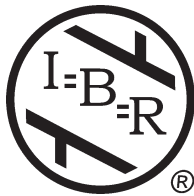
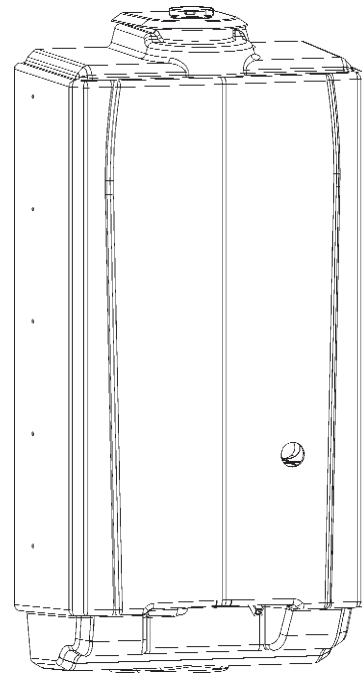
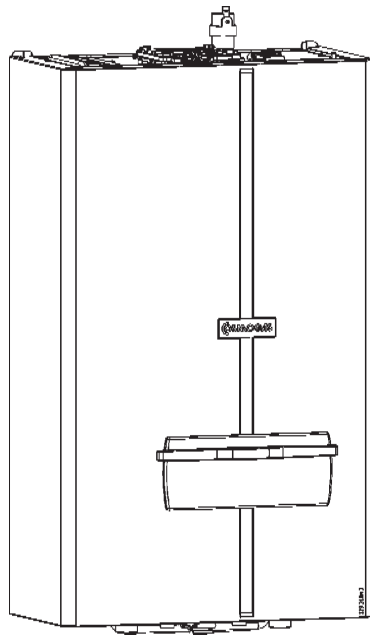


# Smith

RESIDENTIAL BOILERS

## Installation and maintenance instructions for gas-fired condensing hot water boilers models: **GC-160**

(Book No. 62403466, Ed. Sep. 2008)



**ASME**  
certified

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

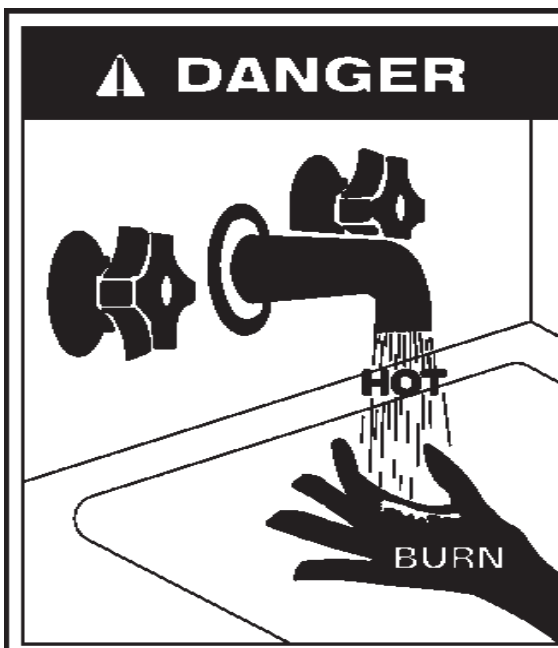
# SAFETY INSTRUCTIONS

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

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
  - Do not try to light any appliance.
  - Do not touch any electrical switch; do not use any phone in your building.
  - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
  - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

**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 instructin manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available, see manual.

121110m0\_a

# 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

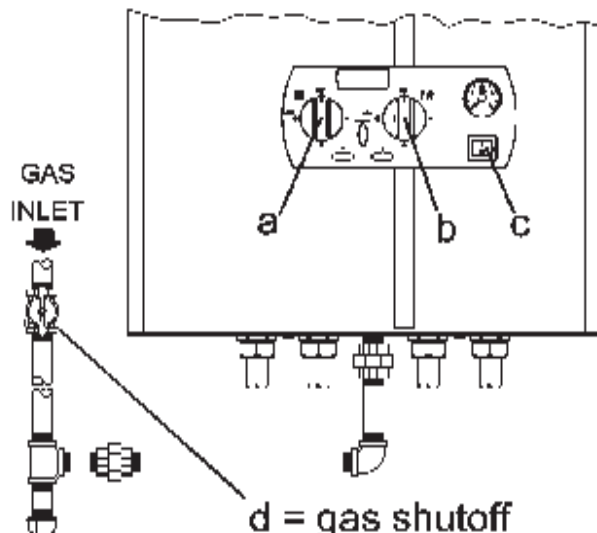
- Do not try to light any appliance.
- Do not touch any electric switch;
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

- 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.

## ☞ Liability

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

## ☞ Hazards and Your Safety - Hot Water Can Scald!

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

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

## ☞ Qualified Technicians:

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

## ☞ Installation and Alterations:

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

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

## ☞ Maintenance:

at least once a year the user must call in a licensed authorized technician for routine maintenance.

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

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

## ☞ Electrical

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

☞ **ATTENTION:** *Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Des erreurs de câblage peuvent entraîner un fonctionnement inadéquat et dangereux. S'assurer que l'appareil fonctionne adéquatement une fois l'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, shut off the gas supply at a location external to the appliance.

☞ **En cas de surchauffe ou si l'alimentation de gaz ne peut être coupée**, ne pas couper ni 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 qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

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

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

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

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# 1 - INSTALLATION - CODE REQUIREMENTS

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## 1.1 - National installation legislation

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

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



## 2 - GENERAL INFORMATION

### 2.1 - Introduction

Congratulations!  
You have effectively purchased one of the best boilers on the market.  
Each single part is built, tested and assembled, with pride, at the COSMOGAS factories, thereby guaranteeing optimum quality control.  
Thanks to on-going research carried out by COSMOGAS, this product has been conceived and is considered to be the best in its class with regards to respect for the environment. Great importance is also given to the end of the boiler's useful life. All of its components can easily be separated into similar and completely recyclable parts.

### 2.2 - Manufacturer

COSMOGAS srl  
Via L. da Vinci 16  
47014 - Meldola (FC)  
ITALY

Tel. +39 0543 498383  
Fax. +39 0543 498393  
www.cosmogas.com  
info@cosmogas.com

Spare parts are available from your local authorized wholesale distributor.  
For a location of the one nearest you call 413 -564- 9538.

### 2.3 - Key to symbols used

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



**CAUTION!!!**

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



**CAUTION!!!**

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

● Operation symbol

☞ Important indication symbol

### 2.4 - Description of models

45

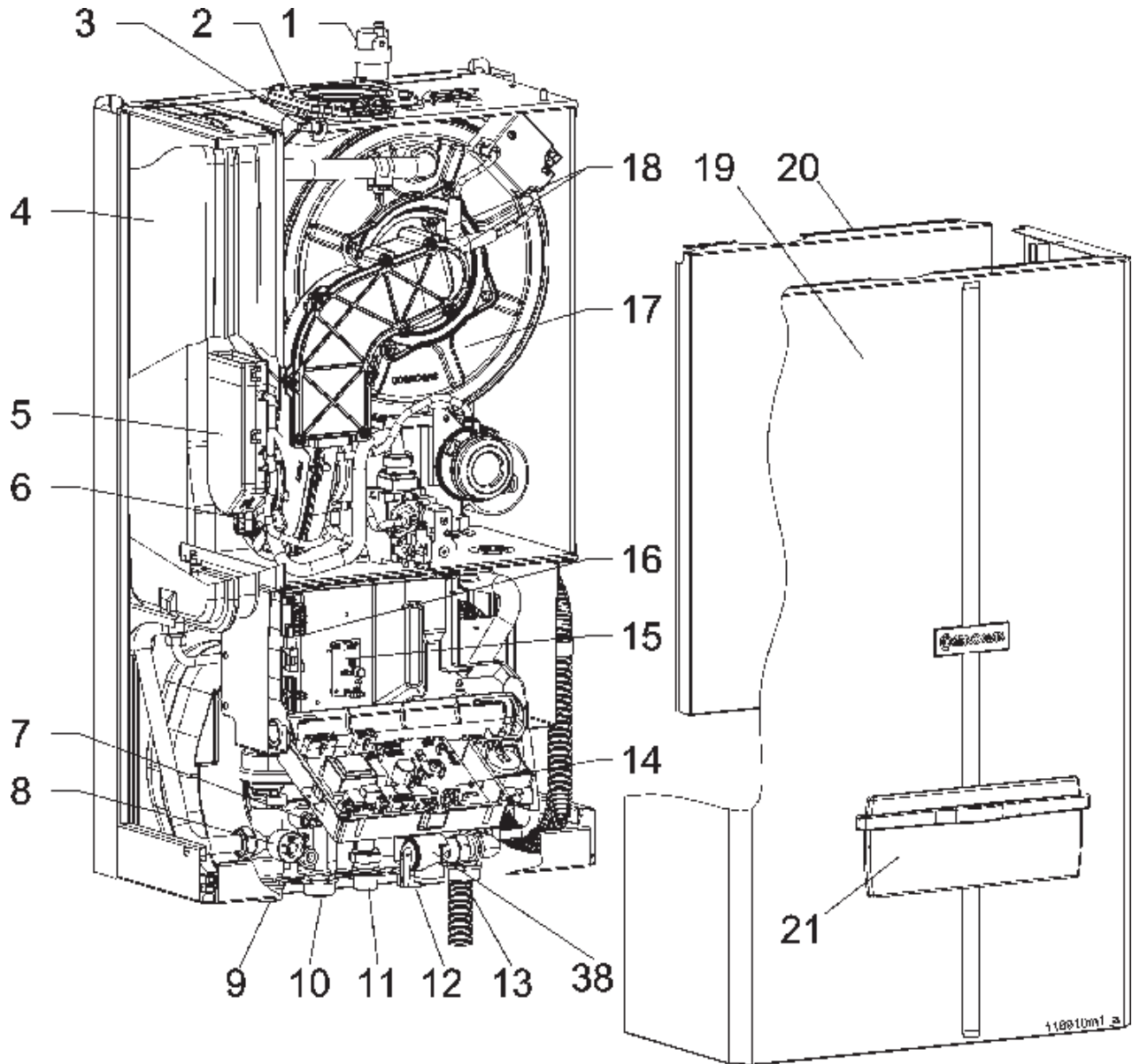
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**AN** = heating only version, for inside installation  
**WN** = combi version (space heating and instantaneous D.H.W. production), for inside installation.  
**AE** = heating only version, for outdoor installation  
**WE** = combi version (space heating and instantaneous D.H.W. production), for outdoor installation.

Modulating gas-fired, condensing hot water boiler, with sealed combustion chamber and pre-mix burner, with maximum power input of 160,000 Btu/hr (47 kW) and minimum of 30,000 Btu/hr (9 kW)



### 3 - MAIN COMPONENTS



- 1 - Automatic air vent
- 2 - Air intake and flue gas discharge fitting (venting system)
- 3 - U7 flue gas temp. sensor and flue safety switch
- 4 - Expansion tank (not present on 45AN and 45AE models)
- 5 - Air drum
- 6 - Air/gas mixer device
- 7 - U2 d.h.w. temp. sensor (not present on 45AN and 45AE models)
- 8 - Heating pressure switch (low water cut-off)
- 9 - Heating supply connection
- 10 - DHW connection (not present on 45AN and 45AE models)
- 11 - Gas inlet connection
- 12 - DCW connection (not present on 45AN and 45AE models)
- 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 - Sealing chamber door
- 21 - Instrument panel door

**Figure 1 - Main components**

### 3 - MAIN COMPONENTS

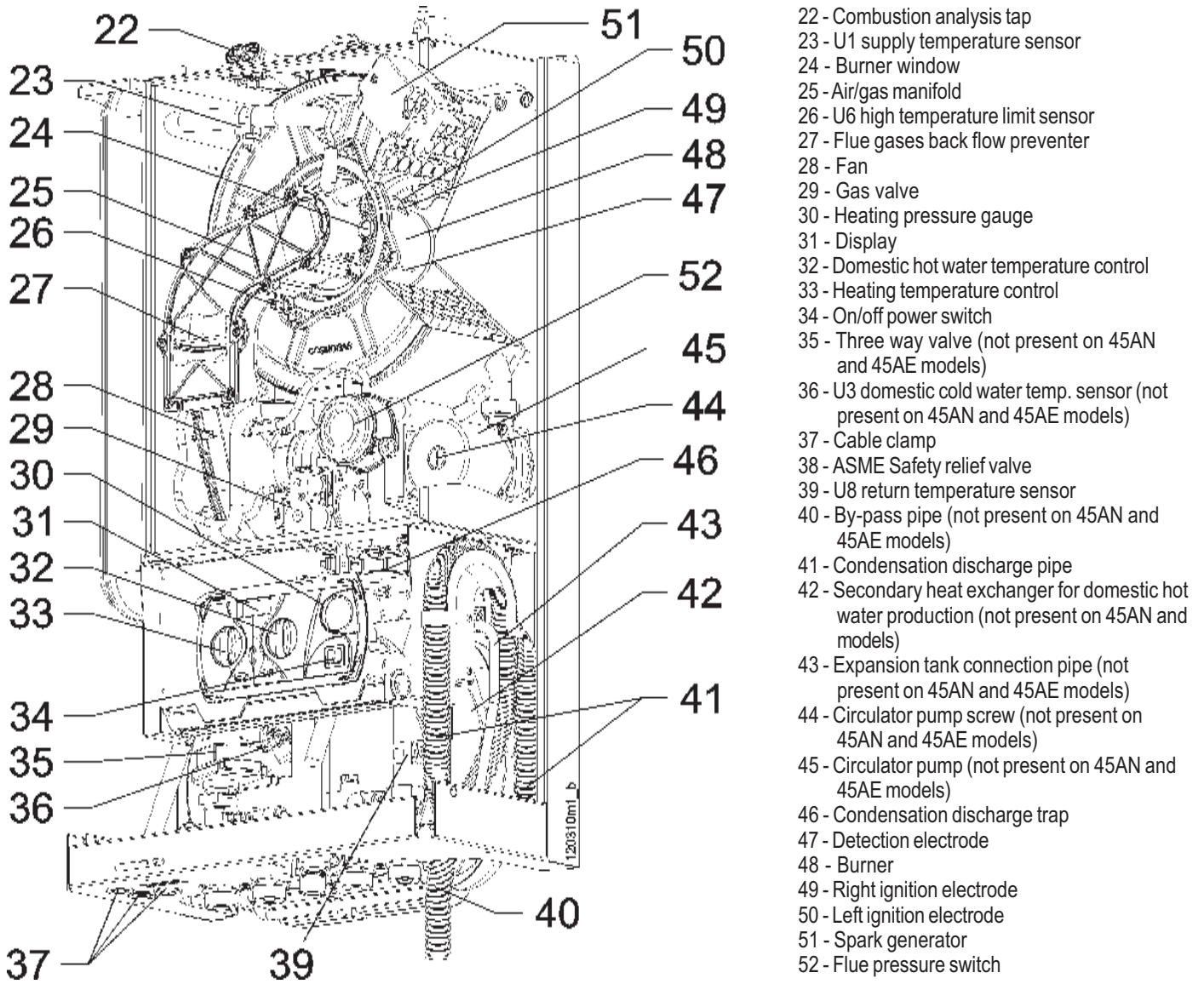
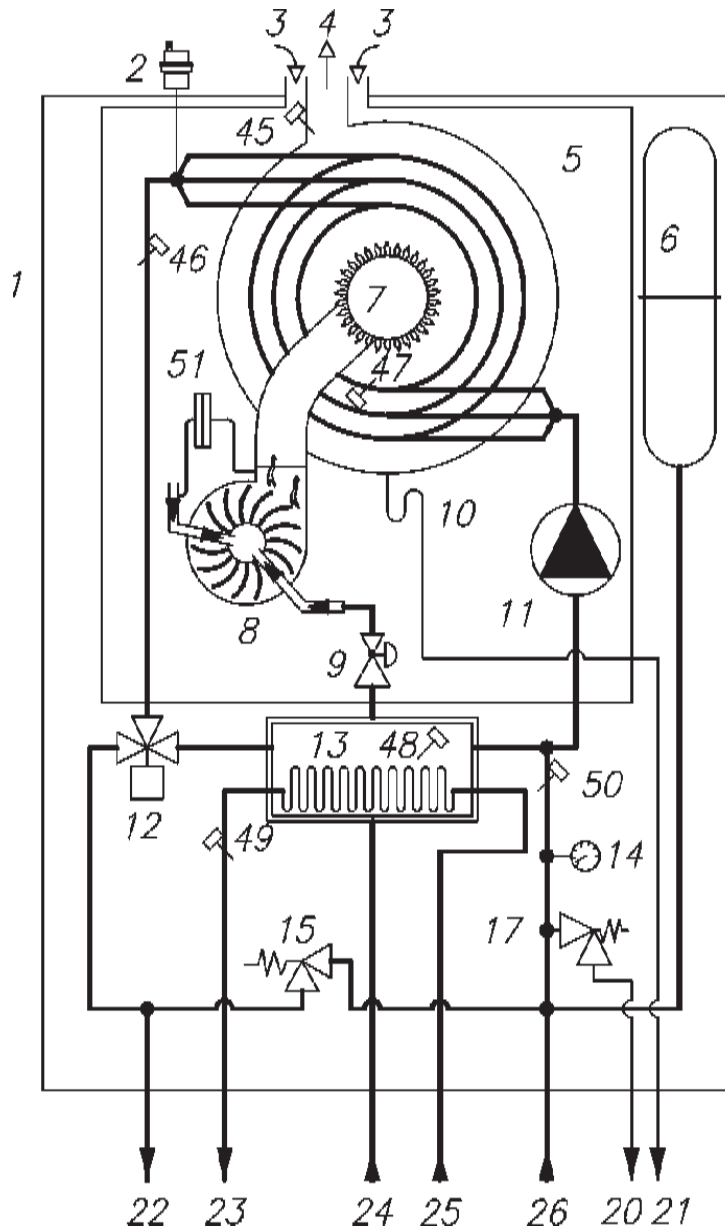


Figure 1 - Main components

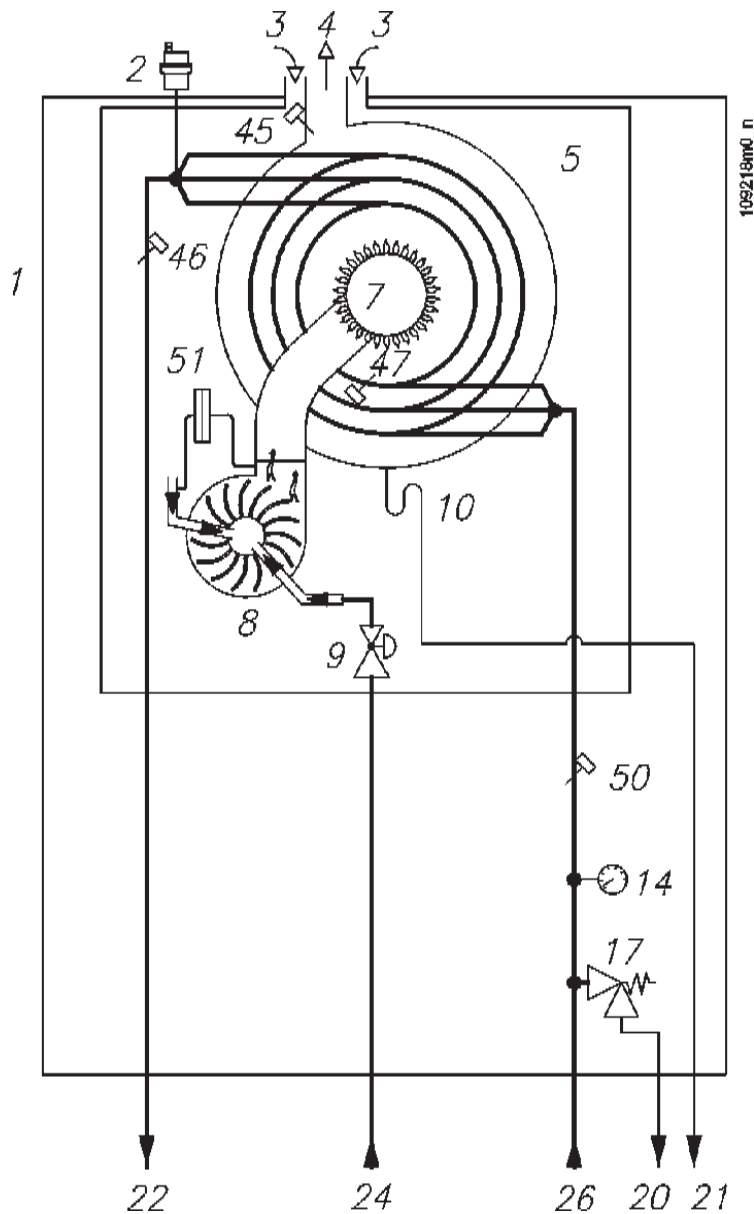
# 4 - FUNCTION OVERVIEW



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

Figure 2 - 45WN and 45WE Hydronic functional schematic

## 4 - FUNCTION OVERVIEW



Key to figure 3:

- 1 = boiler model 45AN or 45AE
- 2 = automatic air vent
- 3 = air intake
- 4 = flue gases discharge
- 5 = sealed combustion chamber
- 7 = burner
- 8 = fan
- 9 = gas valve
- 10 = condensate discharge trap
- 14 = pressure gauge
- 17 = safety relief valve
- 20 = safety relief valve discharge
- 21 = condensation discharge pipe
- 22 = heating supply pipe
- 24 = gas inlet
- 26 = heating return pipe
- 45 = U7 = flue gas temperature sensor and high limit safety switch
- 46 = U1 = boiler temperature sensor
- 47 = U6 = high limit temperature sensor
- 50 = U8 = return temperature sensor
- 51 = flue pressure switch

Figure 3 - 45AN and 45AE Hydronic functional schematic

## 4 - FUNCTION OVERVIEW

### 4.1 - Intended use and functions of the boiler

This gas-fired condensing boiler, is designed to be used for central heating and producing domestic hot water. The maximum output heat is always guaranteed for the production of domestic hot water since it is given priority over space heating demands. Follow the specific procedure in section 12.1 for the adjustment of the domestic hot water temperature. Depending on the model chosen, the following system types can be created:

**- 45WN.** Using this boiler model, a system can be created for the production of instantaneous domestic hot water and a heating system with heating elements functioning at temperatures ranging between 68°F (20°C) and 189°F (87°C).

The boiler can also function directly with a radiant floor panel, see section 5.9.

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 5. The same verification need to be done for the domestic installation, see figure 7.

**- 45AN.** Using this boiler model, a heating system with heating elements functioning at temperatures ranging between 68°F (20°C) and 187°F (87°C) can be configured.

The boiler can also function directly with a radiant floor panel, see section 5.9.

The 45AN 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 3.

To connect the boiler to the heating system, the installer must consider the loss of pressure generated by the boiler (see figure 6), and choose a pump capable of overcoming the head loss of both the boiler and the heating system.

**- 45WE.** This boiler is equal to the 45WN model, but is intended for outdoor installation.

**- 45AE.** This boiler is equal to the 45AN model, but is intended for outdoor installation.

All models can be connected to an indirect storage tank for the production of domestic hot water, section 7.

All models can be connected to a room thermostat, section 6.3 and 6.4.

Because boiler models 45WE and 45AE are usually installed outside the building, they need to be connected to a Remote Command, section 6.8.

An outdoor air temperature sensor can also be connected to the boiler for maximum fuel efficiency and comfort (see section 6.5). In this configuration the room thermostat will compensate by adjusting the room temperature. The room temperature compensation can be of an ON /OFF type or two-stage. For further information on the Climatic heat adjustment, refer to section 12.4.

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

☞ Before installation, thoroughly flush the heating and plumbing systems of any residue or impurities which might compromise the smooth running of the boiler.

☞ Only boilers model 45WE and 45AE are designed for outdoor installation. However also for these boilers you need to choose a sheltered place where it is protected from atmospheric elements including frost.

☞ Refer to figure 8 for minimum clearance distances for installation

and future maintenance.

☞ Refer to section 5.2 for minimum clearance distances from combustible material.

### 4.2 - Setting of the boiler

Inside this instruction manual there are sections that require you to change the settings of the boiler. To do this, the installer needs to operate on several available menus, which are explained within the section the change is needed.

To aid the installer, all menus are also shown in section 16 with an explanation of which varies keys to press.

# 4 - FUNCTION OVERVIEW

## 4.3 - A smart and intelligent boiler

When connected to an outside sensor (optional), this boiler is designed to always work at the maximum efficiency. It will automatically change the supply temperature in relation with the outdoor temperature.

The graph in figure 4 shows an example on how it can work.

This graph represent an installation where the supply and return temperatures are 139°F and 115°F respectively, and the outside temperature is 23°F. The outdoor sensor 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.

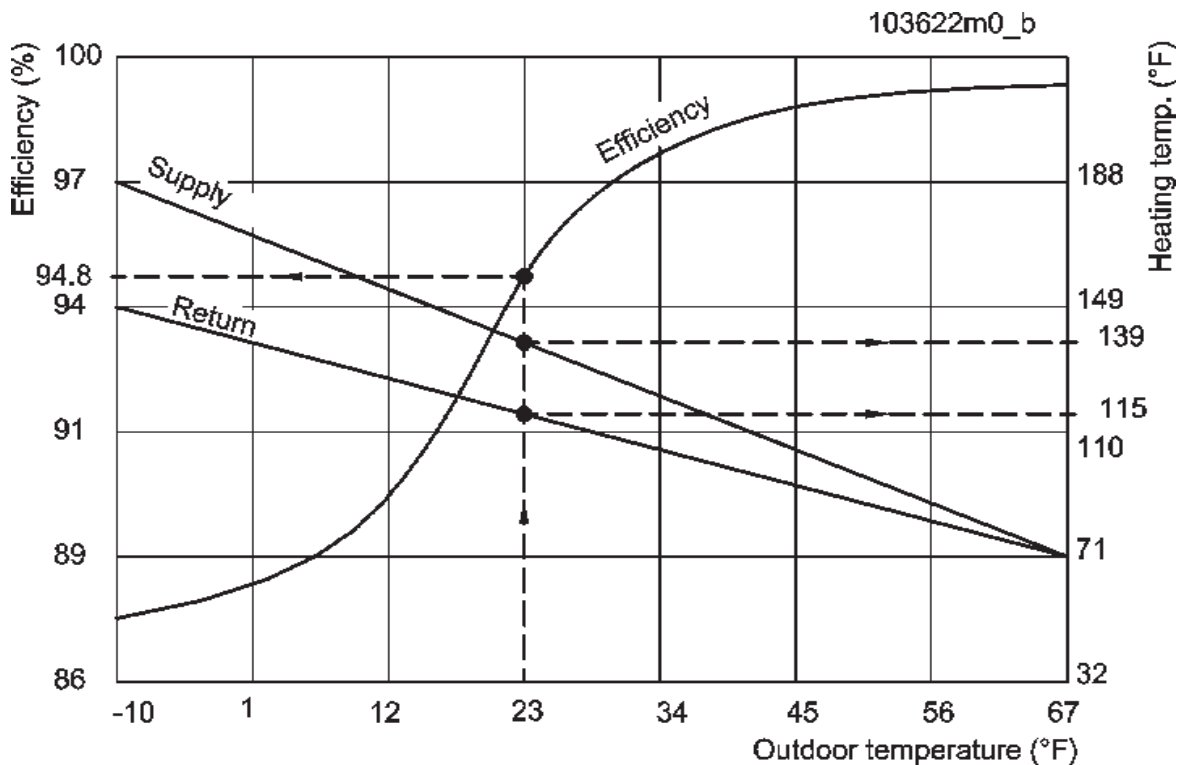
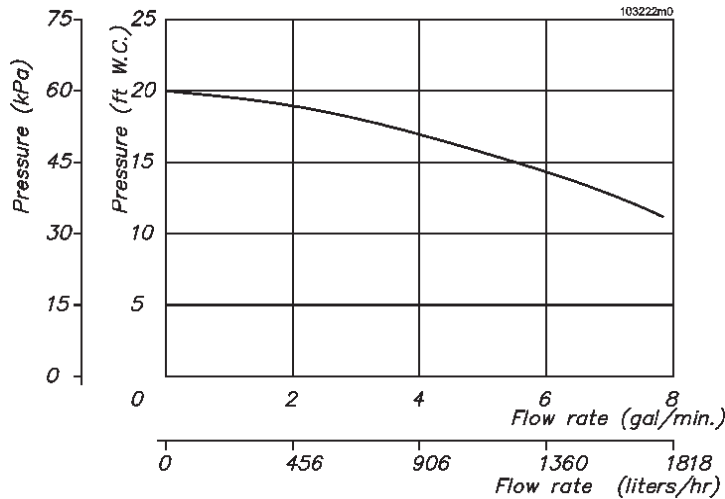
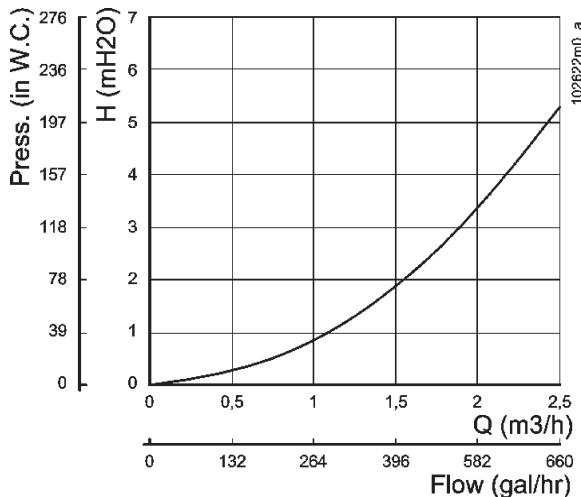


Figure 4 - Relation between outdoor temperature, heating temperature and efficiency

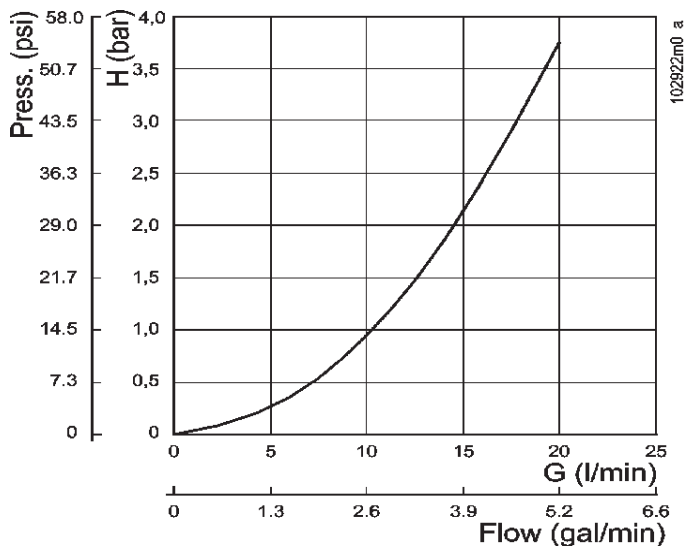
## 4 - FUNCTION OVERVIEW



**Figure 5 - Residual Head for heating circuit for models "45WN" and "45WE"**



**Figure 6 - Boiler Head Loss for models "45AN" and "45AE"**



**Figure 7 - Domestic Water Coil Head Loss for models "45WN" and "45WE"**

### 4.4 - Characteristic curves of heating system's residual head

45WN and 45WE boilers are fitted with its own specific circulator pump. The residual head at the boiler connections is shown in graph form in figure 5.

### 4.5 - Boiler head loss curve

45AN and 45AE boilers are not fitted with an internal pump. The installer needs to install an external pump as illustrated in figure 17, item "6". Use the graph in figure 6 to choose the correct pump.

### 4.6 - Characteristic curve of the domestic side

45WN and 45WE boilers, offers certain resistance to the passage of the domestic water (see graph flow/pressure of figure 7). The installer or the engineer must take account of this in order to ensure the correct domestic water flow to the utilities.



# 5 - INSTALLATION - Mounting & gas and water connections

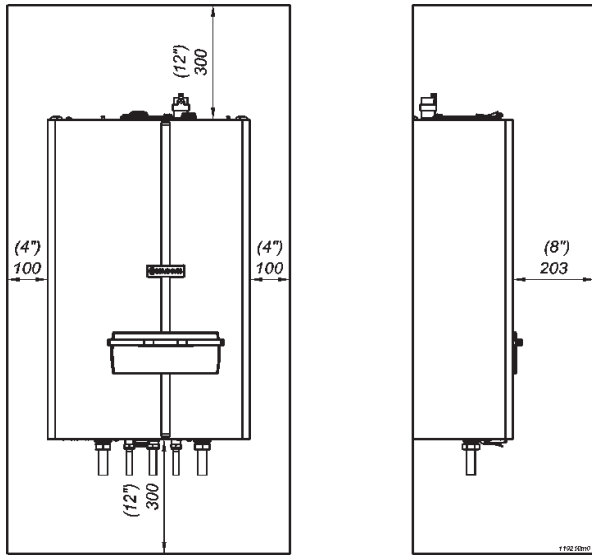


Figure 8 - Recommended minimum clearance distances for proper installation and servicing for models 45WN, 45AN, 45AE and 45WE.

## 5.1 - Clearances for installation and servicing for models

Figure 8 shows the clearances required for installation and servicing.

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

## 5.2 - Clearances from combustible material

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

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

## 5.3 - Choosing the installation location for 45WN and 45AN models



**CAUTION!!!** The boiler must be installed on a vertical wall constructed to bear its weight or the boiler and building may be damaged.

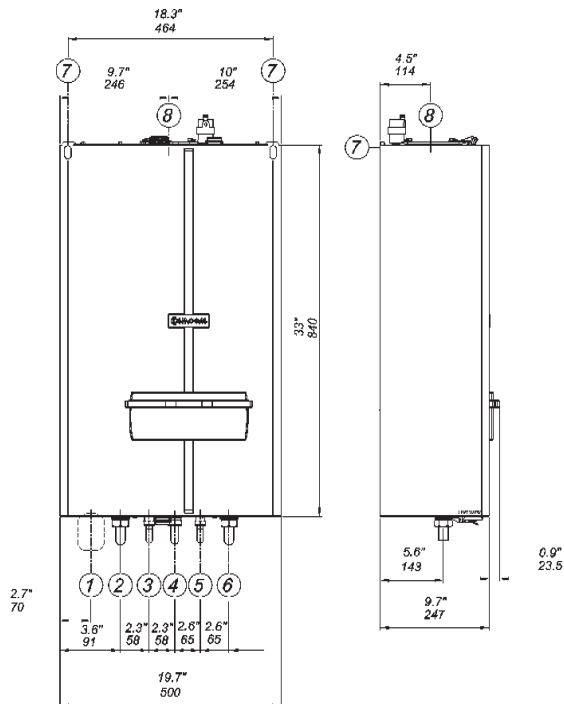
**NOTE:** The boiler must never be installed on carpeting.



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

When locating the boiler the following factors must be considered:

- the location of vent/air intake terminals;
- connection to the gas supply;
- connection to the water supply;
- connection to the heating system;
- connection to the domestic hot water system;
- connection to the electrical supply;
- disposal of the condensation produced by the boiler;
- connection to the room thermostat;
- piping of the safety relief valve discharge;
- possible connection of the outdoor temperature sensor;
- possible connection of an indirect storage tank, see section 7.

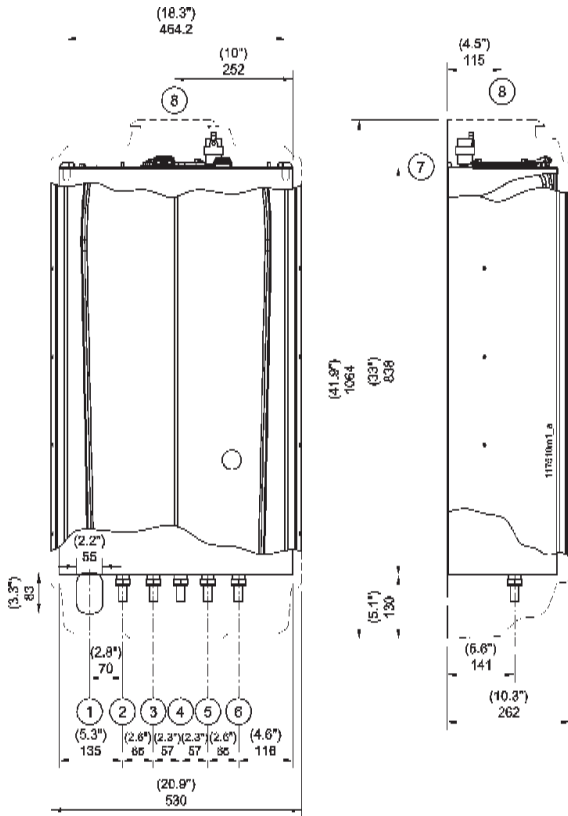


- 1 = Area for power supply cable
- 2 = Heating supply connection (3/4")
- 3 = Domestic hot water connection (3/4") (absent in 45AN model)
- 4 = Gas connection (3/4")
- 5 = Domestic cold water connection (3/4") (absent in 45AN model)
- 6 = heating return connection (3/4")
- 7 = positions for boiler support
- 8 = Flue discharge/air intake connection

Figure 9 - Dimensions for models 45WN and 45AN

# 5-INSTALLATION - Mounting & gas and water connections

## 5.4 - Choosing the installation location for 45WE and 45AE models



- 1 = Area for power supply cable
- 2 = Heating supply connection (3/4")
- 3 = Domestic hot water connection (3/4")  
(absent in 45AE model)
- 4 = Gas connection (3/4")
- 5 = Domestic cold water connection (3/4") (absent in 45AE model)
- 6 = heating return connection (3/4")
- 7 = positions for boiler support
- 8 = Flue discharge/air intake connection

Figure 10 - Dimensions for models 45WE and 45AE



**CAUTION!!!** The boiler must be installed on a vertical wall constructed to bear its weight or the boiler and building may be damaged.

**NOTE:** The boiler must never be installed on carpeting.



**CAUTION!!!** This boiler is designed also for direct outdoor installation. However, if installed outside of the structure that it supplies hot water too, it must be sheltered so it is protected from rain, sun and frost. **NEVER** place this boiler in a location that would subject it to temperatures at or near freezing. Failure to properly locate this boiler can result in premature failure voiding the warranty.

When locating the boiler the following factors must be considered:

- the location of vent/air intake terminals;
- connection to the gas supply;
- connection to the water supply;
- connection to the heating system;
- connection to the domestic hot water system;
- connection to the electrical supply;
- disposal of the condensation produced by the boiler;
- connection to the room thermostat;
- connection to the remote command;
- piping of the safety relief valve discharge;
- possible connection of the outdoor temperature sensor;
- possible connection of an indirect storage tank, see section 7.

## 5-INSTALLATION - Mounting & gas and water connections

### 5.5 - Mounting the boiler

Refer to figure 11:

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



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

- mark the screw holes for the wall bracket, "A";
- remove the cardboard template;
- install the wall bracket "A", using the screws "E", provided;
- hang the boiler on the wall bracket, "A", by hanging connections "B" and "C" on tabs "D".

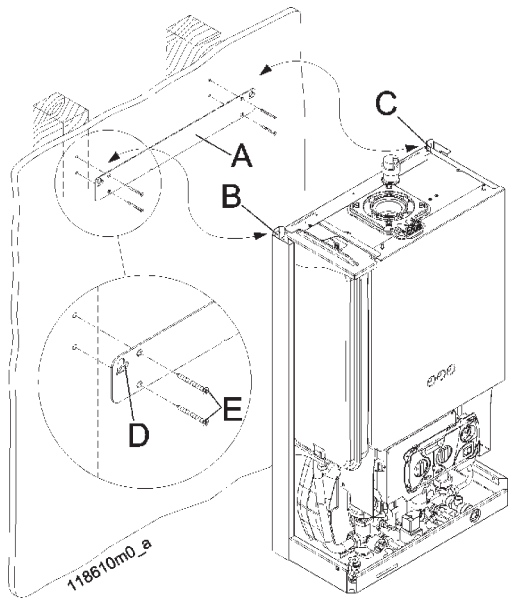


Figure 11 - Wall bracket installation

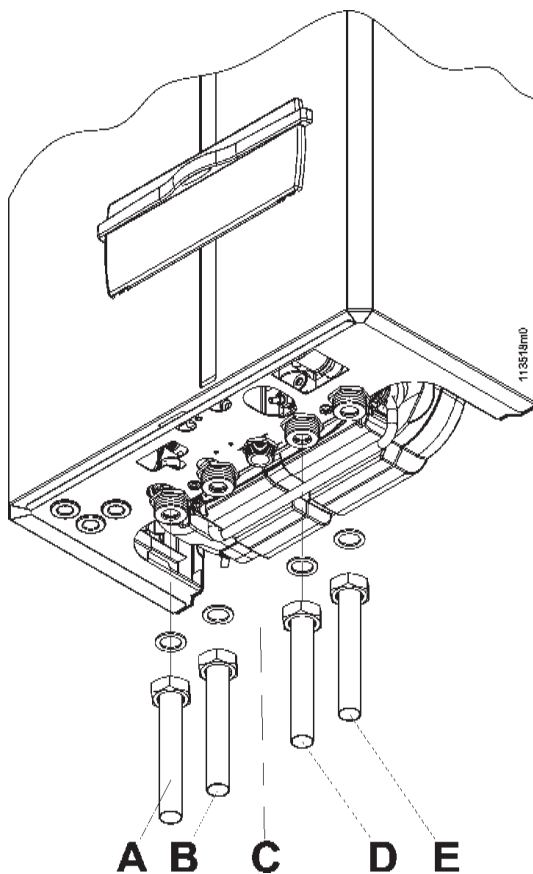
### 5.5- Mounting the plastic cover on a 45WE or 45AE boiler

If you are installing a 45WE or 45AE boiler for outside use, you must also install the plastic outer jacket cover as per section 13.3.1. The plastic cover will need to be cut on the bottom to adapt the passage of:

- the gas and water connections as per section 5.6;
- the condensate drain as per section 5.7;
- the relief valve discharge, as per section 5.8.

### 5.6 - Gas and water connections

The boiler comes with the fittings shown in figure 12.



- A = heating system supply (3/4")**
- B = domestic hot water supply (3/4") (Absent on 45AN and 45AE models)**
- C = Inlet gas connection (3/4")**
- D = domestic cold water (3/4") (Absent on 45AN and 45AE models)**
- E = heating system return (3/4")**

Figure 12 - Fittings supplied with the boiler

# 5 - INSTALLATION - Mounting & gas and water connections

## 5.7 - Condensate disposal

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

This boiler produces water as a byproduct of combustion. The boiler is equipped with a condensate trap, figure 1, item 46, for the evacuation of condensate and to prevent the leakage of combustion products. The condensate trap drains through pipe "C" shown in Figure 13. The condensation disposal system must:

- ☞ be connected to the domestic waste disposal system by means of an appropriate trap capable of preventing the pressurization of the condensate system and the return of sewer gases (see figure 14);
- ☞ comply with national and/or local codes for condensate neutralizer between pipe "C" of figure 13 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;
- ☞ properly pitched towards the point of discharge avoiding high points, which could place the condensate system under pressure;

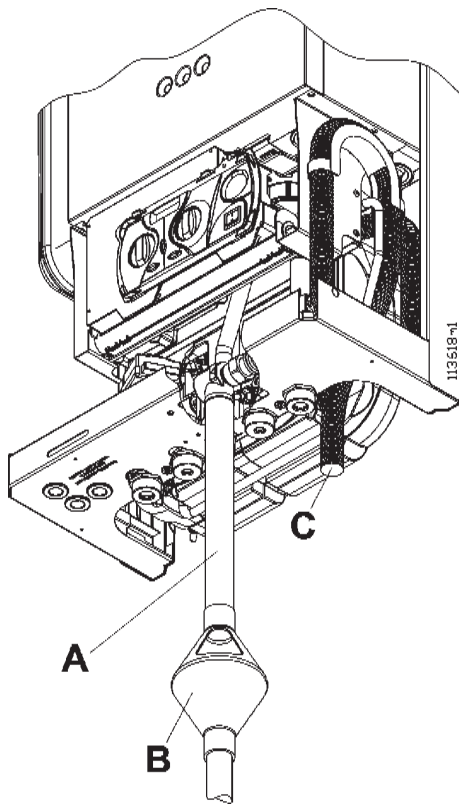


**CAUTION!!!** The condensate drainage system is designed to empty all the condensate produced by one boiler only. Each boiler must be equipped with its own condensate drainage system or the drainage system may malfunction.

## 5.8 - Relief valve

Each boiler is equipped with a safety relief valve set at **30 psi (2 bar)** which must be piped in accordance with the ANSI/ASME Boiler and Pressure Vessel Code, Section IV, to prevent scalding in the event of a discharge, see Figures 1, item "38" and figure 13.

**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!



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

Figure 13 - Relief valve connection

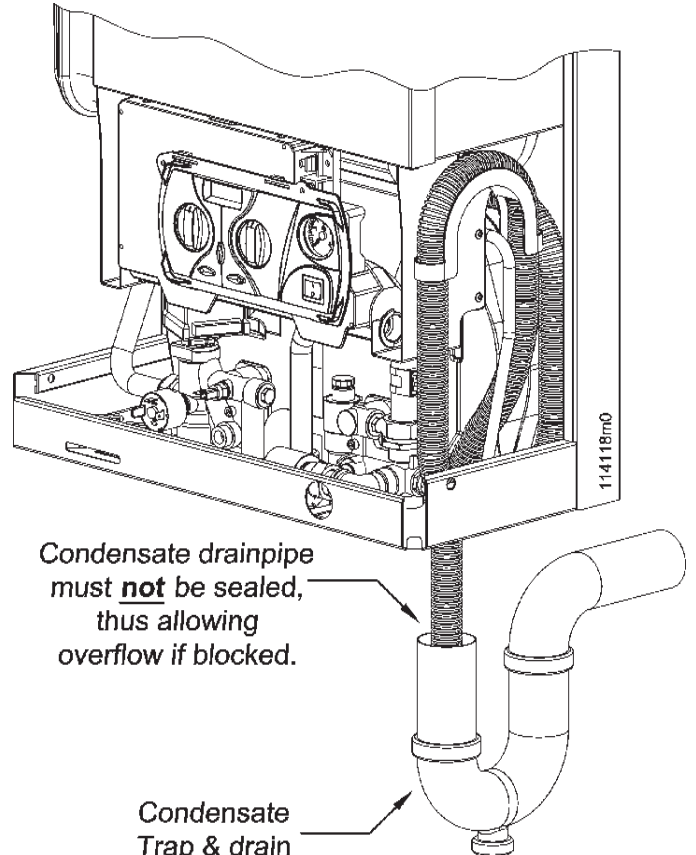


Figure 14 - Condensate trap and drain

# 5 - INSTALLATION - Mounting & gas and water connections

## 5.9 - Supply and return piping



**CAUTION!!!** All heating

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



**CAUTION!!!** This boiler must

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



**CAUTION!!!** Before

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



**CAUTION!!!** This boiler is

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



**CAUTION!!!** The

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

☞ Figure 12 illustrates the position of the supply and return pipes.

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

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

## 5.10 - Low temperature heating systems



**CAUTION!!!** When the boiler

is installed in a low temperature system, the switch “6” in figure 22 must be placed in the ON position to prevent the supply water temperature from exceeding 113°F (45°C) or damage to the low temperature system components could occur (see section 5.9).

With switch “6” in figure 22, 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 radiant panel heating system using plastic piping, precautions must be taken against corrosion caused by water oxygenation. If the piping does not comply with these specifications, the radiant panel circuit must be isolated from the boiler using a titanium plate heat exchanger.

## 5.11 - Use of glycol and other chemicals

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

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



**CAUTION!!!** Any additives

added to the heating system must not be added directly inside the boiler but through the heating system piping to prevent damage to the boiler.

## 5.12 - Domestic hot and cold water (only for 45WN and 45WE models)



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

☞ Figure 12 illustrates the positioning of the domestic hot and cold water pipes.

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

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

☞ 45WN and 45WE boilers can work also like a only heating boilers, simply avoid to connect the domestic pipes “B” and “D” of figure 12.



# 5 - INSTALLATION - Mounting & gas and water connections

## 5.13 - Gas supply piping

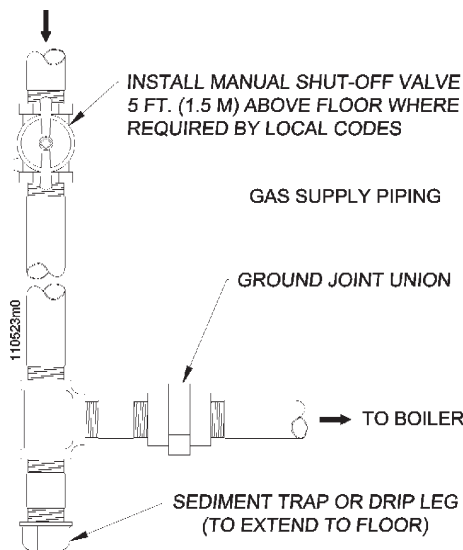
**WARNING!!! Check that the type and the pressure of the gas supplied correspond with those required for the boiler as stated on the rating plate. Never use a gas different than that stated on the boiler rating plate. Failure to comply with this warning can result in a fire or explosion causing extensive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

- ☞ Before installation a thorough internal cleaning of the gas supply line should be performed. Figure 12 shows the positioning of the gas connection on the heater.
- ☞ The boiler and its gas connection must be leak tested before placing the boiler in operation.
- ☞ To avoid damaging the gas control, perform a leak test at a pressure of no greater than 20 in W.C. (50 mbar).

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

- ☞ If the gas type and/or the supply pressure do not match those stated on the boiler rating plate the boiler must be converted to the type of gas and/or supply pressure available. A conversion kit is supplied together with the boiler.
- ☞ The boiler comes from the factory ready to be piped to the gas supply. The National Fuel Gas Code, ANSI Z223.1/NFPA 54 and local codes for gas piping requirements and sizing must be followed.
- ☞ Install a manual gas shutoff valve and drip leg as shown in Figure 15.

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



**Figure 15 - Gas supply piping**

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

## 5.14 - Operating at high altitudes

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

**TABLE 1 GAS PIPE CAPACITY**

Nominal Iron Pipe Size	Pipe length								
	10'	20'	30'	40'	50'	60'	80'	100'	150'
	Gas Pipe Capacity (ft <sup>3</sup> /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 ft<sup>3</sup>/hr is based on a 0.60 specific gravity gas at a pressure of 0.5 psig and a 0.3"WC pressure drop

**TABLE 2 EQUIVALENT PIPE LENGTH CHART**

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

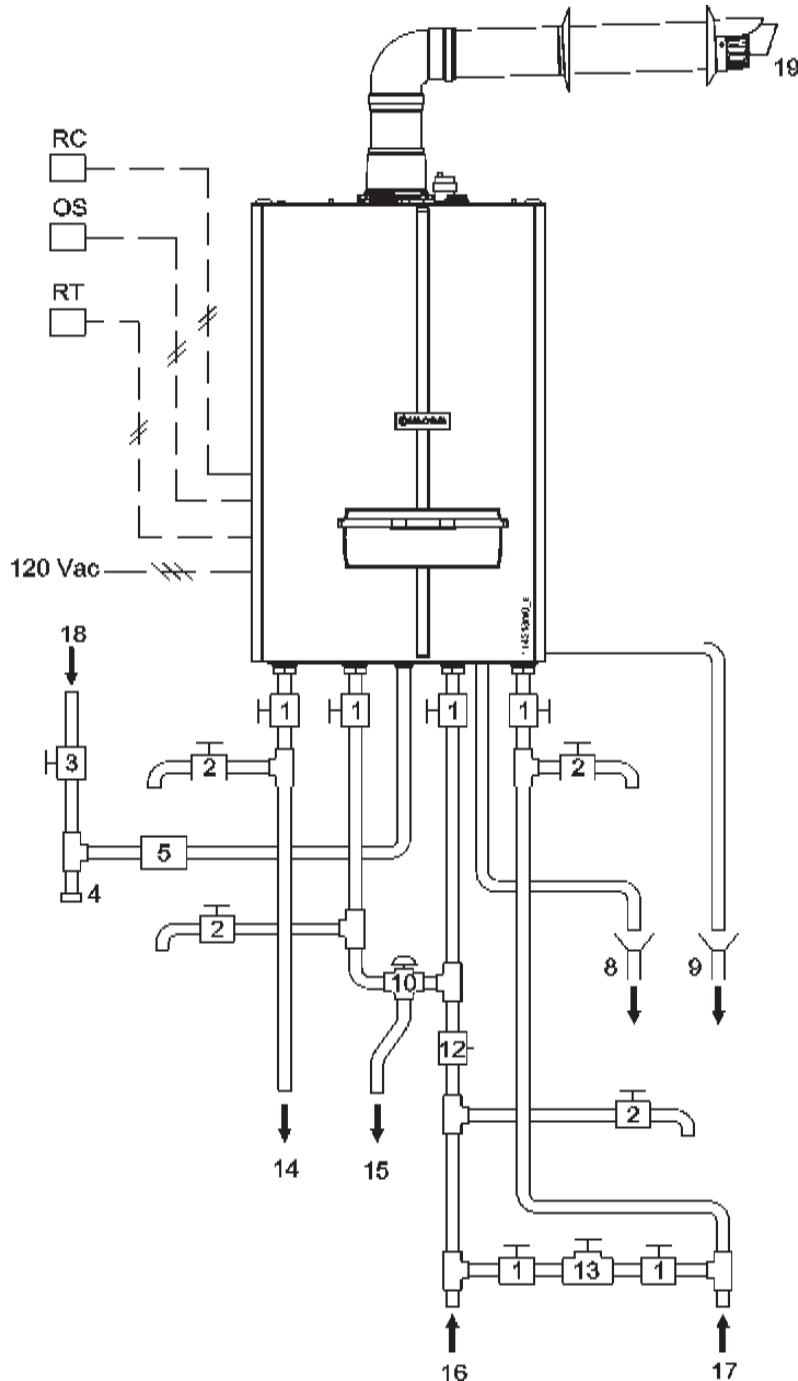
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## 5 - INSTALLATION - Mounting & gas and water connections

### 5.15 - Suggested piping and wiring connections for the 45WN and 45WE versions Boiler

Figure 16 shows the suggested piping and wiring connection for boiler models 45WN and 45WE.

All component listed below, except the flue terminal needs to be field supplied.



- 1 = ball valve
- 2 = drain valve
- 3 = Manual gas shut-off valve
- 4 = sediment trap
- 5 = ground joint union
- 6 = Circulator pump
- 7 = By pass valve
- 8 = Relief valve drain
- 9 = Condensate drain
- 10 = Domestic mixing valve
- 11 = Expansion tank
- 12 = Flow restrictor
- 13 = Fill valve
- 14 = Heating supply
- 15 = Domestic Hot Water
- 16 = Cold water
- 17 = Heating return
- 18 = Gas supply
- 19 = Concentric vent/air intake terminal
- OS = Outdoor sensor (optional)
- RC = Remote command (only for 45WE model)
- RT = Room thermostat
- 120 Vac = Electrical supply

Figure 16 - Typical piping and wiring connections for a boiler models 45WN and 45WE



## 5 - INSTALLATION - Mounting & gas and water connections

### 5.16 - Suggested piping and wiring connections for the 45AN and 45AE versions Boiler

Figure 17 shows the suggested piping and wiring connections for boiler models 45AN and 45AE.

All components listed below, except the flue terminal need to be field supplied.

- 1 = ball valve
- 2 = drain valve
- 3 = Manual gas shut-off valve
- 4 = sediment trap
- 5 = ground joint union
- 6 = Circulator pump
- 7 = By pass valve
- 8 = Relief valve drain
- 9 = Condensate drain
- 10 = Domestic mixing valve
- 11 = Expansion tank
- 12 = Flow restrictor
- 13 = Fill valve
- 14 = Heating supply
- 15 = Domestic Hot Water
- 16 = Cold water
- 17 = Heating return
- 18 = Gas supply
- 19 = Concentric vent/air intake terminal
- OS = Outdoor sensor (optional)
- RC = Remote command (only for 45AE model)
- RT = Room thermostat
- 120 Vac = Electrical supply

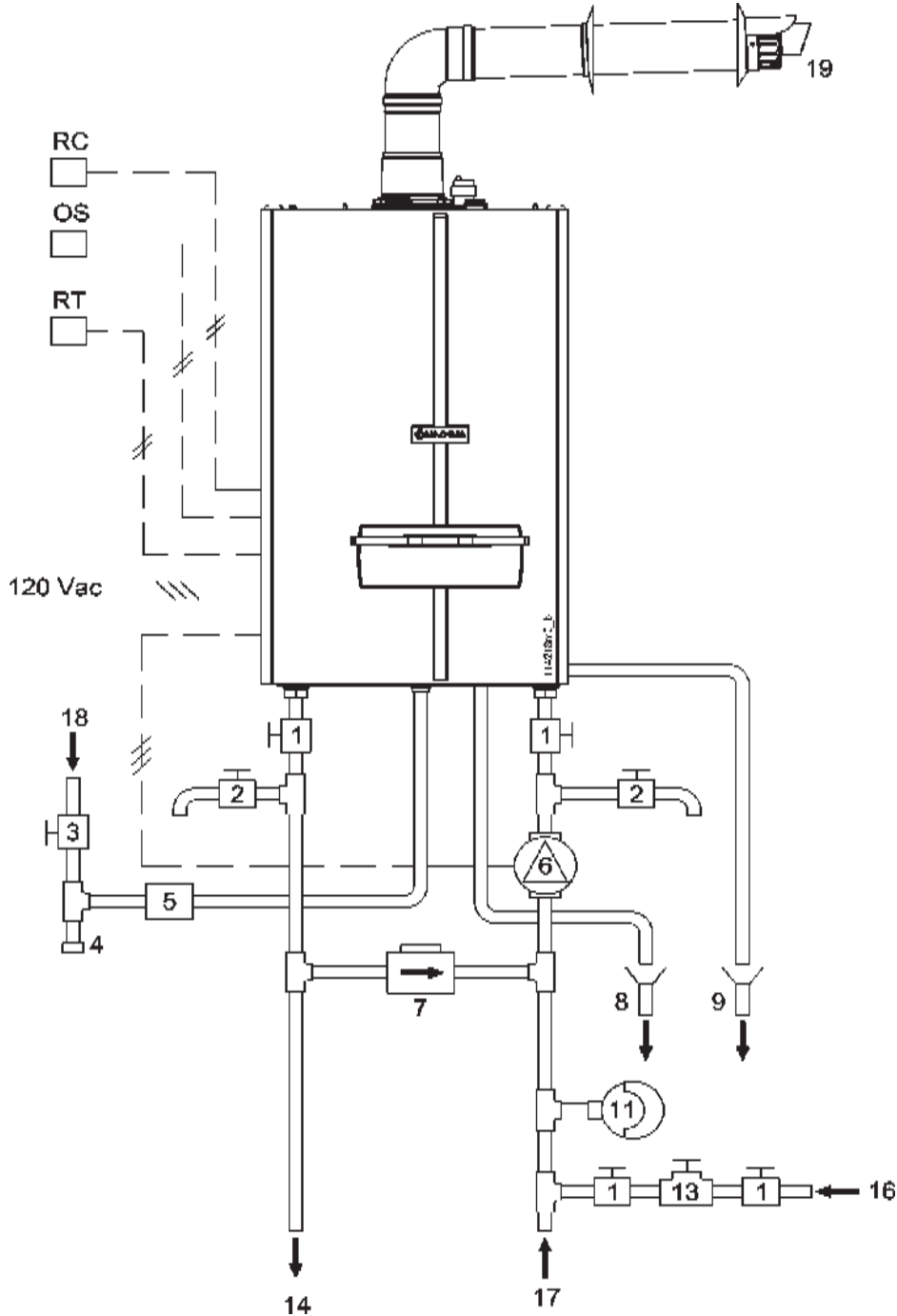


Figure 17 - Typical piping and wiring of a boiler models 45AN and 45AE

## 6 - INSTALLATION - Electrical connections

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### 6.1 - Electrical connections: overview

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

**ATTENTION!!!** *Au moment de l'entretien des commandes, étiquetez tous les fils avant de 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*.

This is an essential safety requirement which must be checked.

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



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



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



## 6 - INSTALLATION - Electrical connections

- route the cable through an empty cable clamp in the junction box
- connect the cable leads to the "RT" terminals as shown in figure 18.

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

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

### 6.5 - Installing the outdoor temperature sensor (optional)

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

boiler proceed as follows:

- remove the boiler casing according to the instructions given in section 13.2 or 13.3 and open the junction box per section 6.2;
- use a two conductor cable with a minimum cross section of # 18 AWG. between the boiler and the outdoor temperature sensor.

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

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

- connect the outdoor temperature sensor cable leads to terminals OS as shown in figure 18;
- 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:

- press down the **Reset** button for 12 seconds until the display starts blinking and shows **U I**;

- then press and release the **Reset** button several times until the following **[CH]** parameter appears;
- 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 12.4;
- press the **Reset** button repeatedly until exiting the menu; the display will no longer flash.

### 6.6 - Wiring the circulator pump for 45AN and 45AE models

Install the circulator pump as per figure 17 item "6". Wire the pump to the boiler following the steps below while referring to figure 18:

- remove the boiler casing according to the instructions given in section 13.2 or 13.3 and open the junction box per section 6.2;
- use a three wire cable with a minimum cross section of # 18 AWG between the boiler and the circulator pump;
- route the circulator cable through an empty cable clamp in the junction box;
- connect the Line and Neutral cable wires respectively to the "4 and 5" terminals in the junction box;
- connect the Ground wire to an empty "Ground" connection inside the junction box.

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

### 6.7 - Alarm output

Inside the electrical box (see 13.16 and 13.17) there is an electrical connection for a 120Vac output that is energized each time the boiler goes into a lock-out or error condition. The Installer can use this output to activate any kind of external signalization devices such an audible alarm, phone, or other devices.

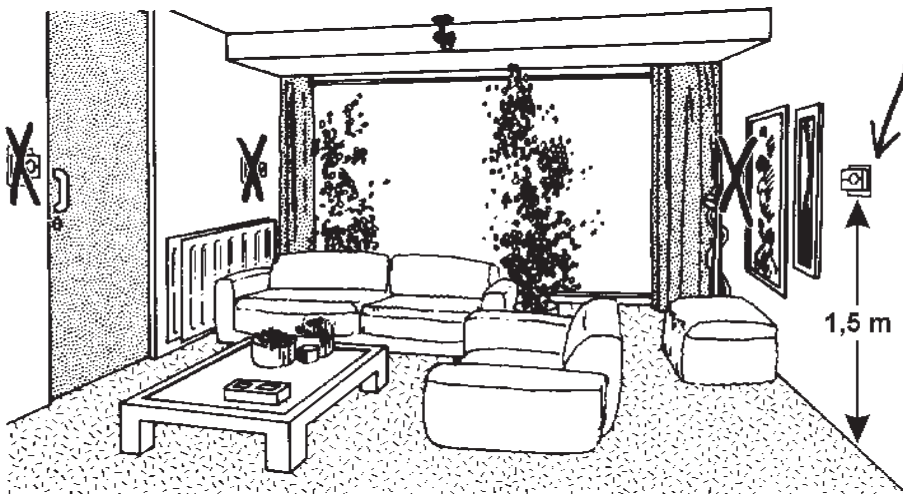


Figure 19 - Room thermostat location

## 6 - INSTALLATION - Electrical connections

### 6.8 - Installing the remote command on 45WE and 45AE models

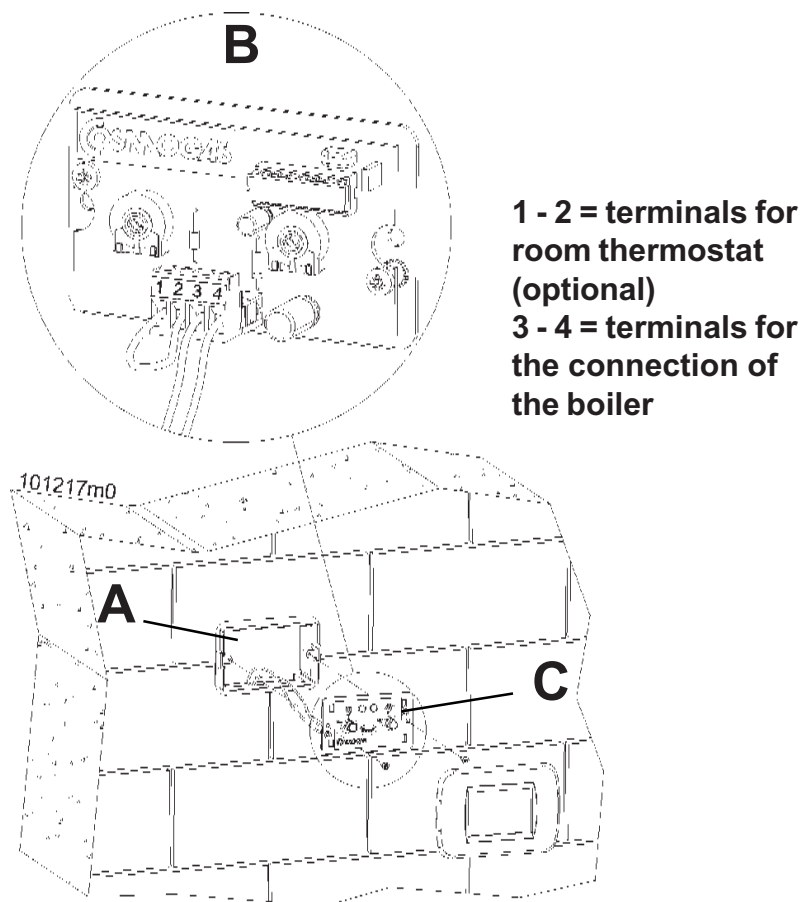
Install the remote command (item “C” of figure 20) in a site inside the house. To connect the remote command to the boiler, proceed as follows:

- remove the boiler casing according to the instructions given in section 13.2 or 13.3 and open the junction box per section 6.2;
- use a two conductor cable with a minimum cross section of # 18 AWG. between the boiler and the remote command.

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

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

- connect the remote command cable leads to terminals “BUS” as shown in figure 18;
- connect the remote command cable leads to terminals N° 3 and 4 of the remote command (see figure 20).



A = Remote command box  
B = rear side of the remote command  
C = Remote command

Figure 20 - Installing of the remote command



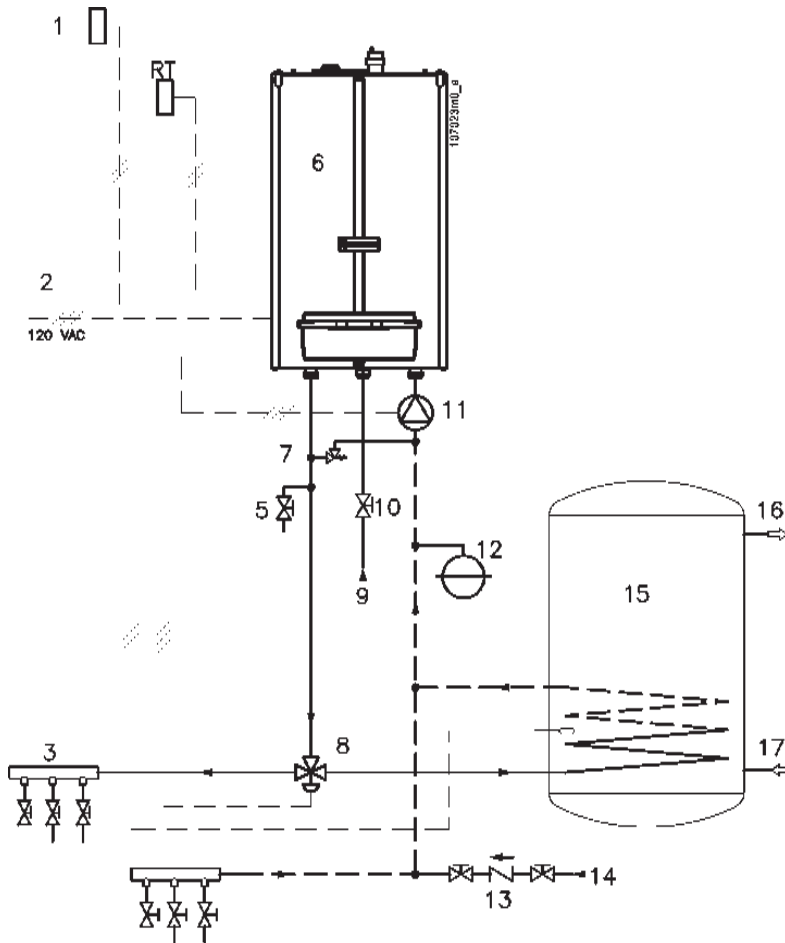
## 7 - INSTALLATION - Indirect storage tank connections

### 7.1 - Connecting the boiler to an indirect storage tank

All boilers listed in this manual, can be connected to an indirect storage tank as follows (the water and electrical connections must be made per figure 21): To make the electrical connections, follow the steps below while referring also to figure 21:

- disconnect the boiler from the electrical supply;
- remove the boiler casing according to the instructions given in section 13.2 or 13.3;
- push the plastic spring tabs "B" shown in figure 22;
- open the front half of the electrical box in the "C" direction as shown in figure 22;
- move switch #1, item "D" in figure 22, to its "ON" position as marked on the control board;
- ensure that switch #5 is in the OFF position;
- on the rear side of the electrical junction box board, if present, disconnect the plug with two wires (see figure 22, item "E"), corresponding to wires #44 and #45.
- use a # 18 AWG two wire cable to connect the indirect storage tank temperature sensor to terminals "TS" as per figure 18;
- insert the probe of the tank temperature sensor into the socket of the storage tank.
- use a #18 AWG four wire cable to connect the three way valve to terminals "1", "2", "3" and Ground as per figure 18 where:
  - "1" = 120Vac Line for domestic side
  - "2" = Neutral
  - "3" = 120Vac Line for heating side

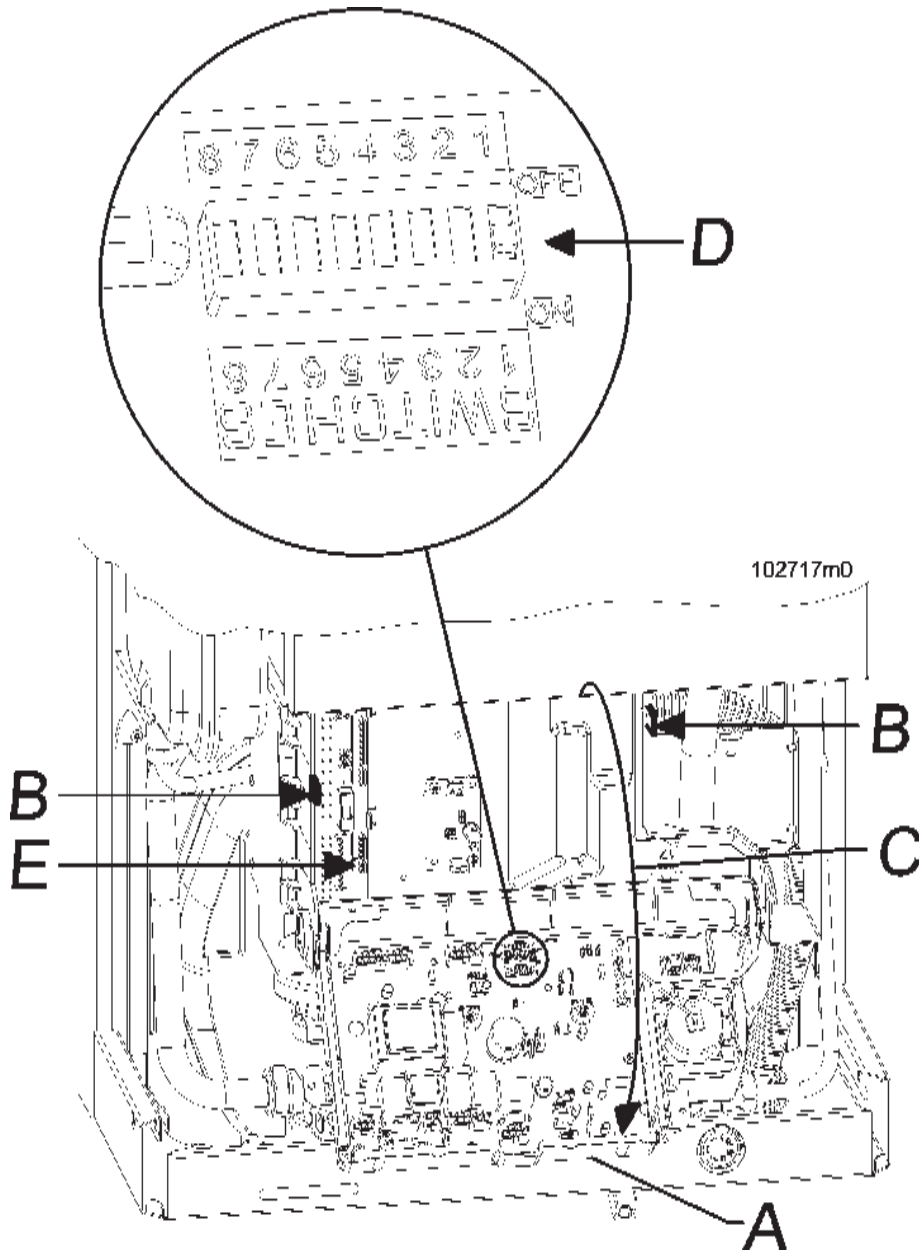
**WARNING!!!** Since the indirect storage tank temperature sensor wires conduct 24 Vac, they must never be run through conduits containing 120 Vac power wires or an electrical shock hazard will exist.



- 1 Outdoor temperature sensor (optional)
- 2 120Vac electrical supply
- 3 Heating system supply circuit
- 4 Room thermostat (field supplied)
- 5 Heating circuit drain valve (field supplied)
- 6 Boiler
- 7 By-pass valve (field supplied on models 45AN and 45AE)
- 8 Three way valve (field supplied)
- 9 Gas supply
- 10 Manual gas shutoff valve (field supplied)
- 11 Circulator pump (field supplied on models 45AN and 45AE)
- 12 Expansion tank (field supplied on models 45AN and 45AE)
- 13 Automatic filling valve (field supplied)
- 14 Cold water inlet connection
- 15 Indirect storage tank (field supplied)
- 16 Domestic hot water outlet
- 17 Domestic cold water inlet
- RT Room thermostat (field supplied)

Figure 21 - Indirect storage tank connections

## 7 - INSTALLATION - Indirect storage tank connections



- 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 22 - Contro board and junction box board details



## 8 - INSTALLATION - Vent & combustion air

### 8.1 - Removing of a boiler from a common venting system

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

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

- (a) Seal any unused openings in the common venting system.
- (b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- (c) Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

- (d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- (e) Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
- (f) Alter it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
- (g) Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1 /NFPA 54 and/or CAN/CSA B149.1, Natural Gas and Propane 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 tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1 /NFPA 54 and/or CAN/CSA B149.1, Natural Gas and Propane Installation Code.

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

- (a) *Sceller toutes les ouvertures non utilisées du système d'évacuation.*
- (b) *Inspecter de façon visuelle le système d'évacuation pour 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 du 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. 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 F du National Fuel Gas Code, ANSI Z223.1/NFPA 54 et (ou) des codes d'installation CSA-B149.*

# 8 - INSTALLATION - Vent & combustion air

## 8.2 - Venting systems

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

**WARNING!!!** Under certain operating conditions the temperature of the boiler's flue gases may reach 230°F, (110°C). Use only the polypropylene vent piping supplied with the boiler or a vent system listed by a nationally recognized testing agency for the application. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

☞ Horizontal vent runs must be sloped upwards not less than 1/4 in/ft (21 mm/m), from the boiler to the vent terminal.

☞ The vent system shall be installed so as to prevent the accumulation of condensate. When horizontal vent runs exceed 5 ft (1.5m), they must be supported at 3 ft (0.98 m), intervals with overhead hangers.

☞ Horizontal vent systems shall terminate at least 4 ft (1.22 m) below, 4 ft (1.22 m) horizontally from, and in no case above or below any door, window or gravity air inlet into any building. It must not terminate less than 4 ft (1.22 m) horizontally from, and in no case above or below, unless a 4 ft (1.22 m), horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment and not less than 7 ft (2.3 m) from any adjacent public walkway. The bottom of the vent terminal(s) shall be located at least 5 ft (1.5 m) above the air intake terminal(s). Avoid terminal locations likely to be affected by winds, snowdrifts, people and pets. **Item unique to CANADA: vent system shall terminate at least 6 ft from electrical and gas meters.**

☞ Due to the high efficiency of the boiler it may discharge what looks like white smoke especially when the outside air temperature is cold. This is a simply water vapor, a purely natural phenomenon and not a reason for concern.

☞ The minimum clearance measurement between two vent end terminations of this kind of boilers shall be not less than 2 ft (0.6 m).

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

## 8.3 - Design of the venting system

This boiler can be fitted with a very long venting system. However there is a relationship between the length of the venting system and the power input of the boiler. Figure 23 shows this relation which and installer must consider when in the designing stage of the venting.

The maximum length of the Split 80/80PP vent system is 300 ft (Air intake plus flue exhaust).

The maximum length of the concentric 60/100PP 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.

Boilers model 45WE and 45AE can be fitted only with coaxial venting system (see section 10.1)

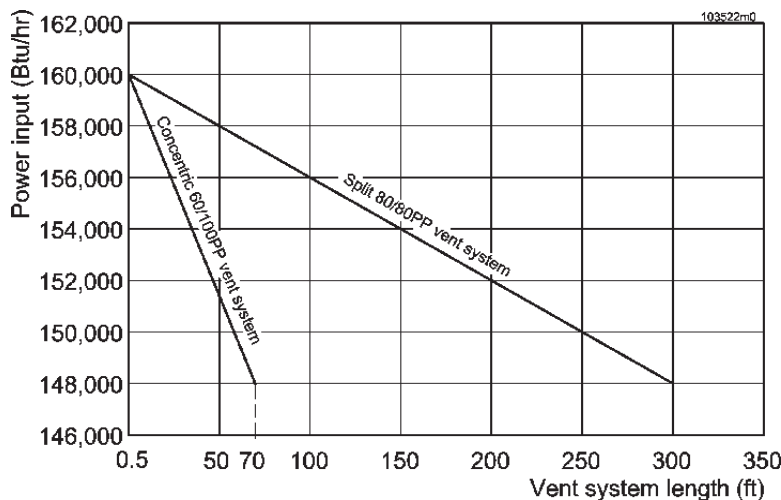


Figure 23 - Relation between Power input and Vent system length

## 9 - INSTALLATION - Split 80/80PP venting system

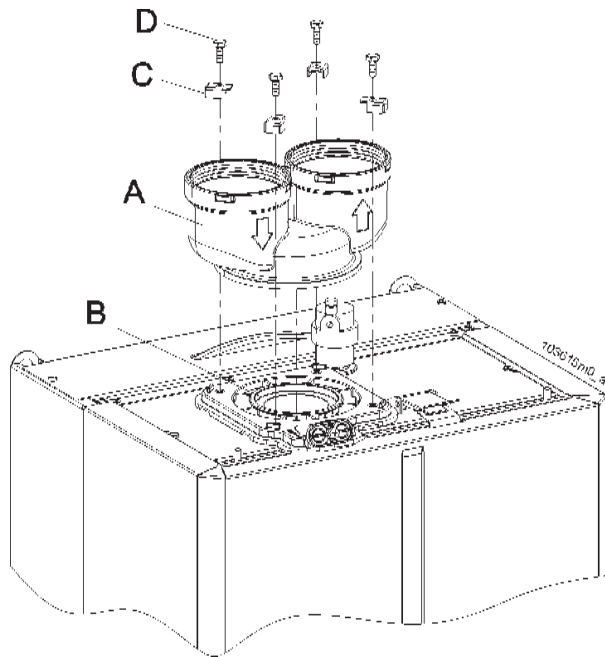


Figure 24 - Installation of "Split 80/80 PP" fitting system

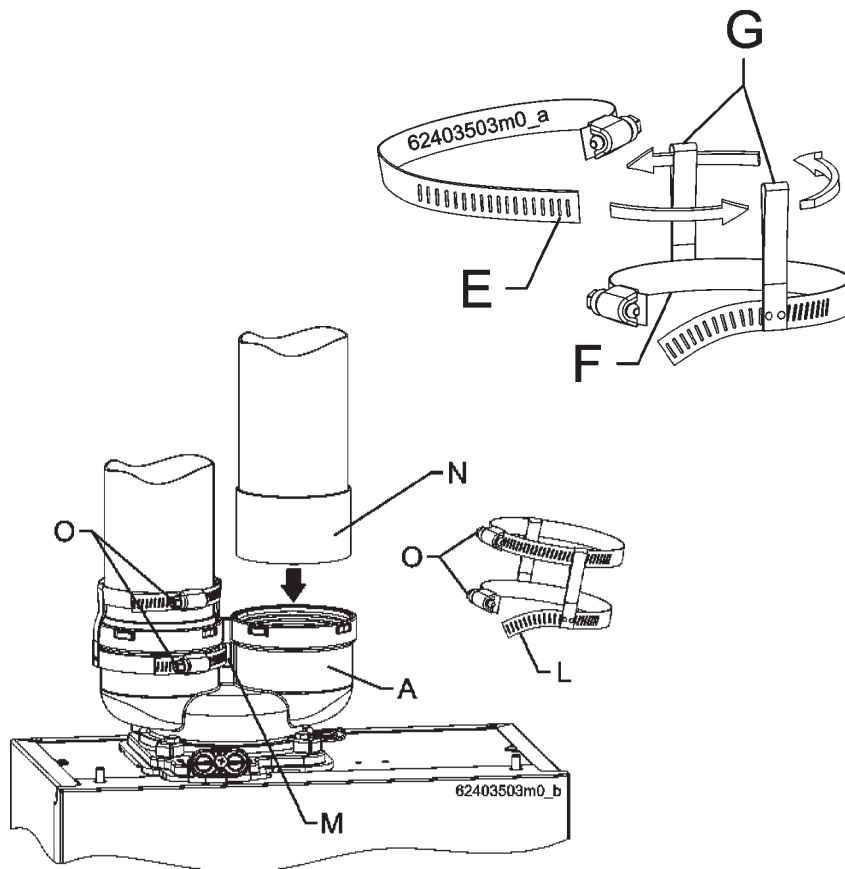


Figure 25 - Secure fixing the pipes to the boiler

### 9.1 - "Split 80/80PP" system (polypropylene) or AL29-4C (UL 1738/UL C 636) system

**NOTE:** This vent system is not available for 45WE and 45AE models

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 24 shows fitting "A" that can freely turn 360 degrees for optimum installation versatility.

**WARNING!** Under certain operating conditions the temperature of the boiler's flue gases may reach 230°F, (110°C). Use only the polypropylene vent piping supplied with the boiler or a vent system listed by a nationally recognized testing agency for the application. Improper venting can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

Pipes or elbows connected directly to the boiler, must be mechanically secure. Follow these instructions (make reference to figure 25):

- prepare the two collars "G" with springs "E" and "F";
- insert the collars "L" in hole "M";
- insert pipe "N" inside fitting "A"
- tight the two collars "O" in a manner to mechanically secure pipe "N" to fitting "A".

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

## 9 - INSTALLATION - Split 80/80PP venting system

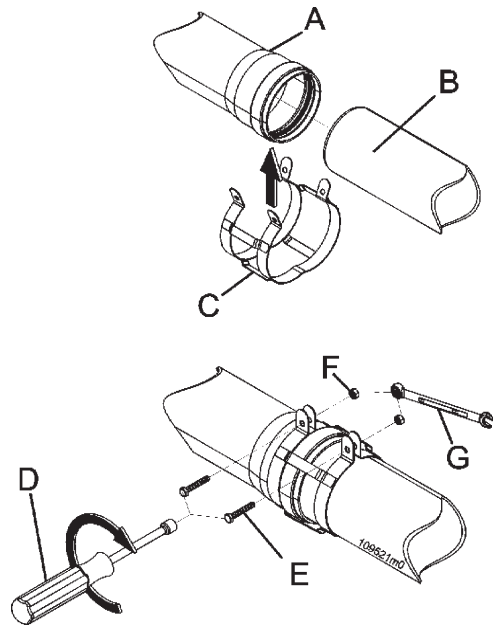


Figure 26 - Secure fixing extensions and elbows together

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

**WARNING!!!** Carefully follow the installation steps below for the assembling the split pipe venting system (elbows and extensions), as illustrated in figure 26. It is necessary to properly insert the male side onto the female side and mechanically secure them by using the proper clamps. Improper venting can result in excessive levels of carbon monoxide or a fire, which can result in severe personal injury or death!

☞ Mechanically secure each joint with the supplied clamps as shown in figure 26. Follow this procedure:

- insert the Male side "B" into the Female side "A";
- use clamp "C" to keep the two pipes together;
- use nuts "F" and bolts "E" to tighten the clamp onto both pipes.
- tighten bolts and nuts.

**CAUTION!!!** If vent and air intake terminals are located on the same wall, maintain the distances given in figure 27, between the vent and air intake, or flue gas recirculation may occur, causing improper boiler operation!

**CAUTION!!!** The air intake terminal must be protected from wind by a 90° elbow, how illustrated on figure 27.

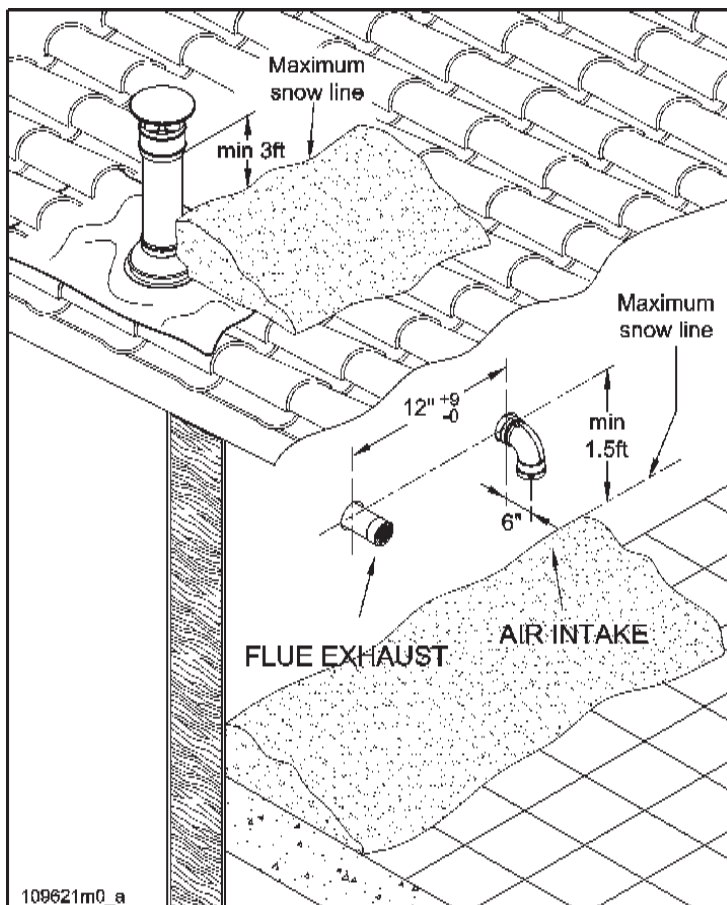


Figure 27 - Clearances of "Split 80/80 PP" system



# 9 - INSTALLATION - Split 80/80PP venting system

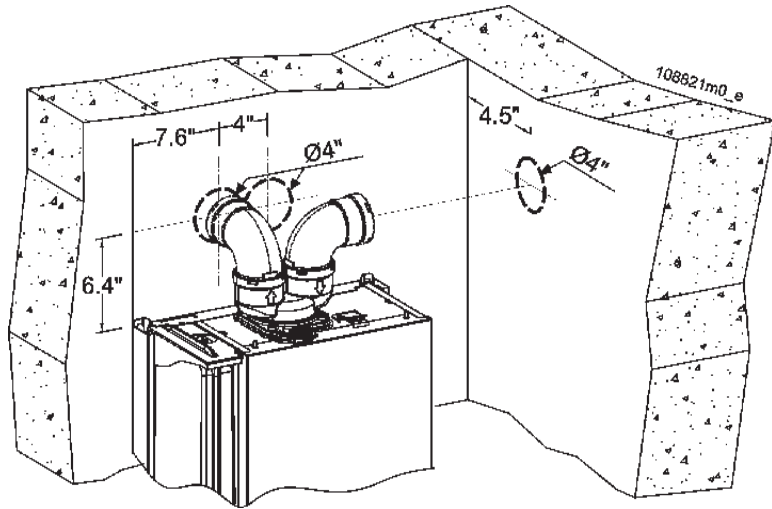


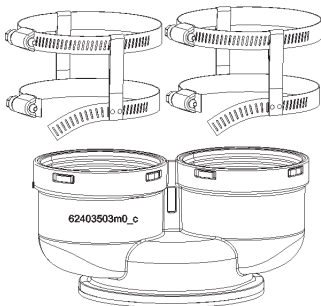
Figure 28 - Interaxes of "Split 80/80 PP" system

## 9.2 - "Split 80/80PP" system components

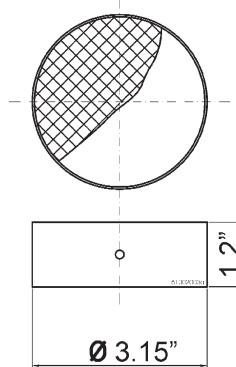
Some of the most commonly used components for installing the "Split 80/80PP" polypropylene vent and combustion air systems are listed below:

- 62617286 - No. 1 - Split adaptor 80/80 PP
- 61302011 - No. 29 - Flue exhaust roof terminal
- 62617236 - No. 11 - 3ft PP M/F extension
- 62617240 - No. 14 - 60 ft PP flexible extension
- 62617241 - No. 16 - Spacer for PP flexible extension
- 62617244 - No. 12 - 90° PP M/F in line elbow
- 62617246 - No. 13 - 45° PP M/F in line elbow
- 62617248 - No. 18 - Secure clamp for PP extensions
- 61302003 - No. 30 - Air intake grid

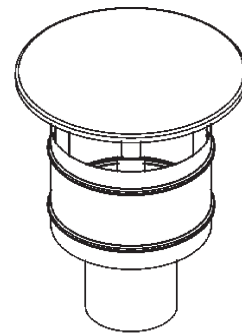
Note: the numbers after the codes correspond to the numbers in figure 29



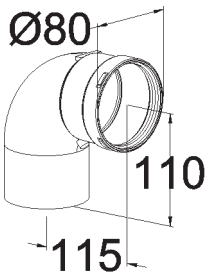
62617286



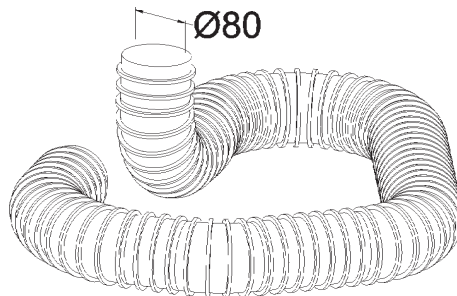
61302003



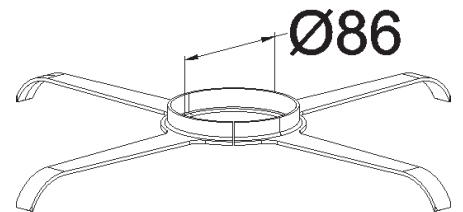
61302011



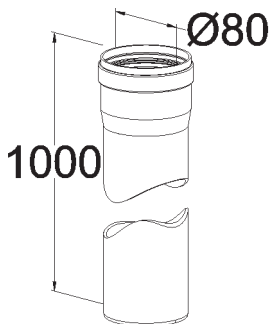
COD. 62617244



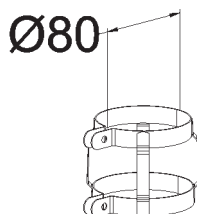
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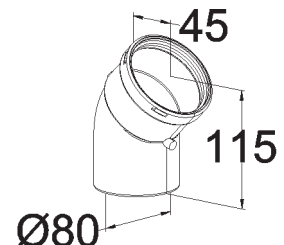
COD. 62617241



COD. 62617236



COD. 62617248



COD. 62617246

## 9 - INSTALLATION - Split 80/80PP venting system

### 9.3 - “Split 80/80PP” system: installation examples

Three installation examples can be seen in figure 29:

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

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

- the second example shows the vent system run through a dormant chimney. Condensation is collected inside the boiler itself. The horizontal section of the vent system must be pitched 1/4 in/ft (21 mm/m) towards the boiler. The intake combustion air system must be pitched outward 1/4 in/ft (21 mm/m) to prevent rainwater from entering the boiler.
- the third example shows the vent system run through a dormant chimney but the vent is done by the flexible polypropylene pipe. Condensation is collected inside the boiler itself. The horizontal section of the vent system must be pitched 1/4 in/ft (21 mm/m) towards the boiler. The intake combustion air system must be pitched outward 1/4 in/ft (21 mm/m) to prevent rainwater from entering the boiler.

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

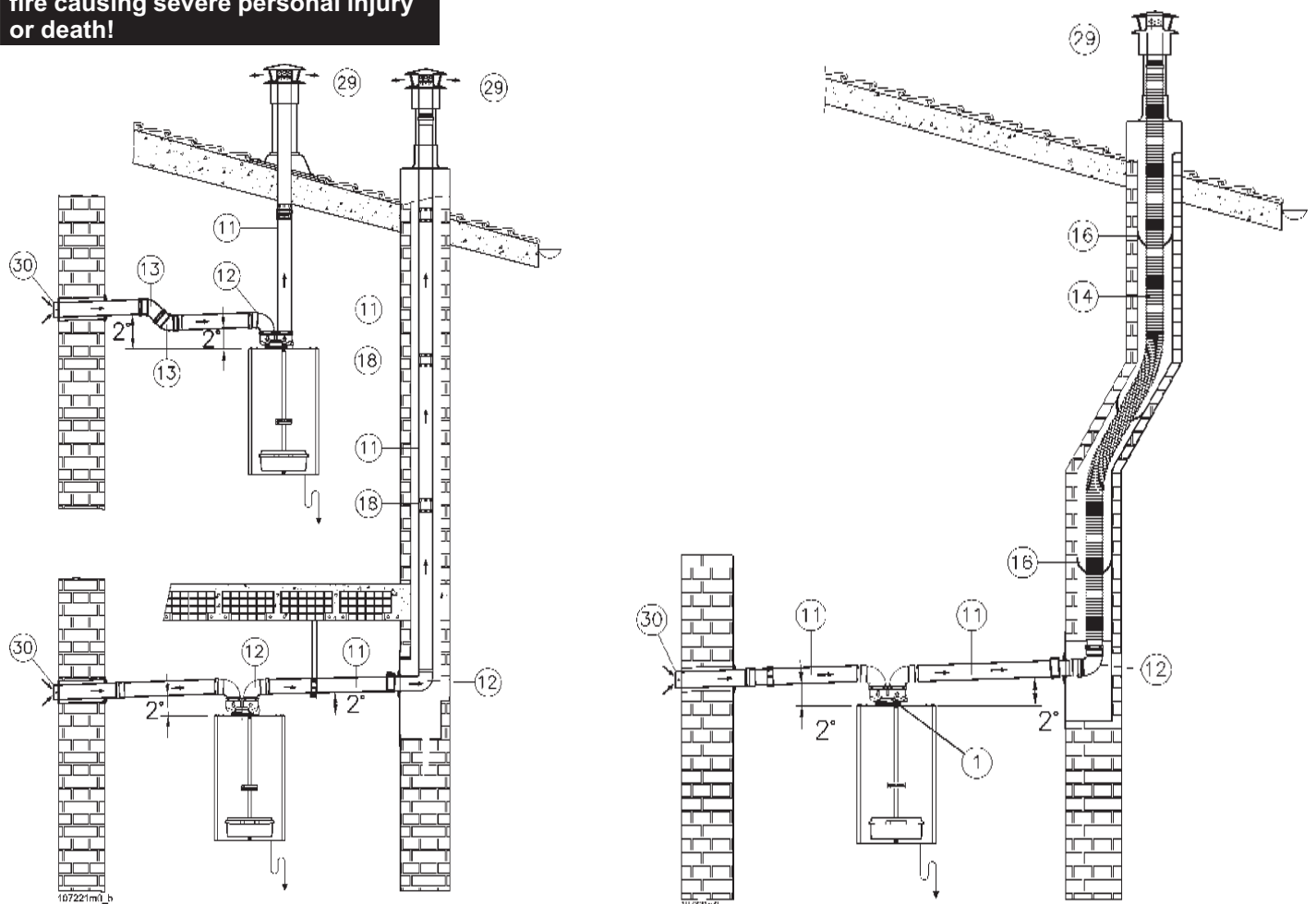


Figure 29 - Installation examples of the “Split 80/80 PP” system (see section 9.2 for the reference of the numbers)



# 10 - INSTALLATION - Coaxial 60/100PP venting system

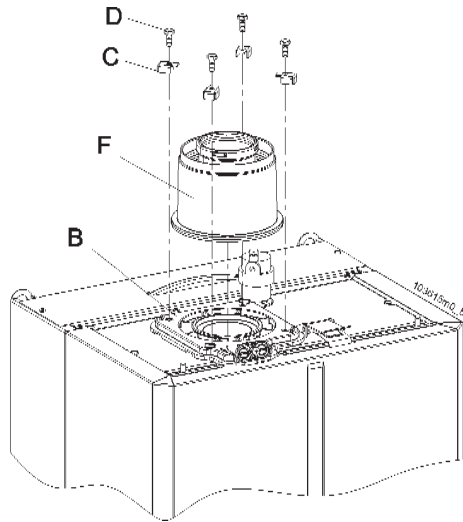


Figure 30 - Installation of the coaxial fitting

## 10.1 - “Coaxial 60/100PP” polypropylene 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 60/100PP” polypropylene vent. Figure 30 shows how to install the “Coaxial 60/100PP” fitting above the boiler:

**WARNING!!! Carefully follow installation steps below, for the coaxial pipe assembly (elbows and extensions), as illustrated in figure 31. 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:

- slip-fit the extension “1” and “2” (see figure 31) together;
- drill a suitable hole “3” with a drill “4” (see figure 31) in a position where the two pipes “1” and “2” are overlapped;
- 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 60/100PP system through an exterior wall. This will allow the system to be easily slipped out for access during routine maintenance.

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

☞ The “Coaxial 60/100PP” system should extend out of the wall to the dimensions shown in figure 33.

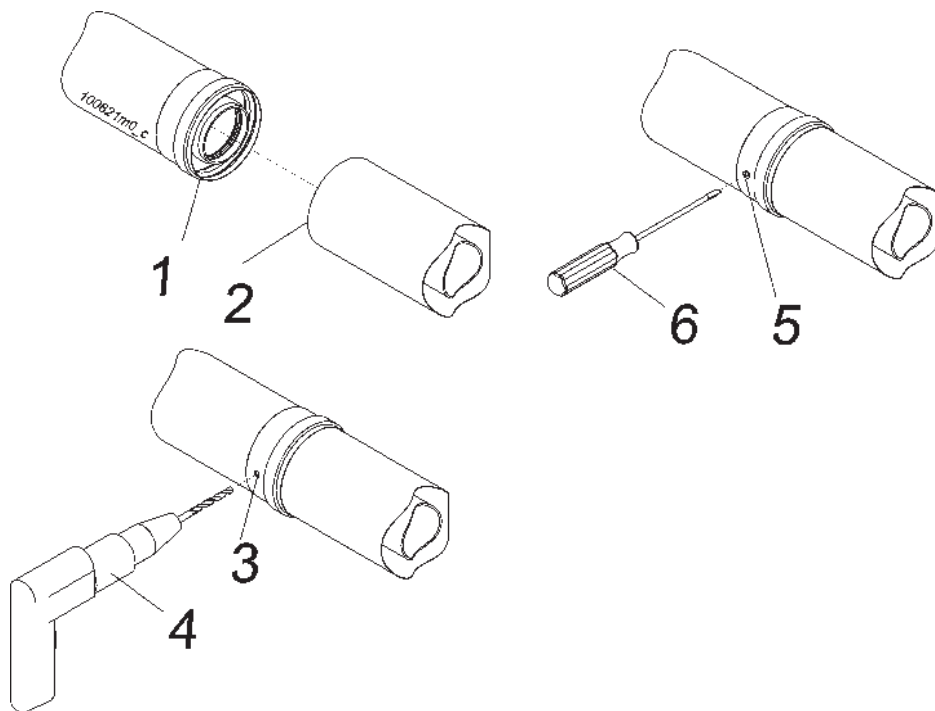
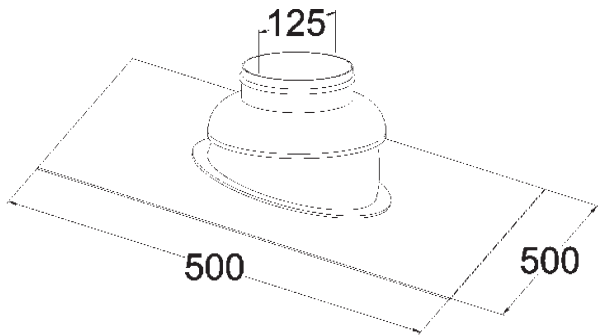


Figure 31 - Secure fixing extensions and elbows together

# 10 - INSTALLATION - Coaxial 60/100PP venting system



COD. 62617255

## 10.2 - "Coaxial 60/100 PP" system components

The following coaxial polypropylene vent and combustion air system components are available, on request, for installing the "Coaxial 60/100PP" system

62617255 - No. 2 flashing for roofs pitched between 15° and 25°

62617234 - No. 1 - In line 90° PP coaxial M/F elbow

62617252 - No. 6 - In line 45° PP coaxial M/F elbow

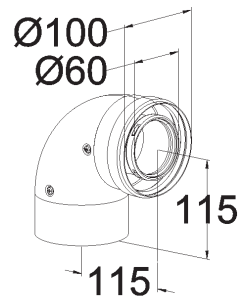
62617231 - No. 7 - 3ft (1m) PP coaxial M/F extension

62617250 - No. 3 - PP coaxial roof end piece

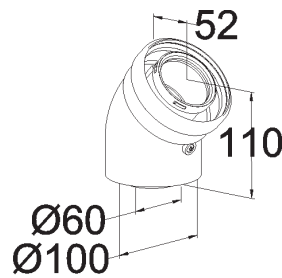
62617232 - No. 5 - PP Coaxial wall end piece

62617224 - No. 8 - PP straight coaxial adaptor

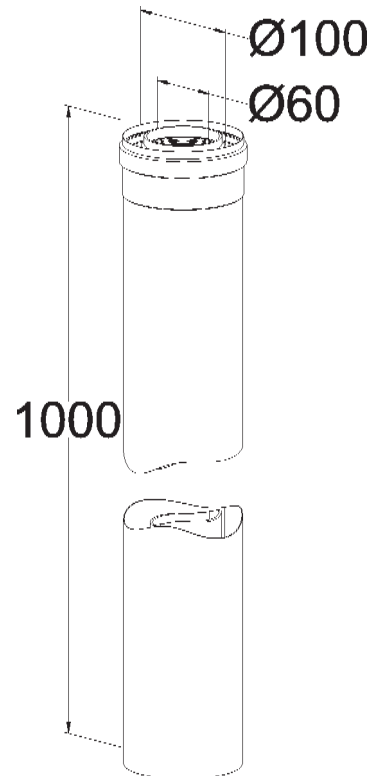
Note: the numbers after the codes correspond to the numbers in figure 32.



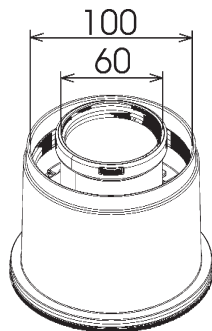
COD. 62617234



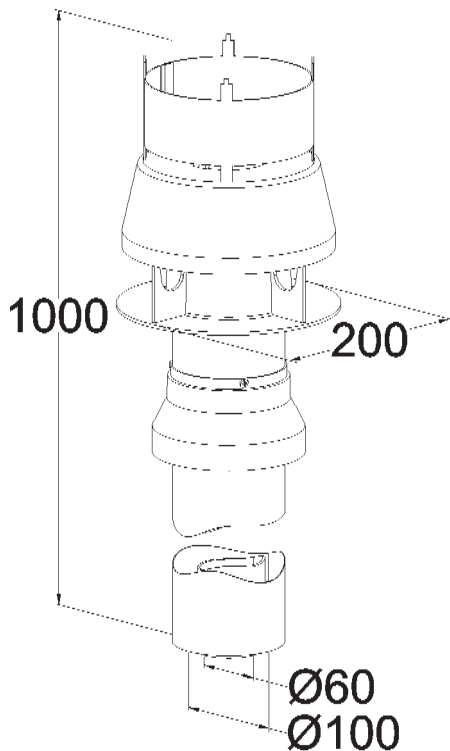
COD. 62617252



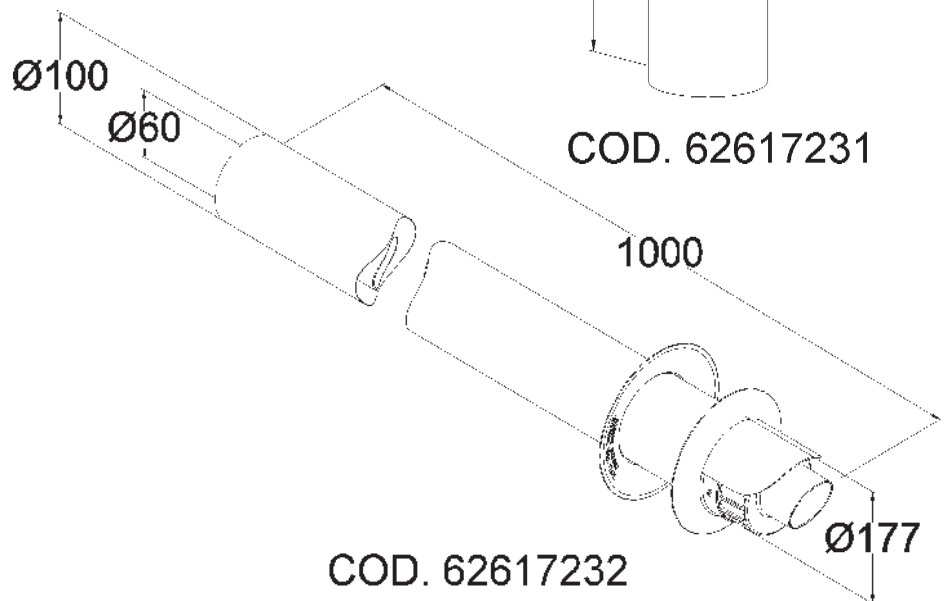
COD. 62617231



62617224



COD. 62617250



COD. 62617232

# 10 - INSTALLATION - Coaxial 60/100PP venting system

## 10.3 - “Coaxial 60/100PP” system: installation examples

When a coaxial vent and combustion air system is installed, figure 32, whether vertical or horizontal, it must be sloped 1/4 in/ft, (21 mm/m) towards the boiler.



**CAUTION!!!** Maintain the distances given in figure 33, between the vent terminal and the wall and also between the vent terminal and the ground level (snow line)

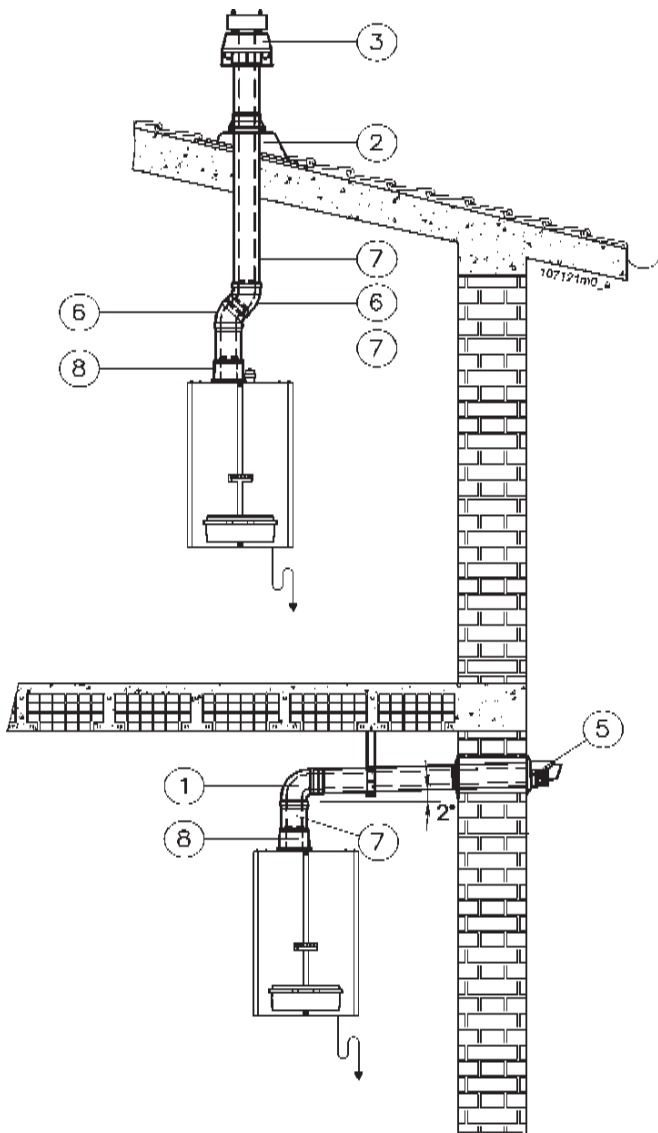


Figure 32 - Installation examples for the coaxial pipe (see section 10.2 for the reference of the numbers)

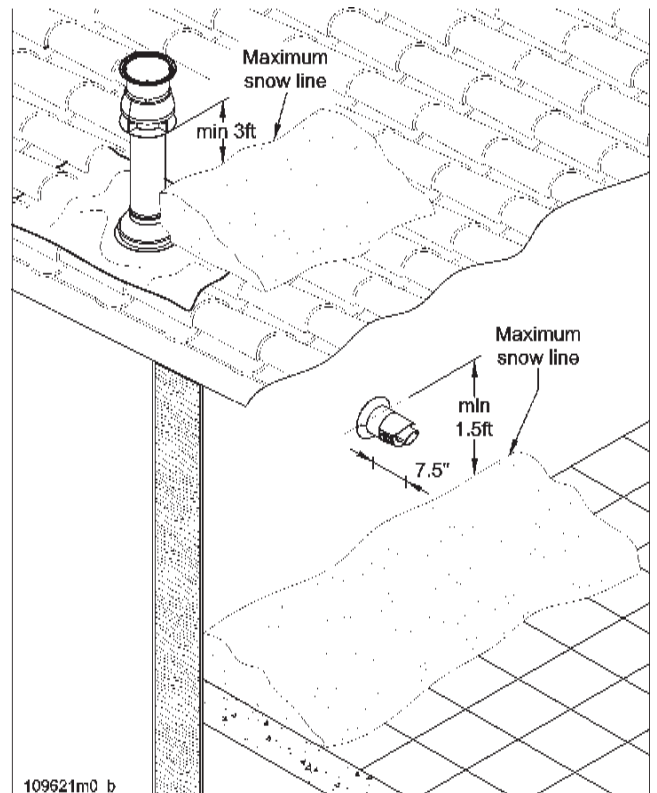


Figure 33 - Clearances for the coaxial vent terminal

# 11 - OPERATING

## 11.1 - Operating

Before starting the boiler, the following must be done.

### 11.1.1 - User instructions

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

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

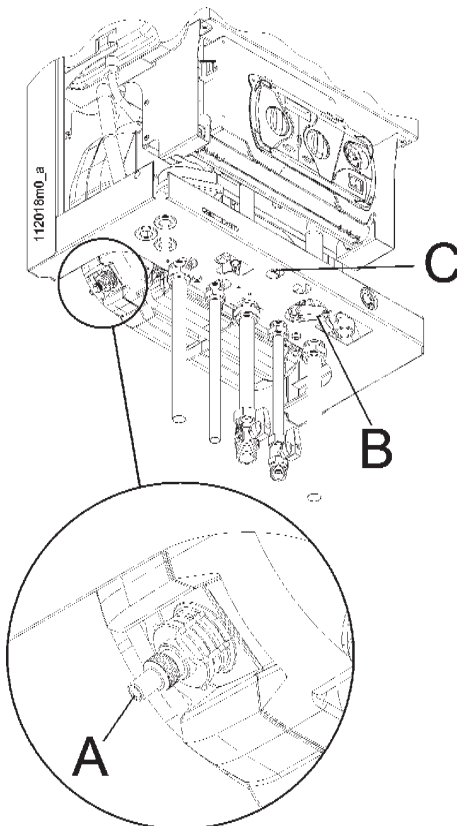


Figure 34 - Purge screw for the domestic hot water heat exchanger

### 11.1.2 - Filling the condensate trap


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


- disconnect the vent discharge fitting from opening "2" shown in figure 1;
- slowly pour approximately 3.4 oz (100 ml), of water into the vent opening - the hole in the middle;
- re-connect the vent discharge fitting;

### 11.1.3 - Filling the heating system

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

To fill the heating system, proceed as follows:

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

 **CAUTION!!!** The addition of any chemical substances, such as anti-freeze, must be carried out according to the product instructions. Read and follow instructions in sections 13.11 and 13.12 to prevent problems.

- open the automatic air vent, shown as item "1" in figure 1, two turns;
- open the fill valve located under the boiler and proceed to fill the heating system and boiler until the pressure

gauge, item "30" in figure 1, reads 20 psi (1.5 bar) and "FILL" disappears from the display;

- check that there is no water leaking from the fittings. If there is the leaks must be eliminated;
- close the fill valve;
- check the pressure gauge during the purging process. If the pressure has dropped, re-open the fill valve to bring the pressure back up to 20 psi (1.5 bar).

### 11.1.4 - Filling of the domestic hot water heat exchanger ("45WN and 45WE" models only)

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

- connect a rubber tube to the pressure coupling "A" shown in figure 34 and place the end in an empty bucket or sink;
- loosen screw "A" as shown in figure 34 until air can be heard escaping;
- once the water runs clear of air bubbles tighten screw "A";
- remove the tube and check that there are no water leaks.

### 11.1.5 – Auto-purging the heating system

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

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## 11.2 - General warnings concerning gas supply

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

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

### **WARNING!!! If you smell gas:**

- Do not try to light any appliance.
- Do not touch any electrical switch. Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

## 11.3 - Confirming the boiler's gas type

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

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

## NATURAL GAS

Maximum supply pressure = 11 in.W.C. (27.5 mbar).

Minimum supply pressure = 1.5 in.W.C. (3.8 mbar).

## LP Gas

Maximum supply pressure = 13 in.W.C. (32.5 mbar).

Minimum supply pressure = 8 in.W.C. (20 mbar).

## 11.4 - Gas type conversion

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

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

## 11.5 - Start-up

- Open the manual gas shut off valve, figure 16 and 17, item "3".
- Switch the on/off power switch, item "34" in figure 1, to "on".
- If the display shows code E 21, it means that the polarity has not been observed between the hot and neutral wires. If this happens the wires must be switched.
- Upon start-up, an **F** is shown for 2 minutes while the boiler goes through its heating system purge cycle as described in section 11.1.5. To by-pass this stage, press the **+** and **-** keys together until a blinking **F** appears. Then press the **Reset** button.
- Rotate knobs "32" and "33" shown in figure 1 to the desired temperature.
- The boiler will fire only when the room thermostat calls for heat. If an external temperature sensor is connected, check that the

temperature calculated is higher than the minimum running temperature as explained in section 12.4.

- If the pump indicator is illuminated, item "6" in figure 42, but the pump is not running, item "45" in figure 1, it may be stuck. If this is the case it can be released by removing screw "44" shown in figure 1 and turning the screw underneath.
- 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.

## 11.6 - Ignition control testing

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

- turn the power switch (item "34" in figure 1) to on;
- close the room thermostat to create a call for heat;
- turn knobs "32" and "33" in figure 1 to their maximum position;
- wait a few minutes for the burner to light-up as indicated when light "3" shown in figure 42 stays illuminated.
- close the manual gas shutoff valve, see figure 16 and 17, item "3";
- after 40 seconds, the display must show L01;
- open the manual gas shutoff valve, see figure 16 and 17, item "3";
- verify your gas meter, gas flow must be zero.

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



## 11.7 - Gas supply pressure checking and adjustment

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

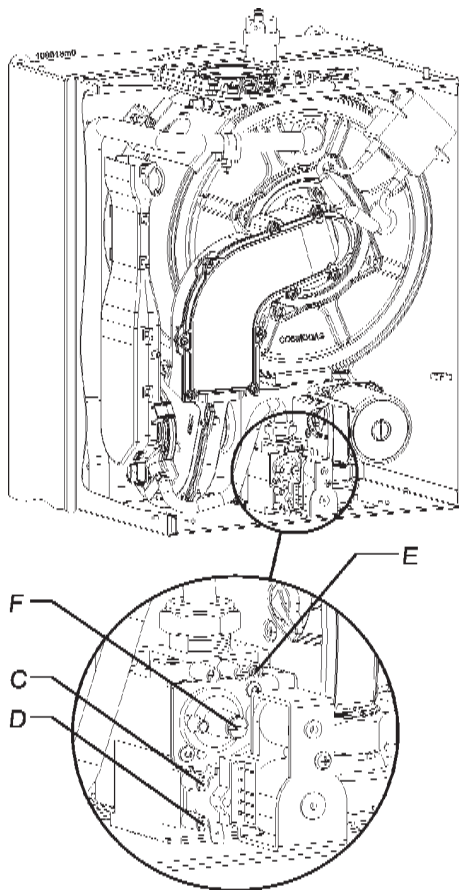
- close the manual gas shut off valve, figure 16 and 17, item "3";
- follow the steps in section 13.2 or 13.3 to remove the front cover;
- turn the screw in pressure connection "D" shown in figure 35 three turns counterclockwise;
- connect a manometer with graduations of at least 0.1 in.W.C. (0.25 mbar);
- open the manual gas shut off valve, figure 16 and 17, item "3";
- check that the gas supply pressure does not exceed the "maximum gas supply pressure" as stated on section 14;
- turn the power switch to on and generate a heat demand by turning knob "33" shown in figure 1 to its maximum setting. Also ensure that the room thermostat is calling for heat;
- press the **+** and **-** keys at the same time for more than 10 seconds, the display will show **F**;
- press the **+** key until the display shows **t**. Now the boiler will run for 10 minutes at maximum input;
- check the manometer to make sure the gas supply pressure does not drop below the "minimum gas supply pressure" as stated on section 14. If the gas supply pressure does not fall within the above values, adjust the upstream gas pressure regulator to bring the gas supply pressure within the maximum and minimum range listed on section 14.

At the end of the check, turn the screw in pressure connection "D" in figure 35, clockwise until snug and checking 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 - High fire, CO2 adjusting screw
- F - Low fire, CO2 adjusting screw

**Figure 35 - Gas valve**



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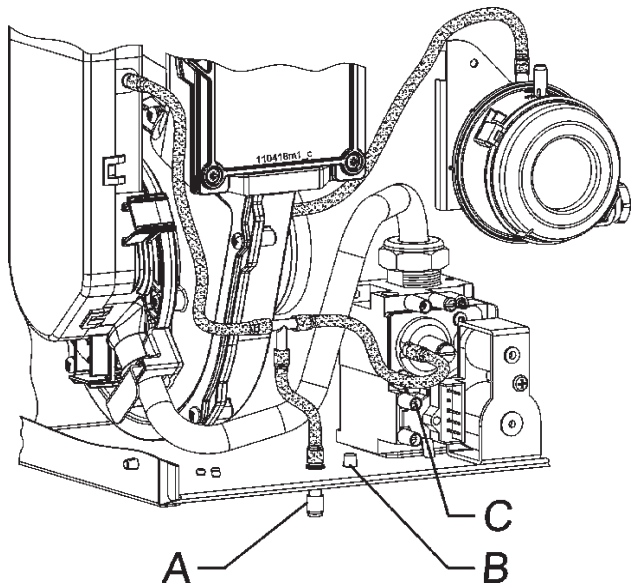


Figure 36 - Combustion air pressure probes

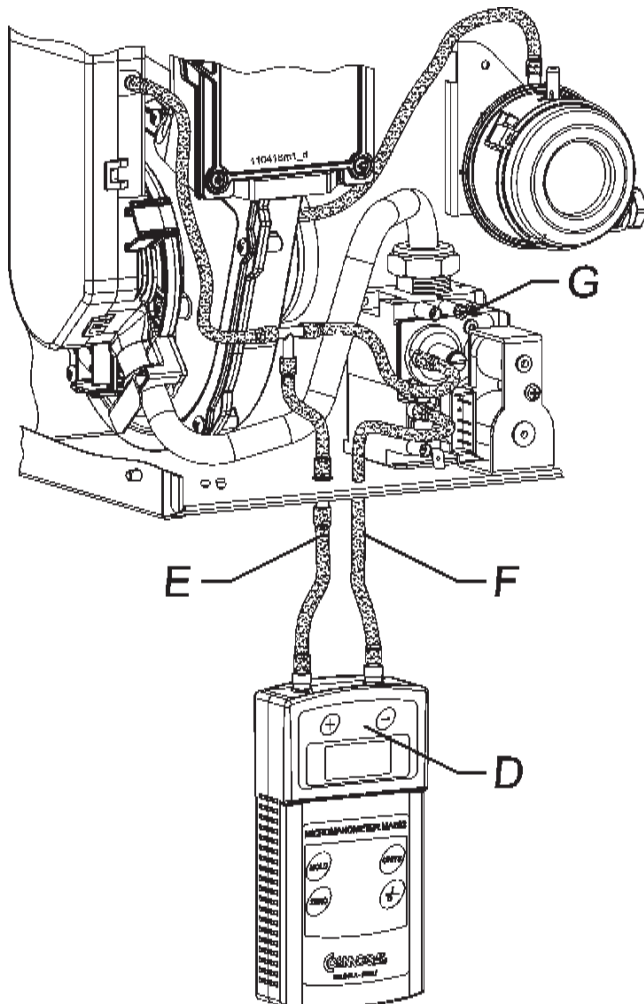


Figure 37 - Checking the combustion air pressure

### 11.8 - Check the combustion air pressure

The boiler has a factory-set air/gas ratio. The pressure of the gas at the burner is indirectly controlled by the blower. The combustion air pressure is checked inside the boiler and must correspond with that shown in the table in section 14 under the item “combustion air pressure”. To carry out the check, proceed as follows while referring to figures 36 and 37:

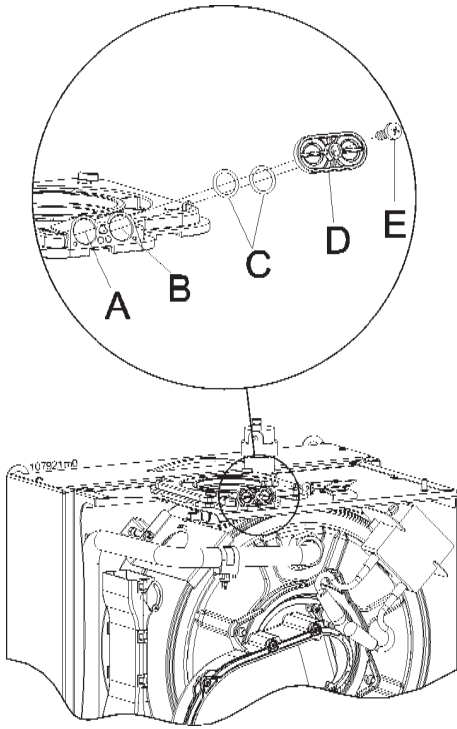
- use a differential manometer with a precision of at least 0.1 in.W.C. (0.25 mbar);
- close the manual gas shut off valve, figure 16 and 17 item “3”;
- open the boiler casing following section 13.2 or 13.3;
- press the two plastic spring tabs labeled “B” shown in figure 18 and rotate the electrical box;
- remove plug “B”;
- turn pressure probe screw “C” one turn counterclockwise;
- 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 37;
- remove plug “A” from the pressure probe and connect the differential positive side of the manometer to it;
- the manometer connections must be made as shown in figure 37, to get the correct pressure reading;
- replace panel “H” of figure 44 and latch it closed. If panel “H” is not properly in place the manometer reading will not be accurate;
- turn the power switch to on, item “34” in figure 1;
- press the **+** and **-** keys together for more than 10 seconds, until a blinking **F** is displayed;
- the combustion blower will run at maximum speed for 10 minutes. During this time the burner will not light;
- compare the pressure on the manometer with the table in section 14, “Combustion air pressure”. The combustion air pressure reading should be within  $\pm 0.3$  in.W.C. (0.75 mbar);
- if the combustion air pressure is too low, check that there are no obstructions in the combustion air and vent systems. Also make sure that panel “H” is properly sealed;
- if the combustion air pressure is within tolerance press the **Reset** button to return the boiler to its normal running mode;
- once the combustion air pressure check has been performed, reassemble everything as it was originally.

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## 11.9 - Checking and adjusting CO2 levels

Section 14 lists the correct CO2 ranges for a boiler running at normal operating conditions at an altitude below 3000 ft (1000m). CO2 values outside of the ranges given in section 14 may lead to malfunctioning of the boiler and cause it to prematurely fail. To check the CO2 value, carry out a combustion analysis as follows while referencing figure 38:

- carefully remove items “E”, “D” and “C” from the combustion air/ vent fitting;
- generate a call for heat or, if this is not possible, fully open a hot water faucet;
- press the **+** and **-** keys



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

Figure 38 - Combustion analysis probes

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 low 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 low fire range given in section 14 making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted.

To adjust the CO2 proceed as follows:

- use a screwdriver to remove the gas valve cap, item “F” in figure 35;
- turn the regulator screw found under cap “F” clockwise to increase the CO2, counter-clockwise to decrease the CO2;
- turn the regulator screw in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value;
- replace the gas valve cap, item “F” in figure 35;
- seal screw “F” 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 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 section 14 making sure to use the range for the gas type in use. If the CO2 reading is outside the specified range, it must be adjusted.

To adjust the CO2 proceed as follows:

- use a screwdriver to turn screw “E” shown in figure 35;
- turn screw “E” clockwise to reduce the CO2, counter-clockwise to increase the CO2;
- turn screw “E” in small increments and wait for the CO2 to stabilize to prevent overshooting the desired value;
- seal screw “E” with red paint or nail polish to discourage tampering.
- press the **Reset** button to return the boiler to its normal operating mode.

**NOTE: During the 10 minutes override mode, error code L06 may appear if the demand on the boiler is low causing the flue gas temperature to increase rapidly, see section 12.12.1.**

### 11.9.1 - Checking and adjusting CO2 levels without CO2 meter

The ionisation current value is directly related to the CO2 value. Therefore, if you are not in possession of a CO2 meter, you can use the ionisation current value to correctly adjust the CO2 value.

To do so, follow exactly the step of section 11.9 and instead of comparing the CO2 value you must compare the right side of the display (ionisation current value) with the corresponding “ionisation current” value in section 14. Because the reading of the ionisation current is not a fixed value but can vary  $\pm 3$ , you must compare the average value of the fluctuation, with the value in section 14 (see also section 13.13.4).

## 11.10 - Adjusting the heating capacity

This boiler has been engineered with an “intelligent” micro-processor control that will adjust the heating output to match the system demand. To maximize the effectiveness of the

system, the parameters **P** found in the “Installers menu”, in section 12.11, 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 39.

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

## 11.11 - Domestic hot water flow rate adjustment (45WN and 45WE models 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:

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

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

## 11.12 - Cold start boiler

The boiler has a “cold start” mode. Any time the room thermostat opens, (no call for heat) the burner stops immediately. However even with the room thermostat contact open, the boiler will still run for freeze protection as described in section 12.8.

"P" parameter value	Correspondent heat output (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\_a

Figure 39 - Correspondence table to set space heating output

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### 12.1 - Adjusting the domestic hot water temperature

The domestic hot water temperature is adjusted by turning knob “32” shown in figure 1. When the knob is turned, the display, item “31” in figure 1, shows a

flashing  $\delta$  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 113°F (45°C) to 158°F (70°C) when an indirect storage tank is used. For boiler model 45WE and 45AE, operate on knob “C” of figure 43.

### 12.2 - Heating system temperature adjustment

The boiler provides hot water to the heating system at the temperature set by adjusting knob “33” as shown in figure 1 or, for boiler model 45WE and 45AE, adjusting knob “A” of figure 43. The room thermostat turns the boilers’ circulator pump on in order to satisfy the heat demand of the rooms controlled by the thermostat. To maximize the boilers’ performance, temperature knob “33” or item “C” in figure 43 for models 45WE and 45AE, 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 “33” or item “C” in figure 43 for models 45WE and 45AE. When the weather gets milder turn the water temperature down. This extremely simple method is suitable for the following types of systems:

- small systems with radiators where the thermostat is installed in a room whose temperature is characteristic of all the other rooms;
- 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).
- 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 (see to an appropriate electrical system).



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

### 12.3 - Heating system type selection

The boiler is factory set for “Thermo-static adjustment” as per section 12.2.

The heating system type can be changed by going to the “Installers’ Menu” in section 12.11 and changing the  $\{H\}$

parameter. One of the three following heating modes can be selected:

-CH = 00 “Thermostatic adjustment”: follow section 12.2;

-CH = 01 “Climatic adjustment”: follow section 12.4 (an outdoor temperature sensor is required);

-CH = 02 “Climatic adjustment with room compensation”: follow section 12.4 to 12.4.6 (an outdoor temperature sensor is required):

### 12.4 - Climatic adjustment

While in the “Installers’ Menu”, set the

$\{H\}$  parameter to 01. In this mode the heating supply water temperature, calculated temperature in figures 40 and 41, will be adjusted automatically based on the input from the outdoor temperature sensor. The relationship between the outdoors temperature and the supply water temperature, corresponds with the graphs shown in figures 40 and 41. In order to change the relationship between the supply water temperature and the outdoors temperature, all the parameters listed in the sections below must be set.

#### 12.4.1 - Climatic adjustment: applicable system

The “Climatic adjustment” 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 make corrections to the room temperature, switching the boiler pump 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 make corrections to the room temperature, switching the boiler pump on and off.

In this type of system it is necessary to consider that the radiant panel systems has an extremely high thermal inertia. It will be necessary to adapt the heating system and use the

“Reaction”  $\{n\}$  parameter in order to speed up any “full operations” situation, see section 12.11.

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 (see to an appropriate electrical system).



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

#### 12.4.2 - Climatic 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 40 and 41. If these default values do not produce a satisfactory result, then



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proceed to make the appropriate adjustments bearing in mind that:

- A - each parameter must be set in small degrees;
- 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 "33" in figure 1 can be used to make the small line shifts, "b", shown in figures 40 and 41. These shifts will move the line in increments of approximately 1 °F (1 °C), up to 18 °F (10 °C).

### 12.4.3 - Climatic adjustment: setting parameters

Refer to section 12.10 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 limit of the supply heating temperature. Its' range of adjustment is between 86 °F (30 °C) and 194 °F (90 °C). The suggested starting values are: 113 °F (45 °C) for "low temperature" systems; 176 °F (80 °C) for "high temperature" systems.

Refer to section 12.11 and set:

- **Ln** = "Reaction" of the calculated temperature with respect to the outdoor temperature input. The range of adjustment is between 1 °F (1 °C) and 18 °F (10 °C). A low "Reaction" value results in a constant dwelling temperature but extended time in reaching full running conditions and

responding to outdoor temperature changes. A high "Reaction" value results in reaching full running conditions quickly, but also possible oscillations in the dwelling temperature.

It is advised to maintain a "Reaction" value between 1 and 2;

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

### 12.4.4 - Climatic adjustment: zone adjustments

The default values previously suggested are for boilers using an outdoor temperature sensor installed in dwellings with average heat loss in areas where the outside temperature for the calculation of the heat requirement is 23 °F (-5 °C). In the event that the climatic zone is different, adjust the gradient of the curve,

parameter **OR**, to obtain a calculated temperature of 176 °F (80 °C) for high temperature systems, see Figure 40. For "Low Temperature" systems adjust the gradient of the curve, parameter **OR**, to obtain a calculated temperature of 113 °F (45 °C), see Figure 41.

### 12.4.5 - Climatic adjustment activation

Once selected, climatic 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 "33" in figure 1, to raise or lower the calculated temperature and match the "Minimum heating temperature" on an advanced or delayed basis.

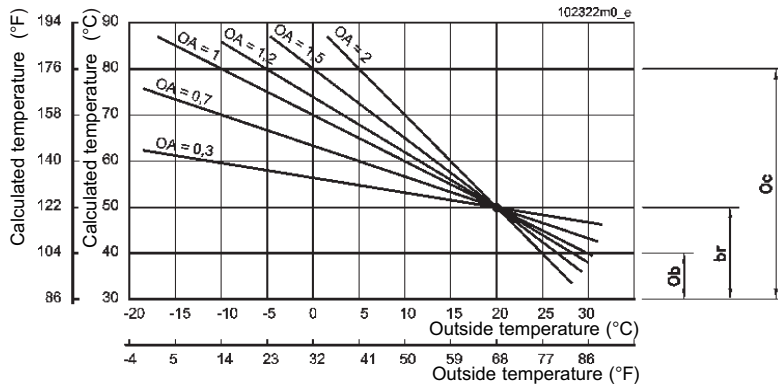
### 12.4.6 – Climatic adjustment with room compensation

While in the "Installers' Menu" set the **CH** parameter to 02, see section 12.11. The system will function exactly as described in the previous "Climatic adjustment" sections except that now the boiler pump will stay on permanently. The opening of the room thermostat contacts will translate into a parallel downward movement of the curve in figure 40 or 41. The value by which the curve moves downwards can

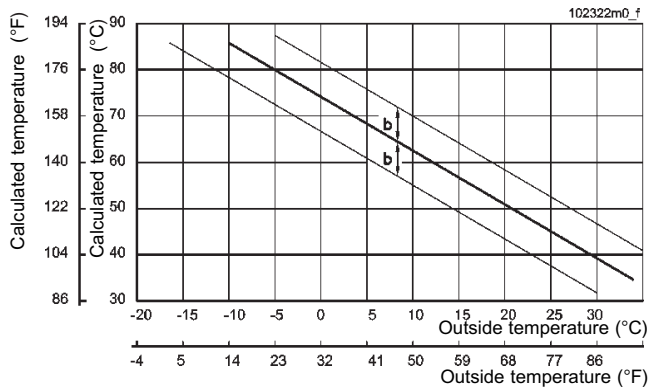
be adjusted by the **Ln** parameter present in the "Installers' Menu", see section 12.11. The **Ln** parameter can range from 1 °F (1 °C) to 36 °F (20 °C). The suggested values for this parameter are:  
- 18 °F (10 °C) for high temperature radiator systems;  
- 6 °F (3 °C) for low temperature radiant 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 12.4.1. 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.

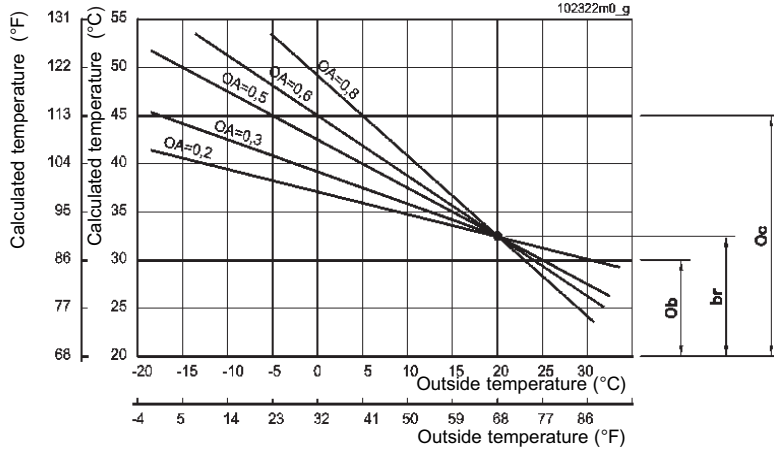
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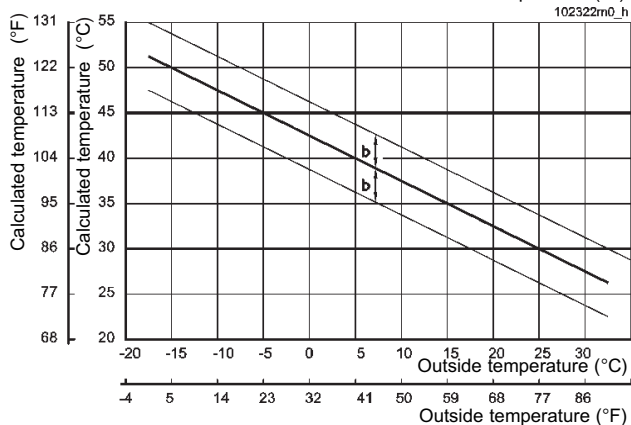
**OA** = Inclination of the line  
**Ob** = Minimum heating temperature  
**Oc** = Maximum heating temperature  
**br** = "Fix point" of the angle fulcrum of the line  
**b** = parallel shift of the line (adjusted by the heating knob, item "33" of figure 1)



**Figure 40 - Graphs of the climatic adjustment for "high temperature" systems**



**OA** = Inclination of the line  
**Ob** = Minimum heating temperature  
**Oc** = Maximum heating temperature  
**br** = "Set point" of the angle fulcrum of the line  
**b** = parallel shift of the line (adjusted by the heating knob, item "33" of figure 1)



**Figure 41 - Graphs of the climatic adjustment for "low temperature" systems**



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## 12.5 - Boiler switch settings

The control board shown in figure 1, item "14", and figure 22, 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 with production of instantaneous D.H.W.
	ON	Boiler with production of D.H.W. via storage tank
2	OFF	Boiler with production of instantaneous D.H.W.
	ON	Position not available for this series of boilers
3	OFF	Heating pressure switch, Low Water Cut Off, disabled
	ON	Heating pressure switch, Low Water Cut Off, enabled
4	OFF	EBM PAPST brand fan
	ON	FIME brand fan
5	OFF	Combination boiler for heating and D.H.W.
	ON	Boiler for heating only
6	OFF	High temperature heating service, 86°F (30°C) and 176°F (80°C)
	ON	Low temperature heating service, 68°F (20°C) and 113°F (45°C)
7	OFF	Boiler configuration change, disabled
	ON	Boiler configuration change, enabled
8	OFF	Maximum heating supply water temperature of 176°F (80°C)
	ON	Maximum heating supply water temperature of 189°F (87°C)

## 12.6 - 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 **AI** 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.

## 12.7 - Circulator pump and three way valve protection

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

## 12.8 - Freeze protection



**CAUTION!!!** For the freeze protection function to work, the boiler must remain connected to the electrical and gas supplies with knobs "32" and "33" in figure 1, in the OFF position.

Once the boiler has reached a temperature of 45 °F (7 °C), the heating pump will automatically come 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 more than a year it should be drained per sections 13.11 and 13.12.

## 12.9 - Display in energy saving mode

If desired, the display, item "31" in figure 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 12.11 and set the **S** parameter at a value other than zero. Keep in mind that each value will correspond to a delay in minutes until the display goes into Energy Saving mode.

# 12 - USE

## 12.10 - “Users’ menu”

When entering the “Users’ menu”, the display, item “31” in figure 1, will start blinking indicating that a change of mode has taken place. To access the “Users’ menu” (see also section 16 to better understand the several menus):

- press the **Reset** button for 2 seconds until the display starts blinking;
- press and release the **Reset** button several times until the desired parameter is displayed;

- use the **+** or **-** keys, to change the value of the selected parameter.
- press **Reset** to save the parameter change before going to the next parameter.

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

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

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

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” of figure 42
<b>0A</b>	Adjustment of the curve angel as shown in figures 40 and 41 when climatic adjustment is active per section 12.3.	Setting range: 0,1 to 5,0
<b>0b</b>	Adjustment of the “Minimum heating temperature” as shown in figures 40 and 41 when climatic adjustment is active per section 12.3.	Setting range: see section 12.4.3
<b>0c</b>	Adjustment of the “Maximum heating temperature” as shown in figures 40 and 41 when climatic adjustment is active per section 12.3.	Setting range: see section 12.4.3
<b>b</b>	Adjustment of the parallel shift of the curve as shown in figures 40 and 41 when climatic adjustment is active per section 12.3.	The adjustment is made by turning knob “33” shown in figure 1. The selected curve can be shifted up or down by 18 °F (10 °C).
<b>c</b>	Display of the calculated heating temperature when climatic adjustment is active per section 12.3, or display of the temperature set by knob “33” shown in figure 1.	Temperature display only with a range between 68 °F (20 °C) and 189 °F (87 °C).
<b>d</b>	Display of the domestic hot water temperature when set by knob “32” shown in figure 1.	Temperature display only with a range between 104 °F (40 °C) and 158 °F (70 °C), see section 12.1
<b>E</b>	Display of last error code registered, section 12.12.2	Error code display per section 12.12.2
<b>L</b>	Display of last lockout occurred, section 12.12.1	Fault code per section 12.12.1

## 12.11 - “Installers’ 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 “31” in figure 1, will start to blink indicating that a change of mode has taken place. To access the “Installers’ Menu” just (see also section 16):

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

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

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

## 12 - USE

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

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” OF FIGURE 42
<b>U1</b>	Boiler and heating supply temperature, measured by U1 sensor	Value in °F (cannot be changed)
<b>U2</b>	Domestic hot water temperature, measured by U2 sensor	Value in °F (cannot be changed)
<b>U3</b>	Domestic cold water (or storage tank) temperature, measured by U3 sensor	Value in °F (cannot be changed)
<b>U4</b>	Outdoor temperature, measured by U4 sensor	Value in °F (cannot be changed) (displayed only if climatic adjustment is active, as per section 12.3)
<b>U5</b>	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)
<b>U6</b>	High limit temperature, measured by U6 sensor	Value in °F (cannot be changed)
<b>U7</b>	Flue gas temperature, measured by U7 sensor	Value in °F (cannot be changed)
<b>U8</b>	Heating return temperature, measured by U8 sensor	Value in °F (cannot be changed)
<b>tY</b>	Type of basic setting of control board	Can be changed in accordance with the instructions indicated in the gas conversion kit
<b>rE</b>	Status of room thermostat contact	00 = contact open (heating service off) 01 = contact closed (heating service on)
<b>F</b>	Measurement of fan speed rotation	Value in g/1’/100 (rpm/100) (cannot be changed)
<b>P</b>	Power set for heating service	Adjustable according to the instructions of section 11.10
<b>CH</b>	Heating service functioning mode	Can be changed: 00 = thermostatic adjustment (see section 12.2); 01 = climatic adjustment (see section 12.4); 02 = climatic adjustment with room compensation (see section 12.4.6);
<b>Cn</b>	Reaction to external temperature	Can be changed from 1 to 10 (active only with climatic changes adjustment). See section 12.4.1 for its adjustment.
<b>br</b>	Angle fulcrum of climatic adjustment	Can be changed from 16°F (-9°C) to 149°F (65°C) (active only with climatic adjustment). See section 12.4.3 for its adjustment.
<b>t n</b>	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 climatic adjustment featuring room compensation) See section 12.4.6 for its adjustment.
<b>L</b>	Boiler knobs’ status	Can be changed: 01 = knobs presents; 00 = knobs absent.
<b>S</b>	Display “31” as per figure 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 12.9)
<b>PS</b>	Disabled for this kind of boiler	

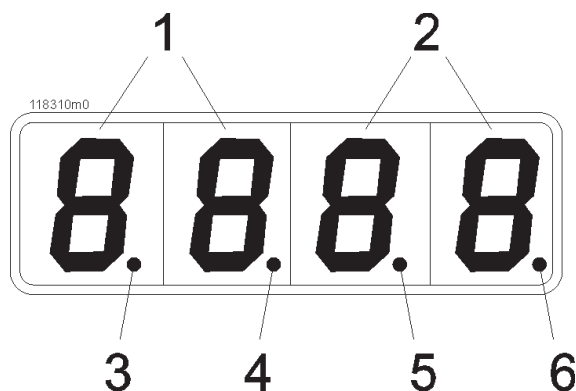
# 12 - USE

## 12.12 - Diagnostics

During the normal operation of the boiler, the display item

“31” in figure 1, continually shows the operating status of the boiler as shown below (see also section 16):

PARAMETER	DESCRIPTION	INFORMATION ON DISPLAY ITEM “2” OF FIGURE 42
<b>0</b>	Boiler in stand-by mode or pause (no request for heating or domestic hot water)	Boiler temperature (°F)
<b>P</b>	Anti-freeze function active	Boiler temperature (°F)
<b>A</b>	Boiler not in lock-out mode but in warning. Turn domestic hot water to OFF position to reinstate heating. Check that there are no leaking faucets or pipes. If the problem persists, contact a professionally qualified technician (see also section 12.6).	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 = Connection interrupted between boilers on the battery
<b>FILL</b>	System pressure too low, system must be filled. See section 11.1.4.	No display
<b>d</b>	Domestic hot water service on	Domestic hot water temperature (°F)
<b>C</b>	Heating service on	Heating temperature (°F)
<b>L</b>	Boiler in lock-out mode. To reset it, press the <b>Reset</b> button. If the lock-out occurs frequently, contact a professionally qualified technician.	Lock-out code (see section 12.12.1 for decodification).
<b>E</b>	Boiler fault. Contact a professionally qualified technician	Error code (see section 12.12.2 for decodification).
<b>F</b>	Auto-purging procedure that last 2 minutes in progress (see section 11.1.5).	Boiler temperature (°F)
<b>AL</b>	Boiler in Anti-legionella functioning (see section 12.6)	Storage tank temperature (°F)



- 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 not function.

Figure 42 - Display of the control board (see also item “31” in figure 1)

# 12 - USE

## 12.12.1 - 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"> <li>a-correct gas supply pressure (see section 11.7);</li> <li>b-ignition spark (see section 13.5);</li> <li>c-correct combustion air pressure (see section 11.8);</li> <li>d-120Vac at the gas valve;</li> <li>e-resistance of the two gas valve coils should be 0.18 kohm and 1.1 kohm;</li> <li>f- If the burner lights, but goes out at the end of the ignition attempt, check: that the ionization current is set at a value greater than 60 (follow procedure in section 13.13.4)</li> </ul>	<ul style="list-style-type: none"> <li>a-If the gas supply pressure is incorrect, it must be adjusted to the correct pressure;</li> <li>b-If spark are not present, check for the correct positioning of the ignition electrode as per section 13.5; If position is correct, check for 120Vac at the supply of the spark generator.</li> <li>c-if the combustion air pressure is incorrect, inspect the vent system and eliminate any obstructions;</li> <li>d-if the voltage to the gas valve is not 120Vac the power control board must be replaced;</li> <li>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.</li> <li>f-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 11.9). Check the flame detection electrode (section 13.5) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.</li> </ul>
L02	Flame extinguishes three times.	<p>Check:</p> <ul style="list-style-type: none"> <li>a-that the ionization current is set at a value greater than 60 (follow procedure in section 13.13.4);</li> <li>b-check that vent terminal is not being adversely affected by wind;</li> </ul>	<ul style="list-style-type: none"> <li>a-If the ionization current is not greater than 60, confirm that the the CO2 content is adjusted properly (see section 11.9). Check the flame detection electrode (section 13.5) and if necessary replace it, check the integrity of the flame detection electrode electrical wires.</li> <li>b-If vent terminal is being adversely affected by wind it must be relocated.</li> </ul>
L03	Boiler temperature is over 203° F (95°C).	Check that the circulator pump is working	If the circulator pump is bad, replace it, if is good, replace the power control board
L04	Gas valve command relay		Replace the power control board
L05	Safety relay	Check for correct polarity of the wires to the pump, try to switching them.	If the pump is properly wired, try to replace the pump. If the pump is good try to replace the power control board.
L06	Flue gas sensor over 230°F (110°C)	<p>Check:</p> <ul style="list-style-type: none"> <li>a - that the electrical resistance of the flue gas sensor complies with the graph in section 13.14;</li> <li>b - that the efficiency of the boiler is over 86%</li> </ul>	<ul style="list-style-type: none"> <li>a-If the flue gas sensor resistance does not correspond with the correct values, replace it;</li> <li>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.</li> </ul>
L07	Electrical circuit of flue gas sensor is interrupted	Check that the electrical resistance of the flue gas sensor corresponds with the graph in section 13.14;	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 temperatures difference between the U1 and U6 sensors is too great	<p>Check that:</p> <ul style="list-style-type: none"> <li>a - the electrical resistance of the two sensors corresponds with the graph in section 13.14;</li> <li>b -check that the heating water flow is not too low.</li> </ul>	<ul style="list-style-type: none"> <li>a-If one or both sensors does not have the correct resistance value, it must be replaced;</li> <li>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.</li> </ul>



# 12 - USE

## 12.12.1 - 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		Replace the gas valve, or replace the power control board
L20	Flame sensed before opening of the gas valve.		Replace the gas valve, or replace the power control board
L25	U1 or U6 sensor increase its temperature too fast	Check: a - that the heating water flow is not too low; b - that the circulator pump is working	a - If temperature difference between U1 and U8 is higher than 55°F (13°C), at maximum input, the heating water flow rate is too low. The heating water flow rate must be corrected. b - replace the circulator pump or 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 must appear when the pressure drops below 8.7 psi (0,6 bar), and must disappear 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 13.14; 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

## 12 - USE

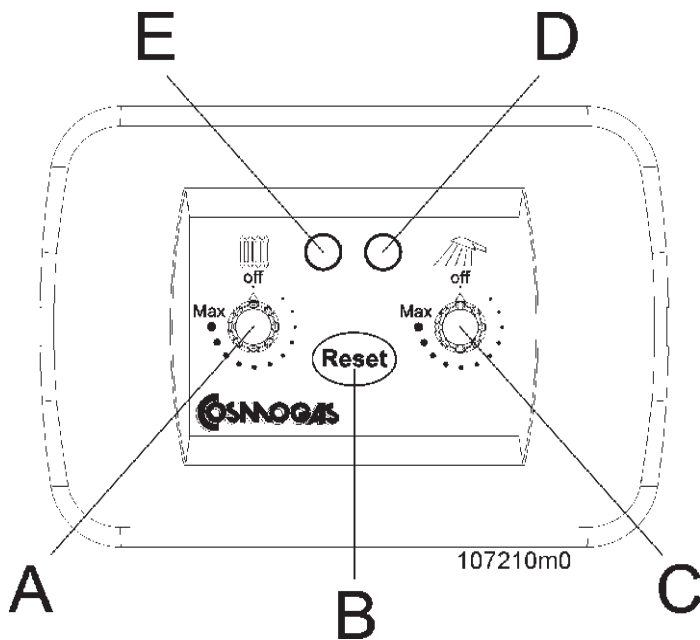
### 12.12.2 - Diagnostics: “E” blocking errors

“E” Code	Blocking description	Checks to make	Solutions
E01	U1 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E02	U2 domestic hot water temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E04	U8 return temperature sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E07	U3 cold water temperature or storage tank sensor circuit interrupted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E08	U6 boiler temperature sensor circuit interrupted.	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	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 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E12	U2 domestic hot water temperature sensor circuit short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	If the sensor resistance does not correspond, it must be replaced; if the electrical circuit is damaged, it must be repaired; if the previous two cases do not apply, replace the power control board
E13	Erroneous temperature reading.		Replace the power control board

## 12 - USE

### 12.12.2 - Diagnostics: “E” blocking errors (continued)

“E” Code	Blocking description	Checks to make	Solutions
<b>E14</b>	U8 return temperature sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	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
<b>E15</b>	U4 outside sensor short-circuited	Check that the electrical resistance of the sensor corresponds with the graph in section 13.15; check that the electrical connection cables between the sensor and the power control board	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
<b>E16</b>	Erroneous temperature reading.		Replace the power control board
<b>E17</b>	U3 cold water temperature or storage tank sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	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
<b>E18</b>	U6 boiler temperature sensor circuit shorted	Check that the electrical resistance of the sensor corresponds with the graph in section 13.14; check that the electrical connection cables between the sensor and the power control board	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
<b>E19</b>	E2prom memory damaged		Replace the command and control board
<b>E20</b>	Flame presence with gas valve closed		Replace the gas valve
<b>E21</b>	Phase and neutral inverted	Invert phase and neutral	If phase and neutral are correctly wired, replace the power and control board
<b>E22</b>	Electrical supply frequency other than 60Hz	Check the electrical frequency of the system. Check if CS parameter is at 02 or 03	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 02 or 03.
<b>E23</b>	Ground connection is absent	Check if the boiler is properly grounded	if the boiler is properly grounded, replace the power control board
<b>E30</b>	Erroneous temperature reading.		Replace the power control board
<b>E31</b>	Erroneous temperature reading.		Replace the power control board
<b>E32</b>	Erroneous temperature reading.		Replace the power control board
<b>E33</b>	Erroneous temperature reading.		Replace the power control board
<b>E42</b>	Program error		Replace the power control board
<b>E50</b>	Error in the boiler TYPE selection	Push ON switches 7 an set again the correct TYPE.	If TYPE values is correct, change the power control board
<b>E51</b>	Reset button pressed too often in a short period time		



- A - Central heating regulation knob**
- B - RESET key**
- C - Domestic hot water regulation key**
- D - Red light (for diagnostic see section 12.13)**
- E - Green light (for diagnostic see section 12.13)**

**Figure 43 - Remote commad**

## 12.13 - Remote command for model 45WE and 45AE

Because the 45WE and 45AE boilers are intended also for outdoor installation, they are supplied with a remote commad that can help you to drive the boiler from inside building. Heating and domestic temperature regulation and reset of the boiler, may be performed directly on the remote command of figure 43. On remote command are present two lights:

- Green light continuously ON: central heating is correctly running;
- Green light blinking every 7 sec.: good communication between the remote command and the boiler (Central heating service is OFF Eg. room thermostat opens);
- Red light continuously ON: boiler is in a lock out condition. Press RESET key to reactivate the boiler. If the lock-out occurs frequently, contact a professionally qualified service technicians;
- Red light blinking: Boiler in a lock out condition for more than 5 minutes Press RESET key to reactivate the boiler. If the lock-out occurs frequently, contact a professionally qualified service technicians;
- Red and green lights blinking: too low pressure to the heating system. Call a professionally qualified service technicians.

### 13.1 - General precaution

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

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



**CAUTION!!!** Before performing any maintenance operations, shut the boiler off, close the manual gas shut-off valve, figures 16 and 17 item “3”, and shut off electrical power to the boiler. Follow the Operating Instructions outlined in the section “SAFETY INSTRUCTION”.

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

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

## 13.2 - Removing the casing for models 45WN and 45AN

In order to remove the casing, follow the steps below while referring to figure 44:

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

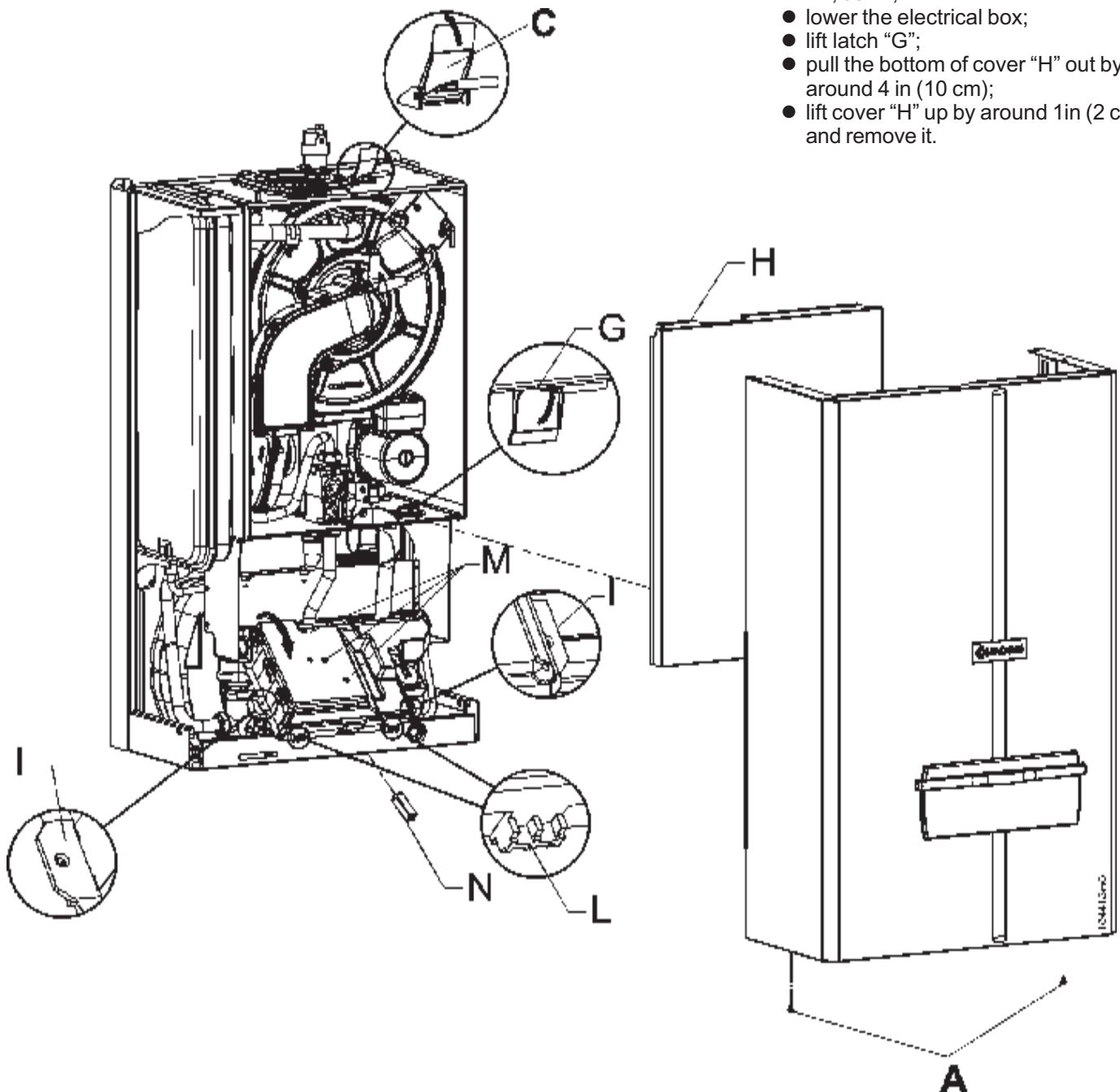


Figure 44 - Removing the casing on models 45WN and 45AN



### 13.3 - Removing the plastic cover on a 45WE and 45AE boilers

In order to remove the casing, follow the steps below while referring to figure 45:

- remove screw "E";
- push upward, with your hands, in the points indicated by "Q" and "R";
- pull-out all the cover
- press the two plastic springs, item "L", down;
- lower the electrical box "S";
- lift latch "G";
- pull the bottom of cover "H" out by around 4 in (10 cm);
- lift cover "H" up by around 1in (2 cm) and remove it.

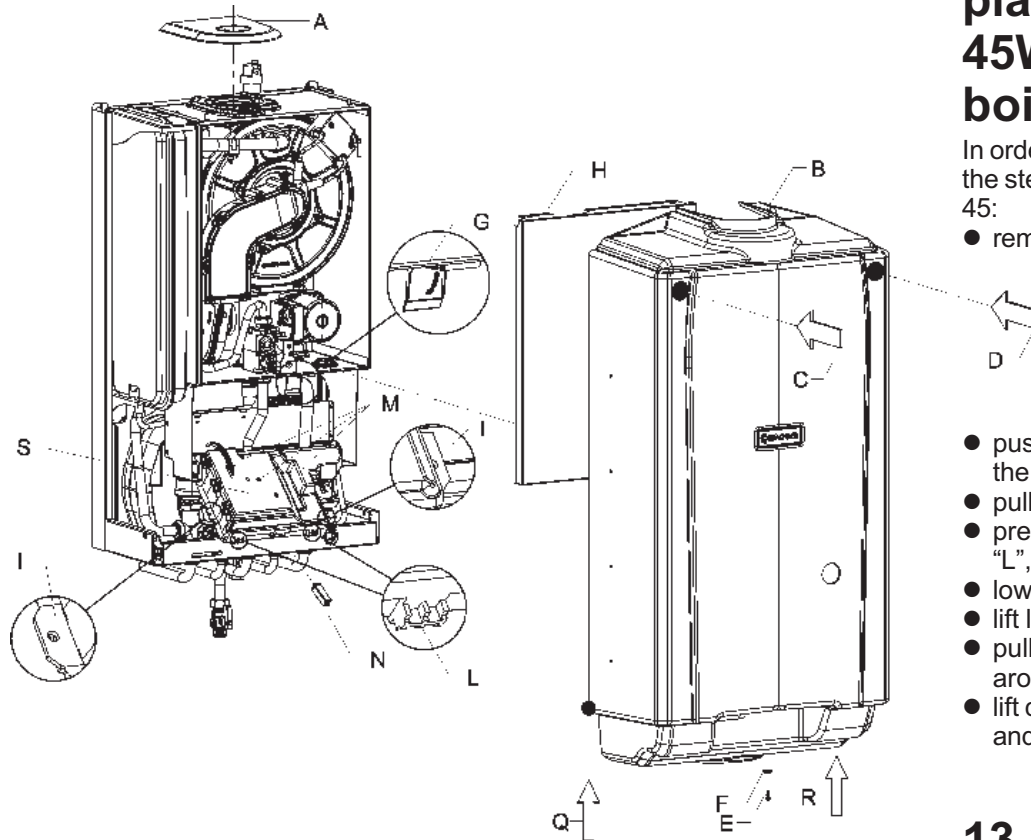


Figure 45 - Mounting and removing the casing on models 45WE and 45AE

### 13.3.1 - Installing the plastic cover on models 45WE and 45AE boilers

Boilers models 45AE and 45WE are delivered with the plastic outer jacket cover in a separate box and need to be field installed. In order to install the plastic cover, follow the steps below while referring to figure 45:

- mount the boiler as per section 5.5;
- mount the coaxial adaptor item "B" in figure 45 bis, as per section 10.1;
- plumb the plastic cover "B" onto the boiler;
- with both hands, push on points "C" and "D" at the same time;
- secure cover "B" with screw "E" and washer "F";
- insert washer "A" onto the coaxial adaptor.

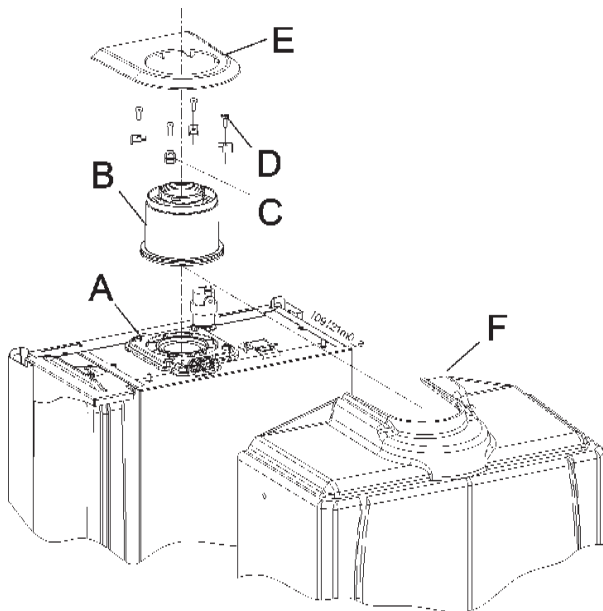


Figure 45 bis - Mounting the plastic cover on a 45WE or 45AE

## 13 - MAINTENANCE

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

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

- follow the steps in section 13.2 or 13.3 to gain access the internal components;
- unscrew nut "D" from the gas valve (taking care not to loose gasket "E" in figure 48);
- disconnect the wires from the ignition electrodes and the wire from the flame detection electrode, figure 1, details "18" and "47";
- disconnect the wire from safety sensor "F" in figure 46;
- unscrew the four nuts "C" in figure 46;

- protect the gas valve outlet, from entering any object or condensing water;
- remove the entire fan - burner assembly, detail "A" in figure 46;
- use a cylindrical brush with plastic bristles to clean the inside of the combustion chamber, detail "H" in figure 46;
- use a vacuum cleaner to remove any unburned residue from the combustion chamber, detail "H" in figure 46;
- using the same vacuum cleaner, clean the surfaces of the burner and around the electrodes;

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

**WARNING!!! while performing the next step, carefully wash only the inside of the combustion chamber "H" of figure 46, 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!**

- using only water, wash the inside of the combustion chamber, detail "H" in figure 46. The water, will drain into the condensate drain;
- reassemble the components by proceeding in reverse order;
- open the manual gas shutoff valve;
- restore electrical power to the boiler;
- 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!**

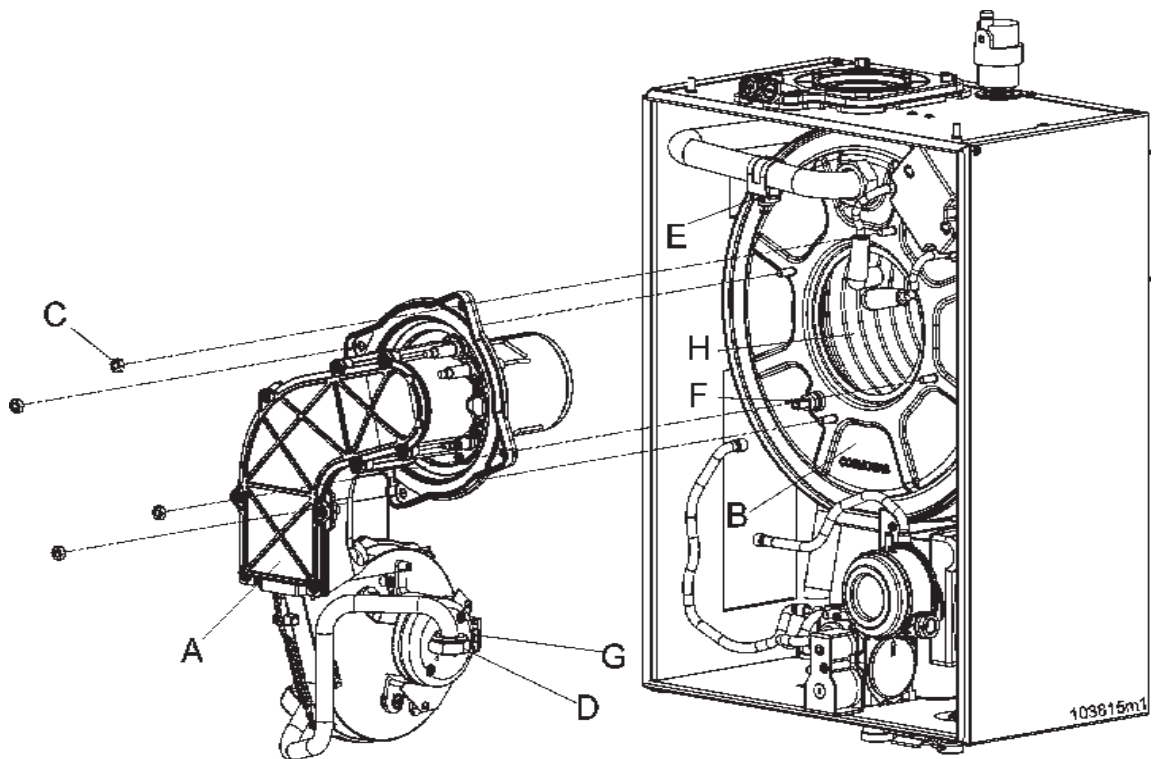


Figure 46 - Remove the fan-burner assembly unit

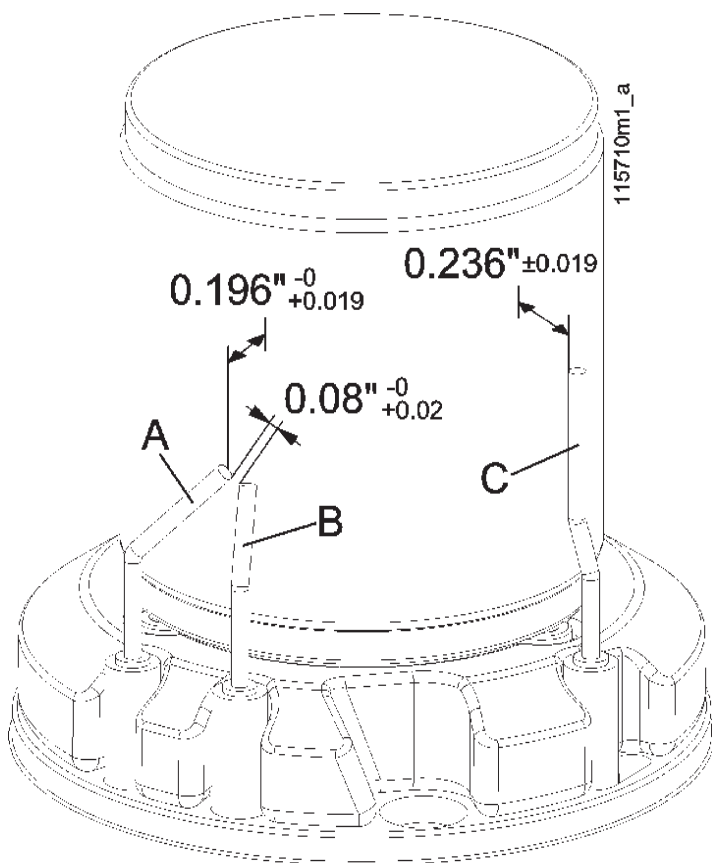
### 13.5 - Correct positioning of the ignition and flame detection electrodes

For the boiler to work properly the electrodes must be positioned as shown in figure 47:

- ☞ the distance between the ignition electrodes "A" and "B", must be between 0.08 in (2 mm), and 0.082 in (2.5 mm);
- ☞ the distance of the ignition electrodes to the burner surface must be between 0.196 in (5.0 mm), and 0.215 in (5.5 mm);
- ☞ the distance of the flame detection electrode to the burner surface must be between 0.236 in (6.0 mm), and 0.276 in (7.0 mm).

### 13.6 - Domestic hot water heat exchanger (only for 45WN model)

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



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

Figure 47 - Positioning electrodes on burner

## 13.7 - Condensate trap cleaning

The condensate trap must be cleaned every year. Follow the steps below to properly clean the condensate trap and its associated components while referring to figure 48:

- run the fan as described in section 13.13.2, to minimize the amount of liquid present in the trap, item "A";
- follow the steps in section 13.2 or 13.3 to gain access the internal components;
- carefully cover the electrical panel with a waterproof material, "B", to prevent water from entering the electrical system;
- grip spring clamp "G" with a pair of pliers and slide it downwards;
- pull the condensation trap hose "H" off the trap;
- remove the fan-burner assembly unit, follow steps of section 13.4;
- protect the gas valve outlet, from entering any object or condensing water;
- unscrew nut "I" from the bottom of the trap, "A", and pull it upwards, taking care not to spill the condensation;
- open the condensate trap taking care not to loose o ring "L" and clean the inside "M";
- re-assemble everything in reverse order, taking care that oring "L" is placed in the proper location;
- refill the condensate trap per section 11.1.2.

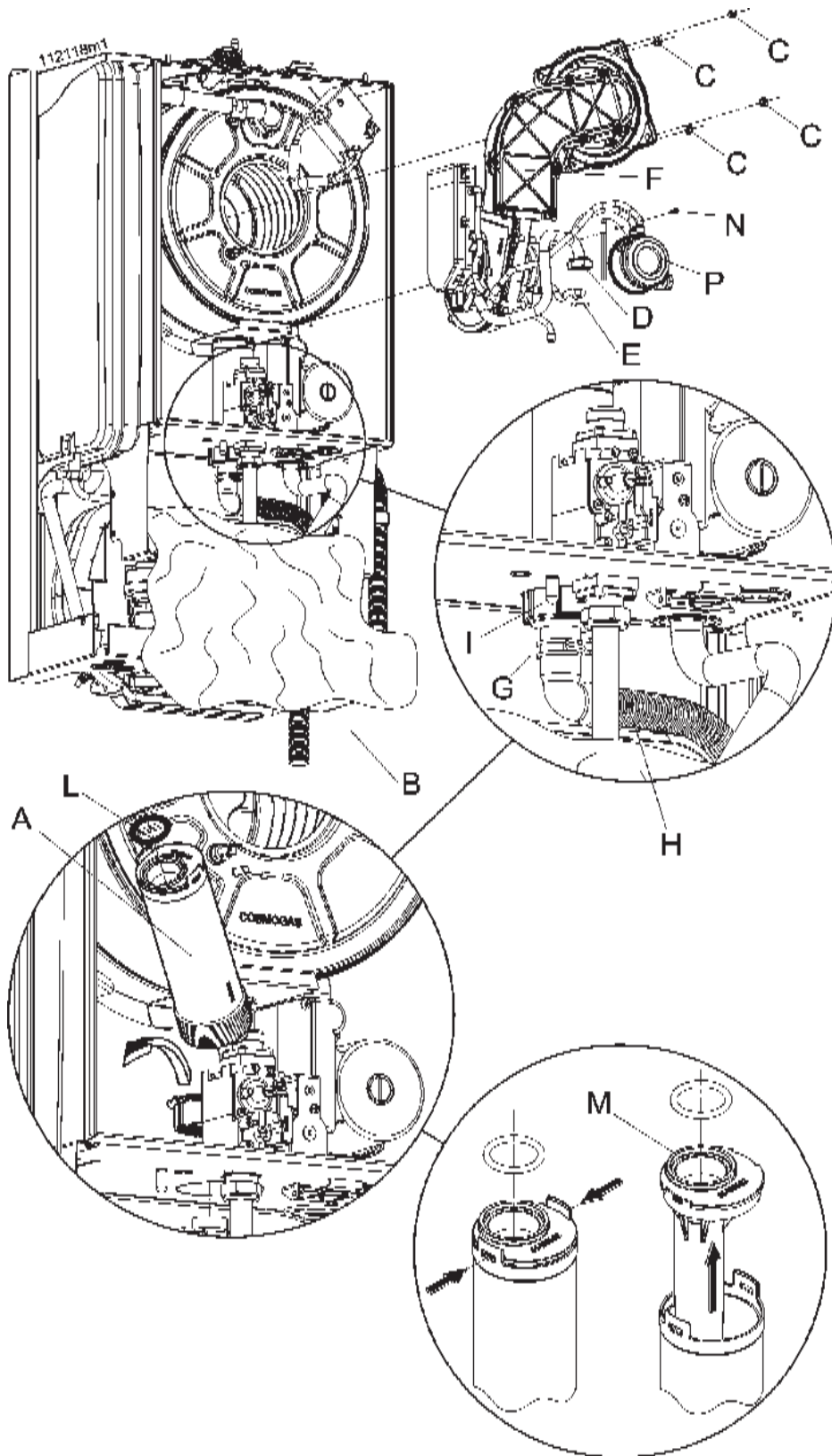
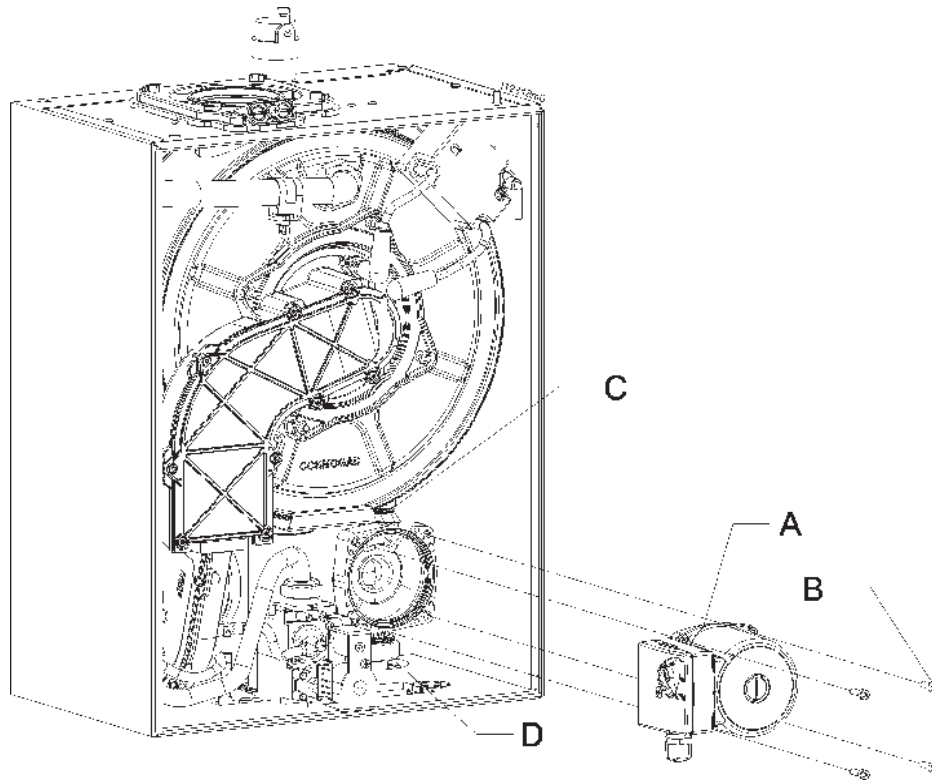


Figure 48 - Removing the condensing trap

## 13 - MAINTENANCE



**Figure 49 - Replacing the pump motor (only for 45WN and 45WE models)**

### 13.8 - Circulator pump motor replacement (only for 45WN and 45WE models)

To replace the circulator pump follow the steps below while, referring to figure 49:

- follow the steps in section 13.11 to isolate and drain the water from the boiler;
- follow the steps in section 13.3 to gain access the internal components;
- remove screws "B";
- remove the circulator pump motor "A";
- label the electrical wires of the circulator pump motor, phase and neutral must be respected;
- disconnect the electrical wires from the circulator pump motor
- install the new circulator pump motor and reassemble the boiler
- open the heating system isolation valves and heating system fill valve
- follow the steps in section 11.1.3 to bleed the air from the heating system.

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

### 13.9 - Expansion tank pressure (only for 45WN and 45WE models)

To check the expansion tank pressure follow the steps below:

- follow the steps in section 13.11 to isolate and drain the water from the boiler
- follow the steps in section 13.2 or 13.3, to gain access the internal components;
- check the pressure of the expansion tank, item "4" of figure 1 (The air inlet probe is on the top of the expansion tank). It must be 14 psi (1 bar). If the pressure is lower recharge the expansion tank while letting the water run out of the heating system drain valve.

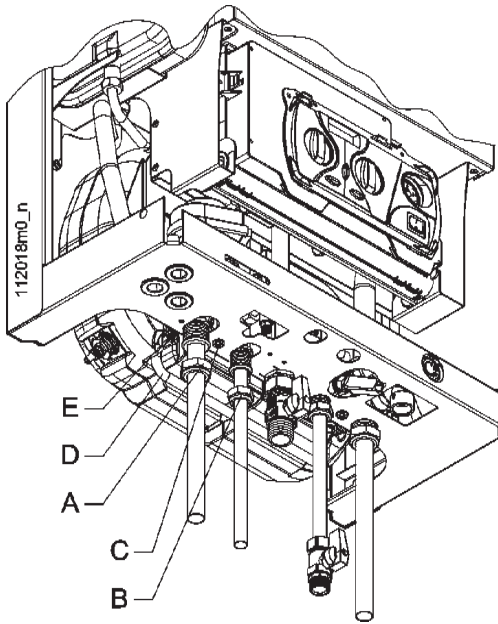


# 13 - MAINTENANCE

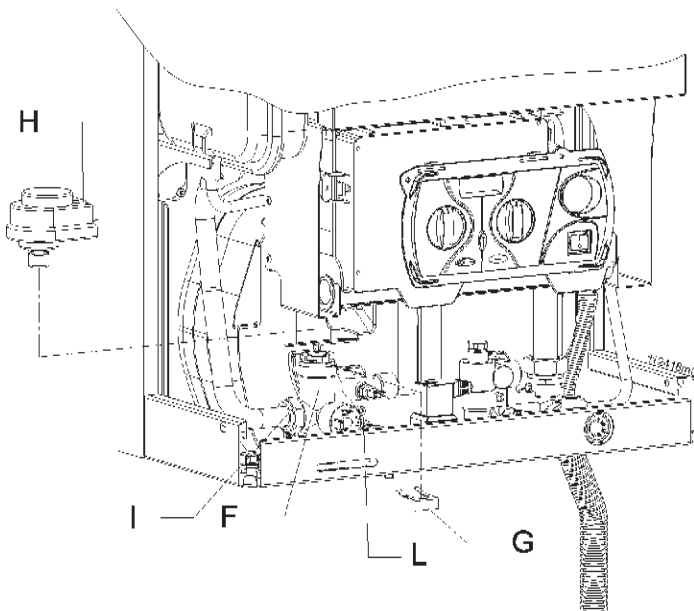
## 13.10 - 3-way valve removal (only for 45WN and 45WE models)

The 3-way valve, detail "F" in figure 51, 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 it follow the steps below while referring to figures 50, 51 and 52:

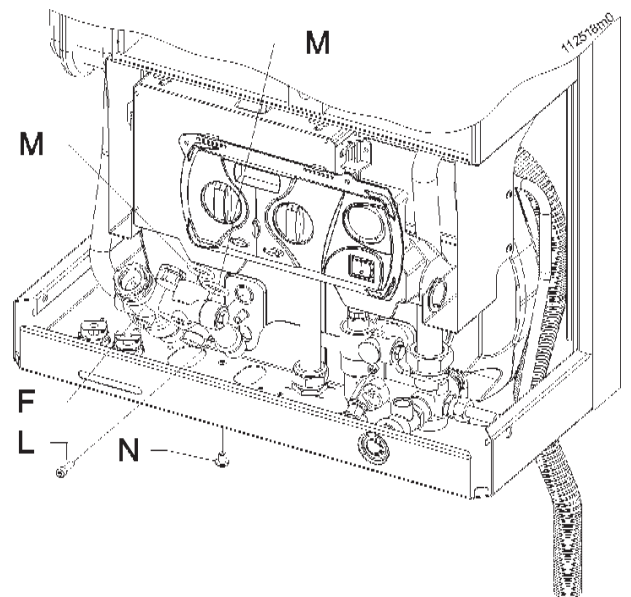
- follow the steps in section 13.11 to isolate and drain the water from the boiler;
- follow the steps in section 13.2 or 13.3, to gain access the internal components;
- disconnect fittings "A" and "B";
- remove screw "C";
- remove spring "E" and by-pass pipe "D" by moving it towards the back of the boiler;
- remove the forked spring clip "G";
- remove the 3-way valve servomotor "H";
- unscrew tubing nut "I";
- remove screw "L";
- remove the 3-way valve body, "F", taking care not to loose the o-rings, "M", figure 52;
- during reassembly, take care to properly position the o rings, "M", figure 52;



**Figure 50 - Supply fittings removal (only for 45WN and 45WE models)**



**Figure 51 - 3-way valve servomotor removal**



**Figure 52 - 3-way valve body removal**



## 13 - MAINTENANCE

### 13.11 - Draining the heating side of the boiler

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

- allow the water inside to cool by switching off the room thermostat and turning knob “33” in figure 1 to minimum. Wait until the display, item “31” in figure 1, shows a temperature less than 104°F (40°C);
- turn off the boiler;
- shut off electrical power to the boiler;
- close the manual gas shutoff valve, figures 16 and 17 item “3”;
- 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.
- close the heating system fill valve;
- follow the steps in section 13.2 or 13.3, to gain access the internal components;
- connect a hose to the boiler drain valve and place the other end in a sink or some other suitable drain;
- open the boiler drain valve and drain the boiler;
- if boiler isolation valves have not been installed in the heating system open any bleed valves at the highest point of the system;
- after draining out all the water, close the bleed valves and the boiler drain valve;

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

### 13.12 - Draining the domestic hot water side of the boiler

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

- turn off the boiler;
- close the valve in the water main supplying the DHW system;

- open all the hot and cold faucets in the building;
- if there isn't a faucet or drain valve below the boiler level, disconnect DHW connections 10 and 12 in figure 1.

### 13.13 – Overrides

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

#### 13.13.1 - Auto-purging

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

#### 13.13.2 - Fan

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

#### 13.13.3 – 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:

- generate a demand for the mode to be overridden:
  - for heating turn up the room thermostat and turn knob “33” in figure 1 to its' maximum;
  - for domestic hot water turn knob “32” in figure 1 to its' maximum and fully open a hot water faucet;

- press the **+** and **-** keys together for more than 10 seconds, until a blinking **F** appears on the display;
- press the **+** key until the display shows:
  - **L** for minimum heating output;
  - **L** - for maximum heating output adjusted by P parameter, see section 11.10;
  - **L** for maximum heating output;
  - **S** for minimum DHW output;
  - **S** for maximum DHW output;
- press the **Reset** key in order to restore the boiler to normal running conditions.

#### 13.13.4 – Checking the flame current

While running at the minimum and maximum output described in section 13.13.3, the display will show the letter of the mode checked. In the second part of the display the value of the ionization current will be shown. 30 corresponds to a current of 1 uA, 99 to a current of 5.5 uA. The flame current must always be at the correspondent value as shown in section 14, header “ionisation current”. If the value is not within the above values, check:

- a - positioning of the flame sensor electrode as per section 13.5;
- b - CO2 content as per section 11.9;
- c - combustion air pressure as per section 11.8.

# 13 - MAINTENANCE

## 13.14 - 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 53.

The temperature sensors are: U1; U2, U3, U5, U6, U7 and U8. The location of each sensor can be found in figures 1 and section 13.16 and 13.17.

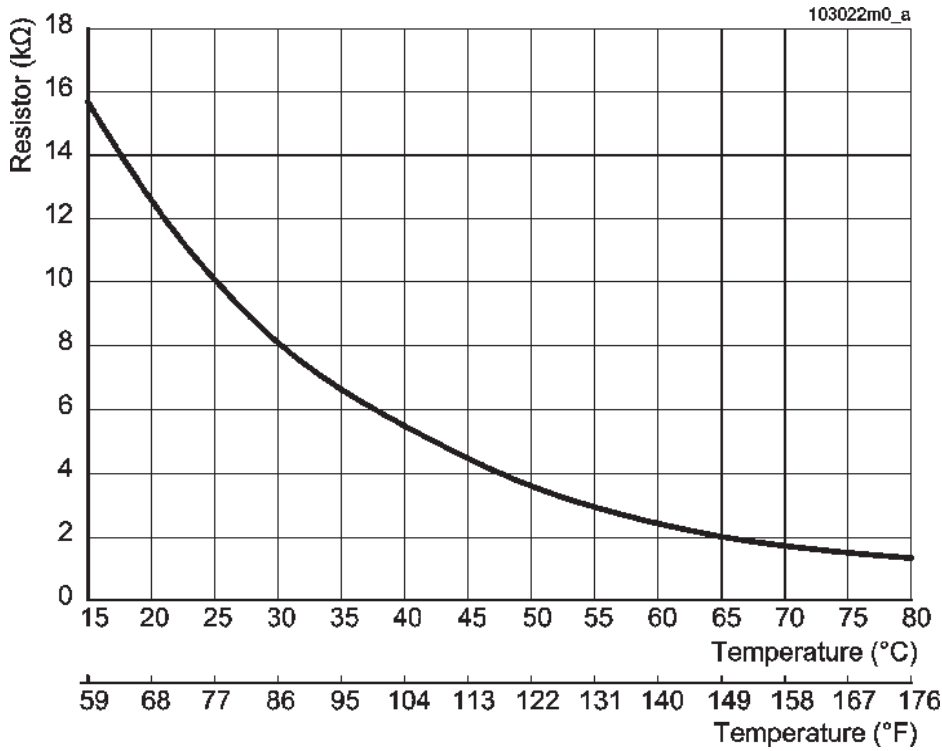


Figure 53 - Water temperature sensors' curve

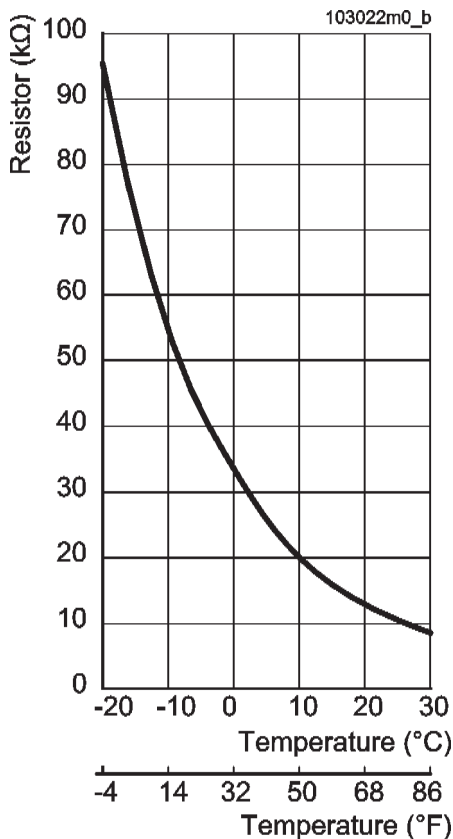


Figure 54 - Outdoor temperature sensor curve

## 13.15 - Outdoor temperature sensor (optional)

An outdoor temperature sensor can be connected to the boiler (see section 6.5). The electrical resistance existing between the sensor wires must correspond with the values shown in figure 54.



# 13 - MAINTENANCE

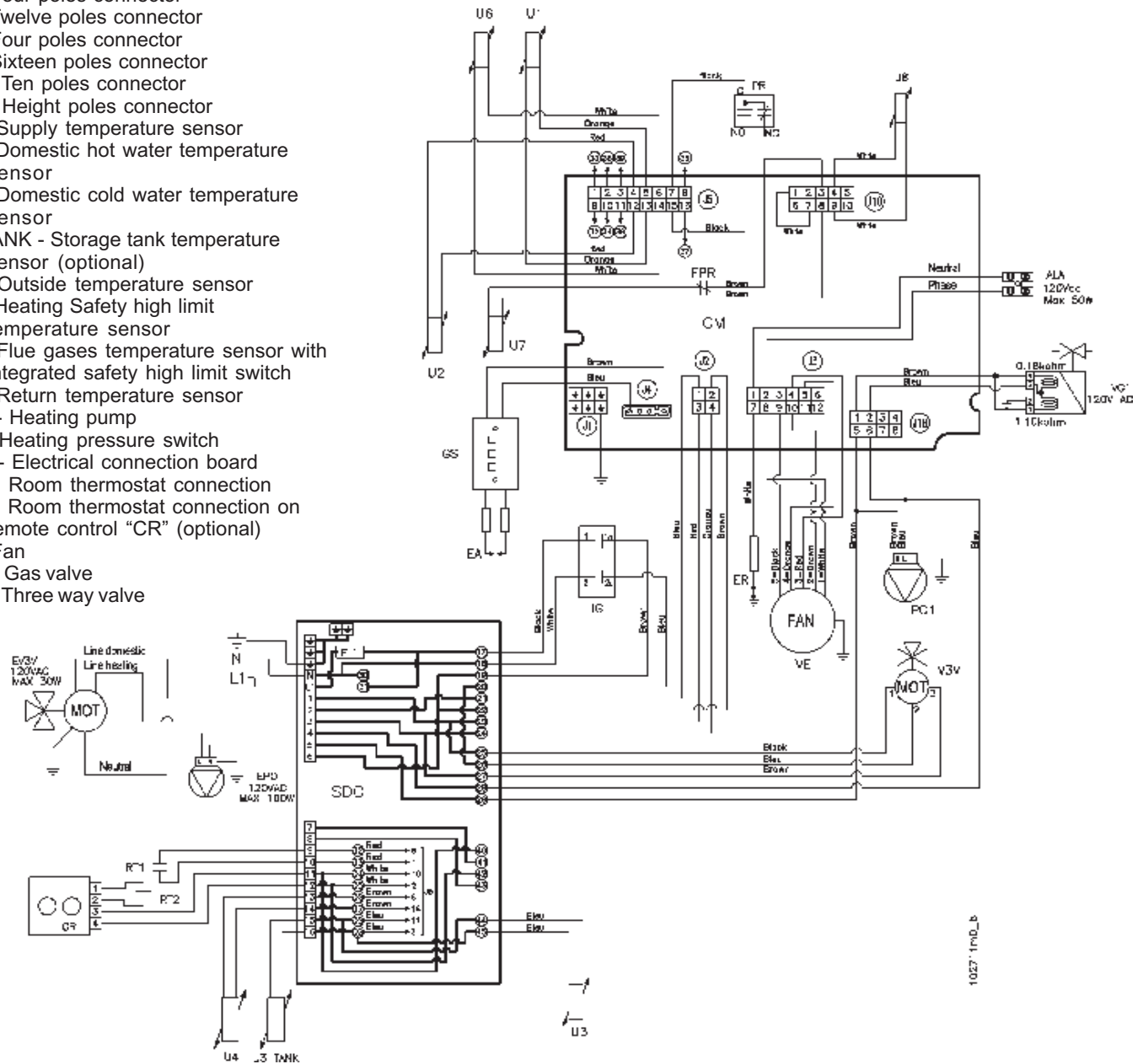
## 13.17 - Multiwire wiring diagram

### LEGEND TO FUNCTIONAL AND MULTIWIRE DIAGRAM

- ALA - Alarm output
- CM - Power control board
- CR - Remote command (only for 45WE and 45AE models)
- EA - Ignition electrode
- ER - Flame detection electrode
- EPO - External pump (REQUIRED FOR MODEL 45AN)
- EV3V - External three way valve (optional)
- F1 - Fuse 2Amps
- FPR - 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
- 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

**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.

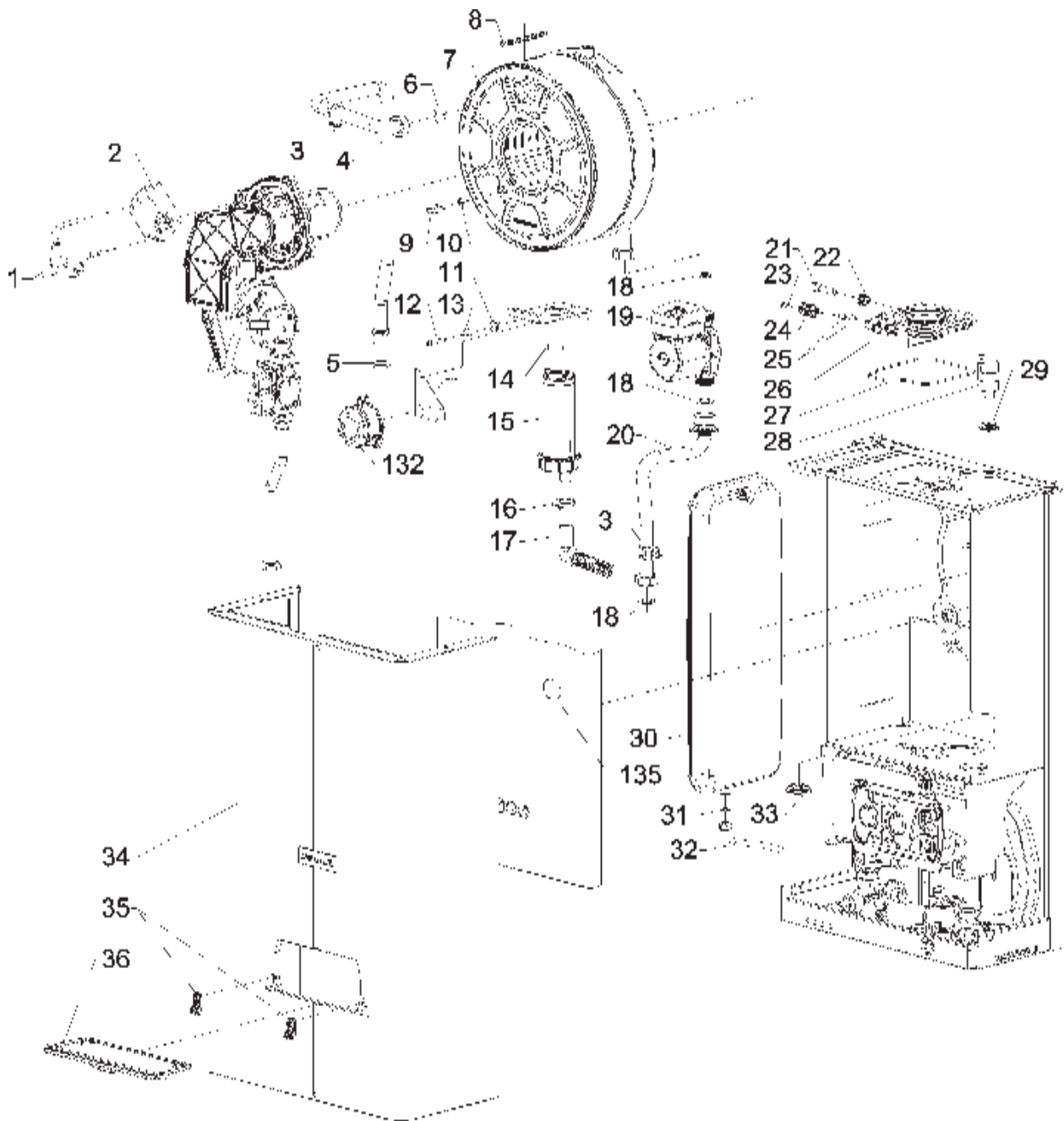


# 14 - TECHNICAL DATA

## MODEL

Country of destination		USA and Canada
Type of boiler		Direct Vent boiler
Category of discharge chimney		IV
CSA certificate N°		2045300 (114696)
Maximum Heat input	Btu/hr	160,000
Minimum heat input	Btu/hr	30,000
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
Gas flow rate	Natural gas gal/hr	1257 (168 ft <sup>3</sup> /hr)
	LP Gas lb/hr	7.44 (4.83 gal/hr)
Gas supply pressure	Natural gas In.W.C.	8
	LP Gas In.W.C.	11
Minimum gas supply pressure	Natural gas In.W.C.	1.5
	LP Gas In.W.C.	8
Maximum gas supply pressure	Natural gas In.W.C.	11
	LP Gas In.W.C.	13
Combustion air pressure with min. length	Natural gas In.W.C.	2.8
	LP Gas In.W.C.	2.4
Combustion air pressure with max. length	Natural gas In.W.C.	2.4
	LP Gas In.W.C.	2.1
Instantaneous d.h.w production (rise 75°F)	gal/min	4.32
Maximum heating temperature	°F	189
Minimum heating temperature	°F	68
Maximum heating pressure	PSI	30
Minimum heating pressure	PSI	8
Maximum pressure of domestic hot water circuit	PSI	150
Minimum pressure of domestic hot water circuit	PSI	1
Capacity of expansion tank	gal	2.64
Supply voltage		120Vac - 60Hz
Absorbed electric power	W	170
Flue gas pipes diameter (split)	" (mm)	3.15 (80)
Max. length flue gas pipes (split)	ft	300
Flue gas pipes diameter (coaxial)	" (mm)	2.36/3.94 (60/100)
Max. length flue gas pipes (coaxial)	ft	70
Equivalent length of one elbow	ft	45° elbow = 3ft, 90° elbow = 5ft
CO (0% O <sub>2</sub> with natural gas)	ppm	15
NO <sub>x</sub> (0% O <sub>2</sub> with natural gas)	ppm	15
CO <sub>2</sub> for Natural gas at high fire	%	8.8 ± 0.2
CO <sub>2</sub> for Natural gas at low fire	%	8.2 ± 0.2
CO <sub>2</sub> for LP gas at high fire	%	10.0 ± 0.2
CO <sub>2</sub> for LP gas at low fire	%	9.2 ± 0.2
Ionisation current for Natural gas at high fire		77 ± 1
Ionisation current for Natural gas at low fire		74 ± 1
Ionisation current for LP gas at high fire		74 ± 1
Ionisation current for LP gas at low fire		74 ± 1
Maximum flue gases temperature	°F	230
Flue gases flow-mass	lb/hr	160
Head pressure available for flue vent/air intake line	In.W.C.	3.6
Maximum condensation flow rate	gal/hr	1.32
Average acidity degree of condensation	PH	4
Boiler weight (45WN and 45WE models)	lb	100
Boiler weight (45AN and 45AE models)	lb	90

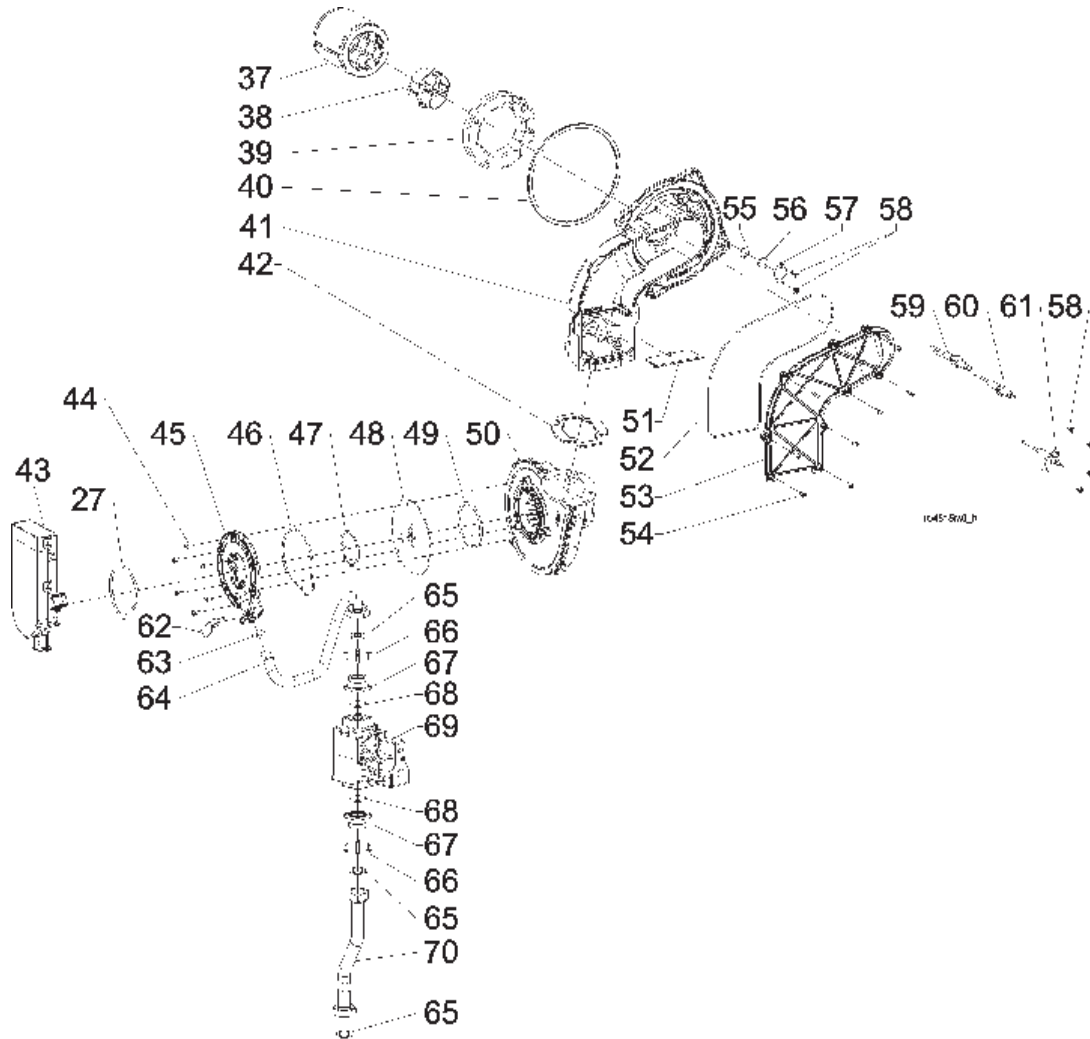
# 15 - SPARE PARTS



1 -	60504206	CABLE UL IGNITOR CONN 90° L155	19 -	62301031	PUMP GRUNDFOS UP 15/58U BRUTE USA
2 -	60510022	SPARK GENERATOR NO CABLE UL	20 -	62622012	COPPER PIPE D22 RETURN SEALING
3 -	62111016	SENSOR NTC 10 KOHMA KLIP DIAM.22			CHAMBER
4 -	62622011	COPPER PIPE D22 M/F 3/4"G-1"G	21 -	62111015	SENSOR NTC 10K BAIO
5 -	60802018	3/4" RING NUT	22 -	XXX	#N/D
6 -	60702030	O-RING NBR 2,62 X 20,63	23 -	60801132	SCREW 4,8X19 ZINC AF TC-CR UNI6954
7 -	62649004	PRIMARY HEAT EXCHANGER C.R.RASME	24 -	61405164	PLUG FOR FLUE AIR FITTING
8 -	60702047	GASKET EPDM X OSSIDO D84 H7	25 -	60702052	O-RING 2050 EPDM 1,78 X 12,42
9 -	62111017	SENSOR NTC 10 KOHM 1/8"	26 -	61405160	DISCHARGE RACCORD PP
10 -	60803027	GASKET COPPER 1/8" SP.1,5	27 -	60702035	GASKET ROUND SPONGE D.3,5 MM IP44 S3
11 -	61405025	SILICONE TAP	28 -	61206001	AUTOMATIC AIR VENT
12 -	60801116	SCREW 6X35 ZINC TC-CR	29 -	60703033	GASKET EPDM D38 F20 SP6
13 -	60803011	WASHER 6X18X1,5 PIA-ZIN-LAR UNI6593	30 -	62201005	EXP TANK LT. 8 561X203X80 RETT.
14 -	60702055	O-RING 134 EPDM 3,53 X 25,8	31 -	60701005	3/8" G GASKET
15 -	62630136	SIPHON	32 -	62625064	EXPTANK PIPE
16 -	60806020	SPRING 28,7	33 -	61102006	FAIRLEAD 6 POLES SILICONE
17 -	60322012	POLIETHYLENE PIPE L=1000	34 -	62610067	EXTERNAL JACKET 500X840X245
18 -	60701001	1"G GASKET	35 -	61405167	DOOR SUPPORT
			36 -	62610065	DOOR ABS

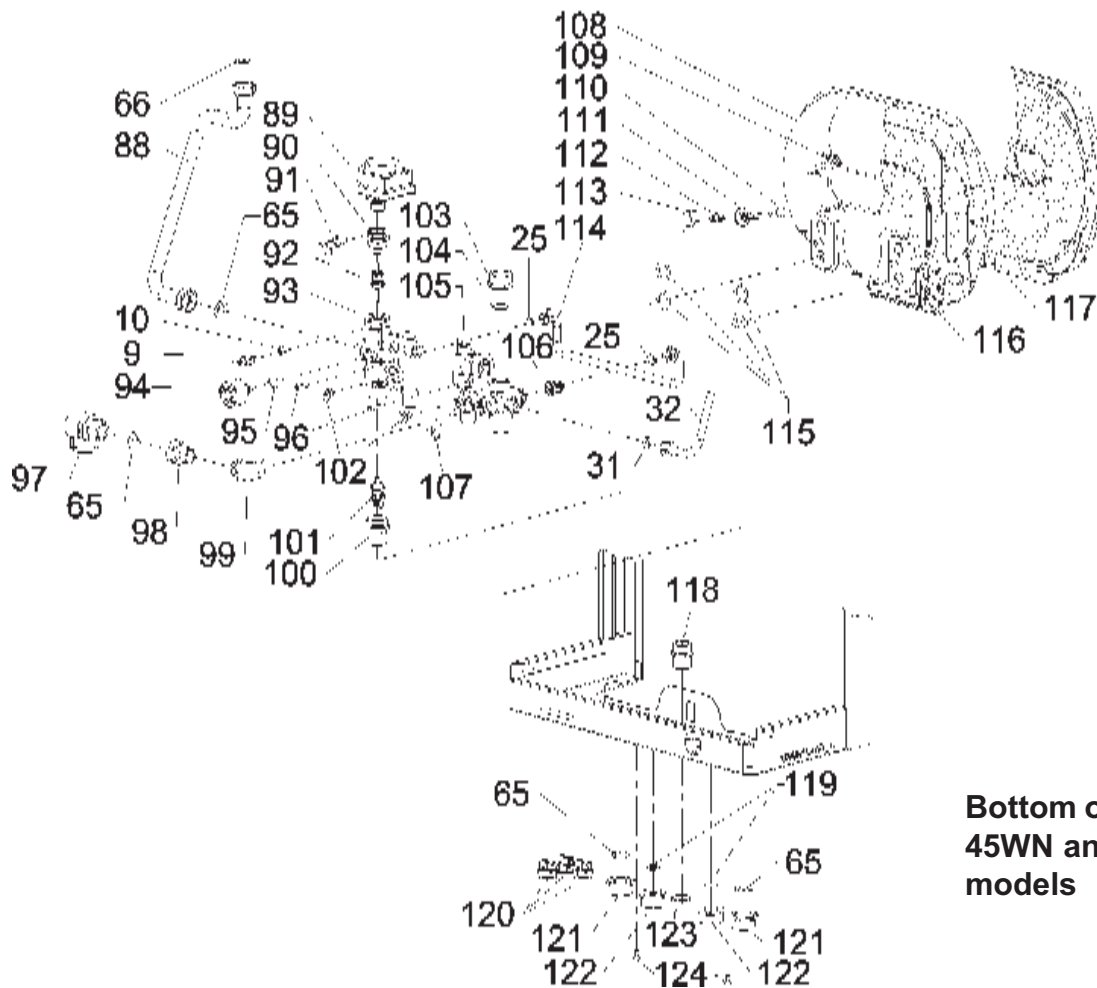
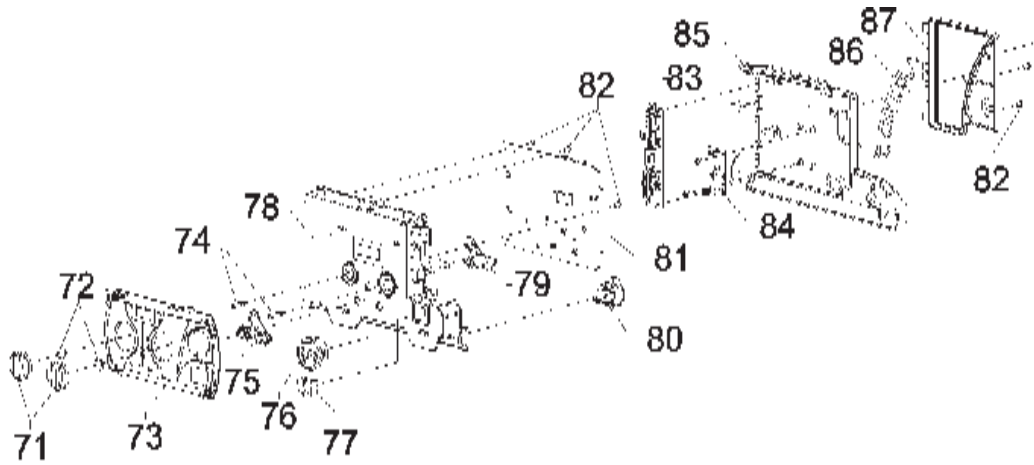


# 15 - SPARE PARTS



37 -	62629036	BURNER HEAD		
38 -	61504029	EXTRUSION L.25MM		
39 -	60909008	THERM. INSULATION VERMICULITE D117 F74 SP21,5		
40 -	60703032	GASKET. SIL. D157 F145 H6,7		
41 -	61404108	BASE MANIFOLD AIR ALUMINUM		
42 -	60703030	GASKET SIL.MANIFOLD FAN D83 SP3,5		
43 -	62651016	MANIFOLD AIR CUTTED		
44 -	60801136	SCREW SELFTAPPING 4X12 TC S-TT UNI-8112		
45 -	61404114	MIXER AIR/GAS "COSMOMIX"		
46 -	60702049	O-RING 3350 NBR 2,62 X 88,57		
47 -	60702048	O-RING 3200 NBR 2,62 X 50,47		
48 -	60408261	DIAPHRAGM COSMOMIX 9 HOLES D.10		
49 -	60702056	O-RING 165 NBR 3,53 X 61,91		
50 -	61901029	FAN 45 KW USA		
51 -	61405174	BACK FLUE-GASES PREVENTER		
52 -	60702051	O-RING 3825 SIL 2,62 X 209,22		
53 -	61404109	COVER MANIFOLD AIR ALUMINUM		
54 -	60801080	SCREW SELFTAPPING 4X10 TC S-TT UNI-8112		
55 -	60701013	GASKET FRIZITE D15,5 F11,5 SP1,5		
56 -	60815011	GLASS PIREX D15,5 SP3,3		
57 -	60404253	FLANGE L21,2 H34		
58 -	60801081	SCREW SELFTAPPING 4X8 TC S-TT UNI-8112		
59 -	60505022	LEFT IGNITION ELECTRODE FOR NOVADENS		
60 -	60505023	RIGHT IGNITION ELECTRODE FOR NOVADENS		
61 -	60505024	DETECTION ELECTRODE FOR NOVADENS		
62 -	60406069	SPRING MIXER		
63 -	60702050	O-RING 3056 NBR (118) 2,62X13,95		
64 -	62624125	GAS PIPE (SIT) USA		
65 -	60701006	GASKET 3/4P 24X15X2 KLINSIL		
66 -	60801014	SCREW 4X10 ZINC TC-CR		
67 -	60101224	FLANGE GAS 32X32 3/4P		
68 -	60702029	O-RING 130 2,62 X 22,22		
69 -	61201040	GAS VALVE SIGMA848 120V		
70 -	62623249	PIPE D18 F/F 3/4P-3/4P SIT USA		
71 -	62103009	CONTROL KNOB S3		
72 -	60702041	O-RING NBR 1,6 X 11,1		
73 -	61405203	FRONT INTERFACE		
74 -	61405151	TREE POTMETER-KNOB		
75 -	61405190	KEYS RUBBER 3 POSITIONS		
76 -	62102009	PRESSURE GAUGE DIAM.38 - 1/4" PSI		
77 -	60506019	GAS VALVE SERVICE SWITCH		
78 -	61405184	BASE ELECTRICAL BOX		
79 -	61405186	FAIRLEAD SX		
80 -	61405188	FAIRLEAD DX		
81 -	62110076	POWER CONTROL BOARD PHC 120V		
82 -	60801138	SCREW 4X8 ZINC TC-CR DIN4042		
83 -	60507056	JUNCTION BOARD 45		
84 -	62118015	INTERFACE OPENTERM		
85 -	61405185	COVER ELECTRICAL BOX		
86 -	61103011	FAIRLEAD 7 EXIT		
87 -	61405189	COVER JUNCTION BOX		
88 -	62623246	PIPE SUPPLY SEALING CHAMBER		
89 -	61203015	3 WAY VALVE MOTOR 120V		

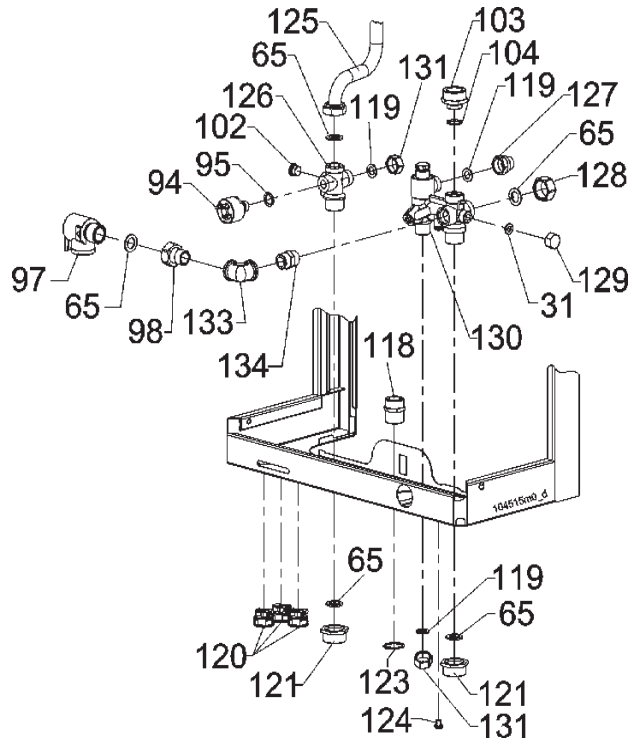
# 15 - SPARE PARTS



**Bottom of the boiler for  
45WN and 45WE  
models**

- |                |                                   |                |                                    |
|----------------|-----------------------------------|----------------|------------------------------------|
| 90 - 61202024  | PLUG PISTON BODY OT.              | 103 - 60110028 | NIPPLE OT 1"-22X1,5 MM             |
| 91 - 60808002  | SPRING FORCK 3V                   | 104 - 60702036 | O-RING 2075 EPDM 1,78 X 18,77      |
| 92 - 61202027  | UPPER PISTON                      | 105 - 61408007 | HYDRONIC RETURN GROUP              |
| 93 - 61408005  | HYDRONIC SUPPLY GROUP.            | 106 - 61202026 | BY-PASS VALVE                      |
| 94 - 62113035  | HEATING PRESSURE SWITCH           | 107 - 60701006 | 3/4" GASKET                        |
| 95 - 60704003  | GASKET COPPER 1/4P                | 108 - 62653003 | DOMESTIC HEAT EXCHANGER "ACQUAJET" |
| 96 - 60801134  | SCREW 5X18 ZINC TC-ES-INC UNI5931 | 109 - 62110052 | SENSOR NTC 10 KOHM KLIP WITH SCREW |
| 97 - 61205010  | ASME SAFETY RELIEF VALVE          | 110 - 60702053 | O-RING 3037 EPDM 2,62 X 9,19       |
| 98 - 60113004  | CONNECTION BRASS 1/2P TO 3/4P MF  | 111 - 62628001 | PURGING PIPE                       |
| 99 - 60101082  | ELBOW BRASS 1/2P MF               | 112 - 61206011 | PURGING VALVE M10X1                |
| 100 - 61202025 | COVER PISTON HEATING              | 113 - 60808003 | FORCK BY-PASS PIPE                 |
| 101 - 61202028 | PISTON HEATING SIDE               |                |                                    |
| 102 - 60107005 | PLUG BRASS 1/4P M WITH O-RING     |                |                                    |

# 15 - SPARE PARTS

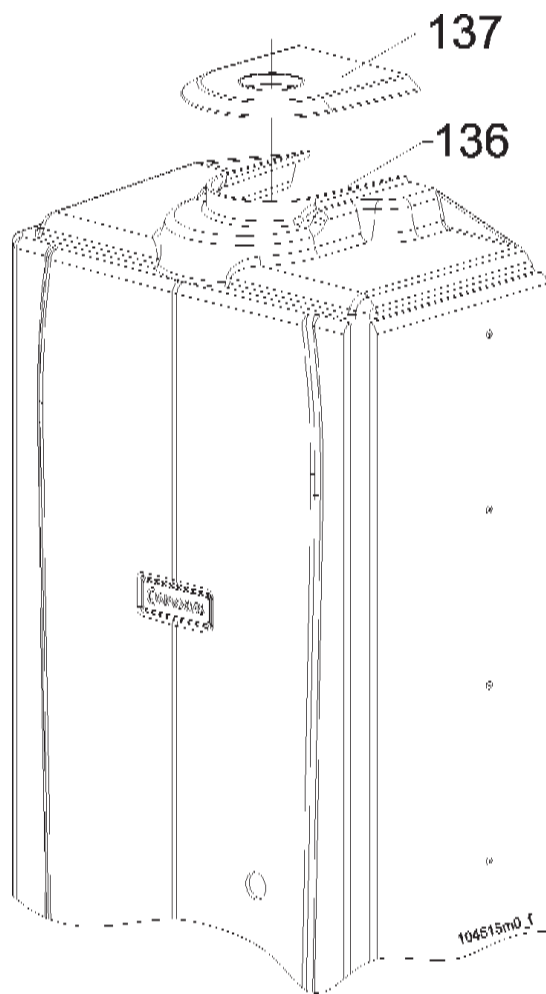


**Bottom of the boiler for  
45AN and 45AE models**

114 -	60305073	BY-PASS PIPE
115 -	60702054	O-RING 4075 EPDM 3,53 X 18,64
116 -	60901022	FRONT THERM. INSULATION "ACQUAJET"
117 -	60901023	REAR THERM. INSULATION "ACQUAJET"
118 -	60110025	NIPPLE OTT 3/4NPT-3/4P USA
119 -	60701004	1/2" G GASKET
120 -	61101001	FAIRLEAD PA 107 SCREW HILO 3,5X14,5
122 -	60101225	CONNECTION BRASS 1/2P TO 1P
123 -	60802018	3/4" NUT
124 -	60801135	SCREW 6X8 ZINC TC-CR DIN7985
125 -	62623248	SUPPLY PIPE FOR ONLY HEATING
126 -	61408008	HYDRONIC SUPPLY GROUP ONLY HEATING
127 -	60101193	1/2"-1/4" FF BRASS FITTING
128 -	60107014	PLUG BRASS 3/4P F
129 -	60107015	PLUG BRASS 3/8P F
130 -	61408009	HYDRONIC RETURN GROUP ONLY HEATING
131 -	60101124	1/2P CAP
132 -	62113041	PRESSURE SWITCH ON 4,5 INWC
133 -	60101064	ELBOW 1/2P F/F BRASS
134 -	60110001	NIPPLE 1/2P BRASS
135 -	60815012	GLASS WINDOW WITH GASKET

# 15 - SPARE PARTS

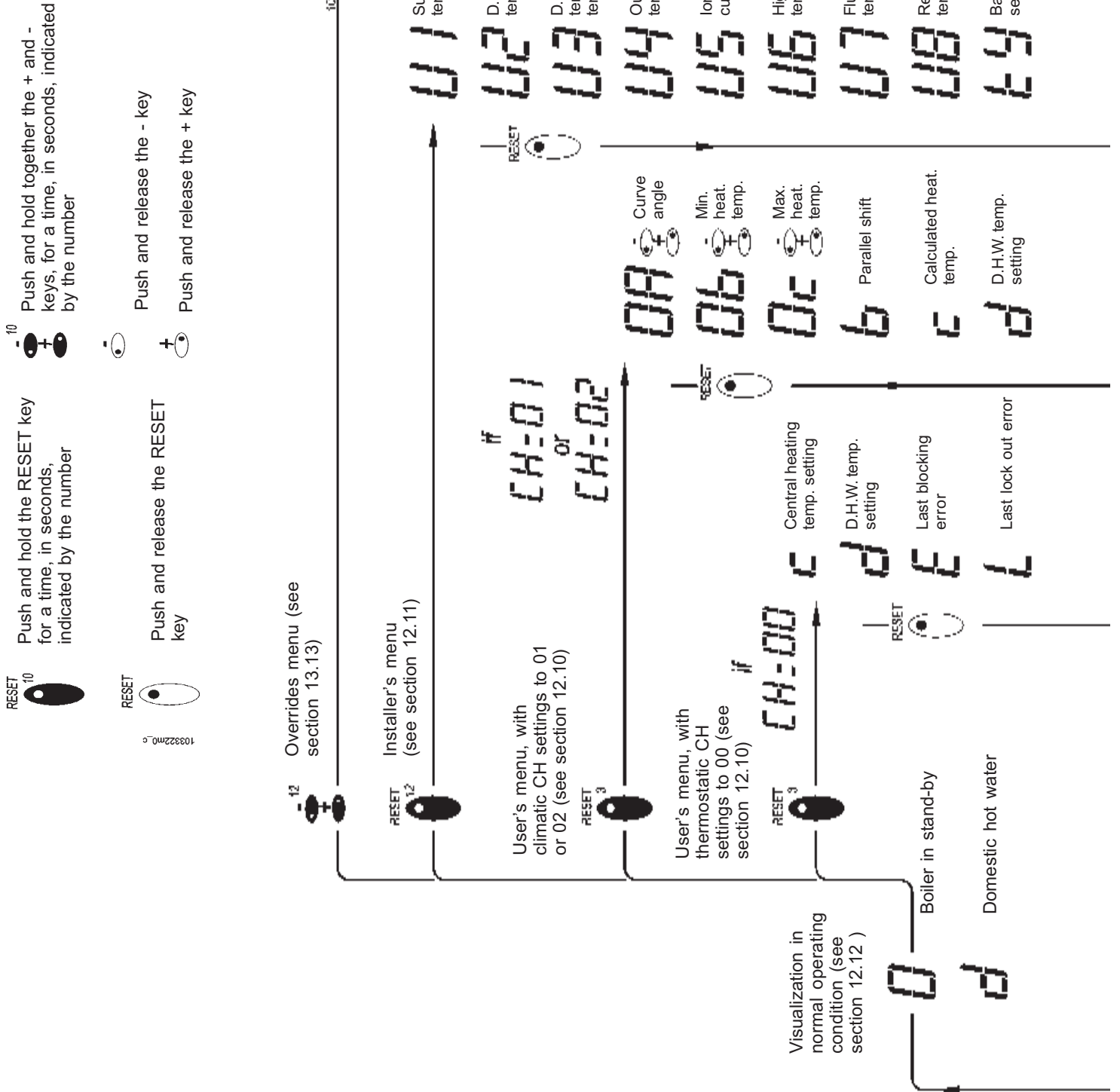
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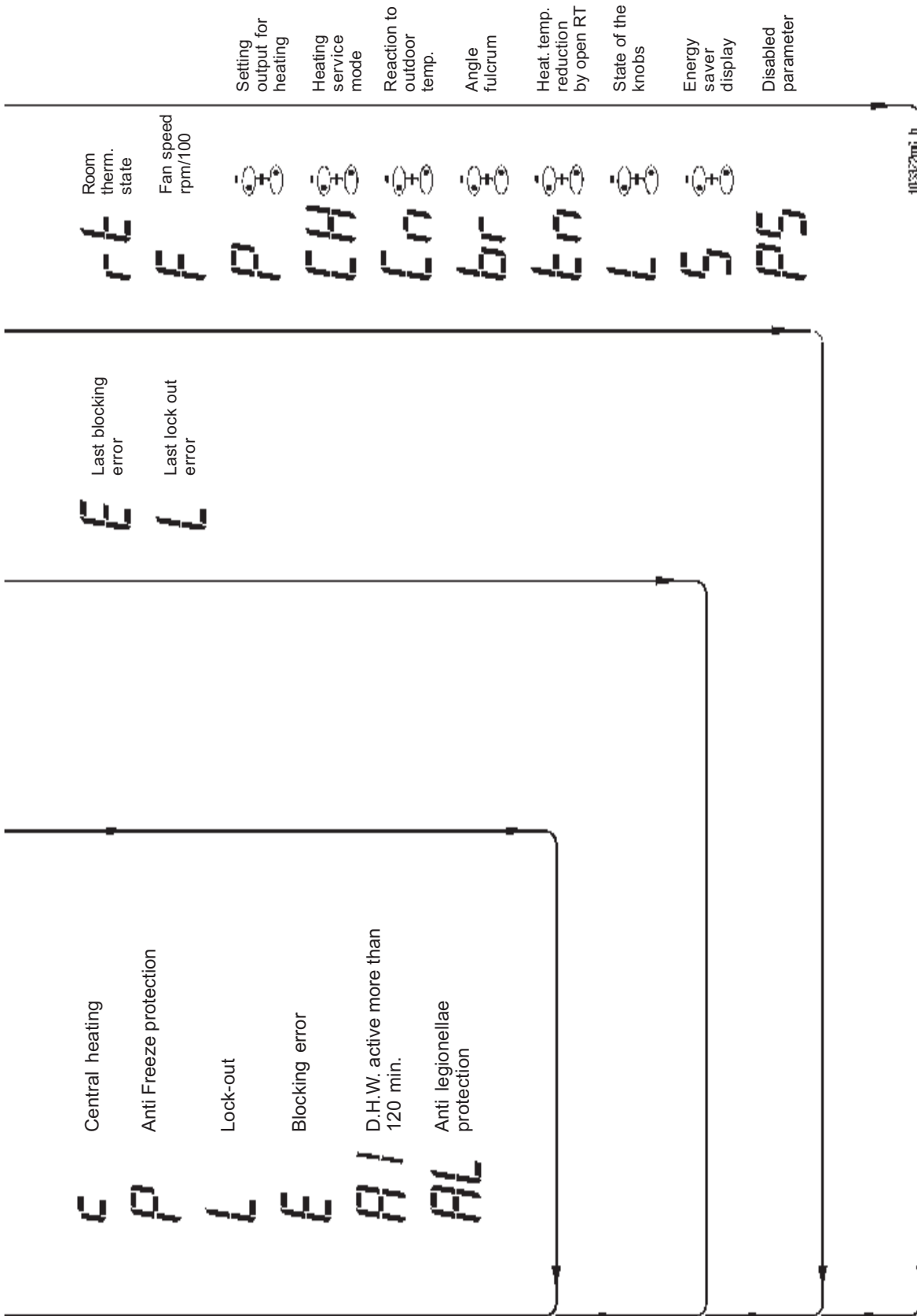
**External jacket for 45AE  
and 45WE models**

- 136 - 62606030 PLASTIC EXTERNAL JACKET
- 137 - 60703039 GASKET EPDM INTERNAL D60

# 16 - MENU'S FLOW CHART



# 16 - MENU'S FLOW CHART





# 16 - MENU'S 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 .

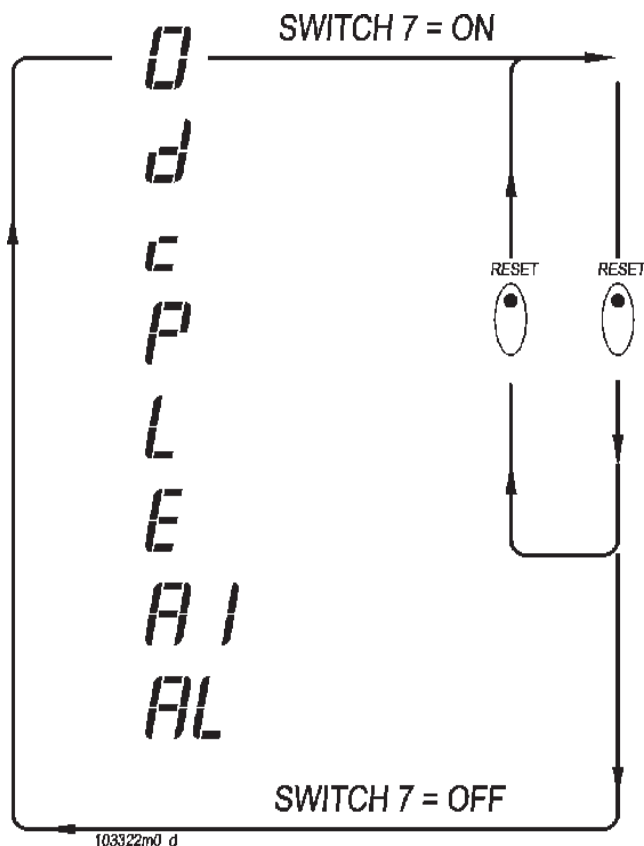
To enter this menu you must:

- shut Off the main electrical supply;
- move the switch n° 7 (see figure 22, item "D") to the ON position;
- lite On the main electrical supply.

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:

- shut Off the main electrical supply;
- move the switch n° 7 (see figure 22, item "D") to the Off position;



ty

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

cS

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

dS

Domestic functionalities selection. Must be always at 00

CU

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

Cr

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

ty

can assume the follow values:

- 61 - for 45xx at NATURAL gas;
- 62 - for 45xx at LP gas;

cS

can assume the follow values:

- 00 - 230Vac, 50Hz, °C;
- 01 - 230Vac, 50Hz, °F;
- 02 - 120Vac, 60Hz, °C;
- 03 - 120Vac, 60Hz, °F

dS

can assume the follow values:

- 00, 01 and 02. Must be always at 00.

CU

If readable, can assume the follow values:

- 00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.

Cr

If readable, can assume the follow values:

- 00, 01, 02, 03, 04, 05, 06, 07 and 08. Must be always at 00.



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**Via L. da Vinci 16**  
**47014 - Meldola (FC)**  
**ITALY**  
**[www.cosmogas.com](http://www.cosmogas.com)**  
**[info@cosmogas.com](mailto:info@cosmogas.com)**

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location of the one nearest you call  
413-564-9538.**