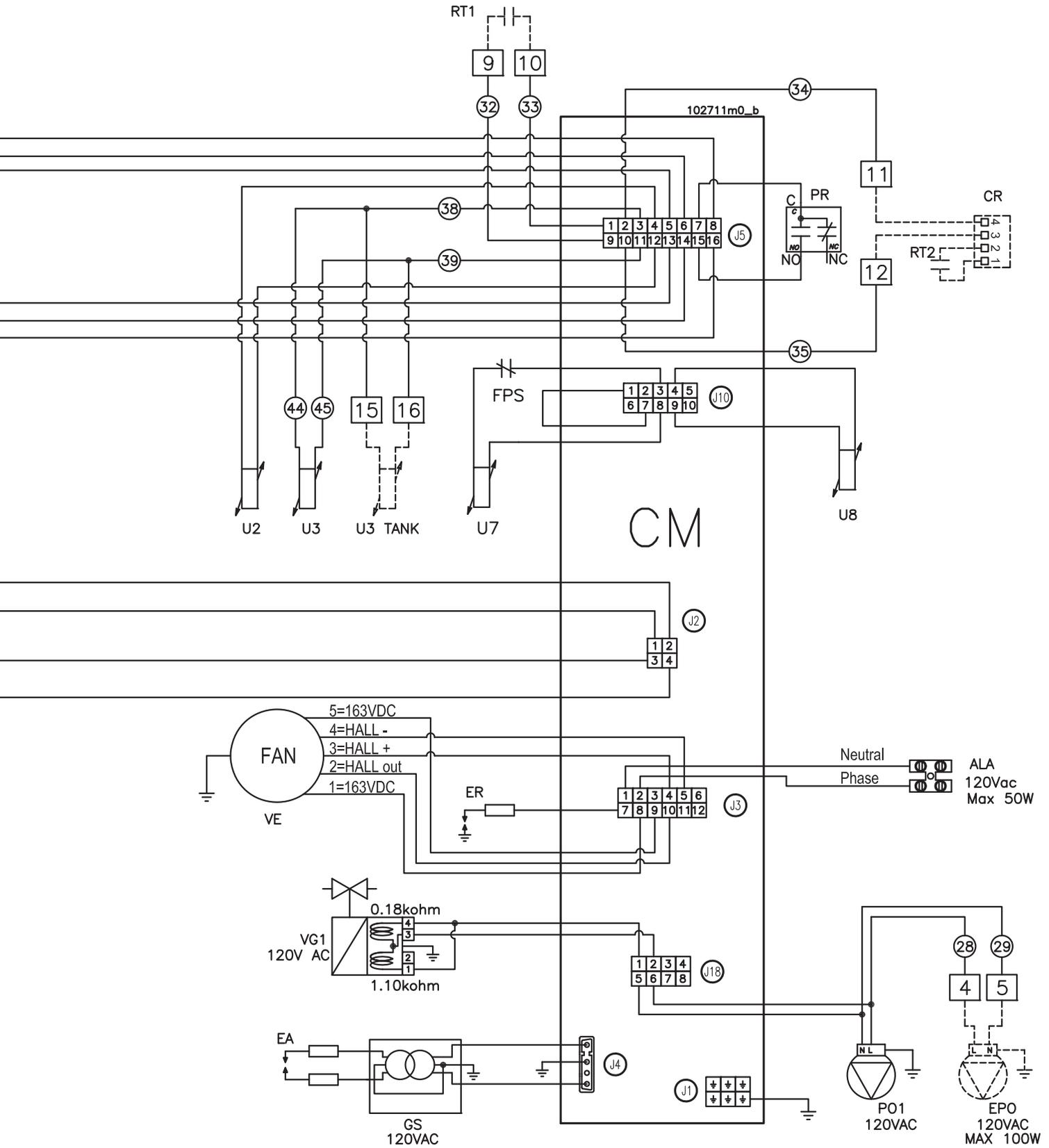
⚠ ATTENTION!!! Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.

LEGEND:

- ALA - Alarm output
- CM - Power control board
- CR - Remote command (only for outdoor models)
- EA - Ignition electrode
- ER - Flame detection electrode
- EPO - External pump (REQUIRED FOR MODEL 160-B)
- 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 with integrated safety high limit switch
- 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



14 - MAINTENANCE



14 - MAINTENANCE

14.16 - 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!

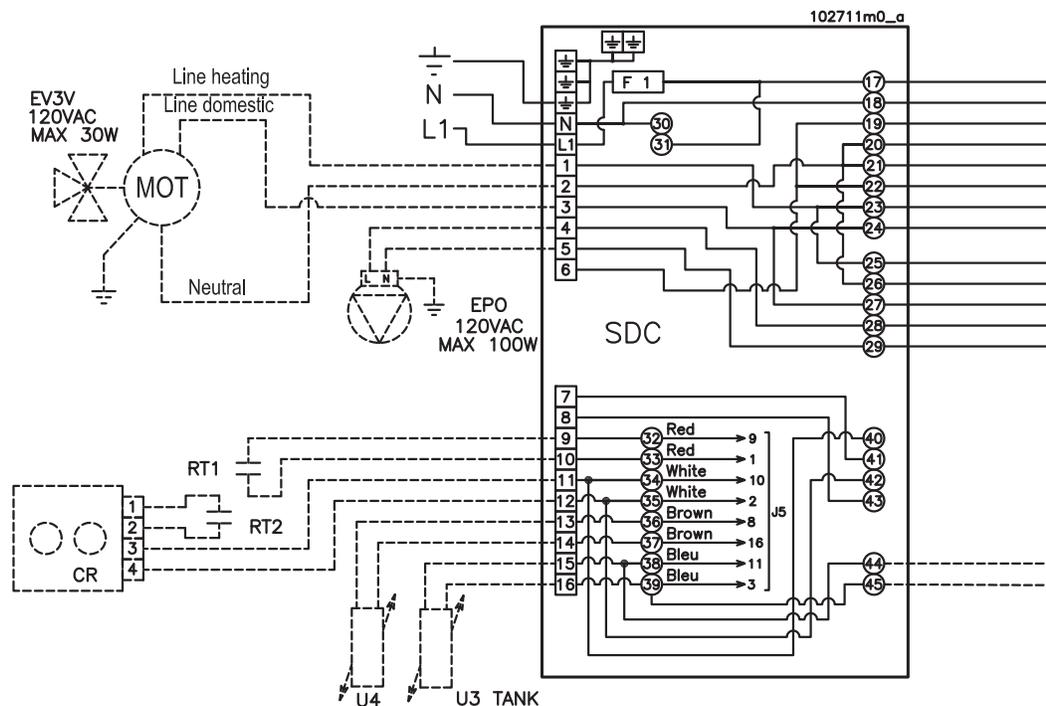


ATTENTION!!!

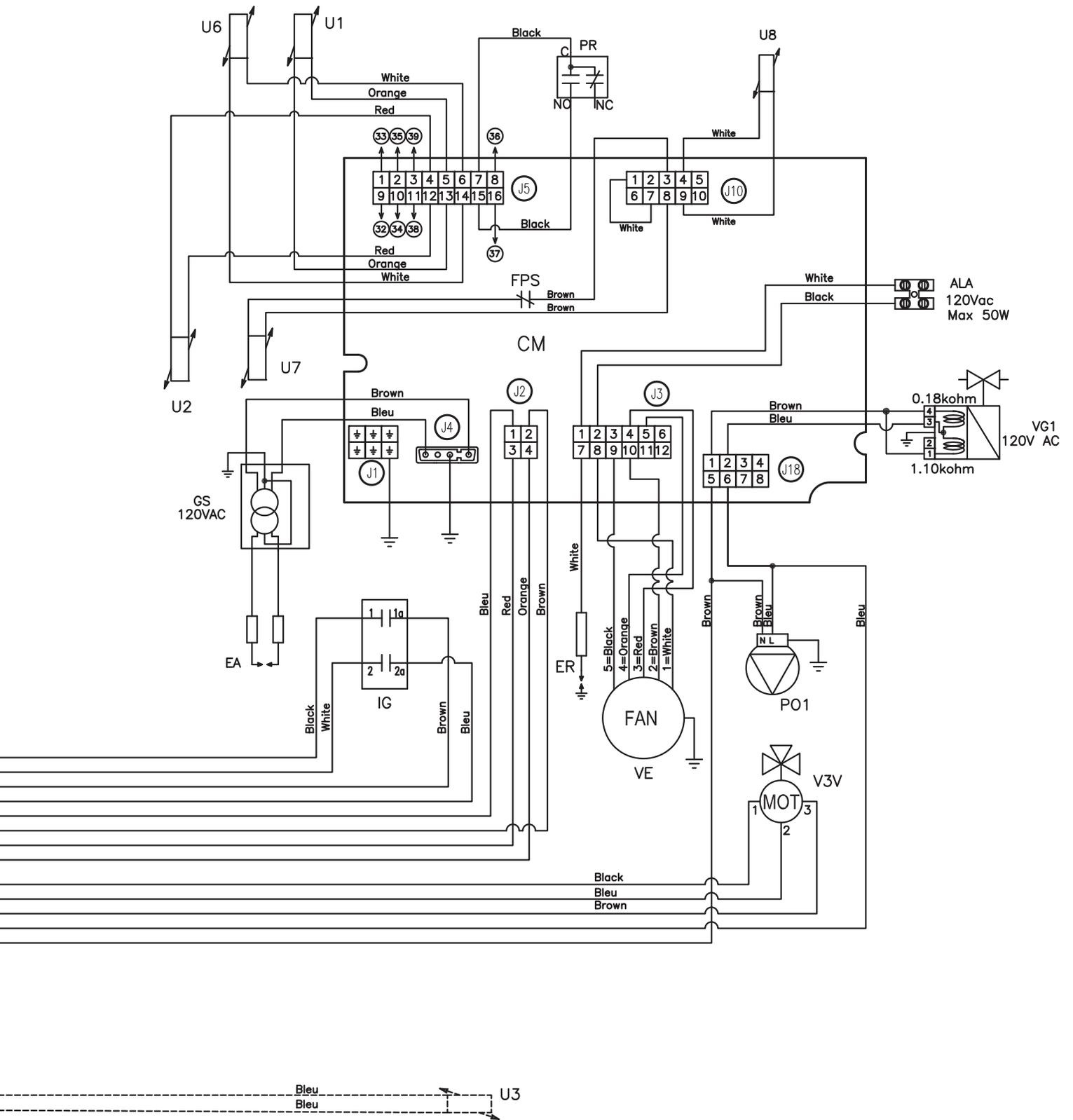
Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien est terminé.

LEGEND:

- ALA - Alarm output
- CM - Power control board
- CR - Remote command (only for outdoor models)
- EA - Ignition electrode
- ER - Flame detection electrode
- EPO - External pump (REQUIRED FOR 160-B model)
- 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 with integrated safety high limit switch
- 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



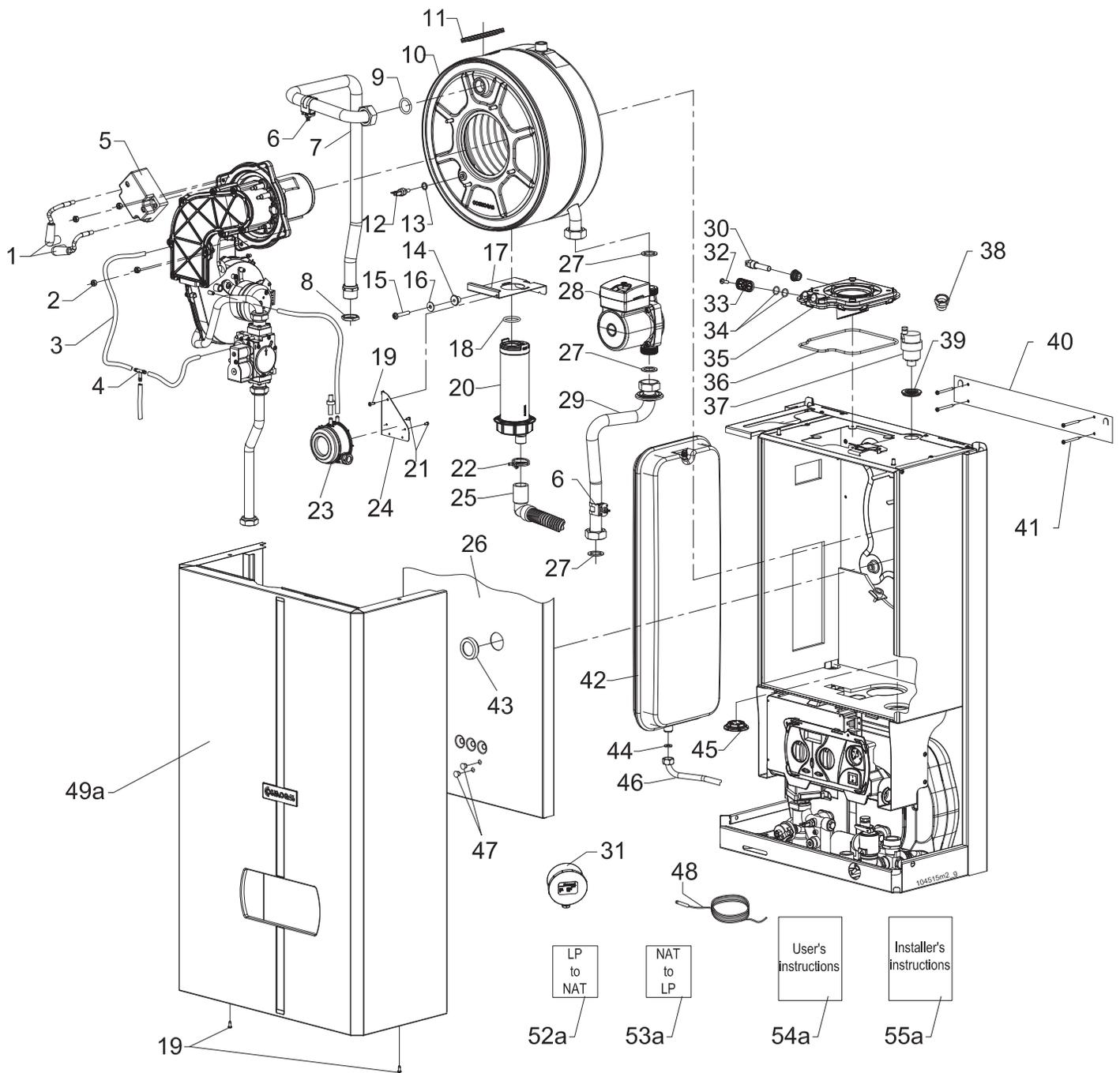
14 - MAINTENANCE



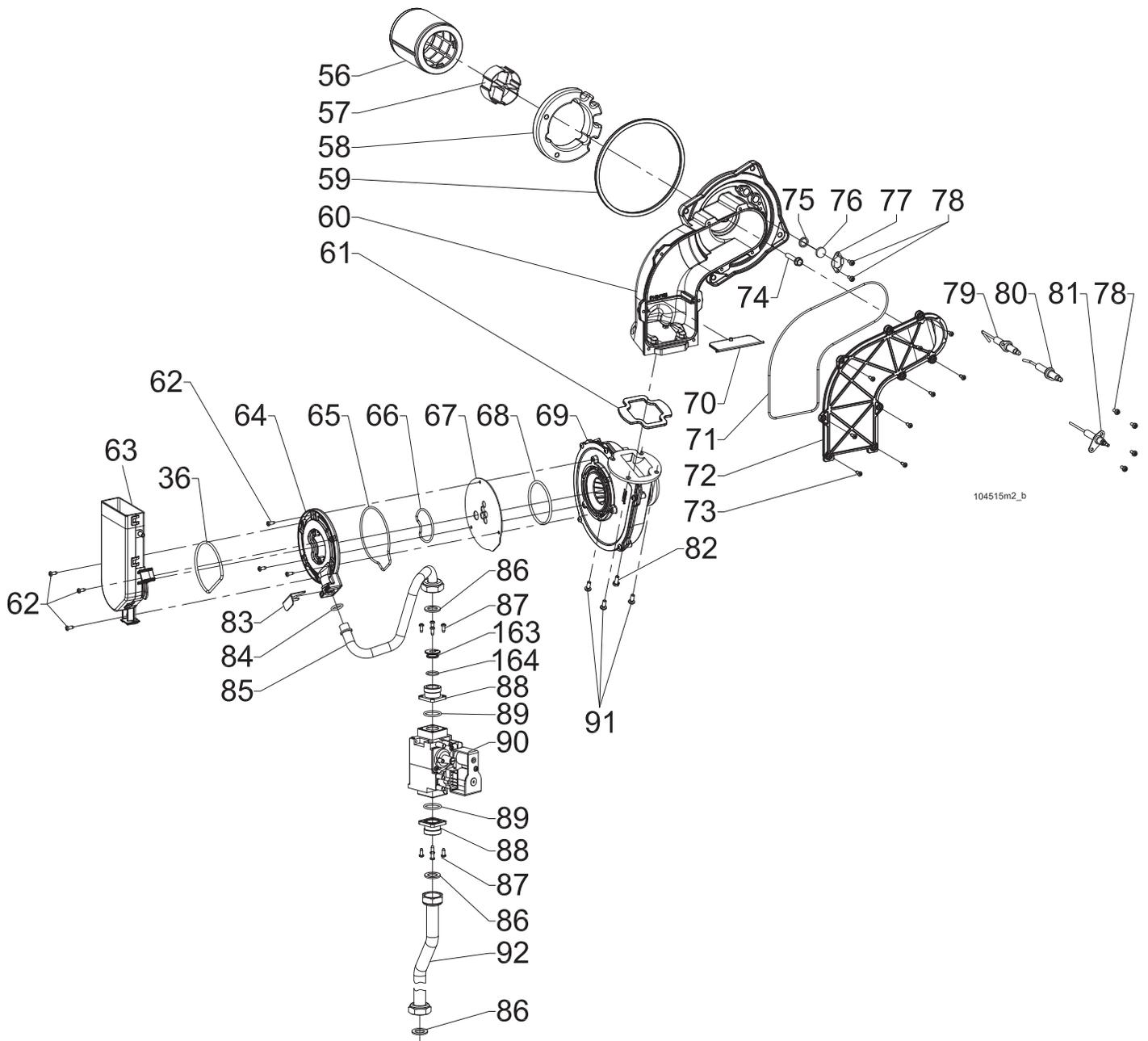
15 - TECHNICAL DATA

MODEL		VSL-160-B; VSL-160-C;
Country of destination		USA and Canada
Type of boiler		Direct Vent and room combustion air
Category of discharge chimney		IV
CSA certificate N°		2045300 (114696)
Maximum Heat input	Btu/hr	160,000
Minimum heat input	Btu/hr	30,000
Efficiency at maximum heat input (160°F/140°F)	%	93
Maximum Heat output (160°F/140°F)	Btu/hr	148,800
Efficiency at minimum heat input (122°F/86°F)	%	97
Minimum heat output (122°F/86°F)	Btu/hr	29,100
Certified AFUE rate	%	93
Gas flow rate	Natural gas	ft ³ /hr
	LP Gas	gal/hr
Gas supply pressure	Natural gas	In.W.C.
	LP Gas	In.W.C.
Minimum gas supply pressure	Natural gas	In.W.C.
	LP Gas	In.W.C.
Maximum gas supply pressure	Natural gas	In.W.C.
	LP Gas	In.W.C.
Combustion air pressure with min. length	Natural gas	In.W.C.
	LP Gas	In.W.C.
Combustion air pressure with max. length	Natural gas	In.W.C.
	LP Gas	In.W.C.
Instantaneous d.h.w production [rise 75°F (42°C)]		gal/min
Maximum heating temperature		°F
Minimum heating temperature		°F
Maximum heating pressure		PSI
Minimum heating pressure		PSI
Maximum pressure of domestic hot water circuit		PSI
Minimum pressure of domestic hot water circuit		PSI
Capacity of expansion tank (160-C model only)		gal
Supply voltage		120Vac - 60Hz
Absorbed electric power		W
Flue gas pipes diameter (split)		" (mm)
Max. length flue gas pipes (split)		ft
Flue gas pipes diameter (coaxial)		" (mm)
Max. length flue gas pipes (coaxial)		ft
Equivalent length of one elbow		ft
CO (Carbon monoxide) with natural gas		ppm
CO (Carbon monoxide) with LP gas		ppm
NOx (0% O ₂ with natural gas)		ppm
CO ₂ (Carbon dioxide) for Natural gas at high fire		%
CO ₂ (Carbon dioxide) for Natural gas at low fire		%
CO ₂ (Carbon dioxide) for LP gas at high fire		%
CO ₂ (Carbon dioxide) for LP gas at low fire		%
O ₂ (Oxygen) for Natural gas at high fire		%
O ₂ (Oxygen) for Natural gas at low fire		%
O ₂ (Oxygen) for LP gas at high fire		%
O ₂ (Oxygen) for LP gas at low fire		%
Ionisation current		
Maximum flue gas temperature		°F
Flue gas mass-flow		lb/hr
Head pressure available for flue vent/air intake line		In.W.C.
Maximum condensation flow rate		gal/hr
Average acidity of condensation		PH
Boiler weight (empty of water) (160-C model)		lb
Boiler weight (empty of water) (160-B model)		lb

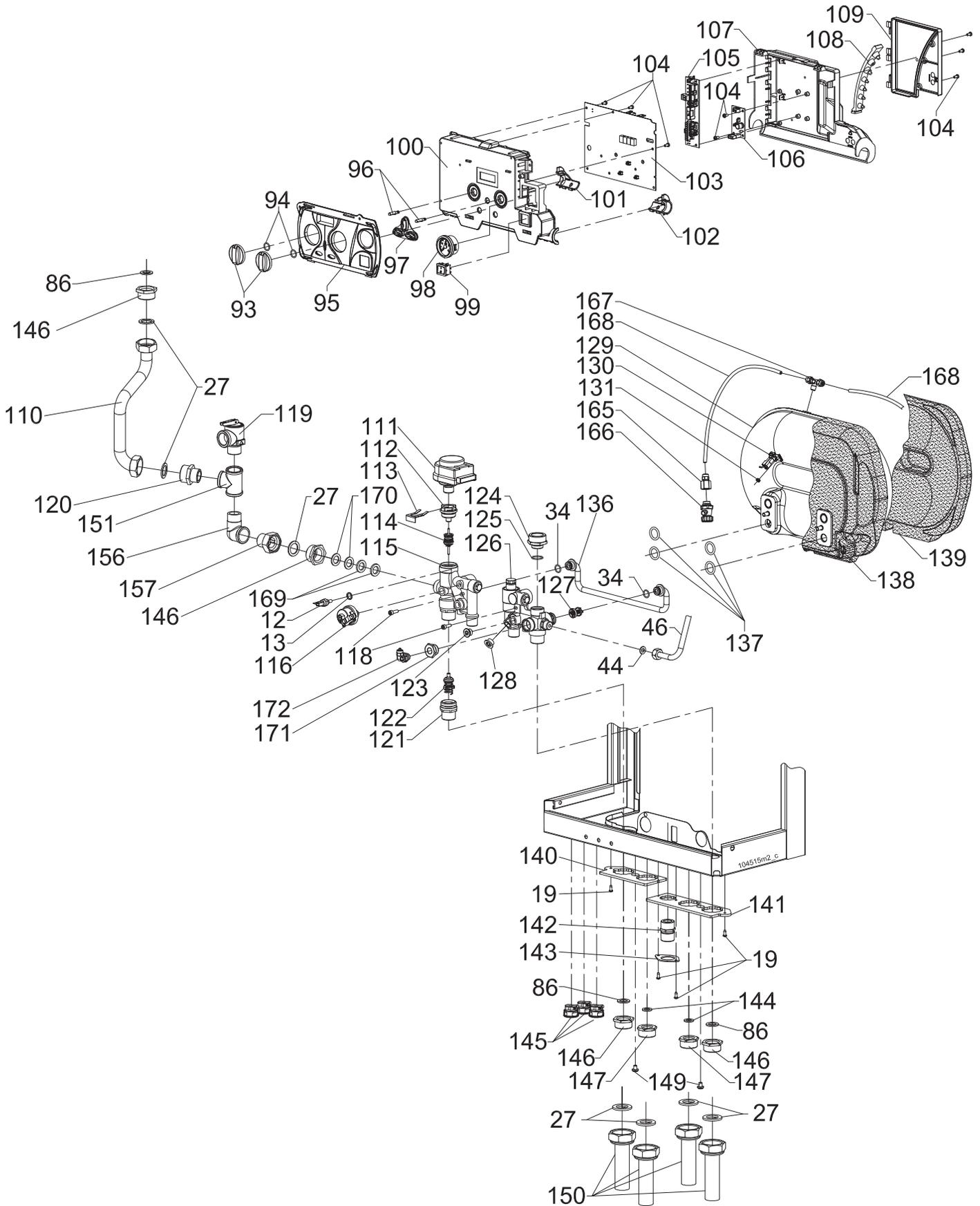
16 - SPARE PARTS



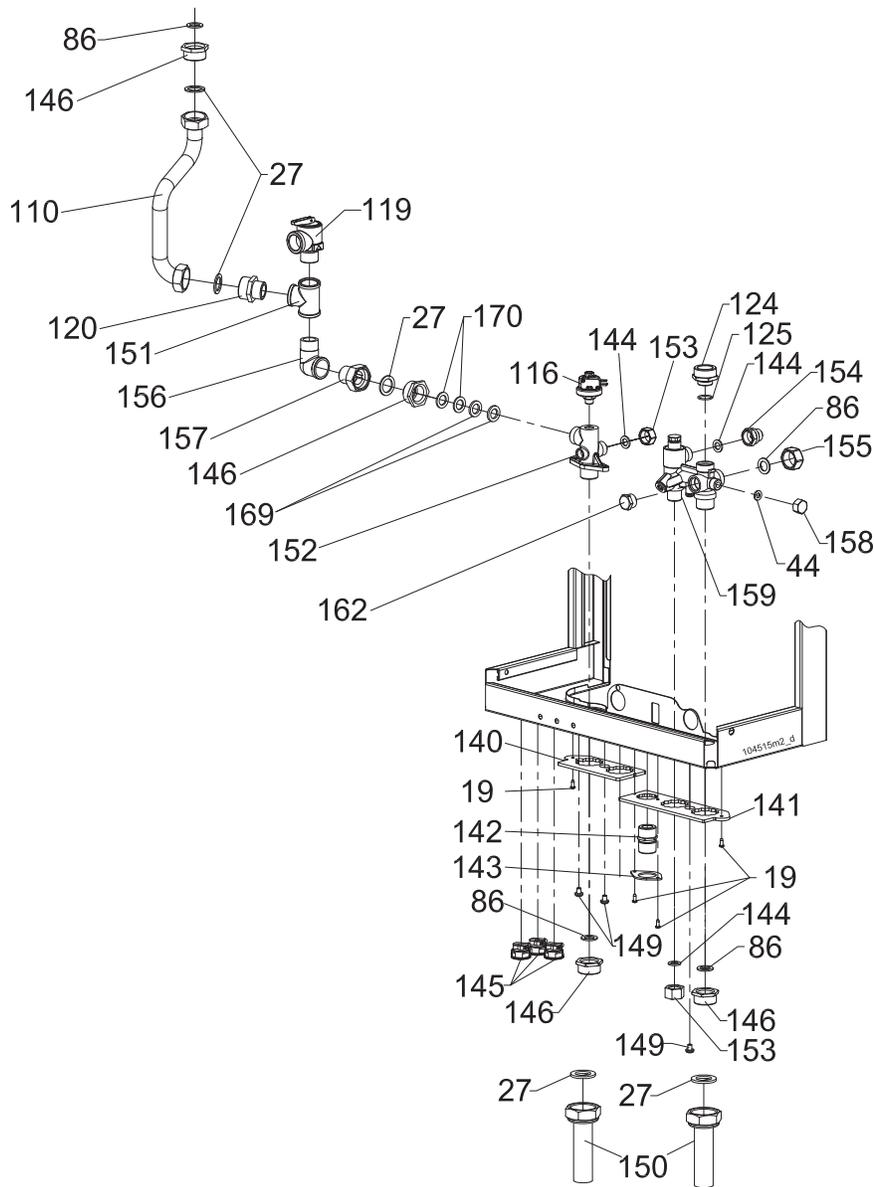
16 - SPARE PARTS



16 - SPARE PARTS



16 - SPARE PARTS



Bottom side of the 160-B model

Spare parts list

- 1 - 81 9010 000 - CABLE UL IGNITOR CONN 90° L155
- 2 - 81 9011 000 - NUT ZINC COATED 6MA
- 3 - 81 9012 000 - SILICONE PIPE D 4X8
- 4 - 81 9013 000 - TEE FOR DRY WATER CONDENSATION
- 5 - 81 9014 000 - SPARK GENERATOR NO CABLE UL
- 6 - 81 9015 000 - SENSOR NTC 10 KOHM A KLIP DIAM.22
- 7 - 81 9016 000 - COPPER PIPE D22 M/F 3/4"G-1"G
- 8 - 81 9017 000 - 3/4" RING NUT
- 9 - 81 9018 000 - O-RING NBR 2,62 X 20,63
- 10 - 81 9019 000 - PRIMARY HEAT EXCHANGER C.R.R ASME
- 11 - 81 9020 000 - GASKET EPDM X OSSIDO D84 H7
- 12 - 81 9021 000 - SENSOR NTC 10 KOHM 1/8"
- 13 - 81 9022 000 - GASKET COPPER 1/8" SP.1,5
- 14 - 81 9023 000 - SILICONE TAP
- 15 - 81 9024 000 - SCREW 6X35 ZINC TC-CR
- 16 - 81 9025 000 - WASHER 6X18X1,5 PIA-ZIN-LAR UNI6593
- 17 - 81 9026 000 - BRACKET SIPHON L84 H130 P32

- 18 - 81 9027 000 - O-RING 134 EPDM 3,53 X 25,8
- 19 - 81 9028 000 - SCREW SELFTAPPING 3.9 X 9.5 CROSS HEAD
- 20 - 81 9029 000 - SIPHON
- 21 - 81 9030 000 - SCREW SELFTAPPING 2.9 X 6.5 CROSS HEAD
- 22 - 81 9031 000 - SPRING 28,7
- 23 - 81 9032 000 - PRESSURE SWITCH ON 4,5 INWC
- 24 - 81 9033 000 - BRACKET PRESSURE SWITCH
- 25 - 81 9034 000 - POLIETYLENE PIPE L=1000
- 26 - 81 9035 000 - SEALING CHAMBER DOOR
- 27 - 81 9036 000 - 1P GASKET
- 28 - 81 9006 000 - PUMP GRUNDFOS UP 15/58U BRUTE USA
- 29 - 81 9038 000 - COPPER PIPE D22 RETURN SEALING CHAMBER
- 30 - 81 9039 000 - SENSOR NTC 10K BAIO
- 31 - 81 9040 000 - OUTDOOR SENSOR
- 32 - 81 9041 000 - SCREW 4,8X19 ZINC AF TC-CR UNI6954
- 33 - 81 9042 000 - PLUG FOR FLUE AIR FITTING
- 34 - 81 9043 000 - O-RING 2050 EPDM 1,78 X 12,42
- 35 - 81 9044 000 - DISCHARGE RACCORD PP
- 36 - 81 9045 000 - GASKET ROUND SPONGE D.3,5 MM IP44 S3
- 37 - 81 9046 000 - AUTOMATIC AIR VENT

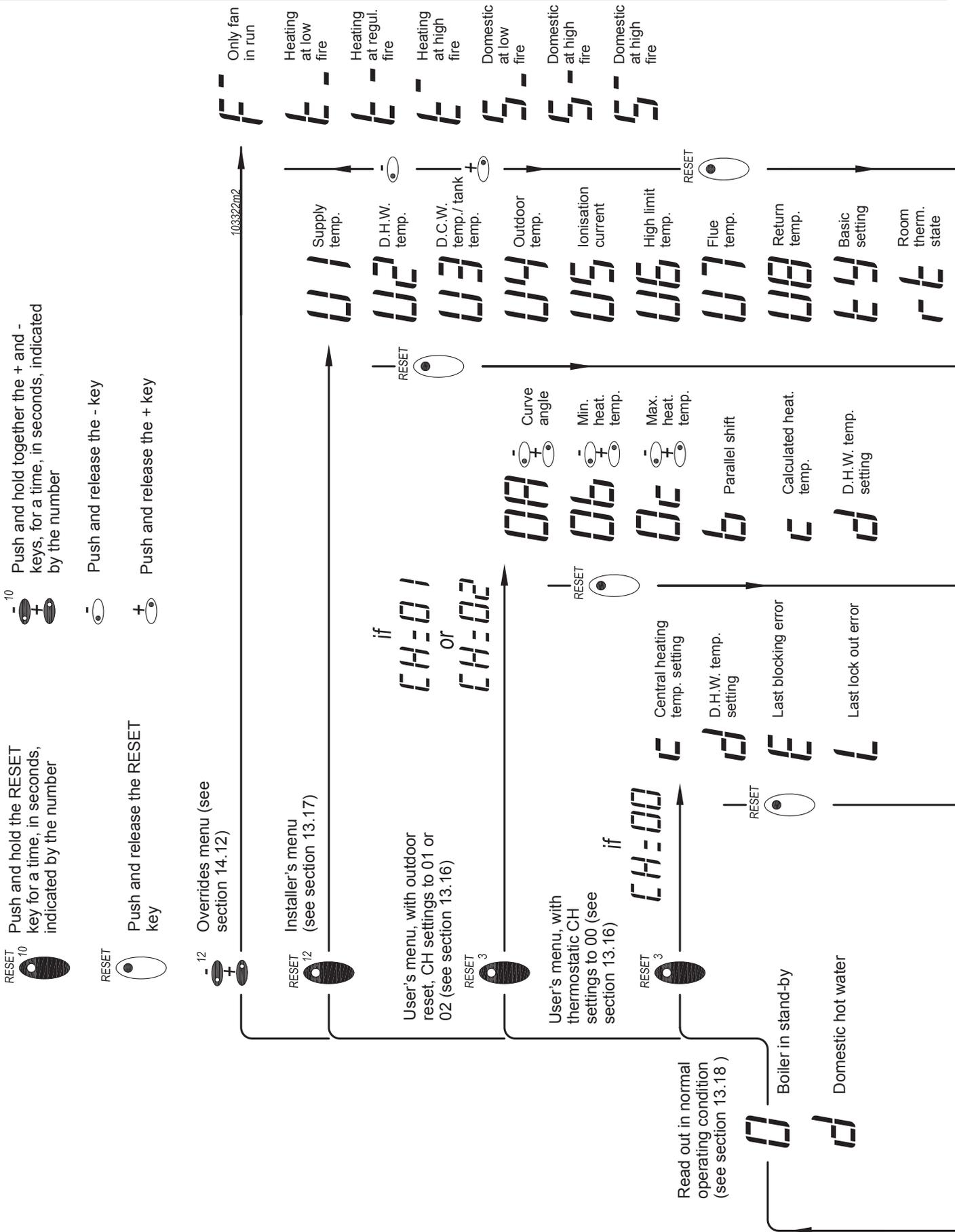
16 - SPARE PARTS

- 38 - 81 9047 000 - 3/8G MALE to 1/8NPT FEMALE BUSHING
- 39 - 81 9048 000 - GASKET EPDM D38 F20 SP6
- 40 - 81 9049 000 - 45xx WALL MOUNTING BRACKET
- 41 - 81 9050 000 - SCREW SELFTAPPING 5X50 WOOD
- 42 - 81 9051 000 - EXP TANK LT. 8 561X203X80 RETT.
- 43 - 81 9052 000 - GLASS WINDOW WITH GASKET
- 44 - 81 9053 000 - 3/8" G GASKET
- 45 - 81 9054 000 - FAIRLEAD 6 POLES SILICONE
- 46 - 81 9055 000 - EXP TANK PIPE
- 47 - 81 9056 000 - PLASTIC CAP TPP 8.5
- 48 - 81 9057 000 - TANK SENSOR
- 49a - 81 9058 000 - EXTERNAL JACKET 500X840X245 WITHOUT DOOR
- 50 - not used
- 51 - not used
- 52a - 81 9191 000 - VSL 160 LP TO NATURAL CONVERSION KIT
- 53a - 81 9190 000 - VSL 160 NATURAL TO LP CONVERSION KIT
- 54a - 81 9063 000 - VSL 160 USER'S INSTRUCTIONS
- 55a - 81 9506 000 - VSL 160 INSTALLER'S INSTRUCTIONS FROM S/N 12130000
- 56 - 81 9065 000 - BURNER HEAD
- 57 - 81 9066 000 - EXTRUSION L.25MM
- 58 - 81 9067 000 - THERM. INSULATION VERMICULITE D117 F74 SP21,5
- 59 - 81 9068 000 - GASKET. SIL. D157 F145 H6,7
- 60 - 81 9069 000 - BASE MANIFOLD AIR ALUMINUM
- 61 - 81 9070 000 - GASKET SIL.MANIFOLD FAN D83 SP3,5
- 62 - 81 9071 000 - SCREW SELFTAPPING 4X12 TC S-TT UNI-8112
- 63 - 81 9072 000 - MANIFOLD AIR CUTTED
- 64 - 81 9073 000 - MIXER AIR/GAS "COSMOMIX"
- 65 - 81 9074 000 - O-RING 3350 NBR 2,62 X 88,57
- 66 - 81 9075 000 - O-RING 3200 NBR 2,62 X 50,47
- 67 - 81 9076 000 - DIAPHRAGM COSMOMIX 9 HOLES D.10
- 68 - 81 9077 000 - O-RING 165 NBR 3,53 X 61,91
- 69 - 81 9078 000 - FAN 45 KW USA
- 70 - 81 9079 000 - BACK FLUE-GASES PREVENTER
- 71 - 81 9080 000 - O-RING 3825 SIL 2,62 X 209,22
- 72 - 81 9081 000 - COVER MANIFOLD AIR ALUMINUM
- 73 - 81 9082 000 - SCREW SELFTAPPING 4X10 TC S-TT UNI-8112
- 74 - 81 9083 000 - SELFTAPPING BOLT 6.3X38
- 75 - 81 9084 000 - GASKET FRIZITE D15,5 F11,5 SP1,5
- 76 - 81 9085 000 - GLASS PIREX D15,5 SP3,3
- 77 - 81 9086 000 - FLANGE L21,2 H34
- 78 - 81 9087 000 - SCREW SELFTAPPING 4X8 TC S-TT NI-8112
- 79 - 81 9088 000 - LEFT IGNITION ELECTRODE
- 80 - 81 9089 000 - RIGHT IGNITION ELECTRODE
- 81 - 81 9090 000 - DETECTION ELECTRODE
- 82 - 81 9091 000 - SCREW 5X12 EXAGONAL HEAD
- 83 - 81 9092 000 - SPRING MIXER
- 84 - 81 9093 000 - O-RING 3056 NBR (118) 2,62X13,95
- 85 - 81 9094 000 - GAS PIPE (SIT) USA
- 86 - 81 9095 000 - GASKET 3/4P 24X15X2 KLINSIL
- 87 - 81 9096 000 - SCREW 4X10 ZINC TC-CR
- 88 - 81 9097 000 - FLANGE GAS 32X32 3/4P
- 89 - 81 9098 000 - O-RING 130 2,62 X 22,22
- 90 - 81 9099 000 - GAS VALVE SIGMA848 120V
- 91 - 81 9100 000 - BOLT 5X12 CROSS HEAD
- 92 - 81 9101 000 - PIPE D18 F/F 3/4P-3/4P SIT USA
- 93 - 81 9102 000 - CONTROL KNOB S3
- 94 - 81 9103 000 - O-RING NBR 1,6 X 11,1
- 95 - 81 9104 000 - FRONT INTERFACE
- 96 - 81 9105 000 - TREE POTMETER-KNOB
- 97 - 81 9106 000 - KEYS RUBBER 3 POSITIONS
- 98 - 81 9107 000 - PRESSURE GAUGE DIAM.38 - 1/4" PSI
- 99 - 81 9108 000 - MAIN SWITCH
- 100 - 81 9109 000 - BASE ELECTRICAL BOX
- 101 - 81 9110 000 - FAIRLEAD SX
- 102 - 81 9111 000 - FAIRLEAD DX
- 103 - 81 9112 000 - POWER CONTROL BOARD PHC 120V
- 104 - 81 9113 000 - SCREW 4X8 ZINC TC-CR DIN4042
- 105 - 81 9114 000 - JUNCTION BOARD 45
- 106 - 81 9115 000 - INTERFACE OPENTERM
- 107 - 81 9116 000 - COVER ELECTRICAL BOX
- 108 - 81 9117 000 - FAIRLEAD 7 EXIT
- 109 - 81 9118 000 - COVER JUNCTION BOX
- 110 - 81 9119 000 - COPPER PIPE D.22 SUPPLY SEALING CHAMBER
- 111 - 81 9120 000 - 3 WAY VALVE MOTOR 120V
- 112 - 81 9121 000 - PLUG PISTON BODY OT.
- 113 - 81 9122 000 - SPRING FORCK 3V
- 114 - 81 9123 000 - UPPER PISTON
- 115 - 81 9124 000 - HYDRONIC SUPPLY GROUP.
- 116 - 81 9125 000 - HEATING PRESSURE SWITCH
- 117 - 81 9126 000 - GASKET COPPER 1/4P
- 118 - 81 9127 000 - SCREW 5X18 ZINC TC-ES-INC UNI5931
- 119 - 81 9128 000 - ASME SAFETY RELIEF VALVE
- 120 - 81 9129 000 - BRASS NIPPLE 1" - 3/4"
- 121 - 81 9130 000 - COVER PISTON HEATING
- 122 - 81 9131 000 - PISTON HEATING SIDE
- 123 - 81 9132 000 - PLUG BRASS 1/4P M WITH O-RING
- 124 - 81 9133 000 - NIPPLE OT 1"-22X1,5 MM
- 125 - 81 9134 000 - O-RING 2075 EPDM 1,78 X 18,77
- 126 - 81 9135 000 - HYDRONIC RETURN GROUP
- 127 - 81 9136 000 - BY-PASS VALVE
- 128 - 81 9137 000 - 3/8" MALE CAP
- 129 - 81 9138 000 - DOMESTIC HEAT EXCHANGER "ACQUAJET"
- 130 - 81 9139 000 - SENSOR NTC 10 KOHM KLIP WITH SCREW
- 131 - 81 9140 000 - NUT ZINC COATED 4MA
- 132 - 81 9141 000 - O-RING 3037 EPDM 2,62 X 9,19
- 133 - 81 9142 000 - PURGING PIPE
- 134 - 81 9143 000 - PURGING VALVE M10X1
- 135 - 81 9144 000 - FORCK BY-PASS PIPE
- 136 - 81 9145 000 - BY-PASS PIPE
- 137 - 81 9146 000 - O-RING 4075 EPDM 3,53 X 18,64
- 138 - 81 9147 000 - FRONT THERM. INSULATION "ACQUAJET"
- 139 - 81 9148 000 - REAR THERM. INSULATION "ACQUAJET"
- 140 - 81 9149 000 - BRACKET EXAGONAL HOLES SHORT
- 141 - 81 9150 000 - BRACKET EXAGONAL HOLES LONG
- 142 - 81 9151 000 - NIPPLE OTT 3/4NPT-3/4P USA
- 143 - 81 9152 000 - BRACKET EXAGONAL HOLE SMALL
- 144 - 81 9153 000 - 1/2" G GASKET
- 145 - 81 9154 000 - FAIRLEAD PA 107 SCREW HILO 3,5X14,5
- 146 - 81 9155 000 - CONNECTION BRASS 3/4P TO 1P
- 147 - 81 9156 000 - CONNECTION BRASS 1/2P TO 1P
- 148 - 81 9157 000 - 3/4" NUT
- 149 - 81 9158 000 - SCREW 6X8 ZINC TC-CR DIN7985
- 150 - 81 9159 000 - COPPER PIPE 1P TO 3/4P
- 151 - 81 9160 000 - BRASS 3/4P FEMALE TEE
- 152 - 81 9161 000 - HYDRONIC SUPPLY GROUP ONLY HEAT
- 153 - 81 9162 000 - 1/2P CAP
- 154 - 81 9163 000 - 1/2"-1/4" FF BRASS FITTING
- 155 - 81 9164 000 - PLUG BRASS 3/4P F
- 156 - 81 9165 000 - BRASS ELBOW 3/4P MF
- 157 - 81 9166 000 - 3/4 NUT
- 158 - 81 9167 000 - PLUG BRASS 3/8P F
- 159 - 81 9168 000 - HYDRONIC RETURN GROUP ONLY HEATING
- 162 - 81 9169 000 - BRASS 1/2P MALE CAP
- 163a - 81 9188 000 - 9.1MM NATURAL GAS INJECTOR
- 163b - 81 9189 000 - 5.7MM LP GAS INJECTOR
- 164 - 81 9200 000 - 2.62X13.10 NBR O-RING
- 165 - 81 9192 000 - Ø6/4-1/4" FEMALE FITTING
- 166 - 81 9193 000 - 1/4" TAP
- 167 - 81 9194 000 - Ø6/4-Ø6/4-1/8" MALE TEE FITTING
- 168 - 81 9195 000 - 4X6 PTFE FLEXIBLE PIPE
- 169 - 81 9196 000 - 24X17X2 AISI316L WASHER
- 170 - 81 9197 000 - 24X17X1.5 AISI316L WASHER
- 171 - 81 9198 000 - 1/2"-1/4" MF BRASS FITTING
- 172 - 81 9199 000 - Ø6/4-1/4" MALE BRASS ELBOW FITTING (WITH VITON O-RING)

If replacement parts are needed

When parts are needed, refer to boiler model and serial number shown on the boiler name/rating plate. Control identification and replacement should be attempted only by a qualified technician. Relief/Safety valves must be ASME rated for the pressure and gross output of the boiler.

17 - READ OUT FLOW CHART



17 - READ OUT FLOW CHART



17 - 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 .

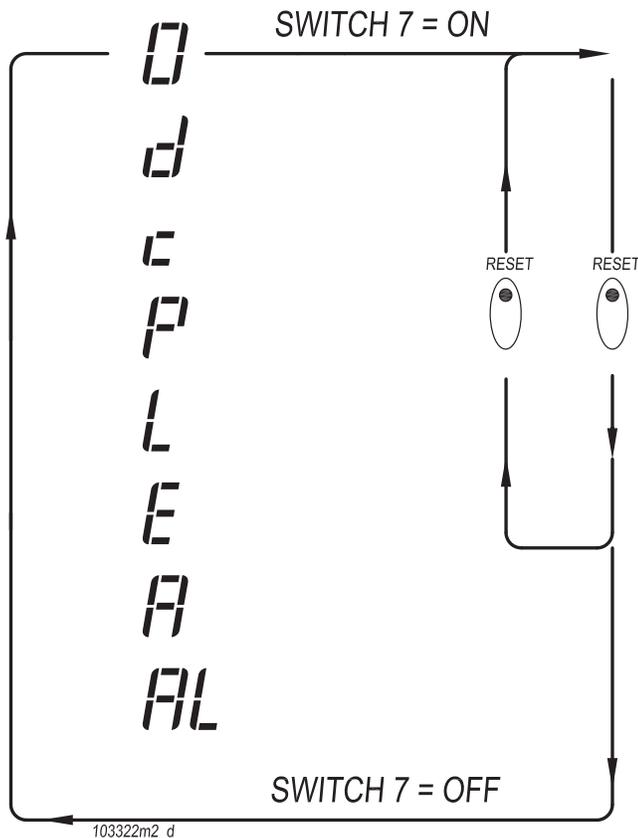
To enter this menu you must:

1. turn the main electrical supply Off;
2. move the switch #7 (see Figure 9-2, 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 # 7 (see Figure 9-2, item "D") to the Off position;



- tY** Basic functionalities selection and Speed blower selection (see below for more explanations)
- tS** Main electrical supply and temperature unit selection (see below for more explanations)
- dS** Domestic functionalities selection. Must be always at 00
- CU** Master or slave selection in a module configuration. Must be always at 00.
- Cr** Rotating selection in a module configuration. Must be always at 00.
- FS** Heating Water Flow Switch. (Function present only for certain boilers) (See below for more explanations)
- Or** Outdoor temperature sensor range (See below for more explanations)

tY may assume the follow values:
61 - for boilers at NATURAL gas;
62 - for boilers at LP gas;

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

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

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

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

FS if readable, may assume the follow values:
00 = Flow Switch disabled;
01 = Flow Switch enabled;

Or if readable, may assume the follow values:
00 = Outdoor minimum temperature of 14°F;
01 = Outdoor minimum temperature of -39°F; (add a 68 kohm 1/4W resistor in parallel with the outdoor sensor).

Slant/Fin

SLANT/FIN CORPORATION, Greenvale, NY 11548
Phone: (516) 484-2600, Fax: (516) 484-5921

www.slantfin.com

Canada: SLANT/FIN LTD/LTEE, Mississauga Ontario
Phone: 905-677-8400

www.slantfin.ca